# Integrated Natural Resources Management Plan

## 2001 – 2005

INRMP

## U.S. Army Garrison Fort Belvoir, Virginia

Directorate of Installation Support – Environmental and Natural Resources Division

March 2001

# *Fort Belvoir Integrated Natural Resources Management Plan 2001 – 2005*

**U.S. Army Garrison Fort Belvoir**
**Fort Belvoir, Virginia**

**Environmental and Natural Resources Division**
**Directorate of Installation Support**

**March 2001**

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# *Integrated Natural Resource Management Plan*
# *U.S. Army Garrison Fort Belvoir*
# *Fort Belvoir, Virginia*

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**APPROVAL**

This Integrated Natural Resources Management Plan meets the requirements of the Sikes Act (16 U.S.C. 670a *et seq.*) as amended in the Sikes Act Improvement Act of 1997; Department of Defense Instruction 4715.3, *Environmental Conservation Program*, and Army Regulation 200-3, *Natural Resources – Land, Forest, and Wildlife Management.*

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# *Integrated Natural Resource Management Plan*
# *U.S. Army Garrison Fort Belvoir*
# *Fort Belvoir, Virginia*

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# Contents

**ACRONYMS AND ABBREVIATIONS** ..... **xvii**

**EXECUTIVE SUMMARY** ..... **xxi**
Purpose ..... xxi
Scope of the Integrated Natural Resources Management Plan ..... xxi
Relationship to the Military Mission ..... xxi
Environmental Compliance ..... xxii
Ecosystem Status ..... xxiii
Partnerships ..... xxiv
Plan Components ..... xxiv
Fort Belvoir's Natural Resources Management Program ..... xxv
Water Resources ..... xxvi
Wetlands ..... xxvi
Undeveloped Areas Vegetation ..... xxvi
Developed Areas Vegetation ..... xxvii
Wildlife ..... xxvii
Endangered, Threatened, and Rare Species ..... xxvii
Special Natural Areas ..... xxviii
Benefits ..... xxviii
Environmental Benefits ..... xxviii
Military Mission Benefits ..... xxix
Quality of Life ..... xxix
Compliance Benefits ..... xxix
Other Benefits ..... xxix
Resource Requirements ..... xxix
Staffing and Organization ..... xxx
Contracting and Partnering ..... xxx
Enforcement ..... xxxi
Conclusion ..... xxxi

**1.0 INTRODUCTION** ..... **1-1**

**2.0 U.S. ARMY GARRISON FORT BELVOIR** ..... **2-1**
2.1 Location ..... 2-1
2.2 Regional Setting ..... 2-1
2.2.1 Topography ..... 2-2
2.2.2 Geology and Geomorphology ..... 2-7
2.2.3 Climate ..... 2-11
2.2.4 Soils ..... 2-12
2.3 Fort Belvoir Site History ..... 2-15
2.4 Acquisition ..... 2-17
2.5 Neighbors ..... 2-18

2.6 Satellite Installations and Subinstallations ..... 2-20
2.7 Jurisdiction ..... 2-20

**3.0 MILITARY MISSION ..... 3-1**
3.1 Overview ..... 3-1
3.1.1 Fort Belvoir's Military Mission ..... 3-1
3.1.2 Mission Elements ..... 3-1
3.2 Natural Resources Needed To Support the Military Mission ..... 3-2
3.2.1 Military Training/Operations ..... 3-4
3.2.2 Cantonment Facilities and Family Housing ..... 3-5
3.2.3 Outdoor Recreation ..... 3-5
3.2.4 Environmental Stewardship ..... 3-6
3.3 Military Mission Effects on Natural Resources ..... 3-6
3.3.1 Military Training/Operations ..... 3-7
3.3.2 Cantonment Facilities and Family Housing ..... 3-7
3.3.3 Outdoor Recreation ..... 3-8
3.3.4 Environmental Stewardship ..... 3-8
3.4 Future Military Mission Effects on Natural Resources ..... 3-8

**4.0 LAND USE AND FACILITIES ..... 4-1**
4.1 Land Use ..... 4-1
4.1.1 Administration ..... 4-2
4.1.2 Research and Development ..... 4-5
4.1.3 Medical ..... 4-5
4.1.4 Community Facilities ..... 4-5
4.1.5 Housing ..... 4-5
4.1.6 Service and Storage ..... 4-5
4.1.7 Recreation ..... 4-5
4.1.8 Environmentally Sensitive Areas ..... 4-6
4.1.9 Transportation Areas ..... 4-7
4.1.10 Training Areas ..... 4-7
4.2 Transportation System ..... 4-8
4.2.1 Roadways ..... 4-8
4.2.2 Multi-use and Pedestrian Trails ..... 4-8
4.2.3 Rail Facilities ..... 4-11
4.2.4 Air ..... 4-11
4.3 Utilities ..... 4-11
4.3.1 Water Supply ..... 4-12
4.3.2 Sanitary Sewer System ..... 4-12
4.3.3 Storm Sewer System ..... 4-12
4.3.4 Electric Power System ..... 4-13
4.3.5 Natural Gas System ..... 4-13
4.3.6 Steam System ..... 4-13
4.3.7 Communications ..... 4-13

4.4 Projected Changes in Facilities ..... 4-14
4.4.1 Major New Building Construction ..... 4-14
4.4.2 Housing ..... 4-15
4.4.3 Recreation ..... 4-15
4.4.4 Training ..... 4-16
4.4.5 Transportation ..... 4-16
4.4.6 Utilities ..... 4-16

**5.0 RESPONSIBLE AND INTERESTED PARTIES ..... 5-1**
5.1 Installation Organizations ..... 5-1
5.1.1 The Garrison Commander ..... 5-1
5.1.2 Directorate of Installation Support ..... 5-1
5.1.3 Directorate of Personnel and Community Activities ..... 5-2
5.1.4 Public Affairs Office ..... 5-3
5.1.5 Staff Judge Advocate ..... 5-3
5.1.6 Provost Marshal's Office ..... 5-3
5.1.7 Directorate of Plans, Training, Mobilization, and Security ..... 5-3
5.1.8 DeWitt Army Community Hospital ..... 5-3
5.1.9 McNellis Veterinary Clinic ..... 5-4
5.1.10 Criminal Investigation Division ..... 5-4
5.1.11 Other Installation and Tenant Organizations ..... 5-4
5.2 Other Defense Organizations and Programs ..... 5-4
5.2.1 Assistant Chief of Staff for Installation Management ..... 5-4
5.2.2 Military District of Washington ..... 5-5
5.2.3 U.S. Army Environmental Center ..... 5-5
5.2.4 Army Center for Health Promotion and Preventive Medicine ..... 5-5
5.2.5 U.S. Army Corps of Engineers ..... 5-5
5.2.6 DoD Legacy Resource Management Program ..... 5-5
5.3 Other Federal Agencies and Programs ..... 5-6
5.3.1 U.S. Fish and Wildlife Service ..... 5-6
5.3.2 Chesapeake Bay Program ..... 5-6
5.3.3 United States Geological Survey ..... 5-6
5.3.4 National Marine Fisheries Service ..... 5-7
5.3.5 U.S. Department of Agriculture ..... 5-7
5.3.6 National Capital Planning Commission ..... 5-7
5.4 State Agencies ..... 5-7
5.5 Regional and Local Agencies ..... 5-8
5.6 Universities ..... 5-10
5.7 Non-Profit Organizations ..... 5-10

**6.0 NATURAL RESOURCES PROGRAM OVERVIEW ..... 6-1**
6.1 Biodiversity Conservation ..... 6-1
6.1.1 What Is Biodiversity? ..... 6-1
6.1.2 What Is Biodiversity Conservation? ..... 6-2
6.1.3 DoD's Role in Biodiversity Conservation ..... 6-2
6.1.4 DoD's Policy on Biodiversity Conservation ..... 6-3
6.1.5 Importance of Biodiversity Conservation to Installations ..... 6-4

6.2 Implementing Biodiversity Conservation ..... 6-4
6.2.1 The Ecosystem Approach ..... 6-4
6.3 Biodiversity Conservation at Fort Belvoir ..... 6-5
6.3.1 Management Philosophy ..... 6-5
6.3.2 Fort Belvoir Natural Resources Program Vision and Mission Statements ..... 6-6
6.3.3 Fort Belvoir Natural Resources Management Program Goals ..... 6-7
6.3.4 Fort Belvoir's Natural Resources Management Program Methodology ..... 6-7

**7.0 WATER RESOURCES ..... 7-1**
7.1 Water Resources Policies ..... 7-7
7.1.1 Federal Water Resources Policy ..... 7-7
7.1.2 State Water Resources Policy ..... 7-9
7.1.3 Department of Defense Water Resources Policy ..... 7-11
7.1.4 Department of the Army Water Resources Policy ..... 7-12
7.1.5 Fort Belvoir Water Resources Policy ..... 7-14
7.1.6 Chesapeake Bay Program ..... 7-14
7.1.7 American Heritage Rivers Initiative ..... 7-15
7.2 Baseline Water Resources Conditions ..... 7-16
7.2.1 Watersheds ..... 7-16
7.2.2 Aquatic Resources ..... 7-24
7.3 Water Resources Management ..... 7-34
7.3.1 Water Resources Conservation Recommendations ..... 7-34
7.3.2 Water Resources Multiple Use Requirements ..... 7-36
7.3.3 Water Resources Management Actions to Date ..... 7-36
7.4 Continuing and Future Water Resources Management ..... 7-43
7.4.1 Water Resources Management Objectives ..... 7-43
7.4.2 Water Resources Management Strategies ..... 7-44

**8.0 WETLANDS ..... 8-1**
8.1 Wetlands Policies ..... 8-2
8.1.1 Federal Wetlands Policy ..... 8-2
8.1.2 State Wetlands Policy ..... 8-2
8.1.3 Department of Defense Wetlands Policy ..... 8-3
8.1.4 Department of the Army Wetlands Policy ..... 8-4
8.1.5 Fort Belvoir Wetlands Policy ..... 8-4
8.1.6 Chesapeake Bay Program ..... 8-5
8.2 Baseline Wetland Conditions ..... 8-5
8.2.1 Wetlands Survey ..... 8-5
8.2.2 Natural Heritage Inventory ..... 8-6
8.3 Wetland Management ..... 8-9
8.3.1 Wetland Conservation Recommendations ..... 8-9
8.3.2 Wetland Management Actions to Date ..... 8-10
8.4 Continuing and Future Wetland Management ..... 8-13
8.4.1 Wetland Management Objectives ..... 8-14
8.4.2 Wetland Management Strategies ..... 8-14

**9.0 UNDEVELOPED AREAS VEGETATION ..... 9-1**
9.1 Undeveloped Areas Vegetation Policies ..... 9-2
9.1.1 Federal Undeveloped Areas Vegetation Policy ..... 9-2
9.1.2 State Undeveloped Areas Vegetation Policy ..... 9-3
9.1.3 Department of Defense Undeveloped Areas Vegetation Policy ..... 9-4
9.1.4 Department of the Army Undeveloped Areas Vegetation Policy ..... 9-5
9.1.5 Fort Belvoir Undeveloped Areas Vegetation Policy ..... 9-7
9.1.6 Chesapeake Bay Program ..... 9-8
9.1.7 Partners in Flight Program ..... 9-9
9.2 Baseline Vegetation Conditions ..... 9-9
9.2.1 Plant Community Survey ..... 9-10
9.2.2 Ecological Communities Assessment of Main Post ..... 9-13
9.2.3 Natural Heritage Inventory ..... 9-16
9.2.4 Floristic Inventory ..... 9-16
9.2.5 Invasive/Exotic Vegetation Survey ..... 9-16
9.2.6 Grassland Survey ..... 9-19
9.2.7 Timber Inventory ..... 9-19
9.2.8 Watershed Survey ..... 9-19
9.2.9 Forest Pest Surveys ..... 9-19
9.3 Undeveloped Areas Vegetation Management ..... 9-20
9.3.1 Undeveloped Areas Vegetation Conservation Recommendations ..... 9-20
9.3.2 Undeveloped Areas Vegetation Multiple Use Requirements ..... 9-20
9.3.3 Undeveloped Areas Vegetation Management Actions to Date ..... 9-22
9.4 Continuing and Future Undeveloped Areas Vegetation Management ..... 9-27
9.4.1 Undeveloped Areas Vegetation Management Objectives ..... 9-27
9.4.2 Undeveloped Areas Vegetation Management Strategies ..... 9-28

**10.0 DEVELOPED AREAS VEGETATION ..... 10-1**
10.1 Developed Areas Vegetation Policies ..... 10-1
10.1.1 Federal Developed Areas Vegetation Policy ..... 10-1
10.1.2 State Developed Areas Vegetation Policy ..... 10-3
10.1.3 Department of Defense Developed Areas Vegetation Policy ..... 10-4
10.1.4 Department of the Army Developed Areas Vegetation Policy ..... 10-5
10.1.5 Fort Belvoir Developed Areas Vegetation Policy ..... 10-8
10.1.6 Chesapeake Bay Program ..... 10-8
10.2 Baseline Developed Areas Vegetation Conditions ..... 10-9
10.2.1 Plant Community Survey ..... 10-9
10.2.2 Urban Forest Inventory ..... 10-9
10.2.3 Improved Grounds Vegetation Inventory ..... 10-10
10.2.4 Invasive Exotic Vegetation Survey ..... 10-10
10.3 Developed Areas Vegetation Management ..... 10-10
10.3.1 Developed Areas Vegetation Conservation Recommendations ..... 10-10
10.3.2 Developed Areas Vegetation Management Actions to Date ..... 10-10
10.4 Continuing and Future Developed Areas Vegetation Management ..... 10-12
10.4.1 Developed Areas Vegetation Management Objectives ..... 10-12
10.4.2 Developed Areas Vegetation Management Actions ..... 10-13

**11.0 WILDLIFE ..... 11-1**
11.1 Wildlife Policies ..... 11-4
11.1.1 Federal Wildlife Policy ..... 11-4
11.1.2 State Wildlife Policy ..... 11-7
11.1.3 Department of Defense Wildlife Policy ..... 11-8
11.1.4 Department of the Army Wildlife Policy ..... 11-9
11.1.5 Fort Belvoir Wildlife Policy ..... 11-15
11.1.6 Chesapeake Bay Program ..... 11-22
11.1.7 Partners in Flight Program ..... 11-22
11.2 Baseline Wildlife Conditions ..... 11-23
11.2.1 Mammals ..... 11-25
11.2.2 Birds ..... 11-27
11.2.3 Reptiles ..... 11-33
11.2.4 Amphibians ..... 11-35
11.3 Wildlife Management ..... 11-38
11.3.1 Wildlife Management Recommendations ..... 11-38
11.3.2 Wildlife Management Actions to Date ..... 11-39
11.4 Continuing and Future Wildlife Management ..... 11-52
11.4.1 Wildlife Management Objectives ..... 11-52
11.4.2 Wildlife Management Strategies ..... 11-53

**12.0 ENDANGERED, THREATENED, AND RARE SPECIES ..... 12-1**
12.1 Endangered, Threatened, and Rare Species Policies ..... 12-3
12.1.1 Federal Endangered, Threatened, and Rare Species Policy ..... 12-3
12.1.2 State Endangered, Threatened, and Rare Species Policy ..... 12-4
12.1.3 Department of Defense Endangered, Threatened, and Rare Species Policy . 12-4
12.1.4 Department of the Army Endangered, Threatened, and Rare Species Policy 12-9
12.1.5 Fort Belvoir Endangered, Threatened, and Rare Species Policy ..... 12-10
12.2 Endangered, Threatened, and Rare Species Baseline Conditions ..... 12-10
12.2.1 Bald Eagle ..... 12-11
12.2.2 Peregrine Falcon ..... 12-12
12.2.3 Wood Turtle ..... 12-12
12.2.4 Rare Species ..... 12-12
12.2.5 Rare Ecological Communities ..... 12-18
12.3 Endangered, Threatened, and Rare Species Management ..... 12-19
12.3.1 Endangered, Threatened, and Rare Species Management Recommendations 12-19
12.3.2 Endangered, Threatened, and Rare Species Management Actions to Date . 12-19
12.4 Continuing and Future Endangered, Threatened, and Rare Species Management .. 12-27
12.4.1 Management Objectives ..... 12-27
12.4.2 Management Strategies ..... 12-27

**13.0 SPECIAL NATURAL AREAS ..... 13-1**
13.1 Special Natural Areas Policies ..... 13-2
13.1.1 Federal Special Natural Areas Policy ..... 13-2
13.1.2 State Special Natural Area Policy ..... 13-2
13.1.3 Department of Defense Special Natural Area Policy ..... 13-2
13.1.4 Department of the Army Special Natural Area Policy ..... 13-4
13.1.5 Fort Belvoir Special Natural Area Policy ..... 13-5
13.1.6 Chesapeake Bay Program ..... 13-5
13.1.7 Partners in Flight Program ..... 13-5
13.2 Special Natural Areas Baseline Conditions ..... 13-6
13.2.1 Designated Special Natural Areas ..... 13-6
13.2.2 Ecologically Significant Natural Resource Areas ..... 13-6
13.3 Special Natural Areas Management ..... 13-15
13.3.1 Special Natural Areas Management Recommendations ..... 13-15
13.3.2 Special Natural Areas Management Actions to Date ..... 13-19
13.4 Continuing and Future Special Natural Areas Management ..... 13-23
13.4.1 Special Natural Areas Management Objectives ..... 13-24
13.4.2 Special Natural Areas Management Strategies ..... 13-25

**14.0 IMPLEMENTATION ..... 14-1**
14.1 Natural Resources Projects ..... 14-1
14.2 Natural Resources Program Management Organization and Staffing ..... 14-4
14.3 Natural Resource Funding ..... 14-10

**15.0 INTEGRATION ..... 15-1**
15.1 Real Property Master Plan Long-Range Component and Real Property Master Plan Installation Design Guide ..... 15-2
15.2 Cultural Resources Management Plan ..... 15-3
15.3 Training Schedule ..... 15-4
15.4 Fort Belvoir Real Property Maintenance Contract ..... 15-4
15.5 Integrated Pest Management Plan ..... 15-5
15.6 Pollution Prevention Plan ..... 15-5
15.7 Stormwater Pollution Prevention Plan ..... 15-5
15.8 Phase II Stormwater Program ..... 15-6
15.9 Master Spill Plan ..... 15-7
15.10 Petroleum Storage Tank Compliance Program ..... 15-7
15.11 Integrated Solid Waste Management Plan ..... 15-8
15.12 Solid Waste Landfill Postclosure Plans ..... 15-8
15.13 Solid Waste Management Units Program ..... 15-9
15.14 Environmental Training Program ..... 15-9

**APPENDICES**

Appendix A. Memorandum of Agreement for Cooperative Law Enforcement between the U.S. Fish and Wildlife Service and Fort Belvoir
Appendix B. Interagency Agreement between the U.S. Army Environmental Center and the Soil Conservation Service
Appendix C. Interagency Agreement between the U.S. Department of Agriculture and the Department of Defense
Appendix D. Fish and Wildlife Tables
Table D.1. Fish
Table D.2. Mammals
Table D.3. Birds
Table D.4. Reptiles
Table D.5. Amphibians
Appendix E. Fort Belvoir Plant List
Appendix F. Plant Communities Mapped on Fort Belvoir Prior to the Development of the Nature Conservancy's National Vegetation System
Appendix G. Ecological Community Types of Fort Belvoir
Appendix H. Fort Belvoir Supplement 1 to AR 200-3: *Natural Resources: Land, Forest, and Wildlife Management*
Appendix I. Fort Belvoir Policy Memorandum #420-22-00: *Tree Removal and Protection Policy*
Appendix J. Fort Belvoir Policy Memorandum #420-26-00: *Excavation Work Permit Requirements and Procedures*
Appendix K. Fort Belvoir Policy Memorandum #200-04-00: *Integrated Pest Management Policy*
Appendix L. Fort Belvoir Environmental Protection Specifications Applicable to Construction Contracts
Appendix M. Vegetation Recommended for Conservation Plantings
Appendix N. Fort Belvoir Bird Checklist
Appendix O. Fort Belvoir Hunting Fact Sheet
Appendix P. DoD Instruction 4715.3, Environmental Conservation Program, dated 3 May 1996
Appendix Q. Department of the Army, Assistant Chief of Staff for Installation Management Memo dated 29 June 1994; Subject: Development of Army Policy and Program for Ecosystems Management

**FIGURES**

Figure 2.1. General location of Fort Belvoir ..... 2-3
Figure 2.2. Fort Belvoir, Virginia ..... 2-5
Figure 2.3. Physiographic provinces of Virginia ..... 2-9
Figure 2.4. Lands in public ownership ..... 2-21
Figure 4.1. Designated Planning Districts and Environmentally Sensitive Areas on Fort Belvoir ..... 4-3
Figure 4.2. Riparian / Resource Protection Areas on Fort Belvoir ..... 4-9
Figure 7.1. Major watersheds originating outside of Fort Belvoir ..... 7-3
Figure 7.2. Watersheds and subwatersheds on Fort Belvoir ..... 7-5

Figure 8.1. Wetlands on Fort Belvoir ..... 8-7
Figure 8.2. Virginia Natural Heritage Inventory Recommended Conservation Areas on Fort Belvoir ..... 8-11
Figure 9.1. Plant communities on Fort Belvoir ..... 9-11
Figure 11.1. Partners in Flight high priority breeding bird habitat on Fort Belvoir ..... 11-36
Figure 11.2. Fish and wildlife migratory routes on Fort Belvoir ..... 11-44
Figure 11.3. Hunting areas and deer spotlight survey route on Fort Belvoir ..... 11-46
Figure 12.1. Threatened and endangered species habitat on Fort Belvoir ..... 12-5
Figure 12.2. Rare plant communities mapped by Virginia Natural Heritage Inventory on Fort Belvoir ..... 12-7
Figure 12.3. Rare species mapped by Virginia Natural Heritage Inventory on Fort Belvoir ..... 12-13
Figure 12.4. Designated Bald Eagle Management Areas on Fort Belvoir ..... 12-23
Figure 13.1. Composite figure of ecologically significant natural resource areas on Fort Belvoir ..... 13-7
Figure 13.2. Hiking trails and wildlife crossings on Fort Belvoir ..... 13-13
Figure 14.1. Natural Resource Projects ..... 14-3
Figure 14.2. Natural Resources Program Funding ..... 14-12

**TABLES**

Table 2.1. Temperature and Precipitation Data for Fort Belvoir ..... 2-11
Table 2.2. Fort Belvoir Soils ..... 2-13
Table 2.3. Major Public Land Owners Near and Adjacent to Fort Belvoir ..... 2-19
Table 2.4. Fort Belvoir Satellite Installations ..... 2-20
Table 3.1. Fort Belvoir Mission-Related Natural Resources Needs and Constraints ..... 3-3
Table 4.1. General Land Use ..... 4-1
Table 4.2. Construction Projects for FY 97 through FY 05 ..... 4-14
Table 7.1. Fort Belvoir Major Watershed Survey – Summary ..... 7-17
Table 7.2. Fort Belvoir Watershed Survey – Accotink Creek ..... 7-17
Table 7.3. Fort Belvoir Watershed Survey – Dogue Creek ..... 7-19
Table 7.4. Fort Belvoir Watershed Survey – Pohick Creek ..... 7-20
Table 7.5. Fort Belvoir Watershed Survey – Gunston Cove ..... 7-21
Table 7.6. Fort Belvoir Watershed Survey – Accotink Bay ..... 7-22
Table 7.7. Fort Belvoir Watershed Survey – Pohick Bay ..... 7-23
Table 7.8. Fort Belvoir Watershed Survey – Potomac River ..... 7-24
Table 7.9. Sources of Fort Belvoir Area Aquatic Resources Information ..... 7-25
Table 7.10. Summary of Habitat Quality Evaluated at Fort Belvoir Streams ..... 7-32
Table 8.1. Wetland Type and Acreage on Fort Belvoir ..... 8-6
Table 9.1. Sources of Fort Belvoir Vegetation Information ..... 9-9
Table 9.2. Acreage and Distribution of Plant Community Types on Fort Belvoir ..... 9-13
Table 9.3. Distribution of Ecological Community Types on Fort Belvoir ..... 9-14
Table 9.4. Invasive/Exotic Vegetation on Fort Belvoir Recommended for Control ..... 9-17
Table 11.1. Species that Benefit from Habitat Recognized by PIF Bird Indicator Species ..... 11-3
Table 11.1. Sources of Fort Belvoir Wildlife Information ..... 11-23
Table 11.2. Partners in Flight Priority Species Pool in Decreasing Order of Concern ..... 11-30

Table 11.3. High Priority Partners in Flight Species for the Mid-Atlantic Coastal Plain Documented as Breeders on Fort Belvoir 1998-1999. ..... 11-33
Table 12.1. Virginia Natural Heritage Ranked Species Identified by the 1996-1997 Natural Heritage Inventory ..... 12-15
Table 12.2. Commonwealth of Virginia and Natural Heritage Ranked Species That Have Been Identified on Fort Belvoir ..... 12-16
Table 12.3. Bald Eagle Management Recommendations of the U.S. Fish and Wildlife Service and the Virginia Department of Game and Inland Fisheries ..... 12-20
Table 12.4. Bald Eagle Management Area Restrictions as Designated in the Bald Eagle Management Plan (depicted in Figure 12.4) ..... 12-25
Table 13.1. Ecologically Significant Natural Resource Areas on Fort Belvoir ..... 13-9
Table 13.2. Key Management Recommendations from the Comprehensive Management Plan for the Fort Belvoir Refuge Complex ..... 13-17
Table 14.1. Natural Resource Branch Technical Areas ..... 14-4
Table 14.2. Program Management Functions ..... 14-5
Table 14.3. Water Resources Technical Area Project Summary ..... 14-13
Table 14.4. Wetland Resources Technical Area Project Summary ..... 14-16
Table 14.5. Undeveloped Areas Vegetation Technical Area Project Summary ..... 14-18
Table 14.6. Developed Areas Vegetation Technical Area Project Summary ..... 14-21
Table 14.7. Wildlife Management Technical Area Project Summary ..... 14-24
Table 14.8. Endangered, Threatened and Rare Species Management Technical Area Project Summary ..... 14-28
Table 14.9. Special Natural Areas Management Technical Area Project Summary ..... 14-31

# *Acronyms and Abbreviations*

| | |
|---|---|
| AEC | U.S. Army Environmental Center |
| AMEDD | Army's Medical Department |
| APHIS | Animal and Plant Health Inspection Service |
| AR | Army Regulation |
| ATM | Asynchronous Transfer Mode |
| BASEOPS | Base Operations |
| BMP | Best Management Practice |
| CA | Cooperative Agreement |
| CBP | Chesapeake Bay Program |
| CBPA | Chesapeake Bay Preservation Act |
| CERL | Construction Engineering Research Laboratory |
| CHPPM | Center for Health Promotion and Preventive Medicine |
| CMD | Contract Management Division |
| CPOC | Civilian Personnel Operations Office |
| CWA | Clean Water Act |
| CZMA | Coastal Zone Management Act |
| D/CEETA | Defense Communications-Electronics Evaluation and Testing Activity |
| DA | Department of the Army |
| DCD | Design and Construction Division |
| DCR | Department of Conservation and Recreation |
| DCR-NHP | Virginia Department of Conservation and Recreation National Heritage Program |
| DIS | Directorate of Installation Support |
| DLA | Defense Logistics Agency |
| DMAP | Deer Management Assistance Program |
| DoD | Department of Defense |
| DPCA | Directorate of Personnel and Community Activities |
| DPOP | Deer Population Control Program |

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| DPTMS | Directorate of Plans, Training, Mobilization, and Security |
| DRMO | Defense Reutilization and Marketing Office |
| EA | Environmental Assessment |
| ECB | Environmental Compliance Branch |
| ENRD | Environmental and Natural Resource Division |
| EPA | Environmental Protection Agency |
| EPG | Engineering Proving Grounds |
| EQCC | Environmental Quality Control Committee |
| ERTC | Engineer Replacement Training Center |
| ESA | Endangered Species Act |
| ESMP | Endangered Species Management Plan |
| FEMA | Federal Emergency Management Agency |
| FY | Fiscal Year |
| GIS | Geographic Information System |
| GMU | George Mason University |
| HEC | Humphreys Engineer Center |
| I-95 | Interstate 95 |
| IDIQ | Indefinite Delivery, Indefinite Quantity |
| INRMP | Integrated Natural Resources Management Plan |
| IPM | Integrated Pest Management |
| IPMP | Integrated Pest Management Plan |
| ISDN | Integrated Services Digital Network |
| LID | Low Impact Development |
| MACOM | Major Army Command |
| MAPS | Monitoring Avian Productivity and Survivorship Program |
| MDW | Military District of Washington |
| MGD | Million Gallons Per Day |
| MOA | Memorandum of Agreement |
| MOU | Memorandum of Understanding |
| msl | Mean Sea Level |
| MS4s | Municipal Separate Storm Sewer Systems |

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| NAWQA | National Water Quality Assessment |
| NEPA | National Environmental Policy Act |
| NMFS | National Marine Fisheries Service |
| NRB | Natural Resources Branch |
| NRCS | Natural Resources Conservation Service |
| NVEOC | Night Vision and Electro-Optics Center |
| O&M | Operations and Maintenance |
| ORISE | Oak Ridge Institute for Science and Education |
| ORV | Off-Road Vehicle |
| PAO | Public Affairs Officer |
| PIF | Partners in Flight |
| PMO | Provost Marshal's Office |
| R&D | Research and Development |
| RBP | Rapid Bioassessment Protocol |
| RCRA | Resource Conservation and Recovery Act |
| ROTC | Reserve Officers Training Corps |
| RPA | Resource Protection Area |
| RPMA | Real Property Maintenance Activities |
| SCS | Soil Conservation Service |
| SJA | Staff Judge Advocate |
| SOP | Standard Operating Procedure |
| SWMU | Solid Waste Management Unit |
| TEC | Topographic Engineering Center |
| TNC | The Nature Conservancy |
| USACE | United States Army Corps of Engineers |
| USDA | United States Department of Agriculture |
| USFWS | United States Fish and Wildlife Service |
| USGS | United States Geological Survey |
| VDEQ | Virginia Department of Environmental Quality |
| VDGIF | Virginia Department of Game and Inland Fisheries |
| VDOT | Virginia Department of Transportation |

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| VMRC | Virginia Marine Resources Commission |
| WES | Waterways Experiment Station |
| WMATA | Washington Area Metropolitan Transit Authority |

# *Executive Summary*

## PURPOSE

This Integrated Natural Resources Management Plan (INRMP) guides the implementation of the U.S. Army Fort Belvoir's natural resources program for the years 2001 through 2005. The plan establishes procedures to ensure the sustainability of the land to accomplish Fort Belvoir's military mission. It outlines conservation efforts for Fort Belvoir's natural resources (e.g., aquatic resources, flora, fauna) and establishes procedures to ensure compliance with related environmental laws and regulations.

## SCOPE OF THE INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

Implementation of this plan applies to organizations both internal and external to Fort Belvoir that influence, or have the potential to influence Fort Belvoir's natural resources. This application includes active duty units, U.S. Army Reserve and National Guard components, tenant and satellite organizations, directorates, private groups, and individuals.

## RELATIONSHIP TO THE MILITARY MISSION

Fort Belvoir's mission is to operate and maintain the installation; provide quality installation support and services to its customers; and to plan, maintain, and execute mobilization readiness, military operations, and contingency missions. Since the departure of the Engineer School in 1988, the emphasis of Fort Belvoir's mission has shifted from training to providing logistical and administrative support to its tenants. Fort Belvoir is home to approximately 100 tenant and satellite organizations, and more than 2,000 family housing units. The installation's 9,094 acres support a working population of approximately 17,000, including 4,500 military personnel.

Fort Belvoir's mission includes the following eight elements:

- Contingency Military Support
- Regional Administration Center
- Regional Logistics Support Center
- Regional Recreation Center
- Regional Classroom Center
- Regional Housing

- Regional Military Community Support
- Regional Environmental Stewardship

Although much of Fort Belvoir's land area remains undeveloped, the installation's mission requires significant administrative space and infrastructure. Fort Belvoir has become the receiving installation of many organizations realigned by the Base Realignment and Closure Acts. New roads and buildings have been constructed on Fort Belvoir, and existing roads have been improved to accommodate increased numbers of personnel. New community support facilities have been built to provide services to military personnel and their dependents in the national capital region. Development is expected to continue as Fort Belvoir becomes host to additional tenants, as well as additional housing and community support facilities. Belvoir's natural resources provide high-quality settings for housing and administration facilities. They also contribute to the installation's Morale, Welfare, and Recreation Programs, which are aimed at improving the quality of life for military and civilian personnel who work and reside on post.

Military training activities on Fort Belvoir are not land intensive. They primarily consist of land navigation, rescue, defensive tactics, mission essential task list skills, road march, float bridge, fixed-wing aircraft, and helicopter transport and touch and go training.

This INRMP addresses the impacts of the military mission (i.e., the eight mission elements) on natural resources and proposes means to mitigate these impacts. It also addresses natural resources required to sustain the various elements of Fort Belvoir's military mission.

## ENVIRONMENTAL COMPLIANCE

Several regulations mandate the preparation and implementation of this INRMP. They are the Sikes Act (16 U.S.C. 670a et seq.) as amended in the Sikes Act Improvement Act of 1997; Department of Defense (DoD) Instruction 4715.3, *Environmental Conservation Program*; and Army Regulation (AR) 200-3, *Natural Resources – Land, Forest, and Wildlife Management*. DoD Instruction 4715.3 requires that INRMPs be maintained and implemented for lands that have suitable habitat for conserving and managing natural ecosystems. The plans are to be developed with active involvement of installation and higher command personnel, and are to involve coordination with relevant outside authorities, partners, and users. Natural resources management is to be integrated and should follow the principles and practices of ecosystem management and biodiversity conservation.

This INRMP should be reviewed annually so it can be updated for mission or environmental changes, and it should be revised and approved by the command level at least every 5 years. This INRMP describes how Fort Belvoir will implement provisions of the Sikes Act, DoD Instruction 4715.3, AR 200-3, and installation regulations and policies. Installation regulations and policies include the Fort Belvoir Supplement to AR 200-3; Fort Belvoir Regulation 210-70, *Range Procedures and Utilization of Training Areas;* Fort Belvoir's *Tree Removal and Protection Policy*, 420-22-00; and, Fort Belvoir *Integrated Pest Management Policy*, 200-04-00. This INRMP helps ensure that Fort Belvoir complies with federal, state, regional, and local statutes, regulations and initiatives, most notably those associated with wetlands (e.g., Clean Water Act, Executive Order 11990, North American Wetlands Conservation, etc.), endangered species (e.g.,

Endangered Species Act, Fish and Wildlife Coordination Act, Bald and Golden Eagle Protection Act), water quality (e.g., Clean Water Act, Phase I and Phase II Stormwater Regulations, Chesapeake Bay Restoration Act, Coastal Zone Management Act), and fish and wildlife management (e.g., Fish and Wildlife Coordination Act, Lacey Act, Migratory Bird Treaty Act, etc.).

The Sikes Act requires Fort Belvoir to coordinate with the U.S. Fish and Wildlife Service (USFWS) and the Virginia Department of Game and Inland Fisheries (VDGIF) to obtain their signatory approval of this plan. Coordination with USFWS is part of the formal consultation process under the Endangered Species Act.

## ECOSYSTEM STATUS

Fort Belvoir is located on the western shore of the Potomac River, approximately 75 miles upstream of the Chesapeake Bay. The installation has more than 12 miles of shoreline, three significant wetland areas (two of which are designated wildlife refuges), and extensive interior contiguous forested areas. Approximately 70% of Fort Belvoir is undeveloped. The installation supports 17 plant community types, four of which possess state conservation rankings of "very rare," or rarer. A large number of fish and wildlife species have been recorded, or are considered likely to occur on Fort Belvoir including 43 species of mammals, 263 species of birds, 32 species of reptiles, 27 species of amphibians, and 60 species of fish. These numbers include three state and/or federal listed species: the bald eagle (federal-listed threatened and state-listed endangered), the peregrine falcon (state-listed endangered), and the wood turtle (state-listed threatened). The installation also supports 89 state rare plant and animal species and 63 Partners in Flight (PIF) priority bird species.

Fort Belvoir's surrounding local area (metropolitan Washington D.C. area) and regional area (Chesapeake Bay region) are both experiencing rapid conversions of undeveloped natural areas to developed land uses. Within the metropolitan Washington D.C. area, Fort Belvoir represents a significant tract of native vegetation in terms of size, diversity, and position relative to the location of off-post tracts of native vegetation. Fort Belvoir has recognized the ecological importance of on-post natural habitats by conserving two installation wildlife refuges (Accotink Bay Wildlife Refuge and Jackson Miles Abbott Wetland Refuge) totaling approximately 1,500 acres and designating a Forest and Wildlife Corridor covering approximately 740 acres. These large areas of native vegetation are aligned on Fort Belvoir's Main Post from the northeast to the southwest. This linear configuration affords a contiguous band of wildlife habitat through the installation, and provides for connection with wildlife habitat areas outside the installation (e.g., Huntley Meadows County Park, Pohick Bay Regional Park, etc.).

Fort Belvoir has completed its primary baseline natural resources surveys. These baseline surveys provide the foundation of the natural resources program. Consistent with the principles of ecosystem management, Fort Belvoir aims to preserve the native diversity of communities and of species within communities. The installation does not emphasize single-species management, nor does it aim to increase the number of species or communities on post. Fort Belvoir fully embraces biodiversity conservation, and has developed and implemented an ecosystem-based natural resources management program.

## PARTNERSHIPS

This INRMP cannot be implemented by Fort Belvoir base operations (BASEOPS) staff alone. In accordance with the ecosystem management philosophy, Fort Belvoir has forged partnerships with federal, state, and local government agencies, and private organizations, to manage its natural resources. Partnering agencies include the USFWS, the VDGIF, the U.S. Army Corps of Engineers, the U.S. Forest Service, the Virginia Department of Forestry, the Virginia Department of Conservation and Recreation (DCR), the Northern Virginia Regional Parks Authority, and the Fairfax County Department of Planning. In addition, Fort Belvoir is an active participant in the Chesapeake Bay Program, which is a DoD and DA-supported program. Fort Belvoir also participates in other international, national, and regional initiatives including the PIF Program and Fairfax County's oral rabies vaccination program. Over the next 5 years, Fort Belvoir will participate in other regional management initiatives as needed and appropriate.

## PLAN COMPONENTS

This INRMP describes Fort Belvoir's environmental setting; the installation history; Fort Belvoir's military mission, its impacts on natural resources, and natural resources needed to support the mission; installation land use and facilities; and parties responsible and/or interested in implementing this INRMP.

This INRMP conveys Fort Belvoir's vision and mission statements for the natural resources program, as well as overall program goals. Fort Belvoir's natural resources management program is fully integrated among all natural resources disciplines. Consequently, implementation of management actions is not necessarily discipline-specific. However, to facilitate the presentation of its natural resources management program in this INRMP, Fort Belvoir's natural resources management program is defined and described in terms of seven major natural resources discipline areas, as follows:

- Water Resources, (e.g., watersheds, aquatic systems, and fish)
- Wetlands
- Undeveloped Areas Vegetation, (e.g., native vegetation communities and forests)
- Developed Areas Vegetation, (e.g., landscaping, urban tree management, grounds maintenance, and pest management)
- Wildlife
- Endangered, Threatened, and Rare Species and Communities
- Special Natural Areas (e.g., refuges, and the Forest and Wildlife Corridor).

These natural resources disciplines areas are presented in seven individual sections of this INRMP. For each of these seven discipline areas, the INRMP describes baseline conditions and presents related management policies, objectives, and actions (e.g., management actions to date, continuing and future management).

This INRMP also includes sections addressing implementation and integration with other related plans (e.g., Long-Range Component of the Master Plan, Design Guidelines, Integrated Pest Management Plan, Stormwater Pollution Prevention Plan, etc.). The implementation section addresses the resource requirements (e.g., staffing and funding), organizational requirements, and contract requirements needed to implement this plan, and thus fulfill the requirements of the Sikes Act, DoD Instruction 4715.3, and AR 200-3. The implementation section describes program management functions necessary to execute projects in each technical area, and provides a summary of projects by fiscal year. The implementation section also discusses necessary funding to implement the INRMP. The integration section identifies other installation plans and programs (e.g., Master Planning, Pollution Prevention, Cultural Resources Management and Stormwater Pollution Prevention, etc.) that could relate to natural resources and the implementation of this INRMP.

This INRMP has been documented using National Environmental Policy Act procedures and policies. The Fort Belvoir INRMP Environmental Assessment documents the evaluation of various approaches to manage Fort Belvoir's natural resources through the implementation of an INRMP.

## FORT BELVOIR'S NATURAL RESOURCES MANAGEMENT PROGRAM

Fort Belvoir's natural resources management philosophy focuses on biodiversity conservation. Installation personnel have developed and implemented an ecosystem-based natural resources management program following this philosophy. Fort Belvoir's vision for the natural resources management program is to manage natural resources using sound ecological principles in an appropriate landscape context (e.g., local, regional, and national), to support the military mission, and to continue to provide opportunities for future generations to access and use the installation's natural resources, consistent with resource conservation.

The mission of the natural resources management program is to manage natural resources as an integral part of Fort Belvoir's military mission. As the guardian of army lands, it is the mission of the natural resources program to maintain the existing level of biodiversity using sound ecological principles to ensure that economic and aesthetic values of public lands are maintained. The program's mission involves ensuring installation compliance with natural resources laws and regulations, as well as providing public access and customer service support to base operations, tenants, military personnel and their families; the research and education community; and the general public.

The objectives and actions in this INRMP are written in accordance with Fort Belvoir's natural resources management philosophy, vision, and mission. Many of the management actions are continuations of existing actions. Management will continue to prioritize conserving and enhancing native resources, while providing balance among the multiple legitimate uses and users of these resources. Continued support of military training and testing will take primacy. After that, management emphasis will be on conservation and enhancement of resources in accordance with established DoD and DA natural resources management policies, and DoD and DA commitments to natural resource stewardship programs, such as the Chesapeake Bay Program and the PIF Program. All of the installation's natural resources management actions

will be in accordance with applicable federal, state, local, DoD, DA, and Fort Belvoir policy. Planned management for each component resource is discussed in the following subsections.

**Water Resources**

Fort Belvoir recognizes that the most significant threats to local water resources today arise from stormwater-related problems, as well as misuse and overuse. Consequently, Fort Belvoir's conservation program will continue to emphasize actions to correct and prevent stormwater-related problems, to restore damaged stream corridors, and to foster wise use of water resources. Fort Belvoir's natural resources management program will continue to promote public access to and appropriate use of water resources, and will continue to provide the public opportunities for recreational use of water resources and for environmental education and scientific research and study of water resources, consistent with resource conservation objectives. The natural resources program will continue to pursue innovative approaches to water resources management, and will increase efforts toward and involvement with regional water resources management actions.

**Wetlands**

Wetlands management on Fort Belvoir will continue to emphasize no net loss of wetlands and conservation and enhancement of native biodiversity. Fort Belvoir will continue to use conservation land-use designations to protect wetland areas from avoidable impact by construction or other land disturbing activities, as well as from impact by land development and land use activities in adjacent areas. The installation will continue to implement damage-control management actions, such as invasive/exotic species management, stormwater management, and problem wildlife management, to protect wetland resources from those threats. Fort Belvoir will continue to consider the potential for impacts to wetlands when making land-use and operational decisions, and will continue to mitigate all unavoidable wetland losses/impacts consistent with U.S. Army Corps of Engineers and U.S. Environmental Protection Agency policies on wetland mitigation. Fort Belvoir will continue to provide the public opportunities for recreational use of wetlands and for environmental education and scientific research and study, consistent with resource conservation objectives. Where practicable and consistent with the installation mission, Fort Belvoir will continue to undertake actions to restore and enhance native wetland conditions.

**Undeveloped Areas Vegetation**

Fort Belvoir's vegetation management program will continue to emphasize sustaining and enhancing forest and grassland resources and controlling invasive/exotic vegetation. The installation will continue to manage threats to the installation's native vegetation by conserving its three special natural areas (i.e., the two refuges and the Forest and Wildlife Corridor), protecting vegetation in wetlands and steep sloped areas, correcting stormwater-related problems, and controlling overabundant wildlife and invasive vegetation. The post also intends to continue to perform vegetation restoration and enhancement in disturbed areas. Fort Belvoir will continue to provide the public opportunities for recreational use of undeveloped areas vegetation and for environmental education and scientific research and study, consistent with resource conservation objectives.

### Developed Areas Vegetation

Fort Belvoir's developed areas management will continue to focus on sustaining and enhancing the installation's urban forest resources and providing grounds maintenance services. Management actions will continue to emphasize minimizing tree loss and mitigating unavoidable losses, reducing mowing throughout the installation, performing pest management in accordance with the installation Integrated Pest Management Plan, and performing invasive/exotic vegetation management.

### Wildlife

Fort Belvoir's overall wildlife management strategy is to conserve and enhance healthy native wildlife communities, rather than emphasizing single-species or game-species management or production. Fort Belvoir's management program recognizes the importance of understanding native habitats, and managing or responding to the forces that influence those habitats. Fort Belvoir's management program will continue to focus on (1) conserving natural habitats in the size and configuration that best supports native wildlife populations; (2) eliminating, minimizing, or offsetting habitat disruptions such as forest fragmentation and damage by overabundant species; (3) enhancing habitat conditions for species and suites of species having recognized conservation priority, such as threatened, endangered, and PIF priority bird species; and (4) using indicator species to evaluate and set priorities for manipulation of habitat conditions. Fort Belvoir's natural resources management program will continue to promote public access to and appropriate use of wildlife resources, and will continue to provide the public opportunities for recreational use of wildlife resources, and for environmental education and for scientific research and study of wildlife resources, consistent with resource conservation objectives. Fort Belvoir will continue management actions to reduce the risk of problem wildlife disrupting mission. Fort Belvoir will continue to use hunting as a wildlife management tool. Fort Belvoir will continue, and expand upon, existing efforts and involvement with regional wildlife management actions.

### Endangered, Threatened, and Rare Species

Fort Belvoir intends to continue the management emphasis on conservation of endangered, threatened, and rare species (and their habitats), and rare ecological communities. The foundation of Fort Belvoir's endangered, threatened, and rare species management is habitat conservation, consistent with the conservation recommendations of DCR's Natural Heritage Program (McCoy and Fleming, 2000; Hobson, 1996; 1997). Much of the installation's bald eagle habitat, as well as most of the installation's rare wetland community types, and their associated rare plant and animal species, are contained within the Accotink Bay Wildlife Refuge. Similarly, some of the installation's wood turtle habitat is included within both refuges and within the Fort Belvoir Forest and Wildlife Corridor. The Fort Belvoir Master Plan designates the installation refuges, corridor, wetlands and steep-sloped areas as "environmentally constrained areas." Such conservation land-use designations protect the habitat in these areas from loss to development or land disturbing training activities.

Fort Belvoir will continue to use conservation land-use designations to protect important habitat areas for these resources, and will continue to implement management actions, such as invasive/exotic species management, stormwater management and problem wildlife management, to control threats to these resources. Fort Belvoir will continue to consider the potential for impacts to these resources when making land-use and operational decisions,

especially with regard to bald eagles and wood turtles. Where practicable and consistent with the installation mission, Fort Belvoir will continue to undertake actions to enhance habitat conditions for endangered, threatened, and rare species.

### Special Natural Areas

Fort Belvoir will continue to maintain and manage the installation refuges and the Forest and Wildlife Corridor with a primary management emphasis on resource conservation. Fort Belvoir will continue to allow for and promote public access for compatible uses such as environmental education, scientific research and study, and low-intensity outdoor recreation, where such access and use is consistent with resource conservation. Fort Belvoir will continue to allow hunting and fishing, consistent with resource conservation objectives. Fort Belvoir will also continue to allow for non-disruptive military activities in these areas, when such activities cannot be supported in the designated training areas, consistent with resource conservation objectives. Management of the refuges and corridor will continue to follow the principles of ecosystem management, and will emphasize conservation of resources that have been assigned a high conservation priority through federal or state statute or regulation, DoD or DA policy, DoD-partnered programs (e.g., Chesapeake Bay Program, PIF program), through the State Natural Heritage Program, or through recognized importance to regional ecosystem function (e.g. wildlife migratory routes).

Since all of the high priority resources on Fort Belvoir are not completely contained within the boundaries of the installation refuges or corridor, Fort Belvoir recognizes the need for additional management actions to protect these resource areas. Fort Belvoir will investigate such actions to protect those resources. Appropriate management actions may be to expand the refuge and/or corridor boundaries to encompass specific resource areas, or to establish buffer areas in association with the refuges and/or the corridor. Another management action may be to define area-specific land-use designations that would be consistent with conservation of these resource areas and incorporate such designations into the Master Plan. Fort Belvoir recognizes that development of a management strategy that would both serve mission needs and provide for appropriate conservation of these resource areas will be a complex action. It appears that the first step should be to re-consider the present boundaries of the refuges and corridor to ensure that the designated areas encompass the most critical of the resource areas.

## BENEFITS

### Environmental Benefits

The INRMP provides the basis for the conservation and protection of natural resources. It will facilitate conservation and enhancement of fish and wildlife habitat by preventing or reducing avoidable losses of native vegetation resulting from development or the invasion of exotic species, and improve water quality and in-stream habitat by controlling stormwater-related sedimentation and erosion. The plan will also conserve and protect natural resources by providing measures to prevent overuse by humans and damage by wildlife.

### Military Mission Benefits

Implementing this plan will support the eight elements of Fort Belvoir's military mission. Fort Belvoir's natural resources provide a high quality setting for those who work, live, and train on post. Fort Belvoir's natural resources and the natural resources program help provide a realistic training environment, which is crucial to ensure military readiness. Implementing this plan also contributes to the installation's commitment to the Army's Quality of Life and Communities of Excellence programs.

### Quality of Life

This plan provides the means to manage natural resources for the benefit of the Fort Belvoir community. It will enhance the natural setting of the post and provide educational and recreational opportunities for members of this community. Areas particularly conducive to recreation include extensive shoreline along navigable waterways, mature forest areas, and grasslands.

### Compliance Benefits

This plan is written in accordance with federal, state, DoD, DA, and Fort Belvoir policy. Implementation of the plan will aid Fort Belvoir in maintaining compliance with regulations related to natural resources conservation. Implementation of this plan will decrease long-term environmental costs and will reduce personal and installation liabilities from non-compliance with environmental laws and regulations. The plan also considers DoD and DA's commitments to natural resources stewardship programs such as the Chesapeake Bay Program and Partners in Flight Program.

### Other Benefits

Implementation of this plan will increase environmental awareness, and awareness of DoD's role in environmental stewardship among the day workers, residents, neighbors, and the general public. Both community relations and Fort Belvoir's environmental image will be enhanced.

## RESOURCE REQUIREMENTS

The primary source of funding for the natural resources program is the Operations and Maintenance, Army (OMA) environmental fund account. This fund source is used for such actions as wildlife studies, plan preparation, wildlife habitat enhancement projects, wetland permit applications, Endangered Species Act consultations, environmental education program, and watershed restoration projects. The OMA non-environmental fund account provides funding for O&M actions including routine grounds maintenance, tree planting, landscaping, pest control, stormwater management, and facilities maintenance. Alternative sources of funding, such as the DoD Legacy Resources Management Program, the Chesapeake Bay Habitat Restoration Challenge Grant, and the National Environmental Education Training Foundation, provide limited funds for specific natural resources conservation projects through a competitive application process.

## Staffing and Organization

This INRMP calls for the staff and organization of the natural resources program to continue as is was for the years 1996 through 2001, with a proposed increase in on-site contractor support. The INRMP calls for the continuation of four government staff positions in the Natural Resources Branch of the Environmental and Natural Resources Division. These government positions will be comprised of Natural Resources Specialists that will provide the core of professionally trained natural resources managers.

Section 107 of the Sikes Act Improvement Act states that the "Secretary of each military department shall ensure that sufficient numbers of professionally trained natural resources management personnel and natural resources law enforcement personnel are available and assigned responsibility to perform tasks necessary to carry out this title, including the preparation and implementation of integrated natural resources management plans." Both the legislative history of the Sikes Act and AR 200-3 indicate that the management and conservation of natural resources under Army stewardship is an inherently governmental function. Section 670a(d) of the Sikes Act states "neither Office of Management and Budget Circular A-76 nor any successor circular thereto applies to the procurement of services that are necessary of…implementation and enforcement of [the INRMP]." Therefore, the provisions of AR 5-20 (*Commercial Activities Program*) do not apply to the planning, implementation, enforcement, or management of Army natural resources management programs.

Contractor personnel will continue to be required to provide technical support to the natural resources program. This support includes conducting research and studies, performing wildlife field surveys, developing and coordinating an environmental education program, completing habitat enhancement projects, developing GIS data layers, developing plans and reports, controlling and managing problem wildlife, performing grounds maintenance, landscaping, pest control, providing impact assessments and recommending mitigation measures, developing engineering concepts and designs, etc. The INRMP calls for continuing the seven on-site contractors supporting Natural Resources Branch staff (in wildlife, forestry, grounds maintenance, pest management, forestry, volunteer coordination, environmental education and outreach, and refuge use), and adding three additional on-site contractors to support environmental education and outreach, stormwater management, and sediment and erosion control.

## Contracting and Partnering

To accommodate changing program needs, and to provide maximum flexibility, the Natural Resources Branch will need to continue to hold an indefinite delivery, indefinite quantity (IDIQ) contract for natural resources support. As stated above, contractor personnel will continue to be required to support the Natural Resources Branch staff in the various discipline areas including wildlife, forestry, grounds maintenance, pest management, stormwater management, refuge management, and education and outreach. As such, the Natural Resources Branch will need to continue to function as the contracting officer's representative (COR) on these contracts. This will enable them to monitor the scope of work and the budgets. In addition, partnerships that have been formed with various federal, state, and local agencies will also continue. Therefore, the Natural Resources Branch will need to execute and control the funding and actions performed under memoranda of understanding and cooperative agreements.

### Enforcement

Through its Memorandum of Agreement for Cooperative Law Enforcement between the U.S. Fish and Wildlife Service and the U.S. Army Garrison Fort Belvoir, dated 20 February 1996, Fort Belvoir has one Special Agent within ENRD. The intent of this agreement is to provide the Special Agent with the authority to enforce all laws administered by the U.S. and the installation relating to fish, wildlife, and other natural resources. Natural resources regulations must continue to be enforced from within the Environmental and Natural Resources Division to maintain an effective natural resources management program as outlined in this INRMP and as required under the Sikes Act.

## CONCLUSION

This INRMP presents a package that will (1) comply with all applicable natural resources statutes, regulations, policies, and directives; (2) conserve and enhance Fort Belvoir's natural resources; (3) support the military mission; (4) provide for balanced public access to and use of installation natural resources, consistent with conservation objectives; and (5) promote and enhance the installation's relationship with the public. This plan will not resolve all existing and/or future environmental issues or conflicts. It does, however, attempt to minimize these issues and conflicts by providing a basis for natural resources-related decision-making.

# 1.0 Introduction

This integrated natural resources management plan (INRMP) is the Commander's plan for managing natural resources to support the military mission while protecting and enhancing those resources for multiple use, sustained yield, and biological integrity. The purpose of the INRMP is to ensure the natural resources conservation measures and Army activities on Fort Belvoir's land are integrated and consistent with federal stewardship requirements. This INRMP is written to reflect the scope of Fort Belvoir's stewardship requirements to sustain ecological resources on a landscape and watershed scale. It is also written to be consistent with federal and state laws and regulations; Department of Defense (DoD), Army, and Fort Belvoir policies; and natural resources management philosophies. This INRMP accomplishes the following:

- Summarizes the installation's history and its military mission
- Describes all parties responsible and/or interested in the implementation of the INRMP
- Provides an overview of Fort Belvoir's natural resources program, including a vision and mission statement, as well as overall goals for the natural resources program
- Describes baseline natural resources conditions at Fort Belvoir, as well as current management
- Outlines management objectives and relevant federal and state laws, as well as Fort Belvoir policies for each of the seven major natural resources discipline areas
- Recommends continuing and future management actions for the characterization, preservation, and enhancement of natural resources
- Promotes the use of natural resources in ways that are beneficial to the military mission, natural resources, and installation and public interests, and that are consistent with resource conservation objectives
- Integrates with other installation processes including master planning, cultural resources management, pest management, pollution prevention, etc.
- Addresses implementation by grouping natural resources projects into three main categories (compliance, stewardship, and service), identifying staffing and funding requirements, and scheduling projects for fiscal years (FY) 01 through 06.

Installation and higher command personnel were involved with the development of this INRMP. In addition, Fort Belvoir coordinated with federal, state, and local agencies during the development of this plan. These agencies include DoD, the U.S. Fish and Wildlife Service, the Virginia Department of Game and Inland Fisheries, the Virginia Department of Conservation and Recreation, and Fairfax County.

This INRMP includes 15 sections. Sections 2 through 5 describe the regional setting of Fort Belvoir and existing environmental conditions; discuss the installation history and land acquisition; provide an overview of the military mission, natural resources that are required to support the mission, and potential impacts to natural resources that may result from the mission; include a description of existing and proposed land use and facilities on Fort Belvoir; and discuss parties responsible and/or interested in implementing this INRMP. Section 6 provides an overview of Fort Belvoir's natural resources program, and presents the program's vision and mission statements. Sections 7 through 13 present management objectives, relevant policies, existing natural resources conditions and management, and continuing and future management for the seven natural resources discipline areas including the following:

- Water Resources
- Wetlands
- Undeveloped Areas Vegetation
- Developed Areas Vegetation
- Wildlife
- Rare, Threatened, and Endangered Species
- Special Natural Areas

Section 14 addresses implementation of this INRMP. This section focuses on staffing levels that are required to implement this plan, and thus fulfill the requirements of the Sikes Act, DoD Instruction 4715.3 (*Environmental Conservation Program*), and AR 200-3 (*Natural Resources – Land, Forest, and Wildlife Management*). The section also describes program management functions necessary to execute projects in each of the discipline areas, the funding for complete program implementation, and a schedule of projects by fiscal year. Finally, Section 15 addresses integration of the INRMP with other plans and programs at Fort Belvoir. This section provides recommendations for revisions to these plans during the next update to ensure consistency with this INRMP.

Some of the projects within this INRMP may change through adaptive management, and may be affected by funding availability. Therefore, it is imperative that this INRMP be reviewed annually so that it can be updated for mission or environmental changes. It should also be revised and approved by the command level at least every 5 years.

# 2.0
# U.S. Army Garrison Fort Belvoir

## 2.1 LOCATION

Fort Belvoir is located in southeastern Fairfax County, Virginia, approximately 18 miles southwest of Washington, D.C., and 95 miles north of Richmond, the Virginia State capital (Figure 2.1). Fort Belvoir's major landholdings are within two separate areas: the 7,678-acre Main Post and the 807-acre Engineering Proving Grounds (EPG). Together with the 581-acre Humphreys Engineer Center and the 28-acre Revana Station, Fort Belvoir has management responsibility for a total of 9,094 acres. U.S. Route 1 bisects Main Post into two distinct geographical areas: North Post and South Post (Figure 2.2). The North Post is bounded by Telegraph Road to the north and northwest; U.S. Route 1 to the south; and Huntley Meadows Park, Woodlawn Plantation, Pole Road Park, and private development to the east. The South Post is bounded by U.S. Route 1 to the north; the Norman M. Cole, Jr., Pollution Control Plant (formerly the Lower Potomac Pollution Control Plant), the Woodrow Wilson Boy Scout Reservation, and private development to the west; Pohick Bay and Gunston Cove to the south; the Potomac River to the southeast; and Dogue Creek, Woodlawn Plantation, and private development to the east. Accotink Village, a 33-acre area along U.S. Route 1, is entirely surrounded by Fort Belvoir, but is not incorporated into the installation's property.

Fort Belvoir owns only land above mean high water. The Commonwealth of Virginia owns land below mean high water with the exception of the Potomac River, which belongs to the State of Maryland.

The EPG is approximately 2 miles northwest of Main Post. It is bounded on the west by Rolling Road, on the east by Backlick Road/U.S. Interstate 95 (I–95), on the south by an industrial park, and on the north by various residential developments (Figure 2.2).

## 2.2 REGIONAL SETTING

Fort Belvoir is located approximately 75 miles upstream from the Chesapeake Bay along the western shore of the Potomac River, one of the bay's six major tributaries. Many areas in the Chesapeake Bay watershed are experiencing population growth and development pressures. The year 2000 population within the Chesapeake Bay watershed is estimated to be more than 17.5 million (U.S. EPA, 2000b). Since 1983, the Chesapeake Bay watershed has been the focus of an extensive restoration effort that involves the State of Maryland; the Commonwealths of Virginia and Pennsylvania; the District of Columbia; federal agencies, including the Department of Defense (DoD) and the Department of the Army (DA); universities; nonprofit organizations; and the general public.

Fort Belvoir is located in Fairfax County, Virginia, one of the largest regional jurisdictions in the Washington, D.C., metropolitan area, covering almost 400 square miles (Woolpert, 1993a). Because Fairfax County is the location of many bedroom communities for employment centers in the Washington, D.C., metropolitan area, the installation faces environmental problems stemming from the county's rapid growth in residential, industrial, and commercial sectors.

Undeveloped areas on Fort Belvoir are a component of southeastern Fairfax County's open space network, which contributes to the Chesapeake Bay Program's restoration efforts. The Comprehensive Plan for Fairfax County defines open space as any public or private land existing primarily in a natural condition that helps to shape the character, form, and quality of county development. As defined, these areas are used for environmental and heritage resource protection, parks and recreation, agriculture, visual relief, and buffering between adjacent land uses.

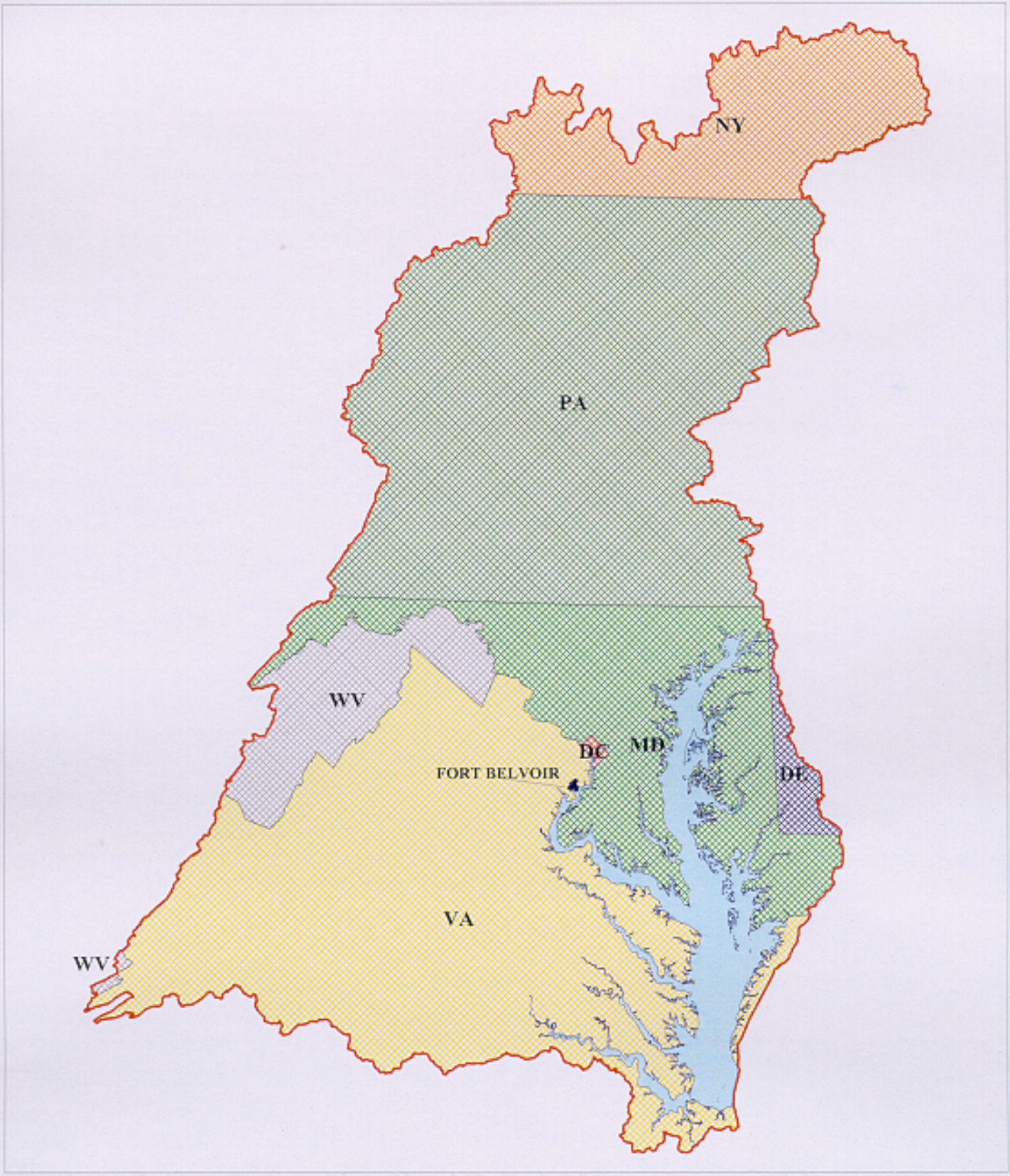
Fort Belvoir's Main Post is located within the county's Lower Potomac Planning District. The Planning District connects Fort Belvoir's open space to other sensitive areas in Fairfax County such as floodplains, stream influence zones, and tidal and non-tidal wetlands associated with major watercourses, including the Potomac River. Significant portions of the Mason Neck peninsula immediately south of Fort Belvoir are held in public ownership, and are managed for the protection of important wildlife habitats and wetlands, with public recreation as a secondary use. The Planning District also includes a number of historic sites and other cultural resources, some of which exist on Fort Belvoir.

According to the Comprehensive Plan, the population of the Lower Potomac Planning District increased from 16,300 in 1980 to 24,371 in 1990 (nearly a 50 percent increase). Between 1990 and 1995, the Lower Potomac Planning District continued to experience growth, with an increase in population to 25,830 (a 6 percent increase). The population of the Springfield Planning District that contains the EPG was 43,240 in 1995, which was an 8 percent increase over the 1990 population (Fairfax County, 1995a).

### 2.2.1 Topography

The topography of Fort Belvoir's Main Post is characterized by uplands and plateaus, lowlands, and steeply sloped terrain. The land ranges in elevation from approximately sea level along the Potomac River to approximately 230 feet above mean sea level (msl) near the intersection of Beulah Street and Woodlawn Road in the upland area of the installation (Figure 2.2) (U.S. Army, 1989).

The uplands and plateaus make up approximately 40 percent of the installation. Upland areas on the North Post are gently rolling to steeply sloped. Fort Belvoir has two nearly level plateaus that run south-southeast to the Potomac River. The easternmost of the two plateaus is almost a mile wide and extends from Abbott Road southeast to 23rd Street. The western plateau is located in the forested training area south of U.S. Route 1. This plateau is lower in elevation and more gently sloping than the eastern plateau. The highest elevation, approximately 160 feet above msl, is




Chesapeake Bay Drainage Area

Fort Belvoir Area

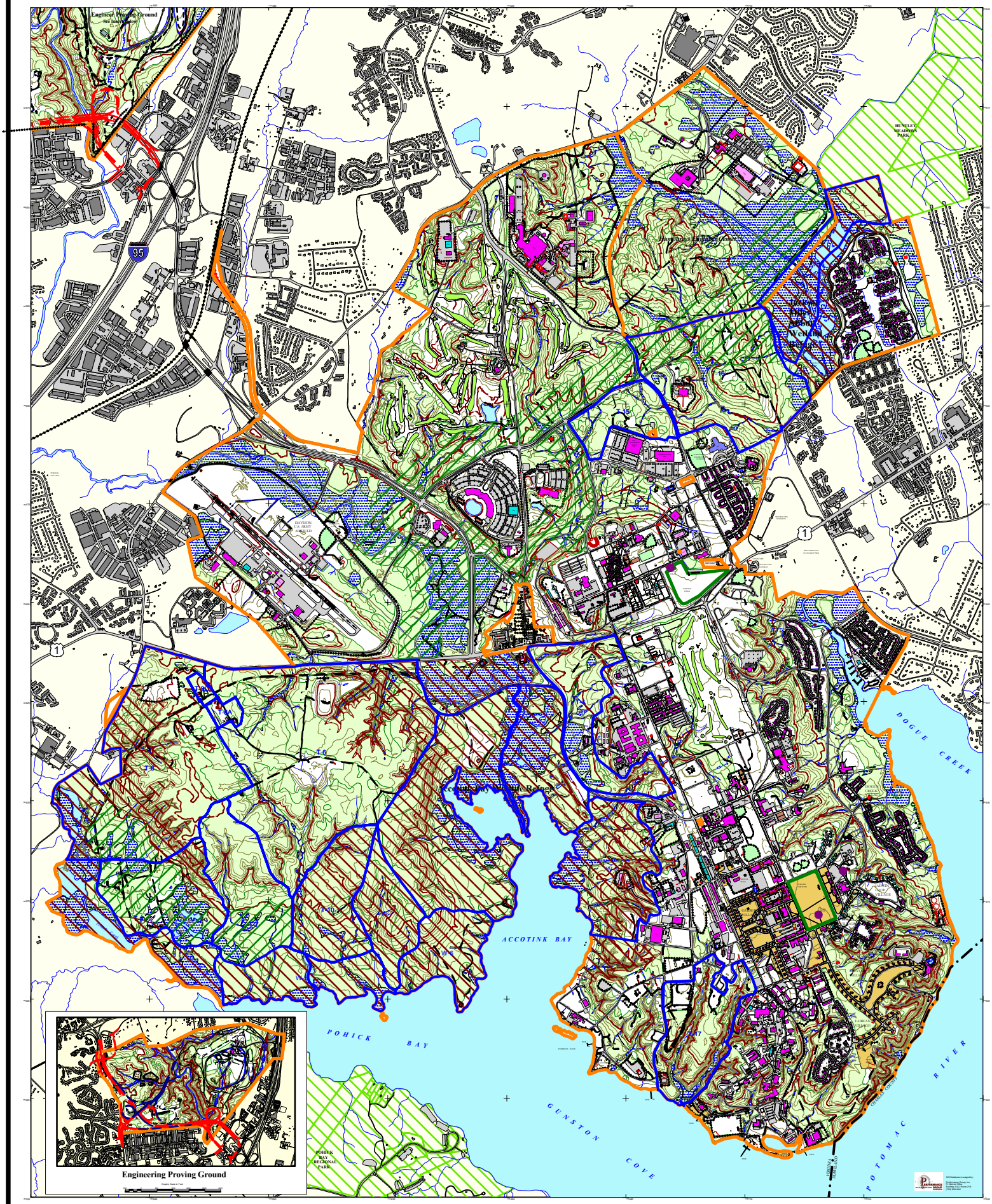
State Boundary

N

GENERAL LOCATION
of FORT BELVOIR

SOURCE: U.S. EPA, REGION III
CHESAPEAKE BAY PROGRAM, 2001

FIGURE: 2.1


Engineering Proving Ground
See Inset Below
95
1
HUNTLEY MEADOWS PARK
Tactical Unit Training Wetland Area
DAVISON U.S. ARMY AIRFIELD
Accotink Bay Firing Range
ACCOTINK BAY
POHICK BAY
GUNSTON COVE
POTOMAC RIVER
DOGUE CREEK
POHICK BAY REGIONAL PARK
Engineering Proving Ground
Graphic Scale in Feet
Legend
Key Map
Fort Belvoir
Graphic Scale in Feet
1 inch = 400 feet
Grid Based on Virginia State Plane Coordinate System (NAD 83)
Lambert Conformal Conic Projection
General Information
This map was prepared and published by Performance Group, Incorporated (PGI) with the intent to meet the National Map Accuracy Standards for a map scale of 1:4,800. Based on the Spatial Data Standards (SDS) version 1.80, approximately 150 separate GIS data layers were used to create this map. Aerial photography dated April 1998 and April 1998, with a ground resolution of one foot, was used as a background for this map. Data and information outside the Fort Belvoir and EPG boundaries was provided by Fairfax County's GIS and Mapping Services office. Please refer all corrections, additions, and comments for improving this product to the Fort Belvoir GIS Center by calling (703) 806-4847.
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FORT BELVOIR
GENERAL SITE MAP
SOURCE: FORT BELVOIR GIS CENTER, 2000
FIGURE: 2.2

located approximately 3,500 feet south of U.S. Route 1 and the same distance east of Pohick Creek (U.S. Army, 1989).

Lowlands make up about 40 percent of the land at Fort Belvoir. The predominant lowland areas on Fort Belvoir are associated with the floodplains of Accotink Creek, Pohick Creek, and Dogue Creek. Additional lowland areas exist between the shoreline and the steeply sloping terrain that surrounds the two plateaus. The lowland topography is gently sloped. Slopes range from about 10 percent at their upland fringes to almost level along the active floodplains. In the floodplains, numerous relict channels provide local relief of 2 to 10 feet (U.S. Army, 1989).

Steeply sloped terrain is the primary component of the remaining 20 percent of the land at the Main Post. Areas of steeply sloped terrain, ravines, and stream valleys surround the two plateaus on the east, south, and west sides, and separate them from the lowlands. Fringe slopes surrounding the eastern plateau range from 20 to 90 percent. Southeast of 23rd Street, the ground plunges to approximately sea level at slopes that range from 10 percent to almost 90 percent near the Officers' Club and the Belvoir Mansion ruins. A combination of weakly cemented sedimentary substrates and exposure to erosive forces of wind and water near the Potomac River are mainly responsible for unstable steep slope conditions. Steep and highly erodible slopes are also found along the eastern and western edges of the western plateau and in deeply cut stream channels. These slopes range from 10 to 50 percent (U.S. Army, 1989). However, they are likely more stable here than at the southern end of the eastern plateau, since they descend to relatively protected waters or to the gently sloping Accotink Valley and Pohick Valley lowlands. There are many seeps and springs along slope faces.

The elevation at EPG (Figure 2.2) ranges from 100 feet at Accotink Creek to 300 feet in the northwest corner. The topography is gently rolling, bisected by the narrow, steep-sloped streambed of Accotink Creek. Steep slopes also occur along intermittent streams that flow into Accotink Creek. Smaller areas of steep slopes are found along the northern boundary of EPG (U.S. Army, 1992).

### 2.2.2 Geology and Geomorphology

The following sections provide a detailed description of geology, geomorphology, and groundwater on Fort Belvoir.

#### *2.2.2.1 Geology*

Fairfax County is divided into two physiographic provinces: the Coastal Plain and the Piedmont Plateau (Hobson, 1996). The fall line, which runs north to south through Virginia, crossing Fairfax County, forms the boundary between the resistant, metamorphic rocks of the Piedmont and the softer, sedimentary rocks of the Coastal Plain (Figure 2.3) (Godfrey, 1980, as cited in Terwilliger, 1991). These two provinces are subdivided into five sections in Fairfax County from west to east: the Piedmont Lowland, the Piedmont Upland, the mixed Piedmont Upland and high Coastal Plain Terraces, the high Coastal Plain, and the low Coastal Plain Terraces (Hobson, 1996). Most of Fort Belvoir including EPG lies within the high and low Coastal Plain Terraces of the Coastal Plain Physiographic Province. A small area of EPG exists along the eastern edge of the Piedmont Plateau in the mixed Piedmont Upland and high Coastal Plain Terraces. There are several geologic formations associated with the Coastal Plain Physiographic Province including

the Potomac Formation, Bacons Castle Formation, Shirley Formation, and Alluvium and Pliocene sand and gravel (Porter et al., 1963 as cited in Hobson, 1996). The Potomac Formation outcrops along the slopes leading down to the Potomac River shoreline on the Main Post.

The Coastal Plain Physiographic Province consists of unconsolidated sand, silt, and clay underlain by residual soil and weathered crystalline rocks. Most of the Coastal Plain Physiographic Province deposits in the Fort Belvoir area consist of a sequence of unconsolidated sediments that belong to the Potomac Group (Larson and Froelich, 1977, as cited in Law Engineering and Environmental Services, 1995). The Potomac Group is characterized by lens-shaped deposits of interbedded sand, silt, clay, and gravel, primarily of non-marine origin (Force, 1975 as cited in Law Engineering and Environmental Services, 1995). The Potomac Group is approximately 600 feet thick beneath most of Fort Belvoir (Larson and Froelich, 1977, as cited in Law Engineering and Environmental Services, 1995).

The Piedmont Plateau Physiographic Province on Fort Belvoir is characterized by undifferentiated metasedimentary and metaigneous rocks (Mixon et al., 1989, as cited in Hobson, 1996).

#### *2.2.2.2 Geomorphology*

Fort Belvoir's uplands are underlain by sands, silts, and clays of riverine origin. Uplands underlain by sands and silts tend to be more stable than those underlain by clays. Uplands that are underlain by clayey soils form undulating and rolling hills and the dominant geomorphic process in these areas is mass wasting which includes downhill creep, landslides, slumping, and rockfalls (excerpted from information in the Fort Belvoir files).

Lowlands and valley bottoms are typically underlain with alluvium. The dominant geomorphic process is active riverine erosion and deposition during overbank flooding. Surface drainage is commonly poor due to the shallow water table.

The dominant geomorphic process in sloping valley sides is characterized by gravitational mass wasting. This includes downhill creep, landslides, slumping, and rockfalls. Drainage usually occurs as surface runoff, with runoff greatest on the steeper slopes and increasing with construction activity and the removal of vegetation, which greatly increases the rate of erosion and the probability of creep and slumping (excerpted from information in the Fort Belvoir files).

#### *2.2.2.3 Groundwater*

Fort Belvoir is underlain by three main groundwater aquifers: the lower Potomac, middle Potomac, and Bacons Castle Formation. The lower Potomac aquifer is the primary aquifer in eastern Fairfax County and on the installation. This aquifer exists between a layer of crystalline bedrock and a thick wedge of clay. The clay wedge contains layers of sandy clays, as well as interbedded layers of sand (excerpted from information in the Fort Belvoir files). Water in the lower Potomac aquifer flows to the southeast and is recharged in the western section of Fort Belvoir and to the north and west of the installation (Grogin and Widdowson, 1998). Water from this aquifer below Fort Belvoir is potable. The middle Potomac aquifer consists of inter-fingering lenses of medium sand, silt, and clay of differing thickness. The middle Potomac confining unit is not present in the Fort Belvoir area. Water flow in the middle Potomac aquifer has not been

Virginia Physiographic Provinces

- Appalachian Plateau
- Blue Ridge
- Coastal Plain
- Piedmont Plateau
- Valley and Ridge

N

# PHYSIOGRAPHIC PROVINCES of VIRGINIA

SOURCE: FORT BELVOIR GIS CENTER; ESRI USA DATASET; and, WOODWARD, S., 1994

FIGURE: 2.3

well studied (Grogin and Widdowson, 1998). The Bacons Castle Formation is the shallowest aquifer in the North and South Posts. This aquifer's flows are localized, originating from various recharges on the installation and draining to nearby streams, creeks, and large surface water bodies.

Although the water table fluctuates based on precipitation, leakage, and evapotranspiration, depth to the water table at Fort Belvoir is typically 10 to 35 feet below the ground surface. However, in some areas, fine-grained sediment (e.g., clay or fine silt) with low permeability is present in the subsurface, creating isolated local or regional confining layers. These confining layers may locally restrict vertical movement of ground water. The water table may be at or near the surface in areas near streams. Under saturated conditions, artesian wells (in which water rises to the surface) have been encountered at Fort Belvoir (excerpted from information in the Fort Belvoir files). This suggests that shallow groundwater flow closely relates to surface drainage features.

### 2.2.3 Climate

Virginia's climate is classified as humid subtropical. This means that Virginia is characterized by warm or hot summers and mild winters, and receives sufficient precipitation to support forests. Temperature and precipitation patterns across Virginia vary by topography and distance from the coast (Crokett, 1972, as cited in Terwilliger, 1996). Virginia is located in a zone of prevailing westerly atmospheric motion. Occasional weather systems that move up the coast from the south are responsible for the heaviest storms and more than half the total annual precipitation (Hayden, 1979, as cited in Terwilliger, 1996).

January and February are the coldest months at Fort Belvoir with an average temperature of 34°F, and July is the hottest month with an average temperature of 79°F. Average annual precipitation is 42 inches, and is generally well distributed throughout the year. The Atlantic Ocean and Gulf of Mexico are the principal sources of moisture. Moist, tropical air flows from the southwest in summer and early fall. The frost-free season is 265 days at Fort Belvoir. Snowfall averages 20.6 inches, but rarely stays on the ground for more than a few days (U.S. Air Force, 1998). Temperature and precipitation data for Fort Belvoir are listed in Table 2.1.

**Table 2.1. Temperature and Precipitation Data for Fort Belvoir**

| | *Temperature (°F)* | | | *Precipitation* | | *Snowfall* |
|---|---|---|---|---|---|---|
| *Month* | *Maximum Daily* | *Minimum Daily* | *Average Daily* | *Average Monthly (inches)* | *No. of Days With 0.004 Inch or More* | *Average Monthly (inches)* |
| January | 42 | 28 | 34 | 2.9 | 11 | 5.8 |
| February | 43 | 30 | 34 | 2.9 | 8 | 6.7 |
| March | 52 | 37 | 42 | 3.8 | 10 | 3.6 |
| April | 65 | 49 | 55 | 3.2 | 7 | 0.1 |
| May | 73 | 54 | 62 | 3.8 | 11 | 0 |
| June | 85 | 63 | 73 | 3.5 | 8 | 0 |
| July | 89 | 70 | 79 | 3.9 | 9 | 0 |
| August | 86 | 67 | 76 | 4.2 | 7 | 0 |

| Table 2.1. Temperature and Precipitation Data for Fort Belvoir | | | | | | |
|---|---|---|---|---|---|---|
| | *Temperature (°F)* | | | *Precipitation* | | *Snowfall* |
| *Month* | *Maximum Daily* | *Minimum Daily* | *Average Daily* | *Average Monthly (inches)* | *No. of Days With 0.004 Inch or More* | *Average Monthly (inches)* |
| *(continued)* | | | | | | |
| September | 77 | 62 | 69 | 3.8 | 10 | 0 |
| October | 67 | 49 | 56 | 3.3 | 7 | 0.1 |
| November | 55 | 38 | 46 | 3.3 | 7 | 0.9 |
| December | 48 | 32 | 39 | 3.4 | 10 | 3.4 |
| **Annual** | **65** | **48** | **56** | **42.0** | **105** | **20.6** |

Source: U.S. Air Force, 1998

Note: These climate data were obtained from records gathered at the Davison Army Airfield at Fort Belvoir, Virginia. Climate data from 1957 are available on record at the airfield. The data above represent the averages for years 1973 through 1997.

The greatest potential for flooding occurs in late winter and early spring, but storms in the late summer and fall can also cause flooding. Thunderstorms are common in the summer months, occurring an average of 44 days per year at Fort Belvoir (U.S. Air Force, 1998). Hurricanes, which typically affect the weather in the United States during August, September, and October, have the potential to cause destructive high winds, torrential rains, and flooding on Fort Belvoir if they enter Virginia or pass close offshore.

### 2.2.4 Soils

The Soil Conservation Service (SCS) surveyed the Fort Belvoir Main Post soils in 1982 (U.S. SCS, 1982). The SCS soil survey described and delineated 19 named soil series within Fort Belvoir. Some series occur in more than one phase. The survey data were mapped and have been incorporated into the Fort Belvoir Geographic Information System (GIS). In addition to the 19 named soil series, there are areas of mixed alluvium (Entisols) and tidal marsh (Histosols) that are not sufficiently defined to be classified as series. Of the area included in the survey, 1,898 acres are described as urban built-up and 587 acres are described as cut and fill. The urban built-up unit includes primarily ridge top or other well-drained flatter areas that have been minimally to drastically disturbed by construction and development over the years. Areas within the urban built-up unit that are not under buildings or paving are vegetated and the soil fertility is maintained by amendment. The cut and fill unit is generally of unknown source, but is likely to be material selected for high structural stability following placement. Table 2.2 lists the soils mapped within Fort Belvoir, along with some selected features.

| Table 2.2. Fort Belvoir Soils | | | | | | |
|---|---|---|---|---|---|---|
| ***Series-Phase*** | ***Taxonomy*** | ***Drainage Class**** | ***Flooding*** | ***Permeability†*** | ***Erosion Factor‡*** | ***Acres§*** |
| Appling gritty loam, 2–7% slope | Typic Hapludults | WD | No | MR surface, M subsoil and substratum | 4 | 19 |
| Appling gritty loam, 7–15% slope | Typic Hapludults | WD | No | MR surface, M subsoil and substratum | 4 | 46 |
| Appling gritty loam, 15–25% slope | Typic Hapludults | WD | No | MR surface, M subsoil and substratum | 4 | 12 |
| Beltsville silt loam, 0–7% slope | Typic Fragiudults | MWD | No | S-VS above and below fragipan, VS within fragipan, M-MR in substratum | 3 | 1,114 |
| Beltsville loam, 2–7% slope | Typic Fragiudults | MWD | No | S-VS above and below fragipan, VS within fragipan, M-MR in substratum | 3 | 45 |
| Beltsville silt loam, 7–15% slope | Typic Fragiudults | MWD | No | S-VS above and below fragipan, VS within fragipan, M-MR in substratum | 3 | 4 |
| Bertie silt loam, 0–2% slope | Aquic Hapludults | MWD | No | M | 5 | 99 |
| Chewacla silt loam, 0–2% slope | Fluvaquentic Dystrochrepts | SPD | Frequent (Nov–Apr) | M surface and subsoil | 5 | 58 |
| Dragston fine sandy loam, 0–2% slope | Aeric Ochraquults | SPD | No | MR | 4 | 138 |
| Dumfries sandy loam, 2–7% slope | Typic Hapludults | WD | No | MR, MR subsoil, R substratum | 5 | 18 |
| Dumfries sandy loam, 7–15% slope | Typic Hapludults | WD | No | MR, MR subsoil, R substratum | 5 | 704 |
| Dumfries sandy loam, 15–25% slope | Typic Hapludults | WD | No | MR, MR subsoil, R substratum | 5 | 900 |
| Dumfries sandy loam, 25–50% slope | Typic Hapludults | WD | No | MR, MR subsoil, R substratum | 5 | 573 |
| Fallsington fine sandy loam, 0–2% slope | Typic Ochraquults | PD | No | M | 4 | 44 |
| Galestown loamy fine sand, 0–2% slope | Psammentic Hapludults | SED | No | R, MR subsoil, R substratum | 5 | 37 |
| Glenelg silt loam, 2–7% slope | Typic Hapludults | WD | No | M | 3 | 0.1 |
| Glenelg silt loam, 7–15% slope | Typic Hapludults | WD | No | M | 3 | 14 |
| Keyport silt loam | Aquic Hapludults | MWD | No | MS surface, S subsoil, M substratum | 3-2 | 217 |
| Lenoir silt loam, 0–2% slope | Aquic Paleaquults | SPD | No | VS | 5 | 74 |
| Louisburg coarse sandy loam, 7–25% slope | Ruptic-Ultic Dystrochrepts | SED-WD | No | MR surface & substratum, M-MR subsoil | 2 | 38 |
| Louisburg coarse sandy loam, 25–50% slope | Ruptic-Ultic Dystrochrepts | SED-WD | No | MR surface and substratum, M-MR subsoil | 2 | 82 |
| Lunt fine sandy loam, 2–7% slope | Typic Hapludalfs | WD-MWD | No | M-MR surface, M subsoil, MR-VR substratum | 4 | 125 |
| Lunt fine sandy loam, 7–15% slope | Typic Hapludalfs | WD-MWD | No | M-MR surface, M subsoil, MR-VR substratum | 4 | 93 |

| Table 2.2. Fort Belvoir Soils | | | | | | |
|---|---|---|---|---|---|---|
| ***Series-Phase*** | ***Taxonomy*** | ***Drainage Class**** | ***Flooding*** | ***Permeability†*** | ***Erosion Factor‡*** | ***Acres§*** |
| ***(continued)*** | | | | | | |
| Lunt fine sandy loam, 15–25% slope | Typic Hapludalfs | WD-MWD | No | M-MR surface, M subsoil, MR-VR substratum | 4 | 27 |
| Matapeake silt loam, 2–7% slope | Typic Hapludults | WD | No | M surface and subsoil | 4 | 283 |
| Matapeake silt loam, 7–15% slope | Typic Hapludults | WD | No | M surface and subsoil | 4 | 99 |
| Mattapex silt loam, 2–6% slope | Aquic Hapludults | WD | No | M | 4 | 320 |
| Mattapex silt loam, 6–10% slope | Aquic Hapludults | MWD | No | M | 4 | 156 |
| Quantico fine sandy loam, 7–15% slope | Typic Hapludults | WD | No | MR surface, M subsoil, M-MR substratum | 4 | 56 |
| Quantico fine sandy loam, 15–25% slope | Typic Hapludults | WD | No | MR surface, M subsoil, M-MR substratum | 4 | 35 |
| Sassafras fine sandy loam, 2–6% slope | Typic Hapludults | WD | No | M, R substratum | 4 | 117 |
| Sassafras fine sandy loam, 6–10% slope | Typic Hapludults | WD | No | M, R substratum | 4 | 24 |
| Wehadkee silt loam, 0–2% slope | Typic Fluvaquents | PD | Frequent (Nov–Jun) | M | 5 | 132 |
| Woodstown fine sandy loam, 0–2% slope | Aquic Hapludults | MWD | No | M | 4 | 119 |
| Woodstown fine sandy loam, 2–6% slope | Aquic Hapludults | MWD | No | M | 4 | 122 |
| Woodstown fine sandy loam, 6–10% slope | Aquic Hapludults | MWD | No | M | 4 | 17 |
| Mixed alluvial, 0–2% slope | Entisols | PD | Frequent (Jan–Dec) | M | 5 | 604 |
| Tidal marsh | Histosols | VPD | Frequent (Jan–Dec) | M | — | 93 |
| Cut and fill | — | — | No | — | — | 587 |
| Urban land, 0–10% slope | — | — | No | > 70% impervious | — | 1,898 |

Source: U.S. SCS, 1982.

*Drainage Class Key:

MWD: Moderately well drained
PD: Poorly drained
SED: Somewhat excessively drained
SPD: Somewhat poorly drained
VPD: Very poorly drained
WD: Well drained

†Permeability Key (depth per hour):

VS: Very slow (less than 0.06 inch)
S: Slow (0.06 to 0.2 inch)
MS: Moderately slow (0.2 to 0.6 inch
M: Moderate (0.6 to 2.0 inches)
MR: Moderately rapid (2.0 to 6.0 inches)
R: Rapid (6.0 to 20 inches)
VR: Very rapid (more than 20 inches)

‡Erosion factor given is the "T" factor, representing an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting soil fertility over a sustained period. Rate is in tons per acre per year.

§All acreages are based on the entire Fort Belvoir area as of 1982 and include EPG. Pits and quarries are included in the category of "cut and fill." Swamps are included in the category of "mixed alluvial land."

## 2.3 FORT BELVOIR SITE HISTORY

According to archeological record, early humans inhabited the Fort Belvoir region since perhaps 11,500 years ago. The first documented inhabitants of the Fort Belvoir region were Native American people, including the first to greet European visitors in the early 1600s. Historical accounts describe Native American villages that once lined the shores of the Potomac River. Villages subsisted on crops such as maize and beans, as well as fish and game taken from the area. Three major groups or tribes existed in the Fort Belvoir area: Patawomeke, Piscataway, and Dogue. Relationships between Native Americans and European colonists were usually friendly in early years, but deteriorated as settlements and land claims expanded (R. Christopher Goodwin and Associates, undated).

Fort Belvoir was in colonial times part of a vast proprietary between the Potomac and Rappahannock Rivers. The proprietary was established in 1649 and known as the Northern Neck. In 1741, Colonel William Fairfax, land agent and cousin of the proprietor, Lord Thomas Fairfax, built a spacious manor house on this estate, which he named "Belvoir." The manor house was destroyed by fire in 1783, and further damaged during the War of 1812. Use of the land for military purposes began in 1915 when the U.S. Army Engineer School began conducting summer training exercises on a 1,500-acre tract of the estate (Woolpert, 1993a).

After the outbreak of World War I, a temporary cantonment area named Camp A.A. Humphreys was constructed on the peninsula between Accotink Bay and Dogue Creek. The Army lands were mostly forest and swamp, with the area surrounding the camp being mostly agrarian. The government acquired an additional 4,800 acres (mainly north of U.S. Route 1) through 1920. At that time, regional transportation systems were improved to accommodate wartime activities at Camp A.A. Humphreys. In order to ensure a drinking water supply to the camp, a dam was constructed in 1918 across Accotink Creek approximately 8 miles upstream of Fort Belvoir's Main Post, creating the current Lake Accotink reservoir near Ravensworth, Virginia. That same year, a water filtration plant was constructed on post (R. Christopher Goodwin & Associates, ND). In 1943, the U.S. Army Corps of Engineers replaced the original Lake Accotink dam (Fairfax County Park Authority, 1998).

Several training schools operated at Camp A.A. Humphreys during World War I. These included the Engineer Replacement and Training Camp; the Engineer Officers' Training Center; the Army Gas School, which provided gas and flamethrower operations training; and the School of Military Mining. Most training was conducted in the area south of U.S. Route 1 between Accotink Bay and Dogue Creek, although parts of the installation east of Accotink Bay were used for rifle ranges (R. Christopher Goodwin & Associates, ND).

At the close of World War I, the U.S. Army Engineer School relocated to Camp A.A. Humphreys, which was designated a permanent post in 1922 and renamed Fort Humphreys. The Engineer School provided training in forestry, road and railroad construction, camouflage, mining, surveying, pontoon bridge construction, photography, printing, and cooking. The site also served as a summer training camp for the Reserve Officers Training Corps (ROTC). The ROTC cadets received basic training in bayonet drill, target practice, military administration and law, first aid and sanitation, bridge building, demolition, reconnaissance, and railroad construction (R. Christopher Goodwin & Associates, ND).

In 1924, the Engineer Board, the forerunner of the Belvoir Research, Development and Engineering Center, relocated to Fort Humphreys. The Engineer Board developed many innovations, including assault boats, portable steel bridges, and mine detectors (R. Christopher Goodwin & Associates, ND).

Many of Fort Belvoir's permanent buildings were constructed between the two World Wars as a result of a nationwide military building program. Most of Fort Humphreys' temporary wood-frame buildings were demolished and replaced by permanent masonry structures. The landscape plan adopted for Fort Humphreys exemplified the Army's efforts at that time to improve the quality of life of its personnel. The plan implemented the philosophies of George B. Ford, planning advisor to the War Department, and of First Lieutenant Howard B. Nurse, Quartermaster Corps officer. The results are still apparent in the configuration of the officer's housing areas (R. Christopher Goodwin & Associates, ND).

In 1935, Fort Humphreys was renamed Fort Belvoir, and it expanded in the 1940s to accommodate increased activity because of the outbreak of World War II. An additional area of 3,000 acres north of U.S. Route 1 was acquired for a new Engineer Replacement Training Center (ERTC) and for new housing. The ERTC schooled troops in reconnaissance, unit coordination, road and obstacle construction, and demolition. Engineering specialists were trained in carpentry, drafting, surveying, and operating construction machinery. Specialized courses were offered in weapons operation such as tanks, flamethrowers, and antiaircraft guns (R. Christopher Goodwin & Associates, ND). Other development north of U.S. Route 1 included construction of the Davison Army Airfield in the western quadrant of the North Post (Figure 2.2).

From World War II to the 1980s, the types of training offered reflected shifts in warfare technology. A close combat range was constructed and a Chemical/Biological/Radiological School started. In the 1950s, the emphasis at Fort Belvoir began shifting from training to research and development. The Engineer Research Laboratories developed and tested new techniques for electrical power generation, camouflage and deception, materiel- and fuel-handling methods, bridging, and mine detection. They experimented with portable copying machines, tropical fungicides, prefabricated buildings, and heavy earth moving equipment. The installation's SM-1 Nuclear Plant became operational in 1957 and was the nation's first national nuclear training facility for military personnel. Additionally, Fort Belvoir provided support to an increasing variety of tenant organizations, including the DeWitt Hospital, the Defense Systems Management College, and the Defense Mapping School (R. Christopher Goodwin & Associates, ND). The 1988 relocation of the Engineer School from Fort Belvoir to Fort Leonard Wood in Missouri completed the shift in Fort Belvoir's function from engineer training to U.S. Army administrative and logistics support.

Fort Belvoir currently provides essential administrative and basic operations support to its tenant organizations. Its location in the national capital region has attracted many tenants from the five military services, as well as many separate DoD agencies.

Relocations to Fort Belvoir include the following:

- U.S. Army Intelligence Security Command headquarters in 1989
- U.S. Army Management Staff College in 1993

- U.S. Army Inspector General School in 1993
- U.S. Army Criminal Investigation Division Command in 1995
- U.S. Army Community and Family Support Center in 1997
- Defense Threat Reduction Agency in 2000.

Fort Belvoir has also become the receiving installation of many organizations realigned by the Base Realignment and Closure Act. For instance, as a result of the closure of the U.S. Army's Cameron Station in 1995, many Defense Logistics Agency (DLA) organizations consolidated functions at the new 806,000-square-foot DLA Headquarters Complex facility at Fort Belvoir. New roads and buildings have been constructed on Fort Belvoir, and existing roads have been improved to accommodate increased numbers of personnel. New community support facilities have been built to provide services to military personnel and dependents in the national capital region. Fort Belvoir is currently estimated to support more than 200,000 military personnel, dependents, and retirees in the region, as well as approximately 4,000 installation dependents and 17,700 military and civilian employees on the installation (Senires-Dubyak, 2000).

## 2.4 ACQUISITION

Much of Fort Belvoir's current acreage was acquired between 1910 and 1953. Subsequent large changes in land ownership became less frequent as regional development increased. New acquisitions and disposals continue to affect natural resources management decisions on the installation.

The major land acquisitions include the following:

- The U.S. Government acquired 1,500 acres from the Otterback family in 1910. In 1912, this land was transferred to the War Department. At that time, the property consisted of farms, forest, and swamps (R. Christopher Goodwin & Associates, ND).
- Between 1919 and 1920, the installation acquired approximately 4,800 acres. This land consisted of 14 farms, some larger tracts, woods, and a mill (Woolpert, 1993a).
- The installation acquired 3,000 acres north of U.S. Route 1 between 1941 and 1953. This land consisted of small farms and the Woodlawn community's school, church, and Odd Fellows Hall (Woolpert, 1993a).

The major land disposals include the following:

- The installation turned over 243 acres comprising the Accotink Dam and Reservoir area to Fairfax County in 1965 (Woolpert, 1993a).
- In 1981, 581 acres at the northeast corner of the installation (the Humphreys Engineer Center or HEC) was turned over to the Office of the Chief of Engineers (Woolpert,

1993a). Since Fort Belvoir continues to provide installation support and natural resources management for the HEC, it is included in this INRMP (Figure 2.2).

- The General Services Administration sold 107 acres north of U.S. Route 1 between Davison Airfield and State Route 611 in 1986 (Woolpert, 1993a).

In 1988, the Assistant Secretary of the Army for Installation, Logistics, and Environment took control of EPG; however, it remains the property of Fort Belvoir. As of 2000, no final decision has been made to either return EPG to Fort Belvoir's control, or to dispose of or develop this largely unimproved land. Due to its probable change in status, natural resources management actions at EPG have been limited to those actions required by law (e.g., Clean Water Act compliance actions), actions to protect natural resources (e.g., controlled deer hunting, regulatory enforcement), and natural resources studies and surveys to support management decisions (e.g., watershed survey, rare species survey). This INRMP addresses EPG with respect to this type of management emphasis.

The Defense Communications-Electronics Evaluation and Testing Activity (D/CEETA) facility occupies a 262-acre research area in the North Post. An additional 18 acres have been occupied by D/CEETA for the purpose of constructing a small visitor-processing center. Construction of the visitor center and its perimeter fence should be completed in 2001.

## 2.5 NEIGHBORS

Natural resources management activities at Fort Belvoir may influence adjacent or nearby properties, and activities or conditions at nearby properties, in turn, may influence natural resources at Fort Belvoir. The area surrounding Fort Belvoir is suburban in character, and local land uses outside Main Post are predominantly residential, although industrial developments such as the Newington Industrial Park occur near I-95 and commercial strip developments occur along major roads such as U.S. Route 1.

Many public and private land holdings share boundaries with Fort Belvoir. Some are small, individual properties and are in residential usage. Adjacent holdings include county and state parks, public utility lands, and residential and industrial sites. Along the southern and southeastern boundaries of Main Post are Pohick Bay, Accotink Bay, Gunston Cove, Dogue Creek, and the Potomac River, which are all open waters managed by the Commonwealth of Virginia, the State of Maryland, and the federal government. Accotink Village is another installation neighbor. The unincorporated Accotink Village is entirely surrounded by Fort Belvoir and includes private residential, institutional, and retail land uses. Additionally, there are various owners and operators of roads and utility corridors that border or pass through the installation.

The area surrounding EPG is residential to the north and west. Backlick Road/I–95 touches the eastern boundary, and there is an industrial park along the southern boundary. There is a commercial strip development along Backlick Road.

The region surrounding Fort Belvoir includes a number of sizable tracts in public ownership or conservation management (Table 2.3, Figure 2.4). These include Huntley Meadows Park adjacent

| Table 2.3. Major Public Land Owners Near and Adjacent to Fort Belvoir | | | | | |
|---|---|---|---|---|---|
| ***Map No. (Fig. 2.4)*** | ***Parcel or Property Name*** | ***Land Use, Function, or Primary Management Goal*** | ***Ownership or Managing Agency*** | ***Approx. miles*/ bearing from Fort Belvoir*** | ***Area* (approx. acres)*** |
| 1 | Huntley Meadows | Local passive recreational park and wildlife management area | Fairfax County Park Authority | Adjacent, N 50° E | 1,400 |
| 2 | Pohick Bay Regional Park | Local active and passive recreation | Northern Virginia Park Authority | Adjacent, S 40° W | 1,150 |
| 3 | Norman M. Cole, Jr., Pollution Control Plant† | Wastewater treatment facility | Fairfax County Dept. of Public Works and Environmental Services | Adjacent, S 45° W | 120 |
| 4 | Woodlawn Plantation | National Historic Site | National Trust for Historic Preservation | Adjacent, East | 80 |
| 5 | Pole Road Park | Local active and passive recreation | Fairfax County Park Authority | Adjacent, East | 40 |
| 6 | Grist Mill Park | Active recreation, team sports, and playing fields | Fairfax County Park Authority | 0.4, East | 95 |
| 7 | U.S. Coast Guard facilities | Various | U.S. Department of Transportation | 0.6, N 35° E | 185 |
| 8 | Gunston Hall Plantation | National Historic Site | Commonwealth of Virginia | 1.1, S 35° W | 700 |
| 9 | Mount Vernon | National Historic Site | Ladies of Mount Vernon Association | 1.2, N 85° E | 525 |
| 10 | Pohick Creek Stream Valley Parks | Local active and passive recreation | Fairfax County Park Authority | 2.1, N 60° W | 280 |
| 11 | Mason Neck State Park | Regional active and passive recreation and wildlife management | Virginia Department of Conservation and Recreation | 2.8, S 15° W | 1,800 |
| 12 | George Washington Memorial Parkway | Scenic drive and local active and passive recreation | National Park Service | 3.0, East and North | 7,200 |
| 13 | Potomac River National Wildlife Refuge Complex | Wildlife habitat preservation | U.S. Fish and Wildlife Service | 3.0, S 30° W | 1,050 |
| 14 | Accotink Stream Valley Park | Local active and passive recreation | Fairfax County Park Authority | 3.1, N 20° W | 55 |
| 15 | Piscataway Park | National colonial farm and natural area maintained for views from Mount Vernon | National Park Service | 3.8, East | 4,050 |
| 16 | Fort Hunt Park | Local passive recreation | National Park Service | 3.8, N 80° E | 240 |
| 17 | Lake Accotink Park | Local active and passive recreation | Fairfax County Park Authority | 4.8, N 35° W | 950 |
| 18 | Fort Washington Park | National Historic Site | National Park Service | 5.0, East | 340 |

Sources:
- USGS 7.5 minute quadrangles: Fort Belvoir, Virginia – Maryland, 1965; Mount Vernon, Virginia – Maryland, 1966; Occoquan, Virginia, 1966
- Fairfax County Section Maps, Revised 1/12/88
- ADC Northern Virginia Street Map Book, 1996
- Street Atlas USA 4.0 Delorme, 1996

* Distances to land holdings are estimated from the point on the Fort Belvoir boundary nearest the holding to its approximate geographic center. Areas are approximated using rough measurements from the sources listed above. † Formerly the Lower Potomac Pollution Control Plant.

and to the north of Main Post; Woodlawn Plantation and Pole Road Park adjacent and to the east of Main Post; Grist Mill Park, Mount Vernon Estate, George Washington Memorial Highway, and Fort Hunt Park to the east; and Pohick Bay Regional Park, Gunston Hall Plantation, Mason Neck Wildlife Refuge, and Mason Neck State Park to the southwest (Figure 2.4). Across the Potomac River, in Maryland, is Piscataway National Park. These public lands and parks provide more natural habitat for a variety of wildlife. Many of these tracts are especially important because of the conservation of undeveloped riparian areas along the shores of the Potomac River.

## 2.6 SATELLITE INSTALLATIONS AND SUBINSTALLATIONS

Fort Belvoir maintains three satellite installations totaling 10.7 acres. The three areas are described in Table 2.4. These satellite installations will not be addressed in this INRMP either because of their relatively small acreages, or because of pending changes in ownership.

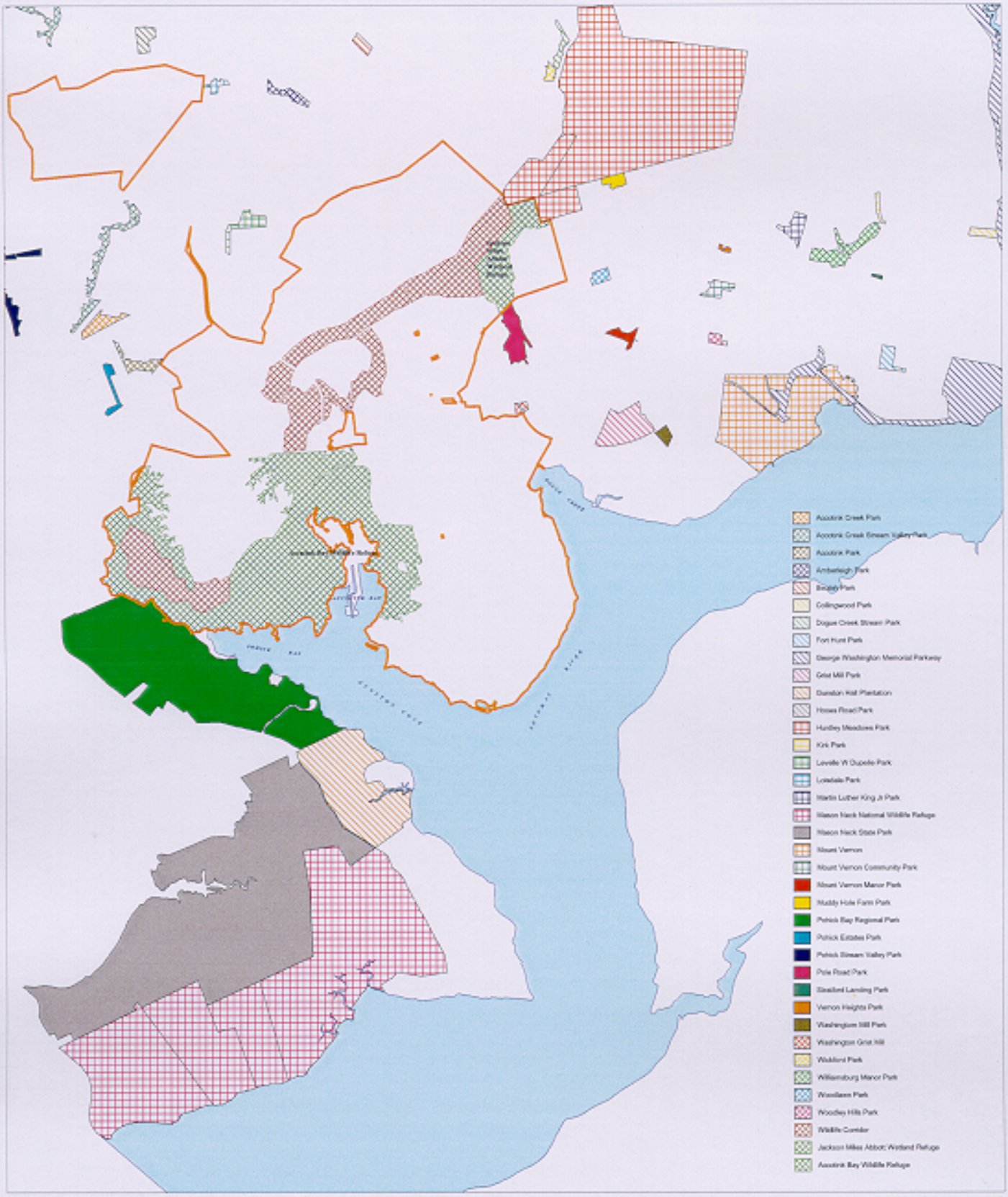
**Table 2.4. Fort Belvoir Satellite Installations**

| *Name* | *Size (acres)* | *Location* | *Description* |
|---|---|---|---|
| Microwave Station | 0.7 | Quantico Marine Corps Base in Prince William County, Virginia, approximately 20 miles south of Fort Belvoir | Small microwave station in the process of disposal |
| Outer Marker | 0.5 | Charles County, Maryland | Navigational beacon for aircraft approaching and leaving Davison Army Airfield |
| Revanna Station | 8.0 | Charlottesville, Virginia | NGIC Building under construction |

Source: Groeneveld, 2000.

## 2.7 JURISDICTION

Fort Belvoir has exclusive jurisdiction over its natural resources. Natural resources law enforcement on the installation can only be performed by enforcement officers with federal commissions. A 1996 Memorandum of Agreement between the U.S. Fish and Wildlife Service and Fort Belvoir delegates to the installation the authority to enforce federal laws dealing with the protection and conservation of fish, wildlife, and natural resources (e.g., Migratory Bird Treaty Act, Endangered Species Act, Marine Mammal Protection Act) (Appendix A).




N

# LANDS IN PUBLIC OWNERSHIP

SOURCE: FORT BELVOIR GIS CENTER;
FAIRFAX COUNTY GIS CENTER

FIGURE: 2.4

# 3.0
# Military Mission

## 3.1 OVERVIEW

This section describes the military mission of Fort Belvoir and the natural resources required to support the mission. In addition, this section describes the impacts of the military mission upon natural resources as well as the effects of natural resources and their management upon the mission.

### 3.1.1 Fort Belvoir's Military Mission

Fort Belvoir's military mission is to operate and maintain the installation; provide quality installation support and services to their customers; and plan, maintain, and execute mobilization readiness, military operations, and contingency missions (Fort Belvoir, 2000f). Since the departure of the Engineer School in 1988, the emphasis of Fort Belvoir's mission has shifted from training to providing logistical and administrative support to its tenants. Fort Belvoir is home to approximately 100 tenant and satellite organizations, including 20 Headquarters, Department of the Army agencies; nine major Army commands (MACOM); and eight non-Army activities (Fort Belvoir, 2000g). A U.S. Navy construction battalion, a U.S. Marine Corps detachment, a U.S. Air Force Activity, and a Department of the Treasury agency are also located at Fort Belvoir.

### 3.1.2 Mission Elements

Fort Belvoir's mission as presented in the installation master plan (Woolpert, 1993a) includes eight elements. These elements are described below.

- **Contingency Military Support.** Fort Belvoir provides contingency military support to the national capital region by supporting permanent party troops (e.g., Fort Belvoir Military Police Company, Military District of Washington Engineering Company, D Company 544th Engineer Battalion, 737th Explosive Ordnance Company, Headquarters Special Activities) and tenants, and by preparing them to accomplish their mission. Contingency support activities at Fort Belvoir include troop training, airfield operations at the Davison Army Airfield, the Defense Communications-Electronics Evaluation and Testing Activity (D/CEETA) communications operations, and the Night Vision and Electro-Optics Center (NVEOC) testing operations.

- **Regional Administrative Center.** As a Regional Administrative Center, Fort Belvoir provides support to host administrative tenants and regional organizations such as the Defense Logistics Agency, Civilian Personnel Operations Office, and various headquarters commands.

- **Regional Logistics Support Center.** As a Regional Support Center, Fort Belvoir supports activities such as supply, storage, maintenance, public works, and expanded light industry (e.g., petroleum, oil, and lubrication storage and motor pool activities).

- **Regional Recreation Center.** Fort Belvoir provides recreational programs and facilities such as fitness and recreational centers, two golf courses, a 105-slip marina, athletic fields, and picnic areas to eligible retired, reserve, and active-duty personnel and their dependents in the national capital region.

- **Regional Classroom Center.** Fort Belvoir hosts professional development and continuing education activities such as the Army Management Staff College, Defense Mapping School, and Defense Systems Management College.

- **Regional Housing.** Fort Belvoir supports Military District of Washington (MDW) and Fort Belvoir housing requirements for troops, family, and transient housing. Fort Belvoir has 2,070 family housing units and 530 rooms for temporary housing (Senires-Dubyak, 2000).

- **Regional Military Community Support.** Fort Belvoir provides community support to eligible retired, reserve, and active-duty personnel and their dependents in the national capital region through its exchange services, commissary services, credit union, banking, gas stations and convenience stores, and dining facilities.

- **Regional Environmental Stewardship.** Fort Belvoir provides protection for environmentally sensitive resources such as wetlands, mature forests, riparian habitats, and rare wildlife and vegetation communities that occur on the installation.

## 3.2 NATURAL RESOURCES NEEDED TO SUPPORT THE MILITARY MISSION

The different elements of Fort Belvoir's mission require various types and degrees of natural resources support. Fort Belvoir's natural resources provide high-quality settings for housing and administration facilities. It also contributes to the installation's Morale, Welfare, and Recreation Programs, which are aimed at increasing the quality of life for military and civilian personnel, who work and reside on post. The natural resources provide numerous opportunities for outdoor recreation activities for residents, day workers, neighbors, and the general public. Areas particularly conducive to passive recreation include extensive shoreline along navigable waterways, mature forest areas, and grasslands. Additionally, natural resources provide a realistic training and testing environment for meeting mission contingency support requirements.

The activities within the eight mission elements can be grouped into four general categories, each with its own natural resources needs. These are military field training/operations, cantonment facilities, outdoor recreation, and environmental stewardship. Most contingency military support activities fall into the category of military field training/operations. Cantonment facilities encompass most regional administrative, logistics support, classroom, housing, and community support activities, as well as indoor recreation. Outdoor recreation and environmental stewardship each have their own set of natural resource needs.

The use of Fort Belvoir's natural resources in military mission activities requires a broad range of natural resources management. These mission activities, and related natural resources needs and constraints are presented in Table 3.1. Existing natural resources on Fort Belvoir may influence the manner in which the military mission is executed. Certain topographic features, the presence of wetlands, or the presence of threatened or endangered species may limit certain military mission activities due to federal, state, and local compliance requirements. Regulatory requirements are summarized within the policy sections of each natural resources program component of this plan (Sections 7 through 13).

**Table 3.1. Fort Belvoir Mission-Related Natural Resources Needs and Constraints**

| *Key Mission Elements* | *Natural Resources Needs* | *Natural Resources Constraints* |
|---|---|---|
| **Military Training/Operations**<br>Aircraft overflight/airfield operations<br>Smoke training<br>Float bridge/fixed bridge training<br>Orienteering<br>Fire training<br>Heavy equipment training<br>Landing activities<br>Defensive tactics training<br>Wire obstacle training | Open areas<br>Forested areas<br>Vegetative cover<br>Stabilized shoreline access<br>Stabilized soils<br>Clean water<br>Freedom from vegetation and wildlife hazards | Erodible soils<br>Steep slopes<br>Wetlands<br>Listed threatened and endangered species<br>Migratory bird species<br>Erodible shoreline |
| **Cantonment Facilities**<br>Housing<br>Administrative<br>Community support<br>Classroom<br>Indoor recreation<br>Infrastructure<br>Research facilities | Buildable lands (slopes less than 4%, minimal vegetation)<br>Stabilized soils<br>Naturalized landscapes<br>Pest control | Erodible soils<br>Steep slopes<br>Wetlands<br>Floodplains<br>Natural wildlife habitat and travel corridors<br>Presence of mature trees<br>Listed threatened and endangered species<br>Migratory bird species |
| **Outdoor Recreation**<br>Golf courses<br>Marina<br>Pedestrian trails<br>Nature watching<br>Nature photography and art<br>Tennis courts, athletic fields, archery range<br>Picnic areas<br>Fishing<br>Hunting | Fish and wildlife<br>Natural vegetation areas<br>Open areas<br>Stabilized shoreline<br>Stabilized soils<br>Clean water | Erodible soils<br>Steep slopes<br>Wetlands<br>Erodible shoreline<br>Natural wildlife habitat<br>Listed threatened and endangered species<br>Migratory bird species |
| **Environmental Stewardship**<br>Soils<br>Water<br>Vegetation<br>Wildlife<br>Designated conservation lands (wildlife refuges, forest and wildlife corridor) | Healthy native ecosystems | Size<br>Habitat fragmentation<br>Degraded stream corridors<br>Invasive, exotic, and feral species<br>Overabundant species<br>Shrinking surrounding natural resource base<br>Degradation of regional natural resources conditions<br>Listed threatened and endangered species<br>Migratory bird species |

### 3.2.1 Military Training/Operations

U.S. Army Garrison, Fort Belvoir's training mission is to command, control, and operate Fort Belvoir and assigned and attached units; to provide installation support to authorized activities and personnel assigned to or located in the geographic support area of Fort Belvoir; and to plan and maintain mobilization readiness for U.S. Army Fort Belvoir (Rhile, 1998).

The military support activities on Fort Belvoir require various types of natural resources. Training units require realistic training environments. For example, the 464th Transportation Company (Medium Boat) U.S. Army Reserve performs ship-to-shore troop and materials transport and requires a natural shoreline on which to train. The 299th Engineering Company (Float Bridge) U.S. Army Reserve is responsible for creating floating bridges to cross streams and rivers, and requires access to open waters in which to train. The MDW Engineering Company requires terrain on which to train with grading and excavation equipment. The types of natural resources that are required to support the various training activities on Fort Belvoir are described below.

- Land navigation can be conducted on any sort of terrain. At Fort Belvoir it is conducted in Training Areas 6, 7, 8, and 9, which are primarily wooded (Figure 2.2).

- Training on fixed-wing aircraft and helicopter transport and helicopter touch-and-go is conducted at Davison Army Airfield. The runways and two helicopter landing pads require adequate clear zones (areas free of trees and other obstructions) to meet safety requirements. Vegetation surrounding the landing areas is maintained in a manner that does not encourage wildlife (e.g., deer, geese, and other birds). In addition to Davison Army Airfield, touch-and-go training is also conducted in cleared areas in Training Areas 16 and 9A (Figure 2.2). Wooded areas act as noise buffers around cleared areas.

- Common task testing, mission essential task list skills training, and expert field medical badge training require a maximum of 2 acres of open area or thinly wooded area for erecting temporary testing stations (i.e., folding tables and sun protection). This type of training does not involve ground disturbance.

- Mortar training requires a minimum 1- to 2-acre clearing, although a larger area may be used so that units can practice moving from point to point within the training area.

- Heavy equipment operations and wire obstacle training exercises are limited to Training Area 16, Grid UT13658840, which is a 2- to 3-acre clearing that is relatively level (Figure 2.2).

- Rescue training is conducted in the cantonment area and in Training Area 8 (Figure 2.2).

- Defensive tactics training requirements vary depending on the exercise; however, they do not involve ground disturbance. Generally, less than an acre is required to train a platoon. Fort Belvoir often uses areas for training that are either wooded or that have variable topography.

- Road march training is conducted on existing roads and trails.
- Fixed bridge training, which requires a land gap suitable for a bridge but no water access, will occur on Fort Belvoir in 2001 (Robinson, 2000).

### 3.2.2 Cantonment Facilities and Family Housing

Cantonment facilities occupy fixed sites on Fort Belvoir. They require the natural resources at their sites to be maintained and managed in such a way as to provide a visually pleasing setting and to preclude interference with ongoing mission operations and activities. Grounds in the cantonment area are typically landscaped with ornamental species, and landscape plantings are selected and maintained to eliminate hazards such as poisonous berry–producing shrubs at child-care centers and near family housing areas, and to conserve energy. The site terrain is modified to move stormwater drainage away from facilities. Pest management practices are conducted to deter problem wildlife and disease-carrying vectors from public areas and facilities.

### 3.2.3 Outdoor Recreation

Outdoor recreation facilities are critical to Fort Belvoir fulfilling its role as a regional recreation center and providing regional environmental stewardship. It is also important to enhance the quality of life of soldiers and military families. Recreational activities require many types of natural resources support. Some outdoor recreation facilities (e.g., golf courses, athletic fields, camping areas) require natural resources to be manipulated to support the recreational activity.

Fort Belvoir maintains two golf courses, a nine-hole course on the South Post and a 36-hole course on the North Post. The golf courses require 437 acres of vegetation maintained as turf, interspersed with patches of natural vegetation and landscape plantings. Maintenance of turf condition requires the use of selected grasses that are seeded, mowed, watered, and fertilized according to a strict regimen. Maintenance also requires control of turf-damaging pests, which range from fungi to wildlife. Landscape plantings are installed and maintained to enhance the visual character of the courses.

Fort Belvoir's marina is located on Dogue Creek, near the River Village and George Washington Village Housing areas. In general, marinas require a suitable shoreline condition with navigable waterway access. Water depths at the Dogue Creek Marina range from 3 feet at low tide to 6 feet at high tide (King, 1999). Marinas also require various developed facilities to support boating activities. The Dogue Creek Marina has two boat launch ramps, pump-out stations, and electric and water hookups. The visual character of the marina facility may be enhanced by natural vegetation along the shoreline or by landscape plantings; however, vegetation may be viewed negatively by marina operators and users when the vegetation precludes the use of areas for marina operations. Hazard vegetation removal and pest management activities are necessary to protect marina facilities and to enhance a boater's experience.

The Fort Belvoir Outdoor Recreation Office controls six soccer fields, one football field, and several softball fields. In general, athletic fields require maintenance of turf grasses for playing fields. Usually these areas are landscaped to provide wind and visual screens. They do require pest management for protection of turf integrity and vitality, and for control of weeds.

Fort Belvoir has several playgrounds, three picnic areas, an outdoor archery range and a Boy Scout camping area. These areas have similar natural resource requirements to the athletic fields. They also have landscape and natural vegetation management requirements for visual enhancement, diversified activities, and natural resource protection.

In contrast to the outdoor recreation activities above, hunting and fishing, as well as other recreation activities such as hiking, bird watching, and nature study require the installation to conserve areas of natural resources, and to provide facilities to support public access to such areas (Section 13).

### 3.2.4 Environmental Stewardship

Fort Belvoir possesses significant natural systems, including wetlands, shoreline, forests, grasslands, and many species of wildlife. The presence of these resources on the installation, relative to Fort Belvoir's geographic location in a growing metropolitan area, provides the installation with an opportunity to demonstrate how a U.S. Army facility can use environmentally sensitive, planned development to enhance its mission effectiveness, while preserving healthy ecosystems. Environmental stewardship on Fort Belvoir includes broader, regional environmental initiatives, such as those described in the Chesapeake Bay Program.

## 3.3 MILITARY MISSION EFFECTS ON NATURAL RESOURCES

As the major administrative and logistics center for the northern Virginia portion of MDW, the installation primarily provides housing and administrative support. This role results in continued development on-post as the installation becomes host to additional tenants, as well as housing and community support facilities. While the emphasis of the Fort Belvoir military mission has shifted from engineer training to logistical and administrative support, military training remains as one of eight mission elements as discussed in Section 3.1.2. Effects from continued development and training are minimized through Fort Belvoir's master planning process, the National Environmental Policy Act (NEPA) process, and the implementation of Fort Belvoir Regulation 210-70 (*Range Procedures and Utilization of Training Areas*).

*The Fort Belvoir Real Property Master Plan, Long-Range Component* (Woolpert, 1993a) establishes the future direction for development on-post. The long-range component of the plan also establishes goals, objectives, and policies to ensure that natural resources are protected and managed in ways that are compatible with Fort Belvoir's military operations and that support the Army's Communities of Excellence Program.

A companion document of the *Fort Belvoir Real Property Master Plan* is the *Installation Design Guide* (Woolpert, 1995). This guide provides a comprehensive and coordinated design framework through the establishment of design principles, design guidelines, and detailed plans. The framework reinforces the distinctive identity of Fort Belvoir's physical and visual elements, including its buildings, streetscapes, waterfront, and large areas of open space. New development or redevelopment on Fort Belvoir must meet the criteria of the *Installation Design Guide*.

NEPA requires review of federally supported activities to determine their potential impact on the environment. NEPA is designed to identify potential environmental problems early in the planning process so the proponent of the action can resolve problems in the early stages of project development. Army Regulation (AR) 200-2 (*Environmental Effects of Army Actions*) sets forth policy, responsibilities, and procedures for integrating environmental considerations into Army planning and decision making. Fort Belvoir Regulation 210-70 provides specific requirements for environmental protection and conservation of training areas.

The following sections provide an overview of impacts that could arise from the various types of mission activities at Fort Belvoir. These impacts do not necessarily occur at Fort Belvoir.

### 3.3.1 Military Training/Operations

Military training activities occurring in undeveloped lands at Fort Belvoir have the potential for disturbing land and water areas and can result in the removal of vegetation, destruction or modification of wildlife habitat, alteration of surface water drainage patterns, and soil erosion. Training that requires the use of installation shoreline can result in shoreline erosion. This includes the 464th Transportation Company's practice with ship-to-shore landing craft, and the 299th Engineering Company's float bridge training. In addition to disturbances from shoreline erosion, certain training activities have the potential for causing fires. Historical records indicate that approximately two mission-related fires occur each year, usually resulting from the use of smoke grenades and vehicle and machine operation in training areas and other off-road areas. Fires that escape control can cause habitat damage, resulting in the movement of wildlife away from the damaged area.

Operations at the Davison Army Airfield require removal of woody vegetation within designated clear zones around the airfield, and control of wildlife species such as deer and waterfowl, which are deemed hazardous to airfield operations. Operations at D/CEETA and the NVEOC require the maintenance of a secure perimeter fence that can preclude wildlife movement through their grounds.

Sources of potential chemical releases from military activities include airfield operations such as de-icing fluids and aqueous-film-forming foam and accidental spills from equipment and vehicles. Release of toxic chemicals can have adverse effects on terrestrial and aquatic wildlife and plants. The fire department is the first to respond to all spills. Most spills are fuel spills.

Noise emissions from military activities include aircraft overflights from Davison Army Airfield, and float bridge training and landing craft operations along the Gunston Cove shoreline. Depending upon the frequency of occurrence and the volume, noise emissions can cause wildlife to move out of nearby areas.

### 3.3.2 Cantonment Facilities and Family Housing

Construction of new administrative centers, classrooms, military community support centers, logistics support centers, housing units, or other facilities can result in the loss or fragmentation of natural habitat and can inadvertently create habitat for problem wildlife species such as starlings, pigeons, raccoons, and feral cats. Landscape plantings can result in unintentional introduction of invasive exotic vegetation. Site development can alter drainage patterns resulting

in soil erosion or downstream flooding. Adherence to Fort Belvoir's master planning process and design specifications reduces the potential for such adverse effects on natural resources.

Operation and maintenance of support facilities can adversely affect natural resources. Maintenance of turf and landscape plantings can result in release of fertilizers and pesticides, and excessive water use through irrigation. Employee activities, such as driving or parking off the pavement, can adversely affect existing site resources, such as mature trees, through compaction of soils or mechanical damage.

Housing area activities can also affect wildlife through indiscriminate removal of vegetation, inappropriate use of household and yard chemicals, feeding and enticing wildlife, failure to contain household pets, and release of nonnative plants or animals.

### 3.3.3 Outdoor Recreation

Outdoor recreation facilities (e.g., golf courses, marinas, playing fields) and activities (e.g., hunting, fishing, hiking, nature watching, organized outdoor events) have the potential for causing natural resources impacts.

Fort Belvoir's two golf courses and athletic fields require large areas of highly managed and manipulated grounds. Turf management operations can result in the release of fertilizers and pesticides. Protection of turf may necessitate measures to deter or remove problem wildlife. The use of groundwater for irrigation can result in locally depressed groundwater levels.

The Dogue Creek Marina displaces natural shoreline conditions and has the potential for affecting natural resources through accidental fuel and oil spills or discharges, noise from watercraft operation, disturbance of wildlife along shorelines by watercraft, and shoreline erosion or accretion due to altered hydrologic patterns.

Outdoor recreation events have the potential to disturb sensitive natural resources. Fishing can result in the release of exotic species that are used for bait.

Unmanaged, large scale foot traffic off established trails has the potential to introduce large-scale foot traffic into undeveloped natural areas where such activity has the potential to destroy vegetation, disturb ground surfaces, and disrupt wildlife. Fort Belvoir hosts about six volksmarches a year.

### 3.3.4 Environmental Stewardship

Environmental stewardship has a positive effect on local and regional ecosystems. It provides for the conservation and enhancement of natural systems. Fort Belvoir's stewardship also benefits natural resources within a larger, regional area.

## 3.4 FUTURE MILITARY MISSION EFFECTS ON NATURAL RESOURCES

At present, the focus of Fort Belvoir's support of tenants and the military community in the National Capital Region is shifting away from field training and toward administrative and

community support activities at Fort Belvoir. Increased logistical and administrative support will place further demands on the natural resources through increased land development, such as more office buildings and landscaped areas, increased military housing, new and expanded community support facilities, and more recreational opportunities. (New facilities planned for construction in support of the mission are discussed in Section 4.) Additionally, continuing population growth will increase the demand for and use of Fort Belvoir's natural areas for outdoor recreation. Increased development of Fort Belvoir will require a greater emphasis on environmental stewardship so Fort Belvoir can continue to carry out its military mission without adversely affecting natural resources. Efforts will continue to be made to direct future development toward previously disturbed areas in accordance with the installation's master plan. Efforts will also continue to be made to balance competing demands for access to installation natural resources, consistent with resource conservation requirements.

# 4.0
# Land Use and Facilities

## 4.1 LAND USE

Fort Belvoir functions as an administrative and logistics center for the Military District of Washington. The general land use on Fort Belvoir is summarized in Table 4.1. This combined land area of 9,094 acres includes the 807 acre Engineering Proving Ground (EPG), 28 acre Revana Station and the 581 acre Humphreys Engineer Center (HEC) which is owned by the Army Corp of Engineers and supported by Fort Belvoir.

**Table 4.1. General Land Use**

| *Category* | *Description* | *Approximate Size (acres)* |
|---|---|---|
| Improved acreage | Structures and adjacent areas such as roads, walkways, parking lots, and golf courses that require intensive maintenance | 2,436 |
| Semi-improved acreage | Areas that require periodic maintenance, primarily weed and brush control | 241 |
| Unimproved acreage | Natural areas requiring limited maintenance including wildlife refuges, forests, wetlands, wildlife corridors, shorelines, and hunting areas | 6,417 |

Source: Fort Belvoir GIS information.

Land use throughout the installation is highly varied and consists of the following: administrative, research and development, medical, community facilities, housing (troop and family), service and storage, recreation, environmentally sensitive areas, and training areas. The *Fort Belvoir Real Property Master Plan, Long Range Component* divides the installation into six planning districts (Figure 4.1) (Woolpert, 1993a): South Post, Southwest Area, South Post Core Area, Lower North Post, Upper North Post and Davison Army Airfield.

The South Post Planning District is located on the Belvoir Peninsula and borders Accotink Bay, Dogue Creek, Gunston Cove, and the Potomac River. This planning area encompasses a portion of Fort Belvoir's historic district. Land uses within this area are primarily research and development, and educational facilities. The South Post Planning District contains several U.S. Army and DoD tenant organizations, including the Defense Mapping School, the U.S. Army Information Systems Software Command, the U.S. Army's DeWitt Hospital, and the Defense Systems Management College. In addition, the South Post Planning District contains research and development facilities, family housing, recreation, administration/education, supply/storage

and maintenance facilities, the eastern third of the Accotink Bay Wildlife Refuge (ABWR) and the South Post Golf Course. Adjacent to this district is the Southwest Area Planning District, which contains most of the training areas, most of the 1,360-acre ABWR, and a portion of Fort Belvoir's Forest and Wildlife Corridor. The Southwest Area Planning District borders Accotink Bay, Pohick Bay and Pohick Creek.

The South Post Core Area Planning District is a rectangular parcel of land within the South Post Planning District, bounded by a series of roads including (from 9th Street) Belvoir Road, Harris Road, 18th Street, Gaillard Road, 21st Street, Rossell Loop, Comstock Road, and Belvoir Drive to 23rd Street. The South Post Core Area Planning District has the highest density of buildings on Fort Belvoir and encompasses most of the Fort Belvoir historic district.

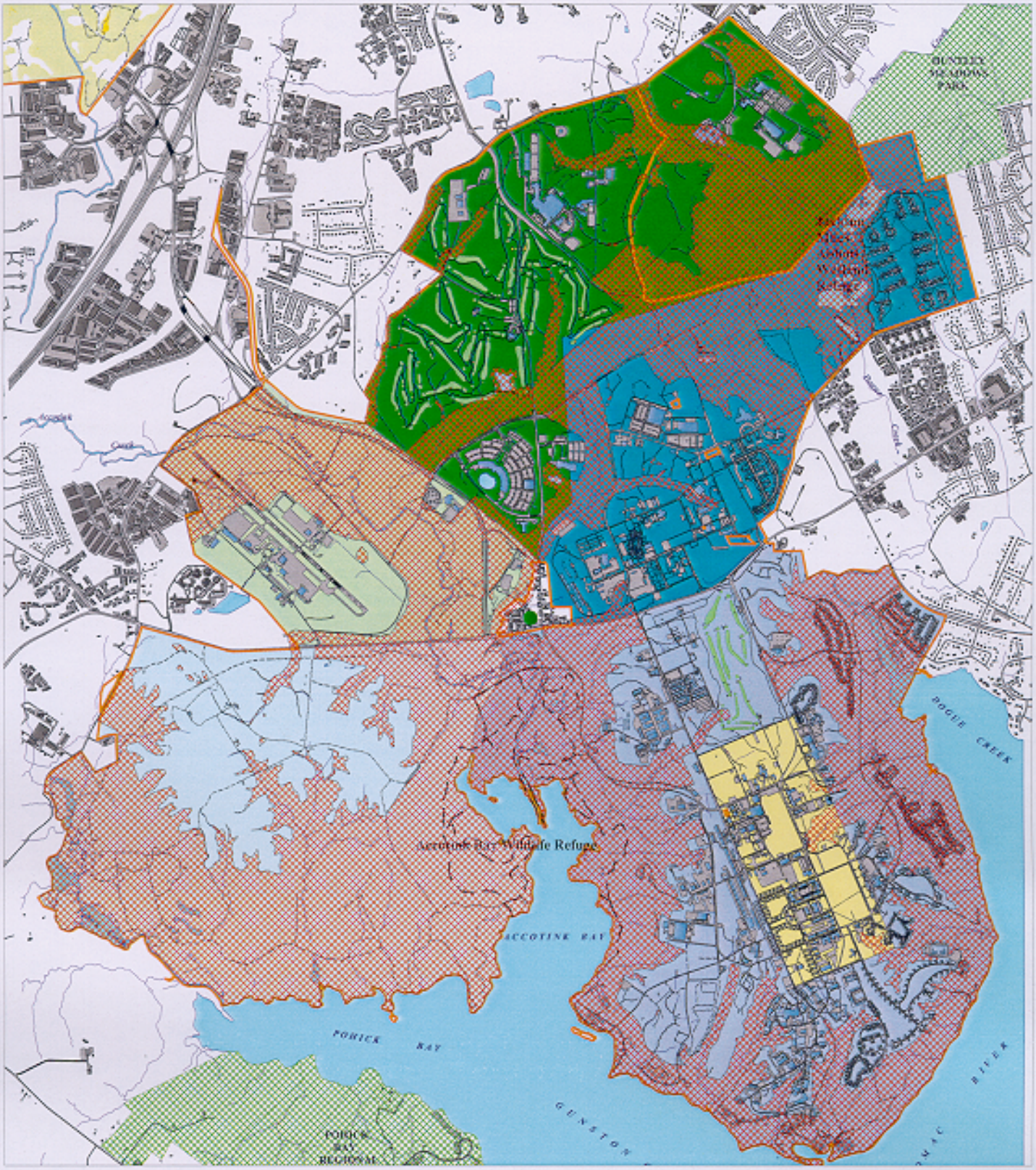
The Upper and Lower North Post Planning Districts accommodate troop and family housing, support facilities, and large tenant organizations such as the Defense Logistics Agency and the Defense Communication Electronics Evaluation and Testing Activity. These planning districts also encompass the North Post Golf Course, the Fort Belvoir Elementary School, the commissary, the post exchange, and recreation facilities for military personnel and their families. Each of these districts contains a portion of Fort Belvoir's Forest and Wildlife Corridor. The Lower North Post Planning District contains the 146-acre Jackson Miles Abbott Wetland Refuge (JMAWR).

The Davison Army Airfield Planning District contains the 388-acre airfield facility located on the western portion of the North Post (Landgraf, 2000a). Davison Army Airfield is a Class A Army airfield providing support facilities for both fixed- and rotary-wing aircraft (Section 4.2.4). This district contains a portion of Fort Belvoir's Forest and Wildlife Corridor.

EPG is not addressed as a separate planning district because it is controlled by the Assistant Secretary of the Army for Installations, Logistics and Environment. EPG consists of heavily wooded areas and training areas, which are rarely used. There are 44 structures at EPG, including 24 buildings and eleven explosives magazines (two of which are currently used) and barricades (Bland, 1999). Most of these structures are abandoned. Only two are occupied; several are used for storage.

### 4.1.1 Administration

Approximately 1,102 acres of the installation are used for administrative purposes (Landgraf, 2000a). Administration facilities include the post headquarters and post administrative offices, Defense Logistics Agency (DLA) Headquarters, and two major Army Command headquarters. Other administrative activities at Fort Belvoir include a printing plant, the Adjutant General's office, and an Adjutant General publications office and training facilities.




Environmentally Sensitive Area

Planning District

- Upper North Post Area
- Lower North Post Area
- Davison Army Airfield Area
- Southwest Area
- South Post Core Area
- South Post Area

N

# DESIGNATED PLANNING DISTRICTS and ENVIRONMENTALLY SENSITIVE AREAS on FORT BELVOIR

SOURCE: WOOLPERT, 1995

FIGURE: 4.1

NOTE: PLANNING DISTRICTS and ENVIRONMENTALLY SENSITIVE AREAS ARE NOT MUTUALLY EXCLUSIVE

### 4.1.2 Research and Development

Research and development, a major function at Fort Belvoir, is conducted on 340 acres. The largest area designated as research is the 280-acre area in the Upper North Post that is currently occupied by the D/CEETA. The Communications and Electronics Command occupies 60 acres on the South Post. Research and development include administrative and laboratory facilities.

### 4.1.3 Medical

Medical facilities at Fort Belvoir occupy 103 acres (Landgraf, 2000a). The main medical facility is the DeWitt Hospital complex located in the center of the South Post. A dispensary and the Logan Dental Clinic are also located on the South Post. Three more dispensaries, two in the troop housing area and one at Davison Army Airfield, are also in operation.

### 4.1.4 Community Facilities

Community facilities for the use of military personnel and their families occupy 451 acres (Landgraf, 2000a). Most community facilities are located on the South Post, including convenience stores, a credit union, an automobile service station, an education center, and a library. Other facilities include a post office, banks, the Sosa Recreation Center, a movie theater, a self-help center, an officers' club, and a community club. Fort Belvoir also offers three child development centers, two on the North Post and one on the South Post. Fort Belvoir Elementary School, a Fairfax County school, is also located on North Post. Fort Belvoir has the largest commissary in the continental United States, located on the North Post. The installation recently constructed a 136,000-square-foot post exchange mall next to the commissary that offers a variety of shops and services, including a food court.

### 4.1.5 Housing

Family housing occupies 569 acres at Fort Belvoir. This housing includes the 2,070 enlisted and officer family units located primarily around the eastern edge of the South Post, and Lewis Heights and Woodlawn Village located on the eastern edge of the North Post. Fort Belvoir's troop housing occupies 72 acres (Landgraf, 2000a). Troop housing includes barracks for 1,200 single enlisted soldiers on the North Post off Gunston Road, and 530 temporary housing rooms for new arrivals and visitors (Senires-Dubyak, 2000).

### 4.1.6 Service and Storage

Service and storage facilities occupy 314 acres and are located throughout Fort Belvoir. These include activities and offices such as warehousing, motor pool facilities, and light-industrial areas. Fort Belvoir also has 129 acres of land dedicated to industrial uses (Landgraf, 2000a).

### 4.1.7 Recreation

Fort Belvoir has many recreation facilities, occupying about 1,006 acres, scattered throughout the installation in areas convenient to the population they serve (Landgraf, 2000a). Facilities available include a nine-hole golf course on the South Post and a 36-hole golf course on the Upper North Post, tennis courts, swimming pools, athletic fields, an archery center and ranges,

three picnic areas with grills, six soccer fields, and two football fields (Gibson, 1999). Fort Belvoir also has a youth services center where summer camps are held and the Sosa Community Center, which offers a variety of video games and pool tables. Fort Belvoir has an extensive system of paved and unpaved walking and running trails on the installation (Section 4.2.2).

The Dogue Creek Marina is located south of the Mount Vernon Road bridge. The marina has 105 wet slips and 300 dry-storage facilities, which are rented on an annual basis (King, 1999). The marina has a sewage pump-out station, electric and water hookups, a marine travel lift, and two boat launch ramps. It does not offer fueling facilities. The marina also rents boats. All marina facilities are open to active and retired military and family, and civilian personnel.

### 4.1.8 Environmentally Sensitive Areas

Fort Belvoir's Real Property Master Plan delineates 3,335 acres of environmentally sensitive areas (Woolpert, 1993a). The identification and delineation of environmentally sensitive areas was done to facilitate decision making in site selection for new facilities construction. The Real Property Master Plan defines environmentally sensitive areas as those areas where development would adversely affect the region surrounding that area, or where the engineering for development would incur excessive costs. Environmentally sensitive areas include wetlands, floodplains, and areas with steep topography, poor soils, endangered species habitat, and cultural resources (Woolpert, 1993a).

Much of the environmentally sensitive acreage is associated with the two wildlife refuges, and with the forest and wildlife corridor. The JMAWR is 146 acres and is located in the northeastern corner of the North Post. The ABWR is 1,360 acres located along Accotink Bay and Accotink Creek in the central portion of the South Post. Fort Belvoir also has 742 acres of designated forest and wildlife corridor that traverse the installation. This corridor connects the Huntley Meadows County Park just north of the installation to the JMAWR on the North Post. The corridor continues through the installation to the ABWR on the South Post and on to the Mason Neck State Park and the Potomac River National Wildlife Refuge Complex south of the installation (Figure 4.1).

In addition to the environmentally sensitive areas described above, the Fort Belvoir Real Property Master Plan considers Fairfax County designated Resource Protection Areas (RPAs), including floodplains, as environmentally sensitive (Woolpert, 1993b). Virginia's Chesapeake Bay Preservation Act defines RPAs as "components of the Chesapeake Bay Preservation Area comprised of sensitive lands at or near the shoreline that have an intrinsic water quality value due to the ecological and biological processes they perform and are sensitive to impacts which may result in significant degradation to the quality of state waters and loss of aquatic habitat." In general, RPAs consist of tidal wetlands, tidal shores, tributary streams, non-tidal wetlands connected by surface flow to a tidal wetland or tributary stream, a 100-foot buffer on the previous areas, and major floodplains.

On March 22, 1989, Fairfax County, in accordance with the Chesapeake Bay Preservation Act, adopted the Chesapeake Bay Preservation Ordinance that restricts development for areas mapped by the county as RPAs. Fairfax County has mapped RPAs on Fort Belvoir, and the installation has entered these areas into its GIS. On Main Post, these are located along Accotink Creek,

Kernon Run, Mason Run, Dogue Creek, Pohick Creek, Accotink Bay, Gunston Cove, the Potomac River, and several unnamed tributaries (Figure 4.2). On EPG, RPAs are mapped along Accotink Creek and Lark Branch, a tributary to Accotink Creek, near the eastern boundary (Figure 4.2).

As part of the National Flood Insurance Program, the Federal Emergency Management Agency (FEMA) has mapped flood hazard areas on Fort Belvoir (FEMA, 1990). The Flood Insurance Rate Maps identify the areas that would be inundated by a 100-year flood and show the areas that are determined to be outside the 500-year flood area. As of 2000, Fort Belvoir did not have electronic floodplain data included in its GIS. Fairfax County is in the process of updating its floodplain maps, which will include the Fort Belvoir area. Fort Belvoir will include the Fairfax County update in its GIS. Although floodplains are not mapped into the GIS, many are encompassed by the RPAs and are considered as severe constraints for planning and development purposes.

Floodplain and RPA management has primarily involved avoidance during development planning. Within this environmentally sensitive designation, 100-year floodplains are considered a moderate constraint and RPAs are considered a severe constraint. Moderately constrained areas are considered to be compatible only with lower intensity development, and must be thoroughly investigated before development. Severely constrained areas have the greatest degree of limitation, and are compatible only with very low-density or no development.

### 4.1.9 Airfield

The Davison Army Airfield encompasses 388 acres in the southwestern corner of the North Post (Section 4.2.4) (Landgraf, 2000a). The airfield is the primary transportation facility on Fort Belvoir. The 12th Aviation Battalion and Operational Support Airlift Agency use the airfield for rotary- and fixed-wing training.

### 4.1.10 Training Areas

In accordance with the U.S. Army Active/Inactive Range Inventory there is approximately 1,838 acres on Fort Belvoir, which are used solely for training (Figure 2.2). This acreage includes the explosive ordnance disposal area in Training Area 6 (Landgraf, 2000a). (Note: The Fort Belvoir Master Plan shows the training area acreage as 462 acres based on future plans to redistribute the area as administrative, research and development, etc.) A limited amount of land is available for military training maneuvers at Fort Belvoir, and many of the training areas are limited in use due to their proximity to on- and off-post housing and traffic.

Facility 7339 and Building 338, located at the tip of the southern peninsula at Whitestone Point along Gunston Cove, includes a boat launch ramp, pier, and harbor master facility/maintenance shop. This facility is used for training, docking, maintenance, and storage. The 299th Engineering Company uses the ramp (and beach areas in the Tompkins Basin Recreation Area) during float bridge training. The 464th Transportation Company secures their boats at the pier.

## 4.2 TRANSPORTATION SYSTEM

Fort Belvoir's transportation system consists primarily of roadways, multi-use and pedestrian trails, and an airfield. Each of these is discussed in detail below.

### 4.2.1 Roadways

Road access to Fort Belvoir is primarily through five named, gated entrances, as well as several unnamed gates. The Tulley Gate, Pence Gate, and Lieber Gate are on U.S. Route 1, and Walker Gate is on Old Mount Vernon Highway. Farrar Gate is on John J. Kingman Road off the Fairfax County Parkway. Unnamed gates are located off Woodlawn Road, Gunston Road, and at various entrances to training areas.

Fort Belvoir is serviced by many types of roadways including public highways, major and minor arterial roads, collector streets, local streets, and unpaved vehicle trails (Figure 2.2). Although several state-maintained highways traverse the installation, Fort Belvoir owns and maintains most of the roads that originate and terminate inside the installation boundaries. As of 2000, roadways within Fort Belvoir comprised approximately 115 miles of paved and 38 miles of unpaved roads (Landgraf, 2000c).

U.S. Route 1 is a state-maintained four-lane undivided artery that bisects Fort Belvoir, dividing it into North and South Posts. The Fairfax County Parkway is a four-lane, state-maintained, divided artery crossing north/south through a portion of Fort Belvoir and terminating at U.S. Route 1. Beulah Street and Woodlawn Road are also state-maintained, two-lane undivided roads crossing north/south through Fort Belvoir, ending at U.S. Route 1. Telegraph Road, a two-lane road currently being widened to a four-lane divided road, passes along the northern border of the installation. Old Colchester Road, a two-lane undivided road, passes along the southwestern boundary. Both of these are state-maintained roads.

Installation roads include paved two-lane roads throughout the developed sections of the north and south posts and unpaved vehicle trails in the training areas. Major bridges in the installation's road network include four public bridges and one restricted bridge. Of the four public bridges, two cross Accotink Creek, one crosses Dogue Creek, and one crosses U.S. Route 1 (on Gunston Road). A major bridge where Poe Road crosses Accotink Creek is not open to the public. Numerous smaller bridges and culverts cross tributaries throughout the installation. Fort Belvoir maintains these roads and bridges. The Virginia Department of Transportation maintains the bridges crossing Accotink Creek on Telegraph Road and U.S. Route 1.

### 4.2.2 Multi-use and Pedestrian Trails

Fort Belvoir contains 13.3 miles of multi-use trails designed to complement the various roads on the post (Landgraf, 2000b). Improved surface trails parallel many of the roads and developments on the post. These improved surface trails consist of a standard 6-foot-wide asphalt-paved surface. Other installation trails include the Fairfax County Parkway Trail, the John J. Kingman Road Trail, the Beulah Street–Woodlawn Road Trail, the Woodlawn Village Trail, and the Golf Course Jogging Trail (Woolpert, 1993a). Multi-use trails are designed to accommodate such activities as biking, jogging, and walking.

N

Riparian/Resource Protection Areas

# RIPARIAN/RESOURCE PROTECTION AREAS on FORT BELVOIR

SOURCE: THOMAS, 1998

FIGURE: 4.2

Fort Belvoir also contains 11.5 miles of pedestrian scenic nature and hiking trails on the post (Landgraf, 2000b). The Belvoir Ruins Trail is located in the vicinity of the Fairfax Mansion Ruins, and there are numerous trails through open spaces, such as the wildlife viewing trails through the ABWR (approximately 9 miles total) and the JMAWR (approximately 0.5 miles total). The Pohick Loop Trail (approximately 0.5 miles total), within the ABWR is accessible to persons with disabilities and has interpretive signs about the natural resources in the area (U.S. Army, 1999). In addition, a new trail providing access to Mulligan Pond that is accessible to persons with disabilities was completed in 1999 as part of a renovation project for the pond to enhance freshwater fishing opportunities on the installation.

### 4.2.3 Rail Facilities

There are no active rail facilities at Fort Belvoir. Railroad tracks formerly associated with the freight line spur of the Richmond, Fredericksburg, and Potomac Railroad have been abandoned. As of 1997, these tracks consisted of the spur line running along the Fairfax County Parkway and Gunston Road to the bridge crossing U.S. Route 1. The railroad track south of that bridge was removed in 1996. The railroad track north of U.S. Route 1 to John J. Kingman Highway has also been removed. North of John J. Kingman Highway, the railroad track will remain in an unmaintained state. The Washington Area Metropolitan Transit Authority (WMATA), in its 25-year *Transit Service Expansion Plan* (WMATA, 1999), has identified various proposals for the expansion of heavy rail, including an extension south to the Fort Belvoir / Lorton area. Thorough studies must be performed prior to any further consideration of this extension. As of 2000, no such studies have either been endorsed or initiated (Donodeo, 2000).

### 4.2.4 Air

The Davison Army Airfield is located along U.S. Route 1 on the North Post of Fort Belvoir. It is a Class A Army airfield equipped with an adjacent heliport that accommodates fixed- and rotary-wing aircraft. The airfield has 4,700 linear feet of painted runway, with extensions for overruns on either end bringing the total length to 5,630 feet. The runway is 81 feet wide, made of asphalt, and is located parallel to a 4,900-foot extended taxiway. A smaller concrete runway that is 450 feet long and 40 feet wide is used for the helipad.

The mission of the Davison Army Airfield is to transport passengers and freight for the Army and the Department of Defense. This facility is also used for training. The airfield contains five repair shops, maintenance aprons, storage areas for fuel and other flammable materials, and fuel dispensing facilities. Aircraft are restricted to a minimum vectoring altitude of 2,000 feet over the ABWR.

## 4.3 UTILITIES

Utilities on Fort Belvoir consist primarily of a county potable water supply and distribution system, groundwater wells, a sanitary sewer system, a storm sewer system, an electric power system, a natural gas system, a steam system, and a communications infrastructure.

### 4.3.1 Water Supply

The Fairfax County Water Authority supplies potable water to Fort Belvoir. The on-post water distribution system is owned, operated, and maintained by Fort Belvoir. The operation, inspection, and maintenance of the water system includes all system appurtenances, including pipes, pump stations, and holding tanks. As of 2001, there were approximately 78 miles of water main (greater than 6-inch) pipe on Fort Belvoir. The ancillary structures that complement the water supply system include three pumping stations, four elevated storage tanks, one ground-level storage tank, and a chlorination unit. One of the four elevated storage tanks is dedicated for use by the North Post Golf Course. The four elevated tanks and one ground storage tank provide approximately 2.6 million gallons of storage. A total of 2.2 million gallons per day (MGD) are provided through two major points of entry, two Fairfax County Water Authority meter vaults/pump stations on Pole Road and Telegraph Road. There are no potable water supply facilities in the training areas.

