APPENDIX M:
FORT HUACHUCA INTEGRATED NATURAL RESOURCE MANAGEMENT PLAN

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN AND ENVIRONMENTAL ASSESSMENT

U.S. ARMY INTELLIGENCE CENTER AND FORT HUACHUCA, ARIZONA

APPROVAL

This Integrated Natural Resources Management Plan meets the requirements of Public Law 105-85, Sikes Act Improvement Act of 1997 (16 U.S.C. 670 *et seq.*) as amended.

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2-21-02
Date

As Secretary to the Arizona Game and Fish Commission, signature by the Director of the Arizona Game and Fish Department represents an agreement by the Commission and the Department to work cooperatively with Fort Huachuca and the U.S. Fish and Wildlife Service to implement those components of the Plan related to the Commission's wildlife management authority.

(Individual, original signatures are on file with the Environmental and Natural Resources Division at Fort Huachuca.)

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN AND ENVIRONMENTAL ASSESSMENT

U.S. ARMY INTELLIGENCE CENTER AND

FORT HUACHUCA, ARIZONA

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PREFACE

The U.S. Army Intelligence Center and Fort Huachuca, Arizona is the home of research, development, testing, and training of the Army's intelligence and communications systems.

It is also home of some of the most diverse and unique plant and wildlife communities in the nation.

Training soldiers in intelligence and communications skills needed to ensure winning on battlefields around the globe and conserving natural resources are both ongoing goals. The U.S. Army Intelligence Center and Fort Huachuca is proving that the two missions are compatible and can even complement each other.

The U.S. Army Intelligence Center and Fort Huachuca trains soldiers and other members of the United States Armed Forces in skills needed to protect the American way of life. The mission of Fort Huachuca has changed over the more than 120 years from frontier cavalry and infantry to today's highly technical electronics testing and training activities. Training opportunities provided at Fort Huachuca are first rate today, just as they have been over the decades.

This Integrated Natural Resources Management Plan is Fort Huachuca's plan for the conservation of natural resources entrusted to the U.S. Army. The plan is for a five-year period, but the philosophy behind it is for a much longer period of time. Fort Huachuca will conserve its biological diversity and make sound decisions regarding the use of natural resources to support both the military mission and needs of the region and the nation.

Lands on Fort Huachuca have been used to serve this nation's defense for more than a century. As the installation begins the 21st Century, this legacy is not taken lightly by those who use Fort Huachuca today. This Integrated Natural Resources Management Plan is dedicated to the next generation of soldiers, their families, and other Americans who will use and appreciate these lands and their natural resources.

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN AND ENVIRONMENTAL ASSESSMENT

U.S. ARMY INTELLIGENCE CENTER AND FORT HUACHUCA, ARIZONA

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"We do not own this land; we are caretakers of the land and the plant and animal species that inhabit it. The American people entrust the land to our care, and we shall fulfill their trust. We shall conserve and protect these resources for the future."[1]

Purpose

This Integrated Natural Resources Management Plan (INRMP) guides implementation of the natural resources program on the U.S. Army Intelligence Center and Fort Huachuca, Arizona (hereinafter called Fort Huachuca) from 2001 through 2005. The program conserves Fort Huachuca's land and natural resources and helps ensure compliance with environmental laws and regulations. The INRMP helps ensure the maintenance of high quality training lands to sustain Fort Huachuca's critical military mission and ensure that natural resources conservation measures and Army military activities are integrated and consistent with federal stewardship requirements. This plan includes the fire management planning strategy, as well as natural resources conservation planning, with various partners, at a regional scale.

Environmental Compliance

This INRMP replaces the 1983 *Cooperative Plan Agreement for the Conservation and Development of the Fort Huachuca Military Reservation, Fort Huachuca, Arizona 85613*. Preparation and implementation of this INRMP are required by Public Law 105-85, the Sikes Act Improvement Act of 1997 (16 U.S.C. 670 *et seq.*), Department of Defense Instruction 4715.3 (*Environmental Conservation Program*), Army Regulation 200-3 (*Natural Resources - Land, Forest, and Wildlife Management*), and Army Memorandum (21 March 1997), *Army Goals and Implementing Guidance for Natural Resources Planning Level Survey (PLS) and Integrated Natural Resources Management Plan (INRMP)*. This INRMP was prepared using *Guidelines to Prepare Integrated Natural Resources Management Plans for Army Installations and Activities* (U.S. Army Environmental Center, 1997). This INRMP helps Fort Huachuca comply with other federal and State laws, most notably laws associated with environmental documentation, wetlands, endangered species, water quality, and wildlife management in general. The plan also describes how Fort Huachuca will implement provisions of AR 200-3 and local regulations, principally Fort Huachuca Regulation 385-8 (*Range and Training Area Operations*).

This INRMP has the signatory approval of the U.S. Fish and Wildlife Service (USFWS). This approval signifies that the INRMP complies with the Endangered Species Act. Review of the INRMP is informal consultation with regard to the Endangered Species Act. Many details from the *Programmatic Biological Opinion for Land Use, Military Operations, and Training Range Utilization at Fort Huachuca* (USFWS, 1999) and its amendments (PBO) are incorporated into this INRMP.

Public Law 105-85, the Sikes Act Improvement Act of 1997 (16 U.S.C. 670 *et seq.*), requires that INRMPs include:

X wildlife management, land management, and wildlife-oriented recreation;
X fish and wildlife habitat enhancement or modifications;
X wetland protection, enhancement, and restoration where necessary for support of fish, wildlife, or plants;
X integration of, and consistency among, the various activities conducted under the plan;

[1] Robert M. Walker, Assistant Secretary of the Army, Testimony before Congress, July 11, 1995.

X establishment of specific natural resource management goals and objectives and time frames for proposed action;
X 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;
X public access to the military installation that is necessary or is appropriate for sustainable use of natural resources by the public, to the extent that the use is consistent with the needs of fish and wildlife resources, and subject to requirements necessary to ensure safety and military security;
X enforcement of applicable natural resource laws (including regulations);
X no net loss in the capability of military installation lands to support the military mission of the installation;
X regular review of this INRMP and its effects, not less often than every five years;
X exemption from procurement of services under Office of Management and Budget Circular A-76 and any of its successor circulars; and
X priority for contracts involving implementation of this INRMP to State and federal agencies having responsibility for conservation of fish and wildlife.

The INRMP will address compliance with the following additional laws:

National Environmental Policy Act of 1969
Endangered Species Act of 1973
National Historic Preservation Act of 1966 (as amended through 1992)
Archaeological Resources Protection Act of 1979
American Indian Religious Freedom Act of 1978
Native American Graves Protection and Repatriation Act of 1990
Federal Noxious Weed Act of 1974
Clean Water Act of 1978
Clean Air Act (as amended through 1990)
Federal Insecticide, Fungicide and Rodenticide Act
Federal Land Policy and Management Act 1979
Protection of Wetlands: Amends Executive Order 11990
Migratory Bird Treaty Act
Executive Order 13112, Invasive Species, 1999

Other pertinent regulations and legislation relevant to natural resources management are listed below. Analysis in this INRMP addresses, but is not limited to, these laws.

Public Law 85-624	Fish and Wildlife Coordination Act
Public Law 96-561	Fish and Wildlife Conservation and Natural Resource Management Programs on Military Reservation: Amends Public Law 86-797 (Sikes Act)
Public Law 89-669	Fish and Wildlife Conservation Act
Public Law 90-465	Conservation Programs on Military Reservations
Public Law 86-70	Bald Eagle Protection Act, as amended
Public Law 93-366	Non-game Act
Public Law 92-522	Federal Water Pollution Control Act Amendments of 1972
Public Law 90-583	Noxious Plant Control Act
Public Law 93-452	Conservation and Rehabilitation Program on Military and Public Lands
Public Law 95-524	Comprehensive Employment and Training Act Amendments

	1978
Title 10 U.S. Code 2671	Military Reservations and Facilities
Title 16 U.S. Code 590	Soil Conservation
Title 16 U.S. Code 1271	National Trails System Act of 1968
Executive Order 11991	Protection and Enhancement of Environmental Quality: Amends Executive Order 11514
Executive Order 11989	Off-Road Vehicles on Public Lands
DoD Instruction 4715.3	Environmental Conservation Program
DoD Directive 6050.2	Use of Off-Road Vehicles on DoD Lands
DoD Instruction 5000.13	Natural Resources
AR 200-1	Environmental Protection and Enhancement
AR 200-2	Environmental Effects of Army Action (NEPA)
AR 200-3	Natural Resources, Land, Forest, and Wildlife Management

Scope

The plan provides the basis and criteria for protecting and enhancing natural resources using watershed, landscape, and ecosystem perspectives, consistent with the military mission. Provisions of the INRMP apply to each directorate, command, and tenant unit at Fort Huachuca, contractors (government and private), private groups, dependents, and individuals who either directly or indirectly use the installation's natural resources, as well as units and outlying detachments of personnel assigned or attached to the installation. This INRMP is an integral part of the U.S. Army Intelligence Center and Fort Huachuca Installation Master Plan. At a regional scale, the INRMP guides Fort Huachuca cooperation in renewable natural resources conservation at a landscape scale.

Relationship to the Military Mission

Since 1877 Fort Huachuca has been used for military missions ranging from frontier cavalry patrols to today's mission of intelligence and communications training and testing. As the U.S. Army Intelligence Center and Fort Huachuca, the installation provides the critical edge in research, development, testing, and evaluation of intelligence, electronic warfare, and information systems and in training soldiers to use these tools on today's highly technological battlefields. Fort Huachuca's ranges and facilities provide a laboratory where American Army forces can test both soldiers and equipment to perfect and practice the principles of engagement for tomorrow's armed conflict.

This INRMP supports the military mission by protecting and enhancing Army lands upon which the mission is dependent. The INRMP also describes recreational opportunities associated with natural resources to the Fort Huachuca community, thus supporting the Army commitment to both Quality of Life and Communities of Excellence programs.

The INRMP describes both impacts of the military mission upon natural resources and means to prevent, reduce, and minimize effects of these impacts. However, this INRMP does not evaluate Fort Huachuca's military mission thoroughly, nor does it replace any requirement for environmental documentation of the military mission at Fort Huachuca.

Partnerships

This document was prepared in partnership and cooperation with the U.S. Fish and Wildlife Service and the Arizona Game and Fish Department, representing the federal and State Sikes Act cooperating

agencies, respectively. Other major partners in the implementation of this Plan are the Bureau of Land Management, Natural Resources Conservation Service, U.S. Forest Service, U.S. Geological Survey, and Arizona Department of Environmental Quality. Other partners in this effort include universities, other federal and State agencies, and other nongovernmental organizations. There are other partnership efforts such as the Upper San Pedro Partnership that can assist in implementation of the INRMP and its integration with ecosystem management activities in the region.

Ongoing and Planned Natural Resource Programs, Initiatives and Projects

This INRMP includes a description of ongoing and planned natural resources programs and projects at Fort Huachuca (summarized in Appendix 15.4). Most of these will either be continued or completed. The most significant projects within this INRMP include:

X rehabilitating and protecting lands to support military training;
X implementing an ecosystem management philosophy that provides for conservation of biodiversity;
X reinitiating the Integrated Training Area Management (ITAM) program;
X monitoring flora, fauna, soils, and water quality;
X implementing a geographic information system to allow better decisions regarding use and management of Fort Huachuca natural resources;
X protection of unique natural resource areas;
X implementing a forest management program, including a coherent wildland fuels and fire management program to support endangered species recovery, support the military mission, and provide improved wildlife habitat;
X managing habitat for all species of wildlife;
X managing fish and wildlife species, including game management programs and programs designed for nongame, particularly species of special concern and neotropical migrant birds;
X managing endangered species and their habitats to ensure compliance with the Endangered Species Act;
X restoring eroded lands and affected habitats to protect wetlands and water quality;
X providing an effective integrated pest management program;
X protecting and conserving wetlands;

X conducting effective natural resources law enforcement;
X informing soldiers and other members of the Fort Huachuca community of the value of installation natural resources and means to conserve those resources;
X implementing a comprehensive, economically sustainable outdoor recreation program in concert with the Directorate of Morale, Welfare, and Recreation, with public access based on natural resource carrying capacity;
X protecting historic properties while conducting natural resources management; and
X using the National Environmental Policy Act (NEPA) process of analyzing potential impacts of Fort Huachuca activities to help conserve natural resources over the long term and at a landscape scale.

In addition, this INRMP expects and anticipates that clearer resolution of some complex, regional scale, and ongoing conservation issues, which affect on post and off post natural resources, will develop over the life of this plan. Resolution would include better characterization of, planning for, and managing the ecological effects from specific concerns. These include:

X accommodating the increased demand for nature-based tourism and outdoor recreation on and near Fort Huachuca, while maintaining the integrity of natural resources,

X controlling exotic (non-native or alien), invasive species, considering that limited information exists regarding proven control techniques, and

X Fort Huachuca's groundwater use and its potential for off-post effects on the San Pedro Riparian National Conservation Area (SPRNCA) or on listed and sensitive species.

The INRMP references and integrates with other, specific planning efforts focused on these conservation issues. Planning and implementation of projects within this INRMP also will contribute to resolving these concerns and to minimizing their undesired effects on natural resources.

Monitoring INRMP Implementation

The INRMP will be evaluated through regular monitoring programs, including the Environmental Compliance Assessment System (ECAS), Army Compliance Testing System (ACTS), and reviews by TRADOC and other interested parties. Fort Huachuca, TRADOC, the USFWS, and Arizona Game and Fish Commission recognize that year-to-year congressional appropriations for the implementation of the Army's mission or changes in the Fort Huachuca mission resulting from Base Realignment and Closure (BRAC) or Force Drawdown may reflect different priorities. If these priorities require deferral, redirection, or cancellation of planned projects or plans, Fort Huachuca, in consultation with TRADOC, will determine which projects or plans should be implemented first. In every case Fort Huachuca and TRADOC will ensure that constraints on the military training mission are minimized and avoided wherever possible.

Costs and Benefits

X **Costs:** This INRMP will cost about $15,827,000 for FY 01 - FY 05 to implement. Funding will be primarily from revenues generated from environmental funds, operation and maintenance, and training funds if ITAM funding is reinitiated.

X **Military Mission Benefits:** Implementation of this INRMP will help maintain the quality of training land. It will enhance mission realism through the perpetuation of more realistic training lands. It will improve the ability for sustainable, long-range planning at Fort Huachuca.

X **Environmental Benefits:** The INRMP provides the basis for the conservation and protection of natural resources. It will help reduce vegetation loss and soil erosion. It will reduce the potential for environmental pollution. It will enhance biodiversity conservation. Plan implementation will increase overall knowledge of the function of Fort Huachuca ecosystems through surveys and research.

X **Other Benefits:** Both community relations and Fort Huachuca's environmental image, internal and external to Defense, will be enhanced. Quality of life for the Fort Huachuca community will be improved. INRMP implementation will decrease long-term environmental costs and reduce potential liabilities due to environmental noncompliance. Implementation will better allow Fort Huachuca to collaborate as a partner in ecosystem management with neighbors and cooperators.

Summary

The INRMP outlines the steps required to meet Department of Defense, U.S. Army, and Fort Huachuca's legal and ethical obligations to provide for the stewardship of the natural resources while enabling accomplishment of the military mission. The INRMP has been generated through cooperation with the appropriate regulatory agencies. As a public document, it will support and perpetuate the military mission while fostering stewardship and goodwill for the U.S. Army and the Department of Defense throughout the Upper San Pedro Valley.

1.0 GOALS, STRATEGIES, AND THE NEPA PROCESS

Army Environmental Vision Statement

The Army will be a national leader in environmental and natural resource stewardship for present and future generations as an integral part of our mission[2].

The Army's commitment to natural resources management is reflected in the *U.S. Army Environmental Strategy into the 21st Century*, which focuses on responsibly managing Army lands to ensure long-term natural resource productivity so the Army can achieve its mission. This Army commitment to natural resources management is emphasized in Army Regulation 200-3 (*Natural Resources - Land, Forest, and Wildlife Management*), which requires that Integrated Natural Resources Management Plans be developed and maintained for all Army installations.

This chapter discusses Fort Huachuca overall strategies for managing natural resources as part of the installation mission. Additionally, the chapter discusses the overall integration of NEPA documentation within this INRMP.

The command and staff of Fort Huachuca are committed to environmental stewardship as an integral part of the mission at Fort Huachuca. This commitment is evidenced by the way past environmental programs would support the requirements of this INRMP.

It is important to understand the relationship between the natural resources program and Fort Huachuca as a whole. A comparison of Fort Huachuca mission, vision, goals, and core values with the mission, goals, and objectives of the natural resources program helps identify this relationship.

1.1 The Fort Huachuca Mission, Purpose, and Vision

Mission Statement/Business Drivers

Promote the best possible quality of life for all.
Satisfy the needs of internal and external customers.
Make absolutely sure we are providing an equal provision of life's chances to all. Encourage and help others to do so as well.

Use all resources as efficiently and effectively as possible to best support accomplishment of the mission of all commands and agencies for which we have accepted that responsibility.

Maximize environmental stewardship performance.
Conserve and protect natural resources, fish, and wildlife to the maximum extent possible consistent with our right to exist and our mandate to protect and defend the people of the United States.

[2] Army Environmental Policy Institute. 1992. *U.S. Army Environmental Strategy into the 21st Century*. U.S. Government Printing Office 1993-747-677, 38 p.

Purpose

Serve those who serve to protect America's families and liberty.

Vision

Always exceed our customers' expectations.

1.2 Fort Huachuca Natural Resources Mission, General Goals, and General Objectives

Mission

Provide professional management to perpetuate the diversity of natural resources and ecological processes and to sustain ecosystem productivity in order to maintain a compatible alliance with the military mission.

Below are general goals for Fort Huachuca natural resources conservation, and objectives used to attain them. These objectives, and those more specific in chapters 7-15, serve as a checklist to monitor the success of the plan. Some objectives fit more than one category. When this occurs, the most-fitting category was chosen.

Goal 1. Provide high quality natural resources as a critical training asset upon which to accomplish the military mission of Fort Huachuca.

Objective. Ensure no net loss in the capability of installation lands to support existing and projected military training and operations on Fort Huachuca.

Goal 2. Manage natural resources on Fort Huachuca under ecosystem management principles to assure good stewardship of public lands entrusted to the care of the Army.

Objective 1. Use adaptive management strategies to protect, conserve, and enhance native fauna and flora, with an emphasis on high priority species, biodiversity conservation, and proper ecosystem functioning.

Objective 2. Monitor and manage soils, water, vegetation, and wildlife on Fort Huachuca with a consideration for all biological communities and human values associated with these resources.

Objective 3. Ensure Fort Huachuca's natural resources program is coordinated with installation organizations, other agencies, and conservation organizations with similar interests.

Goal 3. Improve the quality of life of the Fort Huachuca community and the public through high quality, natural resources-based recreation opportunities.

Objective 1. Provide ecologically sustainable opportunities for outdoor recreation, such as birding, picnicking, hiking, camping, hunting, fishing, nature study, and equestrian activities.

Objective 2. Support conservation education to the local and regional communities.

Goal 4. Comply with laws and regulations that pertain to management of Fort Huachuca's natural resources.

Objective 1. Manage natural resources within the spirit and letter of environmental laws, particularly the Sikes Act upon which this Integrated Natural Resources Management Plan is predicated.

Objective 2. Protect, restore, and manage sensitive species, unique habitats and wetlands.

Objective 3. Use NEPA procedures to make informed decisions that include natural resources considerations and mitigation.

Objective 4. Ensure Fort Huachuca's natural resources program is consistent with the protection of cultural and historic resources.

Objective 5. Implement this INRMP within the framework of Department of Defense and Army policies and regulations.

Objective 6. Protect and manage threatened and endangered species and critical habitat in accordance with the Endangered Species Act (ESA), NEPA, AR 200-3, DoD Directive 4715.3, USFWS regulations and agreements, and other applicable laws or guidance from higher headquarters. Consider species listed by the State of Arizona in the natural resources management program.

1.3 Support of Installation Goals

Implementation of this INRMP will support the mission, vision, and goals of Fort Huachuca. The natural resources team at Fort Huachuca is committed to supporting the military mission, providing stewardship of resources entrusted to the Army, enhancing the quality of life of the Fort Huachuca community and the public, and being a valued member of the Fort Huachuca team. Implementation of this INRMP will demonstrate these qualities.

1.4 Biodiversity Conservation and Ecosystem Management

Biological diversity (biodiversity) refers to the variety and variability among living organisms and the environment in which they occur. Biodiversity has meaning at various levels including ecosystem diversity, species diversity, and genetic diversity. The Department of Defense has developed *A Department of Defense (DoD) Biodiversity Management Strategy* (The Keystone Center, 1996). This Strategy identifies five reasons to conserve biodiversity on military lands:

(1) ***sustain natural landscapes*** required for the training and testing necessary to maintain military readiness;
(2) ***provide the greatest return on the Defense investment*** to preserve and protect the environment;
(3) ***expedite the compliance process*** and help avoid conflicts;
(4) ***engender public support*** for the military mission; and
(5) ***improve the quality of life*** for military personnel.

The Keystone Center report (1996) notes that the challenge is "*to manage for biodiversity in a way that supports the military mission*". This strategy identifies the INRMP as the primary vehicle to implement biodiversity protection on military installations. The model process developed within the strategy includes the following principles:

X support the military mission;
X use joint planning between natural resources managers and military operations personnel;
X integrate biodiversity conservation into INRMP, ITAM, and other planning protocols;
X involve internal and external stakeholders up front;
X emphasize the regional (ecosystem) context;
X use adaptive management;
X involve scientists and use the best science available; and
X concentrate on results.

The Department of Defense (DoD Instruction 4715.3, *Environmental Conservation Program*) describes ecosystem management as, "*a process that considers the environment as a complex system functioning as a whole, not a collection of parts, and recognizes that people and their social and economic needs are a part of the whole*". The Department of Defense goal with regard to ecosystem management is, "*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*."

Principles and guidelines to achieve this goal are:

X Maintain and improve the sustainability and native diversity of ecosystems.
X Administer with consideration of ecological units and time frames.
X Support sustainable human activities.
X Develop a vision of ecosystem health.
X Develop priorities and reconcile conflicts.
X Develop coordinated approaches to work toward ecosystem health.
X Rely on the best science and data available.
X Use benchmarks to monitor and evaluate outcomes.
X Use adaptive management.
X Implement through installation plans and programs.

Fort Huachuca will use ecosystem management to guide its program in the next five years and beyond. This management strategy enables the installation to conduct military training while conserving natural resources upon which the quality of training ultimately depends. The standard and the concept for ecosystem management applied here will be as defined by Grumbine (1994): "Ecosystem management

integrates scientific knowledge of ecological relationships within a complex sociopolitical and values framework toward the general goal of protecting native ecosystem integrity over the long term."

1.5 Integrated Training Area Management

Integrated Training Area Management (ITAM) is an Army-wide program to provide good quality training environments to support the Army's military mission. The ITAM program was initiated with the realization that some Army training lands were being degraded to the point where their capabilities to sustain military missions were in jeopardy. Proper management to support both the military mission and other multiple-use activities is a challenge unique among other managers of public lands.

The ITAM program includes the following four component areas (modified from *Integrated Training Area Management (ITAM) Program Strategy* (Office of the Deputy Chief of Staff for Operations and Plans, 1995)):

X The Land Condition Trend Analysis (LCTA) component is used to inventory and monitor physical and biological resources to meet the multiple-use demands of military installations.
X The Training Requirements Integration (TRI) component integrates military training requirements for land use with the natural resources conditions and capabilities to support these requirements.
X The Environmental Awareness component improves land users understanding of the impacts of their activities on the environment.
X The Land Rehabilitation and Maintenance (LRAM) component includes programming, planning, designing, and executing land rehabilitation and maintenance to support and sustain the military mission.

The ITAM program at Fort Huachuca began in 1992 with contractor-performed LCTA inventory work. In 1995, a full-time LCTA Coordinator was hired, and from 1995 through 1997 field crews collected initial plot data. Initially ITAM was directed by the Environmental Division's Wildlife Management Office (now the Environmental and Natural Resources Division). In 1997, proponency of this program changed from DIS to the Training Division, consistent with Army-wide changes. Reduced budgets beginning in FY 98 forced the temporary discontinuance, until 2001, of the ITAM program at Fort Huachuca. The LCTA Coordinator was the Natural Resources Monitoring Coordinator until October 2000, responsible for monitoring and for managing natural resources databases. The Coordinator continued to use LCTA methodology to monitor vegetation for fuel load evaluation and effects of fire on plant communities for fire management planning on Fort Huachuca.

The Sikes Act requires no net loss in the capability of military installation lands to support the military mission of the installation. ITAM has been an integral program to help ensure no net loss of military mission capabilities on Fort Huachuca. Thus, Fort Huachuca will continue to request funding to reinitiate all aspects of the ITAM program on the installation.

Goals and objectives specific to ITAM are found in the ITAM Program Strategy (Office of the Deputy Chief of Staff for Operations and Plans, 1995). ITAM program components are described in sections 7.1.1 - *Land Condition Trend Analysis*, 8.7 - *Land Rehabilitation and Maintenance*, 8.13 - *Training Requirements Integration*, 10.1 - *Military Personnel Awareness, and* 15.3.2 - *Geographic Information System*.

1.6 INRMP and NEPA Integration

This INRMP includes an Environmental Assessment. This section describes the integration of the INRMP with its NEPA documentation.

1.6.1 Purpose, Need, and Rationale

Fort Huachuca proposes to implement its Integrated Natural Resources Management Plan 2001-2005. The purpose of the Environmental Assessment is to identify and evaluate environmental consequences of implementing the proposed plan, in accordance with the National Environmental Policy Act (NEPA), the Council on Environmental Quality (CEQ) Regulations, and Army Regulation (AR) 200-2, *Environmental Effects of Army Actions*.

AR 200-2 is the regulation the Army uses to establish policy, procedures, and responsibilities for assessing environmental effects of Army actions. AR 200-2 specifically states that development of natural resource management plans requires preparation of an Environmental Assessment.

Council on Environmental Quality regulations allow NEPA documents to be combined with other agency documents to reduce paperwork and duplication (40 CFR 1506.4). These regulations encourage agencies to focus on the purpose of NEPA analysis - better decision making.

This INRMP has been prepared with an embedded, fully integrated Environmental Assessment. This integration satisfies the requirements of AR 200-2 and AR 200-3, as well as supports the intent and spirit of NEPA. A discussion of alternatives is within each section in Chapters 7 through 15. Each management program is discussed under the contexts of integrated proactive management (Proposed Action, Alternative A), management per status quo (No Action, Alternative B), and options other than the proposed action (Other Management Options, Alternative C). Environmental consequences of implementing this plan are in Chapter 16. The Finding of No Significant Impact (FNSI) for the EA within this INRMP is attached to this plan following the appendices.

Cumulative effects are the combined effects of all human actions and natural events on the ecological environment. Cumulative effects result from the incremental impact of actions when they are combined with other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions (40 Code of Federal Regulations 1508.7). Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time. Cumulative effects are discussed in Section 16.9 and a summary of potential environmental consequences is in Section 16.10.

1.6.2 Scope

The proposed action is restricted to implementation of the INRMP. Potential environmental effects associated with the proposed action are required to be assessed in compliance with NEPA, regulations of the CEQ, and AR 200-2. This EA identifies, documents, and evaluates the effects of implementing the

INRMP for Fort Huachuca. Environmental effects of implementing this plan on Fort Huachuca are the focus of environmental assessment aspects integrated into this plan.

1.6.3 Impact Analysis

The analysis process involved the review of installation natural resources-related data collected by Fort Huachuca, other governmental agencies, contractors, and private organizations. The process involved interviews with Fort Huachuca personnel involved with natural resources management, outdoor recreation, and installation maintenance.

1.6.4 Alternatives

Alternatives not considered in alternative analyses sections are those which would compromise Fort Huachuca's military mission, the primary use of these lands. Therefore, options, such as removing large areas from military training, which would inhibit the installation from performing its mission, will not be considered. The exception is the adoption of restrictions or alterations to standard operating procedures to comply with laws, such as the Endangered Species Act.

Proposed Action (Alternative A)

Fort Huachuca proposes to fully implement its Integrated Natural Resources Management Plan, 2001-2005, in part, to avoid or reduce undesired environmental effects of the military mission. This plan presents information on the management of natural resources on Fort Huachuca. It also describes the setting, defines land management units, and describes how these units will be managed to sustain ecological functions, protect federally-listed and other nongame species, provide sustained military use, and support outdoor recreation uses. Major emphasis will be placed on proactive management to minimize potentially negative environmental impacts due to the installation's military mission.

Funding is compliance-based, but funding priorities (Department of Army, undated) are based on different likelihoods and effects of falling into non-compliance. Funding may not be available to accomplish all tasks in each program; thus, this alternative sets high, medium, and low priorities for program tasks and lists priorities in Section 15.6 Table 7. Consequences of the Proposed Action, ***Alternative A***, ***will*** be discussed following each management section.

No Action Alternative (Alternative B)

Under CEQ regulations, a proponent must evaluate the No Action scenario. Therefore, this alternative reflects the No Action scenario and represents management of natural resources per status quo on Fort Huachuca. Compliance with laws and executive orders on endangered species, water quality, federal land management, outdoor recreation, wetlands, etc., as well as Department of Defense and Department of Army policies, would continue as directed. Under the No Action alternative, natural resource management activities and projects would occur, but planning, coordination, and execution would not be integrated at a programmatic level or ecosystem scale. Therefore, neither comprehensive, adaptive management nor ecosystem management would be planned or expected. Consequences of the No Action alternative, ***Alternative B***, ***will*** be discussed following each management section.

Other Management Options (Alternative C)

Virtually every major natural resources program at Fort Huachuca (fish and wildlife, forestry, pest management, fire management, etc.) has options other than ones selected for the INRMP. For example, there are many different strategies with regard to prescribed burning, just as there are numerous options for monitoring wildlife and a wide variety of erosion control options. Inherent with integrated programs, many of these interact with each other. For example, changing the fire management program to implement prescribed burning would drastically affect vegetative and faunal resources, and impacts would be different among plant and animal species.

Individual project options create almost countless potential combinations, each of which could be an alternative to the proposed action. Various laws, compliance documents, Army regulations, etc. prohibit the implementation of many of these possibilities. For example, intensive training in endangered species nesting or roosting areas is not a viable option due to public law and Department of Army policy. On the other hand, the selection of management techniques for rehabilitating damaged land is an option, and there are many choices. The same would be true of changing the monitoring program for vegetation condition trends or changing the wildlife habitat management program.

This Other Management Options alternative, ***Alternative C***, ***will*** be discussed as an alternative action following each management section. Other management alternatives were considered and dismissed from further consideration during development of the INRMP. Management programs and projects selected for the proposed action are based on knowledge and experience from years of professional management of Fort Huachuca's natural resources and the best scientific knowledge, research, and opinions available.

Compliance Alternative (Alternative D)

The Compliance Alternative action is to only implement those portions of the INRMP required to maintain compliance with provisions in the PBO, requirements of the Endangered Species Act, and other laws. Compliance with laws, such as the Endangered Species Act, Clean Water Act, and National Environmental Policy Act, would ensure implementation of some programs but would ignore other programs within the INRMP.

Passage of the Sikes Act in 1997 requires INRMPs to include programs such as fish and wildlife, land, and forest management; fish and wildlife-oriented recreation; fish and wildlife habitat management; sustainable public use of natural resources; etc. (see Executive Summary). The Sikes Act further requires implementation of programs identified within the INRMP. Therefore, each program within the INRMP is compliance driven to a degree. Thus, the Compliance Alternative is not in full compliance with the Sikes Act and ***will not*** be discussed following each management section.

2.0 RESPONSIBLE AND INTERESTED PARTIES

2.1 U.S. Army Intelligence Center and Fort Huachuca

2.1.1 Commanding General

The Commanding General of Fort Huachuca, implements policies and directives of the Department of the Army (DA) and the U.S. Army Training and Doctrine Command (TRADOC). He bears ultimate responsibility for management of natural resources on Fort Huachuca, including its land and wildlife. The Commanding General's position implies support by all other commands on the installation. Acting through the Command Group, personal and special Staff, directors, and separate commanders, the Commanding General is responsible for (Department of the Army, 1995):

X providing for funding and staffing of natural resource management professionals and other resources required to effectively manage natural resources on the installation;
X planning land use to avoid or minimize adverse effects on environmental quality and provide for sustained accomplishment of the mission;
X entering into appropriate cooperative plans with State and Federal conservation agencies for the conservation and development of fish and wildlife, soil, outdoor recreation, and other resources (16 USC 670a);
X ensuring the functioning of an Installation Environmental Quality Control Committee;
X ensuring ongoing and timely coordination of current and planned land uses between mission, natural resources, environmental, legal, and master planning;
X inspecting and reviewing mitigation measures that have been implemented or recommended for the protection of natural resources as prescribed in environmental documentation in accordance with AR 200_2;
X ensuring all installation land users are aware of and comply with procedures and requirements necessary to accomplish objectives of this INRMP together with laws, regulations, and other measures designed to comply with environmental quality objectives; and
X appointing a natural resources management professional as the Installation Natural Resources

Coordinator.

2.1.2 Garrison Commander

The Garrison Commander serves as the principal assistant to the Commanding General for the management of Fort Huachuca. He directs and is responsible for all aspects of garrison operations at Fort Huachuca, including natural resources management. As such, the Garrison Commander is responsible for most of the implementation of this INRMP.

2.1.3 Directorate of Installation Support

The Director of Installation Support (DIS) will maintain an organization with the resources needed to implement the INRMP and, acting through the Chief of the Environmental and Natural Resources Division (ENRD), is responsible for (Department of the Army, 1995):

X developing and implementing programs to ensure the inventory, delineation, classification, and management of all applicable natural resources to include: wetlands, scenic areas, endangered and threatened species, sensitive and critical habitats, and other natural resource areas of special interest;
X providing for the training of natural resources personnel;
X implementing this INRMP;
X reviewing all environmental documents (*e.g*. environmental assessments and impact statements and remedial action plans) and construction designs and proposals to ensure adequate protection of natural resources, ensuring that technical guidance as presented in this INRMP is adequately considered;
X coordinating with local, State, and federal governmental and private conservation organizations relative to natural resources management for Fort Huachuca;
X managing all phases of the natural resources program for Fort Huachuca with appropriate natural resources management personnel; and
X supporting the installation pest control program.

The two wildlife biologists, an ecologist, and the forester carry out DIS responsibilities for the integrated management of natural resources on Fort Huachuca addressed in this INRMP. The ENRD also includes a NEPA coordinator, an environmental engineer provided by the Corps of Engineers, a storm water control manager, an air quality specialist, and an archeologist who assist with these efforts. Pest control is administered by the Contract Management Division of DIS.

Responsibilities of the Environment and Natural Resources Division's natural resources personnel include:

X general enhancement of wildlife habitat;
X ensuring compliance with State and federal laws and regulations involving natural resources and historic properties;
X using natural resources management to support the military mission;
X protecting land investments from depreciation by adopting land management practices based upon soil capabilities;
X administering the hunting and fishing program;
X implementing general wildlife management and research;
X maintaining and implementing the INRMP;
X maintaining a trained, professional staff;

X cooperating with State and federal natural resources agencies;
X protecting and, whenever possible, enhancing wetlands;
X minimizing erosion; and
X protecting threatened and endangered species.

2.1.4 Installation Operations Directorate

The Director of G-3 Operations is responsible for planning, estimating, coordinating, integrating, and supervising: military training, short and long-range mission and mobilization planning, troop movements, aviation operations, range operations, operations and training, intelligence and security activities, emergency operations, special events and ceremonies, and force modernization and integration activities.

The Range Control Office provides access to ranges to accomplish provisions of this plan, assists in enforcing environmental considerations within range regulations and is directly responsible for implementation and/or support of portions of this INRMP which directly affect or interact with training responsibilities, including:

X operating and maintaining Fort Huachuca ranges, associated training facilities, field training sites, and range equipment;
X preparing, maintaining, and enforcing the Range Regulation;
X coordinating with DIS on training activities that may affect threatened and endangered species and other wildlife, wetlands, or historic properties; and
X overseeing ITAM activities.

2.1.5 Directorate of Public Safety

The Directorate of Public Safety (DPS) includes the installation Fire Department and the Provost Marshal Office (PMO). The Fire Department's primary mission is protection of life and property on Fort Huachuca. Secondary missions include wildfire suppression, fire planning, prescribed burning, and fire related training and safety. The Provost Marshal Office is responsible for enforcement of federal, State, and installation hunting and fishing regulations and other applicable natural resources and environmental laws and regulations.

2.1.6 Directorate of Morale, Welfare, and Recreation

The Director of Morale, Welfare, and Recreation (MWR) establishes procedures and governs installation outdoor recreation activities, except hunting and fishing (AR 215_1). Programs that particularly affect Fort Huachuca natural resources include equestrian programs, picnicking, camping, hiking, and golf. Responsibilities include:

X planning and implementing the installation Outdoor Recreation Program (AR 215_2);
X supervising and maintaining outdoor recreation activities, exclusive of hunting and fishing; and
X collecting fees and charges for various outdoor recreation activities.

2.1.7 Public Affairs Office

The Public Affairs Office (PAO) is responsible for promoting an understanding of Fort Huachuca among its various publics and providing professional public affairs advice and support to installation leaders and activities. The PAO is an important component of the natural resources program for Fort Huachuca, especially in disseminating information critical to the success of the program.

2.1.8 Staff Judge Advocate

The Staff Judge Advocate (SJA) provides legal advice, counsel, and services to Command, Staff, and subordinate elements of Fort Huachuca. Specific SJA responsibilities with regard to integrated natural resource management include:

X conducting legal research and preparing legal opinions pertaining to interpretation and application of laws, regulations, statutes, and other directives;
X coordinating with the Department of Justice, Environmental Litigation Division of the Office of the Judge Advocate General, and other Governmental agencies on matters pertaining to litigation for the Federal Government;
X advising the DIS on compliance with NEPA, especially with regard to management of federally-listed species on Fort Huachuca; and
X advising the Range Control Office on laws and regulations that affect training land use, management, and compliance.

2.1.9 Inspector General

The installation Inspector General will determine whether the provisions of DoD Instruction 4715.3 are being adequately accomplished on Fort Huachuca in accordance with this Plan and appropriate Army regulations.

2.1.10 Other Installation Organizations

Implementation of this Plan will require assistance from other directorates and organizations. Such organizations include the Directorate of Contracting (procurement), commanders of major subordinate organizations, and commanders of tenant units and activities.

2.2 Other Defense Organizations

2.2.1 U.S. Army Training and Doctrine Command

The U.S. Army Training and Doctrine Command (TRADOC), located at Fort Monroe, Virginia has signatory approval authority for this INRMP, and is responsible for providing command and technical supervision of Fort Huachuca's natural resources program by (Department of the Army, 1995):

X assisting with program implementation and conducting staff visits to Fort Huachuca,
X reviewing outdoor recreation plans for compatibility with the Installation Master Plan and natural resources management plans and programs,
X ensuring that effective natural resources stewardship is an identifiable and accountable function of management,
X funding environmental salaries and projects based on the Environmental Program Requirements (EPR) system, and
X funding ITAM.

TRADOC will conduct an onsite evaluation under the Environmental Compliance Assessment System of this natural resources program at least once every two to four years and will act as trustee over the overall natural resources program.

2.2.2 Army Environmental Center

The U.S. Army Environmental Center (AEC), located at Aberdeen Proving Ground, Maryland, provides oversight, centralized management, and execution of Army environmental programs and projects. It has support capabilities in the areas of NEPA, endangered species, historic properties, ITAM, environmental compliance, and related areas. The Western Regional Office in Denver has responsibility for Fort Huachuca.

2.2.3 U.S. Army Corps of Engineers

2.2.3.1 Los Angeles District - Arizona Office

The U.S. Army Corps of Engineers, Los Angeles, California assists Fort Huachuca by administering contracts for outside or other agency support and administering wetland permits in accordance with Section 404 and 401 of the Clean Water Act. These contracts include those involved with sensitive species surveys and others.

2.2.3.2 Norfolk District

The U.S. Army Corps of Engineers, Norfolk, Virginia has assisted Fort Huachuca with contractor personnel to function within the Environment and Natural Resources Division and assists with contracting for certain projects, such as this INRMP.

2.2.4 U.S. Army Environmental Training Support Center

The Environmental Training Support Center specializes in providing material for the Environmental Awareness program within ITAM. This support has been used by Fort Huachuca, and this service will likely be used again during 2001-2005.

2.3 Other Federal Agencies

2.3.1 U.S. Department of Interior

2.3.1.1 U.S. Fish and Wildlife Service

The U.S. Fish and Wildlife Service (USFWS), Region 2, has an Ecological Services Office in Phoenix, Arizona and a suboffice in Tucson that provide technical advice for management of natural resources on Fort Huachuca, particularly endangered and threatened species. Department of Army Regulation 200_3, Chapter 11, provides guidance to be followed by Fort Huachuca when dealing with the USFWS for endangered species management.

The USFWS is a signatory cooperator in implementation of this INRMP in accordance with the Sikes Act. Appendix 2.3.1.1 contains specific items of agreement among the USFWS, Arizona Game and Fish Department, and the U.S. Army Intelligence Center and Fort Huachuca, as required by the Sikes Act. This

INRMP replaces the 1983 *Cooperative Plan Agreement for the Conservation and Development of the Fort Huachuca Military Reservation, Fort Huachuca, Arizona*.

2.3.1.2 Bureau of Land Management

The Bureau of Land Management (BLM) has responsibility for lands that adjoin the installation and for the San Pedro Riparian National Conservation Area (SPRNCA). The BLM also administers subsurface mineral rights on several thousand acres of non-federal land around Fort Huachuca.

2.3.1.3 National Park Service

The National Park Service (NPS) is responsible for management of the Coronado National Memorial, south of Fort Huachuca. NPS also has a very significant role in the protection of historic properties on federal land, and as such, could be involved in issues that affect natural resources management on Fort Huachuca.

2.3.1.4 U.S. Geological Survey

The U.S. Geological Survey (USGS) actively conducts geological and hydrological research on and near Fort Huachuca to better manage water and ecosystem resources. USGS is a member of the Upper San Pedro Partnership. USGS operates two stream gauges on post.

The Biological Resource Division (BRD) of USGS maintains a Cooperative Fish and Wildlife Research Unit at the University of Arizona. In addition to biologists from other BRD Science Centers, this unit frequently conducts wildlife research, primarily on birds and their habitat use, on or near Fort Huachuca.

2.3.2 U.S. Department of Agriculture

2.3.2.1 Natural Resources Conservation Service

The Natural Resources Conservation Service (NRCS) provides technical planning and assistance upon request as personnel and resources allow. For instance, NRCS prepared the Integrated Natural Resources Management Plan (draft) (1997) in cooperation with the ENRD, and assisted in preparation of the Fire Management Plan (Robinett *et al*., 1997) and the Agave Management Plan (Howell and Robinett, 1995).

2.3.2.2 U.S. Forest Service

The U.S. Forest Service (USFS) manages the Coronado National Forest, which is adjacent to Fort Huachuca to the southwest. The USFS is responsible for providing assistance to Fort Huachuca as specified in the *Interagency Agreement Between the Department of Defense and the Department of Agriculture for the Conservation of Forests, Vegetative Cover, Soil, and Water on Lands Administered by the Department of Defense*. The USFS has provided guidance for cave management on Fort Huachuca. Coronado National Forest personnel provide forest management project support and firefighting capability and coordination with the installation under an Interservice Support Agreement. Fort Huachuca reimburses the USFS for fire suppression and fuel load reduction conducted on the installation.

The Flagstaff Forestry Sciences Laboratory of the USFS Rocky Mountain Research Station (RMRS) has an ongoing research work unit on Ecosystem Management of the Southwestern Borderlands in

southeastern Arizona. Fort Huachuca and RMRS have mutual concerns about improving grassland and woodland management, particularly the effects of fire on grassland and savanna ecosystems and land uses. RMRS has funded, and administered jointly funded, work on soils and agave on post.

2.3.2.3 Agricultural Research Service

Agricultural Research Service (ARS) operates the Southwest Watershed Research Center to:

- understand the effects of changing climate, land use, and management practices on the hydrologic cycle, soil erosion processes, and watershed resources;
- develop remote sensing technology and apply geospatial analysis techniques;
- develop decision support tools for natural resource management; and
- develop new technology to assess and predict the condition and sustainability of rangeland watersheds.

ARS conducts long-term research at Walnut Gulch Experimental Watershed in the upper San Pedro River valley and coordinates a watershed wide, multidisciplinary Semi-Arid Land Surface Atmosphere (SALSA) research program. It also is a member of the Upper San Pedro Partnership. ARS and Fort Huachuca interact regularly on natural resource data collection, mapping, and information transfer to land managers.

2.4 State Agencies

2.4.1 Arizona Game and Fish Department

The Arizona Game and Fish Department (AGFD) is responsible for management of most fish and wildlife within the State, including those on federal lands. The AGFD provides oversight for hunting and fishing on the installation and assists in managing nongame fish and wildlife. Habitat specialists review Fort Huachuca natural resource management plans and NEPA documents for effects on native wildlife. The agency also is responsible for maintaining a list of Wildlife Species of Concern in Arizona and highly safeguarded plants, some of which are found on Fort Huachuca.

The AGFD is a signatory cooperator in implementation of this INRMP. Appendix 2.3.1.1 contains specific items of agreement among the AGFD, USFWS, and the U.S. Army Intelligence Center and Fort Huachuca, as required by the Sikes Act. This INRMP replaces the 1983 *Cooperative Plan Agreement for the Conservation and Development of the Fort Huachuca Military Reservation, Fort Huachuca, Arizona*.

2.4.2 Arizona Department of Agriculture

The Arizona Department of Agriculture (ADA) is responsible for oversight of implementation of the Native Plant Law. The ADA also maintains the Protected Native Plants List and the Noxious Weed List.

2.4.3 Arizona Department of Environmental Quality

The Arizona Department of Environmental Quality (ADEQ) inspects environmental programs and assures the installation is in compliance with State environmental laws. ADEQ administers the Clean Air Act and Clean Water Act (including Section 401 certification authority) in Arizona, and a smoke management coordinator reviews all prescribed burning plans in the State.

2.4.4 Arizona Department of Water Resources

The Arizona Department of Water Resources (ADWR) administers the State Groundwater Management Act, Arizona Public Water Code, Arizona Surface Water Rights Law, and the Well Construction and Licensing of Well Drillers. ADWR administers and enforces surface and groundwater rights.

2.4.5 Arizona State Land Department

The Arizona State Land Department (ASLD) owns land on the installation's East Range, which is leased to the Army. The ASLD also provides environmental education and natural resources management assistance through Natural Resources Conservation Districts.

2.4.6 State Historic Preservation Office

The State Historic Preservation Office (SHPO) administers the State historic preservation program and is responsible for overseeing the implementation of the National Historic Preservation Act in the State. The SHPO serves as a repository for the location of archeological sites within the installation. The SHPO works closely with the installation archeologist in recording site information and providing consultation for site protection and mitigation. These activities affect natural resources management on Fort Huachuca.

2.5 Universities

Regional universities have provided specialized expertise to help manage natural resources on Fort Huachuca. The University of Arizona has conducted numerous, varied environmental studies for many years, and provides GIS support to the installation under a three-year cooperative agreement. In recent years, both Arizona State University (ASU) and Northern Arizona University (NAU) have engaged in projects on and near Fort Huachuca. Some projects are multi-year and collaborative with other institutions and agencies, such as their projects focused on riparian habitat and species. ASU work is fundamentally ecological in perspective. NAU's is primarily in the area of conservation biology, and the Strategic Environmental Research and Development Program has funded the largest project. The University of Colorado-Boulder, through its involvement with the Audubon Research Ranch, has involved Fort Huachuca lands for years in its projects on birds and their habitats. Colorado State University has supported ITAM related activities, especially LCTA and GIS, and it cooperates with NAU on the SERDP investigation of the effects of ecological fragmentation on wildlife populations. Sam Houston State University has provided fish and wildlife management planning assistance (Sam Houston State University, 1996). Fort Huachuca will continue to use university expertise to assist with its natural resources programs during 2001-2005. A long tradition of college field trips and externally funded research on Fort Huachuca lands will continue to be accommodated when and where appropriate.

2.6 Municipalities

The City of Sierra Vista is responsible for maintaining flood control basins, along Buffalo Soldier Trail, that have been authorized through drainage easement. Huachuca City manages a sewage treatment facility and landfill adjacent to the installation. Huachuca City also has a cooperative fire management agreement with Fort Huachuca. Cooperative relationships such as these and the Upper San Pedro Partnership will be fostered during 2001-2005.

2.7 Other Interested Parties

General public interest in natural resources management at Fort Huachuca is moderately high, in part due to issues associated with water resources. The Audubon Society participates on the installation's Conservation Committee, and The Nature Conservancy provides training on ecological burning and assists with development of subplans for the INRMP. The Center for Biodiversity has expressed serious concerns with regard to groundwater withdrawals occurring at Fort Huachuca. Birding, lepidopterist, native plant, caving, and wildlife photography groups maintain active interests in the biological diversity and natural features in the region.

3.0 SETTING AND FACILITIES

3.1 Location

The Fort Huachuca Military Reservation lies adjacent to the SPRNCA to the east, metropolitan Sierra Vista and Huachuca City along the northern boundary, and Coronado National Forest to the west and south. Fort Huachuca is in the San Pedro River Valley 75 miles southeast of Tucson, Arizona and eight miles north of the Mexican Border in Cochise County, Arizona (Figure 3.1). Tombstone and Bisbee are about 18 and 28 miles, respectively; Douglas is about 60 miles; and Nogales is about 63 miles from the installation. The Huachuca Mountains form the southern and western boundaries of Fort Huachuca. The northern border parallels Babocomari Creek, a tributary of the San Pedro River.

3.2 Acreage and Acquisition

Fort Huachuca has 73,272 acres, including the East Reservation (28,544 acres) and the West Reservation (44,728 acres) (Zillgens, 1991), divided by Arizona Highway 90. The West Reservation is further divided into the West Range, the cantonment or built-up area, and the South Range (Figure 3.1).

The East Reservation includes 13,463 acres of public domain, withdrawn land and 1,537 acres of State Trust land. The public domain land is withdrawn from public use for military purposes pursuant to the Order of the Secretary of Interior (Public Land Order 1471, 8/22/57). These lands are managed primarily for military training consistent with the purpose of the secretarial withdrawal. The BLM, Safford District Resource Management Plan identifies these lands as being managed for military purposes and provides for resource management coordination with Fort Huachuca consistent with requirements of the Federal Land Protection and Management Act (FLPMA).

3.3 Neighbors

Fort Huachuca's Main Post (West and South Range) is bordered on the south and west by USFS land, to the north and west by State Trust and private lands, and to the east by private land. The East Range is bordered on the north by private, State Trust, and BLM land, to the east by BLM land, and to the south by private land. Figure 3.3 shows land ownership for the Fort Huachuca region.

The City of Sierra Vista is immediately adjacent to the installation's South Range to the east and serves as a regional residential and commercial center. Huachuca City lies just north of Fort Huachuca. Other cities and towns in the vicinity of Fort Huachuca include Palominas, Hereford, Whetstone, and Elgin (Figure 3.1).

3.4 Subinstallations

Fort Huachuca controls or has use rights to about 28,256 acres off-installation. These areas are leased, withdrawn or permitted from federal, State, county, and municipal agencies and, in a few cases, private

Figure 3.1: Location of Fort Huachuca, Arizona

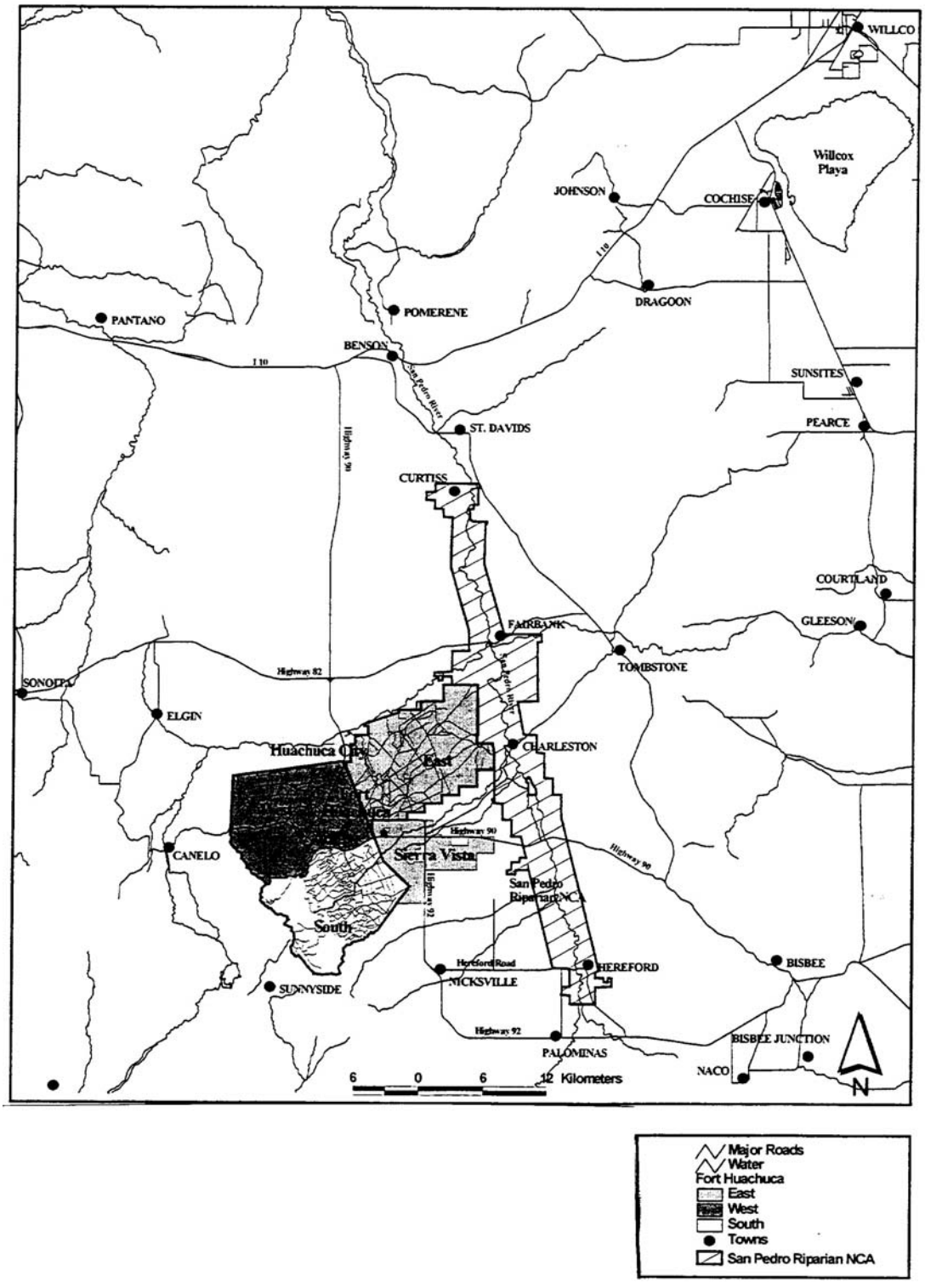
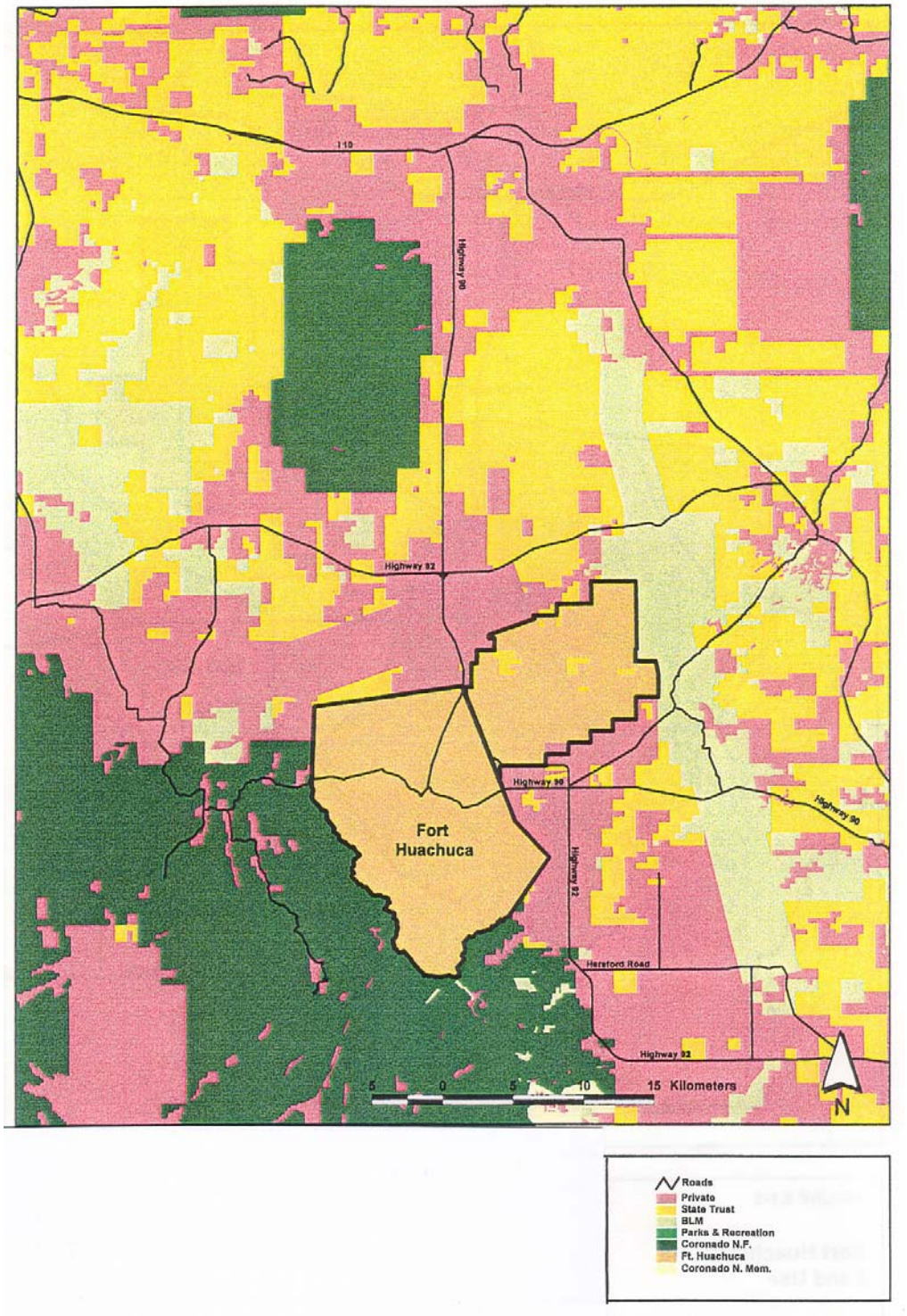


Figure 3.3: Surrounding Land Ownership, Fort Huachuca, Arizona



individuals. The Wilcox Dry Lake area is about 65 miles northeast of Fort Huachuca and covers 27,397 acres (NRCS & ENRD, 1997). The U.S. Army Electronic Proving Grounds Radar Geometric Fidelity Complex and Radar Geology Test area are located there. All support for the area comes directly from Fort Huachuca. The Gila Bend area is about 230 miles northwest of Fort Huachuca, covers 689 acres, and is under the control of Fort Huachuca. The Instrumental Service Range at Gila Bend assists the Pacific Missile Range, White Sands Missile Range, and Edwards Air Force Base.

The PBO (USFWS, 1999) lists 42 current or recent leases for Fort Huachuca.

3.5 Facilities

Fort Huachuca consists of the cantonment area and open/operational areas, including a C-5A aircraft training mockup, a leadership reaction course, short and long land navigation courses, a rappelling tower and cliffs, and live-fire ranges. Chapter 6 further describes these areas.

The following outdoor training facilities are within the cantonment:

X Obstacle Course – clover-shaped with 17 obstacles.
X Confidence Course – clover-shaped with four groups of higher and more difficult obstacles than the obstacle course.

Libby Army Airfield is located in the northernmost corner of the cantonment area. This airfield consists of a 12,000-foot, Class “B” main runway on an east-west axis; a 5,365-foot secondary runway on a southeast-northwest axis; and a 4,300-foot tertiary runway running parallel to the main runway. Support facilities, including a flight control tower, a navigational aids building, an airfield operations building, an airfield fire and rescue station, and storage buildings, are located along the southern side of the main runway. Maintenance facilities and the City of Sierra Vista air terminal are on the northern side of the airfield (Zillgens, 1991).

3.5.1 Transportation System

Fort Huachuca is accessed primarily by State Highway 90, which traverses the installation between the Main Gate and the North Gate. Fort Huachuca can also be accessed through the West Gate, which serves a low volume of traffic. About five miles north of North Gate, Highway 90 intersects with State Highway 82, and about 25 miles north intersects with Interstate 10. Highway 82 extends southwest to Nogales, Arizona where it connects with U.S. Highway 80. Highway 92 connects Fort Huachuca with the International Border through Naco, Arizona (Figure 3.1).

Fort Huachuca has 334 miles of paved roads, 136 miles of improved gravel roads, and 167 miles of firebreak roads and trails. Despite the extensive network of roads, vehicle access is difficult for many areas of the installation, particularly during wet weather.

Fort Huachuca is not served by a railway system. The nearest railhead is at Benson, Arizona. Fort Huachuca is served by commuter airlines daily from Phoenix to the Libby Army Airfield/Sierra Vista Municipal Airport on Fort Huachuca. There are three landing strips on Fort Huachuca; Hubbard, Rugge-Hamilton, and Pioneer. Hubbard Assault Airstrip is a dirt assault strip/landing zone which can accommodate C-130 aircraft. Rugge-Hamilton and Pioneer support the UAV mission. In addition, there are about 15 designated helipads on the installation, although they have not been maintained for over a decade.

3.5.2 Water

Fort Huachuca, Sierra Vista, and Huachuca City depend entirely on groundwater (Arizona Department of Water Resources, 1990). Municipal water wells servicing these population centers are located within six miles of Fort Huachuca. All have depths exceeding 800 feet; most have pumping capacities exceeding 500 gallons per minutes (gpm). Municipal wells are typically pumped at a high continuous rate throughout the peak demand period.

There are more than 80 registered wells in the two townships adjacent to Fort Huachuca (Arizona Department of Water Resources, 1995). Of these, 30 are high-capacity wells tapping the regional aquifer, with pumping capacities exceeding 100 gpm and well depths exceeding 400 feet. Fifteen of these wells are municipal water supply wells. Ten are agricultural or industrial water supply wells. Uses of the remaining five are unidentified. These wells are part of the well field of more than 46 high-capacity wells on or within six miles of Fort Huachuca. Privately-owned wells have a combined pumping capacity exceeding 18,000 gpm.

Water consumption at the installation has steadily decreased as a result of the use of treated effluent for irrigation and an aggressive water conservation program. Effluent use is discussed further in Section 3.5.3. Fort Huachuca predates most development in the Upper San Pedro Basin. The installation has some of the oldest reserved surface water claims in the State of Arizona. Most on-post surface water features are ephemeral, fed only through snowmelt and runoff from the Huachuca Mountains. Under current conditions, there are few exploitable surface water supplies on Fort Huachuca.

Local surface water is generated as storm runoff, snowmelt, and discharge from springs into the stream channels of Garden and Huachuca Canyons. Other canyons located within the boundaries of Fort Huachuca yield little water except for short durations after precipitation events. Springs were once the sole source of water for Fort Huachuca. By 1983, Fort Huachuca no longer used springs for potable water.

Groundwater is the source of Fort Huachuca's potable water supply. The total quantity of groundwater pumped by the post in 2000 was 1,843 acre-feet. Eight municipal water supply wells on Fort Huachuca have depths between 710 and 1,230 feet. Two of the wells (800 gpm pump capacity) are on the East Range and six wells (500-700 gpm pump capacity) are between the Main Gate and the East Gate. Another five wells support military testing and research activities across the post and have minimal production.

3.5.3 Wastewater System

Fort Huachuca has one operational wastewater treatment facility, the Waste Water Treatment Plant (WWTP) #2. WWTP #1 has been closed. The system includes five effluent ponds and three holding ponds. Three effluent ponds on East Range have a combined surface area of 20.7 acres and until 2001 held water year-round. The other two effluent ponds serve as emergency catch basins. The three holding ponds are adjacent to the WWTP and have a combined surface area of 9.9 acres. Construction of seven effluent recharge ponds, which will have short wet-dry cycles, and two storm water detention ponds to detain storm runoff for extended periods will be completed by the end of 2001.

During 2000, 386,752 Kgal/year entered the installation sewer system and was treated at the WWTP. About 142,577 Kgal/year are used for turfgrass irrigation, and the remaining 244,175 Kgal/year enter East Range lagoons for disposal. About 33,452 Kgal/year evaporate from these ponds. The remaining 210,723 Kgal/year are available for infiltration and subsequent recharge of the vadose zone, groundwater, and aquifers. The Water Resource Management-Volume 1: Reclaimed Water Reuse/Recharge and Volume 2:

Landscape and Irrigation Master Plan (GLHN, 1995) discuss groundwater recharge methods using reclaimed effluent.

Fort Huachuca has used treated effluent to water the golf course and a large parade field for three decades. During 2000 Fort Huachuca produced about 1,186 acre-feet of treated effluent. Currently, about 40 percent of the installation's treated effluent is used for landscape maintenance at the Golf Course, Chaffee Parade Field, and the Outdoor Sports Complex. Fort Huachuca plans to reuse or recharge all effluent generated on the installation. The projected cost for expanded effluent reuse and recharge projects in 2001 is $10 million. Future plans indicate that 86 percent of the installation's landscape requirements could be met by expanding the existing treated effluent distribution system. A 19 percent, or 460.3 acre-foot, reduction in the installation's annual groundwater demands would result from this effort.

3.5.4 Storm Water Drainage System

Storm water on Fort Huachuca is not collected or treated. Storm water flows via over-ground flow through ditches, washes, etc. to deposit in river drainages. In the future, some storm water will be directed to the sewage treatment facility.

3.6 Projected Changes in Facilities

The PBO (USFWS, 1999) lists 13 short-range Military Construction Army (MCA) projects for FY 01-04. Facilities development projects include seven MCA, non-appropriated fund, and Army family housing projects; two Operation and Maintenance Army construction projects; and ten physical upgrades or improvements to buildings. These projects will occur within the cantonment area and most will occur within previously disturbed areas. Project review through NEPA will assure that projects creating new footprints or possibly affecting natural resources get complete review for environmental concerns.

Possible projects for Fort Huachuca's open/operational areas that are currently in the conceptual stage include moving the Ammunition Storage Point to South Range. The NEPA process will be used to address environmental and natural resources concerns if these or other projects in open/operational areas are funded.

4.0 MILITARY MISSION

"*Success in the information age will go to those who have the courage to challenge themselves, who constantly innovate, and learn to adapt as they go.*"

General Gordon R. Sullivan, former Army Chief of Staff

4.1 Installation History

The *Fort Huachuca Real Property Master Plan* (Nakata, 1997) and Herbert *et al*. (1990) provide detailed accounts of Fort Huachuca's history. However, much of the following discussion is taken from the *Integrated Natural Resources Management Plan Fort Huachuca, Arizona (Draft)* (NRCS & ENRD, 1997). Other sources are specifically referenced.

The area occupied by Fort Huachuca was home to native, river-dwelling peoples, such as the Sobaipuri and Pima who lived at Bac on the Santa Cruz River and along the San Pedro River. In 1540 the territory was claimed by Spain by Captain General Francisco de Coronado. Mexico took possession of the territory in 1821, and the United States acquired Arizona north of the Gila River via the Mexican War of 1846 and the treaty of Guadalupe Hidalgo in 1848. The area that is now Fort Huachuca was part of the Gadsden Purchase of 1853.

Camp Huachuca was established in 1877 by Captain Marmaduke Whitside. The location served several military purposes: to control Native American disturbances; to effect a stronger military presence along the international boundary; to facilitate location and construction of a railroad linking Tucson to the Pacific Coast, El Paso, Albuquerque and the port city of Guaymas, Mexico; and to protect ranchers and miners on a sparsely settled frontier (Herbert, *et. al*., 1990). Camp Huachuca's name was changed to Fort Huachuca in 1882. Fort Huachuca's Cavalry primarily tried to control marauding Apaches and Mexican bandits until the surrender of Geronimo in 1886.

From 1886 to 1910 the area was relatively calm. The Mexican Revolution of 1910-1920 brought border troubles. Later-day Buffalo Soldiers from Fort Huachuca were included in the expedition to capture or kill Pancho Villa. Buffalo Soldiers of the 9th and 10th cavalry regiments and the 24th and 25th infantry regiments served at Fort Huachuca beginning in 1892 (Smith, 1976).

During WWII soldiers from Fort Huachuca in the 92nd (Buffalo) and the 93rd (Blue Helmet) Infantry Divisions were active in Europe and the Pacific, respectively. The 93rd was reactivated on Fort Huachuca in 1942 and included parts of the "old" 24th Infantry Regiment. The 92nd transferred to Fort Huachuca in 1943 and included parts of the "old" 25th Infantry Regiment (Smith, 1976).

In 1947 Fort Huachuca was deactivated. Undeveloped portions of the installation were turned over to the Arizona Game and Fish Commission, while the cantonment area was transferred to the Arizona National Guard. Ownership was transferred by quit claim deed with recapture provisions to the federal government from the State of Arizona. Undeveloped portions of the installation were managed as a bison preserve. Bison were removed in 1957 following reactivation of the installation.

Fort Huachuca was reactivated temporarily by the U.S. Air Force from January 1951 to June 1953 to support the Korean War. In 1954 Fort Huachuca was reactivated again and put under control of the U.S.

Army Signal Corps. The installation also served as the U.S. Army Electronic Proving Ground. In 1967 the installation became the Headquarters for the U.S. Army Strategic Communications Command

(STRATCOM), which later was renamed the U.S. Army Communications Command. In 1973 the U.S. Army Communications Management Information Systems Activity was assigned to Fort Huachuca. This and the Communications Command were combined into the U.S. Army Information Systems Command. In 1971 the U.S. Army Intelligence Center and School (USAICS) moved to Fort Huachuca from Fort Holabird, MD. In 1988 the U.S. Army Intelligence School mission of Fort Devens, MA., was relocated to Fort Huachuca.

4.2 Mission of the U.S. Army Intelligence Center and Fort Huachuca

In *'Count On Us' The U.S. Army: 'The World's Premier Force '* (Association of the U.S. Army, 1996) Army Chief of Staff General Dennis J. Reimer underscores the importance of training in today's Army:

> *In the future, the Army will inevitably be asked to place soldiers in harm's way with little or no notice. We will then expect them to defeat a determined and dangerous foe. When the deployment orders are issued, we must be satisfied that we have done our best to prepare them for the task at hand. Our watchwords continue to be that we will send no soldier into harm's way who is not trained for the mission.*

Military mission information presented in this Section is taken from the *Ongoing and Programmed Future Military Operations and Activities at Fort Huachuca, Arizona Programmatic Biological Assessment* (Science Applications International Corporation (SAIC), 1998a). SAIC (1998a) describes operations and activities that occur in or are programmed for specific training areas on Fort Huachuca. The *Fort Huachuca, Arizona - A Century of Development and Changing Missions 1877-1977* (Herbert *et al*., 1990) contains a detailed description of Fort Huachuca's changing missions.

The U.S. Army Intelligence Center and Fort Huachuca is the Headquarters for the U.S. Army Intelligence Center (USAIC) and the U.S. Army Signal Command (USASC). The Garrison Commander and principal training staff are integrated into the USAIC Headquarters Command, designated as USAIC&FH. Activities of major tenants assigned to the installation include:

- X research, develop, test, and evaluate concepts, doctrine, materials, and equipment in the areas of intelligence, electronic warfare, and information systems;
- X develop, conduct, and evaluate training in intelligence, electronic warfare, and information systems;
- X provide trained operational forces in the areas of intelligence and communications;
- X perform aviation operations; and
- X provide training opportunities for active duty, Reserve, and National Guard forces.

Ongoing missions and activities of military tenants at Fort Huachuca constitute the operational baseline at the installation, which is comprised almost entirely of intelligence and communications systems testing and training. These activities account for nearly 95 percent of training range use (USAIC&FH, 1997). Other supported activities on Fort Huachuca include field training exercises, aviation activities, live-fire qualification and training, vehicle maneuver training, and administrative and support activities.

Intelligence and Communication Systems

Most operational testing and training at Fort Huachuca is related to intelligence and communications systems. Units are engaged in the development and testing of various types of electronic equipment and training soldiers in the use of this equipment in classrooms and field exercises.

Intelligence and Electronic Warfare Equipment Training and Testing

A major mission at Fort Huachuca is the testing of intelligence and electronic warfare equipment and training of soldiers on intelligence operating procedures requiring realistic placement of intelligence systems over wide areas. Equipment is stationed at various Research, Development, Evaluation, and Testing (RDTE) sites across the installation and off-post to test the capability of electronic systems to operate under a variety of geographic and atmospheric conditions (USAIC&FH, 1992; 1993). Training and testing is conducted by dispatching intelligence and electronic warfare equipment to RDTE sites that meet the requirements for training.

Vehicles and personnel can be deployed to any combination of RDTE sites, but most remain on Fort Huachuca. Training sites generally consist of 1-2 vehicles with 4-6 support personnel and up to 20 students. Types of equipment include electronic, computer, or radar imaging systems. Several types of transmitting antennae are used, from small vehicle or system mounted whip antennae, to ground mounted antennae that can be raised to a height of 20-25 meters. Exercises generally last for no more than 10-11 days with 18 daily hours of operation. Some training requires groups of students to conduct limited dismounted exercises during day/night operations (USAIC&FH, 1992; 1993). This training can require 30-50 students to walk cross-country to other predetermined locations/RDTE sites.

Communications Systems Training and Testing

Another major mission at Fort Huachuca involves radio systems training and testing. Physical components of systems consist of a variety of satellite, troposcatter, high-frequency, and microwave equipment to provide communications support. Vehicles and personnel are deployed to a variety of pre-existing sites across the installation. Typical exercises last 7-14 days with 24-hour operations. Each field unit may utilize 40-80 vehicles, 50 generators, 12 communications shelters, and 80-100 soldiers per site, but generally as few as three vehicles and nine soldiers at each relay site (USAIC&FH, 1992; 1993).

The maximum area covered by a unit during training can be up to 40 acres with 13 remote site locations per exercise. Large bivouac exercises occur in predefined areas used repeatedly for such activities with relay sites located across the installation. Predefined bivouac areas often include permanent structures and concrete pads for repeated bivouac establishment.

Two types of larger exercises, simulated battalion and brigade, are also conducted. Tests are conducted year-round and might last 24 hours per day, 7 days per week, for months at a time. These activities occur at similar sites to those mentioned previously for communications training.

Aviation Activities

Aviation activities at Fort Huachuca include fixed-wing piloted aircraft training, rotary-wing piloted aircraft training, unmanned aerial vehicle testing and training, and unmanned drug surveillance balloon operation. Aviation activities generally occur at Libby Army Airfield (LAAF). The LAAF supports military aircraft involved in test and training programs, troop movements, and standard military, commercial, and private travel operations. Air operations for wildland fire suppression, border patrol

activities, and drug interdiction are supported. LAAF is also an alternate landing site for space shuttle flights.

Approximately 70,000 aviation evolutions occurred annually at LAAF from 1996 through 2000 (each landing or departure counts as one evolution). Military operations included about 50,500 evolutions or 72 percent (of these, 50 percent were jet, and 50 percent were propeller). General aviation accounted for about 11,000 evolutions or 16 percent. Commercial air traffic accounted for about 8,500 evolutions or 12 percent.

Fixed-Wing Piloted Aircraft Training

Guardrail, fixed-wing piloted aircraft training activities are ongoing at Fort Huachuca. Additionally, Fort Huachuca airspace and facilities are used by other DoD agencies for proficiency testing and training.

Individual pilot proficiency training for the U.S. Air Force and U.S. Air Force Reserve is conducted in Fort Huachuca airspace and at LAAF facilities. The most common aircraft is the ground attack A-10 aircraft flown out of Davis-Monthan Air Force Base in Tucson. Training consists of low altitude touch-and-go approaches (simulated aircraft landings and take-offs where aircraft make approaches to the airfield, simulate a landing, and depart without actually grounding the aircraft).

The Arizona Air National Guard (AZ ANG) and Missouri Air National Guard (MO ANG) use Fort Huachuca airspace and LAAF facilities on a regular basis for individual proficiency training of pilots. Drop zones on the East Range and the Hubbard Landing Zone are used by the AZ ANG and MO ANG as training flight destinations/objectives where airdrops or landings can be practiced. The Hubbard Landing Zone provides tactical airlift crews a rare peacetime opportunity to land and takeoff from a dirt runway.

Rotary-Wing Aircraft Operation and Training

Currently, very few Fort Huachuca rotary-wing aircraft operations occur at LAAF. On occasion, rotary-wing operations occur at the various helicopter landing pads across the installation and at the Black Tower Unmanned Aerial Vehicles (UAV) complex on the West Range. Typical rotary-wing aircraft operations include departure from LAAF upwards to approximately 8,500 feet above msl and subsequent cross-country travel throughout Arizona to other military installations and destinations. There are no low-level, rotary-wing aircraft training exercises conducted at Fort Huachuca.

Rotary-wing aircraft testing and training activities at Fort Huachuca use UH-60 helicopters associated with the U.S. Army Electronic Proving Ground Aviation Detachment. These helicopters attempt to electronically jam or interfere with military radio communications systems being tested.

Unmanned Aerial Vehicle Testing and Training

Fort Huachuca is a center for DoD UAV developmental testing and operational training programs. The Fort's geography, climate, remote location, and facilities provide the DOD with excellent conditions for a national UAV testing and training center. UAV activities that currently occur on Fort Huachuca include the developmental testing of a wide variety of UAVs, operational training of UAV operators and maintainers (maintenance technicians), and the development of operational combat units. Fort Huachuca has been serving the DOD in this capacity for over 10 years.

Three general size ranges of UAVs may be operating from or on Fort Huachuca at any time. These are often referred to by their size or system name. For purposes of this document, they will be described as Small, Medium and Large. The UAV program uses flight facilities on the West and East Ranges, and

stationary ground targets throughout southern Arizona. Mobile ground targets may be in southern Arizona or southwestern New Mexico. These 'targets' are for the purposes of gathering intelligence, not for any physical contact or assault. Small and Medium UAVs use Special Use Restricted Airspace in the vicinity of Fort Huachuca The large UAVs may fly both within and outside this restricted air space.
The small UAVs typically have dimensions less than 10 ft long with wingspans up to 12 ft. These UAVs have been proposed for use in military surveillance, law enforcement, and civilian rescue efforts. Medium Tactical UAVs are larger than Small UAVs but less than 25 ft long with a wingspan of less than 30 ft. These aircraft have been designed to perform accurate surveillance and reconnaissance missions under adverse environments and tactical battlefield conditions. Medium UAVs may be used in conjunction with indirect fire assets (artillery and/or mortars) or droppable payloads over the East Range impact area (Area Zulu). Large UAV systems are larger than Medium UAVs with wing spans up to 115 ft or larger. These UAVs can provide long-range, near-real-time reconnaissance, surveillance, target acquisition, and battle-damage assessment day or night and in some difficult weather conditions, as well as work in tandem with other, smaller UAVs. UAV testing and training flights take-off and land at LAAF, Rugge-Hamilton Runway, Pioneer Runway, Hubbard Assault Airstrip, the Demonstration Hill Airstrip and the old East Range Airstrip. Small UAV versions, particularly those called micros, may also take-off and land at almost any location across Fort Huachuca.

UAV testing activities involve the use of multiple UAVs of different sizes. Testing and training of UAV systems of all sizes requires the integration of additional ground or airborne monitoring and control systems for mission coordination and communication testing. Most of these systems are contained in standard military vehicles or aircraft.

Previous environmental analyses have evaluated the use of RATO for UAV operations on the Pioneer and Rugge-Hamilton runways at Fort Huachuca. Current operations includes the continued use of RATO on the West Range and the potential use of RATO on the East Range. Special environmental considerations govern the use of RATO operations.

Unmanned Drug Surveillance Balloon Operation

In 1987 an AEROSTAT (radar system) Drug Surveillance Balloon began operation in the southern portion of the South Range. The blimp-type balloon is ground-tethered and is an aerial platform for radar equipment used to detect aircraft illegally entering the U.S. (Zillgens, 1991). The AEROSTAT provides radar data for U.S. Customs, the DoD, and the FAA. They operate year-round, 24 hours per day.

Field Training Exercises

Fort Huachuca is used for training by various Fort Huachuca operational units and Fort Huachuca partner organizations. All training activities requiring use of range facilities are scheduled, coordinated, and controlled through the Range Control Office. Field training exercises consist of land navigation, patrolling and tactics training, personal development training, and vehicle maneuver training.
On occasion, training units set up bivouacs containing sleeping, mess, and other related facilities for the execution of field training exercises. Specific bivouac areas vary from exercise to exercise and do not always coincide with existing RDTE sites. All training areas except Alpha, Quebec, and Tango are used for bivouac. However, there are approximately 10 established bivouac areas on the installation. These sites are used on a more frequent basis for the larger scale communications testing and training activities. These larger bivouac areas (40 acre) are maintained as permanent areas of repeated use so as to minimize the disturbance associated with additional large set-up areas.