Fort Belvoir has a number of active and inactive groundwater supply wells. None of the wells supply potable water. They are used for irrigation. Three wells at the North Post Golf Course and one at the DLA headquarters building are used to provide irrigation water. A single well at the MDW horse stables in Training Area 8 is used to provide water for the horses. In 1999, 17.8 million gallons were drawn from the three golf course wells, with a peak daily withdrawal of 0.10 million gallons from Well # 1 in June (U.S. Army, 2000i).

In 1997, Fort Belvoir located and mapped existing groundwater supply and monitoring wells throughout the installation. Approximately 220 wells were identified. A majority of these were groundwater-monitoring wells. More than 20 of these wells were to be closed and removed from service. Two deep wells (greater than 300 feet) were closed in 2000.

### 4.3.2 Sanitary Sewer System

Fort Belvoir owns and maintains all sanitary sewer system appurtenances, including pipes, pump stations, and collection structures. As of 2000, Fort Belvoir discharged about 7.8 MGD to the sanitary sewer system that ultimately discharges to Fairfax County's Norman M. Cole, Jr., Pollution Control Plant, formerly known as the Lower Potomac Pollution Control Plant. The system on post includes 37 sewage pumping/lift stations and two main pumping stations. A 6,300-gallon septic tank is also located on post at the Golf Course Maintenance Facility on Telegraph Road. The tank does not have an associated septic field.

### 4.3.3 Storm Sewer System

Fort Belvoir's stormwater sewer system consists largely of open channels that receive overland sheet flow and point source flows originating from within the installation's 58 subwatersheds. Fort Belvoir's storm sewer system consists of approximately 118,360 linear feet of paved drainage ditch and 315,800 linear feet of storm drain. Catch basins within the system have a 2.5- to 3.0-foot drop from the pipe invert to the bottom of the basin. All stormwater is ultimately discharged into the post's watercourses. Additional stormwater management structures include detention ponds and oil/water separators at the motor pools and at the airfield. Fort Belvoir owns and maintains all storm sewer system appurtenances, including pipes, concrete channels, manholes, and detention basins.

### 4.3.4 Electric Power System

The Dominion Virginia Power Company provides electrical service to Fort Belvoir from a substation near the HEC. Fort Belvoir owns and maintains all system appurtenances, including electrical lines, substations, transformers, and grounding points. Power is transferred to a Fort Belvoir-owned switching station and distributed to the post at 34.5 kilovolts. Electrical power is transmitted via approximately 78 linear miles of overhead and 83 miles of underground electrical distribution lines. As of 2000, several overhead feeders were used to serve the various areas of the post, including some feeders that are interconnected to form looped feeder areas. A total of 10 substations on the post are located in various areas to transform power to lower voltages. Fort Belvoir also uses one combination substation and switching station and three switching stations. Auxiliary generators are used as backup for various critical functions on Fort Belvoir (Landgraf, 2000c).

### 4.3.5 Natural Gas System

The natural gas system on Fort Belvoir is owned and operated by Washington Gas. This includes the operation and maintenance of all system appurtenances, including pipes, valves, and header distribution fixtures. Fort Belvoir has been upgrading its natural gas supply system since 1993. These upgrades include the conversion of facilities from Number 2 and Number 6 fuel oil to natural gas, replacement of old piping, and the placement of new main lines and meters. As of 2000, natural gas was distributed throughout the post by more than 25 linear miles of main gas lines and 11 miles of service lines that primarily service the family housing areas. The upgrade of existing pipe and conversion of additional facilities to natural gas will continue over the next few years. All new construction on Fort Belvoir will be hooked into the natural gas system (Landgraf, 2000c).

### 4.3.6 Steam System

The DeWitt Army Community Hospital, Davison Army Airfield, and the larger buildings on Fort Belvoir use steam to provide heat and hot water. Newly constructed facilities such as the DLA, and smaller buildings such as residential buildings, use individual boilers to supply heat and hot water. Fort Belvoir has four high-pressure steam plants and six low-pressure plants. Fort Belvoir owns and maintains all system appurtenances, including boilers, pipes, and distribution fixtures. As of 1997, there were approximately 13 linear miles of steam and condensate distribution lines (supply and return) throughout Fort Belvoir. The majority of the distribution piping associated with each central boiler plant operation is underground. In 1999, Fort Belvoir completed the replacement of all steam traps on the post.

### 4.3.7 Communications

The telecommunications and information services consist of a copper and fiber-optic data-distribution network. The telephone switch is ISDN (Integrated Services Digital Network)-capable, and the network backbone is ATM (Asynchronous Transfer Mode). Most of the distribution cable is carried through an underground ductbank. Fort Belvoir owns all system appurtenances, including copper and fiber-optic cables, utility poles, and computerized

switchboard systems that are associated with inter-base and DoD applications. As of 1997, the main telephone switch handled 18,000 telephone lines. This switch could be upgraded to handle up to 45,000 lines.

## 4.4 PROJECTED CHANGES IN FACILITIES

Projected changes in Fort Belvoir facilities include the construction of major new buildings and recreational areas, and expansions and renovations of existing facilities (Table 4.2). On-post housing will experience construction and renovation. Transportation systems and utilities will be expanded or enhanced as needed to support new construction. Utilities will be privatized in the near future. No change in training areas is anticipated. In addition, it is expected that regional infrastructure systems (e.g., roads, sewer and utility lines) that are located through Fort Belvoir will be constructed or renovated in the near term. These regional systems also support off-post development.

### 4.4.1 Major New Building Construction

Thirty-one major building projects are scheduled at Fort Belvoir for fiscal years (FY) 01 through 05. These projects include 14 carried forward from FY 97 through FY 00 and are shown in Table 4.2.

**Table 4.2. Construction Projects for FY 97 through FY 05**

| *Fiscal Year* | *Project Description* | *Progress Notes** |
|---|---|---|
| 97 | Renovate Barracks: 2110/09/11 | Under construction |
| 97 | Replace Underground Electrical: Woodlawn | On hold |
| 97 | Tompkins Basin Recreation Area | In design |
| 98 | Dogue Creek Village, Ph2 | Under construction |
| 99 | Utility Modernization (BLDG 1422) | ESPC funding |
| 99 | Renovate Barracks: 2102/03/04 | Under construction |
| 99 | Army Reserve Center | Under construction |
| 99 | NGIC Charlottesville | Under construction |
| 00 | Military Police Station | Under construction |
| 00 | Davison Airfield Fire Station | 100 % designed |
| 00 | Bowling Center Addition/Upgrade | — |
| 00 | Utility Modernization | — |
| 00 | Golf Course Maintenance Facilities | Under construction |
| 00 | South 9 Golf Course Club House | Under construction |
| 01 | Dogue Creek Village, Ph3 | In design |
| 01 | NP Golf Club House Addition/Modern | On hold |
| 01 | D/CEETA S-Block Building | In design |
| 01 | DTRA Building | In design |
| 01 | Expand/renovate Main PX | In design |
| 02 | Post Chapel | — |
| 02 | Replacement of Family Housing: T400 Area | Program on hold |
| 02 | School-Age Youth Recreation Facility | — |
| 03 | Replace Main Post Library | — |
| 03 | Replace South Post Gymnasium | — |

| Table 4.2. Construction Projects for FY 97 through FY 05 | | |
|---|---|---|
| 03 | Multipurpose Athletic Fields | — |
| *(continued)* | | |
| 03 | Renovate Quarters: Rossell Loop | — |
| 04 | Indoor Pool Add/Modernization | — |
| 04 | Hospital Replacement | — |
| 04 | Renovate Jadwin: Qtrs. 451-455 | Program on hold |
| 05 | Community Activity Center, N.P. | — |
| 05 | Renovate Quarters: Colyer Village | Program on hold |

Source: Groeneveld, 2000.

*No information was available on the progress of those projects marked by a "—" .

### 4.4.2 Housing

The U.S. Army has proposed to privatize all of its housing by the year 2005. Fort Belvoir continues to be considered. If this occurs, Fort Belvoir will no longer be responsible for maintenance of the privatized housing areas, except the historic homes. As of 2000, Fort Belvoir owned and operated its housing facilities. Proposed new construction and renovations to these facilities include:

- A three-phase project to renovate Dogue Creek Village, which will house junior enlisted personnel. The village is located east of Mount Vernon Road, north of Jadwin Loop, along the western shore of Dogue Creek near its mouth. The second phase of this project, which will renovate a 49-unit complex, is still under way. The third phase, which will consist of an additional 148 renovated units, is scheduled for the year 2001.

- Temporary housing units (T400) built in 1921 are under study for rehabilitation or replacement. These housing units are located on Jadwin Loop, Snow Loop, Harrington Drive, and 21st Street.

- Rossell Housing, which houses field-grade officers, will be revitalized or replaced. This housing area is located on Rossell Loop. This project is scheduled for the year 2002.

- New housing units are planned for Fort Belvoir. These include 380 family housing units and 300 single soldier barracks.

### 4.4.3 Recreation

Facilities supporting recreation activities, as well as outdoor education, are proposed for the Tompkins Basin area of the installation. Currently, design plans are being developed for the future use of this site. The Tompkins Basin Recreation Area will include only land-based recreation facilities (e.g., cabins, RV campsites, tent campsites, hotel/conference center, swimming pool, ball fields, nature trails). Previous plans included a marina with boat launch facilities. These water-based recreation components have been removed from the project. The existing Dogue Creek Marina will undergo major renovation and upgrade.

### 4.4.4 Training

Facility 7339 and building 338, located at the southern tip of Fort Belvoir, is being upgraded to include a permanent pier extension, boat ramp, harbor master facility/maintenance shop, and storage facilities to further accommodate the 464th Transportation Company. A motor pool and Reserve Center are being constructed on North Post.

### 4.4.5 Transportation

Fort Belvoir has several major transportation initiatives in progress. These include the North Post Roads Study, which is being undertaken to address security concerns. The study will evaluate road closures, entry point controls, road realignments, and new roads.

*The Comprehensive Plan for Fairfax County, Virginia* (Fairfax County, 1995a) indicates that the Virginia Department of Transportation plans to widen or relocate several roads crossing or bordering Fort Belvoir as follows:

- U.S. Route 1 will be widened to six lanes through Fort Belvoir.
- Telegraph Road is being widened to four lanes along the entire northern border of Fort Belvoir.
- Woodlawn Road may be closed between U.S. Route 1 and John J. Kingman Road, based upon the outcome of the North Post Road Study.
- John J. Kingman Road may be widened to four lanes from the Fairfax County Parkway to Mulligan Road, based upon the outcome of the North Post Road Study.
- Mulligan Road may be widened to two lanes from Telegraph Road to Pole Road, based upon the outcome of the North Post Road Study.
- The final segment of the Fairfax County Parkway will be constructed and will pass through the EPG. The final segment will be four lanes and will require a new bridge to cross Accotink Creek.

As an alternative mode of transportation, Fort Belvoir will extend the Fairfax County's portion of the Potomac Heritage National Scenic Trail through the installation from the U.S. Route 1 Old Mount Vernon Highway area to Old Colchester Road. This extension will connect with the regional Potomac Heritage National Scenic Trail system.

### 4.4.6 Utilities

Fort Belvoir's sanitary sewer, water, and electric systems will be fully privatized in the near term (Carroll, 1999). A seven-phase upgrade of the electric power system was initiated in 1988 which, when completed, will eliminate most of the existing substations and add new substations only where needed. The future of the seven-phase upgrade plan is dependent on the privatization agreement.

The upgrade of existing pipe and conversion of facilities to natural gas will continue over the next few years. All new construction on Fort Belvoir will be connected to the natural gas system.

Fort Belvoir has completed the two-phase process of converting all large central plants on-post (Buildings 1422 and 332) from Number 6 fuel oil-fired boilers to natural gas-fired boilers with Number 2 fuel oil backup. Central plant 332 was converted to burn natural gas in 1996. The three Number 6 fuel oil-fired central plant 1422 boilers were replaced with three new natural gas-fired boilers in December 2000 (Owens, 2000).

# 5.0
# Responsible and Interested Parties

## 5.1 INSTALLATION ORGANIZATIONS

Fort Belvoir's structure is composed of 15 garrison offices and directorates that report to the Garrison Commander (Fort Belvoir, 2000g). Directorates and offices with roles in implementing the Integrated Natural Resources Management Plan are discussed below. Additionally, Fort Belvoir hosts approximately 100 tenant agencies. Tenants and other parties that may participate in the implementation of this plan are discussed below.

### 5.1.1 The Garrison Commander

The Garrison Commander is responsible for the overall management of Fort Belvoir's facilities. As such, the Garrison Commander manages the installation's 15 base operations organizations such as the Directorate of Installation Support; Directorate of Plans, Training, Mobilization, and Security; and the Directorate of Personnel and Community Activities (DPCA).

To fulfill the environmental stewardship component of Fort Belvoir's mission, the Garrison Commander ensures that Fort Belvoir has the funding, staff, and other resources necessary to effectively manage the installation's natural resources. He or she is also responsible for establishing and enforcing policies and procedures involving fish and wildlife management at Fort Belvoir. The Garrison Commander has the authority to enter into cooperative agreements with states, local governments, nongovernmental organizations, and individuals to maintain and improve natural resources on Fort Belvoir. It is the Garrison Commander's responsibility to see that this INRMP is implemented. The Garrison Commander is also responsible for ensuring land utilization is planned to avoid or minimize adverse effects on environmental quality and to provide for sustained accomplishment of the mission.

### 5.1.2 Directorate of Installation Support

The Directorate of Installation Support (DIS) is the lead organization to implement this INRMP. The Environmental and Natural Resource Division (ENRD) is the lead division for INRMP implementation and natural resources law enforcement. The ENRD is one of the divisions within DIS; the other divisions within the DIS have broad responsibilities for development, maintenance, and operations at Fort Belvoir. The divisions and their responsibilities are summarized below.

- **Natural Resources Branch, Environmental and Natural Resource Division (ENRD).** The Natural Resources Branch of ENRD manages installation natural resources including the two wildlife refuges; forests, fish and wildlife; and water resources (including stormwater and wetlands). The Natural Resources Branch is responsible for oversight of grounds maintenance including landscaping and pest management, environmental

compliance, and participation in the Army's Chesapeake Bay Program. The Natural Resources Branch also forecasts the effects of all DIS activities on natural resources, and identifies appropriate mitigation actions. To accomplish this, the Natural Resources Branch comments on, coordinates, and mitigates design and construction in all phases. Finally, the Natural Resources Branch provides training to educate DIS staff on compliance issues relating to natural resources management, as well as environmental education and outreach to the public.

- **Environmental Compliance Branch, ENRD.** The Environmental Compliance Branch of ENRD is responsible for solid waste management (including recycling), hazardous waste and materials management, medical waste management, underground and above ground storage tank management, pollution prevention, water quality (point source pollution and drinking water), and air quality. The Environmental Compliance Branch is also responsible for cultural resources management and for compliance with the National Environmental Policy Act.

- **Facility Planning Division.** The Facility Planning Division is comprised of Master Planning, Real Property Management, Real Estate actions, Military Construction – Army Program, 1391 Preparation, and Space Utilization. Responsibilities include facility siting, new construction and facility modifications, outgrants, managing the real property inventory, facility inspections, space compliance inspections, and space assignments.

- **Construction Management Division.** The Construction Management Division operates and maintains Fort Belvoir's real property, utilities, infrastructure, and grounds including landscaping maintenance and pest management. The Construction Management Division administers the real property maintenance contract, performs quality control over contract work actions, and prepares independent government cost estimates for operations and maintenance-related projects. It also provides technical engineering and design consulting services and manages construction. The Construction Management Division will follow design guidelines and design recommendations described in this INRMP (e.g. conservation landscaping, low impact development). All design plans should be submitted to ENRD for review.

- **Fire Prevention and Protection Division.** The Fire Prevention and Protection Division is responsible for preventing and suppressing fires on the installation.

- **Installation Safety Office.** The Installation Safety Office is responsible for providing a safe and healthful environment to Army personnel and those exposed to Army operations.

- **Housing Division.** The Housing Division is responsible for managing the installation's family housing, troop billeting and transient billeting.

### 5.1.3 Directorate of Personnel and Community Activities

The DPCA is responsible for developing and operating outdoor recreation programs and facilities. Coordination between the DPCA and the ENRD is an important element of this INRMP. The Sikes Act (16 U.S.C. 670 a et seq.), as amended in the Sikes Act Improvement Act of 1997, requires that components of this INRMP be designed to support sustainable

multipurpose use of natural resources, including public access for recreation. The DPCA operates the Dogue Creek Marina and the two golf courses, and is responsible for coordinating the recreational aspect of Fort Belvoir's hunting program with other directorates, including the DIS and the Directorate of Plans, Training, Mobilization, and Security (DPTMS). DPCA runs the volunteer program and manages Scout activities, including camping. DPCA is also responsible for Youth Services, Child Services, and the Morale and Welfare Programs. DPCA coordinates recreational activities with DIS to ensure safety and compliance issues are addressed, and with DPTMS to ensure that recreational activities do not occur in the same vicinity as training activities.

### 5.1.4 Public Affairs Office

The Public Affairs Office (PAO) is responsible for formulating, implementing, and disseminating all command information to the public, including information about natural resources management. The PAO is responsible for providing timely and accurate information about this INRMP and related activities to installation personnel and neighboring communities.

### 5.1.5 Staff Judge Advocate

The Staff Judge Advocate (SJA) provides legal advice to the Command in all areas of law, including compliance with applicable environmental and natural resource management laws and regulations. The SJA provides advice about the statutory and policy framework in which this INRMP is implemented. It is the SJA's responsibility to ensure that all violations of federal, Commonwealth of Virginia, and local fish and wildlife regulations are investigated and prosecuted as appropriate. The SJA is also involved in enforcement actions; legal interpretation; development of cooperative agreements, Memoranda of Understanding (MOUs), and compliance agreements; and review authority on actions.

### 5.1.6 Provost Marshal's Office

The Provost Marshal's Office (PMO) is responsible for enforcing laws that do not affect natural or cultural resources on Fort Belvoir. This includes land management security requirements. The PMO supports Fort Belvoir's natural resources enforcement personnel in the enforcement of all hunting and fishing laws, as well as other natural resources laws.

### 5.1.7 Directorate of Plans, Training, Mobilization, and Security

The DPTMS has control over troop projects, operations, and support. The DPTMS, in cooperation with the ENRD and the PMO, provides environmental protection for the training areas by controlling unauthorized use, off-road vehicle use, and illegal dumping. The DPTMS reviews all non-training uses of training lands (e.g., biological surveys, recreational activities, hunting, etc.). The DPTMS also implements emergency, contingency, and operational plans.

### 5.1.8 DeWitt Army Community Hospital

Within the Army's Medical Department (AMEDD), Fort Belvoir's DeWitt Army Community Hospital is the central facility of a comprehensive health care system serving military families residing in Northern Virginia. Health services with possible roles in the implementation of this

INRMP include the hospital's Department of Preventive Medicine, which oversees issues such as environmental health and epidemiology, including monitoring tick and mosquito populations for vector-borne diseases.

### 5.1.9 McNellis Veterinary Clinic

Also within AMEDD, Fort Belvoir's McNellis Veterinary Clinic has a direct role in INRMP implementation because it provides drugs and reviews dosages for tranquilizing and treating problem animals, such as feral cats, or injured animals. The Veterinary Clinic determines and provides treatment for sick or injured wildlife as appropriate and incinerates wildlife carcasses. It also has a program for rabies control. As practicable, the Veterinary Clinic performs periodic disease surveys of the installation's deer population.

### 5.1.10 Criminal Investigation Division

The Criminal Investigation Division is responsible for investigating offenses to federal laws, and enforcing federal laws such as the Clean Water Act, Clean Air Act, etc.

### 5.1.11 Other Installation and Tenant Organizations

In addition to the groups and directorates mentioned above, INRMP implementation also requires assistance from Fort Belvoir's Directorate of Resource Management, which controls all authorizations for budget, personnel, and equipment. Other installation directorates and groups have lesser roles than those previously mentioned. Individual tenant organizations may also have a role in implementing this INRMP. Some, such as the Defense Logistics Agency and Davison Army Airfield, are responsible for the grounds maintenance at their facilities. Therefore, they are responsible for implementing the land management and grounds maintenance portions of this INRMP that are relevant to their facilities and included in the intra- and inter-service support agreements. Tenants that conduct outdoor training are required to coordinate with the DPTMS and the ENRD to avoid possible impacts.

## 5.2 OTHER DEFENSE ORGANIZATIONS AND PROGRAMS

In addition to the installation groups and directorates, the following DoD organizations will play a role in implementing this INRMP.

### 5.2.1 Assistant Chief of Staff for Installation Management

The Army's Assistant Chief of Staff for Installation Management (ACSIM) provides policy guidance and program management on all matters relating to overall management and resourcing of Army installations worldwide. ACSIM assures the availability of efficient, effective base services and facilities. Specifically, ACSIM approves installation regulations that are based on Army regulations, the installation master plan, biological assessments, and environmental impact statements.

### 5.2.2 Military District of Washington

Section 1-4 of Army Regulation 200-3 states that commanders of major Army commands will "assist their respective installations with developing and implementing programs to ensure conservation stewardship, compliance, surveys, up-to-date plans, and protection of resources…" The MACOM for Fort Belvoir is the Military District of Washington (MDW). The MDW provides command and technical supervision of the natural resources management program at Fort Belvoir. It approves natural resources budgets and promotes natural resource projects for funding. The MDW has review and approval authority for this INRMP. On Fort Belvoir, the MDW Acquisition Center performs contracting services for the ENRD.

### 5.2.3 U.S. Army Environmental Center

The U.S. Army Environmental Center (AEC) provides technical guidance and support to installations on issues pertaining to natural resource management. The AEC also has centralized support contracts that installations can use to assist in resource management. As part of the Army's Chesapeake Bay Program, the AEC provides program management, technical, and public affairs support for Chesapeake Bay-related projects to installations in the Chesapeake Bay watershed. Fort Belvoir has participated in some of these AEC-supported projects.

### 5.2.4 Army Center for Health Promotion and Preventive Medicine

The Army's Center for Health Promotion and Preventive Medicine (CHPPM) conducts disease vector analysis and verification. CHPPM provides technical guidance and support to installations on pest management. CHPPM prepared the installation integrated pest management (IPM) plan for Fort Belvoir, and will most likely support the installation in the revision and update of the IPM plan.

### 5.2.5 U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers (USACE) provides contract management, construction management, and technical advice. Fort Belvoir has the option to use the USACE's contracts as vehicles for natural resource management and to access USACE organizations such as the Waterways Experiment Station (WES), the Topographic Engineering Center (TEC), and the Construction Engineering Research Laboratory (CERL) for technical assistance. The WES has assisted Fort Belvoir with a variety of projects, including an analysis of boat-use patterns on the Potomac River, a year-round bird survey, a refuge facilities maintenance plan, a wildlife database and wildlife survey protocols, the installation of stream stabilizers such as Bendway Weirs, and preparation of a watershed management plan. The TEC assisted Fort Belvoir in historical shoreline, wetland, and terrain analysis. The CERL provided technical assistance to project design and construction regarding the use of recycled plastic lumber for the fishing piers and wildlife viewing platforms that were constructed at the Jackson Miles Abbott Wetland Refuge.

### 5.2.6 DoD Legacy Resource Management Program

Congress instituted the DoD Legacy Resource Management Program in 1991 to promote stewardship of natural and cultural resources. The intent of the Legacy Program is to fund natural and cultural resources management projects that may go unfunded through normal funding

procedures. Legacy projects demonstrate innovative techniques for management, conservation, and preservation of resources, and they emphasize creative partnerships to accomplish their goals. Legacy funds may be requested annually in accordance with instructions provided by the Office of the Deputy Under Secretary of Defense for Environmental Security and the U.S. Army's Office of the Directorate of Environmental Programs.

## 5.3 OTHER FEDERAL AGENCIES AND PROGRAMS

Federal agencies other than DoD play important roles in implementing this INRMP. The following sections describe these agencies' involvement in the Fort Belvoir INRMP.

### 5.3.1 U.S. Fish and Wildlife Service

The U.S. Fish and Wildlife (USFWS) is a signatory agency of this INRMP, as required by the Sikes Act. The USFWS will play a role in implementing this INRMP. The USFWS is responsible for regulating and enforcing laws affecting federal threatened and endangered species, and fish and wildlife. The USFWS provides technical support and services to Fort Belvoir. The USFWS also manages the Potomac River National Wildlife Refuge Complex, which is located approximately 3 miles southwest of Fort Belvoir (Figure 2.4).

### 5.3.2 Chesapeake Bay Program

The Chesapeake Bay Program (CBP), established in 1983, is a unique partnership among federal, state, and local agencies, as well as universities and nonprofit organizations. The partnership focuses on undertaking cooperative efforts to reduce nutrient and toxic pollution to the Chesapeake Bay, restore habitat and living resources, and coordinate research. The U.S. EPA's Region III Office and Office of Water jointly operate the CBP. The EPA administrator represents all federal agencies as a member of the CBP's Executive Council and as the federal signatory to special directives and agreements. The CBP directs and conducts research and projects associated with restoring the Chesapeake Bay. As such, the CBP can provide technical assistance and other resources that are needed for Fort Belvoir to implement projects designed to restore and protect the Bay (e.g., habitat restoration, pollution prevention opportunity assessments, and conservation landscaping/BayScaping). The CBP can also provide assistance with Fort Belvoir's participation in the Potomac American Heritage Rivers Initiative, which was created to address Executive Order 13061 and outlines commitments for the management of natural resources in the Potomac River watershed (U.S. EPA, 2000a).

### 5.3.3 United States Geological Survey

The United States Geological Survey (USGS) could play a role in implementing the INRMP by providing support in biological, water quality, and hydrologic surveys. In addition, they also maintain national-level databases. USGS could integrate Fort Belvoir's data into national and regional databases.

### 5.3.4 National Marine Fisheries Service

The National Marine Fisheries Service could support in INRMP implementation by providing technical assistance for anadromous fish management.

### 5.3.5 U.S. Department of Agriculture

**Natural Resources Conservation Service.** Fort Belvoir has a cooperative agreement with the Natural Resources Conservation Service (NRCS), formerly the Soil Conservation Service (SCS) (Appendix B). In 1982, the SCS conducted a soil survey of Fort Belvoir Main Post. The NRCS may also assist in the protection and conservation of soil.

**U.S. Forest Service.** In 1990, the U.S. Forest Service and Fort Belvoir signed an interagency agreement to provide cooperative support, coordination, and cost sharing for biological evaluations and specific pest control operations (Appendix C). Current projects being implemented under the agreement include canker worm and gypsy moth field surveys, population monitoring, and biological evaluations for the gypsy moth. Beginning in the spring of 1999, Forest Service funds have been authorized for approved gypsy moth suppression activities as required.

**Animal and Plant Health Inspection Service.** The Animal and Plant Health Inspection Service (APHIS) provides technical advice and services for managing problem wildlife species and bird aircraft strike hazard planning. APHIS also maintains a national database on exotic species and their management.

**Beltsville Agricultural Research Center.** The Beltsville Agricultural Research Center conducts monitoring and analysis of pest populations, and evaluates biological controls and predator controls of specific pest populations.

### 5.3.6 National Capital Planning Commission

The National Capital Planning Commission, as the principal planning agency for the federal government in the National Capital Region (which includes Fairfax County), produces a Comprehensive Plan that is a statement of growth and development policies. This plan forms a framework for policy decisions regarding proposed development in the area. The National Capital Planning Commission reviews plans and programs proposed by various agencies, and considers them according to its goals for the National Capital Region. These goals include the conservation of natural features and resources, and the enhancement of cultural and recreational opportunities, open space, and environmental quality.

## 5.4 STATE AGENCIES

State agencies have regulatory and permitting functions that play an important role in natural resources management on Fort Belvoir. State agencies also can provide technical services via contract or cooperative agreement vehicles to aid Fort Belvoir in implementing this INRMP.

These agencies include the following:

- **Virginia Department of Game and Inland Fisheries (VDGIF).** The VDGIF has legal authority for fish and wildlife in Virginia. The agency develops regulations and enforces all wildlife and fish laws. The agency provides technical support to Fort Belvoir for the management of threatened and endangered species, nongame species and hunting and fishing programs. The VDGIF is a signatory agency for this INRMP, as required by the Sikes Act, and will play a role in its implementation.

- **Virginia Department of Environmental Quality (VDEQ).** The Virginia Department of Environmental Quality has primary responsibility for regulating and enforcing air and water quality.

- **Virginia Department of Forestry.** The Virginia Department of Forestry helps landowners manage and monitor forest resources through a cost-share program. This agency provides technical services regarding forest management to Fort Belvoir. The local office provides woodland fire training as well as personnel and equipment to control forest fires if Fort Belvoir authorities request assistance. Fairfax County also provides fire support under a cooperative assistance agreement with Fort Belvoir.

- **Virginia Marine Resources Commission.** The Virginia Marine Resources Commission's Habitat Division regulates subaqueous lands and tidal wetlands in Virginia through a joint federal/state/local permit process. These joint permit applications are also reviewed by the VDEQ, the state water control board, and the U.S. Army Corps of Engineers.

- **Virginia Department of Conservation and Recreation (DCR).** The DCR is responsible for preserving Virginia's natural and recreational resources, including regulating and providing technical assistance for stormwater management, streambank stabilization, and shoreline erosion control. The DCR maintains databases of rare, threatened and endangered species; significant habitats; and exotic invasive species. The DCR also manages the Mason Neck State Park, located approximately 2.8 miles southwest of Fort Belvoir (Figure 2.4).

## 5.5 REGIONAL AND LOCAL AGENCIES

Local agencies also have an important role in implementing this INRMP, particularly with respect to helping Fort Belvoir accomplish ecosystem and watershed management objectives. These agencies include the following:

- **Fairfax County Deer Management Committee**: Fort Belvoir assisted the Fairfax County Deer Management Committee in developing a Deer Management Plan for Fairfax. The committee now provides advice to landholders with unique deer management situations.

- **Fairfax County Department of Public Works and Environmental Services**: Fort Belvoir works with this agency on regional stormwater and watershed protection initiatives. Fort Belvoir also participates in regional control efforts with respect to controlling gypsy moth and canker worm populations.

- **Fairfax County Health Department**: The Fairfax County Health Department and Fort Belvoir work together in the oral rabies vaccination program. This program is aimed at preventing the spread of rabies through the use of bait containing the vaccine that is dropped from aircraft or placed by hand in areas where raccoons are likely to be located. The Fort Belvoir natural resources staff partnered with the military personnel with the Davison Army Airfield, who provided the aerial support for bait distribution.

- **Fairfax County Department of Parks and Recreation**: Fort Belvoir and the Fairfax County Department of Parks and Recreation have worked together in the development of a regional trails system. These two agencies also partner on environmental education initiatives and on biological surveys, particularly with respect to the wood turtle.

- **Fairfax County Fire and Rescue Department**: Under the provisions of AR 420-90, *Fire and Emergency Services*, Fort Belvoir has a cooperative agreement with Fairfax County Fire and Rescue. This is a reciprocal support agreement that is signed annually by both Fort Belvoir and Fairfax County.

- **Northern Virginia Regional Parks Authority**: The Northern Virginia Regional Parks Authority will be working with the installation in regional ecosystem management initiatives.

- **Northern Virginia Planning District**: Fort Belvoir and the Northern Virginia have worked together in the development of a regional trails system.

- **Fairfax County Department of Planning**: The Fairfax County Department of Planning provides GIS data to Fort Belvoir. The GIS data layers provided by the County include topographic, floodplain, resource protection areas, watershed delineations, water courses, property boundaries, and off-site information.

- **Northern Virginia Soil and Water Conservation District**: This agency provides technical advice and offers workshops on stream restoration and stormwater management.

- **Fairfax and Prince William County Public Schools**: Fort Belvoir is working with a local elementary school through the County's Partners in Education Program.

- **Metropolitan Washington Council of Governments**: The Metropolitan Washington Council of Governments coordinates the implementation of the West Nile Virus Response Plan, which is designed to control the spread of the West Nile Virus. The Fort Belvoir Integrated Pest Management Plan includes general guidance on education, surveillance, monitoring, prevention, and treatment of problem viruses.

## 5.6 UNIVERSITIES

Universities may be contracted to provide specialized services as contractors providing technical support in natural resources management and technical expertise on specific resource issues. In the past, George Mason University in Fairfax, Virginia, was under contract to provide aquatic surveys and wildlife corridor monitoring. George Washington University in Washington, D.C., has conducted vegetation and plant communities surveys. Virginia Polytechnic Institute in Blacksburg, Virginia, has provided subsurface groundwater monitoring. In addition to contract support, universities may also provide assistance through graduate students who seek to fulfill academic requirements by completing specific projects on post.

## 5.7 NON-PROFIT ORGANIZATIONS

In addition to federal and state agencies, non-profit organizations may be interested in INRMP implementation. These include the following:

- **Belvoir Bowhunters.** The Belvoir Bowhunters Club helps with the day-to-day logistics of the hunting program. They help run the check in/check out stations and the game check stations. This Club collects biological data on harvests, and participates in the deer spotlight survey. In addition, they administer the International Bowhunters Safety Course and the qualification test for hunter safety. The Belvoir Bowhunters Club also participates in installation clean up efforts and habitat enhancement projects.

- **The Girl Scouts and Boy Scouts of America.** The Girl Scouts and Boy Scouts of America have provided services to Fort Belvoir including construction, repair, and maintenance of trails, planting trees and a wildflower garden, construction and installation of bird blinds and wood duck boxes, and storm drain stenciling.

- **The Fairfax Audubon Society.** The Fairfax Audubon Society performs bird counts on Fort Belvoir, including the Christmas Bird Count and the breeding bird survey. The Fairfax Audubon Society has also led interpretive bird walks and co-hosted National Public Lands Day.

- **The Nature Conservancy.** The Nature Conservancy (TNC) and DoD signed a Cooperative Agreement in 1988. This agreement allows installation commanders to obtain technical assistance from TNC and state heritage programs and permits TNC to study significant ecosystems under the Army's control. Subsequently, Fort Belvoir and TNC established a Cooperative Agreement in 1990 that allows TNC to conduct ecological inventories on Fort Belvoir and make management recommendations. TNC has used Fort Belvoir's refuges as outdoor classrooms, and has led interpretive bird walks.

- **Fort Belvoir Officers' Wives Garden Club**. The Fort Belvoir Officers' Wives Garden Club helps with beautification projects. The club also installed and maintained the wildflower garden at the Accotink Bay Wildlife Refuge.

# 6.0
# Natural Resources Program Overview

## 6.1 BIODIVERSITY CONSERVATION

Human development in the United States and resulting changes in the landscape are causing the number and variety of species to decline. The Department of Defense manages 25 million acres of public land within the United States, which is among the most important of all federal land holdings based on wealth of natural biological resources. In many instances the lands and waters upon which the Army, Navy, Air Force and Marine Corps have trained and operated for decades represent important ecological assets because of their pristine quality, natural diversity, and sheer beauty. Biodiversity, expressed through the variety and variability among living organisms and their environments, has a major influence on the stability and sustainability of natural systems.

### 6.1.1 What Is Biodiversity?

There are many definitions of biodiversity. One definition as presented in *Conserving Biodiversity on Military Lands* (Leslie, 1996), is "the variety of living organisms, the genetic differences among them, the communities and ecosystems in which they occur, and the ecological and evolutionary processes that keep them functioning, yet ever changing and adapting." As stated in this publication, the easiest way of thinking about biodiversity is simply as "the variety of life and its processes."

There are two aspects of biodiversity that are critical, but frequently overlooked or misunderstood. First, biodiversity is not the same as the number of different kinds of species in a given area; i.e., biodiversity does not equal species richness. Biodiversity is more complex than species richness. Although species richness is certainly one component, biodiversity should be thought of consisting of the following three additional components:

- **Genetic diversity** exists at three levels: genetic variation within a single individual, genetic differences among individuals within a population, and genetic differences among populations.

- **Ecosystem Diversity** refers to the variety of ecosystems across the landscape. An ecosystem is the collection of all living things, plus the non-living environment, within a specific place at a particular time.

- **Landscape Diversity** refers to variation among the ecosystems that interact across a large land area.

The second critical aspect is that biodiversity is not just objects (e.g., animals, rocks). Consequently, biodiversity is not a static condition. Biodiversity depends upon and includes dynamic processes, as well as the objects within the ecosystem. These processes include, but are

not limited to, biogeochemical cycles; biotic and abiotic disturbances; predator-prey, mutualistic, or parasitic relationships; migrations; and competitive effects (Leslie, 1996).

Biodiversity has a major influence on the stability and sustainability of natural systems. Healthy ecosystems provide essential benefits to society. The natural environment serves as the source of foods, fuel, fibers, and many medicines. The natural environment also provides genetic material to ensure the long-term viability of crop plants and sources of new life-saving medicines. Biological communities have an indirect economic value. They "are important in maintaining the chemical quality of natural waters, in buffering ecosystems against floods and droughts, in protecting and maintaining soils, in regulating climate and in breaking down organic and inorganic wastes." (Begon et al, 1996). Beyond these utilitarian values, Americans value healthy natural areas as an invaluable part of their natural heritage.

### 6.1.2 What Is Biodiversity Conservation?

Conservation of biodiversity takes into account not only the living things, but also the setting within which they occur, and the forces and processes acting on them. The ultimate aim of biodiversity conservation is to prevent extinctions of species and communities at local and regional levels, as well as globally.

### 6.1.3 DoD's Role in Biodiversity Conservation

In terms of acreage managed, DoD is the fifth largest federal land manager (Leslie, 1996). Although DoD-managed lands represent only 3 % of the total federal land inventory, there is strong evidence that they have disproportionately high value in terms of biodiversity. DoD reported more than 220 federally listed species as confirmed residents on or migrants through military lands. The Natural Heritage Data Network includes reports of almost 100 of these species for DoD, which is roughly comparable to the total species numbers reported for each of the other major federal landholders (the U.S. Forest Service, Bureau of Land Management, National Park Service, and U.S. Fish and Wildlife Service each have federally listed species totals between 50 and 150).[1] When plotted against the total number of acres held by each agency, the number of listed species on DoD lands is disproportionately great (Leslie, 1996).

DoD recognizes that biodiversity conservation is the foundation of sensible military natural resources management because it accomplishes the following:

- Maintains natural landscapes for realistic military training, today and in the future
- Keeps DoD in compliance with the Endangered Species Act and other environmental laws

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[1] The difference between DoD reporting and Natural Heritage Data Center Network reporting is because data centers may not be aware of all occurrences, may have a data entry backlog, may not have completely recorded the land ownerships for their occurrence records, and generally do not record species and species occurrences in lakes and rivers as under the jurisdiction of a federal agency.

- Contributes to national security by helping maintain the natural resources upon which this country's strength depends
- Provides a public relations benefit because Americans want good stewardship of their natural resources
- Enhances quality of life for military personnel.

### 6.1.4 DoD's Policy on Biodiversity Conservation

DoD's 1994 *Ecosystem Management Policy Directive* issued by the Deputy Undersecretary of Defense for Environmental Security articulates the biodiversity conservation policy embraced by the DoD and the military departments. The directive establishes that the goal of DoD's biodiversity conservation policy is to "maintain and improve the sustainability and native biological diversity of terrestrial and aquatic, including marine, ecosystems while supporting human needs, including the DoD mission."

DoD's *Ecosystem Management Policy Directive* incorporates five major management themes:

- **Ecological Approach**. DoD will continue to shift its focus from protection of individual species to management of ecosystems.
- **Partnerships**. DoD will form partnerships to achieve shared goals.
- **Participation**. Public involvement, communication, and incorporation of public needs and desires into management decisions will be emphasized.
- **Information**. The best available scientific and field-tested information will be used in making decisions and selecting the most appropriate technologies in management of natural resources.
- **Adaptive Management**. Natural resources managers will incrementally implement adaptive management techniques as they become known through the dynamic process of applying the best available scientific data and methodologies.

DoD Instruction 4715.3, *Environmental Conservation Program* and Army Regulation 200-3, *Natural Resources – Land, Forest, and Wildlife* are the primary natural resources management guidance documents for military installations. The DoD instruction was developed to provide guidance to DoD natural resources managers on how to implement DoD's *Ecosystem Management Policy Directive*. The instruction states that "all DoD's conservation programs shall work to guarantee continued access to our land, air, and water resources for realistic military training and testing while ensuring that the natural and cultural resources entrusted to DoD care are sustained in a healthy condition for scientific research, education, and other compatible uses by future generations." The instruction establishes specific management tactics to achieve conservation goals:

- Maintain or restore remaining native ecosystem types across their natural range of variation.

- Maintain or reestablish viable populations of all native species in areas of natural habitat, where practicable.
- Maintain evolutionary and ecological processes, such as disturbance regimes, hydrological processes, and nutrient cycles.
- Manage over sufficiently long periods to allow for changing system dynamics.
- Plan to accommodate human use as necessary.

AR 200-3 was developed to set forth policy, procedures, and responsibilities for the conservation, management, and restoration of installation lands and their associated natural resources, consistent with the military mission and in consonance with national natural resources management policies. The regulation states, "It is the Army's goal to systematically conserve biological diversity on Army lands within the context of its mission. The Army recognizes that natural ecosystems play a vital role in maintaining a healthy environment. Natural ecosystems can best be maintained by protecting the biological diversity of native organisms and the ecological processes that they perform and are part of. Habitat management is the key to effective conservation of biological diversity and the protection of listed species."

### 6.1.5 Importance of Biodiversity Conservation to Installations

Despite its past accomplishments in natural resources conservation, the military faces increasingly difficult land management challenges. Projected changes to weapons systems, fighting and peacekeeping strategies, and operations put increased demands on military lands. With base realignments and closures, the military must satisfy these new requirements with diminishing land resources. Complicating this challenge is the influence of continuing development, especially urbanization, outside the boundaries of military installations. As population growth and urban expansion continue, native species, biological communities, and the ecological processes that sustain them will experience additional pressures. Degrading of landscapes, both on and off installations, will make compliance with environmental permits and implementation of mitigation measures more difficult. These growing pressures are likely to increase the public and regulator focus on stewardship of military lands.

## 6.2 IMPLEMENTING BIODIVERSITY CONSERVATION

### 6.2.1 The Ecosystem Approach

Biodiversity conservation is best accomplished when undertaken on an ecosystem basis. An ecosystem-based approach to natural resources management takes a regional view of management, considering that ecosystem boundaries extend beyond installation boundaries — hence the need for partnering and outreach.

The features of ecosystem-based management, as presented in *Conserving Biodiversity on Military Lands* (Leslie, 1996) include the following:

- Focuses on systems rather than single-species
- Establishes multiple-management objectives (e.g., habitat, watersheds), rather than commodity-based objectives (e.g., timber, game species)
- Strives for a naturally maintained system, rather than human maintenance
- Addresses causative agents of problems, rather than symptoms
- Accommodates uncertainties, rather than trying to eliminate them
- Addresses ecological boundaries, rather than political boundaries
- Incorporates long-term thinking to supplement short-term views
- Monitors, and change management approaches as necessary.

## 6.3 BIODIVERSITY CONSERVATION AT FORT BELVOIR

### 6.3.1 Management Philosophy

Fort Belvoir fully embraces biodiversity conservation, and has developed and implemented an ecosystem-based natural resources management program. The installation does not emphasize single-species management[2]. However, neither does it aim to increase the number of species or number of communities on post. Consistent with the principles of ecosystem management, Fort Belvoir aims for preserving the native diversity of communities and the native diversity of species within communities. Fort Belvoir recognizes that it will conserve the greatest biodiversity if it focuses management efforts at the community level.

The following summarizes Fort Belvoir's management considerations regarding biodiversity conservation:

- Fort Belvoir's 9,094 acres (including the 581 acres owned by the Humphreys Engineer Center), is relatively small when compared with ecosystem boundaries that extend far beyond the installation's boundaries. Because of this, Fort Belvoir must take a regional view and involve outside partners/participants in its management program.
- Fort Belvoir's on-post natural habitat areas already exist as fragments within the larger ecosystem area. Other fragments of natural habitat within the area include Huntley

[2] There are specific instances where single-species management is appropriate. For example, compliance with the Endangered Species Act requires management actions for individual listed species.

Meadows Park to the north and the Mason Neck State Park and the Potomac River National Wildlife Refuge Complex to the south (Figure 2.4). Taken together, these fragments represent a complex of the largest continuous and most diverse habitat area in Eastern Fairfax County. Fort Belvoir recognizes that the ecological function of this larger habitat complex depends upon conservation on Fort Belvoir's component piece. Preservation of the size and continuity of on-post natural habitat is the single most important management tool for maintaining native diversity both within Fort Belvoir and within the broader eastern Fairfax County area.

- Fort Belvoir has completed baseline natural resource surveys (Sections 7 to 12). While the resources have been fairly well inventoried, the natural processes to which they are subject (e.g., nutrient cycling, hydrologic cycle) have not been characterized. Aiming to "restore" a community is difficult because there is not sufficient knowledge about the community. Consequently, Fort Belvoir must assume that its current level of biodiversity, based on existing surveys, is the appropriate level, and all management efforts will be focused on maintaining the current level of biodiversity. Nonetheless, Fort Belvoir must be prepared to change management strategies to accommodate new information as it becomes available.

- Change/variation is inevitable and natural. The installation's natural resources management program needs to allow for naturally occurring change and the processes that cause change. However, Fort Belvoir recognizes that there may be situations where it may be ecologically beneficial to alter/intervene with naturally occurring changes (e.g. succession) these will be considered on a case-by-case basis.

- In the urban landscape of Northern Virginia, humans are a large part of the landscape, both on-post and off-post. Therefore, human activities must be integrated into the landscape in a way that does not degrade the existing environment.

- Management funds and resources are limited, so Fort Belvoir must manage natural resources in the most cost-effective method with a regional approach.

### 6.3.2 Fort Belvoir Natural Resources Program Vision and Mission Statements

Fort Belvoir's Natural Resources Program vision and mission statements are as follows:

| Natural Resources Program Vision Statement |
|---|
| Fort Belvoir's vision for the natural resources program is to manage natural resources using sound ecological principles in an appropriate landscape context (e.g., local, regional, and national), and to continue to provide opportunities for future generations to access and use these resources, consistent with resource conservation. The program will integrate local, regional, and national ecological initiatives that are appropriate to the military mission. The program will be built on a core natural resources team comprised of professionally trained, multi-disciplinary, experienced staff, supported by properly trained and experienced experts and partners. The program will have inherent flexibility to support future changes in mission or the regulatory environment. |

| Natural Resources Program Mission Statement |
| --- |
| The mission of the natural resources program is to manage natural resources as an integral part of Fort Belvoir's military mission. As the guardian of public lands, it is the mission of the natural resources program to maintain the existing level of biodiversity using sound ecological principles to ensure that economic and aesthetic values of public lands are maintained. The program's mission involves ensuring installation compliance with natural resources laws and regulations, as well as providing public access and customer service support to base operations, tenants, military personnel and their families, the research and education community, and the general public. |

### 6.3.3 Fort Belvoir Natural Resources Management Program Goals

The Fort Belvoir natural resources program conserves and protects biodiversity using an ecosystem management approach. Baseline surveys of each resource area (e.g., water resources, wetlands, etc.) were conducted to characterize the resources on-post and to assess their significance. Conservation goals were then established and prioritized so that management strategies could be developed and implemented. These goals are supported by specific resource objectives and actions outlined in Section 7 to 13. They are presented below in no order of importance.

**Program Goal 1.** Ensure compliance of installation actions with federal, state, regional, and local statutes, regulations, and policies applicable to natural resources.

**Program Goal 2.** Manage Fort Belvoir lands to provide balanced, multiple-use opportunities (e.g., military training and testing, environmental education, scientific research and study, low-intensity recreation) without degradation of natural resources in accordance with DoDI 4715.3, *Environmental Conservation*.

**Program Goal 3.** Provide natural resource customer service to military training and testing activities, base operations, tenants, military personnel and their families, the research and education community, and the general public that meet their expectations and demands for quality in accordance with the *Fort Belvoir Strategic Plan* (U.S. Army, 2000f).

**Program Goal 4.** Ensure natural resources stewardship by protecting against loss or degradation of native habitat conditions, and protecting against loss of native biological diversity and structure within native communities.

### 6.3.4 Fort Belvoir's Natural Resources Management Program Methodology

Fort Belvoir follows a regional ecosystem-based approach to natural resources management. This approach requires that Fort Belvoir set management goals and objectives that are both appropriate for the ecological setting, and that are consistent with established conservation initiatives.

The ecosystem approach to natural resources management necessitates that Fort Belvoir continue to (1) obtain and use the best available scientific information; (2) employ a skilled and professionally trained natural resource staff, that are experienced in all areas of natural resources

management, and that are authorized to make sound professional judgments and decisions regarding resource management; and, (3) coordinate with natural resource professionals within the regulatory, scientific and resource-user communities to obtain the best available information on regulatory requirements, conservation initiatives, and implementation technologies.

Fort Belvoir strives to establish natural resources management goals and objectives that are appropriate for the ecological setting, and that are consistent with its military mission. The installation monitors the success of the program through field surveys and monitoring projects and makes corrective actions as necessary using adaptive management techniques.

In keeping with the "regional" ecosystem management approach to natural resources, Fort Belvoir is a partner in two regional programs, the Chesapeake Bay Program and the Partners in Flight Program. The focus of the Chesapeake Bay Program is to restore and protect the Chesapeake Bay and its living resources. Fort Belvoir is an active program participant due to its location along the Potomac River. Additionally, Fort Belvoir participates in the Partners in Flight Program and is currently participating in the formulation of the Mid-Atlantic Coastal Plain Bird Conservation Plan, which takes a regional approach to habitat protection of certain priority bird species. Fort Belvoir has elected to use some of the Partners in Flight priority bird species as indicator species for wildlife management (Section 11).

Fort Belvoir's natural resources management program is "*fully integrated*" among the component natural resources disciplines (e.g., water, vegetation, wetlands, wildlife, etc.). Consequently, implementation of management actions is not necessarily discipline-specific. However, to facilitate the presentation of its natural resources management program in this INRMP, Fort Belvoir's natural resources management program is defined and described in terms of seven major subject areas.

- Section 7 - Water Resources, to include watersheds, aquatic systems, and fish
- Section 8 - Wetlands
- Section 9 - Undeveloped Areas Vegetation, to include native vegetation communities and forests
- Section 10 - Developed Areas Vegetation, to include landscaping, urban tree maintenance, grounds maintenance, and pest management
- Section 11 - Wildlife
- Section 12 - Endangered, Threatened, and Rare Species and Communities
- Section 13, Special Natural Areas to include the installation refuges and the Forest and Wildlife Corridor

Because many of the major management initiatives (e.g., watershed conservation and restoration, integrated pest management) address multiple disciplines, redundancy among the document sections is unavoidable.

# 7.0
# Water Resources

Water is essential to every living creature. Rivers, streams, lakes, and reservoirs provide drinking water, transportation, recreation, and irrigation. These same waters also provide habitat for an abundance of aquatic and amphibious wildlife. Virginia borders one of the nation's most precious water resources, the Chesapeake Bay. The Chesapeake Bay drainage basin encompasses approximately 64,000 square miles and includes portions of Virginia, West Virginia, Maryland, Delaware, Pennsylvania and New York (Figure 2.1). Due in part to its location on the Chesapeake Bay, Virginia is endowed with more than 5,242 miles of tidal shoreline encompassing 2,300 square miles of surface water covering 1,472,000 acres of state-owned bottomlands. These submerged lands harbor Chesapeake Bay grasses, and provide habitat for oysters, shellfish, crabs, and finfish. Along the fringes of the myriad of coves, creeks, rivers and bays of the Chesapeake estuary grow some 225,000 acres of vegetated tidal wetlands. These vegetated areas constitute a vital spawning and nursery area for fish and shellfish, and are an important element of the marine food webs for many economically valuable marine resources of Virginia (Virginia Marine Resources Commission, 2000).

Waters on Department of Defense (DoD) lands throughout the U.S. are fundamental to maintaining the military mission and quality of life for soldiers. DoD uses water resources for amphibious training, water purification training, recreation, and often as a drinking water supply. High water quality is necessary for all of these activities.

Water quality is vulnerable to a variety of human-related and naturally occurring activities. In the Chesapeake Bay watershed, water quality is commonly affected by the following:

- Sedimentation caused by development, shoreline erosion along unbuffered waterways, and poor stormwater volume controls
- Nutrient over-enrichment caused by animal waste runoff, combined sewer overflows, and overfertilization
- Toxics contamination caused by industrial and urban runoff and spills
- Lowered oxygen caused by increased water temperatures in unbuffered waterways and high algal blooms from nutrient over-enrichment.

The effects of such impacts can include elimination of anadromous fish migration, loss of pollution-sensitive aquatic species, fish kills, disease outbreaks, and the establishment and spread of invasive exotic organisms.

The Chesapeake Bay Program has recognized watershed management as the means to restoring water quality in the Chesapeake Bay. Watershed management considers all activities occurring within the area that drains to a waterway, and seeks to balance/manage the activities to enhance or maintain water quality. Common activities associated with watershed management include

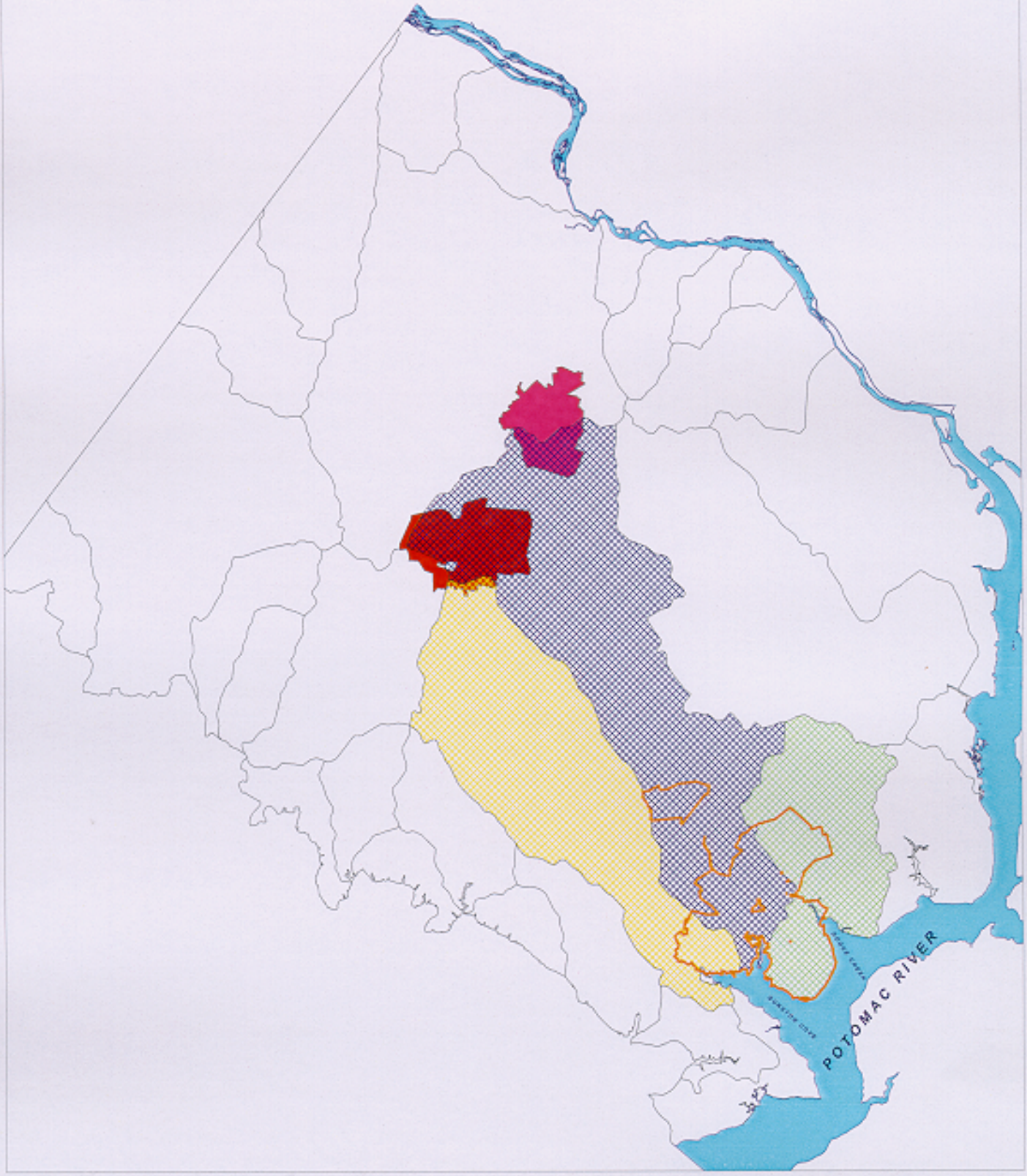
improving stormwater management practices, maintaining vegetated buffers along riparian areas, stabilizing shorelines, and educating developers on environmentally sensitive site design.

DoD and the Department of the Army (DA) became a partner in watershed management in the Chesapeake Bay by signing the commitments outlined in the Chesapeake Bay Program and federal agencies' agreements (U.S. DoD, 1998). DoD and DA recognize that the waters on its lands play a multi-faceted role in maintaining military readiness, quality of life, and ecosystem integrity. Army posts throughout the U.S. are beginning to follow the lead of the installations in the Chesapeake Bay watershed by implementing a watershed approach to land management.

In Fairfax County, efforts to protect water resources have primarily focused on controlling stormwater flows and preventing/correcting associated impacts to aquatic systems (e.g., stream bed and bank scour, erosion and bank undercutting, thermal loading, in-stream blockages to fish migration, and displacement of natural habitat by engineered stabilization structures). Despite Fairfax County's efforts, the rate of development in the County, combined with polluted runoff from roads and nutrient-enriched runoff from yards, continues to degrade water quality in some waterways. Water entering Fort Belvoir in Accotink, Dogue and Pohick Creeks has already been affected by upstream land uses in the Fairfax County area. Fort Belvoir's location at the discharge points of these three drainages makes the installation vulnerable to water quality and hydrologic impacts from land-use patterns and practices outside of its control. Fort Belvoir is meeting the challenge of maintaining and improving water quality in these creeks by managing its land and resources on a watershed level.

Fort Belvoir is located on the Potomac River, the second largest tributary of the Chesapeake Bay, and within the lower reaches of three major tributaries to the Potomac: Accotink Creek, Dogue Creek and Pohick Creek (Figure 7.1). Accotink Creek, at a point five miles upstream from Fort Belvoir's EPG, was included in the U.S. Geological Survey's 1992-1996 National Water-Quality Assessment (NAWQA) for the Potomac River Basin (Ator et al., 1998). NAWQA is a national program that began in 1991 to focus on the water quality of more than 50 major river basins. The NAWQA study concluded that concentrations of nutrients and pesticides in streams of the Potomac River Basin are among the highest in the nation, and are generally related to urban or agricultural land in the contributing watersheds. Overall, the results of the NAWQA Program indicate that Accotink Creek above Fort Belvoir is significantly impacted by urbanization (Ator et al., 1998). Dogue Creek and Pohick Creek, while not included in the NAWQA study, could be expected to have similar types of impacts, although not necessarily to the same degree. Pohick Creek in the vicinity of Fort Belvoir has an additional major source of potential impact – the Norman M. Cole, Jr. Pollution Control Plant, which handles about half of all of the sewage from Fairfax County.

The water resources survey results for Fort Belvoir indicate that the aquatic systems on and through Fort Belvoir, while impacted by urbanization, possess significant aquatic resources with high conservation priority. One of Fort Belvoir's seven watersheds, the Pohick Bay watershed, is nearly unimpacted by urbanization (Figure 7.2). This watershed possesses significant natural resources with high conservation priority. Fort Belvoir's Pohick Bay watershed consists of four subwatersheds: subwatersheds 47, 48, 49, 50, and 51. Subwatershed 48, the only subwatershed with a perennial stream, is of special management interest. The stream, locally known as "Butterfly Creek," is intact and considered to be an excellent example of a natural small-order



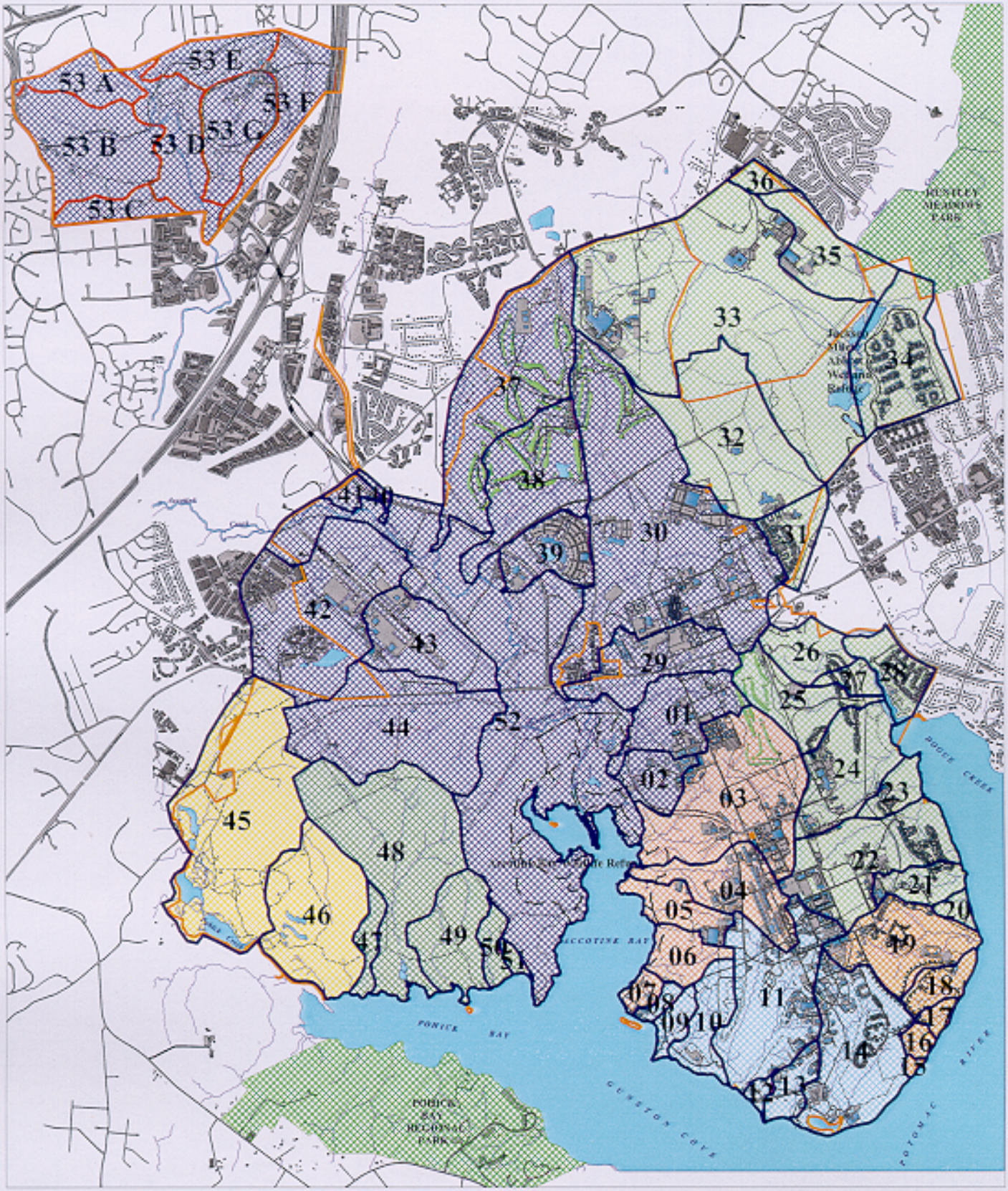

Accotink Creek Watershed
Dogue Creek Watershed
Pohick Creek Watershed
Other Fairfax County Watersheds
City of Fairfax
Town of Vienna
Fort Belvoir Boundary

N

MAJOR WATERSHEDS ORIGINATING OUTSIDE of FORT BELVOIR

SOURCE: FAIRFAX COUNTY GIS CENTER, 1999

FIGURE: 7.1




Subwatershed Boundaries
Accotink Bay Watershed
Accotink Creek Watershed
Pohick Creek Watershed
Fort Belvoir Boundary
Pohick Bay Watershed (Fort Belvoir's ONLY Intact Watershed)
Dogue Creek Watershed
Potomac River Watershed
Gunston Cove Watershed
01-53 Subwatershed Numbers

N

# WATERSHEDS and SUBWATERSHEDS on FORT BELVOIR

SOURCE: LANDGRAF, 1999

FIGURE: 7.2

stream in the Upper Coastal Plain of northern Virginia (Landgraff, 1999). Since such high-quality watersheds and streams are uncommon in this area of Virginia, subwatershed 48 has been recommended for consideration as a reference stream when looking to improve other similar streams within this region (EA, 2000).

## 7.1 WATER RESOURCES POLICIES

### 7.1.1 Federal Water Resources Policy

Fort Belvoir must comply with all federal statutes and regulations regarding water resources, including all fishing regulations. The primary federal law that regulates the protection of water resources is the Clean Water Act (CWA, 33 U.S.C. §1251 et seq.). Two main objectives of the CWA are to:

- Prohibit discharges of pollutants into U.S. navigable waters, except in compliance with a permit.
- Achieve an interim goal of protecting water quality that, wherever attainable, provides for the protection and propagation of shellfish, fish, and wildlife, and provides for recreation in and on the water.

The Phase II Stormwater Regulations under the CWA are the next step in EPA's efforts to preserve, protect, and improve the nation's water resources from polluted stormwater runoff. The Phase II Regulations are intended to further reduce adverse impacts to water quality and aquatic habitat by instituting the use of controls of unregulated sources of stormwater discharges. The Phase II Regulations require additional operators of municipal separate storm sewer systems, or MS4s, and operators of small construction sites, through the use of NPDES permits, to implement programs and practices to control polluted stormwater runoff. The new rule extends coverage of the NPDES stormwater program to small MS4s (serving populations between 1,000 to 100,000) and covers construction sites that disturb between 1 and 5 acres. The term MS4 not only refers to municipally-owned systems, but it also applies to universities and military bases. Small MS4 stormwater management programs must be comprised of six program elements, known as "minimum control measures." These minimum control measures include the following:

- Public education and outreach
- Public participation / involvement
- Illicit discharge detection and elimination
- Construction site runoff control
- Post-construction runoff control
- Pollution prevention / good housekeeping.

Another applicable federal law is the Coastal Zone Management Act (CZMA, 16 U.S.C. §1452, et seq. most recently amended through the Coastal Management Enhancement Act of 1999). The CZMA's goal is "to preserve, protect, develop, and where possible, to restore or enhance, the resources of the Nation's coastal zone…." (§1452[1]). This protection of natural resources includes protection of wetlands, floodplains, estuaries, and fish and wildlife and their habitats, within the coastal zone. Under CZMA, the Coastal Zone Management Program was established. The program is a voluntary partnership between the federal government and U.S. coastal states and territories authorized under the CZMA to preserve, protect, restore, and enhance coastal zone resources.

The CZMA contains a federal consistency requirement, which states that federal actions reasonably likely to affect any land or water use or natural resource of the coastal zone be consistent with the enforceable policies of a coastal state's or territory's federally approved coastal management program. Virginia's federally approved Coastal Resources Management Program focuses on problems associated with polluted runoff, habitat protection, riparian buffers, wetlands, fisheries, sustainable development, waterfront redevelopment, septic systems, and erosion and sediment control. Virginia's coastal zone encompasses the eastern third of the state including the Chesapeake Bay and its tributary rivers.

One-hundred-year floodplains on Fort Belvoir are also protected under Executive Order 11988, *Floodplain Management* (May 24, 1977). Under this order, Fort Belvoir is required to evaluate potential effects of any action occurring in a floodplain.

The Chesapeake Bay Restoration Act of 2000 amends the Federal Water Pollution Control Act to assist in the restoration of the Chesapeake Bay. The Chesapeake Bay Restoration Act of 2000 requires federal agencies that own or operate a facility within the Chesapeake Bay watershed to participate in regional and subwatershed planning and restoration programs. In addition, the Act requires federal agencies that own or occupy real property in the Chesapeake Bay watershed to ensure that the property, and actions taken with respect to the property, comply with the Chesapeake Bay Agreement, the *Federal Agencies Chesapeake Ecosystem Unified Plan*, and any subsequent agreements and plans (Section 7.1.6).

The primary federal regulation guiding fish conservation on military lands is the Sikes Act (16 USC 670a) and the Sikes Act Amendments of 1997 (Title XXIX) (together known as Sikes Act). The act authorizes the Secretary of Defense to (1) carry out a program for the conservation and rehabilitation[1] of natural resources on military installations, and (2) prepare an Integrated Natural Resources Management Plan (INRMP) in cooperation with the USFWS and state fish and wildlife agencies[2]. The Sikes Act requires the INRMP to "… reflect the mutual agreement of

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[1] Conservation and rehabilitation is defined as "…to utilize those methods and procedures to the maximum extent practicable on public lands subject to this subchapter consistent with any overall land use and management plans for the lands involved. Such methods and procedures shall include, but shall not be limited to, all activities associated with scientific resources management such as protection, research, census, law enforcement, habitat management, propagation, live trapping and transplantation, and regulated taking in conformance with the provisions of this subchapter."

[2] State fish and wildlife agencies are defined as "… the one or more agencies of State government that are responsible under State law for managing fish or wildlife resources."

the parties [USFWS and state fish and wildlife agencies] concerning conservation, protection, and management of fish and wildlife resources." Excerpts from the Sikes Act regarding fish and wildlife management are contained in Section 11.1.1. Other federal regulations that combine fish with wildlife resources are also discussed in Section 11.1.1. Federal threatened and endangered species laws are discussed in Section 12.1.1.

The Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (16 USC 4701 et seq.) establishes the federal program, including the Aquatic Nuisance Species Task Force, to prevent the introduction and spread of aquatic nuisance species.

### 7.1.2 State Water Resources Policy

Virginia has promulgated a number of laws and regulations for the protection of water resources, including fish. Much of the charge for ensuring that Virginia's water resources are responsibly used rests with the Virginia Marine Resources Commission, operating under the mandates of Virginia's Wetlands and Subaqueous Laws. The Code of Virginia vests ownership of "all the beds of the bays, rivers, creeks, and shores of the sea in the Commonwealth to be used as a common by all the people of Virginia" (VMRC, 2000). In 1982, the Virginia General Assembly enacted a revised Wetlands Law which brought non-vegetated shoreline between mean low and mean high water under state or local jurisdiction, as well as the vegetated shoreline brought under protection in 1972 (VMRC, 2000).

The Virginia Chesapeake Bay Preservation Act (CBPA, §10.1-2100, et seq., of the Code of Virginia) was enacted to protect the Chesapeake Bay from further degradation due to nonpoint source pollution and sedimentation. Under the CBPA, Fairfax County adopted a Chesapeake Bay Preservation Ordinance (Chapter 118, Code of the County of Fairfax, Virginia) that protects Resource Protection Areas (RPAs) from most forms of development to preserve their function as biological filters and buffers that protect the water quality of the Chesapeake Bay. RPAs filter stormwater runoff and prevent nutrients, toxics, and sediments from entering streams, rivers, and ultimately the Chesapeake Bay. The Chesapeake Bay Preservation Ordinance defines RPAs as consisting of the following:

- A tidal wetland or tidal shore
- A nontidal wetland connected by surface flow and contiguous to a tidal wetland or tributary stream
- A tributary stream
- Any buffer area as follows:
  - Any land within a major floodplain
  - Any land within 100 feet of a tidal shore, a tidal wetland, or a nontidal wetland connected by surface flow and contiguous to a tidal wetland or tributary stream
  - Any land within 100 feet of a tributary stream (§118-1-7 of the Fairfax County Code).

On Fort Belvoir, the 100-year floodplains of Dogue Creek, Accotink Creek, and the Potomac River are considered to be buffer areas, and therefore are RPAs under the Virginia CBPA (Figure 4.2*)*. Water-dependent development and redevelopment are allowed within RPAs (§118-2-1 of the Fairfax County Code), subject to compliance with additional criteria (§118-3-2 of the Fairfax County Code). Exemptions to the ordinance include existing facilities, maintenance of public utilities, water wells, site amenities for passive recreation, historic preservation activities, and archeological activities (§118-5-1, §118-5-2, and §118-5-3 of the Fairfax County Code).

The Virginia Department of Game and Inland Fisheries (VDGIF) is the policy-making entity responsible for conserving, protecting, and replenishing the supply of game, nongame wildlife, and fish of the Commonwealth of Virginia (Virginia Administrative Code, 4 VAC15). Under the wildlife permit program (§29.1-417 of the Code of Virginia) VDGIF must be consulted regarding capture, hold, propagation, and disposal of fish and wildlife. Other state regulations that discuss fish and wildlife management jointly are covered in Section 11.1.2. Virginia rare, threatened, and endangered species laws are discussed in Section 12.1.2.

Other Virginia water resource laws include the following:

- Virginia Water Control Law (§62.1-44.2 of the Code of Virginia) mandates the protection of existing high quality state waters and the restoration of all other state waters to such quality as to permit reasonable public uses and to support aquatic life.

- Virginia Water Quality Standards (Virginia Administrative Code, 9 VAC 25-260) are water quality requirements that implement the Water Control Law.

- Virginia Water Quality Improvement Act (§10.1-2117 through 2134 of the Code of Virginia) establishes a fund aimed at reducing point source nutrient loadings to the Chesapeake Bay.

- Virginia Water Protection Regulations (Virginia Regulations, VR 680-15-02) establishes permits for regulating activities affecting state water quality.

- The Virginia Stormwater Management Act (§62.1-44.15 through 44.30 of the Code of Virginia) allows local governments to regulate the control and treatment of stormwater runoff to prevent flooding and contamination of local waterways.

- The Surface Water Management Act of 1989 (§62.1-242 et seq. of the Code of Virginia) regulates surface water usage to ensure that adequate surface flow of water in streams is maintained to support a variety of uses, including support of aquatic and other water-dependent wildlife.

- The Ground Water Management Act of 1992 (§62.1-254 et seq. of the Code of Virginia) regulates the usage of ground water in certain areas.

- Virginia Pollution Abatement permits for stored or recycled wastewater.

- Virginia Pollutant Discharge Elimination System permit for all point source discharges, including ditches and stormwater pipes, to surface waters.

- Virginia Water Protection permit (Section 401 certification) for discharges of dredged material into waterways or wetlands, or for other instream activities.

- Corrective Action Plan permits for the cleanup of underground storage tanks leaks.

- Virginia Water Protection Permit (§62.1-44.15:5 of the Code of Virginia), for the preservation of instream flows for purposes of protecting, among other things, fish and wildlife resources and habitat.

- *Virginia Acts of Assembly* Chapters 1054 (House) and 1032 (Senate), passed in the 2000 session, amends existing wetland laws to require a Virginia Water Protection Permit from the Water Control Board for certain activities in non-tidal wetlands.

### 7.1.3 Department of Defense Water Resources Policy

DoD's natural resources management policy is contained within DoDI 4715.3, *Environmental Conservation Program*. This instruction requires installations to follow an ecosystem-based approach to natural resources management, to inventory and protect important biological resources, and to promote biodiversity. The instruction also allows for multiple uses of an installation's natural resources, and for public access to these resources for recreation, education and scientific research and study, compatible with the installation's ecosystem management goals. Excerpts from DoDI 4715.3 that are applicable to water resources management are presented below. Excerpts from DoDI 4715.3 that combine fish with wildlife resources are discussed in Section 11.1.3. Excerpts pertaining to threatened and endangered species are presented in Section 12.1.3.

| **Excerpts from DODI 4715.3<br>Select Provisions Applicable to Water Resources** |
|---|
| ■ All DoD conservation programs shall work to guarantee continued access to our land, air, and water resources for realistic military training and testing while ensuring that the natural and cultural resources entrusted to DoD care are sustained in a healthy condition for scientific research, education, and other compatible uses by future generations. (D1a)<br><br>■ The principal purpose of DoD lands and waters is to support mission-related activities. Those lands and waters shall be made available to the public for educational or recreational use of natural and cultural resources when such access is compatible with military mission activities, ecosystem sustainability, and with other considerations such as security. (D1d)<br><br>■ Natural resources under the stewardship and control of DoD shall be managed to support and be consistent with the military mission, while protecting and enhancing those resources for multiple use, sustainable yield, and biological integrity. Land use practices and decision shall be based on scientifically sound conservation procedures and techniques, and use scientific methods and an ecosystem approach. (D2a) |

| Excerpts from DODI 4715.3<br>Select Provisions Applicable to Water Resources |
|---|
| ***(continued)*** |
| ■ Biologically or geographically significant or sensitive natural resources (e.g., wetlands, forests, floodplains, watersheds, estuaries, riparian areas, coastal barrier islands, marine sanctuaries, critical habitats, animal migration corridors) or species (e.g., threatened or endangered species, certain marine mammals, and migratory birds) shall be inventoried and managed to protect these resources, and to promote biodiversity, using the goals identified in paragraph F1a. (D2c) |
| ■ Best management practices shall be used to minimize nonpoint sources of water pollution. DoD actions that might cause nonpoint source pollution shall be consistent with 32 U.S.C. 1251 et seq. (D2f) |
| ■ DoD operations, activities, projects, and programs that affect the land, water, or natural resources of any coastal zone shall be consistent with Sections 1451 et seq., and 1431 et seq. of 16 U.S.C. (D2g) |
| ■ Adverse impacts on floodplains shall be avoided when possible. The direct or indirect support of floodplain development shall be avoided where there is a practicable alternative. (E.O. 11988) (D2k) |
| ■ Portions of installation real property that have significant ecological, cultural, scenic, recreational, or educational value may be set aside for conservation of those resources, where such conservation is consistent with the military mission. (F1j) |

### 7.1.4 Department of the Army Water Resources Policy

The Army's natural resources management policy is contained within AR 200-3, *Natural Resources–Land, Forest and Wildlife Management*. This regulation establishes the Army's requirements for managing and using water resources in accordance with the principles of ecosystem management, and institutes the Army's commitment to conserve, protect, and sustain biological diversity, and to restore degraded ecosystems. AR 200-3 addresses sediment and erosion control, federal actions in or affecting a coastal zone, the protection of aquatic resources, and access to water areas suitable for recreational use. AR 200-3 also establishes the Army's commitment to provide sustained multiple use of, and public access to, natural resources. Excerpts from AR 200-3 that are applicable to water resources management are presented below. AR 200-3 addresses fish and wildlife management requirements together. Excerpts of AR 200-3 addressing fish and wildlife are presented in Section 11.1.4. Excerpts from AR 200-3 regarding threatened and endangered species are discussed in Section 12.1.4.

| Excerpts from AR 200-3<br>Select Sections Applicable to Water Resources |
|---|
| ■ Installation commanders will provide for controlled recreational access at Department of the Army (DA) installations and facilities containing land and water areas suitable for the recreational use and enjoyment of the public. (2-10a1) |

| Excerpts from AR 200-3<br>Select Sections Applicable to Water Resources |
|---|
| ***(continued)*** |

- Installation sources of dust, runoff, silt and erosion debris will be controlled to prevent damage to land, water resources, equipment, and facilities, including adjacent properties. An erosion and sedimentation control plan must be implemented where appropriate. A protective vegetative cover will be maintained over all compatible areas… In order to minimize land maintenance expenditure and help ensure environmental compliance, physically intensive land disturbing activities should be sited on the least erodible lands … The potential erodibility of a site (as diagnosed from existing soil types, slopes and vegetative cover), and the location of adjacent wetlands will be identified and analyzed in all prepared plans for development, training, as well as other land uses…(2-15)

- [F]ederal actions in or affecting a coastal zone must, to the maximum extent practicable, be consistent with that State's Coastal Zone Management Plan. (2-19)

- It is DA policy to avoid adverse impacts to existing aquatic resources and offset those adverse impacts which are unavoidable. (2-21b)

- The natural resources management professional will be an active participant in all planning and decision making activities regarding uses of the land to ensure that current and planned mission activities (for example, master planning, construction requests, site approval requests, and training exercise plans) are conducted in a manner which is compatible with natural resources and other environmental requirements. (3-2b)

- Whenever practicable, Army lands with suitable natural resources will be managed to allow for outdoor recreational opportunities. (7-1a). AR 200-3 defines "Outdoor Recreation" as follows: "Recreational program, activity, or opportunity that is dependent on the natural environment. Examples are hunting, fishing, trapping, picnicking, bird-watching, off-road vehicle use, hiking and interpretive trails use, wildlife and scenic river use, and underdeveloped camping areas. Developed or constructed activities such as golf courses, lodging facilities, boat launching ramps, and marinas are not included."

- All land and water areas will be closed to off-road recreational use by motorized [off-road vehicles] except those areas and trails which are determined suitable and specifically designated for such under the procedures established in this regulation. (8-1b) When ORV use is permitted, the intensity, timing, and distribution will be carefully regulated to protect the environmental values. In designating suitable sites, equitable treatment should be given to all forms of outdoor recreational activity and, where possible, nonconflicting use will be encouraged on existing trails. Prior to designating such areas or trails for ORV use, the environmental consequences must be assessed and environmental statements prepared and processed when such assessments indicated that the proposed use will create a significant environmental impact or be environmentally controversial. (8-1c). AR 200-3 defines ORVs as "A vehicle designed for travel on natural terrain. The term excludes a registered motorboat confined to use on open water and a military, emergency, or law enforcement vehicle during use by an employee or agent of the Government or one of its contractors in the course of employment or agency representation." Note the definition is not limited to "motorized" vehicles. Without such restriction, this INRMP considers ORVs to include both motorized and non-motorized vehicles.

### 7.1.5 Fort Belvoir Water Resources Policy

Fort Belvoir's installation-specific natural resources management policies are contained within the Fort Belvoir Supplement to AR 200-3 (dated February 20, 1996) (Appendix H). This installation regulation includes specific restrictions aimed at protecting installation land and water resources from impact. Excerpts from the Fort Belvoir Supplement to AR 200-3 relevant to water resources are presented below. Fort Belvoir's Supplement to AR 200-3 combines fish with wildlife resources. Excerpts from the supplement regarding fish and wildlife resources are presented in Section 11.1.5.

- "Fisherman and boaters are required to provide for environmental protection of all shoreline areas through restricting watercraft launching to designated marina launch facilities. Streamside clearing, littering, parking in other than designated areas, and driving of privately owned vehicles (POVs) off primary installation roads are prohibited." (6-2f3)

- "Off-road vehicles (ORV), which include, but are not limited to, motorized all-terrain vehicles, snow mobiles and dirt bikes, may not be operated on Fort Belvoir. Bicycles, which include but are not limited to all-terrain bikes and mountain bikes, are not permitted off paved roadways or off paved bike trails, unless otherwise approved by DIS." (8-1g)

- "Privately owned watercraft, which include, but are not limited to, motorboats, personal watercraft, sailboats, canoes, rowboats, kayaks, and inflatable watercraft, must be launched at designated areas. All watercraft, with the exception of wind-board surfers, must be launched at the marina launch facility, unless otherwise approved by DIS… No watercraft shall be launched or landed within the wildlife refuges, unless otherwise approved by DIS." (8-1i)

Fort Belvoir Regulation 210-27, *Range Procedures and Utilization of Training Areas*, provides specific requirements for environmental protection and conservation of training areas. It requires that vehicles stay on established trails and roads, restricts riot control agents to specified training areas to minimize environmental damage, and requires that all waste be removed from the training areas and disposed of properly. The regulation also requires ENRD review of all land disturbing activities (U.S. Army, 1994).

### 7.1.6 Chesapeake Bay Program

Since 1983, the Chesapeake Bay Program (CBP), a cooperative, voluntary program comprised of federal, state, and local agencies, has been working toward the restoration and protection of the Chesapeake Bay. The 1987 *Chesapeake Bay Agreement* set forth specific goals in a number of areas, including water quality. In 1990, DoD and the Environmental Protection Agency signed the *Cooperative Agreement Between DoD and EPA Concerning Chesapeake Bay Activities*, which incorporated the goals of the 1987 agreement and increased cooperation between DoD and other CBP partners. This 1990 agreement was refined in 1993 with the *DoD/EPA Action Items for the Chesapeake Bay Program*. In 1994, 29 federal agencies, including DoD and the Department of the Army, signed the *Agreement of Federal Agencies on Ecosystem Management in the Chesapeake Bay* to commit to manage the Chesapeake Bay watershed as a cohesive

ecosystem, and recommit to work together with the states and other parties to achieve the goals of the 1987 *Chesapeake Bay Agreement*. The major commitment areas in this agreement include partnership, research, data coordination, habitat restoration, nutrient reduction, toxics reduction, and national service. In 1998, in response to the 1998 *Clean Water Action Plan*, federal agencies signed the *Federal Agencies Chesapeake Ecosystem Unified Plan (FACEUP)* to build upon the achievements of the 1994 federal agencies agreement, consistent with the federal agencies' missions and success in securing the necessary resources. Among the water resources-related commitments in *FACEUP* is a call for federal agencies to carry out voluntary stormwater management actions and to encourage construction design that adopts low impact development design and best management practices (BMPs) for stormwater management, as well as sediment and erosion control. Most recently, the Chesapeake Bay Program partners signed a new Bay agreement designed to renew the historically significant 1987 agreement. This new agreement, *Chesapeake 2000*, guides the Chesapeake Bay Program partnership from 2000 until 2010. Specific CBP directives that pertain to water resources include Directive No. 93-1, *Joint Tributary Strategy Statement*; Directive No. 93-4, *Fish Passage Goals*; Directive No. 97-1, *Baywide Nutrient Reduction Progress and Future Directions*; and Directive No. 97-3, *Community Watershed Initiative*.

Fort Belvoir views the 1987 *Chesapeake Bay Agreement*, the *Agreement of Federal Agencies on Ecosystem Management in the Chesapeake Bay, FACEUP*, and *Chesapeake 2000* as the overarching definers of its water resources management program. The agreements consider and integrate all of the forces influencing water resources management through initiatives addressing water quality and living resources. The agreements also embody the recognition of the role of these forces in shaping the condition of the Bay's aquatic resources, and the commitment of all participating agencies, including DoD/DA, to attain specific goals set in the initiatives that together are directed at protecting and restoring the Bay's aquatic resources. The *Chesapeake Bay Agreement*, the *Agreement of Federal Agencies on Ecosystem Management in the Chesapeake Bay, FACEUP*, and *Chesapeake 2000* accomplish this by consolidating existing regulatory requirements, such as water quality protection under the Clean Water Act, and supplementing these regulations with policy and guidance addressing unregulated but nonetheless ecologically significant management considerations, such as vegetation cover and stormwater runoff. In so doing, the agreements effectively guide development of a watershed-based approach to aquatic resources management.

### 7.1.7 American Heritage Rivers Initiative

President Clinton initiated the American Heritage Rivers Initiative in 1997. The Initiative provides federal assistance to facilities and communities along a designated river to complete projects that will restore and protect the river's natural and cultural resources. The Potomac River was designated an American Heritage River in 1998.

Objectives for the Potomac American Heritage River Initiative (U.S Environmental Protection Agency, 1999) to which Fort Belvoir can contribute include:

- Restoring living resources and historic Potomac fisheries
- Achieving the Chesapeake Bay Program's year 2000 nutrient reduction goals

- Developing more effective flood-loss reduction plans
- Promoting appreciation and development of heritage and recreational assets
- Increasing opportunities to learn about the basin's natural features, history, and cultures.

## 7.2 BASELINE WATER RESOURCES CONDITIONS

While the term "water resources" is typically applied to aquatic features such as water quality and fish, Fort Belvoir recognizes that such in-stream resources are inextricably linked to land conditions and activities throughout their watersheds. As a result, Fort Belvoir's water resources management program focuses on a combination of watershed management and aquatic (i.e., in-stream) resource management.

### 7.2.1 Watersheds

#### *7.2.1.1 Watershed Studies*

Information on watershed conditions at Fort Belvoir has been obtained through the following two detailed study efforts:

- A comprehensive baseline watershed survey was undertaken to characterize installation waterways and their associated watersheds, to identify existing problems within installation waterways, and to recommend concepts to correct problems. The findings of this watershed survey are reported in *Watershed Delineation Project and Problem Site Descriptions, Including Maps and Photographs* (Landgraf, 1999). The data from this survey have been incorporated into the Fort Belvoir GIS.

- A stream corridor assessment was undertaken to address further the problem conditions identified in the 1999 watershed survey, and to develop management recommendations to correct existing problems and prevent future problems. The results of the stream corridor assessment, including management recommendations, are reported in *Watershed-based Stream Corridor Management and Protection, Fort Belvoir, Virginia* prepared by the U.S. Army Corps of Engineers Waterways Experiment Station (Allen et al., 1999). This report presents a planned approach to stormwater management; erosion control; water quality management; riparian buffer restoration, maintenance and protection; and fish and wildlife habitat protection and restoration. The report addresses specific types of stream corridor problems, describes solutions, and provides overall recommendations and action items to conserve, enhance, and restore ecological conditions within stream corridors, and prevent future problems.

#### *7.2.1.2 Watershed Conditions*

The baseline watershed survey (Landgraf, 1999) identified seven main watersheds on Fort Belvoir (Figure 7.2 and Table 7.1). Fort Belvoir's three largest watersheds originate off-post: the Accotink Creek watershed, the Dogue Creek watershed, and the Pohick Creek watershed. The majority of water from within installation boundaries flows into these three watersheds. The

remaining installation areas that do not drain to the three major creeks belong to four smaller on-post watersheds: the Accotink Bay watershed, the Pohick Bay watershed, the Gunston Cove watershed, and the Potomac River watershed. These watersheds drain directly into these four waterbodies without first entering Accotink Creek, Dogue Creek, or Pohick Creek. The baseline watershed survey further delineated Fort Belvoir's seven main watersheds into 53 subwatersheds (Figure 7.2). The following text presents summary descriptions of Fort Belvoir's seven main watersheds (Landgraf, 1999).

**Table 7.1: Fort Belvoir Major Watershed Survey – Summary**

| *Watershed* | *Size (acres)* | *Impervious Surface (%)* | *Forest (%)* | *Open Area (%)* | *Wetland (%)* |
|---|---|---|---|---|---|
| Accotink Creek | 4,514.66 | 10.11 | 63.06 | 28.06 | 13.49 |
| Dogue Creek | 2,334.83 | 11.40 | 65.99 | 22.65 | 17.78 |
| Pohick Creek | 698.91 | 0.50 | 94.96 | 4.24 | 19.97 |
| Gunston Cove | 680.57 | 16.49 | 51.85 | 31.66 | 2.98 |
| Accotink Bay | 603.91 | 18.58 | 45.35 | 42.13 | 4.42 |
| Pohick Bay | 565.68 | 0.01 | 93.46 | 6.54 | 5.50 |
| Potomac River | 236.61 | 14.24 | 59.62 | 26.15 | 4.34 |

Source: Landgraf, 1999 updated with information from the 2000 Watershed Update.

### *Accotink Creek*

The Accotink Creek watershed is the largest watershed on the installation. Its total acreage on Fort Belvoir, including EPG, is 4,515 acres. The area is comprised of 14 subwatersheds (Figure 7.2, Table 7.2), 13 of which lie within the Main Post and one consisting of EPG. Accotink Creek and its tributaries flow through the central portion of the installation, draining 3,707 acres, or 44%, of the Main Post. Forests cover 63.06% of Accotink Creek watershed on Fort Belvoir. The Accotink Creek watershed contains the third highest percentage of wetlands (13.49%) on the installation (Landgraf, 1999).

**Table 7.2: Fort Belvoir Watershed Survey – Accotink Creek**

| *Subwatershed* | *Size (acres)* | *Impervious Surface Acres (%)* | | *Forest Acres (%)* | | *Open Area Acres (%)* | | *Wetland Acres (%)* | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 133.22 | 19.82 | (14.9) | 71.37 | (53.57) | 42.03 | (31.55) | 8.81 | (6.61) |
| 2 | 62.43 | 12.63 | (20.2) | 38.43 | (61.56) | 11.37 | (18.21) | 11.54 | (18.48) |
| 29 | 147.83 | 37.91 | (25.6) | 53.47 | (36.17) | 56.44 | (38.18) | 8.87 | (6.01) |
| 30 | 699.63 | 121.15 | (17.3) | 296.81 | (42.42) | 281.67 | (40.26) | 23.02 | (3.29) |
| 37 | 344.14 | 20.97 | (6.1) | 255.66 | (74.29) | 65.51 | (19.04) | 9.73 | (2.83) |
| 38 | 205.97 | 9.77 | (4.8) | 85.16 | (41.35) | 111.04 | (53.91) | 15.93 | (7.73) |
| 39 | 97.97 | 45.28 | (46.2) | 11.02 | (11.25) | 41.67 | (42.53) | 1.43 | (1.46) |
| 40 | 7.68 | 0.83 | (10.8) | 1.87 | (24.35) | 4.98 | (64.84) | 1.13 | (14.71) |
| 41 | 21.20 | 5.59 | (26.4) | 7.87 | (37.14) | 7.73 | (36.48) | 5.86 | (27.65) |
| 42 | 352.08 | 55.10 | (15.6) | 171.33 | (48.66) | 113.65 | (32.28) | 33.58 | (9.54) |
| 43 | 154.93 | 35.63 | (23.0) | 44.89 | (28.97) | 92.41 | (48.03) | 1.77 | (1.14) |

| Table 7.2: Fort Belvoir Watershed Survey – Accotink Creek | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ***Subwatershed*** | ***Size (acres)*** | ***Impervious Surface Acres (%)*** | | ***Forest Acres (%)*** | | ***Open Area Acres (%)*** | | ***Wetland Acres (%)*** | |
| | | | | | | | | | |
| ***(continued)*** | | | | | | | | | |
| 44 | 329.93 | 7.91 | (2.4) | 266.85 | (80.88) | 55.17 | (16.72) | 10.67 | (3.23) |
| 52 | 1,150.95 | 32.79 | (2.9) | 920.60 | (79.99) | 197.56 | (17.16) | 451.04 | (39.19) |
| 53 | 806.70 | 51.02 | (6.3) | 621.19 | (77.00) | 185.51 | (23.00) | 25.71 | (3.19) |
| **Total*** | **4,514.66** | **456.40** | **(10.11)** | **2846.52** | **(63.06)** | **1266.74** | **(28.06)** | **609.09** | **(13.49)** |

Source: Landgraf, 1999 updated with information from the 2000 Watershed Update.

*Total acreages (and percentages) under each land use/land cover category (i.e., impervious, forest, open area, and wetland) do not combine to equal the total acreage (100%) for the watershed because some areas of overlap exist.

Fort Belvoir encompasses 13.6% of the entire 33,156 acres of the Accotink Creek watershed. The watershed is the second largest in Fairfax County, and is about 80 to 85% developed above the installation. Fort Belvoir's portion of the Accotink Creek watershed is relatively undeveloped, containing only 10.11% impervious surface. The headwaters of Accotink Creek originate east of the City of Fairfax and just south of the City of Vienna (Figure 7.1), with tidal influence extending to the U.S. Route 1 crossing. The Cities of Fairfax and Vienna are two of the most densely populated areas in all of Fairfax County. Above Fort Belvoir, Accotink Creek is impounded at Lake Accotink, and then again at several unnamed ponds (Landgraf, 1999).

Within the past 5 years, major development activity within the subwatersheds of Accotink Creek on Fort Belvoir have changed the flow regimes of the watershed. Recent development in the watershed on post is concentrated in the area north of U.S. Route 1 and includes new/expanded facilities at the Davison Army Airfield, expanded North Post Golf Course facilities, new administrative buildings, and new industrial facilities. The newly constructed Fairfax County Parkway has artificially increased the width/depth ratio of four streams that flow into Accotink Creek. On Fort Belvoir, the construction of the Headquarters Defense Logistics Agency building has increased the impervious surface within subwatershed 39 by approximately 800%. This large area of impervious surface largely exists on the building's expansive parking lot. The widening of Telegraph Road at Beulah Street (increase to four-lane divided road with turning lanes and multipurpose trails), and the construction of the new Fairfax County Parkway have increased the impervious surface within subwatersheds 37, 40, and 41. The widening of the remainder of Telegraph Road through Fort Belvoir will also impact these three subwatersheds and subwatershed 42 of Accotink Creek. The future widening of U.S. Route 1 (proposed increase from a four-lane undivided road to a six-lane divided road with turning lanes and multi-purpose trails) will impact subwatersheds 29, 30, 42, 44, 52 of Accotink Creek. These future road widenings will increase the percentage of impervious area and decrease the forest acreage along the road edge. The impacts to these subwatersheds will be increased runoff and subsequent increased stream flow volume, both of which contribute to the instability of stream channels, and attendant degradation of water quality and riparian lands (Landgraf, 1999).

### *Dogue Creek*

The northeast portion of Fort Belvoir is in the Dogue Creek watershed, the second largest watershed on the installation. The Dogue Creek watershed has 15 subwatersheds, all of which are on the Main Post (Figure 7.2, Table 7.3). Fort Belvoir covers slightly more than one-fifth (2,335 acres) of the Dogue Creek watershed in Fairfax County (10,883 acres). The Dogue Creek watershed has the second highest percentage of wetlands (17.78%) on the installation, including large wetland areas in the Jackson Miles Abbott Wetland Refuge (JMAWR), that help reduce storm flow velocities. Impervious surfaces cover 11.40% of the Dogue Creek watershed on Fort Belvoir, and forests cover 65.99% (Landgraf, 1999).

**Table 7.3: Fort Belvoir Watershed Survey – Dogue Creek**

| *Subwatershed* | *Size (acres)* | *Impervious Surface Acres (%)* | | *Forest Acres (%)* | | *Open Area Acres (%)* | | *Wetland Acres (%)* | |
|---|---|---|---|---|---|---|---|---|---|
| 20 | 16.82 | 0.46 | (2.7) | 12.39 | (73.66) | 3.97 | (23.61) | 0.76 | (4.52) |
| 21 | 54.22 | 8.61 | (15.9) | 27.74 | (51.16) | 17.87 | (32.96) | 2.22 | (4.09) |
| 22 | 217.74 | 45.99 | (21.1) | 84.51 | (38.81) | 87.25 | (40.07) | 12.17 | (5.59) |
| 23 | 40.72 | 3.94 | (9.7) | 30.87 | (75.81) | 5.91 | (14.51) | 6.22 | (15.28) |
| 24 | 161.99 | 29.72 | (18.3) | 89.98 | (55.55) | 42.29 | (26.11) | 11.74 | (7.25) |
| 25 | 113.35 | 15.61 | (13.8) | 39.79 | (35.11) | 57.95 | (51.12) | 3.93 | (3.47) |
| 26 | 72.61 | 6.40 | (8.8) | 35.02 | (48.23) | 31.19 | (42.96) | 7.72 | (10.63) |
| 27 | 26.89 | 4.90 | (18.2) | 9.76 | (36.31) | 12.23 | (45.48) | 7.08 | (26.33) |
| 28 | 72.47 | 14.96 | (20.6) | 16.57 | (22.86) | 40.94 | (56.49) | 19.38 | (26.74) |
| 31 | 68.95 | 14.10 | (20.4) | 39.65 | (57.51) | 15.21 | (22.04) | 0.37 | (0.54) |
| 32 | 302.28 | 16.12 | (5.3) | 258.71 | (85.58) | 27.46 | (9.08) | 18.35 | (6.07) |
| 33 | 830.69 | 58.91 | (7.1) | 704.77 | (84.84) | 67.02 | (8.07) | 223.75 | (26.94) |
| 34 | 202.62 | 33.40 | (16.5) | 76.36 | (37.69) | 92.86 | (45.83) | 46.71 | (23.05) |
| 35 | 130.29 | 11.53 | (8.8) | 97.03 | (74.47) | 21.73 | (16.68) | 47.31 | (36.31) |
| 36 | 23.19 | 0.77 | (3.3) | 17.56 | (75.72) | 4.86 | (20.96) | 7.41 | (31.91) |
| **Total*** | **2334.83** | **265.42** | **(11.40)** | **1540.71** | **(65.99)** | **528.74** | **(22.65)** | **415.12** | **(17.78)** |

Source: Landgraf, 1999.

*Total acreages (and percentages) under each land use/land cover category (i.e., impervious, forest, open area, and wetland) do not combine to equal the total acreage (100%) for the watershed because some areas of overlap exist.

Dogue Creek, the main stream of the watershed, originates in Rose Hill near Franconia Road (Figure 7.1), and is tidal up to the U.S. Route 1 bridge. Huntley Meadows Park, located just upstream of Fort Belvoir in the center of the watershed, contains a large wetland area that acts as a settling basin. Several beaver impoundments exist on Dogue Creek within Huntley Meadows Park (Landgraf, 1999).

The Dogue Creek watershed is currently experiencing the most intense off-post development of the three main Fort Belvoir watersheds. Development is occurring off of Fort Belvoir in the northern portion of the watershed, as well as immediately outside Fort Belvoir near the Walker Gate. Within the last nine years, Kingstowne, a mixed residential and commercial development, has grown to engulf most of the land around the headwaters of Dogue Creek above Fort Belvoir (Landgraf, 1999).

Within the installation, the Dogue Creek watershed contains nine of the twelve housing areas on Fort Belvoir. The housing areas contribute a considerable amount of impervious surface to five subwatersheds (subwatersheds 22, 24, 27, 28, and 31). The high percentage of impervious surface area increases runoff velocities and accelerates downstream erosion. The new Fort Belvoir Elementary School, the Beulah Street / Telegraph Road intersection and realignment, and new construction along Telegraph Road have increased impervious surfaces within this watershed. Several areas within the Dogue Creek watershed are under consideration for future facilities construction. Such development would increase impervious surfaces, and contribute additional stormwater runoff (Landgraf, 1999).

***Pohick Creek***

The Pohick Creek watershed is in the southeast corner of the installation, in the undeveloped South Post training area. Fort Belvoir contains only 3% (699 acres) of the overall area (22,755 acres) of the Pohick Creek watershed as delineated by Fairfax County. Two subwatersheds of Pohick Creek are located on post (Figure 7.2, Table 7.4). Pohick Creek is the least developed of the three main Fort Belvoir watersheds. Pohick Creek originates just south of the City of Fairfax (Figure 7.1), and is tidally influenced up to the Old Colchester Road crossing at Fort Belvoir's western boundary. The watershed is experiencing development in the northern and eastern portions above Fort Belvoir. Within the installation, the Pohick Creek watershed has the lowest percentage of open area (4.24%), the second lowest percentage of impervious surface (0.5%), and the highest percentage of wetlands (19.97%) and forests (94.96%) (Landgraf, 1999).

**Table 7.4: Fort Belvoir Watershed Survey – Pohick Creek**

| *Subwatershed* | *Size (acres)* | *Impervious Surface Acres (%)* | | *Forest Acres (%)* | | *Open Area Acres (%)* | | *Wetland Acres (%)* | |
|---|---|---|---|---|---|---|---|---|---|
| 45 | 458.51 | 3.51 | (0.80) | 424.64 | (92.61) | 28.36 | (6.19) | 87.11 | (19.00) |
| 46 | 240.40 | 0.05 | (0.02) | 239.07 | (99.45) | 1.28 | (0.53) | 52.46 | (21.82) |
| **Total*** | **698.91** | **3.56** | **(0.50)** | **663.71** | **(94.96)** | **29.64** | **(4.24)** | **139.57** | **(19.97)** |

Source: Landgraf, 1999.

*Total acreages (and percentages) under each land use/land cover category (i.e., impervious, forest, open area, and wetland) do not combine to equal the total acreage (100%) for the watershed because some areas of overlap exist.

According to the Fairfax County watershed data, the Pohick Creek watershed above Fort Belvoir has the highest number of water impoundments of the three watersheds that pass through Fort Belvoir. Approximately 10 ponds or lakes help slow the waters of Pohick Creek and its tributaries before the creek enters Fort Belvoir. Burke Lake Park, a Fairfax County park, is the largest of the impoundments with 213 acres of surface water. Burke Lake Park is located near the headwaters of South Run, the largest tributary of Pohick Creek (Landgraf, 1999).

The Norman M. Cole, Jr. Pollution Control Plant, formerly known as the Lower Potomac Pollution Control Plant, is a wastewater treatment facility located immediately adjacent to Fort Belvoir on Pohick Creek between Old Colchester Road and U.S. Route 1 (Figure 7.2). The facility receives approximately half of Fairfax County's domestic and commercial wastewater flow. The facility has a rated treatment capacity of 54 million gallons per day (MGD), and

discharges approximately 45 to 50 MGD into Pohick Creek. Variations in the discharge rate are due to fluctuations in water use and flow to the plant. The normal flow of Pohick Creek immediately prior to the point of the treated discharge is approximately 1 to 2 MGD, with close to zero flow during drought conditions (Faha, 2000). Therefore, the treatment plant discharge represents a substantial increase to the natural flow regime of Pohick Creek. The treatment plant operates under a Virginia Pollutant Discharge Elimination System permit, which is issued by the Virginia Department of Environmental Quality to Fairfax County, the plant operator. The plant achieves a 99 to 99.5% removal of suspended matter, organic substances, nutrients, infectious microorganisms, and other pollutants through preliminary, primary, secondary, and tertiary treatment (Fairfax County, 2000a).

### *Gunston Cove*

The Gunston Cove watershed consists of areas on Fort Belvoir that drain directly from Fort Belvoir into Gunston Cove, without first entering Accotink Bay or Pohick Bay. It is one of the four watersheds that originate on post, and is completely contained within Fort Belvoir. Gunston Cove is a tidal waterway, and its watershed is comprised of seven subwatersheds on the installation totaling 681 acres (Figure 7.2, Table 7.5). Of the seven Fort Belvoir watersheds, the Gunston Cove watershed contains the second highest percentage of both impervious surface and open area (16.49% and 31.66% respectively). The watershed also contains the lowest percentage of wetlands (2.98%). The Gunston Cove watershed on Fort Belvoir is 51.85% forested (Landgraf, 1999).

**Table 7.5: Fort Belvoir Watershed Survey – Gunston Cove**

| *Subwatershed* | *Size (acres)* | *Impervious Surface Acres (%)* | | *Forest Acres (%)* | | *Open Area Acres (%)* | | *Wetland Acres (%)* | |
|---|---|---|---|---|---|---|---|---|---|
| 8 | 14.83 | 2.45 | (16.5) | 8.26 | (55.71) | 4.12 | (27.78) | 0.31 | (2.02) |
| 9 | 30.56 | 1.51 | (4.9) | 23.31 | (76.28) | 5.75 | (18.82) | 1.35 | (4.42) |
| 10 | 78.31 | 5.36 | (6.8) | 57.29 | (73.16) | 15.66 | (20.01) | 2.47 | (3.15) |
| 11 | 251.62 | 45.51 | (18.1) | 125.34 | (49.81) | 80.77 | (32.11) | 8.86 | (3.52) |
| 12 | 12.28 | 2.44 | (19.9) | 3.79 | (30.86) | 6.05 | (49.27) | 0.59 | (4.81) |
| 13 | 44.59 | 9.37 | (21.0) | 16.49 | (36.98) | 18.73 | (42.01) | 1.71 | (3.83) |
| 14 | 248.38 | 45.58 | (18.4) | 118.41 | (47.67) | 84.41 | (33.98) | 5.02 | (2.02) |
| **Total*** | **680.57** | **112.22** | **(16.49)** | **352.89** | **(51.85)** | **215.49** | **(31.66)** | **20.31** | **(2.98)** |

Source: Landgraf, 1999.

*Total acreages (and percentages) under each land use/land cover category (i.e., impervious, forest, open area, and wetland) do not combine to equal the total acreage (100%) for the watershed because some areas of overlap exist.

Within the Gunston Cove watershed on Fort Belvoir, steeply graded tributary streams coming down from the upper plateau area are accelerating downstream gully and bank erosion. Sediment from the gully erosion is being deposited in the wetland area prior to Gunston Cove, particularly in subwatershed 11. This erosion can be attributed to heavy stormwater flows from the developed area on post south of 23rd Street along Putnam Road, Gridley Road, Kingman Road, and Burbeck Road. Subwatersheds 8, 9, and 10 face potential increases in stormwater runoff from future development of the Tompkins Basin Recreation Area. Subwatershed 12 contains a stable reach of

stream that can be used as a reference when making improvements to other first-order streams on post (Landgraf, 1999).

### *Accotink Bay*

The Accotink Bay watershed consists of areas that drain directly from Fort Belvoir into Accotink Bay without first draining into Accotink Creek. The watershed originates on, and is completely contained within, Fort Belvoir. Accotink Bay is tidal, and receives drainage from five subwatersheds with a total area of 604 acres (Figure 7.2, Table 7.6). It has the highest overall impervious surface and open area percentages on the installation (18.58% and 42.13% respectively), making it a candidate for reforestation and reduction of impervious surface area. The watershed is 4.42% wetland, and contains the lowest percentage of forested land (45.35%) (Landgraf, 1999).

**Table 7.6: Fort Belvoir Watershed Survey – Accotink Bay**

| *Subwatershed* | *Size (acres)* | *Impervious Surface Acres (%)* | | *Forest Acres (%)* | | *Open Area Acres (%)* | | *Wetland Acres (%)* | |
|---|---|---|---|---|---|---|---|---|---|
| 3 | 330.68 | 54.74 | (16.60) | 134.99 | (40.82) | 140.95 | (42.62) | 14.94 | (4.52) |
| 4 | 132.38 | 39.54 | (29.90) | 38.99 | (29.45) | 53.85 | (40.68) | 7.12 | (5.38) |
| 5 | 58.01 | 10.76 | (18.60) | 39.68 | (68.41) | 44.11 | (13.05) | 1.82 | (3.14) |
| 6 | 60.87 | 4.01 | (6.60) | 54.04 | (88.79) | 2.82 | (4.63) | 2.39 | (3.93) |
| 7 | 21.97 | 3.15 | (14.30) | 6.15 | (27.99) | 12.67 | (57.67) | 0.41 | (1.87) |
| **Total*** | **603.91** | **112.20** | **(18.58)** | **273.85** | **(45.35)** | **254.40** | **(42.13)** | **26.68** | **(4.42)** |

Source: Landgraf, 1999.

*Total acreages (and percentages) under each land use/land cover category (i.e., impervious, forest, open area, and wetland) do not combine to equal the total acreage (100%) for the watershed because some areas of overlap exist.

In addition to including a portion of the South Post golf course and other developed areas, this watershed includes part of the Accotink Bay Wildlife Refuge (ABWR) (Section 13). Subwatersheds 6 and 7 of the Accotink Bay watershed face potential stormwater increases due to the future construction of the Tompkins Basin Recreation Area. Subwatershed 4 has been identified by the watershed survey as the most problematic area due to the severity of gully erosion behind the Roads and Grounds Complex along 16th Street (Landgraf, 1999).

### *Pohick Bay*

The Pohick Bay watershed consists of areas on Fort Belvoir that drain directly from Fort Belvoir into Pohick Bay, without first draining into Pohick Creek. The watershed originates on, and is completely contained within, Fort Belvoir. Pohick Bay is tidal and receives drainage from five subwatersheds with a total area of 566 acres (Figure 7.2, Table 7.7). The Pohick Bay watershed has the lowest percentage of impervious surface (0.01%) and the second highest percentage of forest (93.46%). The watershed on post is 5.50% wetland. Most of Pohick Bay's subwatersheds on post contain little or no impervious surface, and little or no open area (Landgraf, 1999).

| Table 7.7: Fort Belvoir Watershed Survey – Pohick Bay | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ***Subwatershed*** | ***Size (acres)*** | ***Impervious Surface Acres (%)*** | | ***Forest Acres (%)*** | | ***Open Area Acres (%)*** | | ***Wetland Acres (%)*** | |
| 47 | 33.25 | 0.00 | (0.000) | 33.24 | (99.97) | 0.01 | (0.03) | 2.23 | (6.71) |
| 48 | 363.08 | 0.01 | (0.003) | 326.11 | (89.82) | 36.96 | (10.18) | 16.84 | (4.64) |
| 49 | 127.18 | 0.02 | (0.015) | 127.15 | (99.97) | 0.01 | (0.01) | 10.47 | (8.23) |
| 50 | 31.63 | 0.00 | (0.000) | 31.62 | (99.97) | 0.01 | (0.03) | 1.02 | (3.22) |
| 51 | 10.54 | 0.00 | (0.000) | 10.54 | (100.00) | 0.00 | (0.00) | 0.56 | (5.31) |
| **Total*** | **565.68** | **0.03** | **(0.010)** | **528.66** | **(93.46)** | **36.99** | **(6.54)** | **31.12** | **(5.50)** |

Source: Landgraf, 1999.

*Total acreages (and percentages) under each land use/land cover category (i.e., impervious, forest, open area, and wetland) do not combine to equal the total acreage (100%) for the watershed because some areas of overlap exist.

This watershed is in the undeveloped South Post training area, and includes part of the ABWR. The only developed features within the watershed are the unpaved training roads. Problem areas in the watershed are isolated and usually occur at culvert crossings on the training roads. Beaver activity is plugging a culvert within subwatershed 48. The blocked pipe is creating a check dam on the stream and the creek is cutting across a trail. The headwaters of this subwatershed are an open grass area that was formerly used as the impact and demolition area for the installation (training area 6) (Landgraf, 1999).

In contrast to most of the subwatersheds throughout Fort Belvoir, this watershed includes one subwatershed (designated number 48 in Landgraf (1999) (Figure 7.2), and UN-1 in EA (1999) that is considered to be stable and virtually unimpacted by development or land disturbance. This subwatershed is entirely within Fort Belvoir and, except for several unpaved training roads, has no development. The only water conveyances are the culverts underneath the training roads. The unnamed stream within this watershed, locally known as "Butterfly Stream", exhibits very little stormwater disturbance and is considered to be an exemplary example of a natural small-order stream in the Upper Coastal Plain of northern Virginia (Landgraf, 1999). Since examples of such natural watershed and stream conditions are virtually non-existent in this region, this subwatershed has been recommended as suitable for consideration as a reference stream when looking to improve other similar streams within this region (EA, 2000).

### *Potomac River*

A small part of Fort Belvoir drains directly into the Potomac River without first entering Accotink Creek, Dogue Creek, Pohick Creek, Gunston Cove, Accotink Bay, or Pohick Bay. This watershed originates on, and is completely contained within, Fort Belvoir. The Potomac River watershed is comprised of five subwatersheds and has a total area of 237 acres, making it the smallest watershed on the installation (Figure 7.2, Table 7.8). The watershed is 14.24% impervious, 59.62% forested, and 4.34% wetland. Potomac River subwatershed 15 is the smallest subwatershed on post at slightly more than five acres, and is 100% forested (Landgraf, 1999).

| Table 7.8: Fort Belvoir Watershed Survey – Potomac River | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ***Subwatershed*** | ***Size (acres)*** | ***Impervious Surface Acres (%)*** | | ***Forest Acres (%)*** | | ***Open Area Acres (%)*** | | ***Wetland Acres (%)*** | |
| 15 | 5.26 | 0.00 | (0.0) | 5.26 | (100.00) | 0.00 | (0.00) | 0.35 | (6.65) |
| 16 | 16.61 | 0.02 | (0.1) | 16.02 | (96.45) | 0.59 | (3.54) | 1.32 | (7.95) |
| 17 | 15.91 | 1.10 | (6.9) | 13.07 | (82.15) | 1.74 | (10.94) | 1.08 | (6.79) |
| 18 | 43.97 | 5.27 | (12.0) | 27.19 | (61.84) | 11.51 | (26.18) | 0.90 | (2.05) |
| 19 | 154.86 | 27.31 | (17.6) | 79.52 | (51.35) | 48.03 | (31.01) | 6.62 | (4.27) |
| **Total*** | **236.61** | **33.70** | **(14.24)** | **141.06** | **(59.62)** | **61.87** | **(26.15)** | **10.27** | **(4.34)** |

Source: Landgraf, 1999.

*Total acreages (and percentages) under each land use/land cover category (i.e., impervious, forest, open area, and wetland) do not combine to equal the total acreage (100%) for the watershed because some areas of overlap exist.

The Potomac River watershed also has the steepest stream gradients on the installation, with slopes as high as 60%. Three of the subwatersheds are relatively undeveloped due to the severe slopes above the Potomac River. Residential housing is located near two of the Potomac River subwatersheds (subwatersheds 18 and 19) that have severe erosion problems (Landgraf, 1999).

### 7.2.2 Aquatic Resources

#### *7.2.2.1 Aquatic Studies*

Information on water quality, and physical and biological conditions within Fort Belvoir aquatic systems is available through various surveys and studies (Table 7.9).

- A baseline aquatic inventory of Main Post and EPG (EA, 2000) was undertaken to characterize the installation's aquatic resources and provide management recommendations. The inventory addressed the installation's major perennial waterways: Accotink Creek, Dogue Creek, Mason Run, an unnamed tributary to Accotink Bay (designated in this study as UN-2) and an unnamed tributary to Pohick Bay (designated in this study as UN-1, and located within subwatershed 48 as described in Landgraf, 1999). Pohick Creek was not included because of the influence of the discharge from the Norman M. Cole, Jr. Pollution Control Plant immediately adjacent to Fort Belvoir. The baseline aquatic inventory consisted of field survey and sampling during three seasons: summer and fall 1998 and spring 1999. A second year of anadromous fish sampling and fish and benthic survey was conducted in 2000. The baseline inventory included the collection and analysis of basic water quality parameters, the sampling of fish (including anadromous fish) and aquatic invertebrates, and the development of habitat indices. The field survey design and analytic protocols were developed to facilitate statistical analyses, including long-term trend analysis. Data from the baseline aquatic inventory have been incorporated into the installation GIS.

- An inventory of fish species within Fort Belvoir's three major creeks was completed by George Mason University in 1994 (Ernst et al., 1995). The fish species inventory used field sampling to develop a fish species list, but did not provide population information.

This inventory included sampling locations in Pohick Creek, Pohick Bay, Accotink Creek, Accotink Bay, Gunston Cove, and Dogue Creek.

- An aquatic survey and habitat assessment was completed by George Mason University in 1997 (Jones and Kelso, 1999). The aquatic survey sampled fish and benthic macroinvertebraes in Pohick Creek, Accotink Creek and Dogue Creek in fall/winter 1995/1996 and spring 1997. The results of this survey included species lists, estimates of relative abundance, and habitat indices.

- A Natural Heritage Inventory of Fort Belvoir Main Post and EPG waterways was conducted by the Virginia Department of Conservation and Recreation Natural Heritage Program (DCR-NHP) to address the biodiversity of the installation's natural resources (Hobson, 1996; 1997). The purpose of the inventory was to systematically identify the installation's natural heritage resources, including those sites supporting unique or exemplary natural communities, rare species, and other significant natural areas. The survey surveyed aquatic plant and invertebrate species, but did not sample for fish. DCR-NHP in its inventory reports provided management recommendations to protect these species and their habitats. The results of this inventory have been incorporated into the installation GIS.

- Fish sampling of the two-acre Mulligan Pond was performed by the Virginia Department Game and Inland Fisheries (VDGIF) in early spring 1999 in support of the Mulligan Pond restoration project (unpublished data).

- George Mason University is performing long-term monitoring of Gunston Cove (e.g., Jones and Kelso, 1998) for Fairfax County. This monitoring addresses water quality, invertebrates, and fish in Gunston Cove and in Pohick and Accotink Bays. Monitoring results are reported annually to Fairfax County by George Mason University.

**Table 7.9: Sources of Fort Belvoir Area Aquatic Resources Information**

| *Agency* | *Author* | *Survey Area* | *Information* | *Years* |
|---|---|---|---|---|
| U.S. Army Garrison Fort Belvoir | EA 1999, 2000 | Accotink Creek, Dogue Creek, Mason Run, UN-1, UN-2 | Benthic macroinvertebrates, fish (including anadromous fish), habitat, water quality | 1998–2000 |
| U.S. Army Garrison Fort Belvoir | Jones and Kelso 1998, 1999 (George Mason University) | Accotink Creek, Pohick Creek, Dogue Creek | Benthic macroinvertebrates, plankton, fish, habitat, water quality | 1995–96 |
| U.S. Army Garrison Fort Belvoir | Jones and Kelso 1998, 1999 (George Mason University) | Accotink Creek, Pohick Creek, Dogue Creek | Benthic macroinvertebrates, plankton, fish, habitat, water quality | 1997 |
| U.S. Army Garrison Fort Belvoir | Virginia Department of Game and Inland Fisheries 1999 | Mulligan Pond | Fish | 1999 |

| Table 7.9: Sources of Fort Belvoir Area Aquatic Resources Information | | | | |
|---|---|---|---|---|
| ***Agency*** | ***Author*** | ***Survey Area*** | ***Information*** | ***Years*** |
| ***(continued)*** | | | | |
| Fairfax County | Jones and Kelso 1996 (George Mason University) | Accotink Creek, Pohick Creek, Gunston Cove, Dogue Creek | Climate, water quality, plankton, fish (including anadromous fish), benthic organisms | 1984 to date |
| U.S. Geological Survey (USGS) | Ator et al. 1998 (USGS) | 5 miles upstream of EPG and 8 miles upstream of Fort Belvoir Main Post on Accotink Creek in Potomac River basin | Hydrology, environmental setting, water quality parameters (nutrients, pesticides, organics, metals, sediment), water quality ranking in a national context | 1992–96 (Initial sampling period) |
| U.S. Army Garrison Fort Belvoir | Ernst et al., 1995 | Accotink Creek; Pohick Creek; Dogue Creek below Mulligan Pond; and shorelines along Pohick Bay, Accotink Bay, Gunston Cove, and Potomac River | Fish | 1994 |
| U.S. Army Garrison Fort Belvoir | Dames and Moore, Inc., 1997 | North Post Golf Course drainages | Water quality (nutrient and pesticide runoff) | 1996-1997 |
| U.S. Army Garrison Fort Belvoir | Hobson, 1996-1997 (DCR-NHP) | Main Post and EPG | Rare plant communities and species | 1996-1997 |

### *7.2.2.2 Aquatic Conditions*

***Water Quality***

As part of Fort Belvoir's baseline aquatic inventory (EA, 2000), water samples were collected during the summer of 1998 and spring of 1999 in all survey locations of the installation's five main perennial waterways: Accotink Creek, Dogue Creek, Mason Run, UN-1 and UN-2. The water samples were analyzed for nutrients, pesticides, metals, and total petroleum hydrocarbons. Sediment samples were not analyzed as part of this survey. Except for some metals (aluminum, manganese, iron), which had total metal concentrations higher than the U.S. EPA chronic aquatic life or human health criteria, none of the analytes measured were at high levels and some were not detected at all (i.e., pesticides). The U.S. EPA "human health" criteria for iron (300 µg/L) and manganese (50 µg/L) are based upon prevention of objectionable taste and laundry staining, not upon adverse toxicological effects. The chronic aquatic criterion for aluminum (87 µg/L) is based upon long-term exposures for striped bass, and is frequently exceeded in natural waters (EA, 2000).

Water quality sampling results of the Fort Belvoir baseline aquatic resources survey address base flow conditions rather than storm flows. They indicate that at the surveyed sections of the installation streams, base flow does not appear to be influenced by contaminant discharges (EA, 2000). It should be noted that Fort Belvoir's water quality sampling results do not address contaminant inputs from episodic events, such as stormwater flows.

The results of the USGS NAWQA program (Ator et al., 1998) provide an indication of the extent to which urbanization of the watersheds above Fort Belvoir negatively impacts local waterways. The NAWQA study was designed and undertaken to address water quality associated with stormwater flows. The NAWQA study of Accotink Creek (five miles upstream of EPG and eight miles upstream of Fort Belvoir) found the following:

- The largest loadings of total phosphorus per square mile and the most sediment per square mile among Potomac tributaries from which data were collected
- Pesticides in excess of aquatic life criteria in samples collected during periodic storm events in the summer months between 1992 and 1996
- The highest concentration of the insecticides Diazinon® and Malathion® measured in the Potomac River Basin
- The highest concentrations of the pesticides Oryzalins® and methyl chlorophenoxy acetic acid (MCPA) measured by the NAWQA Program nationwide.[3]

Stream habitat at the NAWQA Accotink Creek sampling site was among the most physically degraded in the nation as assessed by the NAWQA Program (Ator et al., 1998). This site was reported to exhibit examples of typical urban site habitat degradation, including lower bank stability, increased bank erosion, and lower densities of riparian vegetation than at less-degraded sites. Habitat quality is one of the primary factors influencing biological (i.e., fish, macroinvertebrate communities) condition in a waterway. The NAWQA study found moderate fish community degradation at the Accotink Creek sampling site. Overall, the results of the NAWQA Program indicate that Accotink Creek above Fort Belvoir is significantly impacted by urbanization (Ator et al., 1998).

The NAWQA Program does not have sampling sites on Dogue or Pohick Creeks, so comparable information is not available for those waterways. The watersheds of both creeks are considerably smaller (10,883 and 22,755 acres, respectively) than the Accotink Creek watershed (33,156 acres), and they have different drainage patterns than Accotink Creek. While the Dogue and Pohick Creek watersheds are influenced by urban land uses, neither is expected to experience the level of degradation reported for the section of Accotink Creek above Fort Belvoir at the present time. The large wetland area in Huntley Meadows Park can be expected to provide some moderation of stormwater flows in Dogue Creek above Fort Belvoir. Similarly, Pohick Creek above Fort Belvoir can be expected to be moderated by a series of regional stormwater ponds. Nonetheless, water quality and flow conditions in the lower reach of Pohick Creek adjacent to Fort Belvoir can be expected to be greatly influenced by discharge from the Norman M. Cole, Jr. Pollution Control Plant.

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[3] The types of pesticides found at the NAWQA Accotink Creek sampling site are those generally used on rights-of-way, turf, golf courses, maintained landscapes, and as additives to asphalt and other building materials.

### *Physical Conditions*

Fort Belvoir's baseline aquatic inventory characterized the physical habitat conditions along the five installation waterways surveyed (EA, 2000). The survey results described the lower reaches of the installation waterways as exhibiting typical upper Coastal Plain characteristics (e.g., slow moving, meandering, vegetated banks, predominated by runs with very little pool or riffle areas, in-stream snags and debris, shifting point/sand bars). Substrate composition, however, was described as being somewhat different than most Coastal Plain streams, having a higher proportion of gravel/cobble and a slightly lower amount of sand, most likely due to Fort Belvoir's location at the upper part of the Coastal Plain. The upper reach of Accotink Creek within EPG was described as having characteristics typical of Piedmont streams (e.g., steep gradient, rocky substrate, riffle habitat). Similarly, the tributary drainage network throughout Fort Belvoir's Main Post was described as exhibiting gradients in their upper reaches more typical to Piedmont streams. Physical habitat degradation (e.g., lower bank stability, bank erosion) was reported within virtually all of the installation's waterways surveyed. These conditions are related to the upstream urban effects of high stormwater flows discussed earlier. Significant erosion and bank instabilities were also reported in the smaller tributary drainages above the major waterways. Riparian forest buffers were reported to exist along both sides of most of the installation waterways (EA, 2000).

### *Benthic Community*

The baseline aquatic inventory sampled benthic communities in Accotink Creek, Dogue Creek, Mason Run, UN-1, and UN-2 during the summer and fall 1998, and spring 1999 survey events. The results indicate a benthic macroinvertebrate community fairly typical of upper Coastal Plain streams, having lower diversity than would be expected from a Piedmont stream. Results showed a predominance of chironomid midge and oligochaete worm taxa, low numbers of the traditional sensitive taxa (i.e., EPT taxa – Ephemeroptera, Plecoptera, Trichoptera), but high numbers of Odonata, the dragonflies and damselflies that are the typical moderately sensitive taxa of low-gradient streams. This species composition indicates a benthic community tolerant of changing physical habitat conditions, as well as of variable water quality conditions. Taxa richness (total number of taxa), which is a measure of diversity in the benthic community, ranged from 14 to 52 taxa at any given site and season, and averaged between 25 to 29 (combined stations) with a total of 197 taxa collected during the baseline inventory (EA, 2000). The diversity and number of the benthic macroinvertebrates at Fort Belvoir is comparable to other Coastal Plain streams in the Mid-Atlantic region (U.S. EPA, 1997).

The baseline aquatic inventory reported seasonal variations in the benthic macroinvertebrate community in all but one of the waterways surveyed, with most of the indices being lower in the spring than in the summer or fall (EA, 2000). The greatest variations were reported at all the Accotink Creek locations, the downstream Mason Run station, and in UN-2. In contrast, UN-1, which has an entirely undeveloped watershed within Fort Belvoir (designated subwatershed 48 in Landgraf [1999]), was reported to have consistently high indices, with no seasonal variation. The Fort Belvoir area experienced drought conditions during the survey sampling period (summer and fall of 1998), followed by some significant winter rainstorms leading into the spring 1999 survey event. Stormwater flow from urbanized land uses may have influenced the benthic macroinvertebrate communities in Accotink Creek, Mason Run, and UN-2 (EA, 2000).

***Fish Community***

The fish survey component of the baseline aquatic inventory included multi-season (summer and fall 1998, and spring 1999) fish sampling (EA, 2000), as well as anadromous fish sampling in the spring 1999 (EA, 1999a) and again in spring 2000 (EA, 2000). The results of the baseline aquatic inventory (EA 1999a; 2000) together with results from the other Fort Belvoir aquatic studies (e.g., Ernst et al., 1995; Jones and Kelso, 1999) indicate a diverse fish community in Fort Belvoir waterways. A total of 57 fish species were identified in installation waterways (Appendix D, Table D.1) through these three survey efforts. An additional three species were identified in Gunston Cove through the long-term Fairfax County monitoring program, for a total of 60 fish species in the immediate Fort Belvoir locality.

The predominant groups of fish in Fort Belvoir waterways, both in numbers of species and in abundance are cyprinids (minnows) (*Hybognathus regius* and *Pimephales notatus*) and centrarchids (sunfish) (*Lepomus* spp.). These two groups typically dominate eastern North American waterways (Ernst et al., 1995). Other dominant fish species in Fort Belvoir waterways are banded killifish (*Fundulus diaphanus*), percids (perch, *Morone americana* and *Perca flavescens*) and American eel (*Anguilla rostrata*). Minnows comprise the majority of the fish in all installation waterways during spring and summer, while killifish dominate in the fall. Sunfish, perch and American eel are abundant year-round, as are blacknose dace (*Rhinichthys atratulus*), rosysided dace (*Clinostomus funduloides*), creek chub (*Semotilus atromaculatus*) and tesselated darter (*Etheostoma olmstedi*). Shiners (spottail, *Notropis hudsonius*) and spotfin (*Cyprinella spiloptera*) are among the abundant fish species during the summer (EA, 1998; 1999b,c; 2000).

Two species of river herring – alewife (*Alosa pseudoharengus*) and blueback herring (*Alosa aestivalis*) – are documented to migrate up Accotink Creek and Dogue Creek during the spawning season, although they do not appear to travel far up installation creeks (EA, 1999a; 2000). Alewives are the most abundant. Blueback herring were documented using installation creeks for the first time in 1999 (EA, 1999a). (Both are documented spawners in Gunston Cove [Jones and Kelso, 1998].) American and hickory shad (*Alosa sapidissima* and *Alosa mediocris*), while identified locally in the Potomac River, are more deep-water spawners and are not expected to occur in Fort Belvoir waterways. Gizzard shad (*Dorosoma cepedianum*), a semi-anadromous species, is another common spawner within Fort Belvoir waterways.

Long-term monitoring of Gunston Cove reveals the most abundant spawners to be river herring (alewife, blueback herring), gizzard shad, the semi-anadromous white perch (*Morone americana*) and various sunfish (Jones and Kelso, 1998). Gunston Cove is recognized as a rich nursery area for these species. White perch is the dominant fish species of Gunston Cove over much of the year. Other abundant species within Gunston Cove include channel catfish (*Ictalurus punctatus*), spottail shiner, bay anchovy (*Anchoa mitchilli*), brown bullhead (*Ameiurus nebulosus*), pumpkinseed (*Lepomis gibbosus*), tesselated darter, yellow perch (*Perca flavescens*), inland silverside (*Menidia beryllina*), mummichog (*Fundulus heteroclitus*) and golden shiner (*Notemigonus crysoleucas*) (Jones and Kelso, 1998).

The fish community in Fort Belvoir waterways is a diverse assemblage, which is characteristic of Coastal Plain streams. The species of fish identified in the Fort Belvoir waterways and in Gunston Cove are those that one would expect in this region. Natural conditions (large, slow moving upper Coastal Plain streams fed by a network of small, short reaching tributaries) dictate

that the species must be tolerant of warm water, low baseline flow, silty/sandy substrate, in-stream snags/debris, etc. Fishes in these waterways must also be tolerant of conditions (e.g., dramatic, ongoing in-stream and bank erosion, siltation, sedimentation, etc.) caused by excessive/unmoderated stormwater flows from developed land areas both on and off the installation, as well as chemical inputs from surrounding urban development. Pohick Creek, in particular, is strongly influenced by the discharge of the Norman M. Cole, Jr. Pollution Control Plant just outside the installation boundary. The fishes in these waterways are also subject to habitat changes caused by beaver activity. Nonetheless, the surveys did report that several species typical to Piedmont streams do occur in Accotink and Dogue Creek.

The smaller tributary streams surveyed during the baseline inventory reported a less diverse fish assemblage than that of the main installation waterways (EA, 2000). This is probably related to limitations in habitat availability (e.g., very small streams, lack of pools) in these small waterways, although there may be potential water quality problems influenced by stormwater or other inputs from the installation. A fish kill recorded in lower Mason Run in the fall of 1999 may be evidence of this problem or an unidentified isolated pollution event. The results of the baseline inventory indicated the occurrence of a viable and substantial anadromous fish migration (especially the herring and perches) up both Accotink and Dogue creeks (EA, 1999a; 2000).

There are no dams or obstructions within the three main creeks through Fort Belvoir, to prohibit anadromous fish passage up Pohick, Accotink and Dogue Creeks through the installation[4] (Figure 11.2). The small size and the intermittent flow conditions of most of the small tributaries on Fort Belvoir preclude all but the smallest fish species. At several locations on the tributary waterways, excessive sedimentation at the mouth of the tributary, or culvert blockages, appear to preclude all fish passage (EA, 2000).

UN-1 is unique for Fort Belvoir. This stream traverses a large undeveloped portion of Fort Belvoir and is not severely influenced by stormwater or other anthropogenic factors. The fish fauna of UN-1 contain healthy populations of American brook lamprey (*Lampetra appendix*). UN-1 is the only stream to yield eastern mudminnows (*Umbra pygmaea*) (EA, 1998; 1999b,c; 2000). Both of these species are indicators of good water quality and unaltered channels.

Fort Belvoir has very little permanent pond habitat. The only ponds (excluding beaver ponds) on post considered capable of supporting fish are (1) the less than one-acre pond at the North Post golf course; (2) the less than one-acre stormwater management pond at INSCOM; and, (3) the two-acre Mulligan Pond at JMAWR. Ernst et al. (1995) reported that these ponds had been stocked in the past with sunfish, perch, or black bass. An early spring fish survey of Mulligan Pond conducted in 1999 by the Virginia Department of Game and Inland Fisheries found gizzard shad (*Dorosoma cepedianum*), largemouth bass (*Micropterus salmoides*), black crappie (*Pomoxis nigromaculatus*), common carp (*Cyprinus carpio*), and various sunfish (unpublished data). Neither of the other ponds have been surveyed within the past seven years.

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[4] There has been a passage problem on Dogue Creek, offsite at a culvert under U.S. Route 1 where obstructions may prohibit fish from freely passing through the culvert. In addition, a waterfall located approximately 50 meters upstream of the culvert inhibits fish movement into the wetland area above U.S. Route 1 and the rest of Dogue Creek.

None of the fish identified in Fort Belvoir waterways or ponds have federal or state threatened or endangered designations. The only such species identified in this region is the shortnose sturgeon (*Acipenser brevirostrum*), which occurs in the deeper waters of the Potomac River. This species is not expected to occur within Fort Belvoir waters. One state species of concern, the bridle shiner (*Notropis bifrenatus*), has been identified in several locations in Accotink and Dogue creeks. The bridle shiner was more abundant in Accotink Creek where it was collected in various types of habitat (EA, 2000). This species is found in quiet streams and creeks. It rarely enters tidal or brackish water.

***Aquatic Habitat Assessments***

Both the George Mason University (GMU) aquatic survey (Jones and Kelso, 1999) and the baseline aquatic inventory (EA, 2000) performed aquatic habitat assessments of Fort Belvoir waterways. These two assessments followed slightly different protocols, which resulted in variation between the two surveys' results. The protocol followed by GMU was a more generalized analysis, and used a reference stream from within a more Piedmont setting for comparison. In contrast, the baseline aquatic inventory followed by EA incorporated regional modifications more appropriate to Coastal Plain streams and to the Potomac River drainage system. Consequently, the GMU assessment is considered to have rated the installation's streams against a set of habitat standards uncharacteristic to this area, resulting in an exaggeration in the level of habitat degradation exhibited by these streams and their aquatic communities. The GMU assessment results, while useful to understanding in-stream conditions at Fort Belvoir, must be used with caution.

The GMU survey (Jones and Kelso, 1999) used the Rapid Bioassessment Protocol (RBP) for fish bioassessments to calculate an Index of Biological Integrity for aquatic communities, and used the Maryland Coastal Plain Macroinvertebrate Index for benthics. The GMU study assessed Pohick Creek, Accotink Creek and Dogue Creek within Fort Belvoir. The baseline aquatic inventory (EA, 2000) used the RBP approach, with regional modifications (U.S. EPA, 1997), and used the Coastal Plain Metric Index for benthic macroinvertebrates and fish. The baseline aquatic inventory assessed Accotink Creek, Dogue Creek and Mason Run (multiple locations on each stream), and UN-1 and UN-2 (one location on each) for the summer, fall, and spring survey events.

The GMU habitat assessment results (Jones and Kelso, 1999) indicated that Pohick, Accotink, and Dogue creeks were degraded, relative to the best streams in the Mid-Atlantic Coastal Plain. At the surveyed locations, GMU rated Accotink as poor to fair for fish and poor for macroinvertebrates. The survey reported that the "…observed degradation appears to be due mainly to activities upstream from Fort Belvoir. Pohick Creek was less degraded than Accotink Creek, even though the former received large quantities of treated effluent from the Norman M. Cole, Jr. Pollution Control Plant operated by Fairfax County. This suggests that nonpoint source pollution from suburban areas farther upstream is the prime degrading factor. This hypothesis is consistent with a stronger effect on Accotink [Creek], which is a larger and more heavily developed watershed than Pohick." (Jones and Kelso, 1999)

Table 7.10 presents a summary of the habitat ratings from the baseline aquatic inventory (EA, 2000). Within Accotink Creek, the upper survey locations (AC-1 and AC-2) tended to have higher overall habitat scores than the lower locations (AC-3 and AC-4) during all seasons. The

greatest differences were in the parameters for channel modification, instream habitat, pools (good to excellent at upper, good at lower) and bank stability (fair to good at upper, poor at lower). The lower stations had a lower diversity of runs and bends; and less snags, riffles, and vegetative and undercut banks. AC-3 also had less pool habitat. Dogue Creek had similarly variable scores between the two survey locations, mostly with regard to channel modification (excellent at upper, poor to fair at lower), pools (excellent at upper, good at lower) and bank stability (poor at upper, good at lower). The spring 1999 survey at the lower Dogue location (DG-3) exhibited impacts on vegetation, possibly as a result of construction activities for the Mulligan Pond renovation project and because of beaver impoundment. Within Mason Run, the lower survey location had slightly higher overall scores than the upper location during all seasons. The upper location had better bank stability (fair, compared to poor at the lower) and lower instream habitat and pools (good, compared with excellent at the lower). The two unnamed tributaries had the highest overall scores, with UN-1 having higher overall scores than UN-2. Both had consistently excellent ratings for channel modification, instream habitat, and good to excellent ratings for pools. UN-1 had the highest habitat score of any station within the study because of slightly better scores for many of the habitat parameters. This is a result of the absence of urban development in its entire watershed.

**Table 7.10: Summary of Habitat Quality Evaluated at Fort Belvoir Streams†**

| | *Summer 1998* | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Habitat Parameters*** | ***AC-1*** | ***AC-2*** | ***AC-3*** | ***AC-4*** | ***DG-1*** | ***DG-3*** | ***DG-4**** | ***MS-1*** | ***MS-2*** | ***UN-1*** | ***UN-2*** |
| a. Channel Modification | 16 | 16 | 12 | 15 | 18 | 7 | N/A | 17 | 18 | 18 | 18 |
| b. Instream Habitat | 13 | 16 | 11 | 14 | 17 | 17 | N/A | 14 | 16 | 17 | 17 |
| c. Pools | 17 | 17 | 11 | 15 | 17 | 14 | N/A | 15 | 17 | 17 | 16 |
| d. Bank Stability | | | | | | | | | | | |
| Left | 6 | 3 | 2 | 2 | 2 | 8 | N/A | 4 | 2 | 5 | 5 |
| Right | 6 | 3 | 2 | 2 | 2 | 8 | N/A | 4 | 2 | 5 | 5 |
| e. Bank Vegetation Type | | | | | | | | | | | |
| Left | 7 | 8 | 7 | 6 | 7 | 9 | N/A | 7 | 7 | 7 | 6 |
| Right | 7 | 8 | 7 | 6 | 7 | 9 | N/A | 7 | 7 | 7 | 6 |
| f. Shading | 12 | 16 | 16 | 16 | 15 | 16 | N/A | 14 | 15 | 17 | 16 |
| g. Riparian Zone Width | | | | | | | | | | | |
| Left | 10 | 10 | 10 | 10 | 10 | 10 | N/A | 10 | 10 | 10 | 10 |
| Right | 10 | 10 | 10 | 10 | 10 | 10 | N/A | 10 | 9 | 10 | 10 |
| **Total Score** | **104** | **107** | **88** | **96** | **105** | **108** | **N/A** | **102** | **103** | **113** | **109** |

| Table 7.10: Summary of Habitat Quality Evaluated at Fort Belvoir Streams† | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *(continued)* | | | | | | | | | | | |
| *Fall 1998* | | | | | | | | | | | |
| ***Habitat Parameters*** | ***AC-1*** | ***AC-2*** | ***AC-3*** | ***AC-4*** | ***DG-1*** | ***DG-3*** | ***DG-4**** | ***MS-1*** | ***MS-2*** | ***UN-1*** | ***UN-2*** |
| a. Channel Modification | 16 | 16 | 12 | 13 | 18 | 5 | N/A | 16 | 17 | 18 | 17 |
| b. Instream Habitat | 16 | 17 | 13 | 13 | 17 | 15 | N/A | 16 | 17 | 18 | 17 |
| c. Pools | 15 | 17 | 12 | 16 | 16 | 12 | N/A | 12 | 16 | 14 | 14 |
| d. Bank Stability | | | | | | | | | | | |
| Left | 6 | 3 | 2 | 3 | 2 | 8 | N/A | 5 | 2 | 5 | 3 |
| Right | 6 | 3 | 3 | 3 | 3 | 8 | N/A | 5 | 2 | 5 | 3 |
| e. Bank Vegetation Type | | | | | | | | | | | |
| Left | 8 | 8 | 8 | 7 | 8 | 9 | N/A | 8 | 8 | 7 | 8 |
| Right | 8 | 8 | 8 | 7 | 8 | 9 | N/A | 8 | 8 | 7 | 8 |
| f. Shading | 16 | 16 | 16 | 16 | 15 | 16 | N/A | 14 | 15 | 17 | 15 |
| g. Riparian Zone Width | | | | | | | | | | | |
| Left | 10 | 10 | 10 | 10 | 10 | 10 | N/A | 10 | 10 | 10 | 10 |
| Right | 10 | 10 | 10 | 10 | 10 | 10 | N/A | 10 | 10 | 10 | 10 |
| **Total Score** | **111** | **108** | **94** | **98** | **107** | **102** | **N/A** | **103** | **104** | **109** | **105** |
| *Spring 1999* | | | | | | | | | | | |
| ***Habitat Parameters*** | ***AC-1*** | ***AC-2*** | ***AC-3*** | ***AC-4*** | ***DG-1*** | ***DG-3*** | ***DG-4**** | ***MS-1*** | ***MS-2*** | ***UN-1*** | ***UN-2*** |
| a. Channel Modification | 16 | 18 | 11 | 14 | 17 | 5 | N/A | 16 | 17 | 17 | 16 |
| b. Instream Habitat | 14 | 17 | 14 | 15 | 16 | 15 | N/A | 16 | 17 | 16 | 16 |
| c. Pools | 16 | 18 | 12 | 16 | 16 | 11 | N/A | 12 | 15 | 14 | 12 |
| d. Bank Stability | | | | | | | | | | | |
| Left | 8 | 1 | 2 | 2 | 2 | 8 | N/A | 3 | 2 | 5 | 5 |
| Right | 7 | 1 | 1 | 2 | 2 | 8 | N/A | 3 | 2 | 5 | 5 |
| e. Bank Vegetation Type | | | | | | | | | | | |
| Left | 8 | 9 | 6 | 7 | 8 | 5 | N/A | 7 | 7 | 7 | 7 |
| Right | 8 | 8 | 6 | 7 | 8 | 6 | N/A | 7 | 7 | 7 | 7 |
| f. Shading | 12 | 16 | 16 | 16 | 16 | 10 | N/A | 10 | 10 | 10 | 10 |
| g. Riparian Zone Width | | | | | | | | | | | |
| Left | 10 | 10 | 9 | 10 | 10 | 10 | N/A | 10 | 10 | 10 | 10 |
| Right | 10 | 10 | 10 | 10 | 10 | 1 | N/A | 10 | 10 | 10 | 10 |
| **Total Score** | **109** | **108** | **87** | **99** | **105** | **79** | **N/A** | **99** | **102** | **108** | **104** |

Source: EA, 2000

† Because of habitat variations both within and among the waterways, care must be taken when comparing results for different waterways.

* Habitat assessment method not appropriate for stream type at DG-4.

Key to numerical ranges:

| | | | | |
|---|---|---|---|---|
| a, b, c, d | 20-16 Excellent | 15-11 Good | 10-6 Fair | 5-0 Poor |
| e, f, g | 10-9 Excellent | 8-6 Good | 5-3 Fair | 2-0 Poor |

All of the survey locations assessed by the baseline aquatic inventory (EA, 2000) had excellent ratings for riparian width, and good to excellent ratings for shading and vegetation type, channel modification, instream habitat and pools. All of the survey locations exhibited some degree of habitat degradation related to bank stability. The most degraded conditions (poor rating) occurred at the lower Accotink Creek, upper Dogue Creek, and lower Mason Run survey locations.

***Natural Heritage Resources***

The natural heritage inventories (Hobson, 1996; 1997) identified four state rare plant species and four state watchlist plant species, all of which occur in wetland or aquatic habitats (Section 12). The natural heritage inventories also identified three federal or state-listed animal species, seven state rare animal species, and 13 state watchlist animal species, all of which inhabit wetland, riparian and/or aquatic areas (Section 12). The natural heritage inventories did not survey for fish.

## 7.3 WATER RESOURCES MANAGEMENT

### 7.3.1 Water Resources Conservation Recommendations

The water resources survey results for Fort Belvoir indicate that the aquatic systems on and through Fort Belvoir, while impacted by urbanization, have a high level of diversity and possess significant aquatic resources with high conservation priority (e.g., four state rare aquatic invertebrates, two river herring, American eel). The survey results indicate that nearly all of Fort Belvoir's waterways are being adversely impacted by on-post and off-post urbanization, mostly as a result of stormwater-related problems. The surveys warn that the situation may become worse as stormwater problems persist. As land development (both on-post and off-post) continues, and as stormwater flow excesses bring such problems as physical habitat loss or degradation due to erosion and sedimentation; water quality degradation due to transport of non-point source pollutants; benthic organism displacement due to excessive in-stream flows and channel scour; and impediment to fish passage due to improperly configured or blocked conveyances. As stream channel conditions degrade and bank instabilities worsen, the likelihood increases for these channel and bank instabilities resulting from flow problems to be "corrected" by hard engineered actions (e.g., channelization, hardened riprap, gabions, etc.), which would displace natural in-stream habitat.

The Fort Belvoir watershed survey identified approximately 1,740 in-stream problem sites (e.g., erosion, unstable channels, undermined structures) related to stormwater-management problems (Landgraf, 1999). The survey ranked the severity of the problems, and provided recommendations to correct the problems. Essentially, the watershed survey recommended an installation-wide program of corrective actions.

Fort Belvoir's *Watershed-based Stream Corridor Management and Protection Plan* (Allen et al., 1999) validated the specific types of in-stream problems at Fort Belvoir, their causes and the corrective actions recommended in the watershed survey report (Landgraf, 1999). The stream corridor management and protection plan then made recommendations for installation-level policy and for watershed-based stream corridor management strategies to correct existing problems and prevent future problems. The stream corridor management plan focused on

stormwater management within watersheds; erosion control within streams and drainageways; riparian buffer protection, restoration and maintenance; and fish and wildlife habitat protection. The management plan provided the following recommendations:

- Implement stormwater management protocols that require best management practices for new construction projects.
- Implement a drainageway maintenance program (e.g., maintenance of existing stormwater management structures).
- Implement a repair/renovation program (e.g., correction of nickpoints and headcuts) to correct erosion problems within streams and drainageways.
- Implement improvements to counter stormwater flow excesses from developed areas (e.g., removal of excess/abandoned pavement, addition of infiltration areas, and energy dissipation at outfalls).

The large number of problem sites identified in the watershed survey contrasts sharply with the fact that Fort Belvoir has preserved riparian buffers along virtually all of the installation streams. The watershed survey concluded that the problems resulted from "improper stormwater management and excess channel velocities, not natural erosive forces" (Landgraf, 1999). For problem streams, the stream corridor management plan (Allen et al., 1999) agreed with the watershed survey's conclusion, and cited the lack of drainage structure maintenance, inadequate riparian buffer width and excessive impervious surfaces as major contributing factors. Although current riparian buffers on Fort Belvoir are sufficient for most streams, the stream corridor management plan cites proposed on-post construction as a possible future compromise to riparian protection. To safeguard against impacts from future construction activities, the stream corridor management plan recommended that Fort Belvoir (1) assess the potential for future problems prior to undertaking construction; (2) take actions to avoid or minimize potential problems; and (3) adopt the guidelines listed in the plan for riparian buffer composition and width.

The results of the aquatic resources surveys (EA, 2000; Jones and Kelso, 1998) and the DCR-NHP Natural Heritage Inventory (Hobson, 1996) consistently cite the impact of present-day stormwater runoff on aquatic resources within installation waterways, and the need for stormwater management improvements to control these impacts.

The baseline aquatic inventory (EA, 2000) and the DCR-NHP Natural Heritage Inventory (Hobson, 1996; 1997) also recommended conservation of specific installation areas to protect regionally rare aquatic resources. EA (2000) recommended conservation of waterway UN-1 to protect a rare example of an undisturbed upper Coastal Plain stream. DCR-NHP (Hobson, 1996) recommended establishment of a large conservation area, to include the watersheds of important aquatic habitats in T-7, T-9 and W-4, which includes UN-1 and its entire watershed (Figure 8.2), to protect rare aquatic plant and invertebrate species.

### 7.3.2 Water Resources Multiple Use Requirements

***Military Training and Testing Requirements***

Fort Belvoir has two Reserve units with water-based training requirements: the 299th Engineer Company and the 464th Transportation Company. The 299th Engineer Company performs float bridge training. The 464th Transportation Company performs safety exercises, beach disembarkments, boat and equipment maintenance, boat operations, and load and unload operations. Both companies require marina facilities and access to open water areas. The 464th also requires access to beach areas for launching and landing trainings.

***Outdoor Recreation Requirements***

The principal outdoor recreation activities involving water resources at Fort Belvoir are fishing, boating, nature watching (e.g., bird watching) and nature art (e.g., outdoor photography). Each of these activities requires appropriate access to water resources, and the use and enjoyment of water resources by each type of activity is predicated on the water resources being in a "healthy condition." Boating requires engineered facilities in a shoreline area such as boat launch, boat slips and docks, and a marina building. Fishing, nature watching, and nature art require much simpler access facilities, such as hiking trails and fishing piers.

***Environmental Education and Scientific Research and Study Requirements***

Environmental education and scientific research and study require appropriate access to water resources, and the presence of "healthy" aquatic systems. Access facilities can be as minor as hiking trails, or could include boat launch facilities for marine research vessels. Educational use of and access to water resources could also entail the availability of on-site classroom and laboratory facilities.

***Land Development and Facilities Maintenance Requirements***

While not specifically addressed in the DoD and Army management policies (Section 7.1), land development and facilities maintenance must be considered as one of the multiple uses of installation lands and waters. This is especially true for Fort Belvoir, which as of 2000, supports more than 100 tenant organizations and approximately 2,070 housing units. Furthermore, short- and long-term planning, as expressed in the *Fort Belvoir Real Property Master Plan* (Woolpert, 1993a) calls for continued development to support new facilities. The siting, construction, maintenance and use of these facilities represent the most significant source of potential impact to water resources on Fort Belvoir. Mission support to the development of new facilities necessitates balancing the need for new and expanded facilities against the need for natural resources conservation.

Water resources can pose threats to the construction and use of installation facilities through flooding, poor drainage and erosion. Mission support regarding the protection of the installation's developed facilities requires siting and design decisions, and maintenance actions to avoid or minimize such risks.

### 7.3.3 Water Resources Management Actions to Date

Fort Belvoir manages its water resources in accordance with the resource conservation and multiple use requirements of DoDI 4715.3 and AR 200-3. Management actions to date have

prioritized balancing conservation of water resources with providing for military mission support and sustained multiple use of water resources. Fort Belvoir approaches water resources management on a watershed basis, consistent with the Chesapeake Bay Program agreements.

Fort Belvoir recognizes that to be effective, water resources management actions must be identified and undertaken at the watershed level. Implementing a watershed-based management strategy for Accotink, Dogue, and Pohick Creeks is complicated by the fact that their watersheds are mostly off-post, where they are not controlled by a single land-management entity. Consequently, the management actions for these watersheds must be undertaken through a cooperative program among the major land holders and land managers within each watershed. In contrast, implementation of a watershed-based management strategy for the four watersheds on Fort Belvoir that are completely contained within the installation—Pohick Bay, Accotink Bay, Gunston Cove, and Potomac River—is simplified by the fact that Fort Belvoir is the sole land holder for these watersheds.