Land Navigation

Land navigation involves the training of personnel to accurately navigate terrain on foot and locate pre-established sites and locations. Land navigation exercises typically involve 15-20 personnel and 4-5 vehicles. Fort Huachuca has two Land Navigation Courses, in training areas Mike and Uniform. Additional land navigation training is conducted across the installation on the West and South ranges. Training in these areas is similar to that which occurs on Land Navigation Courses.

Patrolling and Tactics Training

Patrolling and tactics training occurs across the South and West ranges with exception of training areas Quebec and Tango. These exercises generally last three days and involve about 43 personnel each month of the year. Ammunition used during these operations include pyrotechnics, smoke, and M16A2 blanks. In these training exercises, soldiers maneuver on trails and cross-country (on foot) and occasionally dig holes to bury sensors near trails and roads. However, digging fighting positions, slit trenches, gun positions, sumps, or other holes, or cutting vegetation is prohibited on Fort Huachuca.

Individual Development Training

Several individual development training facilities are located on the South and West ranges and within the cantonment area including:

X a rappelling tower (training area Tango) - a two-level tower platform used for rappelling practice;
X a rappelling cliff (training area Quebec) - cliffs in Garden Canyon which vary in height from 70-100 feet;
X a rope bridge training site (training area Victor) - an open area with four upright telephone pole tops, approximately four feet high;
X a leadership reaction course (training area Uniform) - eight stations, each depicting a situation which requires the negotiation of obstacles by an expedient means; and
X a demonstration hill (training area Kilo) - may be used to conduct various types of demonstrations.

Vehicle Maneuver Training

Vehicle maneuver and driver training activities occur across the installation on roads and trails. Most vehicle maneuver training uses wheeled-vehicles and occasionally, tracked-vehicles. Wheeled-vehicle training maneuvers can include attaching and detaching trailers, loading and unloading equipment, and driver training.

Oversized vehicles are restricted to roads; whereas light vehicles can use roads and trails. No cross-country maneuvering or other use of off-road maneuvering lanes occurs or is planned. Tracked vehicles are permitted only in Bravo, Charlie, Delta, and Foxtrot training areas, and only on designated roads and trails. All existing and planned vehicle maneuver operations will:

X follow Fort Huachuca Regulation 385-8, *Range and Training Area Operations*;
X follow guidelines in the *Installation Spill Contingency Plan - Fort Huachuca, Arizona*; and
X submit Fort Huachuca Form 1155 (Revised 1 Aug 93) through appropriate channels for approval prior to commencement of maneuvers which require access to the East Range.

Off-road vehicle travel is not authorized on most of Fort Huachuca. Training areas Charlie and Delta (East Range) contain the only locations where off-road vehicle training is considered at Fort Huachuca (Figure 6.1.1b). Approximately 5,172 acres within the East Range has been designated for off-road maneuvering lanes, but no off-road activity has occurred since 1994. A biological consultation is underway between the AZ ARNG and USFWS to evaluate the effects of the use of these off-road maneuvering lanes for vehicle training. Off-road vehicle maneuvering lanes on the West Range at Fort Huachuca have been deactivated, and no off-road vehicle activity for this area presently occurs or is planned.

Live Fire Qualification and Training

Most live-fire activities take place on weapons qualifications ranges in training area Tango. Locations of these firing ranges and their associated safety fans are provided in Figure 6.1.1a. Tracer rounds are permitted on all live-fire ranges with the exception of Ranges 2, 3, and 4.

Small Arms

Small arms qualification and live-fire at Fort Huachuca occurs on only nine of 17 live fire ranges in training area Tango. Firing ranges are used for personnel qualification and training throughout the year. No live-fire exercises are allowed at night.

Artillery and Mortars

Historically, the East Range contains several surveyed firing points usable for mortar and artillery firing into impact area Zulu (see Figure 6.1.1b). These firing points support 60- and 80-mm and 4.2-inch mortars, utilizing high explosive, illumination, smoke, and weapons-piercing rounds for training. This training no longer occurs on Fort Huachuca.

Administrative and Support Activities

Administrative and support activities performed at Fort Huachuca are associated with the day-to-day operation of the installation and the ranges performed by USAIC&FH, the directorates, and partner organizations. Several administrative and support organizations at Fort Huachuca support the installation's ongoing role as a major military testing and training installation. Personnel from these organizations are located in the cantonment area.

4.3 Post Population

Population figures are determined biennially, and the most recent numbers are from the 30 March 2001 *Post Population Report* prepared by the Directorate of Resource Management. Two measures of Fort Huachuca's population are the employee population and the "noonday" population. The employee population includes military, civilian, and contractor personnel employed on the installation. The employee population in March 2001was 11,656. The Fort Huachuca noonday population includes assigned military personnel, their family members living on post, and all civilians employed on post. The noonday population in March 2001included 7,041 assigned military and 4,151 military family members. The total population, which includes civilian employees, contractors, military personnel and military dependents living on or off the installation, is estimated to be 17,702.

4.4 Relationships Between Natural Resources and the Military Mission

The conservation of natural resources and the military mission will not be mutually exclusive.[3]

Intelligence and electronic warfare trainers and testers require realistic placement of intelligence systems over wide areas just as they can expect to experience while supporting combat situations. Thus, the environment at Fort Huachuca must be maintained in as natural condition as possible.

Fort Huachuca comprises approximately 114 square miles in the basin and range region of southeastern Arizona and, as such, has the typical flora and fauna ranging from xerophytic (adapted to life in dry environments) to species requiring the more moist slopes of the Huachuca Mountains. The area ranges from mountainous terrain with steep slopes in the southwestern portion of the installation to the relatively flat terrain of East Range. The flora of Fort Huachuca is varied and includes more than 22 plant community biomes ranging from Chihuahuan Desert Scrub to Madrean Montane Conifer Forests and from Sonoran Interior Marshlands to Madrean Riparian Deciduous Forests (Brown *et al*., 1979).

The ecosystem of Fort Huachuca and the surrounding area is fairly fragile. The area typically receives about 14 inches of precipitation a year at the base of the mountains, with less at lower elevations, and up to twice as much at the highest peaks, but it is distributed bimodally (summer and winter). Soils are fragile and vulnerable to disruption, particularly in steep mountainous areas and in semidesert Scrub-Grassland. Since summer precipitation most often occurs in a monsoon pattern, disturbed soils can be easily eroded by water and wind. Soil may also be transported away from disturbed areas, leaving them void of any soil or soil-forming materials.

4.4.1 Compatibility Issues

The purpose of this section is to identify potential conflicts and incompatibility between the conservation efforts of the natural resources and their uses and the military mission. Potential conflicts may be spatial, temporal, or residual/indirect in nature. Spatial conflicts may occur when areas within Fort Huachuca contain natural resources that limit military use, or when more than one natural resource occurs within an area resulting in different management objectives. Temporal conflicts may occur when two parties intend to use an area at the same time or when planned uses are not optimized with respect to biological issues (*e.g.*, activity periods of protected species). Residual/indirect conflicts may occur when incidental noise or wildfire for example, have an effect on natural resources or their planned use.

Occasionally, conflicting military goals and conservation mandates preclude specific military activities in identified areas. This INRMP and other management plans address and work to resolve these conflicts. The following methods have been developed to avoid and minimize potential and existing conflicts.

Vegetative Resources

Twenty two plant community biomes including 68 different series and 125 associations have been identified on Fort Huachuca (Tandy, 1999) (Section 5.6.1 and Appendix 5.6.1). The extent of these associations varies dramatically based on elevation, water availability, topography, soil content, and other abiotic factors. Each vegetation association supports a diverse assemblage of wildlife; some wildlife

[3] AR 200_3, *Natural Resources _ Land, Forest and Wildlife Management*, para 2_11.

species are specific to a vegetation type, whereas others are distributed throughout Fort Huachuca and occur in all vegetation types.

Potential conflicts with the acceptable stewardship of military lands will be avoided through active planning, education, and management, and the inherent limiting effects of the terrain. Impact areas are generally off-limits to all personnel; springs and many other areas of high biological diversity are off-limits or protected by virtue of their location; and measures to protect populations and habitat of threatened and endangered species have been developed. Most testing and training is confined to lower elevation grassland and desert scrub by the natural topography with mountainous forested terrain largely avoided.

Loss of vegetative ground cover in this semi-arid environment, especially on training lands, can significantly constrain training and testing operations, because of erosion and dust problems. Preventing loss of vegetative cover is important because revegetation in this climate is difficult, costly, slow, and unreliable. Change of plant species composition, particularly when nonindigenous, invasive species become established, can have similar, if less direct, adverse impacts on training land usability by affecting soil loss and altering wildland fire risks.

Many species protected under Arizona's Native Plant Law occur on Fort Huachuca training lands, as do sensitive species tracked by cooperating agencies, such as AGFD and the USFS (Table 3, Section 5.6.3). Persistence of populations of these species on the installation will depend primarily on good stewardship of diverse plant communities, and maintaining disturbance patterns within normal ranges of vulnerability.

Federally-listed Species

The Federal Endangered Species Act of 1973, as amended (Act) requires lands under Federal jurisdiction to conserve and recover listed species. As defined in the Act, conservation is the use of all methods and procedures necessary to bring any listed species to the point where protections provided by the Act are no longer necessary. Section 7 directs the Army, *and all other Federal agencies in consultation with and with the assistance of the USFWS,* to use its authorities in furtherance of the purposes of the Act by carrying out programs for the conservation of endangered species and threatened species. Section 7 of the Act also requires the Army to formally consult and confer with the USFWS if any action by the Army may affect a listed species or critical habitat. Pursuant to these requirements and the presence of several federally-listed species on or near Fort Huachuca (Sections 5.6.3 and 5.7.6), the Army has formally consulted with the USFWS to develop measures to avoid or minimize impacts to these species.

The PBO (USFWS, 1999) issued to the Army identifies the Terms and Conditions under which the Army must operate to remain in compliance with the Act. As such, potential conflicts between threatened and endangered species conservation and Fort Huachuca military use of Army lands are being addressed to the satisfaction of both parties. In addition, endangered species management plans addressing potential conflicts and recommendations for management of endangered species and other sensitive wildlife and botanical resources are being developed to address conflicts between these sensitive resources and the military mission on Fort Huachuca.

Historic Properties

An Integrated Cultural Resources Management Plan (Van West *et al.*, 1997) was developed to address conflicts between the numerous historic properties found within Fort Huachuca (identified and as yet undiscovered) and the military mission. Chapter 12 discusses the protection of historic properties as related to implementation of this INRMP. Although many sites exist throughout the installation, historic properties and planned military training and testing activities are compatible in most cases.

Outdoor Recreation

Outdoor recreation opportunities are available to support Fort Huachuca and public quality of life, consistent with available natural resources and compatibility with the military mission. Chapter 11 describes outdoor recreation programs on Fort Huachuca. Fort Huachuca uses several methods to avoid or minimize potential conflicts between outdoor recreation and the military mission.

Hunting and fishing must be accomplished in accordance with Fort Huachuca hunting and fishing fact sheets (Appendix 11.3a and 11.3b respectively), which include procedures and other measures to preclude interference with the military mission and provide for safety.

Activities such as horseback riding, camping, and picnicking receive oversight from the Directorate of Morale, Welfare, and Recreation, which coordinates with the Range Control Office, and in the case of picnicking and camping sells permits. Fort Huachuca has recently revised its policy on off-road vehicle use, and prohibits the use of off-road vehicles, and all vehicles on the installation are restricted to roads and fire breaks. Access to caves is restricted seasonally, and is regulated by the Military Police, who require people to sign-out to use cave sites. The coordinated efforts of the various offices involved with recreation and access to Fort Huachuca allow recreational activities to occur with minimal conflicts with the military mission.

Birding, hiking, bicycling, and other “unofficial” increasing outdoor recreation activities present potential safety risks. These users are unrestricted and unmanaged, and conflicts with military operations are possible.

4.4.2 Effects of the Military Mission on Natural Resources

The Unit Leader’s Handbook for Environmental Stewardship (Department of Army, 1994) lists six primary consequences of intensive and continuous use of Army training lands:

X the loss of historical sites, vegetation, water resources, and wildlife;
X diminished quality of available realistic training areas;
X diminished operational security;
X ineffective tactical operations;
X the creation of safety hazards to personnel and equipment, and
X an increase in training, maintenance costs, and litigation.

Most, if not all, of these consequences have occurred at Fort Huachuca, some more serious than others.

Rainfall is not as low at Fort Huachuca as it is for other semi-arid areas, but due to variable rainfall patterns, precipitation is not always available when it is most needed. This, along with removal of vegetation by past off-road maneuvers, wildfires, construction, and other forms of disturbance, leave voids in vegetation that are either not easily filled, or are often filled by exotic or weedy species. These exotics compete with native plant species and the wildlife dependent upon them.

Fort Huachuca is home to several federally-listed species. These species are vulnerable not only to direct impacts (trampling, wildfire, etc), but also to habitat reduction, degradation and other indirect affects.

Fort Huachuca’s military mission is not heavily land-based. Generally, direct and repeated impacts have been restricted to localized areas, such as RDTE sites, bivouac sites, and impact and firing range areas. Overall, Fort Huachuca’s mission has preserved the natural resources upon which it is based.

4.4.3 Effects of Natural Resources or Their Management on the Military Mission

Fort Huachuca is determined to complete their testing and training mission successfully, and an integral part of that mission is good environmental stewardship. Federally-listed species on Fort Huachuca and off post, such as the case of the lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*), have required development of numerous restrictions to military operations as well as numerous management requirements. Restrictions, such as no off-road vehicle travel, prohibition of night-time training in agave management areas, prohibition of night-time UAV operation during certain times of the year, prohibited use of pyrotechnics in some areas, the closing of some roads and trails, etc., have limited the type and degree of certain military training operations that can be accomplished on the installation. The PBO (USFWS, 1999) delineates requirements of Fort Huachuca to allow continued and future military operations. These are described further in Section 8.4.2.2.1.

Management of soil resources on the installation supports the military mission by directly reducing erosion through revegetation, construction of erosion control structures, and modification of training routines. Scheduling training during the driest seasons (April through June) and allowing sufficient time for soils to dry after heavy rains before resuming training have been adopted at Fort Huachuca. Implementation of the installation's *East Range Watershed Improvement Plan* (SAIC, 1997) and other plans, such as the Garden Canyon plan (Shaw, 1999), have allowed military training to continue in areas that if not appropriately managed, may no longer support certain military missions. Several actions leading to overall increases in watershed quality on Fort Huachuca were accomplished under the ITAM program, which Fort Huachuca is attempting to reinitiate.

Water resources are limited in the semi-arid region of Fort Huachuca, and protection of water resources is important to Fort Huachuca and downstream users of water. To protect surface waters, the installation has put them off-limits to vehicles and other intensive testing and training activities. The installation's numerous conservation measures, such as the effluent reuse program, reduced water scheme, and xeriscaped landscaping, have significantly decreased the amount of water required by the installation. Fort Huachuca has supported many studies related to groundwater in the region.

Fort Huachuca's military mission has adapted to requirements for management of the installation's natural resources. Fort Huachuca is proving that the mission and natural resources management are neither mutually exclusive, nor inherently incompatible.

4.5 Future Military Mission Impacts on Natural Resources

It is difficult to quantify effects of future military missions on natural resources at Fort Huachuca. If basic mission, land area, and intensity of missions remain unchanged, mission impacts on natural resources will remain similar to those today. Fort Huachuca's primary mission is not likely to change, nor in this era of declining resources, is the size of its land area. However, this may not be true for mission intensity.

The Army is being required to make do with less in terms of both quantity and quality of training lands. Effective training resources must be managed so as to not exceed the optimum training carrying capacity of sites to ensure the long-term use of the resource can be guaranteed. Now that Base Realignment and Closure is being implemented, other military missions may look toward Fort Huachuca to fulfill their future training needs. Training, such as basic training, land navigation, etc., could be accommodated at Fort Huachuca, but heavy equipment or armored and gun units probably could not. Even foot training could impact resources by such things as trampling vegetation, dispersing wildlife, and increasing erosion. New missions will be closely scrutinized and undergo NEPA review processes to determine their compatibility with the current mission and resources of Fort Huachuca.

There are numerous positive effects of the military mission on natural resources. The most general and most significant on Fort Huachuca is long-standing commitment to natural resources management, including minimizing and repairing military mission damage. This natural resources commitment is beneficial for both the resources and the users. Also, the presence of Fort Huachuca continues to preserve native ecosystems by preventing development and by ensuring that land uses are conducted in a manner that protects the environment.

5.0 NATURAL RESOURCES AND CLIMATE

Much of the background information presented in this Chapter is taken from the *Ongoing and Programmed Future Military Operations and Activities at Fort Huachuca, Arizona Programmatic Biological Assessment* (SAIC, 1998a). SAIC (1998a) contains more detailed discussions of many topics discussed below, particularly hydrologic resources and issues surrounding those resources. Other sources are specifically referenced.

5.1 Topography and Physiography

The San Pedro River Basin is typical of the Basin and Range Physiographic Province, with elongated north-south trending, block-faulted mountains surrounding a central valley filled with deep alluvium. Topography of Fort Huachuca and the surrounding area is shown in Figure 5.1. The basin is divided into two distinct geographic units, referenced as the Upper San Pedro Basin (USPB) and Lower San Pedro Basin (LSPB). The USPB extends from the headwaters in Mexico to the "narrows" north of Benson, and the LSPB extends from the narrows to the Gila River (Arizona Department of Water Resources (ADWR), 1988). The USPB is further divided into the Benson and Sierra Vista subwatersheds. The Sierra Vista subwatershed contains Fort Huachuca, the City of Sierra Vista, Huachuca City, and most of the San Pedro Riparian National Conservation Area (SPRNCA).

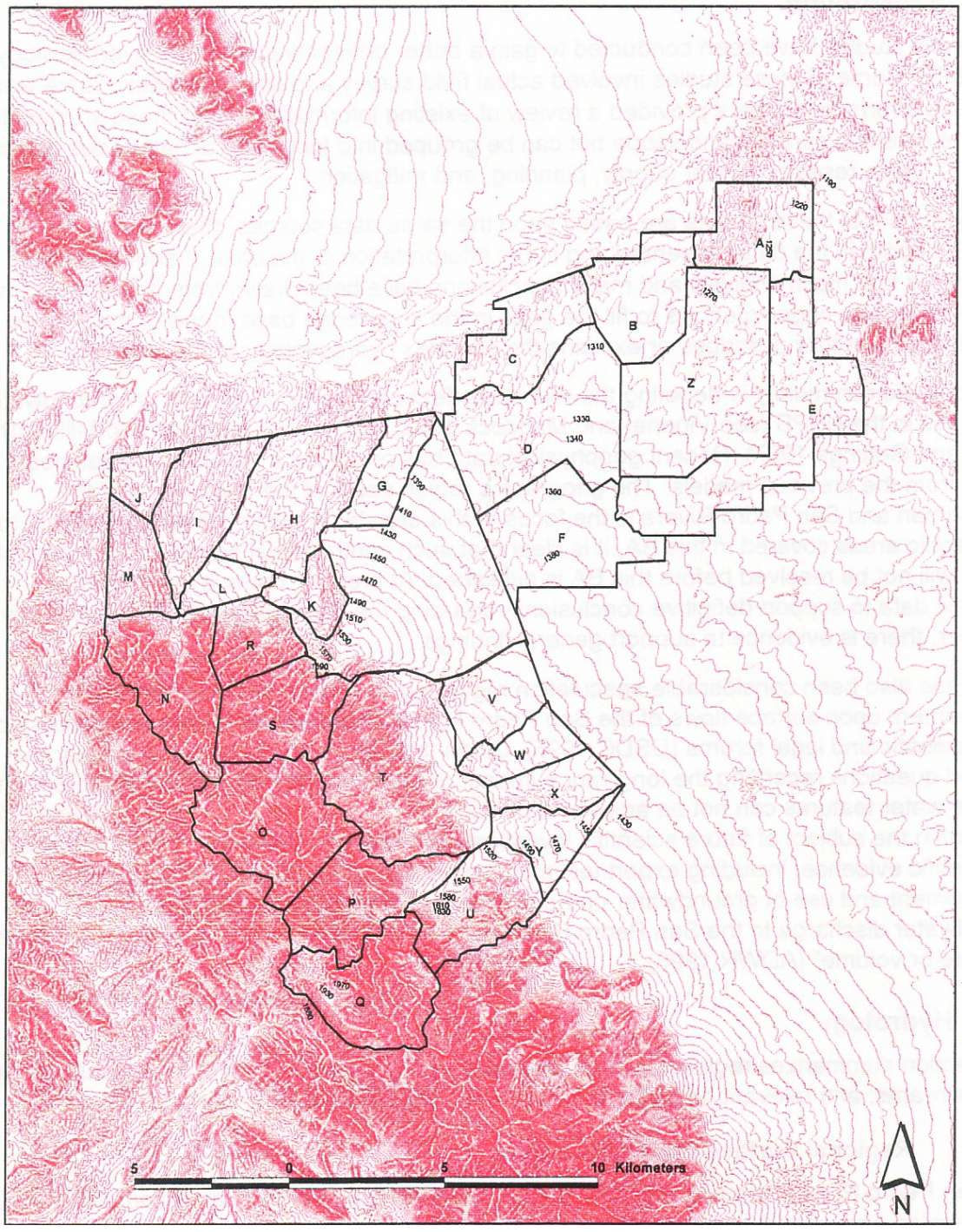
Principal geographic features of the Sierra Vista subwatershed include the Huachuca Mountains; pediment surface and floodplain; several unconnected washes, canyons, and draws; and a small tributary system feeding Soldier Creek. The San Pedro River is about 10 miles east of Fort Huachuca's Main Gate and 0.5 mile east of the installation's eastern boundary. The Babocomari River is within about 0.25 mile of the installation's northern boundary.

The USPB comprises an area of approximately 2,500 square miles. The basin slopes gradually downward from south to north, resulting in a northward surface water flow. Surrounding mountain elevations range from 4,400 to 9,500 feet above msl, while valley floor elevations vary from approximately 4,800 feet near the headwaters in Mexico to 3,300 feet above msl at the narrows (ADWR, 1988). Elevations on Fort Huachuca range from about 3,925 feet above msl in the extreme northeastern portion of the installation to about 8,625 feet above msl on the crest above Scheelite Canyon.

5.2 Geology

The geology of the area between the San Pedro River and the Huachuca Mountains is complex. Remnants of a volcano, active from about 66 to 73 million years ago, are exposed in the beds of the Babocomari and San Pedro rivers and in numerous rocky hills extending from the town of Tombstone to the northern part of the Fort Huachuca East Range. Weathering and erosion have obscured most of the original crater; however, beneath the relatively young alluvium of the Babocomari and San Pedro rivers lies an undulating surface of hard volcanic rock (Cochise County, 1993). The degradation process formed a pediment composed of eroded volcanic detritus and entrained material scoured from original mountain slopes. Minerals in the detritus dissolved and re-crystallized over time, thereby cementing the once loose

Figure 5.1: Topography of Fort Huachuca, Arizona and the Surrounding Area



and porous mix into a nearly impermeable mantle encircling much of the northern and eastern flanks of the Huachuca Mountains. This formation, identified as the Pantano (Brown *et al*., 1966) or Tertiary Conglomerate inhibits the flow of mountain runoff into the regional aquifer.

Fort Huachuca includes the northeastern portion of the Huachuca Mountains and part of the upper San Pedro river valley. The Huachuca Mountains are a faulted complex of Precambrian granitic rocks overlain by Paleozoic sedimentary and metamorphic rocks (NRCS & ENRD, 1997). Much of the valley has been dissected and deeply incised by intermittent drainages.

The oldest outcrops in the Huachuca Mountains are Precambrian granitic rocks. This unit is overlain primarily by Bolsa Quartzite. This formation is overlain by a sequence of limestone and dolomite with interbedded sandstones, shales, and siltstones. The Abrigo, Martin, Escabrosa, and Horquilla limestones are the principal geologic formations, oldest to youngest, in this sequence. The youngest Paleozoic-age sedimentary rocks in the northeastern Huachuca Mountains consist of the Morita Formation and the Glance Conglomerate. The Morita Formation is an assemblage of siltstones and mudstones with lesser amounts of sandstone. The Glance Conglomerate consists of cemented cobble and boulder-sized rock fragments.

The USPB in general is underlain by several hundred feet of consolidated and unconsolidated sedimentary deposits, most of which are capable of transmitting groundwater. These deposits are not uniform and may be more than 1,000 feet thick in the south, where basin and range type faulting has produced a deep graben structure (BLM, 1989), and significantly more shallow in other areas. Valley fill deposits along the northeastern fringe are bisected by deep structural faults and at least one volcanic body. The principal regional hydrostratigraphic features are upper and lower units of unconsolidated basin fill and overlying floodplain alluvium, forming regional and local aquifers.

Geophysical studies confirm the presence of a volcanic body at the approximate confluence of the Babocomari and San Pedro rivers. Wynn and Gettings (1997) have identified a volcanic center and show that parts of the Tombstone Caldera underlie the eastern margins of Fort Huachuca. Volcanic features may play an important role in defining the local groundwater system (Wynn and Gettings, 1997).

5.2.1 Hydrogeology

Most available water is found in a regional aquifer that extends beneath much of the San Pedro basin. In some places, the regional aquifer is disrupted by faulting or other geologic phenomena, and groundwater may be found in subregional or local aquifers. Floodplain aquifers are shallow and more directly connected to surface flow in adjacent streams. Perched aquifers usually represent relatively small volumes of water trapped by impervious layers of rock or sediment. Aquifers receive most of their recharge from mountain fronts and stream channel and valley floor infiltration. Mountain front recharge consists of surface runoff from impermeable surfaces and steep slopes that flows over and infiltrates into permeable basin fill alluvium and eventually reaches the water table. Stream and valley floor infiltration is related to the percolation of surface water downward through alluvial sediments that eventually reach the water table.

Upper and lower basin fill deposits are a major source of groundwater in the USPB and are referred to as the “regional aquifer”. About 1,200 square miles of the USPB is covered by basin fill and floodplain alluvium deposits. The lower unit of the basin fill consists of interbedded sandstone and gravel, ranging in

thickness from 250 to 500 feet. Typically, the unit consists of interbedded layers of gravel, silt, and other fine-grained sediments, exhibiting wide ranges in permeability across the range and depth of the unit. A unit of more recent basin fill overlies the lower unit. This unit consists of sandy, clayey, and silty gravel

beds originating near the mountain fronts. Perched layers are sufficient to provide water wells with limited yields. Several ranch wells derive water from this source; however, volumetrically, perched water is not a significant regional source of supply.

Groundwater generally occurs under unconfined or water table conditions in most of the aquifer. Groundwater may occur under confined conditions where permeable and saturated alluvium is overlain by impervious silt or clay lenses. The two areas in the USPB where confined conditions in the aquifer exist are the Palominas-Hereford area and the St. David-Benson area (Roeske and Werrel, 1973). Another local water table aquifer also exists on the pediment in the Fort Huachuca area (Harshbarger and Associates, 1974). Groundwater flow in the unconfined portion of the aquifer is generally from valley margins near the mountains toward the San Pedro River. Local barriers to flow and centers of groundwater pumping cause exceptions to the general flow direction in some areas.

The floodplain alluvium consists of unconsolidated gravel, sand, and silt derived from erosion of surrounding pediment gravels, mountains, and hills along the San Pedro River. Floodplain alluvium thickness generally ranges from 10 - 40 feet to over 100 feet and may approach 150 feet in places (Roeske and Werrell, 1973).

The width of the floodplain alluvium ranges from less than a few hundred yards to several miles. Because of the unconsolidated character of these units and their high permeability, water withdrawn from these aquifers is rapidly replaced through recharge from streamflow during periods of runoff.

The flow of water in the floodplain alluvium is hypothesized to be at an oblique angle to the San Pedro flowing in a northerly direction. The floodplain alluvium is recharged by streamflow, by upward leakage from the underlying confined portion of the regional aquifer, from lateral flow from the regional aquifer, and by deep percolation from farming activities. In the vicinity of the Babocomari River, a large volcanic plug appears to separate the regional aquifer into west and east units. The plug may isolate the west unit from the floodplain aquifer. The USGS has conducted radionuclide tracer studies which appear to indicate that more water is entering the San Pedro River system from lower elevations and possibly indicates a recharge source closer to the river rather than from the Huachuca Mountains to the west (Poole, 1997).

Water-level changes in the floodplain alluvium show seasonal fluctuations. Flood flows recharge the alluvium each summer and winter, often filling the available storage space to capacity. There have been no long-term declines in water levels of the floodplain alluvium (ADWR, 1991).

A hydrogeologic investigation of the Huachuca Mountains in the vicinity of the Fort was conducted by the USGS (Brown *et al.*, 1966). Most information below is summarized from that report.

The Huachuca Mountains consist of a faulted complex of granite, carbonate rocks, conglomerate, and claystone beds. Thick limestone, dolomite and claystone beds dip 30-40 degrees and are highly fractured. The beds are cavernous where water has dissolved carbonate along fractures and bedding planes. Groundwater generally moves downgradient through interconnected fractures and caverns following local topography. Large springs occur in canyons where downgradient flow is interrupted by impermeable rocks, such as cemented sandstone, siltstone, mudstone, granite, or intrusive dikes.

Groundwater generally flows northeasterly from the east face of the Huachuca Mountains. San Pedro basin fill units are recharged by infiltration through canyon stream channels where runoff from side slopes collects and on alluvial fan slopes along the mountain front. Although some storm runoff recharges the groundwater basin, most infiltrated water is eventually returned to the atmosphere via transpiration. Springs in the Huachuca Mountains are recharged by infiltrating water that is captured by fractures in the carbonate rocks.

Besides the regional aquifer, a local perched aquifer exists along the pediment of the Huachuca Mountains in a zone where the alluvium of the basin fill is underlain at shallow depths by bedrock. The perched aquifer extends from the area of Carr Canyon toward the Fort Huachuca boundary and extends northeasterly toward the San Pedro River (Harshbarger and Associates, 1974). Brown *et al.,* (1966) suggest that a bedrock ridge or northeastward-trending "nose" of low permeability rock may cause a steep north-dipping configuration of the water table southeast of Fort Huachuca and north of Garden Canyon.

5.2.2 Petroleum and Minerals

Silver and lead have been reported to occur at Manila Mine, and gold and lead have been reported in the vicinity of Huachuca Peak (SAIC, 1998b). Scheelite, a mineral containing tungsten, was mined just south of Fort Huachuca. Sand and perhaps granite have been mined in Slaughterhouse Wash along the northern slope of the Huachuca Mountains. Sand, gravel, and crushed rock have been mined in Garden Canyon. There is currently no mining occurring at Fort Huachuca. There are no known petroleum reserves.

5.2.3 Caves

Fort Huachuca has eleven known caves of various types and sizes. A few other caves are reliably reported, but not yet located. Caves and old mine openings are an important resource, primarily because of the fauna that use them and the prehistoric and historic human use of caves. Several of these caves also have geological and paleontological value, including numerous, diverse cave formations remaining despite years of visitation and some vandalism. Manila Mine and Lower Pyeatt Cave are used by the endangered lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*) as roost sites, and two caves, Lower Pyeatt and Indecision, are highly preferred for recreational caving. Pyeatt Cave has been surveyed and mapped in detail. Indecision Cave has also been surveyed and mapped, and photomonitoring points have been established for visitor impact monitoring. For documentation of work in Indecision Cave, a photographic catalogue, impact mapping, and management recommendations were developed.

5.3 Soils

Fort Huachuca exhibits diverse soil depths, textures, and chemical properties, directly related to differences in climate, parent material, and topography. About 30 percent of the soils are less than two feet in depth over bedrock. Soil physical and chemical properties have an influence on the plant communities of the installation and the uses and management of soils by the Army. Soil management is a significant operational consideration at Fort Huachuca. The *Soil Survey of Fort Huachuca* (NRCS, 1997) characterizes soils at the installation, locations of soil types, and potential uses (Figure 5.3).

The NRCS system classifies soils into four groups based on infiltration capacity and ability to transmit water. The mountain front property is dominated by soils classified as hydrologic soil group “D”, with some types classified as hydrologic soil group “C”. Group “D” soil types have very slow infiltration rates when saturated and have an extremely low water transmission rate. These properties are usually caused by a high percentage of clays, claypans or clay layers near the surface, or shallow soils overlying nearly impervious bedrock near the surface. Group “C” soil types have moderate to slow infiltration rates when thoroughly wet and have a slow water transmission rate. Both types promote higher amounts of runoff from storm events.

Many soils in the hilly and mountainous areas, particularly on the South and West ranges, are shallow on steep slopes. These soils tend to be droughty with a low available water capacity and are susceptible to

erosion. High sodium and gypsum contents of many soils on the East Range make these soils subject to gully erosion and piping, and they also are very corrosive to concrete and steel. Soils of the cantonment area consist of alluvial fan soils (White House complex, Lanque soil, Courtland-Sasabe-Diaspar complex, Blacktail-Pyeatt complex, Blakeney soil, and Combate soil (Svetlic, 1994). Almost one-quarter of the installation has deep red clay soils that have slow permeability and are poorly drained. They become very slippery when wet and are susceptible to compaction.

Other properties of soils influencing land use and management are gravely or rocky soils, soils with hard pans, and deep, doughty, sandy soils. Potential rooting depth of the installation's soils is 60 inches or more. Soil-related management factors for soils include flooding hazards and water erosion for the Ubik complex; droughtiness and wind erosion hazards for the Tombstone-Caralampi complex; droughtiness, slow permeability, and high gypsum content for the Libby-Gulch complex; and wind erosion hazards for the Courtland-Sasabe-Diaspar complex.

5.4 Water Resources

5.4.1 Surface Water

The San Pedro River is a major regional stream, draining about 4,600 square miles and extending almost 200 miles from its headwaters in Sonora, Mexico to its confluence with the Gila River near Winkelman, Arizona. Fort Huachuca lies in the Sierra Vista subwatershed of the USPB. Figure 5.4.1 shows regional and local surface water resources.

Surface water flows on Fort Huachuca originate within the installation boundary because of the specific design of early land withdrawals for the military reservation, with exception of Brown Creek in Brown Canyon, which originates in the Miller Peak Wilderness Area. Most surface water features on Fort Huachuca are ephemeral streams, consisting of dry washes, arroyos, or continuous and discontinuous gullies. Ephemeral streams are dry and only flow in response to significant precipitation events.

Figure 5.3 Soils of Fort Huachuca, Arizona

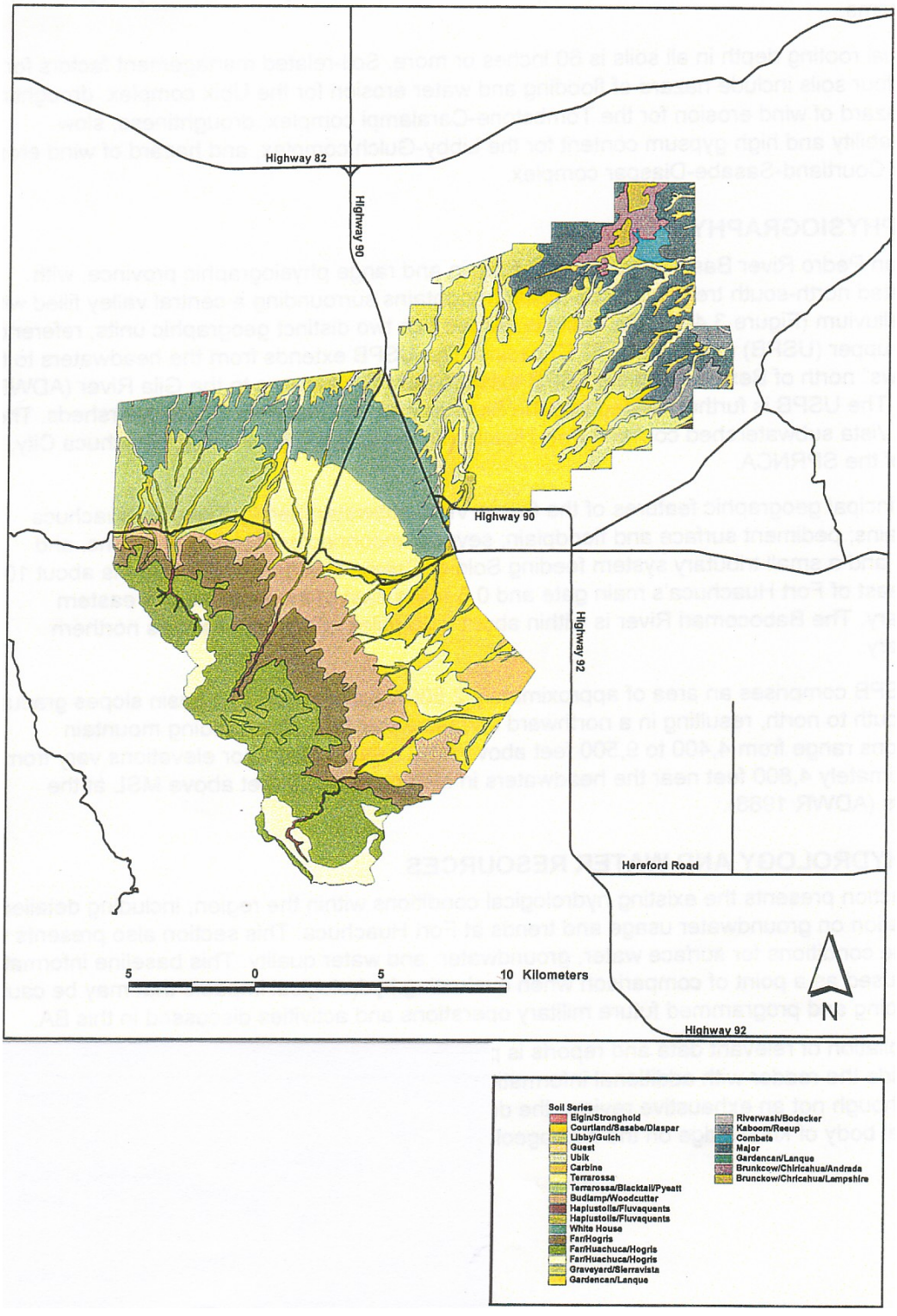
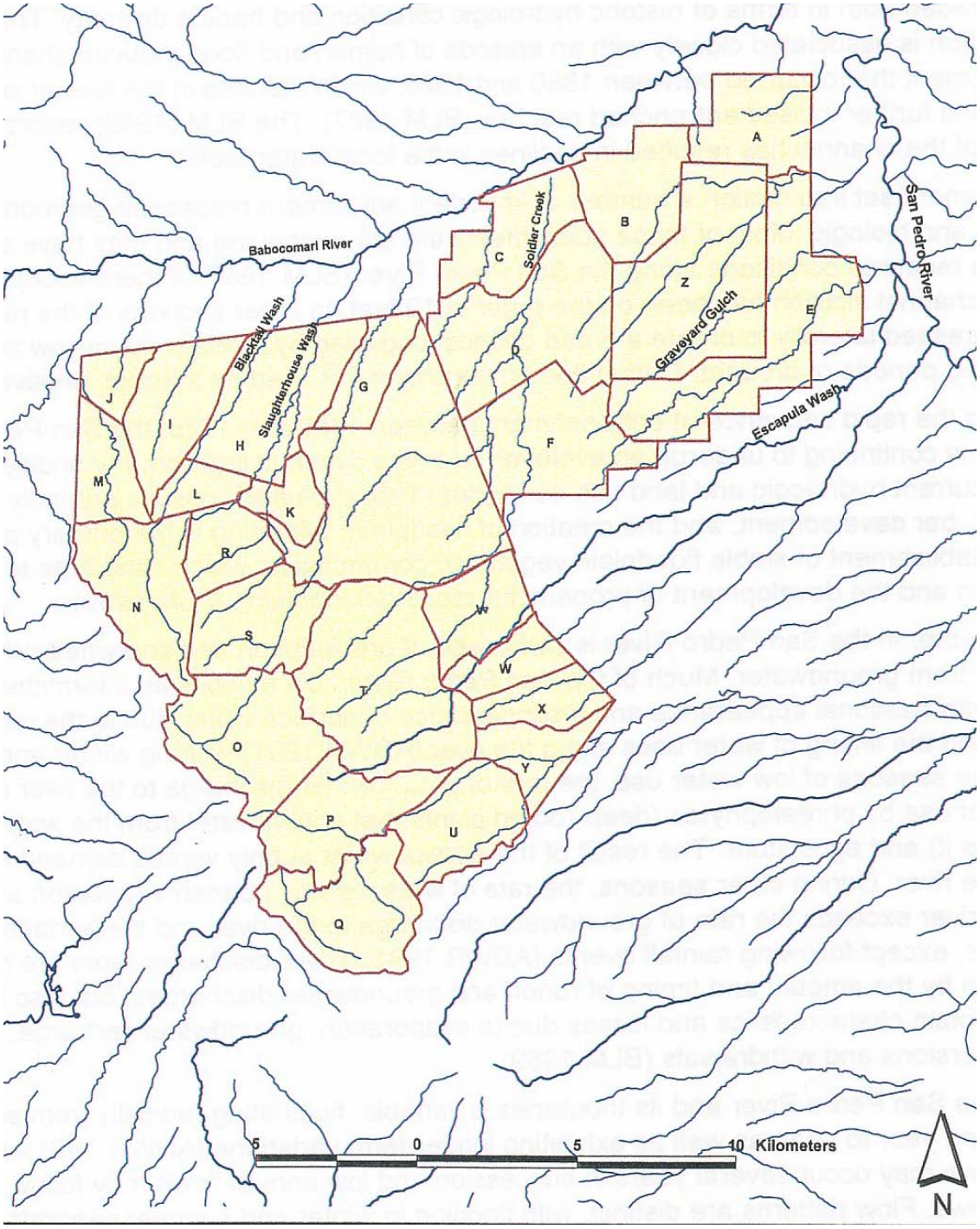


Figure 5.4.1: Surface Waters of Fort Huachuca, Arizona and the Surrounding Area



Ephemeral streams on Fort Huachuca are typically narrow channels with sand and gravel layers at the bottom of channels. Some channels are deeply entrenched. Garden and Woodcutters creeks from the southern end of the installation drain through Sierra Vista and directly into the San Pedro River. Drainages on the installation north of Garden and Woodcutters creeks drain into the Babocomari River, a major tributary of the San Pedro River.