Fort Belvoir recognizes that the first step in promoting regionally coordinated water resources management is for Fort Belvoir to (1) correct existing problems within the four watersheds that are entirely within the installation's control, and (2) protect the integrity of the least-disturbed installation subwatersheds (i.e., subwatersheds 47, 48, 49, 50, and 51). These corrective and protective actions will not only be locally significant, but they will demonstrate Fort Belvoir's stewardship commitment. They will also foster partnerships with Fairfax County and will serve as models of successful design and construction techniques.

#### *7.3.3.1 Water Resources Conservation Actions*

Fort Belvoir works to protect and enhance native aquatic biodiversity by conserving and enhancing native aquatic habitats, correcting and preventing stormwater-related problems, and protecting against overuse and misuse of aquatic resources (e.g., illegal fishing). To date, Fort Belvoir's water resources conservation actions have taken the following basic forms:

- Designating key installation areas (e.g., stream corridors and shorelines) as conservation areas
- Performing watershed improvements, including the following:
  - Implementing measures to control on-post stormwater
  - Implementing projects to correct stormwater-related problems and re-establish natural stream channel conditions downstream
  - Reducing excess impervious surfaces throughout installation watersheds
- Enhancing native habitat conditions within aquatic habitats on Fort Belvoir (i.e., within Mulligan Pond)

- Implementing and enforcing water resources protection regulations
- Coordinating water resources information and supporting water resources management at the regional level.

Each of these conservation actions is discusssed below.

***Conservation Area Designation***
Fort Belvoir has set aside for conservation three large blocks of ecologically significant installation areas by designating two installation refuges and the installation's Forest and Wildlife Corridor (Section 13). All of the Pohick Creek, Pohick Bay, lower Accotink Creek and Accotink Bay shorelines on post are included within the ABWR. All of the upper Dogue Creek stream corridor and Mulligan Pond are within the JMAWR. Sections of upper Accotink Creek and Mason Run are within the Forest and Wildlife Corridor.

The *Fort Belvoir Real Property Master Plan* (Woolpert, 1993a) designates the refuges, corridor, all wetlands, and all steep-sloped riparian areas as "environmentally constrained to development." The steep-sloped riparian areas include virtually all of the Potomac River and much of the Gunston Cove shorelines. This conservation designation effectively directs land-use development away from wetlands, riparian areas, and shorelines.

***Stormwater Control***
In 1999, Fort Belvoir began implementing a long-term program to correct existing stormwater-related problems, and prevent future problems, in accordance with the recommendations of Landgraf (1999) and Allen et al. (1999). This included incorporation of stormwater management facilities/considerations into all facilities construction projects. It also included projects to retrofit existing facilities with structures to control and moderate existing stormwater flows. Also in 1999, Fort Belvoir required two major construction projects to include BMPs and to follow the management recommendations of Allen et al. (1999). These projects were the new U.S. Army Reserve North Post facilities and the Virginia Department of Transportation (VDOT) widening of Telegraph Road through Fort Belvoir. Fort Belvoir required the U.S. Army Reserves to do the following:

- Modify the project grading plan to reduce stormwater impacts by re-directing runoff from existing eroded channels.
- Calculate the post-construction runoff conditions using a pre-construction scenario of no paved surfaces.
- Construct a stormwater pond sized sufficiently to accommodate stormwater from future development within that subwatershed.

In response to Fort Belvoir requirements, on the Telegraph Road widening project, VDOT committed to do the following:

- Use the services of their newly established team of hydrologic and environmental engineers (i.e., the "stream team") to modify the Accotink Creek bridge and channel design using natural stability concepts.

- Modify the culvert design for the Long Branch Creek crossing to correct stream bank erosion and promote natural maintenance of the watercourse to its confluence with Accotink Creek.

***Stream Corridor Restoration***

In 1999, Fort Belvoir began implementing projects to repair stormwater-related problems within installation stream corridors, in accordance with the recommendations of Landgraf (1999) and Allen et al. (1999). Such actions include in-stream corrections such as slope stabilization, riparian buffer enhancements, and the installation of new or the repair of existing stormwater control structures (e.g., energy dissipation and flow moderation devices). As of 2000, Fort Belvoir has initiated the following actions to correct in-stream problems identified by Landgraf (1999), as follows:

- Subwatershed 03 restoration, problem sites corrected along entire length

- Subwatershed 02 restoration, energy dissipation structures at outfall

- Subwatershed 01 restoration, outfall protection and channel repairs

- Subwatershed 04, corrections to upper reaches, including stormwater pond, rock check dam, and outfall protection

- Subwatershed 22 restoration, correction of problem sites along 1,000 linear feet of upper stream channel

- Subwatershed 38, re-establishment of natural stream channel conditions within the wildlife crossing structure under the Fairfax Parkway

- Subwatershed 11, removal of failed concrete channel and re-establishment of natural meandering channel conditions within the housing area (behind Quarter 172, Thermo-Con).

As of 2000, Fort Belvoir has undertaken four projects resulting in approximately 10 acres of riparian buffer enhancement. These projects included the following:

- Plantings along Dogue Creek, just above the Dogue Creek marina

- Plantings along waterways within the Fairfax County Parkway

- Plantings along tributaries of Accotink Creek, along U.S. Route 1

- Plantings along Mason Run.

***Impervious Surface Reduction***
Since 1999, Fort Belvoir has been identifying and removing abandoned pavement to reduce unnecessary impervious surfaces within installation watersheds. Areas where pavement has been removed are replanted with native trees. In 1999, Fort Belvoir removed 2.9 acres; in 2000, 1.5 acres. An additional 3 acres are identified for fiscal year (FY) 01 funding.

***Aquatic Habitat Enhancement***
The only aquatic habitats that belong to Fort Belvoir are the three installation ponds: the 2-acre Mulligan Pond in the JMAWR, the less than one-acre pond on the North Post Golf Course, and the less than one-acre stormwater pond on the INSCOM facility. With the exception of the Potomac River, all of the waterways that pass through or adjacent to Fort Belvoir belong to the Commonwealth of Virginia. The Potomac River belongs to Maryland. Consequently, Fort Belvoir's opportunities for manipulation of aquatic habitats are quite limited.

In 1999, Fort Belvoir undertook a complete renovation of Mulligan Pond to improve fish habitat. The project entailed correcting bank erosion, adding water control capabilities, planting riparian vegetation along the pond shore, installing fish habitat structures, and performing a one-time stocking of channel catfish. Fishing pressure is expected to exceed the pond's self-sustainability, and annual or periodic stocking is being considered to maintain a native, warmwater fishery.

***Regional Coordination***
Fort Belvoir has been working closely with Fairfax County to coordinate watershed GIS mapping. As of 2000, all Fairfax County watershed information has been incorporated into the installation GIS. Although the Fairfax County's watershed information has been incorporated into the Fort Belvoir's GIS, the installation's watershed mapping and characterization efforts are much more extensive than the County's.

Fort Belvoir's Special Agent provides support to federal and state agents on investigative and enforcement actions regarding water resources within the region.

#### *7.3.3.2 Multiple Use Support*

***Military Training and Testing***
The Fort Belvoir Training Regulation (FB 210-27) includes measures to protect waterways from impact by training activities. It requires that vehicles stay on established trails and roads, and that any damage to natural or artificial drainage is repaired by the using unit. The regulation restricts riot control agents to Training Areas T-6C, T-7, and designated areas of T-10, and requires training activities that use the agents to be kept 100 meters away from Pohick Creek and Pohick/Accotink Bay in these areas. All waste must be removed from the training areas and disposed of properly. The regulation requires ENRD review of all land disturbing training activities by application for an excavation permit.

As needed, ENRD provides technical support to military training and testing activities that involve water-based training. In 1999, ENRD performed Clean Water Act, Subaqueous Bed and Fairfax County Wetland permitting; Endangered Species Act consultation; and National Environmental Policy Act document preparation and public coordination for construction of the new U.S. Army Reserves marine facilities on Gunston Cove.

### *Outdoor Recreation*

Fort Belvoir controls the types, locations and magnitude of recreational activities to ensure that such uses do not adversely affect water resources. All proposed recreational activities and events in, or potentially affecting, undeveloped lands or waters must be reviewed by ENRD for potential impact. Fort Belvoir's Supplement 1 to AR 200-3 (Appendix H) states that "[Anglers] and boaters are required to provide for environmental protection of all shoreline areas through restricting watercraft launching to designated marina launch facilities. Streambank clearing, littering, parking in other than designated areas, and driving of privately owned vehicles (POV) off primary installation roads[5] are prohibited." This applies to use requests from outside entities, as well as requests from installation organizations (e.g., Directorate of Personnel and Community Activities). The Fort Belvoir Supplement to AR 200-3 prohibits actions which could adversely affect natural resources within the installation's refuges, and requires anglers and boaters to provide for environmental protection of all shoreline areas. The supplement specifically prohibits boat launching and landing at any location other than at the installation marina, except for installation-sponsored events.

As needed, ENRD provides technical support to outdoor recreation events and facilities that involve water-based recreation. For example, ENRD is providing planning-level support, environmental assessment and regulatory compliance evaluation and coordination on the planned Tompkins Basin Recreation Area complex along Gunston Cove.

Fort Belvoir provides limited public access to installation shorelines and to Mulligan Pond for fishing, consistent with all applicable federal, state and regional fishing regulations. Areas open to the public for fishing include the ABWR shoreline, the Tompkins Basin shoreline (Gunston Cove), and the lower Dogue Creek shoreline. Fort Belvoir does not have an installation fishing permit program. During the 1999 renovation of Mulligan Pond, Fort Belvoir installed two fishing piers that are accessible to persons with disabilities. Fort Belvoir also has a pier along Gunston Cove that is available for use by anglers (this pier is not accessible to persons with disabilities).

Fort Belvoir performed a stocking of Mulligan Pond, after the 1999 renovation project, and is coordinating with state fisheries biologists regarding future stockings to manage a native warmwater fishery in the pond. As stated earlier, it is recognized that fishing pressure is likely to exceed the pond's ability to maintain a self sustaining warmwater fishery. Fort Belvoir is considering stocking on an annual or periodic basis to help maintain a native warmwater fishery.

It is not the installation's policy to manage the pond for a "put and take" fishery. It is installation policy not to stock Mulligan Pond, or any other installation water body, with non-native fish or other non-native aquatics.

### *Environmental Education and Scientific Research and Study*

Fort Belvoir controls the types, locations and magnitude of environmental education and scientific research and study activities to ensure that such uses do not adversely affect water resources. All proposed recreational activities and events in or potentially affecting undeveloped

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[5] Primary installation roads are defined as paved roads and established training roads. POVs must be authorized to use training roads.

areas must be reviewed by ENRD for potential impact. This applies to use requests from outside entities as well as requests from installation organizations.

In 1999, Fort Belvoir initiated the installation's environmental education program. The Fort Belvoir environmental education program is based within the installation's refuge system (Section 13). Activities during the first year included development of age-specific environmental curricula; development of educational materials and displays; providing an environmental component as part of the installation's summer camp program; providing educational talks to school groups, scouting groups and others; and providing guided nature walks within the refuges. In 2000, Fort Belvoir expanded on these offerings, and opened the ABWR Environmental Education Center to provide indoor display and classroom space. The Fort Belvoir Environmental Education program pays major emphasis on water resources, and the installation's role within the Chesapeake Bay Program.

***Land Development and Facilities Maintenance***

Fort Belvoir includes water resources protection as a consideration in all land development decisions. The *Environmental Protection Specifications* for all construction projects include requirements for water resources protection. Installation siting, design, and construction actions involve ENRD as a reviewer. Similarly, the Fort Belvoir Policy Letter #420-26-00 *Excavation Work Permit Requirements and Procedures* (U.S. Army, 2000e) and the Fort Belvoir *Disposal Checklist* administered by the Directorate of Installation Support both require ENRD review.

As addressed earlier, Fort Belvoir has been incorporating BMPs into all construction projects. In 2000, Fort Belvoir began to work with the principles of low impact development (LID) to minimize the long-term effects of new developments on water resources. In developed areas with high impervious cover, excess stormwater runoff can create pollution and degrade natural aquatic communities. Principles of LID focus on soil conservation, runoff dispersion, water retention and treatment, groundwater recharge, and functional landscaping. Common LID practices include elements such as bioretention areas (such as rain gardens), strategic grading, parking lot curb cuts and detention, reduction of impervious surfaces, roof leader disconnects, and rain barrels.

In addition to LID techniques, Fort Belvoir has employed bendway weirs to stabilize a stretch of Accotink Creek. Bendway weirs are environmentally preferable alternatives to channelization for stream stabilization. A series of low-angled stone weirs are placed within the stream to redirect flow in a way that reduces riverbank erosion and channel deepening. These weirs are installed with minimal disturbance to the stream, and require no removal of vegetation. Fort Belvoir, as one of the first military facilities on the east coast to employ bendway weirs, has hosted a muti-agency training session on weir construction.

As needed, ENRD provides technical support to water quality permitting and regulatory compliance actions (e.g., National/Virginia Pollutant Discharge Elimination System permits, Virginia stormwater management regulations, Virginia sediment and erosion control regulations) on all land disturbing projects. In addition, ENRD provides annual training to installation BASEOPS, contractor, and U.S. Army Corps of Engineers construction management staff in compliance with the requirements of the Virginia sediment and erosion control regulations and the Virginia stormwater management regulations.

## 7.4 CONTINUING AND FUTURE WATER RESOURCES MANAGEMENT

Fort Belvoir intends to continue the management emphasis and actions addressed in Section 7.3. Fort Belvoir will continue to conserve and enhance native water resources, while providing balance among the multiple legitimate uses and users of Fort Belvoir's water resources. Continued support of military training and testing will take primacy. After that, management emphasis will be on conservation and enhancement of water resources in accordance with established DoD and DA natural resources management policies, and DoD and DA commitments to natural resource stewardship programs, such as the Chesapeake Bay Program. Fort Belvoir recognizes that the most significant threats to local water resources today arise from stormwater-related problems, well as misuse and overuse. Consequently, Fort Belvoir's conservation program will emphasize actions to correct and prevent stormwater-related problems, to restore damaged stream corridors, and to foster wise use of water resources. Fort Belvoir's natural resources management program will continue to promote public access to and appropriate use of water resources and will continue to provide the public opportunities for recreation and for environmental education and scientific research and study of water resources, consistent with resource conservation objectives. The natural resources management program will continue to pursue innovative approaches to water resources management, and will increase efforts toward and involvement with regional water resources management actions.

### 7.4.1 Water Resources Management Objectives

1. Protect against loss or degradation of native diversity of aquatic resources, as defined by EA (1999a, 2000); Ernst et al. (1995); Jones and Kelso, (1998, 1999), and Hobson (1996, 1997).

2. Conserve and enhance water resources that have been prioritized for conservation by the Chesapeake Bay Program, the Virginia Natural Heritage Program, and the American Heritage Rivers Program. These include the following:

    a. Anadromous and other migratory fish. As of 2000, Fort Belvoir has three species of management emphasis, alewife, blueback herring, and American eel that migrate up installation waterways.

    b. Endangered, threatened, and rare aquatic species and their habitats. As of 2000, Fort Belvoir has several such species that inhabit aquatic and/or wetland habitats (Section 12.2).

3. Protect, enhance, and restore native aquatic habitat conditions by correcting existing stormwater-related problems, and preventing future stormwater-related problems as recommended by Landgraf (1999), Allen et al. (1999), and Hobson (1996), and by adopting innovative approaches to managing stormwater-related issues (e.g., following the principles of LID).

4. Maintain Mulligan Pond as a healthy, sustainable native warmwater fishery.

5. Protect UN-1 as an undisturbed waterway.

6. Provide opportunities for public access for recreation and for environmental education, and study consistent with resource conservation.

### 7.4.2 Water Resources Management Strategies

1. Continue to obtain scientific information on installation water resources to support knowledge of the biodiversity of aquatic communities, to identify stresses and detect changes to biodiversity, and to evaluate the effectiveness of management actions.

   - Complete the next installation-wide aquatic inventory update on a 5-year cycle (in FY 04). The inventory will entail field survey and sampling, and GIS datalayer development. The field survey will address fish, including anadromous and other migratory fish, benthics, and water quality and habitat conditions. The previous inventories will be maintained in such a way that allows for comparison among inventories, and will allow the installation to establish trends.

   - Continue to perform annual in-stream monitoring of fish and benthic communities consistent with the protocol established by the baseline aquatic inventory (EA, 2000).

   - Develop and implement annual fish monitoring of Mulligan Pond. Explore the possibility of having the Mulligan Pond monitoring performed by Virginia Department of Game and Inland Fisheries (VDGIF).

   - Perform year-round surveillance (i.e., close observation, in lieu of studies or monitoring projects) of aquatic systems to detect disruptions and/or locations where threats (e.g., sedimentation) are affecting resource integrity. At a minimum, surveillance will address physical habitat conditions and may include some biological sampling and in-situ water quality measurement. Depending upon resource availability and need, more-elaborate sampling or surveys (e.g., hydrologic monitoring or modeling) may be conducted. Maintain the results in the GIS.

   - Perform localized and/or issue-specific water resources studies/monitoring as needed to support resource management or for specific installation projects, such as new development.

   - Coordinate with other entities performing aquatic studies and management actions in the Fort Belvoir area. These include the long-term aquatic resources monitoring of Gunston Cove being performed by George Mason University for Fairfax County.

   - Complete the next installation-wide watershed inventory update on a 5-year cycle (in FY 04). The inventory will entail field survey, photo-interpretation, land-cover analysis, and GIS datalayer development. The previous inventories will be maintained in such a way that allows for comparison among inventories, and allows the installation to establish trends in land use and land cover. The results will be maintained in the GIS.

   - Perform an annual survey (addressing sedimentation, erosion, water quality, etc.) of a representative sample of installation waterways to assess changes within the stream

corridors, and evaluate the success of management/corrective actions (i.e., the annual watershed monitoring). Prepare an annual report and update the GIS datalayer to record corrective actions undertaken. Maintain the results in the GIS.

- Identify the 100-year floodplain boundaries on post. Incorporate the floodplain boundaries into the GIS. Coordinate with Fairfax County to obtain the results of their floodplain determinations for the Fort Belvoir area.

- Incorporate the boundaries of Fairfax County's Resource Protection Area into the GIS.

- Complete the Fort Belvoir hydrography datalayer. Coordinate with the USGS and the U.S. Army Corps of Engineers to validate the determinations of "perennial" and "intermittent" waterways on post.

- Perform an historic waterways and shoreline delineation and trend analysis to detect change. Obtain historic aerial photography at a minimum of one flight per decade from 1930 to date, and interpret the locations of the waterways and shorelines on post. Maintain the historic waterway and shoreline analysis as individual files on the GIS to allow for comparison among years.

- Coordinate with VDGIF, DCR-NHP, Northern Virginia Soil and Water Conservation District, Chesapeake Bay Program Office, and other appropriate entities regarding stewardship recommendations for water resources.

2. Continue to set aside areas of ecologically significant water resources, consistent with DoD policy for setting aside areas for conservation as "Special Natural Areas" (Section 13). As of 2000, Fort Belvoir has three such areas: two refuges and the Forest and Wildlife Corridor. Consider modifying the boundaries of the refuges and/or establishing a buffer for the refuges, to protect the watershed areas for significant water resources identified through the various installation water resources surveys and studies. Emphasize protection of the UN-1 watershed and any boundary modifications. Continue to designate these set-aside areas as "environmentally constrained to development" in the installation Master Plan.

3. Continue to maintain a riparian buffer along all installation waterways and shorelines consistent with the Chesapeake Bay Program Riparian Buffer Directive and the 1998 *Federal Agencies Chesapeake Ecosystem Unified Plan*.

   - Define the riparian buffer width for all installation waterways based on land management objectives and on the three-zone concept as recommended by Allen et al. (1999). Delineate the riparian buffer in the GIS.

   - Review the Fort Belvoir Master Plan's (Woolpert, 1993a) mapping of "environmentally constrained areas" where they are delineated along shorelines and stream corridors to ensure that the newly established riparian buffer widths are included within the constrained area designation. Develop a recommendation for revision of the Master Plan to incorporate the newly-established riparian buffer designations into the Master Plan's environmentally constrained areas, if necessary.

- Continue to protect riparian buffers from tree-clearing and vegetation removal.

- Continue to re-plant or enhance native vegetation within riparian buffer areas. Example projects include:
  - Reforestation of a minimum 200-foot wide riparian zone on the former petroleum, oil, and lubricant site along Gunston Cove
  - Riparian plantings along the Tompkins Basin shoreline, consistent with the planning for a multi-purpose recreation area at that site
  - Enhanced riparian planting along Dogue Creek above the Mount Vernon Road bridge, consistent with the planning for the Potomac Heritage National Scenic Trail at that location. Additional planting projects will be identified and undertaken as land-use changes (e.g., as old areas are vacated and structures are removed) allow.

- Continue to protect riparian buffer areas by directing water-based training activities (military and civilian) to designated shoreline facilities.

- Continue to protect riparian buffer areas by directing water-based recreational activities to designated public access shoreline areas. Prevent damage from public access in these areas by providing specific protected access points for foot traffic and specific parking facilities within those areas. Continue to limit shoreline access within the refuges to foot traffic only. Design specific public access features for the Tompkins Basin shoreline to facilitate rehabilitation of a vegetated shoreline in this area.

- Enforce the Fort Belvoir Supplement to AR 200-3 prohibitions on boat launching and landings, and on off-road vehicle (which includes bicycles) use, to protect riparian areas from these potentially damaging activities. Develop and install signs along installation shorelines indicating "no boat launching and landing." Develop and install educational displays on shoreline protection.

4. Continue to correct existing stormwater-related problems as recommended by Landgraf (1999) and Allen et al. (1999). Continue the long-term stream corridor restoration projects (also known as watershed restoration projects) begun in 1999. Address at least two subwatersheds each year.

5. Continue to implement actions to counter existing stormwater flow excesses from developed areas, as recommended by Allen et al. (1999). Such actions include the following:

   - Identify excess and abandoned pavements. Develop a phased plan for removal and replanting. Develop this as a GIS data layer. Implement plan to remove excess and abandoned pavements, and replant these areas.

   - Replant disturbed areas with native vegetation

   - Develop and construct a demonstration project for bioretention.

- Add energy dissipation structures at outfall points where problem areas were identified by Landgraf (1999).

6. Develop a program for routine drainageway maintenance, to include maintenance of existing stormwater structures. Such a program should include routine surveillance of conditions within installation drainageways, as well as the condition of all existing stormwater structures. The maintenance program should include routine structure clean-out (e.g., debris clearing from culverts) as well as repair and renovation of existing facilities. The repair and renovation planning should incorporate site-specific corrective action recommendations from Landgraf (1999). Develop a recommendation for a stormwater management working group comprised of representatives from ENRD, the Contract Management Division, and the base maintenance contractor and/or other requirements contractors, as appropriate to review and schedule routine inspection, cleaning, maintenance and repair/replacement of stormwater structures.

7. Continue to implement stormwater management actions, including BMPs, on all construction projects, as recommended by Allen et al. (1999).

8. Incorporate the principles of low impact development (LID) in facility siting and design on post, as recommended within the National Guidance Manual for Low Impact Development. Develop and maintain a LID Policy Letter to use percent impervious surfaces as thresholds for including LID features in project design.

9. Continue to use the installation project/activity review process to incorporate water resources conservation requirements into all phases of facilities siting, construction, renovation, operation, maintenance, and demolition activities; in reviewing and supporting military training and testing activities; in reviewing and responding to outdoor recreation, environmental education, scientific research and study; and all other types of land and water access and use requests.

   - Continue to issue the annual Fort Belvoir Tree Protection Policy Letter to stress preservation of trees and replacement of unavoidable loss of trees due to construction or due to natural causes, such as storm damage, insects or disease. Continue to require all tree removals to be reviewed and approved by ENRD, and replaced at a minimum two-to-one ratio.

   - Review and revise as needed the Fort Belvoir *Environmental Protection Specifications* applicable to construction projects to ensure that they include water resources protection provisions.

   - Review and revise, as needed the *Fort Belvoir Environmental Checklist* to address water resources protection.

   - Develop recommendations to revise the Installation Design Guide and the Fort Belvoir Master Plan to include site planning and construction design that minimizes natural area loss; adopts low impact development and BMPs for stormwater management, and sediment and erosion control; and reduces impervious surfaces.

- Incorporate water resources protection strategies into utilities privatization, and all other privatization and outsourcing actions, as appropriate.

- Develop recommendations for a facilities siting/design review committee to include representatives from ENRD, Master Planning, and the Contract Management Division. The committee should develop and participate in a siting/design review process to ensure the consideration of water resources protection in all facilities siting and design decisions.

- Continue to include water resources protection as part of the Excavation Permit and Demolition Permit review processes.

- Continue to include water resources protection in all real estate actions (e.g., outgrants, leases, rights of entry) as appropriate.

- Review and revise as needed the Fort Belvoir Training Regulation to address water resources protection.

- Develop and issue a Fort Belvoir Stormwater Management Policy Letter that requires all construction projects to include stormwater management planning, regardless of the size of the construction area. The policy letter will require compliance with the Virginia Sediment and Erosion Control Handbook (VA DCR, 1992), and will require stormwater management to be addressed for both the construction and post-construction periods. The policy letter will also address the principles of low impact development.

10. Continue to provide annual training in sediment and erosion control, and in stormwater management requirements and techniques to BASEOPS, contractor and tenant personnel, as appropriate. Identify and provide opportunities for specialized training in innovative water resources management techniques.

11. Continue to perform agency coordination, notification and permitting on installation actions involving water resources.

    - Continue to coordinate with the U.S. Fish and Wildlife Service under the Fish and Wildlife Coordination Act.

    - Continue to coordinate with VDGIF for compliance with Virginia Administrative Code 4 VAC 15-20 et al., governing Virginia game and non-game requirements, including endangered species mandates.

    - Continue to coordinate with the U.S. Army Corps of Engineers and the Virginia Department of Environmental Quality for compliance with the Clean Water Act and its implementing regulations, and Section 10 of the Rivers and Harbors Act.

    - Continue to coordinate with the Virginia Marine Resources Commission for compliance with Virginia Subaqueous Bed Regulations.

- Continue coordination with the Virginia Soil and Water Conservation Board for planning under the Virginia Erosion and Sediment Control Law (Section 10.1-560 of the Code of Virginia).

- Coordinate with the Chesapeake Bay Local Assistance Board for compliance with the Chesapeake Bay Preservation Act.

12. Continue to manage Mulligan Pond as a native, warmwater fishery.

    - Coordinate with VDGIF regarding providing support to Fort Belvoir in the removal of undesirable fish species and the stocking of native fish species.

    - Develop and implement fish habitat improvements at Mulligan Pond to improve fish habitat. Correct bank erosion, add water control capabilities, plant riparian vegetation along the pond shore, and install fish habitat structures.

    - Develop and implement measures as needed to protect shoreline plantings at Mulligan Pond from damage/loss to beavers.

13. Develop and issue a Fort Belvoir Fishing Policy Letter to address protection of water resources from fishing activities. Among other things, the policy letter will include measures to prohibit the use and release of exotic bait species.

14. Develop and participate in partnerships for water resources conservation. Address watershed management, point and nonpoint source runoff, stormwater management, fisheries management, invasives/exotics management, public access, and environmental education. Begin by coordinating with Fairfax County on its stormwater planning and stream protection programs.

15. Participate in annual events such as Potomac River shoreline clean-up days.

16. Evaluate areas where piers, ramps, boardwalks, and other structures can be built to enhance fishing access for people with disabilities.

17. Continue to provide technical assistance to emergency situations, such as fuel spills, that threaten aquatic resources, as needed.

18. Continue to respond to requests for technical information from on-post and off-post entities, as appropriate.

19. Continue to investigate and enforce violations of federal and state laws and regulations, as well as DoD, DA, and Fort Belvoir policies.

# 8.0
# Wetlands

Wetlands perform a variety of functions important to maintaining the quality of natural and cultural resources on Department of Defense lands, and to supporting the military mission and quality of life for soldiers. Healthy native wetlands supply habitat for wetland-dependent plant communities and fish and wildlife species. They contribute to environmental quality by moderating flood flows; protecting against erosion; improving water quality; and supporting global cycling of available nitrogen, sulfur, carbon dioxide, and methane. Additionally wetlands provide aesthetic and recreational value to support the quality of life for soldiers and supply realistic training conditions for field training excercises.

It is estimated that since colonial times, the U.S. has lost over half of its wetlands (U.S. EPA, 1997). National and local rates of wetland loss were the highest from the mid-1950s through the mid-1970s. Between 1982 and 1989, the Chesapeake Bay watershed lost about 2.5% of its wetlands, most of them palustrine (U.S. EPA, 1999a). Activities that have contributed to the losses and degradation of the nation's wetlands include draining for agriculture and development, dredging and stream channelization, disposing of dredge material, impounding, tilling for crop production, logging, mining, and grazing by domestic animals. Other human-related wetland degradation factors include polluted runoff from agricultural, urban, and industrial areas; air contaminants; changing nutrient levels; toxic chemicals; and nonnative species infestations. Natural causes of wetland loss include erosion, subsidence, sea level rise, droughts, and hurricanes and other storms.

Although the rate of wetlands loss has decreased since the mid-1970s, increasing population numbers will inevitably result in intensified pressure on wetlands. As urbanization increases, the function and value of the remaining wetlands may be impaired.

Wetlands impairment has far-reaching ecosystem effects. Wetland-dependent fish and wildlife species populations will continue to decrease until wetland loss and degradation is stopped. Increases in flood damages, drought damages, and declining bird populations are also, in part, the result of wetlands degradation and destruction. DoD recognizes the value of wetlands and is committed to no net loss of wetlands on its lands.

The regional wetland pattern within the Fort Belvoir area is characteristic of the upper Coastal Plain/lower Piedmont, with wetlands typically occurring in association with the drainage network. The larger tributary waterways to the Potomac, such as Accotink Creek, Dogue Creek and Pohick Creek, tend to have wide areas of tidal wetlands (marsh and mudflats) at their outfalls. Upstream from the outfall area, the marsh wetland area gives way to floodplain/bottomland hardwood forest within the riparian zone. This forest area tends to be wider in the lower reaches, where the tidally influenced floodplain is wide and lower, and diminishes in extent further upstream concurrent with the narrowing of the floodplain area.

The Fort Belvoir local area has another characteristic wetland type: the seepage swamp wetland. This type of wetland occurs in steep-sloped areas along the Potomac River and its associated tributaries. The occurrences of this wetland type tend to be limited in extent.

## 8.1 WETLANDS POLICIES

### 8.1.1 Federal Wetlands Policy

There are a number of federal laws, regulations, and policies that mandate wetland protection.

- Executive Order 11990, *Protection of Wetlands* (May 24, 1977), requires federal agencies to take action to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands.
- North American Wetlands Conservation, 16 U.S.C. §4408, requires the restoration, management, and protection of wetlands and habitat for migratory birds on federal lands.
- Wetlands Resources, 16 U.S.C. §3901, calls for intensifying cooperative efforts among federal, state, and local governments, and private interests for the management and conservation of wetlands.
- Wetlands permitting, Section 404 of the Clean Water Act, establishes a permit program for dredging and filling within wetlands.

### 8.1.2 State Wetlands Policy

The Commonwealth of Virginia protects wetlands through a number of laws and provisions.

- The Virginia Wetlands Act of 1972 (Title 62.1 of the Code of Virginia), protects tidal wetlands and regulates wetland development.
- The Virginia Tidal Wetlands Act of 1972 (Title 28.2 of the Code of Virginia), authorizes local governments to exercise jurisdiction and issue permits for wetlands development. Section 28.2-1308 provides standards for use and development of wetlands and utilization guidelines.
- The Chesapeake Bay Preservation Act (§10.1-2100 et seq. of the Code of Virginia), allows for the creation of Chesapeake Bay Preservation Areas and restricts development in related wetlands.
- Virginia Water Protection Regulations (Virginia Regulations, VR 680-15-02), regulates state waters, including wetlands, and requires the Virginia Water Protection Permit for activities involving wetlands under Clean Water Act Section 404.
- *Virginia Acts of Assembly* Chapters 1054 (House) and 1032 (Senate), passed in the 2000 session, amends existing wetland laws to require a Virginia Water Protection Permit from the Water Control Board for certain activities in non-tidal wetlands.

### 8.1.3 Department of Defense Wetlands Policy

DoD's natural resources management policy is contained within DoDI 4715.3, *Environmental Conservation Program*. This instruction requires installations to follow an ecosystem-based approach to natural resources management, to inventory and protect important biological resources, and to promote biodiversity. The instruction articulates DoD's goal of no net loss of wetlands. It also allows for multiple uses of an installation's natural resources, and for public access to these resources for recreation, education and scientific research and study, compatible with the installation's ecosystem management goals. DoD's policy on wetlands, as established in DoDI 4715.3 is as follows:

| **Excerpts from DODI 4715.3<br>Select Provisions Applicable to Wetlands** |
|---|
| ■ DoD lands shall be managed for the goal of no net loss of wetlands. DoD operations and activities shall avoid the net loss of size, function, or value of wetlands. Additionally, the Department of Defense will preserve the natural and beneficial values of wetlands in carrying out its activities (E.O 11990, reference (1)). The development of mitigation "banks" is encouraged as sound conservation planning. D2j |
| ■ All DoD conservation programs shall work to guarantee continued access to our land, air, and water resources for realistic military training and testing while ensuring that the natural and cultural resources entrusted to DoD care are sustained in a healthy condition for scientific research, education, and other compatible uses by future generations. (D1a) |
| ■ The principal purpose of DoD lands and waters is to support mission-related activities. Those lands and waters shall be made available to the public for educational or recreational use of natural and cultural resources when such access is compatible with military mission activities, ecosystem sustainability, and with other considerations such as security…. (D1d) |
| ■ Natural resources under the stewardship and control of the Department of Defense shall be managed to support and be consistent with the military mission, while protecting and enhancing those resources for multiple use, sustainable yield, and biological integrity. Land use practices and decisions shall be based on scientifically sound conservation procedures and techniques, and use scientific methods and an ecosystem approach. (D2a) |
| ■ Biologically or geographically significant or sensitive natural resources (e.g., wetlands, forests, floodplains, watersheds, estuaries, riparian areas, coastal barrier islands, marine sanctuaries, critical habitats, animal migration corridors) or species (e.g., threatened or endangered species, certain marine mammals, and migratory birds) shall be inventoried and managed to protect these resources, and to promote biodiversity, using the goals identified in paragraph F1a. (D2c) |
| ■ Management measures for the removal or control of exotic species shall be included in installation INRMPs when applicable. (D2h) |

| Excerpts from DODI 4715.3<br>Select Provisions Applicable to Wetlands |
| --- |
| ***(continued)*** |
| ■ Consistent with ecosystem-based management, altered or degraded landscapes and associated habitats shall be restored and rehabilitated whenever practical. (D2l) |
| ■ Portions of installation real property that have significant ecological, cultural, scenic, recreational, or educational value may be set aside for conservation of those resources, where such conservation is consistent with the military mission. (F1j) |

### 8.1.4 Department of the Army Wetlands Policy

The Army's natural resources management policy is contained within AR 200-3, *Natural Resources–Land, Forest and Wildlife Management*. This regulation establishes the Army's requirements for avoiding adverse impacts to aquatic resources, and protecting, restoring, and creating wetlands. AR 200-3 institutes the Army's commitment to conserve, protect, and sustain biological diversity, and to restore degraded ecosystems. AR 200-3 also establishes the Army's commitment to provide sustained multiple use of, and public access to, natural resources. DA's policy on wetlands, as established in AR 200-3 is as follows:

| Excerpts from AR 200-3<br>Select Provisions Applicable to Wetlands |
| --- |
| ■ It is DA policy to avoid adverse impacts to existing aquatic resources and offset those adverse impacts which are unavoidable. Additionally, the Army will strive to achieve a goal of no net loss of values and functions to existing wetlands, and permit no overall net loss of wetlands on Army controlled lands. Furthermore, the DA will take a progressive approach towards protecting existing wetlands, rehabilitating degraded wetlands, restoring former wetlands, and creating wetlands in an effort to increase the quality and quantity of the nation's wetlands resource base. To meet this requirement, installations will identify and maintain a current inventory of their wetlands resources. (Para. 2-21b) |
| ■ The natural resources management professional will be an active participant in all planning and decision making activities regarding uses of the land to ensure that current and planned mission activities (for example, master planning, construction requests, site approval requests, and training exercise plans) are conducted in a manner which is compatible with natural resources and other environmental requirements. (Para. 3-2b) |

### 8.1.5 Fort Belvoir Wetlands Policy

Fort Belvoir does not have installation-specific policy regarding wetlands management. Rather, management actions are guided directly by federal, state, DoD, and DA policy.

Fort Belvoir Regulation 210-27, *Range Procedures and Utilization of Training Areas*, helps to protect wetlands on post by providing specific requirements for environmental protection and conservation of training areas. It requires that vehicles stay on established trails and roads, restricts riot control agents to specified training areas to minimize environmental damage, and requires that all waste be removed from the training areas and disposed of properly. The regulation also requires ENRD review of all land disturbing activities (U.S. Army, 1994).

### 8.1.6 Chesapeake Bay Program

DoD and DA are signatory partners in the Chesapeake Bay Program (CBP). The 1987 *Chesapeake Bay Agreement*, the 1990 *Cooperative Agreement Between DoD and EPA Concerning Chesapeake Bay Activities*, the 1993 *DoD/EPA Action Items for the Chesapeake Bay Program*, the 1994 *Agreement of Federal Agencies on Ecosystem Management in the Chesapeake Bay*, the 1998 *Federal Agencies' Chesapeake Ecosystem Unified Plan (FACEUP)*, and the renewed Chesapeake Bay agreement, *Chesapeake 2000*, contain specific goals, objectives, and commitments designed to provide for the restoration and protection of the Bay's living resources and their habitats. The CBP developed a 1989 Chesapeake Bay Wetlands Policy that calls for a commitment by participants to attain a net gain in wetlands acreage within the Chesapeake Bay basin. In 1997, the CBP's Executive Council signed Directive No. 97-2, *Wetlands Protection and Restoration Goals*, which reaffirmed the 1989 policy and called for the development of strategies for implementation. The 1998 *FACEUP* calls for federal agencies to support the CBP by assisting states in implementing their strategies for a net gain of wetlands. This plan established a wetlands restoration goal for federal facilities of 100 acres per year, beginning in 2000. The CBP's renewed Bay agreement, *Chesapeake 2000*, calls for signatories to restore an overall total of 25,000 acres of tidal and non-tidal wetlands by 2010 within the Chesapeake Bay basin, with an average restoration rate by 2005 of 2,500 acres per year.

## 8.2 BASELINE WETLAND CONDITIONS

### 8.2.1 Wetlands Survey

Fort Belvoir completed a baseline inventory of the wetlands on Main Post in 1997 (Figure 8.1) (Paciulli, Simmons and Associates, 1997a) and on EPG in 1999 (Paciulli, Simmons and Associates, 1999b). The purpose of these planning surveys was to identify and map the general locations and types of wetlands on post. The surveys were not intended to serve as jurisdictional delineations.

The baseline wetland inventories were done using photointerpretation of recent installation aerial photography with limited field survey to ground truth. The wetland delineation was done following the U.S. Army Corps of Engineers wetland delineation manual (Environmental Laboratory, 1987), and the wetland types were classified according to the U.S. Fish and Wildlife Service classification system (Cowardin et al., 1979). The results of these surveys have been incorporated into the installation GIS.

Approximately 1,250 acres of wetlands were identified on Fort Belvoir's Main Post and approximately 26 acres on EPG through the baseline wetland surveys (Paciulli, Simmons and

Associates, Ltd., 1997a; 1999b). This represents approximately 11% and 3% of the two installation areas, respectively. As shown in Figure 8.1 and Table 8.1, the predominant wetland type on Fort Belvoir is palustrine forested, which tends to occur in association with the riparian areas of Accotink, Dogue, and Pohick creeks.

**Table 8.1: Wetland Type and Acreage on Fort Belvoir**

| *Wetland Type* | *Acreage* | |
|---|---|---|
| | *Main Post* | *EPG* |
| Palustrine emergent (Total) | 141.900 | 0.750 |
| Temporarily flooded | 2.820 | - |
| Saturated | 4.090 | 0.750 |
| Seasonally flooded | 47.000 | - |
| Semipermanently flooded | 16.420 | - |
| Permanently flooded | 7.900 | - |
| Seasonal/tidal | 63.670 | - |
| Palustrine forested (Total) | 855.570 | 13.520 |
| Broad-leaved deciduous, temporarily flooded | 228.280 | 8.730 |
| Broad-leaved deciduous, saturated | 286.950 | 2.010 |
| Broad-leaved deciduous, seasonally flooded | 260.000 | 2.780 |
| Broad-leaved deciduous, semipermanently flooded | 13.450 | - |
| Broad-leaved deciduous, permanently flooded | 1.130 | - |
| Broad-leaved deciduous, seasonal-tidal | 59.290 | - |
| Broad-leaved deciduous, saturated/semipermanent/seasonal | 3.880 | - |
| Needle-leaved evergreen, seasonally flooded | 2.590 | - |
| Palustrine open water (Total) | 31.920 | 0.180 |
| Permanently flooded | 25.440 | - |
| Intermittently exposed/permanent | 6.480 | 0.180 |
| Palustrine scrub-shrub (Total) | 0.054 | 6.034 |
| Broad-leaved deciduous, saturated | - | 5.990 |
| Broad-leaved deciduous seasonally flooded | 0.054 | 0.044 |
| Riverine tidal (Total) | 165.430 | 0.000 |
| Emergent, regularly flooded | 132.330 | - |
| Flats, regularly flooded | 1.350 | - |
| Open water, permanent | 21.070 | - |
| Unconsolidated shore, regularly flooded | 10.680 | - |
| Riverine, lower perennial, open water, permanent-tidal | 23.720 | 5.250 |
| Riverine emergent, permanently flooded | 26.450 | - |

Source: Paciulli, Simmons & Associates, 1997a and 1999b.

### 8.2.2 Natural Heritage Inventory

In 1997, the Virginia Department of Conservation's Natural Heritage Program (DCR-NHP) completed a natural heritage inventory of Fort Belvoir (Hobson, 1996; 1997). The purpose of the inventory was to systematically identify the installation's natural heritage resources: those sites

FORT BELVOIR WETLAND TYPES

| | | | | | |
|---|---|---|---|---|---|
| PEMA | PFO1C | PSS1B | PEMH | PFO1Y | R1OWV |
| PEMB | PFO1F | PSS1C | PEMR | PFO4C | R1USN |
| PEMC | PFO1H | R1EMN | PFO1A | POWH | R2OWH |
| PEMF | PFO1R | R1FLN | PFO1B | POWZ | REMH |

N

# WETLANDS on FORT BELVOIR

SOURCE: PACIULLI, SIMMONS & ASSOCIATES, LTD., 1997; 1999

FIGURE: 8.1

supporting unique or exemplary natural communities, rare plants and rare animals, and other significant natural areas. The inventory defined three on-post areas associated with extensive wetlands as having significant biodiversity (Figure 8.2):

- Pohick Creek-Pohick Bay-lower Accotink Creek-Accotink Bay wetland complex, rated as B3, "High Significance: excellent example of community type; good occurrence of a G3 (globally rare to uncommon) species."
- Upper Dogue Creek wetland complex rated as B5, "General Biodiversity Significance: good or marginal occurrence of community type, or state-rare species."
- T-17 ravine seeps rated as B1, "Outstanding Significance: only known site for an element, an excellent occurrence of a G-1 (globally rare) species" because these seeps are the only known site in the world to support the northern Virginia well amphipod (*Stygobromus phreaticus*) (Section 12).

DCR-NHP reported that these areas are vulnerable to threats from invasive/exotic vegetation, stormwater management problems (e.g., siltation, erosion, water quality impacts), and problem wildlife, as well as from impacts by adjacent land-use developments. DCR-NHP provided management recommendations to control these threats (Hobson, 1996; 1997).

## 8.3 WETLAND MANAGEMENT

### 8.3.1 Wetland Conservation Recommendations

The results of the installation baseline wetland surveys and natural heritage inventory indicate that Fort Belvoir possesses extensive areas of wetlands, including wetlands that have high priorities for conservation, as assigned by DCR-NHP. While land disturbance (e.g., construction, land disturbing training or outdoor recreation) represent a direct threat to installation wetland resources, Fort Belvoir's wetland resources are also vulnerable to disturbance by invasive/exotic species, stormwater (e.g., erosion and sedimentation), and problem wildlife (e.g., beaver), as well as by impacts from adjacent land-use developments and activities. Management of these threats was emphasized the DCR-NHP natural heritage inventory reports (Hobson, 1996; 1997). Specific recommendations include the following:

- Monitoring rare species
- Monitoring and controlling invasive vegetation (e.g., Phragmites)
- Monitoring and controlling destruction by beaver activity
- Implementing stormwater management actions to control habitat impacts

- Performing hydrologic and water quality assessments of wetland areas and undertaking improvements as needed

- Maintaining a buffer around the Jackson Miles Abbott Wetland Refuge (JMAWR) wetlands.

- Characterize and protect groundwater quality and flow at the T-17 ravine.

DCR-NHP recommended establishing conservation areas to protect the Accotink Bay wetlands, the upper Dogue Creek wetlands and the T-17 ravine (Figure 8.2).

### 8.3.2 Wetland Management Actions to Date

To date, Fort Belvoir's management emphasis has been on protection of wetland areas from loss/disturbance by construction, or by land disturbing outdoor recreation or military training or testing activities. In those instances where a construction-related wetland loss is unavoidable, it has been Fort Belvoir policy to mitigate by replacing the wetlands at a minimum one-to-one basis.

***Wetlands Protection***
Fort Belvoir has set aside for conservation three designated "Special Natural Areas:" the Accotink Bay Wildlife Refuge (ABWR), the JMAWR, and the Forest and Wildlife Corridor (Section 13). Much of the installation's wetland area is included in the two installation refuges. Management of these refuges precludes land-disturbing activities. Furthermore, the Fort Belvoir Master Plan designates all installation wetland areas as "environmentally constrained to development" (Woolpert, 1993a).

These land-use designations have been effective at safeguarding installation wetlands from loss to development, or installation operations. From 1995 to 2000, Fort Belvoir lost only three areas of wetlands to development, including (1) a 4.4-acre forested wetland area filled by VDOT for construction of the Fairfax County Parkway; (2) a 1-acre non-tidal emergent wetland filled for a D.C. National Guard facility at Davison Army Airfield; and (3) a 0.05 acre tidal emergent wetland filled along the Potomac River for a new National Guard launch facility.

Fort Belvoir has wetland mitigation projects for each of these wetland losses including the following:

- A 2-acre forested wetland and a 1.5-acre forested wetland were constructed by VDOT for the Fairfax County Parkway (1995).

- A 1-acre non-tidal emergent wetland was constructed for the D.C. National Guard project[1] (1994).

- A 0.1-acre tidal emergent wetland is being developed for the National Guard project (awaiting contruction as of 2000).

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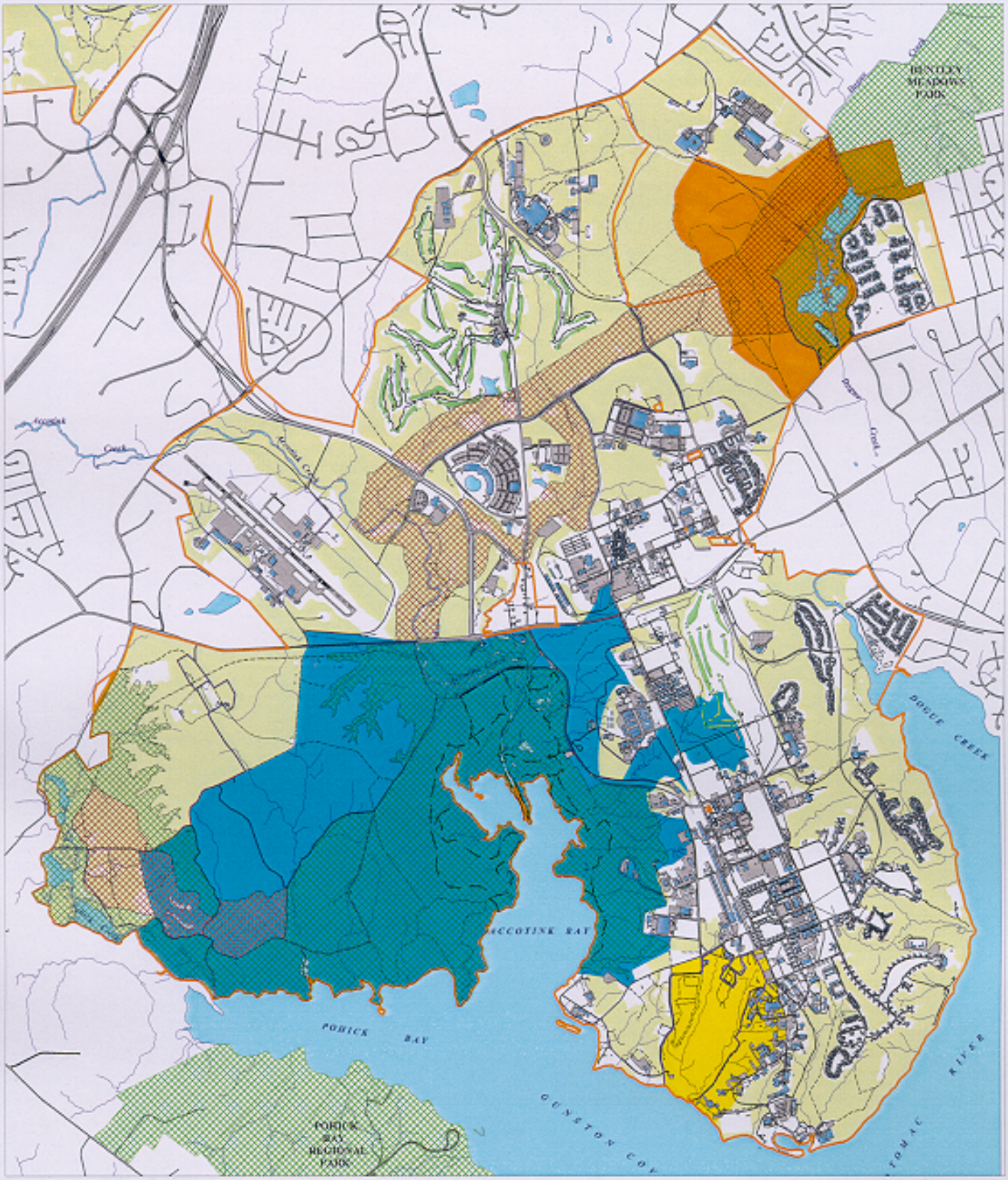
[1] The non-tidal emergent wetland was subsequently changed to a shrub/scrub wetland to reduce its attractiveness to waterfowl, which pose a hazard to the airfield.




Dogue Creek Wetland Conservation Area
Pohick/Accotink Wetland Conservation Area
T-17 Ravine Conservation Area
Accotink Bay Wildlife Refuge
Jackson Miles Abbott Wetland Refuge
Wildlife Corridor

N

# VIRGINIA NATURAL HERITAGE INVENTORY RECOMMENDED CONSERVATION AREAS on FORT BELVOIR

SOURCE: HOBSON, 1996; 1997

FIGURE: 8.2

These mitigation projects are included in the installation GIS. They are being monitored for a period of 5 years, in accordance with the U.S. Army Corps of Engineers wetland mitigation policy.

***Wetlands Enhancement***

In recent years, Fort Belvoir began to address conservation and enhancement of native biodiversity within ecological communities, including wetland communities, by identifying and controlling threats from invasive/exotic species, stormwater-related problems, and problem wildlife.

As addressed in Section 9, Fort Belvoir has implemented an invasive/exotic vegetation management program. The first invasive/exotic vegetation management actions were undertaken in 1999 in an effort to control *Phragmites australis* (phragmites) in Accotink Bay and Dogue Creek. In addition, Fort Belvoir manages problem beaver activity on a case-by-case basis (Section 11).

As addressed in Section 7, Fort Belvoir has implemented a watershed restoration program to correct stormwater-related problems within installation stream corridors, and began implementing best management practices (BMPs) to safeguard against future problems. In selecting locations for watershed restoration projects, Fort Belvoir emphasized watersheds associated with the sensitive lower Accotink Creek-Accotink Bay wetlands. The first project, completed in 1999, addressed subwatershed 03 (Figure 7.2), which drains to refuge area W-3. The next two projects, initiated in 2000, addressed subwatersheds 01 and 02, which also drain to refuge area W-3 (Figure 7.2).

## 8.4 CONTINUING AND FUTURE WETLAND MANAGEMENT

Fort Belvoir intends to continue management for no net loss of wetlands and for conservation and enhancement of native biodiversity. Fort Belvoir will continue to use conservation land-use designations to protect wetland areas from direct impact by construction or other land disturbing activities, as well as from impact by land development and land use activities in adjacent areas. Fort Belvoir will continue to implement management actions, such as invasive/exotic species management, stormwater management, and problem wildlife management, to protect wetland resources from those threats. Fort Belvoir will consider the potential for impacts to wetlands when making land-use and operational decisions, and will continue to mitigate all unavoidable wetland losses/impacts consistent with U.S. Army Corps of Engineers and U.S. Environmental Protection Agency policy on wetland mitigation. Where practicable, and consistent with installation mission, Fort Belvoir will undertake actions to restore and enhance native wetland conditions. Fort Belvoir will continue to promote public access to and appropriate use of wetland resources, and will continue to provide the public opportunities for recreation and for environmental education and scientific research and study of wetland resources, consistent with resource conservation objectives.

### 8.4.1 Wetland Management Objectives

1. Protect against a net loss of wetlands, due to installation activities, as required by Executive Order 11990, *Protection of Wetlands*.

2. Protect against impact (e.g., loss, disturbance, degradation) to wetland resources having high conservation priority, as assigned by the Virginia Natural Heritage Program.

3. Conserve, enhance, and restore native wetland conditions, consistent with the Chesapeake Bay Program Directive 97-2, *Wetlands Protection and Restoration Goals* and the Chesapeake Bay Program's *Federal Agencies' Chesapeake Ecosystem Unified Plan*, signed by DoD and the Army in 1998.

4. Provide opportunities for public access for recreation and for environmental education and scientific research and study, consistent with resource conservation.

### 8.4.2 Wetland Management Strategies

1. Continue to obtain scientific information on installation wetlands to support our knowledge of their biodiversity, to identify stresses and detect changes in biodiversity, and to evaluate the effectiveness of management actions.

   - Complete the next installation-wide wetland inventory update on a 5-year cycle (in fiscal year (FY) 03). The inventory will entail field survey, photo-interpretation, wetland characterization and GIS datalayer development. The inventory update will map wetland boundaries, and will inventory the locations and acreages of each wetland type, consistent with the protocols used during the 1997 and 1999 baseline inventories for Main Post and EPG, respectively. This update will allow for a comparison among inventories to identify changes. The inventory update will include all wetland mitigation sites. Maintain the inventory in the installation GIS.

   - Perform year-round surveillance (i.e., close observation, in lieu of studies or monitoring projects) of wetlands to detect changes, and potential activities impacting wetland conditions. At a minimum, surveillance will address the vegetation component. Apart from obvious physical conditions (e.g., sediment build-up, beaver activity, etc.), stress and changes in biodiversity will be inferred from changes in vegetation conditions. If resources become available, more-sophisticated measures of ecological change (e.g., measures to detect changes in hydrology or nutrient cycling, etc.) may be employed.

   - Develop and implement a program to monitor conditions within the high-rarity ranked wetland communities, as recommended by DCR-NHP (Hobson, 1996; 1997; McCoy and Fleming, 2000). Coordinate with DCR-NHP to develop and implement the monitoring program.

   - Perform localized and/or issue-specific wetland studies/monitoring as needed to support resource management or specific installation projects, such as new development, or changes to land-use practices.

- Perform an historic wetlands identification and trend analysis. Obtain historic aerial photography at a minimum of one flight per decade from 1930 to date, and interpret the wetland boundaries for each decade. Perform a comparative analysis of the change in wetland location and type. Maintain the historic wetland interpretation, as well as all recent wetland inventories as individual files in the installation GIS for use in trend analysis.

- Coordinate with DCR-NHP and other appropriate entities regarding stewardship recommendations for wetland resources.

2. Continue to set aside areas of ecologically significant wetlands, consistent with DoD policy for setting aside areas for conservation as "Special Natural Areas" (Section 13). As of 2000, Fort Belvoir has much of the installation's wetland areas included within two Special Natural Areas: the ABWR and the JMAWR. Consider modifying the boundaries of these refuges and/or establishing a buffer for the refuges to protect ecologically significant wetland resources that presently are located outside the refuge boundaries. Continue to designate these set-aside areas as "environmentally constrained to development" in the installation Master Plan.

3. Continue to implement actions to control threats to native wetland resources:

   - Continue to emphasize wetland resources protection when performing invasive/exotic species management. For example, continue to monitor and control phragmites *Phragmites australis*, as recommended by DCR-NHP (Hobson, 1996; McCoy and Fleming, 2000). In addition, develop and implement a monitoring program for other invasive/exotic species, such as marsh dewflower (*Murdannia keisak*) and hydrilla (*Hydrilla verticillata*), as recommended by McCoy and Fleming (2000). Finally, continue to perform surveillance for outbreaks of other invasive/exotic vegetation that could impact wetland plant communities.

   - Continue to emphasize wetland resources when performing watershed restoration projects. For example, complete the watershed restoration projects associated with lower Accotink Creek and Accotink Bay, as recommended by Landgraf (1999).

   - Continue to control the risk of wildlife impacts to wetland resources. Monitor beaver activity throughout the lower Pohick Creek-Pohick Bay-lower Accotink Creek-Accotink Bay wetland complex, and develop and implement protection measures if impact thresholds have been exceeded, as recommended by DCR-NHP (Hobson, 1996; McCoy and Fleming, 2000).

4. Identify opportunities for wetland creation/enhancement/restoration projects to establish wetland conditions within previously disturbed or degraded areas (e.g., parts of T-9). Develop and maintain an inventory of potential wetland creation/enhancement/restoration project sites. Implement projects, as appropriate and possible.

5. Continue to use the installation project/activity review process to incorporate wetland protection requirements into all phases of facilities siting, construction, renovation, operation, maintenance and demolition activities; in reviewing and supporting military

training and testing activities; and, in reviewing and responding to outdoor recreation, environmental education, scientific research and study, and all other types of land area access and use requests.

- Review and revise, as needed, the Fort Belvoir *Environmental Protection Specifications* to ensure that they include wetland protection provisions.

- Review and revise, as needed the *Fort Belvoir Environmental Checklist* to address wetland protection.

- Incorporate wetland protection strategies into utilities privatization, and all other privatization and outsourcing actions, as appropriate.

- Develop recommendations for a facilities siting/design review committee to include representatives from ENRD, Master Planning and the Contract Management Division. The committee should develop and participate in a design review process to ensure consideration of wetland protection in all facilities siting and design decisions.

- Continue to include wetland protection as part of the Excavation Permit and Demolition Permit review processes.

- Continue to include wetland protection in all real estate actions (e.g., outgrants, leases, rights-of-entry), as appropriate.

- Review and revise as needed the Fort Belvoir Training Regulation to address wetland protection.

- Develop and issue a Fort Belvoir Wetland Protection Policy Letter. The policy letter will specify the installation's commitment to no net loss of wetlands, protection of wetland biodiversity, and preservation of high-quality and rare wetland resources. The letter will specify the installation's commitment to mitigation of wetland impacts.

6. Continue to perform agency coordination, notification and permitting on installation actions within or potentially affecting wetlands.

   - Continue to coordinate with U.S. Army Corps of Engineers and Virginia Department of Environmental Quality for Clean Water Act Section 404 Permit actions, and for Rivers and Harbors Act Section 10 Permit actions.

   - Continue to coordinate with Virginia Marine Resources Commission and the Virginia Department of Environmental Quality for Virginia Subaqueous Bed Permit actions, and with the Water Control Board for Water Protection Permit actions.

   - Continue to coordinate with Fairfax County Wetlands Board for Fairfax County Wetlands Permit actions.

- Continue to coordinate with USFWS, National Marine Fisheries Service, Virginia Department of Game and Inland Fisheries, and other agencies as appropriate, on all wetland permit actions.

- Develop and implement mitigation projects required by wetland permits. Monitor all wetland mitigation sites for 5 years to determine success consistent with U.S. Army Corps of Engineers policy. Perform corrective actions, as needed. Perform all reporting to agencies, as required by permit.

- Develop a request and coordinate with the U.S. Army Corps of Engineers to develop and implement a Fort Belvoir General Permit under the Clean Water Act, Section 404.

7. Continue to provide technical assistance in emergency situations, such as fuel spills, that threaten wetland resources, as needed.

8. Continue to respond to requests for technical information from on-post and off-post entities, as needed.

9. Continue to investigate and enforce violations of federal and state laws and regulations, as well as DoD, DA, and Fort Belvoir policies.

# 9.0
# Undeveloped Areas Vegetation

Undeveloped natural areas perform a host of ecological functions and support multiple societal values – economic, quality of life, aesthetic – in addition to providing military mission support. Maintaining a healthy native vegetation cover is an integral part of protecting water quality, enhancing watersheds and wildlife habitat, and is essential for conserving biodiversity. Maintaining a healthy native vegetation cover is also essential for ensuring the future availability of land and water resources for military training and testing; for providing for sustained multiple uses of an area's natural resources (e.g., production of forest products, provision of opportunities for outdoor recreation, and scientific research and education); and for ensuring a high quality of life for the soldier.

Plant communities are dynamic systems, influenced by natural and human forces. Consequently, management actions must be based not only on knowledge of the plant species comprising the community, but also on an understanding of the physico-chemical factors and forces acting on the community (e.g., hydrology, soil chemistry) and the interrelationship of the plant communities with associated wildlife communities. Natural resource managers must be vigilant to detect changing conditions, and must be able to discern between plant community changes due to the natural dynamics of the system and changes due to disruptions in the natural dynamics. Because the ecological functions of plant communities are influenced by their positions within the larger landscape, natural resource managers must understand and consider the larger landscape context within which the communities are situated.

Fort Belvoir's surrounding local area (metropolitan Washington D.C. area) and regional area (Chesapeake Bay region) are both experiencing rapid conversion of undeveloped natural areas to developed land uses. Throughout the local and regional areas, large tracts of native vegetation are being lost or fragmented, with the consequent impacts on watersheds, water quality, and fish and wildlife habitat. As development replaces open space, vegetation in the remaining undeveloped areas is increasingly subject to disruption by invasions of exotic vegetation, stormwater-related erosion and sedimentation, overuse by humans, and overbrowsing by wildlife.

A large portion (about 70%) of Fort Belvoir (Main Post and EPG combined) is undeveloped and supports predominantly forest communities. The other major native vegetation community types are tidally flooded marsh and shrub-scrub communities. A recent ecological communities survey by DCR-NHP (McCoy and Fleming, 2000) identified 17 native vegetation community types on Fort Belvoir, four of which possess state conservation rankings of "very rare," or rarer (Sections 9.2.2 and 12.2.5). Within the metropolitan Washington D.C. area, Fort Belvoir represents a significant tract of native vegetation in terms of size, diversity, and position relative to the location of off-post tracts of native vegetation.

Within Fort Belvoir's Main Post, areas of native vegetation occur in large blocks, aligned from the northeast to the southwest. This linear configuration affords a contiguous band of wildlife habitat through the installation, and provides for connection with wildlife habitat areas outside

the installation. Vegetation cover in the remaining 30% of Fort Belvoir consists primarily of the improved and semi-improved grounds associated with the installation's developed land uses including administrative, housing and community service facilities, developed training areas, golf courses, and other recreational facilities.

Fort Belvoir, like many other military installations nationwide, represents an area of ecologically significant native vegetation resources within an increasingly urban setting. The continued presence of such "islands" of natural habitat is critical to conservation of native plant species and communities at the local, regional, and even national levels. DoD and the Army have acknowledged the services' responsibility for natural resources conservation in their policies and regulations (Section 9.1), and have successfully demonstrated that not only is it possible to conserve native vegetation resources while performing the military mission, but that the ability to continue to provide realistic military training and testing in the future depends upon doing so.

## 9.1 UNDEVELOPED AREAS VEGETATION POLICIES

### 9.1.1 Federal Undeveloped Areas Vegetation Policy

There is no overarching federal law regarding protection of non-threatened or non-endangered vegetation. (Federal endangered and threatened species regulations are discussed in Section 12.1.1.) There are, however, a number of federal statutes and directives addressing specific requirements pertaining to vegetation. The overall intent of each law is provided in the following bullets:

- The Sikes Act Improvement Act (16 U.S.C. 670a[a 3 A and B]) requires military installations to provide for "(A) the conservation and rehabilitation of natural resources on military installations; [and] (B) the sustainable multipurpose use of the resource which shall include hunting, fishing, trapping and non-consumptive uses." The Sikes Act also requires the INRMP to include, "fish and wildlife habitat enhancements or modifications."

- The Federal Noxious Weed Act of 1974 (7 U.S.C. §§ 2801-2814) prohibits the import or movement of nonindigenous weeds that have the potential to interfere with the growth of useful plants, clog waterways, interfere with navigation, cause disease, and that generally are detrimental to agriculture, commerce, and public health, unless pursuant to a permit. The Act prohibits the sale, purchase, barter, exchange, taking, or giving of a noxious weed in violation of the Act. The Act also requires each federal agency to develop a management program to control undesirable plants on federal lands when a similar state program is in place. Where applicable, federal agencies are to enter into cooperative agreements with state agencies to coordinate the management of undesirable plant species on federal lands.

- Executive Order 13112, *Invasive Species* (February 3, 1999) requires federal agencies to work to prevent introductions of invasive plants, control and monitor detected populations of invasives, restore native species and habitats affected by invasives, and promote public education on invasive species and their control.

- Presidential Memorandum, *Environmentally and Economically Beneficial Practices on Federal Landscaped Grounds*, dated April 26, 1994, and the related guidance (60 FR 40837, August 10, 1995) requires federal agencies to implement environmentally and economically beneficial landscaping practices, including the use of regionally native plants for landscaping.

- Executive Order 13148, *Greening the Government through Leadership in Environmental Management* (April 22, 2000) provides a timeframe by which federal agencies must incorporate the *Guidance for Presidential Memorandum on Environmentally and Economically Beneficial Landscape Practices on Federal Landscaped Grounds* (August 10, 1995) into landscaping programs, policies, and practices.

- Executive Order 11990, *Protection of Wetlands* (May 24, 1977) requires federal agencies to take actions to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands.

- Executive Order 11988, *Floodplain Management* (May 24, 1977) requires federal agencies to take action to reduce the risk of flood loss, to minimize the impacts of floods, and to restore and preserve the natural and beneficial values served by floodplains.

- The Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) (7 U.S.C. 136 et seq.) affords vegetation protection by emphasizing pest management using biological, cultural, chemical, and physical tools in a manner that minimizes economic, health, and environmental risks.

- The Plant Quarantine Act (7 USC 15 1-164a, 167) calls for the Animal and Plant Health Inspection Service (APHIS) to regulate the importation and interstate movement of nursery stock and other plants that may carry harmful pests and diseases.

- The Federal Plant Pest Act (7 USC 150aa-150jj) prohibits the movement of plant pests from a foreign country into and through the U.S., unless permitted by the Secretary of Agriculture. The APHIS has broad authority to inspect, seize, quarantine, and destroy potentially harmful plant and animal materials.

- The Organic Act of 1944 (7 USC 147a, 148, 148a-e) authorizes the APHIS to detect, eradicate, suppress, control, prevent, or retard the spread of plant pests.

### 9.1.2 State Undeveloped Areas Vegetation Policy

Virginia has no overarching vegetation protection law regarding non-threatened or non-endangered plant species and communities. (Endangered, threatened and rare species policy is discussed in Section 12.1.2.) However, the Virginia Noxious Weed Law (Code of Virginia, Title 3.1, Chapter 17.2), relates to plants and seeds used in restoration or landscaping. This law prohibits the movement, transport, delivery, shipment, or offering for shipment into or within Virginia of any noxious weed, without a permit from the Commissioner of Agriculture and Consumer Services. Section 10.1.2 contains a more detailed description of this regulation.

The Virginia Pesticide Control Act (Title 3.1, Chapter 14.1 of the Code of Virginia) confers powers and authority on the Virginia Pest Control Board to develop regulations that restrict or prohibit the sale or use and disposal of any pesticide or pesticide container or residuals that are toxic or hazardous to humans or wildlife, or may adversely affect the environment (Section 10.1.2).

### 9.1.3 Department of Defense Undeveloped Areas Vegetation Policy

The Department of Defense's natural resources management policy is contained within DoDI 4715.3, *Environmental Conservation Program*. This instruction requires installations to follow an ecosystem-based approach to land management, to inventory and protect important biological resources, and to promote biodiversity. It addresses various aspects of land management including forestry and agricultural operations, management measures for the removal or control of exotic species, beneficial landscaping practices, and habitat restoration and rehabilitation.The following excerpts from DoDI 4715.3 are applicable to vegetation management. Excerpts from DoDI 4715.3 regarding endangered and threatened species are listed in Section 12.1.3.

| **Excerpts from DODI 4715.3<br>Select Provisions Applicable to Vegetation Protection** |
|---|
| ■ All DoD conservation programs shall work to guarantee continued access to our land, air, and water resources for realistic military training and testing while ensuring that the natural and cultural resources entrusted to DoD care are sustained in a healthy condition for scientific research, education, and other compatible uses by future generations. (D1a)<br><br>■ The principal purpose of DoD lands and waters is to support mission-related activities. Those lands and waters shall be made available to the public for educational or recreational use of natural and cultural resources when such access is compatible with military mission activities, ecosystem sustainability, and with other considerations such as security… (D1d)<br><br>■ Natural resources under the stewardship and control of the Department of Defense shall be managed to support and be consistent with the military mission, while protecting and enhancing those resources for multiple use, sustainable yield, and biological integrity. Land use practices and decisions shall be based on scientifically sound conservation procedures and techniques, and use scientific methods and an ecosystem approach. (D2a)<br><br>■ Biologically or geographically significant or sensitive natural resources (e.g., wetlands, forests, floodplains, watersheds, estuaries, riparian areas, coastal barrier islands, marine sanctuaries, critical habitats, animal migration corridors) or species (e.g., threatened or endangered species, certain marine mammals, and migratory birds) shall be inventoried and managed to protect these resources, and to promote biodiversity, using the goals identified in paragraph F1a. (D2c) |

| Excerpts from DODI 4715.3<br>Select Provisions Applicable to Vegetation Protection |
|---|
| ***(continued)*** |
| ■ DoD lands shall be reviewed for their suitability for commercial forestry and agricultural outlease purposes. Any such uses must be compatible with use of the land to support the military mission. Forestry and agricultural operations shall also be consistent with long-term ecosystem management goals. Such operations shall be balanced with and used to achieve or maintain other needs for the land, including threatened and endangered species protection, biodiversity conservation, native plant landscaping, watershed protection, wildlife enhancement, outdoor recreation, and natural beauty. (D2e) |
| ■ Management measures for the removal or control of exotic species shall be included in installation INRMPs when applicable. (D2h) |
| ■ Environmentally and economically beneficial landscaping practices shall be used on all DoD lands… Each installation shall, to the extent practical, use regionally native plants for landscaping and other beneficial techniques. (D2i) |
| ■ Consistent with ecosystem-based management, altered or degraded landscapes and associated habitats shall be restored and rehabilitated whenever practical. (D2l) |
| ■ Fire is an integral element of natural processes. All DoD Components shall manage fire in a manner to preserve health and safety, protect facilities, and facilitate the health and maintenance of natural systems. (D2n) |
| ■ Portions of installation real property that have significant ecological, cultural, scenic, recreational, or educational value may be set aside for conservation of those resources, where such conservation is consistent with the military mission. (F1j) |

DoD's pest management policy is contained within DoDI 4150.7, *Department of Defense Pest Management Program.* Excerpts from this instruction are provided in Section 10.1.3 of this INRMP.

Memoranda of Understanding (MOUs) have been established between DoD and the Departments of Agriculture (March 27, 1963) and Interior (April 7, 1978). The MOUs authorize execution of cooperative agreements for mutual conservation objectives. For example, installations may develop cooperative agreements with the Department of Agriculture's Agricultural Research Service, Natural Resources Conservation Service (formerly the Soil Conservation Service), and Forest Service for assistance in the use, development, protection, and conservation of forest and other vegetative cover resources, for soil and water conservation, and for related research.

### 9.1.4 Department of the Army Undeveloped Areas Vegetation Policy

The Department of the Army's (DA's) natural resources management policy is contained within AR 200-3, *Natural Resources–Land, Forest and Wildlife Management*. This regulation establishes DA's requirements for managing and using land and water resources in accordance

with the principles of ecosystem management, and institutes DA's commitment to conserve, protect, and sustain biological diversity, and to restore degraded ecosystems. AR 200-3 also establishes DA's commitment to manage its forested lands on an ecosystem basis, manage habitat to conserve and enhance existing flora and fauna, control off-road vehicle (ORV) use, and minimize costs for grounds maintenance. The following excerpts from AR 200-3 are applicable to vegetation management. Excerpts from AR 200-3 regarding endangered and threatened species are listed in Section 12.1.4.

| **Excerpts from AR 200-3<br>Select Provisions Applicable to Vegetation Protection** |
|---|
| ■ The natural resources management professional will be an active participant in all planning and decision making activities regarding uses of the land to ensure that current and planned mission activities (for example, master planning, construction requests, site approval requests, and training exercise plants) are conducted in a manner which is compatible with natural resources and other environmental requirements. (Para. 3-2b)<br><br>■ Grounds will be maintained at the levels and intensities necessary to meet the designated use criteria, protect, and enhance the natural resources, and ensure a pleasing appearance in harmony with the natural landscape. (Para. 4-1a)<br><br>■ Costs for maintaining grounds will be minimized by providing the least amount of mowed area and landscape plantings necessary to accomplish management objectives and by the use of low maintenance species, agricultural leases, reforestation, natural areas, and wildlife habitat. (Para. 4-1b)<br><br>■ It is Department of the Army policy to maintain, restore, and mange its forest lands on an ecosystem basis. The harvesting of forest products, including other consumptive and non-consumptive activities that take advantage of the forest environment, are allowed and encouraged when conducted consistent with protecting and maintaining a viable, self-sustaining forest ecosystem… Forest ecosystem management strategies should be broad-based to optimize overall natural resources benefits, and not focused on a single management objective, for example, maximizing timber production. (Para. 5-1b)<br><br>■ Volume inventories of forest stands will be made and kept current (not older than ten years) to provide for sustained production of forest products. (Para. 5-2a)<br><br>■ The Forest Service has the delegated responsibility for carrying out the provisions of the Cooperative Forestry Assistance Act of 1978 (16 U.S.C. 2101) on National Forest Service lands and in cooperation with other Federal and managing agencies, the States and private landowners on other forestlands. It is intended that the USDA Forest Service will provide technical assistance and appropriate funds to meet specific pest management project objectives as follows: (1) Provide foliage protection. (2) Reduce specific insect and disease populations. (3) Reduce the risk of artificial spread to uninfested areas. (4) Prevent tree mortality. (Para. 5-3b) |

| Excerpts from AR 200-3<br>Select Provisions Applicable to Vegetation Protection |
| --- |
| *(continued)*<br><br>■ Habitat management efforts will be accomplished in a manner to conserve and enhance existing flora and fauna consistent with the Army goal to conserve, protect, and sustain biological diversity while supporting the accomplishment of the military mission. Activities will be directed towards management to maintain healthy ecosystems, and to restore degraded ecosystems to their historic functions and values. Primary management consideration will be given to the management of indigenous listed, proposed, and candidate species habitats. Also, consideration of other environmentally sensitive areas and other areas of special concern (for example, riparian zones, wetland, highly erodible areas) should be identified and addressed in the Integrated Natural Resources Management Plan. (Para. 6-7)<br><br>■ All land and water areas will be closed to off-road recreational use by motorized ORVs except those areas and trails which are determined suitable and specifically designated for such under the procedures established in this regulation. (Para. 8-1b)<br><br>■ When ORV use is permitted, the intensity, timing, and distribution will be carefully regulated to protect the environmental values. In designating suitable sites, equitable treatment should be given to all forms of outdoor recreational activity and, where possible, nonconflicting use will be encouraged on existing trails. Prior to designating such areas or trails for ORV use, the environmental consequences must be assessed and environmental statements prepared and processed when such assessments indicated that the proposed use will create a significant environmental impact or be environmentally controversial. (Para. 8-1c) |

The DA pest management policy is contained in AR 200-5, *Environmental Quality—Pest Management* (October 29, 1999). This regulation implements the requirements of DoDI 4150.7 to protect natural resources from damage by insects, weeds, and other pests in ways that promote training and readiness with minimum risk to the environment. The regulation promulgates policies, responsibilities, and procedures to implement the Army Pest Management Program, and supplements the federal, state, and local laws described in AR 200-1 for the Army Environmental Program. In implementing DoDI 4150.7, each installation's Department of Public Works must prepare and annually update a pest-management plan. The plan should list all program objectives, prioritized according to the potential or actual impact on health, morale, structures, or property. The current *Fort Belvoir Integrated Pest Management Plan* was approved and signed by the Major Army Command (MACOM) and the Garrison Commander in December of 1998.

### 9.1.5 Fort Belvoir Undeveloped Areas Vegetation Policy

Fort Belvoir has no overarching policy regarding undeveloped areas vegetation management on-post. It does, however, have several policies pertaining to specific aspects of vegetation management (e.g., tree protection during construction, pest management, refuge management, habitat management for wildlife). Fort Belvoir's installation-specific natural resources management policies are contained within the Fort Belvoir Supplement to AR 200-3 (dated February 20, 1996) (Appendix H). This installation regulation includes specific restrictions

aimed at protecting installation land and water resources from impact. The supplement specifies requirements for installation refuge management, urban forest management, wildlife habitat management, and firewood management.

Based on the urban forest management requirements in Fort Belvoir's Supplement to AR 200-3, Fort Belvoir's *Tree Removal and Protection Policy*, 420-22-00, dated August 15, 2000, promotes "site planning techniques and construction practices that maximize retention and protection of existing trees before considering removal"(Appendix I). This regulation requires that "…all proposed tree and shrub removals as well as construction and excavation activities that may impact the growth and survival of trees are to be approved by the DIS." It also requires that "two new trees are to be planted for each tree 4 inches and larger in diameter… removed through construction on Fort Belvoir."

Fort Belvoir's *Integrated Pest Management Policy*, 200-04-00 dated 24 January 2000 requires planning that incorporates "education, record keeping, and best management practices to prevent pests and diseases from damaging property" (Appendix K). It also requires that all pest management operations on Fort Belvoir are carried out in accordance with the *Fort Belvoir Integrated Pest Management Plan* and applicable federal, state, and local laws (U.S. Army, 2000b). The policy letter designates ENRD as the responsible party for pest management compliance on Fort Belvoir, which enables it to enforce its requirements.

Fort Belvoir Regulation 210-27, *Range Procedures and Utilization of Training Areas*, provides specific requirements for environmental protection and conservation of training areas. It requires that vehicles stay on established trails and roads, restricts riot control agents to specified training areas to minimize environmental damage, and requires that all waste be removed from the training areas and disposed of properly. The regulation also requires ENRD review of all land disturbing activities (U.S. Army, 1994).

### 9.1.6 Chesapeake Bay Program

DoD and DA are signatory partners of the Chesapeake Bay Program (CBP). The Chesapeake Bay Program strives to restore and protect the Bay's living resources, their habitats, and ecological relationships. The 1987 *Chesapeake Bay Agreement*, the 1990 *Cooperative Agreement Between DoD and EPA Concerning Chesapeake Bay Activities*, the 1993 *DoD/EPA Action Items for the Chesapeake Bay Program*, the 1994 *Agreement of Federal Agencies on Ecosystem Management in the Chesapeake Bay (FACEUP)*, the 1998 *Federal Agencies' Chesapeake Ecosystem Unified Plan*, and the renewed Chesapeake Bay agreement, *Chesapeake 2000,* contain specific goals, objectives, and commitments designed to provide for the restoration and protection of the Bay's living resources and their habitats. In particular, *FACEUP* commits partners to inventory habitat restoration needs on federal lands and complete two priority habitat restoration projects each year. It also calls for the restoration of 200 miles of forest buffers on federal lands by 2010, as well as the control of terrestrial and aquatic invasive species on priority sites on federal lands. Specific CBP directives that pertain to native vegetation include Directive No. 94-1, *Riparian Forest Buffers*; Directive No. 94-3, *Framework for Habitat Restoration*; and Directive No. 97-3, *Wetlands Protection and Restoration Goals*.

### 9.1.7 Partners in Flight Program

DoD is a partner in promoting and supporting the Partners in Flight (PIF) Program. The PIF Program strives to address the problems facing neotropical migratory birds through communication, cooperation, and conservation efforts, including protection of vital vegetative habitats. As part of the PIF Program, DoD installations are encouraged to incorporate elements of the Partners in Flight Bird Conservation Strategy into their INRMPs. Such elements include habitat management practices such as prescribed burning and timber management programs.

## 9.2 BASELINE VEGETATION CONDITIONS

Information on vegetation conditions at Fort Belvoir has been obtained through various surveys and studies (Table 9.1). Comprehensive plant community descriptions and mapping were developed through a plant communities survey of Main Post and EPG (Paciulli, Simmons and Associates, Ltd., 1998a; 1999a) and an ecological communities assessment of Fort Belvoir Main Post performed by DCR-NHP (McCoy and Fleming, 2000). A natural heritage inventory, which included the identification of rare plant species and communities, was completed in 1997 by DCR-NHP (Hobson, 1996; 1997) for Main Post and EPG (Section 9.2.3). A floristic inventory was developed, listing the plant species on Fort Belvoir Main Post (Wells, 1999) (Appendix E). Important vegetation surveys of Fort Belvoir Main Post include the invasive/exotic vegetation survey (Paciulli, Simmons and Associates, Ltd., 2000b) and the grassland survey (Paciulli, Simmons and Associates, Ltd., 1996). Other important vegetation surveys of Main Post and EPG include the Timber Inventory (North American Resource Management, 1991), the Watershed Survey (Landgraf, 1999), and the forest pest surveys/monitoring.

**Table 9.1: Sources of Fort Belvoir Vegetation Information**

| *Subject/Section* | *Author* | *Method* | *Coverage* | *Year* | *Product* |
|---|---|---|---|---|---|
| Plant Communities (Section 9.2.1) | Paciulli, Simmons & Associates, Ltd. | Photo interpretation and field survey | Installation-wide | 1998 (Main Post); 1999 (EPG) | Community mapping, species list, and report |
| Plant Species (i.e. floristic list) (Section 9.2.4) | George Washington University /Paciulli, Simmons & Associates, Ltd. | Field survey | Installation-wide, exclusive of cantonment areas and EPG | 1999 | Floristic species list |
| Rare Species (Section 12.2.4) | Virginia Department of Conservation and Recreation, Division of Natural Heritage | Field survey | Installation-wide, exclusive of cantonment areas | 1994; 1995; 1996 | Species list, report, and maps |
| Ecological Communities (Section 9.2.2) | Virginia Department of Conservation and Recreation, Division of Natural Heritage | Field survey | Installation-wide, exclusive of cantonment areas and EPG | 2000 | Species list, map, and report; permanent monitoring plots |

| Table 9.1: Sources of Fort Belvoir Vegetation Information | | | | | |
|---|---|---|---|---|---|
| ***Subject/Section*** | ***Author*** | ***Method*** | ***Coverage*** | ***Year*** | ***Product*** |
| ***(continued)*** | | | | | |
| Timber (Section 9.2.7) | North American Resource Management, Inc. | Field survey | Installation wide, exclusive of the cantonment area and EPG | 1991 | Forest inventory, report, and forest compartment maps |
| Urban Forest (Section 10.2.2) | Davey Resource Group | Field survey | All improved grounds | 2000 | List of locations, species, sizes, and management |
| Improved Grounds (Section 10.2.3) | CA Contract | Field survey | All improved grounds maintained in accordance with the CA contract | 2000 | Management units and maintenance activities |
| Invasive Exotic Vegetation (Section 9.2.5) | Paciulli, Simmons & Associates, Ltd. | Field survey | Installation-wide, exclusive of cantonment area and EPG | 2000 | Species list, map, and management plan |
| Grasslands (Section 9.2.6) | Paciulli, Simons & Associates, Ltd. | Field survey | Installation-wide, exclusive of cantonment areas and EPG | 1996 | Map and management plan |
| Watersheds (Section 9.2.8) | Chris Landgraf (PGI, Inc.) | Field survey | Installation-wide | 1999 | Maps and management plan |
| Forest Pests, including gypsy moths and cankerworms | U.S. Department of Agriculture and In-house | Field survey | In forested areas installation-wide | Annually | Survey results, management recommendations |

### 9.2.1 Plant Community Survey

A plant community survey of Fort Belvoir Main Post and EPG was conducted using photointerpretation and limited field survey (Paciulli, Simmons and Associates, Ltd., 1998a; 1999a). This survey described and mapped 16 broad community types, covering all of the Fort Belvoir Main Post. As indicated in Figure 9.1 and Table 9.2, these types included categories such as natural and planted pine forests, various upland and palustrine hardwood stands, tidal and non-tidal wetlands, old field grasslands, and urban land. The plant community descriptions used for this survey were developed in coordination with DCR-NHP.[1] The plant community mapping is included within the installation GIS. A narrative description of each community type is contained within Appendix F.

[1] Descriptions used in this survey predated development of The Nature Conservancy's National Vegetation System (used for the later ecological communities assessment; Section 9.2.2).

BMO–DRY MESIC OAK-HICKORY FOREST, (FLATWOODS MESIC FOREST and MESIC MIXED HARDWOOD FOREST)

MFH–ALLUVIAL MIXED HARDWOOD FOREST, INELLORAINED TYPE

HEM–BEAVER MARSH: SEDGE/RUSH TYPE and BEAVER MARSH: ARROW ARUM TYPE

OEF–MIXED OAK/BEECH FOREST and CHESTNUT OAK/BEECH FOREST, (DRY MESIC OAK-HICKORY FOREST)

PFH–ALLUVIAL MIXED HARDWOOD FOREST: POORLY DRAINED TYPE and BOTTOMLAND HARDWOOD SWAMP

SCP–COASTAL PLAIN/PIEDMONT ACIDIC SEEPAGE SWAMP

TMA–TIDAL FRESHWATER MARSH: MIXED TYPE; TIDAL FRESHWATER MARSH: MUD FLAT TYPE; TIDAL FRESHWATER MARSH: WILD RICE-SMARTWEED TYPE; TIDAL FRESHWATER MARSH: SPIKERUSH-GOLDEN CLUB TYPE

TMH–FLATWOODS MESIC FOREST and MESIC MIXED HARDWOOD FOREST

TSF–TIDAL HARDWOOD SWAMP

TSS–TIDAL SHRUB SWAMP

MPH–MIXED PINE-HARDWOOD FOREST

LPF–LOBLOLLY PINE FOREST

VPF–VIRGINIA PINE FOREST

WPF–WHITE PINE FOREST

GRS–GRASS AREA

OFG–OPEN FIELD GRASS

N

# PLANT COMMUNITIES on FORT BELVOIR

SOURCE: PACUILLI, SIMMONS & ASSOCIATES, Ltd., 1998; McCOY and FLEMING, 2000

FIGURE: 9.1

| Table 9.2: Acreage and Distribution of Plant Community Types on Fort Belvoir | | | |
|---|---|---|---|
| ***Plant Community*** | ***Acreage*** | | ***Distribution*** |
| | ***Main Post**** | ***EPG†*** | |
| Oak/Ericad (Heath Family) Forest | 1,253 | 227 | Upland areas of gravelly ridges and dry slopes |
| Beech Mixed Oak Forest | 1,146 | 12 | Upland areas of gradual, well-drained ravine slopes |
| Tulip Poplar Mixed Hardwood Forest | 987 | 75 | Moist, fertile ravine slopes and ravine bottoms |
| Seep Forest | 39 | 1 | Groundwater-saturated flats and slopes |
| Mixed Pine Hardwood Forest | 196 | 49 | Previously disturbed areas in late succession |
| Virginia Pine Forests | 425 | 185 | Previously disturbed areas in mid-succession |
| Loblolly Pine Forest | 245 | 11 | Planted stands |
| White Pine Forest | 6 | 0 | Planted stands |
| Moderately Well-Drained Floodplain Hardwood Forest | 173 | 40 | Moderately well-drained to somewhat poorly-drained floodplain bottomland |
| Poorly-Drained Floodplain Hardwood Forest | 422 | 13 | Somewhat poorly-drained to very poorly-drained floodplain bottomlands and sloughs |
| Non-Tidal Marsh/Beaver Pond | 131 | 3 | Above tidal limits of Accotink, Pohick, and Dogue Creeks |
| Tidal Marsh | 96 | 0 | Shallow tidal areas of Accotink and Pohick Creeks and at the mouths of several small streams. |
| Freshwater Tidal Swamp Forest | 45 | 0 | Tidally influenced palustrine areas. |
| Tidal Scrub/Shrub Wetland | 16 | 0 | Edges of tidal swamp forests near the transition to tidal marsh. |
| Old Field Grassland | 233 | 53 | Previously disturbed areas in early successional stages. |
| Urban Land | 2,809 | 121 | All developed areas including improved and semi-improved grounds. |

*Source: Paciulli, Simmons and Associates, Ltd., 1998a. The report did not have information on a few small areas; therefore, the total acreage of the plant communities is less than the total acreage of the Main Post.

†Source: Paciulli, Simmons and Associates, Ltd., 1999a. The Accotink Creek Channel was not included in the vegetation community survey; therefore, total acreage of plant communities is less than the total acreage of EPG.

### 9.2.2 Ecological Communities Assessment of Main Post

The ecological communities assessment was conducted using photo interpretation of recent installation aerial photography and extensive multi-season field survey and sampling (McCoy and Fleming, 2000). The assessment was undertaken to provide a more-refined and expanded ecological analysis of the native plant communities on Fort Belvoir. The community descriptions used for this assessment were based upon The Nature Conservancy's (TNC's) National Vegetation Classification (which was not available at the time of the plant communities survey). TNC's National Vegetation Classification is a nationwide effort for standard communities classification that addresses the vegetation cover conditions together with environmental conditions (e.g., hydrologic regime).

The ecological communities assessment identified and described 17 native plant community types on the undeveloped parts of Fort Belvoir Main Post (Table 9.3 ).[2] A total of 472 vascular plant taxa were recorded within the survey plots. As part of the community descriptions, DCR-NHP provided detailed ecological information including vegetation composition, soil chemistry, and physical parameters (e.g., pH, organic matter, moisture, texture, etc.). DCR-NHP assigned conservation priority rankings (i.e., rarity rankings) for each community on post. Representative plots of each ecological community type were permanently marked in the field and their locations were entered into the installation GIS, so that they may be used for future monitoring. The ecological community mapping information has been incorporated into the installation GIS.

**Table 9.3: Distribution of Ecological Community Types on Fort Belvoir**

| *Ecological Group* | *Community Type (State Conservation Rank[a])* | *Distribution on Fort Belvoir* |
|---|---|---|
| Upland Forests | Flatwoods Mesic Forest (S4?) | Level or nearly level topography at low elevations, bordering major streams and alluvial floodplains. |
| | Mesic Mixed Hardwood Forest (S5) | Elevations of 3 m to 33.5 m. Lower, middle, or upper slopes. Along stream bottoms and on level areas. |
| | Dry-Mesic Oak-Hickory Forest (S5) | Well-drained areas around elevation of 24.8 m. Topography ranges from floodplain to ridge crest. |
| | Mixed-Oak / Ericad Forest (S5) | Dry acid ridgetops and upper to middle slopes. Mean elevation is 30.5 m. |
| | Chestnut Oak / Ericad Forest (S4) | North-facing middle and upper slopes of the Coastal Plain and Piedmont. Mean elevation of 20.6 m. |
| Alluvial Forests and Seeps | Alluvial Mixed Hardwood Forest: Poorly-Drained Type (S4) | Low elevation (mean = 5.9 m) forested floodplains or lowlands with poor drainage. |
| | Alluvial Mixed Hardwood Forest: Well-Drained Type (S5) | Alluvial floodplains at low elevation (mean = 7.9 m). Well-drained soils. |
| | Coastal Plain / Piedmont Acidic Seepage Swamp (S2) | Groundwater-saturated stream headwaters, small seeps and runs, stream bottoms at base of slopes. Mean elevation of 9.1 m. |

[2] McCoy and Fleming did not address planted pine stands, or early or transitional successional types addressed by the previous plant communities survey. The difference in the number of community types between this survey and the survey by Paciulli, Simmons and Associates, Ltd., is due to the more refined definitions of ecological communities.

| Table 9.3: Distribution of Ecological Community Types on Fort Belvoir | | |
|---|---|---|
| ***Ecological Group*** | ***Community Type (State Conservation Rank[a])*** | ***Distribution on Fort Belvoir*** |
| ***(continued)*** | | |
| Swamp Forests and Marshes | Bottomland Hardwood Swamp (S4?) | Low elevation (0 to 6.1 m) floodplains. Somewhat poorly drained to poorly drained. |
| | Tidal Hardwood Swamp (S3?) | Tidally-flooded, freshwater forested floodplains of Coastal Plain estuarine rivers and creeks. Poorly-drained alluvial soils. |
| | Tidal Shrub Swamp (S2?) | Freshwater wetlands, usually in marginal zones flooded only irregularly by tides. |
| | Beaver Marsh: Rush – Sedge Type (SM) | Low elevation (mean = 6.1 m) wetlands of Coastal Plain and Piedmont. Common in disturbed, ponded habitats. |
| | Beaver Marsh – Arrow-arum Type (SM) | Low elevation beaver wetlands (mean = 3.1 m) of Coastal Plain and Piedmont. |
| | Tidal Freshwater Marsh: Mixed Type (S1) | Drier portions of the marsh complex influenced by regular tides. Poorly drained soils. |
| | Marsh: Mud Flat Type (S3?) | Tidal freshwater river mud flats with high water levels (1 to 3 m deep). Submerged and exposed daily. |
| | Tidal Freshwater Marsh: Wild Rice – Smartweed Type (S3?) | Tidally influenced river systems with daily tidal flooding but beyond influence of salinity. |
| | Tidal Freshwater Marsh: Spikerush – Golden-club Type (S1) | Tidal marshes within influence of daily flooding but beyond effects of salinity. |

Source: McCoy and Fleming, 2000

[a]State Conservation Rankings:
S1 – Extremely rare, generally with five or less occurrences state-wide, and/or covering <50 ha (124 acres) in aggregate; or covering a larger area but highly threatened with destruction or modification.
S2 – Very rare, generally with 6 to 20 occurrences state-wide, and/or covering <250 ha (618 acres) in aggregate; or covering a larger area but threatened with destruction or modification.
S3 – Rare to uncommon, generally with 21 to 100 occurrences state-wide; or with a larger number of occurrences subject to relatively high levels of threat; may be of relatively frequent occurrence in specific localities or geographic parts of the state.
S4 – Common, at least in certain regions of the state, and apparently secure.
S5 – Very common and demonstrably secure.
S? – Unranked
S_? – Rank uncertain or approximate.
SM – Modified, as applied to early succession communities or beaver wetlands.

Of the Main Post's 17 native vegetation communities, DCR NHP ranked the Coastal Plain/Piedmont acidic seepage swamp and the tidal shrub swamp as "very rare," and the mixed type and spikerush – golden-club type tidal freshwater marshes as "extremely rare" (Appendix G) (McCoy and Fleming, 2000). These four communities are all wetland types (Section 8.0). DCR-NHP identified existing and potential threats to the ecological integrity of each community type on post. The most significant of these threats are (1) displacement by invasive/exotic species, and (2) stormwater-related problems (e.g., sedimentation).[3] A narrative description of each of the 17 DCR-NHP plant community types, including comments on disturbances or threats to each community, is included in Appendix G.

[3] DCR-NHP did not address the threat of land development.

### 9.2.3 Natural Heritage Inventory

The Natural Heritage Inventory of Fort Belvoir (Main Post and EPG) was performed by DCR-NHP to address the biodiversity of the installation's natural resources. This survey involved detailed, multi-season field survey over a two-year period (Hobson, 1996; 1997). The purpose of the inventory was to systematically identify the installation's natural heritage resources (i.e., those sites supporting unique or exemplary natural communities, rare plants and rare animals, and other significant natural areas). The inventory identified four rare plant species and three watchlist plant species (Section 12.2.4).[4] The four rare plant species, velvety sedge (*Carex vestita*), vetchling (*Lathyrus palustris*), water plantain crowfoot (*Ranunculus ambigens*) and river bulrush (*Scirpus fluviatilis*) occur in the freshwater tidal marsh wetlands within the Accotink Bay Wildlife Refuge (ABWR). The locations of the three watchlist plant species, creeping spikerush (*Eleocharis smallii*), blueflag (*Iris versicolor*) and giant bur-reed (*Sparganium eurycarpum*) were not identified in the survey report, although all are wetland species. The inventory identified six locations of "significant vegetation communities" (all of which are wetlands): three associated with Accotink Bay wetlands within the ABWR, two within the lower parts of training areas T-7 and T-10, and one within HEC. The 1996 DCR-NHP inventory defined the boundaries of two recommended conservation areas to protect these resources. A third conservation area, located in the vicinity of training area T-17, was recommended based on the results of a 1997 DCR-NHP zoological inventory (Figure 8.2). The recommended conservation areas are watershed-based and encompass large areas within Fort Belvoir.

DCR-NHP identified existing and potential threats to the rare plant species and significant natural communities, and presented management recommendations (Hobson, 1996) (Section 8.0). These recommendations addressed such threats as invasive species displacement, siltation and toxics in stormwater runoff, altered hydrologic regimes, beaver activity, and shoreline erosion from boat wakes. DCR-NHP recommended long-term monitoring of the occurrences of the rare plant species and significant natural communities on post.

### 9.2.4 Floristic Inventory

A floristic inventory of Fort Belvoir was developed by botanist Dr. Elizabeth Wells of George Washington University (1999). The inventory was developed through a detailed, multi-season field survey of representative locations of all native plant community types on post. A total of 483 species were identified in this inventory (Appendix E).

### 9.2.5 Invasive/Exotic Vegetation Survey

The baseline survey of invasive/exotic vegetation of Fort Belvoir was developed through a multi-season field survey (Paciulli, Simmons and Associates, Ltd., 2000b). Table 9.4 presents the 14 invasive/exotic vegetation species identified at Fort Belvoir with significant occurrences such that they warrant consideration for control. Table 9.4 also summarizes the location and size of each occurrence, and the type of habitat in which the species typically exists. The locations of

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[4] A fourth watchlist species, American frog's bit (*Limnobium spongia*), was identified on Fort Belvoir during the DCR-NHP survey, but has since been removed from the watchlist.

problematic occurrences of invasive and exotic vegetation are being incorporated into the installation GIS.

**Table 9.4. Invasive/Exotic Vegetation on Fort Belvoir Recommended for Control**

| *Scientific Name* | *Common Name* | *Size*[*] | *Habitat*[†] | *Location* |
|---|---|---|---|---|
| Ampelopsis brevipendunculata | Porcelain berry | S | F | Around the drainage culvert off of the perimeter road on the western portion of D/CEETA |
| Celastrus orbiculatus | Oriental bittersweet | L | F | Along both sides of Accotink Creek starting at the footbridge and going south along Beaver Pond Nature Trail and Accotink Creek Trail |
| | | S-M | | Scattered along roadsides throughout the post |
| Festuca elatior | Tall fescue | S-L | G | Fields, open areas and roadsides throughout the post |
| Hedera helix | English ivy | M | F | South side of Accotink Creek near the suspension (foot) bridge |
| | | M | | In woods behind buildings on Jadwin Loop, north of the former sewage treatment facility |
| Hydrilla verticillata | Hydrilla | S | W | In Mulligan Pond |
| Lespedeza cuneata | Chinese lespedeza | S-L | G | Fields, open areas and roadsides throughout the post |
| Lythrum salicaria | Purple loosestrife | S | W | Along the western bank of Dogue Creek, across from Dogue Creek Marina |
| Miscanthus sinensis | Eulalia | S | G | On the north side of Johnson Road near the pier |
| | | S | | West of the intersection of Beulah Street with Woodlawn Road near old debris landfill |
| | | L | | South side of Cissna Road (EPG) before the bridge |
| Phalaris arundinacea | Reed canary grass | L | W | In and along the section of Pohick Creek that is adjacent to T-9 |
| Phragmites australis | Common reed | M | W | Along the western bank of Dogue Creek, across from the marina, near a utility line crossing |
| | | S | | At the intersection of gravel roads, across from Dogue Creek Marina |
| | | S | | In a swale along Poe Road adjacent to the landfill |
| | | S | | In a ditch along Poe Road |
| | | L | | In a wet depression, north of the archery range along the edge of grassland field |
| | | L | | Along the nature trail, north of the archery range |
| | | M | | In a ditch along Wilson Road, just north of R&D area basin |
| | | S | | Along former Keene Road adjacent to building 2454 |
| Polygonum cuspidatum | Japanese knotweed | S | G | Northwest corner of the ABWR parking lot |
| | | M | | Along the south side of Meeres Road, just west of Pole Road |

| Table 9.4. Invasive/Exotic Vegetation on Fort Belvoir Recommended for Control | | | | |
|---|---|---|---|---|
| ***Scientific Name*** | ***Common Name*** | ***Size**** | ***Habitat†*** | ***Location*** |
| ***(continued)*** | | | | |
| Polygonum perfoliatum | Mile-a-minute | S | W | Between Woodlawn Road and the North Golf Course along the abandoned road that is behind the golf green |
| | | S | | Along the unnamed abandoned road northwest of Kingman and Woodlawn Road intersection |
| | | M | | In T-16 just north where Mulligan Road and unnamed road fork |
| | | L | | Along a section of Pohick Creek that is adjacent to T-9 |
| | | M | | Northeast of the intersection of training roads in W-1 and T-11 |
| | | L | | Northeast of building 3065 on Poe Road, at an old well site |
| | | M | | East side of Warren Road opposite its intersection with Thayer Road |
| | | M | | West of the intersection of Beulah Street with Woodlawn Road at an old debris landfill |
| Pueraria lobata | Kudzu | L | F | Old home site located between the Potomac River and the Officers' Club |
| | | L | | Down slope from building 2283 off of Fosters Road |
| | | M | | Surrounding portions of the coal storage area |
| | | L | | Along the access road to the former sewage treatment facility off of Jadwin Loop |
| Wisteria sinensis | Chinese wisteria | L | G, F | In T-16, west of unimproved Mulligan Road just north of Pole Road where it intersects with Old Mill Road |
| | | M | | East of intersection of Beulah Street and Kingman Road in the Forest and Wildlife Corridor |
| | | L | | Northwest of a reforestation site, south of the pond on north golf course |
| | | M | | North of the intersection of training roads in T-9 and T-7 |
| | | S | | Along a railroad bed, west of Tracey Loop and Theots Road intersection |
| | | M | | Northern portion of T-16 on training roads inside of Kingman Gate |
| | | S | | North side of Warren Road, just north of Thayer Road |
| | | L | | From Woodlawn Road to the western side of perimeter road on D/CEETA |
| | | M | | North and scattered locations south of the bridge crossing Accotink Creek on Cissna Road (EPG) |
| | | S | | Along former Keene Road east of parking lot for building 2444 |

Source: Paciulli, Simmons & Associates, Ltd., 2000b

*Size Legend: S = Small, A single plant to an approximate 50 square foot area; M = Medium, Infestation is over 50 square feet but less than one-half acre; L = Large, Infestation is greater than one-half acre.

†Habitat in this table refers to the area in which the species should be controlled on Fort Belvoir. Habitat Legend: G = Grassland; W = Wetland; F = Forest

### 9.2.6 Grassland Survey

The grassland survey was undertaken to identify grassland areas that could be managed to enhance their wildlife habitat value (Paciulli, Simmons and Associates, Ltd., 1996).[5] The inventory used photo interpretation and field surveys to identify 51 grassland areas, ranging from less than 0.5 acre to 20 acres, for a total of 190 acres of grassland on Fort Belvoir. The locations of the inventoried grasslands have been incorporated into the installation GIS. Most of the grassland areas tend to be small and scattered. The larger grassland areas occur on the installation's closed landfills, where landfill closure regulations limit opportunities to manipulate vegetation cover.

The survey generated five general types of management recommendations including the following: (1) enhance and maintain existing grass cover (the primary management recommendation in the plan); (2) reseed with warm season grasses; (3) use plant species that have wildlife habitat benefits; (4) install nesting structures for wildlife; and, (5) control aggressive invading weeds. The survey recommended management actions on 46 of the 51 areas, primarily enhancement and maintenance of existing grass cover. The remaining five areas were not recommended for management due to their small size, or existing or planned development. Subsequent review of the grassland survey recommendations against the PIF priority bird species habitat management recommendations (Watts, 1999) indicates that the grassland survey recommendations expressed in Paciulli, Simmons and Associates, Ltd. (1996) should be revised to address habitat improvements for migratory birds (Section 11).

### 9.2.7 Timber Inventory

Fort Belvoir maintains a current timber inventory, as required by AR 200-3, the current inventory having been completed in 1991 (North American Resource Management, 1991). The timber inventory includes management recommendations, proposed harvest charts, and data summary tables. The current inventory map has been incorporated into the installation GIS. Figure 9.1 presents an overview of the acreage of each forest type as reported in the 1991 inventory. An update to the inventory was initiated in 2000.

### 9.2.8 Watershed Survey

Fort Belvoir completed an installation-wide watershed survey in 1999 (Landgraf, 1999). One of the parameters evaluated was the percent forest, wetland, and open area cover within watersheds and subwatersheds. The watershed survey showed significant variation in subwatershed vegetative cover; percent forested areas varied between 100 and 11, percent wetlands varied between 39 and 0.5, and percent open area varied between 65 and 0 (Section 7).

### 9.2.9 Forest Pest Surveys

Fort Belvoir's gypsy moth populations have remained low over the past years. Although higher egg mass counts have been recorded in the T-6 training area, there has been no significant

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[5] Developed areas where the grass needs to be maintained, such as lawns, recreational fields, and utility rights-of-way, were excluded from this survey.

defoliation or tree mortality since 1994. The release of parasites, as well as favorable weather conditions for the fungus *Entomophaga maimaiga*, has held gypsy moth populations in check. However, there have been regional increases in populations over the past two years. The ramifications of a potential widespread regional resurgence necessitates continued annual monitoring of populations. Fort Belvoir and USDA foresters perform annual egg mass surveys during the fall and winter months to identify potential infestations and habitat impacts. During the late spring and early summer, personnel from the USDA Beltsville Agricultural Research Center collect larval specimens of all instars to help determine the impacts of *Entomophaga maimaiga*, the gypsy moth nuclear polyhyreosis virus, and parasitic insects on population levels. No treatments have been recommended or performed over the past five years.

Fort Belvoir monitors populations of cankerworms in forested areas, including woodland borders of improved grounds. Foresters capture the adult, wingless females using a sticky paste applied to a band of tarpaper wrapped around susceptible trees during winter months. If the moths number greater than 90 per pair of trees monitored (trees selected should be within the same stand), treatment with *Bacillus thuringiensis* (Bt) is considered. A survey performed by a Fort Belvoir forester in 1999 indicated more than 90 moths per acre in two separate forested areas of Fort Belvoir, and treatment was recommended and executed.

## 9.3 UNDEVELOPED AREAS VEGETATION MANAGEMENT

### 9.3.1 Undeveloped Areas Vegetation Conservation Recommendations

The results of the various vegetation surveys indicate that Fort Belvoir has a large amount of undeveloped land (about 70% of the total land area), and that this undeveloped land supports significant native plant resources with high conservation priority. The survey results warn that the installation's vegetation resources face current and future threats, such as loss or fragmentation due to land development or timber harvesting; displacement of native species by invasive/exotic species; erosion/sedimentation from stormwater-related problems; damage/mortality by insects and disease; disturbance/destruction by wildlife (e.g., deer overbrowse, beaver and woodchuck activity); and overuse by humans (e.g., recreational events in excess/inconsistent with resource conditions). Fort Belvoir's conservation efforts must focus not only on controlling these threats, but also on restoring/enhancing conditions where these threats have already had an impact on native vegetation resources.

### 9.3.2 Undeveloped Areas Vegetation Multiple Use Requirements

***Military Training and Testing***

Since the departure of the Engineer School in 1988, Fort Belvoir essentially has no land-disturbing training activities. Present-day troop training activities consist mainly of troop field training activities (e.g., land navigation, rescue training, expert field medical badge training) and rotary aircraft training activities (e.g., helicopter touch-and-go, helicopter transport). Consequently, most of the installation's approximately 1,838 acres of training lands are in forest cover, with several open grassland areas. (Installation training lands are adjacent to and contiguous with both installation refuges and the Fort Belvoir Forest and Wildlife Corridor.) As

of 2000, military mission support requirements relative to vegetation management call for the following:

- Maintenance of large, uninterrupted areas of natural forest and open grassland cover to support troop field training activities, such as orienteering, and to support testing activities, such as testing of night vision equipment
- Maintenance of open, grassland areas to support field training of rotary wing aircraft, such as touch-and-go, and airlifting of troops and equipment based on mission priority
- Maintenance of vegetation cover conditions (e.g., tree height, grass cover, etc.) to minimize potential hazards to aircraft operations at Davison Army Airfield.

***Outdoor Recreation***

The Fort Belvoir Outdoor Recreation program consists of a variety of activities. Major program elements that make use of undeveloped installation land areas include hunting and fishing, summer day camps, hiking, and guided and self-guided nature walks. As of 2000, outdoor recreation program support requirements relative to vegetation management include the following:

- Avoiding fragmentation or loss of native wildlife habitat to support self-sustaining populations of native wildlife
- Maintenance of vegetation cover conditions sufficient to protect fish habitat from stormwater-related impacts, thereby supporting self-sustaining fish populations
- Maintenance of large areas of healthy native plant communities to support native plant observation (including artistic pursuits such as nature photography) and to provide for natural beauty
- Maintenance of vegetation in high use/high traffic recreation areas (e.g., along shorelines) to provide a visually pleasing appearance, and to protect sensitive resources (e.g., use of plantings to direct foot traffic and protect against erosion).

***Forest and Agricultural Products***

Forest products production requires the maintenance of healthy forest stands. As of 2000, forest products support relative to vegetation management include the following requirements:

- Controlling damaging forest pests
- Managing wildfire hazard
- Performing timber stand improvement
- Reforesting disturbed areas
- Conducting forest products sales.

The installation's location within an urban setting, and its considerable distance from timber mills, results in very little commercial interest in forest products. As of 2000, the predominant forest product sales were firewood sales. Fort Belvoir has no agricultural production areas. The installation's urban setting results in no commercial interest in agricultural outleases.

***Environmental Education and Scientific Research and Study***

In recent years, Fort Belvoir has supported an increasing number and variety of environmental education and scientific research programs and activities (Section 13.0). Interest and participation in these types of activities by both the military community and the general public has been increasing steadily. The continued success of environmental education and scientific research and study activities on post requires the continued existence of healthy, native ecosystem conditions that can serve as outdoor classrooms, and as field test and study sites.

***Land Development***

While not specifically addressed in the DoD and the Army's management policies (Section 9.1), the construction, operation, and maintenance of developed facilities, such as administrative, community service, education and housing facilities, along with their supporting infrastructure, influence an installation's native vegetation resources. This is especially true for Fort Belvoir. As of 2000, Fort Belvoir supports more than 100 tenant organizations, and has approximately 2,070 housing units. Short- and long-term planning, as expressed in the *Fort Belvoir Real Property Master Plan* (Woolpert, 1993a), calls for continued development to support new facilities. The siting, construction, maintenance, and use of these facilities represents the most significant source of potential impact to native vegetation resources on Fort Belvoir.

Mission support in this area necessitates balancing the need for new/expanded facilities against the need for natural resources conservation. Conservation of native vegetation resources is important for meeting DoD and Army requirements for protecting and enhancing native biodiversity (Section 9.3.1.1). Maintaining healthy native vegetation is also an important consideration for maintaining soldier quality of life. Fort Belvoir's role as the administrative and community support facility for the National Capital Area means that the installation supports a large number of military and civilian personnel who live, work, and make use of installation facilities and natural resources. Maintaining natural beauty through the protection of healthy native vegetation conditions is very important to maintaining the quality of life for the large number of soldiers and associated personnel at Fort Belvoir. Management of developed areas on the installation is discussed in Section 10.3.

### 9.3.3 Undeveloped Areas Vegetation Management Actions to Date

Fort Belvoir manages its vegetation resources in accordance with the resource conservation and multiple use requirements of DoDI 4715.3 and AR 200-3. To date, Fort Belvoir's natural resources management program has focused on balancing conservation of ecologically significant vegetation resources with providing for military mission support and sustained multiple use of vegetation resources. The program has also emphasized sustaining and enhancing forest and grassland resources and controlling invasive/exotic vegetation.

#### *9.3.3.1 Undeveloped Areas Vegetation Conservation Actions*

Fort Belvoir has set aside for conservation, three large blocks of ecologically significant vegetation by designating two installation refuges and the Forest and Wildlife Corridor (Section 13). Additionally, Fort Belvoir has directed land development away from wetland and steep-sloped riparian areas. The *Fort Belvoir Real Property Master Plan* (Woolpert, 1993a) designates the refuges, corridor, wetlands, and steep-sloped areas as "environmentally constrained to development."

Fort Belvoir has been managing threats to the installation's vegetation resources (e.g., invasive/exotic species, stormwater-related problems, problem wildlife, etc.), and has been performing vegetation restoration and enhancement, as follows:

***Invasive/Exotic Species Management***

Since 1996, Fort Belvoir has been implementing management actions to control invasive/exotic vegetation on post. Management actions to date have focused on eradicating existing priority invasions of exotic plant species including cutting back kudzu (*Pueraria lobata*) along the Potomac River at the Officers' Club, treating phragmites in Accotink Bay and Dogue Creek, treating Japanese bamboo (*Phyllostachys* spp.) at various locations (e.g., ABWR main entrance), and removing purple loosestrife (*Lythrum salicaria*) at Dogue Creek.

***Stormwater Management Problem Correction***

As addressed in Section 7, in 1999 Fort Belvoir initiated a long-term watershed restoration/enhancement program to correct existing stormwater-related problems, and safeguard against future problems. Ongoing erosion and sedimentation within installation stream corridors and drainageways was found to be threatening the integrity of the riparian forest communities and the downstream wetland communities. An example of this type of problem was the extensive sedimentation in areas of the Accotink Bay marsh (subwatershed 03), where the sedimentation resulted in the mortality of riparian forest vegetation, and the promotion of invasive species such as phragmites. Subwatershed 03 was the first watershed addressed for correction in 1999. In 2000, two additional subwatersheds (04 and 11) were addressed for similar types of correction. In addition to these in-stream projects, watershed restoration/enhancement actions have included the removal of abandoned pavement and re-foresting of 10 acres throughout the installation.

***Problem Wildlife Management***

As addressed in Section 11, the primary sources of wildlife impact to Fort Belvoir's vegetation resources are deer overbrowsing, and beaver and woodchuck activities (e.g., tree gnawing and dam construction). Deer management consists primarily of population control, which is a long-term program. Beaver management is undertaken on a case-by-case basis, and consists of installation of beaver guards to protect individual trees. Fort Belvoir uses tree shelters (i.e., tree tubes) to protect newly planted trees from damage by deer and rodents.

***Vegetation Restoration/Enhancement***

During the past 5 years, Fort Belvoir has undertaken a number of reforestation and riparian planting projects. Some reforestation projects were undertaken as part of the Forest and Wildlife Corridor management program (Section 13), which calls for maintenance of a contiguous band of forest habitat through the installation. Other projects, such as the plantings in the vicinity of the

new Fairfax County Parkway through Fort Belvoir, and the plantings in the vicinity of Woodlawn Road and between Woodlawn and Franklin Roads were undertaken as mitigation projects to offset vegetation losses from development projects. Riparian plantings, such as the planting along Dogue Creek near Mount Vernon Road, were undertaken in accordance with the Chesapeake Bay Program's riparian forest buffer directive, which calls for the restoration of 2,010 miles of riparian forest buffer by the year 2010. The use of tree shelters or "tubes" for reforestation has greatly increased the survival and growth rate for tree seedlings associated with such plantings. The shelters are open-ended translucent tubes 4 feet in length placed over the seedling. The bottom of the tube is sealed to the ground with composted leaves and the tube is staked in place. The shelters create a microclimate for the seedling that moderates moisture and temperature changes, and protects against browsing by deer and rodents. Netting is placed over the top of the tube to exclude birds that may become trapped in the tube.

During the past 5 years, Fort Belvoir has also undertaken a number of projects to enhance wildlife habitat value of specific grassland areas. Management actions to date include the use of wildlife seed mixes when replanting specific disturbed areas (e.g., Theote landfill, Fairfax County sewer line); under planting recently thinned pine stands with wildlife seed mixes; and, alteration of the mowing schedule for the grassland area at the ABWR entrance to encourage conversion from fescue to native warm season grasses. From 1995 to 2000, Fort Belvoir has undertaken such habitat enhancement projects on more than 100 acres (e.g., 30 acres pine stands, 30 acres grasslands and rights-of-way and reduced mowing plan, etc.).

***Undeveloped Vegetation Law Enforcement***

Through its Memorandum of Agreement for Cooperative Law Enforcement between the U.S. Fish and Wildlife Service and the U.S. Army Garrison Fort Belvoir, dated 20 February 1996 (Appendix A), Fort Belvoir has one Special Agent within ENRD. The agreement is to provide mutual law enforcement benefits to the installation and to the Fish and Wildlife Service by sharing expertise, training, intelligence, information, and specialized equipment. The intent of this agreement is to provide the Special Agent with the authority to enforce all laws administered by the U.S. and the installation relating to fish, wildlife, and other natural resources. The agreement delegates authority to the Special Agent to enforce several specific federal laws on Fort Belvoir including the following: Lacey Act Amendments of 1981 (16 U.S.C., 3371-3378), Migratory Bird Treaty Act (16 U.S.C. 703-712), Migratory Bird Hunting and Conservation Stamp Tax Act (16 U.S. C. 718-718h), Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d), Airborne Hunting Act (16 U.S. C. 742J-1), National Wildlife Refuge Systems Administrative Act (16 U.S.C., 668dd-668ee), Endangered Species Act of 1973 (16 U.S.C., 1531-1543), Marine Mammal Protection Act of 1979 (16 U.S.C., 1361-1384, 1401-1407), and Archeological Resources Protection Act of 1979 (16 U.S.C. 470a. (A)-(1) (A)).

#### *9.3.3.2 Multiple Use Support*

***Military Training and Testing***

The Fort Belvoir Training Regulation (Fort Belvoir Regulation 210-27) includes measures to protect vegetation and other natural resources from impact by training activities. The regulation requires ENRD review of all land disturbing activities (U.S. Army, 1994).

As needed, ENRD performs specific vegetation and/or land management activities in support of the military mission. An example of recent support actions is the tree hazard removal at Davison Army Airfield.

***Outdoor Recreation***

Fort Belvoir controls the types, locations, and magnitude of recreational activities to ensure that such uses do not adversely affect native vegetation resources. All proposed recreational activities and events must be reviewed by ENRD for potential natural resources impact. This applies to use requests from outside entities as well as requests from installation organizations (e.g., Directorate of Personnel and Community Activities).

In 1998, Fort Belvoir formalized the following broad recreational use restrictions within the Fort Belvoir Supplement to AR 200-3 (Appendix H):

- "Off-road vehicles (ORV), which include but are not limited to motorized all-terrain vehicles, snow mobiles and dirt bikes, may not be operated on Fort Belvoir. Bicycles, which include but are not limited to all-terrain bikes and mountain bikes, are not permitted off paved roadways or off paved bike trails, unless otherwise approved by DIS [Directorate of Installation Support]."

- "Privately owned watercraft, which include but are not limited to motorboats, personal watercraft, sailboats, canoes, rowboats, kayaks, and inflatable watercraft, must be launched at designated areas. All watercraft, with the exception of wind-board surfers, must be launched at the marina launch facility, unless otherwise approved by DIS… No watercraft shall be launched or landed within the wildlife refuges, unless otherwise approved by DIS."

- "Any proposed outdoor recreation use of installation refuges (Accotink Bay Wildlife or Jackson Abbott Wetland refuges) must be coordinated with, and approved by DIS. No outdoor recreational activities which are likely to have a detrimental effect on natural resources shall be permitted to occur in the refuges…"

***Forest and Agricultural Products***

Fort Belvoir has no agricultural activity.

During the past 10 years, Fort Belvoir has had small-scale timber sales, mostly selective thinning of planted loblolly pine stands and firewood sales. The most recent selective thinning was undertaken in 1998 and included three stands, totaling 31 acres. This thinning was done to improve timber stands and wildlife habitat. Also in 1998, seven acres of timber were cut from areas adjacent to Davison Army Airfield to remove the hazard that the trees presented to low flying aircraft.

In the past, Fort Belvoir conducted regular commercial logging of its forested areas. At that time more than 4,000 acres of the installation land area were under multiple use management, including commercial forest. Today, the number of acres actively managed as commercial forest consists of 400 acres of planted loblolly pine. Presently, timber sales are limited to the sale of firewood, which is sold under permit from ENRD. Timber stands of commercial value that will

be impacted by new construction are to be sold and harvested prior to the start of construction. If the timber is not sold, the assessed value of the forest products is to be accounted for.

In recent years the insect pests of major concern to Fort Belvoir have been gypsy moth and canker worms. Fort Belvoir is a cooperator with local, state and federal entities (e.g., Fairfax County Gypsy Moth Program, USDA Agricultural Research Service) to monitor and treat for gypsy moth, and to study the effectiveness of various control technologies. Forest pest management is accomplished in accordance with the *Fort Belvoir Integrated Pest Management Plan* (U.S. Army, 2000b). IPM stresses monitoring and selective use of pesticides.

Fort Belvoir uses Bt for gypsy moth treatment. The decision to make treatments is based upon annual surveys and risk assessments. The most recent treatment was performed in 1992 by aerial spraying (helicopter).

Fort Belvoir initiated treatment of forest areas for canker worms in 1999, when two separate 20-acre areas were treated.[6] The decision to perform treatment is based upon annual surveys and risk assessments.

***Environmental Education and Scientific Research and Study***

In accordance with 32 CFR 190, Part 190 – Natural Resources Management Program, "The Department of Defense shall act responsibly in the public interest in managing its lands and natural resources. There shall be a conscious and active concern for the inherent value of natural resources in all DoD plans, actions and programs." As a steward of these public lands, Fort Belvoir has established a formal program for the education of the public regarding conservation of natural resources. The ABWR Environmental Education Center was opened in April 2000 to promote the use of Fort Belvoir's two refuges (i.e., the ABWR and the Jackson Miles Abbott Wetland Refuge (JMAWR) for this purpose. The refuges and center are the focal point of the program that allows school groups and organizations to use the refuges as an outdoor classroom, allowing participants to gain a better understanding and appreciation of the installation's natural resources. In addition, colleges and universities use the refuges for formal research and study on a case-by-case basis.

***Land Development***

At the site/project level, Fort Belvoir has minimized tree loss to excavation, development and maintenance actions, by institutionalizing standards and practices for tree protection. One major tool is the Fort Belvoir *Tree Removal and Protection Policy* letter (U.S. Army, 2000d), which establishes requirements and criteria for tree protection and replacement, including a two-for-one replacement of all trees lost to new construction (Appendix I). Between 1995 and 2000, Fort Belvoir has replanted more than 100 acres as replacement for trees lost to construction projects. Other major tools are the Fort Belvoir Excavation permit, required under the Excavation Work Policy letter (Appendix J) (U.S. Army, 2000e), the Fort Belvoir Building Disposal Checklist required by the Directorate Installation Support, and the Fort Belvoir *Environmental Protection Specifications* (Appendix L), applicable to construction contracts. The Fort Belvoir permits require ENRD review of all land disturbing and facility demolition activities. Additionally, Fort

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[6] Fort Belvoir makes site-specific treatments in the cantonment area for nuisance control.

Belvoir requires ENRD review of the siting and design, including site layout and landscaping, of all new facilities.

## 9.4 CONTINUING AND FUTURE UNDEVELOPED AREAS VEGETATION MANAGEMENT

Fort Belvoir's vision for the future is to continue the management emphasis and actions addressed in Section 9.3. Simply put, this will be to conserve and enhance native vegetation resources, while providing balance among the multiple legitimate uses/users of installation vegetation resources. Continued support of military training and testing will take priority. After that, management emphasis will be on conservation and enhancement of native vegetation resources in accordance with established DoD and DA natural resources management policies, and DoD and DA commitments to natural resource stewardship programs, such as the Chesapeake Bay Program. Fort Belvoir will continue to provide the public opportunities for recreational use of undeveloped areas vegetation and for environmental education and for scientific research and study, consistent with resource conservation objectives. Fort Belvoir recognizes that, as steward of public lands, the installation has a responsibility to protect natural resources for future generations. Fort Belvoir will accomplish this stewardship through a balanced natural resources management program that emphasizes conservation and enhancement of native biodiversity.

### 9.4.1 Undeveloped Areas Vegetation Management Objectives

1. Protect against loss of native diversity of Fort Belvoir's vegetation resources, as described by DCR-NHP (McCoy and Fleming, 2000; Hobson, 1996; and Paciulli, Simmons and Associates, Ltd., 1998a, 1999a).

2. Conserve and enhance vegetation resources that have been prioritized for conservation by the Virginia Natural Heritage Program:

   a. Endangered, threatened, or rare plant species and their habitats. As of 2000, Fort Belvoir has four state rare plant species and three watchlist plant species (Sections 9.2.3 and 12.2.4):

| State Rare Species | State Watchlist Species |
|---|---|
| *Carex vestita* (velvety sedge) | *Eleocharis smallii* (creeping spikerush) |
| *Lathyrus palustris* (vetchling) | *Iris versicolor* (blueflag) |
| *Ranunculus ambigens* (water-plantain spearwort) | *Sparganium eurycarpum* (large bur-reed) |
| *Scirpus fluviatilis* (river bulrush) | |

   b. State rare plant communities. As of 2000, Fort Belvoir had four plant communities with high ("very rare" or "extremely rare") rarity rankings, as defined and mapped by DCR-NHP (McCoy and Fleming, 2000): Coastal Plain/Piedmont acidic seepage swamp, tidal shrub swamp, tidal freshwater marsh–mixed type, and tidal freshwater marsh–spikerush/golden-club type (see Section 9.2.2).

c. Wetlands

d. Riparian forests

3. Provide land cover conditions compatible with military testing and training requirements.

4. Provide opportunities for public access for recreation and for environmental education, and study consistent with resource conservation.

5. Conserve and enhance the installation's natural beauty.

### 9.4.2 Undeveloped Areas Vegetation Management Strategies

1. Continue to obtain scientific information on installation vegetation resources to support our knowledge of their biodiversity, to identify stresses and detect changes to biodiversity, and to evaluate the effectiveness of management actions.

   - Complete the next installation-wide plant community inventory update on a 10-year cycle (in fiscal year (FY) 10). The inventory will entail field survey, photo-interpretation, community characterization and GIS datalayer development. The inventory update will map plant community boundaries and will inventory the locations and acreages of each plant community type in a way that will allow for a comparison among prior inventories to identify changes. Maintain the inventory in the installation GIS.

   - Continue to perform floristic surveys to update the Fort Belvoir plant species list.

   - Develop and implement a program to monitor conditions within the ecological communities reference plots (McCoy and Fleming, 2000), in accordance with DCR-NHP recommendations. This monitoring will be undertaken to assess changes to the biodiversity of Fort Belvoir's vegetation resources. Include monitoring of the high-rarity-ranked rare plant communities, as recommended by DCR-NHP (Hobson, 1996; McCoy and Fleming, 2000). Coordinate with DCR-NHP to develop and implement the monitoring program. Develop a monitoring plan in FY 02.

   - Perform year-round surveillance (i.e., close observation, in lieu of studies or monitoring projects) of vegetation resources to detect disruptions and/or locations where threats (e.g., problem wildlife, sedimentation) are affecting resource integrity.

   - Perform localized and/or issue-specific vegetation studies (e.g., plant regeneration studies), as needed to support resource management, or for specific installation projects, such as new development.

   - Coordinate with DCR-NHP Stewardship Office, and other organizations involved with plant conservation, regarding stewardship recommendations for vegetation resources.

2. Continue to set aside areas of ecologically significant vegetation, consistent with DoD policy for setting aside areas for conservation as "Special Natural Areas" (Section 13). As of 2000, Fort Belvoir has three such areas: two refuges and the Forest and Wildlife Corridor. Consider modifying the boundaries of the refuges, and/or establishing a buffer for the refuges, to protect ecologically significant vegetation resources that presently are located outside the refuge boundaries. Continue to designate these set-aside areas as "environmentally constrained to development" in the *Fort Belvoir Real Property Master Plan*.

3. Continue to maintain a riparian forest buffer along all installation waterways and shorelines consistent with the Chesapeake Bay Program Riparian Buffer Directive.

   - Continue to designate steep-sloped riparian areas as "environmentally constrained to development" in the installation *Fort Belvoir Real Property Master Plan*.

   - Continue to re-plant, or enhance, native vegetation within riparian areas. Example projects include the following:
     - Reforestation of a minimum 200-foot wide riparian zone on the former petroleum, oil, and lubricant site along Gunston Cove
     - Riparian plantings along the Tompkins Basin shoreline, consistent with the planning for a multi-purpose recreation area at that site
     - Enhanced riparian planting along Dogue Creek above the Mount Vernon Road Bridge, consistent with the planning for the Potomac Heritage National Scenic Trail at that location. Additional planting projects will be identified and undertaken as land-use changes (e.g., as old areas are vacated and structures are removed) allow.

   - Continue to protect riparian buffer areas by directing water-based training activities (military and civilian) to designated shoreline training areas.

   - Continue to direct shoreline recreational activities to designated recreational areas.

4. Continue to develop and implement actions to control invasive/exotic species, consistent with the requirements of Executive Order 13112 to control threats to native plant community integrity by invasive/exotic species.

   - Monitor known populations of invasive/exotic species as recommended by Paciulli, Simmons and Associates, Ltd. (2000b) and DCR-NHP (McCoy and Fleming, 2000). Perform year-round surveillance for new outbreaks. Monitor for success of treatment/control actions.

   - Develop action thresholds for treatment of invasive/exotic species.

   - Continue to make treatments to control phragmites (*Phragmites australis*), as recommended by DCR-NHP (Hobson, 1996; McCoy and Fleming, 2000).

   - Develop and implement control actions for other problematic invasive species, including kudzu (*Pueraria lobata*), Chinese wisteria (*Wisteria sinensis*), mile-a minute

(*Polygonum perfoliatum*), marsh dewflower (*Murdannia keisak*), etc., as recommended by DCR-NHP (McCoy and Fleming, 2000).

- Review and revise the Fort Belvoir *Installation Design Guide* and recommended planting lists to prohibit planting problem species. Develop and provide information on invasive/exotic vegetation control through Self-Help and the Garden Center.

- Establish/participate in a regional effort for invasive/exotic vegetation control.

5. Continue to implement watershed conservation and restoration actions, consistent with the Chesapeake Bay Program (Section 7) to control and correct stormwater-related threats to vegetation resources.

   - Continue to replant and restore native vegetation cover to disturbed areas throughout installation watersheds. This includes the removal of abandoned pavement to reduce impervious surfaces.

   - Continue to correct stormwater-related problems that cause bank and in-stream erosion and bank failure that lead to downstream sedimentation and encourages establishment of invasive/exotic vegetation, as recommended by Landgraf (1999) and Allen et al. (1999).

   - Continue to implement stormwater management actions, including BMPs, to attenuate stormwater flows and prevent sediment from degrading downstream wetlands, as recommended by Allen et al. (1999).

   - Incorporate the principles of low impact development (VA DCR, 1992) in facility siting and design projects on post. Such principles emphasize preservation of vegetation cover and minimization of impervious surfaces.

   - Monitor for success of management actions, and to track existing problems and identify new problems.

6. Continue to manage the populations and the actions of wildlife having deleterious effects on installation vegetation resources and associated wildlife habitats, to control threats to vegetation resource integrity (Section 11).

   - Continue to control the deer population through the Fort Belvoir bowhunting program (Section 11).

   - Continue to monitor beaver and woodchuck activity to detect impact to vegetation resources. Establish impact thresholds that trigger control action. Develop and implement protection measures if impact thresholds have been exceeded, as recommended by DCR-NHP (Hobson, 1996; McCoy and Fleming, 2000).

7. Continue to perform vegetation restoration, enhancement and modification projects to establish or enhance native vegetation in disturbed areas, and to improve native wildlife habitat, as appropriate and possible.

8. Continue to re-establishing native vegetation to disturbed locations within environmentally sensitive areas (e.g., riparian areas, corridor, etc.). Potential projects include:

   - 1800 area abandoned driveway and parking (bottomland hardwood/riparian zone)

   - Petroleum, oil, and lubricant yard in the R&D Center (200-foot-wide riparian buffer for Gunston Cove)

   - Patrick Road along the Potomac River (transitional freshwater wetland).

9. With regard to wildlife habitat enhancement, continue (1) to use wildlife seed mixes recommended by VDGIF when re-planting disturbed areas where appropriate (e.g., utility line rights-of-way) and (2) to convert grasslands from exotic, low-value wildlife cover (e.g., fescue, lespedeza) to native, high-value early and transitional successional habitat conditions, according to the recommendations of Paciulli, Simmons and Associates, Ltd. (1996), the PIF Program (Watts, 1999), and VDGIF where appropriate. Potential projects include the following:

   - Strip mowing, soil amendment, and seeding three old landfill sites along Poe Road including one in the ABWR.

   - Maintaining Theote Debris Fill cap with clover and orchard grass mix

   - Strip mowing training area T-9.

10. Continue to review and respond to military (e.g., Directorate of Plans, Training, Mobilization, and Security; Davison Army Airfield; Reserves, etc.) requirements for vegetation management (e.g., vegetation hazard control).

11. Continue to review and respond to Fort Belvoir Outdoor Recreation Office requests for access to/use of vegetation resources.

12. Continue to manage forests to balance potential commercial value with wildlife value.

    - Continue to control forest pests, in accordance with the principles of Integrated Pest Management, as required by AR 200-5, to control threats to vegetation resource integrity. Continue to monitor gypsy moth and canker worms in accordance with the *Fort Belvoir Integrated Pest Management Plan* (IPMP) (U.S. Army, 2000b). This includes gypsy moth egg mass surveys in the fall and/or winter, and canker worm surveys in the winter. Continue to perform surveillance to detect occurrences of new forest pests in accordance with the Fort Belvoir IPMP.

      - Continue to perform treatments for gypsy moths and canker worms on post in accordance with the Fort Belvoir IPMP.
      - Continue to maintain liaison with Fairfax County, Virginia Department of Forestry and USDA Forest Service personnel regarding current actions,

infestations, new initiatives and new products related to pest monitoring and control.

- Evaluate the threat of wildfire.
  - Review and provide recommendations for updating the Fort Belvoir Fire Department's standard operating procedures concerning wildfire control measures. Create a system to determine when fuel loads in firebreaks pose a fire hazard and maintain firebreaks accordingly. Identify BMPs to reduce fire hazard.
  - Coordinate with the Virginia Department of Forestry for information on fire indices, potentially hazardous fuel loads, and fire prevention measures.

- Continue to perform timber stand improvement.
  - Continue to replant/reforest areas after harvest.
  - Continue to emphasize wildlife habitat enhancement during timber stand improvement. Continue to use wildlife seed mixes in replanting after timber removals, as appropriate.

13. Continue to conduct timber inventories and sales in accordance with the requirements of AR 200-3.

    - Complete the next installation-wide timber inventory in FY 01, on the 10-year cycle set by AR 200-3. The inventory will entail field survey, photo interpretation and GIS datalayer development. The results of the inventory will be incorporated into the installation GIS.

    - Develop timber contracts and conduct sales as warranted to enhance biological integrity and to dispose of timber designated to be removed for new construction. Conduct firewood sales.

14. Continue to use the installation project/activity review process to incorporate vegetation conservation requirements into all phases of facilities siting, construction, renovation, operation, maintenance, and demolition activities; in reviewing and supporting military training and testing activities; and, in reviewing and responding to outdoor recreation, environmental education, scientific research and study, all other types of land area access and use requests.

    - Continue to issue the *Fort Belvoir Tree Protection Policy Letter* to stress preservation of trees, and replacement of unavoidable loss of trees due to construction or due to natural causes, such as storm damage, insects or disease. Continue to require all tree removals to be reviewed and approved by ENRD, and replaced at a minimum two-to-one ratio.

    - Review and revise as needed the Fort Belvoir *Environmental Protection Specifications* applicable to construction contracts to ensure that they include vegetation protection provisions.

    - Review and revise as needed the *Fort Belvoir Environmental Checklist* to address vegetation protection.

- Develop recommendations to revise the *Installation Design Guide* to include site planning and construction design that minimizes natural area loss, adopts low impact development and BMPs (for stormwater management and sediment and erosion control), and reduces impervious surfaces.

- Incorporate vegetation protection strategies into utilities privatization, and all other privatization and outsourcing actions, as appropriate.

- Develop recommendations for the formation of a facilities siting and design review committee that includes representatives from ENRD, Master Planning, and the Contract Management Division. The committee should develop and participate in a siting and design review process to ensure the consideration of vegetation protection in all siting and design decisions.

- Continue to include vegetation protection as part of the Excavation Permit and Demolition Permit review processes.

- Continue to include vegetation protection in all real estate actions (e.g., outgrants, leases, rights of entry) as appropriate.

- Review and revise as needed the Fort Belvoir Training Regulation to address vegetation protection.

15. Continue to provide technical assistance for emergency situations, such as uncontrolled fires, that threaten vegetation resources.

16. Continue to respond to requests for technical information from on-post and off-post entities, as appropriate.

17. Continue to investigate and enforce violations of federal and state laws and regulations, as well as DoD, DA, and Fort Belvoir policies.

# 10.0
# Developed Areas Vegetation

Urban forestry and the landscaping of developed areas can affect both the quality of life for Fort Belvoir residents and the quality of the natural resources on Fort Belvoir. On the installation, a "campus quad" appearance is maintained on the South Post Core Area, and clustered development on the Upper North Post is designed to preserve large areas of open space (Woolpert, 1995). While aesthetics are an important concern to this installation, it is desirable and possible to manage developed areas vegetation with sound stewardship principles in mind. The management of developed areas on Fort Belvoir can result in energy conservation, preservation of historic and specimen trees, grounds maintenance cost savings, beautification and increased property values, improved living and working conditions, soil conservation, enhancement of water supplies, runoff and nonpoint sources of pollution control, and good land stewardship.

Natural plant communities that are located within the developed areas of Fort Belvoir provide numerous benefits to people and wildlife. They can serve as valuable islands of habitat for common wildlife associated with urban areas. In areas where plant communities are contiguous, they may serve as small corridors for migratory species that pass through developed areas. Vegetation in these areas helps reduce the ambient air temperature, thus reducing energy costs during the warmest months and providing a more pleasant living environment. Trees absorb sunlight, preventing the ground from excessive heating and cooling the air directly through evapotranspiration. Vegetation is valuable within developed areas because of beneficial effects on pollution. Grassy areas can reduce and retain stormwater flow from impervious surfaces like roofs and parking lots, while also filtering out pollutants such as toxics and nutrients. Vegetation also provides cleaner air by absorbing carbon and some pollutants. Native vegetation areas on developed land often require little or no management, and therefore can effectively reduce the amount of pesticides and herbicides applied. These areas can also provide varied opportunities for recreation, thus improving quality of life for residents and visitors on Fort Belvoir.

As of 2000, about 30% of Fort Belvoir's Main Post and EPG consists primarily of improved and semi-improved grounds associated with the administrative, housing, community service facilities and golf courses on post. Management actions in the improved and semi-improved areas focus on maintaining aesthetics and function. Management generally includes landscaping, turf management, and urban tree management.

## 10.1 Developed Areas Vegetation Policies

### 10.1.1 Federal Developed Areas Vegetation Policy

Executive Order 13148 *Greening the Government through Leadership in Environmental Management* contains overarching direction regarding management of vegetation in developed areas. The order directs federal agencies to strive to promote the sustainable management of

federal facility lands through the implementation of cost-effective, environmentally sound landscaping practices, and through programs to reduce adverse environmental impacts. The Order requires agencies to incorporate the Guidance for the 1994 Presidential Memorandum on *Environmentally and Economically Beneficial Landscape Practices on Federal Landscaped Grounds* into landscaping programs, policies, and practices (60 Fed. Reg. 40837). This memorandum directs agencies to adopt the following principles where cost-effective and to the extent practicable:

- Use regionally native plants for landscaping.
- Design, use, or promote construction practices that minimize adverse effects on the natural habitat.
- Seek to prevent pollution by, among other things, reducing fertilizer and pesticide use, using integrated pest management techniques, recycling green waste, and minimizing runoff.
- Implement water-efficient practices, such as the use of mulches, efficient irrigation systems, audits to determine exact landscaping water-use needs, and recycled or reclaimed water and the selecting and siting of plants in a manner that conserves water and controls soil erosion. Landscaping practices, such as planting regionally native shade trees around buildings to reduce air conditioning demands, can also provide innovative measures to meet the energy consumption reduction goal established in Executive Order No. 12902, "Energy Efficiency and Water Conservation at Federal Facilities."
- Create outdoor demonstrations incorporating native plants, as well as pollution prevention and water conservation techniques, to promote awareness of the environmental and economic benefits of implementing this directive. Agencies are encouraged to develop other methods for sharing information on landscaping advances with interested non-federal parties.

Other federal regulations that guide undeveloped vegetation management on Fort Belvoir include the following:

- The Federal Noxious Weed Act of 1974 (7 U.S.C. §§ 2801-2814) prohibits the import or movement of nonindigenous weeds that have the potential to interfere with the growth of useful plants, clog waterways, interfere with navigation, cause disease, and that generally are detrimental to agriculture, commerce, and public health, unless pursuant to a permit. The Act prohibits the sale, purchase, barter, exchange, taking, or giving of a noxious weed in violation of the Act. The Act also requires each federal agency to develop a management program to control undesirable plants on federal lands when a similar state program is in place. Where applicable, federal agencies are to enter into cooperative agreements with state agencies to coordinate the management of undesirable plant species on federal lands.
- Executive Order 13112, *Invasive Species*, establishes duties for federal agencies concerning the detection and control of invasive species. To the extent possible, installations should work to prevent introductions of invasive species, control detected

populations, accurately monitor populations, restore native species and habitats affected by invasive species, and promote public education on invasive species and their control.

- The Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) (7 U.S.C. 136 et seq.) affords vegetation protection by emphasizing pest management using biological, cultural, chemical, and physical tools in a manner that minimizes economic, health, and environmental risks.

- The Plant Quarantine Act (7 USC 15 1-164a, 167) calls for the Animal and Plant Health Inspection Service (APHIS) to regulate the importation and interstate movement of nursery stock and other plants that may carry harmful pests and diseases.

- The Federal Plant Pest Act (7 USC 150aa-150jj) prohibits the movement of plant pests from a foreign country into and through the U.S., unless permitted by the Secretary of Agriculture. The APHIS has broad authority to inspect, seize, quarantine, and destroy potentially harmful plant and animal materials.

- The Organic Act of 1944 (7 USC 147a, 148, 148a-e) authorizes the APHIS to detect, eradicate, suppress, control, prevent, or retard the spread of plant pests.

### 10.1.2 State Developed Areas Vegetation Policy

Virginia has no overarching policy to guide the management of vegetation in developed areas. However, the Virginia Noxious Weed Law (Code of Virginia, Title 3.1, Chapter 17.2), relates to plants and seeds used in landscaping. This law prohibits the movement, transport, delivery, shipment, or offering for shipment into or within Virginia of any noxious weed, without a permit from the Commissioner of Agriculture and Consumer Services. The law calls for the Board of Agriculture and Consumer Services to establish implementing regulations; however, to date no regulations have been promulgated. A number of related guidance documents and fact sheets have been issued by the Virginia Department of Conservation and Recreation, Natural Heritage Program; for example, Natural Heritage Technical Report 98-25, *Managing Invasive Alien Plants in Natural Areas, Parks, and Small Woodlands*; Virginia National Heritage Program Fact sheet, *What are Invasive Alien Plant Species and Why are They a Problem?*; and Virginia National Heritage Program Fact sheet, *Invasive Alien Plants List.*

The Virginia Pesticide Control Act (Title 3.1, Chapter 14.1 of the Code of Virginia) confers powers and authority on the Virginia Pest Control Board to develop regulations that restrict or prohibit the sale or use and disposal of any pesticide or pesticide container or residuals that are toxic or hazardous to humans or wildlife, or may adversely affect the environment. The Board is to consult with the Virginia Department of Environmental Quality concerning compliance with applicable waste management regulations for disposal of pesticides concentrates and pesticide containers; the Virginia Department of Labor and Industry concerning safe working conditions for pest control and agricultural workers; and the Department of Game and Inland Fisheries concerning standards for the protection of wildlife and fish. Under the Act, the Board also is to require that pesticides are adequately tested and are safe for local uses and that individuals who sell, store, or apply pesticides commercially are properly trained.

### 10.1.3 Department of Defense Developed Areas Vegetation Policy

Although the Department of Defense (DoD) has no overarching instruction regarding management of vegetation in developed areas, several of its instructions touch upon aspects of such management. DoD's natural resources management policy is contained within DoDI 4715.3, *Environmental Conservation Program*. It states that "Environmentally and economically beneficial landscaping practices shall be used on all DoD lands… Each installation shall, to the extent practical, use regionally native plants for landscaping and other beneficial techniques."

DoD Directive 4700.4, *Natural Resources Management Program*, states that "Costs for maintaining grounds shall be minimized by providing the least amount of mowed areas and special plantings necessary to accomplish management objectives and by the use of low maintenance species, agricultural outleases, wildlife habitat, and tree plantings."

DoD's pest management policy is contained within DoDI 4150.7, *Department of Defense Pest Management Program.* This instruction implements the policy established under DoDI 4715.1, *Environmental Security*, to:

- Establish and maintain safe, effective, and environmentally sound integrated pest management (IPM) programs to prevent or control pests and disease vectors that may adversely impact readiness or military operations by affecting the health of personnel or damaging structures, materiel, or property. (4.1)

- Ensure DoD pest management programs achieve, maintain, and monitor compliance with all applicable Executive Orders and applicable federal, state, and local statutory and regulatory requirements. (4.2)

- Incorporate sustainable IPM philosophy, strategies, and techniques in all aspects of DoD and Component vector control and pest management planning, training, and operations including installation pest management plans and other written guidance to reduce pesticide risk and prevent pollution. (4.3)

Excerpts from DoDI 4150.7 that are applicable to installation pest management programs are presented below.

| **Excerpts from DoDI 4150.7<br>Select Provisions Applicable to Pest Management in Developed Areas** |
|---|
| ■ Develop, maintain, annually review, and revise their pest management plans consistent with the program elements in enclosure 4 and [Armed Forces Pest Management Board] AFPMB Technical Information Memorandum (TIM) 18, "Installation Pest Management Guide," February 1987. (5.3.22.1)<br><br>■ Implement pest management programs approved by pest management consultants and performed by certified pesticide applicators in accordance with the pest management plan written for each installation. (5.3.22.2) |

**Excerpts from DoDI 4150.7**
**Select Provisions Applicable to Pest Management in Developed Areas**

***(continued)***

- Establish pest management self-help programs for military housing when cost effective and when IPM monitoring indicates a need for a self-help program. (5.3.22.3)

- Have all pesticide applications to DoD installations made only by properly trained and certified personnel in accordance with DoD Plan for the Certification of Pesticide Applicators of Restricted Use Pesticides…or by State-certified applicators. (5.3.22.4)

- Use pesticides in accordance with applicable laws including FIFRA…(5.3.22.5)

- Use only pesticides that have been approved by a DoD pest management consultant. Consideration should be given to locally purchased pesticides to ensure conformance with State management plans for ground water protection and to facilitate use of recyclable pesticide containers when appropriate pesticides are not available in the Federal supply system. Pesticides may be procured locally if needed for an emergency, if required due to unique local situations, or if required in quantities so small that assignment of an NSN is not practical. (5.3.22.6)

- Maintain complete daily pesticide application and pest management operations records as required by FIFRA…and 7 U.S.C. 136i-1…or for pest management measures of merit, using DD Form 1532-1 or a computer-generated equivalent. Produce a monthly summary, using DD Form 1532 or computer-generated equivalent, to provide data for regulatory, DoD, Federal, State, or local agency data calls; component program review and oversight; and Measures of Merit…(5.3.22.7)

- Use pest management contracts when more cost-effective than in-house services. Ensure that firms and their employees performing contract pest management work on DoD installations, and in support of DoD operations overseas, comply with all certification, licensing, and registration requirements of the State or county where the work is performed. Ensure that the technical portions of contracts involving pest management reflect IPM methodology and are reviewed and approved by a DoD pest management consultant before solicitation. (5.3.22.8)

- Have quality assurance evaluators…who have been trained in pest management at DoD-sponsored courses, inspect pest management operations and pesticide applications performed by contractors. (5.3.22.9)

- Report pest management operations and pesticide applications performed by contractors… (5.3.22.10)

### 10.1.4 Department of the Army Developed Areas Vegetation Policy

The Department of the Army's (DA's) natural resources management policy is contained within AR 200-3, *Natural Resources–Land, Forest and Wildlife Management*. This regulation establishes the DA's requirements for managing and using land and water resources in accordance with the principles of ecosystem management. Excerpts from AR 200-3 are provided below.

| Excerpts from AR 200-3<br>Select Provisions Applicable to Developed Areas Vegetation Management |
|---|
| ■ The natural resources management professional will be an active participant in all planning and decision making activities regarding uses of the land to ensure that current and planned mission activities (for example, master planning, construction requests, site approval requests, and training exercise plans) are conducted in a manner which is compatible with natural resources and other environmental requirements. (3-2b)<br><br>■ Grounds will be maintained at the levels and intensities necessary to meet the designated use criteria, protect, and enhance the natural resources, and ensure a pleasing appearance in harmony with the natural landscape. Designated turf areas will be maintained (renovated, seeded, aerated, fertilized, and irrigated) to the degree required to maintain a permanent vegetative cover of desirable plants necessary to support the intended use. Guidance available from local agricultural agencies and universities will be used in determining the most adapted species of vegetation and the maintenance practices necessary to meet the designated use. Improved grounds will be maintained at a level comparable with similar public facilities in the area. The Army Community of Excellence and self-help programs are to be an integral and active force in grounds maintenance/landscape improvements and installation beautification initiatives. The appropriate environmental directorate is to provide technical guidance and approved materials to all interested occupants, building managers, tenants, as well as other personnel interested in improving the living and working areas on the installation. (4-1a)<br><br>■ Costs for maintaining grounds will be minimized by providing the least amount of mowed area and landscape plantings necessary to accomplish management objectives and by the use of low maintenance species, agricultural leases, reforestation, natural areas, and wildlife habitat. Standards for maintenance of all categories of grounds will comply with TM 5-630. (4-1b)<br><br>■ All planting, pruning, cultivation, and other maintenance will conform to criteria in TM 5-63O, ANSIZ60 standards, and the approved Installation Design Guide. (4-8a)<br><br>■ Trees and shrubs will be removed if they have become terminally plagued by insect or disease problems, high maintenance costs, health or safety hazard to persons or property, or have become non-complementary to architectural features of the building area. (4-8b)<br><br>■ Justification and merits for landscape and urban forestry expenditures in the urban ecosystem include: energy conservation, preservation of historic and specimen trees, grounds maintenance cost savings, beautification and increased property values, increased species and habitat biodiversity, improved living and working conditions, soil conservation, enhancement of water supplies, control of runoff and non-point sources of pollution, and good land stewardship. (4-8c)<br><br>■ Landscaping will be functional in nature, simple and informal in design, meet professional standards for species, design and installation; be compatible with adjacent surroundings, and complementary to the architectural features and the overall natural setting of the area. Formal landscape designs will be limited to specific high visibility areas including main building and road entrances, ceremonial areas, and other special use sites as warranted. Emphasis will be on the use of low maintenance indigenous plants. Normally not more than one-fourth of an individual foundation perimeter will be planted with shrubs or trees. In arid and semi-arid areas, use water efficient (xeric) plants. A viable Landscape Planting Plan will be an integral part of the Integrated Natural Resources Management Plan Installation Design Guide under the Master Plan. (4-8d) |

**Excerpts from AR 200-3**
**Select Provisions Applicable to Developed Areas Vegetation Management**

***(continued)***

- All landscape plantings will be compatible with other grounds maintenance requirements and will be coordinated with, reviewed, and approved by the Facility Engineer, Master Planning, utilities, and the natural resource manager. Painting or white-washing of tree trunks and stones is not authorized. (4-8h)

- When flowerbeds are an important cultural landscape feature of the community, they may be planted and maintained as a facilities engineering activity but should be limited to the main entrance to the installation, headquarters, or in areas used for ceremonial purposes. When authorized, flower beds will be laid out in accordance with a planting and maintenance plan to ensure that
  1. Costs are minimized by an appropriate mixture of perennials, annuals, and indigenous wildflowers.
  2. Plant materials are compatible with the site, exposure, and growing zone; and exotic species or plant materials that serve as an attractant or host to pests are not used.
  3. Acquisition and/or maintenance costs are reasonable.
  4. Indigenous and cultivable threatened and endangered species are to be given primary consideration. (4-8i)

- Landscape plans and actions in significant historic sites or districts will be reviewed for their potential effect according to AR 420-40 [now AR 200-4], chapter 3. (4-8j)

- The integrated urban forest ecosystem encompasses many environments, disciplines, and concepts. This includes open lands, water, and vegetated areas in and adjacent to improved and semi-improved grounds as well as woodland borders. The urban forest includes individual trees as well as groupings and small tracts scattered among more dominant land uses. Multiple use of this resource must occur within and among this complex system of interspersed land uses. Urban forests are valued primarily for their non-consumptive contributions to our everyday lives and the environment in which we live. See Landscape Plantings, chapter 4, paragraph 4-8c. Wood products and volumes from an urban tree are usually identified only for salvage operations (4-9a)

- An Urban Forest Management Plan will be an integral part of and integrated with the Installation Master Plan, and the natural resource management plan. The plan should include professional standards (National Arborist Association, American Association of Nurseryman "American Standard for Nursery Stock," Council of Tree and Landscape Appraisers "Guide for Plant Appraisal"), technical specifications, training, certification, and requirements for all actions impacting the planting, growth, and survival of all trees in the urban forest ecosystem. This includes specific standards for planting, pruning, fertilizing, removal, utility clearance, and integrated pest management; the identification, protection, and preservation of historic and specimen trees; and the training, licensing, and certification of personnel and contractors. (4-9b)

- All applicable installations with a land management program will have a Command Tree Policy Directive and/or Tree Ordinance that identifies and provides specific requirements, authorization, and approvals for excavation permits, tree removals, and liabilities for unauthorized tree removal and damage. (4-9c)

AR 200-5 *Pest Management* implements the requirements listed above for DoDI 4150.7. The regulation seeks to protect health, property, and natural resources from damage by insects, weeds, and other pests in ways that promote training and readiness with a minimum risk to the environment. The regulation promulgates policies, responsibilities, and procedures to implement the Army Pest Management Program, and supplements the federal, state, and local laws described in AR 200-1 for the Army Environmental Program. In implementing DoDI 4150.7, each installation's Department of Public Works must prepare and annually update a pest management plan. The plan should list all program objectives, prioritized according to the potential or actual impact on health, morale, structures, or property. The current Fort Belvoir Integrated Pest Management Plan was approved and signed by the Major Army Command (MACOM) and the Garrison Commander in December of 1998.

### 10.1.5 Fort Belvoir Developed Areas Vegetation Policy

Fort Belvoir has no overarching policy regarding developed areas vegetation management on-post. It does, however, have several policies pertaining to specific aspects of vegetation management (e.g., tree protection during construction, pest management). Fort Belvoir's installation-specific natural resources management policies are contained within the Fort Belvoir Supplement to AR 200-3 (dated February 20, 1996) (Appendix H). Fort Belvoir's *Tree Removal and Protection Policy* (Appendix I), based on the urban forest management requirements in Fort Belvoir's Supplement to AR 200-3, outlines requirements and criteria for tree protection and replacement. The *Tree Removal and Protection Policy* promotes "site planning techniques and construction practices that maximize retention and protection of existing trees before considering removal." It requires that "…all proposed tree and shrub removals as well as construction and excavation activities that may impact the growth and survival of trees are to be approved by the DIS." The policy also requires that "Two new trees are to be planted for each tree 4 inches and larger in diameter… removed through construction on Fort Belvoir."

Fort Belvoir *Integrated Pest Management Policy*, 200-04-00 dated 24 January 2000 requires planning that incorporates "education, recordkeeping, and best management practices to prevent pests and diseases from damaging property" (Appendix K). It also requires that all pest management operations on Fort Belvoir are carried out in accordance with the Fort Belvoir Integrated Pest Management Plan and applicable federal, state, and local laws (U.S. Army, 2000b). The policy letter designates ENRD as the responsible party for pest management compliance on Fort Belvoir, which enables it to enforce its requirements.

### 10.1.6 Chesapeake Bay Program

DoD and DA are signatory partners of the Chesapeake Bay Program (CBP). The 1987 *Chesapeake Bay Agreement*, the 1990 *Cooperative Agreement Between DoD and EPA Concerning Chesapeake Bay Activities*, the 1993 *DoD/EPA Action Items for the Chesapeake Bay Program*, the 1994 *Agreement of Federal Agencies on Ecosystem Management in the Chesapeake Bay*, the 1998 *Federal Agencies' Chesapeake Ecosystem Unified Plan (FACEUP)*, and the renewed Chesapeake Bay agreement, *Chesapeake 2000*, contain specific goals, objectives, and commitments designed to provide for the restoration and protection of the Bay's living resources and their habitats. In particular, the 1994 *Agreement of Federal Agencies on Ecosystem Management in the Chesapeake Bay* states that federal agencies agree to aid in the

reduction of toxic loadings to the Chesapeake Bay and its tributaries by using "BayScapes" and other successful programs to expedite compliance with the president's directive on environmentally and economically beneficial landscaping practices on federal facililities in the Bay watershed. In addition, the CBP's 1998 *Federal Agencies Chesapeake Ecosystem Unified Plan* commits federal signatory agencies to expand conservation landscaping practices on their facilities through the development and implementation of new specifications and design criteria. Other elements of the plan include model lease provisions for federal facilities that address Chesapeake Bay stewardship goals, the implementation of integrated pest management on 75% of federally-owned facilities in the Bay watershed, and the development of nutrient management plans that address agricultural, construction, turf, golf course and recreation, and other developed federal lands. The *Chesapeake Bay Basinwide Toxics Reduction and Prevention Strategy*, signed in 1994, commits DoD and DA to reduce or eliminate chemical contaminants to the Bay from controllable sources, such as applications of pesticides. The *Toxics 2000 Strategy* renews this commitment and sets new goals for reducing the impacts of chemical contaminants.

## 10.2 BASELINE DEVELOPED AREAS VEGETATION CONDITIONS

As of 2000, Fort Belvoir has completed the following surveys in installation developed areas (Table 9.1):

- Plant community survey and mapping
- Urban forest inventory and mapping
- Improved grounds mapping
- Invasive/exotic vegetation survey and mapping (including developed and undeveloped areas).

### 10.2.1 Plant Community Survey

The installation-wide plant community survey (Section 9.2.1) designated all developed areas at Fort Belvoir as urban land. Urban land consists of improved and semi-improved grounds including buildings, landscaped areas, the airfield, and golf courses. The vegetation is characterized by a wide variety of landscaped trees and shrubs, tall fescue grass, and Kentucky bluegrass (*Festuca arundinacea*) (Paciulli, Simmons and Associates, Ltd., 1998a; 1999a).

### 10.2.2 Urban Forest Inventory

An urban forest inventory was completed for the installation in 2000 (Davey Resource Group, 2000). The inventory data includes recording locations, species, and sizes of urban trees on the installation. The inventory data are included in the installation GIS. The urban forest inventory also includes management recommendations that will be incorporated into the current and future Real Property Maintenance Contract for grounds maintenance.

### 10.2.3 Improved Grounds Vegetation Inventory

Fort Belvoir maintains an inventory of improved grounds (flower beds and mowed areas) on the installation GIS and through the Real Property Maintenance Contract. As of 2000, Fort Belvoir has 18 flower beds totaling 2.6 acres, 720.2 acres of improved mowed areas, and 35.4 acres of semi-improved mowed areas (Bartley, 2000).

### 10.2.4 Invasive Exotic Vegetation Survey

The installation-wide invasive/exotic vegetation survey included species occurring on the unimproved areas, and on the edges of the improved areas of the installation (Paciulli Simmons and Associates, 2000b). Table 9.4 presents a summary of the 14 invasive/exotic vegetation species on Fort Belvoir with significant occurrences to warrant consideration for control. Table 9.4 also summarizes the location and size of each occurrence and the type of habitat in which it exists. The locations of problematic occurrences of invasive and exotic vegetation are being incorporated into the installation GIS.

## 10.3 DEVELOPED AREAS VEGETATION MANAGEMENT

### 10.3.1 Developed Areas Vegetation Conservation Recommendations

As of 1999, Fort Belvoir has existing management plans for improved grounds (as implemented through the Real Property Maintenance Contract), urban forest, and invasive/exotic vegetation. Fort Belvoir's developed areas management will continue to focus on sustaining and enhancing the installation's urban forest resources, and on providing grounds maintenance services. Key installation-wide management actions will continue to emphasize the following:

- Minimizing tree loss to new construction and to operations and maintenance activities, and mitigating unavoidable losses
- Implementing a mowing reduction strategy for the installation
- Performing urban forest management (e.g., street tree planting)
- Performing pest management in accordance with the installation Integrated Pest Management Plan
- Performing invasive/exotic vegetation management.

### 10.3.2 Developed Areas Vegetation Management Actions to Date

Fort Belvoir manages its vegetation resources in the developed areas in accordance with the requirements of DoDI 4715.3, DoDI 4150.7, DoDD 4700.4, and AR 200-3. Fort Belvoir's natural resources management program has focused on balancing the aesthetic and functional requirements with sound stewardship principles. The developed areas vegetation management component of Fort Belvoir's natural resources program has multiple environmental benefits including saving energy and reducing stormwater flow, filtering out pollutants such as nutrients

and toxics, and reducing the use of pesticides, herbicides, and fertilizers. The program also contributes to improving the quality of life for the Fort Belvoir community by enhancing the natural setting on post.

#### *10.3.2.1 Developed Areas Vegetation Conservation*

Fort Belvoir has institutionalized standards and practices to minimize tree losses resulting from excavation, development and maintenance actions. The Fort Belvoir *Tree Removal and Protection Policy* establishes requirements and criteria for tree protection and replacement including a two-for-one replacement of all trees lost to new construction (U.S. Army, 1998a). The Fort Belvoir *Excavation Work* policy letter (U.S. Army, 1998b) through the excavation permit process requires ENRD review and approve all land disturbing actions. The ENRD reviews all designs for new construction and facility renovations including site clearing and layout to minimize vegetation/tree losses. Proposed planting plans are also reviewed to ensure that appropriate plant materials and planting strategies are proposed.

#### *10.3.2.2 Grounds Maintenance Management*

Government specifications in the Real Property Maintenance Contract prescribe standards for managing improved grounds (turf, trees, and landscape beds) on Fort Belvoir. This includes requirements for the flower species to be planted and the level of overall flowerbed care (e.g., fertilizing, weeding mulching, watering, addition of compost and tilling). Fort Belvoir's management actions for flower beds have focused on minimizing intensive planting and maintenance operations, and enhancing the planting of native species.

Mowing and leaf removal specifications in the Real Property Maintenance Contract for improved areas that are typically in highly visible locations, and for semi-improved areas that are in less visible locations reflect land use changes, current activities, and the protection and preservation of natural resources. The specifications include standards and criteria for mowing height and frequency, turf repair and re-establishment, liming and fertilization, landscaping, and tree care. A postwide mowing reduction program begun in 1998 has resulted in the removal of 70 acres from the intensive mowing and leaf removal schedule. Improved tree protection and health was a major factor in the decision to do so. Under the mowing reduction program, designated areas are either removed from mowing or are mowed only when site conditions warrant. All turf areas are reviewed annually for mowing and leaf removal modifications. In determining mowing modifications, the aesthetics, costs, area uses, environmental impacts, and equipment needs are factors that are considered.

#### *10.3.2.3 Urban Forest Management*

Urban forest management on Fort Belvoir has focused on maintaining tree cover and controlling pests. The *Urban Forest Management Plan* is a component of the Real Property Maintenance Contract. The plan specifies routine care for urban trees including health diagnosis, treatment, pruning, removal, transplanting and fertilization.

#### *10.3.2.4 Invasive/Exotic Species Management*

The *Invasive/Exotic Vegetation Management Plan* (Paciulli, Simmons and Associates, Ltd., 2000b) provides strategies for identifying and controlling occurrences of problematic invasive/exotic vegetation on post, and reducing the risk of introducing new problem species or spreading species to new locations. Both unimproved and improved grounds are included in the plan. Plan components include monitoring for occurrences of problematic species, tracking occurrence(s), determining the need for treatment, determining the appropriate treatment regime, and monitoring success of treatments. The plan also includes institutional controls to safeguard against future introductions of invasive/exotic vegetation species.

Invasive/exotic vegetation management to date has focused on eradicating existing priority invasions of exotic species. Projects that have been completed in the developed areas include the following:

- Cutting back kudzu along the Potomac River at the Officers' Club
- Treating Japanese bamboo (*Phyllostachys* spp.) at various locations (e.g., Accotink Bay Wildlife Refuge entrance)
- Controlling phragmites at a number of sites bordering Accotink Bay and Dogue Creek
- Removing purple loosestrife (*Lythrum salicaria)* at Tully Gate, the Youth Center, and other locations in the improved area.

## 10.4 CONTINUING AND FUTURE DEVELOPED AREAS VEGETATION MANAGEMENT

Fort Belvoir's vision for the future is to continue the management emphasis and actions addressed in Section 10.3. Fort Belvoir will continue to implement urban forest management and landscaping practices in the developed areas that contribute to both the quality of life for Fort Belvoir residents and the quality of natural resources on post. The management emphasis will continue to be in accordance with established DoD and DA policies, as well as with commitments in the various Chesapeake Bay Program agreements. These commitments include nutrients and toxics reduction, conservation landscaping, and integrated pest management. Fort Belvoir recognizes that sound management of developed areas can result in numerous benefits, including energy conservation, preservation of historic and specimen trees, increased beautification, improved living and working conditions, soil and water conservation, reduced runoff and non-point sources of pollution, and good land stewardship.

### 10.4.1 Developed Areas Vegetation Management Objectives

- Provide for appropriate planting and maintenance based on site conditions and use.
- Employ conservation landscaping practices that result in energy savings, preservation of historic and specimen trees, manage stormwater and non-point sources of runoff, and reduced grounds maintenance costs.

- Reduce pesticide applications by 50% per unit of improved facilities by the year 2001 and by 75% by 2005 using 1994 as the baseline year.
- Implement initiatives or best management practices to reduce fertilizer/nutrient runoff.
- Maintain and enhance the health and value of landscape trees of the urban forest.
- Maintain a no net loss of urban tree cover to enhance and meet ecological, aesthetic, and conservation needs and objectives.

### 10.4.2 Developed Areas Vegetation Management Actions

1. Implement IPM for controlling pests and nutrient runoff in developed areas.

   - Incorporate IPM practices and techniques into grounds activities and the Real Property Maintenance Contract technical specifications.
   - Implement grounds maintenance cultural practices and standards in the cantonment area to reduce need and dependency on pesticides.
   - Establish best management practices for all organizations and contractors engaged in turf management and maintenance to control and reduce nutrient runoff from the golf courses and other turf areas.
   - Manage trees and landscapes on an individual basis to reduce fertilizer, pesticide and irrigation demands and applications.
   - Ensure that all approved fertilizers, lime and pesticides are properly stored and protected.
   - Conduct annual review and update to the Installation Integrated Pest Management Plan.

2. Implement turf management at levels and intensities necessary to meet the designated use, and to support the elements of the military mission.

   - Review turf mowing levels and areas annually to update specific site requirements, efficiency and compatibility with area use and natural resources. Note sites where mowing should be reduced or eliminated and make appropriate adjustments to GIS maps and contract specifications.
   - Turf areas are to be maintained employing current best management practices based on site conditions (not set schedules) and area use with the highest level of maintenance designated for major entrances, parade fields and major administrative buildings.

- Mow and maintain turf in improved grounds to a height of between 3 and 4.5 inches. Semi-improved grounds are to be maintained between 3 and 8 inches. There is to be no mowing in areas where turf and other vegetation is under severe moisture stress.

- In the goose management areas of Davison Army Airfield, grass is to be mowed no shorter than 7 to 14 inches. Begin mowing grass adjacent to the runways and finish in the infield or outermost grass areas. Do not mow grass adjacent to the runway shorter than in other areas.

3. Implement urban forest management practices to minimize tree loss from development and pests, and preserve historic and specimen trees.

   - Refer to Appendices I through L for current copies of *Fort Belvoir Tree Removal and Protection Policy Letter*, *Excavation Permit Policy Letter*, *Integrated Pest Management Policy Letter*, and the Fort Belvoir *Environmental Protection Specifications* applicable to construction contracts (which contains tree protection standards).

   - Shade trees are to be incorporated into all building and parking designs. Refer to the Fort Belvoir Installation Design Guide.

   - Maintain the two-to-one tree replacement policy.

4. Implement environmentally and economically beneficial landscaping.

   - Conservation landscaping practices are to be implemented. Native plant species are to be utilized for the majority of new plantings. Other considerations include water requirements, soils, and other existing site conditions that relate to plant survival and site compatibility. A list of recommended species for planting in included in Appendix M.

   - Identify annual requirements for landscape plantings as well as tree and shrub seedlings for site reclamation and restoration of native habitat. This includes terminated training areas, building demonstration sites, utility rights-of-way, and other areas suitable for habitat restoration.

   - Continue the mowing reduction program, which includes such actions as eliminating mowing, or reducing mowing frequency.

5. Expand education and outreach efforts to address the benefits of conservation landscaping and integrated pest management.

- A demonstration/education conservation landscape display will be established and maintained on Fort Belvoir. The living display will provide examples of beneficial landscapes for organizations and residents.

- Develop and maintain self-help instruction/technical brochures and training programs for Fort Belvoir personnel that identify procedures, materials and practices in regards to grounds maintenance, landscaping, and integrated pest management.

6. Implement landscaping techniques to control stormwater.

   - Enhance natural runoff/sediment collection basins to reduce the flow of sediment and other pollutants into waterways.

   - Develop a policy and program for planting and preserving trees around stormwater management ponds.

7. Continue to provide technical assistance for emergency situations, such as uncontrolled fires, that threaten developed areas vegetation resources, as needed.

8. Continue to respond to requests for technical information from on-post and off-post entities, as appropriate.

9. Continue to investigate and enforce violations of federal and state laws and regulations, as well as DoD, DA, and Fort Belvoir policies.

# 11.0 Wildlife

The importance of military installations as wildlife habitat has long been recognized. The Sikes Act, enacted in 1960 and amended in 1997, acknowledges the military's role in conserving wildlife resources, and in providing public access to those resources consistent with the military mission.

Maintaining habitat is key to sustaining healthy wildlife populations. Over the past decade wildlife managers on federal, state and private lands have converted from single species management to habitat management, which benefits an array of species. In accordance with, the Department of Defense (DoD) Natural Resources Managers Handbook, *Conserving Biodiversity on Military Lands* (Leslie et al, 1996), Fort Belvoir has focused wildlife conservation efforts on habitat management for all species based on the use of indicator species with conservation importance. Emphasis is placed on indicator species with narrow environmental tolerances, and hence most susceptible to ecological disturbances as a practical method of measuring habitats. This eliminates the need to monitor animals with widespread distribution or those not declining in numbers. An indicator species is a key organism, plant or animal that is sensitive to particular environmental factors, so its presence in an area can provide information about ecological conditions.

Fort Belvoir's selection of indicator species was based upon (1) the recognized rarity of the species at the local, regional and national levels; (2) the availability of information regarding the species, its life history and the processes/forces influencing its rarity; (3) its susceptibility to, and immediacy of, threats; and, (4) the potential for conservation actions to be successful. Using these criteria Fort Belvoir selected four species with conservation importance to serve as "indicator species" for its wildlife conservation efforts. Since these species are typically the most sensitive to habitat conditions, improving habitats for these species will likely benefit habitat conditions for other species as well. In addition to the indicator species, there are two resident species (the bald eagle and the wood turtle) and a migratory species (the peregrine falcon) with endangered and/or threatened status, which specifically require habitat management in accordance with the Endangered Species Act, Sikes Act, and DoD and Department of the Army (DA) policies. These species share habitat requirements of the four indicator species.

The indicator species selected by Fort Belvoir are four of the Partners in Flight (PIF) priority bird species for the Mid-Atlantic Coastal Plain Region. The PIF program is an international-level conservation initiative, to which DoD and DA are signatories. USFWS, as well as state wildlife agencies, including the Virginia Department of Game and Inland Fisheries (VDGIF) through the state nongame program are also partners in this program. Designation of regional PIF priority bird species is the result of a cooperative/coordinated effort among various federal, state and private organizations.

The four indicator species selected for conservation priority use a variety of habitat types throughout Fort Belvoir for foraging and breeding. These species share habitat requirements with

many, if not all, of the other wildlife species on Fort Belvoir. Because of their shared habitat requirements, conservation actions for the seven species (e.g., four indicator and three endangered and/or threatened species) will likely benefit the installation's other wildlife species. Table 11.1 represents the habitat areas of the indicator species and provides examples of other wildlife species that share those habitats. A management strategy using indicator species is new to Fort Belvoir. The indicator species selected are subject to change using adaptive management or through the development of the Wildlife Management Plan. The indicator is associated with specific habitat types and management is implemented on those key habitats where indicator species occur. The ecological foundation for this approach assumes that the maintenance of the indicator species at desired levels concurrently means that the habitat integrity has been preserved. *(Wildlife Ecology and Management,* Second Edition, William L. Robinson and Eric G. Bolen, 1989*)*

Using indicators to manage and monitor habitats allows for efficient use of scarce program resources. Birds are good organisms for biological monitoring, because there are relatively few species, they are nearly all easily recognized, and there are large numbers of amateurs who know them well and observe them regularly. Christmas bird counts and breeding bird censuses have been carried out for many decades and are standardized. They provide excellent long-term records of patterns of distributions and abundances.

Examples included in Table 11.1 show how management of particular of successional/shrub-scrub habitat necessary for the prairie warbler (a PIF high priority bird species) will also benefit the northern fence lizard, the northern black racer, the least shrew, the American woodcock and the white tail deer. It also shows how the protection of forested wetlands necessary for the prothonotary warbler (another PIF high priority bird species) will benefit virtually all of the installation's amphibian species, the eastern mud turtle, eastern rough green snake, star-nosed mole, silver-haired bat, gray fox, as well as those species considered state/federal threatened or endangered (e.g., wood turtle, bald eagle and peregrine falcon).

The quality of the natural habitat on Fort Belvoir is reflected by the diverse wildlife documented on post. Fort Belvoir provides habitats for 43 species of mammals, 263 species of birds, 32 species of reptiles, 27 species of amphibians and 60 species of fish (Section 7).

It is important to understand that habitat for all these species are continuously susceptible to destruction, fragmentation, pollution, and threats from introduced species. This requires active management of the indicator species habitat to ensure the health of the overall ecosystem and the diversity species on Fort Belvoir. Active management includes monitoring of all indicator species, routine surveillance and response to changes in habitat conditions, buffering or accommodating development using BMPs, and controlling public access to habitat areas for recreation.

| Table 11.1: Species that Benefit from Habitat Recognized by PIF Bird Indicator Species | | | |
|---|---|---|---|
| ***Forested Wetland Habitats*** | ***Upland Forest Habitats*** | ***Open Grassland Habitats*** | ***EarlySuccessional/Shrub-Scrub Habitat*** |
| **Prothonotary warbler**<br>***Oritibitarua citrea*** | **Wood thrush**<br>***Hylocichla mustelina*** | **Field sparrow***<br>***Spizella pusilla***<br><br>**Grasshopper sparrow**<br>***Ammodramus savannarum*** | **Prairie warbler**<br>***Dendroica discolor*** |
| All amphibian species found on Fort Belvoir | Northern spring peeper (f, b, h)<br>*Pseudacris c. crucifer* | American toad (f, b)<br>*Bufo a. americanus* | Northern fence lizard (f, b)<br>*Sceloporus undulates hyacinthinus* |
| Wood turtle (f, b, h)<br>*Clemmys insculpta* | Northern ringneck snake (f, b, h)<br>*Diadophis punctatus edwardsi* | Eastern hognose snake (f, b, h)<br>*Heterodon platyrhinos* | Northern black racer (f, b, h)<br>*Coluber c. constrictor* |
| Eastern mud turtle (f, b, h)<br>*Kinosternon s. subrubrum* | Marbled salamander (f, b)<br>*Ambystoma opacum* | Meadow vole (f, b)<br>*Microtus pennsylvanicus* | Least shrew (f, b)<br>*Cryptotis parva* |
| Eastern rough green snake (f, b, h)<br>*Opheodrys a. aestivus* | Deer mouse (f, b)<br>*Peromyscus maniculatus* | Red bat (f)<br>*Lasiurus borealis* | American woodcock (f, b)<br>*Philohela minor* |
| Star-nosed mole (f, b)<br>*Condylura cristata* | Southern flying squirrel (f, b)<br>*Glaucomys volans* | Northern bobwhite quail (f, b)<br>*Colinus virginianis* | Whitetail deer (f, b)<br>*Odocoileus virginiana* |
| Silver-haired bat (b)<br>*Lasionycteris noctivagans* | Wild turkey (f, b)<br>*Meleagris gallopavo* | American kestrel (f, b)<br>*Falco sparberius* | |
| Bald eagle (f, b)<br>*Haliaeetus leucocephalus* | Longtail weasel (f, b)<br>*Mustela frenata* | Eastern cottontail (f, b)<br>*Sylvilagus floridanus* | |
| Peregrine falcon (f)<br>*Falco peregrinus* | | | |
| Gray fox (f, b)<br>*Urocyon cinereoargenteus* | | | |

Note: This information was extracted from Appendix D, Fish and Wildlife Tables. These species do occur in other habitats, but are listed in their primary habitat and need these specific habitats to maintain populations. The use of the habitat area is annotated by: f = foraging; b = breeding; and h = hibernation.

**Bold text** indicates primary indicator species

Underlined text indicates federal/state threatened or endangered species

*The field sparrow is the selected indicator species for the minimum requirements for a grassland habitat (e.g. requires 2 hectares for breeding habitat). The grasshopper sparrow is the "ideal" grassland indicator species requiring 10 hectares, but currently not found on Fort Belvoir. Implementation of the Grasslands Management Plan is expected to address more stringent habitat requirements to support the grasshopper sparrow.

## 11.1 WILDLIFE POLICIES

### 11.1.1 Federal Wildlife Policy

A number of federal statutes and directives mandate wildlife protection and management. The Sikes Act (16 USC 670a) and the Sikes Act Amendments of 1997 (Title XXIX) (together known as Sikes Act) directly regard conservation of wildlife on Department of Defense lands. TheSikes Act authorizes the Secretary of Defense to (1) carry out a program for the conservation and rehabilitation[1] of natural resources on military installations, and (2) prepare an Integrated Natural Resources Management Plan (INRMP) in cooperation with the USFWS and state fish and wildlife agencies[2]. The Sikes Act requires the INRMP to "… reflect the mutual agreement of the parties [USFWS and state fish and wildlife agencies] concerning conservation, protection, and management of fish and wildlife resources."

With regard to installation natural resources management programs, the Sikes Act states:

> "Consistent with the use of military installations to ensure the preparedness of the Armed Forces, the Secretaries of the military departments shall carry out the program required by this subsection to provide for
>
> (A) the conservation and rehabilitation of natural resources on military installations;
>
> (B) the sustainable multipurpose use of the resources, which shall include hunting, fishing, trapping, and non-consumptive uses; and
>
> (C) subject to safety requirements and military security, public access to military installations to facilitate the use."

With regard to development of INRMPs, the Sikes Act states:

> "Consistent with the use of military installations to ensure the preparedness of the Armed Forces, each integrated natural resources management plan prepared under subsection (s)
>
> (1) shall, to the extent appropriate and applicable, provide for
>
> (A) fish and wildlife management, land management, forest management and fish and wildlife-oriented recreation;

---

[1] Conservation and rehabilitation is defined as "…to utilize those methods and procedures to the maximum extent practicable on public lands subject to this subchapter consistent with any overall land use and management plans for the lands involved. Such methods and procedures shall include, but shall not be limited to, all activities associated with scientific resources management such as protection, research, census, law enforcement, habitat management, propagation, live trapping and transplantation, and regulated taking in conformance with the provisions of this subchapter."

[2] State fish and wildlife agencies are defined as "… the one or more agencies of State government that are responsible under State law for managing fish or wildlife resources."

(B) fish and wildlife habitat enhancement or modifications;

(C) wetland protection, enhancement and restoration, where necessary for support of fish, wildlife, or plants;

(D) integration of, and consistency among, the various activities conducted under the plan;

(E) establishment of specific natural resource management goals and objectives and time frames for proposed action;

(F) sustainable use by the public of natural resources to the extent that the use is not inconsistent with the needs of fish and wildlife resources;

(G) public access to the military installation that is necessary or appropriate for the use described in subparagraph (F), subject to requirements necessary to ensure safety and military security;

(H) enforcement of applicable natural resources laws (including regulations);

(I) no net loss in the capability of military installation lands to support the military mission of the installation; and

(J) such other activities as the Secretary of the military department determines appropriate ..."

With regard to implementation and enforcement of the INRMP the Sikes Act states:

"(1) neither Office of Management Budget Circular A-76 nor any successor circular thereto applies to the procurement of services that are necessary of that implementation and enforcement; and

(2) priority shall be given to entering into of contracts for the procurement of such implementation and enforcement services with Federal and State agencies having responsibility for the conservation or management of fish and wildlife."

The Sikes Act also states

"To the extent practicable using available resources, the Secretary of each military department shall ensure that sufficient numbers of professionally trained natural resources management personnel and natural resources law enforcement personnel are available and assigned responsibility to perform tasks necessary to carry out this title, including the preparation and implementation of integrated natural resources management plans."

Other federal laws and orders related to non-endangered or threatened wildlife are listed below. (Federal endangered, threatened, and rare species policies are discussed in Section 12.1.1.)

- The Fish and Wildlife Coordination Act (16 U.S. C. 661 et seq.). The Fish and Wildlife Coordination Act includes provisions for the protection and conservation of game, fur-bearing animals and fish (Chapter 5A, subchapter I).

- Lacey Act (16 U.S.C. §701) and Lacey Act Amendments of 1981 (16 U.S.C. §§3371-3378). The Lacey Act was originally passed in 1900 to aid in the restoration of game and other wild birds in parts of the United States where they have become scarce or extinct, and to regulate the introduction of American or foreign birds or animals in areas where they have not previously existed. The Lacey Act Amendments of 1981 replaces most of the provisions of the Lacey Act and prohibits the import, export, transport, sale, acquisition, receipt, or purchase of wildlife, or plants that are taken, possessed, transported or sold in violation of any federal, state, or tribal law. Also, under the Act, the purchase or sale of fish and wildlife taken or possessed in violation of foreign laws is prohibited. The Act requires that containers or packages containing fish and wildlife in commerce be plainly marked, labeled, or tagged. Violation of the provisions of the Act can result in civil and criminal penalties, cancellation of hunting and fishing licenses, and forfeiture of property.

- Migratory Bird Treaty Act (16 U.S.C. §§703-712). The Migratory Bird Treaty Act prohibits the taking, killing, or possessing of migratory birds. The Act implements various treaties and conventions concerning migratory bird protection between the United States and Canada, Mexico, Japan, and the former Soviet Union. Under the Act, it is unlawful, unless permitted by regulations, to pursue, hunt, take, capture or kill; attempt to take, capture or kill; possess, offer to or sell, barter, purchase, deliver or cause to be shipped, exported, imported, transported, carried, or received any migratory bird, part, nest, egg, or product, manufactured or not. The Act is enforced by the Department of the Interior employees. However, states and territories are permitted to make and enforce laws and regulations that are consistent with the Act or that give further protection to migratory birds, nests and eggs, if such laws do not extend to open seasons.

- The Migratory Bird Hunting and Conservation Stamp Act (16 U.S.C. 718-718j). The Migratory Bird Hunting and Conservation Stamp Act, also known as the Duck Stamp Act, requires waterfowl hunters who are sixteen years or older to purchase and possess a federal hunting stamp. The revenues from the sale of the stamp are collected in the Migratory Bird Conservation Fund and used for the acquisition of migratory bird refuges under the Migratory Bird Conservation Act (16 U.S.C. 715 et seq.) and for the acquisition of waterfowl production areas.

- Airborne Hunting Act (16 U.S.C. 742j-1). The Airborne Hunting Act is section 742j-1 of the Fish and Wildlife Act of 1956 (16 U.S.C. §§742 et seq.). It prohibits people in aircrafts from harassing, capturing, or killing birds, fish, and other animals, except if authorized by a permit or license. A permit or license may be issued to state or federal employees, authorized agents, or other persons for the purpose of administering or protecting land, water, wildlife, livestock, domesticated animals, human life, or crops. Violation of the Act may result in civil and criminal penalties, including imprisonment. Department of Interior employees enforce the Act and are authorized to make arrests

without warrants and to conduct warrant searches. Aircrafts and weapons involved in violations are subject to forfeiture.

- Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d). This act prohibits the pursuing, shooting, shooting at, poisoning, wounding, killing, capturing, trapping, collecting, molesting, disturbing, purchase, or sale of bald and golden eagles. The act also prohibits the barter, transport, export, or import at any time or in any manner a bald or golden eagle, dead or alive; or any part, nest, or egg of these eagles, unless pursuant to a permit or regulation.

- Executive Order 13112, *Invasive Species* (signed Feb. 3, 1999). The Order calls for federal agencies to address invasive species problems and concerns. Under a National Invasive Species Management Plan, agencies are to develop programs to prevent the introduction of invasive species and to provide for the control and minimization of impacts and the restoration of natural species.

- The Animal Damage Control Act (7 USC 426). The Animal Damage Control Act authorizes the Animal and Plant Health Inspection Service to control wildlife damage on federal, state, or private lands. Control of wildlife, including non-native wildlife, may be performed by hunting, trapping, and poisoning.

### 11.1.2 State Wildlife Policy

The Virginia Department of Game and Inland Fisheries (VDGIF) is the policy-making entity responsible for conserving, protecting, and replenishing the supply of game, nongame wildlife, and fish of the Commonwealth of Virginia (Virginia Administrative Code, 4 VAC15). Under the wildlife permit program (§29.1-417 of the Code of Virginia), VDGIF must be consulted regarding capture, hold, propagation, and disposal of wildlife. Virginia law includes a number of provisions on the conservation and protection of wildlife:

- The Wildlife and Fish Laws at § 29.1-542 prohibits the importation of "predatory or undesirable" birds and animals, except under a special permit. The Virginia Administrative Code, 4 VAC15-30-40, lists the types of non-native (exotic) species that require a special permit, " and may be issued by the department [of Game and Inland Fisheries and Boating], if consistent with the department's fish and wildlife management program, to import, possess, or sell."

- The Virginia Land Conservation Foundation and Fund (§10.1-1020 of the Code of Virginia), for the acquiring of property to protect or preserve lands for threatened or endangered species, and fish and wildlife habitat.

- The Agricultural and Forestal Districts Act (§15.2-4301 of the Code of Virginia), to protect and conserve agricultural and forestal lands "as valued natural and ecological resources which provide essential open space for . . . wildlife habitat."

- Local Agricultural and Forestal Districts Act (§15.2-4401 of the Code of Virginia), to encourage localities of Virginia to protect and conserve agricultural and forestal lands "as

valued natural and ecological resources which provide essential open space for . . . wildlife habitat."

- The Animal Damage Control Act (7 USC 426) authorizes the APHIS to control wildlife damage on federal, state, or private lands. Control of wildlife, including non-native wildlife, may be performed by hunting, trapping, and poisoning.

- The Virginia Pesticide Control Act (Title 3.1, Chapter 14.1 of the Code of Virginia) confers powers and authority on the Virginia Pest Control Board to develop regulations that restrict or prohibit the sale or use and disposal of any pesticide or pesticide container or residuals that are toxic or hazardous to humans or wildlife, or may adversely affect the environment (Section 10.1.2).

State policy regarding endangered, threatened, and rare species is discussed in Section 12.1.2.

### 11.1.3 Department of Defense Wildlife Policy

DoD's natural resources management policy is contained within DoDI 4715.3, *Environmental Conservation Program*. This instruction requires installations to follow an ecosystem-based approach to natural resources management, to inventory and protect important biological resources, and to promote biodiversity. The instruction also allows for multiple uses of an installation's natural resources, and for public access to these resources for recreation, education and scientific research and study, compatible with the installation's ecosystem management goals. DoD's policy on wildlife management, as established in DoDI 4715.3, is as follows:

| **Excerpts from DODI 4715.3<br>Select Provisions Applicable to Wildlife** |
|---|
| ■ Biodiversity conservation on DoD lands and waters shall be promoted when consistent with the mission and practicable to achieve the following goals:<br>1. Maintain or restore remaining native ecosystem types across their natural range or variation.<br>2. Maintain or reestablish viable populations of all native species in an installation's areas of natural habitat, when practical. (F2b)<br><br>■ Ecosystem management shall do the following: . . . include a shift from single species to multiple species management. (F2a)<br><br>■ Management measures for the removal or control of exotic species shall be included in installation INRMP's when applicable. (D2h)<br><br>■ Consistent with ecosystem-based management, altered or degraded landscapes and associated habitats shall be restored and rehabilitated whenever practical. (D2l) |

DoD Directive 4700.4, *Natural Resources Management Program*, also provides the following provisions:

| Excerpts from DoD Directive 4700.4<br>Select Provisions Applicable to Wildlife |
|---|
| ■ Lands and waters suitable for management of fish and wildlife resources shall be managed to conserve wildlife resources for the benefit of the public. Nongame as well as game species shall be considered when planning activities. (B3a)<br><br>■ Installation cooperative plans must provide for<br><br>• Fish and wildlife habitat improvements or modifications<br><br>• Range rehabilitation where necessary for support of wildlife<br><br>• Control of off-road vehicle traffic<br><br>• Specific habitat improvement projects and related activities and adequate protection for species of fish, wildlife, and plants considered threatened or endangered. (Definition 5) |

DoD's pest management policy is contained within DoDI 4150.7, *Department of Defense Pest Management Program.* This instruction directs the reduction of feral or stray cats on military installations. It instructs military components, including the Army, to use the Armed Forces Pest Management Board's Technical Information Memorandum No. 37, *Guidelines For Reducing Feral/Stray Cat Populations On Military Installations In The United States*, as guidance for their feral cat program. DoDI 4150.7 also provides guidance for establishing and implementing an integrated pest management program on DoD lands. Excerpts from this instruction are provided in Section 10.1.3 of this INRMP.

DoD policy regarding endangered, threatened, and rare species is discussed in Section 12.1.3.

### 11.1.4 Department of the Army Wildlife Policy

DA's natural resources management policy is contained within AR 200-3, *Natural Resources - Land, Forest and Wildlife Management*. This regulation establishes the DA's requirements for managing and using land and water resources in accordance with the principles of ecosystem management, and institutes the DA's commitment to conserve, protect, and sustain biological diversity, and to restore degraded ecosystems. AR 200-3 also establishes the DA's commitment to manage fish and wildlife populations and their habitats, provide adequate staffing of professionally trained personnel, and establish a fish and wildlife enforcement program. The following excerpts from AR 200-3 present the DA's extensive fish and wildlife management requirements. Excerpts from AR 200-3 regarding threatened and endangered species are listed in Section 12.1.4.

| Excerpts from AR 200-3<br>Select Provisions Applicable to Wildlife |
| --- |
| ■ The natural resources management professional will be an active participant in all planning and decision making activities regarding uses of the land to ensure that current and planned mission activities regarding uses of the land to ensure that current and planned mission activities (for example, master planning, construction requests, site approval requests, and training exercise plans) are conducted in a manner which is compatible with natural resources and other environmental requirements. (3-2b)<br><br>Fish and Wildlife Management Requirements (6-1)<br><br>■ The Fish and Wildlife Management program will provide for the management of fish and wildlife populations and their habitats consistent with accepted scientific principles, in compliance with the Endangered Species Act and other applicable laws and regulations, and in harmony with the total natural resources program. Emphasis will be placed on the maintenance and restoration of habitat favorable to the production of indigenous fish and wildlife, particularly Federally listed species protected under the Endangered Species Act, as amended.<br><br>■ Lands and waters suitable for conservation of fish and wildlife resources will be managed to conserve wildlife resources. Non-game as well as game species will be considered when planning activities.<br><br>■ The suitability and requirement of a military installation for fish and wildlife management will be determined by the installation and the MACOM after consulting with the USFWS and host State. Each installation will be classified as one of the following:<br><br>Category I-Installations with adequate acreage of land and water resources suitable for fish and wildlife management. Each Category I installation will maintain an up to date fish and wildlife cooperative plan according to this regulation.<br><br>Category II-Installations that lack adequate land and water resources for feasible fish and wildlife management. These installations may develop a limited management plan (non-consumptive, preservation, habitat protection, and so forth) based on installation resources and management objectives.<br><br>■ Installation commanders with fish and wildlife management requirements will:<br><br>Program for funds to conduct an effective program pursuant to the Fish and Wildlife Cooperative Plan required by the Sikes Act.<br><br>Require the optimum use and staffing of professionally trained personnel (for example, wildlife biologist) at installations having fish and wildlife management requirements.<br><br>Authorize and control fish and wildlife related activities in conformance with applicable Federal and State laws, Army regulations, and the installation Fish and Wildlife Cooperative Plan.<br><br>Establish a fish and wildlife law enforcement program per paragraph 3-20 to address the requirements of the Fish and Wildlife Cooperative Plan. |

**Excerpts from AR 200-3**
**Select Provisions Applicable to Wildlife**

***(continued)***

Authority to hunt, fish, and trap (6-2)

- (a) Hunting, fishing, and trapping may be permitted within the current huntable population levels and carrying capacity of specific wildlife habitats. The number of users of fish and wildlife resources may be limited on a daily or seasonal basis. Membership in an organization, including rod and gun clubs, will not be a prerequisite for or get priority in receiving permits or authorization to hunt, fish, or trap on Army installations.

- (b) All hunting, fishing, or trapping on a military installation under the control of the Department of the Army will be in accordance with applicable Federal, State, host nation, or territory laws and regulations.(10 USC 2671).

- (c) There will be no hunting, fishing, or other recreational activities in officially designated and marked impact areas and associated buffer zones. Impact areas that have been permanently or temporarily closed may be opened to hunting and fishing only after approval from the Installation Range and Safety Officers. The Range, Safety, and Natural Resource Offices will determine recreational use boundaries (pursuant to the Integrated Natural Resource Management Plan) that are adjacent to impact areas.

- (d) Any individual eligible to hunt, fish, or trap on a military installation must obtain the following:

  A license from the State in which the installation is located except as provided for in paragraph 6-3a(2).

  A special State permit (16 USC 670a) from the commander of said installation, or his designee, when such permits are required.

Whoever violates a requirement prescribed under subsections b or c above is liable of an offense under 10 USC 2671(c).

Installation permits and fees (6-3)

- Installation commanders may issue special installation permits to an individual only when same is in possession of a valid State or territorial hunting, fishing, or trapping license, as applicable except as set forth in subsection (2) below. An exception to the license requirement can be made when State laws do not grant equality of treatment to military personnel by not waiving residency requirements as specified in 10 USC 2671. Commanders will make written applications to U.S Army Directorate of Environmental Programs, Conservation Division through appropriate channels, for approval to issue permits for military personnel to hunt, fish, or trap on the installation without securing an appropriate State, host nation, or territory license.

- The annual demand for operation and maintenance funds frequently has a negative effect on installation efforts to fulfill obligations to foster sound fish and wildlife management programs. As a consequence, other fund sources must be considered. Pursuant to 16 USC 670a-f installation commanders will establish fees for hunting, fishing, or trapping.

**Excerpts from AR 200-3**
**Select Provisions Applicable to Wildlife**

***(continued)***

- Fees [for hunting, fishing, or trapping] are to be used on the installation from which collected for the protection, conservation, and management of fish and wildlife, including habitat restoration and improvement, biologist staff and support costs, and related activities, as stipulated in the Fish and Wildlife Cooperative Plan, but for no other purpose. Funds that are required to support hunting and fishing fee collection administration (that is, printing and issuing of permits) will not exceed 10 percent of the annual revenues from hunting, fishing, and trapping fees. Management of this source of funds will be the responsibility of the installation's natural resources management professional. All fees collected will be accounted for in accordance with guidance provided for the appropriation titled "Wildlife Conservation, Military Reservations," Army account 21X5095 (AR 37-100 and AR 37-108). Unobligated balances will be accumulated with current fee collections, and the total amount accumulated at an installation will be available for obligation as apportioned by the office of Management and Budget. Budget and support information, required to obtain obligation authorities, will be provided annually (Army Budget for Wildlife Fish and Game Conservation, Military Reservations, Report (RCS: ENG-303)) in accordance with instructions provided by USA, C-OK, ATTN: CERM-B, WASH D.C. 2031-1000.

- Special installation permits may be issued subject to the following criteria:

  Persons holding hunting, fishing, or trapping permits will stand at par with each other for use privileges, except that participation will be within manageable quotas and within the capability of the natural resources to support such use.

  The same fee will be charged for a particular use to all users at a particular installation except senior citizens, children under a specified age, and persons with physical disabilities. Fees will be commensurate with program costs, State and local fees for similar activities and facilities, and resources available for use. Exceptions to this must be submitted through command channels to USA Directorate of Environmental Programs, Conservation Division, ATTN: DAIM-ED-N, 600 Army Pentagon, Washington, D.C. 20310-0600, for approval by the Office of the Secretary of the Army.

  Ensure that the Fish and Wildlife Cooperative Plan, as outlined in 16 USC 670b, specifies that the possession of a special installation permit will not relieve the permittee of the requirements of other Federal laws, (for example, Migratory Bird Treaty Act, Lacey Act), nor of the requirements pertaining to State laws as set forth in 10 USC 2671.

- Funds collected pursuant to the Sikes Act (account 21X5095) may be used only to defray the costs of fish and wildlife management programs. The quality of hunting and fishing opportunities are usually in direct relationship with the effort expended for habitat protection and improvement and will receive primary emphasis when developing annual work plans to implement the Fish and Wildlife Management program. Funds collected for hunting and fishing permits will not be used for construction of recreational structures (for example, blinds, deer stands, fishing piers, and so on) or for transportation of hunters to designated stations, unless the only means of participation is by transportation which is required to reach the hunting and/or fishing areas. Such facilities are primarily for recreational use and, therefore, should be funded from the installation MOOR account.

**Excerpts from AR 200-3**
**Select Provisions Applicable to Wildlife**

***(continued)***

- A separate community recreation hunting and fishing activity fee, not accounted for as Sikes Act hunting and fishing permit fees (16 USC 670a), may be charged to users of optional hunting and fishing services. These fees should be used for items not authorized in c above (for example, prizes for fishing rodeos, use of blinds or fishing piers only when they are not a requirement to hunt or fish on the installation, rental of hunting and/or fishing equipment, and so on). All recreation hunting and fishing activity generated from these recreational activity fees will be deposited to the installation morale, welfare, and recreation (MOOR) fund.

Fish and Wildlife Cooperative Plan (6-4)

- In accordance with 16 USC 670a, the Fish and Wildlife Cooperative Plan is that component of the Integrated Natural Resources Management Plan that describes how the fish and wildlife resources at an installation will be managed. It is a tripartite agreement between the Installation, the FWS, and the appropriate State agency designated by the State in which the installation is located. The cooperative plan provides a program of planning for, and the development, maintenance, and coordination of wildlife, fish, and game conservation. It will include Endangered Species Management Plans (ESMPs) for listed and proposed species and critical habitats present on the installation including areas used by tenant organizations (refer to chapter 11 for specific requirements). Each Fish and Wildlife Cooperative Plan (Part IV) will provide for, but not be limited to

  Fish and wildlife habitat improvements or modifications.

  Wildlife considerations in all range rehabilitation.

  Control of off road vehicle traffic.

  ESMPs for listed and proposed species and critical habitat including specific habitat improvement projects and related activities.

  Use and protection of fish and wildlife resources, to include both consumptive and non-consumptive use, and natural resources law enforcement requirements.

  Designated responsibilities for the control and disposal of feral animals.

- A cooperative plan will be adopted by an installation commander only after ensuring its compatibility with the rest of the Integrated Natural Resources Management Plan, the Endangered Species Act and other applicable Federal, State, and local laws and regulations. Agreement by all three parties regarding the fish and wildlife management plan for an installation makes that plan a cooperative plan pursuant to 16 USC 670a and the exclusive fish and wildlife component of the Integrated Natural Resources Management Plan.

- Cooperative plans will be reviewed and updated annually to incorporate new findings, including newly approved [Endangered Species Management Plans] and changes as specified in chapter 11 and revised at least every 5 years.

**Excerpts from AR 200-3**
**Select Provisions Applicable to Wildlife**

***(continued)***

Introduction of new or exotic species (6-5)

- All proposed introduction or reintroduction of wildlife species will be thoroughly assessed in accordance with the National Environmental Policy Act and associated FWS requirements to determine the impact on existing flora and fauna and the installation mission. Introduction of species of fish and wildlife foreign or native to the United States or reintroduction of formerly indigenous species will be accomplished only upon the approval of the FWS, the State, the MACOM, and HQDA (USA Directorate of Environmental Programs, Conservation Division, DAIM-ED-N), and will be made a part of the installation Fish and Wildlife Cooperative Plan. See paragraph 11-14 for additional guidance on the introduction and reintroduction of Federal and State listed, proposed, and candidate species on Army lands.

Population management (6-6)

- Wildlife populations will be managed in accordance with the management objectives set forth in the installation Fish and wildlife Cooperative Plan. Wildlife population management objectives will include, as a minimum:

  Conserve, protect, and enhance threatened and endangered species and their habitats.

  Maintenance of healthy, sustainable wildlife populations within the carrying capacity of the installation's habitat.

  Prevention of health and safety hazards.

  Provision for wildlife related recreation.

  Animal damage control.

Habitat management (6-7)

- Habitat management efforts will be accomplished in a manner to conserve and enhance existing flora and fauna consistent with the Army goal to conserve, protect, and sustain biological diversity while supporting the accomplishment of the military mission. Activities will be directed towards management to maintain healthy ecosystems, and to restore degraded ecosystems to their historic functions and values. Primary management consideration will be given to the management of indigenous listed, proposed, and candidate species habitats. Also, consideration of other environmentally sensitive areas and other areas of special concern (for example, riparian zones, wetlands, highly erodible areas) should be identified and addressed in the Integrated Natural Resources Management Plan.

Diseases affecting fish, wildlife, and domestic animals (6-8)

| Excerpts from AR 200-3<br>Select Provisions Applicable to Wildlife |
|---|
| ***(continued)*** |
| ■ Fish and wildlife populations are susceptible to a large variety of morbidity and mortality factors, some of which may be shared among and between wild and domestic species. Requirements for interaction with other Federal agencies, should a foreign animal disease be introduced on or near a military installation, are outlined in the Forces Command (FORSCOM) Animal Disease Eradication Plan (FADEP). Installation natural resources managers should consult with appropriate Veterinary Corps personnel regarding fish, wildlife, and domestic animal dieoffs and unnatural behavior occurring on their installation. Similarly, the responsible Army veterinarian, natural resource manager, or command element should contact local, State, and Federal officials whenever necessary." |

### 11.1.5 Fort Belvoir Wildlife Policy

Fort Belvoir's installation-specific wildlife management policies are contained within the Fort Belvoir Supplement to AR 200-3 (dated February 20, 1996) (Appendix H). Excerpts relevant to wildlife are presented below:

| Excerpts from Fort Belvoir Supplement to AR 200-3<br>Select Provisions Applicable to Wildlife |
|---|
| Fish and Wildlife Management Requirements. (6-1)<br><br>■ Commander, U.S. Army Garrison Fort Belvoir, has the responsibility to establish and enforce policies and procedures involving fish and wildlife management on Fort Belvoir. In accordance with the Cooperative Plan for Conservation and Development of Fish and Wildlife Resources on military Reservations, all hunting, fishing, and trapping activities on Fort Belvoir will comply with FB Supplemqnt 1 to AR 200-3 and applicable Federal, Commonwealth of Virginia, Fairfax County, Department of the Army, and Fort Belvoir laws and/or regulations. The intent of the above policies is:<br><br>(1)To manage Fort Belvoir's fish and wildlife resources. Habitat improvements and population control will serve as the basic means of perpetuating and improving fish and wildlife resources.<br><br>(2) To conserve and protect fish and wildlife habitat, and sustain biodiversity, on Fort Belvoir.<br><br>(3) To develop and promote good sportsmanship through education and coordinated recreational activities. |

**Excerpts from Fort Belvoir Supplement to AR 200-3**
**Select Provisions Applicable to Wildlife**
***(continued)***

- Major responsibilities performed by the installation Provost Marshal Office (PMO) include the following:

  (1) Within criteria established in paragraphs 6-2 and 6-3 of AR 200-3, support Installation Natural Resource Enforcement Personnel in the enforcement of all hunting, fishing, and trapping laws and regulations.

  (2) If the records at the end of the hunting day indicate that a hunter has failed to check out of his or her hunting area, Outdoor Recreation personnel monitoring the check in/check out of hunters will notify PMO of the missing hunter, home telephone number, etc. The PMO will contact the hunter's home and office to coordinate search activities for the missing hunter.

  (3) Report accidents to the Installation's Safety Director.

- Major responsibilities performed by DIS include the following:

  (1) Provide staff supervision of the fish and wildlife program as outlined in AR 200-3, the Integrated Natural Resource Management Plan, and the Cooperative Agreement.

  (2) Establish maximum number of hunters per hunting area. Determine harvest limits including buck-to-doe ratio, number, sex, and species per hunter and area. This control may be exercised at any time by DIS when deemed necessary in the interest of natural resource conservation or public safety.

  (3) Establish special hunting management, such as early hunting in selected areas, or hunting in areas not designated as hunting areas, inclusive of any security areas. Such special hunting management shall be determined on the basis of the need to reduce or remove deer from specific areas for reasons of safety, herd health, habitat loss, or other environmental concerns. This management will be coordinated with Federal, Commonwealth of Virginia, Outdoor Recreation, and other Army officials for approval.

  (4) Issue an annual Hunting Fact Sheet prior to each hunting season detailing open areas and restrictions projected for that year.

  (5) Develop and implement comprehensive management plans, maintain and manage day-to-day activities at the Accotink Bay Wildlife Refuge and the Jackson Miles Abbott Wetland Refuge.

  (6) Develop and implement a comprehensive management plan for the Fort Belvoir Forest and Wildlife corridor.

  (7) Within criteria established in paragraphs 6-2 and 6-3 of AR 200-3, enforce all hunting, fishing, and trapping laws and regulations.

**Excerpts from Fort Belvoir Supplement to AR 200-3**
**Select Provisions Applicable to Wildlife**
***(continued)***

- Major responsibilities performed by the Directorate of Personnel and Community Activities (DPCA) include the following:

  (1) Coordinate recreational aspects of the hunting program and issue a hunting Memorandum of Instruction annually in coordination with other Directorates to include the Directorate of Installation Support (DIS) and the Directorate of Plans, Training, Mobilization, and Security (DPTMS).

  (2) Issue and record installation's hunting permits.

  (3) Coordinate with DPTMS on the availability of training areas for the recreational hunting program, to avoid conflicts with training activities when making hunting assignments.

  (4) Coordinate with DIS Environmental and Natural Resource Division on the availability of wildlife areas for the recreational hunting program when making hunting assignments.

  (5) Inform PMO of any hunters who fail to check out of their hunting areas at the end of the day so established search procedures can take place.

  (6) Sponsor the required safety briefing(s) and qualification tests.

  (7) Ensure that all hunters have completed a Virginia approved hunter safety course, International Bowhunter Safety course and a DPCA archery proficiency test.

  (8) Promote the organization and development of clubs (conservation, sportsmen, etc.).

  (9) Coordinate new Game Check-in Procedures with DIS, Environmental and Natural Resource Division.

  (10) Coordinate tick and blood samples and collection procedures with DeWitt Army Community Hospital Preventive Medicine.

- Major responsibilities performed by the installation veterinarian include the following:

  (1) Conduct periodic disease surveys of the installation's wildlife populations as practicable.

  (2) Provide drugs and review dosages for tranquilizing wild species of animals.

  (3) Determine and provide treatment for sick or injured wildlife.

**Excerpts from Fort Belvoir Supplement to AR 200-3**
**Select Provisions Applicable to Wildlife**
***(continued)***

- Major responsibilities performed by DPTMS include the following:

  (1) Review proposed hunting seasons, dates, and areas to assure there is no conflict with training, testing, and other official requirements when developing training area schedules.

  (2) Notify the hunter control activities (e.g., DIS and DPCA) of training schedules for each area including any late cancellations.

  (3) Provide environmental protection of the training areas through controlling unauthorized use, off-road vehicle use and illegal dumping in cooperation with DIS and PMO.

- Major responsibilities performed by Staff Judge Advocate include the following:

  (1) Review Fort Belvoir hunting and fishing regulations for conformance with Federal, Commonwealth of Virginia, and Army laws and regulations.

  (2) Ensure that all violations of Federal, Commonwealth of Virginia, local and Army fish and wildlife regulations are investigated and prosecuted as appropriate.

  (3) Review administrative revocation of privileges for legal sufficiency.

Authority to Hunt, Fish and Trap. (6-2)

- Except for the prohibited practices and requirements listed below, the specific fishing laws and regulations to be followed by Fort Belvoir fishermen are identical to those of the Commonwealth of Virginia regulatory agencies governing the water body.

  (1) Current Federal, Commonwealth of Virginia, and local laws and regulations will prescribe open seasons, size, and creel limits of fish taken. Limits may be modified by DIS for natural resource management purposes within the bounds of these laws and regulations.

  (2) Trotlines and snags are not permitted in any fishing waters on the installation.

  (3) Fishermen and boaters are required to provide for environmental protection of all shoreline areas through restricting watercraft launching to designated marina launch facilities. Streambank clearing, littering, parking in other than designated areas, and driving of privately owned vehicles (POV) off primary installation roads are prohibited.

  (4) Scheduled training and military missions have priority over hunting and fishing at all times.

**Excerpts from Fort Belvoir Supplement to AR 200-3**
**Select Provisions Applicable to Wildlife**
***(continued)***

- Except for the prohibited practices and requirements listed below, the specific hunting laws to be followed by Fort Belvoir hunters are identical to those of the Commonwealth of Virginia and Fairfax County regulations. These are published annually by the Virginia Department of Game and Inland Fisheries.

(1) Individuals wishing to hunt deer must have in their possession a current Fort Belvoir area pass and parking permit, a valid Virginia hunting license, and a Virginia Archery Big Game and/or firearms Big Game Stamp. Persons only wishing to hunt small game must have a Virginia hunting license and a Fort Belvoir hunting permit.

(2) Fort Belvoir hunting permits will be issued only upon personal application at the hunting control point on authorized hunting days.

(3) In accordance with the Memorandum of Instruction, persons under eighteen years of age must be accompanied by a licensed parent or guardian while hunting on the Installation.

(4) Permits are not transferable, are valid for the day on which they are issued, and are valid only in the hunting area specified on the permit.

(5) Authorized hunting areas are presented in the annual Hunting Fact Sheet published by DIS.

(6) Trapping may be permitted as required. All trapping will require a special use permit available from DIS and must comply with all Federal, State, and local laws and regulations.

(7) Falconry is permitted on Fort Belvoir in accordance with all Federal, Commonwealth of Virginia, and local restrictions. Falconers will register with DPCA prior to going afield. Falconers will also be required to register and acquire a daily permit from DIS on the day of the hunt. Only two birds may be flown in any one hunting area at one time and this will not reduce the number of hunters permitted in that area. Under no circumstances may raptors be collected on the installation or any raptor's nest be disturbed.

(8) Legal small game to be taken will be designated annually in the DIS Hunting Fact Sheet.

(9) The DPCA will assign hunters to a specific area. Hunters will not enter another hunting area without first reporting back to the hunting control point. They will be reassigned to a new area, if available.

(10) No hunting is permitted in dud or demolition areas. If a dud is found, the site shall be marked and the exact location reported to DPTMS immediately.

(11) All hunters are required to process in and out of the DPCA Outdoor Recreation office whether or not they have harvested any deer. Willful failure of any person to check in and out may cause denial of future hunting privileges on Fort Belvoir. All harvested big game must be checked at the Virginia Game Check Station (Outdoor Recreation office) or Military Police (MP) Station prior to removal from Fort Belvoir.

**Excerpts from Fort Belvoir Supplement to AR 200-3**
**Select Provisions Applicable to Wildlife**
***(continued)***

(12) The hunting permit and parking permit will be issued at the DPCA Outdoor Recreation Office. The parking permit must be displayed on the inside left (driver's side) of the vehicle's windshield.

(13) All deer killed will be tagged in the field, and checked and weighed at the Fort Belvoir Game Check Station, or checked at the MP Station, in accordance with the Memorandum of Instruction.

(14) Organized group hunting is prohibited.

(15) Dogs will not be used for fox hunting.

(16) A Memorandum of instruction will be prepared annually by DPCA to include hunter qualification dates, times, fees, and reservation information (dates and times).

(17) A Hunting Fact Sheet will be prepared annually by DIS and appended to the Memorandum of Instruction prior to distribution to the hunting public. The Hunting Fact Sheet will specify hunting slots and areas open, hunting dates, safety restrictions, legal game, bag limits, legal weapons and special restrictions concerning environmental management.

(18) Bow hunting may be done from the ground or from elevated stands. Hunters are encouraged to use portable tree stands. No additional permanent tree stands will be permitted to be built on the installation. Repair of existing numbered tree stands may be performed. Existing tree stands can be used on a first-come basis. Any hunter using a tree stand on the installation is doing so at HIS/HER OWN RISK. The U.S. Government will not be responsible for any damage or injury to person(s) or property incurred as a result of using a tree stand for hunting on Fort Belvoir.

(19) Scheduled training and military missions have priority over hunting and fishing at all times.

- Hunters will comply with the following safety requirements:

(1) Prior to making a hunting reservation, all hunters will be required to document that they have satisfactorily completed a Virginia approved hunter safety course, International Bowhunter Safety Course, and archery proficiency test.

(2) Buffer areas, within which there will be no hunting, will be included with the safety restrictions in the annual DIS Hunting Fact Sheet.

(3) Hunters will immediately cease hunting and report back to DPCA when any type of training or work activity is observed in their assigned hunting area.

(4) Hunters will ensure that they have a safe field of sight to and beyond their targets.

| Excerpts from Fort Belvoir Supplement to AR 200-3<br>Select Provisions Applicable to Wildlife<br>*(continued)* |
|---|
| ■ Violators of hunting regulations, safety regulations or principles of good sportsmanship are subject to administrative restrictions, revocation of hunting and fishing privileges and possible judicial proceedings in the Federal Magistrate Court. Military personnel may further be subject to disciplinary action under the Uniform Code of Military Justice.<br><br>(1) Application by military personnel for restoration of revoked hunting and fishing privileges on the installation shall be submitted through channels to the installation commander. Application for restoration of hunting and fishing privileges on the installation by civilians will be made in writing to the commander through DIS and DPCA.<br><br>(2) Fishing is authorized from dusk to dawn in accordance with applicable Commonwealth of Virginia regulations, except in access-controlled waters, such as training areas and wildlife refuges. |

Fort Belvoir's DIS natural resources staff creates a hunting fact sheet annually that outlines the hunting season, bag limits, hunting area restrictions, and other regulations that guide the hunting program on Fort Belvoir (Appendix H). The fact sheet is written in accordance with federal, state, Fairfax County, and Fort Belvoir regulations. The fact sheet establishes allowable hunting as follows:

- Archery is the only legal means for hunting deer on Fort Belvoir.
- In accordance with Virginia State regulations governing season and bag limits, squirrel, woodchucks, fox, raccoon and turkey [as amended] may be taken on Fort Belvoir by archers. . . . No other wildlife may be taken by any means at any time.
- Within State of Virginia and U.S. Fish and Wildlife Service federal regulations, falconry is permitted on Fort Belvoir. Falconry is only permitted on Sunday during Fort Belvoir hunting seasons. Falconers are required to register with Outdoor Recreation and sign out for specific hunting areas in the same manner as deer hunters. Falconers are required to possess a U.S. Fish and Wildlife Service Falconry Permit and a valid Commonwealth of Virginia Hunting License. Special permits are available for falconers; however, a maximum of two individuals will be allowed in a training area at one time. No predatory birds may be collected on Fort Belvoir and nests are not to be disturbed in any manner. Falconers should contact Outdoor Recreation for qualification details.
- Failure to strictly adhere to the federal, state, local laws and regulations; the Fort Belvoir MOI and the Fort Belvoir Fact Sheet procedures and restrictions may result in criminal prosecution and/or loss of hunting privileges on Fort Belvoir, as applicable.

Fort Belvoir's *Integrated Pest Management Policy*, 200-04-00 dated 24 January 2000 requires planning that incorporates "education, recordkeeping, and best management practices to prevent

pests and diseases from damaging property" (Appendix K). It also requires that all pest management operations on Fort Belvoir are carried out in accordance with the *Fort Belvoir Integrated Pest Management Plan* and applicable federal, state, and local laws (U.S. Army, 2000b). The policy letter designates ENRD as the responsible party for pest management compliance on Fort Belvoir, which enables it to enforce its requirements.

Fort Belvoir Regulation 40-905, *Animal Control* (U.S. Army, 2000c) addresses the release of domesticated wildlife on installation property. The policy prohibits the release of domestic animals on post and establishes guidelines for capturing and removing feral animals. The regulation applies to all people residing on, employed by, serving on, or visiting Fort Belvoir. It enables Fort Belvoir to enforce the policies established within the regulation.

Fort Belvoir's *Pet Control on Post* Policy 40-14-00 (dated 3 October 2000) aims to maintain a safe and healthy living environment by making pet owners responsible for their pet's actions while on post. The regulation states that "…any pet: (1) not registered with the Fort Belvoir Veterinary Treatment Facility, (2) involved with an act of aggression, or (3) found unleashed or unaccompanied by a responsible party, can be ordered removed from the installation boundaries. Owners are accountable for their pet at all times…"

Fort Belvoir Regulation 210-27, *Range Procedures and Utilization of Training Areas*, provides specific requirements for environmental protection and conservation of training areas. It requires that vehicles stay on established trails and roads, restricts riot control agents to specified training areas to minimize environmental damage, and requires that all waste be removed from the training areas and disposed of properly. The regulation also requires ENRD review of all land disturbing activities (U.S. Army, 1994).

### 11.1.6 Chesapeake Bay Program

DoD and DA are signatory partners of the Chesapeake Bay Program (CBP), through which federal partners, including Fort Belvoir, strive to restore and protect the Bay's natural resources while promoting public awareness. The 1987 *Chesapeake Bay Agreement*, the 1990 *Cooperative Agreement Between DoD and EPA Concerning Chesapeake Bay Activities*, the 1993 *DoD/EPA Action Items for the Chesapeake Bay Program*, the 1994 *Agreement of Federal Agencies on Ecosystem Management in the Chesapeake Bay*, the 1998 *Federal Agencies' Chesapeake Ecosystem Unified Plan (FACEUP)*, and the renewed Chesapeake Bay agreement, *Chesapeake 2000*, contain specific goals, objectives, and commitments designed to provide for the restoration and protection of the Bay's living resources and their habitats. In particular, *FACEUP* commits partners to inventory wildlife habitat restoration needs on federal lands and complete two priority habitat restoration projects each year. Specific CBP directives that pertain to wildlife and wildlife habitat include Directive No. 97-1, *Baywide Nutrient Reduction Progress and Future Directions*; Directive No. 97-3, *Wetlands Protection and Restoration Goals*; Directive No. 94-1, *Riparian Forest Buffers*; Directive No. 94-3, *Framework for Habitat Restoration*; and Directive No. 93-4, *Fish Passage Goals*.

### 11.1.7 Partners in Flight Program

DoD is a partner in promoting and supporting the Partners in Flight (PIF) Program. The PIF Program strives to address the problems facing neotropical migratory birds through

communication, cooperation, and conservation efforts. As part of the PIF Program, DoD installations are encouraged to incorporate elements of the PIF Bird Conservation Strategy into their INRMPs. Such elements include identifying species and habitats most in need of conservation; establishing population and habitat conservation objectives; creating a Bird Conservation Plan to meet established objectives; implementing the plan; and monitoring progress.

## 11.2 BASELINE WILDLIFE CONDITIONS

Fort Belvoir has conducted a number of wildlife surveys for inventory and monitoring purposes (Table 11.1). As of 2000, Fort Belvoir had completed comprehensive installation-wide inventories of all fish and wildlife, except for bats and invertebrates. Various additional wildlife survey efforts have been done or are underway as of 2000. These are discussed below grouped by wildlife type. Surveys for endangered and threatened species (i.e., bald eagle, wood turtle, and peregrine falcon) are addressed in Section 12. Surveys for aquatic resources are presented in Section 7.

**Table 11.1: Sources of Fort Belvoir Wildlife Information**

| *Subject/Section* | *Author* | *Method* | *Coverage* | *Year* | *Product* |
|---|---|---|---|---|---|
| Rare species (Section 12.2.4) | Virginia Department of Conservation and Recreation, Division of Natural Heritage | Field survey | Installation-wide exclusive of cantonment areas | 1994-1995; 1996 | Species lists, report, and maps |
| Wildlife Use of Underpass Structures in Forest and Wildlife Corridor (Section 11.2.1) | George Mason University | Field survey | 3 locations in corridor | Year-round 1995 – 1998 | Movement counts by species, report |
| Small Mammals (Section 11.2.1) | George Mason University | Field survey | Select locations | 1988 – 1994 | Species lists, reports |
| Deer Census (Section 11.2.1) | Inhouse, Vista Technologies, Inc., and Volunteers | Spotlight survey | Installation-wide route | 1988-current | Installation population estimate population trends |
| Deer Population Characteristics (Section 11.2.1) | Inhouse, Vista Technologies, Inc., and volunteers | Measurements | All harvested deer | 1995-current | Total harvest, age sex ratio, weight data |
| Deer Health Check (Section 11.2.1) | Virginia Department of Game and Inland Fisheries, in-house, and Vista Technologies | Necropsy | Select sample | 1987 –current (performed at least every 5 years) | Report |

| Table 11.1: Sources of Fort Belvoir Wildlife Information | | | | | |
|---|---|---|---|---|---|
| ***Subject/Section*** | ***Author*** | ***Method*** | ***Coverage*** | ***Year*** | ***Product*** |
| ***(continued)*** | | | | | |
| Bald Eagle (Section 12.2.1) | In-house and Vista Technologies, Inc. | Fort Belvoir Bald Eagle Management Plan protocol | Nest site and shoreline | Annual, year-round | Nest use and production assessment and shoreline use (foraging) assessment data |
| Year-Round Land Bird Counts (Including Breeding Birds) (Section 11.2.2) | Waterways Experiment Station (WES) and in-house | Point count | Installation-wide, excluding cantonment areas | Annual, one week each season 1998-current | Bird counts by species and report; bird checklist |
| Shorebirds (Section 11.2.2) | In-house | Point count | One location on Accotink Bay | Weekly July 15-October 15; March 15-May 15 1998 - current | Bird counts by species |
| Waterfowl (Section 11.2.2) | In-house and Vista Technologies, Inc. | Point count | Shorelines/tidal marsh areas | Irregular October-April 1997 - current | Bird counts by species |
| Neotropical Migratory Bird (Section 11.2.2) | Institute for Bird Populations | Monitoring Avian Productivity and Survivorship (MAPS) program protocol | Two sites in Training Area 16/HECSA | Annually, May-June 1995-current | Population data, report |
| Christmas Bird Count (Section 11.2.2) | Audubon Society and in-house | Audubon Society protocol | Installation-wide | Annually (December or January), 1941 - current | Bird counts by species |
| Northern Virginia Breeding Bird Survey (Section 11.2.2) | Audubon Society and in-house | Audubon Society protocol | Installation-wide exclusive of cantonment areas and EPG | Annual (June) have data from 1995-current | Bird counts by species |
| Reptiles and Amphibians (Sections 11.2.3 and 11.2.4) | George Mason University | Field survey | Corridor area | 1987 – 1994 | Species lists and reports |
| Reptiles and Amphibians (Sections 11.2.3 and 11.2.4) | In-house | Field survey | Corridor area | 1988-1994 | Counts by species |
| Amphibians (Section 11.2.4) | Dr. Joseph Mitchell | Field survey | South Post training area | 1995 – 1997 | Species list, report |

### 11.2.1 Mammals

With the exception of bats, the mammal species occupying Fort Belvoir are fairly well documented. The mammal surveys are sufficient to provide an inventory of mammal species (except bats) occurring on post. None of the surveys were designed to assess population levels and trends; the results provide general information regarding the abundance and habitat usage of each species on post.

Fort Belvoir performed a series of baseline small mammal field surveys from 1987 through 1994, covering representative areas of all habitat types on post. These surveys were conducted by George Mason University to develop a species list for Fort Belvoir, and to describe wildlife movement/migration routes through the installation. The data have been incorporated into the GIS, but are not in a format suitable for statistical analyses. The collective results of these surveys were published by George Mason University in *The Maryland Naturalist* as "The Mammals of Fort Belvoir, Virginia" (Ernst et al., 1997b). Fort Belvoir monitored wildlife movement through three wildlife-crossing structures along the Fairfax County Parkway from 1995 through 1998. This monitoring was done by George Mason University, and documented wildlife use of the underpass structures. Information from this survey has been incorporated into the installation GIS. During the summer of 2000, Virginia Tech monitored wildlife movement through the underpasses as part of their support to Fairfax County's rabies control program. This effort documented continued wildlife use, including deer (unpublished information).

Other monitoring efforts on Fort Belvoir include deer spotlight monitoring, deer health checks, and raccoon monitoring. The annual deer spotlight surveys, initiated on Fort Belvoir in 1988, are used to estimate the installation deer population. Data from the deer spotlight monitoring surveys have been incorporated into the installation GIS. The deer health check data are used to detect and monitor disease outbreaks and determine overall herd health. The raccoon monitoring effort was initiated in 1999 as part of the installation's participation in Fairfax County's rabies control program.

Forty-three species of mammals have been identified as occurring, or potentially occurring on Fort Belvoir (Appendix D, Table D.2). The resident mammal species appear to be what one would expect to occur in the mix and quality of on-post habitat types. The northern short-tailed shrew (*Blarina brevicauda*) is probably the most abundant mammal on post. This species occurs in a wide variety of terrestrial habitats. The "Mammals of Fort Belvoir, Virginia" report (Ernst et al., 1997b) identified several species of regionally rare mammals through the field surveys. On Fort Belvoir, the southeastern shrew (*Sorex longirostris*), an inhabitant of damp fields, thickets and low-land forest, is at the northern limit of its range; the smokey shrew (*Sorex fumeus)* and the deer mouse (*Peromyscus maniculatus*), both forest inhabitants, are at the eastern limits of their ranges; and the marsh rice rat (*Oryzomys palustris*), an inhabitant of marshes and marsh edges, is at the western limit of its range. The pygmy shrew (*Sorex hoyi*), one of the rarest mammals in the region, occurs in hardwood forests[3]. Appendix D, Table D.2 presents more-specific information on the abundance and habitat usage of Fort Belvoir mammals.

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[3] Although considered regionally rare in the Mammals of Fort Belvoir Survey, these mammals do not carry federal, state, or DCR-NHP status.

Fort Belvoir possesses fairly extensive areas of undisturbed mature forest. These areas provide habitat that supports a variety of small ground-dwelling mammals such as chipmunk (*Tamias striatus*), white-footed mouse (*Peromyscus leucopus*) and woodland vole (*Microtus pineotrum*), as well as for the arboreal squirrels (eastern gray squirrel [*Sciurus carolinensis*] and southern flying squirrel [*Glaucomys volans]*). Forest areas with shade, vegetative ground cover, and woody debris provide habitat conditions for such species as common striped skunk (*Mephites mephites*), which occurs in the more upland settings, and Virginia opossum (*Didelphis virginiana*), which occurs in the more lowland settings.

Fort Belvoir also possesses significant areas of grassy old-field habitat, which occur on Fort Belvoir at three closed landfills, along roadway and utility corridors, and in training areas. These areas provide habitat conditions for such species as the meadow vole (*Microtus pennsylvanicus*) and eastern mole (*Scalopus aquaticus*).

At Fort Belvoir, many mid-sized terrestrial mammals, such as the eastern cottontail rabbit (*Sylvilagus floridana*), woodchuck (*Marmota monax*), and long-tailed weasel (*Mustela frenata*) inhabit the transition areas between forest and old field habitats (i.e., edge areas) where there is both grass cover and tangled underbrush. These species can also be encountered in a wide variety of other habitat types on post.

The extensive stream, marsh, and riparian habitats on post support the water-dependent mammal species, such as beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), river otter (*Lutra canadensis*), mink (*Mustela vison*) and star-nosed mole (*Condylura cristata*). Beaver are of management interest on Fort Belvoir not only from a problem standpoint, but because they can significantly alter habitat conditions through tree removal and dam building. Beaver impoundments appear to be responsible for creating extensive areas of palustrine wetland along Dogue Creek and within drainages to Accotink and Pohick Creeks.

The river otter is another species of management interest. In addition to trapping for the fur trade, which has not occurred at Fort Belvoir in the past several decades, habitat loss and water pollution are the major threats to this species' survival. Although the river otter has not been sighted frequently on Fort Belvoir, there is evidence of recent increases in this species' abundance along Fort Belvoir waterways.

Fort Belvoir's largest mammal, the white tail deer (*Odocoilus virginiana*) can be found throughout the installation, from deep woods to wetlands to housing areas, although its preferred habitats are old-field and second-growth forest. The absence of natural predators at Fort Belvoir and throughout the region has contributed to a steadily increasing regional deer population. This population increase raises significant management concerns not only regarding the detrimental effect of overpopulation on herd health[4], but also on wildlife habitat (i.e., habitat loss through overbrowsing). Additionally, the growing deer population on post poses a safety hazard because of the increased potential for collisions with vehicles. Installation records indicate an average of

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[4] Fort Belvoir experienced an outbreak of epizootic hemmorrhagic disease among the installation deer in late 1999. This outbreak was occurring throughout the Mid-Atlantic at that time.

30 to 35 road kills reported on-post each year[5]. For the past 5 years, the deer population was estimated between 800 and 1,000 animals with an increasing trend. A dramatic increase in population was recorded between 1996 and 1997, but this increase has slowed since 1997.

The raccoon (*Procyon lotor*) is the most abundant predator on Fort Belvoir. Other predators include the common striped skunk, red fox (*Vulpes vulpes*), and the gray fox (*Urocyon cinereoargonteus*). These species tend to hunt edge and corridor areas, and move throughout the installation along drainages. Their populations are influenced by cycles of disease such as canine distemper and rabies. These cycles, in turn, greatly influence population cycles of the smaller mammals, as well as reptiles and amphibians.

Other predators that could occur on Fort Belvoir include the bobcat (*Lynx rufus*), which is reported on the Mason Neck peninsula, and for which tracks have been reported in installation drainages; and the coyote (*Canis latrans*), which occurs in western Fairfax County. Suitable habitat for both species occurs on the installation. If these species were to become resident on post, they would likely influence the populations of other mammal species. In addition to disease and predation, the other major source of mortality among Fort Belvoir mammals is road kill.

As stated earlier, bats have not been fully documented on Fort Belvoir. The installation has conducted one limited survey for bats. This survey identified the big brown bat (*Eptesicus fuscus*), a year-round resident that occupies structures; and the red bat (*Lasiurus borealis*) and eastern pipistrelle (*Pipistrellus subflavus*), both year-round residents of open woodland settings. The survey also identified the migratory silver-haired bat (*Lasionycteris noctivagans*). Other bats considered likely to occur on post (based on regional sightings) are the little brown bat (*Myotis lucifugus*) and Keen's myotis (*Myotis keenii septentrionalis*), which occupy structures and forage over water and in forests, respectively; the hoary bat (*Lasiurus cinereus*), a migratory species; and the evening bat (*Nycticeius humeralis*), a woodland species. Though not recorded in the area, it may be possible for the federally listed endangered Indiana bat (*Myotis sodalis*) to occur in the region.

The house mouse (*Mus musculus*) and the Norway rat (*Rattus norvegicus*), non-native mammals, are documented on post. These animals, along with the woodchuck (*Marmota monax*), can cause damage in the cantonment area. Other problematic mammal species include feral dogs and feral cats. Feral cats are of particular concern because of the risk of disease (e.g., rabies) they pose to humans and pets, and because of their documented devastation of ground nesting birds and small mammals. Fort Belvoir Regulation 40-905, *Animal Control* (U.S. Army, 2000c), prohibits the abandonment of any animal on the installation and outlines procedures if stray animals are found.

### 11.2.2 Birds

The birds of Fort Belvoir are very well documented. Information on the species and abundance of birds on post has been collected through a number of surveys and monitoring efforts undertaken by the installation, as well as by various birding organizations and individuals (Table 11.1).

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[5] Not all road kills are reported. The actual number of road kills is probably higher.

In 1997 and 1998, Fort Belvoir initiated three comprehensive installation-wide survey programs addressing the distribution and seasonal abundance of bird species on post: (1) the year-round (i.e., spring, summer, fall and winter) landbird survey performed by Waterways Experiment Station (WES) and installation staff (Fischer and Fleming, 1999); (2) the shorebird survey performed by installation staff; and (3) the waterfowl survey performed by installation staff.

These major survey efforts were designed and implemented not only to develop a comprehensive species list, but also to assess the relative abundance of bird species, to determine the association of species with habitat types, and to identify trends in populations and distribution over time. These three surveys are intended to continue over the long-term. The data from these surveys have been incorporated into the installation GIS.

Another long-term monitoring program, which has been ongoing at Fort Belvoir since 1995 is monitoring breeding neotropical migratory and resident birds through the Monitoring Avian Productivity and Survivorship Program (MAPS). MAPS is being performed by the Institute for Bird Populations under DoD's Legacy Resources Management Program (Pyle et al., 1999; DeSante et al, 1998). MAPS is a partnership between the United States and Canada designed to provide broad-scale land bird population data (e.g., adult population size, post-fledging productivity, adult survivorship and recruitment). This study is intended to continue for at least a 10-year period.

Other major long-term annual survey events at Fort Belvoir include the Christmas Bird Count (since 1941) and the Northern Virginia Breeding Bird Survey (since 1995). The Christmas Bird Count is performed by the Fairfax Audubon Society with installation staff participation. In 1998, the Northern Virginia Breeding Bird Survey, which was originally initiated by the Fairfax Audubon Society, was incorporated into Fort Belvoir's land bird survey, and is now being performed by Fort Belvoir staff. Data from these surveys are being incorporated into the installation GIS.

As a result of the many surveys and observations over the years, a total of 263 bird species have been identified on Fort Belvoir. Appendix D, Table D.3 presents the species identified on post, together with information on their seasonal abundance and habitat associations. Appendix N presents the Fort Belvoir bird checklist, which provides more detailed information on the seasonal abundance. This large number of bird species on Fort Belvoir reflects the variety and quality of natural habitats at the installation.

Thirty four percent (88 species) of Fort Belvoir bird species are year-round residents, 27% (71 species) are neotropical migrants, and 39% (101 species) are temperate migrants. The most abundant resident landbirds on Fort Belvoir are the red-bellied woodpecker (*Melanerpes carolinus*), American crow (*Corvus brachyrhynchos)*, tufted titmouse (*Parus bicolor*), northern cardinal (*Cardinalis cardinalis*), and American goldfinch (*Carduelis tristis*). The most abundant resident waterbirds are the great blue heron (*Ardea herodias*), Canada goose (*Branta canadensis*), green-winged teal (*Anas crecca*), mallard (*Anas platyrhynchos*), and Forster's tern (*Sterna forsteri*). During the winter, common temperate migrants at Fort Belvoir include the American robin (*Turdus migratorius*), yellow-rumped warbler (*Dendroica coronata*), dark-eyed junco (*Junco hyemalis*), ring-billed gull (*Larus delawarensis*), and white-throated sparrow (*Zonotrichia albicollis*). Abundant neotropical migrants include the black-throated blue warbler

(*Dendroica caerulescens*), black-throated green warbler (*Dendroica virens*), blackpoll warbler (*Dendroica striata*), American redstart (*Setophaga ruticilla*) and rose-breasted grosbeak (*Pheucticus lucovicianus*), which stop over at Fort Belvoir during migration, but do not breed here. The most abundant neotropical migrants breeding on Fort Belvoir include the red-eyed vireo (*Vireo olivaceus*), Acadian flycatcher (*Empidonax virescens*), ovenbird (*Seiurus aurocapillus*), woodthrush (*Hylocichla mustelina*) and indigo bunting (*Passerina cyanea*)[6].

Of the 263 bird species on Fort Belvoir, 99 species (38%) are known to be "common" or "abundant" at the times they occur on post (Fleming, 1998). This indicates that Fort Belvoir affords large areas of suitable habitat for a significant percentage of the installation bird species. Key habitat features on Fort Belvoir include the large contiguous areas of undeveloped land, the landscape of varied ecological communities (e.g., freshwater tidal marsh that is used by killdeer, greater and lesser yellowlegs, spotted sandpiper, and least sandpiper); the early successional old-field habitats used by prairie warblers and field sparrows; the later successional old-field habitats used by yellow-breasted chat, white-eyed vireo and eastern towhee; the forested wetland/riparian forest used by the prothonotary warbler, Kentucky warbler, Acadian flycatcher, yellow-throated vireo, Carolina chickadee, and Louisiana waterthrush; the upland hardwood forest used by the woodthrush, worm eating warbler, eastern wood peewee, and scarlet and summer tanagers; and the abundance of food sources (e.g., soft-bodied insects, seeds, berries, aquatic invertebrates). These natural resources, together with Fort Belvoir's position along the Potomac River corridor, enhance the installation's attraction for both resident and migrant species.

Fort Belvoir supports a significant number of bird species of management concern. Table 12.2 presents the Fort Belvoir bird species considered by DCR-NHP to be rare within Virginia; Table 11.2 presents the PIF priority species for conservation that exist on Fort Belvoir. Table 11.3 presents the PIF high priority species known to breed on Fort Belvoir for which ENRD intends to actively preserve and enhance habitat. DCR-NHP bases its ranking upon the status of the breeding population within Virginia. PIF focuses on migrant and resident land bird species, and bases its ranking upon an assessment of habitat conditions and the species' population throughout the entire range[7] (Hunter et al., 1994; Carter et al., 2000). Fort Belvoir is in the process of preparing a Bird Conservation Plan for the installation).

The only federally or state-listed threatened or endangered bird species resident to Fort Belvoir is the bald eagle (federally-listed threatened and state-listed endangered). The state-endangered peregrine falcon[8] occurs infrequently on post[9], but is not considered to be a resident.

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[6] Neotropical migratory bird species breed in North America, but migrate to wintering grounds in Central and South America. Temperate migrants reside in North America year-round and typically breed in the northern U.S. and Canada, and winter in the southern U.S. Many of these species are undergoing population decline.

[7] The PIF species prioritization process designates a species a score of 1-5 for each of seven criteria: global abundance, winter distribution, severity of threats on the wintering grounds and migration routes, severity of threats of the breeding grounds, importance of the area to the species, and population trends in that region based on the North American Breeding Bird Survey.

[8] The peregrine falcon was removed from the federal endangered species list in August 1999.

| Table 11.2: Partners in Flight Priority Species Pool in Decreasing Order of Concern[a] | | | | | | | |
|---|---|---|---|---|---|---|---|
| ***Entry Level[b]*** | ***Species*** | ***Total Score*** | ***% of Pop.[c]*** | ***AI[d]*** | ***PT[e]*** | ***Regional Status[f]*** | ***Ft Belvoir Status[g]*** |
| **I** | | | | | | | |
| A | Prairie Warbler | 25 | 5.9 | 5 | 5 | B | B |
| | Wood Thrush | 25 | 3.7 | 4 | 5 | B | B |
| | Kentucky Warbler | 24 | 1.6 | 3 | 5 | B | B |
| | Worm-eating Warbler | 24 | 2.9 | 3 | 3 | B | B |
| | Prothonotary Warbler | 23 | 1.7 | 3 | 3 | B | B |
| | Whip-poor-will | 23 | 4.0 | 4 | 4 | B | B |
| | Yellow-throated Vireo | 23 | < 1 | 3 | 5 | B | B |
| | American Black Duck | 22 | 1.6 | 4 | 2 | D | M |
| | Field Sparrow | 22 | 1.5 | 4 | 5 | D | D |
| | Hooded Warbler | 22 | 1.3 | 3 | 4 | B | B |
| | Scarlet Tanager | 22 | 2.4 | 4 | 4 | B | B |
| | American Woodcock | 23 | < 1 | 3 | 5 | D | D |
| B | Cerulean Warbler | 26 | < 1 | 2 | 3 | E | M |
| | Henslow's Sparrow | 25 | < 1 | 2 | 3 | B | PB |
| | Blue-winged Warbler | 23 | 1.1 | 2 | 4 | B | M |
| II | | | | | | | |
| A | Eastern Wood-Pewee | 21 | 2.2 | 5 | 4 | B | B |
| | Marsh Wren | 21 | < 1 | 3 | 5 | D | D |
| | Northern Bobwhite | 21 | 1.4 | 4 | 5 | R | R |
| | Brown Thrasher | 20 | < 1 | 4 | 4 | D | D |
| | Chimney Swift | 20 | 1.7 | 4 | 4 | B | B* |
| | Eastern Towhee | 20 | 2.3 | 4 | 5 | D | D |
| | Gray Catbird | 20 | 2.7 | 4 | 5 | D | D |
| | Virginia Rail | 20 | 2.3 | 5 | 3 | D | D |
| | Carolina Chickadee | 19 | 2.4 | 4 | 4 | R | R |
| | Eastern Kingbird | 19 | < 1 | 3 | 5 | B | B |
| | Yellow-billed Cuckoo | 19 | 1.1 | 4 | 4 | B | B |
| **B** | Acadian Flycatcher | 21 | 4.6 | 4 | 2 | B | B |
| | Forster's Tern (Virginia-SC) | 19 | 3.0 | 3 | 2 | B | M |
| | Pine Warbler | 19 | 3.7 | 4 | 2 | B | B |
| **C** | Louisiana Waterthrush | 21 | 1.8 | 3 | 3 | B | B |
| | Sedge Wren | 21 | < 1 | 2 | 3 | B | M |
| | White-eyed Vireo | 21 | 1.5 | 3 | 4 | B | B |
| | Grasshopper Sparrow | 20 | < 1 | 2 | 5 | B | PB |
| | Short-eared Owl | 19 | < 1 | 2 | 3 | D | W* |

[9] The peregrine falcon has been sighted during spring and fall migrations in the Accotink Bay area.

| Table 11.2: Partners in Flight Priority Species Pool in Decreasing Order of Concern[a] | | | | | | | |
|---|---|---|---|---|---|---|---|
| (continued) | | | | | | | |
| ***Entry Level[b]*** | ***Species*** | ***Total Score*** | ***% of Pop.[c]*** | ***AI[d]*** | ***PT[e]*** | ***Regional Status[f]*** | ***Ft Belvoir Status[g]*** |
| III | | | | | | | |
| | Chuck-will's-window | 20 | 1.2 | 3 | 2 | B | M |
| | Red-headed Woodpecker | 18 | <1 | 2 | 1 | D | D |
| **IV** | | | | | | | |
| | Bald Eagle (U.S.-T; Virginia-E; Maryland-E) | 16 | < 1 | 3 | 1 | R | R |
| **V** | | | | | | | |
| | Least Bittern (Maryland-E) | 18 | 3.6 | 2 | 3 | B | B |
| | Least Tern (Virginia, Maryland -SC) | 17 | 2.4 | 3 | 3 | B | M |
| | Dickcissel (Virginia-SC) | 20 | < 1 | 1 | 3 | B | PB |
| | King Rail (Maryland-T) | 20 | < 1 | 2 | 3 | D | D |
| | American Bittern (Maryland-E) | 18 | < 1 | 2 | 3 | D | D* |
| | Barn Owl (Virginia-SC) | 18 | < 1 | 2 | 3 | D | D |
| | Loggerhead Shrike (Virginia-E) | 18 | < 1 | 2 | 3 | E | PB, W* |
| | Common Tern (Maryland-SC) | 17 | 1.2 | 4 | 4 | D | M |
| | Northern Harrier (Virginia-SC) | 17 | < 1 | 2 | 2 | D | D* |
| | Peregrine Falcon (Virginia-E; Maryland-E) | 17 | < 1 | 2 | 3 | R? | M |
| | Red-eyed Vireo (Virginia-SC) | 17 | < 1 | 3 | 4 | B | B |
| | Yellow-crowned Night Heron (Virginia-T) | 17 | < 1 | 2 | 1 | B | M |
| | Black-crowned Night-Heron (Virginia-SC) | 16 | < 1 | 2 | 3 | D | D* |
| | Brown Creeper (Virginia-SC) | 16 | < 1 | 2 | 3 | D | D |
| | Pied-billed Grebe (Maryland-E) | 16 | < 1 | 2 | 3 | D | W |
| | Bank Swallow (Virginia-SC) | 16 | < 1 | 2 | 3 | B | B |
| | Common Moorhen (Virginia, Maryland-SC) | 15 | < 1 | 2 | 3 | D | M |
| | Great Blue Heron (Maryland-SC) | 15 | 1.5 | 4 | 1 | D | D |
| | Snowy Egret (Maryland-SC) | 15 | 1.4 | 2 | 3 | B | B* |
| | Spotted Sandpiper (Maryland-SC) | 15 | < 1 | 2 | 3 | B | M |
| | Hermit Thrush (Virginia-SC) | 14 | < 1 | 1 | 3 | W | W |
| | Caspian Tern (Virginia-SC) | 14 | < 1 | 2 | 1 | B | M |
| | Little Blue Heron (Virginia-SC) | 14 | < 1 | 1 | 3 | B | B* |
| | Great Egret (Virginia-SC) | 13 | 1.5 | 3 | 1 | B | B* |

Source: Eberly and Fischer, in preparation.

Table Notes:

[a] Values are for the Mid-Atlantic Coastal Plain for species that are known to occur on Fort Belvoir. Scores were developed from Partners in Flight criteria (Hunter et al., 1994; Watts, 1999; Carter et al., 2000).

[b] There are five entry levels into the priority species pool, as follows:

*Tier I*. HIGH CONTINENTAL PRIORITY. Species that are typically of conservation concern throughout their range. These are species showing high vulnerability in a number of factors, expressed as any combination of high parameter scores leading to an average score > 3 (the midpoint); total of 7 parameter scores will be $\geq$ 22, with AI $\geq$ 2 (so that species without manageable populations in the region are omitted).

*Tier I A*. HIGH CONTINENTAL PRIORITY - HIGH REGIONAL RESPONSIBILITY. Species for which this region shares in major conservation responsibility; i.e., conservation in this region is critical to the overall health of this species. Species with AI of 3 - 5, or a high percent population (above threshold in II B).

*Tier I B*. HIGH CONTINENTAL PRIORITY - LOW REGIONAL RESPONSIBILITY. Species for which this region can contribute to range-wide conservation objectives where the species occurs. Species with AI of 2.

*Tier II*. HIGH REGIONAL PRIORITY. Species that are of moderate continental priority, but are important to consider for conservation within a region because of various combinations of high parameter scores, as defined below; total of 7 parameter scores = 19-21.

*Tier II A*. HIGH REGIONAL CONCERN. Species that are experiencing declines in the core of their range and that require short-term conservation action to reverse or stabilize trends. These are species with a combination of high area importance and declining (or unknown) population trend; total of 7 parameters = 19-21, with AI + PT $\geq$ 8.

*Tier II B*. HIGH REGIONAL RESPONSIBILITY. Species for which this region shares in the responsibility for long-term conservation, even if they are not currently declining or threatened. These are species of moderate continental priority with a disproportionately high percentage of their total population in the region; total of 7 parameters = 19-21, with $\geq$ 5% of the global population.

*Tier II C*. HIGH REGIONAL THREATS. Species of moderate continental priority that are uncommon in a region and whose remaining populations are threatened, usually because of extreme threats to sensitive habitats. These are species with high breeding threats scores within the region (or in combination with high non-breeding threats outside the region); total of 7 parameters = 19-21 with TB + TN > 6, or local TB or TN = 5.

*Tier III*. ADDITIONAL WATCH LIST. These species are on the U.S. National Watch List not included in the above tiers. These species score highly enough based on global criteria to warrant conservation attention wherever they occur with an AI of 2 or more.

*Tier IV*. ADDITIONAL FEDERALLY LISTED. Species listed under the U.S. Endangered Species Act receive conservation attention wherever they occur.

*Tier V*. ADDITIONAL STATE LISTED. Species on state endangered, threatened, or special concern lists that did not meet any of above criteria. These are often rare or peripheral populations.

Species that are federally or state listed are noted on the Priority Species Pool by country and/or state using the following codes: E = Endangered, T = Threatened, SC = Special Concern.

[c] Percent of population – percent of range area, weighted by Breeding Bird Survey relative abundance (Rosenburg and Wells, 2000).

[d] AI (Area Importance) – a score of 5 indicates that the Mid-Atlantic Coastal Plain is of high importance to the listed species, decreasing numbers indicate decreasing importance.

[e] PT (Population Trend) – a score of 5 indicates that population numbers for the listed species are decreasing in the Mid-Atlantic Coastal Plain, decreasing numbers indicate less significant population decreases.

[f] Migratory status within the Mid-Atlantic Coastal Plain: B - species that breed but do not winter within the region (neotropical and temperate migrants), D - species that breed and winter in the region (but possibly different populations), E - breeding species reaching distributional limits, R - resident or non-migratory species, _? – status uncertain.

[g] Migratory status within Fort Belvoir: B - species that breed but do not winter on Fort Belvoir (neotropical and temperate migrants), PB - species that could breed on Fort Belvoir with appropriate habitat, D - species that breed

and winter on Fort Belvoir (but possibly different populations), R - resident or non-migratory species, M - species that migrate through Fort Belvoir, and W - species found on Fort Belvoir during the non-breeding season (winter) and possibly during migration. NOTE: D* and B* indicate species found during breeding season and/or migration, but no evidence of actual breeding on Fort Belvoir; W* indicates species that historically occurred on Fort Belvoir during winter.

The Avian Inventory, Monitoring, and Management report produced by Fischer 2000 listed ten species of birds as high priority or entry level 1 breeding species on Fort Belvoir (Fischer et al., 2000). These ten species were detected during the breeding survey period and, at the time of the survey, were listed with PIF as having concern scores higher than 22[10]. Figure 11.1 shows the critical breeding and forage areas for the 10 species listed in Table 11.3.

**Table 11.3: High Priority Partners in Flight Species for the Mid-Atlantic Coastal Plain Documented as Breeders on Fort Belvoir 1998-1999.**

| *Entry Level** | *Species†* | *PIF Score* |
|---|---|---|
| 1 | Wood Thrush | 25 |
| | Prairie Warbler | 25 |
| | Kentucky Warbler | 24 |
| | Acadian Flycatcher | 23 |
| | Yellow-throated Vireo | 23 |
| | Worm-eating Warbler | 23 |
| | Eastern Wood-Pewee | 22 |
| | White-eyed Vireo | 22 |
| | Prothonotary Warbler | 22 |
| | Louisiana Waterthrush | 22 |

Source: Fischer et al., 2000.

*Entry Level I. High overall (global) priority - species scoring 22 or higher in the PIF prioritization system. Indicates high vulnerability of populations throughout the species range, irrespective of specific status in the physiographic area. Species without manageable populations in the area (peripheral) are omitted.

†Species do not match those listed in Table 11.2 due to changes in PIF priority species listings after the completing of the Fischer, 2000 report.

### 11.2.3 Reptiles

The reptile species present at Fort Belvoir have been well-documented through various field surveys (Table 11.1). The data provide an inventory of reptile species occurring or potentially occurring on the installation; however, study limitations preclude detailed abundance and distribution analysis. Reptile surveys include the series of reptile baseline field surveys conducted by George Mason University from 1987 through 1994; a field study by Dr. Joseph Mitchell from

[10] After the submittal of the Fischer report, PIF updated its Mid-Atlantic Coastal Plain priority species scores and removed or added several species to the entry level 1 list (the most current list is reflected in Table 11.2). Despite this change to the PIF list, the ten species listed in Table 11.3 are of management concern on Fort Belvoir and their breeding habitat will continue to be maintained and enhanced.

1995-1996 to test amphibian survey techniques[11], and various herpetological sampling events by installation personnel from 1988 through 1994[12]. The results of the George Mason University studies were published in the *Bulletin of the Maryland Herpetological Society*, as "The Amphibians and Reptiles of Fort Belvoir and Northern Virginia" (Ernst et al., 1997a). Dr. Mitchell's data are published in *Amphibian Decline in the Mid-Atlantic Region: Monitoring and Management of a Sensitive Resource* (Mitchell, 1998). Dr. Mitchell's data and installation staff reptile data are on file at the ENRD office. Data from these surveys have been incorporated into the installation GIS.

Thirty-two species of reptiles have been identified as occurring or likely to occur, on Fort Belvoir: 10 turtles, 18 snakes and four lizards. These species are all typical of the northern Virginia upper Coastal Plain, although several are at the limits of their ranges (e.g., wood turtle (*Clemmys insculpta*), a state-listed threatened species at the southern limit of its range; and the pond slider turtle (*Trachemys scripta*), river cooter (*Pseudemys concinna*), and ground skink (*Scincella lateralis*) at the northern limits of their ranges). Appendix D, Table D.4 presents more-specific information on the abundance and habitats of Fort Belvoir reptiles.

The 18 endemic snake species occur in all habitat types at Fort Belvoir. Aquatic snakes include the northern water snake (*Nerodia sipedon*). Terrestrial species occurring in more xeric habitats include common kingsnake (*Lampropeltis getulus*), queen snake (*Regina septemvitta*), ribbon snake (*Thamnophis sauritus*), corn snake (*Elaphe guttata*) and northern black racer (*Coluber constrictor*). Snakes of moist deciduous woodlands include eastern worm snake (*Carphophis amoenus*), northern ringneck snake (*Diadophis punctatus*), and black rat snake (*Elaphe obsoleta*). The only venomous snake endemic to Fort Belvoir is the copperhead (*Agkistrodon contortix*), which occurs in moist deciduous/mixed woods. The timber rattlesnake (*Crotalus horridus*) and the cottonmouth, or water moccasin (*Agkistrodon piscivorus*) are not native to the northern Virginia area.

Many of the snakes of Fort Belvoir are fairly secretive (e.g., the eastern hognose snake (*Heterodon platyrhinos*), which spends much of its time underground in sandy soils, and the eastern kingsnake (*Lampropeltis getulaus getulaus*), which is predominantly nocturnal. Consequently, these species are not well described for Fort Belvoir. Anecdotal observations indicate that snakes experience a high mortality from predation (e.g., larger snakes, raptors) and by road kills. Management actions in the past have been limited to relocation of individual animals from occupied structures when they pose a problem or safety concern, and capture and removal of exotic species (e.g., boa constrictors) from the installation.

The ten species of turtles present or potentially present on Fort Belvoir occur in association with water. The most common turtle on post, the snapping turtle (*Chelydra serpentina*), as well as the stinkpot (*Sternotherus odoratus*), eastern mud (*Kinosternon subrubrum*) painted turtle (*Chrysemys picta*), redbelly turtle (*Chrysemys rubriventris*), spotted turtle (*Clemmys guttata*),

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[11] Although this was an amphibian survey, ancillary observations and data on reptiles were obtained by Dr. Mitchell throughout it.

[12] Since 1995, Fort Belvoir has been performing field surveys to monitor wildlife movement through the wildlife underpasses along the Fairfax County Parkway on Fort Belvoir.

and pond slider turtle (*Trachemys scripta*) are all aquatic species that tend to occur in shallow, slow moving waters with mud bottoms. The eastern river cooter (*Chrysemys concinna*), not captured but considered possible at Fort Belvoir, is an aquatic species of faster moving waterways. The eastern box turtle (*Terrapene carolina*), a terrestrial species of woodlands, will occupy wet areas during dry periods.

The wood turtle (*Clemmys insculpta*), a state-listed threatened species, occurs at Fort Belvoir (Section 12). Several individuals of this species have been observed at various locations along the Dogue Creek and Accotink Creek drainages, indicating an on-post population). The spotted turtle, while abundant on Fort Belvoir, is decreasing throughout Virginia and it is possible that it will be added to Virginia's list of threatened species.

Field observations indicate that turtles experience high mortality on post from road kill and from predation. Raccoons, foxes, skunks, and snakes all prey upon turtle eggs. Young turtles are preyed upon by these animals, as well as by predatory fishes and various birds. Turtles of all ages appear to be a major prey of raptors such as bald eagles.

The four lizards occurring on Fort Belvoir include the five-lined skink (*Eumeces fasciatus*), the broad-headed skink (*Eumeces laticeps*), and the ground skink (*Scincella lateralis*), all of which occupy mesic, deciduous or deciduous/mixed woods; and the northern fence lizard (*Sceloporus undulatus*), which occupies drier, open areas. All of these species require habitats with debris/structures for cover and basking.

### 11.2.4 Amphibians

The amphibian species present at Fort Belvoir have been well documented (Table 11.1). As noted for reptiles, the studies do not provide information on populations or distribution of amphibians on post. Fort Belvoir has gathered information on amphibians through several surveys including the 1987 through 1994 baseline reptile and amphibian field surveys performed by George Mason University, the 1995 to 1996 amphibian survey technique study performed by Dr. Joseph Mitchell of the University of Richmond, and the 1988 through 1994 in-house reptile and amphibian surveys (as discussed in the reptile section above). Amphibian data have been incorporated into the installation GIS.

Twenty-seven species of amphibians have been identified as occurring, or potentially occurring, on Fort Belvoir: 11 frogs, three toads and 13 salamanders. These species are all typical of the northern Virginia upper Coastal Plain, although several are at the limits of their range. These include the green tree frog (*Hyla cinerea*), southern leopard frog (*Rana utriculara utriculara*), and three-lined salamander (*Eurycea longicauda*), which are at their northern limits. The Jefferson's salamander (*Ambystoma jeffersoniarum*) is within the southern limit of its range. The wood frog (*Rana sylvatica*) and the longtail salamander (*Eurycea longicauda longicauda*) are within their eastern limit. Appendix D, Table D.5 presents more-specific information on the abundance and habitats of Fort Belvoir amphibians.

Hooded Warbler Breeding Habitat
Worm-eating Warbler Breeding Habitat
Yellow-throated Vireo Breeding Habitat
Wood Thrush Breeding Habitat
Kentucky Warbler Breeding Habitat
Prothonotary Warbler Breeding Habitat
Field Sparrow Breeding Habitat
American Woodcock Breeding Habitat
Prairie Warbler Breeding Habitat
Scarlet Tanager Breeding Habitat

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# PARTNERS IN FLIGHT HIGH PRIORITY BREEDING BIRD HABITAT on FORT BELVOIR

SOURCE: FISCHER et al., 2000; UNPUBLISHED DATA

FIGURE: 11.1

The two toads identified at Fort Belvoir are the American toad (*Bufo americanus americanus*), which is widespread and inhabits brushy, damp areas and the Fowler's toad (*Bufo woodhousei fowleri*), which occurs in sandy soils. The eastern spadefoot toad (*Scaphiopus holbrooki holbrooki*), while not identified on the installation, is reported on the Mason Neck peninsula to the south. This species occurs in sandy lowlands.

The 11 frog species occur in habitats associated with water. The bullfrog (*Rana catesbeiana*) and pickerel frog (*Rana palustris*) are aquatic species. The upland chorus frog (*Pseudacris feriarum feriarum*) (a rare species in decline) and the wood frog (*Rana sylvatica*) occur in wetland woods and mesic woods, respectively. The remaining frog species, northern cricket frog (*Acris crepitans crepitans*), northern spring peeper (*Pseudacris crucifer crucifer*), Gray tree frog (*Hyla chrysoscelis*), Copes gray tree frog (*Hyla versicolor*), green frog (*Rana clamitans clamitans*), green tree frog (*Hyla cinerea*) and southern leopard frog occupy various terrestrial habitats (e.g., grassy, brushy, wooded) near water.

Although 13 salamander species were recorded on Fort Belvoir, four were not observed on the installation but are believed to be present. These include the eastern mud salamander (*Pseudotriton montanus montanus*), longtail salamander and three-lined salamander, which were not collected at Fort Belvoir, but are considered likely to occur; and the Jefferson's salamander, which is considered possible, but not likely to occur. Of the installation salamanders, only the redback salamander (*Plethodon cinereus*) and slimy salamander (*Plethodon glutinosus*) are considered terrestrial species. All of the other salamanders spend part or all of their adult lives closely associated with water (e.g., dusky salamander [*Desmognathus fuscus fuscus*] in flowing brooks, spotted salamander [*Ambystoma maculatum*] in woodland ponds, four-toed salamanders [*Hemidactylium scutatum*] in seepages in woods).

Amphibians have complex habitat requirements because of their dual life histories, living part of their lives in aquatic environments and part of their lives in terrestrial environments. The natural mosaic of aquatic and woodland habitats at Fort Belvoir, including the extensive wetland areas, woodlands traversed by extensive drainage systems, and ephemeral ponds (including man-made depressions, such as ditches and tire ruts along the unpaved training area roads) provide extensive areas of suitable amphibian habitat. Microhabitat conditions (e.g., extensive leaf litter, woodland debris, such as fallen logs, and undercut banks in the natural areas on-post) enhance the quality of this habitat. Fort Belvoir's relatively rich amphibian population is vulnerable to losses from predation, climatic and/or physical land surface changes (e.g., development, loss of cover) that cause loss of surface waters or loss of natural ground-level humidity at the forest floor, fragmentation of habitat, and disruption of natural travel corridors.

## 11.3 WILDLIFE MANAGEMENT

### 11.3.1 Wildlife Management Recommendations

Fort Belvoir is coordinating with DoD's Partners in Flight Program (PIF) to prepare a Bird Conservation Plan for the installation (Eberly, in preparation). The plan will outline specific

management actions for the conservation of PIF Priority Bird Species. These management actions are being developed in accordance with the PIF *Mid-Atlantic Coastal Plain Bird Conservation Plan* (Watts, 1999). Recommendations within the draft plan include the following:

- Maintain enough forested wetland habitat to support a stable population of 10 to 15 prothonotary warblers, and 150 to 200 Acadian flycatchers. Adequate habitat for this species ensures adequate habitat for other priority bird species. Identify and conserve existing forested wetland blocks to prevent loss and degradation.

- Maintain enough upland forest habitat to support a population of 600 wood thrushes. Adequate habitat for this species ensures adequate habitat for other priority bird species. Identify and conserve existing contiguous blocks of upland forest.

- Continue to maintain hardwood forests on Fort Belvoir. Hardwood-dominated forests near the fall line are of particular conservation significance to a diverse breeding-bird community.

- Create and maintain enough open grassland to support 10 pairs of grasshopper sparrows. Adequate habitat for this species ensures adequate habitat for other priority bird species.

- Create and maintain enough successional/shrub-scrub habitat to support 50 prairie warblers. Adequate habitat for this species ensures adequate habitat for other priority bird species.

- Perform a biological assessment to evaluate the effects of converting grassland patches less than 10 hectares (25 acres) in size to shrubland. Shifting the management of these lands from grasslands to shrublands would greatly increase the availability of habitat for shrub-dependent birds within the region.

- Ensure that grassland and shrubland management activities do not conflict breeding bird activity by placing restrictions on grassland management activities during June through August, and by conducting shrubland management activities on a four-year cycle between early April and mid-May.

- Coordinate with Huntley Meadows Park, Virginia; Potomac River National Wildlife Refuge, Virginia; Fairfax County, Virginia, Prince Georges and Charles Counties, Maryland; other local DoD installations; and other government organizations to ensure that goals and management actions for migratory birds are consistent.

### 11.3.2 Wildlife Management Actions to Date

Fort Belvoir manages its wildlife resources in accordance with the resource conservation and multiple use requirements of the Sikes Act, DoDI 4715.3, and AR 200-3. Management actions to date have prioritized conservation of ecologically significant wildlife resources, while supporting the military mission and providing public access to installation wildlife resources (as long as the access is consistent with the military mission and resource conservation).

Fort Belvoir follows an ecosystem-based approach to wildlife management. In establishing wildlife management policies and identifying and selecting management actions, Fort Belvoir addresses the installation's biological resources in terms of their landscape setting (local, regional, and national). Fort Belvoir's overall wildlife management policy is to conserve and enhance healthy native wildlife communities, rather than emphasizing single-species[13] or game-species management or production[14].

Fort Belvoir's management program recognizes the importance of understanding native habitats, and managing or responding to the forces that influence those habitats. Fort Belvoir's management program focuses on (1) conserving natural habitats in the size and configuration that best supports native wildlife populations; (2) eliminating, minimizing, or offsetting habitat disruptions such as forest fragmentation and damage by overabundant species; (3) enhancing habitat conditions for species and suites of species having recognized conservation priority, such as threatened, endangered, and PIF priority bird species; and (4) using indicator species to evaluate and set priorities for manipulation of habitat conditions.

Fort Belvoir's wildlife management program stresses balancing public access to and use of wildlife resources with preservation of functional ecosystems. Public access to wildlife habitats is provided in the two installation refuges and along much of the approximately 12 miles of the installation's shoreline. Fort Belvoir allows public access to these areas for a variety of low-intensity recreational uses, such as wildlife viewing, hiking, and nature photography, as well as for hunting and fishing. Fort Belvoir offers a variety of environmental education programs and events (e.g., guided bird walks), and hosts educational programs and events run by other organizations (including activities with "Partners in Education" schools and the Fairfax Audubon Society), in the refuges (Section 13). Fort Belvoir also provides the public with opportunities for recreational hunting (bow hunting) and fishing on post. The current relationship between wildlife management and recreational hunting maximizes hunter opportunity to reduce an overabundant deer population. Season, harvest and area limits that will allow use of archery equipment to effectively reduce the deer population are selected. Hunting is an effective management tool to achieve population levels that are most beneficial to a given species (e.g., populations that minimize the potential for disease problems), and that do not adversely affect other species or

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[13] However, there are specific instances where single-species management is appropriate. For example, compliance with the Endangered Species Act requires management actions for individual listed species.

[14] It should be acknowledged that Fort Belvoir maintains a large number and variety of nest box/platform structures (e.g., bluebird boxes, wood duck boxes, owl and kestrel boxes, bat boxes, martin houses, osprey platforms, etc.). The nest box/platform projects were initiated years ago, prior to Fort Belvoir adopting its current broad-based wildlife program. While it appears that these nest enhancement projects focus on target species and therefore may not be consistent with the installation's present-day management philosophy, they have been shown to be used by most of their target species. The bluebird boxes and wood duck boxes are especially effective. Given the use of these structures by wildlife species that are not considered to be potential problematic species, it was decided to continue maintenance of the structures. If they were not to be maintained, they would have to be removed. The loss of nesting opportunities for wildlife species having some degree of conservation interest appeared not to be appropriate at this time. Fort Belvoir intends to consider evaluating the appropriateness of continuing the nest box structures program into the future.

their habitats. The Fort Belvoir hunting program is not intended to introduce or increase populations of game species.

Fort Belvoir's wildlife program honors the commitments made by DoD and the Department of Army to international and regional programs such as PIF and the Chesapeake Bay Program. The PIF Program is an international partnership that aims to focus resources on the improvement of monitoring and inventory, research, management, and educational programs involving birds and their habitats. DoD committed to this effort by developing a parallel DoD PIF Program. Fort Belvoir is working with the DoD PIF Program representative to prepare a Bird Conservation Plan for the installation (Eberly, in preparation). Fort Belvoir's management emphasis on PIF priority bird species will contribute to PIF goals for the Mid Atlantic Coastal Plain Physiographic Area.

Fort Belvoir's wildlife program also honors commitments made by DoD and DA to the Chesapeake Bay Program, a regional initiative that aims to preserve and restore the Chesapeake Bay and its watershed including its living resources. As a signatory partner of the 1994 and 1998 federal agencies' agreements, which are based upon the overall Chesapeake Bay Program goals, DoD and DA committed to be stewards of the Bay's living resources. Fort Belvoir's efforts to conserve and enhance healthy native wildlife communities directly contribute the living resource goals of these Agreements and the overall Chesapeake Bay Program.

Wildlife management actions to date at Fort Belvoir include:

- Wildlife data collection (baseline and monitoring studies)
- Native wildlife habitat conservation and enhancement
- Preservation of wildlife movement corridors
- Prohibition of introductions of non-native wildlife species and release of domestic species
- Removals of feral animals from the wild
- Population management for select species (i.e., overabundant species such as deer)
- "Problem"[15] and dangerous wildlife control
- Wildlife disease monitoring and treatment
- Education, outreach, and training
- Partnering on regional wildlife management actions, such as participation the Fairfax Deer Management Committee.

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[15] "Problem" refers to any individual or species that causes damage to or interferes with humans and other wildlife, including wildlife habitat. Problem species in this context are identified on a case-by-case basis by Fort Belvoir natural resources staff and do not necessarily meet the Virginia Department of Game and Inland Fisheries definition of nuisance species.

The following sections present specific information on Fort Belvoir's wildlife management actions to date. Management actions for endangered and threatened species (i.e., bald eagle, wood turtle, and peregrine falcon) are addressed in Section 12.

#### *11.3.2.1 Habitat Conservation*

The broadest management action within Fort Belvoir's wildlife program has been setting aside large blocks of natural area for conservation (Section 13). Fort Belvoir has designated two installation refuges (ABWR and Jackson Miles Abbott Wetland Refuge [JMAWR]), totaling 1,506 acres and the Fort Belvoir Forest and Wildlife Corridor, for an additional 742 acres (Figure 4.1), all of which are designated as conservation areas within the Fort Belvoir Master Plan (Woolpert, 1993a). Specifically, the Fort Belvoir Master Plan designates the installation refuges and the Forest and Wildlife Corridor, as well as all steep-sloped areas (many of which are adjacent to the installation riparian areas) and wetlands as "environmentally constrained to development." This designation has been effective at safeguarding valuable wildlife habitat from loss to development, and at preserving functioning wildlife movement/migratory routes within and through the installation. Management actions for the installation refuges and corridor are addressed in Section 13.

#### *11.3.2.2 Mammal Management*

As documented through the baseline surveys, Fort Belvoir supports a fairly diverse mammal community. The baseline survey results indicate that the installation's mammal species are typical to the Northern Virginia area, and that these species appear to be present at the levels of abundance that one would expect for undisturbed habitat in this area[16]. The baseline surveys do not indicate a need for any species or habitat-specific management recommendations for mammals.

The principal management need identified through the baseline surveys is the need to (1) preserve native wildlife habitat on Fort Belvoir, and (2) preserve wildlife movement/migratory corridors within and through the installation. Ernst et al. (1988) documented an area running from the northeast to the southwest through the installation that supported movement of mammals, as well as amphibians and reptiles. This report also documented shorter, more-localized wildlife movement routes along stream corridors within the installation (Figure 11.2). The results of this work led to the establishment of the Fort Belvoir Forest and Wildlife Corridor (Section 13).

Fort Belvoir, as is presently true throughout all of Northern Virginia, has an overabundant deer population. The results of the annual deer spotlight surveys (Figure 11.3 shows the survey route) for the past 5 years estimate the population to be between 800 and 1,000 deer, or 50 to 70 deer per square mile. This density is well above the level that can be supported in good physical condition over an extended period of time and far above the target population level set by Fairfax County (8 to 15 deer per square mile) (Fairfax County, 2000b). The over-population of deer is of management concern not only for the deer themselves, but also for other wildlife. A large deer

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[16] Normalcy of abundance is based on judgement of natural resources managers at Fort Belvoir rather than data analysis.

population increases the risk for human safety and health issues due to vehicle collisions and disease. Overbrowsing reduces habitat quality for more than just deer, and coincides with a decline in herd health. This decline includes lowered body weights, increased parasitism, and increased disease prevalence. In the absence of marked herd reduction, neither herd health nor habitat quality will improve, as each constrains the other (Deer Management Planning Committee, 1999). Fort Belvoir recognizes the need to manage toward reduction in the size of the installation's deer herd.

Fort Belvoir recognizes that deer hunting is the only effective, practical and adaptive method available for deer population management. Consequently, Fort Belvoir is using deer hunting, through a bow hunting-only program, as the installation's primary deer management tool[17]. Fort Belvoir uses regulated hunting to manage the effects of deer on other plant and animal communities, and to reduce urban (e.g., vehicle collision, landscape damage), ecosystem, forestry and other types of deer damage. Fort Belvoir's herd reduction goal, which is consistent with Virginia's Deer Management Plan (Deer Management Planning Committee, Virginia Department of Game and Inland Fisheries, 1999), is intended to manage deer at a level most compatible with local social, economic, political and biological needs, and to preserve native wildlife habitat. In other words, conservation of the installation's biodiversity is the primary purpose of the Fort Belvoir deer hunting program; providing opportunities for recreational hunting is secondary. Organizational responsibilities regarding the deer hunting program are specified in the Fort Belvoir Supplement to AR 200-3 (Appendix H). Additionally, DIS issues an annual Hunting Fact Sheet (Appendix O).

Fort Belvoir has participated in Virginia's Deer Management Assistance Program (DMAP) since 1987. In 2000, Fort Belvoir began participating in Virginia's Deer Population Control Program (DPOP). These site-specific programs allow more-liberal harvest of anterless deer than what could be obtained under the existing system of county regulations. Fort Belvoir is also a participant in the Fairfax County Deer Management Committee regarding regional deer management efforts. Deer harvest levels at Fort Belvoir for the past 5 years have increased annually ranging from 179 to 250. Exclusive use of archery tackle for hunting has proven effective in stabilizing the installation's deer population level; however, greater harvest levels are needed to reduce the herd size. It is our intention to continue archery only hunting, increasing hunter success through the DMAP and DPOP, to move from herd maintenance to population reduction. This approach will meet safety constraints and maximize the recreational value of urban hunting.

Deer can present a safety hazard to aircraft operations at Davison Army Airfield. For the past five years, Fort Belvoir has operated under official kill permits from Virginia Department of Game and Inland Fisheries to remove deer from Davison Army Airfield as needed in response to airfield safety issues.

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[17] The bow hunting program also allows for taking squirrel, woodchuck, fox, and raccoon, which are considered to be overabundant species on post. In 2000, at the request of the hunting community and with support from VDGIF, Fort Belvoir added turkey to the list of species that may be taken during the deer bow hunting season. This was purely a recreational decision; turkey are not considered an overabundant species on Fort Belvoir.

Anadromous Fish Sampling Points

Anadromous Fish Routes

Heavily Used Wildlife Movement Areas

Wildlife Corridor

Jackson Miles Abbott Wetland Refuge

Accotink Bay Wildlife Refuge

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# FISH and WILDLIFE MIGRATORY ROUTES on FORT BELVOIR

SOURCES: EA, 1999d; UNPUBLISHED DATA

FIGURE: 11.2

Deer Survey Route

Hunting Area

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HUNTING AREAS and DEER SPOLIGHT SURVEY ROUTE on FORT BELVOIR

SOURCE: HUDSON, UNPUBLISHED DATA

FIGURE: 11.3

Fort Belvoir supports periodic deer herd health checks by VDGIF. VDGIF undertakes herd health checks on a periodic basis, no less frequently than once every 5 years. The most recent herd health check was undertaken in March 1999. The results indicated overall "poor" condition, which is typical in overpopulated areas (Lovelace, 1999). In 1999, Fort Belvoir coordinated with Virginia Department of Game and Inland Fisheries in responding to a statewide increase in epizootic hemorrhagic disease.

Raccoon are a species of management concern because of their association with rabies. In 1999, Fort Belvoir began participating in a program with Fairfax County to test the effectiveness of oral rabies vaccination on raccoons. Extensive data on raccoon population, movement and health conditions were collected. Rabies vaccination baits were distributed on Fort Belvoir in the spring of 2000 and again in the fall of 2000. A post-treatment survey indicated that 37% of the installation's raccoon population was successfully vaccinated after the spring 2000 distribution. A post-treatment survey for the fall 2000 distribution will be conducted in winter 2000. It is expected that other species, such as striped skunk, red fox and gray fox also received treatment; however, because these species are not target species in the study, they are not being evaluated in the post-treatment surveys.

Woodchuck are a species of management concern because of their potential for damage to structures, utilities and landscape materials. Fort Belvoir's management actions to date for woodchuck have been to trap and relocate or euthanize individuals determined to be causing problems or posing safety risks.

Beaver are another species of management concern because of their ability to alter habitats and impact man-made structures. To date, Fort Belvoir's management approach for beaver has been to control the animal's activity rather than control its population. Management actions are site-specific, such as installation of beaver guards on trees and on wildlife nest box structures to prevent gnawing, and installation of beaver guards on culverts to prevent damming. Various ecological surveys of Fort Belvoir caution that beaver have the potential to negatively impact habitat for several rare species and plant communities on post (Hobson, 1996; McCoy and Fleming, 2000). These surveys recommend monitoring beaver activity, and undertaking control actions if necessary.

Other species of management concern because of their potential for disruption of installation activities or destruction of installation resources include the striped skunk, raccoon, house mouse, Norway rat and feral cats. Skunks, raccoons, and all other native mammals are handled on a case-by-case basis when they become a problem. Fort Belvoir removes the house mouse and Norway rat to control damage.

Feral cats pose a significant threat to native wildlife populations, and pose a safety hazard to installation personnel and their pets due to disease. Scientists estimate that hundreds of millions of birds and small wildlife are killed each year by free-roaming domestic cats (American Bird Conservancy, undated). DoD Instruction 4150.7-1 requires military facilities to use the Armed Forces Pest Management Board Technical Information Memorandum No. 37, *Guidelines For Reducing Feral/Stray Cat Populations On Military Installations In The United States*, as

guidance for their feral cat programs. In accordance with this Memorandum Fort Belvoir Regulation 40-905, *Animal Control* (U.S. Army, 2000c) prohibits the release of domestic animals on post, and establishes guidelines for capturing and removing feral animals. This regulation applies to all persons residing on, employed by, serving on, or visiting Fort Belvoir, and it is enforceable by the Fort Belvoir game warden and military police. Fort Belvoir's feral cat management to date has been to trap and remove feral cats from the wild. Individual feral cats that can be rehabilitated are put up for adoption; those that cannot are euthanized.

#### *11.3.2.3 Bird Management Actions*

As of 2000, Fort Belvoir is completing its third year of installation-wide bird monitoring. This effort has been extremely valuable in identifying and evaluating the bird species and their habitat associations at Fort Belvoir. The results of this survey effort document that Fort Belvoir supports a highly diverse bird community, including a significant number of bird species of management priority. The study results leave no doubt as to the high value of Fort Belvoir's natural habitat to migratory bird communities at the regional, national and international levels.

Until 1999, Fort Belvoir's bird-habitat enhancement actions were limited to installing and maintaining nest box structures (e.g., bluebirds, wood ducks, owls, kestrels, prothonotary warblers) and osprey nest platforms; converting manicured lawn areas to old field conditions; and using wildlife seed mixes when re-seeding disturbed areas such as utility rights-of-way and closed landfills.

In 1999, Fort Belvoir began coordination with the PIF program to develop specific management actions for PIF priority bird species on post. The Avian Inventory, Monitoring, and Management report (Fischer, 2000) identified 10 high priority PIF bird species that breed on Fort Belvoir (Table 11.3). These 10 species have varied habitat requirements. Some, like the wood thrush, require large tracts of undisturbed forest. Others, like the prairie warbler, require areas of early successional vegetation (i.e., a mix of grass with shrub/scrub woody vegetation). Figure 11.1 shows the critical breeding and forage area for the 10 PIF priority bird species. Management actions for forest dwelling species can be accomplished through the conservation of the large forest tracts presently occurring on Fort Belvoir and controlling fragmentation. However, management actions for the prairie warbler and other early successional dwelling species, require active management to maintain sufficiently sized areas of early successional vegetation. Since early successional vegetation is a transitional vegetation type, intervention is required to preclude this type from being replaced by forest cover. Fort Belvoir is coordinating with the DoD PIF Coordinator to identify specific installation areas for maintenance as early successional habitat and to develop the appropriate management regime (Eberly, in preparation). While these management actions (i.e., conservation of interior forest habitat and maintenance of early successional habitat) have been selected to support PIF priority bird species, Fort Belvoir recognizes that they will benefit other wildlife species on post.

The results of the bird surveys indicate that the cowbird, a nest parasite that poses a significant threat to nesting migrants including several of the PIF priority species breeding on Fort Belvoir, occurs throughout the installation and extends into all forest tracts on post. Cowbirds benefit from fragmentation, which occurs throughout the installation. The installation bird surveys

(Fisher et al., 1999) recommend eliminating excessive areas of fragmentation to control cowbird intrusion into the installation's forest tracts and to protect vulnerable migratory bird species from nest predation.

Fort Belvoir has, as does all of northern Virginia, an overabundance of resident Canada geese. The ecological and societal problems resulting from an overabundance of geese are well-documented (Nelson and Oetting, 1998). At Fort Belvoir, geese can also present a serious threat to airfield safety at Davison Army Airfield. In 1999, in coordination with Davison Army Airfield, Fort Belvoir developed and implemented a goose hazard management program for the airfield. This program relies upon harassment by trained border collies, use of bird distress recordings and noise cannons, and habitat manipulation (e.g., maintaining tall grass along runway areas and eliminating open water areas within the airfield's wetland mitigation site) to deter geese. Davison Army Airfield maintains a Bird Aircraft Strike Hazard Plan; Fort Belvoir ENRD is responsible for implementing wildlife management actions at the airfield. Control of geese elsewhere on the installation where they pose a problem (i.e., North Post golf course and DLA Headquarters facility) is done through harassment by trained border collies.

Other than geese, bird problems during the past five years tend to be site-specific instances. While the Defense Logistics Agency headquarters building experienced a pigeon problem because the building's design included extensive ledge areas, most bird problem situations tend to occur when a bird enters an occupied structure, or constructs a nest on the ground in a high-traffic area or on a structure where they interfere with installation operations. These instances are handled by relocating the birds, as necessary and in accordance with federal regulations. There have been occasions when ospreys have constructed nests on facilities and interfered with operations, or presented potential facilities maintenance risks. These situations are handled on a case-by-case basis, and have included removal of nest material during the non- nesting season, and the placement of nest excluders on structures to render the structures unsuitable for osprey nesting (e.g., specific types of electric poles where there is an electrocution hazard).

For the past decade, falconry has been the only hunting program for game birds. In 2000, at the request of the hunting community and with support from VDGIF, Fort Belvoir added wild turkey to the list of species that may be taken by bow hunting during the deer-hunting season. VDGIF (Gary Norman, 2000) advised that the incidental harvest of wild turkey during the deer-hunting season with archery tackle is not considered to have an effect on turkey population. VDGIF recommended that all hunters be required to record data from turkey sightings and from harvest, and that these data be submitted to the state. Fort Belvoir has placed this requirement on installation hunters. VDGIF also recommended re-evaluation of turkey hunting if the hunters are more successful that anticipated (Gary Norman, 2000).

Fort Belvoir has a draft West Nile Virus (WNV) Surveillance and Response Plan, which is being developed and coordinated through the Virginia Department of Health, the Metropolitan Washington Council of Governments Regional Health Officers Committee, Fairfax County, and the Fort Belvoir Environmental Health and Preventative Medicine Office. The program includes public awareness and education, ongoing surveys, and monitoring of high risk areas; preventative actions including personal precautions and reducing potential breeding sites; and larviciding during the breeding season. Dead birds are monitored as potential carriers of the WNV. Suspect

birds are sent to an authorized laboratory for testing. Fort Belvoir is making preparations for mosquito adulticiding in 2001 in the event that the WNV becomes a risk to residents.

#### *11.3.2.4 Amphibian and Reptile Management*

The results of the installation surveys indicate that Fort Belvoir possesses very diverse amphibian and reptile communities, including two rare species (Table 12.2). The installation survey results emphasize the importance of Fort Belvoir's natural habitat to the conservation of these species. The surveys document how land areas like Fort Belvoir are becoming islands of habitat essential for the continued survival of amphibians and reptiles. These species, with their limited ranges and complex habitat requirements, are highly vulnerable to the effects of urbanization.

Nationwide, amphibians are recognized as a group of animals experiencing population declines. Additional studies are needed at Fort Belvoir to ascertain whether similar declines are occurring on post. Dr. Joseph Mitchell, University of Richmond, developed a survey protocol for monitoring amphibian populations (Mitchell, 1998). This survey protocol might be appropriate to use at Fort Belvoir. Various other nationwide survey protocols exist that could also be used at Fort Belvoir. These include the North American Amphibian Monitoring program, FROGWATCH USA and PRIMENet Amphibian Monitoring Program. Information on these protocols can be found at the Patuxent Wildlife Research Center at http://www.mp1-pwrc.usgs.gov/amphibian_monitoring.html. In addition, a nationwide effort, Partners in Amphibian and Reptile Conservation, is underway to assess declines in all reptiles and amphibians, and uses the same approach as PIF in utilizing partnerships to more effectively approach conservation efforts.

At Fort Belvoir, the major threats to amphibians and reptiles are habitat loss and fragmentation, and chemical exposures. Amphibians are particularly vulnerable to habitat fragmentation where it eliminates the connectivity among their varied habitat types. Amphibian survival depends upon continuity among wet habitats as well as between upland and wet habitats. Fort Belvoir recognizes the importance of preserving this interface of habitat types. Amphibians are also highly sensitive to environmental chemical contamination, given their physiology and close association with soils and water. Fort Belvoir controls the potential threats from pesticides by following an Integrated Pest Management program (U.S. Army, 2000b) (Section 10). Another significant threat to amphibians is habitat disruption and degradation caused by stormwater management problems (e.g., sedimentation). Controlling this threat is a major factor in Fort Belvoir's stormwater management program (Section 7).

#### *11.3.2.5 Wildlife Enforcement*

Through its Memorandum of Agreement for Cooperative Law Enforcement between the U.S. Fish and Wildlife Service and the U.S. Army Garrison Fort Belvoir, dated 20 February 1996 (Appendix A), Fort Belvoir has one Special Agent within ENRD. The agreement is to provide mutual law enforcement benefits to the installation and to the Fish and Wildlife Service by sharing expertise, training, intelligence, information, and specialized equipment. The intent of this agreement is to provide the Special Agent with the authority to enforce all laws administered by the U.S. and the installation relating to fish, wildlife, and other natural resources. The agreement delegates authority to the Special Agent to enforce several specific federal laws on

Fort Belvoir including the following: Lacey Act Amendments of 1981 (16 U.S.C., 3371-3378), Migratory Bird Treaty Act (16 U.S.C. 703-712), Migratory Bird Hunting and Conservation Stamp Tax Act (16 U.S. C. 718-718h), Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d), Airborne Hunting Act (16 U.S. C. 742J-1), National Wildlife Refuge Systems Administrative Act (16 U.S.C., 668dd-668ee), Endangered Species Act of 1973 (16 U.S.C., 1531-1543), Marine Mammal Protection Act of 1979 (16 U.S.C., 1361-1384, 1401-1407), and Archeological Resources Protection Act of 1979 (16 U.S.C. 470a. (A)-(1) (A)).

## 11.4 CONTINUING AND FUTURE WILDLIFE MANAGEMENT

Fort Belvoir intends to continue the management emphasis and actions addressed in Section 11.3. Fort Belvoir will continue to conserve wildlife resources, while providing opportunities for public access to installation wildlife, as long as such access is consistent with the military mission and with resource conservation. Continued support to military training and testing will take priority. After that, management emphasis will be on conservation and enhancement of native resources in accordance with the Sikes Act, DoD and DA polices, and DoD and DA-partnered programs, such as the Chesapeake Bay Program and the PIF program. Fort Belvoir will continue to focus habitat conservation and enhancement actions on species with recognized conservation priority, and will continue to use indicator species to evaluate habitat enhancement needs and success. Fort Belvoir's natural resources management program will continue to promote public access to and appropriate use of wildlife resources and will continue to provide the public opportunities for recreation and for environmental education, and for scientific research and study of wildlife resources, consistent with resource conservation objectives. The natural resources management program will continue to be involved in local, regional and national level wildlife management initiatives and actions. Fort Belvoir will continue to use hunting as a wildlife management tool.

### 11.4.1 Wildlife Management Objectives

1. Protect against the loss of native diversity of Fort Belvoir's wildlife resources, as described by the planning level surveys.

2. Emphasize for conservation those wildlife species that have been prioritized for conservation by federal or state statute or regulation, DoD or DA policy (e.g., DODI 4715.3), DoD partnered programs (e.g., Chesapeake Bay Program, PIF Program), State Natural Heritage Program, or through recognized importance to regional ecosystem function. Use these species as "indicator species" for the development and implementation of habitat enhancement projects, consistent with the principles of ecosystem management:

   - Federal and state listed threatened or endangered species (bald eagle, wood turtle and peregrine falcon), and their habitat

   - State-listed rare animal species, and their habitat

   - PIF priority bird species.

3. Conserve and enhance native wildlife habitat conditions to ensure habitat areas are sufficiently sized, sufficiently positioned, and possess the appropriate conditions to support healthy, self-sustaining native wildlife populations.

4. Conserve and enhance wildlife movement/migration routes within and through Fort Belvoir.

5. Protect the military mission from hazard or disturbance by wildlife.

6. Protect the public from hazard or disturbance by wildlife.

7. Provide opportunities for public access for recreation and for environmental education and study consistent with resource conservation.

### 11.4.2 Wildlife Management Strategies

1. Develop a Fort Belvoir Wildlife Management Plan. The Wildlife Management Plan should include, but not be limited to, wildlife management objectives, and studies/surveys necessary to meet objectives, field survey protocols, analytic procedures, reporting and record keeping. The Wildlife Management Plan should identify the wildlife population and habitat management projects appropriate to meet management objectives. The Plan should also identify the metrics to be used to assess the success of the management actions.

2. Continue to obtain scientific information on installation wildlife resources to support our knowledge of their biodiversity; to identify stresses and detect changes to biodiversity, and to evaluate the effectiveness of management actions. Such actions include the following:

   - Complete the baseline planning level wildlife surveys (e.g., bat survey), and update the wildlife inventory information on a regular cycle (e.g., a 10-year cycle).

   - Continue to perform indicator species monitoring (e.g., bald eagle surveys, migratory bird surveys).

   - Continue to support outside entities performing established wildlife surveys on Fort Belvoir (e.g., Christmas Bird Count, by Audubon Society, and Monitoring Avian Productivity and Survivorship program, funded by DoD Legacy Program).

   - Perform wildlife studies and monitoring in accordance with the Fort Belvoir Wildlife Management Plan. Such studies are likely to include monitoring wildlife movement/migration through the installation, including wildlife use of existing wildlife crossing studies; monitoring the effects of wildlife (e.g., deer overbrowse) on habitat conditions (e.g., forest stratification, forest regeneration); monitoring the effects of predation (e.g., turtle nest predation). These types of studies and monitoring efforts will be developed and undertaken to determine the need for management actions, and to assess the success of management actions that have been undertaken.

- Develop and implement turkey surveys and harvest data collection to evaluate the effects of hunting harvest on the installation's turkey population.

- Continue to perform year-round surveillance (i.e., close observation, in lieu of studies or monitoring projects) of wildlife resources to detect disruptions.

- Perform localized and/or issue-specific wildlife studies, as needed to support resource management or for specific installation projects such as new land-use development.

- Continue to coordinate with USFWS, VDGIF, DCR-NHP, and other organizations involved with wildlife conservation, regarding stewardship recommendations for wildlife resources.

3. Complete and maintain the Fort Belvoir Wildlife Information System as a comprehensive database of installation wildlife information. Continue to integrate this database with the Fort Belvoir GIS.

4. Continue to set aside areas of ecologically significant wildlife resources, consistent with DoD policy for setting aside areas for conservation as "Special Natural Areas" (Section 13). As of 2000, Fort Belvoir has three such areas: two refuges and the Forest and Wildlife Corridor. Consider modifying the boundaries of the refuges and/or establishing a buffer for the refuges, to protect ecologically significant wildlife resources that presently are located outside the refuge boundaries. Consider modifying the Corridor boundaries to encompass known wildlife migratory areas presently located outside the Corridor boundary. Continue to designate these set-aside areas as "environmentally constrained to development" in the installation Master Plan.

5. Continue to implement actions to control threats to native wildlife habitat:

   - Continue to monitor and control invasive/exotic plant species to prevent displacement of native plant species, and consequent impacts on wildlife habitat.

   - Continue to conserve wetlands and riparian forest buffers.

   - Continue to implement watershed conservation and restoration actions.

   - Continue to monitor and control wildlife that cause significant habitat destruction/degradation.

   - Continue to manage pesticide use in accordance with the *Fort Belvoir Integrated Pest Management Plan* (U.S. Army, 2000b) to prevent pollution.

   - Continue efforts to avoid native habitat loss or fragmentation when siting and constructing new facilities on post.

6. Continue to implement installation-wide actions to enhance broad wildlife habitat conditions:

   - Use native wildlife seed mixes for re-seeding areas, as appropriate, to benefit wildlife.

- Reduce the location and frequency of mowing and grounds maintenance activities (e.g., leaf pick-up), as appropriate, to reduce disturbance and pollution pollution, and to promote more-natural habitat conditions.

- Remove abandoned impervious surfaces and replant with native, "wildlife friendly" plants, as appropriate.

- Enhance vegetation within disturbed riparian areas, using native plants.

- Replant disturbed areas within the Forest and Wildlife Corridor to enhance forest cover conditions.

- Implement maintenance/corrective actions within all installation wildlife crossing structures to maintain these structures free of impediments to wildlife movement.

- Implement grassland management actions to enhance native habitat conditions.

- Evaluate the effectiveness of Fort Belvoir's existing nest box program, and determine whether the program should be continued, modified or terminated. If the program is to be continued, develop a recommendation for a volunteer project(s) to assume responsibility for maintenance and data gathering.

- Evaluate and correct wildlife hazards, such as electrocution hazards, fence hazards, etc.

7. Consider implementation of grassland and early successional habitat enhancement/management projects identified for PIF priority bird species (Eberly, in preparation). In selecting projects for execution, evaluate them for their potential benefit to other wildlife of hunting interest (deer, turkey) as well as wildlife of conservation interest (amphibians).

8. Continue the Fort Belvoir deer hunting program, with participation in VDGIF's DPOP and DMAP.

   - Continue to perform data collection in support of the program:
     - Perform annual population census (e.g., annual spotlight survey).
     - Perform annual harvest data collection. This includes installation-specified data as well as VDGIF-required data.
     - Support VDGIF on herd health checks.
     - Support Veterinarian Services in disease data collection.
     - Collect road kill data.
     - Coordinate with VDGIF regarding other types of data collection, as appropriate.

   - Continue to set hunting season dates and harvest limits in coordination with VDGIF. Dates and limits will be set to best support maintenance of an installation deer population level most beneficial to herd health. Up through 2000, season dates and harvest limits were set to reduce herd size. These limits reviewed annually, because events and conditions, such as the 1999 outbreak of epizootic hemorrhagic disease,

may significantly impact population levels. Fort Belvoir may continue to request participation in DPOP, which allows for extended season to increase harvest. The recommendation to request participation in DMAP and DPOP is made by the Natural Resources Branch each year by July 15th.

- Continue to designate installation areas as open or closed to hunting, and continue to specify hunting area restrictions as needed for safety or resource-protection considerations (e.g., annual closing of T-10 and W-7 during the bald eagle nesting season). Explore opportunities for increasing hunter allotments to hunting areas. The recommendations for hunting areas opening and closing are made by the Natural Resources Branch.

- Continue to remove deer where they cause damage/safety risks. Deer removal is done under the kill permit. The recommendation to enact deer removal is made by the installation game warden.

- Continue to participate in the Fairfax County Deer Management Committee to develop and implement a regional program to control deer overpopulation.

- Continue to issue the Directorate of Installation Support Annual Hunting Fact Sheet.

- Continue to execute hunting program responsibilities in accordance with Fort Belvoir's Supplement to AR200-3. The Directorate of Installation Support is responsible for the biological/resource management aspects of the hunting program, as well as for enforcement. The Directorate of Personnel and Community Activities (DPCA) is responsible for the recreational aspects of the hunting program.

- Evaluate opportunities to provide hunting access and opportunities for persons with disabilities.

- Continue to coordinate with VDGIF regarding recommendations for deer management.

- Continue to allow for incidental take of other game species during deer season.

9. Continue the goose hazard management program for Davison Army Airfield. As long as it remains effective, Fort Belvoir will continue the present program of harassment by trained border collies, the use of noise devices, and maintenance of grass to a height that is less attractive to geese. If the program effectiveness decreases, Fort Belvoir will explore alternative controls with the USDA.

10. Continue feral cat control in accordance with DoD, DA and Fort Belvoir policy on feral cats, which call for the removal of feral cats from the wild, and the prohibition of release of cats to the wild. Fort Belvoir will not support the establishment and maintenance of feral cat colonies by any organization or individual.

11. Continue to support regional efforts for wildlife disease monitoring and control:

- Fairfax County's raccoon rabies treatment program.

- Fairfax County's West Nile Virus program.

12. Continue to review and respond to military (e.g., Directorate of Plans, Training, Mobilization, and Security; Davison Army Airfield; Reserves, etc.) requirements for wildlife management to reduce wildlife hazard/disturbance.

13. Continue to review and respond to tenant and AFH requirements for wildlife management to reduce wildlife hazard/disturbance.

14. Continue to review and respond to DPCA Outdoor Recreation Office requests for access to/use of wildlife resources for expansion of recreational opportunities (e.g., hunting, bird watching, wildlife art, etc).

15. Continue to review and respond to requests from the public for access to/use of wildlife resources for expansion of recreational opportunities (e.g., hunting, bird watching, wildlife art, etc).

16. Continue to use the installation project/activity review process to incorporate wildlife conservation requirements into all phases of facilities siting, construction, renovation, operation, maintenance and demolition activities; in reviewing and supporting military training and testing activities; and, in reviewing and responding to outdoor recreation, environmental education, scientific research and study, and all other types of access and use requests.

    - Review and revise, as needed, the Fort Belvoir *Environmental Protection Specifications* applicable to construction projects to ensure that they include wildlife protection provisions.

    - Review and revise, as needed, the Fort Belvoir Environmental Checklist to address wildlife protection.

    - Develop recommendations to revise the Installation Design Guide to include "wildlife sensitive" facilities siting, design and construction considerations.

    - Incorporate wildlife protection strategies into utilities privatization, and all other privatization and outsourcing actions, as appropriate.

    - Develop recommendations for a facilities siting/design review committee to include representatives from ENRD, Master Planning, and the Contract Management Division. The committee should develop and participate in a design review process to ensure consideration of wildlife protection.

    - Continue to include wildlife protection as part of the Excavation Permit and Demolition Permit review processes.

- Continue to include wildlife protection in all real estate actions (e.g., outgrants, leases, rights of entry).

- Continue to include wildlife protection in the Fort Belvoir Training Regulation.

- Classify open/undeveloped installation areas by their suitability for development and recreation based upon sensitivity and value to wildlife. This system would identify areas that would least harm Fort Belvoir's wildlife resources if they were to be developed and/or used for recreation.

17. Continue to coordinate with USFWS under the Sikes Act and the Fish and Wildlife Coordination Act. Continue to coordinate with VDGIF under the Sikes Act, and state wildlife regulations. Maintain wildlife handling and display permits from USFWS and VDGIF. Perform all reporting requirements of these permits.

18. Develop a recommendation for, and facilitate implementation of, a regional wildlife management consortium to include neighboring land managers.

19. Investigate the appropriateness of Fort Belvoir's participation in regional and national-level wildlife conservation programs, such as Partners in Amphibian and Reptile Conservation.

20. Continue to provide technical assistance for emergency situations, such as fire, that threaten wildlife resources.

21. Continue to respond to requests for technical information from on-post and off-post entities, as appropriate.

22. Continue to investigate and enforce violations of federal and state laws and regulations, as well as DoD, DA, and Fort Belvoir policies.

# 12.0
# Endangered, Threatened, and Rare Species

Plant and animal species are vanishing at an alarming rate. It is difficult to estimate the overall rate of extinction. Some species, like the larger birds and mammals, are more susceptible to extinction than most. The same is true of fishes limited to one or two freshwater streams. Most kinds of insects and small organisms are so difficult to monitor as to make exact numbers unattainable. Nevertheless, biologists using several indirect methods of analysis generally agree that on the land at least and on a worldwide basis, species are vanishing 1,000 times faster than before the arrival of humans (Wilson, 1992). This is the highest rate since the Mesozoic Era 65 million years ago, which was marked by the mass extinction of dinosaurs.

While climate change and overexploitation were major forces in past extinctions, habitat loss is by far the most significant force in present-day extinction. A primary cause of habitat loss is urbanization and its associated decreases in natural vegetation areas such as forestlands and wetlands. Wetland losses can be attributed to development, the creation of ponds and reservoirs, agricultural practices, and sea level rise. Between 1950 and late 1970s, freshwater wetlands in the Chesapeake Bay watershed were lost at an annual rate of over 2,800 acres (U.S. EPA, 1999a). Within the Bay watershed in the past 25 years, forests have been lost mostly to urbanization and partly to agricultural conversion at a rate of nearly 100 acres per day (U.S. EPA, 1999b). As urbanization increases, the function/value of the remaining natural habitat can be impaired by fragmentation and stressed by impacts/influences (e.g., pollution) from surrounding developed land. When coupled with habitat losses at the larger landscape level, local losses can threaten the survival of not only individual species, but of entire communities. Especially vulnerable are those species with more-specialized habitat requirements, and migratory species with multiple habitat requirements.

Within the U.S., federal land holdings such as DoD installations play a key role in the protection and restoration of declining species. DoD has demonstrated that it is possible to manage its lands to support the military mission and to promote species protection/restoration. DoD's shift in focus in the 1990s toward ecosystem management provides greater protection for declining species. A 1996 document, *Conserving Biodiversity on Military Lands: A Handbook for Natural Resources Managers*, provides guidance and tools for natural resource managers on DoD installations to conserve ecosystems and rare species while maintaining military readiness (Leslie, 1996). One example of the successful combination of species protection and military mission is the 1996 issuance by the Army of new rules for the preservation of red-cockaded woodpecker populations. These rules, while greatly expanding available maneuver space in training areas, also provide red-cockaded woodpecker habitat improvements and better species management (U.S. Army, 1997).

Under the Endangered Species Act of 1973, plant and animal species in danger of extinction throughout all or a significant part of their range are listed as "endangered." Species that are likely to become endangered within the foreseeable future throughout all or a significant part of their range are listed as "threatened." Endangered and threatened listings impart protective status

to the listed species and their habitats. Additional designations under the Endangered Species Act are "proposed endangered" and "proposed threatened," for species awaiting additional data to determine the need for listing; "candidate" where the data support a species listing, but the listing procedure has been delayed; and "species of concern" for species under consideration for listing. These latter listings do not impart any protective status.

States, including Virginia, have state endangered species acts that provide "endangered" and "threatened" listings and protection status for species vulnerable to extinctions at the state level. States also have Natural Heritage Programs that maintain listings and rarity (i.e., conservation) rankings of rare plant and animal species, and ecological communities. Unlike endangered and threatened listings, rare species listings and their rankings are not legal designations, and do not provide any protective status. They are use to prioritize resources for conservation.

Virginia's Department of Conservation and Recreation, Division of Natural Heritage (DCR-NHP) rates individual species and communities with resource conservation rankings from S1 (extremely rare) to S5 (very common). DCR-NHP rates specific sites of these species and communities with site conservation rankings of B1 (outstanding significance) to B5 (general biodiversity significance).

Fort Belvoir has one federal-listed species: the threatened bald eagle. There are no federal-listed endangered species, candidate or proposed species, or federal species of concern, on Fort Belvoir. There are no designated critical habitats for federal-listed species on Fort Belvoir.

While the bald eagle's demise was largely a result of pollution (i.e., organochlorine pesticides, which caused eggshell thinning and reproductive failure), this species' recovery remains vulnerable to habitat loss. The U.S. Fish and Wildlife Service's Chesapeake Bay Bald Eagle Recovery Program (which includes eagles of the Fort Belvoir area) sets the following goals for recovery of the Chesapeake Bay bald eagle population: (1) a nesting population of 300 to 400 pairs with an annual nest productivity of 1.1 young per nest sustained over five years, and (2) permanent protection of sufficient roosting habitat (considered to be at least 30 percent of suitable habitat) (U.S. FWS, 1990). The nesting population goal is anticipated to be met in 2000; however, the habitat goal has not been met.

Bald eagle habitat is confined to near-shore areas. Within the Chesapeake Bay region, much of this area is in private ownership. If the bald eagle were to be de-listed, as is being considered by USFWS, the habitat protection presently afforded under the Endangered Species Act would be lifted, making these areas more easily developed. With an anticipated increase in the Chesapeake Bay region human population of 2.5 million persons by 2020, and the current political pressure to de-list the bald eagle, there is concern that sensitive bald eagle habitat will be lost to development. The USFWS is presently evaluating how to protect bald eagle habitat if the eagle is removed from Endangered Species Act listing. It is reasonable to anticipate that federal landholders will be expected to provide continued protection of bald eagle habitat in the event that this species is de-listed.

Fort Belvoir has three state-listed species that occur on post on a regular basis: the state-listed endangered bald eagle, the state-listed threatened wood turtle (*Clemmys insculpta*), and the state-listed endangered peregrine falcon (*Falco peregrinus*) that occurs during fall migration (Figure

12.1). The wood turtle is at the southernmost limit of its range in northern Virginia. This is a highly mobile species with complex habitat requirements. The wood turtle was listed as state threatened in 1991. This species has rapidly disappeared from northern Virginia in the past 20 years, principally due to loss of habitat to development (Ernst et al., 1997a). The peregrine falcon has been regularly recorded on Fort Belvoir for the past three years as it migrates through the area and takes advantage of foraging habitat along the Accotink Stream / Accotink Bay stream corridor.

The Northern Virginia well amphipod (*Stygobromus phreaticus*) was first discovered during surveys at Fort Belvoir conducted by DCR-NHP from April 1996 through October 1996. This was the first known sighting of the amphipod since its collection from wells in Vienna in 1941 and Alexandria in 1948 (Hobson, 1997). Little is known about the amphipod; it is not state or federally listed but is referred to as "globally rare" (Sauseville, 2000). It has been noted, however, that "this species may be particularly sensitive to groundwater contamination and pollution as well as withdraw of water from subterranean habitats" (Thorpe, 1991).