Fort Huachuca has about 4.5 miles of perennial streams (Garden Canyon - 3.5 miles, Huachuca Canyon - 0.75 miles, minor lengths in McClure and Blacktail canyons). There are 39 known springs on the installation.

There are 16 ponds with about 32 acres of surface area on Fort Huachuca. Table 1 below lists installation ponds, location, size, and depth.

Table 1: Ponds on Fort Huachuca

Pond	Game Management Area	Size (Acres)	Depth (Feet)
Golf Course	V	5	>14
Officers Club	Cantonment	3	>15
Gravel Pit	T-2	5	>13
Woodcutters	T-3	2.5	>15
Fly	T-1	3.25	5
Lower Garden	Y	2.5	8
Middle Garden	U	2	8
Sycamore I	H	2.5	15
Sycamore II	J	1.75	7
Tinker Canyon	U	1	8
Blacktail	N-2	1.5	-
Hidden	I	0.75	2.5
Antelope	I	1.5	2
Laundry Ridge	K	-	-
Upper Garden	Q	-	-
Kino	M	-	-

Surface water derived from the Babocomari River is relatively good quality (BLM, 1989), but parts of the San Pedro River are impaired under Section 303d of the Clean Water Act, according to the EPA. Parameters of concern are fecal coliforms, nitrates, and turbidity (www.epa.goc/iwi/303d/15050202_303d.html). Water quality in the San Pedro River has been monitored for decades by a number of State and federal agencies. Pollutant releases have historically occurred when intense rainstorms cause failure, breach, or emergency release from holding ponds, sewage lagoons, and tailings dams. On occasion, sewage or mining wastes not associated with the installation have been intentionally or accidentally released, usually to create additional storage capacity. Such events have significant impact on downstream water quality and have historically harmed downstream uses and users of San Pedro River water.

5.4.2 Groundwater

There has been considerable controversy involving the use of groundwater by Fort Huachuca and possible effects of that use on groundwater and riparian resources. This INRMP addresses natural resources activities that may affect groundwater and incorporates land management practices to enhance water recharge, evaluate the potential effects of the installation's groundwater use off the installation. To mitigate potential effects of Fort Huachuca's groundwater use, the Army has agreed to implement many water conservation and effluent reuse

measures. Fort Huachuca's PBO includes information on these measures. A water resources management plan for Fort Huachuca is under development.

Herbert *et. al*. (1990) presents a detailed description of the purposes for which water was reserved for operation of the installation from 1877 throughout its subsequent history. SAIC (1998a, Appendix C) provides a summary of published literature pertaining to the better understanding of the hydrogeology of the USPB. The PBO (USFWS, 1999) provides discussions of the possible impacts to threatened and endangered species, particularly the Huachuca water umbel and southwestern willow flycatcher, from Fort Huachuca's groundwater pumping activity.

A regional aquifer extends beneath much of the San Pedro basin and provides most of the water to the area. Groundwater generally occurs under unconfined or water table conditions in most of the aquifer. Besides the regional aquifer, a local perched aquifer exists along the pediment of the Huachuca Mountains. Groundwater is further discussed in Section 5.2.1 - *Hydrogeology*.

Generally, the chemical quality of groundwater obtained by Fort Huachuca and other users in the USPB is good; suitable for domestic uses. The chemical quality of water withdrawn from the floodplain aquifer is good and considered suitable for most uses, although there may be areas with elevated levels of fluoride and sulfate as found in St. David and Benson. Groundwater on the installation is treated with chlorine. No other treatment is required.

5.5 Climate

The USPB has a dry climate with relatively mild winters and warm summers. Fort Huachuca's climate ranges from hot in dry valley bottoms to cool on moist mountain peaks. The principal meteorological station is located just south of LAAF. Thirteen remote meteorological stations on Fort Huachuca, and three off the installation along the San Pedro River, also collect data on temperature, precipitation, wind speed, soil temperature, relative humidity, solar radiation, and barometric pressure.

5.5.1 Precipitation

The Huachuca Mountains receive an average annual precipitation exceeding 30 inches per year (ADWR, 1988). About 60 percent of annual precipitation falls during the summer "monsoon" season, and about 30 percent occurs during winter. Spring and fall are typically dry (Sellers and Hill, 1974). Maximum "monsoonal" precipitation falls on the southeastern (windward) side of the Huachuca Mountains (ADWR, 1988). Average annual precipitation at Fort Huachuca is 15 inches. Roughly one-tenth of the winter precipitation falls as snow, but snow rarely remains for more than a day or two, except at high elevations.

5.5.2 Temperature

Average minimum and maximum daily air temperatures at the LAAF station are 35° Fahrenheit (F) in January and 90° F in June (NRCS & ENRD, 1997). The average yearly temperature is 62.1° F with a high average yearly temperature of 74.3° F and a low average yearly temperature of 50.4° F (NRCS & ENRD, 1997). The summer average high temperature is 88° F, and the average winter low is 32° F. Clear skies or high thin clouds are common and permit intense surface heating during the day and rotational cooling at night, creating large diurnal temperature fluctuation that averages about 30° F. The growing season averages about 232 days, but for native vegetation there are two seasons of growth regulated by precipitation (Shaw, 1999).

5.5.3 Winds and Severe Weather

The average wind velocity on Fort Huachuca is seven miles per hour. Daily wind gusts of 20-30 miles per hour are common. The potential for severe weather at Fort Huachuca is relatively low. Tropical storms and hurricanes from the Pacific and Gulf of Mexico and winter Pacific storm systems occasionally bring enhanced or extended rainfall to the area. Tornadoes are rare in southeastern Arizona, but summer storms can bring hail and high winds. Intensity and frequency of storms vary greatly from year to year. Lightning strikes are common during convective thunderstorms in summer.

5.6 Flora

Fort Huachuca plant species composition and vegetation productivity are largely determined by rainfall distribution (as influenced by topography). At lower elevations within the San Pedro River Valley, xerophytic (adapted to life in dry environments) shrubs and grasses provide sparse vegetative cover, while stands of trees and shrubs predominate on the moister slopes of the Huachuca Mountains. Nearly 1,000 species of plants have been identified on the installation (Appendix 5.6.2).

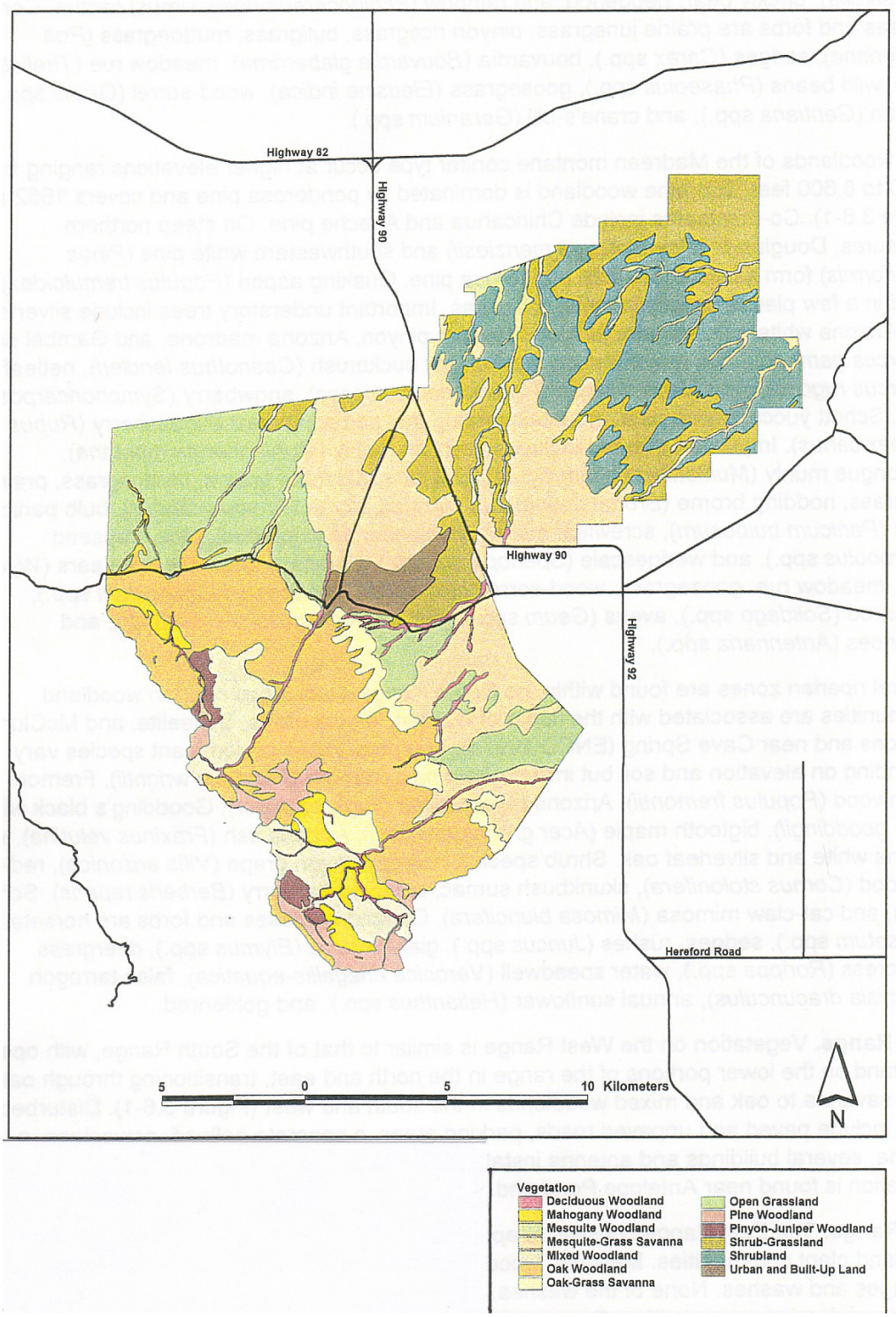
The distribution and composition of vegetation in the region has been affected by a series of natural and human-caused disturbances, including intense grazing until 1887, a major earthquake in 1887, fires and heavy rainfall following the earthquake, intermittent drought, woodcutting, continued moderate grazing, natural fire suppression, and troop training. Large areas of semi-desert grassland have been invaded by velvet mesquite (*Prosopis velutina*) since the turn of the century. Other native grassland areas on the installation have been invaded by Lehmann lovegrass (*Eragrostis lehmanniana*), a warm season perennial from Africa introduced to the area in the 1930s and 1940s.

5.6.1 Vegetation Types

Fort Huachuca includes vegetation types ranging from scrublands, scrub-grasslands and open grasslands of the lowlands through oak-grass savannas and oak woodlands of the foothills, to oak and pinyon-juniper woodlands or conifer forests of the upper elevations. Thirteen vegetation types have been mapped on Fort Huachuca (Figure 5.6.1). All vegetation types known or expected to occur on Fort Huachuca along with LCTA monitoring plots established in the various plant communities are listed in Tandy (1999) and in Appendix 5.6.1. Table 2 below compares occurrence of these vegetation types on the South, West, and East Ranges at Fort Huachuca.

In addition to upland vegetation types, four riparian forest types have been mapped on Fort Huachuca: Interior Southwestern Riparian Deciduous Forest and Woodland (Mesquite Series and Cottonwood-Willow/Mixed Broadleaf Series), Madrean Riparian Deciduous Forest, and Rocky Mountain Riparian

Figure 5.6.1: Vegetation Types on Fort Huachuca, Arizona



Deciduous Forest. Garden, McClure, Cave Spring, Scheelite, Sawmill, Huachuca, and Blacktail canyons support most of the 674 acres of higher elevation riparian habitat on Fort Huachuca. Most mesquite riparian forest or woodland is on the East Range.

TABLE 2: VEGETATION TYPE OCCURRENCE COMPARISON (TANDY, 1999)

	South Range (Acres	West Range (Acres)	East Range (Acres)	Total (Acres)
Vegetation type **Vegetation formation** **Climatic zone and formation type** **Regional formation (Biome)** **Series** **Association**				
Upland Desertland Warm Temperate Chihuahuan Desertscrub	0	0	10,411	10,411
Grassland Warm Temperate Scrub-Grassland Mixed Grass-Scrub Mixed Grass-Prosopis spp. Mixed Grass-Mixed Scrub Madrean Grassland	 3,945 2,636 1,329	 7,219 7,648 237	 17,004 0 0	 28,168 10,284 1,566
Cold Temperate Madrean Montane Grassland	83	2	0	85
Scrubland Warm Temperate Interior Chaparral Mountain Mahogany	1,025	327	0	1,352
Forest and Woodland Warm Temperate Madrean Evergreen Forest and Woodland Encinal (Oak) Oak Pinyon-juniper Oak-Pine Cold Temperate Madrean Montane Conifer Forest	 7,162 292 2,257 1,652	 5,568 256 713 38	 0 0 0 0	 12,730 548 2,970 1,690
Wetland Forest Cold or Warm Temperate Riparian Forest	697	321	18	1,036

	South Range (Acres	West Range (Acres)	East Range (Acres)	Total (Acres)
Urban and constructed land	0	1,395	0	1,395
Total	21,078	23,724	27,433	72,235

South Range

Open Scrub-Grasslands and mesquite Scrub-Grasslands cover 6,578 acres and occur in predominantly flat or gently sloping expanses and shallow drainages in the eastern portion of the South Range. Scrublands, woodlands and forests of various types cover 12,854 acres and occupy the western portion of the range, which has mountainous, often steep terrain including several large canyons. In the firing range areas, disturbance includes paved and unpaved roads (including many fire breaks), parking areas, towers, firing structures, and areas of frequent accidental vegetation burns in the flat areas and lower slopes of the foothills.

Predominant vegetation types in the eastern portions of the South Range are open Scrub-Grassland and mesquite Scrub-Grassland which cover 6,578 acres. Elevations for these vegetation types range from about 4,200 to 5,100 feet above msl. This is the largest vegetation type on Fort Huachuca. Common species include velvet mesquite, Palmer agave, sotol (*Dasylirion wheeleri*) and a variety of grasses including gramas (*Bouteloua* spp.), lovegrasses (*Eragrostis* spp.) and muhlies (*Muhlenbergia* spp.). Cacti, such as cane cholla (*Opuntia spinosior*), prickly pears (*Opuntia* spp.), pincushions (*Mammillaria* spp.) and hedgehogs (*Echinocereus* spp.) are also common in certain associations.

A mixture of oak woodland and montane grassland occurs from approximately 5,000 feet to 5,800 feet above msl. Typical tree species are evergreen oaks (Arizona white oak - *Quercus arizonica,* Emory's oak - *Q. emoryi,* Mexican blue oak - *Q. oblongifolia)* and alligator juniper (*Juniperus deppeana*). Some velvet mesquite occurs in this vegetation type. The canopy cover of trees is generally less than 15 percent. Major grasses include bull muhly (*Muhlenbergia emersleyi*), sideoats grama (*Bouteloua curtipendula*), onesided crinkleawn (*Trachypogon secundus*), plains lovegrass (*Eragrostis intermedia*), single threeawn (*Aristida orcuttiana*) and, under trees, pinyon ricegrass (*Piptochaetium fimbriatum*).

Montane scrublands, woodlands or forests dominate higher elevations of the range. Oak woodlands and mountain mahogany and other scrublands occur at elevations ranging from 5,200 to 7,200 feet above msl. Arizona white, Emory's and silverleaf oaks (*Q. hypoleucoides*) dominate many areas, while alligator juniper and border pinyon (*Pinus discolor*) are important co-dominants. On steep limestone slopes, mountain mahogany (*Cercocarpus montanus* variety *paucidentatus*) often forms a dense scrubland. Within the evergreen forests in canyon bottoms or on cool northern exposures, pine species, such as Apache (*Pinus engelmannii*), Chihuahuan (*P. leiophylla* variety *chihuahuana*), Arizona (*P. arizonica*), southwestern White (*P. strobiformis*) and ponderosa (*P. ponderosa* variety *scopulorum*) occur as well as Arizona madrone (*Arbutus arizonica)*. Important shrubs include sacahuista (*Nolina microcarpa*), Schott's yucca (*Yucca schottii*), Pointleaf manzanita (*Arctostaphylos pungens*), Wright's silktassel (*Garrya wrightii*), skunkbush sumac (*Rhus trilobata*), sotol, agaves, evergreen sumac (*Rhus virens*), common hoptree (*Ptelea trifoliata*), prickly pears, Arizona (*Echinocereus coccineus*) and rainbow (*E. rigidissimus*) hedgehog cacti. Common grasses and forbs are pinyon ricegrass, bullgrass, longtongue muhly (Muhlenbergia longiligula), firecrackerbush (*Bouvardia ternifolia*), Fendler's meadow rue (*Thalictrum fendleri*), wild beans (*Phaseolus* spp.), and woodsorrels (*Oxalis* spp.).

Pine forests of the Madrean Montane Forest type occur at higher elevations ranging from 6,000 to 8,600 feet above msl. Pine forests are dominated by ponderosa, southwestern white, Arizona, Chihuahuan or Apache pine. On steep northern exposures, Douglas-fir (*Pseudotsuga menziesii*) and southwestern white Pine form associations with Arizona or ponderosa pine. Quaking aspen (*Populus tremuloides*) is found in a few places, usually areas with moist soils. Important hardwood trees include silverleaf, Arizona white and Gambel's (*Quercus gambelii*) oaks. Major shrubs are Fendler's ceanothus (*Ceanothus fendleri*), netleaf oak (*Quercus rugosa*), New Mexico locust (*Robinia neomexicana*), whortleleaf snowberry (*Symphoricarpos oreophilus*), Schott's yucca, sacahuista, and hairy mountain mahogany. Important grasses include mountain muhly (*Muhlenbergia montana*), longtongue muhly, bullgrass, sideoats grama, prairie junegrass (*Koeleria macrantha*), nodding brome (*Bromus anomalus*), fringed brome (*Bromus ciliatus*), bulb panic grass (*Panicum bulbosum*), screwleaf muhly (*Muhlenbergia virescens*), Fendler's meadow rue, woodsorrels and whitemargin pussytoes (*Antennaria marginata*).

Several riparian zones are found on the South Range. Madrean Riparian Deciduous Forests are of the Mixed Broadleaf-Mixed Conifer Series and are associated with parts of the floors of Garden, Scheelite, Sawmill and McClure Canyons. Proportions of dominant trees vary but include bigtooth maple (*Acer grandidentatum*), Douglas-fir, Arizona sycamore (*Platanus wrightii*), Fremont cottonwood (*Populus fremontii*), Arizona walnut (*Juglans major*), Goodding's willow (*Salix gooddingii*), Chihuahuan ash (*Fraxinus papillosa*), Arizona madrone, Arizona white, silverleaf, netleaf and canyon live (*Quercus chrysolepis*) oaks. Shrub species include canyon grape (*Vitis arizonica*), Virginia creeper (*Parthenocissus quinquefolia*), New Mexico raspberry (*Rubus neomexicana*), western white honeysuckle (*Lonicera albiflora*), skunkbush sumac, Wilcox's barberry (*Berberis wilcoxii*), smooth sumac (*Rhus glabra*), western poison ivy (*Toxicodendron rydbergii*), arroyo willow (*Salix lasiolepis*) and birchleaf buckthorn (*Frangula betulifolia*). Common forbs and grasses include deergrass (*Muhlenbergia rigens*), nodding brome, fringed brome, bulb panic grass, Fendler's meadow rue, woodsorrel, golden columbine (*Aquilegia chrysantha*), Rothrock's basketflower (*Centaurea rothrockii*), hummingbird trumpet (*Epilobium canum*), coralbells (*Heuchera sanguinea*), Chiricahua mountain larkspur (*Delphinium andesicola*) and wormwood (*Artemisia dracunculus*). The streams within these riparian forest are often bordered by marsh vegetation including giant sedge (*Carex ultra*), horsetails (*Equisetum* spp.), scarlet monkeyflower (*Mimulus cardinalis*) and various other sedges (*Carex* spp.) and rushes (*Juncus* spp.). Watercress, an alien species (Rorippa nasturtium-aquaticum), is often abundant in these marshes. Rarer marsh species include Santa Rita mountain aster (*Aster potosinus*), Huachuca water umbel (*Lilaeopsis schaffneriana* variety *recurva*) and Chiricahua dock (*Rumex orthoneurus*).

Interior Southwestern Riparian Deciduous Forests are dominated by Arizona sycamore, Fremont cottonwood, Arizona walnut, Goodding's willow, velvet ash (*Fraxinus velutina*), western soapberry (*Sapindus saponaria* variety *drummondii*), desert willow (*Chilopsis linearis*), netleaf hackberry (*Celtis laevigata* variety *reticulata*) and/or alligator juniper. Shrubs include those found in madrean riparian forests except that cat-claw mimosa (*Mimosa aculeaticarpa* variety *biuncifera*), littleleaf sumac (*Rhus microphylla*), Chihuahuan brickellbush (*Brickellia floribunda*) and mule's fat (*Baccharis salicifolia*) may also be common. Many of the same forbs and grasses of Madrean riparian forests are also found here.

West Range

Vegetation on the West Range is similar to that of the South Range with much open Scrub-Grassland on the lower portions in the north and east, transitioning through an oak woodland-montane grassland mosaic to oak and mixed woodlands in the south and west and to conifer forests on the highest north slopes.

Riparian forests of the West Range differ in the two main canyons - Huachuca and Blacktail. Huachuca Canyon contains Interior Southwestern Riparian Deciduous Forests and Rocky Mountain Riparian Deciduous Forests. The latter is not found in any of the canyons of the South Range. Blacktail Canyon

contains Rocky Mountain Riparian Deciduous Forests, Madrean Riparian Deciduous Forests and Interior Southwestern Riparian Deciduous Forests. The latter are found near Antelope Pond and on lower Blacktail, Slaughterhouse and Huachuca Creeks.

Rocky Mountain Riparian Deciduous Forests are similar to Madrean riparian forests but also contain box elder (*Acer negundo*) and lack bigtooth maple and Douglas-fir. This type of forest is found on Fort Huachuca only in segments of Blacktail and an area in Huachuca Canyon around Moss Falls. Many of the same shrub types are found here that are characteristic of Madrean riparian forests. An additional species in the Rocky mountain type is oceanspray (*Holodiscus discolor*). Likewise, many of the grasses and forbs are found in both riparian forests. In Rocky Mountain riparian forests, one can also sometimes find Columbian monkshood (*Aconitum columbianum*), darkthroat shootingstar (*Dodecatheon pulchellum*) and lemon lily (*Lilium parryi*).

Disturbed areas on the West Range include paved and unpaved roads, parking areas, a concrete helipad, powerlines, a pipeline, several buildings and antenna installations, and the UAV site.

East Range

The East Range is dominated by Chihuahuan Desertscrub and Scrub-Grassland including extensive areas of velvet mesquite scrub. Grasslands, mostly now dominated by the alien species Lehmann's lovegrass (*Eragrostis lehmanniana*), occur on the northern portion of the range. Chihuahuan Desertscrub dominated by Velvet Mesquite or Creosote Series occupies much of the upland southern portion. This community occurs at elevations of 3,900 to 4,400 feet above msl. Parts of what are now Chihuahuan Desertscrub are thought to have once been Scrub Grassland that were altered by severe livestock overgrazing prior to government ownership. Dominant shrubs include creosote bush (*Larrea tridentata*), velvet mesquite (*Prosopis velutina*), honey mesquite (*Prosopis glandulosa*), desert broom (*Baccharis sarothroides*), tarbush (*Flourensia cernua*), viscid acacia (*Acacia neovernicosa*) and whitethorn acacia (*Acacia constricta*). The hills in the northeastern section are whitethorn desertscrub (*Acacia constricta* Association). Other important species are bush muhly (*Muhlenbergia porteri*), black grama (*Bouteloua eriopoda*), purple threeawn (*Aristida purpurea*), low wooly grass (*Erioneuron pulchellum*), and desert zinnia (*Zinnia acerosa*).

The intermittent washes of the East Range are occupied by riparian communities. Interior Southwestern Riparian Deciduous Forest and Woodland of Mesquite Bosques and the Mixed Broadleaf Series are extensive. There are also large areas of Interior Southwestern Swamp and Riparian Scrub of the Sumac-Sacaton Series on the floodplains (*Rhus microphylla-Sporobolus wrightii* Association).

Except for the cantonment area, the East Range is the most disturbed and altered area on Fort Huachuca. Much of the upland area is in a very degraded vegetation condition because of excessive grazing for many decades prior to its acquisition by the army in 1952. About 1960, the East Range was fenced, and conditions improved, but scrub and non-native species have largely replaced the former scrub-grassland. Unpaved roads, tracks, and jeep trails are common. An unpaved airstrip is present in the east-central region, and roads have been changed to circumvent this area. The central eastern section is a former bombing range that apparently contains much hazardous, unexploded ordnance. The northwestern corner of the range contains a large amount of litter and debris from a neighboring landfill located off of the installation in Huachuca City. An old agricultural field and an observation platform are near the center of the northern border.

5.6.2 Floral Inventory

The *Land Condition Trend Analysis At Fort Huachuca, Arizona 1992-1993* (Block, 1994) summarizes a floristic survey performed by the Center for Ecological Management of Military Lands Floristic Lab (Colorado State University). This survey verified 813 plant taxa, 763 species, 383 genera, and 90 plant families on Fort Huachuca. This list has been expanded as new species have been discovered. LCTA and other general/incidental surveys occurring since Block's 1994 summary have added many taxa to those known to occur on the installation. A complete inventory of all plant species known to occur on Fort Huachuca is included in Appendix 5.6.2.

5.6.3 Special Status Flora

> *Virtually all ecologists would argue that every species extinction diminishes humanity.*
> Edward O. Wilson, Harvard University

Special status plant species are listed as threatened or endangered, are proposed for listing, are candidates for Federal listing or are included in Arizona's Native Plant Law and are special status species tracked by the AGFD Heritage Data Management System (HDMS). Fort Huachuca has been included and staff have participated fully in periodic workshops reviewing the status of sensitive plant species on public lands in southeastern Arizona, such as USFS and BLM lands adjacent to or near the installation. Fort Huachuca maintains notebooks compiled, by species, for these workshops from State HDMS location records and other source material. Table 3 below lists threatened, endangered, proposed, candidate, and other sensitive flora known to occur on Fort Huachuca. General locations of threatened, endangered, and candidate species (plant and animal) on Fort Huachuca are shown in Figure 5.6.3.

The Huachuca water umbel (*Lilaeopsis schaffneriana* var. *recurva*) is the only federally-listed as endangered and State-listed highly safeguarded plant known to occur on Fort Huachuca. Lemmon fleabane (*Erigeron lemmonii*) is a federal candidate species and State-listed highly safeguarded plant known to occur on the installation.

Table 3: Special Status Flora Occurring on Fort Huachuca

Species	Federal Status	State Status	USFS Status
		NPL	
Plummer onion (*Allium plummerae*)		SR	
Lemmon fleabane (*Erigeron lemmonii*)	C	HS	
Woodland spurge (*Euphorbia plummerae*) (=*macropus*)	SC	SR	S
Huachuca golden aster (*Heterotheca rutteri*)	SC		S
Pringle hawkweed (*Hieracium pringlei*)	SC		S
Huachuca water umbel (*Lilaeopsis schaffneriana* var. *recurva*)[4]	E	HS	S
Lemon lily (*Lilium parryi*)	SC	SR	S

[4] Designated critical habitat includes lands on Fort Huachuca.

Species	Federal Status	State Status NPL	USFS Status
Leafy lobelia (*Lobelia fenestralis*)		SR	
Madrean adders mouth (*Malaxis corymbosa*)		SR	
Wilcox fishhook cactus (*Mammillaria wrightii* var. *wilcoxii*)		SR	
Chiricahua (or Blummer's) dock (*Rumex orthoneurus*)	SC	HS	S
Green death camas (*Zigadenus virescens*)		SR	

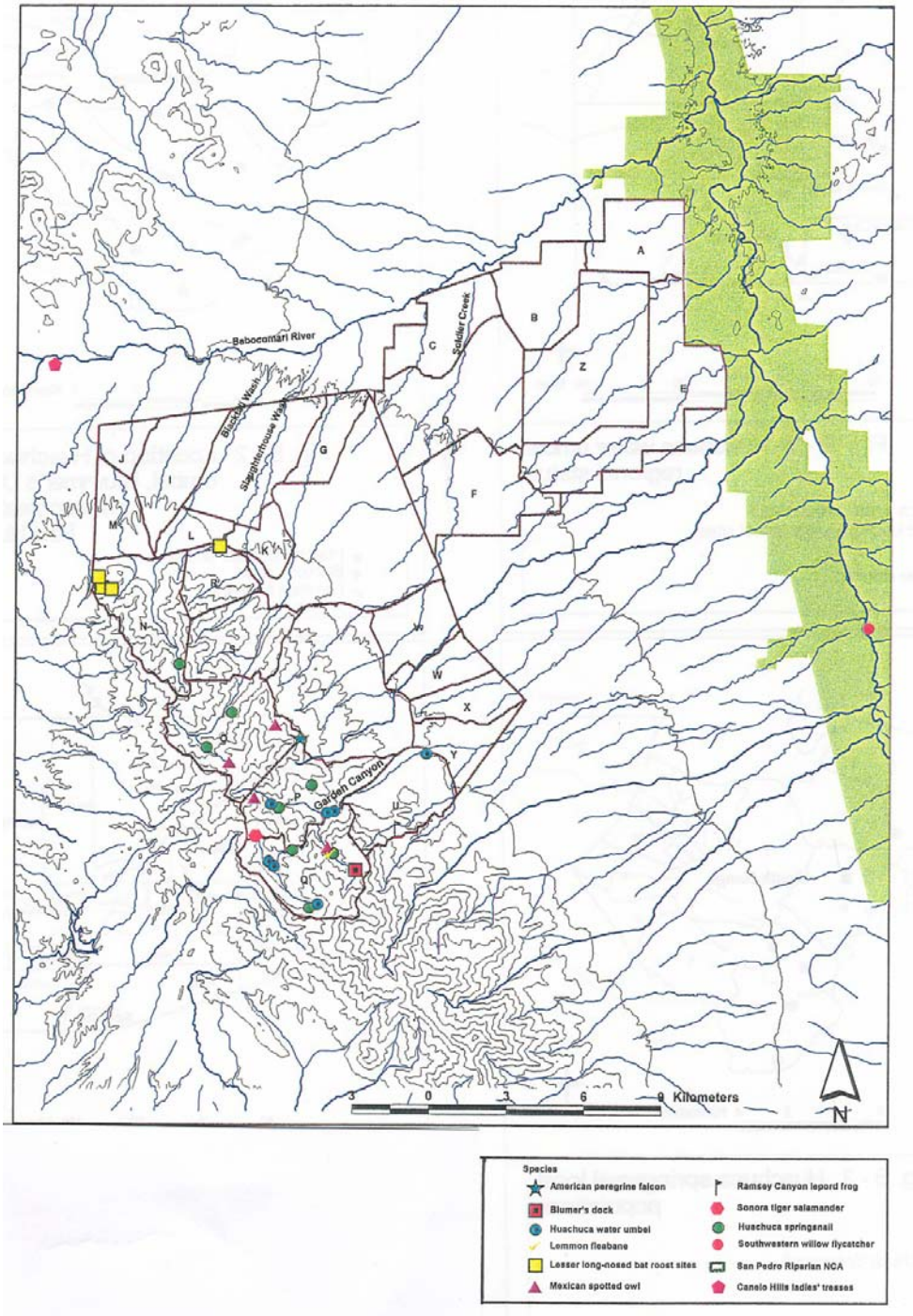
Federal status: E - endangered: species in imminent jeopardy of extinction.
C - candidate: species for which there is sufficient information to support a proposal for listing under the ESA.
SC - species of concern: federal land and wildlife management agencies should cooperate in the conservation of these species in an effort to reduce, mitigate, and possibly eliminate the need for future listing of these species under the ESA.

State Status: HS - highly safeguarded: Arizona native plants whose prospects for survival in the State are in jeopardy or are in danger of extinction, or are likely to become so in the foreseeable future, as described by the Arizona Native Plant Law (1993).
SR - salvage restricted: Arizona native plants not included in the highly safeguarded category, but have a high potential for theft or vandalism, as described by the Arizona Native Plant Law (1993).

USFS Status: S - sensitive: species classified as sensitive by the Regional Forester when occurring on lands managed by the U.S.D.A Forest Service.

Other federally-listed and State-listed as highly safeguarded plant species that are known to occur or to have occurred in Cochise County, Arizona are the Cochise pincushion cactus (*Coryphantha robbinsorum*) and the Canelo Hills ladies' tresses (*Spiranthes delitescens*). The Cochise pincushion cactus is only known to occur in the southeastern corner of Cochise County and in adjacent Sonora, Mexico. It is not

Figure 5.6.3: Locations of Threatened, Endangered, and Sensitive Species on Fort Huachuca, Arizona and the Surrounding Area



known nor likely to occur on Fort Huachuca due to lack of suitable habitat. The Canelo Hills ladies' tresses is only known to occur in southern Arizona in four cienegas (wetland communities located in arid areas): one in Cochise County and three in Santa Cruz County. The Canelo Hills ladies' tresses is not known to occur on Fort Huachuca, and no potential habitat for this plant is present on the installation.

SAIC (1998a) provides detailed discussions of the description, ecology, distribution, abundance, and specific location of species found on Fort Huachuca and the Cochise pincushion cactus and Canelo Hills ladies tresses. The PBO (USFWS, 1999) provides detailed status and environmental baseline information on Huachuca water umbel, and Canelo Hills ladies' tresses. Appendix 5.6.3 contains an AGFD HDMS list of special status species documented within Fort Huachuca and within ten miles of the post. The following sections are brief discussions of the two species with federal status found on Fort Huachuca.

Endangered Species Act Listed and Candidate Plant Species

Huachuca Water Umbel

The Huachuca water umbel was federally listed as a endangered plant on February 5, 1997. This species is also a U.S. Forest Service (USFS) sensitive plant and is classified as highly safeguarded by the Arizona Native Plant Law of 1993. The Huachuca water umbel inhabits cienegas and associated vegetation within desertscrub, grassland, oak woodland, and coniferous forests at elevations of 4,000 to 6,500 feet above msl. The primary threat to this species is alteration of ground and surface water flows which may degrade or destroy wetland habitat (USFWS, 1995c). Wildfires are of concern because of increased erosion, reduced water infiltration, and other negative impacts that can occur after a fire (Rinne and Neary, 1996). Excessive rates of erosion and disturbance near plant sites caused by wildfires, recreationists, or road construction could result in a population being scoured by a flash flood.

The Huachuca water umbel occurs in southeastern Arizona and adjacent Sonora, Mexico. In Arizona, populations occur in Pima, Santa Cruz, and Cochise counties. The water umbel has been documented from 24 sites in Arizona in three major watersheds: the San Pedro River, Santa Cruz River, and Rio Yaqui (USFWS, 1997a). There are seven populations of this species on Fort Huachuca's South Range in Garden, Sawmill, and McClure canyons. Potential habitat for this plant may exist around ponds in the southwestern corner of the East Range of Fort Huachuca; however, no plants have been found during formal or incidental surveys of the pond area (SAIC, 1998a). Critical habitat for Huachuca water umbel was designated in 1999 (USFWS, 1999c). A portion of Garden Canyon Creek (3.8 miles) and riparian habitat are designated.

Lemmon Fleabane

The Lemmon fleabane is a federal candidate species, a USFS sensitive plant, and is classified as a highly safeguarded species by Arizona Native Plant Law 1993. This plant is a small, flowering, prostrate perennial belonging to the sunflower family that grows in dense clumps (up to 20 inches diameter) within crevices, ledges, and boulders on rugged peaks and cliffs of the Huachuca Mountains (Warren *et al.*, 1991). Little is known about the ecology or population biology of this species (Warren and Reichenbacher, 1991). Lemmon fleabane may not be susceptible to human disturbance due to its relatively inaccessible cliff habitat. Potential threats to its continued success may include extended drought, rock falls, illegal rock climbing (Warren *et al.*, 1991; SAIC, 1998a), and wildfire.
Although its range was thought to historically include a wider area of Arizona, recent taxonomic analysis has indicated that Lemmon fleabane is endemic only to Scheelite Canyon of the South Range of Fort Huachuca in the Huachuca Mountains on two separate cliff faces (Warren *et al.*, 1991). In 1991 surveys for the Lemmon fleabane located 441 individual plants in Scheelite Canyon between 6,300 and 6,600 feet

above msl. No populations of this species have been found outside of Scheelite Canyon, but potential habitat may occur in other areas within Fort Huachuca.

5.6.4 Wetlands

The U.S. Congress enacted the Clean Water Act in 1972 to *restore and maintain the chemical, physical, and biological integrity of the Nation's waters*. Section 404 of the Clean Water Act delegates jurisdictional authority over wetlands to the Corps of Engineers and the Environmental Protection Agency (EPA). Waters of the United States protected by the Clean Water Act include rivers, streams, estuaries, and most ponds, lakes, and wetlands. The Corps of Engineers and the EPA jointly define wetlands as .. *areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas*.

The USFWS defines wetlands to include a variety of areas that fall into one of five categories:

X areas with hydrophytes and hydric soils, such as those commonly known as marshes, swamps, and bogs;
X areas without hydrophytes but with hydric soils __ for example, flats where drastic fluctuation in water levels, wave action, turbidity, or high concentration of salts may prevent the growth of hydrophytes;
X areas with hydrophytes but nonhydric soils, such as margins of impoundments or excavations where hydrophytes have become established but hydric soils have not yet developed;
X areas without soils but with hydrophytes, such as the seaweed-covered portion of rocky shores; and
X wetlands without soils and without hydrophytes, such as gravel beaches or rocky shores without vegetation.

Wetlands on Fort Huachuca are primarily associated with streams and ponds. A National Wetlands Inventory of Fort Huachuca was completed in 2000 for the entire installation (USFWS, 2000a). Mylar maps have been produced and digitized, and a project report produced.

Fort Huachuca contains 64 acres of wetlands and 770 acres of riparian habitat. This acreage amounts to about one percent of the installation's total area. Palustrine unconsolidated bottom wetlands are the predominant type, representing about sixty-five percent of the installation's wetlands. The next most common wetland type is palustrine emergent wetlands totaling 13 acres. The predominant riparian type is emergent alkali sacaton, totaling 188 acres or twenty-four percent of the riparian vegetation. Linear wetlands and riparian habitats account for 275 miles including rivers, streams, and vegetated habitats (2.1 miles of wetlands and 69.6 miles of riparian and 203 miles of rivers and streams respectively). About seventy-nine percent of linear features depicted on the maps are intermittently flooded stream beds (USFWS, 2000a). Wetland and riparian acreages are totaled in Table 4 below.