Eighty-nine plant and animal species with state rarity/conservation rankings of either S3 ("rare to uncommon"), S2 ("very rare"), or S1 ("extremely rare") have been identified as occurring on Fort Belvoir (Table 12.2).[1] In addition, seven rare ecological community types have been identified as having rankings of S3, S2, or S1 (Section 9.2.2; Table 9.3). These communities are presented in Figure 12.2. DCR-NHP has delineated the boundaries of three areas on Fort Belvoir to encompass all of the rare plant species and rare ecological communities, and most of the rare animal species. DCR-NHP ranked one of these areas as B1 (outstanding significance), one as B3 (high significance) and one as B5 (general biodiversity significance) (Hobson, 1996; 1997; McCoy and Fleming, 2000) (Figure 8.2).

## 12.1 ENDANGERED, THREATENED, AND RARE SPECIES POLICIES

### 12.1.1 Federal Endangered, Threatened, and Rare Species Policy

The Endangered Species Act of 1973, 16 USC §§ 1531-1543, was enacted to protect plant and animal species considered to be in danger of extinction. The Act affords legal protection to species listed as endangered and threatened, including protection of their habitats. The USFWS makes the listings (as well as downlistings and de-listings) of endangered and threatened species on the basis of the species' population, it's biological vulnerability and threats to its survival. The USFWS also develops and implements recovery plans for listed endangered species.

The Endangered Species Act establishes the federal government's responsibility for protection and recovery of species considered to be in danger of extinction. The act requires federal agencies to undertake affirmative actions to protect and restore populations of listed threatened and endangered species, and to prevent proposed and candidate species from being listed.

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[1] This number includes all rare species with S1, S2, or S3 rankings, with the exception of four species with rankings of either SU or SH.

Two additional federal regulations protect endangered and threatened wildlife species. The Fish and Wildlife Coordination Act (16 U.S. C. 661 et seq.) includes provisions for the protection of bald and golden eagles (Chapter 5A, subchapter II) and endangered species of fish and wildlife (Chapter 5A, subchapter III). The Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d) prohibits the pursuing, shooting, shooting at, poisoning, wounding, killing, capturing, trapping, collecting, molesting, disturbing, purchase, or sale of bald and golden eagles. The act also prohibits the barter, transport, export, or import at any time or in any manner a bald or golden eagle, dead or alive; or any part, nest, or egg of these eagles, unless pursuant to a permit or regulation. Violators may be subject to criminal and civil penalties. The act is enforced by the Department of Interior employees, who have the authority to make arrests without warrants and to conduct warrant searches.

### 12.1.2 State Endangered, Threatened, and Rare Species Policy

The Commonwealth of Virginia's two state endangered species acts were enacted to protect plant and animal species from extinction at the state level. One (§ 29.1-563, Code of Virginia), administered by the Virginia Department of Game and Inland Fisheries, addresses fish and wildlife, excluding insects. The other (§§ 3.1-1020 through 1030, Code of Virginia) administered by the Virginia Department of Agriculture and Consumer Services addresses plants and insects.

The Virginia Natural Area Preserves Act of 1989 (§§ 10.1-209 through 217, Code of Virginia) established the Virginia Department of Conservation and Recreation, Division of Natural Heritage as the state agency responsible for inventory, database maintenance, protection and management of Virginia's natural heritage resources (i.e., the habitats of rare, threatened, or endangered plant and animal species, rare or state significant communities, and other natural features). DCR-NHP is part of an international network of natural heritage programs, coordinated by The Nature Conservancy, which uses standardized inventory methodologies and the Biological and Conservation Data System technology (Hobson, 1996). DCR-NHP makes rarity/conservation rankings, and makes site-specific element occurrence rankings and biodiversity rankings through natural heritage inventories.

### 12.1.3 Department of Defense Endangered, Threatened, and Rare Species Policy

DoD's natural resources management policy is contained within DoDI 4715.3, *Environmental Conservation Program*. This instruction requires installations to follow an ecosystem-based approach to natural resources management, to inventory and protect important biological resources, and to promote biodiversity. The instruction also allows for multiple uses of an installation's natural resources, and for public access to these resources for recreation, education and scientific research and study, compatible with the installation's ecosystem management goals. DoD's policy on threatened and endangered species management, as established in DoDI 4715.3, is as follows:

- Wood Turtle Observation Point
- Important Wood Turtle Habitat
- Peregrine Falcon/Bald Eagle High Use Forage Area
- Bald Eagle High Use Forage Areas
- Bald Eagle Occasional Use Forage Areas
- Bald Eagle Nesting Habitat

N

THREATENED and ENDANGERED SPECIES HABITAT on FORT BELVOIR

SOURCE: PACIULLI, SIMMONS & ASSOCIATES, LTD., 2000; CLINE, 1996; UNPUBLISHED DATA

FIGURE: 12.1

Tidal Freshwater Marsh: Spikerush-Golden-club Type
Tidal Freshwater Marsh: Wild Rice-Smartweed Type
Tidal Freshwater Marsh: Mud Flat Type
Tidal Freshwater Marsh: Mixed Type
Coastal Plain/Piedmont Acidic Seepage Swamp
Tidal Hardwood Swamp
Tidal Shrub Swamp

N

RARE PLANT COMMUNITITES MAPPED by VIRGINIA NATURAL HERITAGE INVENTORY on FORT BELVOIR

SOURCE: McCOY AND FLEMING, 2000

FIGURE: 12.2

| Excerpts from DoDI 4715.3<br>Select Provisions Applicable to Endangered, Threatened, and Rare Species |
| --- |
| ■ Threatened and endangered species management and recovery efforts on DoD lands and waters shall be consistent with Section 1531 *et seq.* of 42 (sic) U.S.C (reference (d)) and other legal mandates. Procedures to comply with these mandates shall emphasize military mission requirements and inter-agency cooperation during consultation, species recovery planning, and management activities. Opportunities to conserve Federally listed species and the ecosystems on which whose species depend shall be identified. The Department of Defense shall accept an unequal or disproportionate burden for the conservation of threatened and endangered species only when it is required by legal authority or its has been expressly determined that it is in the Department of Defense's best interest. (D.2.d)<br><br>■ Biologically or geographically significant or sensitive natural resources (e.g., wetlands, forests, floodplains, watersheds, estuaries, riparian areas, coastal barrier islands, marine sanctuaries, critical habitats, animal migration corridors) or species (e.g., threatened or endangered species, certain marine mammals, and migratory birds) shall be inventoried and managed to protect these resources, and to promote biodiversity, using the goals identified in paragraph F1a. (D2c)<br><br>■ All DoD conservation programs shall work to guarantee continued access to our land, air, and water resources for realistic military training and testing while ensuring that the natural and cultural resources entrusted to DoD care are sustained in a healthy condition for scientific research, education, and other compatible uses by future generations. (D1a) |

### 12.1.4 Department of the Army Endangered, Threatened, and Rare Species Policy

The Army's natural resources management policy is contained within AR 200-3, *Natural Resources–Land, Forest and Wildlife Management*. This regulation establishes the Army's requirements for managing and using land and water resources in accordance with the principles of ecosystem management, and institutes the Army's commitment to conserve, protect, and sustain biological diversity, and to restore degraded ecosystems. AR 200-3 also establishes the Army's commitment to carry out mission and program requirements that are consistent with the requirements of the Endangered Species Act, be sensitive to those species listed as endangered or threatened under state law, and prepare endangered species management plans for listed and proposed species. The Army's policy on threatened and endangered species management, as established in AR 200-3, follows:

| Excerpts from AR 200-3<br>Select Provisions Applicable to Endangered, Threatened, and Rare Species |
| --- |
| ■ DA personnel at all levels must ensure that they carry out mission requirements in harmony with the requirements of the Endangered Species Act (ESA) of 1973, section 1531 to 1544, title 16, United States Code (16 U.S.C. 1531- 1544). (11-1a) |

| Excerpts from AR 200-3<br>Select Provisions Applicable to Endangered, Threatened, and Rare Species |
|---|
| ***(continued)*** |
| ■ Section 7(a)(1) of the ESA requires the Army to carry out programs for the conservation of listed species… Therefore, the Army has a responsibility to take affirmative measures to increase, as well as to avoid actions likely to jeopardize, listed species… (Para. 11-2a) |
| ■ Installations will avoid taking actions that result in the need to list candidate species as threatened or endangered. (11-4a) |
| ■ Installations are encouraged to develop ESMPs [Endangered Species Management Plans] for candidate species, and to participate in conservation agreements with the FWS. (11-4a) |
| ■ Army installations must be sensitive to those species listed as endangered or threatened under State law, but not federally listed. Whenever feasible, installations should cooperate with State authorities in efforts to conserve these species. There is no requirement for ESMPs for State-listed species. Installations, however, will identify State-listed species in the installation's cooperative plan and set forth agreed conservation measures. (11-4b) |
| ■ Installations will prepare ESMPs for listed and proposed species and critical habitat present on the installation … (11-5a(1)) |
| ■ The natural resources management professional will be an active participant in all planning and decision making activities regarding uses of the land to ensure that current and planned mission activities (for example, master planning, construction requests, site approval requests, and training exercise plans) are conducted in a manner which is compatible with natural resources and other environmental requirements. (3-2b) |

### 12.1.5 Fort Belvoir Endangered, Threatened, and Rare Species Policy

Fort Belvoir does not have installation-specific policy regarding endangered, threatened, and rare species management. Rather, management actions are guided directly by federal, state, DoD and DA policy.

## 12.2 ENDANGERED, THREATENED, AND RARE SPECIES BASELINE CONDITIONS

Information on endangered and threatened rare plant and animal species, and rare ecological communities of Fort Belvoir has been obtained through various surveys. The results of these surveys have been incorporated into the installation GIS.

In 1997, DCR-NHP completed a multi-year natural heritage inventory survey (Hobson, 1996; 1997). The purpose of the inventory was to systematically identify the installation's natural heritage resources: those sites supporting unique or exemplary natural communities, rare plants and rare animals, and other significant natural areas. The natural heritage inventory identified

three installation areas with significant biodiversity, all of which included wetlands: (1) the Pohick Creek-Pohick Bay-lower Accotink Creek-Accotink Bay wetland complex; (2) the upper Dogue Creek wetland complex; and, (3) the T-17 ravine seeps (Figure 8.2). These areas included one federal-listed threatened/state-listed endangered animal species (bald eagle), one state-listed threatened species (wood turtle), four rare plants and seven rare animals (Table 12.1), along with two broadly defined rare wetland community types, and one rare upland community type as occurring on Fort Belvoir. No federal or state-listed threatened or endangered plant species were identified on post during the inventory.

In 2000, DCR-NHP completed an ecological communities assessment of Fort Belvoir Main Post (McCoy and Fleming, 2000). This assessment was undertaken as an expansion and follow-on to the DCR-NHP natural heritage inventory. The purpose of the ecological communities assessment was to develop an ecological-based definition and description of the ecological communities on post, consistent with The Nature Conservancy's National Vegetation Classification system. The ecological communities assessment defined and described the communities in greater detail than was done in the previous natural heritage inventory, and addressed plant relationships with site environmental conditions (e.g., hydrology, soil chemistry). The ecological communities assessment confirmed the high biodiversity of the Fort Belvoir wetland communities, as previously reported by the natural heritage inventory, and assigned these communities a high priority for conservation.

Other survey efforts contributing information on installation endangered, threatened and rare species include aquatic surveys (Ernst et al., 1995; and EA, 2000); wildlife surveys (Ernst et al., 1990, 1997a, 1997b, 1998); and, avian inventory and monitoring surveys (Fischer et al., 1999) undertaken in coordination with the Partners in Flight program (Section 11).

### 12.2.1 Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) is the only federal-listed species known to inhabit Fort Belvoir. It is listed as threatened by the USFWS and endangered by the VDGIF. Fort Belvoir provides valuable nesting, foraging and loafing habitat for resident and migratory bald eagles. The installation has one active nest site in the Accotink Bay Wildlife Refuge (ABWR). The nest site has been active since 1990, fledging 11 eaglets from 1990 through 2000. The installation shoreline along Pohick Creek, Pohick Bay, Accotink Bay, Accotink Creek, Gunston Cove, Potomac River and Dogue Creek is used year-round by bald eagles as foraging and loafing habitats. The shoreline extending from Pohick Creek and around Accotink Creek within the ABWR is a high-use foraging area with the greatest eagle activity occurring during the winter. In recognition of the importance of this shoreline, in 1997 the VDGIF officially added this shoreline to the Mason Neck Eagle Concentration Area. This is one of only five such designated Eagle Concentration Areas in all of Virginia.

Potential threats to bald eagle nesting, foraging and loafing habitat include disturbances caused near shore by boating and jet ski activity, possible increase in training activity, development of areas adjacent to eagle nesting areas, and hunting of waterfowl.

### 12.2.2 Peregrine Falcon

The peregrine falcon (*Falco peregrinus*) is a state-listed endangered species. The peregrine falcon occurs along the Accotink Creek/Accotink Bay stream corridor during fall migration. This area of Fort Belvoir provides valuable foraging habitat for migratory falcons. Falcons have been recorded on Fort Belvoir during the last three fall migrations (six sightings in 1998, four in 1999 and three in 2000).

Potential threats to the peregrine falcon foraging habitat include disturbances near the shoreline, shoreline development, and waterfowl hunting.

### 12.2.3 Wood Turtle

The wood turtle (*Clemmys insculpta*) is the only state-listed threatened species known to inhabit Fort Belvoir.[2] The wood turtle is found primarily in mesic deciduous woodlands in and near clear creeks in Fairfax County (Ernst et al., 1997a). The wood turtle is very mobile and is a highly terrestrial species that typically uses creeks for hibernacula and mating.

The wood turtle was first observed in the Jackson Miles Abbott Wetland Refuge (JMAWR) near the western edge of the marsh in 1988 (Belfit, 1988, as cited in Hobson, 1996). Despite continuous searches, no other sightings were made on Fort Belvoir for ten years. In 1998 two wood turtles were observed on Fort Belvoir, a female along Dogue Creek near the JMAWR, and a male along Accotink Creek near U.S. Route 1. In 1999, a different male was observed along Accotink Creek in the ABWR. Huntley Meadows Park, to the northeast of the JMAWR, has a population of wood turtles that have been monitored for several years. The recent sightings of three different individuals within the Dogue Creek and Accotink Creek corridors on Fort Belvoir indicate that this species is established on post. Figure 12.1 identifies the installation areas that are considered to possess wood turtle habitat.

Development and stormwater runoff are the two main site-specific and local threats to the wood turtle population on Fort Belvoir. Development-related alterations to riparian forest buffers could affect water quality, stream flow and stream channels, and reduce the habitat area required for the wood turtle.

### 12.2.4 Rare Species

The Fort Belvoir Natural Heritage Inventories (Hobson, 1996; 1997) (Figure 12.3) (Section 9.2.3) identified seven Virginia state rare animal species and four Virginia state rare plant species on the installation.[3] The inventory also identified 16 state watchlist animal species and three state watchlist plant species on Fort Belvoir (Table 12.1). Each of these species was documented as occurring in aquatic and/or wetland habitats on Fort Belvoir.

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[2] Two other state-listed threatened species, the loggerhead shrike (*Lanius ludovicianus*) and upland sandpiper (*Bartramia longicauda*) have been sighted in the past on Fort Belvoir, but none have been sighted during the past 3 years of bird surveys.

[3] With the exception of *Lampsilis radiata* (eastern lampmussel), all other species were found living. The lampmussel found was an empty shell.

# RARE SPECIES MAPPED by VIRGINIA NATURAL HERTIGE INVENTORY on FORT BELVOIR

SOURCE: HOBSON, 1996; 1997

FIGURE: 12.3

The list of rare animal species provided in the Natural Heritage Inventory report (Hobson, 1996; 1997) does not contain the complete list of rare animals that occur on Fort Belvoir. This is mainly because the inventory surveyed areas that were determined to have high potential for rare species or exemplary vegetation communities rather than surveying throughout the post. In addition, the Virginia rare animal species list is a "living" list that is updated annually. This necessitates regular cross-referencing with species documented on the installation. Table 12.2 presents a comprehensive listing of all birds, mammals, reptiles, and amphibians that have been documented as occurring on post and that have been designated as a Virginia state-rare species with a state rarity rank of either S1, S2, or S3.[4]

**Table 12.1: Virginia Natural Heritage Ranked Species Identified by the 1996-1997 Natural Heritage Inventory**

| | *Scientific Name* | *Common Name* | *DCR-NHP Status* |
|---|---|---|---|
| State Rare Animals | Ischnura prognata | furtive forktail | S2/S3 |
| | Ixobrychus exilis | least bittern | S2 |
| | Lampsilis radiata | eastern lampmussel | S2 |
| | Nehalennia gracilis | sphagnum sprite | S2 |
| | Neurocordulia obsoleta | umber shadowfly | S2 |
| | Stygobromus phreaticus | Northern Virginia well amphipod | S1 |
| | Utterbackia imbecillis-Anodonta imbecillis | paper pondshell | S2 |
| State Rare Plants | Carex vestita | velvet sedge | S2 |
| | Lathyrus palustris | vetchling | S1 |
| | Ranunculus ambigens | water-plantain spearwort | S2 |
| | Scirpus fluviatilis | river bulrush | S1 |
| State Watchlist Animals | Amphiagrion saucium | eastern red damsel | Watchlist |
| | Ardea herodias | Great Blue Heron | Watchlist |
| | Brachymesia gravida | four-spotted pennant | Watchlist |
| | Chromagrion conditum | aurora damsel | Watchlist |
| | Cordulegaster erronea | tiger spiketail | Watchlist |
| | Cordulegaster obliqua | arrowhead spiketail | Watchlist |
| | Enallagma durum | big bluet | Watchlist |
| | Erythrodiplax minuscula | little blue dragonlet | Watchlist |
| | Lampetra aepyptera | least brook lamprey | Watchlist |
| | Leptodea ochracea | tidewater mucket | Watchlist |
| | Lestes inaequalis | elegant spreadwing | Watchlist |
| | Notropis bifrenatus | bridle shiner | Watchlist |
| | Stygobromus tenuis | Potomac groundwater amphipod | Watchlist |
| | Stylurus plagiatus | russet-tipped clubtail | Watchlist |
| | Sympetrum ambiguum | blue-faced meadowfly | Watchlist |
| | Tachopteryx thoreyi | gray petaltail | Watchlist |
| State Watchlist Plants | Eleocharis smallii | creeping spikerush | Watchlist |
| | Iris versicolor | blueflag | Watchlist |
| | Sparganium eurycarpum | large bur-reed | Watchlist |

Source: Hobson, 1996 and 1997.

[4] Partners in Flight species are discussed in Section 11.

| Table 12.2: Commonwealth of Virginia and Natural Heritage Ranked Species That Have Been Identified on Fort Belvoir | | | | |
|---|---|---|---|---|
| ***Scientific Name*** | ***Common Name*** | *Taxon* | *Virginia Status*[*] | *DCR-NHP Status*[†] |
| Condylura cristata | Star-nosed mole | Mammal | — | S3 |
| Lasionycteris noctivagans | Silver-haired bat | Mammal | — | S3 |
| Lasiurus cinerus | Hoary bat | Mammal | — | SU |
| Myotis leibii | Small-footed bat | Mammal | — | S1 |
| Accipiter cooperi | Cooper's hawk | Bird | — | S1S2 |
| Accipiter striatus | Sharp-shinned hawk | Bird | — | S3S4 |
| Actitis macularia | Spotted sandpiper | Bird | — | S2 |
| Aegolius acadicus | Northern saw-whet owl[‡] | Bird | SC | S1 |
| Anas discors | Blue-winged teal | Bird | — | S1 |
| Anas strepera | Gadwall | Bird | — | S2 |
| Aquila chrysaetos | Golden eagle[‡] | Bird | — | SH |
| Ardea alba | Great egret | Bird | SC | S2BS4N |
| Ardea herodias | Great blue heron | Bird | — | S3S4 |
| Asio flammeus | Short-eared owl[‡] | Bird | — | S1 |
| Asio otus[c] | Long-eared owl[‡] | Bird | SC | S1 |
| Bartramia longicauda | Upland sandpiper[‡] | Bird | LT | S1S2 |
| Botaurus lentiginosus | American bittern | Bird | — | SU |
| Carpodacus purpureus | Purple finch | Bird | SC | S1 |
| Catharus guttatus | Hermit thrush | Bird | SC | S1 |
| Catharus ustulata | Swainson's thrush | Bird | — | S1 |
| Certhia familiaris | Brown creeper | Bird | SC | S2S3 |
| Circus cyaneus | Northern Harrier | Bird | SC | S1S2 |
| Cistothorus platensis | Sedge wren | Bird | SC | S1 |
| Contopus borealis | Olive-sided flycatcher | Bird | — | SH |
| Dendroica fusca | Blackburnian warbler | Bird | — | S2 |
| Dendroica magnolia | Magnolia warbler | Bird | SC | S1S2 |
| Dolichonyx oryzivorus | Bobolink | Bird | — | S1 |
| Egretta caerulea | Little blue heron | Bird | SC | S2B, S4N |
| Egretta thula | Snowy egret | Bird | — | S2 |
| Empidonax alnorum | Alder flycatcher | Bird | SC | S1 |
| Empidonax flaviventris | Yellow-bellied flycatcher | Bird | SC | S1 |
| Falco perigrinus | Peregrine falcon | Bird | LE | S1 |
| Fulica americana | American coot | Bird | — | S1 |
| Gallinula chloropus | Common moorhen | Bird | SC | S1 |
| Haliaeetus leucocephalus | Bald eagle | Bird | LE | S2 |
| Ixobrychus exilis | Least bittern | Bird | — | S2 |
| Lanius ludovicianus | Loggerhead shrike | Bird | LT | S2 |
| Larus atricilla | Laughing gull | Bird | — | S3S4 |
| Lophodytes cucullatus | Hooded merganser | Bird | — | S1 |
| Loxia curvirostra | Red crossbill | Bird | SC | S1 |
| Melospiza georgiana | Swamp sparrow | Bird | — | S1 |
| Mergus merganser | Common merganser | Bird | — | S1 |
| Nycticorax nycticorax | Black-crowned night heron | Bird | — | S2S3 |
| Nycticorax violacea | Yellow crowned night heron | Bird | SC | S2 |

| Table 12.2: Commonwealth of Virginia and Natural Heritage Ranked Species That Have Been Identified on Fort Belvoir | | | | |
|---|---|---|---|---|
| ***Scientific Name*** | ***Common Name*** | *Taxon* | *Virginia Status*[*] | *DCR-NHP Status*[†] |
| ***(continued)*** | | | | |
| Oporonis philadelphia | Mourning warbler | Bird | SC | S1 |
| Petrochelidon pyrrhonota | Cliff swallow | Bird | — | S3S4 |
| Phalocrocorax auritus | Double-crested cormorant | Bird | — | S1B, S4N |
| Plegadis falcinellus | Glossy ibis[c] | Bird | SC | S2 |
| Podilymbus podiceps | Pied-billed grebe | Bird | — | S2 |
| Porzana carolina | Sora | Bird | — | S1 |
| Rallus elegans | King rail | Bird | — | S2 |
| Rallus limicola | Virginia rail | Bird | — | S2 |
| Regulus calendula | Golden-crowned kinglet | Bird | SC | S2 |
| Riparia riparia | Bank swallow | Bird | — | S3S4 |
| Seiurus noveboracensis | Northern waterthrush | Bird | — | S1 |
| Sitta candensis | Red-breasted nuthatch | Bird | SC | S2 |
| Sphyrapicus varius | Yellow-bellied sapsucker | Bird | — | S1 |
| Sterna antillarum | Least tern | Bird | SC | S2 |
| Sterna caspia | Caspian tern | Bird | SC | S1 |
| Sterna forsteri | Forster's tern | Bird | SC | S3S4 |
| Sterna hirundo | Common tern | Bird | — | S3 |
| Troglodytes troglodytes | Winter wren | Bird | SC | S2 |
| Vermivora chrysoptera | Golden-winged warbler | Bird | SC | S3 |
| Vermivora ruficapilla | Nashville warbler | Bird | — | S1 |
| Clemmys guttata | Spotted turtle | Reptile | — | S3S4 |
| Clemmys insculpta | Wood turtle | Reptile | LT | S2 |
| Stygobromus phreaticus | Northern Virginia well amphipod | Crustacean | — | S1 |
| Stygobromus tenuis | Potomac amphipod | Crustacean | — | S3 |
| Lampetra aepyptera | Least brook lamprey | Fish | — | S3 |
| Notropis bifrenatus | Bridle shiner | Fish | SC | S2/S3 |
| Amphiagrion saucium | Eastern red damsel | Insect | — | S3 |
| Brachymesia gravida | Four-spotted pennant | Insect | — | S3 |
| Chromagrion conditum | Aurora damsel | Insect | — | S3 |
| Cordulegaster erronea | Erroneous biddie | Insect | — | S3 |
| Cordulegaster obliqua | Arrowhead spiketail | Insect | — | S3 |
| Enallagma durum | Big bluet | Insect | — | S3 |
| Erythrodiplax minuscula | Blue dragonlet | Insect | — | S3 |
| Ischnura prognata | Furtive forktail | Insect | — | S3 |
| Lestes inaequalis | Elegant spreadwing | Insect | — | S3 |
| Nehalennia gracilis | Sphagnum sprite | Insect | — | S2 |
| Neurocordulia obsoleta | Umber shadowdragon | Insect | — | S3 |
| Stylurus plagiatus | Russet-tipped clubtail | Insect | — | S3 |
| Sympetrum ambiguum | Blue-faced meadowfly | Insect | — | S3 |
| Tachopteryx thoreyi | Gray petaltail | Insect | — | S3 |
| Lampsilis radiata | Eastern lampmussel | Mollusk | SC | S2 |
| Leptodea ochracea | Tidewater mucket | Mollusk | — | S3 |
| Arenaria lateriflora | Sandwort | Plant | — | S1 |

| Table 12.2: Commonwealth of Virginia and Natural Heritage Ranked Species That Have Been Identified on Fort Belvoir | | | | |
|---|---|---|---|---|
| ***Scientific Name*** | ***Common Name*** | *Taxon* | *Virginia Status** | *DCR-NHP Status†* |
| ***(continued)*** | | | | |
| Blephilia hirsuta | Hairy woodmint | Plant | — | S3 |
| Botrychium oneidense | Blunt-lobed grape fern | Plant | — | S2 |
| Calamovilfa brevipilis | Pine barrens reedgrass | Plant | — | S1 |
| Carex vestita | Velvety sedge | Plant | — | S2 |
| Eleocharis equisetoides | Spike-rush | Plant | — | S1 |
| Eleocharis smallii | Creeping spikerush | Plant | — | S3? |
| Iris versicolor | Blueflag | Plant | — | S3 |
| Lathyrus palustris | Vetchling | Plant | — | S1 |
| Ranunculus ambigens | Water plantain crowfoot | Plant | — | S1 |
| Scirpus fluviatilis | River bulrush | Plant | — | S1 |
| Sparganium eurycarpum | Giant bur-reed | Plant | — | S3 |

Sources: Bird identification information from Fleming, 2000; Mammal identification information from Fort Belvoir files; Reptile identification information from Fort Belvoir files; Crustacean information from Hobson, 1996 and 1997; Insect information from Hobson, 1996 and 1997; Mollusk information from Hobson, 1996 and 1997; Plant information from Wells, 1999 and Hobson, 1996 and 1997. All species status information was updated according to Roble, 1999 and Killeffer, 2000.

***Virginia Status Listings:**
LE: Listed Endangered
LT: Listed Threatened
SC: Special Concern; animals that merit special concern according to the VDGIF.

**†Natural Heritage Rankings:**
S1: Extremely rare; usually 5 or fewer occurrences in the state; or may have a few remaining individuals; often especially vulnerable to extirpation.
S2: Very rare; usually between 5 and 20 occurrences; or few occurrences with many individuals; often susceptible to becoming endangered.
S3: Rare to uncommon; usually between 20 and 100 occurrences; may have fewer occurrences, but with a large number of individuals in some populations; may be susceptible to large-scale disturbances.
SH: Historically known from the state, but not verified for an extended period, usually more than 15 years; this rank is used primarily when inventory has been attempted recently.
SU: Status uncertain, often because of low search effort or cryptic nature of the element.
S_B, S_N: Breeding and nonbreeding status of an animal in Virginia, when they differ.
?: Indicates an uncertain ranking.

‡A vagrant species that does not breed on Fort Belvoir and has been documented on post less than four times.

### 12.2.5 Rare Ecological Communities

The ecological communities assessment (McCoy and Fleming, 2000) identified 17 community types on Fort Belvoir Main Post, four of which are ranked “very rare” or “extremely rare”, and three of which are ranked as “rare to uncommon”(Note, S1 = extremely rare; S2 = very rare and S3= rare to uncommon):

- Coastal Plain/Piedmont Acidic Seepage Swamp - G2, G3, S2
- Tidal Hardwood Swamp - G3, S3?[5]
- Tidal Shrub Swamp - G? [5], S2?[5]
- Tidal Freshwater Marsh: Mixed Type - G-?[5], S1
- Tidal Freshwater Marsh: Mud Flat Type - G? [5], S3? [5]
- Tidal Freshwater Marsh: Wild Rice - Smartweed Type - G? [5], S3? [5]
- Tidal Freshwater Marsh: Spikerush - Golden-club Type - G1G3, S1.

The ecological communities assessment identified existing and potential threats to the biodiversity of these wetland communities (McCoy and Fleming, 2000). The most significant threat is posed by invasive/exotic species. Aggressive invasive/exotic vegetation, such as *Phragmites australis*, marsh dewflower (*Murdannia keisak*), hydrilla (*Hydrilla verticillata*), and eulalia (*Microstegium vimineum*) were encountered in installation wetlands. The oriental mystery snail (*Cipangopaludina chinensis*), which can negatively alter vegetational habitat, was encountered throughout the installation. DCR-NHP also noted that these wetlands are vulnerable to stormwater-related problems (e.g., sedimentation), degraded water quality and boat wakes, as well as by beaver activity (Hobson, 1996).

## 12.3 ENDANGERED, THREATENED, AND RARE SPECIES MANAGEMENT

### 12.3.1 Endangered, Threatened, and Rare Species Management Recommendations

The results of the various surveys indicate that Fort Belvoir possesses a large number of rare plant and animal species (including the federal threatened/state endangered bald eagle, state endangered peregrine falcon, and state threatened wood turtle), and rare ecological communities. The surveys also indicate that the habitat areas for these species require protection. New development, shoreline disturbances, and waterfowl hunting activity are examples of threats to the habitat for bald eagle and peregrine falcon populations. Wood turtle habitat faces threats from the reduction of riparian forest buffers, which degrade water quality, increase stream flow and alter stream channels. The biodiversity of wetland ecological communities is threatened by the introduction of invasive/exotic species. Fort Belvoir's efforts to eliminate these threats should also address related impacts that have already occurred.

### 12.3.2 Endangered, Threatened, and Rare Species Management Actions to Date

The foundation of Fort Belvoir's endangered, threatened and rare species management is habitat conservation, consistent with the conservation recommendations of DCR-NHP (McCoy and

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[5] Those rankings still in question are yet to be determined by NHP because Virginia-wide surveys are not yet complete.

Fleming, 2000; Hobson, 1996; 1997). Much of the installation's bald eagle habitat, as well as the installation's rare wetland community types, and their associated rare plant and animal species, are contained within the ABWR. Similarly, some of the installation's wood turtle habitat is included within both refuges and within the Fort Belvoir Forest and Wildlife Corridor. The Fort Belvoir Master Plan designates the installation refuges, the corridor, wetlands and steep-sloped areas as "environmentally constrained areas." Such conservation land-use designations protect the habitat in these areas from loss to development or land disturbing training activities.

In recent years, Fort Belvoir began to address conservation and enhancement of native biodiversity within ecological communities by identifying and controlling threats from invasive/exotic species and from stormwater-related problems (Sections 9 and 7, respectively).

#### *12.3.2.1 Bald Eagle Management*

With the discovery of the bald eagle nest on Fort Belvoir in 1990[6], Fort Belvoir implemented a bald eagle management program. The program focused primarily on the protection of nesting bald eagles and nest habitat. Measures to protect bald eagle nest habitat were established in the 1991 Fort Belvoir *Eagle Management Plan*. The ABWR was expanded to include the active nest site and associated protection area (Section 13).

In 2000, Fort Belvoir developed the Fort Belvoir *Bald Eagle Management Plan* (Paciulli, Simmons & Associates, Ltd., 2000a) to replace the 1991 *Eagle Management Plan*. The 2000 Plan expanded management actions to address conservation of all bald eagle habitat on post, not just nesting habitat. The *Bald Eagle Management Plan* was developed in accordance with the requirements of AR 200-3, and incorporated the management requirements and recommendations of the USFWS *Bald Eagle Guidance for Virginia* (U.S. FWS, 2000) and the VDGIF *Management Guidelines and Recommendations for Fort Belvoir* (Cline, 1996), both of which emphasize conservation of all bald eagle habitat, including foraging habitat (Table 12.3).

**Table 12.3: Bald Eagle Management Recommendations of the U.S. Fish and Wildlife Service and the Virginia Department of Game and Inland Fisheries**

| *Agency* | *Recommendation* |
|---|---|
| U.S. Fish and Wildlife Service Bald Eagle Guidance for Virginia (U.S. Fish and Wildlife Service, 2000) | Establish primary and secondary nest management zones and a shoreline management zone.<br><br>Within the primary nest management zone (750-foot radius around active nests), prohibit all activities during the breeding/nesting season, and prohibit any habitat modifications (e.g., clearcutting, development) at any time.<br><br>Within the secondary nest management zone (1,320-foot radius around active nests), restrict activity during the breeding/nesting season, and limitations on habitat alterations.<br><br>Conditions for shoreline management zones should be developed on a case-by-case basis. |

[6] There has been confirmed eagle nesting activity on Belvoir from 1936 until 1959. Historic nest sites are recorded in lower T-6, T-7 and T-10 (Cline, 1996).

| Table 12.3: Bald Eagle Management Recommendations of the U.S. Fish and Wildlife Service and the Virginia Department of Game and Inland Fisheries | |
|---|---|
| ***Agency*** | ***Recommendation*** |
| ***(continued)*** | |
| Virginia Department of Game and Inland Fisheries Management Guidelines and Recommendations for Fort Belvoir (Cline, 1996) | Establish management zones around active bald eagle nests and along the installation shoreline.<br><br>Establish primary and secondary nest management zones at 750- and 1,320-foot radii, respectively, around active nests, and establish land use and activity restrictions specific to each zone (e.g., no clear cutting or construction within the primary zone; no human activity within the primary zone from November 15 through July 15).<br><br>Protect shoreline by preserving a forest buffer up to 750 feet inland (300 feet minimum), and protect the designated "high use foraging area" from increases in boating activity.<br><br>Undertake a public information effort to protect eagle foraging habitat from disturbance by human activity. |

Sources: U.S. Fish and Wildlife Service, 1998 and Cline, 1996

The *Fort Belvoir Bald Eagle Management Plan* (Paciulli, Simmons & Associates, Ltd., 2000a) established four major management actions:

- Designating specific eagle management areas (i.e., Active Nest Site Protection Area, Historic Nest Site Protection Area, High-Use Foraging Protection Area, and Occasional Use Foraging Protection Area (Figure 12.4), with area-specific management activities to protect the eagle and its habitat on Fort Belvoir (Table 12.4)
- Implementing habitat enhancement projects by correcting utility poles that pose an electrocution hazard, and performing timber stand improvements to improve potential nest habitat
- Developing and implementing an eagle awareness training program for installation personnel, and developing and implementing a public education program on bald eagles and their protection to minimize the risk of disturbance to eagles
- Continuous monitoring of bald eagle activity and bald eagle habitat on post, including the active nest site, potential nest habitats, and shoreline foraging and loafing areas.

#### *12.3.2.2 Wood Turtle Management*

Since discovery of the wood turtle on Fort Belvoir in 1988, wood turtle management has focused primarily on habitat conservation. Conservation of wood turtle habitat, especially migratory corridors, was a major factor in the designation and delineation of the Fort Belvoir Forest and Wildlife Corridor.

#### *12.3.2.3 Peregrine Falcon Management*

As of 2000 no specific peregrine falcon habitat management activities have been undertaken. Except for the Tompkins Basin area, the entire Accotink Creek/Accotink Bay stream corridor below U.S. Route 1 is within the ABWR. This conservation land use designation protects this area from land disturbing activities, such as shoreline development.

#### *12.3.2.4 Rare Species and Rare Ecological Communities Management*

Conservation of rare plant and animal species and their habitats were important considerations in the establishment of the two installation refuges (ABWR and JMAWR). These refuge designations have effectively protected a large amount of the installation's rare wetland communities, and associated rare plant and animal species, from loss to development or training activities.

As addressed in Section 7, Fort Belvoir has initiated a watershed restoration program to correct stormwater problems within the installation stream corridors, and has begun to implement best management practices on construction projects. The first watershed restoration projects, undertaken in 1999 and 2000, focused on subwatersheds of the Accotink Bay freshwater tidal wetlands in an effort to help protect rare wetland communities and their associated rare plant and animal species by controlling sedimentation.

As addressed in Sections 9.3 and 10.3, Fort Belvoir has initiated an invasive/exotic vegetation management program. The first invasive/exotic vegetation management actions were undertaken in 1999 in an effort to control *Phragmites australis* in the Accotink Bay freshwater tidal wetlands to help protect rare wetland communities and their associated rare plant and animal species.

#### *12.3.2.5 Endangered and Threatened Species Law Enforcement*

Through its Memorandum of Agreement for Cooperative Law Enforcement between the U.S. Fish and Wildlife Service and the U.S. Army Garrison Fort Belvoir, dated 20 February 1996 (Appendix A), Fort Belvoir has one Special Agent within ENRD. The agreement is to provide mutual law enforcement benefits to the installation and to the Fish and Wildlife Service by sharing expertise, training, intelligence, information, and specialized equipment. The intent of this agreement is to provide the Special Agent with the authority to enforce all laws administered by the U.S. and the installation relating to fish, wildlife, and other natural resources. The agreement delegates authority to the Special Agent to enforce several specific federal laws on Fort Belvoir including the following: Lacey Act Amendments of 1981 (16 U.S.C., 3371-3378), Migratory Bird Treaty Act (16 U.S.C. 703-712), Migratory Bird Hunting and Conservation Stamp Tax Act (16 U.S. C. 718-718h), Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d), Airborne Hunting Act (16 U.S. C. 742J-1), National Wildlife Refuge Systems Administrative Act (16 U.S.C., 668dd-668ee), Endangered Species Act of 1973 (16 U.S.C., 1531-1543), Marine Mammal Protection Act of 1979 (16 U.S.C., 1361-1384, 1401-1407), and Archeological Resources Protection Act of 1979 (16 U.S.C. 470a. (A)-(1) (A)).

Bald Eagle Management Zone 1: 750 Feet

Bald Eagle Management Zone 2: 1320 Feet

Fort Belvoir Bald Eagle Management Areas

Active nest site protection zone

Historic nest site protection zone

Bald Eagle High Use Forage Area

Bald Eagle Occasional Use Forage Area

N

# DESIGNATED BALD EAGLE MANAGEMENT AREAS on FORT BELVOIR

SOURCE: PACIULLI, SIMMONS, and ASSOCIATES, LTD., 2000

FIGURE: 12.4

| Table 12.4 Bald Eagle Management Area Restrictions as Designated in the Bald Eagle Management Plan (depicted in Figure 12.4) | | | | | | |
|---|---|---|---|---|---|---|
| ***Management Area*** | ***Land Area Designation*** | ***Land Use Development*** | ***Training Activities*** | ***Recreation Activities*** | ***Facilities Maintenance Activities*** | ***Land/Resources Management Activities*** |
| Area 1: Active Nest Site Protection Area (all of W-7* and T-10†; lower part of W-1, at and above 100-ft contour level) | Incorporate T-10 into the ABWR. | No land-use changes for development (e.g., no land clearing or new facilities construction) in entire area. | No land disturbing training activities in entire area. No training activities within 750-ft radius of nest tree between November 15 and July 15. For Davison Army Airfield-controlled aircraft, no helicopter overflights under 1,000 ft altitude; no fixed wing overflights under 500 ft altitude over nest tree. | No hunting or other recreation activities within 750-ft radius of nest tree between November 15 and July 15. No new hiking trails within 1,320 – ft radius of nest tree. | Keep training road between W-7 and T-10 closed. Mark boundaries of W-7 and T-10 as Eagle Protection Area. | No land management activities within 1,320-ft radius of nest tree between November 15 and July 15. No timber clearcutting in entire area. No aerial pesticide spraying within 750-ft radius of nest tree. Access of Fort Belvoir personnel or representatives within 750-ft radius of nest tree between February 1 and July 15 must be coordinated with VDGIF and USFWS. |
| Area 2: Historic Nest Site Protection Area (lower parts of T-6 and T-7 at and below 125-ft contour level) | Consider incorporating this area into the ABWR in the future. | No land-use changes for development (land clearing or new facilities construction). | No land disturbing training activities. | None | None | No timber clearcutting. |
| Area 3: High Use Foraging Area Protection Area (extends a minimum of 750 ft inland from shoreline of upper Pohick Creek and Pohick and Accotink Bays. All of F-1‡, W-5 and W-6; lower parts of W-1 and W-2 at or below 25-ft contour level; lower part T-9) | Consider incorporating lower part of T-9 into the ABWR in the future. | No land-use changes for development (land clearing or new facilities construction). | No land disturbing training activities No shoreline training activities (e.g., landing craft, float bridge training). | No recreation other than hunting, fishing and low-intensity passive recreation. No launching or landing of any recreational watercraft. | None | No timber clearcutting. |

| Table 12.4 Bald Eagle Management Area Restrictions as Designated in the Bald Eagle Management Plan (depicted in Figure 12.4) | | | | | | |
|---|---|---|---|---|---|---|
| ***Management Area*** | ***Land Area Designation*** | ***Land Use Development*** | ***Training Activities*** | ***Recreation Activities*** | ***Facilities Maintenance Activities*** | ***Land/Resources Management Activities*** |
| ***(continued)*** | | | | | | |
| Area 4: Occasional Use Foraging Area Protection Area (750 ft inland from shoreline of upper Pohick Creek, Gunston Cove, Potomac River and Dogue Creek (i.e., the remainder of Fort Belvoir shoreline not included in Area 3) | None. | None | None | None | None | No timber clearcutting. |

Source: Paciulli, Simmons & Associates, Ltd., 2000a.

* W – Wildlife Area
† T – Training Area
‡ F– Floodplain Area

## 12.4 CONTINUING AND FUTURE ENDANGERED, THREATENED, AND RARE SPECIES MANAGEMENT

Fort Belvoir intends to continue the management emphasis on conservation of endangered, threatened and rare species (and their habitats), and rare ecological communities. Fort Belvoir will continue to use conservation land-use designations to protect important habitat areas for these resources, and will continue to implement management actions, such as invasive/exotic species management, stormwater management and problem wildlife management, to control threats to these resources. Fort Belvoir will consider the potential for impacts to these resources when making land-use and operational decisions, especially with regard to bald eagles and wood turtles. Where practicable and consistent with installation mission Fort Belvoir will undertake actions to enhance habitat conditions for endangered, threatened, and rare species.

### 12.4.1 Management Objectives

1. Protect against impact to federal- and state-listed species (e.g., bald eagle, wood turtle, and peregrine falcon). Conserve and enhance their habitat conditions.

2. Conserve habitats/populations of rare animal and plant species, and ecological communities that have been prioritized for conservation by the Virginia Natural Heritage Program.

### 12.4.2 Management Strategies

1. Continue to obtain scientific information on endangered, threatened, and rare species, and their habitats, and on rare species and ecological communities to support our knowledge of these species and communities and their status, and to identify stresses and detect changes to their populations and/or habitats on post.

   - Continue to monitor federal and state species listings to identify changes in species listing status, and changes in species records for the Fort Belvoir area.

   - Complete the next installation-wide rare species inventory update on a 5-year cycle (in fiscal year (FY) 02). The inventory will entail field survey, records review and GIS datalayer development, consistent with the protocols used during the 1996 and 1997 baseline inventories. The update will allow for a comparison to update changes. Coordinate survey information with USFWS and VDGIF. Maintain the inventory in the installation GIS.

   - Continue to perform annual bald eagle surveys in accordance with the Bald Eagle Management Plan (Paciulli, Simmons & Associates, Ltd., 2000a): annual nest habitat surveys and seasonal foraging habitat surveys. Maintain the results in the installation GIS.

- Continue to perform year-round surveillance (i.e., close observation, in lieu of studies or monitoring projects) of bald eagles and their habitat to detect changes in presence/activity and potential impacting activities/conditions.

- Develop and implement a baseline survey to characterize the on-post wood turtle population, and to evaluate habitat conditions. The survey will be used to develop and implement monitoring of wood turtles and their habitat on Fort Belvoir, as recommended by DCR-NHP (Hobson, 1996). Coordinate this monitoring program with the Huntley Meadows wood turtle monitoring program. Coordinate survey information with VDGIF and DCR-NHP. Maintain the results in the installation GIS.

- Continue to coordinate with USFWS, VDGIF, DCR-NHP and other appropriate entities regarding protection requirements for, and current population and other information on, bald eagles and wood turtles, and for other listed and rare species, and rare ecological communities, as they may be encountered on Fort Belvoir.

- Develop and implement a study to evaluate the *Stygobromus phreaticus* (northern Virginia well amphipod), as recommend by the Natural Heritage Program (Hobson, 1997).

- Develop and implement a program to monitor rare plant and animal species, and rare ecological communities, as recommended by DCR-NHP (Hobson, 1996; 1997; McCoy and Fleming, 2000). Monitoring will address populations and habitat conditions, and will be developed to assess integrity and to detect existing and potential impacts. Maintain the monitoring results in the installation GIS. Areas to be considered for monitoring include the freshwater tidal wetlands (W-5, W-6, W-1, W-2, W-3); the acidic seepage swamp wetlands (lower T-9, lower T-7, W-1, eastern T-16 and lower HEC); the T-17 ravine; and, the freshwater marsh of W-4.

- Perform localized and/or issue-specific rare species/communities studies/monitoring as needed to support resource management, or specific installation projects, such as new development or changes to land-use practices. Coordinate the survey results with VDGIF and DCR-NHP. Maintain the results in the installation GIS.

2. Continue to set aside habitat areas for endangered, threatened, and rare species, and rare ecological communities, consistent with DoD policy for setting aside areas for conservation as "Special Natural Areas" (Section 13). As of 2000, Fort Belvoir has three such areas: two refuges and the Forest and Wildlife Corridor. Continue to designate these set-aside areas, as well as wetlands and steep-sloped areas, as "environmentally constrained to development" in the installation Master Plan. Consider modifying the boundaries of the refuges and/or establishing a buffer for the refuges, to protect habitat areas for rare resources with high conservation priorities, as designated by DCR-NHP. Considerations should include the following:

   - Expanding the current ABWR (Figure 4.1) to include the land area of F-1, T-9, T-7, T-10 and T-6 below the 125-foot contour (Figure 2.2), as recommended in the *Bald Eagle Management Plan*. This coincides with the Historic Nest Protection Area (Figure 12.4), and would result in all of the three major eagle management areas

(Active Nest Site Protection Area, Historic Nest Site Protection Area, and High Use Foraging Protection Area) being incorporated into the refuge. It would also include all of the rare wetland communities associated with the Pohick Creek-Pohick Bay-lower Accotink Creek-Accotink Bay wetland complex into the refuge. This area represents part of the Pohick / Accotink conservation site recommended by DCR-NHP (Figure 8.2) (Hobson, 1996).

- Expanding the current JMAWR (Figure 4.1) to incorporate the wetlands of eastern T-16 (Figure 2.2 and 8.1) and the lower part of HEC. This would incorporate all of the rare wetland communities associated with the upper Dogue Creek-Mulligan Pond wetland complex into the refuge. This area represents all of the Dogue Creek conservation area recommended by DCR-NHP (Figure 8.2) (Hobson, 1996).

- Defining and designating buffer areas adjacent to ABWR and JMAWR to protect resources within the refuges. Develop land use considerations for these buffer areas.

- Designating part of T-17 as a conservation area within the Tompkins Basin Recreation Area. This area includes the ravine site recommended by DCR-NHP for conservation to protect the northern Virginia well amphipod (Figure 8.2) (Hobson, 1997).

3. Continue to implement the bald eagle management actions set forth in the *Bald Eagle Management Plan* (Paciulli, Simmons & Associates, Ltd., 2000a).

   - Continue to manage the four designated eagle management areas on Fort Belvoir: Active Nest Site Protection Area, Historic Nest Site Protection Area, High-Use Foraging Area, Occasional Use Foraging Area (Figure 12.4 and Table 12.4) to protect eagle habitat on post.

   - Continue to implement bald eagle habitat enhancement projects. These include correcting electrocution hazards by installing raptor guards, or re-configuring or replacing all electric poles that pose an electrocution hazard, and making selective timber cuts in planted pine stands to improve nest habitat conditions.

   - Develop and implement an eagle awareness-training program for installation personnel, and a public education program, including information displays and handout materials, on bald eagles to safeguard against disturbance to bald eagles.

4. Develop, maintain, and implement Endangered Species Management Plans for all federal and state-listed species, and federal candidate species in accordance with the requirements of AR 200-3.

   - Complete the revisions to the *Bald Eagle Management Plan* on a 5-year cycle (FY 05). Perform an annual review of the plan.

   - Develop a wood turtle management plan. Use the results of the installation baseline wood turtle survey, and coordinate with VDGIF, DCR-NHP, and other appropriate entities to develop the plan. This plan will stress habitat protection, and will explore conservation land-use designations to protect habitat. (The wood turtle, a highly

mobile species having varied habitat requirements, will have management issues associated with preservation of migratory corridors, as well as protection of nesting and hibernating habitat.) The management plan will include a long-term monitoring effort, and will explore using opportunities for coordinating/integrating installation monitoring and management efforts with regional efforts. Perform an annual review of the plan.

- Develop a management plan for any other federal-, or state-listed species, or federal candidate species that occur on post.

5. Continue to implement actions to control threats to rare plant and animal habitats, and rare ecological communities:

   - Continue to emphasize rare plant and animal species habitats, and rare ecological communities when performing invasive/exotic species management. For example,
     - Continue to monitor and control *Phragmites australis* (phragmites), as recommended by DCR-NHP (Hobson, 1996; McCoy and Fleming, 2000).
     - Develop and implement a monitoring and control program for other invasive/exotic species such as marsh dewflower (*Murdannia keisak*) and hydrilla (*Hydrilla verticillata*), which could impact rare wetland species and communities.
     - Continue to perform surveillance for outbreaks of other invasive/exotic vegetation that could impact the rare plant communities, as recommended by DCR-NHP (Hobson, 1996; McCoy and Fleming, 2000).

   - Continue to emphasize rare plant and animal species habitats, and rare ecological communities when performing watershed restoration projects. For example, complete the watershed restoration projects associated with lower Accotink Creek and Accotink Bay, as recommended by Landgraf (1999).

   - Continue to control the risk of problem wildlife impacts to rare plant and animal species habitats, and rare ecological communities. For example:
     - Continue to control the deer population through the hunting program.
     - Monitor beaver activity to detect impacts to rare wetland communities. Develop and implement protection measures if impact thresholds have been exceeded, as recommended by DCR-NHP (Hobson, 1996; McCoy and Fleming, 2000).

6. Continue to use the installation project and activity review process to incorporate threatened, endangered, and rare species/communities conservation requirements into all phases of facilities siting, construction, renovation, operation, maintenance, and demolition activities; in reviewing and supporting military training and testing activities; and in reviewing and responding to outdoor recreation, environmental education, scientific research and study, and all other types of land area access and use requests.

   - Review and revise, as needed, the Fort Belvoir *Environmental Protection Specifications* applicable to construction projects to ensure that they include threatened, endangered, and rare species/communities protection provisions.

- Review and revise as needed, the *Fort Belvoir Environmental Checklist* to address threatened, endangered, and rare species/communities protection.

- Incorporate threatened, endangered and rare species/communities conservation strategies and specifications into utilities privatization, and all other privatization and outsourcing actions, as appropriate.

- Develop recommendations for a facilities siting/design review committee to include representatives from ENRD, Master Planning and the Contract Management Division. The committee should develop and participate in a design review process to ensure consideration of threatened, endangered and rare species/communities protection in all siting and design decisions.

- Continue to include threatened, endangered and rare species/communities protection as part of the Excavation Permit and Demolition Permit review processes.

- Continue to include threatened, endangered and rare species/communities protection in all real estate actions (e.g., outgrants, leases, rights of entry), as appropriate.

- Review and revise the Fort Belvoir Training Regulation as needed to address threatened, endangered and rare species/communities protection.

7. Develop and participate in regional partnerships for threatened, endangered and rare species, and rare ecological communities protection.

   - Initiate a cooperative effort with Pohick Regional Park regarding bald eagle protection (especially with regard to marina operations) and Huntley Meadows regarding the wood turtle protection. Include additional neighbors in this cooperation as appropriate.

   - Continue to coordinate with and provide support to the Mason Neck Bald Eagle Survey program, a volunteer program.

   - Continue to coordinate with and provide support to the VDGIF annual bald eagle nest survey and annual Potomac River shoreline survey. Continue to coordinate installation eagle monitoring information with VDGIF.

   - Continue to review local and regional off-post actions for potential to impact on-post listed and rare species, and rare ecological communities.

8. Continue to perform agency coordination on installation actions potentially affecting endangered, threatened, or rare species, or rare ecological communities.

   - Continue to coordinate with USFWS, National Marine Fisheries Service (NMFS), VDGIF, and DCR-NHP regarding the potential for installation actions to affect endangered, threatened, or rare species, or rare ecological communities.

   - Perform Endangered Species Act Section 7 Consultation with the USFWS or NMFS on installation actions that may affect federally listed species.

- Investigate and enforce violations of federal and state endangered species statutes and regulations.

- Coordinate with USFWS, NMFS and VDGIF on listed species mortalities.

9. Continue to provide technical assistance for emergency situations, such as uncontrolled fires, that threaten listed or rare species.

10. Continue to respond to requests for technical information from on-post and off-post entities, as appropriate.

11. Continue to investigate and enforce violations of federal and state laws and regulations, as well as DoD, DA, and Fort Belvoir policies.

# 13.0
# Special Natural Areas

Department of Defense (DoD) installations nationwide contain some of America's most precious natural resources. As steward of these resources, DoD is responsible not only for assuring for their conservation, but also for providing the public opportunities for appropriate educational and recreational use, consistent with military mission.

One of the ways DoD installations protect significant natural resource areas is to designate them as "Special Natural Areas." Under DoD and Department of the Army (DA) policies (Section 13.1) such Special Natural Area designations can include refuges, scenic areas and watchable wildlife areas. Setting aside special installation areas under such a designation allows an installation to focus its management actions on conservation and make resource access/use decisions accordingly.

Fort Belvoir possesses a variety of ecologically significant natural resource areas. These include extensive wetlands, extensive riparian forest buffers and important native wildlife habitats, such as habitats for the federal- and state-listed bald eagle, the state-listed wood turtle and peregrine falcon, anadromous fish species, Partners in Flight (PIF) high priority bird species (Section 11.2.2), and several state-rare plant and animal species (Section 12.2.4). Fort Belvoir also has several state-rare plant communities, a regionally rare watershed and locally important wildlife migratory corridors. These on-post resource areas factor into biodiversity conservation efforts at the local, regional and national levels. The importance of conserving these on-post resources is underscored by the increasing urbanization locally, and throughout the Chesapeake Bay region.

Fort Belvoir has three designated Special Natural Areas. These designated areas include many, but not all, of the ecologically significant natural resource areas on post (Section 13.2.1). In 1979, Fort Belvoir established the Accotink Bay Wildlife Refuge (ABWR) to protect sensitive wetlands and wildlife habitats associated with Accotink Bay, and to provide opportunities for environmental education and low-intensity recreation. In 1988, Fort Belvoir established a second refuge, the Jackson Miles Abbott Wetland Refuge (JMAWR), to protect another sensitive wetland area and to provide opportunities for bird watching. In 1993 Fort Belvoir established the Fort Belvoir Forest and Wildlife Corridor to protect forested wildlife habitat and to preserve an important wildlife migratory corridor through the installation.

Fort Belvoir manages these three Special Natural Areas with the primary emphasis on conservation. Access to and use of these areas for environmental education, scientific research and study, low-intensity recreation and low-intensity military training and testing is allowed as long as the access and use are compatible with resource conservation.

The installation's refuges serve as the foundation of the installation's natural resources education program. Where compatible with resource conservation, the refuges are made available for use as outdoor classrooms for educational programs run by off-post organizations (e.g., field trips by local high school and university classes) as well as for installation-run programs. In 2000, Fort Belvoir opened the ABWR Environmental Education Center to provide limited indoor classroom

space to support the refuge-based educational programs. Given the installation's location within the populous Washington D.C. metropolitan area, Fort Belvoir's refuges and associated education programs are potentially accessible to a very large population base.

## 13.1 SPECIAL NATURAL AREAS POLICIES

### 13.1.1 Federal Special Natural Areas Policy

Two major federal regulations relate to special natural areas management on Fort Belvoir. The Program for Conservation and Rehabilitation of Natural Resources on Military Installations (16 U.S.C.§670a. Section (a)(3)) requires installations to implement a program to provide for "the sustainable multipurpose use of the resources, which shall include hunting, fishing, trapping, and nonconsumptive uses" and to provide "public access to military installations to facilitate the use."

Natural Resources Management Program (32 Code of Federal Regulations 190) provides in §190.4(a) that "the Department of Defense shall act responsibly in the public interest in managing its lands and natural resources. There shall be a conscious and active concern for the inherent value of natural resources in all DoD plans, actions, and programs." Also, "DoD lands shall be available to the public and DoD employees for enjoyment and use of natural resources, except when a specific determination has been made that a military mission prevents such access for safety or security reasons or that the natural resources will not support such usage." §190.4 (g)

### 13.1.2 State Special Natural Area Policy

Virginia has no overarching special natural area policy that affects the management of Fort Belvoir's refuge and forest and wildlife corridor.

### 13.1.3 Department of Defense Special Natural Area Policy

DoD's natural resources management policy is contained within DoDI 4715.3, *Environmental Conservation Program*. This instruction requires installations to follow an ecosystem-based approach to natural resources management, to inventory and protect important biological resources, and to promote biodiversity. DoDI 4715.3 acknowledges the need to set aside for conservation installation areas having significant natural resources. The instruction also acknowledges the need to provide the public with opportunities to access these resources for education, scientific research and study, and recreation, consistent with ecosystem management goals. Key excerpts from DoDI 4715.3 are as follows:

**Excerpts from DoDI 4715.3**
**Select Provisions Applicable to Special Natural Resource Areas**

- Portions of installation real property that have significant ecological, cultural, scenic, recreational, or educational value may be set aside for conservation of those resources, where such conservation is consistent with the military mission. (F1j)

- Areas on DoD installations that contain natural resources that warrant special conservation efforts, after appropriate study and coordination, may be designated as special natural areas. The integrated natural resources management plan for the installation shall address special management provisions necessary for the protection of each area. Special natural areas include botanical areas, ecological reserve areas, geological areas, natural resources areas, riparian areas, scenic areas, zoological areas, "watchable wildlife" areas, and traditional cultural places having officially recognized special qualities or attributes. (F2e)

- All DoD conservation programs shall work to guarantee continued access to our land, air, and water resources for realistic military training and testing while ensuring that the natural and cultural resources entrusted to DoD care are sustained in a healthy condition for scientific research, education, and other compatible uses by future generations. (D1a)

- The principal purpose of DoD lands and waters is to support mission-related activities. Those lands and waters shall be made available to the public for educational or recreational use of natural and cultural resources when such access is compatible with military mission activities, ecosystem sustainability, and with other considerations such as security, safety, and fiscal soundness. Opportunities for such access shall be equitably and impartially allocated. INRMPs and ICRMPs [Integrated Cultural Resources Management Plans] shall describe areas appropriate for public access. (D1d)

- Natural resources under the stewardship and control of the Department of Defense shall be managed to support and be consistent with the military mission, while protecting and enhancing those resources for multiple use, sustainable yield, and biological integrity. Land use practices and decisions shall be based on scientifically sound conservation procedures and techniques, and use scientific methods and an ecosystem approach. (D2a)

- Biologically or geographically significant or sensitive natural resources (e.g., wetlands, forests, floodplains, watersheds, estuaries, riparian areas, coastal barrier islands, marine sanctuaries, critical habitats, animal migration corridors) or species (e.g., threatened or endangered species, certain marine mammals, and migratory birds) shall be inventoried and managed to protect these resources, and to promote biodiversity, using the goals identified in paragraph F1a. (D2c)

- Management measures for the removal or control of exotic species shall be included in installation INRMP's when applicable. (D2h)

- Consistent with ecosystem-based management, altered or degraded landscapes and associated habitats shall be restored and rehabilitated whenever practical. (D2l)

| Excerpts from DoDI 4715.3<br>Select Provisions Applicable to Special Natural Resource Areas |
|---|
| *(continued)*<br><br>■ Fire is an integral element of natural processes. All DoD Components shall manage fire in a manner to preserve health and safety, protect facilities, and facilitate the health and maintenance of natural systems. (D2n)<br><br>■ DoD installations may engage in public awareness and outreach programs to educate the public regarding the resources on military lands and DoD efforts to conserve those resources. (D1i) |

### 13.1.4 Department of the Army Special Natural Area Policy

DA's natural resources management policy is contained within AR 200-3, *Natural Resources—Land, Forest and Wildlife Management*. This regulation establishes the Army's requirements for managing and using land and water resources in accordance with the principles of ecosystem management, and institutes the Army's commitment to conserve, protect, and sustain biological diversity, and to restore degraded ecosystems. AR 200-3 acknowledges the need to set aside for conservation installation areas having significant natural resources, and the necessity of providing the public with opportunities to access these resources for education, scientific research and study, and recreation, consistent with ecosystem management goals. Key excerpts from Army policy, AR 200-3, *Natural Resources—Land, Forest and Wildlife Management* are as follows:

| Excerpts from AR 200-3<br>Select Provisions Applicable to Special Natural Resource Areas |
|---|
| ■ The natural resources management professional will be an active participant in all planning and decision making activities regarding uses of the land to ensure that current and planned mission activities (for example, master planning, construction requests, site approval requests, and training exercise plans) are conducted in a manner which is compatible with natural resources and other environmental requirements. (3-2b)<br><br>■ Areas that contain natural resources that warrant special conservation efforts will be identified during the inventory and classification process. After appropriate study and coordination, such areas may be managed as "Special Interest Areas" for their unique features. The integrated natural resources management plan will address the special management necessary for the area and all current and future land uses will consider the uniqueness of the area and plan accordingly to ensure conservation of the resources, and the protection and enhancement of threatened and endangered species habitats. (2-11c)<br><br>■ The Army will maintain a Natural Resources R&D program as part of the R&D effort in support of military installations. This program will be funded primarily with R&D funds and may be supplemented by O&M and reimbursable funds. (2-25a)<br><br>■ Whenever practicable, Army lands with suitable natural resources will be managed to allow for outdoor recreational opportunities. (7-1a) |

### 13.1.5 Fort Belvoir Special Natural Area Policy

Fort Belvoir Supplement 1 to AR 200-3 specifies requirements for natural resources management, including management of installation refuges used for outdoor recreation. Excerpts from the Fort Belvoir Supplement to AR 200-3 relevant to special natural areas are presented below.

| **Excerpts from Fort Belvoir Supplement 1 to AR 200-3<br>Select Provisions Applicable to Special Natural Resource Areas** |
|---|
| ■ Develop and implement comprehensive management plans, maintain and manage day-to-day activities at the Accotink Bay Wildlife Refuge (ABWR) and the Jackson Miles Abbott Wetland Refuge (JMAWR). (6-1g5)<br><br>■ Develop and implement a comprehensive management plan for the Fort Belvoir Forest and Wildlife Corridor. (6-1g6)<br><br>■ Fishing is authorized from dusk to dawn in accordance with applicable Commonwealth of Virginia regulations, except in access-controlled waters, such as training areas and wildlife refuges. (6-2i2)<br><br>■ Any proposed outdoor recreation use of installation refuges (ABWR or JMAWR) must be coordinated with, and approved by the DIS [Directorate of Installation Support]. No outdoor recreational activities which are likely to have a detrimental effect on natural resources shall be permitted to occur in the refuges… (7-1e)<br><br>■ No watercraft shall be or launched or landed within the wildlife refuges, unless otherwise approved by DIS. (8-1i) |

### 13.1.6 Chesapeake Bay Program

DoD is a signatory partner of the Chesapeake Bay Program, through which federal partners, including Fort Belvoir, strive to restore and protect the Bay while promoting public awareness. The 1987 *Chesapeake Bay Agreement*, the 1990 *Cooperative Agreement Between DoD and EPA Concerning Chesapeake Bay Activities*, the 1993 *DoD/EPA Action Items for the Chesapeake Bay Program*, the 1994 *Agreement of Federal Agencies on Ecosystem Management in the Chesapeake Bay*, the 1998 *Federal Agencies' Chesapeake Ecosystem Unified Plan (FACEUP)*, and the renewed Chesapeake Bay agreement, *Chesapeake 2000,* contain goals, objectives, and commitments designed to provide for the restoration and protection of the Bay's living resources and their habitats. Specifically, the 1998 FACEUP includes commitments relating to smart growth. These commitments include discouraging development in "greenfield" sites and increasing public access to the Chesapeake Bay and its resources.

### 13.1.7 Partners in Flight Program

DoD is a partner in promoting and supporting the Partners in Flight (PIF) Program. The PIF Program strives to address the problems facing neotropical migratory birds through

communication, cooperation, and conservation efforts. As part of the PIF Program, DoD installations are encouraged to incorporate elements of the PIF Bird Conservation Strategy into their INRMPs. Such elements include identifying species and habitats most in need of conservation; establishing population and habitat conservation objectives; creating a Bird Conservation Plan to meet established objectives; implementing the plan; and monitoring progress.

## 13.2 SPECIAL NATURAL AREAS BASELINE CONDITIONS

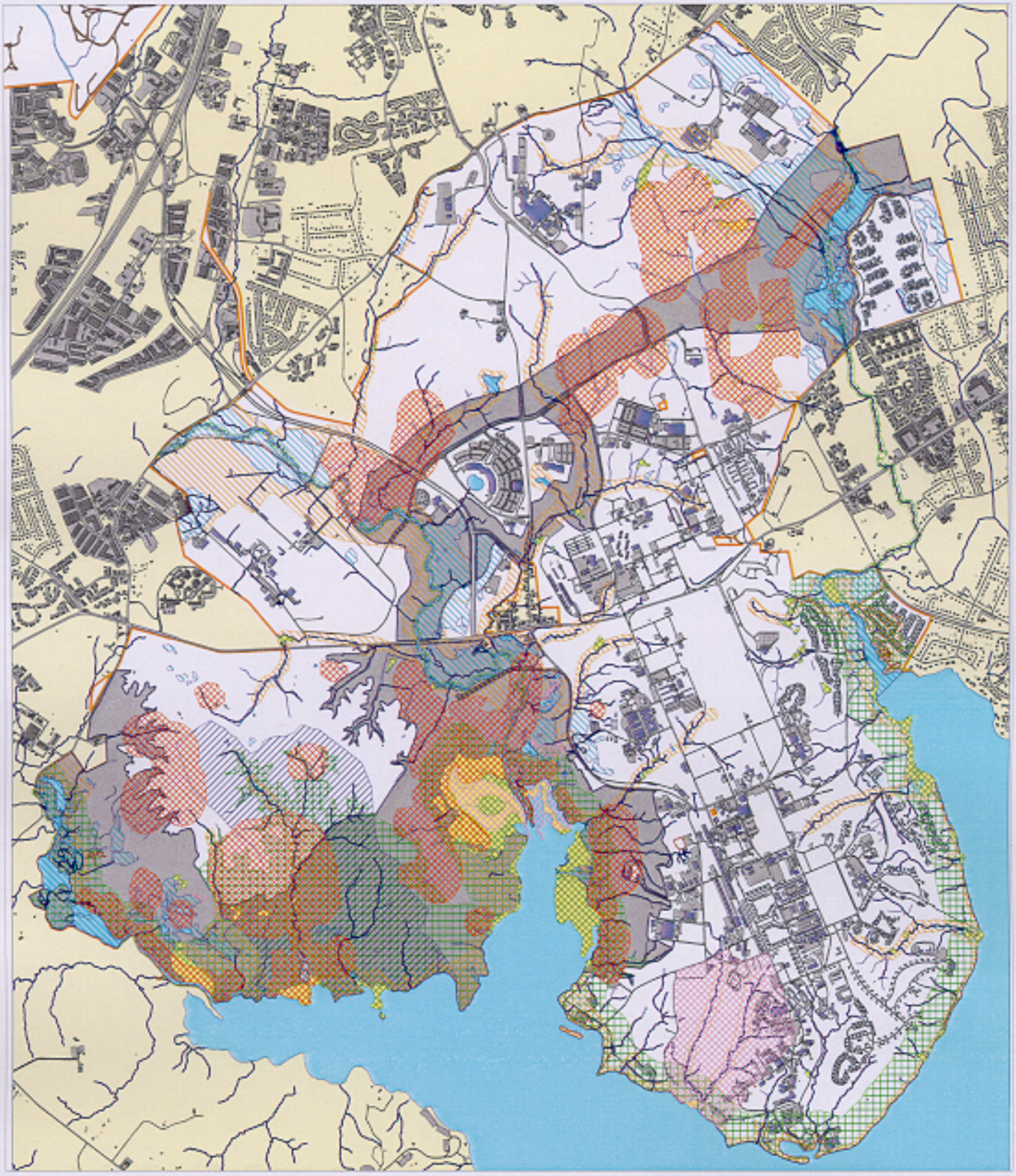
### 13.2.1 Designated Special Natural Areas

As of 2000, Fort Belvoir has designated three Special Natural Areas: two refuges (ABWR and JMAWR) and the Fort Belvoir Forest and Wildlife Corridor (Figure 4.1). As indicated in Figure 13.1, as of 2000 the boundaries of these Special Natural Areas encompass many, but not all, of the ecologically significant natural resource areas on post.

The two refuges and the corridor are included in the Fort Belvoir Real Property Master Plan (Woolpert, 1993a), where they are designated as "environmentally constrained" land uses and "permanently preserved and therefore unavailable for development." The Master Plan, including these refuge and corridor designations, was documented in the National Environmental Policy Act (NEPA) *Environmental Assessment (EA) for the Long Range Component of the Real Property Master Plan* (Woolpert, 1993b).

### 13.2.2 Ecologically Significant Natural Resource Areas

Information on the natural resources of Fort Belvoir has been obtained through various planning level surveys and studies (Sections 7 through 12). As documented through these surveys and studies, Fort Belvoir possesses significant natural resource areas that are important to biodiversity conservation at the local, regional and national levels. The most ecologically significant of these on-post natural resource areas are presented in Table 13.1. Each of these resources has been assigned a high conservation priority through federal or state statute or regulation, DoD or DA policy (e.g., DoDI 4715.3), DoD-partnered programs (e.g., Chesapeake Bay Program, PIF Program), state natural heritage program, or through recognized importance to regional ecosystem function (e.g., wildlife migratory routes).



All PIF Breeding Bird Species
All Rare Plant and Animal Species
All Rare Plant Communities
All Wetlands
Riparian/Resource Protection Area
Intact Watershed
All Threatened and Endangered species
Corridor and Refuge

N

(SEE FIGURES 4.2, 7.2, 8.1, 8.2, 11.1, 11.2, 12.1, 12.2, 12.3, and 12.4 for INDIVIDUAL MAPS of these RESOURCES)

COMPOSITE FIGURE of
ECOLOGICALLY SIGNIFICANT
NATURAL RESOURCE AREAS
on FORT BELVOIR

SOURCE: FORT BELVOIR GIS CENTER, 2000; ENRD STAFF, 2000

FIGURE: 13.1

| Table 13.1: Ecologically Significant Natural Resource Areas on Fort Belvoir | | | |
|---|---|---|---|
| | ***Accotink Bay Wildlife Refuge*** | ***Jackson Miles Abbott Wetland Refuge*** | ***Fort Belvoir Forest and Wildlife Corridor*** |
| Wetlands (Figure 8.1) | X | X | X |
| Riparian forest buffers, and designated riparian resource protection areas (RPAs) (Figure 4.2) | X | X | X |
| Recognized significant habitat for the federal-listed threatened / state-listed endangered bald eagle (Figure 12.1) | X | | |
| Habitat for the state-listed threatened wood turtle (Figure 12.1) | X | X | X |
| Habitats for state-rare plant species and/or globally rare and state-rare animal species (Figure 12.3) | X | X | |
| State-rare plant communities (Figure 12.2) | X | | |
| Habitats for PIF priority bird species (Figure 11.1) | X | X | X |
| Waterways that provide passage and spawning habitats for anadromous/migratory fish, including river herring (Figure 11.2) | X | | X |
| Contiguous forest that provides migratory corridor(s) for wildlife (Figure 11.2) | X | X | X |
| A rare, intact example of an undisturbed watershed within the Mid-Atlantic region (subwatershed 48) (Figure 7.2) | X | | |

Figure 13.1 presents a composite map of the approximate locations of these ecologically significant installation areas. As depicted in this figure, much but not all of these ecologically significant areas are contained within the three designated Special Natural Areas (i.e., the two refuges and the corridor).

### *13.2.2.1 Accotink Bay Wildlife Refuge*

***History***

The ABWR was established in 1979 to protect areas of recognized ecological significance, most notably the freshwater tidal marsh and climax hardwood forest adjacent to Accotink Bay. The

refuge was also intended to provide the public with opportunities for environmental education and for low-intensity outdoor recreation. The refuge initially encompassed a 460-acre area along Accotink Bay in the south-central part of the installation. Through a series of subsequent expansions, the ABWR was enlarged to encompass the entire shoreline/slope area around Accotink and Pohick Bays, the entire riparian area along Accotink Creek south of U.S. Route 1, part of the Pohick Creek riparian area, and portions of the upland plateau of the South Post training area. The expansions were undertaken, as military mission changes allowed, to incorporate more of the recognized sensitive natural resources into the refuge. In 1999 training area T-10 was approved by Command for incorporation into the refuge to include the bald eagle "active nest protection area" within the refuge (Section 12.3.1). As of 2000, the ABWR encompasses 1,360 acres in the southwest part of the installation.

The ABWR includes all of the tidal marsh wetlands associated with Accotink and Pohick Bays. Several rare plant and animal species, and rare plant communities occur in these wetlands. The refuge does not include two adjacent, ecologically significant wetland areas (Figure 8.1): the coastal plain/piedmont acidic seepage swamp in training areas T-9 and T-7, containing several rare plant communities, and several rare plant and animal species (Figure 12.2 and 12.3). The refuge includes the lower part of subwatershed 48 (Figure 7.2, Section 7.2.1), which is considered to be a rare example of an undisturbed Mid-Atlantic upper Coastal Plain stream. The refuge includes the lower parts of the riparian protection areas associated with lower Accotink Creek, Accotink Bay, lower Pohick Creek and Pohick Bay (Figure 4.2), and borders the lower part of Accotink Creek, a major waterway used by migratory fish (Section 7.2.1). The refuge includes most of Fort Belvoir's designated bald eagle management areas along Accotink and Pohick bays (Figure 12.4, Section 12.3.1); however, part of the "high-use foraging protection area" and all of the "historic nest site protection area" are outside the refuge boundaries, extending into T-9, T-7 and T-6. The refuge includes all peregrine falcon foraging habitat (Figure 12.1, Section 12.2.2), much but not all of the on-post wood turtle habitat (Figure 12.1, Section 12.2.3) and most of the PIF priority bird species habitat (Figure 11.1, Section 11.2.2) in the southwestern part of the installation.

Training areas T-6 and T-7, which include ecologically significant natural resources, were part of an area proposed for inclusion into the refuge during the 1989 refuge expansion. Military training requirements at that time however precluded incorporation of T-6 and T-7 into the refuge. Instead, the commander approved adding T-6 and T-7 to the refuge on a delayed basis, documenting that these two areas would be added to the refuge after the Advanced Individual Training departed from Fort Belvoir, which was projected to occur in the mid-1990s. However, the addition of T-6 and T-7 to the refuge was not made, and these two areas have remained designated as training areas. Training area T-9, which also includes several ecologically significant natural resources, has not been previously proposed for inclusion into the refuge.

As of 2000, the military training and testing use of the South Post training areas, including T-6, T-7, and T-9, is minimal, involving mostly small unit maneuvers and bivouac training. These areas are typically not disrupted by present-day training activities. Consequently, the significant natural resources in these areas remain intact and contiguous with the ABWR.

### *Use*

The ABWR has been open to the public since it was established. The primary management emphasis has been on resource conservation. Consequently, public access to and use of refuge resources have been limited to low-intensity activities, all of which must be approved in advance by DIS ENRD. Activities with the potential to disrupt natural resources, such as bike/off-road vehicle (ORV) use and horseback riding, are prohibited. Boat launches and landings are prohibited. No land disturbing activities are allowed. Except for hunting and fishing, no other active recreation activities (e.g., camping, picnicking, campfires/cookouts, etc.) are permitted. Organized large-group events require special permission from DIS ENRD because of their potential impact to sensitive resources. DIS ENRD may grant approval for such events on a case-by-case basis only after ENRD determines that such events will not impact refuge resources. No facilities construction, other than for appropriate public access and educational facilities, is allowed.

Fort Belvoir initiated a refuge use survey of the ABWR in 1998. The survey, which made use of comment cards, interviews, trail use counters, and education center attendance, was designed to assess user volume, user activities, and user perception of refuge resources. The survey was intended to be a multi-year effort. The results from the first survey indicate that between July 1998 and September 1999 more than 800 individuals used the ABWR. During the second survey year, surveys showed 1,893 people used the refuge.[1] The primary reason visitors came to the refuge during both survey years was for the quiet enjoyment of nature, trails, and wildlife.

### *Facilities*

Existing refuge facilities are limited to a hiking trail network and associated public access and educational features sufficient to support low-intensity use (Figure 13.2). As of 2000, the ABWR trail network is approximately 9 miles in length and has a natural surface, except for the 0.5-mile paved Pohick Loop Trail, which is accessible to persons with disabilities. There are several wildlife observation structures along the trails, parking facilities at three trailheads (main entrance, Pohick Loop Trail and Basin Trail) and restrooms (compost toilet facilities) at the main entrance on Pohick Road. Information kiosks and interpretive signs are located along major trails. (Fort Belvoir maintains a current ABWR trail pamphlet including use restrictions, and provides copies of the pamphlet, along with the Fort Belvoir bird checklist, at the major trailheads.) The Accotink Bay Wetland Refuge boundary and facilities have been incorporated into the installation GIS.

In 2000, the ABWR Environmental Education Center was opened to provide a focal point for the public visiting the refuge. The center is open seasonally and provides information regarding refuge hours and use, as well as natural resource exhibits, brochures, videos, and computer programs. Interpretive programs are offered regularly. In addition, organized school, civic, and professional groups may reserve dates for special interpretive talks or outdoor classroom activities.

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[1] Actual users are expected to be higher than this record

#### *13.2.2.2 Jackson Miles Abbott Wetland Refuge*

***History***

The JMAWR was established in 1988 to protect an area of sensitive wetlands along Dogue Creek. This refuge was also intended to provide public access to an important bird watching area. The refuge has not been expanded since it was established. As of 2000, JMAWR encompasses 146 acres along Dogue Creek in the northeastern part of the installation (Figure 4.1).

The JMAWR includes a beaver-impounded section of Dogue Creek, which supports several state-rare animal species, and the 1.5-acre man-made Mulligan Pond. Additional forested wetlands continue beyond the refuge boundary into training area T-16 and into the Humphries Engineer Center (HEC) (Figure 8.1, Section 8.2.1). These exterior wetland areas include a state-rare plant community (Figure 12.2). The JMAWR includes all of the resource protection areas along Dogue Creek main stem (in the North Post) but does not include the resource protection areas along two major drainages through T-16 and HEC, or the resource protection areas along the lower Dogue Creek in South Post (Figure 4.2, Section 7.1.2). The refuge includes some of the on-post wood turtle habitat (Figure 12.1, Section 12.2.3) and PIF priority bird species habitat (Figure 11.1, Section 11.2.2) in the northeastern part of the installation. Large tracts of wood turtle habitat and PIF priority bird species habitats occur outside the refuge, in T-16 and lower HEC.

As of 2000, T-16 and the lower part of HEC are undeveloped, and T-16 supports limited, low-intensity military training and testing activities. These areas are typically not disrupted by present-day training or other mission activities. Consequently the significant natural resources in these areas remain intact and contiguous with the refuge.

***Use***

The JMAWR has been open to the public since it was established. Use management is the same as for the ABWR. JMAWR surveys indicated that the primary use is for nature walking, dog walking, fishing, bird watching, and wildlife observation.

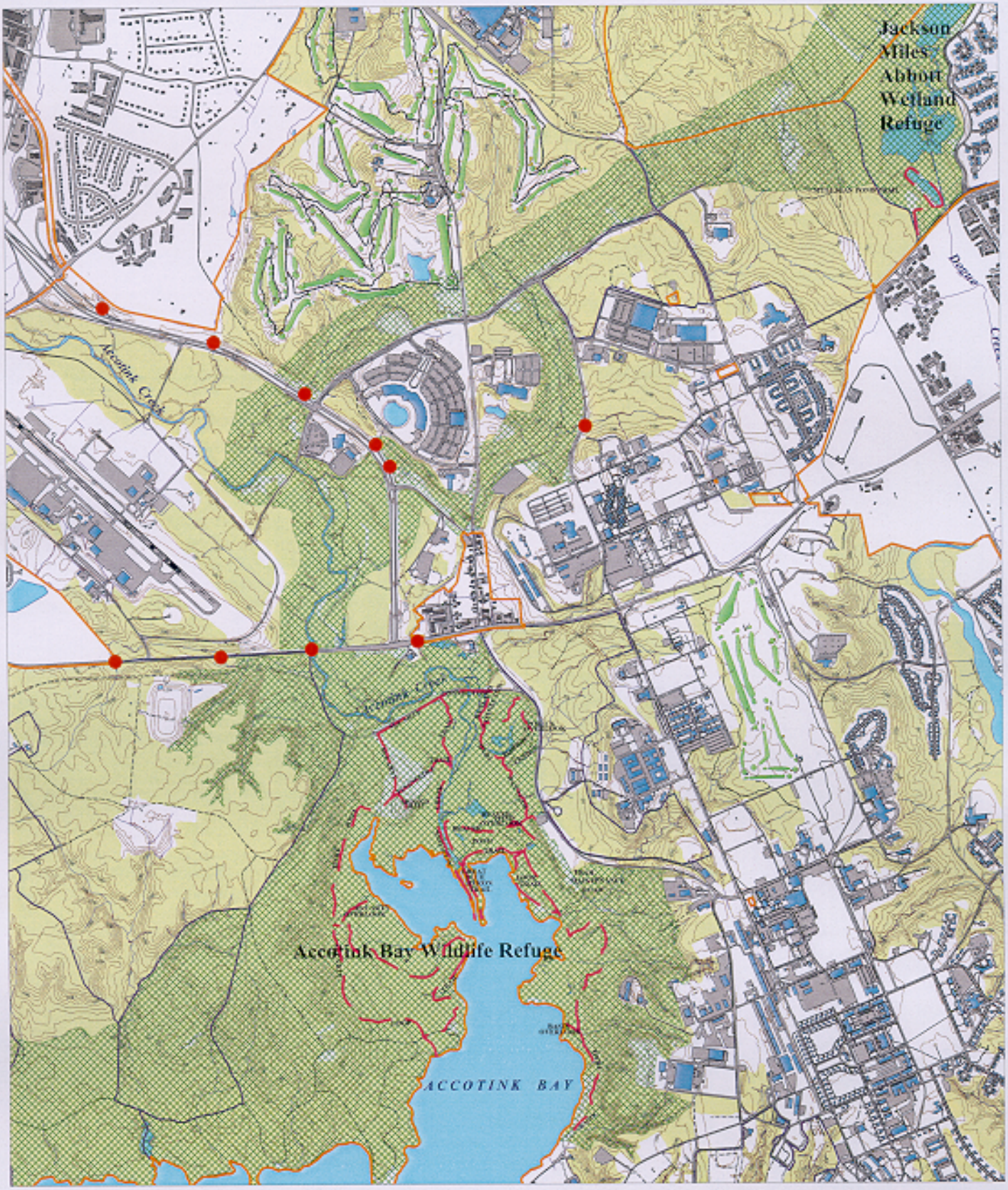
***Facilities***

Existing facilities are limited to the 0.6-acre hiking trail, a portion of which is accessible to persons with disabilities, two fishing piers accessible to persons with disabilities over Mulligan Pond, a wildlife viewing structure over the impoundment area, and parking facilities and an information kiosk at the entrance on Meers Road. The JMAWR boundary and facilities have been incorporated into the installation GIS.

#### *13.2.2.3 Fort Belvoir Forest and Wildlife Corridor*

***History***

The Fort Belvoir Forest and Wildlife Corridor was established in 1993 as a NEPA mitigation action to offset the ecological impacts of habitat fragmentation caused by several major construction projects on Fort Belvoir. The corridor was established to protect significant wildlife habitat, and to maintain a continuous area of natural forest habitat connecting larger natural areas to the north and south of Fort Belvoir, facilitating wildlife movement through the installation (Paciulli, Simmons and Associates, Ltd., 1993).




Wildlife Crossings

Refuge Hiking Trails

Pohick Trail--Wheelchair Accessible

N

# HIKING TRAILS and WILDLIFE CROSSINGS on FORT BELVOIR

SOURCE: FORT BELVOIR GIS CENTER, 2000

FIGURE: 13.2

The Fort Belvoir Forest and Wildlife Corridor was established to have a minimum width of 250 to 300 meters (820 to 984 feet), based upon the results of a George Mason University study of minimum corridor widths for wildlife migration (Ernst et al., 1998). As shown in Figure 4.1, the corridor extends from JMAWR in the northeastern part of the installation to the ABWR in the southwestern part. The corridor and the two refuges together provide a continuous forest band through Fort Belvoir. As of 2000 the corridor encompasses 742 acres, exclusive of the refuge areas. The corridor underwent a minor modification of its boundaries in 1999, as it was incorporated into the installation GIS. Apart from that modification, there has been no expansion of the corridor since it was established.

The corridor includes some of the installation's habitat for the wood turtle and the PIF priority bird species. The corridor also includes the riparian forest buffer and wetlands along the section of Accotink Creek, north of U.S. Route 1, and along two major drainages to Accotink Creek.

***Use***

The corridor is not open to public use, except for installation-authorized events. Military training occurs within the parts of the corridor that are designated as training land. The installation bow hunting program authorizes controlled access to designated corridor areas. Fort Belvoir has allowed specific recreational events, such as volksmarches, on a case-by-case basis when such events would not conflict with the military training mission or with resource conservation. No facilities construction, except for wildlife habitat/movement enhancement, is authorized. No user surveys have been conducted within the corridor.

***Facilities***

The only corridor facilities are six wildlife crossing structures (Figure 13.2): three of which cross the Fairfax County Parkway, two that cross U.S. Route 1, and one that crosses Gunston Road. Four additional crossings outside the corridor were also constructed: two of which cross the Fairfax County Parkway, and two that cross U.S. Route 1. Wildlife crossing structures consist of oversized box culverts with natural bottoms and daylighting by grids in the center of the culverts. The wildlife crossing structures were installed to mitigate the impacts of the construction of these roads on wildlife movement through the corridor.[2] There are no public access facilities (e.g., trails) in the corridor. The corridor boundary and the wildlife crossing structures have been incorporated into the installation GIS.

## 13.3 SPECIAL NATURAL AREAS MANAGEMENT

### 13.3.1 Special Natural Areas Management Recommendations

The results of the planning level natural resources surveys of Fort Belvoir (Sections 7 through 12) document a variety of ecologically significant resources occurring both inside and outside the boundaries of the three designated Special Natural Areas. The study results warn that these resources are vulnerable to a number of threats, including displacement by exotic species; de-

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[2] These mitigation efforts did not address all previously existing roads and developed areas within the Corridor.

stabilization, erosion or sedimentation resulting from stormwater problems; damage/mortality caused by insects or disease; and, disturbance/destruction caused by wildlife (e.g., deer overbrowsing, beaver activity) or by overuse by humans. The resources within the designated Special Natural Areas, while protected from direct loss to development, are nonetheless vulnerable to "spill-over" impact by any adjacent development (e.g., lighting, noise, activity, accidental chemical spills, stormwater runoff, problem wildlife, etc.). The resources that remain outside the designated Special Natural Areas are vulnerable to displacement by development.

The planning level surveys, most notably the ecological communities survey (McCoy and Fleming, 2000) and the natural heritage inventory (Hobson, 1996; 1997), recommended management actions to control the threats to the installation's significant resources. The natural heritage inventory (Hobson, 1996) recommended the establishment of conservation areas, covering areas larger than the present-day refuges, to protect the significant resources within and adjacent to the refuges from development and other land disturbing activities, and to buffer the adverse impacts of nearby developed land uses on sensitive resources (Section 12). In addition to recommending two conservation areas, one each for the ABWR and the JMAWR, the natural heritage inventory recommended establishing a third conservation area to protect a significant rare species in training area T-17, along Gunston Cove (Hobson, 1997) (Figure 8.2). These DCR-NHP-recommended conservation areas would essentially increase by size and number the designated special natural areas on post. They would dramatically increase both the areas associated with the ABWR and JMAWR, and would add a new area at T-17. It should be noted that the DCR-NHP conservation area recommendations are not an express recommendation to increase refuge boundaries to those limits. Instead, they represent a recommendation to enact conservation management within those defined areas. The recommended conservation area boundaries represent the whole of the areas within which such management actions are recommended by DCR-NHP to conserve Fort Belvoir's ecologically-significant resources.

#### *13.3.1.1 Refuges*

In 1998 Fort Belvoir prepared the *Comprehensive Management Plan for the Fort Belvoir Refuge Complex* (Paciulli, Simmons and Associates, Ltd., 1998b). Development of this plan took into account DCR-NHP's conservation recommendations, the results of the planning level surveys completed to date (which excluded the watershed, aquatic resources, ecological communities, and bird surveys), as well as the Fort Belvoir military mission. This plan recommended that management priority be given to the protection of the refuges from manmade or natural disasters. The specific management recommendations made in the plan can be grouped according to five topics:

- Use Management
- Boundaries and Buffers
- Natural Resources Conservation
- Educational Opportunities
- Facilities Maintenance

Table 13.2 presents a summary of the plan's key management recommendations, organized according to these five topics.

| Table 13.2: Key Management Recommendations from the Comprehensive Management Plan for the Fort Belvoir Refuge Complex | |
|---|---|
| ***Topic*** | ***Management Recommendations*** |
| Use Management | ■ Limit public access to the presently accessible areas, unless future studies specifically indicate that additional public areas can be created without damage to the ecosystem.<br>■ Prohibit horses, bicycles, ORVs, boat landings and launchings, etc.<br>■ Allow classes, and scientific research and inventory in the non-public areas.<br>■ Allow archery hunting in the public and non-public areas as a means to control the deer population.<br>■ Allow fishing in Mulligan Pond, Dogue Creek, Accotink Creek, Pohick Creek, and Accotink and Pohick Bays.<br>■ Limit recreation to hunting, fishing and passive recreational activities such as wildlife/nature photography.<br>■ Prohibit/control large organized recreational events such as volksmarches and orienteering competitions.<br>■ Encourage non-disruptive military use if other natural (training) areas do not provide proper space or training scenarios. |
| Boundaries and Buffers | ■ Add training area T-10 to the ABWR, to protect the active bald eagle nest.<br>■ Add the landfills to the refuge(s) since other (land-disturbing) uses are not feasible at the landfills. Landfills occur in areas T-6, T-16, W-1, and W-3.<br>■ Modify the refuge boundaries to follow the top of slopes and specific contours. Add small areas, as necessary, to bring the refuge boundaries out to known fences, roads or other geographic feature. Delete small, isolated segments that are not functionally part of the refuge.<br>■ Expand JMAWR (1) to the south/southwest to include the remainder the of wetlands and floodplains southwest of Mulligan Pond and along the south side of Kingman road, and (2) to the north to include the wetlands and bottomlands from Kingman Road north to Telegraph Road.<br>■ Provide a buffer to both refuges to protect against development adjacent to the refuges, in the event training departs, and the training land is developed or excessed. |
| Natural Resources Conservation | ■ Protect and enhance conditions for endangered, threatened, and rare species and their habitats (Section 12).<br>■ Protect and enhance wetlands (Section 8).<br>■ Protect and enhance habitat conditions for anadromous fish species (Section 7).<br>■ Protect and enhance habitat conditions for non-game bird populations (Section 11).<br>■ Conserve riparian forest buffer habitat (Section 7). |

| Table 13.2: Key Management Recommendations from the Comprehensive Management Plan for the Fort Belvoir Refuge Complex | |
|---|---|
| ***Topic*** | ***Management Recommendations*** |
| ***(continued)*** | |
| Educational Opportunities | ■ Ensure that the refuges are a showcase for Fort Belvoir and other partners in environmental education and resource management.<br>■ In collaboration with various partners, provide a wide range of innovative environmental education programs and activities.<br>■ Ensure that the primary objectives of environmental education are to conserve and enhance biological resources, and to motivate citizens to learn the role of management in the maintenance of healthy ecosystems. |
| Facilities Maintenance | ■ Rehabilitate Mulligan Pond, and repair and upgrade the public access facilities at JMAWR.<br>■ Repair and upgrade public access facilities at the ABWR.<br>■ Construct a refuge headquarters and environmental education center at the ABWR. |

Source: Paciulli, Simmons and Associates, Ltd., 1998b

### *13.3.1.2 Forest and Wildlife Corridor*

In 1993, Fort Belvoir prepared *The Forest and Wildlife Corridor Management Plan* (Paciulli, Simmons and Associates, Ltd., 1993). This plan recommended two conservation management initiatives to conserve the habitat value of the corridor, and to protect and enhance wildlife movement: (1) restrict disruptive activities within the corridor, and (2) enhance natural habitat within the corridor. The plan stressed establishing and maintaining woodland habitat diversity, restricting land clearing, limiting public access, reducing edge habitat and providing wildlife habitat enhancement. Key management recommendations from the 1993 corridor management plan are summarized below:

- Reduce fencing within the corridor.
- Add wildlife crossing structures at existing roads (e.g., U.S. Route 1) and in new road designs.
- Use plantings, integrated pest management practices and stormwater management practices to minimize impacts of the North Post Golf Course.
- Use forest management practices (e.g., forest fire protection, insect and disease control, timber stand improvements) to preserve biodiversity and maintain forest health.
- Reforest disturbed areas.
- Avoid large-scale human intrusions that may fragment the corridor.
- Provide awareness training in corridor conservation and management.

In 1999, Fort Belvoir prepared an updated corridor management plan (Paciulli, Simmons and Associates, Ltd., 1999d). The 1999 plan update management recommendations are summarized below:

- Refine the corridor boundary.
- Maintain and enhance existing wildlife crossing structures.
- Identify locations for future wildlife crossing structures, and reforest disturbed and open areas.
- Safeguard the corridor and its function from future encroachment by development.

### 13.3.2 Special Natural Areas Management Actions to Date

Fort Belvoir is a strong proponent for conservation of ecologically significant resources. Fort Belvoir recognizes the existence and importance of such resources within its boundaries, and has used the DoD- and DA-authorized designation of Special Natural Areas to conserve these resources. Fort Belvoir further recognizes the importance of balancing compatible public access to and use of these resources. As directed by the Sikes Act and DoD and DA policy, the installation has managed public access to and use of the installation's Special Natural Areas accordingly.

Fort Belvoir manages the three designated Special Natural Areas in accordance with the resource conservation and multiple use requirements of DoDI 4715.3 and AR 200-3. To date, the key management emphasis for Fort Belvoir's designated Special Natural Areas has been to conserve areas of ecologically significant resources, while (1) providing the public an opportunity to access those resources for environmental education, scientific research and study, and low-intensity outdoor recreation consistent with resources conservation, and (2) allowing for non-disruptive military activities.

The following presents management actions undertaken specifically to address conditions within the Special Natural Areas on Fort Belvoir, as well as actions addressing public access and use, including the installation natural resources education program. Installation-wide natural resources management actions (e.g., aquatic resources management, wetlands management, fish and wildlife management, threatened/endangered species management, native vegetation resources management) are addressed in Sections 7 through 12.

#### *13.3.2.1 Refuges*

***Accotink Bay Wildlife Refuge***

The following key management actions have been undertaken in the ABWR during the past five years:

- Command approval to expand the refuge boundary to include T-10 (to be renamed W-8) to incorporate the whole of the active bald eagle nest protection area into the refuge

- Modified grounds maintenance actions at several locations (e.g., refuge main entrance, "bus turn around area") to restore/enhance native grassland conditions
- Coordinated timber stand improvement actions with wildlife habitat enhancement actions within several planted pine stands
- Used wildlife seed mixes to stabilize disturbed areas (e.g., Fairfax County sewer line replacement project)
- Executed watershed restoration projects for two refuge subwatersheds
- Initiated *Phragmites australis* control actions
- Installed and maintained various wildlife habitat improvement structures throughout the refuge
- Renovated and upgraded the refuge trail system, including trail realignment, bridge repair/replacement, and wildlife viewing structures. Included the new Pohick Loop Trail, which is accessible to persons with disabilities. Performed routine maintenance of trail facilities
- Renovated the refuge main entrance, including parking area repair and stormwater improvements, repair and maintenance of toilet facilities
- Developed and implemented a Refuge Facilities Maintenance Plan, as part of the installation's Real Property Maintenance Contract
- Developed and installed new interpretive displays.

***Jackson Miles Abbott Wetland Refuge***

- Renovated Mulligan Pond, including installation of new water control structure, stabilization of inlet and outlet areas, bank planting, dredging for sediment removal, and fish stocking
- Renovated and upgraded the refuge trail system, including trail realignment, wildlife viewing structure, trail section that is accessible to persons with disabilities, and fishing pier
- Renovated the refuge main entrance, including parking facilities
- Developed and implemented a Refuge Facilities Maintenance Plan, as part of the installation's Real Property Maintenance Contract
- Developed and installed new interpretive displays.

#### *13.3.2.2 Forest and Wildlife Corridor*

Management actions to date have focused on conserving the Forest and Wildlife Corridor as a continuous forested band through Fort Belvoir, and maintaining and enhancing wildlife

movement through the corridor. Corridor management actions that have been accomplished since 1993 include the following:

- Developed and installed two wildlife crossing structures for the Fairfax Parkway, and one for Gunston Road, where these roads cross the corridor
- Emphasized siting of new facilities outside the corridor boundaries
- Minimized land-disturbing activities and tree removal within the corridor
- Relocated the southern portion of the Intelligence and Security Command security fence outside of the corridor
- Reforested the disturbed area between the North Post Golf Course and Kingman Road
- Reforested the open area along the Fairfax County Parkway through the corridor
- Reforested the disturbed area to the south of the Defense Logistics Agency Child Care Complex, between Beulah Road and Backlick Road
- Reforested the disturbed area east of the Beulah Road-Wills Road intersection
- Executed a natural stream channel restoration project to improve conditions at one of the Fairfax County Parkway wildlife crossing structures
- Enforced trespassing and illegal dumping infractions within the corridor
- Responded to a variety of use requests for the corridor land area.

#### *13.3.2.3 Conservation Education and Outreach*

The installation's refuges serve as the foundation of the installation's natural resources education program. Where compatible with resource conservation, the refuges are made available for use as outdoor classrooms for educational programs run by off-post organizations (e.g., field trips by local high school and university classes), as well as for installation-run programs. The ABWR Environmental Education Center provides limited indoor classroom space to support the refuge-based educational programs, and is the central information source for refuge use and resources.

Fort Belvoir has recently expanded its focus to reach out to the broader community outside its gates. As such, the installation's education and outreach program includes participating in and promoting the conservation education and outreach components of such programs as the Chesapeake Bay Program, the PIF Program, and the Virginia Birding Trail Program.

***Education***

The following educational activities have been accomplished through 2000:

- Hosted the 1999 DoD Earth Day Celebration in the JMAWR

- Hosted approximately 15 weekend interpretive programs to the public during the 2000 season (e.g. bird walks, fishing clinics, wildflower walks, etc.)
- Provided Earth Day Program to the Fort Belvoir Elementary School in 1999
- Hosted Earth Day 2000 with approximately 100 children from Fort Belvoir's Youth Services participating in environmental education activities
- Received attendance of approximately 1,540 people at the ABWR Environmental Education Center from July to October 2000
- Supported the Boy Scouts of America summer camp by providing educational activities for 312 scouts
- Supported Youth Services and Defense Logistics Agency summer camps for 60 children in 1999 and 26 children in 2000
- Conducted programs for Metz Junior High School, and Henderson Elementary School in 2000
- Participated in the Partners in Education program with Mount Vernon High School and Woodley Hills Elementary School
- Participated in the Woodley Hills Elementary School Science Day in 2000
- Coordinated native plant demonstration project with Fort Belvoir Girl Scouts and Garden Club.

***Outreach***

The following outreach activities were included as part of the management of the refuges:

- Hosted the 2000 PIF Mid-Atlantic Coastal Plain Bird Conservation Plan Conference with over 70 participants from local, regional, state, and federal natural resources agencies
- Hosted the local VDGIF's Virginia Birding Trail Program informational session
- Supported various environmental events by outside entities (e.g., Fairfax County Arbor Day, Earth Day on the Mall in Washington, D.C.)
- Supported various scouting organization events (e.g. volksmarches, Eagle Scout projects)
- Hosted the 1999 and 2000 National Public Lands Day events, including activities such as renovations of trail facilities on the McCarty and Basin trails
- Held various shoreline clean-up events, including the 2000 Virginia Waterways Shoreline Clean-Up.

#### *13.3.2.4 Special Natural Areas Law Enforcement*

Through its Memorandum of Agreement for Cooperative Law Enforcement between the U.S. Fish and Wildlife Service and the U.S. Army Garrison Fort Belvoir, dated 20 February 1996 (Appendix A), Fort Belvoir has one Special Agent within ENRD. The agreement is to provide mutual law enforcement benefits to the installation and to the Fish and Wildlife Service by sharing expertise, training, intelligence, information, and specialized equipment. The intent of this agreement is to provide the Special Agent with the authority to enforce all laws administered by the U.S. and the installation relating to fish, wildlife, and other natural resources. The agreement delegates authority to the Special Agent to enforce several specific federal laws on Fort Belvoir including the following: Lacey Act Amendments of 1981 (16 U.S.C., 3371-3378), Migratory Bird Treaty Act (16 U.S.C. 703-712), Migratory Bird Hunting and Conservation Stamp Tax Act (16 U.S. C. 718-718h), Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d), Airborne Hunting Act (16 U.S. C. 742J-1), National Wildlife Refuge Systems Administrative Act (16 U.S.C., 668dd-668ee), Endangered Species Act of 1973 (16 U.S.C., 1531-1543), Marine Mammal Protection Act of 1979 (16 U.S.C., 1361-1384, 1401-1407), and Archeological Resources Protection Act of 1979 (16 U.S.C. 470a. (A)-(1) (A)).

## 13.4 CONTINUING AND FUTURE SPECIAL NATURAL AREAS MANAGEMENT

Fort Belvoir intends to maintain and manage the refuges and the Forest and Wildlife Corridor with a primary management emphasis on resource conservation. Fort Belvoir will allow for and promote public access for compatible uses such as environmental education, scientific research and study and low-intensity outdoor recreation, where such access and use is consistent with resource conservation. Fort Belvoir will continue to allow hunting and fishing, consistent with resource conservation objectives. Fort Belvoir will also allow for non-disruptive military activities in these areas, when such activities cannot be supported in the designated training areas, and where consistent with resource conservation objectives. Management of the refuges and corridor will continue to follow the principles of ecosystem management, and will emphasize conservation of the following resources which, as documented in Sections 7 through 12, have been assigned a high conservation priority through federal or state statute or regulation, DoD or DA policy, DoD-partnered programs (e.g., Chesapeake Bay Program, PIF program), through the State Natural Heritage Program, or through recognized importance to regional ecosystem function (e.g. wildlife migratory routes):

- Wetlands (Figure 8.1)
- Riparian forest buffers, and designated riparian resource protection areas (RPAs) (Figure 4.2)
- Recognized significant habitat for the federal-listed threatened / state-listed endangered bald eagle (Figure 12.1)
- Habitat for the state-listed threatened wood turtle (Figure 12.1)

- Habitats for state rare plant species and/or globally rare and state rare animal species (Figure 12.3)
- State rare plant communities (Figure 12.2)
- Habitats for PIF priority bird species (Figure 11.1)
- Waterways that provide passage and spawning habitats for anadromous/migratory fish, including river herring (Figure 11.2)
- Contiguous forest that provides migratory corridor(s) for wildlife (Figure 11.2)
- A rare, intact example of an undisturbed watershed within the Mid-Atlantic region (subwatershed 48) (Figure 7.2).

As addressed in Section 13.2.2 and depicted in Figure 13.1, these ecologically significant areas are not completely contained within the boundaries of the installation refuges or corridor. As addressed in Section 13.3, DCR-NHP recommended additional conservation measures to encompass these areas. Consequently, Fort Belvoir recognizes the need for additional management actions to protect these resource areas. Appropriate management actions may be to expand the refuge and/or corridor boundaries to encompass specific resource areas, or to establish buffer areas in association with the refuges and/or corridor. Or, it may be to define area-specific land-use designations that would be consistent with conservation of these resource areas. Fort Belvoir recognizes that development of a management strategy that would both serve mission needs and provide for appropriate conservation of these resource areas will be a complex action. It appears that the first step should be to re-consider the present boundaries of the refuges and corridor to ensure that the designated areas encompass the most critical of the resource areas. Figure 13.1 presents a composite of the locations of all of the ecologically significant resources on Fort Belvoir. It clearly indicates those land areas having the greatest concentration of resources that would most be appropriate to add to the refuges and corridor.

### 13.4.1 Special Natural Areas Management Objectives

1. Protect against impacts to natural resources that have been assigned high conservation priority:

    a. Wetlands (Figure 8.1)

    b. Riparian forest buffers, and designated riparian resource protection areas (RPAs) (Figure 4.2)

    c. Recognized significant habitat for the federal-listed threatened / state-listed endangered bald eagle (Figure 12.1)

    d. Habitat for the state-listed threatened wood turtle (Figure 12.1)

    e. Habitats for state rare plant species and/or globally rare and state rare animal species (Figure 12.3)

f. State rare plant communities (Figure 12.2)

g. Habitats for PIF priority bird species (Figure 11.1)

h. Waterways that provide passage and spawning habitats for anadromous/migratory fish, including river herring (Figure 11.2)

i. Contiguous forest that provides migratory corridor(s) for wildlife (Figure 11.2)

j. A rare, intact example of an undisturbed watershed within the Mid-Atlantic region (subwatershed 48) (Figure 7.2)

2. Provide opportunities for environmental education, scientific research and study, and low-intensity outdoor recreation, consistent with resource conservation.

3. Support military training and testing consistent with resource conservation.

### 13.4.2 Special Natural Areas Management Strategies

1. Maintain designated set-aside areas for ecologically significant resources, consistent with DoD policy for setting aside areas for conservation. Such areas include the two installation refuges and the Forest and Wildlife Corridor. Continue to designate these set-aside areas as "environmentally constrained to development" in the installation Master Plan.

2. Continue to obtain scientific information on refuge and corridor resources to support our knowledge of their biodiveristy, to identify stresses and detect changes to biodiversity, and to evaluate the effectiveness of management actions. Continue to incorporate the refuges and corridor into the installation-wide survey and monitoring programs (e.g., rare species surveys [Section 12.2], bald eagle monitoring [Section 12.2], aquatic monitoring [Section 7.2.2], etc.). Develop and implement studies and surveys as needed to address management issues specific to the refuges and/or corridor. These include:

   - User surveys of the refuges

   - Wildlife movement through the corridor, including wildlife use of the crossing structures (Section 11.2).

3. Review the existing boundaries for the two installation refuges, and consider expanding the boundaries or establishing buffers to protect ecologically significant resources that are inside the refuges as well as ecologically significant resources that are outside the refuge boundaries. This was recommended by the Natural Heritage Program (Section 12) (Hobson, 1996) and by the *Comprehensive Management Plan for the Fort Belvoir Refuge Complex* (Paciulli, Simmons and Associates, Ltd., 1998b).

4. Continue to control access to and use of the refuges and corridor.

   - Continue to limit refuge use to environmental education, scientific research and study, and low-intensity outdoor recreation and military testing and training, consistent with

resource conservation. Continue to prohibit land disturbing activities, and other activities and events that may conflict with resource conservation.

- Continue to limit corridor use to scientific research and study, and low-intensity outdoor recreation and military testing and training, consistent with resource conservation. Continue to prohibit land-disturbing activities, and other activities and events that may conflict with resource conservation.

- Continue to require coordination of refuge and corridor access and use requests through ENRD.

- Continue to monitor refuge and Corridor use, and evaluate effect on resource conservation. Considering altering use policy, if necessary, to protect resources.

- Develop and issue a Refuge Use and Fact Sheet.

5. Continue to prioritize the refuges and corridor during resource management projects (e.g., invasive/exotic species control, watershed restoration, problem wildlife control, vegetation restoration and enhancement, etc.)

6. Maintain the installation's refuge complex as the foundation for the natural and cultural resources education program.

   - Develop, maintain, and staff an Environmental Education Center.

   - Develop and maintain environmental education materials, such as displays, handouts, and curricula.

   - Continue Partner in Education relationship with local schools.

   - Investigate partnering, or entering into Memoranda of Agreement with Universities or other educational institutions to support educational programs at the refuge.

   - Conduct educational events in/associated with the refuge. Support appropriate events conducted by outside organizations.

   - Develop and maintain interpretive displays along the refuge trail system.

7. Continue routine maintenance of refuge trail system and associated public access facilities.

8. Establish and manage a Qualified Volunteer Program for the refuges, to provide support in facilities maintenance and in educational programs.

9. Continue to preserve and enhance wildlife habitat and the wildlife migratory function within the corridor by maintaining a contiguous forest cover.

- Continue to prohibit land-clearing and development within the corridor.[3]

- Add wildlife crossing structures where needed. Perform routine maintenance, and repair and modify existing structures as needed.

- Continue to limit public assess to the corridor.

- Consider expanding the corridor boundary, or designating a buffer, to protect corridor resources, as recommended by the updated corridor management plan (Paciulli, Simmons and Associates, Ltd., 1999d). Expansion should include designation of a corridor boundary up Accotink Creek to Telegraph Road. Wildlife monitoring has demonstrated significant wildlife migration along the Accotink Creek stream valley. Such an expansion would incorporate the whole of the Accotink Creek riparian area into the installation corridor and refuges, consistent with the Chesapeake Bay Riparian Forest Protection Initiative.

10. Continue to provide technical assistance for emergency situations, such as fuel spills or uncontrolled fires that threaten special natural area resources, as needed.

11. Continue to respond to requests for technical information from on-post and off-post entities, as appropriate.

12. Continue to investigate and enforce violations of federal and state laws and regulations, as well as DoD, DA, and Fort Belvoir policies.

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[3] Some clearing and development will be unavoidable, such as utility line installation and maintenance, and roadway widening.

# 14.0
# Implementation

## 14.1 NATURAL RESOURCES PROJECTS

The Natural Resources projects in this Integrated Natural Resources Management Plan (INRMP) can be categorized into the following three work types:

- Compliance
- Stewardship
- Service

Each of these three work categories includes schedule-driven projects (Natural Resources Branch [NRB]-defined actions, such as biological studies and watershed improvement projects) and event-driven projects (response actions, such as technical response and support to spills or wildfires, or to customers on pest management or problem wildlife incidents). They include short-term actions such as providing technical input to siting a new facility, as well as long-term actions, such as monitoring the success of a wetland mitigation project.

***Compliance projects*** encompass all of the actions necessary to ensure that the installation is in compliance with applicable federal, state, regional and local natural resources statutes and regulations. These projects include routine compliance actions; such as annual reports on Virginia Department of Game and Inland Fisheries wildlife salvage and display permits, and annual bald eagle surveys; as well as project-specific compliance actions, such as a Joint Permit Application for a specific construction project. Compliance projects encompass coordination with regulatory authorities; such as development and negotiation of permit applications; as well as associated support actions, such as field surveys to identify baseline conditions, and monitoring programs to assess the success of impact mitigation measures.

The compliance projects presented in this INRMP were identified from existing and established compliance actions as well as from projections of future requirements. Some of the compliance projects are known and quantifiable (e.g., monitoring of wildlife movement through the wildlife crossing structures within the Forest and Wildlife Corridor, which was established as a National Environmental Policy Act mitigation action in the Base Realignment and Closure Environmental Impact Statement). Others, such as developing, negotiating, and implementing Clean Water Act permits, or performing Section 7 consultation under the Endangered Species Act for future construction projects, are not readily quantifiable. For instance, the number or complexity of construction projects, as well as the regulatory agency climate, may be different in 5 years and therefore impossible to predict today.

***Stewardship projects*** are actions identified and undertaken to promote the conservation goals expressed in Department of Defense (DoD) and Department of the Army (DA) policies, and in DoD and DA partnership programs, such as the Chesapeake Bay Program. Stewardship projects

encompass such actions as resource conservation, technology demonstration, and outreach. These types of projects are typically identified and planned by the NRB, although there are occasions where Fort Belvoir will be requested by higher headquarters (e.g., Major Army Command or DA level), or by outside organizations (e.g., Fairfax County) to implement or participate in a stewardship project. Such projects may include streamside planting for regional riparian reforestation goals, wetland creation for Chesapeake Bay Program goals, or participation in the Partners in Education program. Stewardship projects are the actions that truly establish the installation's position as a leader in natural resources conservation. Given Fort Belvoir's location within the metropolitan Washington D.C. area, there is significant opportunity for the installation to participate in, and benefit from, high-priority and high-visibility stewardship projects.

The stewardship projects presented in this INRMP were identified based upon established and projected conditions and opportunities. These types of projects are more easily projected than compliance projects. Stewardship projects identified in this INRMP include constructing low impact development (LID) demonstration projects, performing various habitat enhancement projects, reforesting riparian areas, hosting natural resources conferences and training events, and participating in regional public outreach programs such as the Virginia Coastal Birding Trail. While this INRMP identifies stewardship projects reasonably anticipated at this time, it is possible for new stewardship opportunities to arise at any time (e.g., new state initiatives, new DoD-funded conservation programs).

***Service projects*** consist of actions undertaken to enhance the quality of life for the military community, support military training and testing activities, and support tenant operations at Fort Belvoir. While some service projects (e.g., the Fort Belvoir environmental education and environmental volunteer coordination programs) are NRB-defined actions, most of the service projects undertaken by NRB are response-driven actions. Examples include responding to customer requests for solving problems with pest management; wildlife control; or grounds maintenance; or responding to customer requests for recreational and educational events or volunteer service. These types of projects also include responding to events and requests for actions that arise from outside the installation boundary. Examples of these types of projects include responding to the appearance of West Nile Virus in the Washington D.C. metropolitan area and responding to Fairfax County's request for installation participation in a regional raccoon rabies vaccination program. Although service projects tend not to have much advance warning, they typically require immediate and sustained response.

Service projects are the least quantifiable projects within the natural resources management program. This INRMP identifies specific recurring service projects, such as goose hazard management at the airfield, hunting program support, environmental education program management, and the environmental volunteer coordination program. It also identifies potential broad types of services that can be expected to be required from the natural resources program into the future. These services include technical responses to spills and wildfires; response to customers regarding pest management, wildlife and grounds maintenance problems; response to customers requesting access to natural resources for recreational or educational purposes; and responses to on-post and off-post entities requesting information on installation natural resources and their management. This INRMP cannot predict or quantify the exact number or complexity of service projects required of the natural resources management program for the next five years. The unforeseen arrival of West Nile Virus is an example of the type of unpredictable events that

place urgent demands for unprogrammed service on NRB staff. There are likely to be additional service projects arising over the next 5 years that have not been identified in this INRMP.

Figure 14.1 presents a summary of the projects from this INRMP, excluding program management functions. The figure indicates whether the projects are compliance, stewardship or service. It should be noted that the projects presented in this INRMP, and summarized in Figure 14.1, represent a continuation of the projects that are in place or in planning as of 2000. In other words, implementation of these projects does not represent a departure from, nor an expansion of, the natural resources program as it exists in 2000. At the end of this section there is a summary of individual projects listed by fiscal year (Tables 14.3 through 14.9). Neither Figure 14.1 nor Tables 14.3 through 14.9 include natural resource program management actions.

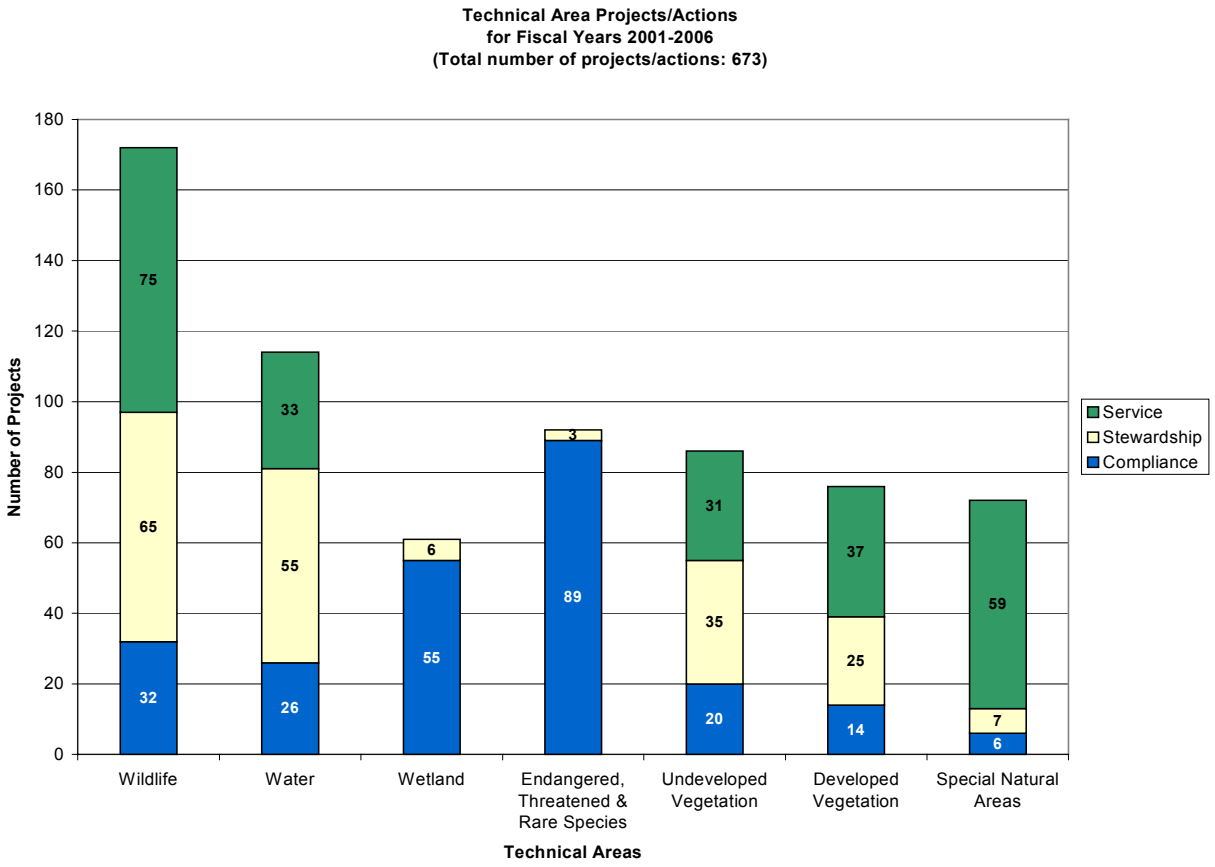


**Figure 14.1: Natural Resource Projects**

## 14.2 NATURAL RESOURCES PROGRAM MANAGEMENT ORGANIZATION AND STAFFING

Responsibility for development and control of the Fort Belvoir natural resources management program is with the NRB of the Environmental and Natural Resources Division (ENRD) of the Directorate of Installation Support (DIS). NRB has the responsibility for most but not all of the facets of program implementation; the exception is facilities management. The Contract Management Division (CMD) of DIS has the responsibility for the installation's operations and maintenance program, and facilities construction program, both of which are contracted out. This means that all base operations (BASEOPS) grounds maintenance, landscaping, pest management and stormwater management projects are executed by contractors controlled by CMD.

As of 2000, execution of natural resources projects is accomplished through contractors or funded government agencies, with the program management components of the projects (e.g., contract management, agency negotiation) being performed by government staff. It is intended to continue this project execution strategy. Continuation of this project execution strategy does not represent a departure from the natural resources program as it exists in 2000.

In 2000, NRB had four government staff positions. These positions provide for a core of professionally trained and experienced natural resource managers, as required under the Sikes Act. Government staff in the four natural resources specialist positions are program managers, responsible for controlling the development and implementation of the natural resources management program. Within their technical areas, the government staff are responsible for developing and overseeing execution of natural resource policy; developing and controlling short- and long-term program execution strategies (including budgets and work plans); developing, selecting, and controlling contracts and contractors; negotiating with regulatory agencies; representing the installation to outside entities; and making decisions on natural resource access, use, and disposal actions. Table 14.1 presents the technical areas managed by NRB staff.

**Table 14.1: Natural Resource Branch Technical Areas**

| *Natural Resource Branch Chief* | *Natural Resource Specialist* | *Natural Resource Specialist* | *Natural Resource Specialist* |
|---|---|---|---|
| General program oversight all NR programs | Forestry | Watersheds | Refuges |
| Wetlands | Ground maintenance | Stormwater | Environmental education program |
| Endangered, threatened and rare species | Pest management | Wildlife | Environmental volunteer program |
| Aquatic resources | Landscaping | Forest & Wildlife Corridor | Environmental training and outreach |

*Program Management* functions consist of actions essential to implementing the natural resources program in each technical area. Program management involves:

- Establishing program policies, goals and objectives to assure installation compliance with all applicable regulatory, stewardship, and service requirements
- Developing and executing strategies for planning, organizing, and staffing program work (e.g., the Program Objective Memorandum [POM] and the Annual Work Plan)
- Developing and executing strategies for controlling the execution of program work (e.g., contract management, staff supervision, schedule, and resource management)
- Developing and executing strategies for integrating the natural resources program with on-post and off-post organizations and activities
- Developing and executing strategies for determining the success of the program at accomplishing the program goals and determining the need for program changes

Table 14.2 presents a summary of the natural resources program management functions necessary to execute projects in each technical area.

**Table 14.2: Program Management Functions**

| *Goal Setting* | *Planning* | *Organizing* | *Staffing* | *Controlling* | *Leading* |
|---|---|---|---|---|---|
| Determine the policies, goals, objectives, and strategies for the natural resources program. | Perform long-term and short-term planning. | | | | |
| | Determine what is to be included in the POM. | Determine and establish coordination actions within NRB as well as among all installation and off-post entities that interface with the natural resource program. | Determine how projects are to be staffed (by contractor, government staff, other agency, partner organization, volunteer, etc.) | Perform regular coordination among NRB staff and contractor staff (e.g., weekly staff meetings, monthly contractor in-progress review meetings). | Take charge and initiate actions. Direct the activities of individuals and groups toward the accomplishment of the natural resources goals and objectives. |

| Table 14.2: Program Management Functions | | | | | |
|---|---|---|---|---|---|
| ***Goal Setting*** | ***Planning*** | ***Organizing*** | ***Staffing*** | ***Controlling*** | ***Leading*** |
| | | | ***(continued)*** | | |
| | Determine what is to be included in the Annual Work Plan. | Determine and allocate authority among all proponents and implementers of the natural resource program. | Perform contract acquisition, contract management, and contract control actions. Develop Memoranda of Understanding (MOUs), Memoranda of Agreement (MOAs), and Cooperative Agreements (CAs) for partnering efforts with other agencies and organizations. Execute and control funding and actions performed under MOUs, MOAs, and CAs. | Perform regular coordination among DIS organizations (e.g., contracts management, engineering, facilities planning, and financial management). | Create an environment in which subordinates and others are rewarded for accomplishment of group and individual goals. |
| | | Determine and use the process and metrics for measuring success of the program organization. | Perform government staff management actions (e.g., employee appraisals). | Perform regular coordination among BASEOPS organizations (e.g., Environmental Quality Control Committee [EQCC] meetings). | Clearly assign responsibilities and tasks to others and establish effective controls, ensuring that employees have the necessary resources and authority. |
| | | Determine and direct participation in regional and national level studies and resource management initiatives (e.g., Chesapeake Bay Program, Partners in Flight Program, Partners in Education Program, Fairfax County Deer Management Program). | Respond to unplanned events. Re-allocate resources, re-prioritize work, re-direct staff, re-direct contractors, etc. | Perform regular coordination among agencies and outside individuals and entities involved in natural resource study and management (e.g., regional natural resources coordination committee). | Evaluate employees, providing performance feedback and facilitating professional growth. |

| Table 14.2: Program Management Functions | | | | | |
|---|---|---|---|---|---|
| ***Goal Setting*** | ***Planning*** | ***Organizing*** | ***Staffing*** | ***Controlling*** | ***Leading*** |
| | | | ***(continued)*** | | |
| | | | Determine and use the process for measuring the success of the program staffing. | Perform project-specific negotiations with agencies. | Perform volunteer coordination with individuals and outside entities to participate in natural resources programs. |
| | | Integrate policy into installation actions through installation regulations and policies (e.g., the Fort Belvoir Supplement to AR 200-3; the Fort Belvoir Training Regulation; resource-specific Policy Letters, such as Tree Protection Policy Letter, Integrated Pest Management Policy Letter, Refuge Use and Management Policy Letter). | | Determine and use process and metrics for assessing program success. | Determine and direct participation in educational and outreach events (e.g., Earth Day events, technical conferences). |
| | | Integrate policy into installation actions through installation plans (e.g., Real Property Master Plan). | | Coordinate with natural resources agencies regarding stewardship recommendations. Determine and direct stewardship actions (e.g., for water resources, wetlands, native vegetation re-sources, fish and wildlife, endangered and threatened species) appropriate to installation mission and resources. | |

| Table 14.2: Program Management Functions | | | | | |
|---|---|---|---|---|---|
| ***Goal Setting*** | ***Planning*** | ***Organizing*** | ***Staffing*** | ***Controlling*** | ***Leading*** |
| | | | ***(continued)*** | | |
| | | Integrate policy into installation actions through installation control documents (e.g., Fort Belvoir demolition permit, Fort Belvoir excavation permit, Fort Belvoir standard construction specifications for Environmental Protection). | | Determine and delineate specific installation areas for conservation of significant natural resources (e.g., riparian buffers, refuges, wildlife corridor). Determine and direct conservation requirements and actions for those areas. | |
| | | Integrate policy into installation actions through installation coordination committees (e.g., EQCC, DIS facilities maintenance committee). | | Determine and direct resource conservation actions to be undertaken (e.g., reforesting riparian areas, controlling invasive/exotic species, enhancing native habitats for wildlife, correcting stormwater management problems). | |
| | | Determine and direct resource protection to be incorporated into installation activities (e.g., incorporate best management practices [BMPs] and principles of LID on construction projects). | | Review and respond to requests for service from on-post entities. | |
| | | | | Review and respond to requests for support from outside entities. | |
| | | | | Review and respond to requests for access to and use of natural resources on-post. | |

| Table 14.2: Program Management Functions | | | | | |
|---|---|---|---|---|---|
| ***Goal Setting*** | ***Planning*** | ***Organizing*** | ***Staffing*** | ***Controlling*** | ***Leading*** |
| ***(continued)*** | | | | | |
| | | | | Negotiate compliance actions with regulatory agencies (e.g., formal Section 7 consultation under Endangered Species Act). | |
| | | | | Represent the installation to outside agencies and the public (e.g., speak at public hearings, such as Section 404 permit hearings). | |
| | | | | Determine natural resources disposal actions (e.g., timber sales). | |

In 2000, ENRD had one government staff position for Special Agent. The Special Agent is responsible for investigating and enforcing natural resources compliance actions.

The four natural resources specialists are supported by various contract personnel. The natural resources specialists determine the need for contract support; determine the contract vehicle to be used; and develop, implement, and control the contracts. Contract personnel are accessed through various contract vehicles: U.S. Army Corps of Engineers indefinite delivery, indefinite quantity (IDIQ) contracts; the Oak Ridge Institute for Science and Education (ORISE) program; the Colorado State University contract; and the General Services Administration schedule; as well as through other government organizations. These organizations include the U.S. Army Corps of Engineers Waterways Experiment Station; and the Virginia Department of Conservation and Recreation, Division of Natural Heritage. NRB maintains one IDIQ contract for natural resources support and accesses other Corps' IDIQ contracts, as needed.

Contract personnel provide technical support to the development and implementation of the natural resources program. Such support includes conducting research and studies, preparing management plans and other documents, performing data management and analysis, and developing management recommendations. Specific program implementation actions performed by contract personnel include: wildlife field surveys; habitat enhancements; environmental education program development and coordination; Geographic Information System (GIS) datalayer development; goose hazard control; deer management; volunteer program coordination; problem wildlife management; and technical support to pest management, grounds maintenance and landscaping. In 2000, NRB staff was supported by nine contract personnel working on-site, and 30 additional contract personnel working off-site. (The need for three

additional on-site contractors, two for environmental education programs and one for stormwater management and erosion control was identified, but not funded.)

In 2000, the Real Property Maintenance Activities (RPMA) Contract had approximately 50 staff positions (prime and subcontractor) assigned to executing natural resources operations and maintenance (O&M) work (e.g., lawn mowing and pesticide application), and the Requirements Contracts had approximately 10 to 20 staff assigned to natural resources projects at any one time. Although these contracts are controlled by CMD, NRB staff has significant responsibility for technical oversight and coordination of these contractors' work. NRB provides policy and technical guidance and oversight to CMD to assure that the installation's facilities construction and maintenance operations are consistent with installation natural resources conservation policies and programs. NRB is a key participant in the development and source-selection of the RPMA Contract. NRB uses the RPMA contract to perform grounds maintenance, pest management, refuge facilities maintenance actions, and some habitat enhancement projects. NRB uses the Requirements Contracts to execute various construction projects such as the watershed improvement projects.

Implementation of this INRMP calls for maintaining the current NRB organization of a core of technical program managers supported by contractors: a core staff of four government staff positions, with on-site contractor support of approximately 10 personnel. The 10 contract support personnel are needed in the following quantities and disciplines: three wildlife technicians, one forestry technician, one pest management specialist, one stormwater management and erosion control specialist, one GIS specialist, and three education and outreach specialists. Off-site technical contractor support requirements will vary, depending upon project schedules. To accommodate changing program needs, and to provide maximum flexibility, NRB will continue to hold an IDIQ contract for natural resources support. NRB staff will continue to serve as Contracting Officer Representatives on this and other contracts (e.g., other Corps of Engineers IDIQ contracts).

In addition to managing contracts and executing planned projects for their technical areas, the NRB staff must also have the ability to respond to customer service and emergency response/corrective actions. Customer service and emergency response/corrective actions vary widely but they typically all have several things in common when responding: (1) they require an immediate response and (2) they require continued commitment through completion. In general, customer service and emergency response/corrective actions cannot be ignored, deferred, or partially completed. Often, they have Command-level interest. More than 70 % of NRB government staff time is spent supporting customer service and emergency response/corrective actions. While NRB staff has developed a program of planned actions, the reality of the Fort Belvoir natural resources program is that the NRB staff operates within a response environment.

## 14.3 NATURAL RESOURCE FUNDING

The primary source of funding for the natural resources program is the O&M, Army environmental fund account. The O&M, Army non-environmental fund account provides funding for O&M actions, including routine grounds maintenance, tree planting, landscaping, pest management, stormwater management, facilities maintenance, etc. Alternative funding sources, such as the DoD Legacy Program, provide limited funds for specific resource

conservation projects (e.g., riparian corridor plantings) through a competitive application process. Funds for major construction projects, such as the Potomac Heritage National Scenic Trail, or a new environmental education center, must be obtained through the Military Construction Army program.

The first step in planning for long-term natural resources requirements is done as part of the annual input into the Army's POM process. Natural resource projects are identified for 7 years beyond the current year and budget years. Projects identified during POM are refined through the Army Budget Cycle and the Office of the Secretary of Defense/Office of Management and Budget process. The POM, known locally as the Environmental Program Requirements, must identify the long-term projects from this INRMP.

Figure 14.2 represents natural resources program funding from FY-90 through FY-07. This figure excludes government staff salaries, travel and training. During the period FY-90 through FY-93, there were very few natural resources management actions/projects at Fort Belvoir. Management emphasis was focused mostly on wildlife and endangered species. The period FY-94 through FY-97 was the beginning of planning level surveys to support INRMP development. Surveys undertaken during that time include various wildlife surveys, wetland surveys, and endangered species surveys. Habitat enhancements were mostly limited to forest and wildlife corridor projects.

The period FY-98 through FY-01 was the completion of the INRMP planning level surveys (e.g., aquatic resources, watersheds, etc.). Resource management requirements were identified, and specific management plans (e.g., Bald Eagle Management Plan, Stream Corridor Protection Plan, Grassland Management Plan, Invasive/Exotic Vegetation Management Plan, Refuge Management Plan) were developed during this time. Additional services (e.g., goose hazard management, pest management, environmental education, watershed restoration) were added to the installation's natural resources management program.

During the period FY-02 through FY-07, the natural resources management program plans to continue services provided in previous years (as appropriate) and implement the actions/projects addressed by this INRMP and its supporting sub-plans (e.g., Bald Eagle Management Plan). Such actions include correcting existing stormwater problems, implementing wildlife habitat enhancement and restoration projects and constructing new educational and public access facilities in the refuges.

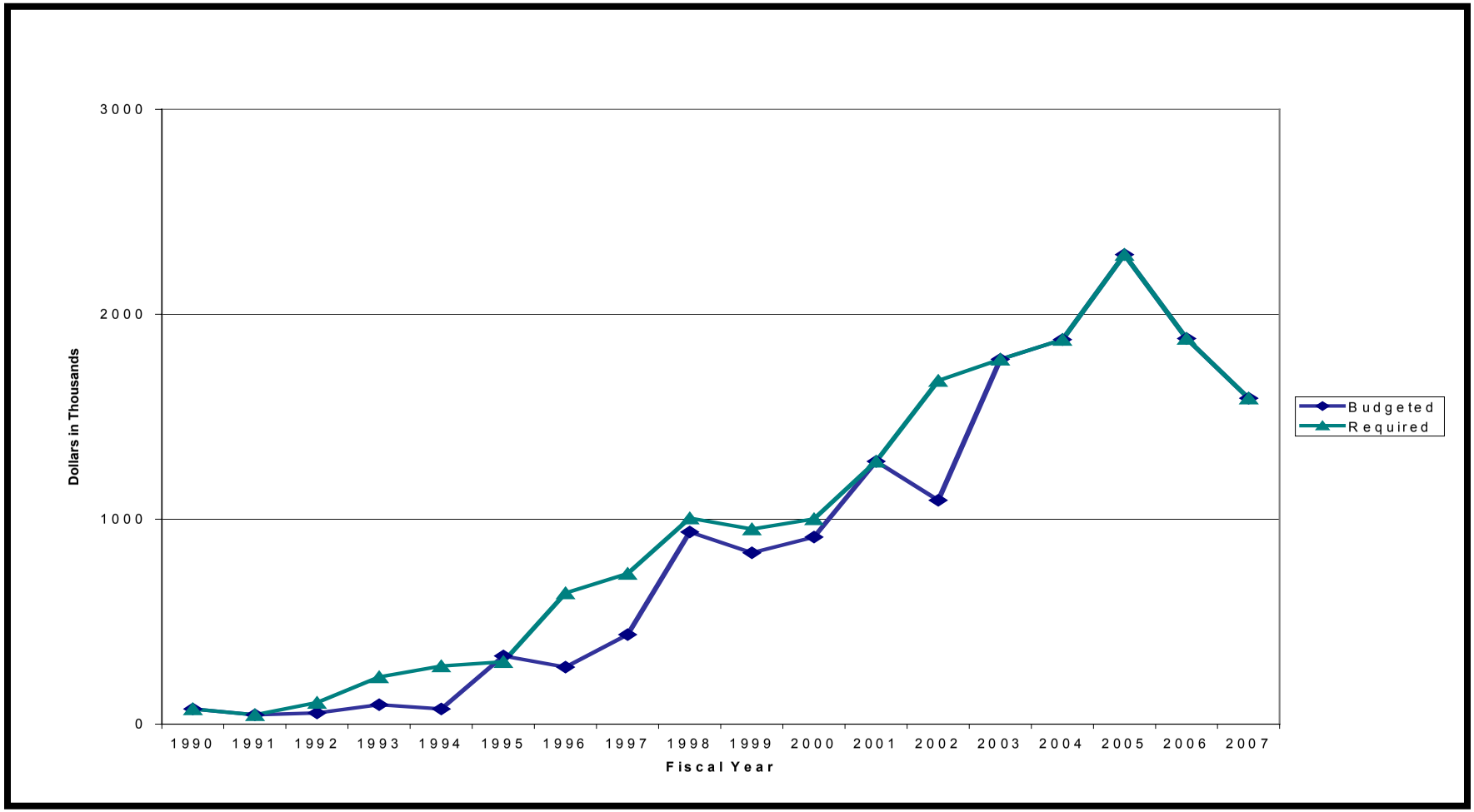


**Figure 14.2: Natural Resources Program Funding**

Tables 14.3 through 14.9 provide a summary of individual projects listed by fiscal year.

| Table 14.3: Water Resources Technical Area Project Summary | | | | | |
|---|---|---|---|---|---|
| ***FY-01*** | ***FY-02*** | ***FY-03*** | ***FY-04*** | ***FY-05*** | ***FY-06*** |
| In-stream aquatic monitoring | In-stream aquatic monitoring | In-stream aquatic monitoring | In-stream aquatic monitoring | In-stream aquatic monitoring | In-stream aquatic monitoring |
| Aquatic system surveillance | Aquatic system surveillance | Aquatic system surveillance | Aquatic system surveillance | Aquatic system surveillance | Aquatic system surveillance |
| Localized/issue/ project specific water resource studies/ monitoring | Localized/issue/ project specific water resource studies/monitoring | Localized/issue/ project specific water resource studies/ monitoring | Localized/issue/ project specific water resource studies/monitoring | Localized/issue/ project specific water resource studies/ monitoring | Localized/issue/ project specific water resource studies/ monitoring |
| Watershed monitoring | Watershed monitoring | Watershed monitoring | Watershed monitoring | Watershed monitoring | Watershed monitoring |
| Replant riparian buffers | Replant riparian buffers | Replant riparian buffers | Replant riparian buffers | Replant riparian buffers | Replant riparian buffers |
| Continue to correct stormwater related problems | Continue to correct stormwater related problems | Continue to correct stormwater related problems | Continue to correct stormwater related problems | Continue to correct stormwater related problems | Continue to correct stormwater related problems |
| Continue to make watershed improvements | Continue to make watershed improvements | Continue to make watershed improvements | Continue to make watershed improvements | Continue to make watershed improvements | Continue to make watershed improvements |
| Water resources training | Water resources training | Water resources training | Water resources training | Water resources training | Water resources training |
| Provide technical assistance to emergency situations that threaten aquatic resources | Provide technical assistance to emergency situations that threaten aquatic resources | Provide technical assistance to emergency situations that threaten aquatic resources | Provide technical assistance to emergency situations that threaten aquatic resources | Provide technical assistance to emergency situations that threaten aquatic resources | Provide technical assistance to emergency situations that threaten aquatic resources |
| Continue to maintain GIS datalayers for water resources | Continue to maintain GIS datalayers for water resources | Continue to maintain GIS datalayers for water resources | Continue to maintain GIS datalayers for water resources | Continue to maintain GIS datalayers for water resources | Continue to maintain GIS datalayers for water resources |
| Continue to enforce violations of water resource regulations | Continue to enforce violations of water resource regulations | Continue to enforce violations of water resource regulations | Continue to enforce violations of water resource regulations | Continue to enforce violations of water resource regulations | Continue to enforce violations of water resource regulations |
| | Mulligan Pond fish monitoring plan | Fish monitoring Mulligan Pond | Fish monitoring Mulligan Pond | Fish monitoring Mulligan Pond | Fish monitoring Mulligan Pond |
| Installation wide aquatic inventory | | | | | Installation wide aquatic inventory |
| | | Installation wide watershed inventory | | | |
| Installation wide flood-plain identification | | | | | |

| Table 14.3: Water Resources Technical Area Project Summary | | | | | |
|---|---|---|---|---|---|
| ***FY-01*** | ***FY-02*** | ***FY-03*** | ***FY-04*** | ***FY-05*** | ***FY-06*** |
| ***(continued)*** | | | | | |
| Installation wide RPA identification | | | | | |
| | Complete GIS hydrography datalayer | | Complete historic waterways/shoreline delineation and trend analysis | | |
| | Complete analysis of conservation area boundary and buffers | | | | |
| | Complete riparian buffer area delineation | | | | |
| | | Complete review of Master Plan for water resources protection | | | |
| | Complete Tompkins Basin shoreline access design | | | | |
| | | | Develop and install shoreline protection signs | Maintain signage | Maintain signage |
| | Develop a routine drainage-way monitoring & maintenance program | Continue routine maintenance program | Continue routine maintenance program | Continue routine maintenance program | Continue routine maintenance program |
| | | | Develop and install educational displays along shoreline | Maintain displays | Maintain displays |
| Review and revise Environmental Checklist to include water resources protection | | | | | |
| | | Develop recommendations to revise Installation Design Guide and Master Plan to incorporate water resources protection | | | |

| Table 14.3: Water Resources Technical Area Project Summary | | | | | |
|---|---|---|---|---|---|
| ***FY-01*** | ***FY-02*** | ***FY-03*** | ***FY-04*** | ***FY-05*** | ***FY-06*** |
| ***(continued)*** | | | | | |
| | Establish facilities siting/design review committee to ensure consideration of water resources protection | Continue facilities siting/design review committee | Continue facilities siting/design review committee | Continue facilities siting/ design review committee | Continue facilities siting/ design review committee |
| | Review and revise training regulation to include water resources protection | | | | |
| | Develop Stormwater Management Policy Letter | | | | |
| | | | Develop & implement fish habitat improvements at Mulligan Pond | | |
| | | Develop & implement beaver guards on vegetation at Mulligan Pond | Develop & implement beaver guards on vegetation at Mulligan Pond | Develop & implement beaver guards on vegetation at Mulligan Pond | |
| Initiate coordination with Fairfax County on Stormwater Planning & Stream Protection Programs | Continue coordination with Fairfax County on Stormwater Planning & Stream Protection Programs | Continue coordination with Fairfax County on Stormwater Planning & Stream Protection Programs | Continue coordination with Fairfax County on Stormwater Planning & Stream Protection Programs | Continue coordination with Fairfax County on Stormwater Planning & Stream Protection Programs | Continue coordination with Fairfax County on Stormwater Planning & Stream Protection Programs |
| | | Complete evaluation of opportunities for special needs fishing | | | |
| | | | Develop Watershed Protection Plan | | |

| Table 14.4: Wetland Resources Technical Area Project Summary | | | | | |
|---|---|---|---|---|---|
| ***FY-01*** | ***FY-02*** | ***FY-03*** | ***FY-04*** | ***FY-05*** | ***FY-06*** |
| Wetland Surveillance | Wetland Surveillance | Wetland Surveillance | Wetland Surveillance | Wetland Surveillance | Wetland Surveillance |
| Localized/issue/ project specific wetland studies/ monitoring | Localized/issue/ project specific wetland studies/ monitoring | Localized/issue/ project specific wetland studies/ monitoring | Localized/issue/ project specific wetland studies/ monitoring | Localized/issue/ project specific wetland studies/ monitoring | Localized/issue/ project specific wetland studies/ monitoring |
| Control wildlife impacts to wetlands | Control wildlife impacts to wetlands | Control wildlife impacts to wetlands | Control wildlife impacts to wetlands | Control wildlife impacts to wetlands | Control wildlife impacts to wetlands |
| Provide technical assistance to emergency situations that threaten wetlands | Provide technical assistance to emergency situations that threaten wetlands | Provide technical assistance to emergency situations that threaten wetlands | Provide technical assistance to emergency situations that threaten wetlands | Provide technical assistance to emergency situations that threaten wetlands | Provide technical assistance to emergency situations that threaten wetlands |
| Continue to maintain GIS wetland datalayer | Continue to maintain GIS wetland datalayer | Continue to maintain GIS wetland datalayer | Continue to maintain GIS wetland datalayer | Continue to maintain GIS wetland datalayer | Continue to maintain GIS wetland datalayer |
| Continue to investigate/ enforce violations of wetland regulations | Continue to investigate/ enforce violations of wetland regulations | Continue to investigate/ enforce violations of wetland regulations | Continue to investigate/ enforce violations of wetland regulations | Continue to investigate/ enforce violations of wetland regulations | Continue to investigate/ enforce violations of wetland regulations |
| Develop wetland protection policy letter | Continue to issue wetland protection policy letter | Continue to issue wetland protection policy letter | Continue to issue wetland protection policy letter | Continue to issue wetland protection policy letter | Continue to issue wetland protection policy letter |
| | | Complete Installation Wide Inventory | | | |
| | Develop & implement monitoring program for high-rarity wetlands | Continue monitoring program for high-rarity wetlands | Continue monitoring program for high-rarity wetlands | Continue monitoring program for high-rarity wetlands | Continue monitoring program for high-rarity wetlands |
| | Perform historic wetlands identification & trend analysis | | | | |
| | | | Identify opportunities for wetland creation & enhancement | Identify opportunities for wetland creation & enhancement | |
| | Review & revise Installation Design Guide concerning wetland protection | | | | |

| Table 14.4: Wetland Resources Technical Area Project Summary | | | | | |
|---|---|---|---|---|---|
| ***FY-01*** | ***FY-02*** | ***FY-03*** | ***FY-04*** | ***FY-05*** | ***FY-06*** |
| ***(continued)*** | | | | | |
| Review/revise Environmental Checklist to include wetland protection | | | | | |
| | Establish facilities siting/design review committee to ensure consideration of wetland protection | Continue coordination of facilities siting/ design review committee to ensure consideration of wetland protection | Continue coordination of facilities siting/ design review committee to ensure consideration of wetland protection | Continue coordination of facilities siting/ design review committee to ensure consideration of wetland protection | Continue coordination of facilities siting/ design review committee to ensure consideration of wetland protection |
| | Review/revise training regulation to include wetland protection | | | | |
| 99th Reserve Wetland Mitigation | 99th Reserve Wetland Mitigation | | | | |

| Table 14.5: Undeveloped Areas Vegetation Technical Area Project Summary | | | | | |
|---|---|---|---|---|---|
| ***FY-01*** | ***FY-02*** | ***FY-03*** | ***FY-04*** | ***FY-05*** | ***FY-06*** |
| Continue to perform floristic surveys | Continue to perform floristic surveys | Continue to perform floristic surveys | Continue to perform floristic surveys | Continue to perform floristic surveys | Continue to perform floristic surveys |
| Perform vegetation surveillance | Perform vegetation surveillance | Perform vegetation surveillance | Perform vegetation surveillance | Perform vegetation surveillance | Perform vegetation surveillance |
| Perform localized/issue-specific studies | Perform localized/issue-specific studies | Perform localized/issue-specific studies | Perform localized/issue-specific studies | Perform localized/issue-specific studies | Perform localized/issue-specific studies |
| Continue to develop & implement invasive/exotic vegetation controls | Continue to develop & implement invasive/exotic vegetation controls | Continue to develop & implement invasive/exotic vegetation controls | Continue to develop & implement invasive/exotic vegetation controls | Continue to develop & implement invasive/exotic vegetation controls | Continue to develop & implement invasive/exotic vegetation controls |
| Continue to implement watershed conservation/ restoration actions | Continue to implement watershed conservation/ restoration actions | Continue to implement watershed conservation/ restoration actions | Continue to implement watershed conservation/ restoration actions | Continue to implement watershed conservation/ restoration actions | Continue to implement watershed conservation/ restoration actions |
| Implement Integrated Pest Management | Implement Integrated Pest Management | Implement Integrated Pest Management | Implement Integrated Pest Management | Implement Integrated Pest Management | Implement Integrated Pest Management |
| Perform timber stand improvement | Perform timber stand improvement | Perform timber stand improvement | Perform timber stand improvement | Perform timber stand improvement | Perform timber stand improvement |
| Continue to issue Tree Protection Policy Letter | Continue to issue Tree Protection Policy Letter | Continue to issue Tree Protection Policy Letter | Continue to issue Tree Protection Policy Letter | Continue to issue Tree Protection Policy Letter | Continue to issue Tree Protection Policy Letter |
| Continue to provide technical assistance to emergency situations that threaten vegetation | Continue to provide technical assistance to emergency situations that threaten vegetation | Continue to provide technical assistance to emergency situations that threaten vegetation | Continue to provide technical assistance to emergency situations that threaten vegetation | Continue to provide technical assistance to emergency situations that threaten vegetation | Continue to provide technical assistance to emergency situations that threaten vegetation |
| Continue to maintain GIS vegetation datalayers | Continue to maintain GIS vegetation datalayers | Continue to maintain GIS vegetation datalayers | Continue to maintain GIS vegetation datalayers | Continue to maintain GIS vegetation datalayers | Continue to maintain GIS vegetation datalayers |
| Continue to investigate/ enforce violations of vegetation regulations | Continue to investigate/ enforce violations of vegetation regulations | Continue to investigate/ enforce violations of vegetation regulations | Continue to investigate/enforce violations of vegetation regulations | Continue to investigate/ enforce violations of vegetation regulations | Continue to investigate/ enforce violations of vegetation regulations |

| Table 14.5: Undeveloped Areas Vegetation Technical Area Project Summary | | | | | |
|---|---|---|---|---|---|
| ***FY-01*** | ***FY-02*** | ***FY-03*** | ***FY-04*** | ***FY-05*** | ***FY-06*** |
| ***(continued)*** | | | | | |
| | Develop and implement program to monitor high-rarity ranked plant communities | Continue monitoring high-rarity ranked plant communities | Continue monitoring high-rarity ranked plant communities | Continue monitoring high-rarity ranked plant communities | Continue monitoring high-rarity ranked plant communities |
| | | | Establish/participate in regional effort for invasive/exotic vegetation control | Continue coordination of regional effort for invasive/ exotic vegetation control | Continue coordination of regional effort for invasive/exotic vegetation control |
| Review/provide recommend-ations for Fire Department SOP for wildlife management | | | | | |
| Review/revise Environmental Checklist to include vegetation protection | | | | | |
| | Review/revise Installation Design Guide to include vegetation protection (BMPs, LID) & eliminate invasive/exotic plants | | | | |
| | Establish facilities siting/design review committee to ensure consideration of vegetation protection | Continue facilities siting/design review committee to ensure consideration of vegetation protection | Continue facilities siting/design review committee to ensure consideration of vegetation protection | Continue facilities siting/ design review committee to ensure consideration of vegetation protection | Continue facilities siting/design review committee to ensure consideration of vegetation protection |

| Table 14.5: Undeveloped Areas Vegetation Technical Area Project Summary | | | | | |
|---|---|---|---|---|---|
| ***FY-01*** | ***FY-02*** | ***FY-03*** | ***FY-04*** | ***FY-05*** | ***FY-06*** |
| | Review/revise Training Regulation to include vegetation protection | | | | |
| | | Develop Invasive/Exotic Plant Management Plan | | | |
| | | Complete vascular plant survey | | | |

| Table 14.6: Developed Areas Vegetation Technical Area Project Summary | | | | | |
|---|---|---|---|---|---|
| ***FY-01*** | ***FY-02*** | ***FY-03*** | ***FY-04*** | ***FY-05*** | ***FY-06*** |
| Continue to develop & implement grounds maintenance practices/ standards to reduce need/ dependency on pesticides | Continue to develop & implement grounds maintenance practices/ standards to reduce need/ dependency on pesticides | Continue to develop & implement grounds maintenance practices & standards to reduce need/ dependency on pesticides | Continue to develop & implement grounds maintenance practices/standards to reduce need/ dependency on pesticides | Continue to develop & implement grounds maintenance practices/ standards to reduce need/ dependency on pesticides | Continue to develop & implement grounds maintenance practices/ standards to reduce need/ dependency on pesticides |
| Continue to perform vegetation surveys | Continue to perform vegetation surveys | Continue to perform vegetation surveys | Continue to perform vegetation surveys | Continue to perform vegetation surveys | Continue to perform vegetation surveys |
| Perform vegetation surveillance | Perform vegetation surveillance | Perform vegetation surveillance | Perform vegetation surveillance | Perform vegetation surveillance | Perform vegetation surveillance |
| Continue to issue Integrated Pest Management Policy Letter | Continue to issue Integrated Pest Management Policy Letter | Continue to issue Integrated Pest Management Policy Letter | Continue to issue Integrated Pest Management Policy Letter | Continue to issue Integrated Pest Management Policy Letter | Continue to issue Integrated Pest Management Policy Letter |
| Continue to develop/ implement turf management standards | Continue to develop/implement turf management standards | Continue to develop/ implement turf management standards | Continue to develop/implement turf management standards | Continue to develop/ implement turf management standards | Continue to develop/ implement turf management standards |
| Continue to develop/ implement urban forestry | Continue to develop/ implement urban forestry | Continue to develop/ implement urban forestry | Continue to develop/ implement urban forestry | Continue to develop/ implement urban forestry | Continue to develop/ implement urban forestry |
| Implement conservation landscaping | Implement conservation landscaping | Implement conservation landscaping | Implement conservation landscaping | Implement conservation landscaping | Implement conservation landscaping |
| Continue to maintain GIS vegetation datalayers | Continue to maintain GIS vegetation datalayers | Continue to maintain GIS vegetation datalayers | Continue to maintain GIS vegetation datalayers | Continue to maintain GIS vegetation datalayers | Continue to maintain GIS vegetation datalayers |
| Continue to investigate/ enforce violations of vegetation regulations | Continue to investigate/ enforce violations of vegetation regulations | Continue to investigate/ enforce violations of vegetation regulations | Continue to investigate/enforce violations of vegetation regulations | Continue to investigate/ enforce violations of vegetation regulations | Continue to investigate/ enforce violations of vegetation regulations |
| | Perform site reclamation/ restoration to native landscaping | Perform site reclamation/ restoration to native landscaping | | | |

| Table 14.6: Developed Areas Vegetation Technical Area Project Summary | | | | | |
|---|---|---|---|---|---|
| ***FY-01*** | ***FY-02*** | ***FY-03*** | ***FY-04*** | ***FY-05*** | ***FY-06*** |
| ***(continued)*** | | | | | |
| | | | Establish/participate in regional effort for invasive/exotic vegetation control | Establish/ participate in regional effort for invasive/ exotic vegetation control | Establish/ participate in regional effort for invasive/exotic vegetation control |
| Review/provide recommendations for Fire Department SOP for wildfire management | | | | | |
| Review/revise Environmental Checklist to include vegetation protection | | | | | |
| | | | Develop/construct a demonstration/ education conservation landscape display | Continue to maintain demonstation/ education conservation landscape display | Continue to maintain demonstration/ education conservation landscape display |
| | | | Develop/maintain self-help brochures & training programs | Maintain self-help brochures & training programs | Maintain self-help brochures & training programs |
| | Review/revise Installation Design Guide to include vegetation protection (BMPs, LID), eliminate invasive/exotic plants and implement planting of shade trees with new construction | | | | |
| | Establish facilities siting/design review committee to ensure consideration of vegetation protection | Continue facilities siting/design review committee to ensure consideration of vegetation protection | Continue facilities siting/design review committee to ensure consideration of vegetation protection | Continue facilities siting/ design review committee to ensure consideration of vegetation protection | Continue facilities siting/design review committee to ensure consideration of vegetation protection |

| Table 14.6: Developed Areas Vegetation Technical Area Project Summary | | | | | |
|---|---|---|---|---|---|
| ***FY-01*** | ***FY-02*** | ***FY-03*** | ***FY-04*** | ***FY-05*** | ***FY-06*** |
| ***(continued)*** | | | | | |
| | Review/revise Training Regulation to include vegetation protection | | | | |
| Develop Historic Tree Management Plan | Develop Historic Tree Management Plan | | | | |
| | | | Develop Urban Tree Management Plan | | |

| Table 14.7: Wildlife Management Technical Area Project Summary | | | | | |
|---|---|---|---|---|---|
| ***FY-01*** | ***FY-02*** | ***FY-03*** | ***FY-04*** | ***FY-05*** | ***FY-06*** |
| Perform wildlife/habitat surveillance | Perform wildlife/habitat surveillance | Perform wildlife/habitat surveillance | Perform wildlife/habitat surveillance | Perform wildlife/habitat surveillance | Perform wildlife/habitat surveillance |
| Perform localized/issue specific studies | Perform localized/issue specific studies | Perform localized/issue specific studies | Perform localized/issue specific studies | Perform localized/issue specific studies | Perform localized/issue specific studies |
| Complete/ maintain Wildlife Information Management System | Complete/maintain Wildlife Information Management System | Complete/ maintain Wildlife Information Management System | Complete/maintain Wildlife Information Management System | Complete/ maintain Wildlife Information Management System | Complete/ maintain Wildlife Information Management System |
| Continue to control invasive/exotic species | Continue to control invasive/exotic species | Continue to control invasive/exotic species | Continue to control invasive/exotic species | Continue to control invasive/exotic species | Continue to control invasive/exotic species |
| Continue to monitor/control wildlife that impact habitat | Continue to monitor/control wildlife that impact habitat | Continue to monitor/control wildlife that impact habitat | Continue to monitor/control wildlife that impact habitat | Continue to monitor/control wildlife that impact habitat | Continue to monitor/control wildlife that impact habitat |
| Continue to re-seed using native mixes | Continue to re-seed using native mixes | Continue to re-seed using native mixes | Continue to re-seed using native mixes | Continue to re-seed using native mixes | Continue to re-seed using native mixes |
| Continue to manage pesticide use IAW IPMP | Continue to manage pesticide use IAW IPMP | Continue to manage pesticide use IAW IPMP | Continue to manage pesticide use IAW IPMP | Continue to manage pesticide use IAW IPMP | Continue to manage pesticide use IAW IPMP |
| Continue to reduce mowing/grounds maintenance | Continue to reduce mowing/grounds maintenance | Continue to reduce mowing/grounds maintenance | Continue to reduce mowing/grounds maintenance | Continue to reduce mowing/grounds maintenance | Continue to reduce mowing/grounds maintenance |
| Continue to remove abandoned impervious surfaces and replant | Continue to remove abandoned impervious surfaces and replant | Continue to remove abandoned impervious surfaces and replant | Continue to remove abandoned impervious surfaces and replant | Continue to remove abandoned impervious surfaces and replant | Continue to remove abandoned impervious surfaces and replant |
| Continue to enhance corridor vegetation | Continue to enhance corridor vegetation | Continue to enhance corridor vegetation | Continue to enhance corridor vegetation | Continue to enhance corridor vegetation | Continue to enhance corridor vegetation |
| Continue to enhance riparian vegetation | Continue to enhance riparian vegetation | Continue to enhance riparian vegetation | Continue to enhance riparian vegetation | Continue to enhance riparian vegetation | Continue to enhance riparian vegetation |

| Table 14.7: Wildlife Management Technical Area Project Summary | | | | | |
|---|---|---|---|---|---|
| ***FY-01*** | ***FY-02*** | ***FY-03*** | ***FY-04*** | ***FY-05*** | ***FY-06*** |
| ***(continued)*** | | | | | |
| Continue to implement maintenance/ corrective actions to wildlife crossing structures | Continue to implement maintenance/ corrective actions to wildlife crossing structures | Continue to implement maintenance/ corrective actions to wildlife crossing structures | Continue to implement maintenance/ corrective actions to wildlife crossing structures | Continue to implement maintenance/ corrective actions to wildlife crossing structures | Continue to implement maintenance/ corrective actions to wildlife crossing structures |
| Evaluate & correct wildlife hazards | Evaluate & correct wildlife hazards | Evaluate & correct wildlife hazards | Evaluate & correct wildlife hazards | Evaluate & correct wildlife hazards | Evaluate & correct wildlife hazards |
| Continue to provide technical assistance in emergency situations that threaten wildlife | Continue to provide technical assistance in emergency situations that threaten wildlife | Continue to provide technical assistance in emergency situations that threaten wildlife | Continue to provide technical assistance in emergency situations that threaten wildlife | Continue to provide technical assistance in emergency situations that threaten wildlife | Continue to provide technical assistance in emergency situations that threaten wildlife |
| Continue to participate in the Fort Belvoir deer hunting program | Continue to participate in the Fort Belvoir deer hunting program | Continue to participate in the Fort Belvoir deer hunting program | Continue to participate in the Fort Belvoir deer hunting program | Continue to participate in the Fort Belvoir deer hunting program | Continue to participate in the Fort Belvoir deer hunting program |
| Continue to participate in VDGIF's Deer Population Control Program & Damage Control Assistance Program | Continue to participate in VDGIF's Deer Population Control Program & Damage Control Assistance Program | Continue to participate in VDGIF's Deer Population Control Program & Damage Control Assistance Program | Continue to participate in VDGIF's Deer Population Control Program & Damage Control Assistance Program | Continue to participate in VDGIF's Deer Population Control Program & Damage Control Assistance Program | Continue to participate in VDGIF's Deer Population Control Program & Damage Control Assistance Program |
| Continue to implement goose hazard management program at DAAF | Continue to implement goose hazard management program at DAAF | Continue to implement goose hazard management program at DAAF | Continue to implement goose hazard management program at DAAF | Continue to implement goose hazard management program at DAAF | Continue to implement goose hazard management program at DAAF |
| Continue to implement Installation Wide feral cat program | Continue to implement Installation Wide feral cat program | Continue to implement Installation Wide feral cat program | Continue to implement Installation Wide feral cat program | Continue to implement Installation Wide feral cat program | Continue to implement Installation Wide feral cat program |
| Continue to participate in Fairfax County's raccoon rabies control program | Continue to participate in Fairfax County's raccoon rabies control program | Continue to participate in Fairfax County's raccoon rabies control program | Continue to participate in Fairfax County's raccoon rabies control program | Continue to participate in Fairfax County's raccoon rabies control program | Continue to participate in Fairfax County's raccoon rabies control program |
| Continue to participate in Fairfax County's West Nile Virus management program | Continue to participate in Fairfax County's West Nile Virus management program | Continue to participate in Fairfax County's West Nile Virus management program | Continue to participate in Fairfax County's West Nile Virus management program | Continue to participate in Fairfax County's West Nile Virus management program | Continue to participate in Fairfax County's West Nile Virus management program |

| Table 14.7: Wildlife Management Technical Area Project Summary | | | | | |
|---|---|---|---|---|---|
| ***FY-01*** | ***FY-02*** | ***FY-03*** | ***FY-04*** | ***FY-05*** | ***FY-06*** |
| ***(continued)*** | | | | | |
| Continue to review/respond to tenant & AFH requirements for wildlife management | Continue to review/respond to tenant & AFH requirements for wildlife management | Continue to review/respond to tenant & AFH requirements for wildlife management | Continue to review/respond to tenant & AFH requirements for wildlife management | Continue to review/respond to tenant & AFH requirements for wildlife management | Continue to review/respond to tenant & AFH requirements for wildlife management |
| Continue to maintain GIS wildlife datalayer | Continue to maintain GIS wildlife datalayer | Continue to maintain GIS wildlife datalayer | Continue to maintain GIS wildlife datalayer | Continue to maintain GIS wildlife datalayer | Continue to maintain GIS wildlife datalayer |
| Continue to investigate/ enforce violations of wildlife regulations | Continue to investigate/ enforce violations of wildlife regulations | Continue to investigate/ enforce violations of wildlife regulations | Continue to investigate/enforce violations of wildlife regulations | Continue to investigate/ enforce violations of wildlife regulations | Continue to investigate/ enforce violations of wildlife regulations |
| Review/revise Environmental Checklist to include wildlife protection | | | | | |
| Develop/ implement turkey surveys & harvest data | Implement turkey surveys & harvest data | Implement turkey surveys & harvest data | Implement turkey surveys & harvest data | Implement turkey surveys & harvest data | Implement turkey surveys & harvest data |
| Complete baseline wildlife surveys | | | | | |
| | Develop a wildlife management plan | | | | |
| | | | Perform wildlife studies/ monitoring IAW wildlife management plan | | |
| | Evaluate effectiveness of the nest box program | | | | |
| | | Implement grassland & early habitat enhancement projects IAW PIF priority bird species | Implement grassland & early habitat enhancement projects IAW PIF priority bird species | Implement grassland & early habitat enhancement projects IAW PIF priority bird species | |
| | Evaluate opportunities to provide hunting access to persons with disabilities | Evaluate opportunities to provide hunting access to persons with disabilities | | | |

| Table 14.7: Wildlife Management Technical Area Project Summary | | | | | |
|---|---|---|---|---|---|
| ***FY-01*** | ***FY-02*** | ***FY-03*** | ***FY-04*** | ***FY-05*** | ***FY-06*** |
| | Review/revise Installation Design Guide to include wildlife issues | | | | |
| | Establish a facilities siting/design review committee to ensure consideration of wildlife issues | Continue facilities siting/design review committee to ensure consideration of wildlife issues | Continue facilities siting/design review committee to ensure consideration of wildlife issues | Continue facilities siting/ design review committee to ensure consideration of wildlife issues | Continue facilities siting/design review committee to ensure consideration of wildlife issues |
| | Review/revise training regulation to include wildlife protection | | | | |
| | | Develop a classification of undeveloped areas according to their suitability for development/ value as wildlife habitat | | | |
| | | | Establish/participate in a regional effort for wildlife management committee | Continue participation in regional effort for wildlife management | Continue participation in regional effort for wildlife management |
| | | | Investigate participation in regional/national level wildlife conservation programs | Continue participation in regional/national level wildlife conservation programs | Continue participation in regional/national level wildlife conservation programs |
| | | Develop Forest and Wildlife Corridor Management Plan | | | |

| Table 14.8: Endangered, Threatened and Rare Species Management Technical Area Project Summary | | | | | |
|---|---|---|---|---|---|
| ***FY-01*** | ***FY-02*** | ***FY-03*** | ***FY-04*** | ***FY-05*** | ***FY-06*** |
| Continue to monitor species listings | Continue to monitor species listings | Continue to monitor species listings | Continue to monitor species listings | Continue to monitor species listings | Continue to monitor species listings |
| Continue to perform annual bald eagle monitoring | Continue to perform annual bald eagle monitoring | Continue to perform annual bald eagle monitoring | Continue to perform annual bald eagle monitoring | Continue to perform annual bald eagle monitoring | Continue to perform annual bald eagle monitoring |
| Perform bald eagle surveillance | Perform bald eagle surveillance | Perform bald eagle surveillance | Perform bald eagle surveillance | Perform bald eagle surveillance | Perform bald eagle surveillance |
| Perform localized/issue specific studies | Perform localized/issue specific studies | Perform localized/issue specific studies | Perform localized/issue specific studies | Perform localized/issue specific studies | Perform localized/issue specific studies |
| Continue to enhance bald eagle habitat | Continue to enhance bald eagle habitat | Continue to enhance bald eagle habitat | Continue to enhance bald eagle habitat | Continue to enhance bald eagle habitat | Continue to enhance bald eagle habitat |
| Continue to control risk of wildlife impacts to rare plant & animal species habitats and rare ecological communities | Continue to control risk of wildlife impacts to rare plant & animal species habitats and rare ecological communities | Continue to control risk of wildlife impacts to rare plant & animal species habitats and rare ecological communities | Continue to control risk of wildlife impacts to rare plant & animal species habitats and rare ecological communities | Continue to control risk of wildlife impacts to rare plant & animal species habitats and rare ecological communities | Continue to control risk of wildlife impacts to rare plant & animal species habitats and rare ecological communities |
| Continue to support Mason Neck Bald Eagle Survey Program | Continue to support Mason Neck Bald Eagle Survey Program | Continue to support Mason Neck Bald Eagle Survey Program | Continue to support Mason Neck Bald Eagle Survey Program | Continue to support Mason Neck Bald Eagle Survey Program | Continue to support Mason Neck Bald Eagle Survey Program |
| Continue to support annual VDGIF bald eagle survey | Continue to support annual VDGIF bald eagle survey | Continue to support annual VDGIF bald eagle survey | Continue to support annual VDGIF bald eagle survey | Continue to support annual VDGIF bald eagle survey | Continue to support annual VDGIF bald eagle survey |
| Continue to provide technical assistance in emergency situations that threaten listed/ rare species | Continue to provide technical assistance in emergency situations that threaten listed/rare species | Continue to provide technical assistance in emergency situations that threaten listed/rare species | Continue to provide technical assistance in emergency situations that threaten listed/rare species | Continue to provide technical assistance in emergency situations that threaten listed/ rare species | Continue to provide technical assistance in emergency situations that threaten listed/ rare species |
| Continue to investigate/ enforce violations of ETRS regulations | Continue to investigate/ enforce violations of ETRS regulations | Continue to investigate/ enforce violations of ETRS regulations | Continue to investigate/enforce violations of ETRS regulations | Continue to investigate/ enforce violations of ETRS regulations | Continue to investigate/ enforce violations of ETRS regulations |
| Continue to maintain GIS ETRS datalayer | Continue to maintain GIS ETRS datalayer | Continue to maintain GIS ETRS datalayer | Continue to maintain GIS ETRS datalayer | Continue to maintain GIS ETRS datalayer | Continue to maintain GIS ETRS datalayer |

| Table 14.8: Endangered, Threatened and Rare Species Management Technical Area Project Summary | | | | | |
|---|---|---|---|---|---|
| ***FY-01*** | ***FY-02*** | ***FY-03*** | ***FY-04*** | ***FY-05*** | ***FY-06*** |
| ***(continued)*** | | | | | |
| | Complete Installation Wide T&E Inventory | | | | |
| | Develop/ implement baseline wood turtle survey | | | | |
| | | Develop/ implement rare species/ communities monitoring program | Develop/implement rare species/ communities monitoring program | Develop/ implement rare species/ communities monitoring program | |
| Develop/ implement eagle awareness program | | | | | |
| | | | | Revise Bald Eagle Management Plan | |
| | Develop Wood Turtle Management Plan | | | | |
| Review/revise Environmental Checklist to include ETRS protection | | | | | |
| | Initiate eagle protection cooperative agreement with Pohick Regional Park | Continue eagle protection cooperative agreement with Pohick Regional Park | Continue eagle protection cooperative agreement with Pohick Regional Park | Continue eagle protection cooperative agreement with Pohick Regional Park | Continue eagle protection cooperative agreement with Pohick Regional Park |
| | Initiate wood turtle protection cooperative agreement with Huntley Meadows | Continue wood turtle protection cooperative agreement with Huntley Meadows | Continue wood turtle protection cooperative agreement with Huntley Meadows | Continue wood turtle protection cooperative agreement with Huntley Meadows | Continue wood turtle protection cooperative agreement with Huntley Meadows |

| Table 14.8: Endangered, Threatened and Rare Species Management Technical Area Project Summary | | | | | |
|---|---|---|---|---|---|
| ***FY-01*** | ***FY-02*** | ***FY-03*** | ***FY-04*** | ***FY-05*** | ***FY-06*** |
| ***(continued)*** | | | | | |
| | Establish a facilities siting/ design review committee to ensure consideration of threatened, endangered and rare species/ communities protection | Continue a facilities siting/ design review committee to ensure consideration of threatened, endangered and rare species/ communities protection | Continue a facilities siting/design review committee to ensure consideration of threatened, endangered and rare species/ communities protection | Continue a facilities siting/ design review committee to ensure consideration of threatened, endangered and rare species/ communities protection | Continue a facilities siting/ design review committee to ensure consideration of threatened, endangered and rare species/ communities protection |
| | Review/revise training regulation to include threatened, endangered and rare species/ communities protection | | | | |
| | Review/revise Installation Design Guide to ensure consideration of ETRS | | | | |

| Table 14.9: Special Natural Areas Management Technical Area Project Summary | | | | | |
|---|---|---|---|---|---|
| ***FY-01*** | ***FY-02*** | ***FY-03*** | ***FY-04*** | ***FY-05*** | ***FY-06*** |
| Continue to perform refuge/ corridor biological surveys in conjunction with installation wide surveys | Continue to perform refuge/ corridor biological surveys in conjunction with installation wide surveys | Continue to perform refuge/ corridor biological surveys in conjunction with installation wide surveys | Continue to perform refuge/ corridor biological surveys in conjunction with installation wide surveys | Continue to perform refuge/ corridor biological surveys in conjunction with installation wide surveys | Continue to perform refuge/ corridor biological surveys in conjunction with installation wide surveys |
| Continue to conduct user surveys of refuge facilities | Continue to conduct user surveys of refuge facilities | Continue to conduct user surveys of refuge facilities | Continue to conduct user surveys of refuge facilities | Continue to conduct user surveys of refuge facilities | Continue to conduct user surveys of refuge facilities |
| Continue to conduct wildlife movement surveys in corridor | Continue to conduct wildlife movement surveys in corridor | Continue to conduct wildlife movement surveys in corridor | Continue to conduct wildlife movement surveys in corridor | Continue to conduct wildlife movement surveys in corridor | Continue to conduct wildlife movement surveys in corridor |
| Continue to perform refuge/ corridor surveillance | Continue to perform refuge/ corridor surveillance | Continue to perform refuge/ corridor surveillance | Continue to perform refuge/ corridor surveillance | Continue to perform refuge/ corridor surveillance | Continue to perform refuge/ corridor surveillance |
| Develop Refuge Use/Fact Sheet | Implement Refuge Use/Corridor Access requests | Implement Refuge Use/Corridor Access requests | Implement Refuge Use/Corridor Access requests | Implement Refuge Use/ Corridor Access requests | Implement Refuge Use/ Corridor Access requests |
| Develop and implement environmental education materials/ programs in conjunction with the Environmental Education Center | Develop and implement environmental education materials/ programs in conjunction with the Environmental Education Center | Develop and implement environmental education materials/ programs in conjunction with the Environmental Education Center | Develop and implement environmental education materials/ programs in conjunction with the Environmental Education Center | Develop and implement environmental education materials/ programs in conjunction with the Environmental Education Center | Develop and implement environmental education materials/ programs in conjunction with the Environmental Education Center |
| Continue to participate in the Partners in Education Program | Continue to participate in the Partners in Education Program | Continue to participate in the Partners in Education Program | Continue to participate in the Partners in Education Program | Continue to participate in the Partners in Education Program | Continue to participate in the Partners in Education Program |
| Continue to conduct education events in association with the refuges | Continue to conduct education events in association with the refuges | Continue to conduct education events in association with the refuges | Continue to conduct education events in association with the refuges | Continue to conduct education events in association with the refuges | Continue to conduct education events in association with the refuges |

| Table 14.9: Special Natural Areas Management Technical Area Project Summary | | | | | |
|---|---|---|---|---|---|
| ***FY-01*** | ***FY-02*** | ***FY-03*** | ***FY-04*** | ***FY-05*** | ***FY-06*** |
| ***(continued)*** | | | | | |
| Develop and maintain interpretive displays in refuge and education center | Develop and maintain interpretive displays in refuge and education center | Develop and maintain interpretive displays in refuge and education center | Develop and maintain interpretive displays in refuge and education center | Develop and maintain interpretive displays in refuge and education center | Develop and maintain interpretive displays in refuge and education center |
| Continue to implement routine maintenance of refuge trails and facilities | Continue to implement routine maintenance of refuge trails and facilities | Continue to implement routine maintenance of refuge trails and facilities | Continue to implement routine maintenance of refuge trails and facilities | Continue to implement routine maintenance of refuge trails and facilities | Continue to implement routine maintenance of refuge trails and facilities |
| | Review/revise/staff Special Natural Areas boundary expansion | | | | |
| Establish/manage Qualified Volunteer Program for the refuges | Continue to manage Qualified Volunteer Program for refuges | Continue to manage Qualified Volunteer Program for refuges | Continue to manage Qualified Volunteer Program for refuges | Continue to manage Qualified Volunteer Program for refuges | Continue to manage Qualified Volunteer Program for refuges |
| | Design ABWR Visitor Center | Complete ABWR Visitor Center Exhibit Design | | | |
| | | | Develop Refuge Management Plan | | |
| | | | | ABWR Visitor Center Construction | ABWR Visitor Center Exhibit Construction |

# 15.0
# Integration

In accordance with Army Regulation (AR) 200-3, this Integrated Natural Resources Management Plan (INRMP) has been reviewed for its consistency with other Fort Belvoir management plans. Section 9-1b of AR 200-3 outlines criteria that an INRMP must meet to be considered integrated. One of the criteria is that the INRMP be compatible with the installation's master plan, pest management plan, and master training schedule. This section of the INRMP evaluates these plans, as well as other installation plans and programs that do not directly address natural resources management, but could relate to natural resources and this INRMP. Plans and programs directly addressing natural resources management (e.g., Bald Eagle Management Plan, Watershed Management Plan, Bird Conservation Plan, etc.) are discussed in Sections 7 – 13. Fort Belvoir's military mission as it relates to natural resources is discussed in Section 3. The plans and programs examined in this section include:

- Real Property Master Plan, Long-Range Component
- Real Property Master Plan, Installation Design Guide
- Training schedule
- Integrated Cultural Resources Management Plan
- Real Property Maintenance Contract
- Integrated Pest Management Plan
- Pollution Prevention Plan
- Phase II stormwater program
- Stormwater Pollution Prevention Plan
- Master Spill Plan
- Petroleum storage tank compliance program
- Integrated Solid Waste Management Plan
- Solid Waste Landfill Postclosure Plans
- Solid waste management units program
- Environmental training program

Fort Belvoir Directorate of Installation Support (DIS) Environmental and Natural Resources Division (ENRD) personnel provide input to these plans and programs as they are written and

updated. Additionally, Fort Belvoir DIS staff attends weekly meetings where the activities, plans, and programs of each DIS division are discussed. Furthermore, ENRD attends the monthly Major Project Review meeting, which is held at the Command headquarters. This facilitates coordination of the DIS Natural Resources Branch (NRB) with Environmental Compliance Branch (ECB) and other installation entities on activities that may affect natural resources on post.

## 15.1 REAL PROPERTY MASTER PLAN LONG-RANGE COMPONENT AND REAL PROPERTY MASTER PLAN INSTALLATION DESIGN GUIDE

The *Fort Belvoir Real Property Master Plan Long-Range Component* (Woolpert, 1993a) establishes the future direction for on-post development and includes means to ensure natural resources protection. The long-range component designates environmentally sensitive areas on post that are the least desirable for development (i.e., wetlands; floodplains; and areas with steep topography, poor soils, endangered species habitat, and cultural resources). It also encourages siting development in previously developed areas. The *Fort Belvoir Real Property Master Plan Installation Design Guide* (Woolpert, 1995) is a companion to the long-range component. The installation design guide provides comprehensive design guidelines for the development, redevelopment, and refurbishment of existing and future structures on Fort Belvoir including buildings, streetscapes, and improved grounds. The installation design guide also addresses management of the open space and landscapes connected to the built areas.

As part of the transportation management component of the master plan, Fort Belvoir is conducting a planning-level study to determine needed roadway and intersection improvement for projected growth at Fort Belvoir. NRB staff will review the results of the study to offer recommendations for meeting transportation needs while minimizing impacts on installation natural resources.

The master plan is currently being revised with a scheduled completion date in 2003. Installation design guide revisions are ongoing. NRB staff will work with installation master planners and designers to ensure that the revised master plan and design guide are prepared in accordance with the goals and objectives outlined in this INRMP. Specific items that should be revised in the *Fort Belvoir Real Property Master Plan, Long-Range Component* include the following:

- Adapting smart growth principles by directing development toward areas where natural resources would be least impacted (the current master plan directs development toward previously developed areas, but does not evaluate the suitability of previously undeveloped, non-sensitive areas for development)

Specific items that should be added to or updated in the *Fort Belvoir Real Property Master Plan – Installation Design Guide* include:

- Guidelines for landscaping and building design to reduce energy costs
- Recommendations for vegetation management in improved grounds and natural borders
- Guidelines for habitat restoration and environmentally beneficial landscaping

- Recommendations for using more pervious materials to enhance desirable tree growth, improve infiltration, and reduce non-point source pollution
- Systems for non-point source stormwater control (e.g., bioretention/filtration of stormwater, curb cuts, rain leader disconnects, and other low impact development techniques for stormwater management).
- Adding riparian forest buffers as environmentally sensitive areas and indicating the types of activities permitted within them
- Incorporating the list of recommended native plant species (Appendix M) into the installation design guide
- Revising the grading section to include land manipulation for stormwater runoff control. (This section currently describes the use of berms and plantings for visual screening only)
- Incorporating the current Fort Belvoir tree protection standards.

In addition to providing input in the revision of the master plan and installation design guide, Fort Belvoir plans to initiate a facilities siting/design review committee to include representatives from ENRD, Master Planning, and the Contract Management Division. The committee will develop and participate in a siting/design review process to ensure the consideration of all aspects of natural resources protection.

## 15.2 CULTURAL RESOURCES MANAGEMENT PLAN

Fort Belvoir's Integrated Cultural Resources Management Plan (R. Christopher Goodwin & Associates, 2000 draft) facilitates installation compliance with cultural resource management laws and policies. Cultural resource management is integrated into the existing framework of Fort Belvoir's operations and mission in a manner consistent with current federal (principally the National Historic Preservation Act of 1966, as amended), Department of Defense and Department of the Army (AR 200-4) laws and regulations.

Fort Belvoir has been conducting cultural resource investigations since the 1960s. Fort Belvoir's historic resources encompass both pre-installation history (dating back 5,000 years) and U.S. military history from World War I through the Cold War. These resources include buildings, structures, archeological sites and historic landscapes.

A GIS data layer was developed for all known archeological sites on the installation, to facilitate installation wide project planning. The installation's historic buildings are also included in a separate GIS data layer containing the Fort Belvoir Historic District.

Existing planning procedures and policies at Fort Belvoir facilitate coordination within DIS divisions, as well as between DIS & other BASEOPS and tenant organizations. These planning procedures and policies enable cultural resources concerns to be addressed during planning for undertakings on the installation. This includes coordination between NRB staff, such as weekly staff meetings, participation in the Installation Planning Board, coordination with Facilities Area

Coordinating Officers and review of Fort Belvoir permit actions (e.g., Excavation and Demolition Permits). Additional coordination is accomplished through procedural reviews.

The Integrated Facilities System (IFS) is a database system that tracks all alterations and repairs undertaken throughout the installation in the form of a routine service order or an Individual Job Order. All buildings that have been surveyed and found to be "potentially-eligible" or "eligible" for listing in the National Register of Historic Places or "contributing" to the Fort Belvoir Historic District have been keyed as "historic" in the database. This code indicates that anyone initiating work must coordinate the undertaking with the Cultural Resource Manager.

A recommendation of the current Integrated Cultural Resource Management Plan includes preparing a landscape preservation plan for the Fort Belvoir Historic District. This plan will document the historical evolution of the landscape design of the historic district, identify character-defining features associated with the designed and natural landscape and recommend measures to maintain and safeguard historic landscape features. This effort will be coordinated with the natural resource staff responsible for managing developed areas vegetation.

## 15.3 TRAINING SCHEDULE

The Fort Belvoir training schedule is devised annually by the Department of Plans, Training, Mobilization, and Security (DPTMS). Since training activities generally involve maneuvers on foot or trail, natural resources management activities can often be held simultaneously in a training area. NRB staff contact DPTMS if they need access to a training area to ensure that their activities will not interfere with the military mission.

## 15.4 FORT BELVOIR REAL PROPERTY MAINTENANCE CONTRACT

The Real Property Maintenance Contract, revised by ENRD staff in 1999, specifies Fort Belvoir standards and best management practices for managing and maintaining improved grounds (trees, turf, landscape beds, and new plantings) and special management areas (grasslands, wildlife/wetland refuges, and corridors) on Fort Belvoir.

During or before the next update of the Real Property Maintenance Contract in 2004, Fort Belvoir NRB staff will ensure that the practices outlined in the contract are consistent with the goals and objectives outlined in this INRMP. Specific areas of focus will be:

- Incorporating the list of recommended native plant species for restoration and landscaping (Appendix M of this plan)
- Updating integrated pest management procedures
- Updating refuge facilities maintenance
- Updating requirements for special management areas based on current surveys and objectives.

## 15.5 INTEGRATED PEST MANAGEMENT PLAN

Fort Belvoir's *Integrated Pest Management Plan* was prepared in accordance with AR 420-76 (under revision to become AR 200-5) and DoD Instruction 4150.7 to facilitate a pattern of coordinated and integrated responses to pest problems encountered at the installation. The plan was updated in 2000 by the Center for Health Promotion and Preventive Medicine and NRB staff (U.S. Army, 2000b). NRB staff was involved in preparing and approving the plan. The plan serves as a tool to reduce reliance on pesticides, to enhance environmental protection, and to maximize the use of integrated pest management techniques. The majority of pesticides, herbicides, and fungicides used at Fort Belvoir are applied at the installation golf courses. Despite a major expansion (from 18 to 36 holes) at the north golf facility and the construction of several new administrative (tenant) facilities over the past 7 years, Fort Belvoir has been able to significantly reduce its usage of pesticides by implementing standard and practices outlined in the Integrated Pest Management Plan. Using a combination of cultural and biological controls as well as new initiatives in the Integrated Pest Management Plan, Fort Belvoir was able to reduce its pesticide usage by 60 percent between 1996 and 1999.

Fort Belvoir NRB staff will continue to provide input during updates of the Integrated Pest Management Plan to ensure that it is consistent with the goals and objectives of this INRMP. Of particular importance is the management objective in the INRMP to reduce pesticide applications by 50% per unit of improved facilities by the year 2001 and by 75% by 2005 using 1994 as the baseline year (Section 10.4), which are goals established by the Chesapeake Bay Program.

## 15.6 POLLUTION PREVENTION PLAN

The *Fort Belvoir Pollution Prevention Plan* (Parsons Engineering Science, 2000) specifies actions that the installation must take to meet federal, state, DoD, and Army (AR 200-1) pollution prevention policy goals. The plan also serves to reduce long-term liabilities associated with waste disposal and to protect public health and the environment by reducing the amount of waste generated and decreasing use of toxic materials, fuels, and chemicals. The plan recommends options for non-toxic chemical substitutions; recycling chemical, organic, and solid wastes (including composting); reducing air emissions; and conserving energy and water. The goals and actions in the pollution prevention plan are consistent with the goals and objectives of this INRMP. The pollution prevention plan is updated on a 2-year cycle.

## 15.7 STORMWATER POLLUTION PREVENTION PLAN

The *Stormwater Pollution Prevention Plan U.S. Army Garrison Fort Belvoir, Virginia* (CDM Federal Program Corporation, 1999) provides the guidance necessary to satisfy the requirements of the installation's general stormwater permit issued by the Virginia Department of Environmental Quality (VDEQ) on May 22, 1998. The plan identifies point sources of pollution throughout the installation that may impact stormwater runoff and practices to prevent or reduce point-source pollutants in stormwater discharges. The plan designates a stormwater pollution prevention team consisting of ECB personnel, and outlines responsibilities for maintaining stormwater management devices; inspecting, testing, and maintaining equipment whose

breakdown could lead to water pollution; training personnel in good housekeeping, spill prevention and response, and material management practices; and performing annual site compliance evaluations. The goals and actions in the stormwater pollution prevention plan are consistent with the goals and objectives of this INRMP.

## 15.8 PHASE II STORMWATER PROGRAM

The new Phase II Stormwater Regulations require that operators of regulated small municipal separate storm sewer systems (MS4s) and small construction activities (disturbing land between 1 and 5 acres) apply for National Pollutant Discharge Elimination System permit coverage by December 2002 (or December 2004 if a watershed plan is in place) and implement programs and practices to control polluted runoff from non-point sources. MS4s include military bases such as Fort Belvoir. Permit coverage will require that a program to meet the requirements in the permit be developed within 5 years from permit issuance. As discussed in Section 7.1.1, small MS4 stormwater management programs must be comprised of six "minimum control measures" including best management practices (BMPs) to control post-construction runoff. These BMPs include infiltration and vegetative management practices. Fort Belvoir DIS-ENRD staff will develop and implement the required program in accordance with the goals and objectives established in this INRMP. Specifically, the following management recommendations from Section 7.4.2 should be considered for incorporation into the stormwater program developed under the Phase II Stormwater Regulations since they can be used to meet the required six minimum controls:

- Maintain a riparian buffer along all installation waterways and shorelines.
- Correct existing stomwater-related problems as recommended by Langraf (1999) and Allen et al. (1999) and continue long-term stream corridor restoration projects.
- Implement actions to counter existing flow excesses from developed areas as recommended by Allen et al. (1999).
- Develop a program for routine drainageway maintenance, to include maintenance of existing stormwater structures and establish a stormwater management working group.
- Implement stormwater management actions, including BMPs, on all construction projects, as recommended by Allen et al. (1999).
- Incorporate principles of low impact development in facility siting and design on post as recommended within the National Guidance Manual for Low Impact Development.

- Use the installation project/activity review process to incorporate water resources conservation requirements into all phases of facilities siting and construction.

## 15.9 MASTER SPILL PLAN

Fort Belvoir is finalizing an updated Installation Master Spill Plan, which incorporates an updated Spill Prevention Control and Countermeasures Plan, and an Oil Discharge Contingency Plan. The intent of the Fort Belvoir Master Spill Plan (Dewberry & Davis, 2000 draft) is to provide guidance regarding preventing and responding to a hazardous material/waste or petroleum spill on post. The plan is consistent with the federal, state, and Army (AR 200-1) environmental and health and safety regulations for hazardous material/waste release prevention and response programs. The Master Spill Plan is updated every 3 years.

The Master Spill Plan outlines requirements for spill prevention and response training, containment, inspections, inventory control, leak detection, preventative maintenance, and self-audit programs. In case of a spill, the plan supplies procedures for notification and response. To facilitate predicting spill movement and protecting sensitive resources, the Master Spill Plan includes information on post-wide topography, geology, hydrology (including surface water, groundwater, and wetlands), wildlife significant habitats, adjoining areas, landmarks, historical sites, and water supply and disposal systems (including potable water supply, sanitary sewage, and stormwater drainage). The plan also contains detailed information (e.g., locations of storm drain inlets, nearest surface water, nearest telephone, etc.) for any area where there is potential for a large spill (e.g., aboveground storage tanks, hazardous materials storage areas, etc.).

The installation fire department is the first responder to all spills. It is responsible for stopping leaks, ensuring human safety, and containing spills. ECB staff is responsible for reporting the spill to the necessary state or federal agency (depending on the location of the spill) and performing appropriate clean up and mitigation as required by the agency. Fort Belvoir staff always meets or exceeds mitigation requirements. In cases where spill response staff believe that there may be damage to wildlife or special natural areas, the NRB staff is informed and provides input to clean-up and mitigation. Likewise, if NRB staff notice damage to wildlife, water, or vegetation that may be due to a leak or spill, spill response staff is immediately notified and an investigation ensues.

## 15.10 PETROLEUM STORAGE TANK COMPLIANCE PROGRAM

Fort Belvoir's petroleum storage tank compliance program is administered in accordance with all applicable federal, state, and Army (AR 200-1) regulations. This program addresses all compliance aspects related to the use and storage of petroleum in both aboveground and underground storage tanks. As new storage tanks are installed, the post specifies the installation of a tank system that would meet the requirements of all applicable regulations regardless of whether or not the system is actually regulated. This typically includes automatic tank gauging/monitoring systems, secondary containment, and spill, overfill, and corrosion protection.

Under its underground storage tank management and removal program, Fort Belvoir has upgraded all regulated tank systems (to meet the requirements of 40 CFR 280) and continues to remove and upgrade tank systems as warranted.

At sites where confirmed petroleum releases have been identified, Fort Belvoir coordinates with the VDEQ to satisfy reporting and further action requirements. Further actions are generally required when there is an unacceptable risk to human health or the environment, when liquid-phase hydrocarbons (typically referred to as "free produce") exist on groundwater, or when soil is saturated with petroleum. In all cases, Fort Belvoir maintains compliance with the VDEQ requirements.

## 15.11 INTEGRATED SOLID WASTE MANAGEMENT PLAN

Fort Belvoir's Integrated Solid Waste Management Plan (ISWMP) was initially prepared in 1995 and last updated in 1999 (Vista Technologies, 1999). The ISWMP provides the framework to facilitate and maintain compliance with applicable federal, state, local, and Army solid waste management regulations. The primary goal of the IWMP is to reduce materials that must be disposed of by incineration or landfilling. In general, the planning goal is to use integrated solid waste management planning to reduce solid waste management costs and potential environmental impacts while improving overall solid waste management. The current plan is projected for a 10-year period from 1999 through 2008. The goals and actions in the ISWMP are consistent with the INRMP. ECB staff will coordinate with NRB staff as needed to satisfy the goals of the ISWMP and this INRMP.

## 15.12 SOLID WASTE LANDFILL POSTCLOSURE PLANS

Fort Belvoir has no active landfills. However, the installation manages two closed landfills that are regulated by VDEQ (Cullum Woods Municipal Waste Landfill and Theote Debris Landfill) and several small landfills that are regulated under the federal Resource Conservation and Recovery Act (RCRA).

In accordance with Virginia solid waste management regulations, Fort Belvoir prepared postclosure plans for both the Cullum Woods Landfill (SCS Engineers, 1993) and the Theote Debris Landfill (U.S. Army Corps of Engineers, 1993). The postclosure plans outline necessary measures to assess, evaluate, and manage the landfills to reduce potential for harm to human health and the environment. Methane and groundwater monitoring occur regularly at both landfills and groundwater and methane remediation/mitigation efforts are underway at the Cullum Woods Landfill. In addition, semi-annual inspections of each landfill are conducted to evaluate the integrity of the landfill cover and ensure that there are no erosion issues. The INRMP calls for conversion of grasslands from exotic, low value wildlife cover to native, high-value early and transitional successional habitat conditions for several landfill sites. ECB personnel will coordinate with NRB staff to select native seed mixtures and mowing cycles for the landfills that provide food and cover for wildlife.

## 15.13 SOLID WASTE MANAGEMENT UNITS PROGRAM

Solid waste management units (SWMUs), areas where solid waste is stored, managed, treated, or generated, are defined and regulated under RCRA. There are a total of 238 SWMUs at Fort Belvoir, as identified through a series of studies (U.S. Army, 1982; A.T. Kearney, 1988; and CH2MHill, 1992). Since 1992, Fort Belvoir has evaluated each SWMU and prepared action plans for all of the SWMUs at the Main Post and EPG (Dewberry & Davis, 1999a and 1999b). The action plans guide the investigations and closure procedures for a SWMU. During the management and closure of SWMUs, ECB staff reports any scenarios that have the potential to impact natural resources to the NRB staff for input.

## 15.14 ENVIRONMENTAL TRAINING PROGRAM

Fort Belvoir ECB and NRB staff determine training requirements and ensure that the necessary training is provided. Environmental training related to natural resources health at Fort Belvoir has included:

- Hazardous waste management training – conducted to meet RCRA requirements and to satisfy the conditions in Fort Belvoir's Part-B permit
- Hazardous waste facility operators course (and refresher) – required under 40 CFR 264, Protection of Environment
- Hazardous waste generators course (and refresher) – required under 40 CFR 264 and 40 CFR 265
- Oil spill control and recover training – required pursuant to the Clean Water Act, the Oil Pollution Act, and the Master Spill Plan
- Emergency spill response exercise – required in accordance with the Master Spill Plan
- Booming safety training – required in accordance with the Master Spill Plan
- Erosion and sediment control training and stormwater management training – pursuant to the requirements of federal and state guidelines, class content is in accordance with the Virginia Erosion and Sediment Control Field Manual and the Virginia Stormwater Management Handbook
- Degreasing equipment training – conducted as a pollution prevention exercise

The environmental training courses are consistent with the goals and objectives outlined in this INRMP. Additional courses are added when required by law or deemed necessary by NRB and ECB staff.

# *References*


Allen, H.H., M. Jourdan, and N.R. Oswalt. 1999. *Watershed-based Stream Corridor Management and Protection Fort Belvoir, VA*. Preliminary Final Report Prepared for U.S. Army Garrison, Fort Belvoir Directorate of Installation Support Environmental and Natural Resource Division. 36 pp + appendices.

American Bird Conservancy. Undated. *Cats Indoors! The Campaign for Safer Birds and Cats*. Internet URL: http://abcbirds.org/catsindoors.htm . Accessed on November 14, 2000.

Ator, S.W., J.D. Blomquist, J.W. Brakebill, J.M. Denis, M.J. Ferrari, C.V. Miller, and H. Zappia. 1998. *Water Quality in the Potomac River Basin, Maryland, Pennsylvania, Virginia, West Virginia, and the District of Columbia, 1992-1996*: U.S. Geological Survey Circular 1166, Internet URL: http://water.usgs.gov/pubs/circ1166, updated June 10, 1998.

Bartley, B. 2000. Personal communication: Flower beds and mowed areas inventory. Horne Engineering Services, Inc. 1 February 2000.

Begon, M., J. L. Harper, and C. R. Townsend. 1996. *Ecology – Individuals, Populations, and Communities*. 3rd Edition. Blackwell Science, Ltd. Page 917.

Bland, S.A. 1999. Personal communication: Up-to-date real property information. Horne Engineering Services, Inc. 22 January 1999.

Carroll, A. 1999. Fort Belvoir. Personal communication: Privatization of utilities. Horne Engineering Services, Inc. 22 January 1999.

Carter, M. F., W. C. Hunter, D. N. Pashley, and K. V. Rosenberg. 2000. *Setting conservation priorities for landbirds in the United States: the partners in flight approach*. Auk 117:541-548.

Cheek, J. 2000. Personal communication: Deer population and hunting activity on Fort Belvoir. Horne Engineering Services, Inc. 27 April 2000.

Cline, Keith, 1996. *Management Guidelines and Recommendations for Fort Belvoir.* (Regarding Bald Eagle). Virginia Department of Game & Inland Fisheries.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. Prepared for Office of Biological Services, U.S. Fish and Wildlife Service, Washington, D.C.

Davey Resource Group. 2000. Fort Belvoir Urban Forest Inventory. Prepared for U.S. Army Garrison, Fort Belvoir Directorate of Public Works Environmental and Natural Resource Division, Fort Belvoir, Virginia

Deer Management Planning Committee, Virginia Department of Game and Inland Fisheries. 1999. *Virginia Deer Management Plan, Wildlife Information Publication No. 99-1.* 68 pp.

DeSante, D.F., D.R. O'Grady, K.M. Burton, P. Velex, D. Froehlich, E.E. Fuess, H. Smith and E.D. Ruhlen. 1998. *The Monitoring Avian Productivity and Survivorship (MAPS) Program Sixth and Seventh Annual Report (1995 and 1996).* Bird Populations 4: 69-122.

Dewberry and Davis. 1998. *Master Spill Plan.* Fort Belvoir, Virginia.

Donodeo, K. 2000. Personal communication: Washington Metropolitan Transit Authority Transit Service Expansion Plan. Horne Engineering Services, Inc. 15 February 2000.

EA Engineering, Science & Technology, Inc (EA). 1998. *Summer 1998 Data Report for Aquatic Investigations and Stream Monitoring of Fort Belvoir, Virginia – Draft.* Prepared for the Department of the Army, U.S. Army Garrison, Fort Belvoir Directorate of Installation Support, Fort Belvoir, Virginia. 11 pp + tables and figures.

EA Engineering, Science & Technology, Inc. (EA). 1999a. *Fort Belvoir Anadromous Fish Study Report.* Draft Report.

EA Engineering, Science & Technology, Inc. (EA). 1999b. *Fall 1998 Data Report for Aquatic Investigations and Stream Monitoring of Fort Belvoir, Virginia*. Draft Report.

EA Engineering, Science & Technology, Inc. (EA). 1999c. *Spring 1999 Data Report for Aquatic Investigations and Stream Monitoring of Fort Belvoir, Virginia*. Draft Report.

EA Engineering, Science & Technology, Inc. (EA). 2000. *Summary Report for Aquatic Investigations and Stream Monitoring of Fort Belvoir, Virginia.* Prepared for U.S. Army Garrison, Fort Belvoir Directorate of Installation Support Environmental and Natural Resources Division, Fort Belvoir, Virginia.

Eberly, C. in preparation. *Fort Belvoir Bird Management Plan*.

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual Technical Report*
*Y-87-1*. U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi.

Environmental Protection Agency. 1997. *America's Wetlands, Our Vital Link: Status and Trends*. Internet URL: http://www.epa.gov/OWOW/wetlands/vital/status.html. Accessed on November 13, 2000.

Ernst, C.H., S.W. Sekscienski, A. Sinclair, and A. Laemmerzahl, 1990. *Evaluation of Vertebrate Diversity at Fort Belvoir, Fairfax County, Virginia.*

Ernst, C.H., J.C. Wilgenbusch, D.R. Morgan, T.P. Boucher and M. Sommerfield, 1995. Fishes of Fort Belvoir, Virginia. *The Maryland Naturalist*. 39 (3-4): 1 - 60.

Ernst, C.H., S.C. Belfit, S.W. Sekscienske, and A.F. Lammerzahl. 1997a. The Amphibians and Reptiles of Fort Belvoir and Northern Virginia. *Bulletin of the Maryland Herpetological Society*. 33(1). [Department of Biology, George Mason University, Fairfax, Virginia 22030-4444, USA.]

Ernst , C.H., P.S. Miller, A.F. Laemmerzahl and T.P. Boucher. 1997b. The Mammals of Fort Belvoir, Virginia. *The Maryland Naturalist*. 41 (3-4). [Department of Biology, George Mason University, Fairfax, Virginia 22030-4444, USA.]

Ernst, C.H., T.R. Brophy, M. Cogliano, S.E. D'Alessandro, C.M. Ernst, K.A. Hansknecht and A.F. Laemmerzahl, 1998. *Fort Belvoir Forest and Wildlife Corridor Monitoring Study*. [Department of Biology, George Mason University, Fairfax, Virginia 22030-4444, USA.]

Faha, T. 2000. Wastewater Permits Manager. Virginia Department of Environmental Quality, Northern Regional Office. Personal Communication: Wastewater permitting. Horne Engineering Services, Inc. 25 February 2000.

Fairfax County. 1995. *The Comprehensive Plan For Fairfax County, Virginia*. Fairfax County Government Publications Center, 12000 Government Center Parkway, Ste. 156, Fairfax, Virginia. 487 pp.

Fairfax County. 2000a. *Department of Public Works and Environmental Services, County Sanitary Sewer System: Norman M. Cole, Jr. Pollution Control Plant*. URL: http://www.co.fairfax.va.us/gov/dpw/sss/wwtrmnt.htm. Accessed February 15, 2000.

Fairfax County. 2000b. *One-Year Operational Plan for Fairfax County Integrated Deer Management Plan*. A collaborative effort of Natural Resource Consultants, Inc., Fairfax County staff, Virginia Department of Game and Inland Fisheries, and the Northern Virginia Regional Park Authority.

Fairfax County Park Authority. 1998. Brochure – *Lake Accotink Historical Facts*. Fairfax County Park Authority, Fairfax, Virginia.

FEMA. March 5, 1990 update. Flood Insurance Rate Maps for Fairfax County.

Fischer, R.A., M.P. Guilfoyle and G. Fleming, 1999. *Avian Inventory, Monitoring and Management on U.S. Army Garrison Fort Belvoir, Virginia*. Summer, 1998. U.S. Army Waterways Experiment Station, Vicksburg, Mississppi. 9 pp + appendices.

Fleming. G.W. 2000. Personal communication: Rare bird species on Fort Belvoir. Horne Engineering Services, Inc. 20 November 2000.

Fleming, G.W., ed. 1998. *Checklist of the Birds in the Fort Belvoir, Virginia Area*. Pamphlet prepared by the U.S. Army Garrison Fort Belvoir Directorate of Installation Support Environmental and Natural Resource Division.

Gibson, T. 1999. Fort Belvoir. Personal communication: Outdoor recreation at Fort Belvoir. Horne Engineering Services, Inc. 4 February 1999.

Goodman, S.W. 1994. *Memorandum for Assistant Secretary of the Army, Navy, and Air Force on Implementation of Ecosystem Management in the DoD*. Office of the Under Secretary of Defense, Washington, D.C.

Groeneveld, M. 2000. Personal communication: Construction projects for FY 90 through FY05. Fort Belvoir Environmental and Natural Resources Division. 7 December 2000.

Grogin, L. and M.A. Widdowson. 1998. *Groundwater Flow Modeling of the Aquifer System at Fort Belvoir: Phase I Report.* Prepared by The Charles E. Via, Jr., Department of Civil and Environmental Engineering Virginia Polytechnic Institute and State University. Submitted to Law Engineering and Environmental Services. 14 pp + appendices.

Hobson, C.S. 1996. *A Natural Heritage Inventory of U.S. Army Fort Belvoir, Virginia. Natural Heritage Technical Report 96-03.* Virginia Department of Conservation and Recreation, Division of Natural Heritage, Richmond, Virginia. Unpublished report submitted to U.S. Army Fort Belvoir, Directorate of Public Works – Environmental and Natural Resources Division. February 1996. 57 pp. plus appendices.

Hobson, C. S. 1997. *A Natural Heritage Zoological Inventory of U.S. Army Fort Belvoir. Natural Heritage Technical Report 97-5.* Virginia Department of Conservation and Recreation Division of Natural Heritage, Richmond. Unpublished report submitted to U.S. Army Fort Belvoir, Directorate of Public Works – Environmental and Natural Resources Division. 23 pp + appendix.

Hunter, W. C., M. F. Carter, D. N. Pashley, and K. Barker. 1994. The Partners In Flight prioritization scheme. Pp. 109-119 in D. Finch and P Stangel (eds.), *Status and Management of Neotropical Migratory Birds*. U.S.D.A. General Technical Report RM-229, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado.

Jones, C.R. and D.P. Kelso. 1996. *An Ecological Study of Gunston Cove Final Report.* Prepared by the Department of Biology, George Mason University. Submitted to the Department of Public Works County of Fairfax, Virginia.

Jones, C.R. and D.P. Kelso. 1998. *Fort Belvoir Aquatic Studies 1995-96 Final Report.* Prepared by the Department of Biology, George Mason University. Submitted to the U.S. Army Garrison Fort Belvoir. 52 pp.

Jones, C.R. and D.P. Kelso. 1999. *Fort Belvoir Aquatic Studies 1997 Final Report*. Prepared by the Department of Biology, George Mason University. Submitted to the U.S. Army Garrison Fort Belvoir. 62 pp.

Kicos, M. 2000. Personal communication regarding Fort Belvoir's volunteer program. Horne Engineering Services, Inc. 21 April 2000.

Killeffer, S. 2000. *Natural Heritage Resources of Virginia: Rare Vascular Plants*. Virginia Department of Conservation and Recreation, Division of Natural Heritage, Richmond, Virginia. April 2000. Internet URL: http://www.dcr.state.va.us/dnh/plantlst00.pdf. Accessed 7 December 2000.

King, D. 1999. Personal communication: Fort Belvoir Marina. Horne Engineering Services, Inc. 4 February 1999.

Landgraf, Christopher. 1999. *Watershed Delineation Project and Problem Site Descriptions, Including Maps and Photographs*. Prepared for the Environmental and Natural Resources Division, U.S. Army Garrison, Fort Belvoir, Directorate of Installation Support, Fort Belvoir, Virginia by Performance Group, Inc. March 1999.

Landgraf, C. 2000a. Personal communication: Fort Belvoir acreage verifications. Horne Engineering Services, Inc. 25 February 2000.

Landgraf, C. 2000b. Personal communication: Fort Belvoir acreages and linear miles of trails / shoreline. Horne Engineering Services, Inc. 11 April 2000.

Landgraf, C. 2000c. Personal communication: Fort Belvoir utilities information / linear miles of roads. Horne Engineering Services, Inc. 15 June 2000.

Law Engineering and Environmental Services. 1995. *Updated Site Characterization Report*, Building 1803. 4 pp.

Leslie, M., G.K. Meffe, J.L. Hardesty, and D.L. Adams. 1996. *Conserving Biodiversity on Military Lands: A Handbook for Natural Resources Managers*. The Nature Conservancy, Arlington, Virginia.

Lisle, L.D. 1999. Fort Belvoir. Personal communication: Land use changes at Fort Belvoir. Horne Engineering Services, Inc. 23 February 1999.

Lovelace, D. 1999. *Fort Belvoir Deer Herd Health Evaluation*. March 2, 1999. 2pp.

McCoy, K.M. and G.P. Fleming, 2000. Ecological Communities of the U.S. Army Garrison, Fort Belvoir. Fort Belvoir, Virginia. Natural Heritage Tech. Rep. 00-08, Virgnia Dept. of Conservation and Recreation, Division of Natural Heritage, Richmond. Unpublished report submitted to the U.S. Army. 156 pp. plus appendices.

Mitchell, J.C., Ph.D. 1998. *Amphibian Decline in the Mid-Atlantic Region: Monitoring and Management of a Sensitive Resource Final Report.* Prepared by the Department of Biology, University of Richmond. Submitted to the Legacy Resource Management Program U.S. Department of Defense. 10 pp.

Nelson, Harvey K., and Robert B. Oetting. 1998. Giant Canada goose flocks in the United States. Pp. 483-495 in D.H. Rush, M.D. Samuel, D.D. Humburg, and B.D. Sullivan, eds. *Biology and Management of Canada Geese*. Proc. Int. Canada Goose Symp. , Milwaukee, Wisconsin. Jamestown, North Dakota: Northern Prairie Wildlife Research Center Home Page. http://www.npwrc.usgs.gov/resource/1999/gcanada/gcanada.htm.

Norman, G. 2000. Personal communication with VDGIF: Turkey hunting on Fort Belvoir. Fort Belvoir ENRD, 24 August 2000.

North American Resource Management, Inc. 1991. Fort Belvoir Timber Inventory. Prepared for U.S. Army Garrison, Fort Belvoir Directorate of Public Works Environmental and Natural Resource Division, Fort Belvoir, Virginia

Owens, B. 2000. Personal communication with DIS-ENRD: Fort Belvoir Utilities. Horne Engineering Services Inc. November 2000

Paciulli, Simmons & Associates, Ltd. 1993. *Fort Belvoir Forest and Wildlife Corridor Management Plan*. Prepared for U.S. Army Garrison, Fort Belvoir Directorate of Public Works Environmental and Natural Resource Division, Fort Belvoir, Virginia.

Paciulli, Simmons & Associates, Ltd. 1996. *Fort Belvoir Grassland Habitat Management Plan.* Prepared for the Fort Belvoir Directorate of Engineering and Housing, Environmental and Natural Resources Division, Fort Belvoir, Virginia. 17 pp. plus appendices.

Paciulli, Simmons & Associates, Ltd. 1997a. *Wetlands Mapping Fort Belvoir, Virginia.* Prepared for U.S. Army Garrison, Fort Belvoir Directorate of Public Works Environmental and Natural Resource Division, Fort Belvoir, Virginia.

Paciulli, Simmons & Associates, Ltd. 1997b. *Wetland Mitigation Site Assessment Fort Belvoir, Virginia.* Prepared for US Army Garrison, Fort Belvoir Directorate of Installation Support Environmental and Natural Resources Division, Fort Belvoir, Virginia. 10 pp + appendices.

Paciulli, Simmons & Associates, Ltd. 1998a. *Vegetation Cover Map Project Fort Belvoir, Virginia.* Prepared for the U.S. Army Garrison, Fort Belvoir Directorate of Public Works Environmental and Natural Resource Division, Fort Belvoir, Virginia.

Paciulli, Simmons & Associates, Ltd. 1998b. *Comprehensive Management Plan for the Fort Belvoir Refuge Complex.* Prepared for the U.S. Army Garrison, Fort Belvoir Directorate of Public Works Environmental and Natural Resource Division, Fort Belvoir, Virginia.

Paciulli, Simmons & Associates, Ltd. 1999a. *Vegetation Cover Map Project Fort Belvoir, Virginia.* Prepared for the U.S. Army Garrison, Fort Belvoir Directorate of Public Works Environmental and Natural Resource Division, Fort Belvoir, Virginia.

Paciulli, Simmons & Associates, Ltd. 1999b. *Wetlands Mapping Engineering Proving Grounds, Fort Belvoir, Virginia.* Prepared for U.S. Army Garrison, Fort Belvoir Directorate of Public Works Environmental and Natural Resource Division, Fort Belvoir, Virginia.

Paciulli, Simmons & Associates, Ltd. 1999c. *Wetland Mitigation Site Assessment Fort Belvoir, Virginia.* Prepared for US Army Garrison, Fort Belvoir Directorate of Installation Support Environmental and Natural Resources Division, Fort Belvoir, Virginia. 8 pp + appendices.

Paciulli, Simmons & Associates, Ltd. 1999d. *Fort Belvoir Forest and Wildlife Corridor Management Plan- Update*. Prepared for U.S. Army Garrison, Fort Belvoir Directorate of Public Works Environmental and Natural Resource Division, Fort Belvoir, Virginia.

Paciulli, Simmons & Associates, Ltd. 2000a. *Bald Eagle Management Plan Fort Belvoir, Virginia*. Prepared for the Environmental and Natural Resources Division Directorate of Installation Support, Fort Belvoir, Virginia.

Paciulli, Simmons & Associates, Ltd. 2000b. *Invasive Exotic Vegetation Management Plan Fort Belvoir, Virginia.* Prepared for U.S. Army Garrison, Fort Belvoir Directorate of Installation Support Environmental and Natural Resource Division. 36 pp + appendices.

Pyle, P., D. R. O'Grady and D.F. DeSante, 1999. *The 1998 Annual Report of the Monitoring Avian Productivity and Survivorship (MAPS) Program on Military Installations and Other Federal Lands in the Midwest and East; Fort Leavenworth and Sunflower Army Ammunition Plant; Fort Leonardwood; Crane Naval Surface Warfare Center; Jefferson Proving Ground; Fort Know; Fort Belvoir, Mason Neck NWR, and Fort A.P. Hill; Fort Bragg; and the Tidewater Navy Installation. Abridged For Fort Belvoir, Mason Neck NWR, and Fort A.P. Hill*. The Institute for Bird Populations.

R. Christopher Goodwin & Associates. Undated. *Fort Belvoir: Host to History*. Prepared for the U.S. Army Garrison Fort Belvoir and the Department of Defense Legacy Resource Management Program, Fort Belvoir, Virginia. 29 pp.

R. Christopher Goodwin & Associates. 2000 draft. Fort Belvoir Integrated Cultural Resources Management Plan. Prepared for the U.S. Army Garrison Fort Belvoir and the Department of Defense Legacy Resource Management Program, Fort Belvoir, Virginia. 168 pp.

Rihle, D., SSG. 1998. Personal communication: Fort Belvoir Military Mission Statement. Horne Engineering Services, Inc. 10 November 1998.

Robinson, MSG Russell. 2000. Personal communication: United States Army Reserve, 299th Engineer Company, Fort Belvoir, Virginia. Horne Engineering Services, Inc. 4 April 2000.

Roble, S.M. 1999. *Natural Heritage Resources of Virginia: Rare Animals*. Virginia Department of Conservation and Recreation, Division of Natural Heritage, Richmond, Virginia. April 1999. Internet URL: http://www.dcr.state.va.us/dnh/anlist99.pdf. Accessed 7 December 2000.

Rosenberg, K. V. and J. V. Wells. 2000. Global Perspectives on Neotropical Migrant Conservation in the Northeast: Long-term Responsibility vs. Immediate Concern. In R. E. Bonney, D. Pashley, R. J. Cooper, and L. Niles (Eds.). *Strategies for bird conservation: The Partners in Flight planning process*. Cornell Lab of Ornithology. Internet URL: http://birds.cornell.edu/pifcapemay/ . Accessed 16 November 2000.

SCS Engineers. 1993. *Post-Closure Plan, Theote Debris Landfill*. 49 pp. plus appendices.

Senires-Dubyak, S. 2000. Personal communication: Housing and residential statistics. Horne Engineering Services, Inc. 4 April 2000.

Terwilliger, K. 1991. *Virginia's Endangered Species*. Blacksburg, Virginia: The McDonald and Woodward Publishing Company.

Thorp, J.H., and A.P. Covich (eds.). 1991. *Ecology and classification of North American freshwater invertebrates*. Academic Press.

United States Department of the Air Force (U.S. Air Force). 1998. Combat Climatology Center, Davison Army Airfield. *Operational Climatic Data Summary – January 1973 through December 1997*. 9 pp.

United States Department of the Army (U.S. Army). 1989. *Map of Fort Belvoir Special.* 30th Engineer Battalion (Topo), Fort Belvoir, Virginia.

U.S. Army Corps of Engineers (U.S. Army). 1992. *Final Environmental Impact Statement: Engineer Proving Ground, Fort Belvoir, Virginia*. U.S. Army Corps of Engineers, Baltimore District.

U.S. Army Corps of Engineers (U.S. Army). 1993. *An Update Closure Plan For Columm Woods Municipal Waste Landfill*. 21 pp. plus appendices.

United States Department of the Army (U.S. Army). Undated. Fort Belvoir Environmental Protection Specifications Applicable to Construction Contracts.

United States Department of the Army (U.S. Army). 1994. Fort Belvoir Regulation 210-27: *Installations Range Procedures and Utilization of Training Areas*. 41 pp.

United States Department of the Army (U.S. Army). 1997. *New Rules Aid Army Training, Protect Rare Woodpeckers*. U.S. Army Environmental Center, Environmental Update. Winter, 1997 edition.

United States Department of the Army (U.S. Army). 1999. *Accotink Bay Wildlife Refuge* [guide]. Fort Belvoir Virginia: U.S. Army, Fort Belvoir.

United States Department of the Army (U.S. Army). 2000a. USAGFB Policy Letter #200-04-00. Memorandum: *Integrated Pest Management Policy*.

United States Department of the Army (U.S. Army). 2000b. USAGFB Integrated Pest Management Plan. Unpublished document. Last revision 20 September 2000.

United States Department of the Army (U.S. Army). 2000c. Fort Belvoir Regulation 40-905: *Animal Control* 8 pp.

United States Department of the Army (U.S. Army). 2000d. USAGFB Policy Letter #420-22-00. Memorandum: *Tree Removal and Protection Policy*.

United States Department of the Army (U.S. Army). 2000e. USAGFB Policy Letter #420-26-00. Memorandum: *Excavation Work Permit Requirements and Procedures.*

United States Department of the Army (U.S. Army). 2000f. *USAGFB Fort Belvoir Strategic Plan for 2002*. Fort Belvoir Virginia: U.S. Army, Fort Belvoir.

United States Department of the Army (U.S. Army). 2000g. USAGFB Communities of Excellence Nomination Package: Fort Belvoir. U.S. Army Headquarters, Washington, D.C.

United States Department of the Army (U.S. Army). 2000h. USAGFB Policy Letter #40-14-00. Memorandum: *Pet Control on Post*.

United States Department of the Army (U.S. Army). 2000i. USAGFB Directorate of Installation Support (DIS). Letter from Lieutenant Colonel David J. Farace to Mr. Kultar Singh of the Virginia Department of Environmental Quality regarding the Fort Belvoir Water Withdrawal Report for 1999. 8 February 2000.

United States Department of Defense (U.S. DoD). 1998. *Restoring and Protecting the Chesapeake Bay: A Department of Defense Initiative, 1984-1997*. Office of the Deputy Under Secretary of Defense (Environmental Security), Washington, D.C.

United States Environmental Protection Agency (U.S. EPA). 1997. Field and Laboratory Methods for Macroinvertebrates and Habitat Assessment of Low Gradient Nontidal Streams, Mid-Atlantic Coastal Streams Workshop, Environmental Services Division, U.S. Environmental Protection Agency Headquarters, Region 3, Wheeling, West Virginia. 23 pp.

United States Environmental Protection Agency (U.S.EPA). 1999a. *Chesapeake Bay Wetlands: Wetland Loss Continues*. U.S. EPA, Region 3, Chesapeake Bay Program. Internet URL: http://www.chesapeakebay.net/status/WetlandLoss.cfm?SUBJECTAREA=WETLAND. Accessed on November 13, 2000.

United States Environmental Protection Agency (U.S.EPA). 1999b. *Chesapeake Bay Forests: Forest Acreage Declining*. U.S. EPA, Region 3, Chesapeake Bay Program. Internet URL: http://www.chesapeakebay.net/status/forestdecline.cfm?SUBJECTAREA=ABOUT_THE_BAY. Accessed on November 1, 2000.

United States Environmental Protection Agency (U.S.EPA). 2000a. Internet site for American Heritage Rivers Initiative. Internet URL: http://www.epa.gov/rivers/98rivers/fspotoma.html Accessed 18 January 2000.

United States Environmental Protection Agency (U.S.EPA). 2000b. Region III, Chesapeake Bay Program Office. Internet URL: http://www.chesapeakebay.net/info/pop.cfm. Accessed 27 March 2000.

United States Fish and Wildlife Service (U.S. FWS). 1990. *Chesapeake Bay Region Bald Eagle Revised Recovery Plan*. Chesapeake Bay Region Bald Eagle Recovery Team and Region Five U.S. Fish and Wildlife Service.

United States Fish and Wildlife Service (U.S. FWS). 2000. *Bald Eagle Guidance for Virginia*, U.S. FWS, Virginia Field Office. May, 2000.

United States Soil Conservation Service (U.S. SCS). 1982. *Soil Survey Report: Fort Belvoir, VA*. U.S. Department of Agriculture, Soil Conservation Service, Richmond, Virginia. 256 pp.

Virginia Department of Conservation and Recreation (VA DCR). Undated. *Native Plants for Conservation Landscaping and Restoration*. Internel URL: http://www.dcr.state.va.us/dnh/native.htm. Accessed November 21, 2000.

Virginia Department of Conservation and Recreation (VA DCR). 1992. *Virginia Erosion and Sediment Control Handbook*, 3rd Edition. Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 203 Governor St., Ste. 206, Richmond, Virginia 23219-2094

Virginia Department of Conservation and Recreation (VA DCR). 1999. *Virginia Stormwater Management Handbook*, 1st Edition. Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 203 Governor St., Ste. 206, Richmond, Virginia 23219-2094.

Vista Technologies. 1999. Fort Belvoir Integrated Solid Waste Management Plan. Prepared for the U.S. Army Garrison, Fort Belvoir Directorate of Public Works Environmental and Natural Resource Division, Fort Belvoir, Virginia

Washington Metropolitan Area Transit Authority (WMATA). 1999. *Transit Service Expansion Plan*. WMATA, Washington, D.C. 16 pp.

Watts, B.D., 1999. *Partners in Flight: Mid-Atlantic Coastal Plain Bird Conservation Plan (Physiographic Area # 44)*. Draft. College of William and Mary, Center for Conservation Biology.

Wilson, E. O. 1992. *The Diversity of Life*. Cambridge, Massachusetts. Harvard University Press.

Wells, E.F. 1999. *Fort Belvoir Plant List*. George Washington University.

Woolpert. 1993a. *Real Property Master Plan Long Range Component: Fort Belvoir*. Alexandria, Virginia: Woolpert. 254 pp.

Woolpert. 1993b. *Real Property Master Plan Long Range Component Environmental Assessment: Fort Belvoir*. Alexandria, Virginia: Woolpert. 66 pp + maps.

Woolpert. 1995. *Real Property Master Plan Installation Design Guide: Fort Belvoir*. Alexandria, Virginia: Woolpert. 536 pp.

# APPENDICES

# APPENDIX A

## MEMORANDUM OF AGREEMENT
## FOR
## COOPERATIVE LAW ENFORCEMENT
## BETWEEN THE
## U.S. FISH AND WILDLIFE SERVICE
## AND
## FORT BELVOIR

United States Department of the Interior

FISH AND WILDLIFE SERVICE
300 Westgate Center Drive
Hadley, MA 01035-9589

TAKE PRIDE IN AMERICA

# MEMORANDUM OF AGREEMENT
## for Cooperative Law Enforcement between the U.S. Fish and Wildlife Service and Fort Belvoir, Virginia

This Memorandum of Agreement is a cooperative agreement entered into under authority of the Fish and Wildlife Improvement Act of 1978 Section 3-(a)-(d), 16 U.S.C. Section 742L (1982 Supp) between the U.S. Fish and Wildlife Service, hereinafter "Service" or "Regional Director" and Fort Belvoir, Virginia hereinafter "the Installation."

Whereas, the Congress of the United States has found that the protection and conservation of fish, wildlife, and other natural resources is in the best interest of the public and have enacted various laws to provide for protection and conservation of wildlife and native plants to prevent, detect, and reduce violation of conservation laws and to apprehend violators of such laws.

Whereas, the Service and the Installation recognize that mutual benefits will accrue to the law enforcement efforts of each by entering into a cooperative agreement to share law enforcement expertise, training, intelligence information, specialized equipment, and other facilities and to designate law enforcement officers to efficiently enforce all laws administered by the U.S. and the Installation relating to fish, wildlife, and other natural resources.

Whereas, the Regional Director has determined that it is necessary and appropriate to utilize certain officers, services, and facilities of the Installation to assist in providing effective enforcement of Federal laws on the lands and waters and within the Installation.

Whereas, the Installation has determined that it is necessary and appropriate to utilize certain officers, services, and facilities of the Service to assist in providing effective enforcement of Federal laws on the lands and waters and within the Installation.

Therefore, the parties agree that:

A. <u>Delegation of Federal Authority</u>:

(1) The Regional Director hereby delegates to the Installation the authority to enforce the following Federal laws dealing with the protection and conservation of fish,

wildlife, and natural resources of the United States and regulations issued pursuant thereto within the limitations of and subject to the jurisdiction of the laws of the State:

(a) Lacey Act Amendments of 1981 (16 U.S.C. 3371-3378);

(b) Migratory Bird Treaty Act (16 U.S.C. 703-712);

(c) Migratory Bird Hunting and Conservation Stamp Tax Act (16 U.S.C. 718-718h);

(d) Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d);

(e) Airborne Hunting Act (16 U.S.C. 742J-1);

(f) National Wildlife Refuge Systems Administrative Act (16 U.S.C. 668dd-668ee);

(g) Endangered Species Act of 1973 (16 U.S.C. 1531-1543);

(h) Marine Mammal Protection Act (16 U.S.C. 1361-1384, 1401-1407);

(i) Archeological Resources Protection Act of 1979 (16 U.S.C. 470a.(A)-(1)(A).

(2) The Regional Director specifically delegates to the Installation the same authority to search, seize, arrest, and exercise other law enforcement functions under the laws specified in paragraph A(1) of this Agreement as if the Installation were employed by the Department of Interior, and authorized by the Secretary of Interior to enforce those laws.

B. Redelegation of Federal Authority:

(1) The Installation, through the Garrison Commander, may designate individuals to exercise the authority to enforce the conservation laws and regulations of the United States as specified above. This delegation may only be to a person who meets all the following criteria:

(a) Is employed as a full-time wildlife law enforcement officer of the Installation, whose principal duty is the enforcement of conservation laws or native plant protection, who has completed one of the Federal Law Enforcement Training Center's basic law enforcement training courses, and who has completed any probationary period.

(b) Is proficient in the use of firearms as demonstrated by meeting the firearms qualification and requalification standards required of the U.S. Fish and Wildlife Service and agrees to observe the Service policy on use of firearms when acting pursuant to this Agreement.

(2) The Installation shall notify the Service of the full name, address, date of birth and social security number of each designee. This designation shall become effective upon the filing of such information with the Regional Director. The Installation shall issue a Service identification card (Form 3-522a) to each designee. If at any time, any person designated to exercise such authority under this Agreement fails to meet any of the criteria set forth in paragraph 1, above, the Installation shall terminate the designation when the Installation becomes aware of same, and shall promptly notify the Regional Director.

(3) An employee of the Installation who has been delegated authority under this Agreement may only exercise such authority within the boundaries of Virginia, District of Columbia, D.C. and within an adjacent State when circumstances so require. An officer of the Installation may exercise such authority anywhere within the jurisdiction of the United States when accompanied by a Special Agent of the Service or when under the direct supervision of the Service.

(4) The Regional Director may, by written notice to the Installation, terminate any designation made by the Installation.

(5) The Installation and officers to whom it has designated authority pursuant to this Agreement shall, while acting under this Agreement:

(a) Continue to provide compensation under current Installation coverage for work-related injuries while Installation officers are acting under this Agreement. Designated individuals may be considered eligible for compensation under Title 5 of Chapter 81, sub-chapter III, United States Code.

(b) Be considered to be investigative or law enforcement officers of the United States for the purpose of the tort claim provisions of Title 28, United States Code.

(c) Shall be considered to be officers or employees of the United States within the meaning of sections 111 and 1114 of Title 18, United States Code.

(d) Installation must recall and cancel any designation of authority upon termination of employment or reassignment of the officer concerned to non-law enforcement duties or upon notice that the person no longer meets any of the criteria for issuance of such authority. Notice of such recall or cancellation shall immediately be given to the Regional Director and the Assistant Regional Director, Law Enforcement Division, Virginia.

C. Procedures for Investigating Federal Offenses:

The following procedures shall govern any investigations or prosecutions of Federal offenses made pursuant to designation or redesignation under this Agreement:

(1) Officers of the Installation who are delegated authority under this Agreement may take necessary police actions for violations of the Federal laws that are the subject of this Agreement which occur in their presence or view. The Installation will refer appropriate violations of Federal law or regulation to the Service's Senior Resident Agent in Richmond, VA as expeditiously as possible.

(2) The Installation shall submit in a timely manner appropriate investigative or other reports to the Assistant Regional Director, Law Enforcement Division, or his designee, on law enforcement activities conducted under authority of this Agreement.

(3) Federal prosecution of any violation off the Installation may not occur without prior approval of the Assistant Regional Director, Law Enforcement Division, or his designee. Only the Assistant Regional Director, Law Enforcement Division, or his designee shall act in liaison and conduct case handling and referral to Federal statutes and regulations.

(4) The Service's interpretations and policies will be followed by the Installation law enforcement officers when exercising Federal enforcement authority under this Agreement off the Installation.

D. Coordination:

(1) The Assistant Regional Director, Law Enforcement Division, in Hadley, Massachusetts and/or the Senior Resident Agent in Richmond, VA, and the Garrison Commander of the Installation, or his designee, shall meet within thirty (30) days after the signing of this Agreement and as necessary thereafter for the purpose of:

(a) Identifying enforcement problems in areas of concurrent jurisdiction that may require joint enforcement operations or investigations;

(b) Identifying enforcement problems that may require covert investigation;

(c) Identifying the need for specialized law enforcement equipment;

(d) Discussing new techniques and methods for the detection and apprehension of violators of conservation laws and the exchange of law enforcement information in general;

(e) Reviewing training programs and the identification of the need for additional instruction in Federal laws, policies, interpretations, and other appropriate subjects; and

(f) Agreeing upon procedures for the care, handling, identification and storage of evidence and/or seized property.

E. Actions to be Taken by the Parties:

(1) The Service will provide to the Installation, subject to available resources and manpower, copies of Federal laws and regulations and pertinent Service policy and interpretations; the assistance of Special Agents and use of undercover vehicles and equipment for specific, high-priority enforcement operations.

(2) The Service will place a high priority on the investigation of major violations involving interstate transportation of illegally taken resident native wildlife and plants.

(3) The Installation will provide the Service, subject to available resources and manpower, copies of facility laws and regulations and pertinent policy and interpretations, assistance by Installation officers and use of equipment for specific enforcement operations.

F. Amendment, Effective Date and Termination:

(1) This Agreement shall become effective on the date signed by both parties, and filed with the Garrison Commander, and shall continue in effect until terminated;

(2) The Agreement may be revised or amended by consent of the parties, but such revisions or amendments shall not be effective until reduced to writing and signed by both parties; and

(3) This Agreement may be terminated by either party upon giving thirty (30) days written notice prior to termination.

Regional Director
U.S. Fish and Wildlife Service
Hadley, Massachusetts

Date: 11-9-95

THOMAS M. BRADY
COL, AG
Garrison Commander

Date: 2 Feb 1996

# APPENDIX B

## INTERAGENCY AGREEMENT
## BETWEEN
## THE U.S. ARMY ENVIRONMENTAL CENTER
## AND THE
## SOIL CONSERVATION SERVICE

# A Summary of the Interagency Agreement between U.S. Army Environmental Center and the Soil Conservation Service

***Participating Agencies:***
U.S. Army Environmental Center
Soil Conservation Service

***Objectives of the Program:***
Improve the integration of U.S. Army mission requirements with ecosystem planning as outlined in the MOU between the USAEC and the SCS.

***Date Effective:***
This Interagency Agreement (IAG) will remain in force for as long as the underlying MOU is valid or can be terminated by either agency upon 90 days written notice. Effective December 1, 1993.

***Other Information:***
SCS agrees to detail to the USAEC a person for a period of 1 year with four 1-year renewable options who will:

- Coordinate and assist individual SCS state offices and Army installation in the development of IAG's and scopes of work to meet the specific IAG requirements developed and outlined for each individual installation/state.
- Assist USAEC by working with SCS state, regional, and national offices to conduct quality assurance evaluations of the IAG and MOU implementation to ensure that this implementation has been performed efficiently and, through mutual sharing of the implementation results, eliminate duplication of work in development of new IAG and MOU agreements.
- Work with USAEC's Compliance Division managers, and Army installation staff to identify requests for ecosystem planning assistance for U.S. Army installation.
- Serve as a subject matter expert on environmental issues primarily concerning the prevention and mitigation of soil erosion; however, the individual may also include identification/assessment of other natural/cultural resource requirements.
- Assist SCS state offices and specific installations in the scheduling or work, planning, and installation of conservation methods.

# APPENDIX C

## INTERAGENCY AGREEMENT
## BETWEEN
## THE U.S. DEPARTMENT OF AGRICULTURE
## AND THE
## DEPARTMENT OF DEFENSE

**MEMORANDUM OF AGREEMENT**

**between the**

**UNITED STATES DEPARTMENT OF AGRICULTURE**

**and the**

**UNITED STATES DEPARTMENT OF DEFENSE**

**for the**

**CONDUCT OF FOREST INSECT AND DISEASE SUPPRESSION ON LANDS ADMINISTERED BY THE U.S. DEPARTMENT OF DEFENSE**

Suppression of damaging forest insect and disease outbreaks is essential for maintaining the health and productivity of the nation's forests. Annually, insects and diseases kill more trees and reduce forest growth more than all other destructive agents combined. This is a matter of great concern to the administrators responsible for managing and protecting forests on public and private lands.

Section 5 of the Cooperative Forestry Assistance Act of 1978 (16 U.S.C. 2101) authorizes the Secretary of Agriculture to protect trees and forests, wood products, stored wood and wood in use from insects and diseases. This is done directly by the USDA on National Forest System lands and in cooperation with other Federal land managing agencies, the States and private land owners on other forest lands. The Secretary of Agriculture has delegated the responsibility for carrying out the provisions of the Cooperative Forestry Assistance Act to the Forest Service. Annual appropriations, based on estimated suppression costs developed by the Forest Service, the Department of Defense, other Federal agencies, States and other cooperating entities, are necessary to implement this responsibility.

It is Agreed:

1. That the two Departments will, under the legal, fiscal and other limitations governing each, cooperate fully in the planning, coordination and execution of field operations to prevent and suppress damaging forest insect and disease outbreaks whenever it is determined to be necessary.

2. That the guiding principles of this cooperation shall be those established by authorizing legislation, agency policy and other direction specified in the Cooperative Forestry Assistance Act of 1978, the National Environmental Policy Act and the Federal Insecticide, Fungicide, and Rodenticide Act as amended.

3. That the Secretaries of the Department of Agriculture and the Department of Defense shall authorize their respective agencies concerned with the suppression of forest insects and diseases to develop and execute coordinated work programs and projects.

4. That, for coordinating and funding forest insect and disease suppression programs and projects, the Departments will:

A. *Responsibilities of the Department of Agriculture, Forest Service:*

(1) Designate an office which will be responsible for coordinating activities conducted under this MOA.

(2) Provide overall leadership and coordination for insect and disease suppression activities on forest lands when the activities are financed wholly or in part with Federal funds appropriated under Section 5 of the Cooperative Forestry Assistance Act of 1978 (16 USC 2101).

(3) To the extent possible, provide technical and financial assistance to agencies of the Department of Defense for forest insect and disease suppression programs and gypsy moth eradication projects on forest lands administered by the Department of Defense.

(4) Conduct detection surveys and biological evaluations of insect and disease outbreaks on forest lands administered by the Department of Defense.

(5) Subject to budgetary limitations, annually transfer from the USDA Forest Service, Forest Pest Management to Department of Defense Agencies such finances as are mutually determined as necessary for forest insect and disease suppression on forest lands administered by the Department of Defense. To the extent possible, jointly determine annual suppression funding needs by November 30.

(6) Assist agencies of the Department of Defense in organizing and performing general forest insect and disease field surveillance on forest lands administered by the Department of Defense.

(7) Inform local and national Department of Defense personnel of forest insect and disease conditions on other lands that may affect Department of Defense administered land.

(8) Suppress forest insect and disease outbreaks on National Forest System lands and cooperate with other agencies to suppress forest insect and disease outbreaks which threaten forest lands administered by the Department of Defense.

(9) Provide training opportunities for Department of Defense personnel in techniques for the prevention, detection and suppression of destructive forest insects and diseases in order to promote forest health.

b. *Responsibilities of agencies of the Department of Defense:*

(1) Designate an office which will be responsible for coordinating activities conducted under this MOA.

(2) Notify DoD Agencies that technical assistance is available from the Forest Service and that a biological evaluation or equivalent documentation is required before funds for a forest pest suppression project can be transferred from the Forest Service.

(3) Facilitate conduct of detection surveys and forest insect and disease evaluations by Forest Service personnel on Department of Defense administered lands.

(4) Base decisions on whether to implement suppression programs and projects on:

(a) An appraisal of current pest infestation significance and projected significance with and without suppression activities. This information, as well as a discussion of alternative pest management tactics, is provided by the Forest Service in a biological evaluation.

(b) An evaluation of the resources threatened within the context of management objectives.

(c) An analysis of possible adverse environmental effects of suppression alternatives.

(d) An economic analysis of the proposed action.

(5) Perform field surveillance and specialized detection surveys as necessary to supplement Forest Service activities.

(6) Conduct suppression activities on Department of Defense administered land.

(7) Cooperate with other agencies on adjacent or intermingled lands on forest insect and disease surveillance, prevention and suppression activities.

(8) Report suppression project accomplishments to the Forest Service by November 1 each year covering all forest insect and disease management expenditures for the previous fiscal year.

(9) Participate in an annual coordination meeting with the Forest Service to set priorities for funding proposed forest pest suppression projects.

(10) Submit a formal request for forest insect and disease suppression funding to USDA Forest Service by November 15 of each year.

This agreement is effective upon the date of signature by both parties. It defines, in general terms, the basis on which the parties will cooperate and is not a financial obligating document.

This agreement shall continue indefinitely, but may be modified or discontinued at the request of either party. Requests for termination or any change shall be submitted to the other party for consideration not less than 30 days in advance of the effective date desired.

for F. Dale Robertson
Chief
Forest Service

Date: November 15, 1990

Thomas E. Baca
Deputy Assistant Secretary
of Defense for Environment

Date: December 11, 1990

## Forest Pest Suppression Program Background and Procedures

1. Forest Pest Suppression monies are allocated by Congress to the U.S. Forest Service for the agency's support of forest pest suppression on federal agencies land. The funds are "no year" and can only be used for USFS approved FPS projects.

2. If an installation believes they have a pest problem, they should contact the USFS, (Attachment (4)), to provide survey support and a biological assessment to determine if control measures are needed. USFS personnel can also provide training to installation personnel, if requested.

3. If a survey indicates a need for control, installations should submit a USFS FS-3400-2 form, (Attachment (5)), to the Armed Forces Pest Management Board (AFPMB) through the chain of command.

4. Funding requests should be for the cost of contracting the control operation. In house costs such as the cost of pest management and natural resource personnel time to administer and support the operation should not be charged to the project. However, if the installation contract support office charges for their services, then those costs could be charged to the project.

5. The AFPMB forwards all requests to USFS Headquarters for approval. The USFS approves a project, based on a biological assessment recommending control measures be applied, by evaluating the USFS FS-3400-2 form, and consulting with the local USFS field office.

6. The USFS informs the AFPMB of all approved projects and the funding level. The USFS executes the paper work at the beginning of the second quarter of the fiscal year, informing the US Treasury to send the appropriate funding to each of the services. The USFS doesn't know all its requirements or how much funds it has until late December. The AFPMB informs each of the service program managers, both pest management and natural resources. The program managers in turn inform the appropriate installations and also inform their service Comptroller to forward the funds to the designated installations for the specific FPS project.

7. If the funding requested and approved is not fully expended on the project; (for example, the pest population collapsed or weather conditions are unfavorable during the insect's susceptible stage, or the project costs were over estimated) **the funds are not available for any other FPS project, unless USFS approval is given**. These "leftover" funds can only be expended after submitting a FS-3400-2 form for another project and receiving USFS approval.

8. Unused USFS funds remain at the receiving installation but are under the accountability of the Service Program Manager. These unused "no year" USFS funds are to remain available and be subject to withdrawal by the Service Program Manager for use by another installation or until the USFS gives approval for use by the installation for a new forest pest suppression project.

9. Accurate accountability of funds expended is, as always, an integral part of the program. **Please note, if you received funding for a project in FY 97, a brief report, (Attachment (6)), of the accomplishments and funds expended is required to be sent up through the chain of command to the AFPMB by Oct 15, 1997.**

10. Please note the milestone dates, (Attachment (3)), by which notification, actions, and information need to be forwarded to the appropriate command level. The AFPMB will roll all DoD activity requests, submitted FS-3400-2 forms, and accomplishment reports into a single report for submission to the USFS.

As a final reminder, if aerial application of pesticide is to be the method of control, the project must be approved IAW DoD Instruction 4150.7 and service component environmental documentation requirements, environmental analysis and validation.

# APPENDIX D

## FISH AND WILDLIFE TABLES

**TABLE D.1. FISH**
**TABLE D.2. MAMMALS**
**TABLE D.3. BIRDS**
**TABLE D.4. REPTILES**
**TABLE D.5. AMPHIBIANS**

# Detailed Key to Tables D.1 through D.5

## ABUNDANCE

The following definitions were used for mammals, reptiles, amphibians, and fish:

**Common (C)**– Species that are likely to be found on Fort Belvoir.

**Uncommon (U)** – Species that have been identified on Fort Belvoir in the last 10 years but not frequently enough to meet the requirement of Common. These species may occur at Fort Belvoir, but they are not expected to occur.

**Historical (H)** – Species that have been recorded on Fort Belvoir but not in the last 10 years. These species could occur as one individual or as a small group on rare occasions. Species placed in this category could be present on Fort Belvoir at the levels of abundant or occasional but due to the areas sampled or the behavior of the species, they were not identified

Birds were rated based on a Checklist of Birds in the Fort Belvoir Area (Fleming 1997). This checklist identifies each species as:

**Abundant (A)** – Very common

**Common (C)** – Likely to be present in suitable habitat (should see or hear)

**Uncommon (U)** – Present in small numbers (might see or hear)

**Occasional (O)** – Seen or heard only a few times during a season

**Rare (R)** – May be present but not every year

## HABITAT USAGE

The following categories were used to assign and rate the various habitats on Fort Belvoir for mammals, reptiles, amphibians, and fish:

**Preferred habitat** – This is the habitat where this species spends most of its time. This habitat contains characteristics to which the species is most adapted.

**Common habitat** – This habitat may be used when the preferred habitat is locally not present or unavailable due to high population densities in the preferred habitat. This habitat may also be used for travel between other suitable habitats.

**Rarely used habitat** – This habitat is unlikely to be used by this species. On rare occasions, this habitat may only be used for travel between other habitats.

# Detailed Key to Tables D.1 through D.5

## HABITAT DESCRIPTIONS

The following definitions were used to characterize the habitats that may be used by mammals, reptiles, birds, and amphibians:

**Open Water** – Any water area including creeks, rivers, lakes, ponds and bays that do not have emergent vegetation.
**Emergent Wetlands** – Wetland areas such as marshes that contain emergent vegetation.
**Bottomland Forest** – Periodically flooded lowland forests along streams or rivers (riparian areas).
**Upland Forest** – Wooded areas with soils that are typically moderately well to well drained.
**Grassland** – Areas that are vegetatively dominated by grasses. These areas may contain a few shrubs or trees. This habitat description also includes the brush/shrub areas that are typical in areas where forested habitat adjoins grassland habitat. These areas are very important to a variety of wildlife including birds, mammals and reptiles.
**Maintained** – Any developed area that is routinely maintained including golf courses, road side ditches, agricultural fields, lawns, ornamental vegetation, and gardens.
**Critical Habitats** – This habitat is crucial for the existence of the species. The elimination of this habitat would inhibit the ability of the species to sustain a population.

The following habitat definitions were used for fish:

**Deep water** - All water with depths greater than 10 feet. These areas are typically not used for spawning and do not typically provide adequate vegetation for cover.
**Shallow water** - All water with depths of less than 10 feet. These areas may be used for spawning and may provide adequate vegetation for cover. Sunlight penetrating shallow water supports phytoplankton, benthic algae, and submerged aquatic vegetation, which provides potential productive areas for small fish and spawning.
**Ponds** - All inland freshwater bodies located on Fort Belvoir.
**Streams** - All flowing systems including Accotink Creek, Pohick Creek, Dogue Creek and their tributaries.
**Emergent marsh** - A water system with little or no current which contains emergent vegetation.

## BREEDING PERIOD

The breeding period for each species was based on regional literature. The breeding period identifies the generally accepted time period in which a particular species mates and lays eggs (if applicable), until the emergence of the young (through hatching or birth). With amphibians, this also includes the time period needed for metamorphosis.

## Table D.1: Inland Fishes Collected on Fort Belvoir

| Common Name | Scientific Name | Abundance | | | Stream Size | Spawn Status |
|---|---|---|---|---|---|---|
| | | Spring | Summer | Fall | | |
| **Lampreys** | **Petromyzontidae** | | | | | |
| American brook lamprey | *Lampetra appendix* | o | r | o | 1 | R |
| **Gars** | **Lepisosteidae** | | | | | |
| Longnose gar | *Lepisosteus osseus* | c | r | o | 2 | R |
| **Bowfins** | **Amiidae** | | | | | |
| Bowfin | *Amia calva* | r | r | r | 2 | R |
| **Freshwater eels** | **Anguillidae** | | | | | |
| American eel | *Anguilla rostrata* | a | a | c | 3 | C |
| **Herrings** | **Clupeidae** | | | | | |
| Blueback herring | *Alosa aestivalis* | o | a | o | 2 | A |
| Alewife | *Alosa pseudoharengus* | a | c | a | 2 | A |
| Gizzard shad | *Dorosoma cepedianum* | a | a | c | 2 | R |
| **Trouts** | **Salmonidae** | | | | | |
| Rainbow trout | *Oncorhynchus mykiss* | r | r | r | 3 | R |
| **Anchovys** | **Engrulidea** | | | | | |
| Bay anchovy | *Anchoa mitchilli* | o | r | o | 2 | E |
| **Carps and Minnows** | **Cyprinidae** | | | | | |
| Goldfish | *Carassius auratus* | o | o | o | 2 | R |
| Rosyside dace | *Clinostomus funduloides* | a | a | o | 1 | R |
| Satinfin shiner | *Cyprinella analostana* | r | r | r | 3 | R |
| Spotfin shiner | *Cyprinella spiloptera* | c | a | a | 3 | R |
| Common carp | *Cyprinus carpio* | a | a | a | 2 | R |
| Cutlips minnow | *Exoglossum maxillinggua* | r | r | r | 2 | R |
| Common shiner | *Luxilus cornutus* | a | a | o | 3 | R |
| Eastern silvery minnow | *Hybognathus regius* | o | a | a | 3 | R |
| River chub | *Nocomis micropogon* | o | a | c | 3 | R |
| Golden shiner | *Notemigonus crysoleucas* | o | a | o | 3 | R |
| Bridle shiner | *Notropis bifrenatus* | c | o | c | 3 | R |
| Spottail shiner | *Notropis hudsonius* | a | a | a | 3 | R |
| Swallowtail shiner | *Notropis procone* | r | o | o | 3 | R |
| Blacknose dace | *Rhinichthys atratulus* | a | a | a | 3 | R |
| Longnose dace | *Rhinichthys cataractus* | c | a | a | 3 | R |
| Creek chub | *Semotilus atromaculatus* | c | c | c | 1 | R |
| Fall fish | *Semotilus corparalis* | r | r | r | 3 | R |

## Table D.1: Inland Fishes Collected on Fort Belvoir

| Common Name | Scientific Name | Abundance | | | Stream Size | Spawn Status |
|---|---|---|---|---|---|---|
| | | Spring | Summer | Fall | | |
| **Suckers** | **Catostomidae** | | | | | |
| Qilllback | *Carpoides cyprinus* | r | c | r | 2 | R |
| White sucker | *Catostomus commersoni* | c | c | c | 3 | R |
| Creek chubsucker | *Erimyzon oblongus* | c | c | c | 3 | R |
| Northern hog sucker | *Hypentelium nigricans* | r | r | o | 2 | R |
| Shorthead redhorse | *Moxostoma macrolepidotum* | r | r | r | 2 | R |
| **Bullhead catfishes** | **Ictaluridae** | | | | | |
| Yellow bullhead | *Ameiurus natalis* | c | c | c | 2 | R |
| Brown bullhead | *Ameiurus nebulosus* | c | c | c | 2 | R |
| Channel catfish | *Ictalurus puctatus* | c | c | c | 2 | R |
| white catfish | *Ameiurus catus* | o | o | o | 2 | R |
| **Needlefishes** | **Belonidae** | | | | | |
| Altlantic needlefish | *Strongylura marina* | r | r | r | 2 | E |
| **Mudminnows** | **Umbridae** | | | | | |
| Eastern mudminnow | *Umbra pygmaea* | c | c | c | 1 | R |
| **Killifishes** | **Cyprinodontidae** | | | | | |
| Banded killifish | *Fundulus diaphanus* | a | a | a | 3 | R |
| Mummichog | *Fundulus heteroclitus* | c | o | a | 2 | R |
| **Livebearers** | **Poeciliidae** | | | | | |
| Eastern mosquitofish | *Gambusia holbrooki* | o | o | o | 3 | R |
| Mosquitofish | *Gambusia affinis* | o | o | a | 3 | R |
| **Silversides** | **Atherinidae** | | | | | |
| Inland silverside | *Menidia beryllina* | c | a | a | 2 | R |
| **Temperate Basses** | **Percichthyidae** | | | | | |
| White perch | *Morone americana* | o | a | a | 2 | R |
| Striped bass | *Morone saxatilis* | r | c | o | 2 | A |

## Table D.1: Inland Fishes Collected on Fort Belvoir

| Common Name | Scientific Name | Abundance | | | Stream Size | Spawn Status |
|---|---|---|---|---|---|---|
| | | Spring | Summer | Fall | | |
| **Sunfishes** | **Centrarchidae** | | | | | |
| Bluespotted sunfish | *Enneacanthus gloriosus* | o | r | o | 3 | R |
| Redbreasted sunfish | *Lepomis auritus* | a | a | a | 3 | R |
| Green sunfish | *Lepomis cyanellus* | o | o | o | 3 | R |
| Pumpkinseed | *Lepomis gibbosus* | a | a | a | 3 | R |
| Redear sunfish | *Lepomis microlphus* | r | r | r | 3 | R |
| Bluegill | *Lepomis macrochirus* | a | a | a | 3 | R |
| Warmouth | *Lepomis gulosus* | o | o | o | 2 | R |
| Longear sunfish | *Lepomis megolotis* | r | o | r | 3 | R |
| White crappie | *Pomoxis annularis* | r | r | r | 2 | R |
| Black crappie | *Pomoxis nigromaculatus* | o | o | o | 2 | R |
| Smallmouth bass | *Micropterus dolomieu* | o | o | o | 2 | R |
| Largemouth bass | *Micropterus salmoides* | c | c | a | 2 | R |
| **Perches** | **Percidae** | | | | | |
| Tessellated darter | *Etheostoma olmstedi* | a | a | a | 3 | R |
| Yellow perch | *Perca flavescens* | c | c | c | 2 | R |
| **Drumes** | **Sciaenidae** | | | | | |
| Spot | *Leiostomus xanthurus* | r | r | r | 2 | R |
| **Soles** | **Soleidae** | | | | | |
| Hogchoker | *Trinectes maculatus* | c | r | r | 2 | R |

Sources: all the reports cited, plus Fort Belvoir unpublished data

**Relative Abundance** : Abundant = a. numerous individuals, captured in high numbers at several stations.
Common = c. likely to be captured, present ,but not at every station.
Occasional = o. possible to be captured, only captured every now and then.
Rare = r. unlikely to be collected, captured at few stations in very low numbers.

**Seasons** : Spring = march - May
Summer = June - July
Fall = August -October

**Stream Status** : Small stream = 1 (I.E. Mason Run)
Large stream = 2 (I.E. Accotink Creek)
Uses both small and large streams = 3

**Spawning Status** :
Anadromous = A. Fishes living in the ocean, but which enter freshwater streams to spawn.
Catadromous = C. Fishes living in freshwater streams, but which return to the ocean to spawn.
Estuarine = E. Fishes unlikely to be located above the mouth of a stream.
Resident = R. Fishes that are year round residents.

## Table D.2: Mammals Identified and Potentially Occurring at Fort Belvoir And Their Characteristics For Management

| Scientific Name | Common Name | Regional Abundance | Habitat Usage | | | | | Important Habitat(s) | Diet |
|---|---|---|---|---|---|---|---|---|---|
| | | | Wetlands | Bottomland | Upland | Grassland | Maintained | | |
| **Small Mammals** | | | | | | | | | |
| *Blarina brevicauda* | Northern short-tailed shrew | C | 1 f | 1 f b | 1 f b | 2 f | 2 f | E F O | I H |
| *Sorex fumeus* | Smokey shrew | | | | | | | | |
| *Sorex hoyi* | Pygmy shrew | U | 1 f b | 1 f b | 1 f b | 1 f b | 3 | E F | I H |
| *Sorex longirostris* | Southeastern shrew | U | 1 f b | 1 f b | 2 f b | 2 f | 3 | M | I H |
| *Condylura cristata* | Star-nosed mole | U | 1 f b | 1 f b | 2 f b | 2 f | 3 | M A | I C |
| *Scalopus aquaticus* | Eastern mole | C | 3 f | 1 f b | 2 f b | 1 f b | 2 f | E O | I C |
| *Peromyscus leucopus* | White-footed mouse | C | 3 | 1 f b | 1 f b | 2 | 3 | E F | O |
| *Peromyscus maniculatus* | Deer mouse | U | 3 | 1 f b | 1 f b | 2 f | 3 | E F. | O |
| *Mus musculus* | House mouse | C | 3 | 2 f b | 2 f b | 1 f b | 1 f b | E O | O |
| *Zapus hudsonius* | Jumping mouse | U | 1 f b h | 2 | 2 | 1 f b h | 3 | M E | O |
| *Microtus pennsylvanicus* | Meadow vole | C | 3 | 3 | 3 | 1 f b | 2 f | O | H I |
| *Microtus pinetorum* | Woodland vole | C | 3 | 1 f b | 1 f b | 2 f | 2 f b | E F | H |
| *Cryptotis parva* | Least shrew | U | 1 f b | 3 | 3 | 1 f b | 3 | EO | H |
| *Oryzomys palustris* | Marsh rice rat | C | 1 f b | 2 f b | 3 | 3 | 3 | M A | O |
| **Bats** | | | | | | | | | |
| *Eptesicus fuscus* | Big brown bat | C | 1 f | 1 f | 1 f | 1 f | 1 f b h r | E FA | I |
| *Myotis lucifugus* | Little brown bat | U | | | | | | | |
| *Lasiurus cinerus* | Hoary bat | U | | | | | | | |
| *Myotis sodalis* | Indiana bat | U | | | | | | | |
| *Myotis leibii* | Small-footed bat | | | | | | | | |
| *Nycticeius humeralis* | Evening bat | C | | | | | | | |
| *Lesiurus borealis* | Red bat | C | 1 f | 3 | 3 | 1 f | 1 f b h | E A | I |
| *Lasionycteris noctivagans* | Silver-haired bat | U | 1 f b | 1 b | 3 | 1 f | 2 f b | E A | I |
| *Pipistrellus subflavus* | Eastern pipistrelle | C | 1 f | 2 f | 3 | 2 f | 2 f | E A | I |
| *Myotis keenii* | Keen's Myotis | U | 3 f | 2 f r | 1 f r | 3 f | 1 b h r | F | I |
| **Medium-sized mammals** | | | | | | | | | |
| *Castor canadensis* | Beaver | C | 1 f b | 1 f b | 2 f | 3 | 3 | A | H |
| *Ondatra zibethicus* | Muskrat | C | 1 f b | 1 f b | 3 | 3 | 3 | M A | H |
| *Mustela frenata* | Long tailed weasel | U | 3 f | 3 f | 1 f b | 1 f b | 3 f | E F | C |
| *Didelphis virginiana* | Opossum | C | 1 f b | 1 f b | 2 | 3 | 3 | A | O |
| *Marmota momax* | Woodchuck | C | 2 f b h | 1 f b h | 2 f b h | 1 f b h | 2 f b h | E | H |
| *Mephitis mephites* | Common striped skunk | C | 3 | 2 f | 1 f b | 1 f b | 1 f b | F | O |
| *Procyon lotor* | Raccoon | C | 1 f | 1 f b | 1 f b | 2 f | 1 f | E | O |
| *Sylvilagus floridanus* | Eastern cottontail | C | 2 f | 2 f | 1 f b edge | 1 f b edge | 1 f | E | H |
| *Mustela vison* | Mink | U | 1 f b | 1 f b | 2 f b h | 3 | 3 | A | C |
| *Sciurus carolinensis* | Eastern gray squirrel | C | 3 | 1 f b | 1 f b | 3 | 1 | E F | H |
| *Glaucomys volans* | Flying squirrel | U | 3 | 1 f b | 1 f b | 3 | 2 f b h | F | H |
| *Tamias striatus* | Chipmunk | C | 3 | 2 f b | 1 f b | 2 | 1 f | E F | H I |
| *Lutra canadensis* | River otter | U | 1 f b | 1 f b | 3 | 3 | 3 | M A | C |
| *Rattus norvegicus* | Norway rat | U | 2 f b | 2 f b | 3 | 2 f b | 1 f b | O E | O |

## Table D.2: Mammals Identified and Potentially Occurring at Fort Belvoir And Their Characteristics For Management

| *Scientific Name* | Common Name | Regional Abundance | Habitat Usage | | | | | Important Habitat(s) | Diet |
|---|---|---|---|---|---|---|---|---|---|
| | | | Wetlands | Bottomland | Upland | Grassland | Maintained | | |
| **Large Mammals** | | | | | | | | | |
| *Odocoilus virginiana* | Whitetail deer | C | 2 f | 1 f | 1 f b | 1 f b | 2 f | E | H |
| *Lynx rufus* | Bobcat | U* | 1 f | 1 f b | 1 f b | 2 f | 2 | F | C |
| *Urocyon cinereoargonteus* | Gray fox | U | 2 f | 1 f b | 1 f b | 2 f | 2 f | F E | C |
| *Vulpes vulpes* | Red fox | C | 2 f | 2 f b | 2 f b | 1 f b | 1 f b | O E F | C |
| *Canis latrans* | Coyote | U* | 3 f b | 2 f b | 1 f b edge | 1 f b | 3 | O E F | C |

Sources: all the reports cited, plus Fort Belvoir unpublished data

*See discussion in text

Abundance Codes:
C - Common
U - Uncommon

Habitat Rating:
1 - Preferred Habitat
2 - Common Habitat
3 - Rarely Used Habitat

Habitat Usage:
f - Foraging
b - Breeding
h - Hibernating

Critical Habitat
A - Aquatic
E - Edge
F - Forest
O - Open
M - Marsh

Dietary Code:
C - Carnivore
H - Herbivore
O - Omnivore
I - Insectivore

## Table D.3: Avian Species Identified in the Fort Belvoir Area and Their Characteristics for Management[a]

| Scientific Name | Common Name | Abundance | | | | Habitat Usage | | | | | | Diet | Nesting on Fort Belvoir | Nesting Period |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Winter | Spring | Summer | Fall | Open Water | Emergent Wetlands/ Shoreline | Bottomland Forest | Upland Forest | Grassland | Maintained | | | |
| **Creepers** | | | | | | | | | | | | | | |
| *Certhia familiaris* | Brown creeper | C | O | R | C | | f | f b | f b | | f | I | Y | 3-7 |
| **Wrens** | | | | | | | | | | | | | | |
| *Cistothorus palustris* | Long-billed marsh wren | R | O | R | O | | f b | | | | | I | Y | 3-8 |
| *Cistothorus platensis* | Sedge wren | | | | R | | f | | | f | | I | N | - |
| *Thryothorus ludovicianus* | Carolina wren | C | C | C | C | | f b | f b | f b | f b | f b | I | Y | 4-7 |
| *Troglodytes aedon* | House wren | R | U | C | U | | | f b | f b | f b | f b | I | Y | 4-7 |
| *Troglodytes troglodytes* | Winter wren | O | | | O | | f | f | f | f | f | I | N | - |
| **Kinglets & Gnatcatchers** | | | | | | | | | | | | | | |
| *Polioptila caerulea* | Blue-gray gnatcatcher | R | A | C | C | | | f b | f b | f b | f b | I | Y | 4-7 |
| *Regulus calendula* | Golden-crowned kinglet | U | | | U | | | f | f | f | f | I | N | - |
| *Regulus satrapa* | Ruby-crowned kinglet | U | U | | U | | | f | f | f | f | I | N | - |
| **Thrushes** | | | | | | | | | | | | | | |
| *Catharus fuscescens* | Veery | | O | | O | | f | f | f | | | O | N | - |
| *Catharus guttatus* | Hermit thrush | U | O | | U | | f | f | f | f | f | O | N | - |
| *Catharus minimus* | Gray-cheeked thrush | | O | O | | | f | f | f | f | f | I | N | - |
| *Catharus ustulata* | Swainson's thrush | | U | | U | | | f | f | f | f | I | N | - |
| *Hylocichla mustelina* | Wood thrush | O | O | C | C | | f b | f b | f b | f b | f b | O | Y | 4-7 |
| *Sialia sialis* | Eastern bluebird | U | A | A | U | | | | | f b | f b | I | Y | 3-7 |
| *Turdus migratorius* | American robin | U | C | C | C | | f b | f b | f b | f b | f b | I | Y | 4-7 |
| **Mimics & Thrashers** | | | | | | | | | | | | | | |
| *Dumetella carolinensis* | Gray catbird | R | U | U | U | | | | | f b | f b | I | Y | 5-8 |
| *Minus polyglottos* | Mockingbird | A | A | A | A | | f b | | | f b | f b | I | Y | 3-8 |
| *Taxostoma rufum* | Brown thrasher | O | U | U | U | | f b | f b | f b | f b | f b | I | Y | 3-7 |
| **Waxwings** | | | | | | | | | | | | | | |
| *Bombycilla cedrorum* | Cedar waxwing | U | U | C | U | | | | | f | f | O | N | - |
| **Shrikes** | | | | | | | | | | | | | | |
| *Lanius ludovicianus* | Loggerhead shrike | R | | | R | | | | | f | f | I | N | - |
| **Starlings** | | | | | | | | | | | | | | |
| *Sturnus vulgaris* | European Starling | A | A | A | A | | | | f b | f b | f b | I | Y | 4-7 |

## Table D.3: Avian Species Identified in the Fort Belvoir Area and Their Characteristics for Management[a]

| Scientific Name | Common Name | Abundance | | | | Habitat Usage | | | | | | Diet | Nesting on Fort Belvoir | Nesting Period |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Winter | Spring | Summer | Fall | Open Water | Emergent Wetlands/ Shoreline | Bottomland Forest | Upland Forest | Grassland | Maintained | | | |
| **Vireos** | | | | | | | | | | | | | | |
| *Vireo elivaceus* | Red-eyed vireo | | A | A | A | | f b | f b | f b | f b | f b | I | Y | 5-8 |
| *Vireo flavifrons* | Yellow-throated vireo | | O | U | O | | | | fb | fb | fb | I | Y | 4-7 |
| *Vireo gilvus* | Warbling vireo | | O | R | O | | f | f | f | f | f | I | N | |
| *Vireo griseus* | White-eyed vireo | | C | C | U | | f b | f b | f | f b | f | O | Y | 3-7 |
| *Vireo philadelphicus* | Philadelphia vireo | | R | | R | | f | f | f | f | f | I | N | - |
| *Vireo solitarius* | Solitary vireo | | O | | O | | | f | f | f | f | O | N | - |
| **Warblers** | | | | | | | | | | | | | | |
| *Dendroica castanea* | Bay-breasted warbler | | R | | R | | | f | f | f | f | I | N | - |
| *Dendroica cerulea* | Cerulean warbler | | R | | R | | | f | f | f | f | I | N | - |
| *Dendroica coronata* | Yellow-rumped warbler | A | C | | C | | f | f | f | f | f | O | N | - |
| *Dendroica discolor* | Prairie warbler | | C | C | R | | | | f b | f b | f b | I | Y | 5-7 |
| *Dendroica dominica* | Yellow-throated warbler | | R | R | R | | f | f b | f b | f | f | I | Y | 4-6 |
| *Dendroica fusca* | Blackburnian warbler | | U | | U | | | f | f | | | I | N | - |
| *Dendroica magnolia* | Magnolia warbler | | O | | O | | f | f | f | f | f | I | N | - |
| *Dendroica palmarum* | Palm warbler | R | U | | U | | f | | | f | f | I | N | - |
| *Dendroica pensylvanica* | Chestnut-sided warbler | | C | | C | | | | f | f | f | I | N | - |
| *Dendroica petechia* | Yellow warbler | | C | C | C | | f | f | | f | f | I | N | - |
| *Dendroica pinus* | Pine warbler | R | C | C | C | | | | f b | f | f b | O | Y | 3-6 |
| *Dendroica stiata* | Blackpoll warbler | | C | | U | | | f | f | f | f | I | N | - |
| *Dendroica tigrina* | Cape May warbler | | O | | O | | | f | f | f | f | I | N | - |
| *Dendroica virens* | Black-throated green warbler | | U | | U | | | f | f | f | f | I | N | - |
| *Denroica caerulescens* | Black-throated blue warbler | | U | | U | | | | | | | | | |
| *Geothlypis trichas* | Common yellowthroat | R | C | C | C | | f b | | | f b | f b | I | Y | 4-7 |
| *Helmitheros vermivorus* | Worm-eating warbler | | O | U | O | | | f b | f b | | | I | Y | 5-6 |
| *Icteria virens* | Yellow-breasted chat | | O | | U | | f b | | | f b | f b | | Y | 5-6 |
| *Mniotilta varia* | Black and white warbler | R | C | R | C | | | f b | f b | f b | f b | I | Y | 4-6 |
| *Oporonis agilis* | Connecticut warbler | | R | | R | | f | f | f | f | f | I | N | - |
| *Oporonis formosus* | Kentucky warbler | | U | U | | | f b | f b | f b | | | I | Y | 5-6 |
| *Oporonis philadelphia* | Mourning warbler | | R | | R | | | f | f | f | | I | N | - |
| *Parula americana* | Northern parula warbler | | C | C | C | | f | f | f | f | f | I | N | - |
| *Protonotaria citrea* | Prothonotary warbler | | C | C | R | | f b | f | | | | I | Y | 3-6 |
| *Seiurus aurocapillus* | Ovenbird | | U | O | U | | | f b | f b | | | O | Y | 5-7 |
| *Seiurus motacilla* | Louisiana waterthrush | | U | O | U | | f b | f b | f b | | | C | Y | 4-6 |
| *Seiurus noveboracensis* | Northern waterthrush | | U | | U | | f | f | f | f | f | I | N | - |
| *Setophaga ruticilla* | American redstart | R | C | R | C | | f b | f b | f b | f b | f b | I | Y | 5-7 |

## Table D.3: Avian Species Identified in the Fort Belvoir Area and Their Characteristics for Management[a]

| Scientific Name | Common Name | Abundance | | | | Habitat Usage | | | | | | Diet | Nesting on Fort Belvoir | Nesting Period |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Winter | Spring | Summer | Fall | Open Water | Emergent Wetlands/ Shoreline | Bottomland Forest | Upland Forest | Grassland | Maintained | | | |
| *Vermivora celata* | Orange-crowned warbler | R | | | R | | | f | f | f | | I | N | - |
| *Vermivora chrysoptera* | Golden-winged warbler | | O | | O | | f | f | f | f | f | I | N | - |
| *Vermivora peregrina* | Tennessee warbler | | U | | U | | f | f | f | f | f | O | N | - |
| *Vermivora pinus* | Blue-winged warbler | | O | R | O | | | | f | f | | I | N | - |
| *Vermivora ruficapilla* | Nashville warbler | | U | R | O | | f | | | f | f | I | N | - |
| *Wilsonia candensis* | Canada warbler | | U | | U | | f | f | f | f | f | I | N | - |
| *Wilsonia citrina* | Hooded warbler | | O | U | | | f b | f b | f b | | | I | Y | 4-6 |
| *Wilsonia pusilla* | Wilson's warbler | | O | | O | | f | f | f | | f | I | N | - |
| **Tanagers** | | | | | | | | | | | | | | |
| *Piranga olivacea* | Scarlet tanager | | C | U | C | | | f b | f b | f | f b | I | Y | 5-7 |
| *Piranga rubra* | Summer tanager | | O | O | O | | | f b | f b | f | f | I | Y | 3-8 |
| **Cardinals & Grosbeaks** | | | | | | | | | | | | | | |
| *Cardinalis cardinalis* | Northern cardinal | A | A | A | A | | f b | f b | f b | f b | f b | O | Y | 3-8 |
| *Coccothraustes vespertinus* | Evening grosbeak | R | | | R | | | f | f | f | f | O | N | - |
| *Guiraca caerulea* | Blue grosbeak | | U | O | | | | f | | f | f | I | N | |
| *Passerina cyanea* | Indigo bunting | | A | A | U | | f b | f b | f b | f b | f b | O | Y | 5-8 |
| *Pheocticus ludovicianus* | Rose-breasted grosbeak | | C | | U | | | f | f | f | f | O | N | - |
| **Sparrows** | | | | | | | | | | | | | | |
| *Conotrichia albicollis* | White-throated sparrow | C | U | | U | | | f | f | f | f | O | N | - |
| *Junco hyemalis* | Dark-eyed junco | C | | | C | | | | f | f | f | O | N | - |
| *Melospiza georgiana* | Swamp sparrow | U | C | R | U | | f | f | | f | f | O | N | - |
| *Melospiza lincolnii* | Lincoln's sparrow | R | R | | R | | f | f | f | f | f | I | N | - |
| *Melospiza melodia* | Song sparrow | C | C | C | C | | f b | | | f b | f b | O | Y | 2-8 |
| *Passer domesticus* | House sparrow | A | A | A | A | | | | | f b | f b | O | Y | 4-9 |
| *Passerculus sandwichensis* | Savanna sparrow | R | U | | U | | f | | | f | f | I | N | - |
| *Passerella iliaca* | Fox sparrow | R | U | | U | | | | f | f | f | H | N | - |
| *Pipilo erythrophthalmus* | Eastern towhee | U | C | C | C | | | | fb | fb | | O | Y | 4-8 |
| *Pooecetes gramineus* | Vesper sparrow | R | O | R | O | | | | | f | f | I | N | - |
| *Spizella arborea* | American tree sparrow | O | R | | O | | | | f | f | f | O | N | - |
| *Spizella passerina* | Chipping sparrow | R | C | U | C | | f b | | | f b | f b | O | Y | 3-8 |
| *Spizella pusilla* | Field sparrow | C | C | C | C | | | | | f | f | I | Y | - |
| *Zonotrichia leuchophrys* | White-crowned sparrow | R | O | R | U | | f | | | f | f b | O | N | - |
| **Black birds & Orioles** | | | | | | | | | | | | | | |
| *Agelaius phoeniceus* | Red-winged blackbird | U | A | A | C | | f b | | | f b | f | H-I | Y | 3-7 |
| *Dolichonyx oryzivorus* | Bobolink | | O | R | O | | f | | | f | f | I-H | N | - |
| *Euphagus carolinus* | Rusty blackbird | O | O | | O | | f | f | f | f | f | O | N | - |

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| Scientific Name | Common Name | Abundance | | | | Habitat Usage | | | | | | Diet | Nesting on Fort Belvoir | Nesting Period |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Winter | Spring | Summer | Fall | Open Water | Emergent Wetlands/ Shoreline | Bottomland Forest | Upland Forest | Grassland | Maintained | | | |
| *Icterus galbula* | Northern oriole | | U | U | O | | | f b | f b | f b | f b | O | Y | 5-6 |
| *Icterus spurius* | Orchard oriole | | O | O | | | f | | | f b | f b | I | Y | 4-7 |
| *Molothrus ater* | Brown-headed cowbird | U | A | A | A | | | f b | f b | f b | f b | I | Y | - |
| *Quiscalus quiscula* | Common grackle | R | A | A | A | | f b | f b | f b | f b | f b | O | Y | 3-6 |
| *Sturnella magna* | Eastern meadowlark | R | U | R | U | | | | | f | f | I | N | - |
| **Finches & Crossbills** | | | | | | | | | | | | | | |
| *Carduelis pinus* | Pine siskin | O | O | R | O | | | f | f | f | f | I | N | - |
| *Carpodacus mexicanus* | House finch | C | C | C | C | | | | | f b | f b | O | Y | 2-8 |
| *Carpodacus purpureus* | Purple finch | U | R | R | U | | f | f b | f b | f | f | H | Y | 4-7 |
| *Loxia curvirostra* | Red crossbill | | R | | R | | | f | f | f | f | O | N | - |
| *Loxia leucoptera* | White-winged crossbill | | R | | | | | f | f | f | f | O | N | - |
| *Spinus* spp. | American goldfinch | A | A | A | A | | f b | | | f b | f b | I | Y | 6-9 |
| **Plovers** | | | | | | | | | | | | | | |
| *Charadrius semipalmatus* | semipalmated plover | | R | R | O | | f | | | | | I | | - |
| *Charadrius vociferus* | Killdeer | U | C | C | C | | | | | f b | f b | I | Y | 4-7 |
| **Sandpipers** | | | | | | | | | | | | | | |
| *Actitis macularia* | Spotted sandpiper | R | C | R | C | f | f | | | | | I | N | - |
| *Calidris alpina* | Dunlin | R | | | | X | f | | | | | O | N | - |
| *Calidris melanotos* | Pectoral sandpiper | | R | R | O | | f | | | f | f | I | N | - |
| *Calidris minutilla* | Least sandpiper | | R | R | U | | f | | | f | f | I | N | - |
| *Calidris pusilla* | Semipalmated sandpiper | | O | R | O | | f | | | | | I | N | - |
| *Calidris pusilla* | Western sandpiper | | R | R | R | | f | | | | | I | N | - |
| *Gallinago gallinago* | Common snipe | R | O | | O | | f | | | | | I | N | - |
| *Scolopax minor* | Woodcock | O | U | U | O | | f b | f b | f | f b | f | I | Y | 3-5 |
| *Tringa flavipes* | Lesser yellowlegs | | U | R | C | | f | | | | | I | N | - |
| *Tringa melanoleuca* | Greater yellowlegs | R | U | R | U | | f | | | | | I | N | - |
| *Tringa solitaria* | Solitary sandpiper | | O | R | O | f | f | f | | | | I | N | - |
| **Gulls & Terns** | | | | | | | | | | | | | | |
| *Chlidonias niger* | Black tern | | R | | R | f | f | | | | | O | N | - |
| *Larus argentatus* | Herring gull | A | O | O | U | f | f | | | | f | O | N | - |
| *Larus atricilla* | Laughing gull | R | O | O | U | f | f | | | | | O | N | - |
| *Larus delawarensis* | Ring-billed gull | A | O | C | A | f | f | | | | f | O | N | - |
| *Larus fuscus* | Lesser black-backed gull | R | R | | R | f | f | | | | | O | N | - |
| *Larus marinus* | Great black-backed gull | C | U | R | U | f | f | | | | | O | N | - |
| *Larus philadelphia* | Bonaparte's gull | R | U | | O | f | f | | | | | O | N | - |
| *Sterna albifrons* | Least tern | | R | | R | f | f | | | | | O | N | - |

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| Scientific Name | Common Name | Abundance | | | | Habitat Usage | | | | | | Diet | Nesting on Fort Belvoir | Nesting Period |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Winter | Spring | Summer | Fall | Open Water | Emergent Wetlands/ Shoreline | Bottomland Forest | Upland Forest | Grassland | Maintained | | | |
| *Sterna caspia* | Caspian tern | | O | R | O | f | f | | | | | C | N | - |
| *Sterna forsteri* | Forster's tern | | C | O | C | f | f | | | | | O | N | - |
| *Sterna hirundo* | Common tern | R | U | U | U | f | f | | | | | C | N | - |
| **Turkeys & Quail** | | | | | | | | | | | | | | |
| *Colinus virginianus* | Bobwhite | R | R | R | R | | | | | f b | f b | O | Y | 4-9 |
| *Meleagris gallopavo* | Wild turkey | U | U | U | U | | | f b | f b | f b | f b | C | Y | 3-7 |
| **Vultures** | | | | | | | | | | | | | | |
| *Cathartes aura* | Turkey vulture | A | A | A | A | | | f b | f b | f | f | C | Y | 3-6 |
| *Coragyps atratus* | Black vulture | O | U | U | U | | f | f | f | f | f | C | N | - |
| **Eagles & Hawks** | | | | | | | | | | | | | | |
| *Accipiter cooperi* | Cooper's hawk | O | O | R | U | | f b | f b | f b | f | f | C | Y | 4-6 |
| *Accipiter striatus* | Sharp-shinned hawk | O | U | R | U | | f | f | f | f | f | C | N | - |
| *Buteo jamaicensis* | Red tailed hawk | C | U | U | U | | f | f | f b | f | f | C | Y | 2-6 |
| *Buteo lagopus* | Rough-legged hawk | R | | | | | f | | | f | f | C | N | - |
| *Buteo lineatus* | Red-shouldered hawk | A | A | A | A | | f b | f b | f | f | f | C | Y | 3-6 |
| *Buteo platypterus* | Broad-winged hawk | | O | R | O | | | f b | f b | f | f | C | Y | 4-6 |
| *Circus cyaneus* | Northern Harrier | R | O | R | O | | f | | | f | f | C | N | - |
| *Haliaeetus leucocephalus* | Bald eagle | C | C | C | C | f | f b | fb | f b | f | | C | Y | 11-7 |
| *Pandion haliaetus* | Osprey | | O | A | O | f b | f b | | | | | C | Y | 4-6 |
| **Falcons** | | | | | | | | | | | | | | |
| *Falco columbarius* | Merlin (Pigeon hawk) | R | R | | U | | f | | f | | | C | N | - |
| *Falco perigrinus* | Peregrine falcon | R | R | | R | f | f b | f | f | f | f | C | N | - |
| *Falco sparverius* | American kestrel | O | O | O | U | | f b | | | f b | f b | C | Y | 4-6 |
| **Owls** | | | | | | | | | | | | | | |
| *Bubo virginianus* | Great-horned owl | O | O | O | O | | f b | f b | f b | f b | f | C | Y | 1-6 |
| *Otus asio* | Eastern screech owl | U | O | O | U | | f | f b | f b | f | f | C | Y | 2-7 |
| *Strix varia* | Barred owl | C | C | C | C | | f b | f b | f b | f | f | C | Y | 3-6 |
| *Tyto alba* | Barn owl | R | R | R | R | | f | | | f b | f b | C | Y | 3-7 |
| **Doves** | | | | | | | | | | | | | | |
| *Columba livia* | Rock dove | C | C | C | C | | f b | | | f b | f b | H | Y | 3-11 |
| *Zenaida macroura* | Mourning dove | A | A | A | A | | f b | | | f b | f b | H | Y | 4-8 |
| **Cuckoos** | | | | | | | | | | | | | | |
| *Coccyzus americanus* | Yellow-billed cuckoo | | O | C | O | | f b | f b | f b | f b | f b | I | Y | 3-8 |
| *Coccyzus erythropthalmus* | Black-billed cuckoo | | O | R | O | | f | f | f | f | f | I | N | - |

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| **Goatsuckers** | | | | | | | | | | | | | | |
| *Caprimulgus carolinensis* | chuck-wills-widow | | R | | | | | f | f b | f | f | I | N | 3-7 |
| *Caprimulgus vociferous* | Whip-poor-will | | O | O | O | | | | fb | fb | f | I | Y | 5-7 |
| *Chordeiles minor* | Common nighthawk | | U | R | U | | f | f | f | f | f | I | N | - |
| **Swifts** | | | | | | | | | | | | | | |
| *Chaetura pelagica* | Chimney swift | | A | A | A | f | f | | | f b | f b | I | Y | 5-7 |
| **Hummingbirds** | | | | | | | | | | | | | | |
| *Archilochus colubris* | Ruby-throated hummingbird | | C | C | | | f b | f b | f | f | f b | O | Y | 3-7 |
| **Kingfishers** | | | | | | | | | | | | | | |
| *Ceryle alcyon* | Belted kingfisher | C | C | C | C | f | f b | f b | | | | C | Y | 4-8 |
| **Woodpeckers** | | | | | | | | | | | | | | |
| *Centurus carolinus* | Red-bellied woodpecker | A | A | A | A | | f b | f b | f | f b | f | I | Y | 4-7 |
| *Colaptes auratus* | Common flicker | C | C | C | C | | | f b | f b | f b | f b | I | Y | 4-6 |
| *Dryocopus pileatus* | Pileated woodpecker | C | C | C | C | | f b | f b | f | f b | f | I | Y | 3-6 |
| *Melanerpes crythocephalus* | Red-headed woodpecker | R | R | R | R | | f b | | f b | f b | f b | I | Y | 4-8 |
| *Picoides pubescens* | Downy woodpecker | A | A | A | A | | f b | f b | f b | f | f | I | Y | 4-7 |
| *Picoides villosus* | Hairy woodpecker | C | C | C | C | | f | f b | f b | f | f | I | Y | 3-7 |
| *Sphyrapicus varius* | Yellow-bellied sapsucker | O | O | | O | | | f | f | f | f | I | N | - |
| **Flycatchers** | | | | | | | | | | | | | | |
| *Contopus borealis* | Olive-sided flycatcher | | R | | R | | f | f | f | f | f | I | N | - |
| *Contopus virens* | Eastern wood pewee | | C | C | U | | f b | f b | f b | f b | f b | O | Y | 5-7 |
| *Empidonax alnorum* | Alder flycatcher | | R | R | R | | f | f | | f | f | I | N | |
| *Empidonax flaviventris* | Yellow-bellied flycatcher | | R | R | R | | f | f | f | f | f | I | N | - |
| *Empidonax minimus* | Least flycatcher | | O | R | O | | f | f | f | f | f | I | N | |
| *Empidonax traillii* | Willow flycatcher | | O | R | O | | f | f | | f | f | I | N | |
| *Empidonax virescens* | Acadian flycatcher | | A | C | U | | | f b | f b | f b | f b | I | Y | 4-7 |
| *Myiarchus crinitus* | Great crested flycatcher | | U | C | O | | | f b | f b | f b | f b | O | Y | 3-7 |
| *Sayoris phoebe* | Eastern phoebe | O | U | O | O | | f | f b | f | f | f b | I | Y | 4-6 |
| *Tyrannus tyrannus* | Eastern kingbird | | C | A | O | | f b | | | f b | f b | I | Y | 5-7 |
| **Pipits** | | | | | | | | | | | | | | |
| *Anthus spinoletta* | Water pipit | R | R | | R | | f | | | f | f | I | N | - |
| **Larks** | | | | | | | | | | | | | | |
| *Eremophila alpestris* | Horned lark | R | R | R | R | | f | | | f | f | I | N | - |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
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| **Swallows** | | | | | | | | | | | | | | |
| *Hirundo pyrrhonota* | Cliff swallow | | O | O | O | | f | | | f | f | I | N | |
| *Hirundo rustica* | Barn swallow | | C | C | C | | f b | | | f b | f b | I | Y | 4-7 |
| *Progne subis* | Purple martin | | U | U | U | | | | | f b | f b | I | Y | 3-7 |
| *Riparia riparia* | Bank swallow | | O | O | O | f | f b | f b | | f b | f b | I | Y | 3-9 |
| *Stelgidopteryx serripennis* | Rough-winged swallow | | U | U | O | | f | fb | | | | I | Y | 4-7 |
| *Tachycineta bicolor* | Tree swallow | | C | C | C | | f b | | | f b | f b | I | Y | 3-9 |
| **Jays & Crows** | | | | | | | | | | | | | | |
| *Corvus branchyrhynchos* | Common crow | A | A | A | A | | f b | f b | f b | f b | f b | I | Y | 2-6 |
| *Corvus ossifragus* | Fish crow | C | C | C | C | | f | fb | | | | O | Y | 4-7 |
| *Cyanocitta cristata* | Blue jay | C | C | C | C | | | | f b | f b | f b | O | Y | 3-7 |
| **Chickadees & Titmice** | | | | | | | | | | | | | | |
| *Parus atricapillus* | Black-capped chickadee | R | | | | | | f | f | f | f | I | N | - |
| *Parus bicolor* | Tufted titmouse | A | A | A | A | | fb | fb | | | f | O | Y | 3-5 |
| *Parus carolinesis* | Carolina chickadee | A | A | A | A | | | fb | fb | fb | fb | O | Y | 3-5 |
| **Nuthatches** | | | | | | | | | | | | | | |
| *Sitta candensis* | Red-breasted nuthatch | O | O | | O | | | f | f | | f | I | N | - |
| *Sitta carolinensis* | White-breasted nuthatch | C | U | U | U | | f | f b | f b | f | f | I | Y | 3-6 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Winter | Spring | Summer | Fall | Open Water | Emergent Wetlands/ Shoreline | Bottomland Forest | Upland Forest | Grassland | Maintained | | | |
| **Loons** | | | | | | | | | | | | | | |
| *Gavia immer* | Common loon | U | U | | U | f | f | | | | | C | N | - |
| *Gavia stellata* | Red-throated loon | R | R | | | f | f | | | | | C | N | - |
| **Grebes** | | | | | | | | | | | | | | |
| *Podiceps auritus* | Horned grebe | R | R | | R | f | f | | | | | C | N | - |
| *Podiceps grisegena* | Red-necked grebe | R | R | | R | f | f | | | | | C | N | - |
| *Podilymbus podiceps* | Pied-billed grebe | U | U | R | U | f | f | | | | | C | N | - |
| **Cormorants** | | | | | | | | | | | | | | |
| *Phalocrocorax auritus* | Double-crested cormorant | R | C | U | C | f | f | | | | | C | N | 4-7 |
| **Bitterns & Egrets** | | | | | | | | | | | | | | |
| *Botaurus lentiginosus* | American bittern | R | U | R | U | | f | | | | | C | N | - |
| *Casmerodius albus* | Great egret | R | O | C | C | f | f | | | | | C | N | - |
| *Egretta thula* | Snowy egret | | R | O | R | f | f | | | | | C | N | - |
| *Ixobrychus exilis* | Least bittern | | U | U | R | f | f b | | | | | C | Y | 5-7 |
| **Herons & Night-Herons** | | | | | | | | | | | | | | |
| *Ardea herodias* | Great blue heron | A | A | A | A | f | f | | | | | C | N | - |
| *Butorides striatus* | Green-backed heron | R | C | U | U | f b | f b | | | | | C | Y | 4-6 |
| *Egretta caerulea* | Little blue heron | | R | R | R | f | f | | | | | O | N | - |
| *Nycticorax nycticorax* | Black-crowned night heron | R | R | O | O | f | f | | | | | C | N | - |
| *Nycticorax violacea* | Yellow crowned night heron | | R | R | R | | fb | fb | | | | C | Y | 4-5 |
| **Swans & Geese** | | | | | | | | | | | | | | |
| *Branta canadensis* | Canadian goose | A | A | A | A | f | f b | | | f | f | H | Y | 3-4 |
| *Chen caerulescens* | Snow goose | R | | | | | f | | | | f | H | N | - |
| *Cynus colunbianus* | Tundra swan | C | | | | f | f | | | | f | H | N | - |
| **Ducks** | | | | | | | | | | | | | | |
| *Aix sponsa* | Wood duck | R | C | C | C | f | f b | b | b | | b | H | Y | 4-7 |
| *Anas acuta* | Pintail | O | O | | O | f | f | | | | | O | N | - |
| *Anas americana* | American wigeon | R | u | | R | f | f | | | | f | O | N | - |
| *Anas clypeata* | Northern shoveler | R | O | | O | f | f | | | | | O | N | - |
| *Anas crecca* | Green-winged teal | O | U | R | U | f | f | | | | | H | N | - |
| *Anas discors* | Blue-winged teal | R | U | R | U | f | f | | | | | O | N | - |
| *Anas platyrhynchos* | Mallard | A | A | A | A | f | f b | | | | | H | Y | 3-7 |
| *Anas rubripes* | Black duck | C | C | C | C | f | f | | | | | O | N | - |
| *Anas strepera* | Gadwall | R | O | | R | f | f | | | | | H | N | - |

## Table D.3: Avian Species Identified in the Fort Belvoir Area and Their Characteristics for Management[a]

| Scientific Name | Common Name | Abundance | | | | Habitat Usage | | | | | | Diet | Nesting on Fort Belvoir | Nesting Period |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Winter | Spring | Summer | Fall | Open Water | Emergent Wetlands/ Shoreline | Bottomland Forest | Upland Forest | Grassland | Maintained | | | |
| *Aythya affinis* | Lesser scaup | A | C | R | C | f | f | | | | | O | N | - |
| *Aythya americana* | Redhead | R | R | | R | f | f | | | | | H | N | - |
| *Aythya collaris* | Ring-necked duck | R | U | | O | f | f | | | | | O | N | - |
| *Aythya marila* | Greater scaup | O | O | | O | f | f | | | | | O | N | - |
| *Aythya valisineria* | Canvasback | O | O | | O | f | f | | | | | H | N | - |
| *Bucephala albeola* | Bufflehead | C | U | | U | f | f | | | | | I | N | - |
| *Bucephala clangula* | Common goldeneye | R | R | | R | f | f | | | | | O | N | - |
| *Clangula hyemalis* | Old squaw | R | R | | R | f | f | | | | | C | N | - |
| *Lophodytes cucullatus* | Hooded merganser | C | U | R | U | f | f | | | | | C | N | - |
| *Melonitta deglandi* | White winged scoter | R | | | | f | f | | | | | C | N | - |
| *Melonitta perspicillata* | Surf scoter | R | | | | f | f | | | | | C | N | - |
| *Mergus merganser* | Common merganser | A | C | | C | f | f | | | | | C | N | - |
| *Mergus serrator* | Red-breasted merganser | C | U | | U | f | f | | | | | C | N | - |
| *Oxyura jamaicensis* | Ruddy duck | C | U | R | U | f | f | | | | | H | N | - |
| **Rails & Coots** | | | | | | | | | | | | | | |
| *Fulica americana* | American coot | C | O | R | O | f | f | | | | | H | N | - |
| *Gallinula chloropus* | Common moorhen | | O | R | O | f | fb | f | | | | O | Y | 5-7 |
| *Porzan carolina* | Sora | | O | R | O | f | f | | | | f | H | N | - |
| *Rallus elegans* | King rail | R | R | O | R | | f b | | | f b | f b | O | Y | 3-7 |
| *Rallus limicola* | Virginia rail | R | O | R | R | | f b | | | | | I | Y | 5-7 |

Sources: all the reports cited, plus Fort Belvoir unpublished data

[a]Additional vagrant species (species that have been seen on Fort Belvoir less than four times) include: western grebe, glossy ibis, Mississippi kite, golden eagle, upland sandpiper, Bohemian waxwing, snowy owl, long-eared owl, snow bunting, Thayers gull, Sutton's warbler, cinnamon teal, brown-headed nuthatch, mute swan, trumpeter swan, northern goshawk, long-billed dowitcher, stilt sandpiper, white-rumped sandpiper, common ground dove, saw-whet owl, vermillion flycatcher, Bachman's warbler, LeConte's sparrow, ring-necked pheasant, black-throated gray warbler, and short-eared owl.

Abundance Codes:
A - Abundant
C - Common
O - Occassional

Habitat Codes:
b - breeding
f - foraging
x - recorded presence

C - Carnivore
H - Herbivore
I - Invertebrates
O - Omnivore

## Table D.4: Reptiles Identified at Fort Belvoir And their Characteristics For Manangemen

| Scientific Name | Common Name | Regional Abundance | Habitat Usage: Open Water | Habitat Usage: Emergent Wetlands | Habitat Usage: Bottomland Forest | Habitat Usage: Upland Forest | Habitat Usage: Grassland | Habitat Usage: Maintained | Diet | Active Period | Nesting Period |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Turtles** | | | | | | | | | | | |
| *Pseudemys concinna* | River cooter | | | | | | | | | | |
| *Terrapene c. carolina* | Eastern box turtle | C | 3 | 1 fb | 1 fb | 1 f | 2 fb | 2 fb | O | 4-11 | 4-9 |
| *Kinosternon s. subrubrum* | Eastern mud turtle | C | 3 | 1 fb | 1 f b h | 2 f b | 3 | 3 | O | 4-10 | 5-6 |
| *Pseudemys picta* | Painted turtle | C | 1 f | 1 f b | 1 f | 3 | 3 | 3 | C -> H | 4-10 | 5-7 |
| *Chelydra s. serpentina* | Common snapping turtle | C | 1 f | 1 f b h | 1 f b | 1 f b | 3 | 3 | O | 4-10 | 5-6 |
| *Chrysemys rubriventris* | Redbellied turtle | C | 1 f | 1 f b | 1 f b | 3 | 3 | 3 | O->C | 3-11 | 5-7 |
| *Clemmys guttata* | Spotted turtle | C | 2 f h | 1 f b h | 1 f b | 2 f b | 2 f b | 2 f b | O | 2-6 | 8-9 |
| *Clemmys insculpta* | Wood turtle | U | 3 | 1 f b h | 1 f b h | 1 f b | 3 | 2 f b | O | 4-11 | 5-6 |
| *Sternotherus odoratus* | Eastern musk turtle | C | 1 f b | 1 f b | 1 f b | 3 | 3 | 3 | O | 11-Apr | 6 |
| *Trachemys scripta* | Pond slider turtle | C | 1 f b | 1 f b h | 1 f h | 1 f b | 3 | 3 | I ->H | 4-10 | 6-7 |
| **Snakes** | | | | | | | | | | | |
| *Crotalus horridus* | Timber rattlesnake | H | 3 | 3 | 2 f b h | 1 f b h | 3 | 3 | C | 4-10 | 4-9 |
| *Agkistrodon contortrix mokeson* | Northern copperhead | C | 3 | 1 f b h | 1 f b h | 2 f b h | 3 | 1 f b h | O | 4-10 | 4-9 |
| *Carphophis a. amoenus* | Eastern worm snake | C | 3 | 3 | 1 f b | 1 f b | 2 f | 2 f | I | 4-6 | 6-7 |
| *Coluber c. constrictor* | Northern black racer | C | 3 | 1 f | 2 f b h | 1 f b h | 1 f b h | 1 f b h | C | 4-10 | 6-7 |
| *Diadophis punctatus edwardsi* | Northern ringneck snake | C | 3 | 3 | 1 f b h | 1 f b h | 1 f | 1 f | C | | 4-6 |
| *Elaphe g. guttata* | Corn snake | H | 3 | 3 | 2 f b h | 1 f b h | 1 f b | 1 f b h | C | | 9 |
| *Elaphe o. obsoleta* | Black rat snake | C | 2 | 1 f | 1 f b h | 1 f b h | 1 f b h | 1 f b h | C | 3-11 | 5-6 |
| *Heterodon platyrhinos* | Eastern hognose snake | C | 3 | 3 | 2 f | 1 f b h | 1 f b h | 1 f b | C | 4-11 | 5-6 |
| *Lampropeltis g. getulus* | Eastern kingsnake | U | 3 | 2 f | 1 f b h | 1 f b h | 1 f b | 1 f | C | | |
| *Lampropeltis triangulum* | Milksnake | H | 3 | 3 | 2 f b h | 1 f b h | 1 f h | 1 f h | C | 3-11 | 6-9 |
| *Lampropeltis calligaster rhombmaculata* | Mole Kingsnake | H | 3 | 3 | 2 f | 1 h | 1 h | 1 h | C | | |
| *Nerodia s. sipedon* | Northern water snake | C | 1 f b | 1 f b h | 1 f h | 3 | 3 | 3 | C | 4-11 | 8-9 |
| *Opheodrys a. aestivus* | Eastern rough green snake | C | 2 f | 1 f b h | 1 f b h | 2 f b h | 2 f | 2 f | I | 4-9 | 6-7 |
| *Regina septemvittata* | Queen snake | U | 1 f b | 1 f b h | 1 f b h | 3 | 3 | 3 | I | 4-10 | 4-9 |
| *Storeria d. dekayi* | Northern brown snake | C | 3 | 1 f b h | 1 f b h | 2 f b h | 2 f b | 1 f h | I | 3-11 | 3 - 8 |
| *Storeria o. occipitomaculata* | Northern redbelly snake | U | 3 | 1 f b h | 1 f b h | 2 f b h | 3 | 2 f | I | 3-11 | 3 - 9 |
| *Thamnophis s. sauritus* | Eastern ribbon snake | C | 2 f | 1 f b h | 1 f b h | 3 | 3 | 2 f b h | C | 4-10 | 4-9 |
| *Thamnophis s. sirtalis* | Eastern garter snake | C | 3 | 1 f b h | 1 f b h | 2 f b h | 2 f b h | 2 f b h | C | 4-11 | 3-10 |
| *Virginia v. valeriae* | Smooth earth snake | U | 3 | 2 f b h | 1 f b h | 3 | 3 | 1 f b h | I | 4-9 | 3-9 |
| **Lizards** | | | | | | | | | | | |
| *Eumeces fasciatus* | Five-lined skink | C | 3 | 3 | 1 f b h | 1 f b h | 2 f | 2 f b | C-I | 4-11 | 5-6 |
| *Eumeces laticeps* | Broad-headed skink | C | 3 | 3 | 1 f b | 1 f b | 2 f | 2 f | I | 4-10 | 5-7 |
| *Sceloporus undulatus hyacinthinus* | Northern fence lizard | C | 3 | 3 | 2 f b | 2 f b | 1 f b | 1 f b | I | 4-10 | 6-9 |
| *Scincella lateralis* | Ground skink | C | 3 | 3 | 1 f b | 1 f b | 3 | 2 f | I | 4-9 | 4-8 |

Sources: all the reports cited, plus Fort Belvoir unpublished data

Abundance Codes:
C - Common
U - Uncommon
H - Historical

Habitat Ratings:
1 -Preferred Habitat
2 - Common Habitat
3 - Rarely Used Habitat

Habitat Usage:
f - Foraging
b - Breeding
h - Hibernation

Dietary Codes
C- Carnivore
H - Herbivore
O - Omnivore
I - Insectivore

## Table D.5: Amphibians Identified in the Fort Belvoir Area and Their Characteristics For Management

| Scientific Name | Common Name | Regional Abundance | Habitat Usage | | | | | | Breeding Period |
|---|---|---|---|---|---|---|---|---|---|
| | | | Open Water | Emergent Wetlands | Bottomlands | Uplands | Grassland | Maintained | |
| **Frogs** | | | | | | | | | |
| *Acris c. crepitans* | Northern cricket frog | C | 3 | 1fb | 1fb | 3 | 2 | 3 | 4-7 |
| *Hyla cinera* | Green treefrog | C | 3 | 1 f b | 1 f b | 2 f b | 3 | 3 | 4-8 |
| *Hyla v. chrysocelis* | Cope's gray treefrog | C | 3 | 2 f b | 1 f b | 2 f b | 3 | 3 | 3-7 |
| *Hyla versicolor* | Gray treefrog | C | 3 | 1 f b | 1 f b | 2 f b | 3 | 3 | 4-7 |
| *Pseudacris c. crucifer* | Northern spring peeper | C | 3 | 1 f b | 1 f b | 1 f b (h) | 2 f b | 2 f b | 2-7 |
| *Pseudacris triseria* | Upland chorus frog | U | 3 | 1 f b | 1 f b | 1 f b | 1 f | 1 f | 3-4 |
| *Rana c. clamitans* | Green frog | C | 3 | 1 f b | 1 f b | 2 f b | 3 | 2 f b | 5-7 |
| *Rana catesbeiana* | Bullfrog | C | 1 | 1 f b | 1 f b | 2 f b | 3 | 2 f b | 4-7 |
| *Rana palustris* | Pickerel frog | C | 3 | 1 f b | 1 f b | 2 f b | 2 f b | 2 f b | 3-5 |
| *Rana sylvatica* | Woodfrog | C | 3 | 2 f b | 1 f b h | 2 f b | 2 f | 2 f | 2-5 |
| *Rana u. utricularia* | Southern leopard frog | C | 3 | 1 f b | 1 f b | 3 | 3 | 3 | 2-5 |
| **Toads** | | | | | | | | | |
| *Bufo a. americanus* | American toad | C | 3 | 1 f b | 1 f b | 1 f b | 1 f | 1 f | 3-6 |
| *Bufo woodhousei* | Woodhouse's toad | C | 3 | 1 f b | 1 f b | 2 | 2 f | 2 f | 4-8 |
| *Scaphiopus h. holbrooki* | Eastern spadefoot | H | 2 | 1 f b | 1 f b | 2 | 2 | 2 | 4-8 |
| **Salamander** | | | | | | | | | |
| *Ambystoma jeffersonium* | Jefferson's salamander | H | 3 | 2 f b | 1 f b | 2 f b | 3 | 3 | 4-8 |
| *Ambystoma maculatum* | Spotted salamander | C | 3 | 1 f b | 1 f b | 2 f b | 3 | 3 | 2-4 |
| *Ambystoma opacum* | Marbled salamander | C | 3 | 2 f b | 1 f b | 1 f b | 3 | 3 | 10-11 |
| *Desmognathus f. fuscus* | Northern dusky salamander | U | 3 | 2 f b | 1 f b | 3 | 3 | 3 | 5-7 |
| *Eurycea b. bislineata* | Northern two-lined salamander | U | 3 | 2 f b | 1 f b | 2 f b | 3 | 3 | 3-5 |
| *Eurycea guttolineata* | Three-lined salamander | | | | | | | | |
| *Eurycea longicauda* | Longtail salamander | | | | | | | | |
| *Hemidatylium scutatum* | Four-toed salamander | U | 3 | 2 f b | 1 f b | 1 f b | 3 | 3 | 3-4 |
| *Notophtalmus v. viridescens* | Red-spotted newt | U | 3 | 1 f b | 1 f b | 2 f (eft) | 3 | 3 | 3-4 |
| *Plethodon cinereus* | Red back salamander | C | 3 | 2 f b | 1 f b h | 1 f b | 3 | 3 | 3-4 |
| *Plethodon cylindraceus* | White-spotted slimy salamander | U | 3 | 2 f b | 1 f b | 1 f | 3 | | 5-6 |
| *Pseudotriton m. montanus* | Eastern mud salamander | H | 3 | 1 f b | 1 f b | 3 | 3 | 3 | 10-2 |
| *Pseudotriton r. ruber* | Northern red salamander | C | 3 | 1 f b | 2 f b | 2 f b | 3 | 3 | 8-9 |

Sources: all the reports cited, plus Fort Belvoir unpublished data

Abundance Codes:
C - Common
U - Uncommon
H - Historical

Habitat Rating:
1 - Preferred
2 - Common Habitat
3 - Rarely Used Habitat

Habitat Usage
h - hibernating
f - foraging
b - breeding

# APPENDIX E

# FORT BELVOIR PLANT LIST

# FORT BELVOIR PLANT LIST

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June 1999

Nomenclature of all taxa in this list follows Manual of vascular plants of northeastern United States and adjacent Canada, 2nd edition, by Gleason and Cronquist (1991). The divisions of the plant kingdom are arranged by order of increasing advancement. Families within the divisions are arranged alphabetically.