Table 4: Wetland and Riparian Acreages on Fort Huachuca

Wetland Type	Acreage
Palustrine Unconsolidated Bottom	37.9
Palustrine Emergent Wetland	13.4

Palustrine Forested Wetland	6.1
Palustrine Unconsolidated Shore	3.7
Palustrine Scrub/Shrub Wetland	1.8
Total Wetlands	**63.9**

Riparian Habitat Type	Acreage
Riparian Emergent Alkali Sacaton	188
Riparian Forested Mixed Deciduous	105.7
Riparian Forested Cottonwood	7.3
Riparian Forested Sycamore	2.5
Riparian Forested Willow	1.5
Riparian Scrub-Shrub Mesquite	337.8
Riparian Scrub-Shrub Mixed Deciduous	92.8
Riparian Scrub-Shrub Rabbitbrush	31.7
Riparian Scrub-Shrub Willow	3.1
Total Riparian Habitat	**770.2**

5.7 Fauna

Fort Huachuca's significant wildlife diversity is directly related to the habitat diversity in the region. The isolation of the Huachuca Mountains from the other mountain ranges results in "mountain islands." These islands are known for their diversity of vegetation types, usually along an elevational gradient, and typically exhibit high degrees of species endemism. The installation's proximity to Mexico also results in wildlife species occurring here that are not known to occur elsewhere in the U.S. or are more commonly associated with the tropics.

The biotic diversity on Fort Huachuca mirrors similar habitats outside installation boundaries. Information on species abundance and trends generally has not been collected; therefore, current abundance and trends of most species on the installation are unknown. Various inventories have confirmed the native occurrence of almost 315 birds, 80 mammals, 60 reptiles, 15 amphibians, and no native fish species on the installation. The following sections summarize by taxon the biological diversity on Fort Huachuca.

5.7.1 Mammals

Large mammals on Fort Huachuca include the Coues white-tailed deer (*Odocoileus virginianus couesi*), desert mule deer (*O. hemionus eremicus*), pronghorn antelope (*Antilocapra americana*), collared peccary or javelina (*Pecari tajacu*), mountain lion (*Puma concolor*), and black bear (*Ursus americanus*).

Coues white-tailed deer population densities fluctuated within certain bounds, between 1956 and 1995, that may have had a general downward trend as occurred in most of southeastern Arizona. A slight

decline may have occurred between 1967 and 1982, but densities since then have remained relatively stable. Desert mule deer populations remained within relatively stable bounds between 1981 and 1995 (Sam Houston State University, 1996). Since 1995, both species have declined significantly, although not quantified, presumably due to effects of persistent drought.

Pronghorn were reestablished to Fort Huachuca from northern Arizona in 1949 by the Arizona Game and Fish Commission, and a small population remains on the West Range. Population numbers have fluctuated widely. To offset fluctuations, AGFD and the Army have transplanted pronghorn to the East and South ranges. The Chihuahuan subspecies of pronghorn was first reestablished to the installation in 1987 onto the South Range. Although pronghorn formerly existed in southeastern Arizona, it was extirpated in the 1800s. For pronghorn overall, about 20 have persisted on the South Range, 8-9 on the West Range, and none have been observed on the East Range from 1998-2000.

Common small to medium sized mammals found on the installation include the desert cottontail (*Sylvilagus auduboni*), eastern cottontail (*S. floridanus*), black-tailed jackrabbit (*Lepus californicus*), antelope jackrabbit (*L. alleni*), spotted ground squirrel (*Spermophilus spilosoma*), rock squirrel (*S. variegatus*), Huachuca gray squirrel (*Sciurus arizonensis huachuca*), hooded skunk (*Mephitis macroura*), striped skunk (*M. mephitis*), spotted skunk (*Spilogale glacilis*), hog-nosed skunk (*Conepatus mesoleucus*), Sonoran opossum (*Didelphis virginiana californica*), coati (*Nasua narica*), ringtail (*Bassariscus astutus*), raccoon (*Procyon lotor*), bobcat (*Lynx rufus*), coyote (*Canis latrans*), and gray fox (*Urocyon cinereoargenteus*) (Sam Houston State University, 1996). In limited areas of montane riparian habitat in Garden, Huachuca, and Blacktail Canyon, the Arizona shrew occurs, a State Wildlife Species of Concern in Arizona (WSCA).

Mines and natural caves located on the installation provide potential roosting habitat for bats. Bats also use the many cliff faces and rocky ledges of mountain ranges for roosting sites. At least 18 species of bats occur on the installation (Sidner, 1994), of which the cave myotis (*Myotis velifer*), Mexican long-tongued bat (*Choeronycteris mexicana*), and western red bat (*Lasiurus blossevillii*) are Arizona species of special concern (see Section 5.7.6). Of particular concern is the lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*), a federally-listed endangered species and a WSCA.

The black-tailed prairie dog (*Cynomys ludovicianus*), a candidate for federal listing, occurred on or adjacent to Fort Huachuca land until 1938, and potential habitat still exists on the South and West Ranges. Fort Huachuca has potential habitat for two federally-listed endangered and WSCA mammals, the jaguar (*Panthera onca*) and the Mexican gray wolf (*Canis lupus baileyi*). Neither is known to occur on the installation. Fort Huachuca may have potential habitat for jaguarundi *(Felis yagouaroundi tolteca*), a federally endangered cat that has some potential to occur in Cochise County, but has never been physically documented up in Arizona. These species are discussed further in Section 5.7.6.

5.7.2 Birds

Southeastern Arizona possesses one of the greatest diversities of bird species of any similarly-sized region in North America. More than 400 bird species occur here each year, and a total of almost 500 bird species has been recorded (Taylor, 1995). The *Birds of Fort Huachuca - An Informational Checklist* (Breland, 1981) lists 313 bird species found on the installation, including 48 families representing 18 orders, have been observed on Fort Huachuca. These include 254 neotropical migrants that spend some time on the installation.

Some more common or conspicuous bird species include the Mexican jay (*Aphelocoma ultramarina*), Steller's jay (*A. coerulescens*), bridled titmouse (*Baeolophus wollweberi*), American redstart (*Myioborus pictus*), gray vireo (*Vireo vicinior*), warbling vireo (*V. gilvus*), gray flycatcher (*Empidonax wrightii*),

vermilion flycatcher (*Pyrocephalus rubinus*), summer tanager (*Ipiranga rubra*), yellow warbler (*Dendroica petechia*), and elegant trogon (*Trogon elegans*). The northern buff-breasted flycatcher (*Empidonax fulvifrons pygmaeus*) has a limited distribution in the U.S., but sustains a well known breeding population in Sawmill Canyon. Common game birds include the mourning dove (*Zenaida macroura*), white-winged dove (*Z. asiatica*), Gambel's quail (*Lophortyx gambelli*), scaled quail (*Callipepla squamata*), Montezuma quail (*Cyrtonyx montezumae*), and Gould's wild turkey (*Meleagris gallapavo mexicana*) (Sam Houston State University, 1996).

Waterfowl commonly occurring on Fort Huachuca include surface-feeding ducks using the smallest to the largest bodies of water, and diving ducks using several of the larger ponds. The most common surface feeders include the mallard (*Anas platyrhyncos*), green-winged teal (*A. carolinensis*), and northern shoveler (*Spatula clypeata*). The most common divers include ring-necked duck (*Aytha collaris*) and ruddy duck (*Oxyura jamaicensis*). The American coot (*Fulica americana*) are widespread and common on the installation. The most commonly observed wading and shorebirds are the great blue heron (*Ardea herodias*), white-faced ibis (*Plegadis chihi*), common snipe (*Capella gallinago*), and various other sandpipers and plovers.

Two federally-listed bird species occur on Fort Huachuca; the bald eagle (*Haliaeetus leucocephalus*), which uses Willcox Playa, and Mexican spotted owl (*Strix occidentalis lucida*) (SAIC, 1998a). Fort Huachuca also has potential habitat for the northern aplomado falcon (*Falco femoralis septentrionalis*), federally endangered and a State WSCA, but this species is not known to occur on the installation. Federally-listed species are further discussed in Section 5.7.6.

The American peregrine falcon (*Falco peregrinus anatum*) was a federally endangered species that was delisted in 1999, and in Arizona is listed as a WSCA (USFWS, 1999b). In Arizona, peregrine falcons occupy habitat with tall cliffs suitable for nesting and nearby water or vegetation capable of providing habitat for its prey, primarily birds. Primary threats to peregrine falcons include ingestion of DDT and other organochlorides in wintering areas, habitat loss, and declining prey populations. Human disturbances include noise associated with construction, aircraft, transportation, and recreation (Groves, 1996). Individual birds vary in their tolerance to human disturbance.

In southeastern Arizona, breeding peregrine falcons are probably year-round residents. It is likely that nonresident peregrines winter in the area and others migrate through. In 1996, peregrine falcons established a nesting territory on Fort Huachuca (AZ ARNG, 1996). This was the first nesting attempt recorded for the peregrine falcon on Fort Huachuca in recent years, and the outcome of this nesting attempt was not determined. Surveys indicated this species did not nest on Fort Huachuca in 1997 (Duncan, 1997) or 1998, but an immature (probable young of the year) was seen in 1998 soaring not far from the 1996 nest (Snyder, 2000a). Three large chicks near fledging were seen in 1999, at or near the 1996 nest site (Snyder, 2000b). Nesting occurred in 2001, but the single chick died in the nest. Peregrine falcon pairs also occupy breeding territories in the Dragoon and Chiricahua Mountains, 30 miles and 65 miles northeast of Fort Huachuca, respectively.

Suitable cliff habitat on the South Range is limited to several cliffs in Woodcutters, Rock Spring, Huachuca, Scheelite, and Tinker canyons. The few small cliffs in Blacktail Canyon on the West Range may provide marginal habitat for nesting peregrines. Blacktail Canyon has not been surveyed using standard survey protocol (SAIC, 1998a). Suitable peregrine falcon nesting habitat does not exist on the East Range, but foraging habitat is present. A peregrine falcon was observed at a reservoir in the southwestern corner of the East Range. Waterbirds, such as ducks, shorebirds, and passerines, use the reservoirs and associated vegetation and are prey of peregrine falcons.

The Apache goshawk (*Accipiter gentilis atricapillus*), one of two subspecies of the Northern Goshawk (*Accipiter gentilis*), a WSCA, that have been described and proposed for North America, occurs in extreme southeast Arizona, southwest New Mexico, and the Sierra Madre of Mexico. The Apache goshawk is the southernmost form of the goshawk in the Western Hemisphere. The status of the Apache goshawk has been of concern to wildlife managers in the southwestern United States and it is likely that the species will be petitioned for threatened or endangered status in the next few years. The Apache goshawk's range in the United States is roughly bounded by the Gila River on the north, the Atascosa Mountains on the west, and the Animas Mountains on the east, and area roughly 160 miles by 100 miles (Snyder, 2000b).

Fort Huachuca has three known historic Apache goshawk nesting areas. In addition, habitat on the installation is used for foraging by pairs nesting outside the installation and in winter presumably by both resident and migrant goshawks. During 1998 and 1999 Apache goshawks have been observed and active nests have been located on and adjacent to Fort Huachuca (Snyder, 2000a, 2000b).

5.7.3 Fish

No native fish have been known to occur on Fort Huachuca since 1893. Fish species on the installation have been stocked, including the rainbow trout (*Oncorhynchus mykiss*), channel catfish (*Ictalurus punctatus*), largemouth bass (*Micropterus salmoides*), bluegill sunfish (*Lepomis macrochirus*), and redear sunfish (*L. microlophis*) (Sam Houston State University, 1996). Bullhead have been found in two ponds on Fort Huachuca, from unauthorized releases. Gila topminnow (*Poeciliopsis occidentalis occidentalis*) were released on many sites on the installation in the 1980s, however, all releases failed (Weedman and Young, 1997; Weedman, 1998). Desert pupfish (*Cyprinodon macularius*) and Gila chub were also released in the 1980s at a few sites on Fort Huachuca, but had failed by June 1988.

Potential habitat is present on Fort Huachuca for two federally-listed fish species: Gila topminnow, and desert pupfish (SAIC, 1998a). These are briefly discussed in Section 5.7.6.

5.7.4 Reptiles and Amphibians

A good example of the diversity of the region is the 75 species of amphibians and reptiles that occur in the Huachuca Mountains and Upper San Pedro River (Taylor, 1995). In the early 1990s a study was conducted in the Huachuca Mountains to gather baseline data concerning the distribution and abundance of amphibian and reptile species by vegetation type (Morrison *et al*., 1995). Fourteen reptile species and one amphibian species were recorded in upland habitats, with mixed pine-oak forest having the largest abundance of species.

Lizards are the most abundant reptiles on Fort Huachuca (Morrison *et al*., 1995). Lizards found on the installation include the mountain or Yarrow's spiny lizard (*Sceloporus jarrovi*), Clark or collared swift lizard (*S. clarki*), *S. scalarus* spp., Uta climbing lizard (*Urosaurus ornatus*), whiptail (*Cnemidophorus sonorensis*), Sonoran alligator lizard (*Elgaria kingi*), mountain skink (*Eumeces callicephalus*), and other *Cnemidophorus* spp. Some of the more renown snakes found on Fort Huachuca include the black-tailed rattlesnake (*Crotalus molossus*), western diamondback rattlesnake (*C. atrox*), banded rock rattlesnake (*C. lepidus*), twin-spotted rattler (*C. pricei)*, ridge-nosed rattlesnake (*C. willardi*), Sonoran mountain king snake (*Lampropeltis pyromelana*), gopher snake (*Pituophis melanoleucus*), and Sonoran whipsnake (*Masticophis bilineatus*) (Sam Houston State University, 1996). One native, terrestrial turtle, the western box turtle (*Terrapene ornata*) is found in grasslands, and one native aquatic turtle, the Sonora mud turtle (*Kinosternon sonoriensi*) is found in at least one pond on Fort Huachuca.

The three amphibians most commonly found on the installation are the native redspotted toad (*Bufo punctatus*) and Couch's spade foot (*Scaphiophus couchi*), and the introduced bullfrog (*Rana catesbeiana*) (Sam Houston State University, 1996). One federally-listed amphibian, the Sonora tiger salamander (*Ambystoma tigrinum stebbinsi*) and one species that is the subject of a Conservation Agreement under the ESA, the Ramsey Canyon leopard frog (*Rana subaquavocalis*) occur on Fort Huachuca. Potential habitat is present for the Chiricahua leopard frog (*Rana chiricahuensis*), a federally proposed threatened species, but it has not been documented on the installation. These species are further discussed in Section 5.7.6. The systematics of both leopard frog and tiger salamander populations on Fort Huachuca are uncertain and continue to be investigated with new genetic techniques. Taxonomic status of both is likely to change in the next two years. The Huachuca tree frog (*Hyla wrightorum*) is a rare and isolated variety that breeds on Fort Huachuca. From recent research, it may be described as a new, distinct species within several years.

5.7.5 Other Faunal Species

Kral (1991) observed, collected, and identified 129 species of butterflies in Garden and Sawmill canyons. Species identified represent the following families: Hesperiidae (55 species), Papilionidae (5 species), Pieridae (17 species), Lycaenidae (14 species), Riodinidae (6 species), Libytheidae (1 species), Heliconiidae (1 species), Nymphalidae (22 species), Satyridae (6 species), and Danaidae (2 species). A butterfly checklist for Fort Huachuca was published with 179 species, and more have been documented on the installation in the past several years.

A wide variety of insects and other invertebrates inhabit the installation including many spiders, such as the black widow (*Latrodectus mactans*), various tarantula species (*Avicularia* spp.), scorpions, sunspiders (Solpugidae), whip scorpions or vinegaroons (*Trithyreus* spp.), and centipedes (Chilopoda). The Huachuca springsnail (*Pyrgulopsis thompsoni*), a federal candidate species and a WSCA, occurs on Fort Huachuca. The springsnail is discussed further in Section 5.7.6.

5.7.6 Special Status Fauna

Special status faunal species are listed as threatened or endangered, are proposed for listing, or are candidates for listing by the State and/or federal government. Fort Huachuca lands were included and a biologist participated in a workshop reviewing the status of sensitive bat, shrew, and rodent species on the Coronado National Forest adjacent to or near the installation. Fort Huachuca maintains notebooks compiled, by species, for these workshops from State HDMS location records and other source material. Table 5 below lists threatened, endangered, proposed, and candidate fauna known to occur on Fort Huachuca. General locations of threatened, endangered, and candidate plant and animal species on Fort Huachuca are shown in Figure 5.6.3.

Table 5: Special Status Fauna Occurring or Potentially Occurring on Fort Huachuca

Species	Federal Status	State Status	USFS Status
Bald eagle (*Haliaeetus leucocephalus*)	T	WC	none
Mexican spotted owl (*Strix occidentalis lucida*)	T	WC	S
Elegant trogon (*Trogon elegans*)	none	WC	S
Northern buff-breasted flycatcher (*Empidonax fulvifrons pygmaeus*)	SC	WC	S
Northern goshawk (*Accipiter gentilis*)	SC	WC	S

Species	Federal Status	State Status	USFS Status
Arizona shrew (*Sorex arizonae*)	SC	WC	S
Cave myotis (*Myotis velifer*)	SC	None	none
Lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*)	E	WC	S
Mexican long-tongued bat (*Choeronycteris mexicana*)	SC	WC	S
Western red bat (*Lasiurus blossevillii*)	none	WC	S
Yellow-nosed cotton rat (*Sigmodon ochrognathus*)	SC	None	none
Jaguarundi (*Felis yagouaroundi tolteca*)	E	none	S
Black-tailed prairie dog (*Cynomys ludovicianus*)	C	WC	none
Huachuca springsnail (*Pyrgulopsis thompsoni*)	C	none	none
Arizona ridgenose rattlesnake (*Crotalus willardi willardi*)	none	WC	S
Desert massasauga (*Sistrurus catenatus edwardsi*)	none	WC	S
Mexican garter snake (*Thamnophis eques megalops*)	SC	WC	S
Sonora tiger salamander (*Ambystoma tigrinum stebbinsi*)	E	WC	none
Ramsey Canyon leopard frog (*Rana subaquavocalis*)	SC	none	none
Chiricahua leopard frog (*Rana chiricahuensis*)	PT	WC	S

Federal status: E - endangered: species in imminent jeopardy of extinction.
T - threatened: species in imminent jeopardy of becoming endangered.
PT - proposed threatened.
C - candidate: species for which there is sufficient information to support a proposal for listing under the Endangered Species Act.
SC - species of concern: include the entire realm of taxa whose conservation status may be of concern to the USFWS.

State Status: WC - Wildlife Species of Concern in Arizona: species whose occurrence in Arizona is or may be in jeopardy, or with known or perceived threats or population declines.

USFS Status: S - sensitive: species classified as such by the Regional Forester when occurring on lands managed by the U.S.D.A. Forest Service.

Endangered Species Act Listed, Proposed, Candidate, and Conservation Agreement Species

One invertebrate species, the Huachuca springsnail, is a federal candidate and a State WSCA that occurs on the installation. Listed birds that occur on Fort Huachuca are the bald eagle and the Mexican spotted owl, which are federal threatened species and a WSCA. The only federally-listed mammal (endangered) known to occur on Fort Huachuca is the lesser long-nosed bat. One amphibian on Fort Huachuca, the Sonora tiger salamander, is federally-listed as endangered and a WSCA. The Ramsey Canyon leopard frog is a WSCA, and is managed under a Conservation Agreement under Endangered Species Act provisions, to which Fort Huachuca is signatory.

Other threatened, endangered, proposed, and candidate fauna known to occur or have occurred in Cochise County include the northern aplomado falcon, jaguar, ocelot (*Felis pardalis*), Mexican gray wolf, black-tailed prairies dog, Chiricahua leopard frog, Gila topminnow, and desert pupfish. Fort Huachuca has potential habitat for these species; however, they are not known to occur on the installation.

In addition, the southwestern willow flycatcher (*Empidonax trailli extimus*), cactus ferruginous pygmy-owl (*Glaucidium brasilianum cactorum*), loach minnow (*Rhinichthys cobitis*), spikedace (*Meda fulgida*), and razorback sucker (*Xyrauchen texanum*) are known to occur or have occurred in Cochise County, Arizona. Sixty kilometers (37 mi.) of the Upper San Pedro River, from the confluence of the Babocomari River upstream to the Mexico border, are critical habitat designated to include unoccupied habitat considered essential for recovery of the spikedace and loach minnow (USFWS, 2000c). However, Fort Huachuca has little or no potential habitat for these species, and they have not been documented on the installation (SAIC, 1998a). Jaguarundi have been reported in or near the Huachuca Mountains, but never actually confirmed in Arizona. Potential habitat may occur on post, but it may be outside the range of the species.

SAIC (1998a) provides detailed discussions of description, ecology, distribution, abundance, and specific locations of the species mentioned above and those that occur on the installation. The PBO (USFWS, 1999) provides detailed status and environmental baseline information on the southwestern willow flycatcher, Mexican spotted owl, lesser long-nosed bat, Sonora tiger salamander, spikedace, and loach minnow. Appendix 5.6.3 contains an AGFD Heritage Data Management System list of special status species documented within Fort Huachuca and within ten miles of the post. The following sections are brief discussions of those faunal species occurring or with potential to occur on Fort Huachuca or that may be affected by activities at Fort Huachuca.

5.7.6.1 Mammals

Lesser Long-Nosed Bat

The lesser long-nosed bat was federally-listed as endangered on September 22, 1988. This bat is also a State WSCA. The lesser long-nosed bat is a medium- to large-sized leaf-nosed bat of the family Phyllostomatidae, found in arid regions ranging from Central America to a small portion of the southwestern United States. In the southwestern United States, lesser long-nosed bat roosts are known to occur in six counties in southern Arizona and one county in New Mexico. These bat populations occupy the northern portion of their range from spring to autumn, then migrate south for the winter. Seasonal movements of bats apparently coincide with the blooming of appropriate food plant species, namely agave and columnar cacti, such as organ pipe. This bat was found to be in jeopardy because of disturbance of roost sites, loss of food sources (paniculate agave), and direct killing by humans.

The greatest densities of lesser long-nosed bats are located in northern Mexico and in southern Arizona. Estimated sizes of roosts ranged from 200-150,000 bats in 1992-1993. Of the three maternity roosts in Arizona, the largest, located about 150 miles from Fort Huachuca in Organ Pipe Cactus National Monument, has contained an estimated 20,000 adult bats (USFWS, 1994). At least three large, post-maternity roosts are located near Fort Huachuca (Sidner, 1996). Over 15,000 lesser long-nosed bats have been recorded at a mine in the Coronado National Memorial, about 10 miles from Fort Huachuca, and over 30,000 bats at Patagonia Cave, about 20 miles from the installation. A large roost on private land several miles north of the installation was discovered in 1999.

Historic and more recent surveys have identified lesser long-nosed bat roosts on Fort Huachuca during the post-breeding season. Sidner (2000) conducted surveys of five potential roost sites on Fort Huachuca from 1990-1999, and found that Manila Mine and Pyeatt Cave on West Range were used primarily as day roosts by lesser long-nosed bats and other bat species. Lesser long-nosed bats occupied these sites primarily from July through October.

In 1990-1992, the number of lesser long-nosed bats was less than 200. The number of bats peaked to 1,400 in 1993 and then declined to 500-600 bats in 1994 and 1995. Peak counts at Manila Mine decreased

from 610 in 1996 to 93 in 1997. This mine was also used less often as a day roost than in 1996. Day roost activity on Fort Huachuca increased in 1998 to more than 500 and in 1999 increased drastically to over 3,800 observed (Sidner, 2000). Variations may be due to the flowering pattern of *Agave palmeri*. Nectar feeding activity at *A. palmeri* plants by lesser long-nosed bats on Fort Huachuca was greatly reduced in 1997 compared with 1996 (Sidner, 1997).

Habitat requirements of lesser long-nosed bats vary seasonally and apparently are synchronized with the flowering of food plants. During the reproductive season of April through June, lesser long-nosed bats are found in Sonoran desertscrub habitat in the northern part of their range. At this time bats feed on flowers and fruits of saguaro and organ pipe cacti and use caves and mines as maternity roosts. Because Sonoran desertscrub vegetation does not occur at Fort Huachuca, it is unlikely that lesser long-nosed bat maternity roosts exist in the immediate area. From late summer into fall (July to October), bats are found at higher elevations in grassland habitat foraging primarily on agaves. Caves and mines are used by adults and young for day and night roosting. By November most lesser long-nosed bats have vacated their northern grassland habitat and begun their southward migration.

Lesser long-nosed bats are highly mobile. Studies have documented bat movements of greater than 15-19 miles from their roosts to foraging sites (USFWS, 1994). Based on location of food plants relative to roost sites in Organ Pipe Cactus National Monument, it is suspected that adult females and their young fly 26-31 miles each night to forage. At least two major post-maternity roosts are within 19 miles of agave stands on Fort Huachuca, and these stands are considered to be one of the best areas in southern Arizona for Palmer agave (Howell and Robinett, 1995). Therefore, it is possible that the agave stands on Fort Huachuca are utilized by bats that roost in other areas.

Fort Huachuca's South Range has no known mines or caves suitable for roosting habitat for lesser long-nosed bats. Populations of Palmer agave found on the South and West Ranges represent the primary food source for lesser long-nosed bats on Fort Huachuca. Several areas of agave stands on the South and West Ranges are protected as designated Agave Management Areas (Howell and Robinett, 1995). These stands have relatively high densities of agave compared with other populations across the installation. Fort Huachuca's East Range has no known roosting habitat for lesser long-nosed bats. Only a few agaves are present in the grasslands located in the northwestern corner of this range (Chambers Group, 1993).

Black-tailed Prairie Dog

The black-tailed prairie dog was placed on the candidate list on February 4, 2000 (USFWS, 2000d), in response to a petition to list it as threatened throughout its range. Black-tailed prairie dogs occurred on or adjacent to Fort Huachuca land until at least 1938, when a biologist collected two animals six miles southeast of Fort Huachuca's cantonment area (Hoffmeister, 1986). Potential habitat still exists on the South and West Ranges. Black-tailed prairie dogs were considered extirpated in 1960 from Arizona, after a widespread poisoning campaign that stemmed largely from perceptions that they competed with livestock (Van Pelt, 1999).

Intensive grazing about 1900 may have encouraged the expansion of black-tailed prairie dog occupied habitat in Arizona, and then control efforts may have been the principal factor that subsequently suppressed populations. Shrub invasion may have limited recovery. The species largely disappeared from Arizona prior to the documented occurrence of sylvatic plague, an exotic and completely lethal disease to the species, in Arizona. However, disease is an additional factor that could affect the future viability of black-tailed prairie dogs that may be reestablished in previously occupied habitat in the State. Arizona is near the identified epicenter for outbreaks for this disease. However, in Arizona, sylvatic plague may not occur at elevations below 4,500 feet (1,372 meters), where most of the species occurred historically. An intensive survey for plague by the USDA Animal Damage Control on Fort Huachuca grasslands in the

early 1990s found no antibodies or evidence of exposure to plague in blood samples from numerous, livetrapped carnivore species that probably fed on rodents that could carry plague.

Proposals and discussions about reestablishing black-tailed prairie dogs on Fort Huachuca began in mid 1965, and have been revisited periodically, for land on or near the fort, in the 1970s, 1980s and 1990s. Objectives of AGFD, Fort Huachuca and others neighbors and partners focused initially on restoring to Arizona a vanished species and enhancing recreational opportunity. More recently, interest in prairie dog reestablishment broadened to an ecosystem perspective, including the role of black-tailed prairie dogs in increasing and maintaining biological diversity and in improving watershed condition and desired hydrologic processes. A preliminary assessment of the potential for prairie dog reestablishment and management was developed under the DoD Legacy Program (Van Pelt and Belitsky, 1995).

An Arizona subspecies (or variety), if it remains recognized as a valid taxon, is only remnant in the United States, because none exist in Arizona and only a few occur west of the Pecos River in southwestern New Mexico and western Texas. (Some genetic data indicates the black-tailed prairie dog should be considered a monotypic species; other biologists think there are two subspecies of black-tailed prairie dog: the Arizona black-tailed prairie dog (C. l. arizonensis) and the major subspecies (C. l. ludovicianus). The Arizona variety occurs in northeastern Mexico, and individuals in Chihuahua, Mexico comprise the largest remaining complex of any prairie dog species or subspecies. The remainder of the species occurs in the Great Plains area.

Black-tailed prairie dogs are small, stout, ground squirrels that weigh approximately 1-3 pounds. They are diurnal, burrowing animals, and spend most of the day above ground. They are very social and live in aggregations called colonies. Females usually do not breed until their second year, and live 3-4 years, producing a single litter annually of usually 4-5 pups. Heavy livestock use in an area may increase colony growth rates, while an ungrazed area showed expansion rates of only 1-2 percent annually. They may use roads for dispersal over distances up to 6 miles; however, dispersal is usually about 3 miles or less. Individuals dispersing from home colonies generally move into an established colony rather than attempting to initiate a new colony.

The black-tailed prairie dog has been recognized as having biological importance as a keystone species. Keystone species influence ecosystem functions through their activities in unique and significant ways. The ecological effect caused by a keystone species is disproportionate to its numerical abundance and its removal or decline initiates changes in ecosystem structure and a decline in overall species diversity. Prairie dogs perform several roles inasmuch as they are prey, provide shelter, modify vegetation and soil structure (including increased water infiltration and nutrient availability), and influence ecological processes in a manner not entirely duplicated by other prairie herbivores.

As a result of the petition and the USFWS finding, AGFD and the other 10 state wildlife agencies throughout the historic range of black-tailed prairie dogs began development and implementation of a conservation agreement to conserve and manage black-tailed prairie dogs. The state agencies think that a cooperative, range-wide approach is needed to achieve long-term species conservation, and also may prevent the need for federal listing. As signatories on the Conservation Agreement, AGFD agreed to organize and lead a statewide Arizona Working Group, which included active participation by Fort Huachuca. The working group released in August 2001 a late draft Interagency Management Plan for Black-tailed Prairie Dogs in Arizona for public comment.

5.7.6.2 Birds

Bald Eagle

The bald eagle was federally-listed as endangered in most States, but was reclassified as threatened because of significant increases in the number of breeding pairs (USFWS, 1995c). The bald eagle is also a State WSCA.

Bald eagles generally nest near water in forest stands that contain a mixture of tall, old, and dead or dying trees. In winter bald eagles may expand their home range in search of food or migrate to areas where food is available. Bald eagles are known to congregate at reservoirs, lakes, or rivers. Availability of roosting habitat is an important component of the eagle winter ecology. Roosting habitat consists of trees that extend above the forest canopy and provide a protected microclimate for resting eagles. Eagles feed primarily on fish and waterbirds but also on small mammals and mammal carcasses. Some eagle populations are migratory, whereas others remain near their breeding areas year-round (Stalmaster, 1987).

The bald eagle has a limited distribution in Arizona, with nesting populations found only along the Colorado, Salt, Gila, Bill Williams, Aqua Fria, San Pedro, and Verde rivers in northern and central portions of the State (Hunt *et al.*, 1992). Wintering areas include the Colorado River and various reservoirs in northern and central Arizona. The Arizona Bald Eagle Winter Counts frequently record bald eagles wintering around Parker Canyon Lake on the southwestern slope of the Huachuca Mountains. Transient bald eagles have occasionally been recorded along the San Pedro River. Winter use of Willcox Playa by several bald eagles may occur when water is present to attract waterfowl that can serve as prey.

A bald eagle was observed flying over the West Range of Fort Huachuca in 1998. However, suitable nesting habitat or roosting habitat does not exist on Fort Huachuca. Small numbers of eagles may winter intermittently in large cottonwood or sycamore trees in the SPRNCA adjacent to Fort Huachuca.

Mexican Spotted Owl

The Mexican spotted owl is federally-listed as threatened and is also a State WSCA. Spotted owl habitat on Fort Huachuca is designated as critical habitat (USFWS, 2001). Habitat characteristics of Mexican spotted owl nesting and roosting sites generally consists of multi-layered, uneven-aged forests with high canopy closure or rocky, shaded canyons (USFWS, 1995e). In the Huachuca Mountains many spotted owl nest sites were described as Madrean pine-oak woodland with montane conifer species and some broadleaf riparian component (Duncan, 1991). Cliffs are present at some sites and used for nesting.

Information is limited on the habitat use by foraging owls in southeastern Arizona. However, in northern Arizona owls forage primarily in mixed conifer forest on rocky slopes and pine-oak-juniper forest (Ganey and Balda, 1994). Fort Huachuca's South Range has comparable habitat types, typically at higher elevations. Long-distance movements of resident spotted owls during the nonbreeding season are thought to be limited, although some owls are known to migrate to lower elevations.

The Mexican spotted owl geographic range covers portions of southwestern United States and extends into Mexico. Because the breeding habitat of this species is confined to mountain ranges and canyons, owl distribution is patchy throughout its range. The Mexican Spotted Owl Recovery Team delineated six recovery units (RU) in the United States and five in Mexico. The Huachuca Mountains are included in the Basin and Range - West RU, which is characterized by mountain ranges isolated by desert basins. This RU, along with the Upper Gila Mountains and the Basin and Range - East RUs, are believed to be important habitat because of the high number of spotted owls relative to the other RUs (USFWS, 1995a).

Five Mexican spotted owl territories occurred on Fort Huachuca in 1995. From 1997 through 1999, three breeding pairs where found on Fort Huachuca. Mexican spotted owl survey information is in Section 7.2.2.1.2.

Seasonal movements of owls occupying territories on Fort Huachuca or use of the Fort Huachuca area by migrant owls are unknown. During the nonbreeding season in 1989 and 1990 a spotted owl was detected near Tinker Ridge, adjacent to Fort Huachuca (Duncan, 1991). It is probable that spotted owls are present on breeding territories on Fort Huachuca during the nonbreeding season. No potential spotted owl nesting, foraging, or wintering habitat is present on the East Range.

Northern Aplomado Falcon

The northern aplomado falcon was federally-listed as endangered in 1986. The aplomado falcon recovery plan was established in 1990 with the goal of achieving 60 breeding pairs within the United States (USFWS, 1990). Arizona classifies this falcon as a WSCA. Habitat requirements for the northern aplomado falcon consist of open grassland savanna with widely scattered woody vegetation and relatively little ground cover. Nests are located in arboreal bromeliads, at the base of palm fronds, and in small, abandoned corvid and raptor nests. Aplomado falcons feed primarily on large insects and small-to-medium-sized birds.

The northern aplomado falcon declined from various human-caused disturbances, such as agricultural development, fire suppression, channelization of once permanent desert streams, recreational activities, direct persecution, and pesticide contamination (USFWS, 1990; Corman, 1992; Ward and Ingraldi, 1994). In addition, overgrazing by livestock appears to be an important factor in the decline of this falcon (Montoya *et al.*, 1997).

No breeding aplomado falcons have been documented in Arizona since the 1940s. Occasional sightings of individual aplomado falcons have been confirmed in western Texas and eastern New Mexico, but no confirmed sightings have been reported for Arizona (Ward and Ingraldi, 1994). The nearest known breeding population to Fort Huachuca is in Chihuahua, Mexico (about 350 miles from Fort Huachuca). Most known populations are found in the Mexican states of Veracruz, Chiapas, Tabasco, and Campeche.

In 1992, the AGFD evaluated potential release sites for the aplomado falcon in southeastern Arizona. A site on the San Pedro River near Hereford, about eight miles from the installation, was ranked second of 10 potential reestablishment sites evaluated (Corman, 1992). Based on the AGFD evaluations in 1992, semidesert grassland and riparian communities on Fort Huachuca have a strong potential to support released or recolonizing aplomado falcons. The proximity of these habitat types on the East and South ranges to abundant songbird populations in the San Pedro Riparian Natural Conservation Area (SPRNCA) suggests that foraging or nesting falcons may occur through much of these areas as aplomado falcon populations recover in the future.

Southwestern Willow Flycatcher

The southwestern willow flycatcher is a small passerine bird of about 5.75 inches in length and weighs only 0.4 ounces. The subspecies was listed as endangered in February 1995 (USFWS, 1995f). Arizona lists the subspecies as a WSCA. Critical habitat was designated in July 1997 and includes 18 critical habitat units with 599 river miles in Arizona, California, and New Mexico. Parts of the SPRNCA were included in the critical habitat designation.

The southwestern willow flycatcher is a neotropical migratory species that breeds in the southwestern U.S. from about April 1 to September 1 and migrates to Mexico, Central America, and possibly northern

South America during the non-breeding season (Phillips, 1948; Stiles and Skutch, 1989; Peterson, 1990; Ridgely and Tudor, 1994; Howell and Webb, 1995). The flycatcher is a riparian obligate, nesting along rivers, streams, and other wetlands where dense growths of willow (*Salix* sp.), seepwillow (*Baccharis* sp.), buttonbush (*Cephalanthus* sp.), boxelder (*Acer negundo)*, saltcedar (*Tamarix chinensis)*, or other plants are present, often with a scattered overstory of cottonwood and/or willow. Flying insects, particularly Hymenoptera (ants, bees, and wasps), Diptera (flies), and Hemiptera (true bugs), are the most important prey of the southwestern willow flycatcher; however, they will also glean larvae of non-flying insects, such as Lepidoptera (butterflies and moths), from vegetation (Drost *et al*., 1998).

Unitt (1987) reviewed historical and contemporary records of southwestern willow flycatcher throughout its range, and determined that it had "declined precipitously..." and that although the data revealed no trend in the past few years, the population was clearly much smaller than 50 years ago, and no change in factors responsible for the decline seem likely. Declining numbers have been attributed to loss, modification, and fragmentation of riparian breeding habitat, loss of wintering habitat, and nest predation/brood parasitism by the brown-headed cowbird (McCarthey *et al.,* 1998; Sogge *et al.,* 1997). Habitat loss and degradation is caused by a variety of factors, including urban, recreational, and agricultural development; water diversion and groundwater pumping; channelization; and livestock grazing. Fire is an increasing threat to willow flycatcher habitat (Paxton *et al.,* 1996). Fire frequency in riparian vegetation increases with dominance by saltcedar (DeLoach, 1991), and water diversions or groundwater pumping that results in desiccation of riparian vegetation (Sogge *et al.,* 1997). The presence of livestock, range improvements such as waters and corrals, and agriculture provide feeding areas for cowbirds. These feeding areas, if near riparian habitats, coupled with habitat fragmentation, facilitate cowbird parasitism of flycatcher nests (Tibbitts *et al.,* 1994; Hanna, 1928; Mayfield, 1977).

In 1997 surveys of the SPRNCA resulted in the first confirmed nesting pair of southwestern willow flycatchers in the SPRNCA since the 1950s. Southwestern willow flycatchers have not been documented on Fort Huachuca, and suitable habitat is not thought to occur on the installation.

5.7.6.3 Fish

Gila Topminnow

The Gila topminnow is the northern species of topminnow. The Gila topminnow was federally-listed as endangered in 1967. In Arizona, this fish is a WSCA. The topminnow inhabits springs, marshes, permanent streams, intermittent streams, and cienegas at elevations below 4,920 feet above msl. This species prefers areas with dense matting of algae, debris, and emergent or aquatic vegetation (USFWS, 1983). The topminnow tends to congregate in shallower waters or near the surface of deeper waters in areas of moderate current, below riffles, and along the margins. The topminnow is omnivorous, foraging on organic detritus, algae and other plants, and invertebrates, such as crustaceans, insects, and mosquito larvae. The demise of this subspecies is attributed to habitat destruction and to competition with, and predation, by the non-native mosquito fish (*Gambusia affinis*).

In Arizona, the Gila topminnow was common and abundant in the Gila River basin, including the San Pedro River, until the mid- to late 1940s. Reestablishments of the Gila topminnow in Arizona have restored populations and established new ones in some areas. Thirty-seven reestablishments occurred in the San Pedro drainage, including Fort Huachuca, in Aravaipa Creek, and in the Babocomari River. These reestablished populations have since failed. The Gila topminnow now occurs in 11 indigenous localities in southern Arizona. All but a few populations are considered to be in danger of extirpation (Southwestern Field Biologists, 1996). Potential habitat for the Gila topminnow is present on Fort Huachuca, but the species is not known to occur on the installation.

Desert Pupfish

The desert pupfish was listed as a federally endangered species in 1995. This species is also listed as a USFS sensitive species and endangered in Mexico. A federal recovery plan was approved in 1993. Critical habitat was designated at Quitobaquito Springs, Pima County, Arizona (Southwestern Field Biologists, 1996). In Arizona, this fish is a WSCA.

Desert pupfish typically occupy cienegas, springs, small streams, and edges of larger bodies of water with shallow, clear water and soft substrates (USFWS, 1993). Reasons for decline in pupfish numbers include dewatering, stream impoundment, channelization, livestock grazing, pesticide application, and interactions with non-native species.

The pupfish was once common in southern Arizona, southeastern California, and New Mexico. Distribution was widespread but probably not continuous. Endemic to the Gila River basin, the desert pupfish was extirpated from the state. This species occurred in the San Pedro River until the 1950s. Indigenous populations are now found only in Quitobaquito Springs (Organ Pipe Cactus National Monument). Potential habitat for the desert pupfish may be present on Fort Huachuca, but there have been no evaluations of habitat here, and the species is not known to occur on the installation.

5.7.6.4 Amphibians

Sonora Tiger Salamander

The Sonora tiger salamander was federally-listed as endangered in 1997. Arizona lists this amphibian as a WSCA. Habitat requirements for the subspecies include lakes, ponds, and stock tanks in the desert grassland areas of southern Arizona with surrounding vegetation types ranging from arid plains and rolling grassland to mountain meadows and forests. The Sonora tiger salamander inhabited springs and cienegas historically, but currently persists only in livestock tanks (USFWS, 1995c).

The Sonora tiger salamander population has decreased significantly since the 1950s. The most serious threat has been disease and predation by introduced nonnative fishes, crayfish, and bullfrogs. In addition, anglers have used this salamander or an introduced subspecies for fishing bait. Smaller populations are vulnerable to reduced fitness resulting from inbreeding and random extirpation from habitat destruction. Habitat destruction and degradation from livestock overgrazing, water diversions, dredging, and groundwater pumping pose serious threats to the continued success of extant populations of this salamander (USFWS, 1997a).

Prior to human settlement, the salamander inhabited springs, natural cienegas, and backwater pools throughout its range. However, all confirmed historical and extant aquatic populations of the Sonora tiger salamander have been found in cattle tanks or impounded cienegas (USFWS, 1997a). All known populations are located in Santa Cruz and Cochise counties, Arizona primarily in the San Rafael Valley to the west of the Huachuca Mountains. Three populations of Sonora tiger salamanders are known to exist in the Huachuca Mountains. These salamanders occur in Scotia and Copper canyons (off Fort Huachuca) and in Upper Garden Canyon on Fort Huachuca.

Fort Huachuca's known population of Sonora tiger salamander inhabits an artificial pond built for fishing. Drought conditions in early 1996 severely diminished the volume of the tank, and surveys of this population in April 1996 detected only one branchiate salamander. In 1997, Sonoran tiger salamanders were collected from the Upper Garden Canyon Pond. Drought conditions persisted sporadically through the late 1990s, and the pond annually dried for a month or longer. However, the salamander population has persisted each year probably from terrestrial metamorphs that return to the pond for late winter

breeding. There is still uncertainty regarding the exact genetic status of these salamanders, and whether there has been hybridization in this pond between native Sonora and non-native barred tiger salamander subspecies.

Stock tanks and springs in the South and West Ranges also represent potential habitat for the salamander. Effluent ponds in the southwestern corner of the East Range may provide potential habitat for the Sonora tiger salamander, but are most likely colonized by the non-native barred tiger salamander introduced into this area for fish bait. This subspecies occupied East Range ponds before a die-off in 1998 and pond drying in 1999.

Ramsey Canyon Leopard Frog

The Ramsey Canyon leopard frog is a relatively newly described leopard frog species found only in the Huachuca Mountains. The Ramsey Canyon leopard frog was removed as a candidate for federal listing while conservation efforts work for recovery, and remains a WSCA. It inhabits stock ponds and natural or plunge pools that are 1.0 - 4.3 feet deep. Plant communities surrounding these sites are typically oak woodland or semidesert grassland.

Primary threats to the Ramsey Canyon leopard frog are population fragmentation, low population sizes, and habitat loss due to water diversion and groundwater pumping (AGFD, 1996). In addition, adequate water flows, pond depth, oxygen levels, pH levels, and predation by bullfrogs and non-native fishes are thought to be critical to the species preservation. A Conservation Agreement has been signed by affected landowners and managers (Fort Huachuca, USFS, The Nature Conservancy, USFWS, and AGFD) to remove threats that might require Federal listing, and to ensure the long-term viability of Ramsey Canyon leopard frogs.

The Ramsey Canyon leopard frog is limited to artificial ponds in four canyons within a 3.7 mile radius on the eastern slope of the Huachuca Mountains near Fort Huachuca (AGFD, 1995). Fort Huachuca has a population in Tinker Canyon, and captive bred frogs were introduced into Lower Garden Canyon pond in 1996. However, the Lower Garden Canyon Pond was dry in 1997, and no frogs were present during surveys. Reservoirs on the East Range are outside of the known elevational range for this species but may provide potential habitat for the Ramsey Canyon leopard frog. However, surveys conducted on Fort Huachuca by AGFD from 1994 to 1997 did not detect Ramsey Canyon leopard frogs in these areas.

In addition to the Fort Huachuca population of the Ramsey Canyon leopard frog, populations exist in Miller, Brown, and Ramsey canyons. The species has been reestablished into a previously occupied pond site in Brown Canyon about 200 meters south of the installation boundary.
Scientific inconsistency and uncertainty exist among amphibian geneticists regarding the genetic and the correct taxonomic status of leopard frogs on the east slope of the Huachuca Mountains. The current scientific literature describes the Ramsey Canyon leopard frog as a distinct species, whose closest relative is the Chiricahua leopard frog. Scientific research, peer review and publication may clarify leopard frog taxonomy in this area within the life of this plan. The two species may be lumped back together as one, but management focus (see Chapter 8) for leopard frogs on Fort Huachuca may not fundamentally or necessarily change.

Chiricahua Leopard Frog

The Chiricahua leopard frog is proposed for Federal listing as threatened (USFWS, 2000c), and is included as a WSCA. This species is highly aquatic, found primarily in deep pools of rocky streams in woodlands and forests (Stebbins, 1985). This species appears to require permanent or nearly permanent water sources. The Chiricahua leopard frog is declining in Arizona, and it is suspected that introduced

bullfrogs and fish are responsible (AGFD, 1997). Disease factors and threats, especially chytrid fungus, recently have gained increased attention and concern.

The Chiricahua leopard frog has two separate ranges: montane portions of the Mogollon Rim extending into New Mexico and southeast montane regions of Arizona and adjacent Sonora, Mexico (Platz and Mecham, 1979). Potential habitat exists on the South and West ranges for this frog. However, surveys conducted by AGFD in 1996 failed to document the Chiricahua leopard frog on the installation. Reservoirs on the East Range of Fort Huachuca are below the known elevation range of this species, but they may provide potential habitat.

5.7.6.5 Invertebrates

Huachuca Springsnail

The Huachuca springsnail is a federal candidate species and is a State WSCA. This snail is very small (0.7 - 0.9 inch), with a conical shell. Species identification must be accomplished by examining characteristics of the reproductive organ. This species occupies shallow areas of springs, often at the rocky seep of a spring source, between 4,500 and 6,600 feet above msl. These springs contain vegetation, have a slow to moderate flow, and firm substrates, such as roots, wood, and rocks. Populations can be locally abundant, but habitat within springs is limited. Threats to the species are habitat destruction by residential development, water diversions, recreational use, and livestock grazing (USFWS, 1995b).

The springsnail is found in springs of southern Santa Cruz and Cochise counties as well as northern Sonora, Mexico. In 1992, potential habitat (16 aquatic areas) was surveyed, and nine populations were documented on Fort Huachuca in Garden, Sawmill, Cave Springs, McClure, Huachuca, and Blacktail canyons (USFWS, 1997b; AGFD, 1993; Landye, undated).

6.0 LAND USE AND MANAGEMENT UNITS

6.1 Land Use

Most of Fort Huachuca is used for open/operational areas, and only about 5,270 acres are used for cantonment. The East Range consists almost entirely of open/operational areas. Installation open/operational areas are divided into training ranges. Figure 6.1 shows these major land areas on Fort Huachuca.

6.1.1 Open/Operational Areas

Open/operational areas on the West and East ranges are used as training ranges and test ranges. Active and Reserve component units of all services use training areas mainly for mountain/desert training, escape and evasion training, brigade-size field training exercises, and maneuver exercises.

The West Range is west and north of the cantonment area and covers 16,453 acres (about 26 square miles) (Figure 6.1). The West Range is used for training, research, development, and testing. There are no live fire training areas in this range. The northwestern corner of the West Range, known as training area Juliet, is predominantly used by the Intelligence School for training of remote control pilots for UAVs. The U.S. Army Electronic Proving Ground also performs some research and development testing in this area. The launching of UAVs from a supporting facility is one of the tests performed on the West Range.

The South Range is south of the cantonment and covers about 24,334 acres (about 38 square miles) which includes most of the installation's extent of the Huachuca Mountains (Figure 6.1). Eastern slopes of the mountains are used, in part, for impact areas from firing positions in flat terrain of the eastern portion of the range. Training and some testing occur in the northern portion of the mountains. The range is divided into 12 training areas, 17 firing ranges, and several impact areas (Figure 6.1.1a).

The East Range is east of the cantonment area and State Highway 90 and covers about 27,215 acres (about 43 square miles) (Figure 6.1). East Range is used for research and development testing and training. The area contains six training areas, a demolition range, a tactical assault landing strip, an impact area, three drop zones, and five off-road maneuvering areas (no longer used) (Figure 6.1.1b). Area Zulu contains a 6,954-acre impact area for self-propelled artillery and mortars. When live fire exercises occur, the entire East Range is closed for all other training activities. Some areas within Training Area Zulu may contain unexploded ordnance. Fort Huachuca Range Control dictates strict adherence to the off-limits policy of this impact area, and warning signs are posted to alert personnel of the potential danger. Aside from hunting, outdoor recreation is not permitted on the East Range (NRCS and ENRD, 1997).

Figure 6.1: Land Use at Fort Huachuca, Arizona

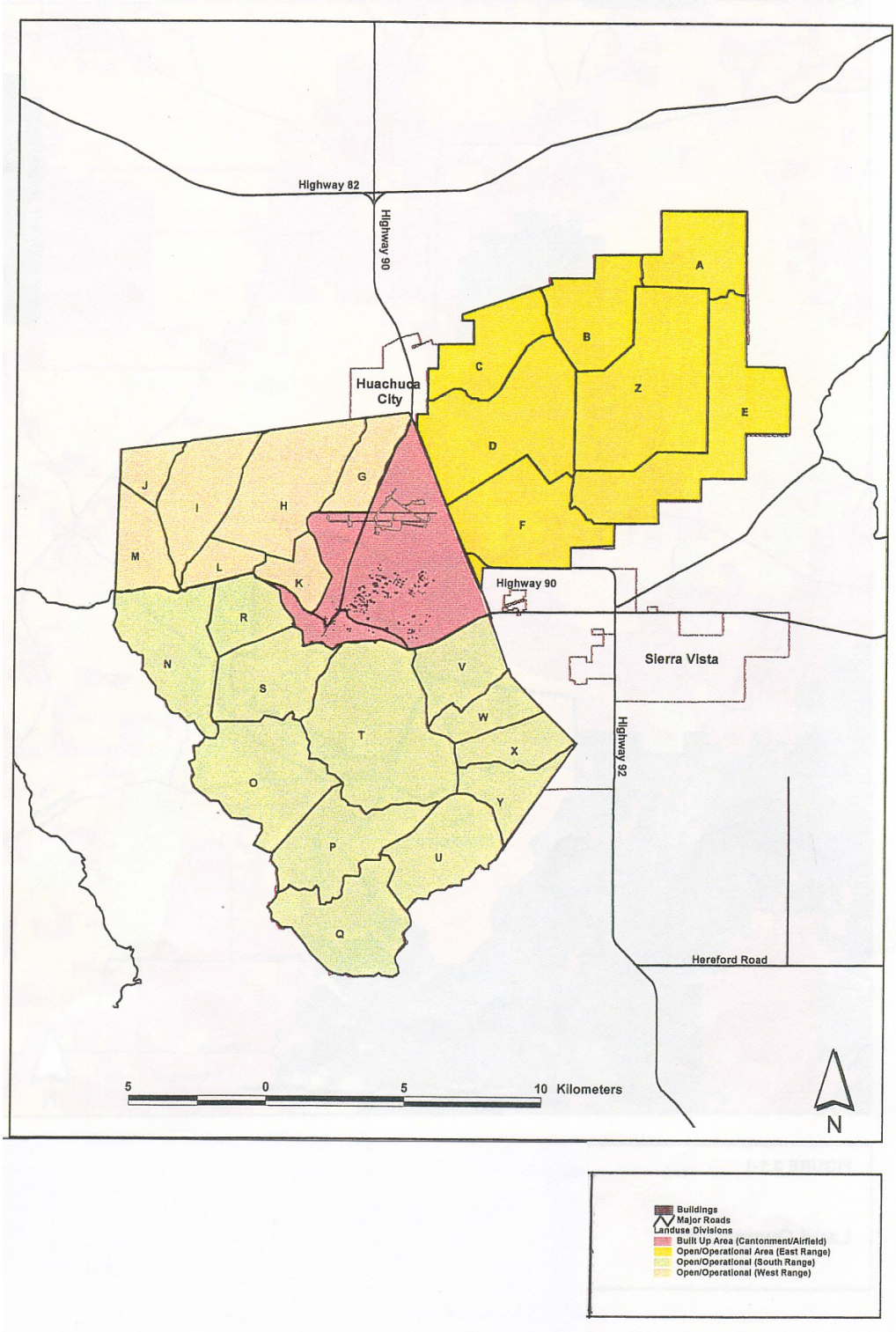


FIGURE 6.1.1a: South Range Training Ranges

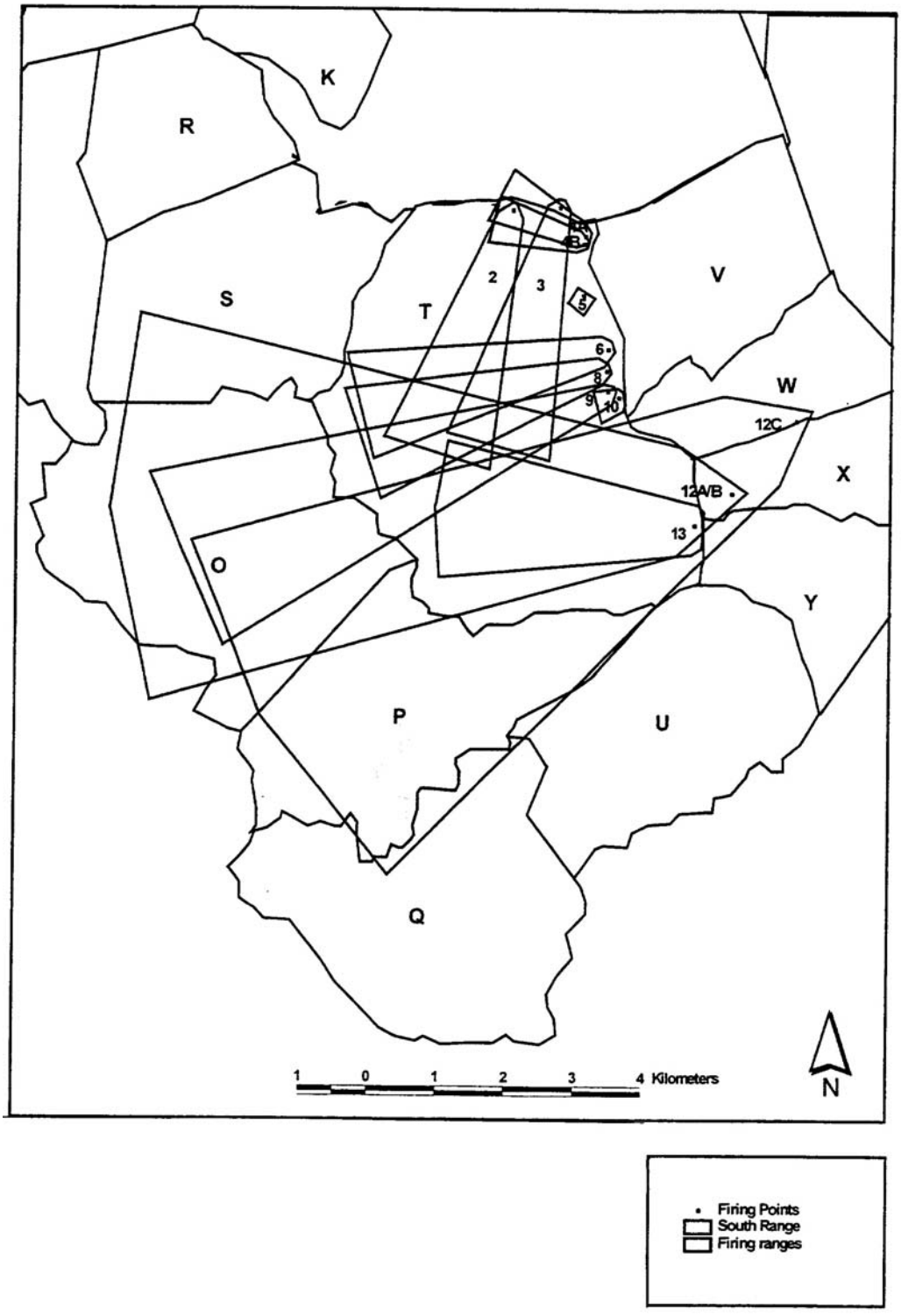
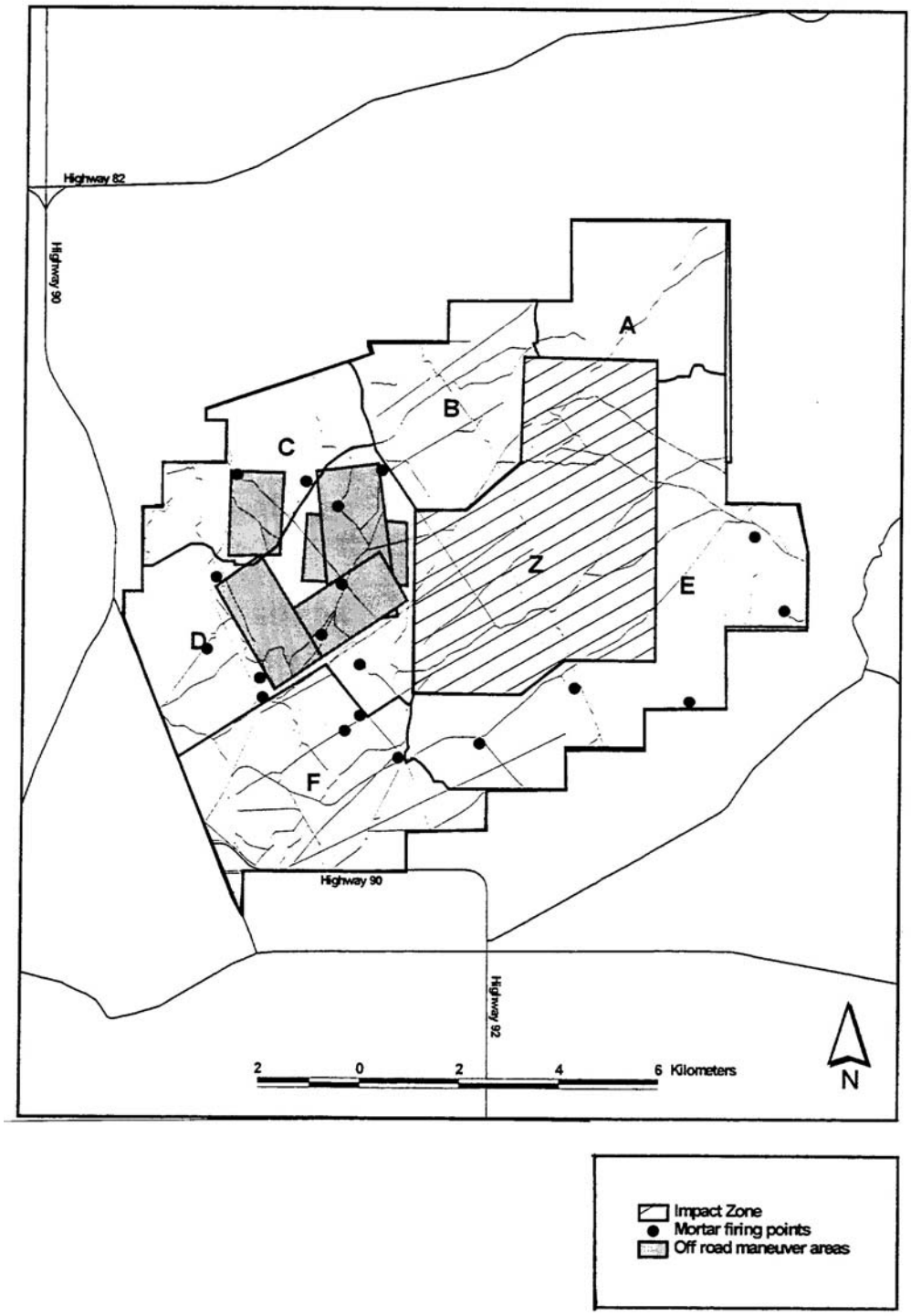


FIGURE 6.1.1b: East Range Training Ranges and Firing Points



6.1.2 Cantonment Area

The cantonment area, 5,270 acres, includes the buildings and structures traditionally thought of as cantonment and the LAAF. Both are located on the eastern edge of the West Range. The two areas are located more than a mile apart, and are separated by a reserved land/buffer land use zone.

Most buildings and structures on the installation are within the cantonment area. A variety of housing and community support services, as well as administrative and operational directorates and training facilities, are within the cantonment area. Major command headquarters are located throughout the cantonment as well as maintenance and storage facilities, facilities for research, development and testing, medical care, and training. More than 2,000 buildings are within the cantonment area.

6.1.3 Surrounding Land Use

Land surrounding Fort Huachuca is directly affected by Cochise County, Santa Cruz County and City of Sierra Vista land use restrictions. A large portion of land adjacent to the installation is under the control of the BLM and the USFS (Figure 3.3).

Cochise County zoning districts maintain land use throughout the county. Approximately 90 percent of the unincorporated areas of the county are zoned RU for rural development. Lands adjoining the installation at the northern, southern, and portions of the western and eastern borders are zoned RU 4 and require a minimum lot size of four acres (Zillgens, 1991). Transitional Residence zones along the eastern border of the installation have a minimum lot size of 36,000 ft^2. Additional areas around Huachuca City and along State Highway 92 south of Sierra Vista are classified as urban growth areas.

The Huachuca Ecosystem Management Area of the Coronado National Forest encompasses 75,000 acres (117 square miles) of forest land south and west of the installation in the Huachuca Mountains. This land is predominately undeveloped and contains very few major access roads, campgrounds, or other high volume recreation facilities. Forest management plans for the Coronado National Forest delineate management areas adjacent to the installation for visual resources, dispersed recreation, livestock grazing, game habitat, fuel wood harvest, and wilderness (Zillgens, 1991). The *Coronado National Forest Plan* (USFS, 1986), a comprehensive land use plan with an intended life of 10-15 years, is in pre-revision planning in 2001.

The SPRNCA, established by Act of Congress in 1988, is the primary focus of natural resources conservation in the valley bottom of the San Pedro Basin and is intensively managed by the BLM for a variety of wildlife, environmental, and recreational uses. The SPRNCA's purpose is to protect the riparian area and aquatic, wildlife, archaeological, paleontological, scientific, cultural, educational, and recreational resources within the area. It extends from the community of Curtis to a few miles south of Hereford. The SPRNCA corridor lies as close as ½ mile from the northeastern boundary of the installation, and is about 10 miles from the installation to the south. The SPRNCA is about five miles wide at its widest point and encompasses both sides of the San Pedro River.

The Las Cienegas National Conservation Area was established by Act of Congress in December, 2000 for lands in the Sonoita Valley about 12 miles northwest of Fort Huachuca. The area between these Federal properties is open land, except for a 2-lane highway. The purpose of the approximately 42,000-acre Las Cienegas National Conservation Area, which is part of the contiguous 142,800-acre Sonoita Valley Acquisition Planning District, is to preserve delicate desert landscapes and rare wildlife species, such as the Gila topminnow. The conservation area includes a large portion of Cienega Creek and a small portion of the Babocomari River. It is home to undeveloped and diverse terrain, from marshlands and grasslands

to mesquite bosques. The conservation area consists of federal land overseen by the Bureau of Land Management, which developed a Draft Las Cienegas Resource Management Plan in 2001 (BLM, 2001).

6.2 Management Units

6.2.1 Training Areas

Figure 6.1 shows training areas on Fort Huachuca. The installation has 26 training areas designated by letter (A through Z). Most training area boundaries coincide with boundaries for other management purposes. The use of common boundaries for different purposes simplifies overall management. Military activities that occur on the installation are discussed in Section 4.2. Table 6 below shows the acreage of each training area and range on which it is located.

Table 6: Training Area Acreage

Training Area	Size (acres)	Location	Training Area	Size (acres)	Location
Alpha	2,471	East	Bravo	2,471	East
Charlie	2,100	East	Delta	4,694	East
Echo	4,942	East	Foxtrot	3,583	East
Golf	1,087	West	Hotel	4,200	West
India	2,223	West	Juliet	1,111	West
Kilo	1,136	West	Lima	840	West
Mike	1,087	West	November	3,410	West
Oscar	2,619	South	Papa	3,459	South
Quebec	2,347	South	Romeo	1,359	West
Sierra	2,322	South	Tango	5,312	South
Uniform	2,347	South	Victor	1,729	South
Whiskey	1,482	South	X-Ray	1,235	South
Yankee	1,482	South	Zulu	6,954	East
			TOTAL	68,002	

6.2.2 Game Management Areas

Game management areas are identical to the installation training areas. However, for game management purposes, some ranges are further subdivided numerically (F-1, F-2, N-1, N-2, T-1, T-2, T-3, etc.). Figures showing game management areas are in Appendix 11.3a - *Fort Huachuca Hunting Regulations*.

6.2.3 Watershed Management Areas

Watersheds transcend training area or other specific land use boundaries. These areas are defined by watershed boundaries and have resource concerns that are specific to their watershed. Parts of the watersheds on Fort Huachuca are typically steep with perennial waters flowing from them. These watersheds are critical components in recharging the groundwater aquifer under the installation. These areas provide outdoor recreation area and provide habitat requirements for abundant and diverse wildlife populations. Fort Huachuca has three distinct Watershed Management Areas on the West and South ranges: Garden Canyon, Huachuca Canyon, and Blacktail Canyon. Management subplans have been or are being developed for these areas on Fort Huachuca.

Garden Canyon

The Garden Canyon Watershed Management Area is a 7,425-acre mountainous watershed. Elevation ranges from about 8,625 feet above msl on the crest above Scheelite Canyon to 4,950 feet above msl at Lower Garden Canyon pond. Vegetation varies from Madrean Montane Forest at the highest elevations with associations of Douglas-fir, pines (Arizona, ponderosa, southwestern white, Apache), aspen and Gambel's oak; Madrean Evergreen Forest and Woodland including Oak-Pine forests (Apache and Chihuahuan pines with Arizona white, silverleaf or netleaf oaks) and Encinal with Arizona white, Emory, and silverleaf oaks, border pinyon and alligator juniper; Scrublands of hairy mountain mahogany, Parry's agave or coral bean; at lower elevations and on warmer exposures the Encinal is a patchwork, with Madrean Montane Grassland dominated by perennial warm bunch grasses forming part of the mosaic. The canyon bottoms contain riparian forests and sometimes marshes.

The Garden Canyon Watershed Management Area is subdivided into five sub-watersheds for use and management: Upper Garden Canyon, Middle Garden Canyon, McClure Canyon, Scheelite Canyon, and Sawmill Canyon. The *Garden Canyon Watershed, A Vision and A Mission* (Shaw, 1999) specifies uses and management of the Garden Canyon area. Management of the Garden Canyon area is further discussed in Section 8.12.1.5.

Sawmill Canyon is a 920-acre watershed in the upper, southwestern portion of the Garden Canyon drainage. It is mountainous and comprised of nearly equal parts of Madrean Evergreen Forest and Woodland and Scrubland, much of it Southwestern Interior Chaparral of Mountain Mahogany Series. . Sawmill Creek is ephemeral, and Sawmill Springs produces a small perennial flow. Cabin Springs at the mouth of Sawmill Canyon also produces a small perennial flow creating a series of unique wetland areas (cienegas). The northern half of this area is porous limestone, making it an important area for recharge of the perennial flow in Garden Canyon.

Scheelite Canyon is a very steep and rugged watershed of about 1,245 acres draining from a peak near Ramsey Peak northwesterly into Garden Canyon. It is a diverse region containing almost all of the plant communities found in the Garden Canyon watershed above 5,500 feet above msl. The creek is ephemeral. Nearly all of this area has limestone parent materials, making it a very important catchment for recharge of the perennial flow in Garden Canyon. Because Scheelite Canyon remains shaded, cool and relatively moist, several plant and animal species, including some that are Federal or State protected, occur much lower in elevation than would be expected normally.

McClure Canyon is a steep, mountainous watershed of about 1,580 acres running from the south side of Huachuca Peak southeasterly to its confluence with Garden Canyon. McClure Creek is ephemeral throughout its length except for two, small, perennial stretches below upper and lower McClure Springs, and in the small, Cave Springs, side drainage. Northern and southern sides of this watershed are porous limestone parent materials, making it an important catchment for the recharge of the perennial flow in

Garden Canyon. It contains a high diversity of plant communities including almost all those found in Scheelite Canyon and Garden Canyon. It has well developed stands bigtooth maple and sycamore, of the Madrean Riparian Deciduous Forests.

Upper Garden Canyon includes an area from Gate 7 to the Garden Canyon Creek gauging station in the narrows at the mouth of the canyon. This area is about 1,655 acres and includes several small tributary areas that are not part of Sawmill, Scheelite, or McClure canyons. It is a steep, mountainous area comprised of a diverse mixture of pine-oak, pinyon-juniper, mixed oak, mahogany, and riparian woodlands. Over three miles of its length have perennial flow from Spring Number 4 to just above the gauging station. Streamflow is sustained by eight springs in this stretch. Some of these (1a, 1b, 3, 4, and Chain springs) issue from cracks in carbonate rocks and drain the limestone catchments. These springs can go dry in droughty periods. Others (1, 2, and the Picnic Area springs) occur at points where impervious rock like siltstone and quartzite force the water in porous limestones to the surface. Springs number 1 and 2 are the main exit points for groundwater in the Garden Canyon drainage. They each produce as low as 40 gallons per minute in summer to nearly 1,000 gallons per minute in winter (Pecora, 1966).

Middle Garden Canyon is the lowest subdivision of the Garden Canyon area. It runs from the Gauging Station through an open, alluvial valley to the upper Garden Canyon pond. It includes about 2,025 acres, two-thirds of which are mixed-oak woodlands with the remainder being oak-grass savannah and deciduous riparian woodland. This stretch of Garden Canyon is ephemeral, usually flowing from December through March and for short periods in August and September after heavy summer rainfall. This is the area where most of the perennial flow of Garden Canyon recharges into the alluvial aquifer under Fort Huachuca and Sierra Vista. The groundwater table in the alluvial valley is very shallow in this area.

Recommendations for fire and fuels management in the Garden Canyon Watershed Management Area are detailed in the Fire Management Plan in Section 8.11. At least two federally-listed species and three proposed species occur in the area. More than 20 candidate or sensitive species of plants or animals reside or breed in the area. The area attracts a high rate of public recreational use. Camping, hunting, birding, hiking, horseback riding, orienteering, bicycling, and photography are some recreational uses in this area. Military training occurs in the upper and middle segments of the canyon. The Garden Canyon watershed is in very good to excellent condition. Riparian areas are in good condition in most areas but have been impacted by the main road in several areas. The area is an extremely important watershed for the recharge of the alluvial aquifer under Fort Huachuca and Sierra Vista. The average discharge of water from the area at the Gauging Station was 503 gallons per minute for a 3-1/2 year period from October 1, 1959 to June 30, 1963 (Pecora, 1966).

Huachuca Canyon

The Huachuca Canyon Watershed Management Area is a 4,020-acre mountainous watershed ranging in elevation from 8,410 feet above msl at the top of Huachuca Peak to about 5,050 feet above msl at the canyon mouth. Vegetation ranges from Madrean Montane Forest at the highest elevations and on northern aspects (dominated by pines (Arizona, ponderosa, southwestern white, Apache) and oaks (Gambel's, Arizona White, Silverleaf) but lacking Douglas-fir), to Oak-Pine forests to Encinal to scrublands of various types and Madrean Grasslands. These scrublands and grasslands occur primarily either on the crests of ridges or on steep slopes with southern and southeasterly aspects. The canyon bottom is dominated by riparian forests of either the Rocky Mountain Riparian Deciduous or Interior Southwestern Riparian Deciduous types. The former contains several plant species not known from other localities on Fort Huachuca. The latter are some of the best developed sycamore/cottonwood forests on the installation.

Huachuca Canyon has no large, named tributaries. Perennial streamflow in Huachuca Creek occurs only for short distances below Springs Number 2 and 3. The one-mile reach of stream between Springs 1, 2, and 3 runs for 8 - 10 months, usually drying up in May, June, or July. A narrow band of porous rock forms the main reservoir in the drainage area. Springs 1, 2, and 3 occur where impervious layers of quartzite intercept water flow in the limestone causing it to surface. Average water flow from these springs from October 1, 1959 to January 29, 1962 was 106 gallons per minute. Most of the catchment of Huachuca Canyon is made up of impervious parent materials resulting in most precipitation being converted to runoff rather than being stored and released through springs (Pecora, 1966). Streamflow and runoff from Huachuca Canyon are important sources of groundwater recharge for the alluvial aquifer under Fort Huachuca.

Huachuca Canyon is a mountainous watershed in very good condition. Riparian communities are in very good condition. The canyon is valuable habitat for plant and animal species. A Legacy Program grant to study fire regimes will include Huachuca Canyon.

Huachuca Canyon attracts less public use for recreation than Garden Canyon. Military and civilian personnel use the canyon extensively for recreation activities, such as hiking, running, hunting, picnicking, and birding/wildlife viewing. Little military training occurs in Huachuca Canyon.

Blacktail Canyon

The Blacktail Canyon Watershed Management Area is a 2,020-acre mountainous watershed which ranges in elevation from 7,600 feet above msl, on top of the ridge between it and Huachuca Canyon, to 5,200 feet above msl at the mouth of the canyon near the West Gate. Vegetation ranges from Arizona Pine forest in the canyon above Blacktail Springs through pinyon-juniper and mixed oak woodlands into Mountain Mahogany, Ocotillo or Coral Bean scrublands and Madrean Grasslands. Part of the canyon bottom below Blacktail Springs is dominated by Madrean Riparian Deciduous Forest, containing well developed bigtooth maples and Arizona madrones. Above that is a small area of Rocky Mountain Riparian Deciduous Forest containing a stand of Box Elder. That association also occurs near Deer Spring. Downstream are drier riparian communities dominated by oaks, alligator juniper, Arizona walnut and velvet ash.

Blacktail Canyon has no large tributaries. Deer Springs Canyon and adjoining basin create moderate sized side drainage. Perennial flow in this canyon only occurs for a short distance below Blacktail Springs. Ephemeral stream flow occurs in the rest of the canyon for a couple of months in winter, and in summer after heavy rainfall. Most of the catchment of this canyon is comprised of relatively impervious parent materials. Only a small part is underlain by porous limestone rock, limiting the importance of the water resources of this watershed. No information is known as to the flow and yield of Blacktail Springs.

The condition of the watershed in Blacktail Canyon is good. Riparian communities are in good and improving condition, especially the uppermost reaches of the main canyon where the road washed out in the mid-1980s, and was abandoned. Road blockage and seeps are allowing herbaceous and woody riparian vegetation to reestablish in disturbed areas. Due to the limited extent of perennial flow, riparian habitats in the canyon are not as extensive as those found in Garden and Huachuca canyons.

Blacktail Canyon attracts the least public recreational use of any of the mountainous areas on Fort Huachuca. Military and civilian personnel use the area for hunting, hiking, and horseback riding. Considerable military training occurs in this canyon

6.2.4 Grazing Areas

There is one grazing area on Fort Huachuca. This area is on the West Range and consists of 1,460 acres around the Buffalo Corral. The area is broken into three pastures and is moderately to heavily grazed by Army-owned horses, which are rented for recreational riding. The area is intended to be managed under the *Grazing Management Plan, Buffalo Corral, Fort Huachuca* (Bemis, 1993). Grazing management is further discussed in Section 8.2.

7.0 INVENTORY AND MONITORING

The first step in biodiversity conservation is to prepare an inventory. Inventory, as used here, is developing an itemized list or catalogue of components of an ecosystem. This process has been ongoing for many years on Fort Huachuca, primarily driven by early and continuing interest in the great variety and unusual species of plants and animals, then by the Endangered Species Act and, more recently, by implementation of the Land Condition Trend Analysis program. This INRMP continues the process of conducting basic inventories of the installation's natural resources. In general, these are Planning Level Surveys, and they are high-priority projects in the budgeting system.

Monitoring allows determination of trends (or absolute numbers if needed) of individual species or higher associations of species, such as vegetation cover types or plant communities. Monitoring is generally performed on a regular basis, and often targets species with high economic or human-use values, sensitive species, and/or indicator species of overall ecosystem health.

Fort Huachuca's ITAM program collected considerable inventory data that could be indicators of ecosystem damage as a result of military activities. Fort Huachuca's natural resources program inventories and monitors soil, water, and high priority plant and animal species and habitats. Both inventory and monitoring data are used to evaluate general and site-specific ecosystem integrity.

General Goal 1. Inventory Fort Huachuca natural resources and regularly monitor resources that are indicators of overall ecosystem integrity, habitat conditions, capability of lands to support military missions, status of sensitive species or communities, and other special interests.

General Goal 2. Analyze inventory and monitoring data to implement an adaptive management strategy, using landscape level monitoring protocols.

General Goal 3. Develop computer databases, linked to a geographic information system, for the wide variety of flora and fauna information collected on the installation.

7.1 Floral Inventory and Monitoring

7.1.1 Land Condition Trend Analysis

The application of Land Condition Trend Analysis (LCTA) data:

X better distributes training loads on the land,
X reduces the need for expensive land rehabilitation programs,
X reduces some subjectivity from land management decisions,
X helps ensure the sustained availability and productivity of Army lands, and
X provides input for implementing this INRMP and preparing NEPA and other environmental documents.

LCTA uses a wide array of natural resources data, such as soils, ground cover, above-ground vegetation/stem density, disturbance types, etc., to determine condition of land and trends in that condition, emphasizing effects of the conduct of the military mission. Tazik *et al.* (1992) describe procedures for the standard LCTA plot inventory.

LCTA was initiated on Fort Huachuca in 1992 with 134 core plots and nine special use plots selected for long-term comparisons. From 1993 to 1997 an additional 80 plots were established. Core plots were allocated using vegetation and satellite imagery to produce a stratified random allocation. LCTA core plots were designed to be intensively monitored on a long-term basis. Frequency of intensive monitoring is dependent upon management objectives and the amount of change occurring annually on the installation.

Of the 240 plots on Fort Huachuca, 89 are special use plots in areas such as riparian communities and areas of Palmer agave. Initial inventory of plots occurred in 1992-1993 and during 1995-97. A photographic archive of LCTA plots is stored at the ENRD office, as is an herbarium collection of more than 800 species and more than 2,000 specimens. Extra herbarium specimens are stored at the University of Arizona and Colorado State University herbaria. LCTA data are also available in GIS format at the Advanced Resources Technology Lab at the University of Arizona.

The LCTA program was focused on plant monitoring and inventory. Animal surveys often associated with LCTA programs on other military installations (*e.g.*, birds, small mammals) were not included in early LCTA work on Fort Huachuca. Detailed information regarding LCTA activities on Fort Huachuca for 1992 and 1993 are discussed in *Land Condition Trend Analysis At Fort Huachuca, Arizona 1992-1993* (Block, 1994). More recent LCTA information for Fort Huachuca is presented in *Land Condition Trend Analysis At Fort Huachuca 1992-97, A Progress Report* (Tandy, 1997).

As discussed in Section 1.5, the ITAM program was inactive from 1998 through 2000. Section 1.5 also discusses the fact that the Sikes Act requires no net loss in the capability of military installation lands to support the military mission of the installation. LCTA is directly related to that capability on Fort Huachuca. Fort Huachuca will continue to request funding to support the ITAM program, including LCTA, on the installation.

7.1.1.1 Alternative A - Proposed Action

Goal. Provide land managers and trainers with long-term assessments of changes in vegetative cover and botanical and wildlife composition under varying levels and types of use, and maintain floral and faunal databases.

Objective. Maintain an active LCTA or other comprehensive natural resource monitoring program on Fort Huachuca.

7.1.1.2 Alternative B - No Action

Under Alternative B, monitoring to determine the condition of land and trends in that condition, emphasizing effects of the conduct of the military mission, would occur sporadically or may not occur at all. General and site-specific ecosystem integrity would suffer under the No Action alternative.

7.1.1.3 Alternative C - Other Management Options

Military installations must ensure no loss in the capability of the lands to support the military mission. Monitoring effects of military activities is an integral part in ensuring no loss in the capability of the lands. Thus, not monitoring is not a viable option. There are numerous other land condition monitoring programs used by other agencies, but none are specifically designed to monitor effects of military activities. They would be less effective.