## DIVISION LYCOPODIOPSIDA FERN ALLIES

### ISOETACEAE

*Isoetes engelmannii* A. Braun, Engelmann's quillwort (native)

### LYCOPODIACEAE

*Lycopodium appressum* (Chapman) Lloyd & Underw., southern clubmoss (native)
*Lycopodium digitatum* Dillen, southern ground cedar (native)
*Lycopodium tristachyum* Pursh, wiry ground cedar (native)

## DIVISION POLYPODIOPHYTES FERNS

### ASPLENIACEAE

*Asplenium platyneuron* (L.) Oakes, ebony spleenwort (native)
*Athyrium filix-femina* (L.) Roth var. *asplenioides* (Michx.) Farw., lady fern (native)
*Polystichum acrostichoides* (Michx.) Schott, Christmas fern (native)
*Thelypteris hexagonoptera* (Michx.) Weatherby [*Phegopteris hexagonoptera* (Michx.) Fee], broad beech-fern (native)
*Thelypteris noveboracensis* (L.) Niewland, New York fern (native)
*Thelypteris palustris* Schott, marsh fern (native)

### BLECHNACEAE

*Woodwardia areolata* (L.) Moore [*Lorinseria areolata* (L.) Presl], netted chain-fern (native)

### DENNSTAEDTIACEAE

*Dennstaedtia punctilobula* (Michx.) Moore, hay-scented fern (native)
*Pteridium aquilinum* (L.) Kuhn, bracken fern (native)

### ONOCLEACEAE

*Onoclea sensibilis* L., sensitive fern (native)

### OPHIOGLOSSACEAE

*Botrychium oneidense* (Gilbert) House, blunt-lobed grape fern (native)
*Botrychium virginianum* (L.) Swartz, rattlesnake fern (native)
*Ophioglossum vulgatum* L. var. *pycnostichum* Fernald, adder's tongue (native)

### OSMUNDACEAE

*Osmunda cinnamomea* L., cinnamon fern (native)
*Osmunda regalis* L. var. *spectabilis* (Willd.) Gray, royal fern (native)

### POLYPODIACEAE

*Polypodium virginianum* L., rock cap fern (native)

**DIVISION PINOPHYTA** GYMNOSPERMS

CUPRESSACEAE
*Juniperus virginiana* L., eastern red cedar (native)

PINACEAE
*Pinus echinata* L., shortleaf pine (native)
*Pinus resinosa* Aiton, red pine (alien; native farther west and north)
*Pinus strobus* L., white pine (alien; native farther west and north)
*Pinus taeda* L., loblolly pine (native)
*Pinus virginiana* Miller, scrub pine, Virginia pine (native)
*Tsuga canadensis* (L.) Carriere, eastern hemlock (rarely native in Northern Virginia)

**DIVISION MAGNOLIOPHYTA** ANGIOSPERMS

**CLASS MAGNOLIOPSIDA** DICOTYLEDONS

ACERACEAE
*Acer negundo* L., boxelder (native)
*Acer rubrum* L., red maple (native)
*Acer saccharinum* L., silver maple (native)

AMARANTHACEAE
*Alternanthera philoxeroides* (Mart.) Griseb., alligator weed (alien)

ANACARDIACEAE
*Rhus copallinum* L., shining sumac (native)
*Rhus glabra* L., smooth sumac (native)
*Rhus typhina* L., staghorn sumac (native)
*Toxicodendron radicans* (L.) Kuntze, poison ivy (native)

ANNONACEAE
*Asimina triloba* (L.) Dunal, pawpaw (native)

APIACEAE
*Daucus carota* L., Queen Anne's lace (alien)
*Cryptotaenia canadensis* (L.) DC., honewort (native)
*Hydrocotyle americana* L., marsh pennywort (native)
*Osmorhiza longistylis* (Torr.) DC., long-styled sweet cicely (native)
*Sanicula marilandica* L., black snakeroot (native)
*Sanicula canadensis* L., Canada sanicle (native)

APOCYNACEAE
*Apocynum cannabinum* L., Indian hemp (native)
*Vinca minor* L., periwinkle (alien)

AQUIFOLIACEAE
*Ilex opaca* Aiton, American holly (native)

*Ilex verticillata* (L.) A Gray, winterberry (native)

ARALIACEAE
*Aralia spinosa* L., Hercules's club (native)
*Hedera helix* L., English ivy (alien)

ARISTOLOCHIACEAE
*Aristolochia serpentaria* L., Virginia snakeroot (native)
*Asarum canadense* L., wild ginger (native)

ASCLEPIADACEAE
*Asclepias incarnata* L. var. *pulchra* (Ehrh.) Pers., swamp milkweed (native)
*Asclepias syriaca* L., common milkweed (native)
*Asclepias tuberosa* L., butterfly weed (native)

ASTERACEAE
*Achillea millefolium* L., yarrow (alien)
*Ambrosia artemisiifolia* L., common ragweed (native)
*Antennaria plantaginifolia* (L.) Richards, pussy toes (native)
*Anthemis arvensis* L., corn chamomile (alien)
*Arctium minus* (Hill) Bernhardi, burdock (alien)
*Artemisia vulgaris* L., mugwort (alien)
*Aster divaricatus* L., white heart-leaved aster (native)
*Aster lateriflorus* (L.) Britton, goblet aster (native)
*Aster pilosus* Willd., awl aster (native)
*Bidens bipinnata* L., spanish needles (native)
*Bidens frondosa* L., devil's beggar ticks (native)
*Bidens laevis* (L.) BSP., bur-marigold (native)
*Centaurea maculosa* Lam., spotted knapweed (alien)
*Chrysanthemum leucanthemum* L., [*Leucanthemum vulgare* Lam.], ox-eye daisy (alien)
*Cirsium discolor* (Muhl.) Sprengel, field thistle (native)
*Cirsium vulgare* (Savi) Tenore [*Cirsium lanceolatum* (L.) Hill, *Carduus lanceolatus* L.] , bull thistle (alien)
*Conyza canadensis* (L.) Cronq. [*Erigeron canadensis* L.], horseweed (native)
*Erechtites hieracifolia* (L.) Raf., fireweed (native)
*Erigeron annuus* (L.) Pers., annual fleabane (native)
*Erigeron philadelphicus* L., Philadelphia daisy (native)
*Erigeron strigosus* Muhl., rough fleabane (native)
*Eupatorium coelestinum* L. [*Conoclinium coelestinum* (L.) DC.], mist flower (native)
*Eupatorium dubium* Willd., joe-pye weed (native)
*Eupatorium fistulosum* Barratt, hollow-stemmed joe-pye weed (native)
*Eupatorium hyssopifolium* L., eupatorium ( native)
*Eupatorium serotinum* Michx., late eupatorium (native)
*Gnaphalium obtusifolium* L., fragrant cudweed (native)
*Gnaphalium purpureum* L., purple cudweed (native)
*Hieracium gronovii* L., beaked hawkweed (native)
*Hieracium venosum* L., rattlesnake weed (native)
*Hypochoeris radicata* L., spotted cat's ear (alien)
*Krigia virginica* (L.) Willdenow, dwarf dandelion (native)

*Lactuca canadensis* L., tall lettuce (native)
*Lactuca floridana* (L.) Gaertner, woodland lettuce (native)
*Mikania scandens* (L.) Willd., climbing hempweed (native)
*Polymnia uvedalia* L., yellow-flowered leaf-cup (native)
*Rudbeckia fulgida* Aiton, eastern coneflower (native)
*Rudbeckia hirta* L., black-eyed Susan (native)
*Rudbeckia laciniata* L., cutleaf coneflower (native)
*Senecio aureus* L., heart-leaved groundsel (native)
*Silphium trifoliatum* L., whorled rosin-weed (native)
*Solidago flexicaulis* L., goldenrod (native)
*Solidago graminifolia* (L.) Salisbury, goldenrod (native)
*Solidago nemoralis* Aiton, goldenrod (alien)
*Taraxacum officinale* Wiggers, dandelion (alien)
*Tragopogon dubius* Scop., goat-beard (alien)
*Tussilago farfara* L., coltsfoot (alien)
*Verbesina occidentalis* (L.) Walter, southern flatseed-sunflower (native)
*Xanthium strumarium* L., common cocklebur (alien)

BALSAMINACEAE
*Impatiens capensis* Meerburg, touch-me-not (native)

BERBERIDACEAE
*Berberis thunbergii* DC., Japanese barberry (alien)
*Podophyllum peltatum* L., May-apple (native)

BETULACEAE
*Alnus serrulata* (Aiton) Willd., smooth alder (native)
*Betula nigra* L., river birch (native)
*Carpinus caroliniana* Walter, hornbeam (native)
*Corylus americana* Walter, American hazel-nut (native)

BIGNONIACEAE
*Campsis radicans* (L.) Seemann, trumpet creeper (native)
*Catalpa speciosa* Warder, northern catalpa (alien; native farther west in U.S.)
*Paulownia tomentosa* (Thunb.) Steudel, empress tree (alien)

BORAGINACEAE
*Cynoglossum virginianum* L., wild comfrey (native)
*Mertensia virginica* (L.) Pers., eastern bluebell (native)
*Myosotis arvensis* (L.) Hill, field scorpion-grass (alien)
*Myosotis laxa* Lehm., smaller forget-me-not (native)

BRASSICACEAE
*Alliaria petiolata* (Bieb.) Cavara & Grande, garlic mustard (alien)
*Arabis laevigata* (Muhl.) Poiret, rock cress (native)
*Barbarea vulgaris* R. Brown, yellow rocket, winter cress (alien)
*Brassica napus* L., turnip (alien)
*Capsella bursa-pastoris* (L.) Medikus, shepherd's purse (alien)

*Cardamine concatenata* (Michx.) O. Schwarz, five-parted toothwort (native)
*Cardamine hirsuta* L., hoary bitter cress (alien)
*Cardamine pensylvanica* Muhl., Pennsylvania bitter cress (native)
*Cardamine rhomboidea* (Pers.) DC. [*Cardamine bulbosa* (Scheb.) BSP], spring cress (native)
*Lepidium campestre* (L.) R. Brown, field cress (alien)
*Lepidium virginicum* L., poor man's pepper (native)
*Rorippa palustris* (L.) Besser, common yellow cress (native)

CAESALPINIACEAE
*Cercis canadensis* L., redbud (native)
*Chamaecrista fasciculata* (Michx.) Greene [*Cassia fasciculata* Michx.], partridge pea (native)
*Gleditsia triacanthos* L., honey locust (alien; native farther west in U.S.)
*Senna hebecarpa* (Fern.) Irwin & Barneby [*Cassia hebecarpa* Fern.], northern wild senna (native)

CALLITRICHACEAE
*Callitriche heterophylla* Pursh, water-starwort (native)

CANNABACEAE
*Humulus japonicus* Siebold & Zucc., Japanese hops (alien)

CAMPANULACEAE
*Lobelia cardinalis* L., cardinal flower (native)
*Lobelia inflata* L., Indian tobacco (native)
*Lobelia siphilitica* L., lobelia (native)
*Triodanis perfoliata* (L.) Nieuwland [*Specularia perfoliata* (L.) DC.], Venus's looking glass (native)

CAPRIFOLIACEAE
*Lonicera japonica* Thunberg, Japanese honeysuckle (alien)
*Lonicera maackii* (Rupr.) Maxim, oriental bush honeysuckle (alien)
*Lonicera sempervirens* L., trumpet honeysuckle (native)
*Sambucus canadensis* L., elderberry (native)
*Symphoricarpos orbiculatus* Moench, coral berry (native)
*Viburnum acerifolium* L., flowering maple (native)
*Viburnum dentatum* L., arrow-wood (native)
*Viburnum nudum* L., possum haw (native)
*Viburnum prunifolium* L., black haw (native)

CARYOPHYLLACEAE
*Arenaria lateriflora* L., sandwort (native)
*Cerastium nutans* Raf., mouse-ear chickweed (alien)
*Cerastium semidecandrum* L., mouse-ear chickweed (alien)
*Dianthus armeria* L., Deptford-pink (alien)
*Saponaria officinalis* L., soapwort (alien)
*Silene antirrhina* L., catchfly (native)
*Silene latifolia* Poiret [*Lychnis alba* Miller], white campion (alien)
*Stellaria media* (L.) Cyrillo, chickweed (alien)
*Stellaria graminea* L., common stichwort (alien)
*Stellaria pubera* Michx., giant chickweed (native)

CELASTRACEAE
*Celastrus orbiculatus* Thunberg, oriental bittersweet (alien)
*Euonymus americanus* L., strawberry bush (native)

CHENOPODIACEAE
*Chenopodium album* L., lamb's quarter (alien)
*Chenopodium ambrosioides* L., Mexican tea (alien; native of tropical America)

CLUSIACEAE
*Hypericum hypericoides* (L.) Crantz, St. Andrew's cross (native)
*Hypericum mutilum* L., small St. John's wort (native)
*Hypericum perforatum* L., common St. John's wort (alien)
*Hypericum punctatum* Lam., spotted St. John's wort (native)

CONVOLVULACEAE
*Calystegia sepium* (L.) R. Br., hedge bindweed (native)
*Ipomoea lacunosa* L., white morning-glory (native)

CORNACEAE
*Cornus amomum* Miller, swamp dogwood (native)
*Cornus florida* L., flowering dogwood (native)
*Nyssa sylvatica* Marshall var. *sylvatica*, black gum (native)
*Nyssa sylvatica* Marshall var. *biflora* (Walter) Sargent, swamp black gum (native)

CRASSULACEAE
*Sedum ternatum* Michx., stonecrop (native)

CUCURBITACEAE
*Sicyos angulatus* L., bur cucumber (native)

CUSCUTACEAE
*Cuscuta compacta* Jussieu, dodder (native)
*Cuscuta gronovii* Willd., common dodder (native)

EBENACEAE
*Diospyros virginiana* L., persimmon (native)

ELAEAGNACEAE
*Elaeagnus angustifolia* L., Russian olive (alien)
*Elaeagnus pungens* Thunb., thorny eleagnus (alien)
*Elaeagnus umbellata* Thunb., autumn olive (alien)

ERICACEAE
*Chimaphila maculata* (L.) Pursh, spotted wintergreen (native)
*Epigaea repens* L., trailing arbutus (native)
*Eubotrys racemosa* (L.) Nutt. [*Leucothoe racemosa* (L.) Gray], swamp fetterbush (native)
*Gaylusaccia baccata* (Wangenh.) K. Koch, black huckleberry (native)
*Gaylusaccia frondosa* (L.) T. & G., dangleberry (native)

*Lyonia ligustrina* (L.) DC., male-berry (native)
*Kalmia latifolia* L., mountain laurel (native)
*Rhododendron periclymenoides* (Michx.) Shinn. [*R. nudiflorum* (L.) Torr.], pinkster flower (native)
*Rhododendron viscosum* (L.) Torr., swamp azalea (native)
*Vaccinium corymbosum* L.,[ includes *Vaccinium atrococcum*], highbush blueberry (native)
*Vaccinium pallidum* Aitons [includes *Vaccinium vacillans*], hillside blueberry (native)
*Vaccinium stamineum* L., deerberry (native)

EUPHORBIACEAE
*Euphorbia maculata* L. [*Euphorbia supina* Raf.], spotted spurge (native)

FABACEAE
*Amorpha fruticosa* L., false indigo (native)
*Amphicarpaea bracteata* (L.) Fern., hog-peanut (native)
*Baptisia tinctoria* (L.) R. Brown, yellow wild indigo (native)
*Coronilla varia* L., crown vetch (alien)
*Desmodium nudiflorum* (L.) DC., naked tick-trefoil (native)
*Desmodium paniculatum* (L.) DC., beggar's ticks (native)
*Galactia regularis* (L.) BSP [*Galactia volubilis* (L.) Britton], milk pea (native)
*Lespedeza bicolor* Turcz., shrubby lespedeza (alien)
*Lespedeza cuneata* (Dum. Cours.) G. Don, Chinese lespedeza (alien)
*Lespedeza repens* (L.) Barton, smooth trailing lespedeza (native)
*Lespedeza stipulacea* Maxim, Korean clover (alien)
*Lespedeza striata* (Thunb.) Hook. & Arnott, Japanese clover (alien)
*Medicago lupalina* L., black medick (alien)
*Melilotus alba* Medikus, white sweet clover (alien)
*Melilotus officinalis* (L.) Pallas, yellow sweet clover (alien)
*Pueraria lobata* (Willd.) Ohwi, kudzu (alien)
*Robinia pseudoacacia* L., black locust (native)
*Stylosanthes biflora* (L.) BSP, pencil flower (native)
*Tephrosia virginiana* (L.) Pers., goat's rue (native)
*Trifolium aureum* Pollich, [*Trifolium agrarium* L.], palmate hop-clover (alien)
*Trifolium arvense* L., rabbit-foot clover (alien)
*Trifolium campestre* Schreber, pinnate hop-clover (alien)
*Trifolium dubium* Sibth., little hop-clover ( alien)
*Trifolium pratense* L., red clover (alien)
*Trifolium repens* L., white clover (alien)
*Vicia angustifolia* L., narrow-leaved vetch (alien)
*Wisteria sinensis* (Sims) Sweet, Chinese wisteria (alien)

FAGACEAE
*Castanea pumila* (L.) Miller, chinquapin (native)
*Fagus grandifolia* Ehrh., beech (native)
*Quercus alba* L., white oak (native)
*Quercus coccinea* Muenchh., scarlet oak (native)
*Quercus falcata* Michx., southern red oak (native)
*Quercus ilicifolia* Wangenh., bear oak (native)
*Quercus palustris* Muenchh., pin oak (native)

*Quercus phellos* L., willow oak (native)
*Quercus prinus* L., rock chestnut oak (native)
*Quercus rubra* L., red oak (native)
*Quercus stellata* Wangenh., post oak (native)
*Quercus velutina* Lam., black oak (native)

FUMARIACEAE
*Corydalis flavula* (Raf.) DC., corydalis (native)
*Dicentra cucullaria* (L.) Bernh., Dutchman's breeches (native)

GERANIACEAE
*Geranium carolinianum* L., cranesbill (native)

HALORAGACEAE
*Myriophyllum spicatum* L., European water milfoil (alien)

HAMAMELIDACEAE
*Hamamelis virginiana* L., witch hazel (native)
*Liquidambar styraciflua* L., sweet gum (native)

HYDROCHARITACEAE
*Hydrilla verticillata* (L.f.) Royle, hydrilla (alien)

JUGLANDACEAE
*Carya cordifolrmis* (Wangeh.) K. Koch, bitternut-hickory (native)
*Carya glabra* (Miller) Sweet, pignut hickory (native)
*Carya tomentosa* (Poiret) Nutt., mockernut hickory (native)
*Juglans nigra* L., black walnut (native)

LAMIACEAE
*Blephilia hirsuta* (Pursh) Benth. (native)
*Collinsonia canadensis* L., northern horse-balm (native)
*Cunila origanoides* (L.) Britton, stone mint (native)
*Glechoma hederacea* L., ground ivy (alien)
*Hedeoma pulegioides* (L.) Persoon, pennyroyal (native)
*Lamium amplexicaule* L., henbit (alien)
*Lamium purpureum* L., red dead nettle (alien)
*Lycopus americana* Muhl., American water horehound (native)
*Mentha piperita* L., peppermint (alien)
*Perilla frutescens* (L.) Britton, beefsteak plant (alien)
*Prunella vulgaris* L., self-heal (alien)
*Pycnanthemum tenuifolium* Schrader, mountain mint (native)
*Salvia lyrata* L., sage (native)
*Scutellaria elliptica* Muhl., skullcap (native)
*Teucrium canadense* L., American germander (native)

LARDIZABALACEAE
*Akebia quinata* (Houtt.) Decne, fiveleaf akebia (alien)

LAURACEAE
*Lindera benzoin* (L.) Blume, spicebush (native)
*Sassafras albidum* (Nuttall) Nees, sassafras (native)

LINACEAE
*Linum virginianum* L.,Virginia yellow flax (native)

LYTHRACEAE
*Lythrum salicaria* L., purple loosestrife (alien)

MAGNOLIACEAE
*Liriodendron tulipifera* L., tulip tree (native)
*Magnolia virginiana* L., sweet bay (native)

MALVACEAE
*Hibiscus moscheutos* L., rose mallow (native)

MIMOSACEAE
*Albizia julibrissin* Durazz, mimosa (alien)

MORACEAE
*Morus alba* L., white mulberry (alien)
*Morus rubra* L., red mulberry (native)

NYMPHAEACEAE
*Nuphar advena* (Aiton) Aiton f. [*N. luteum* (L.) Sibthorp & Smith], yellow water-lily (native)

OLEACEAE
*Chionanthus virginicus* L., fringe tree (native)
*Forsythia suspensa* (Thunb.) Vahl, golden bells (alien)
*Fraxinus pennsylvanica* Marshall, green ash (native)
*Ligustrum sinense* Loureiro, swamp privet (alien)

ONAGRACEAE
*Circaea lutetiana* L. var. *canadensis(* L.) A.& M., common enchanter's nightshade (native)
*Ludwigia alternifolia* L., square-pod water primrose (native)
*Ludwigia palustris* (L.) Elliott, common water-purslane (native)
*Ludwigia peploides* (HBK.) Raven, floating seedbox (alien)
*Oenothera biennis* L., common evening-primrose (native)

OROBANCHACEAE
*Epifagus virginiana* (L.) Barton, beech-drops (native)

OXALIDACEAE
*Oxalis stricta* L., wood sorrel (native)
.*Oxalis violacea* L., violet wood-sorrel (native)

PASSIFLORACEAE

*Passiflora lutea* L., passion flower (native)

PHYTOLACCACEAE
*Phytolacca americana* L., pokeweed (native)

PLANTAGINACEAE
*Plantago aristata* Michx., buckhorn (native)
*Plantago lanceolata* L., English plantain (alien)
*Plantago major* L., common plantain (alien)
*Plantago rugelii* Decne., American plantain (native)

PLATANACEAE
*Platanus occidentalis* L., sycamore (native)

POLYGALACEAE
*Polygala sanguinea* L., blood milkwort (native)
*Polygala incarnata* L., pink milkwort (native)

POLYGONACEAE
*Polygonum arifolium* L., halberd-leaved tearthumb (native)
*Polygonum cespitosum* Blume, lady's thumb (alien)
*Polygonum cuspidatum* Sieb. & Zucc., Japanese knotweed (alien)
*Polygonum perfoliatum* L., mile-a-minute (alien)
*Polygonum persicaria* L., lady's thumb (alien)
*Polygonum punctatum* Elliott, dotted smartweed (native)
*Polygonum sagittatum* L., arrow-leaved tearthumb (native)
*Polygonum virginianum* L., jumpseed (native)
*Rumex acetosella* L., red sorrel (alien)
*Rumex crispus* L., curly dock (alien)

PORTULACACEAE
*Claytonia virginiana* L., spring beauty (native)

PRIMULACEAE
*Lysimachia ciliata* L., fringed loosestrife (native)
*Lysimachia nummularia* L, moneywort (alien)
*Lysimachia quadrifolia* L., whorled loosestrife (native)

RANUNCULACEAE
*Cimicifuga racemosa* (L.) Nutt., black snakeroot (native)
*Clematis terniflora* DC. [*Clematis dioscoreifolia* Levl. & Vaniot], Japanese virgin's bower (alien)
*Clematis virginiana* L., virgin's bower (native)
*Ranunculus abortivus* L., small-flowered crowfoot (native)
*Ranunculus alleghiensis* Britton, Allegheny buttercup (native)
*Ranunculus ambigens* S. Wats., water-plantain spearwort (native)
*Ranunculus bulbosus* L., common buttercup (alien)
*Ranunculus ficaria* L., lesser celandine (alien)
*Ranunculus recurvatus* Poiret, hooked crowfoot (native)

*Thalictrum clavatum* DC., mountain meadow-rue (native)
*Thalictrum dioicum* L., early meadow-rue (native)

ROSACEAE
*Agrimonia parviflora* Aiton, southern agrimony (native)
*Amelanchier arborea* (Michaux f.) Fernald, serviceberry (native)
*Duchnesea indica* (Andrews) Focke, Indian strawberry (alien)
*Fragaria virginiana* Duchesne, strawberry (native)
*Geum canadense* Jacq., avens (native)
*Potentilla canadensis* L., running five fingers (native)
*Potentilla recta* L., sulphur five fingers (alien)
*Potentilla simplex* Michx., old-field five fingers (alien)
Prunus mahaleb L., mahaleb-cherry (alien)
*Prunus serotina* Ehrh., black cherry (native)
*Pyrus malus* L., apple (alien)
*Rosa multiflora* Thunberg, multiflora rose (alien)
*Rosa palustris* Marshall, swamp rose (native)
*Rosa wichuraiana* Crepin, memorial rose (alien)
*Rubus argutus* Link, southern blackberry (native)
*Rubus bifrons* Vest, Himalaya-berry (alien)
*Rubus occidentalis* L., black raspberry (native)
*Rubus phoenicolasius* Maxim, wineberry (alien)
*Spiraea japonica* L.f., Japanese spirea (alien)

RUBIACEAE
*Cephalanthus occidentalis* L., common buttonbush (native)
*Galium aparine* L., cleavers (native)
*Galium circaezans* Michx., forest bedstraw (native)
*Galium obtusum* Bigelow, blunt-leaved bedstraw (native)
*Galium triflorum* Michx., sweet-scented bedstraw (native)
*Hedyotis caerulea* (L.) Hook, [*Houstonia caerulea* L.], mountain bluets (native)
*Hedyotis longifolia* (Gaertner) Hook. [*Houstonia longifolia* Gaertner] (native)
*Hedyotis purpurea* (L.) T. & G. [*Houstonia purpurea* L.] (native)
*Hedyotis nuttalliana* Fosb. [*Houstonia tenuifolia* Nuttall] (native)
*Mitchella repens* L., partridge berry (native)

RUTACEAE
*Poncirus trifoliata* (L.) Raf., trifoliate orange (alien)

SALICACEAE
*Populus alba* L., white poplar (alien)
*Populus deltoides* Marshall, cottonwood (native)
*Populus grandidentata* Michx., big-toothed aspen (native)
*Salix nigra* Marshall, black willow (native)

SAURURACEAE
*Saururus cernuus* L., lizard's tail (native)
SAXIFRAGACEAE

*Penthorum sedoides* L., ditch stonecrop (native)

SCROPHULARIACEAE
*Gratiola neglecta* Torr., hedge hyssop (native)
*Linaria canadensis* (L.) Dumont, toad flax (native)
*Lindernia dubia* (L.) Pennell, false pimpernel (native)
*Mazus pumilus* (Burm. f.) van Steenis [*Mazus japonicus* (Thunb.) Kuntze] (alien)
*Mimulus ringens* L., Allegheny monkey-face (native)
*Penstemon digitalis* Nutt., white beard-tongue (native)
*Verbascum thapsus* L., common mullein (alien)
*Verbascum blattaria* L., moth-mullein (alien)
*Veronica arvensis* L., corn speedwell (alien)
*Veronica officinalis* L., common speedwell (alien)
*Veronica serpyllifolia* L., thyme-leaved speedwell (alien)

SOLANACEAE
*Datura stramonium* L., jimson weed (possibly native)
*Solanum carolinense* L., horse nettle (native)
*Solanum nigrum* L. [includes *Solanum americana* Miller], black nightshade (native)

SIMAROUBACEAE
*Ailanthus altissima* (Miller) Swingle, tree of heaven (alien)

ULMACEAE
*Celtis laevigata* Willd., southern hackberry (native)
*Ulmus americana* L., American elm (native)
*Ulmus pumila* L., Siberian elm (alien)
*Ulmus rubra* Muhl, slippery elm (native)

URTICACEAE
*Boehmeria cylindrica* (L.) Swartz (native)
*Laportea canadensis* (L.) Wedd., stinging nettle (native)

VALERIANACEAE
*Valerianella radiata* (L.) Dufr., corn salad (native)
*Valerianella locusta* (L.) Betcke, European corn salad (alien)

VERBENACEAE
*Verbena hastata* L., common vervain (native)
*Verbena urticifolia* L., white verbain (native)

VIOLACEAE
*Viola rafinesquii* Greene (native)
*Viola pedata* L., bird-foot violet (native)
*Viola sagittata* Aiton, arrowhead violet (native)
*Viola sororia* Willd., [*Viola affinis* Le Conte, *Viola papilionacea* Pursh], dooryard violet (native)

VITACEAE

*Ampelopsis brevipedunculata* (Maxim) Trautv., porcelain berry
*Parthenocissus quinquefolia* (L.) Planchon, Virginia creeper (native)
*Vitis aestivalis* Michx., summer grape (native)
*Vitis labrusca* L., fox-grape (native)
*Vitis vulpina* L., frost-grape (native)

**CLASS LILIOPSIDA** MONOCOTYLEDONS

AGAVACEAE
*Yucca filamentosa* L., Adam's needle (native)

ALISMATACEAE
*Alisma subcordatum* Raf., southern water-plantain (native)
*Sagittaria latifolia* Willd., common arrow-head (native)

ARACEAE
*Arisaema triphyllum* (L.) Schott, jack in the pulpit (native)
*Orontium aquaticum* L., golden club (native)
*Peltandra virginica* (L.) Kunth (native)
*Symplocarpus foetidus* (L.) Nutt., skunk cabbage (native)

COMMELINACEAE
*Commelina communis* L., asiatic dayflower (alien)
*Murdannia keisak* (Hassk.) Hand.-Mazz., aneilima (alien)

CYPERACEAE
*Carex albolutescens* Schweinitz (native)
*Carex comosa* F. Boott (native)
*Carex crinita* Lam. (native)
*Carex flaccosperma* Dewey (native)
*Carex frankii* Kunth (native)
*Carex granularis* Muhl. ex Schkuhr. (native)
*Carex laevivaginata* ((Kuk.) Mackenzie (native)
*Carex lurida* Wahlenb. (native)
*Carex nigromarginata* Schweinitz (native)
*Carex radiata* (Wahlenb.) Small [*Carex rosea* Schkuhr] (native)
*Carex squarrosa* L. (native)
*Carex tribuloides* Wahlenb. (native)
*Carex umbellata* Schkuhr (native)
*Carex vulpinoidea* Michx. var. *ambigua* F. Boott. (native)
*Carex vulpinoidea* Michx. var. *vulpinoidea* (native)
*Cyperus iria* L., iria flatsedge (alien)
*Eleocharis equisetoides* (Elliott) Torr., spike-rush (native)
*Eleocharis ovata* (Roth) Roemer & Schultes [*Eleocharis obtusa* (Willd.) Schultes], blunt spike-rush (native)
*Scirpus atrovirens* Willd., black bulrush (native)
*Scirpus cyperinus* (L.) Kunth, wool-grass (native)
*Scirpus polyphyllus* Vahl, many-leaved bulrush (native)
DIOSCOREACEAE

*Dioscorea batatas* Decne., cinnamon-vine (alien)
*Dioscorea villosa* L., colic root (native)

IRIDACEAE
*Iris pseudacorus* L., yellow iris (alien)
*Iris virginica* L., southern blue flag (native)
*Sisyrinchium angustifolium* Miller (native)
*Sisyrinchium mucronatum* Michx. (native)

JUNCACEAE
*Juncus acuminatus* Michx., rush (native)
*Juncus biflorus* Elliott [*Juncus marginatus* Rostk. var. *biflorus* (Elliott) Torr.], rush (native)
*Juncus diffusissimus* Buckley, slimpod rush (native)
*Juncus effusus* L., rush (native)
*Juncus tenuis* Willd., path rush (native)
*Luzula bulbosa* (Wood) Rydberg, wood rush (native)
*Luzula echinata* (Small) Hermann, wood rush (native)

LEMNACEAE
*Lemna minor* L., duckweed (native)
*Lemna perpusilla* Torr., duckweed (native)
*Spirodela polyrhiza* (L.) Schleiden, duckweed (native)

LILIACEAE
*Allium vineale* L., field garlic (alien)
*Erythronium americanum* Ker Gawler, trout lily (native)
*Hemerocallis fulva* (L.) L., day-lily (alien)
*Hypoxis hirsuta* (L.) Cov., common star-grass (native)
*Medeola virginiana* L., Indian cucumber root (native)
*Narcissus pseudo-narcissus* L., daffodil (alien)
*Ornithogalum umbellatum* L., star of Bethlehem (alien)
*Uvularia perfoliata* L., bellwort (native)
*Uvularia sessilifolia* L., bellwort (native)

ORCHIDACEAE
*Cypripedium acaule* Aiton, pink lady-slipper (native)
*Goodyera pubescens* (Willd.) R. Brown, downy rattlesnake plantain (native)
*Habenaria lacera* (Michx.) Lodd., ragged fringed orchid (native)
*Liparis liliifolia* (L.) Rich., large twayblade (native)
*Tipularia discolor* (Pursh) Nutt., crane-fly orchid (native)

POACEAE
*Agrostis gigantea* Roth, redtop (alien)
*Anthoxanthum odoratum* L., sweet vernal grass (alien)
*Arthraxon hispidus* (Thunb.) Makino, joint-headed arthraxon (alien)
*Bromus japonicus* Thunb., Japonese chess (alien)
*Calamovilfa brevipilis* (Torrey) Scribner (native)
*Cynodon dactylon* (L.) Pers., Bermuda grass (alien)

*Dactylis glomerata* L., orchard grass (alien)
*Danthonia spicata* (L.) F. Beauv., poverty oatgrass (native)
*Echinochloa crusgalli* (L.) P. Beauv., barnyard grass (alien)
*Echinochloa walteri* (Pursh) Heller, Walter's wild millet (native)
*Elymus virginicus* L., Virginia wild rye (native)
*Festuca elatior* L., tall fescue (alien)
*Holcus lanatus* L., velvet grass (alien)
*Imperata cylindrica* (L.) Beauv., cogon grass (alien)
*Leersia oryzoides* (L.) Swartz, rice cut-grass (native)
*Leersia virginica* Willd., white grass (native)
*Lolium perenne* L. var. *aristatum* Willd., Italian ryegrass (alien)
*Microstegium vimineum* (Trin.) A. Camus, Japanese stilt grass (alien)
*Miscanthus sinensis* Andersson, eulalia (alien)
*Panicum anceps* Michx., panic grass (native)
*Panicum clandestinum* L. [*Dichanthelium clandestinum* (L.) Gould], (native)
*Panicum latifolium* L. [*Dichanthelium latifolium* (L.) Harvill], (native)
*Panicum laxifolium* Lam. [*Dichanthelium laxifolium* (Lam.) Gould], (native)
*Phalaris arundinacea* L., reed canary grass (native)
*Phleum pratense* L., timothy (alien)
*Phragmites australis* (Cav.) Trin, common reed (alien)
*Poa pratensis* L., Kentucky bluegrass (native)
*Poa trivialis* L., rough bluegrass (alien)
*Schizachyrium scoparium* (Michx.) Nash, [*Andropogon scoparium* Michx.] little bluestem (native)
*Setaria faberi* R. Herrm., giant foxtail grass (alien)
*Sorghum halepense* (L.) Pers., Johnson grass (alien)
*Tripsacum dactyloides* (L.) L., gama-grass (native)

PONTEDERIACEAE
*Pontederia cordata* L., pickerel-weed (native)

SMILACINACEAE
*Smilax glauca* Walter, greenbrier (native)
*Smilax rotundifolia* L., greenbrier (native)

SPARGANIACEAE
*Sparganium americanum* Nutt., bur-reed (native)

TYPHACEAE
*Typha angustifolia* L., narrow-leaved cattail (native)
*Typha latifolia* L., common cattail (native)

# APPENDIX F

## PLANT COMMUNITIES MAPPED ON FORT BELVOIR PRIOR TO THE DEVELOPMENT OF THE NATURE CONSERVANCY'S NATIONAL VEGETATION SYSTEM

Plant Communities Mapped on Fort Belvoir Prior to the Development of the Nature Conservancy's National Vegetation System.

## Oak/Ericad (Heath Family) Forests

Oak/ericad forests are upland forests of gravelly ridges and dry slopes, generally located at the tops of hills and bluffs and along steep, well-drained slopes. The overstory is dominated by chestnut oak (*Quercus prinus*), with a mixture of northern red oak (*Quercus rubra*), white oak (*Quercus alba*), and scarlet oak (*Quercus coccinea*). At Fort Belvoir, vegetation in the understory varies between two topographically different types. Arid plateaus are generally composed of chestnut oak and white oak with huckleberry (*Gaylussacia baccata*) and deerberry (*Vaccinium stamineum*) in the understory. Cooler, northerly-facing steep slopes are dominated by chestnut oak, and the understory generally consists of mountain laurel (*Kalmia latifolia*) (Paciulli, Simmons and Associates, Ltd., 1998).

## Beech Mixed Oak Forests

At Fort Belvoir, beech mixed oak forests are generally located on the more gradual slopes, topographically below oak/ericad forests. Mixed oak species of white oak and northern red oak are dominant trees with American beech (*Fagus grandifolia*) dominant as shrubs in the understory. Other common shrubs in the understory consist of flowering dogwood (*Cornus florida*), red maple (*Acer rubrum*), and cherryleaf viburnum (*Viburnum prunifolium*). Occasional areas of mature American beech are found in lower, moister elevations or within ravines (Paciulli, Simmons and Associates, Ltd., 1998).

## Tulip Poplar Mixed Hardwood Forest

Tulip poplar mixed hardwood forests are upland forests of moist fertile ravine slopes and ravine bottoms. At Fort Belvoir, they are found in habitats similar to beech mixed oak forest, but are more common on more gradual slopes and ravine bottoms. Tulip poplar (*Liriodendron tulipifera*) trees are dominant within this vegetation community type, but American beech, white oak, and northern red oak are also mixed. Understory species are similar to that of beech mixed oak forests and consist of flowering dogwood, American beech, and red maple shrubs (Paciulli, Simmons and Associates, Ltd., 1998).

A tulip popular mixed hardwood forest community just west of the mouth of Accotink Creek, within the Accotink Bay Wildlife Refuge, has been identified as a significant community of its type due to its age and extent. This community type is common in Virginia; however, mature examples are rare (Hobson, 1996).

## Seep Forests

Seep forests are often open-canopy forests of groundwater-saturated flats and slopes, generally surrounded by mixed hardwood forests. They occur along slopes where groundwater flows to the surface. Characteristic species are red maple, black gum (*Nyssa sylvatica*), sweetbay magnolia (*Magnolia virginiana*), skunk cabbage (*Symplocarpus foetidus*), sensitive fern (*Onoclea sensibilis*), and royal fern (*Osmunda regalis*). Key indicators are large mats of skunk cabbage and other herbaceous wetland vegetation. Although not a dominant forest type, seep forests are of special interest at Fort Belvoir, because they provide unique wetland habitats within the dominant upland forests (Paciulli, Simmons and Associates, Ltd., 1998).

Three acid seep swamps on Fort Belvoir have been identified as significant vegetation communities. One

of these is adjacent to the fresh tidal marsh at the mouth of Accotink Creek, another lies at the foot of upland slopes in Training Areas T-9 and T-7, and the third is located on HEC in the Dogue Creek watershed. These seeps provide habitat on Fort Belvoir for the state rare sphagnum sprite (*Nehalennia gracilis*) and a state rare sedge (*Carex vestita*). They also provide habitat for several watchlist species (species ranked by DCR-NHP as S3 – "rare to uncommon," or SU – "status uncertain") including the gray petaltail (*Tachopteryx thoreyi*), aurora damsel (*Chromagrion conditum*), and eastern red damsel (*Amphiagrion saucium*). The watchlist dragonfly species, *Gomphaeschna furcillata,* has also been recorded in this habitat on Fort Belvoir (Hobson, 1996).

## Mixed Pine Hardwood Forests

Mixed pine hardwood forests consist of transitional forests between early successional pine and climax hardwood types. Vegetation is a variable mix of pines, oaks, and other hardwoods. At Fort Belvoir, mixed pine hardwood forests were identified where hardwoods and pine trees appeared to be evenly distributed or where neither hardwoods nor pines appeared to be more than 70% dominant. Virginia pine is the dominant pine in mixed pine hardwood forests, although some stands mixed with loblolly pine exist. Dominant hardwoods in mixed pine hardwood forests are variable, but can be generalized based on topography and their position bordering mapped hardwoods. For example, mixed pine hardwood forests mapped at the tops of dry ridges and bordered by oak/ericad forest are likely to have chestnut oak or scarlet oak as the dominant hardwood in the mix. Lowland areas tend to have tulip poplar and red maple mixed with Virginia pine. Upland areas tend to be mixed with white oak and chestnut oak (Paciulli, Simmons and Associates, Ltd., 1998).

## Virginia Pine Forests

Virginia pine forests consist of early successional forest of old fields or other land clearings dominated by Virginia pine (greater than 70% dominance). Virginia pines are most abundant and occur naturally compared to forests of loblolly pine and white pine, which most likely have been introduced by plantings in former clearings (Paciulli, Simmons and Associates, Ltd., 1998).

## Loblolly Pine Forest

Small portions of the installation have been planted in loblolly pine. The loblolly pine forests at Fort Belvoir are usually planted and often appear in rows. Native stands are not prevalent at Fort Belvoir (Paciulli, Simmons and Associates, Ltd., 1998).

## White Pine Forest

One stand of planted white pine large enough for mapping occurs at the Elhers Road entrance to Davison Army Airfield. White pine is also used throughout Fort Belvoir for landscaping; however, these areas were not included because they are located within improved grounds (Paciulli, Simmons and Associates, Ltd., 1998).

## Moderately Well-Drained Floodplain Hardwood Forests

Moderately well-drained floodplain hardwood forests are dominant within the major floodplains. They are palustrine forests of moderately well-drained to somewhat poorly-drained floodplain bottomland. These hardwood forests are generally located above streambanks in non-hydric soils that are mixed with

upland and wetland vegetation. They are flooded regularly, but the well-drained soils do not retain hydrology long enough to support wetland vegetation. At Fort Belvoir, moderately well-drained floodplain hardwood forests are dominated by tulip poplar mixed with red maple and sweet gum (*Liquidambar styraciflua*) trees. The understory consists of ironwood (*Carpinus caroliniana*), red maple, and spicebush (*Lindera benzoin*) shrubs. In both the moderately well-drained floodplain hardwood forests and tulip poplar mixed hardwood forests, the tulip poplar is the dominant indicator species. However, the composition of other characteristic species is significantly different. Characteristic species of moderately well-drained floodplain hardwood forests are adapted to moister soils within the floodplain (Paciulli, Simmons and Associates, Ltd., 1998).

## Poorly Drained Floodplain Hardwood Forest

The poorly drained floodplain hardwood forest type is a palustrine forest occurring on somewhat poorly-drained to very poorly-drained floodplain bottomlands and sloughs. Its composition is variable, and it is generally located on hydric soils (soils that are inundated or saturated for a significant amount of time so that anaerobic conditions are created) dominated by hydrophytic vegetation (plants typically found in wetland habitats). They are most extensive along Pohick Creek and Accotink Creek floodplains and consist of a variable mix of pin oak (*Quercus palustris*), willow oak (*Quercus phellos*), green ash (*Fraxinus pennsylvanica*), sycamore (*Platanus occidentalis*), red maple, river birch (*Betula nigra*), and sweet gum. The understory contains highbush blueberry (*Vaccinium corymbosum*) (Paciulli, Simmons and Associates, Ltd., 1998).

Poorly drained hardwood forests differ from moderately well-drained hardwood forests in that they are located on wetter soils and are dominated by hydrophytic vegetation. Moderately well-drained floodplain hardwood forests are located within drier soils and are mixed with hydrophytic and non-hydrophytic vegetation. Poorly drained floodplain hardwood forests are usually jurisdictional wetlands under Section 404 of the Clean Water Act.

## Non-Tidal Marsh/Beaver Pond Community

Non-tidal marsh/beaver pond areas are successional herbaceous to scrubby wetlands of variable composition. They consist of emergent wetlands that are above the tidal limits of Accotink Creek and Pohick Creek, and emergent wetlands within Jackson Miles Abbott Wetland Refuge along Dogue Creek. Large areas of emergent wetlands border the braided channels within Pohick Creek's floodplain and above the tidal influence. Many of these areas are created or influenced by beaver activity that has caused flooding and created open marshes in areas previously dominated by hardwood forests. Beavers have created a large marsh along Poe Road. Vegetation composition is variable, consisting of emergents including arrow arum (*Peltandra virginica*), rice cutgrass (*Leersia oryzoides*), sedges (*Carex* sp.), rushes (*Juncus* sp.), smartweeds (*Polygonum* sp.), and swamp rose mallow (*Hibiscus moscheutos*). Common shrubs are buttonbush (*Cephalanthus occidentalis*), swamp rose (*Rosa palustris*), and swamp dogwood (*Cornus amomum*) (Paciulli, Simmons and Associates, Ltd. 1998). The beaver pond complexes at Fort Belvoir support two state-rare damselfly species: the sphagnum sprite and the furtive forktail (*Ischnura prognata*). The state rare least bittern (*Ixobrychus exilis*) has been known to use marshes in the Dogue Creek wetlands (Hobson, 1996).

## Tidal Marsh Community

Tidal marshes dominate shallow tidal areas of Accotink and Pohick Creeks, and also occur at the mouths of several streams that flow from Fort Belvoir into surrounding tidal waters. Tidal marsh consists of a

variable mix of emergent wetland vegetation such as arrow arum, yellow pond lily (*Nuphar luteum*), pickerelweed (*Pontedaria cordata*), wild rice (*Zizania aquatica*), cattail (*Typha latifolia*), and river bulrush (*Scirpus fluviatilis*) (Paciulli, Simmons and Associates, Ltd., 1998).

The fresh tidal marsh at the mouth of Accotink Creek is an area of semipermanently flooded herbaceous vegetation, which has been identified as a significant community. It represents a community type that is fairly uncommon in Virginia. This community is in good to excellent condition with little evidence of disturbance and is one of the better examples of its type in Virginia. Several rare plant species, including vetchling (*Lathyrus palustris*), water-plantain spearwort (*Ranunculus ambigens*), and river bulrush (*Scirpus fluviatilis*) occur within this community at the head of Accotink Bay. The watchlist plant species large bur-reed (*Sparganium eurycarpum*) and creeping spikerush (*Eleocharis smallii*) also occur within this community (Hobson, 1996).

## Freshwater Tidal Swamp Forest Community

Freshwater tidal swamp forests are tidally influenced palustrine forests. At Fort Belvoir, the dominant trees are green ash and red maple. The understory composition is variable, and influenced by the extent of tidal flooding and openness of the canopy. Typical shrubs in less inundated areas include highbush blueberry, arrowwood viburnum, and silky dogwood (*Cornus amomum*) in areas less inundated. Areas that have an open canopy and are semi-permanently to permanently flooded have an understory that includes typical broadleaf emergents such as arrow arum, yellow pond lily (*Nuphar luteum*), and pickerelweed that occupy adjacent tidal marshes (Paciulli, Simmons and Associates, Ltd., 1998).

Two significant areas of tidal swamp forest occur as peninsulas that extend into Gunston Cove. Tidal forests are also located along the upper tidal limits of Accotink Bay.

## Tidal Scrub/Shrub Wetland Community

Tidal scrub/shrub wetlands at Fort Belvoir are the least dominant tidal vegetation community and are generally located along the edges of tidal swamp forests near the transition to tidal marsh. They are tidally influenced palustrine scrub/shrub wetlands dominated by woody plants less than three inches in diameter at breast height, but greater than 3.2 feet in height. Tidal scrub/shrub vegetation at Fort Belvoir consists of black willow (*Salix nigra*), red maple, common alder (*Alnus serrulata*), and green ash (Paciulli, Simmons and Associates, Ltd., 1998).

## Old Field Grasslands

In the Mid-Atlantic region, old field grasslands generally are abandoned fields and clearings that are still in early successional stages. At Fort Belvoir, they generally consist of unimproved open fields or areas that are infrequently mowed. Old field grasslands occur in areas previously cleared for landfills, farming, and training. Approximately 190 acres of grasslands and potential grasslands have been identified at Fort Belvoir. They range in size from less than one-half acre to more than 20 acres (Paciulli, Simmons and Associates, Ltd., 1996). Old field grasslands do not include grounds such as golf course roughs since they tend to be landscaped and mowed occasionally. Dominant vegetation consists of a variable mix of grasses and wildflowers (forbs). Characteristic species are broomsedge (*Andropogon virginicus*), tall fescue (*Festuca elatior*), and bushclover (*Lespedeza cunneata*). These areas are valuable for providing habitat for song birds, ground nesting birds, and small mammals, which provide food sources for wildlife such as fox and birds of-prey (Paciulli, Simmons and Associates, Ltd., 1998).

| Urban Land |
| --- |
| All developed areas at Fort Belvoir are identified as urban land. Urban land consists of improved and semi-improved grounds. This includes open lands, natural tree stands and woodland borders, buildings and paved areas, turf and landscaped areas. Open areas such as the airfield and golf courses are considered urban land. The vegetation is characterized by a wide variety of native trees, planted landscape trees and shrubs, tall fescue grass, and Kentucky bluegrass (*Festuca arundinacea*) (Paciulli, Simmons and Associates, Ltd., 1998). Vegetation management of developed lands is presented in the following chapter 10.0 Developed Areas. |

# APPENDIX G

# ECOLOGICAL COMMUNITY TYPES
# OF
# FORT BELVOIR

# Ecological Community Types of Fort Belvoir

Flatwoods Mesic Forest
Mesic Mixed Hardwood Forest
Dry-Mesic Oak-Hickory Forest
Mixed-Oak / Ericad Forest
Chestnut Oak / Ericad Forest
Alluvial Mixed Hardwood Forest: Poorly-Drained Type
Alluvial Mixed Hardwood Forest: Well-Drained Type
Coastal Plain / Piedmont Acidic Seepage Swamp
Bottomland Hardwood Swamp
Tidal Hardwood Swamp
Tidal Shrub Swamp
Beaver Marsh: Rush – Sedge Type
Beaver Marsh – Arrow-arum Type
Tidal Freshwater Marsh: Mixed Type
Marsh: Mud Flat Type
Tidal Freshwater Marsh: Wild Rice – Smartweed Type
Tidal Freshwater Marsh: Spikerush – Golden-club Type

## Flatwoods Mesic Forest

### *Description*

The Flatwoods Mesic Forest canopy is somewhat open (60-80% cover) and composed of tall (>20m) *Fagus grandifolia* (American beech) and *Liriodendron tulipifera* (yellow poplar). Other trees that can occur in the canopy are *Liquidambar styraciflua* (sweetgum), *Platanus occidentalis* (sycamore), and mesophytic *Quercus* spp. such as *Q. rubra*, *Q. shumardii*, *Q. alba*, and *Q. phellos* (red, Shumard, white, and willow oaks). *Fagus grandifolia* and *Carpinus caroliniana* (American hornbeam) are the most common species in the open to sparse understory (5-40% cover). The shrub layer is open with typically less than 5% cover. The species that occur in the open layer are *Ilex opaca* var. *opaca* (American holly) and young *Fagus grandifolia*, *Carpinus caroliniana*, *Liquidambar styraciflua*, and *Quercus* spp. saplings. This community type can be found on flats along wetlands, so an occasional wetland shrub (e.g., *Rhododendron viscosum* [swamp azalea], *Lyonia ligustrina* [maleberry]) or herb may be a component at the community edge.

The herb layer is sparse in this type (0-5% cover). Woody seedlings of *Acer rubrum* (red maple), *Amelanchier arborea* (downy serviceberry), *Carpinus caroliniana*, *Fagus grandifolia*, *Liquidambar styraciflua*, *Liriodendron tulipifera*, *Nyssa sylvatica* (black gum), *Quercus phellos*, and *Viburnum dentatum* (southern arrow-wood) account for a majority of the species found in the lowest layer. True herbs include *Carex swanii* (swan sedge), *Epifagus virginiana* (beechdrops), and *Parthenocissus quinquefolia* (Virginia creeper).

The vegetational character of the community type is relatively consistent throughout the growing season due to the dominance of woody saplings, seedlings, and persistent herbs. The mean species richness of this type is 32.

### *Threats or disturbances*

*Microstegium vimineum* (eulalia) was present in one of the representative plots. *Microstegium vimineum* is an invasive exotic annual grass that forms dense monospecific stands and tends to exclude native herbaceous vegetation. Further habitat disturbance included trash washed up into the habitat during high water.

## Mesic Mixed Hardwood Forest

### *Description*

The Mesic Mixed Hardwood Forest is characterized by high cover of *Fagus grandifolia* (American beech) and *Liriodendron tulipifera* (yellow poplar) in the tall (>20m), somewhat open to dense (70-100% cover) canopy. Other hardwoods in the mixed canopy include *Quercus alba*, *Q. pagoda*, *Q. rubra*, *Q. velutina*, and *Q. montana* (white, cherrybark, northern red, black, and chestnut oaks), *Carya alba* and *C. cordiformis* (mockernut and bitternut hickories), *Fraxinus americana* (white ash), and *Platanus occidentalis* (sycamore). The understory (trees in the 6-20m) is usually sparse (<25% cover) and can include *Fagus grandifolia*, *Cornus florida* (flowering dogwood), *Carpinus caroliniana* (American hornbeam), *Liriodendron tulipifera*, *Nyssa sylvatica* (black gum), *Acer rubrum* (red maple), *Carya alba*, *Amelanchier arborea* (downy serviceberry), *Prunus serotina* var. *serotina* (wild black cherry), and *Fraxinus americana*.

The vegetational character of the shrub layer is variable, although the cover is consistently sparse (<25% cover). *Asimina triloba* (pawpaw) can can high cover in both the shrub and herb layers, but is not uniformly present throughout the type. *Asimina triloba* is a rhizomatous plant that forms dense thickets and therefore, when present, can be a large component of the shrub layer. Other shrubs and woody vines of the community type are *Lindera benzoin* (spicebush), *Amelanchier arborea*, *Vitis aestivalis* var. *aestivalis* (summer grape), *Ilex opaca* var. *opaca* (American holly), and *Parthenocissus quinquefolia* (Virginia creeper). Young trees of the understory are also present in the shrub layer.

The herb layer of this community ranges from sparse when *Asimina triloba* is present (5-25% cover), to very sparse (0-5% cover). Typical plants of the herb layer are *Botrychium virginianum* (rattlesnake fern), *Euonymus americanus* (American strawberry-bush), *Maianthemum racemosum* ssp. *racemosum* (false solomon's seal), *Lonicera japonica* (honeysuckle), *Toxicodendron radicans* (poison ivy), and *Parthenocissus quinquefolia*. Woody seedlings account for a third to half of the species recorded in the herb layer based on data recorded from five representative vegetation samples.

The vegetative character of this type is relatively consistent throughout the growing season. Mean species richness is 32.

### *Threats or disturbances*

Evidence of disturbance includes *Lymantria dispar* (gypsy moth) damage, *Discula destructiva* (dogwood anthracnose), exotic plants, and trash.

## Dry-Mesic Oak-Hickory Forest

### *Description*

The Dry-Mesic Oak-Hickory forest has a 60-100% closed canopy >20 m tall. The dominant species are mixed and variable, and can include *Quercus alba* (white oak), *Quercus rubra* (northern red oak), *Quercus coccinea* (scarlet oak), *Quercus montana* (chestnut oak), *Carya alba* (mockernut hickory), *Carya glabra* (pignut hickory), *Liquidambar styraciflua* (sweet gum), *Liriodendron tulipifera* (yellow poplar), and *Fagus grandifolia* (American beech). The presence of *Carya alba* or *Carya glabra* with *Quercus* spp. in the overstory is truly diagnostic of this type. Trees present in the canopy are also present in the understory. *Nyssa sylvatica* (black gum) is an additional species common to the 10-20 m layer. The lowest tree layer (6-10 m) is sparse (0-25% cover) and typically composed of several species. *Cornus florida* (flowering dogwood), *Toxicodendron radicans* (poison ivy), *Carpinus caroliniana* (eastern hornbeam), and *Ilex opaca* var. *opaca* (American holly), as well as many of the canopy species, are found in the understory.

The shrub stratum is very sparse to sparse (0-25% cover) in most stands of this type. If either *Kalmia latifolia* (mountain laurel) or *Asimina triloba* (pawpaw) is present in this forest type, shrub cover can be significant. *Asimina triloba* and *Kalmia latifolia* are rhizomatous shrubs that form dense thickets and therefore, when present, can contribute high cover to the shrub stratum. *Chionanthus virginicus* (fringetree), *Corylus americana* (American hazelnut), *Prunus serotina* var. *serotina* (wild black cherry), *Vaccinium corymbosum* (highbush blueberry), *Amelanchier arborea* (downy serviceberry), *Sassafras albidum* (sassafras), and *Celtis occidentalis* (common hackberry) were all documented in the shrub stratum of this type.

The very sparse herb layer (<25% cover) consists primarily of woody seedlings from the overstory. *Vaccinium pallidum* (early lowbush blueberry) is nearly constant in the herb layer, but achieves <1% mean cover. Other typical taxa of the herb layer are *Euonymus americanus* (American strawberry-bush), *Parthenocissus quinquefolia* (Virginia creeper), *Smilax glauca* (whiteleaf greenbrier), *Smilax rotundifolia* (common greenbrier), and *Toxicodendron radicans*. Community structure is consistent during the growing season and mean species richness is 36.

### *Threats or disturbances*

Evidence of disturbance includes *Lymantria dispar* (gypsy moth) damage, *Discula destructiva* (dogwood anthracnose), exotic plants (*Lonicera japonica* [honeysuckle] and *Celastrus orbiculatus* [oriental bittersweet]), and trash.

## Mixed-Oak / Ericad Forest

### *Description*

*Quercus alba* (white oak) and *Quercus montana* (chestnut oak) are the dominant canopy trees in the Mixed Oak / Ericad Forest type. Other oaks variably found in the community type are *Quercus rubra* (northern red oak) and *Quercus falcata* (southern red oak). Cover of the canopy (>20 m tall) is open to dense (40-80%). The understory (6-20 m) of *Acer rubrum* (red maple), *Fagus grandifolia* (American beech), *Nyssa sylvatica* (black gum), *Quercus montana*, and *Quercus alba* is sparse (5-25% cover). The shrub layer is also sparse and can include *Ilex opaca* var. *opaca* (American holly), *Kalmia latifolia* (mountain laurel), and young trees.

The presence of *Gaylussacia baccata* (black huckleberry), *Vaccinium stamineum* (deerberry), and/or *Vaccinium pallidum* (early lowbush blueberry) characterizes the sparse herb layer. These species belong to the *Ericaceae* (heath) family, a family of acidophilic, typically shrubby plants. Where canopy gaps have formed, from tree death or storm damage, these ericads occur with greater cover. Other species of the thin poor soils are *Epifagus virginiana* (beechdrops), *Chimaphila maculata* (spotted wintergreen), *Danthonia spicata* (povery oat-grass), *Euonymus americanus* (American strawberry-bush), and *Viburnum acerifolium* (maple-leaf viburnum). This stratum is sparse and species poor, with a mean species richness of 15. Based on three plot samples, woody saplings account for as much as two-thirds of the herb layer species.

The character of this community type is quite consistent throughout the growing season. Overall mean species richness is 18.

### *Threats or disturbances*

*Lymantria dispar* (gypsy moth) damage was noted in this community type. The habitat has also been severely altered in some areas by training practices and logging.

## Chestnut Oak / Ericad Forest

### *Description*

The nearly closed canopy of this Chestnut Oak / Ericad Forest type is dominated by *Quercus montana* (chestnut oak). This species has a mean cover of 50-75% in the community type and is largely dominant in the >20 m class. Other species present in the uppermost stratum are *Acer rubrum* (red maple) and *Quercus velutina* (black oak). The 10-20 m layer is variable in density, ranging from 5-60% cover based on four plot samples. The most consistent species of this stratum is *Fagus grandifolia* (American beech). Other contributing species include *Acer rubrum*, *Quercus montana*, *Quercus coccinea* (scarlet oak), *Quercus velutina*, and *Liquidambar styraciflua* (sweetgum). The lowest layer of the understory (6-10 m) is very sparse to open. *Sassafras albidum* (sassafras) is characteristic of this stratum and occurs in all four of the sampled plots.

Shrub cover is typically high (60-80%) due to the prevalence of *Kalmia latifolia* (mountain laurel). This species is part of the *Ericaceae*, a family of acidophyllic, typically shrubby plants. It forms thickets and therefore can attain high cover when it is present. Other shrubs occuring at low cover within the *Kalmia latifolia* thicket are *Ilex opaca* var. *opaca* (American holly), *Viburnum acerifolium* (maple-leaf viburnum), *Hamamelis virginiana* (witchhazel), and *Asimina triloba* (pawpaw).

The dense shade of *Kalmia latifolia*, together with the thin, acidic soils of this type, precludes a significant herb layer. *Chimaphila maculata* (spotted wintergreen), *Epifagus virginiana* (beechdrops), *Epigea repens* (trailing arbutus), *Mitchella repens* (partridge-berry), *Vaccinium pallidum* (early lowbush blueberry), *Medeola virginiana* (Indian cucumber-root), *Smilax rotundifolia* (common greenbrier), and *Polystichum acrostichoides* (Christmas fern) are a few of the species that do occur in the herb layer. Woody seedlings account for a significant number (53%-100%) of the species recorded in the herb layer. No species recorded, however, had a mean cover >1%.

This oak / ericad forest type is floristically uniform throughout the growing season because of its predominantly woody herb layer. Mean species richness for this type is 19.

### *Threats or disturbances*

*Lymantria dispar* (gypsy moth) herbivory was noted in three of the four plots. The impact of the large *Odocoileus virginianus* (white tailed deer) population at Fort Belvoir was indicated by browse lines in two plots. Soil erosion was also recorded in two plots.

## Alluvial Mixed Hardwood Forest: Poorly Drained Type

### *Description*

The canopy (>20m) of this poorly drained Alluvial Mixed Hardwood Forest consists of water tolerant tree species such as *Acer rubrum* (red maple), *Liquidambar styraciflua* (sweetgum), *Liriodendron tulipifera* (yellow poplar), *Quercus palustris* (pin oak), *Ulmus americana* (American elm), and *Quercus phellos* (willow oak). The understory (10-20 m) is sparse to open (0-60% cover). *Acer rubrum*, *Liquidambar styraciflua*, *Nyssa sylvatica* (black gum), and robust vines of *Toxicodendron radicans* (poison ivy) are found in this stratum. The 6-10 m stratum is sparse (0-25% cover) and composed of smaller trees of the higher strata. *Carpinus caroliniana* (eastern hornbeam) is another associate in the understory.

The shrub layer of this type is sparse (0-25% cover). True shrubs include *Juniperus virginiana* (eastern red cedar), *Ilex verticillata* (winterberry), *Vaccinium fuscatum* (hairy highbush blueberry), and *Lindera benzoin* (spicebush).

Cover of the herb layer in sampled plots is sparse to open (0-40%), but can be relatively high in species richness. Although not all are true herbs, forty-eight species were recorded for the herb layer in two plots. *Aster lateriflorus* (calico aster), *Athyrium filix-femina* var. *asplenioides* (lady fern), *Boehmeria cylindrica* (false nettle), *Campsis radicans* (trumpet vine), *Parthenocissus quinquefolia* (Virginia creeper), *Smilax rotundifolia* (common greenbrier), and *Lycopus virginicus* (Virginia bugleweed) occur frequently in this stratum.

The community type has pronounced, temporal differences in hydrology produced by seasonal flooding, but the vegetational character does not deviate significantly. Mean species richness for the type is 39.

### *Threats or disturbances*

Opportunities for the flood transport of seeds and plant materials have encouraged many exotic species. *Lonicera japonica* (honeysuckle), *Berberis thunbergii* (barberry), *Rosa multiflora* (multiflora rose), *Stellaria media* (chickweed), and *Celastrus orbiculatus* (bittersweet) were documented in plots of this type, but their contributions to cover were insignificant. The alien grass *Microstegium vimineum* (eulalia), however, was significant in this type. *Microstegium vimineum* is an invasive exotic annual grass that forms dense monospecific stands and tends to exclude native herbaceous vegetation.

The true character of this community type at Fort Belvoir is questionable. Hydrology on the base has been significantly altered for training and drainage purposes. Ditching and other alterations have occurred adjacent to several of the plot sites and undoubtably have influenced these stands. It is difficult to clearly identify the impact of these changes.

## Alluvial Mixed Hardwood Forest: Well-Drained Type

### *Description*

This community type consistently has tall (>20 m) *Liquidambar styraciflua* (sweetgum) and *Liriodendron tulipifera* (yellow poplar) in the canopy. Less abundant associates are *Acer rubrum* (red maple), *Quercus pagoda* (cherrybark oak), and *Quercus palustris* (pin oak). A sizable *Carya cordiformis* (bitternut hickory); (70 cm DBH) was in one plot and contributed significant cover. Mean canopy cover across all plots was somewhat open to dense (60-100% cover). One plot documented a young, early succession forest with a canopy <20 m tall. Understory layers (6-10 m and 10-20 m) include young trees of the overstory, as well as *Carpinus caroliniana* (eastern hornbeam), *Nyssa sylvatica* (black gum), and abundant young *Fagus grandifolia* (American beech). Woody vines of *Toxicodendron radicans* (poison ivy) and *Vitis vulpina* (winter grape) contribute cover in these strata.

The shrubs *Lindera benzoin* (spicebush), *Asimina triloba* (pawpaw), *Sassafras albidum* (sassafras), *Corylus americana* (American hazelnut), and *Ilex opaca* var. *opaca* (American holly) can occur in the sparse to very open shrub stratum (5-40% cover). Sapling trees of the overstory and understory are also common in this stratum.

*Microstegium vimineum* (eulalia), an exotic grass, has severly impacted much of this habitat at Fort Belvoir and typically forms dense (80%-100%) cover in the herb layer. Cover of native species is very sparse or sparse (0-25%). *Lindera benzoin*, which is characteristic in the shrub layer, also achieves one of the highest covers in the herb layer. Other native species that consistently characterize the herb layer are *Cinna arundinacea* (wood reedgrass), *Galium circaezans* (southern forest bedstraw), *Geum canandense* (white avens), *Polystichum acrostichoides* (Christmas fern), and *Smilax rotundifolia* (common greenbrier).

Some ephemeral species may have been excluded from documentation of this community type, because all samples were completed later in the growing season. Many early flowering species flourish in mesic habitats and could be present before *Microstegium vimineum* begins its growth. Consequently, the herb stratum experiences seasonal differences in cover and composition. Mean community type species richness is 43.

### *Threats or disturbances*

*Liriodendron tulipifera* and *Liquidambar styraciflua* are shade intolerant species that successfully colonize after disturbance (e.g. logging). Their presence in large stands, as recorded in this type, can indicate a forest in early successional development.

Of all the community types at Fort Belvoir, this type is most visibly disturbed and degraded by exotic species, specifically *Microstegium vimineum*.

## Coastal Plain / Piedmont Acidic Seepage Swamp

### *Description*

The Coastal Plain / Piedmont Acidic Seepage Swamp community supports a mix of wetland and upland plants under an open forest canopy. The canopy (>20 m) typically includes *Acer rubrum* (red maple) and *Liriodendron tulipifera* (yellow poplar). Overstory cover is sparse to somewhat open (5-60%). Canopy trees in one sample do not reach 20 m, but have 60-80% cover in the 10-20 m class. The understory layers can include *Nyssa sylvatica* (black gum), *Fagus grandifolia* (American beech), *Carpinus caroliniana* (eastern hornbeam), large *Magnolia virginiana* (sweetbay magnolia), and small trees of the overstory species. Two of the seepages sampled near Accotink Bay have *Fraxinus pennsylvanica* (green ash) in the 6-10 m stratum. This tree is common in the tidal hardwood swamp and bottomland hardwood swamps that occur along Accotink Bay. Seepage habitat near other wetlands will often share hydrophytic species because of similar soil conditions.

Shrub cover is minimal (0%-5%) to moderately dense (60-80%). *Magnolia virginiana* is the most diagnostic species of this startum. *Chionanthus virginicus* (fringetree), *Ilex verticillata* (winterberry), *Leucothoe racemosa* (fetterbush), *Lindera benzoin* (spicebush), *Rhododendron viscosum* (swamp azalea), *Toxicodendron vernix* (poison sumac), *Viburnum nudum* (possum-haw), *Lyonia ligustrina* (maleberry), and *Vaccinium corymbosum* (highbush blueberry) are also found in the shrub layer. *Magnolia virginiana*, *Lindera benzoin*, *Rhododendron viscosum*, and *Vaccinium corymbosum* each have >25% cover in at least one sample.

The herb layer of this seepage type is characterized by plants of saturated, acidic soils. Herbaceous cover is typically high (80-100%) and relatively diverse. Mean species richness of the herb layer from the six plot samples is 35. This number does include woody seedlings, but they are not the significant components of this stratum as in upland types. Common seepage plants that contribute high cover to this type are *Symplocarpus foetidus* (skunk cabbage) and *Osmunda cinnamomea* (cinnamon fern). *Arisaema triphyllum* (jack-in-the-pulpit), *Boehmeria cylindrica* (false nettle), *Carex laevivaginata* (smooth-sheath sedge), *Cinna arundinacea* (wood reedgrass), *Impatiens capensis* (spotted jewelweed), *Lycopus virginicus* (Virginia bugleweed), *Mitchella repens* (partridge-berry), and *Smilax rotundifolia* (common greenbrier) were all constant in the plots sampled.

Once *Symplocarpus foetidus* dies back in early summer, other hydrophytic species dominate the community type. This transition of herbaceous species can produce large changes in species composition and structure during the growing season. Mean community type species richness is 42.

### *Threats or disturbances*

Beaver impoundments are encroaching on the seepage wetlands found in training area T-9. A few exotics are present in this community type, but do not severely impact the habitat.

## Bottomland Hardwood Swamp

### *Description*

This Bottomland Hardwood Swamp community type is easily recognized by its nearly monospecific canopy of *Fraxinus pennsylvanica* (green ash). The canopy is open to somewhat open (40-80% cover) and the majority of cover occurs at ca. 20 m. Other trees that can be present in the overstory are *Betula nigra* (river birch), *Acer rubrum* (red maple), *Platanus occidentalis* (sycamore), and *Salix nigra* (black willow). The understory (6 m–20 m) is sparse to very sparse (0-25% cover). *Acer negundo* (box elder), *Acer rubrum*, young *Fraxinus pennsylvanica*, *Betula nigra*, and *Ulmus americana* (American elm) are components of varying importance. The woody vines *Toxicodendron radicans* (poison ivy), *Parthenocissus quinquefolia* (Virginia creeper), and *Vitis vulpina* (winter grape) reach into the upper understory.

The shrub layer is very sparse. *Ilex verticillata* (winterberry) is a common shrub that occurs in these low, wet flood plains. Other shrubs found in this habiatat are *Acer negundo*, *Diospyros virginiana* (persimmon), young *Liquidambar styraciflua* (sweetgum), young *Fraxinus pennsylvanica*, *Alnus serrulata* (smooth alder), *Viburnum dentatum* (southern arrow-wood), and *Lindera benzoin* (spicebush). The woody vines *Parthenocissus quinquefolia*, *Toxicodendron radicans*, *Lonicera japonica* (honeysuckle), and *Vitis labrusca* (fox grape) also occur in the shrub layer.

The high species richness of this type (mean =51) is largely attributable to the herb layer. This layer of the Bottomland Hardwood Swamp is extremely dense and stratified. *Saururus cernuus* (lizard's tail) and *Poa trivialis* (rough bluegrass) have the highest covers for most of the growing season. Many other herbaceous species occur in this habitat and often have low cover (<1%). *Amphicarpaea bracteata* (hog peanut), *Aster lateriflorus* (calico aster), *Boehmeria cylindrica* (false nettle), *Cinna arundinacea* (wood reedgrass), *Circaea lutetiana* ssp. *canadensis* (enchanter's nightshade), *Commelina virginica* (Virginia dayflower), *Cryptotaenia canadensis* (honewort), *Dichanthelium clandestinum* (deer-tongue panic grass), *Galium aparine* (cleavers), *Geum canandense* (white avens), *Glyceria striata* var. *striata* (fowl mannagrass), and *Impatiens capensis* (spotted touch-me-not) are consistently found in this habitat, though in very low numbers.

The vegetational character of this forest differs throughout the growing season. In early to mid spring, graminoid vegetation covers the forest floor. Mats of *Lysimachia nummularia* (moneywort) are particularly notable in the spring before the grasses and other herbs attain full size. By mid-summer, *Saururus cernuus* and other dicotyledons increase greatly in cover.

### *Threats or disturbances*

The presence of this community type on a flood plain greatly influences the character of the habitat. Moving bodies of water easily disperse seed, so the creeks promote the introduction of non-native species. The exotics *Lysimachia nummularia*, *Lonicera japonica*, *Microstegium vimineum* (eulalia), *Alliaria petiolata* (garlic mustard), *Artemesia vulgaris* var. *vulgaris* (mugwort), *Festuca pratenses* (meadow fescue), *Glechoma hederacea* (ground ivy), *Ligustrum obtusifolium* (border privet), and *Stellaria media* (common chickweed) were all recorded within this community type. *Poa trivialis*, one of the nominal herbs of this type, is also an exotic plant.

## Tidal Hardwood Swamp

### *Description*

This Tidal Hardwood Swamp Forest has a sparse to open canopy (5-40% cover) that reaches a maximum height of about 20 m. The canopy dominant is *Fraxinus pennsylvanica* (green ash), with *Liriodendron tulipifera* (yellow poplar), *Nyssa sylvatica* (black gum), and *Fraxinus profunda* (pumpkin ash) as minor associates. The understory is very sparse to sparse (0-10% cover) and relatively low in diversity. The understory species include *Acer rubrum* (red maple), *Magnolia virginiana* (sweetbay magnolia), *Fraxinus profunda*, and *Fraxinus pennsylvanica*.

The shrub layer is very sparse to very open (0-40% cover). The common shrub species include *Alnus serrulata* (smooth alder), *Ilex verticillata* (winterberry), *Leucothoe racemosa* (fetterbush), *Lindera benzoin* (spicebush), *Vaccinium corymbosum* (highbush blueberry), *Viburnum prunifolium* (smooth black-haw), *Viburnum dentatum* (southern arrow-wood), and *Cornus amomum* (silky dogwood). The vines *Toxicodendron radicans* (poison ivy), *Parthenocissus quinquefolia* (Virginia creeper), *Smilax rotundifolia* (common greenbrier), and *Lonicera japonica* (honeysuckle) also reach this stratum.

The herb layer is dense (80-100% cover). *Polygonum punctatum* (dotted smartweed) and *Saururus cernuus* (lizard's tail) contribute the greatest herbaceous cover. *Peltandra virginica* (arrow-arum) is another diagnostic species of this type, occurring in all plots, with a mean cover of 2-5%. Additional constant species of the herb layer are *Boehmeria cylindrica* (false nettle), *Carex crinita* (long hair sedge), *Carex lurida* (sallow sedge), *Carex tribuloides* (blunt broom sedge), *Cinna arundinacea* (wood reedgrass), *Dioscorea quaternata* (whorled wild yam), *Galium tinctorium* (stiff marsh bedstraw), *Geum canandense* (white avens), *Glyceria striata* var. *striata* (fowl mannagrass), *Lycopus virginicus* (Virginia bugleweed), *Mikania scandens* (climbing hempweed), and *Polygonum arifolium* (halberd-leaf tearthumb). The dense herb layer persists throughout the growing season. Species richness for this community type is 47.

### *Threats or disturbances*

The exotic forb *Murdannia keisak* (marsh dewflower) is abundant in the community type. This species becomes established in freshwater wetlands and forms a solid mat of vegetation that crowds out native species. The oriental mystery snail (*Cipangopaludina chinensis*) is seemingly ubiquitous in the tidal swamps and marshes at Fort Belvoir. These snails can negatively alter the vegetational habitat and have been identified as intermediate hosts for parasitic organisms that can affect human health.

## Tidal Shrub Swamp

### *Description*

This is a characteristic, shrubby community occurring near the upper reaches of tidal influence. *Alnus serrulata* (smooth alder) and *Salix nigra* (black willow) are the most constant and abundant shrub species in this dense stratum (40-80% cover). *Cornus amomum* (silky dogwood), *Viburnum dentatum* (southern arrow-wood), *Lindera benzoin* (spicebush), *Ilex verticillata* (winterberry), *Rosa palustris* (marsh rose), and *Corylus americana* (American hazelnut) are also common in the shrub layer. Isolated small trees <10 m tall (e.g. *Fraxinus pennsylvanica* [green ash], *Platanus occidentalis* [sycamore], and *Salix nigra*) can be present in this community. The average height of the shrub layer is ca. 2 m.

The herb layer is typically dense (80-100% cover) and rich with forbs. Two herbs that also frequently reach shrub height are *Apios americana* (American groundnut) and *Mikania scandens* (climbing hempweed). *Boehmeria cylindrica* (false nettle), *Carex crinita* (long hair sedge), *Cinna arundinacea* (wood reedgrass), *Geum canandense* (white avens), *Impatiens capensis* (spotted jewelweed), *Pilea fontana* (blackfruit clearweed), *Polygonum arifolium* (halberd-leaf tearthumb), and *Polygonum punctatum* (dotted smartweed) are other common herbs. *Pilea fontana* was chosen as the nominal herb because of its high diagnostic value for this community type.

This shrub swamp is compositionally consistent throughout the growing season, but the relative covers of species change as they each achieve their maximal size. Community type mean species richness is 44.

### *Threats or disturbances*

Exotic plants were noted in the plots of this community type. *Lonicera japonica* (honeysuckle) and *Microstegium vimineum* (eulalia) were present in most (80%) samples. *Murdannia keisak* (marsh dewflower) has a high mean cover (5-10%) for this type.

**Beaver Marsh: Rush – Sedge Type**

***Description***

A very sparse tree cover (typically 10 m tall) characterizes the Sedge – Rush Beaver Marsh community type. The few water-tolerant woody species that occur in this open layer are *Acer rubrum* (red maple), *Liriodendron tulipifera* (yellow poplar), and *Quercus phellos* (willow oak). The shrub stratum has a cover of 5-40% and is well developed with a mix of wetland shrubs. These include *Leucothoe racemosa* (fetterbush), *Rhododendron viscosum* (swamp azalea), *Vaccinium corymbosum* (highbush blueberry), and *Viburnum nudum* (possum-haw).

The herb layer is dense and stratified with graminoids, woody saplings, and forbs. The diagnostic species soft rush, *Carex lurida* (sallow sedge), and *Carex stricta* (tussock sedge) contribute the greatest cover among samples of this community type. Other commonly occurring herbs include *Boehmeria cylindrica* (false nettle), *Galium tinctorium* (stiff marsh bedstraw), *Juncus acuminatus* (sharp-fruited rush), *Mikania scandens* (climbing hempweed), *Osmunda cinnamomea* (cinnamon fern), *Sparganium americanum* (American burreed), *Symplocarpus foetidus* (skunk cabbage), *Utricularia biflora* (two-flower baldderwort), and *Woodwardia areolata* (netted chain fern).

The relative covers of species in this type are seasonably variable, but composition is quite stable during the growing season. Mean species richness for the two plots is 41.

***Threats or disturbances***

The exotics *Microstegium vimineum* (eulalia) and *Lonicera japonica* (honeysuckle) are the only invasive species recorded in the two samples of this community type. They do not currently pose a serious threat to the habitat. Beaver activity continually alters local hydrology and could potentially increase or decrease the range of the nontidal wetland communities.

## Beaver Marsh – Arrow-arum Type

### *Description*

This beaver marsh type can have considerable floristic variation. Canopy cover is very sparse to absent (0-5%) and *Acer rubrum* (red maple) was the sole canopy tree species recorded in this type. The shrub layer is also very sparse or absent. When present, shrubs can include *Acer negundo* (box elder), *Leucothoe racemosa* (fetterbush), and young *Acer rubrum*. The herb stratum is dense. One or a few species contribute most of the cover, but the dominant species can vary within the community type. Characteristic high-cover herbs are *Peltandra virginica* (arrow-arum), *Saururus cernuus* (lizard's tail), and *Leersia oryzoides* (rice cutgrass). While a few species attain high cover, many additional herbs occur in low numbers, including *Alisma subcordatum* (broad-leaved water plantain), *Scutellaria lateriflora* (mad dog skullcap), *Triadenum walteri* (Walter's St. John's wort), *Carex lurida* (sallow sedge), and *Lycopus virginicus* (Virginia bugleweed).

The dominant vegetation is fairly persistent throughout the growing season. *Leersia oryzoides*, however, increases in cover and dominance as the season progresses. Mean species richness for the three plots of this community type is 31.

### *Threats or disturbances*

Two exotic species, *Microstegium vimineum* (eulalia) and *Iris pseudacorus* (yellow flag), were documented in this community type but do not currently compromise the habitat quality.

## Tidal Freshwater Marsh: Mixed Type

### *Description*

The Tidal Freshwater Marsh: Mixed Type is characterized by high species richness and lack of clear dominance by one or a few species. The physiognomy is considered herbaceous although some low woody species (e.g. *Salix caroliniana* [Carolina willow]) can be present and the herbs can be rather tall. The mixed marsh vegetation often reaches heights of 1.5 m. Vegetation cover is essentially 100% and layered. Species that occur in all five examples of this community type (constancy=100%) include *Apios americana* (American groundnut), *Boehmeria cylindrica* (false nettle), *Carex comosa* (bristly sedge), *Hibiscus moscheutos* ssp. *moscheutos* (eastern rose-mallow), *Polygonum arifolium* (halberd-leaf tearthumb), *Scirpus fluviatilis* (river bulrush), and *Typha latifolia* (broad-leaved cattail). The nominal species (*Typha latifolia*, *Scirpus fluviatilis*, *Carex comosa*) are highly indicative of the community type. *Carex tribuloides* (blunt broom sedge), *Lycopus americanus* (American bugleweed), *Mikania scandens* (climbing hempweed), *Peltandra virginica* (arrow-arum), *Polygonum sagittatum* (arrow-leaved tearthumb), and *Pontedaria cordata* (pickerelweed) are common associates in these marshes. Many other herbs are present in low numbers. The mean species richness for this type is 35, with a range of 23 to 41.

### *Threats or disturbances*

Many exotic plants were recorded from plots of this type. The most invasive species is *Murdannia keisak* (marsh dewflower), which forms a solid mat of vegetation that crowds out native species. Other exotic taxa recorded were *Arthraxon hispidus* (joint-head arthraxon), *Hydrilla verticillata* (hydrilla), and *Microstegium vimineum* (eulalia).

## Tidal Freshwater Marsh: Mud Flat Type

### *Description*

The Tidal Freshwater Marsh: Mud Flat Type has an entirely herbaceous physiognomy with dense cover (80-100%) of mostly leafy forbs. *Nuphar advena* (spatterdock) and *Peltandra virginica* (arrow-arum) are the characteristic and dominant species. *Nuphar advena* is rhizomatous and can therefore occur in nearly monospecific stands. *Peltandra virginica* produces a pedunculate fruit that hangs down into the mud and decays, releasing the seeds in the immediate substrate. Because of this reproductive strategy, *Peltandra virginica* is also found in large populations. Both of these wetland plants are large-leaved, and produce substantial cover. The floating/submergent exotic *Hydrilla verticillata* (hydrilla) also has very high cover, sometimes forming solid mats under the emergent forbs. Species with significant mean cover in thi stype are *Pontedaria cordata* (pickerelweed) (2-5%), *Scirpus fluviatilis* (river bulrush) (1-2%), and *Zizania aquatica* (wild rice) (1-2%). *Cinna arundinacea* (wood reedgrass), *Ludwigia palustris* (marsh seedbox), *Mikania scandens* (climbing hempweed), *Mimulus alatus* (winged monkey-flower), *Murdannia keisak* (marsh dewflower), *Sagittaria latifolia* (broad-leaf arrowhead), and *Typha latifolia* (broad-leaved cattail) occur in small numbers and collectively account for less than 2% of the total cover in a given plot. The species richness of this type is very low, with as few as three species in a 100 $m^2$ plot. The mean species richness for this type is seven.

### *Threats or disturbances*

The exotic, floating/submergent aquatic plant *Hydrilla verticillata* can have high cover in the mud flat community type. This rhizomatous plant aggressively crowds out native vegetation and forms large mats that prevent light from reaching native aquatic species. It also provides increased habitat for mosquitos and clogs waterways for navigation. This noxious weed has had a profound impact on the Potomac River and its tributaries. It will continue to compromise the integrity of the Pohick Bay and Accontink Bay marshes. Another exotic, *Murdannia keisak*, was documented in one plot of this type. This exotic species forms a solid mat of vegetation that outcompetes native species.

The oriental mystery snail (*Cipangopaludina chinensis*) is seemingly ubiquitous in the marshes at Fort Belvoir. These snails can negatively alter the vegetational habitat and have been identified as intermediate hosts for parasitic organisms that can affect human health.

## Tidal Freshwater Marsh: Wild Rice – Smartweed Type

### *Description*

The robust annual *Zizania aquatica* (wild rice) is the dominant and characteristic species of this community type, with a 75-100% late-season cover. *Polygonum punctatum* (dotted smartweed) is found in fairly dense cover (10-25%) under the tall stems of *Zizania aquatica*. Other species present are *Sagittaria latifolia* (broadleaf arrowhead), *Cyperus erythrorhizos* (red-root flatsedge), *Orontium aquaticum* (golden club), and *Peltandra virginica* (arrow-arum). Species richness is low (14 species) in the one sampled plot, which is typical of the wild rice tidal marsh.

### *Threats or disturbances*

The floating/submergent *Hydrilla verticillata* (hydrilla) is an abundant part of this community type. This rhizomatous plant aggressively crowds out native vegetation and forms large mats that prevent light from reaching native aquatic species. It also provides increased habitat for mosquitos and clogs waterways for navigation. This noxious weed has had a profound impact on the Potomac River and its tributaries. It will continue to compromise the integrity of the Pohick Bay and Accontink Bay marshes. The other two exotics noted, *Lysimachia nummularia* (moneywort) and *Microstegium vimineum* (eulalia), are not as prevalent as *Hydrilla verticillata*.

## Tidal Freshwater Marsh: Spikerush – Golden-club Type

### *Description*

This community is a distinctive marsh type that occurs in relatively small patches within mixed marsh vegetation. *Eleocharis palustris* (creeping spikerush), a rhizomatous perennial, is locally dominant and creates small, relatively monospecific areas in the marsh vegetation. *Orontium aquaticum* (golden club) has a moderately high cover (5-10%) in the one sampled plot and was consistently present in other patches of this type that were observed. Minor associates are *Peltandra virginica* (arrow-arum), *Polygonum punctatum* (dotted smartweed) and *Polygonum sagittatum* (arrow-leaved tearthumb), *Scirpus tabermontani* and *S. cyperinus* (soft-stem and woolgrass bulrush), *Asclepias incarnata* (swamp milkweed), *Bidens connata* (purple-stem swamp beggar-ticks), *Leersia oryzoides* (rice cutgrass), and *Sparganium eurycarpum* (giant burreed). Other marsh species from the surrounding mixed marsh could be expected in this type. More plot samples are needed to produce a more robust classification and description of this provisional type. Species richness of the representative plot is 14

### *Threats or disturbances*

The exotic forb *Murdannia keisak* (marsh dewflower) was documented in this type. This species forms a solid mat of vegetation that crowds out native species. Additionally, the oriental mystery snail (*Cipangopaludina chinensis*) is present in this marsh type at Fort Belvoir. These snails can negatively alter the vegetational habitat and have been identified as intermediate hosts for parasitic organisms that can affect human health.

# APPENDIX H

## FORT BELVOIR SUPPLEMENT 1 TO AR 200-3:
## *NATURAL RESOURCES: LAND, FOREST, AND WILDLIFE MANAGEMENT*

DEPARTMENT OF THE ARMY
U.S. ARMY GARRISON, FORT BELVOIR
Fort Belvoir, Virginia 22060-5928

FB Supplement 1
to AR 200-3

20 February 1998

# NATURAL RESOURCES
# LAND, FOREST AND WILDLIFE MANAGEMENT

FOR THE COMMANDER:

MICHAEL A. LEEPER
COL, AD
Garrison Commander

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JOHN S. HODGE
Acting Adjutant General

History. This is a new Fort Belvoir Supplement.

Summary. This supplement establishes procedures and policies of the requirements of AR 200-3 specific to U.S. Army Garrison, Fort Belvoir Installation. It specifies the responsibilities of the Directorate of Installation Support, Environmental and Natural Resource Division for Natural Resources Management, including enforcement of fish and wildlife laws and regulations.

Applicability. This supplement applies to all base operations, tenants, contractors, and all military and civil users of the natural resources of U.S. Army Garrison, Fort Belvoir.

Suggested Improvements. The proponent of this supplement is the Directorate of Installation Support, US Army Garrison Fort Belvoir. Users are invited to send comments and suggested improvements on DA Form 2028, Recommended Changes to Publications and Blank Forms, to Directorate of Installation Support, ATTN: Environmental and Natural Resource Division, 9430 Jackson Loop, Suite 107, Fort Belvoir, VA 22060-5130.

FB Supplement 1 to AR 200-3 (20 Feb 98)

AR 200-3, 28 February 1995, is supplemented as follows:

Page 10, Paragraph 4-9, Urban Forest Management. Add subparagraphs (1) through (3) to subparagraph c:

(1) All proposed tree and shrub removals as well as excavations that may impact tree growth and survival are to be approved by the Directorate of Installation Support (DIS), Environmental and Natural Resource Division. Dogwood, holly, redbud, and mountain-laurel are to be left standing on utility rights-of-way unless an exception to this policy is specifically approved in writing by DIS.

(2) It is the policy of Fort Belvoir to promote site planning techniques and construction practices that maximize retention and protection of existing trees before considering removal. Tree protection measures for retained trees will be required for all new construction.

(3) Two new trees are to be planted for each tree removed through new construction on Fort Belvoir. Requirements for size, species, and location of new plantings will depend on the individual situation. Replacements may include landscape plantings for improved grounds as well as tree seedlings for reforestation. The DIS will make this assessment and recommendation. New planting plans must be approved in writing by DIS, prior to removal of any trees.

Page 11, Paragraph 5-2 (b) (1), Timber Management. Add the following to subparagraph (c):

Local restrictions are as follows:

(1) All other personnel must purchase a written permit to remove firewood from the tree maintenance residue stockpile.

(2) The procedures for obtaining firewood and for storing firewood at installation quarters and the location of the tree maintenance residue stockpile are specified in the Annual Firewood Permits and Receipts Fact Sheet issued by DIS.

(3) The cutting of firewood from any other source on Fort Belvoir is prohibited without first obtaining a firewood permit from DIS, Environmental and Natural Resource Division.

(4) A firewood permit must accompany all firewood removed from Fort Belvoir. The permit must be shown to the Military Police or other official personnel upon request. Procedures for obtaining a firewood permit are specified in the annual Firewood Permits and Receipts Fact Sheet.

(5) Annual firewood prices will be established by DIS and will be based on current market value.

(6) The issuance of permits will be governed by the demand and the availability of resources.

(7) The U.S. Government will not be responsible for any damage or injury to persons or property incurred as a result of the cutting and removal of firewood at Fort Belvoir.

(8) Failure to follow these regulations may result in termination of the permit, and those individuals will not receive additional firewood permits.

(9) All inquiries about firewood should be directed to DIS, Environmental and Natural Resource Division.

Page 13, paragraph 6-1 Fish and Wildlife Management Requirements. Add subparagraphs e through k after subparagraph d.

e. Commander, U.S. Army Garrison Fort Belvoir, has the responsibility to establish and enforce policies and procedures involving fish and wildlife management on Fort Belvoir. In accordance with the Cooperative Plan for Conservation and Development of Fish and Wildlife Resources on Military Reservations, all hunting, fishing, and trapping activities on Fort Belvoir will comply with FB Supplement 1 to AR 200-3 and applicable Federal, Commonwealth of Virginia, Fairfax County, Department of the Army, and Fort Belvoir laws and/or regulations. The intent of the above policies is:

(1) To manage Fort Belvoir's fish and wildlife resources. Habitat improvements and population control will serve as the basic means of perpetuating and improving fish and wildlife resources.

(2) To conserve and protect fish and wildlife habitat, and sustain biodiversity, on Fort Belvoir.

(3) To develop and promote good sportsmanship through education and coordinated recreational activities.

f. Major responsibilities performed by the installation Provost Marshal Office (PMO):

(1) Within criteria established in paragraphs 6-2 and 6-3 of AR 200-3, support Installation Natural Resource Enforcement

Personnel in the enforcement of all hunting, fishing,and trapping laws and regulations.

(2) If the records at the end of the hunting day indicate that a hunter has failed to check out of his or her hunting area, Outdoor Recreation personnel monitoring the check in/check out of hunters will notify PMO of the missing hunter, home telephone number, etc. The PMO will contact the hunter's home and office to coordinate search activities for the missing hunter.

(3) Report accidents to the Installation's Safety Director.

g. Major responsibilities performed by DIS:

(1) Provide staff supervision of the fish and wildlife program as outlined in AR 200-3, the Integrated Natural Resource Management Plan and the Cooperative Agreement.

(2) Establish maximum number of hunters per hunting area. Determine harvest limits including buck-to-doe ratio, number, sex, and species per hunter and area. This control may be exercised at any time by DIS when deemed necessary in the interest of natural resource conservation or public safety.

(3) Establish special hunting management, such as early hunting in selected areas, or hunting in areas not designated as hunting areas, inclusive of any security areas. Such special hunting management shall be determined on the basis of the need to reduce or remove deer from specific areas for reasons of safety, herd health, habitat loss, or other environmental concerns. This management will be coordinated with Federal, Commonwealth of Virginia, Outdoor Recreation, and other Army officials for approval.

(4) Issue an annual Hunting Fact Sheet prior to each hunting season detailing open areas and restrictions projected for that year.

(5) Develop and implement comprehensive management plans, maintain and manage day-to-day activities at the Accotink Bay Wildlife Refuge and the Jackson Abbott Wetland Refuge.

(6) Develop and implement a comprehensive management plan for the Fort Belvoir Forest and Wildlife Corridor.

(7) Within criteria established in paragraphs 6-2 and 6-3 of AR 200-3, enforce all hunting, fishing, and trapping laws and regulations.

h. Major responsibilities performed by the Directorate of Personnel and Community Activities (DPCA):

(1) Coordinate recreational aspects of the hunting program and issue a hunting Memorandum of Instruction annually in coordination with other Directorates to include DIS and DPTMS.

(2) Issue and record installation's hunting permits.

(3) Coordinate with Directorate of Plans, Training, Mobility and Security, (DPTMS) on the availability of training areas for the recreational hunting program, to avoid conflicts with training activities when making hunting assignments.

(4) Coordinate with DIS Environmental and Natural Resource Division on the availability of wildlife areas for the recreational hunting program when making hunting assignments.

(5) Inform PMO of any hunters who fail to check out of their hunting areas at the end of the day so established search procedures can take place.

(6) Sponsor the required safety briefing(s) and qualification tests.

(7) Ensure that all hunters have completed a Virginia approved hunter safety course, International Bowhunter Safety course and a DPCA archery proficiency test.

(8) Promote the organization and development of clubs (conservation, sportsmen, etc.).

(9) Coordinate new Game Check-in Procedures with DIS, Environmental and Natural Resource Division.

(10) Coordinate tick and blood samples and collection procedures with DeWitt Army Community Hospital Preventive Medicine.

i. Major responsibilities performed by the installation veterinarian:

(1) Conduct periodic disease surveys of the installation's wildlife populations as practicable.

(2) Provide drugs and review dosages for tranquilizing wild species of animals.

(3) Determine and provide treatment for sick or injured wildlife.

j. Major responsibilities performed by DPTMS:

(1) Review proposed hunting seasons, dates and areas to assure there is no conflict with training, testing, and other official requirements when developing training area schedules.

(2) Notify the hunter control activities (e.g., DIS and DPCA) of training schedules for each area including any late cancellations.

(3) Provide environmental protection of the training areas through controlling unauthorized use, off-road vehicle use and illegal dumping in cooperation with DIS and PMO.

k. Major responsibilities performed by Staff Judge Advocate (SJA):

(1) Review Fort Belvoir hunting and fishing regulations for conformance with Federal, Commonwealth of Virginia, and Army laws and regulations.

(2) Ensure that all violations of Federal, Commonwealth of Virginia, local and Army fish and wildlife regulations are investigated and prosecuted as appropriate.

(3) Review administrative revocation of privileges for legal sufficiency.

Page 13, Paragraph 6-2, Authority to Hunt, Fish and Trap. Add subparagraphs f through j after subparagraph e.

f. Except for the prohibited practices and requirements listed below, the specific fishing laws and regulations to be followed by Fort Belvoir fishermen are identical to those of the Commonwealth of Virginia regulatory agencies governing the water body.

(1) Current Federal, Commonwealth of Virginia, and local laws and regulations will prescribe open seasons, size, and creel limits of fish taken. Limits may be modified by DIS for natural resource management purposes within the bounds of these laws and regulations.

(2) Trotlines and snags are not permitted in any fishing waters on the installation.

(3) Fishermen and boaters are required to provide for environmental protection of all shoreline areas through restricting watercraft launching to designated marina launch facilities. Streambank clearing, littering, parking in other than designated areas, and driving of privately owned vehicles (POV) off primary installation roads are prohibited.

(4) Scheduled training and military missions have priority over hunting and fishing at all times.

g. Except for the prohibited practices and requirements listed below, the specific hunting laws to be followed by Fort Belvoir hunters are identical to those of the Commonwealth of Virginia and Fairfax County regulations. These are published annually by the Virginia Department of Game and Inland Fisheries.

(1) Individuals wishing to hunt deer must have in their possession a current Fort Belvoir area pass and parking permit, a valid Virginia hunting license, and a Virginia Archery Big Game and/or firearms Big Game Stamp. Persons only wishing to hunt small game must have a Virginia hunting license and a Fort Belvoir hunting permit.

(2) Fort Belvoir hunting permits will be issued only upon personal application at the hunting control point on authorized hunting days.

(3) In accordance with the Memorandum of Instruction, persons under eighteen years of age must be accompanied by a licensed parent or guardian while hunting on the Installation.

(4) Permits are not transferable, are valid for the day on which they are issued, and are valid only in the hunting area specified on the permit.

(5) Authorized hunting areas are presented in the annual Hunting Fact Sheet published by DIS.

(6) Trapping may be permitted as required. All trapping will require a special use permit available from DIS and must comply with all Federal, State, and local laws and regulations.

(7) Falconry is permitted on Fort Belvoir in accordance with all Federal, Commonwealth of Virginia, and local restrictions. Falconers will register with DPCA prior to going afield. Falconers will also be required to register and acquire a daily permit from DIS on the day of the hunt. Only two birds may be flown in any one hunting area at one time and this will not reduce the number of hunters permitted in that area. Under no circumstances may raptors be collected on the installation or any raptor's nest be disturbed.

(8) Legal small game to be taken will be designated annually in the DIS Hunting Fact Sheet.

(9) The DPCA will assign hunters to a specific area. Hunters will not enter another hunting area without first reporting back to the hunting control point. They will be reassigned to a new area, if available.

(10) No hunting is permitted in dud or demolition areas. If a dud is found, the site shall be marked and the exact location reported to DPTMS immediately.

(11) All hunters are required to process in and out of the DPCA Outdoor Recreation Office whether or not they have harvested any deer. Willful failure of any person to check in and out may cause denial of future hunting privileges on Fort Belvoir. All harvested big game must be checked at the Virginia Game Check Station (Outdoor Recreation Office) or Military Police (MP) Station prior to removal from Fort Belvoir.

(12) The hunting permit and parking permit will be issued at the DPCA Outdoor Recreation Office. The parking permit must be displayed on the inside left (driver's side) of the vehicle's windshield.

(13) All deer killed will be tagged in the field, and checked and weighed at the Fort Belvoir Game Check Station, or checked at the MP Station, in accordance with the Memorandum of Instruction.

(14) Organized group hunting is prohibited.

(15) Dogs will not be used for hunting.

(16) A Memorandum of Instruction will be prepared annually by DPCA to include hunter qualification dates, times, fees, and reservation information (dates and times).

(17) A Hunting Fact Sheet will be prepared annually by DIS and appended to the Memorandum of Instruction prior to distribution to the hunting public. The Hunting Fact Sheet will specify hunting slots and areas open, hunting dates, safety restrictions, legal game, bag limits, legal weapons and special restrictions concerning environmental management.

(18) Bow hunting may be done from the ground or from elevated stands. Hunters are encouraged to use portable tree stands. No additional permanent tree stands will be permitted to be built on the installation. Repair of existing numbered tree stands may be performed. Existing tree stands can be used on a first-come basis. Any hunter using a tree stand on the installation is doing so at HIS/HER OWN RISK. The U.S. Government will not be responsible for any damage or injury to person(s) or property incurred as a result of using a tree stand for hunting on Fort Belvoir.

(19) Scheduled training and military missions have priority over hunting and fishing at all times.

h. Hunters will comply with the following safety requirements:

(1) Prior to making a hunting reservation, all hunters will be required to document that they have satisfactorily completed a Virginia approved hunter safety course, International Bowhunter Safety Course, and archery proficiency test.

(2) Buffer areas, within which there will be no hunting, will be included with the safety restrictions in the annual DIS Hunting Fact Sheet.

(3) Hunters will immediately cease hunting and report back to DPCA when any type of training or work activity is observed in their assigned hunting area.

(4) Hunters will ensure that they have a safe field of sight to and beyond their targets.

i. Violators of hunting regulations, safety regulations or principles of good sportsmanship are subject to administrative restrictions, revocation of hunting and fishing privileges and possible judicial proceedings in the Federal Magistrate Court. Military personnel may further be subject to disciplinary action under the Uniform Code of Military Justice.

(1) Application by military personnel for restoration of revoked hunting and fishing privileges on the installation shall be submitted through channels to the installation commander. Application for restoration of hunting and fishing privileges on the installation by civilians will be made in writing to the commander through DIS and DPCA.

(2) Fishing is authorized from dusk to dawn in accordance with applicable Commonwealth of Virginia regulations, except in access-controlled waters, such as training areas and wildlife refuges.

<u>Page 15, Paragraph 7-1, Outdoor Recreation</u>. Add subparagraph e after subparagraph d.

e. Any proposed outdoor recreation use of installation refuges (Accotink Bay Wildlife or Jackson Abbott Wetland refuges) must be coordinated with, and approved by DIS. No outdoor recreation activities which are likely to have a detrimental effect on natural resources shall be permitted to occur in the refuges. Installation refuges are closed from dusk to dawn unless otherwise approved by DIS.

Page 15, Paragraph 8-1, Recreational Off-Road Vehicles (ORV), Overview. Add subparagraphs g through j after subparagraph f.

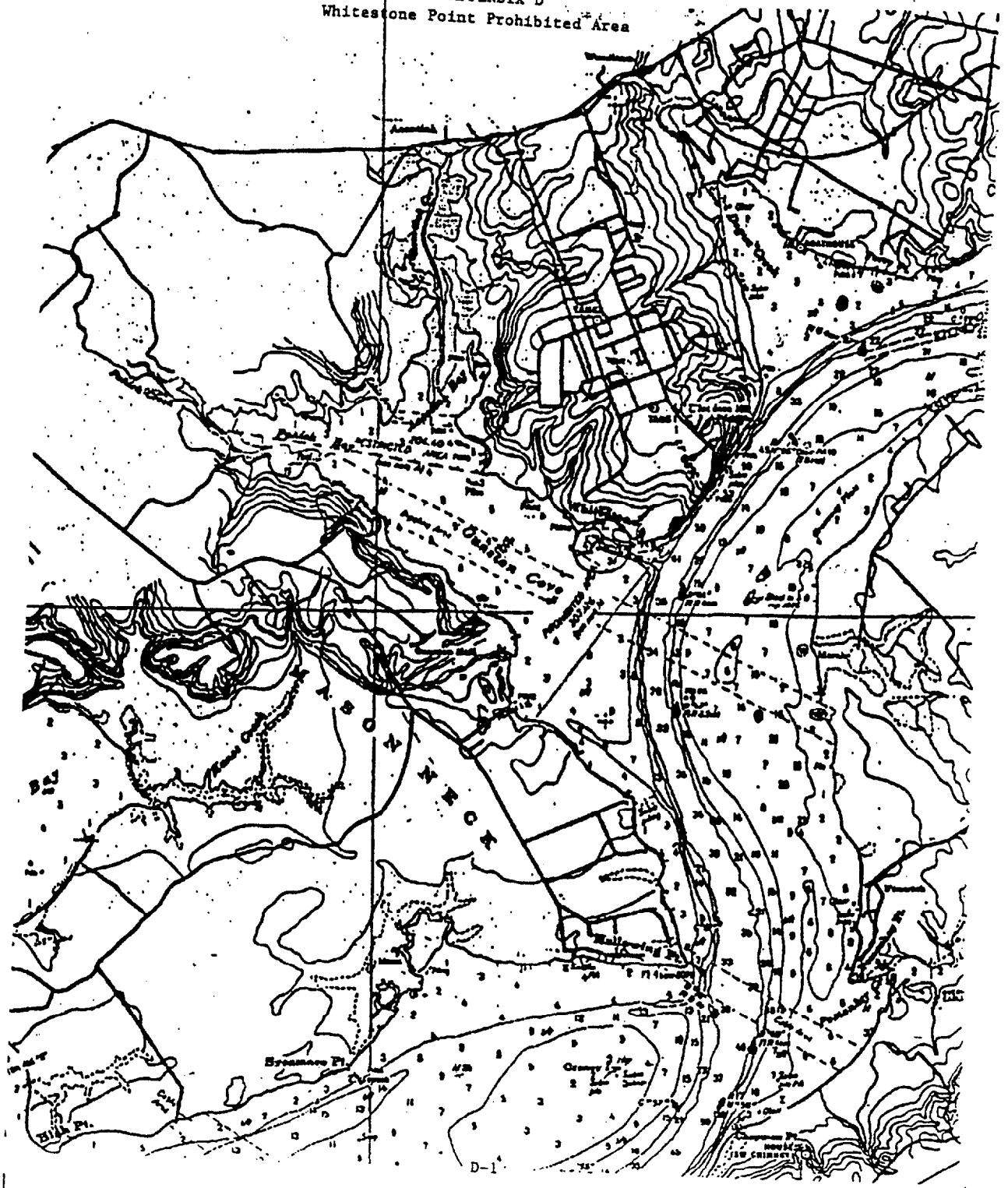
g. Off-road vehicles (ORV), which include but are not limited to motorized all-terrain vehicles, snow mobiles and dirt bikes, may not be operated on Fort Belvoir. Bicycles, which include but are not limited to all-terrain bikes and mountain bikes, are not permitted off paved roadways or off paved bike trails, unless otherwise approved by DIS.

h. Privately owned vehicles (POV), which include but are not limited to state-licensed pickup trucks, sedans, and motorcycles, may not be used on the secondary roads of the installation unless authorized and participating in post-sponsored or approved activities such as volunteer work, research, hunting, wood collecting or training. All participants must carry written authorization from the activity director or his/her authorized representative which specifies the time(s) for which the activity is approved.

i. Privately owned watercraft, which include but are not limited to motorboats, personal watercraft, sailboats, canoes, rowboats, kayaks, and inflatable watercraft, must be launched at designated areas. All watercraft, with the exception of wind-board surfers, must be launched at the marina launch facility, unless otherwise approved by DIS. With the exception of wind-board surfers, no watercraft shall be launched or landed in Tompkins Basin, unless otherwise approved by DIS. No watercraft shall be or launched or landed within the wildlife refuges, unless otherwise approved by DIS.

j. The area known as Whitestone Point, north of Gunston Cove is a "Prohibited Area", from the shoreline at low tide point 207 feet into the cove. No watercraft are authorized in this area, including the T-Pier, except for assets of the Departments of Defense and Transportation (see chart in Appendix A).

APPENDIX D
Whitestone Point Prohibited Area



# APPENDIX I

## FORT BELVOIR POLICY MEMORANDUM #420-22-00:
## *TREE REMOVAL AND PROTECTION POLICY*

**DEPARTMENT OF THE ARMY**
**HEADQUARTERS, U. S. ARMY GARRISON, FORT BELVOIR**
**9820 FLAGLER ROAD, SUITE 213**
**FORT BELVOIR, VIRGINIA 22060-5930**

**REPLY TO ATTENTION OF**

ANFB-ELE-E (25-30xx) 15 August 2000
USAGFB Policy Memorandum # 420-22-00

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Tree Removal and Protection Policy

(Expires 14 August 2001)

1. Applicability. This policy applies to all military, civilian and tenant activities on Fort Belvoir.

2. Proponent. The proponent and responsible agency of this policy is the Directorate of Installation Support (DIS), Environmental and Natural Resource Division (ELE-E), 806-4007.

3. Policy.

a. In recognition of the value and benefits that trees provide to the Fort Belvoir Community, all proposed tree and shrub removals as well as construction and excavation activities that may impact the growth and survival of trees are to be approved by the DIS. Dogwood, holly, redbud, and mountain laurel are to be left standing on utility rights-of-way unless an exception to this policy is specifically approved in writing by the DIS.

b. It is the policy of Fort Belvoir to promote site planning techniques and construction practices that maximize retention and protection of existing trees before considering removal. When considering open trenching of utility lines, equal design consideration must be given to boring, pipe-bursting, slip-lining and other techniques that result in lower impacts to trees. Utility rights-of-way are to be co-located where warranted except when prohibited by code. Tree protection measures for retained trees will be required for all construction.

c. All contractors and sub-contractors are required to contact the DIS, Environmental and Natural Resource Division for a brief review of natural resource protection requirements before the start of work on Fort Belvoir. This is to be done in conjunction with the excavation permit.

d. Two new trees are to be planted for each tree 4 inches and larger in diameter (diameter breast height) removed through construction on Fort Belvoir. Requirements for size and species

will depend on site characteristics and location. The DIS will make this assessment and recommendation. Replacements will generally follow the scheme that includes nursery grown landscape trees for trees that are removed in improved grounds and high visibility areas, and tree seedlings with a mixture of landscape trees for trees lost in unimproved grounds. The primary contractor/agency for the job will be responsible for purchasing and planting designated trees unless otherwise noted in the statement of work, or as the contracting officer directs. New planting plans must be approved in writing by the DIS prior to the removal of any trees.

4. This policy letter does not supersede any other policy letter.

KURT A. WEAVER
COL, AR
Garrison Commander

DISTRIBUTION:
F

# APPENDIX J

## FORT BELVOIR POLICY MEMORANDUM #420-26-00:
## *EXCAVATION WORK PERMIT REQUIREMENTS AND PROCEDURES*

**DEPARTMENT OF THE ARMY**
**HEADQUARTERS, U. S. ARMY GARRISON, FORT BELVOIR**
**9820 FLAGLER ROAD, SUITE 213**
**FORT BELVOIR, VIRGINIA 22060-5928**

**REPLY TO ATTENTION OF**

ANFB-ELC-C (25-30xx) 1 November 2000
USAGFB Policy Memorandum #420-26-00

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Excavation Work Permit Requirements and Procedures

(Expires 31 October 2001)

1. Applicability. This policy applies to any agency, activity, company or individual who desires to perform any and all types of excavation work on Fort Belvoir.

2. Proponent. The proponent and responsible agency of this policy is the Directorate of Installation Support (DIS), Contract Management Division (CMD) at 806-3765.

3. Policy.

a. Any agency, activity, company, or individual who desires to perform any type of excavation work on Fort Belvoir must obtain an excavation permit prior to commencement of that work in order to minimize the risk of damage to underground utilities and/or communications. Excavation work may include installation of signs and/or fence posts; planting of trees, shrubs, etc.; and digging for any reason. Excavation clearance is necessary in order to ensure the safety of the those individuals doing the work; to avoid costly repairs to utility or communication systems; and avoid the expense and inconvenience caused by interruptions of utility service.

b. Prior to undertaking any activity which involves digging, an excavation permit FB(DIS)FM 75-R must be obtained from the DIS, CMD at 9430 Jackson Loop, Room 215. When appropriate for the work to be accomplished, a drawing showing the general layout and path of the proposed excavation will be provided with the permit request. The requester is required to stake or flag the excavation route every 30 feet and hand carry Items F3 to F9 on the permit for signature. The DIS, CMD will process the permit for excavation. Processing of this permit will take approximately 10-14 days. When each activity has signed the

permit, the permit will be assigned an excavation risk classification and expiration date as follows: Class I, severe risk, 15 days; Class II, minimal risk, 30 days. The risk classification is based on the number of utilities and communications lines in the area to be excavated. In addition to the aforementioned requirements, the requester is also required to contact Miss Utility to obtain clearances and is responsible for following their procedures as well.

c. Once the permit is approved, it must be kept on-site at all times. The party granted the excavation permit is required to hand-dig within a 10-foot radius of the locator's marks until the exact location of all lines have been determined. If the work is going to exceed the permit expiration date, the requester shall call the DIS, CMD for an extension. The expiration date will be extended only if the utility and communication marks are maintained by the requester; if not, all excavation work will stop until a new permit is approved.

d. The Government, regardless of the type of excavation, reserves the right to have DIS personnel present on-site during any excavation. The Government, at the time of excavation permit processing, will specify on the permit (to include a name and telephone contact number) if on-site DIS personnel are required to be present during excavation. If the excavation permit specifies that a Government representative(s) will be present, the excavator will notify the Government point of contact listed on the excavation permit not less than 24 hours (one full working day) before excavation begins. Failure by the excavator to notify the point of contact listed on the excavation permit may result in the issuance of a "stop work" order by the appropriate authority.

e. The requester shall protect from damage all existing improvements, utilities, communications and vegetation at or near the work site. The requester will be held liable for all damage to persons or property that occurs as a result of the requester's fault or negligence.

4. This policy does not supersede any other policy letter.

KURT A. WEAVER
COL, AR
Garrison Commander

DISTRIBUTION:
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# APPENDIX K

## FORT BELVOIR POLICY MEMORANDUM #200-04-00:
## *INTEGRATED PEST MANAGEMENT POLICY*

**DEPARTMENT OF THE ARMY**
**HEADQUARTERS, U. S. ARMY GARRISON, FORT BELVOIR**
**9820 FLAGLER ROAD, SUITE 213**
**FORT BELVOIR, VIRGINIA 22060-5928**

**REPLY TO ATTENTION OF**

ANFB-ELE-E (25-30xx) 24 January 2000
USAGFB Policy Letter # 200-04-00

MEMORANDUM FOR SEE DISTRUBTION

SUBJECT: Integrated Pest Management Policy

(Expires 23 January 2001)

1. Applicability. This policy applies to any group or individual performing pest management operations on Fort Belvoir.

2. Proponent. The proponent and responsible agency of this policy and pest management compliance on Fort Belvoir is the Directorate of Installation Support (DIS), Environmental and Natural Resources Division (ELE-E) at 806-4007.

3. Policy.

a. All pest management operations on Fort Belvoir must be in compliance with the Fort Belvoir Integrated Pest Management (IPM) Plan (May 98) as well as applicable Federal, State and local laws. This includes the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), as amended; the Virginia Pesticide Control Act (1995), as amended; and DoD Measures of Merit which mandates reductions in pesticide applications. DoD Instruction 4150.7, DoD Pest Management Program; Army Regulation 200-5, Pest Management (29 Oct 99); and the Interservice Support Agreement (ISA) specify specific agency responsibilities regarding pesticide applications, records and contracts. Under the Fort Belvoir ISA, all organizations on Fort Belvoir are required to contact ANFB-ELE-E for pest management contract support. Both the Fort Belvoir and the MACOM Pest Management Coordinators must review and approve all pest management contract requests and proposals.

b. IPM is a planned decision making process that incorporates education, record keeping and best management practices (cultural, biological, and habitat modification) to prevent pests and diseases from causing damage to personnel and property. The IPM objective is to identify operational procedures that use the least toxic method to control pest populations in a cost-effective, environmentally sound manner.

c. All agencies and certified contractors must submit in writing to the Fort Belvoir Pest Management Coordinator (FB-PMC), a Fort Belvoir IPM Evaluation and Execution Form (FB(DIS)FM 76-E, Aug 99). This form must be completed by the requesting agency and pest management contractor and approved by the FB-PMC for each target pest annually by specific building/site location before any pesticides are applied.

d. All monthly pesticide applications must be recorded on DD Form 1532 (Pest Management Report) and submitted to the Fort Belvoir PMC by the 10th day of the following month.

e. All contractors or subcontractors must submit copies of their Pesticide Applicator Certifications to the FB-PMC prior to applying pesticides on Fort Belvoir.

4. This policy letter does not supersede any other policy letter.

KURT A. WEAVER
COL, AR
Garrison Commander

Distribution:
F

# APPENDIX L

## FORT BELVOIR ENVIRONMENTAL PROTECTION SPECIFICATIONS APPLICABLE TO CONSTRUCTION CONTRACTS

# ENVIRONMENTAL PROTECTION

## PART 1 GENERAL

### 1.1 GENERAL

Work covered by this section includes furnishing all labor, materials and equipment and performing all work required to prevent or control environmental pollution resulting from construction operations required under this contract except for those measures set forth in other sections of these specifications. Herein, environmental pollution is defined as the presence of chemical, physical or biological elements or agents in air, water and on land which adversely affect human health or welfare; unfavorably alter ecological balances important to human life or affect other species of importance to humanity.

### 1.2 APPLICABLE REGULATIONS

Contractor and his subcontractors, in performance of work under this contract, shall comply with all applicable Federal, State and local laws and regulations concerning environmental pollution control and prevention, as well as all applicable provisions of Corps of Engineers Manual EM 385-1-1 (Safety and Health Requirements Manual, Oct 87). Minimum standards to meet Virginia Erosion & Sediment Control Regulations (VR 625-02-00) are found in Chapter 8, 1992 Edition of the Virginia Erosion & Sediment Control Handbook.

### 1.3 NOTIFICATION

Contracting Officer shall notify Contractor in writing of any noncompliance with provisions in this section and the action to be taken. The Contractor shall take corrective action immediately upon receipt of such notice. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue a Stop Order on all or part of the work until satisfactory corrective action has been taken. No part of time lost due to any such Stop Orders shall be made the subject of a claim for time extension or for excess costs or damages by the Contractor unless it is later determined that the Contractor was in compliance.

### 1.4 SUBCONTRACTORS

Compliance with these provisions by subcontractors shall be the responsibility of the Contractor.

### 1.5 WATER RESOURCE PROTECTION

The Contractor shall not pollute streams, lakes, reservoirs etc. with fuels, oils, bitumens, calcium chloride, acids, construction wastes or any other harmful materials. Contractor is responsible to investigate and comply with all applicable Federal, State and local laws concerning pollution of water resources. All work under this contract shall be performed such that objectionable conditions will not be created in bodies of water in or adjacent to the project area(s).

### 1.6 LAND RESOURCE PROTECTION

Land resources within project boundaries and outside the limits of permanent work performed under this contract shall be preserved in their present condition or be restored to a condition that appears natural and does not detract form the appearance of the work. Contractor shall confine

his construction activities to areas defined by contract plans and specifications.

1.6.1 EROSION CONTROL

The contractor shall submit for approval, an erosion and sedimentation control plan for each delivery order as required by the Contracting Officer. Each plan shall conform to the minimum standards and specifications of the Virginia Erosion & Sediment Control Handbook. For delivery orders not requiring a plan, the contractor is responsible to meet the minimum requirements for controlling erosion and sedimentation from any land-disturbing activities.

1.6.1.1 No disturbed area will be left denuded for more than 90 calendar days unless otherwise authorized by the Contracting Officer. Disturbed area not paved, sodded or built upon by 1 November, or disturbed after that date, are to be seeded within 15 days with oats, abuzzi rye or equivalent and mulched with hay or straw mulch at the rate of two tons per acre.

1.6.1.2 All erosion and sediment control measures are to be placed prior to or as the first step in grading.

1.6.1.3 All temporary earth berms, diversions, sediment dams and stock piles are to be seeded and mulched with straw for temporary vegetative cover within 7 days after grading.

1.6.1.4 During construction all storm sewer inlets will be protected from sedimentation. Inlet protection shall be maintained or modified as required by the construction process.

1.6.1.5 Structural measures such as berms, dikes, traps, basins, etc., will be installed and stabilized according to this plan prior to any other grading, clearing, or disturbance of the existing surface of the site.

1.6.1.6 All structural sediment control measures are to remain in place until permission for their removal has been obtained from the Contracting Officer. All temporary erosion and sediment controls will be removed and the areas stabilized prior to final payment of the delivery order.

1.7 PROTECTION OF RETAINED TREES

1.7.1 Contractor shall be responsible for the protection of the tops, trunks and roots of all existing trees that are to be retained on the site. After trees have been removed along the limits of clearing, protective devices shall be installed as soon as possible. Protection shall be maintained until all work in the vicinity has been completed and shall not be removed without the written approval of the Contracting Officer. If the Contracting Officer finds that the protective devices are insufficient to protect the trees retained on the site, additional protective devices shall be installed to insure adequate protection.

1.7.2 Heavy equipment, vehicular traffic or stockpiling of any materials shall not be permitted within the drip line of trees to be retained.

1.7.3 No toxic materials shall be stored within 100 (one hundred) feet from the drip line of trees to be retained.

1.7.4 Except in areas marked on the plans to be cleared, the Contractor

shall not deface, injure or destroy trees or shrubs, nor remove or cut them without special authority. No ropes, cables or guys shall be fastened to or attached to any existing nearby trees for anchorage unless specifically authorized by the Contracting Officer. Where such special emergency use is permitted, the Contractor shall first adequately wrap the trunk with a sufficient thickness of burlap or rugs over which softwood cleats shall be tied before any rope, cable or wire is placed.

1.7.5 No protective devices, signs, utility boxes or other objects shall be nailed to trees to be retained on the site.

1.7.6 Devices

Any device may be used which will effectively protect the roots, trunk and top of the trees retained on the site. Personnel working in the vicinity of the trees must be instructed to honor the protective devices. The protective devices outlined below are suggestion only and are not intended to exclude the use of other devices which may be approved by the Contracting Officer to protect the trees retained.

1.7.6.1 Snow Fence

Standard 4 (four) foot high snow fence shall be placed at the drip line on posts mounted 6 (six) feet apart.

1.7.6.2 Board Fencing

Board fencing consisting of 4 x 4 posts set securely in the ground and protruding at least 5 (five) feet above the ground shall be placed at the drip line with a minimum of two horizontal boards between each post.

1.7.6.3 Posts, String and Flagging

Posts with a minimum size of 2 x 2 or 2 (two) inch diameter set securely in the ground and protruding at least 5 (five) feet above the ground shall be placed at the drip line with two rows of string at least 2 (two) feet apart running between each post with colored surveyor's flagging tied securely to the string at 5 (five) foot intervals.

1.8 RESTORATION OF LANDSCAPE DAMAGE

Any trees or other landscape feature scarred or damaged by Contractor's equipment or operations shall be restored as nearly as possible to its original condition at the Contractor's expense. The Contracting Officer will direct what method of restoration shall be used and whether damaged trees shall be treated and healed or removed and disposed of under requirements for clearing and grubbing. All scars made on retained trees by equipment, construction operations or by the removal of limbs larger than 1 (one) inch in diameter shall be coated as soon as possible with an approved tree wound dressing. All trimming or pruning shall be performed in an approved manner by experienced workmen with saws or pruning shears. Tree trimming with axes will not be permitted. Where tree climbing is necessary, the use of climbing spurs will not be permitted. The use of climbing ropes shall be required by the Contracting Officer where necessary for safety. Trees that are to remain, either within or outside established clearing limits, that are subsequently damaged by the Contractor and are beyond saving in the opinion of the Contracting Officer, shall be immediately removed and replaced with a nursery-grown tree of the same species. Replacement trees shall measure no less than 2 (two) inches in diameter at 6 (six) inches above the ground level.

## 1.9 TECHNICAL ADVICE

Technical advice and additional information on tree preservation and planting may be obtained from the Baltimore District Corps of Engineers Office.

## 1.10 STORAGE AND SERVICE FACILITIES

Contractor's storage and service facilities, required temporarily in the performance of the work, shall be located in portions of the job site or areas to be cleared, and require written approval of the Contracting Officer. Where buildings or platforms are constructed on sidehills, the Contracting Officer may require cribbing to obtain level foundations. Benching or leveling of earth may not be allowed depending on the location of the proposed facility.

## 1.11 POST-CONSTRUCTION CLEANUP OR OBLITERATION

The Contractor shall obliterate all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles for excess or waste materials and any other vestiges of construction operations as directed by the Contracting Officer. It is anticipated that excavation, filling and plowing of roadways will be required to restore the area to near natural conditions which will permit the growth of vegetation thereon. The disturbed areas shall be graded and filled as required, and forest litter, humus or topsoil or combination thereof shall be spread to a depth of approximately 6 (six) inches over the entire area and the entire are seeded. Restoration to original contours is required unless otherwise directed by the Contracting Officer.

## 1.12 PROTECTION OF FISH AND WILDLIFE

The Contractor shall perform all work and take such steps as required to prevent any interference with or disturbance to fish and wildlife. The Contractor will not be permitted to alter water flows or otherwise disturb native habitat adjacent to the project area which, in the opinion of the Contracting Officer, are critical to fish or wildlife. Fouling or polluting of water will not be permitted.

## 1.13 DUST CONTROL

Contractor shall maintain all work areas free from dust which contributes to air pollution. Approved temporary methods of stabilization consisting of sprinkling, chemical treatment, light bituminous treatment or similar methods may be permitted to control dust. Sprinkling, to be approved, must be repeated at such intervals as necessary to keep all parts of the disturbed area damp at all times and the Contractor must have sufficient competent equipment on the job to accomplish this if sprinkling is used. Dust control shall be performed as the work proceeds and whenever a dust nuisance or hazard occurs.

## 1.14 BURNING

Burning of refuse and debris is not permitted.

## 1.15 MAINTENANCE OF POLLUTION CONTROL FACILITIES

During the life of this contract, the Contractor shall maintain all facilities constructed for pollution control under this contract while operations creating the particular pollutant are being conducted or until

the material concerned has stabilized to the extent that pollution is no longer occurring.

1.16 FLUORESCENT FIXTURES

All fluorescent fixtures which are to be disposed of will have their ballasts, except those specifically identified as containing no polychlorinated biphenyls (PCB's), placed in 55-gallon containers and transported to Building 1495 for disposal by the Directorate of Public Works, Environmental and Natural Resource Division (703-806-4007).

PART 2 (NOT APPLICABLE)

PART 3 (NOT APPLICABLE)

END OF SECTION

# APPENDIX M

# VEGETATION RECOMMENDED FOR CONSERVATION PLANTINGS

# Table M.1: Native Ferns, Grasses and Vines

| Scientific Name | Common Name | Uses[a] | | | | Region[b] | | | Light[c] | | | Moisture[d] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | W | H | C | D | M | P | C | S | P | F | L | M | H |
| **Ferns and Fern Allies** | | | | | | | | | | | | | | |
| *Adiantum pedatum* | maidenhair fern | | x | x | | x | x | x | x | | | | x | |
| *Asplenium platyneuron* | ebony spleenwort | | x | | | x | x | x | x | x | | | x | |
| *Athyrium asplenioides* (*A. filix-femina*) | Southern ladyfern | | x | x | | x | x | x | x | | | | x | x |
| *Botrychium virginianum* | Rattlesnake fern | | x | | | x | x | x | x | x | | x | x | |
| *Dennstaedtia punctilobula+* | hay-scented fern | | | x | | x | x | x | | x | x | x | x | |
| *Dryopteris intermedia* | evergreen wood-fern | | x | x | | x | x | x | x | x | | x | x | x |
| *Dryopteris marginalis* | marginal shield-fern | | x | x | | x | x | | x | x | | | x | |
| *Onoclea sensibilis+* | sensitive fern | | x | x | | x | x | x | | x | x | | x | x |
| *Osmunda cinnamomea* | cinnamon fern | | x | x | | x | x | x | x | x | | | x | x |
| *Osmunda regalis* | royal fern | | x | x | | x | x | x | | x | | | x | x |
| *Polystichium acrostichoides* | Christmas fern | | x | x | | x | x | x | x | | | | x | |
| *Thelypteris palustris* | marsh fern | | x | | | x | x | x | | x | x | | x | x |
| *Woodwardia virginica+* | Virginia chain fern | | x | x | | | | x | x | x | x | | x | x |
| **Grasses, sedges, and reeds** | | | | | | | | | | | | | | |
| *Agrostis perennans* | autumn bentgrass | | | x | | x | x | x | x | x | x | x | x | x |
| *Andropogon gerardii* | big bluestem | x | x | x | x | x | x | | | x | x | x | x | |
| *Andropogon glomeratus* | bushy bluestem | | x | x | | x | x | x | | x | x | | x | x |
| *Andropogon virginicus* | broomsedge | | x | x | | x | x | x | | x | x | x | x | x |
| *Arundinaria gigantea* | wild cane, river cane | x | | x | | x | x | x | x | x | x | x | x | x |
| *Calamagrostis canadensis* | bluejoint reedgrass | x | | x | | x | | | | x | x | | x | x |
| *Carex crinita var. crinita* | long hair sedge | x | x | x | | x | x | x | | x | x | | x | x |
| *Carex lurida* | sallow sedge | x | | x | | x | x | x | | x | x | | x | x |
| *Carex pensylvanica* | Pennsylvania sedge | x | | x | | x | x | x | x | x | x | x | x | |
| *Carex plantaginea* | plantain-leaved sedge | | x | x | | x | x | | x | | | | x | |
| *Carex stricta* | tussock sedge | x | | x | | x | x | x | | x | x | | x | x |
| *Chasmanthium latifolium* (*Uniola l.*) | river oats, spanglegrass | | x | x | | x | x | x | x | x | x | | x | |
| *Danthonia sericea* | silky oatgrass | x | | x | | x | x | x | | x | x | x | x | |
| *Danthonia spicata* | poverty oatgrass | x | | x | | x | x | x | x | x | x | x | x | |
| *Dichanthelium clandestinum* | deer-tongue | x | | x | x | x | x | x | | x | x | x | x | x |
| *Dichanthelium commutatum* | variable panicgrass | x | x | x | x | x | x | x | x | x | | x | x | |
| *Dulichium arundinaceum* | dwarf bamboo | x | | x | x | x | x | x | | x | x | | | x |
| *Elymus hystrix* (*Hystrix patula*) | bottlebrush grass | x | x | | | x | x | x | x | x | x | x | x | |
| *Elymus virginicus* | Virginia wild rye | x | | x | | x | x | x | x | x | | x | x | |
| *Festuca rubra* | red fescue | x | | x | x | x | | | | x | x | x | x | |
| *Juncus canadensis* | Canada rush | x | | x | | | x | x | | x | x | | x | x |
| *Juncus effusus* | soft rush | x | | x | | x | x | x | | x | x | | x | x |
| *Leersia oryzoides* | rice cutgrass | x | | x | | x | x | x | | x | x | | x | x |
| *Panicum amarum* | coastal panic grass | x | x | x | | | | x | | | x | x | | |
| *Panicum virgatum* | switch grass | x | x | x | | x | x | x | | x | x | x | x | x |
| *Saccharum giganteum* (*Erianthus giganteus*) | giant plumegrass | x | x | x | | | x | x | | x | x | | x | x |
| *Schizachyrium scoparium* | little bluestem | x | x | x | x | x | x | x | | x | x | x | x | |
| *Scirpus cyperinus* | woolgrass bulrush | x | x | x | | x | x | x | | x | x | | x | x |
| *Sorghastrum nutans* | Indian grass | x | x | x | x | x | x | x | | x | x | x | x | |
| *Sparganium americanum* | American bur-reed | x | | x | | x | x | x | | x | x | | | x |

| Scientific Name | Common Name | Uses[a] | | | | Region[b] | | | Light[c] | | | Moisture[d] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | W | H | C | D | M | P | C | S | P | F | L | M | H |
| *Tridens flavus* | redtop | x | x | x | x | x | x | x | | x | x | x | x | |
| *Tripsacum dactyloides* | gama grass | x | x | x | x | x | x | x | | x | x | | x | x |
| *Typha latifolia* | broad-leaved cattail | x | | x | | x | x | x | | | x | | x | x |
| *Zizania aquatica* | wild rice | x | x | x | | | | x | | | x | | | x |
| **Vines** | | | | | | | | | | | | | | |
| *Bignonia capreolata* | crossvine | x | x | | | x | x | x | x | x | | | x | x |
| *Celastrus scandens* | climbing bittersweet | x | x | | | x | x | x | x | x | x | | x | |
| *Clematis virginiana* | virgin's bower | | x | | | x | x | x | | x | x | | x | |
| *Decumaria barbara* | climbing hydrangea | | x | x | | | | x | x | x | | | x | x |
| *Gelsemium sempervirens* | Carolina jessamine | x | x | | | | | x | x | x | x | x | x | x |
| *Lonicera sempervirens* | trumpet honeysuckle | | x | x | | x | x | x | | x | | | x | |
| *Parthenocissus quinquefolia* | Virginia creeper | x | x | x | | x | x | x | | x | x | | x | |
| *Wisteria frutescens* | Atlantic wisteria | | x | | | | | x | | x | x | | x | x |
| + May be aggressive in garden setting. | | | | | | | | | | | | | | |
| * Due to the rarity and sensitivity of habitat in Virginia, these species are recommended for horticultural use only. Planting these species in natural areas could be detrimental to the survival of native populations. | | | | | | | | | | | | | | |

Source: VA DCR, undated.

[a]Recommended Uses
W = Wildlife
H = Horticulture and Landscaping
C = Conservation and Restoration
D = Domestic Livestock Forage

[b]Native Regions
M = Mountains
P = Piedmont
C = Coastal Plain

[c]Minimum Light Requirements
S = Full Shade
P = Partial Sun
F = Full Sun

[d]Minimum Moisture Requirements
L = Low Moisture
M = Moderate Moisture
H = High Moisture

## Table M.2: Native Herbs

| Scientific Name | Common Name | Uses[a] | | | | Region[b] | | | Light[c] | | | Moisture[d] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | W | H | C | D | M | P | C | S | P | F | L | M | H |
| **Herbs** | | | | | | | | | | | | | | |
| *Aster cordifolius* | heart-leaved aster | | x | x | | x | x | x | | x | x | | x | |
| *Aster divaricatus* | white wood aster | x | x | x | | x | x | | | x | x | x | x | |
| *Aster laevis* | smooth blue aster | x | x | x | | x | | | | | x | x | | |
| *Aster novae-angliae* | New England aster | | x | x | | x | | | | x | x | x | x | |
| *Aster novi-belgii* | New York aster | x | x | x | | | | x | | x | x | | x | |
| *Aster pilosus* | white heath aster | x | x | x | | x | x | x | | | x | x | | |
| *Aster umbellatus* | flat-top white aster | | x | x | | x | x | | | x | x | | x | x |
| *Baptisia australis** | blue wild indigo | x | x | | | x | x | | | x | x | | x | |
| *Baptisia tinctoria* | yellow wild-indigo | x | x | | | x | x | x | | x | x | x | | |
| *Bidens cernua+* | nodding beggar-ticks | x | x | x | | x | x | x | | x | x | x | x | x |
| *Boltonia asteroides** | aster-like boltonia | | x | | | | | x | | | x | | x | |
| *Caltha palustris* | marsh marigold | | x | x | | x | | x | | x | x | | | x |
| *Chamaecrista fasciculata+* | partridge pea | | | x | | x | x | x | | | x | x | x | |
| *Chelone glabra* | white turtlehead | | x | x | | x | x | x | x | x | | | | x |
| *Chrysogonum virginianum* | green and gold | | x | x | | x | x | x | x | | | | x | |
| *Chrysopsis mariana (Heterotheca m.)* | Maryland golden aster | x | x | x | | x | x | x | | x | x | x | | |
| *Cimicifuga racemosa* | black cohosh | | x | | | x | x | x | x | x | | | x | |
| *Clitoria mariana* | Maryland butterfly pea | | x | x | | x | x | x | x | x | | x | | |
| *Convallaria majuscula (C. montana)* | American lily-of-the-valley | | | x | | x | | | x | x | | | x | |
| *Coreopsis tripteris* | tall coreopsis | | x | x | | x | x | x | | x | x | | x | |
| *Coreopsis verticillata* | threadleaf coreopsis | | x | x | | x | x | x | | x | x | x | | |
| *Delphinium tricorne* | dwarf larkspur | | x | | | x | x | | x | x | | | x | |
| *Desmodium paniculatum* | narrow-leaf tick trefoil | x | | x | | x | x | x | x | | | x | | |
| *Dicentra cucullaria* | Dutchman's breeches | | x | | | x | x | | x | | | | x | |
| *Dicentra eximia* | wild bleeding heart | | x | | | x | x | | | x | x | x | | |
| *Dodecatheon meadia* | shooting star | | x | | | x | | | | x | x | | x | |
| *Equisetum hyemale* | horsetail, scouring rush | | | x | | x | x | x | x | x | x | | x | x |
| *Eupatorium coelestinum* | mistflower | x | x | x | | x | x | x | x | x | x | | x | |
| *Eupatorium fistulosum* | Joe Pye weed | x | x | x | | x | x | x | | x | x | | x | |
| *Eupatorium perfoliatum* | common boneset | | | x | | x | x | x | | x | x | | x | x |
| *Geranium maculatum* | wild geranium | | x | | | x | x | | x | x | x | | x | |
| *Helenium autumnale* | sneezeweed | x | x | x | | x | x | x | | x | x | | x | |
| *Helianthus angustifolius* | narrow-leaf sunflower | x | x | x | | | x | x | | x | x | | x | x |
| *Helianthus decapetalus* | ten-petaled sunflower | x | x | x | | x | x | x | | x | x | | x | |
| *Helianthus divaricatus* | woodland sunflower | x | x | x | | x | x | x | | x | | x | | |
| *Heliopsis helianthoides* | oxeye sunflower | x | x | x | | x | x | x | | x | x | x | x | |
| *Hepatica acutiloba* | sharp-lobed hepatica | | x | | | x | | | x | | | x | x | |
| *Hepatica americana* | round-lobed hepatica | | x | | | x | x | x | x | | | x | x | |
| *Heuchera americana* | alumroot | | x | | | x | x | x | x | | | x | | |
| *Hibiscus moscheutos* | Eastern rosemallow | x | x | x | | x | x | x | | | x | | | x |
| *Iris cristata* | dwarf crested iris | | x | | | x | x | | x | x | | | x | |
| *Iris prismatica* | slender blueflag | | x | | | | | x | | x | x | | x | x |
| *Iris virginica* | Virginia blue flag | | x | x | | | x | x | | x | x | | | x |
| *Kosteletskya virginica* | seashore mallow | x | | x | | | | x | | | x | | | x |

| Scientific Name | Common Name | Uses[a] | | | | Region[b] | | | Light[c] | | | Moisture[d] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | W | H | C | D | M | P | C | S | P | F | L | M | H |
| *Lespedeza capitata* | round-head bush clover | x | | x | | x | x | x | | | x | x | | |
| *Liatris graminifolia* | grass-leaf blazing star | x | x | x | | x | x | x | | x | x | x | x | |
| *Liatris spicata* | spiked blazing star | x | x | x | | x | | | | x | x | | x | |
| *Liatris squarrosa* | plains blazing star | x | x | x | | | x | | | x | x | | x | |
| *Lilium canadense* | Canada lily | | x | | | x | x | | | x | x | | x | x |
| *Lilium philadelphicum* | wood lily | | x | | | x | | | | x | x | x | | |
| *Lilium superbum* | Turk's cap lily | | x | | | x | x | x | | x | x | | x | x |
| *Lobelia cardinalis* | cardinal flower | x | x | x | | x | x | x | | x | x | | | x |
| *Lobelia siphilitica* | great blue lobelia | x | x | x | | x | x | x | x | x | | | | x |
| *Lupinus perennis* | lupine, sundial lupine | | x | | | x | x | x | | x | x | x | | |
| *Maianthemum racemosa (Smilacina r.)* | false Solomon's seal | | x | x | | x | x | x | x | x | | | x | |
| *Mertensia virginica* | Virginia bluebells | | x | x | | x | x | | x | x | | | x | x |
| *Mimulus ringens* | monkeyflower | | x | x | | x | x | x | | | x | | | x |
| *Monarda didyma* | bee balm | x | x | x | | x | | | x | x | | | x | |
| *Monarda fistulosa* | wild bergamot | x | x | x | | x | x | x | | x | x | x | x | |
| *Nymphaea odorata* | American water lily | x | x | x | | x | x | x | | | x | | | x |
| *Oenothera fruticosa* | sundrops | x | x | x | | x | x | x | | | x | | x | x |
| *Opuntia humifusa (O. compressa)* | Eastern prickly-pear | x | x | x | | x | x | x | | | x | x | | |
| *Peltandra virginica* | arrow arum | x | x | x | | | x | x | | x | x | | | x |
| *Penstemon laevigatus* | smooth beardtongue | | x | | | x | x | x | x | x | x | | x | |
| *Phlox carolina* | thick-leaved phlox | x | x | x | | | | | | x | x | x | x | x |
| *Phlox divaricata* | woodland phlox, wild blue phlox | | x | x | | x | x | | | x | | x | x | |
| *Phlox paniculata* | summer phlox, garden phlox | | x | x | | x | x | x | | x | x | | x | |
| *Phlox stolonifera* | creeping phlox | | x | x | | x | | | x | x | | | x | |
| *Phlox subulata* | moss phlox | | x | x | | x | x | | | | x | x | | |
| *Physostegia virginiana* | obedient plant | | x | x | | x | x | | | x | x | | x | |
| *Podophyllum peltatum+* | mayapple | x | x | x | | x | x | x | | x | x | | x | |
| *Polemonium reptans* | Jacob's ladder | | x | | | x | x | x | x | x | | | x | |
| *Polygonatum biflorum* | Solomon's seal | | x | | | x | x | x | x | x | | x | x | |
| *Pontederia cordata* | pickerel weed | x | x | x | | | x | x | | | x | | | x |
| *Porteranthus trifoliatus(Gillenia t.)* | bowman's root | | x | | | x | x | | x | x | | | x | |
| *Pycnanthemum incanum* | hoary mountain mint | x | | x | | x | x | x | x | | | x | | |
| *Pycnanthemum tenuifolium* | narrow-leaved mountain mint | x | x | x | | x | x | x | | x | x | x | x | |
| *Rhexia virginica* | Virginia meadow-beauty | x | | x | | x | x | x | | | x | | | x |
| *Rudbeckia fulgida* | early coneflower | | x | x | | | x | | | x | x | x | x | |
| *Rudbeckia hirta* | black eyed Susan | | x | x | | x | x | x | | x | x | x | x | |
| *Rudbeckia laciniata* | cut-leaved coneflower | x | x | x | | x | x | x | | x | x | | x | |
| *Rudbeckia triloba* | three-lobed coneflower | x | x | x | | x | x | x | | x | x | | x | |
| *Sagittaria latifolia* | broadleaf arrowhead | x | x | x | | x | x | x | | | x | | | x |
| *Salvia lyrata+* | lyre-leaf sage | | | x | | x | x | x | | x | x | x | | |
| *Sanguinaria canadensis* | bloodroot | | x | | | x | x | x | x | | | | x | |
| *Saururus cernuus* | lizard's tail | | x | x | | x | x | x | | x | x | | | x |
| *Saxifraga virginiensis* | early saxifrage | | x | | | x | x | x | x | x | x | x | x | |
| *Sedum ternatum* | wild stonecrop | | x | | | x | x | x | x | x | | | x | |

| Scientific Name | Common Name | Uses[a] | | | | Region[b] | | | Light[c] | | | Moisture[d] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | W | H | C | D | M | P | C | S | P | F | L | M | H |
| *Senecio aureus+* | golden ragwort | x | | x | | x | x | x | x | x | | | x | x |
| *Senna marilandica (Cassia m.)* | Maryland wild senna | | x | x | | x | x | x | | x | | x | x | |
| *Silene virginica* | fire pink | | x | | | x | x | | | x | x | x | x | |
| *Silphium perfoliatum* | cup plant | x | | x | | x | x | | x | x | x | | x | |
| *Solidago caesia* | bluestem goldenrod | x | x | x | | x | x | x | x | x | | | x | |
| *Solidago odora* | sweet goldenrod | x | x | x | | x | x | x | | x | x | x | | |
| *Solidago pinetorum+* | pineywoods goldenrod | x | | x | | | x | x | | x | x | x | | |
| *Solidago puberula* | downy goldenrod | x | x | x | | x | x | x | | | x | x | | |
| *Solidago rugosa+* | rough-stemmed goldenrod | x | | x | | x | x | x | | x | x | | x | |
| *Solidago sempervirens* | seaside goldenrod | x | x | x | | | | x | | x | x | | x | |
| *Thalictrum dioicum* | early meadowrue | | x | | | x | x | | x | | | | x | |
| *Tiarella cordifolia var. collina* | clumping foamflower | | x | | | x | x | | x | | | | x | |
| *Tiarella cordifolia var. cordifolia* | spreading foamflower | | x | | | x | x | | x | | | | x | |
| *Tradescantia virginiana* | Virginia spiderwort | | x | x | | x | x | x | x | x | x | | x | |
| *Trillium erectum* | wakerobin | | x | | | x | | | x | | | | x | |
| *Trillium grandiflorum* | white trillium | | x | | | x | x | | x | | | | x | |
| *Uvularia grandiflora* | bellwort | | x | | | x | | | x | | | | x | |
| *Verbena hastata* | blue vervain | x | | x | | x | x | | | x | x | | x | x |
| *Vernonia noveboracensis* | New York ironweed | x | x | x | | x | x | x | | x | x | | | x |
| *Veronicastrum virginicum* | Culver's root | | x | x | | x | | | | x | x | x | x | x |
| *Viola cucullata* | marsh blue violet | x | x | x | | x | x | x | | x | x | | | x |
| *Viola pedata* | bird's foot violet | x | x | | | x | x | x | | x | x | x | | |
| *Viola pubescens (V. pennsylvanica)* | yellow violet | x | x | x | | x | x | | x | x | | | x | |
| *Yucca filamentosa* | common yucca | x | x | | | x | x | x | | | x | x | | |
| *Zephranthes atamasco* | Atamasco lily | | x | x | | | | x | | x | x | | x | x |

+ May be aggressive in garden setting.

* Due to the rarity and sensitivity of habitat in Virginia, these species are recommended for horticultural use only. Planting these species in natural areas could be detrimental to the survival of native populations.

Source: VA DCR, undated.

[a]Recommended Uses
W = Wildlife
H = Horticulture and Landscaping
C = Conservation and Restoration
D = Domestic Livestock Forage

[b]Native Regions
M = Mountains
P = Piedmont
C = Coastal Plain

[c]Minimum Light Requirements
S = Full Shade
P = Partial Sun
F = Full Sun

[d]Minimum Moisture Requirements
L = Low Moisture
M = Moderate Moisture
H = High Moisture

# Table M.3: Native Shrubs

| Scientific Name | Common Name | Uses[a] | | | | Region[b] | | | Light[c] | | | Moisture[d] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | W | H | C | D | M | P | C | S | P | F | L | M | H |
| **Shrubs** | | | | | | | | | | | | | | |
| *Alnus serrulata* | common alder | x | x | x | | x | x | x | x | x | x | | | x |
| *Aronia arbutifolia* | red chokeberry | | x | x | | x | x | x | x | x | | | x | x |
| *Aronia melanocarpa* | black chokeberry | | x | x | | x | x | x | | x | x | x | x | x |
| *Baccharis halimifolia* | high tide bush | | x | x | | | | x | | | x | x | x | x |
| *Callicarpa americana* | American beautyberry | x | x | | | | | x | x | x | | | x | |
| *Castanea pumila* | Allegheny chinkapin | x | x | x | | x | x | x | x | x | x | x | | |
| *Ceanothus americanus* | New Jersey tea | x | x | x | | x | x | x | | x | x | x | | |
| *Cephalanthus occidentalis* | buttonbush | | x | x | | x | x | x | | x | x | | | x |
| *Clethra alnifolia* | sweet pepper-bush | x | x | x | | | | x | x | x | | | x | x |
| *Cornus amomum* | silky dogwood | x | | x | | x | x | x | x | x | | | x | x |
| *Crataegus crus-galli* | cockspur hawthorn | x | x | x | | x | x | x | | x | x | x | x | |
| *Gaultheria procumbens* | wintergreen | x | x | | | x | x | x | x | x | | x | x | |
| *Gaylussacia baccata* | black huckleberry | x | x | x | | x | x | x | x | x | | x | x | |
| *Gaylussacia frondosa* | dangleberry | x | x | x | | x | | x | x | x | x | x | | |
| *Hamamelis virginiana* | witch hazel | | x | x | | x | x | x | x | x | | x | x | |
| *Hydrangea arborescens* | wild hydrangea | | x | | | x | x | x | x | x | | | x | |
| *Ilex decidua* | deciduous holly, possumhaw | x | x | x | | | x | x | x | x | | | x | |
| *Ilex glabra* | inkberry | x | x | x | | | | x | x | x | | x | x | |
| *Ilex verticillata* | winterberry | x | x | x | | x | x | x | | x | x | | x | x |
| *Ilex vomitoria* | Yaupon holly | x | x | x | | | | x | x | x | x | x | | |
| *Itea virginica* | Virginia willow | x | x | x | | | | x | x | x | | | | x |
| *Iva fruitescens* | marsh elder | | x | x | | | | x | | | x | x | x | |
| *Kalmia latifolia* | mountain laurel | x | x | x | | x | x | x | x | x | | | x | |
| *Leucothoe axillaris* | coastal dog-hobble | | x | | | | | x | x | | | | x | |
| *Leucothoe racemosa* | fetterbush, sweetbells | | x | x | | x | x | x | | x | x | | x | |
| *Lindera benzoin* | spicebush | x | x | x | | x | x | x | x | | | | x | |
| *Lyonia lucida* | shining fetterbush | | x | x | | | | x | x | x | | | x | |
| *Myrica cerifera* | Southern wax myrtle | x | x | x | | | | x | x | x | | x | x | |
| *Myrica heterophylla* | Southern bayberry | x | x | x | | | | x | x | x | | x | x | |
| *Myrica pensylvanica* | Northern bayberry | x | x | x | | | | x | | | x | x | x | x |
| *Pieris floribunda* | evergreen mountain fetterbush | | x | x | | x | | | x | | | | x | |
| *Rhododendron atlanticum* | dwarf azalea | x | x | | | | | x | | x | | | x | |
| *Rhododendron calendulaceum* | flame azalea | | x | | | x | | | | x | | | x | |
| *Rhododendron catawbiense* | Catawba rhododendron | | x | x | | x | x | | | x | x | | x | |
| *Rhododendron cumberlandense* | Cumberland flame azalea | | x | | | x | | | | x | | | x | |
| *Rhododendron maximum* | great rhododendron, rose bay | x | x | x | | x | x | | x | x | | | x | x |
| *Rhododendron periclymenoides* | pinxter flower | | x | x | | x | x | x | x | x | | | x | x |
| *Rhododendron prinophyllum* | rose azalea | x | x | | | x | | | x | x | x | x | x | |
| *Rhododendron viscosum (R. serrulata)* | swamp azalea | | x | x | | x | x | x | | x | x | | x | x |
| *Rhus aromatica* | fragrant sumac | | x | | | x | x | | | x | x | x | | |

| Scientific Name | Common Name | Uses[a] | | | | Region[b] | | | Light[c] | | | Moisture[d] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | W | H | C | D | M | P | C | S | P | F | L | M | H |
| *Rhus copallinum* | winged sumac, flameleaf sumac | x | x | x | | x | x | x | x | x | | x | | |
| *Rosa carolina* | pasture rose | x | | x | | x | x | x | | x | x | x | x | |
| *Rubus allegheniensis* | Alleghany blackberry | x | x | x | | x | x | | | | x | x | | |
| *Rubus odoratus* | purple flowering raspberry | | | x | | x | | | | x | | | x | |
| *Salix humilis* | prairie willow | | x | x | | x | x | x | | | x | x | | |
| *Salix sericea* | silky willow | | x | x | | x | x | x | | x | x | | x | |
| *Sambucus canadensis* | common elderberry | x | x | x | | x | x | x | | | x | | x | x |
| *Spiraea alba* | narrow-leaved meadowsweet | x | x | x | | x | | | | | x | | x | |
| *Spiraea latifolia* | broad-leaved meadowsweet | x | x | x | | x | | | | | x | | x | |
| *Stewartia malacodendron** | silky camelia | | x | | | | | x | x | x | | | x | |
| *Vaccinium angustifolium* | Northern lowbush blueberry | x | x | x | | x | | | | | x | x | | |
| *Vaccinium corymbosum* (*V. virgata, formosa*) | highbush blueberry | x | x | x | | x | x | x | x | x | x | x | x | x |
| *Viburnum dentatum* | Southern arrow-wood viburnum | x | x | x | | x | x | x | | x | x | x | x | |
| *Viburnum nudum* | possum-haw viburnum | | x | x | | x | x | x | x | x | | | | x |
| *Viburnum prunifolium* | black-haw viburnum | x | x | x | | x | x | x | | x | x | | x | |

+ May be aggressive in garden setting.

* Due to the rarity and sensitivity of habitat in Virginia, these species are recommended for horticultural use only. Planting these species in natural areas could be detrimental to the survival of native populations.

Source: VA DCR, undated.