7.1.2 Floral Surveys

7.1.2.1 Alternative A - Proposed Action

LCTA data (Block, 1994; Tandy, 1997) and numerous other studies that included vegetation surveys, such as research involving temperate savannah ecotones (Weltzin and McPherson, 1999), canopy removal in oak woodlands (McPherson and Weltzin, 1997), soil moisture resource partitioning by trees and grasses (Weltzin and McPherson, 1997), and incidental surveys, are adequate for Fort Huachuca's needs during the next five years. Additional discoveries of plant species on the installation are likely. Herbarium mounts are useful for identifying plants during specific surveys and other field projects.

Goal. Incorporate flora species of Fort Huachuca as part of the natural resources baseline data.

Objective 1. Update the flora inventory (including herbarium mounts) as new species are found during natural resource surveys and monitoring, site-specific surveys, sensitive plant species surveys, and other projects.

Objective 2. Develop and maintain a computerized plant checklist.

Objective 3. Monitor distribution and abundance of Lehmann lovegrass (*Eragrostis lehmanniana*) near small arms firing ranges, according to Section 7 informal consultation 16 June 1998.

7.1.2.2 Alternative B - No Action

Floral surveys, such as those discussed for the Proposed Action, would continue to occur under Alternative B, and inventory data would continue to steadily grow as a by-product of other vegetative projects. Thus, alternatives A and B are identical with regard to general floral surveys.

7.1.2.3 Alternative C - Other Management Options

Options for maintaining a floral inventory range from no additional work maintaining and expanding the inventory to the other extreme of expending a great deal of effort specifically developing a more complete floral inventory. However, considering that the existing and reasonably large floral inventory is steadily growing as a by-product of other vegetation projects, the current level of inventory adequately supports the overall natural resources program.

7.1.3 Rare, Endangered, and Nonindigenous Plant Monitoring

Fort Huachuca has supported periodic survey and monitoring for Huachuca water umbel, Lemon lily, Chiricahua dock, and Lemmon fleabane. The PBO (USFWS, 1999) specifies continued annual monitoring of the Huachuca water umbel. Surveys for other species, including species that are being considered for listing and have potential to occur on Fort Huachuca, will be conducted as appropriate for specific activities and projects, and if the listing status of species change.

Goal 1. Monitor federally-listed threatened or endangered plant species on Fort Huachuca during 2001-2005.

Goal 2. Monitor areas critical to federally-listed plant and animal species.

Goal 3. Monitor other special status plant species on Fort Huachuca during 2001-2005 to the degree possible with available funding.

7.1.3.1 Alternative A - Proposed Action

7.1.3.1.1 Huachuca Water Umbel

There are seven populations of Huachuca water umbel on Fort Huachuca in Garden Canyon and its tributary McClure and Sawmill Canyons (SAIC, 1996). Three of these populations were located by an installation biologist in 1995 and 1996. Three populations were previously known, and the seventh population was located in McClure Canyon in 1997. In addition, surveys conducted by the University of Arizona have located additional populations off post in the region. Final results of these surveys are not yet available. The Programmatic Biological Opinion (USFWS, 1999) includes reasonable and prudent measures with regard to the Huachuca water umbel. Critical Habitat designation included 3.8 miles of riparian habitat in Garden Canyon (USFWS, 1999c).

Objective 1. Inventory and monitor Huachuca water umbel populations at Fort Huachuca and on the SPRNCA, as required by the PBO and as specified in the agreed protocol.

Objective 2. Document any destruction or adverse modification of Critical Habitat.

Objective 3. Fund and participate in studies of the hydrology of the Upper San Pedro River Basin.

Objective 4. Prepare annual reports on survey results for the USFWS.

7.1.3.1.2 Lemmon Fleabane

Recent taxonomic analysis has indicated that Lemmon fleabane is endemic only to Scheelite Canyon on Fort Huachuca in the Huachuca Mountains (Warren *et al*., 1991). Surveys in 1991 located 441 individual plants on two separate cliff faces. Potential habitat may occur in other areas within the installation; however, no additional plants were found outside Scheelite Canyon in surveys conducted in 1997.

Objective 5. Periodically monitor Lemmon fleabane populations in Scheelite Canyon.

7.1.3.1.3 Palmer's Agave

Although Palmer's agave is not a rare or endangered plant, its association with life requirements (forage plant) of the endangered lesser long-nosed bat necessitates treating it as such. Forage plants for the bat include Palmer's agave and possibly Parry's agave (known to hybridize at and near Fort Huachuca). Fort Huachuca has developed an Agave Management Plan (Howell and Robinett, 1995), which established agave management areas and a monitoring schedule. Agave stands on Fort Huachuca will be monitored, and the Fort Huachuca Agave Management Plan will be updated, as required in the PBO. Management of agave is discussed further in association with the lesser long-nosed bat in Section 8.4.2.2.1 and Section 8.12.

Objective 6. Monitor Palmer's agave populations on the West and South ranges every five years, and establish trends in bat forage resources.

Objective 7. Conduct pre-construction surveys, per procedures in Appendix B of the PBO (pp. 10-13).

Objective 8. Ensure training and recreational activities do not adversely affect Agave Management Areas (AMA).

Objective 9. Plan fire management activities to minimize adverse effects in AMA.

7.1.3.2 Alternative B - No Action

Monitoring of federally-listed plant species would continue under Alternative B as described in the Programmatic Biological Opinion (USFWS, 1999). Palmer's agave monitoring and management would continue due to its association with the lesser long-nosed bat. The No Action and proposed action alternatives are identical with regard to monitoring federally-listed plant species. However, monitoring of potentially federally-listed or otherwise rare and non-native plants may not occur or would occur to a lesser degree under Alternative B.

7.1.3.3 Alternative C - Other Management Options

The PBO (USFWS, 1999) specifies monitoring of the Huachuca water umbel. The PBO for the lesser long-nosed bat requires monitoring of Palmer's agave. To not monitor the Huachuca water umbel and Palmer's agave is not an option. However, there is no requirement to monitor other than federally-listed species. Thus, the option to not survey or consider these species is viable. At the other extreme is the option to treat these species the same as federally-listed species. This would be extremely expensive, could significantly affect the military mission, and would be contrary to Army policy (AR 200-3). Army funding very likely would not be available to support this option.

7.1.4 Wetlands

A National Wetlands Inventory, specific to Fort Huachuca's needs, provides adequate wetlands information for management purposes.

7.1.4.1 Alternative A - Proposed Action

Goal. Maintain baseline database on wetlands resources and riparian habitat at Fort Huachuca.

Objective 1. Use site-specific surveys to evaluate wetland resources, including jurisdictional status, if any wetland impacts are proposed.

Objective 2. Document any loss of wetlands.

7.1.4.2 Alternative B - No Action

Alternatives A and B are identical with regard to inventory of wetlands on Fort Huachuca.

7.1.4.3 Alternative C - Other Management Options

Jurisdictional wetland surveys must be conducted when proposed actions may affect wetlands. Wetlands (jurisdictional or otherwise) on the installation are well known and will be verified by the National Wetlands Inventory; thus, there is no need for additional wetland surveys.

7.2 Faunal Inventory and Monitoring

Faunal inventory and monitoring on Fort Huachuca are accomplished primarily as part of either the identification and protection of sensitive species or managing recreational aspects associated with fauna. Incidental observations are documented during field operations specific to other projects.

7.2.1 Species Other Than Federal- or State-listed Threatened or Endangered Species

7.2.1.1 Alternative A - Proposed Action

Goal 1. Incorporate fauna species of Fort Huachuca as part of the natural resources baseline data.

Goal 2. Monitor animal take, collection and harvest activities on Fort Huachuca to document levels of take, detect large changes in populations or distribution, and document new species occurrence.

7.2.1.1.1 Mammals

ERND, with assistance from the MWR Sportsman Center, monitors big game harvest by staffing a game check station during general deer hunts and otherwise using self check-in by hunters. Data, including the number of animals, weight, general age, number of antler points for bucks, and hunter effort, are collected for deer and antelope. Probably the most useful harvest data collected is the weight of yearling, male deer, which gives an indication of habitat conditions. A five-year analysis of big game harvest data has been completed using a student volunteer. Harvest data are on file at the ENRD office.

Fort Huachuca has been part of an antelope habitat suitability study conducted by the AGFD. An annual aerial survey is done jointly with AGFD for population counts on potential habitats on the East, West, and South Ranges. Incidental javelina and coyote sightings are recorded.

Weight, area, and date of harvest are collected for javelina. Body measurements for mountain lions are taken along with other general harvest information. Body measurements would also be collected for bears, but only one bear has been harvested since bear hunting opened in 1985.

Fort Huachuca has served annually since 1989 to train volunteers in techniques to monitor lions. A regional conservation group now coordinates the training and monitoring event, which is led by biologists from around the southwest. These independent wildlife scientists perform data management and analysis. Each June standard routes are used to perform track counts and teach the techniques needed to monitor presence of these wide-ranging predators. This effort and expertise also provides information on other infrequently seen species, and can be used to survey for rare carnivores that may occur on the installation.

Small mammals have not been inventoried comprehensively on Fort Huachuca in the past two decades. However, very good mammal data exists from past efforts over many years in certain vegetation types. Also, current, habitat-specific data on terrestrial mammal occurrence have been collected as part of several research efforts, some of which are ongoing. A hantavirus survey provided information on small mammal species occurrence in riparian and wash habitats. Annually, data on several, cave roosting bat species are collected during roost exit counts of endangered lesser long-nosed bats. In addition, Mexican long-tongued bats were fitted with radio transmitters in 1999 to monitor foraging behavior and use of agave. Coati are the subject of a long-term research project, and general information on other carnivores is being collected through live trapping and tracking. More intensive research on skunk species started in 2000 under AGFD Heritage funding. Grassland fire effects investigations also began in 2000, including a

focused effort on small mammal populations. Other small mammal surveys to date have been incidental observations as part of other activities. Small game species are not monitored directly, but hunter sign-out sheets collect data on number of hunter days by species or group of species. These records are filed, but data have not been analyzed.

Objective 1. Monitor hunter harvested big game.

Objective 2. Cooperate with the AGFD for annual antelope surveys, and use AGFD survey data on other big game species for surrounding areas for relative abundance and sex and age ratios.

Objective 3. Support annual lion track count sessions with conservation community volunteers.

Objective 4. Track and support on and off-installation research that monitors other non-federally-listed mammals.

Objective 5. Add to the small mammal baseline inventory using observations and data from other field projects. Compile and analyze all data from past dedicated and incidental inventories.

Objective 6. Conduct habitat-specific, small and medium-sized mammal inventories. Monitor black-tailed prairie dog numbers and location if they are reestablished on Fort Huachuca.

Objective 7. Automate the hunter check-in/out data collection system.

7.2.1.1.2 Birds

Birds have been inventoried extensively on Fort Huachuca and the surrounding area. Several different bird lists have been developed and are available through governmental agencies. Breland (1981) presents an informational checklist of birds of Fort Huachuca. Fort Huachuca's Game Management Office updated this checklist in 1992. The installation is part of a coordinated effort to document breeding birds in Arizona, which is published in the *Arizona Breeding Bird Atlas.* Trail registers at the two most populated birding areas provide many records and information on species observed by birders on the installation.

Many research projects have added to the information available on bird species that occur on Fort Huachuca, several in cooperation with AGFD. Elegant trogon surveys and research in riparian and upland forest habitat (Hall, 1996), and past as well as current buff-breasted flycatcher surveys and research in pine-oak and mixed conifer habitat (Morrison and Martin, 1997) provide much information on forest breeding bird species. Past and recently begun studies of ecological effects of grassland fire (Aid, 1990) provide detailed information in grassland breeding birds. Montezuma quail habitat use and development of quail census methods were studied by AGFD through 2000. Gould's turkey habitat use has been analyzed, mapped, and modeled, and results are available for planning habitat improvements (Wakeling, 2000; Wakeling *et al*., 2001). Turkey surveys along established routes are performed on the installation and surrounding areas in cooperation with AGFD and other groups (Heffelfinger *et al*., 2000). Cowbird populations and their potential impacts to threatened and endangered species, particularly the southwestern willow flycatcher, have been studied by independent researchers.

Objective 8. Continue to add to the avian baseline inventory of species occurrence and habitat affinities by using incidental observations and data from cooperative research and other field projects.

Objective 9. Encourage other independent research efforts over the next five years.

7.2.1.1.3 Fish

There is no current justification for inventory or monitoring of fish populations on the installation. Monitoring will occur if native fish are reestablished on Fort Huachuca. Monitoring for presence of sport fish, likely released without authorization, is needed in ponds and streams managed for federal status aquatic species. Close follow-up monitoring after such fish are removed may be necessary. If law enforcement becomes a responsibility under the natural resources program, creel surveys may be developed and performed to measure aspects of recreational fisheries.

7.2.1.1.4 Reptiles and Amphibians

AGFD conducted inventories of riparian herpetofauna from 1995-1998 under a DoD Legacy Program funded *Survey and Management of Sensitive Herpetofauna*, and produced an *Aquatic Herpetofauna Inventory of Fort Huachuca and Vicinity* (Sredl *et al*, 2000b). Inventory and monitoring of Ramsey Canyon leopard frogs is discussed in Section 7.2.2.1.6.

Objective 10. Implement the amphibian management plan for Fort Huachuca (Sredl et al, 2000a).

Objective 11. Monitor populations and habitat of herpetofauna in the Huachuca Mountains and riparian areas on Fort Huachuca, along with distribution of the nonindigenous, invasive crayfish.

Objective 12. Continue to add to the amphibian and reptile baseline inventory using observations and data from other field projects. Continue to support a long-term research project on western box turtles using a study area on the installation.

7.2.1.1.5 Invertebrates

Fort Huachuca is internationally known as one of the best locations in the United States to observe and collect a diversity of butterfly species. Butterflies have been inventoried as part of the development of a installation-wide butterfly checklist. The installation, particularly Garden Canyon, receives significant demand for butterfly collection, and impacts of collection are a natural resources concern. The concerns are primarily about overcollecting in a place that is so popular, accessible, and relatively small, and about destructive collecting to find certain life stages of invertebrates, such as plant destruction to get at larvae of butterflies. The prohibition against unauthorized removal of any material from the installation includes scientific collecting, and therefore, ENRD has issued invertebrate collecting permission letters to bonafide scientists, educators, and serious collectors with institutional affiliation. These collectors are required to provide the installation a list of species collected on Fort Huachuca to renew collection letter permission. ENRD has developed a cooperative relationship with many of the most active collectors and/or groups that observe or collect on the installation. This relationship may be developed into a monitoring program that would require observers/collectors to provide information to the ENRD on species, numbers, dates and habitat. Pollinators, including invertebrates, are gaining increasing conservation attention in the Sonoran Desert and San Pedro Valley.

There has been no systematic survey for invertebrates on the installation. It is difficult to justify a general survey for invertebrates at this time.

Objective 13. Continue to provide written scientific collecting authorization for appropriate, sustainable types and levels of collecting, to collectors who can demonstrate affiliation with bonafide scientific, educational or interpretive entities. Unaffiliated collectors who can demonstrate a record or provide references from previous collecting and scientific collaboration, and an intent that their collection will go

to scientific or educational purposes, may also be authorized to collect invertebrates on Fort Huachuca as appropriate.

Objective 14. Continue to collect inventory data on butterflies from outside sources. Continue to require collectors to provide a written list of species documented on the installation and where the specimens and collecting records ultimately will be deposited, to have a permit renewed.

Objective 15. Develop an invertebrate species list using observations and data from other field projects.

Objective 16. Investigate the development of a more formal invertebrate monitoring program, particularly for taxa, such as butterflies, that may be indicators of plant species diversity or ecological functions.

7.2.1.2 Alternative B - No Action

Inventory and monitoring of faunal species other than federally- or State-listed species would continue under the No Action alternative. However, some projects would not be implemented. For example, under Alternative B, data from past dedicated and incidental surveys and data from hunter-harvested small game would not be analyzed; the hunter check-in/out data collection system would not be automated; the herpetofauna management plan would not be implemented; and an invertebrate species list using observations and data from other field projects would not be developed. The No Action alternative provides a less comprehensive approach to inventory and monitoring of faunal species on Fort Huachuca.

7.2.1.3 Alternative C - Other Management Options

There is the option to do less or none of the projects under the Proposed Action involving the collection of faunal inventory and related data proposed action. There are also numerous other fauna inventory and monitoring techniques available for use in southern Arizona. These could be used to any degree on Fort Huachuca. However, considering declining DoD budgets and increasing compliance-driven programs, it is unlikely that significantly more faunal surveys or monitoring programs can be justified for species that are not federally-listed.

7.2.2 Federal- or State-listed Threatened or Endangered Animal Species

Fort Huachuca has supported surveying and periodic monitoring for several federally-listed threatened, endangered, and/or candidate species, including the southwestern willow flycatcher, Sonora tiger salamander, and Huachuca springsnail. Annual monitoring or survey is performed for the Mexican spotted owl, lesser long-nosed bat, and the recently delisted American peregrine falcon on Fort Huachuca. The PBO (USFWS, 1999) specifies that existing monitoring of federally-listed threatened and endangered species will continue, including annual monitoring programs for the Mexican spotted owl, lesser long-nosed bat, and Sonora tiger salamander.

Goal 1. Monitor federally-listed threatened or endangered animal species on Fort Huachuca during 2001-2005.

Goal 2. Monitor State Wildlife Species of Concern animal species on known Fort Huachuca during 2001-2005 to the degree possible with available funding.

Objective. Maintain a comprehensive, sensitive animal species list for Fort Huachuca.

7.2.2.1 Alternative A - Proposed Action

7.2.2.1.1 Southwestern Willow Flycatcher (Endangered)

Fort Huachuca has supported periodic monitoring and surveying for the southwestern willow flycatcher in the SPRNCA. Fort Huachuca biologists surveyed 12.9 miles of the San Pedro River, and BLM biologists surveyed 4.1 miles in 1997. One singing southwestern willow flycatcher was recorded by BLM biologists, and a nest was subsequently found. This was the first confirmed nesting of the southwestern willow flycatcher in the area of SPRNCA since 1957. There has not been a confirmed or documented sighting of a southwestern willow flycatcher on Fort Huachuca. Survey methods and results are discussed in the Biological Assessment (SAIC, 1998a) and adhere to USFWS protocol (Sogge *et al*., 1997).

Objective 1. Fund comprehensive annual status surveys for southwestern willow flycatcher at all suitable habitats potentially affected by Fort Huachuca actions, including riparian vegetation that is potential

habitat, Babocomari Cienega (if permission is obtained), and in the SPRNCA in cooperation with the BLM.

Objective 2. Monitor habitat conditions in the SPRNCA and any habitats acquired or for which easements or permission to enter are obtained.

X Take aerial photos of the riparian corridor in 2000, 2004, and 2008 and construct vegetation maps from each photo series within one year of obtaining the photographs.

X Conduct ground-truthing to assure reasonable accuracy of the mapping effort and provide trend analyses of the 2004 and 2008 efforts to determine gains or losses in flycatcher habitat.

Objective 3. Prepare annual reports of the southwestern willow flycatcher for the USFWS.

7.2.2.1.2 Mexican Spotted Owl (Threatened)

Owl inventory and monitoring on Fort Huachuca has gone on since 1991. In 1995 survey and nest monitoring efforts documented 17 occupied spotted owl territories in the Huachuca Mountains (Duncan, 1991; 1995; Duncan and Taiz, 1992b). Five of these territories occurred on Fort Huachuca. In 1996, SAIC conducted surveys of suitable habitat in areas that did not contain previously identified territories. These surveys followed the Mexican Spotted Owl Inventory Protocol published by the U.S. Forest Service Southwest Region (USFS, 1996). The monitoring and surveys did not identify any new breeding territories until 2000. Reproductive monitoring, banding owls for demographic information, and blood and feather collection to support population genetic analysis have also occurred periodically.

Surveys conducted in 1997 by Duncan (1997) found three breeding pairs on Fort Huachuca in Scheelite, McClure, and Upper Huachuca canyons. A single owl was heard vocalizing in the Rock Springs Trail territory between Charlie and Delta breaks; however, no owls were recorded during the subsequent daytime follow-up survey. No owls were found in Woodcutter's, Split Rock, and Blacktail canyons. This occupancy pattern has continued through 2000, except for the new territory, breeding pair, and nest site found in middle Huachuca Canyon in 2000. Other areas of the installation do not contain suitable habitat for Mexican spotted owls.

Objective 4. Conduct annual reproductive monitoring of known Mexican spotted owl Protected Area Centers and survey potential habitat at Fort Huachuca, in accordance with USFWS survey protocol.

Objective 5. Monitor take of Mexican spotted owls and document any destruction or adverse modification of Critical habitat (*e.g*. from fires).

Objective 6. Prepare annual monitoring reports of the Mexican spotted owl for the USFWS.

7.2.2.1.3 Lesser Long-nosed Bat (Endangered)

Little was known of the lesser long-nosed bat on Fort Huachuca prior to listing. Projects begun in 1989 resulted in the discovery and consistent monitoring of numerous day, night, and potential roosts. Monitored sites include Manila Mine, Pyeatt, Upper Pyeatt, and Indecision Caves and Wren Bridge.

Objective 7. Conduct annual monitoring of known or potential lesser long-nosed bat roosts on Fort Huachuca.

Objective 8. Monitor Palmer's agave populations on the West and South Ranges every five years to establish trends in bat forage resources, according to protocol approved by the USFWS.

Objective 9. Monitor "take" of lesser long-nosed bats and document any disturbance of roost sites.

Objective 10. Prepare annual monitoring reports of the lesser long-nosed bat for the USFWS.

7.2.2.1.4 American Peregrine Falcon (Delisted)

In 1992, AGFD began a five-year program to locate breeding peregrine falcons and monitor their occupancy and productivity. Breeding pairs at more than 200 sites were located through this effort. However, peregrine falcons were not known to nest on Fort Huachuca until 1996, when a survey of nesting habitat within South Range conducted by SAIC found one active falcon aerie on a cliff north of upper Woodcutters Canyon. The same area was surveyed in 1997, but no peregrine falcons were located (Duncan, 1997). However, a probable immature (bird of the year) peregrine was seen soaring near these same cliffs on the east side of Huachuca Peak in 1998 during Apache goshawk surveys. In 1999, this raptor biologist confirmed 3 fledgling peregrines at a nest in these cliffs (Snyder, 2000b). A peregrine falcon was reported at an effluent pond in the southwestern corner of the East Range, and a peregrine falcon was killed when it collided with a chain link fence around the AEROSTAT site in the early 1990s (SAIC, 1998a). The peregrine was delisted under the ESA in 1999, and is being monitored under a nation-wide management plan.

Objective 11. Conduct annual monitoring of potential peregrine falcon nest sites at Fort Huachuca early in the breeding season.

Objective 12. Monitor "take" of peregrine falcons and document any disturbance of nest sites.

Objective 13. Prepare annual monitoring reports of the peregrine falcon for the USFWS.

7.2.2.1.5 Sonora Tiger Salamander (Endangered)

The status of the Sonora tiger salamander is discussed in Section 5.7.6.4. Surveys from 1995 through 1998 conducted by the AGFD did not locate any salamanders in lower elevation stock tanks and springs on the South Range or effluent ponds in the southwestern corner of the East Range (Wallace, 1998; Sredl, *et al.*, 2000b). But in 1998, these East Range effluent ponds were well sampled with seine nets by Arizona State University (ASU), and breeding populations of what was determined to be the introduced, invasive barred tiger salamander subspecies were found (Collins and Snyder, 1998). In May, 1998, a

massive die-off was reported in the farthest downstream of these ponds, where the most salamanders had been seined in 1997. Almost 2,500 dead branchiate salamanders (adult, but still aquatic, forms) were counted, and samples were collected and sent to an amphibian disease specialist at ASU, but a causative disease or toxin could not be identified.

In 1997, four Sonora tiger salamanders were collected from the Upper Garden Canyon pond by Arizona State University for genetic studies on this subspecies. Results of this research have been inconclusive at

the level of detail needed to resolve their exact taxonomic status, and whether hybridization has occurred in this population between the native Sonora subspecies and the introduced barred tiger salamander subspecies. Laboratory genetic work continues.

Objective 14. Annually monitor the Upper Garden Canyon pond in March-April for Sonora tiger salamander breeding activity, and if not detected then, monitor in June or early July (pre-monsoon) to determine condition of the habitat and the presence of aquatic salamanders, according to protocol approved by the USFWS.

Objective 15. Monitor "take" of Sonora tiger salamanders and document any disturbance of salamanders or salamander habitat.

Objective 16. Prepare annual monitoring reports of the Sonora tiger salamander for the USFWS.

7.2.2.1.6 Ramsey Canyon Leopard Frog (Subject of multi-agency Conservation Agreement)

The status of the Ramsey Canyon leopard frog is discussed in Section 5.7.6.4. The AGFD conducted surveys from 1994 through 1997 but did not find any additional populations on the installation.

Objective 17. Monitor Ramsey Canyon leopard frog populations often enough each year to detect presence, reproduction, and metamorphosis of tadpoles.

7.2.2.1.7 Huachuca Springsnail (Candidate)

The status of the Huachuca springsnail is discussed in Section 5.7.6.5. A 1992 survey of potential habitat documented Huachuca springsnails on the installation.

Objective 18. Inventory remote springs not surveyed for springsnail.

Objective 19. Monitor Huachuca springsnail populations on Fort Huachuca as needed.

7.2.2.2 Alternative B - No Action

The Proposed Action and No Action alternatives are identical with regard to monitoring federal- or State-listed threatened or endangered animal species on Fort Huachuca.

7.2.2.3 Alternative C - Other Management Options

Options exist with regard to monitoring of federally-listed species on Fort Huachuca. However, these options are related to the protocols and techniques used to monitor these species and not the requirement to monitor. For example, if research indicates that a different protocol might be more appropriate to monitor Mexican spotted owls in Protected Area Centers at Fort Huachuca, changes to monitoring protocol could take place following consultation and agreement with the USFWS. The option to not monitor these species does not exist, particularly for those species addressed in the PBO (USFWS, 1999). There is no legal requirement to monitor State-listed species, so options ranging from no survey or monitoring to greater-than-planned activities are available.

7.3 Water Quality Monitoring

7.3.1 Surface Water

Fort Huachuca has limited surface water resources (Section 5.4.1), and there is no reason to suspect that water quality parameters in these waters are other than normal for these types of water bodies. To date, there has been no water quality monitoring on the installation as part of the natural resources program. However, surface water is monitored as part of the Storm Water Pollution Prevention program and Waste Water Treatment Plant operation.

Stormwater is monitored as specified in the Stormwater Pollution Prevention Plan (Webb, 2000). Quarterly monitoring occurs at industrial areas, and samples are analyzed for properties of turbidity, color, sheen, etc. Beginning in 1999 and repeated biennially, qualitative analysis of samples taken at the Cleanfill Landfill and DRMO Hazardous Waste Warehouse is conducted quarterly. Fort Huachuca maintains conditions within limits of two State stormwater permits.

Waste Water Treatment Plant monitoring occurs at the treatment facility. No treated water is discharged off-post. About 40 percent of the treated effluent is land-applied to the golf course, Chaffee Parade Field, and the Outdoor Sports Complex. Effluent reuse is further discussed in Section 3.5.3.

7.3.2 Groundwater

Groundwater is discussed in Section 5.4.2. Groundwater monitoring and management are not natural resources responsibilities within the Army and thus are not a required part of this INRMP. Groundwater management is within the Environmental and Natural Resources Division, DIS.

Fort Huachuca has 16 test and monitoring wells (nine test and seven monitoring) that are monitored. Currently two monitoring and two test wells are equipped with continuous recorders that are under the USGS data gathering program. Additionally, two test wells are monitored by ADWR. One of these index wells is equipped with a continuous recorder and the other is monitored on a quarterly basis. Seven test and five monitoring wells are monitored by the installation on a 50-day cycle. Readings by the USGS and the installation are analyzed by the Corps of Engineers Hydrologic Engineering Center located at Davis, California, and a trend analysis report is prepared annually. The data collected by ADWR is incorporated into a well sweep analysis report prepared approximately every five years by ADWR.

Two shallow wells at the South Range Landfill have been used to monitor leachate that collects at the bottom of the wells. There is one deep, regional well, and two regional wells are under construction. Water samples are taken quarterly from the three existing wells and will be collected from all five after development of the new wells is completed. The East Range Mineshaft, which was historically used for dumping and burning debris, has three wells reaching to the aquifer. Semi-annual samples are taken from one of the three wells. The former AAFES PX Service Station has 26 wells, associated with a perched aquifer. Semi-annually, groundwater measurements are taken from 21 of the wells, and water samples are collected from 11 wells.

7.4 Soils Inventory and Monitoring

Fort Huachuca has a complete soils inventory (NRCS, 1997). No additional general soils surveys are required during the next five-year period. However, Fort Huachuca has a PBO requirement to monitor general soil condition, via LCTA techniques. Geomorphic or surficial geologic mapping would enhance

management usefulness of existing soil and geologic maps for natural and cultural resource conservation, erosion control planning, and vegetation restoration.

7.4.1 Alternative A - Proposed Action

Goal 1. Use soil parameters to manage military activities, protect soil stability, rehabilitate training lands, and conserve wildlife habitat.

Objective 1. Use site-specific soil testing for natural resources programs, such as erosion control.

Objective 2. Use soil inventory data to make decisions regarding land use, restoration options, and wildlife habitat management options.

Goal 2. Monitor general soil condition, erosion, and effects of erosion control.

Objective 1. Identify and characterize erosion sites, and digitize data for GIS analysis.

Objective 2. Perform pre- and post-treatment monitoring of erosion sites.

Goal 3. Enhance applications of land surface map data for management decisions.

Objective. Develop a digitized geomorphic surface map of the installation.

7.4.2 Alternative B - No Action

Soils inventory and monitoring would be the same for alternatives A and B. However, under the No Action alternative, management actions, such as GIS analysis, pre- and post-treatment monitoring of erosion sites, and development of geomorphic or surficial geologic maps, would not occur. Thus, existing soils data would be of less use for natural and cultural resource conservation, erosion control planning, and vegetation restoration.

7.4.3 Alternative C - Other Management Options

Additional general soil surveys are not a useful option due to the high quality, current soils survey for the installation. Not using data from this inventory is an option but not one that is prudent in terms of compliance and stewardship.

7.5 Fire Monitoring

7.5.1 Fire History

Fire history data can be used to examine some effects of fire frequency and intensity on plant communities, soils, and wildlife species. Natural and human-ignited fires, mostly occurring in grassland and oak woodland communities, were documented on Fort Huachuca from 1973 to 1977, intermittently from 1977 through 1993, and for every fire after 1993. Documentation included date of fire, fire location, number of acres burned, fire intensity, photographs of individual fires and their immediate effects, and the measure of sensitivity of each fire with concerns for its effect on endangered species, potential for erosion, etc. In addition, boundaries of 10 burned areas were mapped using Global Positioning System (GPS). These data were incorporated into a Geographic Information System (GIS) database to create a

fire history map displaying the distribution of fires in grassland and oak woodland communities for the period of 1973-1993 (Robinette *et al.*, 1997).

Two fire history studies were conducted on Fort Huachuca to determine the natural interval of historical fires and their distribution in pine and pine-oak communities. Both studies used dendroecological methods to reconstruct historical fire frequencies. Danzer (1998) determined the effect of fire and land use history on stand structure in mixed-conifer communities. Kaib (1998) compared historical frequencies of fires between pine-oak sites in southwestern Arizona, southwestern New Mexico, and northern Mexico.

7.5.1.1 Alternative A - Proposed Action

Goal. Use fire history data from Fort Huachuca to improve natural resources management.

Objective 1. Continue collecting fire history data.

Objective 2. Digitize fire history and mapping data for GIS entry and analysis.

7.5.1.2 Alternative B - No Action

The Proposed Action and No Action alternatives are identical with regard to the collection and analysis of fire history data on Fort Huachuca.

7.5.1.3 Alternative C - Other Management Options

There is the option to do less or none of the proposed action with regard to fire history data collection and analysis. In addition, numerous other parameters could be documented relative to fire history. These could be used to varying degrees on Fort Huachuca. However, due to declining budgets and increasing mandatory compliance programs, the collection of significantly more fire history information is difficult to justify.

7.5.2 Fire Effects Monitoring

The monitoring of fire and fuel treatment effects is necessary to evaluate plant community response and to quantify vegetation trends through time. Fire effects investigation is the single-most, all-inclusive type of research being done on the installation today. Effects of fire (or lack of fire) on soils, vegetation, State and federally protected species, and numerous other parameters are being documented. One example is a study of the use of fire to reduce the distribution of the exotic Lehmann lovegrass. Future studies will provide an understanding of ways to protect and/or enhance natural ecosystems. For instance, pre- and post-fire research, particularly in riparian areas, is needed to assess impacts to Gould's turkey and the buff-breasted flycatcher, which may benefit from understory fires.

Monitoring plant communities for fire management became a major focus of the LCTA program beginning in 1996. Permanent plots were established within major and small, important vegetation types, to monitor plant composition and structure. In addition, a subset of the LCTA plots were included in a fuel inventory study. A pilot fuel inventory study was conducted to collect baseline information on amounts and distribution of fuel loads in plant communities ranging from conifer to grassland throughout the installation (Danzer, 1997). A subsequent fuel inventory study, concentrating in Garden Canyon, used remote sensing and GIS technology with extensive field verification to create a fire hazard map (Watts *et al.*, in press). Expansion of the fire hazard map over the entire installation will continue over the next

several years as part of the development of a military training and natural resource fire management decision tool.

7.5.2.1 Alternative A - Proposed Action

Goal. Monitor effects of fire and fuels management on Fort Huachuca ecosystems.

Objective 1. Monitor fire suppression and prescribed fire activities via an on-site natural resource advisor.

Objective 2. Develop and test protocols for monitoring effects of fires and fuel reduction treatments (pruning and thinning) on populations, habitat components, and ecological processes in affected watersheds.

Objective 3. Develop monitoring plans for all fire and fuel treatment activities that may adversely affect federally-listed species.

Objective 4. Coordinate monitoring with the USFWS, USFS, NPS, AGFD, and ADEQ.

7.5.2.2 Alternative B - No Action

The No Action and Proposed Action alternatives are identical with regard to monitoring the effects of fire on Fort Huachuca.

7.5.2.3 Alternative C - Other Management Options

The PBO requires Fort Huachuca to monitor the effects of fire. Thus, monitoring fires, suppression activities, and their ecological effects is a high priority for compliance funding.
There are numerous other parameters of fire effects that could be documented, and could be used to varying degrees on Fort Huachuca. However, due to declining budgets and increasing compliance-related programs, the collection of significantly more fire effects information is difficult to justify.

8.0 NATURAL RESOURCES MANAGEMENT

This chapter includes management practices that directly affect soil, water, vegetation, and fauna. It includes forest management, habitat management, grounds maintenance, erosion control, and direct manipulations of wildlife. Other programs include fire management, special interest area protection, wetlands management, water quality programs, game harvest, and pest management. The *Secretary of Defense 1987 Conservation Award Report for Fort Huachuca, Arizona* (Fort Huachuca, 1987) contains a pre-1987 history of natural resources programs and program accomplishments on the installation.

8.1 Forest Management

Fort Huachuca has about 23,650 acres of forest or woodland. However, there is little or no potential for a commercial forestry operation because of tree size, physical access, and lack of nearby mills (ENRD, 1995). Fort Huachuca's Forester provides information and guidance for the multiple use of forest lands and management of forest resources. The plan addresses issues of fire management, use and sale of forest

products, recreation, wildlife, and forest insects and disease (ENRD, 1995). Reports and records of the forest management program are maintained on an annual basis and filed by the installation Forester.

Forest and woodland types at Fort Huachuca encompass four major biomes (Brown, 1982; Tandy, 1999a); Appendix 5.6.2.2: Madrean Montane Forest, Madrean Evergreen Forest and Woodland, Madrean Riparian Deciduous Forest, and Interior Southwestern Riparian Deciduous Forest and Woodland. A fifth, Rocky Mountain Riparian Deciduous Forest is very limited in extent. In addition, Fort Huachuca has areas that resemble woodland due to the cover of velvet mesquite. Most of these areas are probably more extensive now than in the past because mesquite has encroached on grassland areas over the last century. Vegetation types including woodlands are further discussed in Section 5.6.1.

A sawmill was built on the “Old Post” in 1878 in the mouth of Huachuca Canyon. Timber harvested in Huachuca Canyon was used in the construction of stables and tent frames. In 1882, another sawmill was established in Sawmill Canyon, a tributary in the upper part of Garden Canyon. This mill produced lumber for construction of the earliest buildings. In subsequent years this mill was moved to the upper end of Sawmill Canyon to process logs from Ramsey and Pat Scott Peaks.

Most forest products were firewood (oak) and fence posts (juniper). Historic cutting areas were Woodcutters, Tinker, and Blacktail Canyons. Contracts were let to individuals to cut firewood for military use. The last such contract was in 1942.

More recently, fuelwood has been harvested on Fort Huachuca from oak woodlands in the 1970s and 1980s. Commercial fuelwood harvests started in 1982 in designated sale stands, and cut about 750 cords a year through 1988. These sales supplied about 20 percent of the demand for fuelwood by the Sierra Vista market. More limited, diffuse fuelwood cutting has been permitted since then.

Since 1988, fuelwood harvest has been limited primarily to trees top-killed by fires, pruning lower trunks of trees, and trimming and tree removal operations in the cantonment area. The fuelwood program sells permits for $25 per ½ cord to individuals under a self-help cutting program, generally using only dead standing or down trees. Permits for pruning live trees are also sold to private individuals. Live trees are pruned to maintain the canopy but still remove ladder fuel. Used utility poles are also sold through the Forestry office. The total number of permits (fuelwood, pruning, utility poles) sold by the Forestry office is about 100 annually.

Current management of forest resources outside the cantonment area on Fort Huachuca emphasizes protection. No pre-commercial thinning type of cutting is warranted, and no harvest is planned, except possibly fuelwood harvest from dead trees and fuel load reduction activities in areas along the base of the mountains and into the lower parts of canyons. The *Fort Huachuca Fire Management Plan* (Robinett *et al*., 1997) recommends the adoption of prescribed burning and cultural treatments to remove ladder fuels and break-up fuel continuity in some woodland areas. Fort Huachuca forest resources will be managed as part of programs planned for the installation as a whole, especially through the Fire Management Plan, rather than via a forest management plan. Fire management is further discussed in Section 8.11.

Most forestry activities presently occur within the cantonment area. Activities include maintenance of healthy trees and shrubs and removal of damaged or dead trees, implementing xeriscaping principles to use native species better suited to the local climate, as required by Presidential Memorandum (Office of the President, 1994), assisting with planning of tree and shrub placement as part of a self-help landscaping program, and maintaining vegetation in historical areas to visibly depict the military presence.

8.1.1 Alternative A - Proposed Action

Goal 1. Manage forest resources outside the cantonment area under requirements of the installation fire management strategy, to enhance desired ecological processes and benefit wildlife populations.

Objective 1. Continue to sell fuelwood and other wood or plant permits to help manage forest resources, reduce ladder fuels, and provide useful forest products to the local community.

Objective 2. Maintain sufficient dead and down wood in all canyon bottoms, especially in riparian vegetation, to provide for wildlife habitat requirements.

Objective 3. Maintain reasonable density of snags throughout all forest types to provide for wildlife habitat requirements.

Goal 2. Maintain an aesthetically pleasing cantonment area using principles of urban forestry and xeriscaping.

Objective 1. Implement the Presidential Memorandum on *Environmentally and Economically Beneficial Practices on Federal Landscaped Grounds* (Office of the President, 1994).

Objective 2. Use xeriscaping to minimize water use and improve cantonment landscaping.

Goal 3. Develop in 2002 a geographically based Forest, Woodland, and Urban Forestry Management Plan that is consistent and integrated with the installation fire management plan and with cantonment area tree planting and landscaping guidelines.

Objective. Map and digitize specific fuel load reduction, pruning and wood cutting treatment areas, and planting sites, along with area-specific guidelines for prescriptions.

8.1.2 Alternative B – No Action

Management of forest resources on Fort Huachuca under the No Action alternative would be similar to the Proposed Action. For example, requirements of the installation fire management strategy, providing forest products to the local community, and implementing the Presidential Memorandum would continue. However, forest management that provides for wildlife habitat requirements, maintains snags, uses xeriscaping in urban forestry, or maps and digitizes specific management projects may not be implemented or would be implemented to a lesser extent under the No Action alternative. Therefore, the Proposed Action offers a more comprehensive and integrated approach than the No Action alternative for forest management on Fort Huachuca.

8.1.3 Alternative C - Other Management Options

Numerous options are available with regard to managing forest resources on Fort Huachuca. The installation could revert back to managing for commercial forestry as in the past, but this could significantly affect ecosystem functionality, and certain aspects of past activities probably would be contrary to requirements of current threatened and endangered species management. Fort Huachuca could cease selling fuelwood and/or pruning permits for areas outside of the cantonment, but this would increase fuel loading and the fire hazard potential. Fort Huachuca is required to implement the Presidential Memorandum including xeriscaping. This is not only fiscally prudent but is also prudent in terms of compliance and stewardship.