[a]Recommended Uses
W = Wildlife
H = Horticulture and Landscaping
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[b]Native Regions
M = Mountains
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[d]Minimum Moisture Requirements
L = Low Moisture
M = Moderate Moisture
H = High Moisture

## Table M.4: Native Trees

| Scientific Name | Common Name | Uses[a] | | | | Region[b] | | | Light[c] | | | Moisture[d] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | W | H | C | D | M | P | C | S | P | F | L | M | H |
| **Small trees** | | | | | | | | | | | | | | |
| *Amelanchier arborea* | downy serviceberry | x | x | x | | x | x | x | | x | x | | x | |
| *Amelanchier canadensis* | Canada serviceberry | x | x | x | | x | x | x | | | x | | x | x |
| *Amelanchier laevis* | smooth serviceberry | x | x | x | | x | | | | x | x | x | x | |
| *Asimina triloba* | paw paw | x | x | x | | x | x | x | x | x | | | x | |
| *Cercis canadensis* | redbud (Eastern) | | x | x | | x | x | x | x | x | | | x | |
| *Chionanthus virginicus* | fringetree | | x | | | x | x | x | | x | x | | x | |
| *Cornus alternifolia* | alternate-leaf dogwood | x | x | x | | x | x | | x | x | | x | x | |
| *Cornus amomum* | silky dogwood | x | | x | | x | x | x | x | x | | | x | x |
| *Cornus florida* | flowering dogwood | x | x | x | | x | x | x | x | x | | x | x | |
| *Crateagus crus-galli* | cockspur hawthorne | x | x | x | | x | x | x | | x | x | x | x | |
| *Crateagus flava* | October haw | x | x | | | x | x | x | | x | x | | x | |
| *Euonymous atropurpureus* | wahoo | | x | x | | x | x | x | x | x | | | x | |
| *Halesia tetraptera (H. carolina)* | common silverbell | | x | | | x | | | | x | x | | x | |
| *Ilex opaca* | American holly | x | x | x | | x | x | x | x | | | | x | |
| *Magnolia virginiana* | sweetbay magnolia | | x | x | | | x | x | x | x | | | x | x |
| *Morus rubra* | red mulberry | x | x | x | | x | x | x | x | x | | | x | |
| *Ostrya virginiana* | Eastern hop-hornbeam | | x | | | x | x | x | x | x | | | x | |
| *Persea borbonia* | redbay, sweet bay | | x | x | | | | x | x | x | | | x | x |
| *Prunus americana* | American wild plum | | x | x | | x | x | x | | x | | | x | |
| *Prunus virginiana* | choke cherry | x | x | x | | x | | | | x | | | x | |
| *Rhus glabra* | smooth sumac | x | x | x | | x | x | x | | | x | x | x | |
| *Rhus hirta (R. typhina)* | staghorn sumac | x | x | x | | x | x | x | | | x | x | | |
| *Salix nigra* | black willow | | | x | | x | x | x | | x | x | | x | x |
| **Medium to Large Trees** | | | | | | | | | | | | | | |
| *Acer rubrum* | red maple | | x | x | | x | x | x | | | x | | x | x |
| *Acer saccharum* | sugar maple | | x | x | | x | x | | | x | x | | x | |
| *Aesculus flava (A. octandra)* | yellow buckeye | | x | | | x | x | | | x | | | x | |
| *Betula alleghaniensis* | yellow birch | x | x | x | | x | | | | x | x | | x | |
| *Betula lenta* | sweet birch, black birch | x | x | x | | x | x | | | x | x | | x | |
| *Betula nigra* | river birch | x | x | x | | x | x | x | | | x | | x | x |
| *Carya alba (C. tomentosa)* | mockernut hickory | | | x | | x | x | x | x | x | | x | x | |
| *Carya glabra* | pignut hickory | x | x | x | | x | x | x | x | x | | x | | |
| *Carya ovata* | shagbark hickory | | | x | | x | x | x | | x | x | | x | |
| *Chamaecyparis thyoides** | Atlantic white cedar | x | x | | | | | x | x | x | | | x | x |
| *Diospyros virginiana* | persimmon | x | x | x | | x | x | x | x | x | x | x | x | |
| *Fagus grandifolia* | American beech | x | x | | | x | x | x | x | x | x | | x | |
| *Fraxinus americana* | white ash | x | x | | | x | x | x | | x | x | | x | |
| *Fraxinus pensylvanica* | green ash | x | x | x | | x | x | x | | x | x | | x | |
| *Juglans nigra* | black walnut | x | | x | | x | x | x | | x | x | | x | |
| *Juniperus virginiana* | red cedar (Eastern) | x | x | | | x | x | x | | x | x | x | x | |
| *Liquidambar styraciflua* | sweetgum | | x | x | | x | x | x | x | x | x | | x | x |
| *Liriodendron tulipifera* | tulip-tree, tulip poplar | x | x | x | | x | x | x | | | x | | x | |
| *Magnolia acuminata* | cucumber magnolia | | x | | | x | | | | | x | | x | |
| *Nyssa aquatica* | water tupelo | x | x | x | | | | x | | x | x | | | x |
| *Nyssa sylvatica* | black gum | x | x | x | | x | x | x | | x | x | | x | |
| *Oxydendrum arboreum* | sourwood | | x | | | x | x | x | | x | | | x | |

| Scientific Name | Common Name | Uses[a] | | | | Region[b] | | | Light[c] | | | Moisture[d] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | W | H | C | D | M | P | C | S | P | F | L | M | H |
| *Pinus echinata* | shortleaf pine | | x | | | x | x | x | | x | x | x | | |
| *Pinus serotina* | pond pine | x | x | x | | | | x | | | x | | x | x |
| *Pinus strobus* | white pine | | x | x | | x | x | x | | | x | x | x | |
| *Pinus taeda* | loblolly pine | x | x | x | | | x | x | | | x | x | | x |
| *Pinus virginiana* | Virginia pine | | | x | | x | x | x | | | x | x | | |
| *Platanus occidentalis* | sycamore | | | x | | x | x | x | | x | x | | x | x |
| *Prunus pennsylvanica* | pin cherry, fire cherry | x | | x | | x | | | | x | x | x | | |
| *Prunus serotina* | wild black cherry | x | | x | | x | x | x | | x | x | x | | |
| *Quercus alba* | white oak | x | x | x | | x | x | x | | x | x | x | | |
| *Quercus bicolor* | swamp white oak | x | | x | | x | x | x | x | x | | | | x |
| *Quercus coccinea* | scarlet oak | x | x | | | x | x | x | | x | x | x | | |
| *Quercus falcata* | Southern red oak | x | x | x | | x | x | x | x | x | | x | x | |
| *Quercus ilicifolia* | bear oak | x | | x | | x | x | | | | x | x | · | |
| *Quercus laurifolia* | swamp laurel oak | x | | x | | | | x | | x | x | | x | x |
| *Quercus michauxii* | swamp chestnut oak | x | x | | | | x | x | | x | x | | | x |
| *Quercus montana (Q. prinus)* | chestnut oak | x | | x | | x | x | x | x | x | | x | | |
| *Quercus nigra* | water oak | x | | x | | | | x | x | x | | x | x | |
| *Quercus palustris* | pin oak | x | x | x | | x | x | x | x | x | | | x | x |
| *Quercus phellos* | willow oak | x | x | x | | | x | x | | x | x | | x | x |
| *Quercus rubra* | Northern red oak | x | x | x | | x | x | x | | x | x | x | x | |
| *Quercus stellata* | post oak | x | x | x | | x | x | x | | | x | x | | |
| *Quercus velutina* | black oak | x | | x | | x | x | x | x | x | | x | | |
| *Robinia pseudoacacia* | black locust | | | x | | x | x | x | | x | x | | x | |
| *Sassafras albidum* | sassafras | | | x | | x | x | x | | x | x | x | x | |
| *Taxodium distichum* | bald cypress | | x | x | | | | x | | | x | | | x |
| *Thuja occidentalis* | white cedar | x | x | x | | x | | | | | x | | x | x |
| *Tilia americana* | American basswood | | | x | | x | x | x | | x | | | x | |
| *Tsuga canadensis* | Eastern hemlock | x | x | x | | x | x | | | x | x | | x | |
| *Tsuga caroliniana* | Carolina hemlock | x | x | x | | x | | | | x | x | x | x | |

+ May be aggressive in garden setting.

* Due to the rarity and sensitivity of habitat in Virginia, these species are recommended for horticultural use only. Planting these species in natural areas could be detrimental to the survival of native populations.

Source: VA DCR, undated.

[a]Recommended Uses
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L = Low Moisture
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H = High Moisture

## Table M.5: Native Riparian Plants

| Scientific Name | Common Name | Uses[a] | | | | Region[b] | | | Light[c] | | | Zone[d] | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | W | H | C | D | M | P | C | S | P | F | 1 | 2 | 3 | 4 |
| **Herbaceous plants** | | | | | | | | | | | | | | | |
| *Acorus americanus (A. calamus)* | sweet flag | | x | x | | x | x | x | | x | x | x | | | |
| *Amsonia tabernaemontana* | blue star | | x | | | | x | x | x | x | | | | x | x |
| *Arisaema triphyllum* | Jack-in-the-pulpit | | x | | | x | x | x | x | | | | | x | x |
| *Asarum canadense+* | wild ginger | | x | x | | x | x | x | x | | | | | | x |
| *Asclepias incarnata* | swamp milkweed | x | x | x | | x | x | x | | x | x | x | x | | |
| *Aster novae-angliae* | New England aster | | x | x | | x | | | | x | x | | | x | |
| *Aster novi-belgii* | New York aster | x | x | x | | | | x | | x | x | x | x | | |
| *Aster umbellatus* | flat-top white aster | | x | x | | x | x | | | x | x | | | x | |
| *Bidens cernua+* | nodding beggar-ticks | x | x | x | | x | x | x | | x | x | x | x | | |
| *Boltonia asteroides** | aster-like boltonia | | x | | | | | x | | | x | x | x | x | |
| *Caltha palustris* | marsh marigold | | x | x | | x | | x | | x | x | | | x | |
| *Chamaecrista fasciculata+* | partridge pea | | | x | | x | x | x | | | x | | | | x |
| *Chelone glabra* | white turtlehead | | x | x | | x | x | x | x | x | | | x | x | |
| *Chrysogonum virginianum* | green and gold | | x | x | | x | x | x | x | | | | | | x |
| *Coreopsis tripteris* | tall coreopsis | | x | x | | x | x | x | | x | x | | x | x | x |
| *Delphinium tricorne* | dwarf larkspur | | x | | | x | x | | x | x | | | | | x |
| *Dicentra cucullaria* | Dutchman's breeches | | x | | | x | x | | x | | | | | | x |
| *Equisetum hyemale* | horsetail, scouring rush | | | x | | x | x | x | x | x | x | | x | x | x |
| *Eupatorium coelestinum* | mistflower | x | x | x | | x | x | x | x | x | x | | | x | x |
| *Eupatorium fistulosum* | Joe Pye weed | x | x | x | | x | x | x | | x | x | | x | x | x |
| *Eupatorium perfoliatum* | common boneset | | | x | | x | x | x | | x | x | x | x | x | |
| *Helenium autumnale* | sneezeweed | x | x | x | | x | x | x | | x | x | x | x | x | |
| *Helianthus decapetalus* | ten-petaled sunflower | x | x | x | | x | x | x | | x | x | | | x | x |
| *Heliopsis helianthoides* | oxeye sunflower | x | x | x | | x | x | x | | x | x | | | x | x |
| *Hibiscus moscheutos* | Eastern rosemallow | x | x | x | | x | x | x | | | x | x | x | | |
| *Iris virginica* | Virginia blue flag | | x | x | | | x | x | | x | x | x | x | | |
| *Kosteletskya virginica* | seashore mallow | x | | x | | | | x | | | x | x | x | | |
| *Lilium superbum* | Turk's cap lily | | x | | | x | x | x | | x | x | | | x | x |
| *Lobelia cardinalis* | cardinal flower | x | x | x | | x | x | x | | x | x | x | x | x | |
| *Lobelia siphilitica* | great blue lobelia | x | x | x | | x | x | x | x | x | | | | x | x |
| *Maianthemum racemosa* | false Solomon's seal | | x | x | | x | x | x | x | x | | | | x | x |
| *Mertensia virginica* | Virginia bluebells | | x | x | | x | x | | x | x | | | | x | x |
| *Mimulus ringens* | monkeyflower | | x | x | | x | x | x | | | x | x | x | x | |
| *Monarda didyma* | bee balm | x | x | x | | x | | | x | x | | | | x | x |
| *Nymphaea odorata* | American water lily | x | x | x | | x | x | x | | | x | x | | | |
| *Oenothera fruticosa* | sundrops | x | x | x | | x | x | x | | | x | x | x | x | x |
| *Peltandra virginica* | arrow arum | x | x | x | | | x | x | | x | x | x | x | | |
| *Phlox divaricata* | woodland phlox | | x | x | | x | x | | | x | | | | x | x |
| *Phlox paniculata* | summer phlox | | x | x | | x | x | x | | x | x | | | x | x |
| *Podophyllum peltatum+* | mayapple | x | x | x | | x | x | x | | x | x | | | | x |
| *Polemonium reptans* | Jacob's ladder | | x | | | x | x | x | x | x | | | | | x |
| *Pontederia cordata* | pickerel weed | x | x | x | | | x | x | | | x | x | | | |
| *Rhexia virginica* | Virginia meadow-beauty | x | | x | | x | x | x | | | x | | | x | |
| *Rudbeckia laciniata* | cut-leaved coneflower | x | x | x | | x | x | x | | x | x | | x | x | x |
| *Sagittaria latifolia* | broadleaf arrowhead | x | x | x | | x | x | x | | | x | x | x | | |

| Scientific Name | Common Name | Uses[a] | | | | Region[b] | | | Light[c] | | | Zone[d] | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | W | H | C | D | M | P | C | S | P | F | 1 | 2 | 3 | 4 |
| *Saururus cernuus* | lizard's tail | | x | x | | x | x | x | | x | x | x | x | | |
| *Senecio aureus+* | golden ragwort | x | | x | | x | x | x | x | x | | | x | x | x |
| *Solidago rugosa+* | rough-stemmed goldenrod | x | | x | | x | x | x | | x | x | | x | x | x |
| *Verbena hastata* | blue vervain | x | | x | | x | x | | | x | x | | x | x | |
| *Vernonia noveboracensis* | New York ironweed | x | x | x | | x | x | x | | x | x | | x | x | x |
| *Viola cucullata* | marsh blue violet | x | x | x | | x | x | x | | x | x | | | x | |
| *Viola pubescens* | yellow violet | x | x | x | | x | x | | x | x | | | | | x |
| *Zephranthes atamasco* | Atamasco lily | | x | x | | | | x | | x | x | | x | x | x |
| **Ferns and fern allies** | | | | | | | | | | | | | | | |
| *Athyrium asplenioides* | Southern ladyfern | | x | x | | x | x | x | x | | | | | x | x |
| *Botrychium virginianum* | Rattlesnake fern | | x | | | x | x | x | x | x | | | | | x |
| *Onoclea sensibilis+* | sensitive fern | | x | x | | x | x | x | | x | x | | | x | x |
| *Osmunda cinnamomea* | cinnamon fern | | x | x | | x | x | x | x | x | | | x | x | |
| *Osmunda regalis* | royal fern | | x | x | | x | x | x | | x | | | | x | x |
| *Polystichium acrostichoides* | Christmas fern | | x | x | | x | x | x | x | | | | | | x |
| *Thelypteris palustris* | marsh fern | | x | | | x | x | x | | x | x | x | x | x | |
| *Woodwardia virginica+* | Virginia chain fern | | x | x | | | | x | x | x | x | x | x | | |
| **Grasses, sedges, reeds** | | | | | | | | | | | | | | | |
| *Agrostis perennans* | autumn bentgrass | | | x | | x | x | x | x | x | x | x | x | x | x |
| *Andropogon gerardii* | big bluestem | x | x | x | x | x | x | | | x | x | | x | x | |
| *Andropogon glomeratus* | bushy bluestem | | x | x | | x | x | x | | x | x | | | x | |
| *Arundinaria gigantea* | wild cane, river cane | x | | x | | x | | | x | x | x | | x | x | x |
| *Carex crinita var. crinita* | long hair sedge | x | x | x | | x | x | x | | x | x | x | x | x | |
| *Carex lurida* | sallow sedge | x | | x | | x | x | x | | x | x | x | x | x | |
| *Carex stricta* | tussock sedge | x | | x | | x | x | x | | x | x | x | x | x | |
| *Chasmanthium latifolium* | river oats, spanglegrass | | x | x | | x | x | x | x | x | x | | x | x | x |
| *Dichanthelium clandestinum* | deer-tongue | x | | x | x | x | x | x | | x | x | x | x | x | x |
| *Dichanthelium commutatum* | variable panicgrass | x | x | x | x | x | x | x | x | x | | | | | x |
| *Dulichium arundinaceum* | dwarf bamboo | x | | x | x | x | x | x | | x | x | x | x | x | |
| *Elymus hystrix (Hystrix patula)* | bottlebrush grass | x | x | | | x | x | x | x | x | x | | | | x |
| *Elymus virginicus* | Virginia wild rye | x | | x | | x | x | x | x | x | | | x | x | x |
| *Juncus canadensis* | Canada rush | x | | x | | | x | x | | x | x | x | x | x | |
| *Juncus effusus* | soft rush | x | | x | | x | x | x | | x | x | x | x | x | |
| *Leersia oryzoides* | rice cutgrass | x | | x | | x | x | x | | x | x | x | x | x | |
| *Panicum virgatum* | switch grass | x | x | x | | x | x | x | | x | x | x | x | x | |
| *Saccharum giganteum* | giant plumegrass | x | x | x | | | x | x | | x | x | x | x | x | |
| *Scirpus cyperinus* | woolgrass bulrush | x | x | x | | x | x | x | | x | x | x | x | x | |
| *Sparganium americanum* | American bur-reed | x | | x | | x | x | x | | x | x | x | | | |
| *Tripsacum dactyloides* | gama grass | x | x | x | x | x | x | x | | x | x | x | x | x | x |
| *Typha latifolia* | broad-leaved cattail | x | | x | | x | x | x | | | x | x | | | |
| *Zizania aquatica* | wild rice | x | x | x | | | | x | | | x | x | | | |
| **Vines** | | | | | | | | | | | | | | | |
| *Bignonia capreolata* | crossvine | x | x | | | x | x | x | x | x | | | x | x | x |
| *Celastrus scandens* | climbing bittersweet | x | x | | | x | x | x | x | x | x | | | | x |
| *Clematis virginiana* | virgin's bower | | x | | | x | x | x | | x | x | x | x | x | x |
| *Parthenocissus quinquefolia* | Virginia creeper | x | x | x | | x | x | x | | x | x | | x | x | x |
| **Shrubs** | | | | | | | | | | | | | | | |
| *Alnus serrulata* | common alder | x | x | x | | x | x | x | x | x | x | x | x | x | |
| *Aronia arbutifolia* | red chokeberry | | x | x | | x | x | x | x | x | | | x | x | x |
| *Aronia melanocarpa* | black chokeberry | | x | x | | x | x | x | | x | x | | x | x | x |

| Scientific Name | Common Name | Uses[a] | | | | Region[b] | | | Light[c] | | | Zone[d] | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | W | H | C | D | M | P | C | S | P | F | 1 | 2 | 3 | 4 |
| *Callicarpa americana* | American beautyberry | x | x | | | | | x | x | x | | | | x | x |
| *Cephalanthus occidentalis* | buttonbush | | x | x | | x | x | x | | x | x | x | x | | |
| *Clethra alnifolia* | sweet pepper-bush | x | x | x | | | | x | x | x | | | | x | |
| *Cornus amomum* | silky dogwood | x | | x | | x | x | x | x | x | | | x | x | |
| *Hydrangea arborescens* | wild hydrangea | | x | | | x | x | x | x | x | | | | | x |
| *Ilex decidua* | possumhaw | x | x | x | | | x | x | x | x | | | x | x | x |
| *Ilex verticillata* | winterberry | x | x | x | | x | x | x | | x | x | | x | x | x |
| *Itea virginica* | Virginia willow | x | x | x | | | | x | x | x | | | x | x | |
| *Leucothoe racemosa* | fetterbush, sweetbells | | x | x | | x | x | x | | x | x | | x | x | |
| *Lindera benzoin* | spicebush | x | x | x | | x | x | x | x | | | | | x | x |
| *Myrica cerifera* | Southern wax myrtle | x | x | x | | | | x | x | x | | x | x | x | x |
| *Rhododendron viscosum* | swamp azalea | | x | x | | x | x | x | | x | x | | x | x | |
| *Rubus allegheniensis* | Alleghany blackberry | x | x | x | | x | x | | | | x | | x | x | x |
| *Salix sericea* | silky willow | | x | x | | x | x | x | | x | x | | x | x | |
| *Sambucus canadensis* | common elderberry | x | x | x | | x | x | x | | | x | | x | x | x |
| *Spiraea alba* | narrow-lvd. meadowsweet | x | x | x | | x | | | | | x | | x | x | |
| *Spiraea latifolia* | broad-lvd. meadowsweet | x | x | x | | x | | | | | x | | x | x | x |
| *Vaccinium corymbosum* | highbush blueberry | x | x | x | | x | x | x | x | x | x | | x | x | x |
| *Viburnum dentatum* | So. arrow-wood viburnum | x | x | x | | x | x | x | | x | x | | | | |
| *Viburnum prunifolium* | black-haw viburnum | x | x | x | | x | x | x | | x | x | | | | |
| **Small trees** | | | | | | | | | | | | | | | |
| *Amelanchier arborea* | downy serviceberry | x | x | x | | x | x | x | | x | x | | | | x |
| *Amelanchier canadensis* | Canada serviceberry | x | x | x | | x | x | x | | | x | | x | x | x |
| *Amelanchier laevis* | smooth serviceberry | x | x | x | | x | | | | x | x | | | | x |
| *Asimina triloba* | paw paw | x | x | x | | x | x | x | x | x | | | | x | x |
| *Cornus alternifolia* | alternate-leaf dogwood | x | x | x | | x | x | | x | x | | | | | x |
| *Crateagus flava* | October haw | x | x | | | x | x | x | | x | x | | | x | |
| *Morus rubra* | red mulberry | x | x | x | | x | x | x | x | x | | | | x | x |
| *Ostrya virginiana* | Eastern hop-hornbeam | | x | | | x | x | x | x | x | | | | | x |
| *Persea borbonia* | redbay, sweet bay | | x | x | | | | x | x | x | | | | x | |
| *Rhus glabra* | smooth sumac | x | x | x | | x | x | x | | | x | | | x | x |
| *Salix nigra* | black willow | | | x | | x | x | x | | x | x | x | x | x | |
| **Medium to Large Trees** | | | | | | | | | | | | | | | |
| *Acer rubrum* | red maple | | x | x | | x | x | x | | | x | x | x | x | x |
| *Betula lenta* | sweet birch, black birch | x | x | x | | x | x | | | x | x | | | x | x |
| *Betula nigra* | river birch | x | x | x | | x | x | x | | | x | | x | x | |
| *Diospyros virginiana* | persimmon | x | x | x | | x | x | x | x | x | x | | x | x | x |
| *Fraxinus americana* | white ash | x | x | | | x | x | x | | x | x | | x | x | x |
| *Fraxinus pensylvanica* | green ash | x | x | x | | x | x | x | | x | x | | x | x | |
| *Juglans nigra* | black walnut | x | | x | | x | x | x | | x | x | | x | x | x |
| *Liquidambar styraciflua* | sweetgum | | x | x | | x | x | x | x | x | x | | x | x | x |
| *Liriodendron tulipifera* | tulip-tree, tulip poplar | x | x | x | | x | x | x | | | x | | | x | x |
| *Nyssa aquatica* | water tupelo | x | x | x | | | | x | | x | x | x | | | |
| *Nyssa sylvatica* | black gum | x | x | x | | x | x | x | | x | x | | x | x | x |
| *Oxydendrum arboreum* | sourwood | | x | | | x | x | x | | x | | | | x | x |
| *Pinus taeda* | loblolly pine | x | x | x | | | x | x | | | x | | x | x | x |
| *Platanus occidentalis* | sycamore | | | x | | x | x | x | | x | x | | x | x | x |
| *Quercus bicolor* | swamp white oak | x | | x | | x | x | x | x | x | | | x | x | |
| *Quercus laurifolia* | swamp laurel oak | x | | x | | | | x | | x | x | | x | x | |
| *Quercus michauxii* | swamp chestnut oak | x | x | | | | x | x | | x | x | | x | x | x |

| Scientific Name | Common Name | Uses[a] | | | | Region[b] | | | Light[c] | | | Zone[d] | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | W | H | C | D | M | P | C | S | P | F | 1 | 2 | 3 | 4 |
| *Quercus nigra* | water oak | x | | x | | | | x | x | x | | | x | x | x |
| *Quercus palustris* | pin oak | x | x | x | | x | x | x | x | x | | | x | x | |
| *Quercus phellos* | willow oak | x | x | x | | | x | x | | x | x | | x | x | x |
| *Taxodium distichum* | bald cypress | | x | x | | | | x | | | x | x | | | |
| +May be aggressive in garden setting. | | | | | | | | | | | | | | | |
| *Due to the rarity and sensitivity of habitat in Virginia, these species are recommended for horticultural use only. | | | | | | | | | | | | | | | |
| Planting these species in natural areas could be detrimental to the survival of native populations. | | | | | | | | | | | | | | | |

Source: VA DCR, undated.

[a]Recommended Uses
W = Wildlife
H = Horticulture and Landscaping
C = Conservation and Restoration
D = Domestic Livestock Forage

[b]Native Regions
M = Mountains
P = Piedmont
C = Coastal Plain

[c]Minimum Light Requirements
S = Full Shade
P = Partial Sun
F = Full Sun

[d]Minimum Moisture Requirements
L = Low Moisture
M = Moderate Moisture
H = High Moisture

# APPENDIX N

# FORT BELVOIR BIRD CHECKLIST

| VISITS 1 | 2 | 3 | 4 | SPECIES | MONTHS J | F | M | A | M | J | J | A | S | O | N | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | **CREEPERS** | | | | | | | | | | | | |
| | | | | brown creeper* | ■ | ■ | ■ | ■ | ■ | – | – | – | – | – | ■ | ■ |
| | | | | **WRENS** | | | | | | | | | | | | |
| | | | | Carolina wren* | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | | | | house wren* | – | – | – | ■ | ■ | ■ | ■ | ■ | ■ | ■ | – | – |
| | | | | winter wren | – | – | – | | | | | | | – | – | – |
| | | | | sedge wren | | | | | | | | – | – | – | | |
| | | | | marsh wren* | – | – | – | – | | – | – | – | – | – | – | – |
| | | | | **KINGLETS & GNATCATCHERS** | | | | | | | | | | | | |
| | | | | golden-crowned kinglet | ■ | ■ | ■ | | | | | | | ■ | ■ | ■ |
| | | | | ruby-crowned kinglet | ■ | ■ | ■ | ■ | | | | | ■ | ■ | ■ | ■ |
| | | | | blue-gray gnatcatcher* | – | – | – | – | ■ | ■ | ■ | ■ | ■ | ■ | – | – |
| | | | | **THRUSHES** | | | | | | | | | | | | |
| | | | | eastern bluebird* | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | | | | veery | | | – | – | – | | | – | | – | | |
| | | | | gray-cheeked thrush | | | | – | – | – | – | – | – | | | |
| | | | | Swainson's thrush | | | | ■ | ■ | | | | ■ | ■ | | |
| | | | | hermit thrush | ■ | ■ | ■ | ■ | ■ | | | | | ■ | ■ | ■ |
| | | | | wood thrush* | – | – | – | – | ■ | ■ | ■ | ■ | ■ | ■ | – | – |
| | | | | American robin* | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | | | | **MIMICS & THRASHERS** | | | | | | | | | | | | |
| | | | | gray catbird* | – | – | – | – | ■ | ■ | ■ | ■ | ■ | ■ | – | – |
| | | | | northern mockingbird* | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | | | | brown thrasher* | – | – | – | – | ■ | ■ | ■ | ■ | ■ | – | – | – |
| | | | | **WAXWINGS** | | | | | | | | | | | | |
| | | | | cedar waxwing | ■ | ■ | ■ | ■ | | | | ■ | ■ | ■ | ■ | ■ |
| | | | | **SHRIKES** | | | | | | | | | | | | |
| | | | | loggerhead shrike | – | – | – | | | | | | | – | – | – |
| | | | | **STARLINGS** | | | | | | | | | | | | |
| | | | | European starling* | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | | | | **VIREOS** | | | | | | | | | | | | |
| | | | | white-eyed vireo* | | | | – | ■ | ■ | ■ | ■ | ■ | ■ | | |
| | | | | solitary vireo | | | | ■ | – | | | – | ■ | – | | |
| | | | | yellow-throated vireo* | | | | – | ■ | ■ | – | | – | | | |
| | | | | warbling vireo | | | | – | – | – | – | ■ | – | | | |
| | | | | Philadelphia vireo | | | | – | – | | | – | – | | | |
| | | | | red-eyed vireo* | | | | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| | | | | **WARBLERS** | | | | | | | | | | | | |
| | | | | blue-winged warbler | | | | – | ■ | – | | – | ■ | | | |
| | | | | golden-winged warbler | | | | – | – | | | – | – | | | |
| | | | | Tennessee warbler | | | | ■ | ■ | ■ | | ■ | ■ | | | |
| | | | | orange-crowned warbler | – | – | – | | | | | | | – | – | – |
| | | | | Nashville warbler | | | | ■ | ■ | – | | – | ■ | – | | |
| | | | | northern parula warbler | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | |
| | | | | yellow warbler | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | |
| | | | | chestnut-sided warbler | | | | ■ | ■ | ■ | | | ■ | ■ | | |
| | | | | magnolia warbler | | | | – | – | ■ | | | ■ | – | | |
| | | | | Cape May warbler | | | | – | – | ■ | | | ■ | – | – | |
| | | | | black-throated blue warbler | | | | ■ | ■ | | | – | ■ | ■ | | |
| | | | | black-throated green warbler | | | | ■ | ■ | | | | ■ | ■ | | |
| | | | | blackburnian warbler | | | | ■ | ■ | | | | ■ | ■ | | |
| | | | | yellow-rumped warbler | ■ | ■ | ■ | ■ | ■ | ■ | | | | ■ | ■ | ■ |
| | | | | yellow-throated warbler* | | | | ■ | – | – | – | – | – | – | | |
| | | | | pine warbler* | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | | | | prairie warbler | | | | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| | | | | palm warbler | – | – | ■ | ■ | | | | ■ | ■ | | – | – |
| | | | | bay-breasted warbler | | | | – | – | | | – | – | – | | |

| VISITS 1 | 2 | 3 | 4 | SPECIES | MONTHS J | F | M | A | M | J | J | A | S | O | N | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | blackpoll warbler | | | | ■ | ■ | ■ | | ■ | ■ | ■ | | |
| | | | | cerulean warbler | | | | – | – | | | – | – | – | | |
| | | | | black & white warbler* | – | – | – | ■ | ■ | – | – | ■ | ■ | – | – | – |
| | | | | prothonotary warbler* | | | | ■ | ■ | ■ | ■ | – | – | – | | |
| | | | | worm-eating warbler* | | | | – | ■ | ■ | ■ | ■ | – | | | |
| | | | | Kentucky warbler* | | | | ■ | ■ | – | – | ■ | ■ | | | |
| | | | | Connecticut warbler | | | | | | | | – | – | | | |
| | | | | mourning warbler | | | | – | – | | | – | – | | | |
| | | | | hooded warbler* | | | | – | ■ | ■ | ■ | ■ | – | | | |
| | | | | Wilson's warbler | | | | – | – | | | – | – | | | |
| | | | | Canada warbler | | | | ■ | ■ | | | ■ | ■ | ■ | | |
| | | | | American redstart* | – | – | – | ■ | ■ | – | – | ■ | ■ | – | – | – |
| | | | | ovenbird* | | | | ■ | ■ | ■ | – | – | ■ | ■ | | |
| | | | | northern waterthrush | | | | ■ | ■ | | | | ■ | | | |
| | | | | Louisiana waterthrush* | | | | ■ | ■ | ■ | – | – | ■ | ■ | | |
| | | | | common yellowthroat* | – | – | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | – | – |
| | | | | yellow-breasted chat* | | | | – | – | – | – | – | ■ | ■ | | |
| | | | | **TANAGERS** | | | | | | | | | | | | |
| | | | | summer tanager* | | | | – | – | – | – | – | – | | | |
| | | | | scarlet tanager* | | | | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| | | | | **CARDINALS & GROSBEAKS** | | | | | | | | | | | | |
| | | | | northern cardinal* | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | | | | evening grosbeak | – | – | – | – | | | | | | – | – | – |
| | | | | rose-breasted grosbeak | | | | | ■ | ■ | | ■ | ■ | | | |
| | | | | blue grosbeak* | | | | | ■ | ■ | ■ | ■ | ■ | – | | |
| | | | | indigo bunting* | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | |
| | | | | **SPARROWS** | | | | | | | | | | | | |
| | | | | eastern towhee* | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | | | | American tree sparrow | – | – | – | – | | | | | – | – | – | – |
| | | | | chipping sparrow* | – | – | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | – |
| | | | | field sparrow* | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | | | | vesper sparrow | – | – | – | – | – | – | – | – | – | | – | – |
| | | | | Savannah sparrow | – | – | ■ | ■ | ■ | | | | ■ | ■ | – | – |
| | | | | fox sparrow | – | – | – | ■ | ■ | | | | ■ | ■ | – | – |
| | | | | song sparrow* | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | | | | Lincoln's sparrow | – | – | – | – | | | | | – | – | – | – |
| | | | | swamp sparrow | ■ | ■ | ■ | ■ | ■ | – | – | – | ■ | ■ | ■ | ■ |
| | | | | white-throated sparrow | ■ | ■ | ■ | ■ | | | | | ■ | ■ | ■ | ■ |
| | | | | white-crowned sparrow | – | – | – | – | | | | | – | – | – | – |
| | | | | house sparrow* | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | | | | dark-eyed junco | ■ | ■ | ■ | ■ | – | – | | | | | ■ | ■ |
| | | | | **BLACKBIRDS & ORIOLES** | | | | | | | | | | | | |
| | | | | bobolink | | | – | – | | | | – | – | | | |
| | | | | red-winged blackbird* | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | | | | eastern meadowlark | – | – | ■ | ■ | – | – | – | – | ■ | ■ | – | – |
| | | | | rusty blackbird | – | – | ■ | ■ | | | | | – | – | – | |
| | | | | common grackle* | – | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | – | – |
| | | | | brown-headed cowbird* | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | | | | orchard oriole* | | | | | ■ | ■ | ■ | ■ | ■ | | | |
| | | | | Baltimore oriole* | | | | – | ■ | ■ | ■ | – | – | | | |
| | | | | **FINCHES & CROSSBILLS** | | | | | | | | | | | | |
| | | | | purple finch* | ■ | ■ | ■ | ■ | ■ | – | – | – | – | ■ | ■ | ■ |
| | | | | house finch* | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | | | | American goldfinch* | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | | | | red crossbill | – | – | | | | | | | | | – | – |
| | | | | white-winged crossbill | – | – | – | | | | | | | | | |
| | | | | pine siskin | – | – | – | – | – | – | – | – | – | – | – | – |

## VAGRANTS

- western grebe
- glossy ibis
- Mississippi kite
- golden eagle
- upland sandpiper
- Bohemian waxwing
- snowy owl
- long-eared owl
- snow bunting
- Thayers gull
- Sutton's warbler
- cinnamon teal
- brown-headed nuthatch
- mute swan
- trumpeter swan
- northern goshawk
- long-billed dowitcher
- stilt sandpiper
- white-rumped sandpiper
- common ground dove
- saw-whet owl
- vermilion flycatcher
- Bachman's warbler
- LeConte's sparrow
- ring-necked pheasant
- black-throated gray warbler

## JACKSON MILES ABBOTT

This checklist is dedicated to the memory of Lieutenant Colonel Jackson Miles Abbott for his great interest in the birds of the Fort Belvoir area. He made important and lasting contributions to the field of ornithology, particularly his 30-year survey of the nesting success of the bald eagle. This survey proved invaluable in relating the eagles decline to the use of the pesticide dichlorodiphenyl trichloroethane (DDT) and played an important role in having it banned on a national level. This aided in the return of the bald eagle as a year-round resident and breeding bird at Fort Belvoir.

## EDITORIAL NOTES

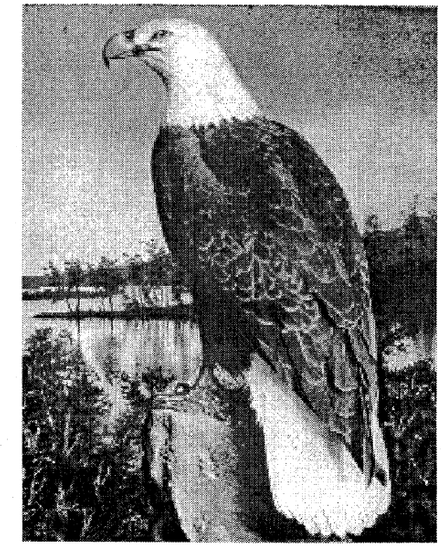
Many areas of Fort Belvoir are restricted or have limited access. Before going afield in areas other than the established trail system of the Accotink Bay Wildlife Refuge or the Jackson Miles Abbott Wetland Refuge, contact the Environmental and Natural Resource Division (ENRD) for permission.

U.S. Army Garrison Fort Belvoir
Directorate of Installation Support
Environmental and Natural Resource Division
9430 Jackson Loop, Fort Belvoir, Virginia 22060-5130
(703) 806-4007

This list is edited and published by the ENRD. Please send any comments, corrections or new observations (especially nesting notes) to this office to aid in future revisions.

Revised by: Gregory W. Fleming October 1998

# Checklist of the Birds in the Fort Belvoir, Virginia Area



Fort Belvoir, an 8,656-acre Army installation along the Potomac River shoreline, affords excellent opportunities for year-round birding. Approximately one quarter of the Installation's land area is designated as Wildlife Refuge or Forest and Wildlife Corridor, resulting in the conservation of a variety of ecologically significant habitats, including freshwater tidal marsh, grassland, bottomland hardwood forest and upland forest. More than 250 species of birds have been recorded at Fort Belvoir, attesting to the effectiveness of the Installation's natural resource management program.

**Environmental and Natural Resource Division**
**Directorate of Installation Support**
**Fort Belvoir, Virginia**

| VISITS | DATE | TIME | WEATHER CONDITIONS |
|---|---|---|---|
| VISIT 1 | | | |
| VISIT 2 | | | |
| VISIT 3 | | | |
| VISIT 4 | | | |

**When birding on Fort Belvoir, please follow the Birding Code of Ethics:**

1. Exercise restraint and caution during observation, photography, recording or filming.
2. Avoid the use of recordings and other methods of attracting birds.
3. Keep well back from nests and nesting colonies, roosts, display areas and important feeding sites.
4. Stay on trails and keep habitat disturbance to a minimum.
5. Follow all regulations governing the use of roads and public areas.
6. Respect the interests and rights of all other persons participating in other legitimate outdoor activities on the installation.

## RELATIVE ABUNDANCE

Abundant: numerous individuals, easily seen or heard in suitable habitat

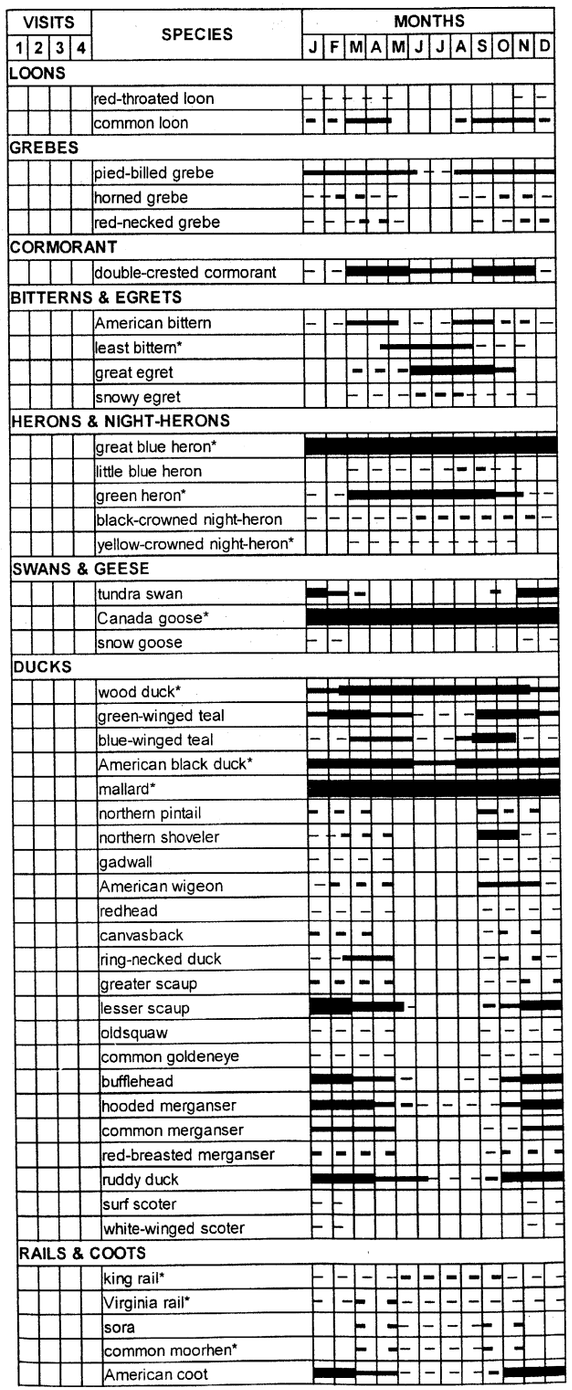
Common: likely to be seen or heard in suitable habitat

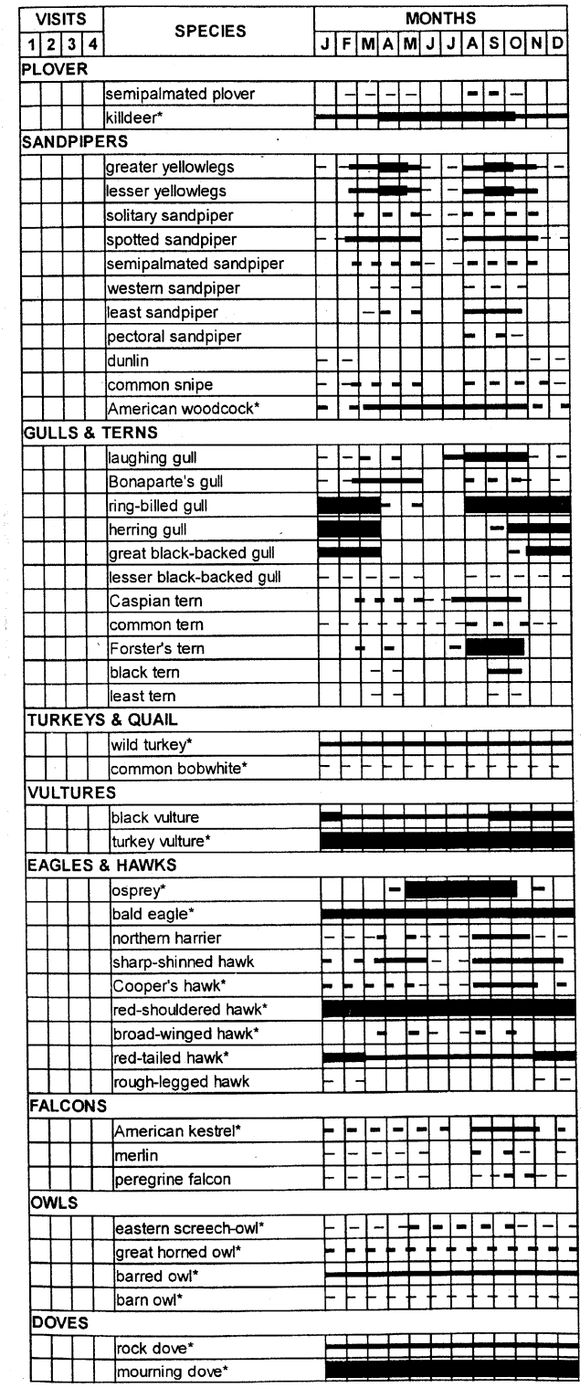
Uncommon: possible to see or hear in suitable habitat

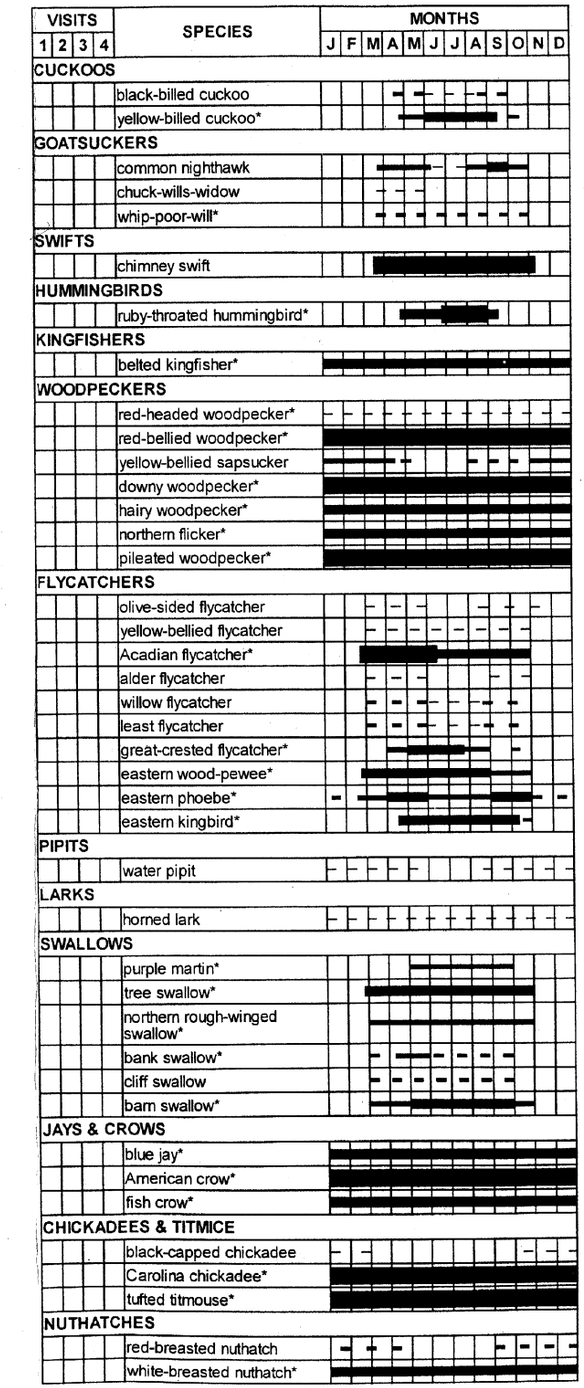
Occasional: seasonally possible to see or hear in low numbers in suitable habitat

Rare: unlikely to be seen or heard

* Species which nests or has nested



# APPENDIX O

# FORT BELVOIR HUNTING FACT SHEET

ANFB-ELE-ER (200-3)

**Fact Sheet for 2000-2001 Hunting Season on Fort Belvoir**

1. All hunting activities on Fort Belvoir are authorized and controlled by the Installation Commander in compliance with applicable Federal, Commonwealth of Virginia, Fairfax County, and Fort Belvoir regulations. Failure to strictly adhere to the rules set forth in the Directorate of Installation Support (DIS) Fact Sheet and Directorate of Personnel and Community Activities (DPCA) Memorandum of Instruction (MOI) may result in the revocation of hunting privileges on Fort Belvoir and/or criminal prosecution.

2. Archery is the only legal means for hunting deer on Fort Belvoir. Archers must use broadhead arrows with blades at least 7/8-inch wide or expand upon impact to 7/8 inch width and bows capable of propelling any arrow in their possession 125 yards. Possession or use of a crossbow is prohibited on Fort Belvoir.

3. The archery season runs 7 October 2000 through 6 January 2001. Fort Belvoir is open to hunting Monday through Saturday.

4. The daily bag limit is two deer per day. Hunters may utilize tags attached to the Virginia Big Game License, bonus tags and/or DMAP tags 7 October 2000 - 6 January 2001. **There are no additional restrictions on antlered deer taken on Fort Belvoir from 7 October 2000 - 6 January 2001.**

5. Under special permit from the Virginia Department of Game and Inland Fisheries, Fort Belvoir will open hunting from **16 September 2000 - 6 October 2000**. Only tags issued and attached to each hunting pass may be used and are **only valid for antlerless deer**. Unused tags must be returned each day with the hunting pass.

6. Any person harvesting a deer shall, immediately upon taking possession of the deer (before removing the deer from the place of harvest), detach from his/her license for hunting deer the appropriate tag and shall attach such tag to the deer. After tagging the deer, it must be taken without unnecessary delay to the check station located at building 773, Outdoor Recreation. If this check station is closed, the deer must be taken to Building 1131, Military Police Station. After arriving at the proper check station, an official game check card will be issued. All deer must be checked in at the proper check station before 2100 hours.

**No deer may leave the installation without being properly checked in accordance with the above procedures.**

7. In accordance with State regulations governing season and bag limits, squirrel, woodchucks, fox, and raccoon may be taken on Fort Belvoir by archers during deer hunts. No other wildlife may be taken by any means at any time.

8. Within Virginia State and U.S. Fish and Wildlife Service Federal regulations, falconry is permitted on Fort Belvoir. Falconry is only permitted on Sunday during Fort Belvoir hunting seasons. Falconers are required to register with Outdoor Recreation and sign out for specific hunting areas in the same manner as deer hunters. Falconers are required to possess a U.S. Fish and Wildlife Service Falconry Permit and a valid Commonwealth of Virginia Hunting License. Special permits are available for falconers; however, a maximum of two (2) individuals will be allowed in a training area at one time. No predatory birds may be collected on Fort Belvoir and nests are not to be disturbed in any manner. Falconers should contact Outdoor Recreation for qualification details.

9. Hunters are responsible for demonstrating good sportsmanship by taking every precaution to avoid upsetting the sensibilities of the non-hunting public. While hunting, tracking wounded game, field dressing, or transporting game, hunters will avoid disruptive public contact whenever possible.

10. There will be no hunting within 100 yards of any inhabited residence, recreation site, airfield, work place, or primary road. This includes the retirement community land adjacent to R-1. The primary roads on Fort Belvoir include John J. Kingman Road, Poe Road, and Accotink Road, as well as all paved roads. Secondary roads are defined as unpaved roads used for vehicular travel and negotiable by standard commercial four-wheel drive vehicles. Parking for each hunting area will be strictly in accordance with the parking map located at building 773.

11. **Blaze orange <u>is</u> required** and must be worn by all hunters on Fort Belvoir in accordance with Virginia hunting regulations.

12. Open areas, number of hunters per area, bag limits and legal sex are subject to change at any time during the season. Changes will be posted on the hunter bulletin board at Building 773. **(IT IS THE RESPONSIBILITY OF EACH HUNTER TO READ THE BULLETIN BOARD.)**

13. All hunters are required to abide by all applicable U.S. Army regulations relating to speed limits, consumption of alcoholic beverages, littering, trespassing, etc.

14. Table 1. gives the open areas and the maximum number of hunters per area. Table 2. is a summary of additional

restrictions on specified areas. Figure 1 is a map showing locations of hunting areas.

15. One dog may be used for tracking wounded deer; however, it must remain on a leash at all times, be removed from the hunting area immediately after retrieving the deer, and checked into and out of the area by PMO or Outdoor Recreation. This dog must have been previously trained for blood trailing and approved by DIS.

16. No permanent hunting stands (those attached to trees with nails and/or screws) will be constructed, repaired or utilized on Fort Belvoir. **All elevated stands must be portable.**

17. No weapons are allowed in the hunting areas except when in possession of a currently permitted hunter. Currently permitted means that he or she is assigned to the area and is going to or from the assigned hunting area and is hunting within the legal time limits and other constraints set by Virginia Game and Inland Fisheries Department and Fort Belvoir. This restriction includes possession of a weapon in a vehicle. **No firearms, crossbows or similar weapons are allowed in hunting areas under any circumstances.**

18. Training areas are off limits to unauthorized personnel.

19. Requests for assistance with wildlife management actions will be posted on the hunter bulletin board at building 773.

20. Hunters are required to comply with the collection of biological data at the check station. Data to be collected include hunter survey forms, deer weight, antler measurement, and removal and retention of deer jawbones for aging. If requested the hunter will be required to bring the animal to the game check station whole for a complete health check (reproductive organs, kidney fat, heart fat, bone marrow, etc.). **This is mandatory.**

21. Failure to strictly adhere to the Federal, State, local laws and regulations; the Fort Belvoir MOI and the Fort Belvoir Fact Sheet procedures and restrictions may result in criminal prosecution and/or loss of hunting privileges on Fort Belvoir, as applicable.

3 Encls

DAVID J. FARACE
LTC, EN
Director of Installation Support

**TABLE 1**

**Maximum Number of Hunters Per Hunting Area**

| Area | Slots |
|---|---|
| EPG | 12 |
| F-1 | 3 |
| F-2 | 3 |
| F-3 | 3 |
| F-4 | 3 |
| **H-1** | **3** |
| H-2 | 2 |
| **H-3** | **1** |
| H-4 | 2 |
| **H-5** | **1** |
| **H-6** | **2** |
| **H-13** | **3** |
| **H-14** | **2** |
| **H-15A** | **4** |
| R-1 | 2 |
| R-2 | 14 |
| **R-3** | **4** |
| T-1 | 2 |
| T-4 | 3 |
| T-6B | 9 |
| T-6C | 6 |
| T-7 | 5 |
| T-8 | 10 |
| T-9 | 4 |
| T-9A | 2 |
| T-10 | 6 |
| T-15B | 2 |
| T-16 | 10 |
| T-17 | 3 |
| W-1 | 12 |
| W-3 | 5 |
| **W-3B** | **3** |
| W-4 | 4 |
| W-5 | 5 |
| W-6 | 4 |
| W-7 | 2 |
| **Total** | **161** |

**Table 2**

**Hunting Areas and Special Restrictions**

1. Area F-2. This is the flood plain area between Pohick and Poe Roads. The boundaries are north of Poe Road, south of Route 1 and east of Accotink Creek. The following additional restrictions apply:

a. The Fairfax County Homeless shelter is off limits.
b. Deer will not be removed by Pohick Road.
c. Only elevated stand hunting is permitted.

2. Area F-3. This is located north of Route 1 and Davison Airfield. Hunting area boundaries are north of McCutchen Road, southeast of Farrar Drive and southwest of the Fairfax Parkway; and northeast of Santjer Road on a diagonal line to McCutchen Road. There will be elevated stand only hunting in this area.

3. Area F-4. This area is bounded by Telegraph Road to the north, Fairfax County Parkway to the east and the Davison Army Airfield to the south and west. There will be elevated stand only hunting in this area.

4. Area T-4. This area is the wooded area between Gunston Road and Pohick Road. It is bounded on the north by the ridge line above Route 1, on the west by Pohick Road and on the south by the recycling building 1089. The following additional restrictions apply:

a. There will be no hunting on the improved grounds surrounding the buildings at Pope Heights located west of building 1484.
b. All parking and deer removal will be done through Pope Heights or the leaf pile located west of building 1089.
c. Only elevated stand hunting is permitted.

5. Areas W-1, W-2 and W-3. These areas are part of the Accotink Bay Wildlife Refuge. The boundaries of W-3 are south of Pohick Road, southeast of the road that divides W-2 and W-3, north of the archery field range, east of Accotink Creek and west of the road at map marker 124. The following restrictions apply:

a. Only elevated stand hunting is permitted.
b. No parking or deer removal from entrance to Wildlife Refuge.
c. No game to be removed along Pohick Road.
d. W-2 including the **Pohick Loop Handicap Trail** is **closed** to hunting.

6. Area T-17. This is the land navigation training area used by the Defense Mapping School. It is bordered to the west by

McClellan Loop Road, to the north by the firewood cutting area, to the east by the RD&E perimeter fence and to the south by the shoreline. The following restrictions apply:

a. Deer removal is permitted only at the north edge of the woodline of the hunting area. Parking is permitted at the north edge of the woodline and is also available on the East Side of McClellan Loop, however vehicles must not block the road.

b. Hunters must pay particular attention to not disturb the numerous survey stakes in the area.

7. EPG (North Facility). This is the detached segment of Fort Belvoir which is located on the northwest side of Interstate 95. This area is bordered to the west by Highway 638 and straddles Accotink Creek. The following restrictions apply:

a. Testing requirements are top priority for the area. The schedule should be given to the Director of Outdoor Recreation as early as possible to avoid conflicts.

b. No cameras are permitted within the area.

c. In addition to a 100 yard restricted area around occupied facilities and major roads, there will be no hunting within 100 yards of any munitions storage perimeter fence.

d. Any hunter that has not departed the EPG area by 2000 hours is subject to apprehension by the Military Police.

8. Area R-1. This is the narrow strip located to the southwest of Davison U.S. Army Airfield. It is bordered to the northeast by the Davison Airfield fence and the southwest by private property as indicated on Figure 1. The following restrictions apply:

a. The only access is off U.S. Route 1 at the old road marked with sign "R-1". All game must be loaded within the treeline along the access road.

b. Only elevated stand hunting is permitted.

9. Area T-1. This small hunting area is located in Tompkin's Basin east of Warren Road and north of Johnson Road. The following restrictions apply:

a. Only elevated stand hunting is permitted.

b. Parking and deer removal is permitted only from Wood Road at the top of the Warren Road hill or at the dirt road adjacent to building 677 fence.

10. Davison USAAF. Hunting area boundaries and additional restrictions will be provided by the Davison USAAF security.

11. Areas W-7 and T-10. There will be no hunting west of the large N-S drainage in W-7 at any time and the road dividing T-10 and W-7 is closed to all traffic. Both areas are open to elevated stand hunting only. **All of W-7 and T-10 will be closed 15 November 2000 through the remainder of the hunting season in accordance with the Eagle Management Plan.**

12. Area H-2. This area is located between the sewage lift station and the Officer's Club. The following restrictions shall apply:

a. Hunting is restricted to Monday - Friday from 30 minutes before sunrise to 1500 hours (3 p.m.). Any hunter that has not departed this area by 1500 hours is subject to apprehension by the Military Police. This area is closed to hunting when there is no school.

b. Hunting is prohibited 100 yards from any road or building.

c. A key will be permanently affixed to the parking permit for this area. The hunter is to open the gate and immediately close and lock the gate upon entering the assigned hunting area. The gate must be closed and locked at all times.

d. Hunters will park only in designated parking areas and must load game in the same area. Hunters must take every precaution not to offend the general public, this includes placing the animal out of site within the vehicle and completely covering it with a blanket or tarp while exiting the area.

e. Only hunting from elevated stands is permitted in this area.

13. Area H-4. This area is bordered by the Dogue Creek tidal flats to the east and the dirt road to the southwest. All parking and deer removal will be from this road. The following restrictions shall apply:

a. Hunting is restricted to Monday - Friday from 30 minutes before sunrise to 1500 hours (3 p.m.). Any hunter that has not departed this area by 1500 hours is subject to apprehension by the Military Police. This area is closed to hunting when there is no school.

b. Hunting is prohibited 100 yards from any road or building.

c. A key will be permanently affixed to the parking permit for this area. The hunter is to open the gate and immediately close and lock the gate upon entering the assigned hunting area. The gate must be closed and locked at all other times.

d. Hunters will park only in designated parking areas and must load game in the same area. Hunters must take every precaution not to offend the general public, this includes placing the animal out of site within the vehicle and completely covering it with a blanket or tarp while exiting the area.

e. Only hunting from elevated stands is permitted in this area.

14. Area 15-B. This area is bordered to the north by Kingman Road, to the south by Wills Road and the dirt access road leading to building S2436, to the west by Keene Road, and the east by

Stonewall Jackson Road and field markers. The following restrictions shall apply:

a. Only elevated stand hunting is permitted.

b. All parking and removal of deer will be from Kingman Road or the dirt access road leading to building S2436.

15. W-4 Area. This area is located within the Jackson Miles Abbott Wetland Refuge. It is bordered on the north by Kingman Road, to the west by T-16, to the east by Dogue Creek, and to the south by field markers.

a. Only hunting from portable tree stands is permitted in this area.

b. NO PARKING OR DEER REMOVAL FROM WOODLAWN VILLAGE.

16. Area T-9A. This area is bordered by T-8 to the north, T-9 to the east and F-1 to the west and south. No hunting is permitted within 100 yards of building 3065.

17. Area H-1. This area is located north and east of the NCO Club parking lot bordered on the south by Surveyor Road and on the north by Belvoir property line. The western boundary is the abandoned roadway from the NCO parking lot to Washington Road and the wood line to Stevens Road. The following restriction shall apply:

a. Hunting is prohibited 100 yards from any road or building.

b. Hunters will park in designated parking area only and must load game in the same area.

c. Only hunting from elevated stands is permitted.

18. Area H-3 This area north of Harris Road and follows the natural drainage to the intersection of Mount Vernon and Gillispe Roads. The following restrictions shall apply:

a. Hunting is prohibited 100 yards from any road or building. Hunters will limit their travel to areas immediately adjacent to the drainage channel to maintain a 100-yard buffer from the Youth Center and Housing area.

b. Only hunting from elevated stands is permitted.

c. Hunters will park in designated areas only and must load game in the same area. Hunters must take every precaution not to offend the general public, this includes placing the animal out of sight within the vehicle and completely covering it with a blanket or tarp while exiting the area.

d. Hunting is restricted to Monday-Friday from 30 minutes before sunrise to 1500 hours (3p.m.). Any hunter that has not departed this area by 1500 hours is subject to apprehension by the Military Police. This area is closed to hunting whenever there is no school.

19. Area H-5. This area is bordered by the Potomac River on the

east and Belvoir Village Housing on the west. Patrick Road is the northern boundary and Fairfax Ruins and gravesite are on the south end.

a. Hunting is prohibited 100 yards from any housing.

b. Only hunting from elevated stands is permitted.

c. Hunters will park in designated areas only and will load game in the same area.

d. Hunting is restricted to Monday-Friday from 30 minutes before sunrise to 1500 hours (3p.m.). Any hunter that has not departed this area by 1500 hours is subject to apprehension by the Military Police. This area is closed to hunting whenever there is no school.

20. Area H-6. This area is bordered on the south by the CRML Compound and on the north by Fairfax Village Housing Area and the dirt road leading into the pump station at Fairfax Ruins. The Potomac River is the east boundary and the west boundary is the old perimeter fence road at the R&D Center. The following restrictions shall apply:

a. Hunting is prohibited 100 yards from any buildings excluding the log cabin in Fairfax Ruins.

b. Only hunting from elevated stands is permitted.

c. Hunters will park in designated areas only and will load game in the same area.

d. Hunting is restricted to Monday-Friday from 30 minutes before sunrise to 1500 hours (3p.m.). Any hunter that has not departed this area by 1500 hours is subject to apprehension by the Military Police. This area is closed to hunting whenever there is no school.

21. Area H-13. This area is bordered clockwise from the north by the North Post Golf Course, Beulah Road, J.J. Kingman Road, railroad tracks, Accotink Road and an unnamed stream at Fort Belvoir property line. The following restrictions apply:

a. Hunting is prohibited 100 yards from any road, building, or active recreational area.

b. Only hunting from elevated stands is permitted.

c. Hunters will park in designated areas only.

22. Area H-14. This area is bordered on the south and east by the golf course and on the north and west by the DRMO compound and access roads. The following restrictions apply:

a. Hunting is prohibited 100 yards from any road, building, or active recreational area.

b. Only hunting from elevated stands is permitted.

c. Hunters will park in designated areas only.

23. Area H15-A. Woodlawn Road, J.J. Kingman Road, Beulah Road and the golf course border this area. The following restrictions apply:

*a.* Hunting is prohibited 100 yards from any road, building or active recreational area.

*b.* Only hunting from elevated stands is permitted.

*c.* Hunters will park in designated areas only.

24. Area R-3. This area is the wooded northern portion of Humphrey Engineer Center Support Activity and is bordered by Telegraph Road and an overhead electric right of way. The following restrictions apply:

a. Hunting is prohibited 100 yards from any road or building.

b. Only hunting from elevated stands is permitted.

c. Hunters will park in designated areas only.

25. Area W-3B. Tracy Loop borders this area on the north and Warren Road along the south. Hunting is prohibited 100 yards from any road or building.

# APPENDIX P

## DEPARTMENT OF DEFENSE INSTRUCTION 4715.3, ENVIRONMENTAL CONSERVATION PROGRAM

Department of Defense

# INSTRUCTION

NUMBER 4715.3

May 3, 1996

USD(A&T)

SUBJECT: Environmental Conservation Program

References: (a) DoD Directive 4715.1, "Environmental Security," February 24, 1996
(b) DoD Directive 6050.16, "DoD Policy for Establishing and Implementing Environmental Standards at Overseas Installations," September 20, 1991
(c) Overseas Environmental Baseline Guidance Document, October 1992[1]
(d) Sections 1531, 1996 and 4341 of title 42, United States Code
(e) through (gg), see enclosure 1

## 1. PURPOSE

This Instruction:

1.1. Implements policy, assigns responsibilities, and prescribes procedures under reference (a) for the integrated management of natural and cultural resources on property under DoD control.

1.2. Authorizes the publication of "A Resource Manager's Guide to Volunteer and Partnership Programs" and "A Guide to Integrated Natural Resources Management."

1.3. Implements references (d) through (gg).

1.4. Establishes the DoD Conservation committee that reports to the Environmental Safety and Occupational Health (ESOH) Policy Board.

[1] Available from the Office of the Deputy Under Secretary of Defense (Environmental Security), 3400 Defense Pentagon, Washington, DC 20301-3400

1.5. Designates "DoD Executive Agents" to lead DoD implementation of key conservation issues, as specified in enclosure 2.

## 2. APPLICABILITY AND SCOPE

2.1. This Instruction applies to:

2.1.1. The Office of the Secretary of Defense (OSD); the Military Departments (including the Coast Guard when it is operating as a Military Service in the Navy), the Chairman of the Joint Chiefs of Staff, the Unified Combatant Commands, the Inspector General of the Department of Defense, the Defense Agencies, and the DoD Field Activities, including any other integral DoD organizational entity or instrumentality established to perform a Governmental function (hereafter referred to collectively as "the DoD Components"). The term "Military Services," as used herein, refers to the Army, the Navy, the Air Force, and the Marine Corps.

2.1.2. DoD operations, activities, and installations in the United States; U.S. territories, trusts, and possessions; and including Government-owned and contractor-operated facilities. Outside the United States, DoD Directive 6050.16 (reference (b)) shall apply, consistent with international agreements, status of forces agreements, final governing standards (FGS) issued for host nations, or where no FGS have been issued, the criteria under the Overseas Environmental Baseline Guidance Document (reference (c)).

2.1.3. Public lands withdrawn from all forms of appropriation under public land laws and reserved for use by the Department of Defense.

2.2. This Instruction does not apply to the Civil Works function of the Army.

## 3. DEFINITIONS

Terms used in this Instruction are defined in enclosure 3.

## 4. POLICY

### 4.1. General Conservation Management

4.1.1. All DoD conservation programs shall work to guarantee continued access to our land, air, and water resources for realistic military training and testing while ensuring that the natural and cultural resources entrusted to DoD care are sustained in a healthy condition for scientific research, education, and other compatible uses by future generations.

4.1.2. All DoD facilities and installations shall within available resources plan, program, and budget to achieve, monitor, and maintain compliance with all applicable Executive orders and Federal natural and cultural resources statutory and regulatory requirements, and State regulations as required by applicable references to this Instruction.

4.1.3. Internal conservation self-assessments shall be conducted at least annually and external conservation self-assessments at least once every 3 years at all installations that require an integrated natural resources management plan (INRMP) and/or an integrated cultural resources management plan (ICRMP). At a minimum, those reviews shall assess adherence to the finding priorities defined in enclosure 4, and the status of the measures of merit defined in enclosure 5. Results should not normally be released to regulators.

4.1.4. The principal purpose of DoD lands and waters is to support mission-related activities. Those lands and waters shall be made available to the public for educational or recreational use of natural and cultural resources when such access is compatible with military mission activities, ecosystem sustainability, and with other considerations such as security, safety, and fiscal soundness. Opportunities for such access shall be equitably and impartially allocated. INRMPs and ICRMPs shall describe areas appropriate for public access.

4.1.5. Native Americans shall have access to DoD sites and resources that are of religious importance, or that are important to the continuance of their cultures (e.g., areas containing traditionally used plants and traditionally used hunting areas), consistent with the military mission, appropriate laws (42 U.S.C. 1996, reference (d)), and regulations, and subject to the same safety, security, and resource considerations as the general public.

4.1.6. Federal or State conservation officials shall be given access to DoD-controlled natural and cultural resources to conduct official business consistent with an installation's operational, security, and safety policies and procedures, and with applicable requirements of laws and regulations (e.g., Section 1531 et seq. of 42

U.S.C. and 36 CFR 60 (references (d) and (e)).

4.1.7. DoD installations may use appropriate partnerships and volunteers to enhance conservation programs when practicable (10 U.S.C. 1588(a)(2), reference (f)). When practicable, that work shall be performed under the direction of professionally trained natural or cultural resources personnel.

4.1.8. Conventional procurement methods as well as cooperative agreements in accordance with 31 U.S.C. 6301-6308 and 16 U.S.C. 670 et seq. (references (g) and (h)) may be used to accomplish work identified in installation INRMPs. Authority for approving cooperative agreements is hereby delegated to the Secretaries of the Military Departments. This authority may be further delegated to lower echelons of a Military Department at the discretion of the pertinent Secretary.

4.1.9. DoD installations may engage in public awareness and outreach programs to educate the public regarding the resources on military lands and DoD efforts to conserve those resources.

4.1.10. Personnel assigned duties involving natural or cultural resources shall have the appropriate knowledge, skills, and professional training and education to carry out those responsibilities. Necessary supplemental training to ensure that proper and efficient management of those resources shall be provided quickly. Staffing levels and authority adequate to ensure that appropriate resource management and protection shall be provided, in accordance with Section 328 of NDA Report 103-701 and Section 2852 of NDA Report 103-499 (references (i) and (j)).

4.1.11. The natural and cultural resources identified on installations proposed for closure shall be addressed during disposal and reuse planning (e.g., 40 CFR 1500-1508 and Section 4341 of 42 U.S.C., references (k) and (d)). Conservation easements may be granted on portions of installation real property that have significant ecological, cultural, scenic, recreational, or educational value when specifically authorized (e.g., E.O. 11990 and E.O. 12898, references (l) and (m)). Where appropriate, and in accordance with requirements governing property disposal, the DoD Components shall give consideration to providing excess property to conservation agencies or organizations.

4.1.12. Professional natural and cultural resources staff shall oversee the enforcement of applicable laws as an integral part of an installation's conservation program.

4.1.13. The management and conservation of natural and cultural resources under DoD control, including planning, implementation, and enforcement functions, are inherently Governmental functions that shall not be contracted (DoD 3210.6-R, reference (n)). DoD Components that have contractor-operated installations or facilities shall ensure that contract instruments clearly address contractor and Government functions as they relate to natural and cultural resources.

4.2. Natural Resources Management

4.2.1. Natural resources under the stewardship and control of the Department of Defense shall be managed to support and be consistent with the military mission, while protecting and enhancing those resources for multiple use, sustainable yield, and biological integrity. Land use practices and decisions shall be based on scientifically sound conservation procedures and techniques, and use scientific methods and an ecosystem approach.

4.2.2. INRMPs shall incorporate the principles of ecosystem management (enclosure 6). INRMPs shall be prepared, maintained, and implemented for all lands and waters under DoD control that have suitable habitat for conserving and managing natural ecosystems. Each plan shall contain information needed to make appropriate decisions about natural resources management, including that identified in enclosure 7.

4.2.3. Biologically or geographically significant or sensitive natural resources (e.g., wetlands, forests, floodplains, watersheds, estuaries, riparian areas, coastal barrier islands, marine sanctuaries, critical habitats, animal migration corridors) or species (e.g., threatened or endangered species, certain marine mammals, and migratory birds) shall be inventoried and managed to protect these resources, and to promote biodiversity, using the goals identified in paragraph 6.2.2., below.

4.2.4. Threatened and endangered species management and recovery efforts on DoD lands and waters shall be consistent with Section 1531 et seq. of 42 U.S.C. (reference (d)) and other legal mandates. Procedures to comply with these mandates shall emphasize military mission requirements and interagency cooperation during consultation, species recovery planning, and management activities. Opportunities to conserve Federally listed species and the ecosystems on which those species depend shall be identified. The Department of Defense shall accept an unequal or disproportionate burden for the conservation of threatened and endangered species only when it is required by legal authority or it has been expressly determined that it is in the Department of Defense's best interest.

4.2.5. DoD lands shall be reviewed for their suitability for commercial forestry and agricultural outlease purposes. Any such uses must be compatible with use of the land to support the military mission. Forestry and agricultural operations shall also be consistent with long-term ecosystem management goals. Such operations shall be balanced with and used to achieve or maintain other needs for the land, including threatened and endangered species protection, biodiversity conservation, native plant landscaping, watershed protection, wildlife enhancement, outdoor recreation, and natural beauty. Forestry proceeds shall be distributed as in Section 2665 of 10 U.S.C. and DoD Instruction 7310.5 (references (f) and (o)).

4.2.6. Best management practices shall be used to minimize nonpoint sources of water pollution. DoD actions that might cause nonpoint source pollution, shall be consistent with 32 U.S.C. 1251 et seq. (reference (p)).

4.2.7. DoD operations, activities, projects, and programs that affect the land, water, or natural resources of any coastal zone shall be consistent with Sections 1451 et seq., 3501 et seq., and 1431 et seq. of 16 U.S.C. (reference (h)).

4.2.8. Management measures for the removal or control of exotic species shall be included in installation INRMPs, when applicable.

4.2.9. Environmentally and economically beneficial landscaping practices shall be used on all DoD lands (the Presidential Memorandum and 60 FR 40837, references (q) and (r)). Each installation shall, to the extent practical, use regionally native plants for landscaping and other beneficial techniques.

4.2.10. DoD lands shall be managed for the goal of no net loss of wetlands. DoD operations and activities shall avoid the net loss of size, function, or value of wetlands. Additionally, the Department of Defense will preserve the natural and beneficial values of wetlands in carrying out its activities (E.O. 11990, reference (l)). The development of mitigation "banks" is encouraged as sound conservation planning.

4.2.11. Adverse impacts on floodplains shall be avoided when possible. The direct or indirect support of floodplain development shall be avoided where there is a practicable alternative (E.O. 11988, reference (s)).

4.2.12. Consistent with ecosystem-based management, altered or degraded landscapes and associated habitats shall be restored and rehabilitated whenever practical.

4.2.13. All DoD Components shall develop and promulgate criteria and procedures for assessing natural resource damage claims in the event natural resources under DoD control are damaged by oil or a hazardous substance released by another party. The funds recovered by the Department of Defense as a result of natural resources damage claims shall be used for restoration, replacement, or acquisition of equivalent natural resources (33 U.S.C. 2701 et seq., reference (t)) on the installation where the damages occurred.

4.2.14. Fire is an integral element of natural processes. All DoD Components shall manage fire in a manner to preserve health and safety, protect facilities, and facilitate the health and maintenance of natural systems.

4.3. Cultural Resources Management

4.3.1. Cultural resources under the control of the Department of Defense shall be identified, protected, curated, and interpreted through a comprehensive program that complies with legally-mandated requirements and results in sound and responsible cultural resources stewardship.

4.3.2. DoD installations shall develop a program to preserve the historic character and function of military properties in a cost-effective manner that supports the military mission and protects the health and safety of the occupants and employees.

4.3.3. ICRMPs shall be prepared, maintained, and implemented for all lands and waters under DoD control that contain cultural resources. Each plan shall contain information needed to make appropriate decisions about cultural resources management, including that identified in enclosure 7.

4.3.4. All properties, including those from the "Cold War" era, shall be evaluated in a manner fully consistent with military mission requirements and using the appropriate criteria in 36 CFR 800 (reference (e)) to determine eligibility for nomination to the National Register of Historic Places (National Register). Eligible properties shall be used for mission purposes to the maximum extent possible before acquiring, constructing, or leasing other buildings (Section 470 et seq. of 16 U.S.C., reference (h)).

4.3.5. An economic analysis shall be conducted on all National Register-eligible historic properties that are being considered for demolition and replacement (Section 2825 of 10 U.S.C., reference (f)). The economic analysis should include an evaluation of life-cycle maintenance costs, utility costs, replacement costs,

and other pertinent factors.

4.3.6. Native American human remains and cultural items shall be managed and repatriated to culturally-affiliated or lineally-descended Native American organizations in accordance with 25 U.S.C. 3001 and 43 CFR 10 (references (u) and (v)).

4.3.7. Consultations with Federally-recognized tribal governments and other Native American organizations shall be carried out in accordance with Sections 1996 and 4341 of 42 U.S.C., 36 CFR 800, 25 U.S.C. 3001, 43 CFR 10, 32 CFR 22, and Section 470 aa-ll of 16 U.S.C. (references (d), (e), (u), (v), (w), and (h)), and shall follow the principles established in enclosure 8.

## 5. RESPONSIBILITIES

5.1. The Under Secretary of Defense for Acquisition and Technology, through the Deputy Under Secretary of Defense for Environmental Security, shall:

5.1.1. Establish additional conservation policy and guidance, where necessary, in accordance with DoD Directive 4715.1 (reference (a)).

5.1.2. Designate responsibilities and provide procedures for implementing the DoD conservation program.

5.1.3. Ensure that the conservation ethic is integrated throughout the Department of Defense through education, training, and awareness programs.

5.1.4. Support DoD Component conservation budget requirements.

5.1.5. Monitor implementation of this Instruction, including adherence to finding priorities for conservation (enclosure 4), the use of appropriate measures of merit (enclosure 5), and the periodic review of the DoD Component conservation programs.

5.1.6. Identify opportunities for improved efficiency through increased interagency and DoD Component cooperation, information sharing, technology demonstration and transfer, and public communication.

5.1.7. In coordination with the DoD Components, establish goals and objectives for the DoD conservation program.

5.1.8. Integrate the DoD conservation program with other environmental security programs.

5.1.9. Coordinate with other Federal Agencies on conservation matters of national or regional scope.

5.1.10. Oversee the DoD Conservation Committee. The DoD Conservation Committee shall:

5.1.10.1. Recommend natural and cultural resources policy and program improvements to the ESOH Policy Board.

5.1.10.2. Review, analyze, and make recommendations on conservation issues of common interest to the DoD Components.

5.1.10.3. Review compliance with this Instruction.

5.1.10.4. Coordinate natural and cultural resources management programs among the DoD Components.

5.1.10.5. Coordinate periodic natural and cultural resources training opportunities for DoD employees.

5.1.11. In coordination with the DoD Components, designate and oversee "DoD Executive Agents" for specific conservation-related issues or areas. Designated "DoD Executive Agents" are in enclosure 2.

5.1.12. In coordination with the DoD Comptroller, establish policy for administration of the DoD Reserve Account established by Section 2665 of 10 U.S.C. (reference (f)) and the forestry funds therein.

5.1.13. Ensure that the demonstration, validation, and certification of critical conservation technologies emerging from the technology base.

5.1.14. Gather information from the DoD Components and prepare a consolidated DoD response for statutory reporting requirements.

5.2. The Secretaries of the Military Departments and the Directors of the Defense Agencies, under OSD Principal Staff Assistants and those that report directly to the Secretary or Deputy Secretary of Defense, shall:

5.2.1. Integrate the DoD conservation program with mission activities, including environmental programs.

5.2.2. Ensure compliance with this Instruction, including compliance by tenant activities. Develop and implement programs to monitor, achieve, and maintain compliance with applicable Federal statutory requirements and State regulations as required by applicable references in enclosure 1.

5.2.3. Plan, program, and budget for conservation requirements necessary to execute conservation programs consistent with DoD guidance and fiscal policies, and within available resources.

5.2.4. Lead in the stewardship of natural and cultural resources under their jurisdiction.

5.2.5. Ensure that internal conservation self-assessments are conducted at least annually and external conservation self-assessments are conducted at least once every 3 years at all appropriate installations. Promptly correct identified "problem areas," using priorities defined in paragraph 6.1.3., below.

5.2.6. Present annual reviews on the status of the DoD Components' conservation programs to the Deputy Under Secretary of Defense for Environmental Security (DUSD(ES)) or designated representative.

5.2.7. Advise and consult on conservation issues and policies of general DoD interest through participation with the DoD Executive Agent, the DoD Conservation Committee, the ESOH Policy Board, and the Defense Environmental Security Council.

5.2.8. Ensure that installations prepare, maintain, and implement INRMPs and ICRMPs, and that those plans are fully coordinated with appropriate installation offices responsible for preparing and maintaining training plans and master plans. Ensure that each plan is reviewed, and updated, as appropriate, every 5 years, or earlier, as changing circumstances warrant.

5.2.9. Carry out the responsibilities of "DoD Executive Agents" for specific environmental conservation areas when designated by the DUSD(ES) under paragraph 5.1.11., above. "DoD Executive Agents" shall:

5.2.9.1. Monitor and analyze legislation, regulations, and emerging trends, as appropriate, and coordinate input or responses, where necessary.

5.2.9.2. Identify, participate in, and promote the establishment of regional ecosystem management efforts.

5.2.9.3. Provide analysis and point papers for issues of concern.

5.2.9.4. Recommend policy changes and positions for all of the Department of Defense.

5.2.9.5. Develop technical alerts for the DoD Components on upcoming changes.

5.2.9.6. Support public affairs offices, as necessary.

5.2.9.7. Develop a Charter outlining functions and responsibilities, as necessary.

5.2.9.8. Brief the DoD Conservation Committee, the ESOH Policy Board, or the Defense Environmental Security Council, as required, on the status of the DoD Executive Agent program.

5.2.10. Promptly notify the DUSD(ES) of significant conservation issues.

5.3. The Under Secretary of Defense for Personnel and Readiness shall:

5.3.1. Incorporate conservation values into DoD education, training, construction programs, and performance evaluation policies.

5.3.2. Ensure that sufficient qualified personnel and training are available to carry out the requirements of this Instruction.

5.3.3. Identify opportunities for efficiencies in providing conservation training through increased interagency and DoD Component cooperation.

5.4. The Director, Defense Research and Engineering, under the Under Secretary of Defense for Acquisition and Technology, shall:

5.4.1. Develop an integrated and coordinated science and technology program to address the conservation program requirements identified by the DUSD(ES).

5.4.2. Issue guidance to the DoD Components on conservation science and

technology programs.

## 6. PROCEDURES

### 6.1. General Conservation Management

6.1.1. Conservation management is a dynamic process. A consistent conservation management approach includes those systematic procedures that should be used by each DoD installation or activity, as follows:

6.1.1.1. Assess military mission.

6.1.1.2. Prepare detailed inventory of resources.

6.1.1.3. Analyze and assess risk to the resources.

6.1.1.4. Prepare management plans.

6.1.1.5. Implement management plans.

6.1.1.6. Monitor and assess results.

6.1.1.7. Conduct needs assessment survey.

6.1.1.8. Reassess inventories.

6.1.1.9. Reanalyze and reassess risk to resources.

6.1.1.10. Adjust program, as necessary.

6.1.2. Each DoD Component shall ensure that current and planned installation programs, plans, and projects (e.g., training and test range management plans, master plans, integrated pest management plans, endangered species recovery plans, golf course management plans, grounds maintenance plans, facilities construction site approvals, and other land use activities) are integrated and compatible with natural and cultural resources programs, plans, and projects.

6.1.3. All natural and cultural resources compliance requirements shall be categorized based on the "Environmental Quality Conservation Compliance Classes" defined in enclosure 4. All projects in Classes 0, I, and II shall be funded consistent with timely execution to meet future deadlines. Each DoD Component shall use

Defense Planning Guidance to determine funding priority for the Environmental Quality Conservation Compliance Classes.

6.1.4. Each DoD Component shall ensure that proven and scientific data collection methods and sampling techniques are used to develop and update natural and cultural resources inventories.

6.1.5. Cooperative agreements may be entered into with other Federal Agencies, States, local governments, nongovernmental organizations, and individuals to provide for the maintenance and improvement of natural resources or conservation research on DoD installations Agreements authorized by 10 U.S.C. 1588(a)(2) (reference (f)) are not subject to 31 U.S.C. 6301 (reference (g)), but must comply with the procedural requirements of DoD 3210.6-R (reference (n)). Those agreements may be used; e.g., for inventories, monitoring, research, minor construction and maintenance, public awareness, and other work that supports the DoD conservation program. All such agreements must contain language that state the DoD Component shall carry out its obligations under the agreement to the extent that funding is available.

6.1.6. INRMPs and ICRMPs shall be developed with the active involvement of installation and higher command personnel, in coordination with relevant outside authorities and partners (DoD Directive 4165.61, reference (x)), and with their users. They shall be reviewed annually, updated as mission or environmental changes warrant, and revised and approved by appropriate command levels at least every 5 years. The DoD Components shall ensure that consultation, agreements, concurrence, and approvals required by law are carried out.

6.1.7. The DoD Conservation Committee shall be chaired by the Director, Conservation, or other designated "representative of the DUSD(ES)." Each Military Department, each Military Service, the Defense Logistics Agency, and the "representative of the DUSD(ES)" shall have one vote. "Primary voting members" and "alternates to the DoD Conservation Committee" shall be designated in writing. Each Military Department shall designate up to 4 individuals eligible to vote. The Armed Forces Pest Management Board and the Office of General Counsel shall each have one "nonvoting member to the DoD Conservation Committee." Other DoD offices shall attend at the invitation of the Chair of the DoD Conservation Committee, after seeking concurrence from the appropriate DoD Component. Ad hoc subcommittees may be established, as needed.

6.1.8. A planning level survey, as follows, is an essential initial step in

managing an installation's natural and cultural resources:

6.1.8.1. The biological inventory should include, at a minimum, soils, vegetative communities, critical species (e.g., threatened and endangered, locally rare, keystone), and delineation of wetlands and water sources.

6.1.8.2. The cultural resources inventory of historic buildings should include, at a minimum, the identification and preliminary assessment of all National Register-eligible historic buildings and structures. Objects, districts, and landscapes covered by Section 470 et seq. of 16 U.S.C., (reference (h)) should also be included.

6.1.8.3. The cultural resources inventory of archeological resources should include, at a minimum, the analysis, identification, and prioritization of all potential archeological locations on the installation and verification of the presence or absence of archeological resources in all areas that might be adversely impacted by military activities.

6.1.9. Partnerships and interagency agreements can be useful for meeting DoD conservation goals. Each partnering or cooperating agreement in which DoD formally participates should recognize that:

6.1.9.1. The primary DoD mission is the protection of national security. DoD activities on military lands are vital to fulfillment of that mission.

6.1.9.2. Actions specified in those agreements should not detract from the military mission.

6.1.9.3. Military lands cannot be used for the mitigation of impacts of actions occurring off the installation that affect the environment.

6.1.9.4. Military lands cannot be set aside as permanent environmental preserves. The Department of Defense must maintain the flexibility to adapt our defense mission to political and technological developments.

6.1.9.5. The Department of Defense cannot commit funding before the Congress makes it available.

6.1.10. Portions of installation real property that have significant ecological, cultural, scenic, recreational, or educational value may be set aside for conservation of those resources, where such conservation is consistent with the military mission. Such areas shall be reassessed if the military needs of the installation change, during any

base realignment or closure action involving the property, or if the property becomes excess and requires disposal.

6.1.11. When an installation determines that the disclosure of information on the location or character of natural or cultural resources may create a substantial risk of harm, theft, or destruction of such resources, invasion of privacy, trespass on Government property, interference with the military mission, and/or interference with the rights guaranteed to Native American groups under 42 U.S.C. 1996 (reference (d)), the installation shall ensure that documents and other data provided to the public do not disclose such information. That information may be provided to other Agencies and other parties in accordance with DoD Component policies and procedures.

6.1.12. Before disposing of DoD properties, the DoD Component with responsibility for the property involved shall:

6.1.12.1. Identify all significant natural and cultural resources, and determine whether they may be affected by the disposal action.

6.1.12.2. Provide disposal plans to appropriate Agencies, organizations, and individuals, and provide a reasonable opportunity for review and comment before proceeding with the disposal action.

6.1.12.3. Ensure that "museum objects and documents" are identified and preserved.

6.1.12.4. Dispose of the property in accordance with any other legal requirements.

6.2. Natural Resources Management

6.2.1. Ecosystem management shall do the following:

6.2.1.1. Include a shift from single species to multiple species management, insofar as that is consistent with the requirements of Section 1531 et seq. of 42 U.S.C. (reference (d));

6.2.1.2. Consider the formation of partnerships necessary to assess and manage ecosystems that cross political boundaries;

6.2.1.3. Use the best available scientific information in decision-making and adaptive management techniques in natural resource management;

6.2.1.4. Include associated cultural values.

6.2.1.5. Use principles and guidelines defined in enclosure 6 for all DoD lands and waters.

6.2.2. Biodiversity conservation on DoD lands and waters shall be promoted when consistent with the mission and practicable to achieve the following goals:

6.2.2.1. Maintain or restore remaining native ecosystem types across their natural range of variation.

6.2.2.2. Maintain or reestablish viable populations of all native species in an installation's areas of natural habitat, when practical.

6.2.2.3. Maintain evolutionary and ecological processes, such as disturbance regimes, hydrological processes, and nutrient cycles.

6.2.2.4. Manage over sufficiently long-time periods for changing system dynamics.

6.2.2.5. Accommodate human use in those guidelines.

6.2.3. Ecosystem management and biodiversity conservation are closely interrelated. Key elements of that relationship are as follows:

6.2.3.1. Integrate ecosystem management with mission readiness in the context of a shrinking DoD land base and budget.

6.2.3.2. Perform operational, testing, training, and maintenance activities in concert with natural resources conservation.

6.2.3.3. Integrate ecosystem conservation considerations into marine and oceangoing operations plans.

6.2.3.4. Biodiversity conservation contributes to overall ecosystem integrity and sustainability, which in turn supports the military mission.

6.2.3.5. Ecosystem management and responsibilities under existing environmental protection and natural resources management authorities and directives are related.

6.2.3.6. A full and evolving array of ecosystem management tools as options shall be considered and retained.

6.2.3.7. Regional approaches incorporating cooperation with other DoD Components, other Federal Agencies, and with adjoining property uses should be encouraged. That cooperation can result in significant conservation, public relations, and compliance benefits for DoD installations.

6.2.4. Agricultural and forest products shall not be given away, abandoned, carelessly destroyed, used to offset contract costs or traded for services, supplies, or products, or otherwise be improperly removed. Forest products may be harvested to generate electricity, heat, steam, or for other uses only if the Military Services' forestry account is paid fair market value. Planned forest product sales shall continue on land reported as excess until actual closure, disposal, or transfer occurs. That portion of the proceeds from sales of land that is attributable to the value of standing timber on the land sold shall be deposited in the Military Service's forestry account. Agricultural proceeds shall be used exclusively to fund natural resources management program requirements and the administrative expenses of agricultural and grazing leases (Section 2667(d) of 10 U.S.C., reference (f)). Authorized uses of cropland and grazing funds are personnel salaries (limited to professional and technical support of the grazing and cropland programs in support of management goals and objectives); development of INRMPs; administrative expenses (training, scientific meetings, parts, supplies); and improvements to the land to include increased productivity, reduced soil erosion, and fencing.

6.2.5. Areas on DoD installations that contain natural resources that warrant special conservation efforts, after appropriate study and coordination, may be designated as special natural areas. The integrated natural resources management plan for the installation shall address special management provisions necessary for the protection of each area. Special natural areas include botanical areas, ecological reserve areas, geological areas, natural resources areas, riparian areas, scenic areas, zoological areas, "watchable wildlife" areas, and traditional cultural places having officially recognized special qualities or attributes.

6.2.6. Procedures shall be established to ensure that no Federal funds are expended in the undeveloped and unprotected coastal barriers of the Coastal Barrier Resource System unless those expenditures are for military activities essential to national security. If such expenditures are necessary, the actions shall be coordinated with the Department of the Interior (Section 3501 et seq. of 16 U.S.C., reference (h)).

6.3. Cultural Resources Management

6.3.1. Routine DoD management of historic buildings, districts, sites, ships, aircraft, objects, and structures, and other cultural resources should include sound and cost-effective preservation techniques.

6.3.2. At the earliest planning stage of any undertaking that might affect a cultural resource, the affected DoD Component shall start interagency consultation procedures to explain the undertaking, its area of potential effect, and a preliminary determination on whether or not the resources will be affected. Consultation shall be undertaken, as appropriate, with the Advisory Council on Historic Preservation, the State Historic Preservation Office, Federally-recognized Indian tribes and other Native American organizations and other interested organizations and individuals as provided in 42 U.S.C. 1996, 36 CFR 800; 25 U.S.C. 3001, and Section 470 aa-ll of 16 U.S.C. (references (d), (e), (u) and (h)).

6.3.3. If the economic analysis described in paragraph 4.3.5., above, demonstrates that revitalization cost of historic properties exceeds 70 percent of replacement cost, replacement construction may be used. However, the 70 percent value may be exceeded where the significance of a particular historic structure warrants special attention, or if warranted by long-term life-cycle cost comparisons. An assessment of new construction must evaluate life-cycle maintenance cost and replacement cost as alternatives for consideration by the decisionmaker. Replacement cost shall not be based on replacement in kind, but shall be based on a design that is architecturally compatible with the historic property. Federal Agencies are required to make maximum reuse of historic buildings before disposal, new construction, or leasing (Section 470 et seq. of 16 U.S.C., reference (h)). If the building to be disposed of is historic, potential reuses of the building must be analyzed prior to making a decision to dispose of it.

6.3.4. Consultation with Federally-recognized Indian tribes or other Native American organizations is required by law when some human remains or cultural items, as defined in 25 U.S.C. 3001 (reference (u)), or when a site of religious or cultural importance are found on DoD property. If such items are unearthed, the requirements of reference (u) must be met. The installation should consult with the tribe(s), to the extent possible early in the planning process, and should take into account the interests of the potentially affected tribe(s) when carrying out the action.

7. EFFECTIVE DATE

This Instruction is effective immediately.

Paul Kaminski

Paul Kaminski
Under Secretary of Defense
for Acquisition and Technology

Enclosures - 8

E1. References, continued
E2. DoD Executive Agents for Conservation Issues
E3. Definitions
E4. Programming and Budgeting Priorities for Conservation Program
E5. Conservation Measures of Merit
E6. Ecosystem Management Principles and Guidelines
E7. Contents of INRMPs and ICRMPs
E8. Principles for Consultations with Native American

# E1. ENCLOSURE 1

## REFERENCES, continued


(e) Title 36, Code of Federal Regulations, Parts 60, 78, 79, 800 and 1228, "National Register of Historic Places," current edition

(f) Sections 1588(a)(2), 2665, 2667(d) and 2825 of title 10, United States Code

(g) Sections 6301-6308 of title 31, United States Code

(h) Sections 431-433, 470 et seq., 670 et seq., 1361-1407 1431 et seq., 1531 et seq. and 3501 et seq. of title 16, United States Code

(i) Section 328 of National Defense Authorization Report 103-701

(j) Section 2852 of National Defense Authorization Report 103-499

(k) Title 40, Code of Federal Regulations, Parts 1500-1508, "Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act" current edition

(l) Executive Order 11990, "Protection of Wetlands," May 24, 1977

(m) Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," February 11, 1994

(n) DoD 3210.6-R, "DoD Grant and Cooperative Agreement Regulations," March 1995, authorized by DoD Directive 3210.6, April 4, 1991

(o) DoD Instruction 7310.5, "Accounting for Production and Sale of Forest Products," January 25, 1988

(p) Section 1251 et seq. of title 32, United States Code

(q) Presidential Memorandum, "Environmentally and Economically Beneficial Practices on Federal Landscaped Grounds," April 26, 1994

(r) Federal Register, Volume 60, page 40837, August 10, 1995

(s) Executive Order 11988, "Floodplain Management," May 24, 1977, as amended

(t) Section 2701 et seq. of title 33, United States Code

(u) Section 3001 of title 25, United States Code

(v) Title 43, Code of Federal Regulations, Part 10, "Native American Graves Protection and Repatriation Act Regulation," December 4, 1995

(w) Title 32, Code of Federal Regulations, Parts 22 and 229, "Archeological Resources Protection Act of 1979; Uniform Regulations."

(x) DoD Directive 4165.61, "Intergovernmental Coordination of DoD Federal Development Programs and Activities," August 9, 1983

(y) Presidential Memorandum, "Government-to-Government Relations with Native American Tribal Governments," April 29, 1994

(z) DoD Directive 4100.15, "Commercial Activities Program," March 10, 1989

(aa) Federal Register, Volume 53, page 4742, February 17, 1988
(bb) Federal Register, Volume 48, page 44716, September 29, 1983
(cc) Executive Order 12962, "Recreational Fisheries," June 7, 1995
(dd) Executive Order 11644, "Use of Off-Road Vehicles on the Public Lands," February 8, 1972
(ee) Executive Order 11989, "Off-Road Vehicles on Public Lands," May 24, 1977
(ff) Executive Order 11593, "Protection and Enhancement of the Cultural Environment," May 13, 1971
(gg) DoD Instruction 4715.9, "Environmental Planning and Analysis," May 3, 1996

# E2. ENCLOSURE 2

## DoD EXECUTIVE AGENTS FOR CONSERVATION ISSUES

E2.1. NAVY.

The DoD Executive Agent for the Chesapeake Bay Program.

E2.2. NAVY.

The DoD Executive Agent for the Gulf of Mexico Program.

E2.3. ARMY.

The DoD Executive Agent for the Mojave Desert Ecosystem Initiative.

E2.4. NAVY.

The DoD Executive Agent for the Partners In Flight Initiative.

E2.5. AIR FORCE.

The DoD Executive Agent for the Biodiversity Initiative.

E2.6. NAVY.

The DoD Executive Agent for the Coastal America Initiative.

E2.7. AIR FORCE.

The DoD Executive Agent for the Cold War Initiative.

E2.8. ARMY.

The DoD Executive Agent for the DoD Forestry Reserve Account Program.

# E3. ENCLOSURE 3

## DEFINITIONS

E3.1.1. Best Management Practices. Resource management decisions that are based on the latest professional and technical standards for the protection, enhancement, and rehabilitation of natural and cultural resources.

E3.1.2. Biodiversity. The variety of life forms and processes and the environment in which they occur. Biodiversity includes the number and variety of living organisms, the genetic differences among them, the communities and ecosystems in which they occur, and the ecological and evolutionary processes that keep them functioning, yet ever changing and adapting.

E3.1.3. Candidate Species. Any species, plant or animal, which is being considered for listing as threatened or endangered by the U.S. Department of the Interior.

E3.1.4. Conservation. Planned management, use, and protection of natural and cultural resources to provide sustainable use and continued benefit for present and future generations, and the prevention of exploitation, destruction, waste, and/or neglect.

E3.1.5. Conservation Self-assessment. A multimedia inspection or evaluation of an installation's natural and cultural resources program. EXTERNAL CONSERVATION SELF-ASSESSMENTS are conducted by designated DoD representatives from outside the installation being inspected. INTERNAL CONSERVATION SELF-ASSESSMENTS are usually conducted by installation personnel.

E3.1.6. "Cold War" Historic Resources. Buildings, structures, sites, objects, and districts built, used or associated with critical events or persons during the "Cold War" period (1945-1989) and that possess exceptional historic importance to the nation or that are outstanding examples of technological or scientific achievement.

E3.1.7. Cultural Resources. Buildings, structures, sites, districts, and objects eligible for or included in the National Register of Historic Places; "cultural items" as defined in 25 U.S.C. 3001 (reference (u)); American Indian, Eskimo, Aleut, or Native Hawaiian sacred sites for which access is protected under 42 U.S.C. 1996 (reference

(d)); "archeological resources" as defined by Section 470 aa-ll of 16 U.S.C. (reference (h)); and "archeological artifact collections and associated records" defined under 36 CFR 79 (reference (e)).

E3.1.8. Ecosystem. A dynamic and natural complex of living organisms interacting with each other and with their associated nonliving environment.

E3.1.9. Ecosystem Management. A goal-driven approach to managing natural and cultural resources that supports present and future mission requirements; preserves ecosystem integrity; is at a scale compatible with natural processes; is cognizant of nature's timeframes; recognizes social and economic viability within functioning ecosystems; is adaptable to complex and changing requirements; and is realized through effective partnerships among private, local, State, tribal, and Federal interests. Ecosystem management is a process that considers the environment as a complex system functioning as a whole, not as a collection of parts, and recognizes that people and their social and economic needs are a part of the whole.

E3.1.10. Exotic Species. Species that occur in a given place, area, or region as the result of direct or indirect, deliberate or accidental introduction of the species by human activity.

E3.1.11. Integrated Cultural Resources Management Plan. A plan that defines the process for the management of cultural resources on DoD installations.

E3.1.12. Integrated Natural Resources Management Plan. An integrated plan based, to the maximum extent practicable, on ecosystem management that shows the interrelationships of individual components of natural resources management (e.g., fish and wildlife, forestry, land management, and outdoor recreation) to mission requirements and other land use activities affecting an installation's natural resources.

E3.1.13. Mitigation. Lessening the adverse effects an undertaking may cause relative to natural or cultural resources. Mitigation can include limiting the magnitude of the action; repairing, rehabilitating, or restoring the affected resource; avoiding the effect altogether; reducing or eliminating the effect over time by preservation and maintenance operations during the life of the action; and/or compensating for the effect by providing substitute resources or environments.

E3.1.14. Mitigation Banking. Actions taken to compensate for future adverse effects of undertakings by providing substitute resources or environments in advance of any specific undertaking.

E3.1.15. Multiple Use. The integrated, coordinated, and compatible use of natural resources so as to achieve a sustainable yield of a mix of desired goods, services, and direct and indirect benefits while protecting the primary purpose of supporting and enhancing the military mission and observing stewardship responsibilities.

E3.1.16. Operational Carrying Capacity. The amount of military operations a given area can support without causing permanent environmental damage.

E3.1.17. National Register of Historic Places. The official Federal list of sites, districts, buildings, structures, and objects worthy of preservation consideration because of significance in American history, architecture, archeology, engineering, or culture. Significance may be local, State, or national in scope. National Register eligibility criteria are published in 36 CFR 60 (reference (e)).

E3.1.18. National Register Resource and/or Historic Property. Any resource that meets eligibility criteria for the National Register of Historic Places, whether or not it has been formally registered, identified or acknowledged as "eligible." "Historic property" is used synonymously with "National Register resource."

E3.1.19. Native Americans. American Indians, Eskimos, Aleuts, and Native Hawaiians.

E3.1.20. Natural Resources. All elements of nature and their environments of soil, air, and water. Those consist of two general types, as follows:

E3.1.20.1. Earth Resources. Nonliving resources such as minerals and soil components.

E3.1.20.2. Biological Resources. Living resources such as plants and animals.

E3.1.21. Needs Assessment Survey. An inventory of an installation's inventories, management plans, personnel, training, supplies, equipment, and other management tools to identify future actions and resources needed for the installation to comply with the requirements of this Instruction.

E3.1.22. Planning Level Survey and/or Inventory of Biological, Cultural, or Earth Resources. An inventory of "sensitive and significant resources" that must be identified to integrate legal and stewardship requirements with military requirements

so that defense preparedness is maintained.

E3.1.23. Sensitive Resources. "Resources" identified as "highly responsive or susceptible to modification by external agents or influences."

E3.1.24. Significant Resources. "Resources" identified as "having special importance," or as "having or likely to have more influence on a particular aspect of the environment than other components."

E3.1.25. Stewardship. The management of resources entrusted to one's care in a way that preserves and enhances the resources and their benefits for present and future generations.

E3.1.26. Sustainable Yield. Managing a renewable natural resource to provide an annual or periodic yield of goods, services, and direct and indirect benefits, into perpetuity. That may include, but is not limited to, maintaining economic benefits, ecological processes and functions, and biodiversity.

E3.1.27. Tribe. A Federally-recognized tribe or other Federally-recognized Native American group or organization.

E3.1.28. Undertaking. Any Federal, Federally-assisted, or Federally-licensed action, activity, or program, new or continuing, that may have an effect on National Register resources and thereby triggers procedural responsibilities under Section 470 et seq. of 16 U.S.C. (reference (h)).

E3.1.29. Wetlands. Lands where saturation is the dominant factor determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface. Common terms used to describe various wetlands include "marshes," "bogs," "swamps," "small ponds," "sloughs," "potholes," "vernal pools," and "wet meadows."

# E4. ENCLOSURE 4

## PROGRAMMING AND BUDGETING PRIORITIES FOR CONSERVATION PROGRAMS

### E4.1. CLASS 0: RECURRING NATURAL AND CULTURAL RESOURCES CONSERVATION MANAGEMENT REQUIREMENTS.

Includes activities needed to cover the recurring administrative, personnel, and other costs associated with managing DoD's conservation program that are necessary to meet applicable compliance requirements (Federal and State laws, regulations, Presidential Executive orders, and DoD policies) or that are in direct support of the military mission. Also included are environmental management activities associated with the operation of facilities, installations, and deployed weapons systems. Recurring costs consist of manpower, training, supplies, hazardous waste disposal, operating recycling activities, permits, fees, testing and monitoring and/or sampling and analysis, reporting and recordkeeping, maintenance of environmental conservation equipment, and compliance self-assessments.

### E4.2. CLASS I: CURRENT COMPLIANCE.

Includes projects and activities needed because an installation is currently out of compliance (has received an enforcement action from a duly authorized Federal or State agency, or local authority); has a signed compliance agreement or has received a consent order; has not met requirements based on applicable Federal or State laws, regulations, standards, Presidential Executive orders, or DoD policies, including those listed in enclosure 2; and/or are immediate and essential to maintain operational integrity or sustain readiness of the military mission. "Class I" also includes projects and activities needed that are not currently out of compliance (deadlines or requirements have been established by applicable laws, regulations, standards, DoD policies, or Presidential Executive orders, but deadlines have not passed or requirements are not in force) but shall be if projects or activities are not implemented in the current program year. Those activities include the following:

E4.2.1. Environmental analyses for natural and cultural resource conservation projects, and monitoring and studies required to assess and mitigate potential impacts of the military mission on conservation resources.

E4.2.2. Planning (e.g., 42 U.S.C. 4341 (reference (d)) documentation, master

plans, and integrated natural and cultural resource management plans, etc.).

E4.2.3. Baseline inventories of natural and cultural resources.

E4.2.4. Biological assessments, surveys, or habitat protection for a specific listed species, critical for the protection of the species so that proposed or continuing actions can be modified in consultation with the U.S. Fish and Wildlife Service or the U.S. National Marine and Fisheries Service to prevent "taking" of the species.

E4.2.5. Inventories and surveys of historical and archeological sites critical for the protection of cultural resources so that continuing actions can be modified in consultation with the Advisory Council for Historic Preservation.

E4.2.6. Mitigation to meet existing regulatory permit conditions or written agreements, such as those required under Section 4341 of 42 U.S.C., Sections 1361-1407, 703, and 470 et seq. of 16 U.S.C., and Section 1251 et seq. of 32 U.S.C., and (references (d), (h), and (p)), and included in documents required by Section 4341 of 42 U.S.C. (reference (d)).

E4.2.7. Nonpoint source pollution or watershed management studies or actions needed to meet compliance dates cited in approved State coastal nonpoint source pollution control plans, as required to meet consistency determinations under Sections 1451 et seq. and 703 et seq. of 16 U.S.C. (reference (h)).

E4.2.8. Wetlands delineation, following existing statutory requirements, critical for the prevention of adverse impacts to wetlands without a permit so that continuing actions can be modified to ensure mission continuity, as required by 32 U.S.C. 1251 et seq. (reference (p)).

E4.2.9. Efforts to achieve compliance with requirements that have deadlines that have already passed, as cited in DoD executed agreements, such as support for the Chesapeake Bay Agreement Action Plan and the DoD Mojave Desert Ecosystem Management Initiative.

E4.2.10. Initial curation of archeological materials, as required under 32 CFR 22 and 229, Section 470 aa-ll of 16 U.S.C, and 36 CFR 78 and 79, and (references (w), (h), and (e)).

E4.2.11. Consultations with Native American groups, if reinterment of Native American remains under 25 U.S.C. 3001 (reference (u)) is part of their wishes.

E4.3. CLASS II: MAINTENANCE REQUIREMENTS.

Includes those projects and activities needed that are not currently out of compliance (deadlines or requirements have been established by applicable laws, regulations, standards, Presidential Executive orders, or DoD policies) but deadlines have not passed or requirements are not in force), but shall be out of compliance if projects or activities are not implemented in time to meet an established deadline beyond the current program year. Examples include the following:

E4.3.1. Compliance with future requirements that have deadlines.

E4.3.2. Conservation and Geographic Information System mapping in order to be in compliance with Federal, State and local regulations, Presidential Executive orders, and DoD policy.

E4.3.3. Efforts undertaken in accordance with non-deadline specific compliance requirements of leadership initiatives, such as Coastal America, the "Chesapeake Bay Agreement Action Plan," and "Mojave Desert Ecosystem Management Initiative."

E4.3.4. Wetlands enhancement, in order to achieve the President's order for "no net loss" or to achieve enhancement of existing degraded wetlands, as required under E.O. 11990 (reference (l)) and 32 U.S.C. 1251 et seq. (reference (p)).

E4.3.5. Public education programs that educate the public on the importance of protecting archeological resources as required by Section 470 aa-ll of 16 U.S.C. (reference (h)).

E4.4. CLASS III: ENHANCEMENT ACTIONS, BEYOND COMPLIANCE

Includes those projects and activities that enhance conservation resources or the integrity of the installation mission, or are needed to address overall environmental goals and objectives, but are not specifically required under regulation or Executive order and are not of an immediate nature. Examples include the following:

E4.4.1. Community outreach activities, such as "Earth Day" and "Historic Preservation Week" activities.

E4.4.2. Educational and public awareness projects, such as interpretive displays, oral histories, "watchable wildlife" areas, nature trails, wildlife checklists, and

conservation teaching materials.

E4.4.3. Biological assessments, surveys, or habitat protection for a candidate species for listing as "endangered or threatened."

E4.4.4. Restoration or enhancement or cultural or natural resources when no specific compliance requirement dictates a course or timing of action.

E4.4.5. Reinterment of Native American remains on land managed or controlled by the Department of Defense.

E4.4.6. Management and execution of volunteer and partnership programs.

# E5. ENCLOSURE 5

## CONSERVATION MEASURES OF MERIT

### E5.1. PREPARATION OF INRMPs (NUMBER OF INSTALLATIONS)

E5.1.1. Requiring integrated plans.

E5.1.2. With up-to-date, approved plans.

E5.1.3. Where an existing plan needs to be updated.

E5.1.4. Where a plan is appropriate or needed, but does not exist.

E5.1.5. Where a plan is not appropriate.

### E5.2. PREPARATION OF ICRMPs (NUMBER OF INSTALLATIONS)

E5.2.1. Requiring plans.

E5.2.2. With up-to-date, approved plans.

E5.2.3. Where an existing plan needs to be updated.

E5.2.4. Where a plan is needed but does not exist.

E5.2.5. Where a plan is not needed.

### E5.3. COMPLETION OF PLANNING LEVEL SURVEY AND INVENTORY OF BIOLOGICAL RESOURCES (NUMBER OF INSTALLATIONS)

E5.3.1. With completed inventories.

E5.3.2. With partial inventories.

E5.3.3. Without inventories, but needed.

E5.3.4. Inventories not needed.

E5.4. COMPLETION OF WETLAND INVENTORIES (NUMBER OF INSTALLATIONS)

E5.4.1. With completed inventories.

E5.4.2. With partial inventories.

E5.4.3. Without inventories, but needed.

E5.4.4. Inventories not needed.

E5.5. COMPLETION OF PLANNING LEVEL SURVEY AND INVENTORY OF CULTURAL RESOURCES (NUMBER OF INSTALLATIONS)

E5.5.1. With completed historic building inventories.

E5.5.2. With partial historic building inventories.

E5.5.3. Without historic building inventories, but needed.

E5.5.4. Historic building inventories not needed.

E5.5.5. With completed archeological inventories.

E5.5.6. With partial archeological inventories.

E5.5.7. Without archeological inventories, but needed.

E5.5.8. Archeological inventories not needed.

E5.6. ARCHEOLOGICAL RESOURCES COMPLIANCE (NUMBER OF INSTALLATIONS)

E5.6.1. With archeological collections.

E5.6.2. With collections curated in accordance with reference (x).

E5.6.3. Where professional curation actions are needed.

E5.6.4. With known archeological sites.

E5.6.5. With site protection procedures in effect.

E5.6.6. Where site protection procedures are needed.

# E6. ENCLOSURE 6

# ECOSYSTEM MANAGEMENT PRINCIPLES AND GUIDELINES

## E6.1. GOAL OF ECOSYSTEM MANAGEMENT

To ensure that military lands support present and future training and testing requirements while preserving, improving, and enhancing ecosystem integrity. Over the long term, that approach shall maintain and improve the sustainability and biological diversity of terrestrial and aquatic (including marine) ecosystems while supporting sustainable economies, human use, and the environment required for realistic military training operations.

## E6.2. PRINCIPLES AND GUIDELINES

E6.2.1. Maintain and Improve the Sustainability and Native Biodiveristy of Ecosystems. Ecosystem management involves conducting installation programs and activities in a manner that identifies, maintains, and restores the "composition, structure, and function of natural communities that comprise ecosystems," to ensure their sustainability and conservation of biodiveristy at landscape and other relevant ecological scales to the maximum extent that mission needs allow.

E6.2.2. Administer with Consideration of Ecological Units and Timeframes. Ecosystem management requires consideration of the effects of installation programs and actions at spatial and temporal ecological scales that are relevant to natural processes. A larger geographic view and more appropriate ecological time frames assist in the analysis of cumulative effects on ecosystems that may not be apparent with smaller and shorter scales. Regional ecosystem management efforts are generally more appropriate than either national or installation-specific efforts. Consideration of sustainability under long-term environmental threats, such as climate change, is also important.

E6.2.3. Support Sustainable Human Activities. People and their social, economic, and national security needs are an integral part of ecological systems, and management of ecosystems depends on sensitivity to those issues. Consistent with mission requirements, actions should support multiple use (e.g., outdoor recreation, hunting, fishing, forest timber products, and agricultural outleasing) and sustainable development by meeting the needs of the present without compromising the ability of future generations to meet their own needs.

E6.2.4. Develop a Vision of Ecosystem Health. All interested parties (Federal, State, tribal, and local governments, nongovernmental organizations, private organizations, and the public) should collaborate in developing a shared vision of what constitutes desirable future ecosystem conditions for the region of concern. Existing social and economic conditions should be factored into the vision, as well as methods by which all parties may contribute to the achievement of desirable ecosystem goals.

E6.2.5. Develop Priorities and Reconcile Conflicts. Successful approaches should include mechanisms for establishing priorities among the objectives and for conflict resolution during both the selection of the ecosystem management objectives and the methods for meeting those objectives. Identifying "local installation objectives" and "urban development trends" are especially important to determine compatibility with ecosystem objectives. Regional workshops should be convened periodically to ensure that efforts are focused and coordinated.

E6.2.6. Develop Coordinated Approaches to Work Toward Ecosystem Health. Ecosystems rarely coincide with ownership and political boundaries so cooperation across ownerships is an important component of ecosystem management. To develop the collaborative approach necessary for successful ecosystem management, installations should:

E6.2.6.1. Involve the military operational community early in the planning process. Work with military trainers and others to find ways to accomplish the military mission in a manner consistent with ecosystem management.

E6.2.6.2. Develop a detailed ecosystem management implementation strategy for installation lands and other programs based on the vision developed in subsection E6.2.4., above, and those principles and guidelines;

E6.2.6.3. Meet regularly with regional stakeholders (e.g., State, tribal, and local governments; nongovernmental entities; private landowners; and the public) to discuss issues and to work towards common goals.

E6.2.6.4. Incorporate ecosystem management goals into strategic, financial, and program planning and design budgets to meet the goals and objectives of the ecosystem management implementation strategy.

E6.2.6.5. Seek to prevent undesirable duplication of effort, minimize inconsistencies, and create efficiencies in programs affecting ecosystems.

E6.2.7. Rely on the Best Science and Data Available. Ecosystem management is based on scientific understanding of ecosystem composition, structure, and function. It requires more and better research and data collection, as well as better coordination and use of existing data and technologies. Information should be accessible, consistent, and commensurable. Standards should be established for the collection, taxonomy, distribution, exchange, update, and format of ecological, socioeconomic, cartographic, and managerial data.

E6.2.8. Use Benchmarks to Monitor and Evaluate Outcomes. Accountability measurements are vital to effective ecosystem management. Implementation strategies should include specific and measurable objectives and criteria with which to evaluate activities in the ecosystem. Efficiencies gained through cooperation and streamlining should be included in those objectives.

E6.2.9. Use Adaptive Management. Ecosystems are recognized as open, changing, and complex systems. Management practices should be flexible to accommodate the evolution of scientific understanding of ecosystems. Based on periodic reviews of implementation, adjustments to the standards and guidelines applicable to management activities affecting the ecosystem should be made.

E6.2.10. Implement Through Installation Plans and Programs. An ecosystem's desirable range of future conditions should be achieved through linkages with other stakeholders. "Specific DoD activities" should be identified, as appropriate, in installation INRMPs and ICRMPs and in other planning and budgeting documents.

# E7. ENCLOSURE 7

## CONTENTS OF INRMPs AND ICRMPs

### E7.1. GENERAL CONTENTS

An INRMP or ICRMP shall do the following:

E7.1.1. Include a summary of general information about the installation's mission and history, as well as specific management information necessary for managing the installation's natural or cultural resources.

E7.1.2. Provide natural or cultural resources context information about the installation's mission and history.

E7.1.3. Identify all legal requirements pertinent to natural or cultural resources management.

E7.1.4. Identify the installation's natural or cultural resources.

E7.1.5. Recommend procedures for managing the installation's natural or cultural resources in a manner that is compatible with the installation mission, satisfies legal requirements, and is consistent with ecosystem management principles and guidelines.

E7.1.6. Establish priorities for natural or cultural resources management that ensure compliance with legal requirements and ongoing stewardship responsibilities.

E7.1.7. Provide management procedures for the ongoing identification, maintenance, and enhancement of natural or cultural resources.

E7.1.8. Promote the use of natural or cultural resources in ways that are beneficial to the military mission, the resources, and other public interests.

E7.1.9. Be thoroughly integrated with other installation plans, including the INRMP, the ICRMP, the installation master plan, the facilities maintenance plan, training and range area management plans, mobilization and deployment plans, and information management systems.

E7.1.10. Establish requirements, goals, and targets that can be easily reflected in budget documents and decisionmaking processes, and addressed in conservation

self-assessments.

E7.1.11. Address natural and cultural resources, ecosystems, and areas of critical or special concern from both technical and policy standpoints.

## E7.2. SPECIFIC CONTENTS OF AN INRMP

An IMRMP shall include, as appropriate:

E7.2.1. A summary of known natural resources information.

E7.2.2. Analysis of the sufficiency of the existing information on natural resources and associated contexts to meet compliance requirements.

E7.2.3. Information on areas that have not been inventoried and a plan for completion of the inventory.

E7.2.4. Identification and prioritization of actions required to implement goals and objectives of the plan.

E7.2.5. Identification of the type and location of actions that may affect natural resources.

E7.2.6. Procedures to ensure that actions of the installation and its tenants are planned and carried out in ways that protect and enhance its natural resources.

E7.2.7. Identification of unique natural resource issues confronting the installation.

E7.2.8. Conservation and mitigation strategies for threatened natural resources.

E7.2.9. Coordination processes between the installation, regulatory agencies and the public that help to ensure proper management of an installation's natural resources.

E7.2.10. Provisions for sharing appropriate natural resources information with Federal and State agencies, nongovernmental organizations, researchers, and the general public.

E7.2.11. Standard operating procedures for routine occurrences and where blanket statements can coordinate a process, such as inventories, repetitive ecosystem maintenance and enhancement, and spill responses where natural resources are

involved and tailored for the particular conditions at the installation.

E7.2.12. Procedures for consultation with all interested groups and individuals that represent an interest in natural resources.

E7.2.13. Provisions for enforcement of natural resource laws and regulations by professionally trained personnel.

E7.2.14. Provisions for public access to natural resources, as appropriate.

## E7.3. SPECIFIC CONTENTS OF AN ICRMP

An ICRMP shall include, as appropriate:

E7.3.1. A summary of known cultural resources information and a list and brief description of properties listed or eligible for listing in the National Register of Historic Places.

E7.3.2. Analysis of the sufficiency of the existing information on cultural resources and associated contexts to meet compliance requirements.

E7.3.3. Information on areas that have not been inventoried and a plan for completion of the inventory.

E7.3.4. Identification and prioritization of actions required to implement goals and objectives of the plan.

E7.3.5. Identification of the type and location of actions that may affect cultural resources.

E7.3.6. Procedures to ensure that actions of the installation and its tenants are planned and carried out in ways that protect and enhance its cultural resources.

E7.3.7. Identification of unique cultural resource issues confronting the installation.

E7.3.8. Preservation and mitigation strategies for threatened cultural resources.

E7.3.9. Coordination processes between the installation, regulatory agencies and the public that help to ensure proper management of an installation's cultural resources.

E7.3.10. Provisions for permanent storage of historic property records, as required by reference (cc) and other recordkeeping requirements.

E7.3.11. Standard operating procedures for routine occurrences and where blanket statements can coordinate a process, such as inventories, repetitive maintenance and repair, unexpected discovery and reporting, and spill responses where cultural resources are involved and tailored for the particular conditions at the installation.

E7.3.12. Procedures for the documentation of historic properties that will be altered or destroyed as a result of DoD action or assistance, in accordance with 36 CFR 79 (reference (e)).

E7.3.13. Procedures for consultation with all interested groups and individuals that represent an interest in cultural resources.

E7.3.14. Procedures for unanticipated discovery of an historic property or other cultural resource.

E7.3.15. Procedures to ensure that all archeological collections are properly processed, maintained and preserved, in accordance with 32 CFR 22 (reference (w)).

E7.3.16. Provisions for sharing appropriate cultural resources information with Federal and State agencies, nongovernmental organizations, researchers, and the general public.

E7.3.17. Provisions for enforcement of cultural resource laws and regulations by professionally trained personnel.

E7.3.18. Provisions for public access to cultural resources, as appropriate.

# E8. ENCLOSURE 8

## PRINCIPLES FOR CONSULTATIONS WITH NATIVE AMERICANS

### E8.1. GENERAL PRINCIPLES FOR NATIVE AMERICAN CONSULTATIONS

Native Americans often have strong religious and cultural ties to natural areas. Where applicable, DoD must consider these interests in land management decisionmaking through consultation to identify and protect Native American cultural resources. The Department of Defense shall carry out consultations with Native American tribal governments in a manner that respects the sovereign status of each such Federally-recognized tribe. The Department of Defense shall consult to the greatest extent practicable and to the extent permitted by law prior to taking actions that affect the protected interests of Federally-recognized tribal governments. Consultation shall be conducted with sensitivity to cultural values, socioeconomic factors, and the administrative structure of the native group.

### E8.2. GOALS OF CONSULTATION PRINCIPLES

The goals of those consultation principles are to do the following:

E8.2.1. Increase DoD awareness of the requirements of Native American cultures and religions, while increasing Native American awareness of DoD mission requirements.

E8.2.2. Increase Native American participation, as appropriate, in consultations on DoD actions and decisions that affect issues of significance to Native Americans.

E8.2.3. Educate DoD personnel about relevant policies and laws on Native Americans.

E8.2.4. Provide access by Native Americans to sacred and religious sites on DoD lands.

E8.2.5. Protect Native American cultural and historical resources on DoD lands or on non-DoD lands used by the Department of Defense.

### E8.3. CONSULTATION PRINCIPLES

E8.3.1. Respect the Sovereign Status of Each Native American Tribal Government. The Department of Defense must work directly with Federally-recognized tribes on a government-to-government basis, recognizing the sovereignty of each tribe. First contact should be made with the tribal leadership under the Presidential Memorandum (reference (y)).

E8.3.2. Recognize the Importance and Variety of Traditional Native American Culture and Authorities. Native Americans have many different cultures, not just one. Consultations may differ from tribe to tribe.

E8.3.3. Recognize Native Americans Have a Strong Connection to Traditional Tribal Lands and Their Resources. Historically, Native Americans have practiced religious ceremonies on lands owned by the Department of Defense or adjacent to lands owned by the Department of Defense. Fishing, hunting, and gathering activities are a pivotal part of the traditional culture of Indian tribes. The Department of Defense shall provide access to sacred sites for Native Americans who wish to perform religious or traditional ceremonies; collect botanical, animal, mineral, or other cultural resources; or to exercise their right to receive repatriated ancestral remains and artifacts when possible. Except where required by competent authority, the Department of Defense shall limit access to those sites when necessary for the military mission, for reasons of safety or security, to ensure compliance with applicable laws and regulations, or to prevent serious negative environmental consequences. Although the Department of Defense is not responsible for protecting natural and cultural resources near DoD lands, the Department of Defense is responsible for considering whether projects on military lands do not create an adverse effect on natural and cultural resources on property adjacent to DoD lands.

E8.3.4. Improve Communications and Coordination Between the Department of Defense and Native Americans. The Department of Defense shall identify institutional, political, economic, social, and other barriers to full communications and coordination, and work towards eliminating them. The Department of Defense shall take a proactive approach to involving tribal governments in the decisionmaking process at the earliest date possible and continue those consultations until completion of the project or action. There is no simple and universally correct way to coordinate or consult with Native American groups. Appropriate approaches vary from tribe to tribe and situation to situation. Oral communications will often be the preferred means of communications. Planning shall be undertaken with an effort to minimize any negative effects on Native Americans or their lands or cultural resources. The Department of Defense shall also comply with all notification and consultation

requirements contained in the National Environmental Policy Act (NEPA) (reference (k)) and Section 4341 of 42 U.S.C. (reference (d)) and other appropriate statutes.

E8.3.5. Comply with All Applicable Executive Orders and Federal, State, and Local Statutory and Regulatory Requirements on Native American Issues. The Department of Defense shall work with Native Americans to ensure the requirements of all appropriate laws and guidelines are met.

E8.3.6. Maintain the Secrecy of Native American Religious and Ceremonial Practices on DoD Lands. Many traditional religious and cultural practices require privacy and cannot be performed in the presence of nonparticipants. The Department of Defense shall work with tribal governments to protect the privacy of those practices. Archeological sites, traditional cultural properties, and sacred sites shall be protected from illegal entry or disturbance in accordance with DoD Directive 4165.61 and 36 CFR 79 (references (x) and (e)).

E8.3.7. Assign Specific Personnel at Each Installation to Work on Cultural Issues and Provide Necessary Training for All Appropriate DoD Personnel. At each DoD installation, the base commander shall choose a staff member to serve as a liaison between the Department of Defense and tribal governments, if present. This person should be trained to deal with Native American issues. Other appropriate DoD personnel shall participate in training courses and workshops to learn about local Indian tribes, including those who currently reside in the area of the installation, and those tribes who historically have lived in the area and may return during the year to participate in religious or ceremonial activities. Those courses should cover Native American traditional, religious, and cultural values and practices, and how best to communicate on an intercultural level keeping in mind that Native Americans often record their history orally.

E8.3.8. Prepare and Distribute Maps Showing Traditional and Contemporary Tribal Lands On and Adjacent to Military Installations. To ensure that tribes who have an interest in DoD lands for religious ceremonies or cultural practices are identified and contacted when proposed actions or projects come up, the Department of Defense shall develop maps identifying traditional and contemporary tribal lands in and around DoD installations.

E8.3.9. Support Cooperative Efforts That Encourage Tribal and Federal Partnerships in the Management of DoD Lands. The Department of Defense supports the use of agreements such as Memoranda of Agreement and Memoranda of Understanding between the Department of Defense and other Federal Agencies, State

governments, nonprofit organizations, or tribes, when possible. The primary goal of formalized agreements with tribal governments is better management of DoD lands in such a manner as to minimize adverse impacts to Native Americans. Cooperative efforts are an important part of an ongoing process to open up communications between DoD personnel and tribes to work together on the shared goal of protection of cultural resources and traditional Native American practices.

# APPENDIX Q

## DEPARTMENT OF THE ARMY, ASSISTANCE CHIEF OF STAFF
## FOR
## INSTALLATION MANAGEMENT MEMORANDUM
## SUBJECT: DEVELOPMENT OF ARMY POLICY AND PROGRAM FOR ECOSYSTEMS MANAGEMENT

DEPARTMENT OF THE ARMY
ASSISTANT CHIEF OF STAFF FOR INSTALLATION MANAGEMENT
600 ARMY PENTAGON
WASHINGTON DC 20310-0600

REPLY TO
ATTENTION OF

DAIM-ED-N

29 JUN 1994

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Development of Army Policy and Program for Ecosystem Management

1. References:

a. Report of the National Performance Review, entitled "From Red Tape to Results: Creating a Government that Works Better & Costs Less", by Vice President Al Gore, 7 Sep 93.

b. Memorandum from Deputy Under Secretary of Defense for Environmental Security to the Assistant Secretaries of the Services, 23 Mar 94; subject: Mojave-Sonoran Ecosystem Management Initiative.

c. Memorandum from Deputy Under Secretary of Defense for Environmental Security to the Assistant Secretary of the Army (I,L,&E), 8 Apr 94; subject: Executive Agent for Mojave Ecosystem Management Initiative

d. FY93 Defense Appropriations Bill (Public Law 102-172 and Senate Report 102-408), Legacy Resource Management Program, Establishment of a Biological Diversity Task Area.

e. US Army Environmental Strategy into the 21st Century, dated 1992.

2. Per the findings of the National Performance Review (Reference 1a), the White House Office on Environmental Policy established an Interagency Task Force to develop and implement cross-agency ecosystem management. This Task Force recently appointed DOD lead federal agent for the Mojave Ecosystem Management Initiative (Reference 1b). Subsequently, DOD appointed Army as Executive Agent (Reference 1c). Reference 1b establishes the goal of ecosystem management for DOD as "...to restore and maintain the health, sustainability, and biological diversity of ecosystems...." A complementary effort in the Legacy Resource Management Program (Reference 1d), has a task area to develop a biodiversity management strategy for DOD.

Additionally, Army recognizes that environmental protection is becoming increasingly important, as evidenced in The Army Plan and Army Environmental Strategy (Reference 1e). In particular, expectations are rapidly increasing for a proactive conservation program that is not based on crises and concerns.

3. This memorandum initiates a deliberate process by Army to determine and, subsequently, establish Army policy for ecosystem management per the objectives of the Conservation Pillar in the Army's Environmental Strategy and in concert with the objectives of the White House Task Force on Ecosystem Management. This policy development will include restoration and maintenance of biodiversity as an objective within ecosystem management. Although sustainment of ecosystem function and values will require an interagency approach, each agency will use different methods and intensities of management depending on the kinds of land uses being executed. Army's objective in ecosystem management will be to move from single species management to sustainment of functioning ecosystems.

4. An Army Ecosystem Management Board (AEMB) will be established to improve coordination (facilitate idea exchange and conflict resolution) among those offices responsible for conservation programs and those that impact upon the ecosystem through current land use practices. The AEMB will replace the Land Use Management Control Board (LUM-CB) and provide a broadened focus from strict land use management to full-spectrum ecosystem management. The AEMB will be an integrated body of ARSTAF, MACOM, FOA, and installation ecosystem managers that develops a comprehensive ecosystem management process that supports Federal ecosystem management objectives and the Army's Environmental and Installation Strategies.

5. Once the AEMB is fully established, the AEMB will be used to identify required authorities, policies and resources for ecosystem management. Actions of the AEMB will include:

a. Define information requirements for defining, evaluating, and managing ecosystems, including data collection standards and protocols, requirements for information management, and uses of this information in the decision support and planning processes. This action will place priority on existing capabilities and ongoing efforts by federal agencies (US Department of Agriculture-Soil Conservation Service and USDA-Agriculture Research Service, US Geological Survey, National Biological Survey, US Fish and Wildlife Service, Corps of Engineers and others).

b. Establish a comprehensive process to fully utilize all funding sources (Environmental, OMA, Mission, Legacy, SERDP, and Reimbursable) to "buy out" for installations, baseline data, other essential information and necessary tools, where lacking, in a systematic and prioritized manner.

c. Evaluate how existing ecosystem-related policy/guidance (such as AR 420-74, Natural Resource Management, and component parts of the Integrated Natural Resource Management Plan) is being used in the resourcing and decision-making process. This evaluation will include a determination of institutional knowledge at the installation, MACOM and HQDA levels, of Army ecosystems-- characteristics, conditions, trends and sustainability of resources to include water quality, soil stability, viability of native plant communities and habitat for wildlife.

6. In concert with the actions of the AEMB, identified in item 5, my office will task the Army Environmental Center (AEC) to evaluate and propose a plan to the AEMB for establishing an Army net-working and communications capability for the management of conservation information deemed essential by decision-makers for ecosystem management.

7. It is essential that the AEMB establish a linkage with the primary Army users (trainers, engineers and recreation managers), as well as with other federal agencies, to ensure that relevant components of ecosystem management policy can be merged into appropriate programs (ITAM, RMAT, master planning) for execution.

8. In the next few weeks, a draft charter for the Army Ecosystem Management Board will be sent for your review and comment. After concurrence on the draft, the first meeting of the AEMB will be held to initiate the actions discussed in item 5 of this memorandum.

9. For additional information on this subject, please contact my Associate Director for Conservation (Mr. Don Bandel), at (703) 696-8813 or FAX (703) 696-8821.

FOR THE ASSISTANT CHIEF OF STAFF FOR INSTALLATION MANAGEMENT:

GERALD C. BROWN
Brigadier General, USA
Director, Environmental Programs

DAIM-ED-N
SUBJECT: Develop of Army Policy and Program for Ecosystem Management

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US ARMY PACIFIC, ATTN: APEN (MR. STAN SOKOLOSKI)

CHIEF, NATIONAL GUARD BUREAU, ATTN: NGB-ARE (COL SPENCE)

CF:
SAILE-ESOH (MR. HUBER)
AEPI (MR. RIGGINS)

3000 DEFENSE PENTAGON
WASHINGTON DC 20301-3000

ISITION AND
CHNOLOGY

DUSD(ES)/EQ-CO

08 AUG 1994

MEMORANDUM FOR ASSISTANT SECRETARY OF THE ARMY
(INSTALLATIONS, LOGISTICS, AND ENVIRONMENT)
ASSISTANT SECRETARY OF THE NAVY
(INSTALLATIONS AND ENVIRONMENT)
ASSISTANT SECRETARY OF THE AIR FORCE
(MANPOWER, RESERVE AFFAIRS, INSTALLATIONS
AND ENVIRONMENT)

SUBJECT: Implementation of Ecosystem Management in the DoD

I want to ensure that ecosystem management becomes the basis for future management of DoD lands and waters. Ecosystem management is not only a smart way of doing business, it will blend multiple-use needs and provide a consistent framework to managing DoD installations, ensuring the integrity of the system remains intact. Ecosystem management of natural resources draws on a collaboratively developed vision of desired future ecosystem conditions that integrates ecological, economic, and social factors. It is a goal-driven approach to restoring and sustaining healthy ecosystems and their functions and values using the best science available. The goal is to maintain and improve the sustainability and native biological diversity of terrestrial and aquatic, including marine, ecosystems while supporting human needs, including the DoD mission.

Ecosystem management will include:

1. Ecological approach: The DoD will continue to shift its focus from protection of individual species to management of ecosystems.

2. Partnerships: The DoD will form partnerships to achieve shared goals. Ecosystems cross political boundaries, making the need for cooperation, coordination, and partnerships essential for managing ecosystems.

3. Participation: Public involvement, communication, and incorporation of public needs and desires into management decisions will be emphasized.

4. Information: The best available scientific and field-tested information will be used in making decisions and selecting the most appropriate technologies in management of natural resources.

5. Adaptive management: Resource managers will incrementally implement adaptive management techniques as they become known through the dynamic process of applying the best available commercial and scientific data.

Taking an ecological approach involves a greater understanding and recognition of interrelationships among components of the environment (including people) across the landscape and over time. On DoD installations, ecosystem management will be achieved by developing and implementing integrated natural resources management plans and ensuring they remain current. Information from the environmental impact analysis process and other sources will be integrated into these plans as appropriate. Goals must be defined through individual installation planning and, consistent with resource management needs and military missions requirements, ecosystem management must be broadly applied across the land base to achieve those desired goals. Such an approach will require a range of management practices, identification of projected outputs, monitoring to ensure success and improve knowledge, and a commitment from everyone involved to accomplish results.

The DoD is already actively involved with implementation of ecosystem management at some of its installations. These efforts are being significantly expanded by our active participation in the Interagency Ecosystem Management Task Force. The Task Force's activities include regional ecosystem management initiatives, one of which is the Ecosystem Management Team for the Mojave Desert, with DoD as the lead, in partnership with the Department of Interior.

I want you to give additional emphasis to the DoD-wide ecosystem management effort by implementing appropriate policies at all installations. Policy developed by the Services must be consistent with the principles of ecosystem management as outlined in the attachment and as directed by regulatory agencies. Please provide me a report on regional ecosystem management programs which you currently have underway by September 1, 1994. I will be requesting the status of your progress in implementing these ecosystem management principles by July 1, 1995.

If you require additional information, please contact Mr. Peter Boice at (703) 604-5707.

Sherri W. Goodman
Deputy Under Secretary of Defense
(Environmental Security)

Attachment

# Department of Defense
# Ecosystem Management Principles

**Components of ecosystem management:**

Ecosystem management is a goal-driven approach to environmental management that is at a scale compatible with natural processes; is cognizant of nature's time frames; recognizes social and economic viability within functioning ecosystems; and is realized through effective partnerships among private, local, state, tribal, and federal interests. Ecosystem management is a process that considers the environment as a complex system functioning as a whole, not as a collection of parts, and recognizes that people and their social and economic needs are a part of the whole.

Goal:

The goal of ecosystem management is to preserve, improve, and enhance ecosystem integrity. Over the long term, this approach will maintain and improve the sustainability and biological diversity of terrestrial and aquatic (including marine) ecosystems while supporting sustainable economies and communities.

**Principles and guidelines:**

1. Maintain and improve the sustainability and native biological diversity of ecosystems. Ecosystem management involves conducting installation programs and activities in a manner that recognizes, restores, and sustains the composition, structure, and function of natural communities that comprise ecosystems, in order to ensure their sustainability and biological diversity at landscape and other relevant ecological scales.

2. Administer with consideration of ecological units and time frames. Ecosystem management requires the consideration of effects of installation programs and actions at spatial and temporal ecological scales that are relevant to natural processes. A larger geographic view and more appropriate ecological time frames should assist in analysis of cumulative effects on ecosystems that may not be apparent with smaller and shorter scales. Consideration of sustainability under long-term environmental threats, such as climate change, is also important.

3. Support sustainable human activities. People and their social, economic, and national security needs are an integral part of ecological systems, and management of ecosystems depends upon sensitivity to these issues. Actions should support sustainable development by meeting the needs of the present without compromising the ability of future generations to meet their own needs.

4. Develop a vision of ecosystem health. All interested parties (federal, state, tribal, and local governments, non-governmental organizations, private organizations, and the public) will collaborate in developing a vision of what constitutes desirable future ecosystem conditions concerning sustainable health and biodiversity. Existing social and economic conditions should be factored into the vision, as well as methods in which all parties can contribute to the achievement of desirable ecosystem dynamics.

5. Develop priorities and reconcile conflicts. Successful approaches should include mechanisms for establishing priorities among the objectives and for conflict resolution during both the selection of the ecosystem management objectives and the methods for meeting these objectives. Identifying local installation objectives and urban development trends are especially important to determine compatibility with ecosystem objectives. Regional workshops should be convened periodically to ensure that efforts are focused and coordinated.

6. Develop coordinated approaches to work toward ecosystem health. Ecosystems rarely coincide with ownership and political boundaries so cooperation across ownerships is an important component of ecosystem-based management. To develop the collaborative approach necessary for successful ecosystem management, installations should:

- develop a detailed ecosystem management implementation strategy for installation lands and other programs based on the vision developed above and these principles and guidelines;

- collaborate with state, tribal, and local governments, non-government entities, private landowners, and the public in order to achieve the desired future conditions for the ecosystem;

- inform interested individuals and nearby communities of our ecosystem management practices and actively solicit their input and suggestions;

- incorporate ecosystem management goals into strategic, financial, and program planning and design budgets to meet the goals and objectives of the ecosystem management implementation strategy; and

- seek to prevent undesirable duplication of effort, minimize inconsistencies, and create efficiencies in programs affecting ecosystems.

7. Rely on the best science available. Ecosystem management is based on scientific understanding of ecosystem composition, structure, and function.

8. Use benchmarks to monitor and evaluate outcomes. Accountability measurements are vital to effective ecosystem management. Implementation strategies should include specific, measurable objectives and criteria with which to evaluate activities in the ecosystem. Clear, specific accountability systems, including those in appropriate budget structures, should be developed to ensure timely, effective implementation of the strategies. Efficiencies gained through cooperation and streamlining should be included in the objectives.

9. Use adaptive management. Ecosystems are recognized as open, changing, complex systems. Management practices should be flexible to accommodate the evolution of scientific understanding of ecosystems. Based on periodic reviews of implementation, adjustments to the standards and guidelines applicable to management activities affecting the ecosystem should be made.

10. Implement through installation plans and programs. An ecosystem's desired range of future conditions should be achieved through linkages and subsequent adjustments and implementation of DoD plans and activities.

ARMY ENVIRONMENTAL STRATEGY ACTION PLAN (ASAP)
CONSERVATION PILLAR

**ECOSYSTEM MANAGEMENT PROGRAM** (new)

1. **STATUTES:**

a. Clean Water Act of 1987 (ongoing reauthorization)

b. Endangered Species Act of 1973 (ongoing reauthorization)

c. National Environmental Policy Act of 1969 (NEPA)

d. The Sikes Act of 1962 (ongoing reauthorization)

e. Noise Control Act of 1972

f. National Historic Preservation Act of 1966

g. Federal Noxious Weed Act of 1974

2. **GOAL:**

a. DOD GOAL: Per memorandum from the Deputy Under Secretary of Defense to the Assistant Secretaries of the Services (23 Mar 94), "The goal of ecosystem management is to restore and maintain the health, sustainability, and biological diversity of ecosystems while supporting sustainable economies and communities. For the Department of Defense, this means protecting the wealth and diversity of species and habitats found on DoD lands while at the same time managing these lands to ensure our continued ability to conduct our military mission."

b. ARMY GOAL: Army supports and amplifies the DOD goal. Ecosystem management is a recognition and awareness of the linkage and interconnections among all elements of natural systems, with a knowledge and readiness to minimize disruptions to these resources caused by human decisions and actions. An ecologically literate Army will know the effects of land uses on deforestation, desertification, soil loss, biodiversity and water quality, and thus, be capable of sustaining the resources and the land uses.

c. ACTION PLAN GOAL: The goal of this Action Plan is to manage surface water, topsoil and native biological (vegetation and wildlife) resources for sustained availability and quality under a regime of Army land uses (training, testing, production, storage, construction, and recreation). This Action Plan does not directly manage installation air or natural resources on cantonment areas. However, the effects of cantonment area management and air quality on the soil, water, and biological resources of the unimproved acres is included.

3. **POLICIES:** (new)

a. The proposed policies that follow are a result of an interpretation by DAIM-ED-N of relevant Statutes identified in item 1 of this Plan (singularly and collectively) for the purpose of establishing Army's course of action to minimize adverse changes to ecosystem resources while maximizing land use opportunities. These policies are the foundation upon which the Major Program Actions of this Action Plan are based (item 8).

b. Proposed broad policies are:

(1) In coordination with other federal agencies, characterize the essential component parts of ecosystems; i.e., water, soils, species and ecological units within a landscape and establish linkages among the component parts.

(2) Describe the status and health of ecosystems on Army lands in terms of water quality, soil stability, and maintenance of native species and natural communities.

(3) Through the planning process, describe individual and cumulative effects of Army land uses on ecosystems and present decision-makers with alternatives (spatial and temporal) that minimize impacts while meeting ecosystem objectives and mission requirements.

(4) Periodically monitor and evaluate ecosystem health, and establish benchmarks of "progress" and "acceptability". [Examples include: "progress"--identification of highly erodible soils, preparation of erosion and sediment control plans, and monitor resource status within last 5 years; "acceptability"--native species being maintained, plant communities sustained, soils stable, water quality acceptable, etc].

4. **EXISTING INSTRUCTIONS AND GUIDANCE TO THE FIELD:**

a. This is a new action plan. The existing guidance is per memorandum, dated 29 Jun 94, from Army's Director of Environmental Programs initiating Army's process for development of policy and program for Ecosystem Management.

b. Proposed instructions and guidance include:

(1) Revision of AR 200-3 (natural Resources -- Land, Forest, and Wildlife Management) to include requirements for ecosystem management.

(2) Inclusion of ecosystem management principles into Training Circular TC 25-1, Training Land and AR 210-21 (Army Ranges and Training Land Program).

(3) Inclusion of ecosystem management principles into AR 210-20 (Master Planning for Army Installations) and the Army Installation Management Action Plan.

5. **ONGOING R&D ACTIVITIES:**

a. Currently, Army does not have a singular, integrated approach to R&D for ecosystem management. Funding sources include SERDP, EQT, Legacy and reimbursables. In order to achieve the defined goal of ecosystem management (item 2) for Army, DAIM-ED-N through the Army Ecosystem Management Board (AEMB), will provide oversight of applied R&D for ecosystem management from all funding sources. This coordination is essential to efficiently use limited funds and ensure that R&D efforts are focused on Army priority requirements.

b. Per funded proposal from DOD (Legacy Technology funds), entitled "Information Standards for Conservation Decision-Making", Army will identify ecosystem technologies and business practices for Army and DOD.

c. Ongoing R&D--A comprehensive evaluation of Army's ecosystem management R&D by the AEMB will be conducted in FY95.

d. Achieving some of the identified Major Program Actions (item 8) will require applied R&D. Requirements will be articulated in FY95 along with the review in "c" above.

6. **MAJOR PROGRAM MANAGEMENT GOALS:**

a. Ensure Army can continue to meet federal stewardship requirements in the context of Army's purposes for having land.

(1). **maintain surface water quality**; i.e., ensure that turbidity and sediment levels, as created by non-point sources, do not degrade aquatic biota and habitat or exceed federal and state water quality standards.

(2). **maintain soil productivity**; i.e., keep soil erosion within acceptable limits, restore and stabilize degraded soils and maintain long-term productivity.

(3). **maintain biological diversity**; i.e., maintain and re-establish native plant communities and associated native animal species.

7. **PROGRAM MANAGEMENT APPROACH:**

a. FOR DOD: Army (DAIM-ED-N) is executive agent for DOD in the Mojave Desert Ecosystem Management Initiative. A Memorandum of Agreement between DOD and Department of Interior to define roles and responsibilities is being negotiated at this time.

b. FOR ARMY: The Army Ecosystem Management Board (AEMB), whose membership is drawn from HQDA, MACOMs, FOAs, and installations, will oversee the ecosystem management program. The AEMB will be chartered for its activities by Army (Assistant Chief of Staff for Installation Management). The AEMB members are:

Executive Council

Principal Members

| | | |
|---|---|---|
| Mr. Don Bandel | DAIM-ED-N | (703) 696-8813 |
| Mr. Lawrence Cole | AMXEN | (309) 782-4531 |
| COL Van Epps | FCEN | (404) 669-5412 |
| COL Philip Spence | NGB-ARE | (703) 756-5770 |
| Mr. Philip Prisco | ATBO-L | (804) 727-3300 |
| COL Leonard Hassel | AEAEN | 011-49-6221-57-7328 |
| Mr. Sokoloski | APEN | (808) 438-1025 |
| COL Boone | AFRC | (404) 629-8264 |

Advisory Members

| | | |
|---|---|---|
| Mr. Michael Cain | DAIM-ED-C | (703) 696-8813 |
| Mr. Stan Shelton | DAIM-FDP | (703) 694-3986 |
| COL Miller | DAMO-TRS | (703) 614-6814 |
| Dr. Don Leverenz | CERD-M | (202) 272-1849 |
| Dr. Dave Guzewich | SFIM-AEC-EC | (410) 671-1210 |
| COL McGowan | DAJA-EL | (703) 696-1230 |
| COL Ozolek | ATIC-CTS | (804) 878-4858 |

Work Group

| | | |
|---|---|---|
| Dr. Vic Diersing | DAIM-ED-N | (703) 696-8813 |
| Mr. Phil Pierce | DAIM-ED-N | (703) 696-8813 |
| Mr. Don Cole | DAIM-ED-N | (703) 696-8813 |
| Mr. Larry Hirai | APEN-EV | (808) 438-8997 |
| Mr. Bill Woodson | AMXEN-M | (309) 782-4062 |
| Mr. Bob Anderson | ATBO-SE | (804) 727-2077 |
| Dr. Mark Imley | NGB-ARE | (703) 607-7989 |
| Mr. Stuart Cannon | AFPI-ENE | (404) 669-5762 |
| Hr. Wolfgang Grimm | AEAEN | 011-49-6221-57-7699 |
| Mr. Scott Belfit | SFIM-AEC-EC-N | (410) 671-6831 |

Task Area Committees

Includes installation managers, subject matter experts, R&D personnel, and execution support personnel (AEC).

c. The program management approach will require that various agencies (including DOD) and Army offices (primarily acting through the AEMB) work in concert to achieve the objectives of this Action Plan. Expected support and interaction include the following.

(1) Inter-agency:

(a) Department of Interior:

- Establish a Memorandum of Agreement (MOA) between DOD and DOI as pre-requisite for defining roles and responsibilities of their respective Bureaus and our Departments in execution of coordinated programs including the Mojave Desert Ecosystem Management Initiative.

- National Biological Survey (NBS)--Ensure that Army's gathering of biological data is consistent with the protocols and standards of NBS. Leverage the efforts of NBS, by securing Army/DOD funds from Legacy, SERDP, and other funding sources. Ensure that R&D conducted by Corps laboratories is fully integrated with the objectives of NBS. Identify information NBS will require of Army to meet reporting requirements.

- Geological Survey (GS)-- Ensure that the mapping procedures and surface water monitoring procedures, for non-point sources, are fully utilized and consistent with USGS standards.

(b) Department of Agriculture:

- Soil Conservation Service (SCS) -- Coordinate with and request evaluation from SCS (including ARS) on the technical validity and value of Army's methods of estimating soil erosion on Army installations. Adjust Army methods and associated policy per input from SCS.

- Agriculture Research Service and Plant Material Centers (ARS, PMC)--Ensure that revegetation initiatives (execution and R&D) are consistent with and fully utilize the expertise within ARS and PMC.

(2) Intra-agency:

(a) Department of Defense:

- Deputy Under Secretary of Defense for Research & Acquisition Technology (DUSD-R&AT)--DOD directive 4700.4 (24 Jan 89) states that the Director, Defense Research and Engineering, through the DUSD (R&AT) shall conduct appropriate research, development, tests and evaluations to support integrated natural resources management programs. DAIM-ED-N (with support from AEMB) will provide an annual summary report on the effectiveness of the R&D program in support of ecosystem management. This report will be submitted through DASA (ESOH) to DUSD (R&AT).

- Deputy Under Secretary of Defense for Environmental Security (DUSD-ES) --On an annual basis, DAIM-ED-N, with support from the AEMB, will, through the SAILE-ESOH, provide DUSD-ES a summary report on the effectiveness of DOD's ecosystem management program with suggestions for improvement.

(b) Army:

- Deputy Assistant Secretary of the Army for Environment, Safety, & Occupational Health (DASA-ESOH) -- Request that the DASA-ESOH (or his designee) review the draft Action Plan to ensure the Plan is consistent with Army's long-term policy objectives for ecosystem management.

- Assistant Chief of Staff for Installation Management (ACSIM) -- Request that ACSIM (or his designee) review the draft Action Plan and edit before final submittal of Plan for execution by Army.

- Associate Director for Conservation -- Request that the Associate Director of Conservation ensure this Action Plan is fully complementary to, and not duplicatory of, other relevant Actions Plans in DAIM-ED-N.

- DAMO-TRS--Establish an understanding that DCSOPS is responsible for execution of the ITAM program that meets DCSOPS operational requirements and ecosystem management requirements of DAIM-ED-N. Coordinate closely with DAMO-TRS to incorporate the principles of ecosystem management into mission operations.

- DAIM-FDP--Establish an understanding that DAIM-FDP is responsible for execution of the RMAT program that meets DAIM-FDP operational requirements and ecosystem management requirements of DAIM-ED-N. Coordinate closely with DAIM-FDP to develop policy and program for ecosystem management, with an objective to incorporate the principles of ecosystem management into installation management.

- MACOMS--Establish an understanding that the MACOMS, as Army's principal customer, are responsible for execution of the Army's ecosystem management program on their respective installations.

- AEC--Establish an understanding that AEC is responsible for supporting the execution of ACSIM and MACOM programs that meets ODEP policies, plans and programs. On an annual basis, DAIM-ED-N and MACOMS will review the progress of AEC in executing the taskings of HQDA and MACOMS in support of the ecosystem management program.

- CERD-Establish an understanding that CERD is responsible for execution of the applied R&D program (SERDP and EQT) that meets the requirements established by ODEP, MACOMs and installations. On an annual basis, DAIM-ED-N and MACOMS will review the progress of CERD in support of the ecosystem management program.

8. **MAJOR PROGRAM ACTIONS:**

a. Draft and staff Ecosystem Management policy for Army.--Ensure polices are consistent with lead federal agencies and Army land use requirements.

b. Draft and staff Ecosystem Management program for Army.--Ensure program is consistent from federal and Army policies and meets land use requirements.

(1). Define the Conservation baseline.--Identify information required as pre-requisite for planning, management and sustained use of natural resources. As reference, see the three management goals of ecosystem management (item 6). This will include an assessment of what's being managed, determination of resource conditions, and projection of long-term resource trends based on established and future land uses.

(2). Develop standard scopes of work for data collection.--Identify and/or develop example scopes of work for gathering the required information identified above that are consistent with and/or "blessed" by the lead or regulatory agent. Examples include, T&E species, plant communities, floral survey, faunal surveys, identification of highly erodible soils, estimating soil loss by wind and water, determination of water sedimentation rates and level of turbidity, etc.

(3). For installations, establish a systematic and prioritized process to "buy out" essential baseline information as a pre-requisite for planning and informed management.--Establish a process to "buy out", in priority order, all essential information/planning needs using all funding sources available (VENC, RPMA, TATM, Legacy [Army and DOD], SERDP, EQT, and reimbursable). It should be noted that a "buy out" process will necessarily require tracking of work accomplished as well as effort remaining for each installation, MACOM and Army-wide.

(4). Identify requirements for automated systems and develop a plan for networking/communication.--Identify requirements for automated systems. Develop a plan for managing and communicating essential conservation information (capture, storage, manipulation, retrieval, and display) within Army (all levels), and from Army to DOD and others (congress, USFWS, NBS, SCS, etc).

(5). Define content and develop standard format for preparing Integrated Natural Resource Management Plans.--Through the AEMB, establish an Army work group (assistance from others) to develop and recommend a standard format for Integrated Plans that fully incorporates resource inventory data, resource conditions, land rehabilitation requirements, long-term budget needs, limitations to operations, and options to resolve conflicts. Also, identify automated software capabilities for rapid summary of "essential information" for use by installation managers in the 5-year update of Plans.

(6). Identify requirements for monitoring (kinds and periodicity) natural resource trends.--Evaluate and determine natural resource attributes that should be periodically monitored to provide an installation-wide assessment of the status and changes of the Army natural resource base as it relates to long-term accomplishment of Federal conservation objectives and mission requirements. This assessment must allow for comparison of installations and summary "roll-ups" by MACOM, region, type of land use, DOD, etc. Note, the updating of Integrated Plans must be coordinated with the 5-year summary of resource trends.

9. MANAGEMENT INDICATORS:

a. Army policy developed that fully defines minimum essential ecosystem baseline data as pre-requisite for land use planning and management (GREEN, AMBER, RED).

b. Availability of standard Scopes of Work for gathering required ecological baseline information that is consistent with and/or "blessed" by the lead or regulatory agency (GREEN, AMBER, RED?).

c. Establishment of a singular, systematic and prioritized process to "buy out" essential baseline information as pre-requisite for planning and informed management (GREEN, AMBER, **RED**).

d. Percentage of installations having completed gathering of minimum natural resources data as pre-requisite for informed decision-making (GREEN, AMBER, **RED?**).

e. Percentage of installations having monitored resource trends during the past three years (67-100% GREEN, 34-66% AMBER, 0-33% **RED**).

f. Percentage of installations having current Integrated Natural Resource Management Plans based on completed resource inventory and evaluation of resource trends (67-100% GREEN, 34-66% AMBER; 0-33% **RED**).

10. **ISSUES AND CONCERNS:**

a. Army experiences costly planning errors from lack of information on ecosystem resources and status--Army is unable to quantify what is being managed, unable to monitor changing conditions of ecosystems, unable to estimate total land area requirements for resource sustainment and mission accomplishment, and risks opportunities for long-term mission execution via land degradation and non-compliance.

b. Lack of professional land management staff at installations to receive and integrate ecosystem objectives with land use activities.

c. Increasing environmental laws and enforcement, placing constraints on land use.

d. Increasing use and impacts on CONUS installations.

e. Inability to focus applied R&D efforts (SERDP, EQT, Legacy Technology) on Army's needs.

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