8.2 Agricultural Outleases/Grazing

Fort Huachuca has no agricultural outleases. There are no plans to institute such leases because they are not considered cost-effective or compatible with either the military mission or with ecosystem management strategies.

Grazing was a part of Fort Huachuca long before the installation was established, but probably not at intensive levels. Cattle were the primary grazers but were later replaced by bison in 1950. Bison were removed from Fort Huachuca in 1956. Currently, no grazing occurs on the installation with the exception of horses at the Buffalo Corral, which include 1,460 acres on the West Range. This area is grazed by government-owned horses, which are rented to individuals for recreational riding.

The Buffalo Corral area comes under the *Grazing Management Plan, Buffalo Corral, Fort Huachuca* (Bemis, 1993). Implementation of the grazing plan is the responsibility of the Directorate of Moral, Welfare and Recreation. The Buffalo Corral area consists of three pastures with stock rotated between each pasture. Pastures can provide feed for 80 horses under the planned utilization level of 15-40 percent harvest of available forage. The Plan includes recommendations for putting stock on line (available for riders) for each day of the week.

8.2.1 Alternative A - Proposed Action

Goal. Manage lands used for grazing to avoid ecosystem degradation.

Objective. Implement the Grazing Management Plan (Bemis, 1993) on Fort Huachuca.

8.2.2 Alternative B - No Action

The No Action and Proposed Action alternatives are identical with regard to implementation of agricultural or grazing outleases on Fort Huachuca.

8.2.3 Alternative C - Other Management Options

Fort Huachuca could eliminate grazing. However, this may be cost prohibitive, and would ultimately eliminate the equestrian program. The installation could experiment with more intensive grazing or other grazing systems. However, the level of grazing currently practiced and the system used has been developed over time and is expedient. The current system includes concerns for ecosystem integrity, compliance, and stewardship. It is the most prudent measure, which allows continuation of equestrian programs on Fort Huachuca.

8.3 Habitat Management

Habitat management is accomplished through wetlands and vegetation management, site protection, wildland fire management, erosion control, nonindigenous species control, recreation management, management of military activities, water management, and focused wildlife habitat management projects. The following sections describe the focused wildlife habitat programs and projects. All other activities are described in their corresponding sections of the plan.

The purpose of habitat management is to affect wildlife populations by managing the resources on which they depend. This means increasing access to food, cover, and/or water for desirable species, while considering military training requirements. Habitat management is the responsibility of the DIS Natural Resource staff.

Management activities to improve vegetation cover and wildlife habitat on the installation include brush removal in desert scrub areas, prescribed fire, regeneration cutting of select sites of mountain mahogany, nonindigenous species removal, and root plowing some woody areas. Habitat management for federally- or State-listed species consists primarily of protecting habitat.

8.3.1 Habitat Management Strategy and Goals

Goal 1. Use ecological functions and landscape level planning to adjust limiting factors and promote priority endemic species.

Goal 2. Base species management priorities on conservation needs as defined by global, regional, and local abundance; distribution and threats; population trends; importance of areas to species; potential for population and/or habitat management; and human interests.

8.3.2 Wildlife Habitat Projects

Below habitat management practices on Fort Huachuca are categorized as a means to discuss them. However, there is overlap within these sections as well as with other sections of this INRMP.

8.3.2.1 Wildlife Water Devices

Many species are dependent on free standing water for survival and reproduction. Fort Huachuca initiated a guzzler installation program in the early 1970s for big and small game management. The installation has about 40 guzzlers of two basic designs. One design uses an inverted umbrella device that feeds a 2,300-gallon metal storage tank. Newer models of this type have fiberglass components requiring less maintenance. The second design uses a funnel-shaped, cement slab to collect precipitation and send it through a trough to a tank. Most guzzlers on Fort Huachuca are between 15 and 25 years old and are in need of maintenance. A few are barely operable.

8.3.2.1.1 Alternative A - Proposed Action

Goal. Provide supplemental sources of water for wildlife, especially to mitigate loss of natural water sources.

Objective 1. Assess the appropriateness of specific water devices and locations on Fort Huachuca, using current information on benefits versus potential risks, such as increased predation.

Objective 2. Where water devices are appropriate, use the lowest maintenance design available.

Objective 3. Use volunteers to maintain and inspect devices that are appropriate to keep functional.

8.3.2.1.2 Alternative B - No Action

The Proposed Action and No Action alternatives are similar with regard to wildlife water devices. However, an assessment of the appropriateness of certain water devices and, to some extent, the use of volunteers to maintain and inspect water devices may not occur under the No Action alternative. The

Proposed Action offers a more comprehensive and integrated approach to wildlife water device management than the No Action alternative.

8.3.2.1.3 Alternative C - Other Management Options

There is no requirement to maintain or protect guzzlers. There are some “natural system” strategies that would preclude the use of artificial watering devices in southern Arizona. Thus, the installation could elect to do less, or even no, maintenance or protection of them and could remove them. However, until guzzlers are determined to be inappropriate for the area, it is fiscally prudent to maintain them in a cost-effective manner rather than allow them to degenerate.

8.3.2.2 Woody Vegetation Removal

Brush Removal

Brush removal along contours in desert scrub areas is accomplished to restore and improve wildlife habitat. Thinning is performed for wildland fuel hazard reduction and to improve wildlife habitat for certain species.

Regeneration Cutting

Regeneration cutting of mountain mahogany was an annual practice on Fort Huachuca until about 1990. Three - four acre areas of mountain mahogany were cut in late summer to a height of 2 - 3 feet, which produced regeneration of new shoots and increased deer browse. Regeneration cutting could be reinitiated, but it is not a priority project at this time. Regeneration cutting has potential as a good volunteer project if such assistance becomes available.

Mesquite Root Plowing and Upland Revegetation

Root plowing and upland revegetation has been performed primarily on the East Range to reduce woody growth, mainly mesquite, and recover desert grassland. About 4,000 acres were treated using root plowing and revegetation. In general, results of these operations were successful in reestablishing some grass cover. Soil and water management in these areas also benefited from this program. Mesquite root plowing could be reinitiated, but it is not a high priority project at this time.

8.3.2.2.1 Alternative A - Proposed Action

Goal. Manage woody vegetation to maintain soil stability, reestablish or maintain native herbaceous cover, improve wildlife habitat, and maintain ecosystem functionality.

Objective 1. Design and plan fuel hazard reduction while providing wildlife habitat benefits.

Objective 2. Investigate restoration techniques for scrub grassland (semidesert grassland) that may include a combined management strategy of prescribed burning, selective herbicide use, and reseeding with native species.

Objective 3. Investigate reinitiating of regeneration cutting of mountain mahogany.

Objective 4. Investigate reinitiating of mesquite root plowing and revegetation.

8.3.2.2.2 Alternative B - No Action

The Proposed Action provides for an integrated approach to woody vegetation removal and wildlife habitat management in general. Under the Proposed Action discontinued projects, such as regeneration cutting of mountain mahogany and mesquite root plowing, would be investigated for reinitiation because these practices were generally successful but were not priorities in budgeting. These and other habitat projects would be considered under the Proposed Action, and therefore, the No Action alternative observes a narrower focus and is less comprehensive than the Proposed Action.

8.3.2.2.3 Alternative C - Other Management Options

In general, there is no requirement to consider most wildlife species in fuel hazard reduction programs. However, listed species and potential impacts to those species must be considered before initiating fuel hazard reduction operations. By considering these species and incorporating provisions to protect them, most other species also benefit. Thus, the option to not consider wildlife in the design, planning, and implementation of a fuel hazard reduction program is not viable.

There is no requirement to provide increased deer browse or root plowing and upland revegetation on the installation. Options for performing regeneration cutting on Fort Huachuca range from not performing any additional cutting to actively cutting mountain mahogany to provide additional browse.

8.3.2.3 Prescribed Fire

Desert grassland areas on Fort Huachuca were burned through the late 1980s to maintain open grassland areas for pronghorn antelope. Since then, few prescribed fires have been allowed due to regulatory requirements and reductions in staffing to plan and perform such operations.

SAIC (1998a) recommends development of a schedule for prescribed burns and fuel load reduction for installation woodlands and grasslands. This would reduce the potential for stand-replacing wildfires in areas inhabited by, or which are potential habitat for, federally- or state-listed flora and fauna. Prescribed burning is discussed in Section 8.11- *Fire Management*.

8.3.2.3.1 Alternative A - Proposed Action

Goal. Use prescribed fire to maintain or enhance ecosystem functionality, reduce woody vegetation encroachment in grasslands, and reduce risk of catastrophic wildfires.

Objective. Implement prescribed burning as specified in the *Fort Huachuca Fire Management Plan* (Robinett *et al*., 1997) and the Programmatic Biological Opinion (USFWS, 1999). Because fire can favor some nonindigenous invasive species such as Lehmann's lovegrass, fire frequency or return interval for a given area should be about 10-12 years.

8.3.2.3.2 Alternative B - No Action

The No Action and Proposed Action alternatives are identical with regard to implementation of a prescribed burning program on Fort Huachuca.

8.3.2.3.3 Alternative C - Other Management Options

Options are limited with regard to implementing fire management strategies, including prescribed fire, within requirements of the Endangered Species Act, as established in the Programmatic Biological Opinion (USFWS, 1999) without consultation and/or coordination with the USFWS. However, future research and the result of current management activities may find other viable options but currently requirements of the PBO are the most appropriate option.

8.3.2.4 Revegetation

Fort Huachuca has a policy of ensuring that planning for soil disturbing activities includes revegetation with native plant species. This policy follows the Presidential Memo on *Environmentally and Economically Beneficial Practices on Federal Landscaped Grounds* (Office of the President, 1994) and the Executive Order on *Invasive Species* (Office of the President, 1999). This policy helps ensure that the timing and frequency of fire, altered primarily due to establishment of nonindigenous invasive species such as Lehmann lovegrass, should not change drastically from the historic range of variability. Appendix B of the PBO (USFWS, 1999) requires that no revegetation occurs with either nonindigenous grasses or other plants that may alter fire frequencies in wildland areas. However, the primary purpose to perform revegetation on Fort Huachuca is to reestablish herbaceous cover to enhance watershed processes.

8.3.2.4.1 Alternative A - Proposed Action

Goal. Use native species to restore soil and vegetative cover following soil disturbance, as well as on lands degraded from past land use activities.

Objective 1. Develop a revegetation manual detailing planting seasons, seed sources, sites in need of revegetation, seeding and planting techniques, and monitoring methods.

Objective 2. Improve seeding and revegetation techniques.

8.3.2.4.2 Alternative B - No Action

The No Action and Proposed Action alternatives are similar except that under No Action a revegetation manual would probably not be developed. This type manual is the next step in a progressive land management program. The Proposed Action provides for advancement of revegetation efforts on Fort Huachuca, thus, helping sustain the military's ability to continue land-based training. Thus, the Proposed Action is the most viable option.

8.3.2.4.3 Alternative C - Other Management Options

There is no specific requirement to revegetate disturbed soil on Fort Huachuca. Options for revegetation range from not performing any revegetation to doing extensive revegetation. Likewise, there are many options with regard to specific techniques used for revegetation. However, developing a manual and continuing to experiment with options for revegetation that are specific to southeastern Arizona and Fort Huachuca is the most prudent avenue to follow in terms of compliance and stewardship. Fort Huachuca is required to implement the Presidential Memorandum (Office of the President, 1994) and executive order on invasive species.

8.3.2.5 Fence Removal

Grasslands of Fort Huachuca have been fragmented over time, not only by changes in vegetative composition but also by obstructions, such as fencing. This fragmentation potentially affects species such as mule deer, antelope, and javelina, and some of the fencing and other wire is safety hazard to wildlife

and recreational users. Several sections of what are presumed to be old livestock management fences are intact on the installation. Most of the boundary fences in grassland areas have “hog wire” (mesh design

wire fencing), which can be a severe deterrent to animal movements, attached to the standard barbed wire fence. Available information indicates this mesh is a remnant of bison management in the early 1950s when Fort Huachuca was briefly an AGFD refuge. No military, security, administrative, or management need or value for this derelict fencing has been identified.

8.3.2.5.1 Alternative A - Proposed Action

Goal. Improve wildlife access to grassland habitats.

Objective 1. Remove unnecessary internal fences, abandoned wire, and other man-made materials using volunteer efforts and service projects when feasible.

Objective 2. Replace the bottom wire on boundary fences with smooth wire to allow easier animal passage, and modify remaining fences to other applicable wildlife design guidelines where appropriate.

Objective 3. Build any new fencing to wildlife design guidelines where appropriate.

8.3.2.5.2 Alternative B - No Action

The No Action and Proposed Action alternatives are identical with regard to fence removal on Fort Huachuca.

8.3.2.5.3 Alternative C - Other Management Options

Options for fence removal range from not removing any fences to implementing the proposed action and removing all unnecessary fences. Not removing any fences or not replacing the bottom wire on boundary fences to allow access is feasible but not in the best interest of species such as javelina and antelope. A lesser degree of removal is possible, and depending on location, this option may meet the objective of allowing unimpeded ingress and egress for most wildlife species.

8.3.2.6 Endangered Species Habitat Management Projects

Since endangered species habitat projects are highly individual species-oriented, they are discussed in Section 8.4.2 to allow for a more cohesive understanding of management programs designed for these species.

8.4 Fish and Wildlife Population Management

Goal. Maintain fish and wildlife populations at target levels in accordance with species priorities, population ecology, population health considerations, habitat carrying capacities, and human interest.

8.4.1 Game Management

8.4.1.1 Wildlife

Fort Huachuca has developed management plans for game species on the installation, including the *Whitetail Deer, Mule Deer, and Antelope Harvest Report and Management Plan;* the *Javelina*

Management Plan; the *Gould Turkey Reintroduction Plan;* the multi-agency *Southeastern Arizona Turkey Management Plan* (Heffelfinger *et al*, 2000); the interagency *Fisheries Management Plan;* and the *Problem Bear Plan*. These plans provide information on hunter numbers, harvest results, survey results, population size and health, management strategies, and habitat improvements. Most of these plans have not been updated for several years, but aspects of each management plan have been incorporated into other installation plans. The deer and antelope plan was last updated to include 1991 harvest and 1992 management plans.

Population management of game species is accomplished through recreational hunting and subsequent harvest on the installation. Fort Huachuca follows State guidelines and regulations for big and small game seasons and types of permits issued for each big game species. In general, the installation has been more conservative over the last several years concerning the number of permits issued. Hunters are required to follow State regulations, and additional installation regulations and requirements described in an annual fact sheet (Appendix 11.3a). Section 11.3 discusses requirements for hunting on the installation.

8.4.1.1.1 Alternative A - Proposed Action

Goal. Manage game species to produce harvestable surpluses on a sustained basis.

Objective 1. Update and implement annual harvest and management plans for game species.

Objective 2. Establish a schedule for cooperative review and analysis with AGFD, on a rotating basis, so that game species plans are comprehensively revisited approximately every three years.

8.4.1.1.2 Alternative B - No Action

The No Action and Proposed Action alternatives are identical with regard to managing game species on Fort Huachuca.

8.4.1.1.3 Alternative C - Other Management Options

While there is no mandate to provide management programs that support hunting but the Sikes Act requires that outdoor recreation be part of this INRMP. Both the committee language for the 1997 amendments to this Act and Army regulations (AR 200-3) require the installation to evaluate the use of hunting within the constraints of the military mission and consistent with protection of natural resources and maintenance of quality hunting conditions. The game management program at Fort Huachuca is consistent with laws and regulations. The option to reduce or eliminate game management is available, particularly if the needs of the military mission become more exclusive. The option to increase game management is available, but it is not as high a priority as programs associated with threatened or endangered species.

8.4.1.2 Fish

Population management of fisheries is accomplished through stocking and recreational fishing. Historically, Fort Huachuca's fishery consisted of up to 16 ponds (depending on annual precipitation). During dry years, the fishery was reduced to eight perennial impoundments, and in wet years additional ponds became available. Garden Creek has about four miles of flow, and was previously stocked with rainbow trout for a put-and-take fishery. Stocking no longer occurs there.

Fort Huachuca's fishery now consists of a zone relatively accessible and close to the cantonment area, which includes six ponds: Golf Course, Gravel Pit, Woodcutters, O Club, and Sycamore ponds I and II. Other ponds previously managed as fisheries have been eliminated from the program due to several factors, including issues associated with water usage in the San Pedro Basin, management of threatened and endangered amphibians, decreasing accessibility, and/or difficulty in maintaining water levels. The ponds still managed for recreational fisheries are impoundments in small to medium sized watershed areas that drain into these ponds. A lesser discharge volume and peak runoff, compared to the large canyon watersheds on the Fort, should reduce the probability during high water events of nonindigenous aquatic species moving from the pond downstream to the Babocomari or San Pedro Rivers.

Annually through spring 2000, about 12,000 rainbow trout were acquired from a USFWS hatchery and were stocked from November through March. Trout were dispersed among the seven ponds available for fishing depending on water levels. Water in installation ponds becomes too warm to sustain a year-round trout population. Thus, trout fishing is a put and take fishery. Loss of water in some impoundments, loss of funding due to lower license sales, drought, and issues associated with stocking a nonindigenous species, reduced this program over the last several years. In fall 2000, severe constraints on fish hatchery operations and production in the region completely removed this source of trout for at least one year.

8.4.1.2.1 Alternative A - Proposed Action

Largemouth bass, bluegill, and redear sunfish reproduce in perennial ponds on Fort Huachuca. Channel catfish are also present but do not reproduce. Perennial pond populations are periodically supplemented by stockings with fish provided by the AGFD. Stockings of warm water species are contingent on the availability of surplus fish and budget constraints. Sources of catchable sized channel catfish, which are not expected to reproduce well in ponds on Fort Huachuca, are available.

Harvest of fisheries resources is through recreational fishing. Fort Huachuca's fishery is best described as an urban fishery that gets high use and has limited resources. Over 27,000 people in a 50-mile radius of the installation have access to its fisheries resources (Sam Houston State University, 1996). The installation follows State fishing regulations (Appendix 11.3b), but additional Fort Huachuca fishing regulations also apply. Other requirements of Fort Huachuca anglers are discussed in Section 11.3.

Goal. Manage game fish to produce harvestable surpluses on a sustained basis (to the greatest extent possible considering budget limitations).

Objective 1. Explore alternatives to stocking rainbow trout for the put-and take fishery.

Objective 2. Continue periodic stockings of warm water species in appropriate ponds close to the cantonment area and in small to medium sized drainage areas.

Objective 3. Seek professional fisheries management guidance for installation ponds from AGFD.

8.4.1.2.2 Alternative B - No Action

The No Action and Proposed Action alternatives are identical with regard to management of game fish on Fort Huachuca.

8.4.1.2.3 Other Management Options

While there is no legal mandate to provide management programs that support fishing, the Sikes Act requires that outdoor recreation be part of this INRMP. Both the committee language for the 1997

amendments to this Act and Army regulations (AR 200-3) require the installation to evaluate the use of fishing within the constraints of the military mission and consistent with protection of natural resources and maintenance of quality fishing conditions. The fish management program at Fort Huachuca is consistent with laws and regulations. The option to reduce or eliminate fish management is available, particularly if requirements for water conservation preclude the maintenance of pond water levels. The option to increase fish management is available, but it is not as high a priority as programs associated with threatened or endangered species.

8.4.2 Federal Endangered, Threatened, and Candidate Species

Fort Huachuca has developed a number of plans (e.g., Howell and Robinett, 1995; Shaw, 1999; Robinett *et al*., 1997; NRCS and ENRD, 1997) to assist in guidance of management of the installation's resources, including its threatened and endangered species. The PBO (USFWS, 1999) includes management requirements for listed species that may be affected by installation activities. Endangered Species Management Plans are being developed for those species requiring more detailed management strategies than those covered in other documents. These documents will be used to continue protection and management of sensitive species and habitats within the installation.

This section includes population management of endangered, threatened, and other species of special concern, unless they have been discussed elsewhere. AR 200-3 states (Section 11-2(a-e)) that the Army has five primary requirements under the Endangered Species Act:

1) to conserve (i.e. help recover) listed species,
2) not to "jeopardize" listed species,
3) to "consult" and "confer",
4) to conduct a biological assessment, and
5) not to "take" listed fish and wildlife species or to remove or destroy listed plant species.

Fort Huachuca is committed to these five primary requirements, taking into account allowed incidental take.

Fort Huachuca has taken many actions to protect federally-listed threatened and endangered as well as candidate species and their habitat. These include but are not limited to the following measures:

X an indefinite suspension of live fire on Firing Range 1 (machine gun range);
X prohibiting night fire on Firing Ranges 2 (Zero Range), 3 (multipurpose small arms), and 4 (pistol qualification) from July through October;
X prohibiting pyrotechnics in areas designated as a protected agave management areas;
X prohibiting night training in areas designated as a protected agave management areas from July through October;
X prohibiting wheeled and tracked vehicles from leaving established roadways in any training range;
X requiring fire suppression plans prior to approval of training in areas designated as major agave stands; and
X installation of human access barriers and alarm systems in lesser long-nosed bat roosting caves to prevent entry and disturbance during roosting periods.

The PBO (USFWS, 1999) is a "plan-level" biological opinion, in that it addresses a range of programs and projects, and all aspects of Army activities at Fort Huachuca are covered to the project level for 10 years from the date of the final PBO (through 2008). The USFWS concluded that Army activities are not

likely to jeopardize the continued existence of the Huachuca water umbel, the southwestern willow flycatcher (and are not likely to result in adverse modification of critical habitat designated for either species), the Mexican spotted owl, the lesser long-nosed bat, and the Sonora tiger salamander. The PBO includes concurrence that Army actions may affect, but are not likely to adversely affect, the Canelo Hills ladies' tresses, spikedace, and loach minnow. Fort Huachuca intends to implement a diverse and comprehensive range of proposed mitigation measures in the PBO that cover one or more listed species, including those without any incidental take anticipated.

The PBO (USFWS, 1999) includes the following requirements:

- ***Incidental take statements.*** Incidental take is anticipated for each animal species except the southwestern willow flycatcher (incidental take does not apply to listed plant species). Incidental take statements include *reasonable and prudent measures* for minimizing incidental take. Implementation of these measures through *terms and conditions* are mandatory.

    - ***Reasonable and prudent alternatives.*** The installation must implement reasonable and prudent measures to minimize incidental take of the Mexican spotted owl, lesser long-nosed bat, and Sonora tiger salamander. For each species, the measures are prompt implementation of the proposed mitigation measures for that species. The Army's proposed action, all ongoing and planned operations of the installation, cannot occur without implementation of these actions.

X ***Conservation recommendations.*** Conservation measures are recommended, voluntary actions for all listed species.

The USFWS assumes that terms and conditions will be implemented as soon as possible, or as specified in the PBO. Failure to promptly carry out terms and conditions may nullify the exemption from incidental take under the Endangered Species Act and leave Fort Huachuca and/or its permittee/contractors subject to prosecution for an unlawful take. Reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions are presented for each species, as appropriate, in Section 8.4.2.2.

8.4.2.1 Status of Endangered Species

Sections 5.6.3 and 5.7.6 discuss the status of species that are federal and/or State endangered, threatened, or candidate species at Fort Huachuca. Sections 7.1.3.1 and 7.2.2.1 describe monitoring programs for these species on Fort Huachuca.

Goal. At a minimum, sustain residential or migratory populations of endangered, threatened, or candidate species and their habitats at current levels, with the long term goal of conserving and recovering listed species and their habitats in accord with specific Recovery Plans and the Endangered Species Act.

8.4.2.2 Federally-listed, Proposed Candidate and Conservation Agreement Species Management Programs

Monitoring programs for federal and/or State endangered and threatened species are described in Section 7.2.2.1. The PBO (USFWS, 1999) included 18 mitigation measures proposed by Fort Huachuca to reduce adverse effects of military activities on listed species and critical habitat. Most measures will be implemented depending on available funding.

Goal 1. Implement the proposed mitigation measures identified in the PBO (USFWS, 1999).

Goal 2. Support recovery and evaluate establishment of candidate, proposed and listed species when feasible and within DoD guidelines that do not jeopardize the military mission.

8.4.2.2.1 Alternative A - Proposed Action

1. Point of Contact.

Objective 1. Fort Huachuca will designate a management representative (point of contact) within the Range Control office to improve assurances that operations will be conducted in compliance with environmental requirements.

Objective 2. The representative will ensure compliance with mitigation measures by installation users, have authority to halt activities that may be in violation of such measures, and coordinate with ENRD.

2. Training and Fire Suppression Capability.

Objective. Unit commanders will be responsible for ensuring that unit personnel are trained in natural resource protection procedures, that the unit has fire suppression capabilities, and that restrictions or guidelines for training or testing are followed.

3. Erosion Control.

Objective. Fort Huachuca will implement the East Range Watershed Improvement Plan (SAIC, 1997) or more detailed plans, which identified watershed improvement strategies and best management plans, such as check dams, revegetation, and reseeding actions, to retard erosion on the East Range. Other erosion control measures proposed on the training ranges include scheduling training during the driest seasons

(April through June), when possible, and allowing sufficient time for soils to dry after heavy rains before resuming training.

4. Water Conservation as part of an Army Water Resources Management Plan. To reduce net annual water consumption, the Army will implement the following water conservation measures, and/or other measures identified during the planning process:

A. Demolish excess buildings and infrastructure.
B. Modernize golf course irrigation system.
C. Install additional waterless urinals in high use areas and in other areas as urinals need replacing and funding allows.
D. Xeriscape lawns around buildings.
E. Use gray water in residential and barrack areas.
F. Conduct periodic water leak detection surveys.
G. Change watering policy and aggressively enforce it.
H. Implement conservation technology.

Objective. Implement water conservation measures identified in the PBO (USFWS, 1999).

5. Effluent reuse and recharge as part of Army and Regional Water Resources Management Plans. To reduce net water consumption, the Army will implement the following water recharge and effluent reuse projects, and/or other measures identified during the planning process:

A. Measure effluent and stormwater recharge from East Range effluent ponds.
B. Reengineer East Range effluent ponds to increase recharge.
C. Implement Hatfield pilot recharge project.
D. Study and implement a Huachuca Creek recharge project.
E. Restore East Range drainages to increase recharge.
F. Implement a Buffalo Soldier Trail recharge project.
G. Capture water discharge into sanitary sewer.
H. Capture additional stormwater.
I. Encourage community water reclamation projects.
J. Support pilot in-channel recharge/erosion control projects.
K. Eliminate groundwater pumping near the SPRNCA.

In addition to implementing some or all of the proposed projects above, the Army will continue to support hydrogeologic research in the subwatershed to gain a better understanding of the hydrology and how it may be affected by cultural water uses.

Objective. Implement water recharge and effluent reuse projects identified in the PBO (USFWS, 1999), and continue to support hydrologic research in the subwatershed.

6. Monitoring and Surveying of Listed and Candidate Species. Monitoring for listed and candidate species is discussed in Section 7.2.2.

Objective. Continue to periodically monitor and survey for listed and candidate species.

7. Integrated Training Area Management (ITAM). The objectives of ITAM include avoidance of extreme environmental damage and destruction of habitat for sensitive species, conservation and enhancement of natural resources, and compliance with the Endangered Species Act. Fort Huachuca has initiated implementation of the ITAM program; however, funding for the program has been suspended. The installation intends to continue the program if and when funding becomes available.

Objective. Continue to request funds to implement the ITAM program.

8. Wildfire Prevention/Suppression. The Fort Huachuca Fire Department has mutual aid agreements with the USFS, Sierra Vista, Huachuca City, and Palominas fire departments for assistance in case of major fires. In addition to the mutual aid agreements, Fort Huachuca has a Memorandum of Understanding with the USFS that allows Fort Huachuca access to the National Wildfire Coordinating Group and the provision by the USFS of one Type 7 engine, one slurry bomber, and two USFS personnel to be stationed at the installation from May to August. Fort Huachuca pays the USFS $20,000 a year for this additional protection. The Range Control Officer and Fort Huachuca Fire Chief have the authority to restrict activities on the range at any time to prevent wildfires.

Objective 1. Continue Mutual Aid Agreements for wildfire suppression or management for natural resource benefits.

Objective 2. Continue to fund the USFS for additional wildfire protection, vegetation management, and suppression support.

Objective 3. Restrict range activities to prevent wildfires.

9. Agave Management.

Agave management is designed to maintain self-sustaining natural populations of *Agave palmeri* on Fort Huachuca and ensure the continued protection of these populations from natural and human threats. Agave management will help protect the forage base of the lesser long-nosed bat and other species using agave. Activities include the identification of areas to be protected based on recent surveys; exclusion of tracked vehicles, pyrotechnics, and off-road training from these areas; and active fire suppression in these areas. The Range Control Officer is responsible for implementation of and compliance with protection measures.

The Agave Management Plan (Howell and Robinett, 1995) has the following protection measures:

X training areas with protected agave stands, as well as the rest of the South and West ranges, will be off-limits to all off-road vehicle travel, including armor and tracked vehicles;
X pyrotechnics will be banned from use within these areas;
X fires in these areas will be actively suppressed unless the area is approaching its natural fire return interval of 10 years, in which case a prescribed burn or managed natural fire may take place; and
X training and test sites in these areas will not be used by personnel on foot unless the activity has a range control-approved plan for fire suppression and appropriate fire fighting equipment.

The Agave Management Plan provides recommendations for prescribed burns in or near agave stands, including protecting the densest areas of agaves within prescribed burn areas, and constraining prescribed

burns in areas with agave densities greater than 259 plants per square mile where greater than half that number are young age classes (Howell and Robinett, 1995). Adaptive management will be needed to apply managed fire in grassland ecosystems containing agave, particularly with regard to the seasonal timing of fires, to achieve desired ecological benefits.

Objective 1. Update and implement the Agave Management Plan (Howell and Robinett, 1995), including a well designed, long term monitoring and data management program.

Objective 2. Identify and designate significant agave stands according to specific criteria for defining and mapping them.

Objective 3. Implement all protection measures and adhere to all training restrictions.

10. Range Management. The Range Control office has the responsibility to review training forms, inspect training and testing units, inspect use of training areas, and monitor training area conditions.

Objective. In addition to existing range management procedures, implement the following procedures to enhance compliance with management protocols:

X revise and implement Fort Huachuca Regulation 385-8, *Range and Training Area Operations*, to specify the completion of environmental awareness training (including protected resource identification) prior to the initiation of training or testing and the responsibility of unit commanders to become familiar with environmental policies and operational requirements;
X revise and implement Fort Huachuca Regulation 385-8 to prohibit vehicular entry into protected agave management areas;
X implement policies to specify limits to range access during certain seasons to minimize effects on agave plant populations, riparian zones, erodible soils, and any areas identified for non-use for purposes of restoration, reseeding, recovery, or protection;
X provide unit commanders with a checklist of required activities prior to initiation of training or

testing, including environmental awareness training, familiarization with protected or restricted areas, provision of fire suppression equipment, and assurance by the appropriate environmental office that the testing or training activity is in compliance with NEPA and ESA requirements; and

X implement erosion control measures to reduce erosion throughout the installation (*i.e*. gabions, runoff control structures, and revegetation) where appropriate and as funding becomes available.

11. Recreation Management. Current restrictions on recreation prohibit night time access in training areas, including mountain and canyon areas.

Objective. Implement the following recreation management measures to reduce the risk of accidental fire, human disturbance, or direct mortality to federally-listed threatened, endangered, and candidate species:

X install and maintain exclosure fencing or other barriers, such as boulders, around known populations of Huachuca water umbel to prevent accidental crushing of individual plants by persons or vehicles;

X improve the current off-road vehicle policy by developing a map based regulation that shows areas, roads and firebreaks as open or closed to unauthorized motorized vehicles;

X protect ponds inhabited by the Sonora tiger salamander and other amphibians from disturbance by vehicles, including recreational vehicles;

X develop a regulation on Fort Huachuca to address issues relating to recreation on the installation; and

X upgrade the entry alarm system and protection barriers at caves where lesser long-nosed bats are known to roost to prevent disturbance during the roosting period.

12. Environmental Awareness Education. The environmental awareness program under ITAM (if funded) would provide operational units with maps, handbooks, cards, and videos to enhance the ability of the units to identify and protect sensitive resources.

Objective 1. The Range Control Officer, who is responsible for distributing educational materials to operational units, will meet annually with personnel from the ENRD to verify the location of protected resources and restricted areas.

Objective 2. Annually update maps delineating protected resources and restricted areas as needed by the Range Control Officer in cooperation with ENRD personnel to reflect the most recent survey data and other information. These maps will be provided to operational units prior to initiation of training or testing activities.

Objective 3. Update environmental awareness handbooks, cards, and videos to comply with current status and knowledge of listed, proposed, and candidate species at and near Fort Huachuca. Use a two-year update cycle, because of the number of protected species known or with potential to occur in the vicinity of Fort Huachuca.

13. Monitoring. General conditions of vegetation and soils at Fort Huachuca were monitored through the LCTA program until 1998.

Objective 1. Continue to monitor federally-listed threatened and endangered species, including annual monitoring programs for the Mexican spotted owl, lesser long-nosed bat, Huachuca water umbel, and Sonora tiger salamander. Continue to monitor the delisted American peregrine falcon under the national management plan developed to sustain the species.

Objective 2. Monitor *Agave palmeri* populations on Fort Huachuca no less than once every five years.

Objective 3. Periodically survey for other species, including candidate species, with potential to occur on Fort Huachuca, as appropriate.

14. Groundwater Studies and Usage. Fort Huachuca will undertake additional research intended to reduce uncertainty associated with groundwater issues, including quantification of the installation's contribution to the increasing population of the county, as well as other factors.

Additional investigations into the connectivity of the Fort Huachuca/Sierra Vista well fields and San Pedro River flows are needed. Fort Huachuca will help improve the state of knowledge regarding groundwater resources of the region. With this continued commitment to resolution of regional groundwater issues, the potential for Fort Huachuca-related groundwater pumping to adversely affect protected species and habitat in the SPRNCA would be reduced.

Objective 1. Complete and support dissemination of the Alternative Future Scenarios Planning Study.

Objective 2. Conduct additional investigations into the connectivity of the Fort Huachuca/Sierra Vista well fields and San Pedro River flows.

Objective 3. Continue to study potential effects of groundwater pumping and identify appropriate measures to reduce impacts.

Objective 4. Make results of all investigations available to the USFWS and regional hydrological researchers and seek consultation with the USFWS as appropriate if significant changes in the current understanding of regional groundwater resources are found.

15. Individual Species Research. Research is needed on federally-listed threatened, endangered, and candidate species and their habitats that occur on the installation. Studies should include but not be limited to such areas as habitat condition assessment and trends analysis, habitat requirements, population surveying, habitat preservation plans, and species reestablishment studies.

Objective 1. Coordinate with the USFWS and AGFD, as necessary, to develop studies on federally-listed threatened, endangered, and candidate species and their habitats that occur on Fort Huachuca.

Objective 2. Monitor off site research on federally-listed threatened, endangered, and candidate species and their habitats that occur on Fort Huachuca and use results of these research projects to improve management programs on Fort Huachuca.

Objective 3. Attend various symposia, workshops, and conferences that include research and management of federally-listed threatened, endangered, and candidate species that occur on Fort Huachuca and use information to improve management programs on Fort Huachuca.

16. Integrated Natural Resource Management Plan. The draft Integrated Natural Resources Management Plan (NRCS and ENRD, 1997) provides a comprehensive natural resource management plan for resource managers and installation tenants. This plan combines all aspects of ongoing conservation measures and proposed mitigation addressed in the Programmatic Biological Opinion (USFWS, 1999) into a programmatic environmental program which will guide Fort Huachuca's environmental stewardship in the future.

Objective. Complete the INRMP and obtain USFWS and AGFD approval of the Plan by 2001.

17. Endangered Species Management Plans. Management plans are needed for federally-listed threatened, endangered, and candidate species and their habitats that occur on the installation. Plans should include but not be limited to habitat condition improvement and protection.

Objective. Coordinate with the USFWS and AGFD, as necessary, to develop endangered species management plans by 2002 for federally-listed threatened, endangered, and candidate species and their habitats that occur on Fort Huachuca as of 2001.

18. Species-Specific Management. In addition to the above, mitigation measures, reasonable and prudent measures, with their implementing terms and conditions, are listed for most species.

Goal 1. Implement reasonable and prudent measures, as well as terms and conditions, for species with potential to be adversely affected by Fort Huachuca actions.

Goal 2. Implement conservation recommendations, if funding is available, for species with potential to be adversely affected by Fort Huachuca actions.

Huachuca Water Umbel (Endangered)

Objective 1. Implement these agreed measures from the PBO for the Huachuca water umbel.

1. Fort Huachuca will construct rock barriers around Huachuca water umbel populations.

2. Fort Huachuca will initiate prescribed fire and fuel management in the Huachuca Mountains.

3. Fort Huachuca will close roads and fire breaks to vehicle travel in the immediate watersheds of water umbel populations in the Huachuca Mountains where vehicle travel is causing erosion, and where that erosion could result in scouring or sedimentation of downstream water umbel populations (Fort Huachuca will coordinate with the USFWS in identifying roads and fire breaks needing closure.

4. Fort Huachuca will maintain the barrier to vehicle travel at Gate No. 7.

5. Fort Huachuca will provide annual monitoring of Huachuca water umbel populations at the installation and, in coordination with the BLM, throughout the SPRNCA. Monitoring protocols will be coordinated with the USFWS.

6. During fire suppression, prescribed fire, and managed natural fire activities in Garden, McClure, or Sawmill canyons, the following measures will be implemented:

a. One of the objectives of fire activities will be protection of Huachuca water umbel populations. This objective will not in any way constrain the fire boss from taking any action as needed to protect life or property.

b. A Resource Advisor(s) will be on the fire during all activities. Resource Advisors will be qualified biologists designated to coordinate Huachuca water umbel-related concerns and serve as an advisor to the fire boss. They will also serve as field contact representatives responsible for coordination with the USFWS. They will monitor fire activities to ensure the protective measures endorsed by the fire boss are implemented. Resource Advisors will be on call 24 hours a day during the fire season.

c. Off-road vehicle activity will be kept to a minimum. Vehicles will be parked as close to roads as possible, and vehicles will use wide spots in roads or disturbed areas to turn around. If off-road travel is necessary, local fire-fighting units should go off-road first because of their prior knowledge of the area.

d. Use of tracked vehicles will be restricted to improving roads or constructing lines where a short distance of line might save a large area from fire.

e. Fort Huachuca will, to the extent possible, obliterate vehicle tracks made during the fire, especially those of tracked vehicles.

f. Areas disturbed for crew camps, landing strips, staging areas, and any other new areas of disturbance created during the fire will be kept to the minimum area possible and will be located in previously disturbed sites whenever possible. No such areas will be located at or immediately upstream of Huachuca water umbel sites.

g. A mitigation/monitoring plan will be developed by Fort Huachuca in coordination with the USFWS for each prescribed fire, managed natural fire, or fuels treatment that may adversely affect the Huachuca water umbel. The mitigation/monitoring plan will ensure that adverse effects to Huachuca water umbel and its habitat are minimized. The effects of prescribed fire and fuels treatment on the water umbel and its habitat will also be monitored. Mitigation/monitoring plans will be approved by the USFWS prior to implementing prescribed fire or fuels management. Mitigation and monitoring for managed natural fire that may adversely affect the Huachuca water umbel will be coordinated with and approved by the USFWS as soon as possible after a decision is made to let a natural fire burn under controlled conditions.

7. Fort Huachuca will fund water umbel habitat management or restoration where habitat has been degraded or lost, or where potential exists for creating water umbel habitat. Assistance will take the form of funding and/or technical assistance. Projects funded should include both off-post and on-post projects. Installation activities could include restoration and protection of cienega conditions in Garden Canyon and other wetted sites. Off-post, Fort Huachuca could assist BLM, the Coronado National Forest, or other land owners/managers of water umbel habitat potentially affected by the proposed action. Off-post projects that Fort Huachuca should consider funding include cienega restoration or protection in Scotia Canyon or elsewhere in the Huachuca Mountains, if approved by and coordinated with the Coronado National Forest, and restoration or protection of cienega conditions on the San Pedro RNCA, if approved by and coordinated with the BLM. All plans and agreements for funded projects will be coordinated with and approved by the USFWS.

Southwestern Willow Flycatcher (Endangered)

Objective 2. Implement these agreed measures from the PBO for the southwestern willow flycatcher.

1. Fort Huachuca will maintain existing fire breaks on the perimeter of Area ZULU, and on the eastern boundary of the East Range.

2. Fort Huachuca will vigorously suppress any fire on the eastern third of the East Range, except in the impact area, and implement all portions of the proposed action and proposed mitigation measures relevant to fire suppression on the East Range.

3. If surveys confirm presence of southwestern willow flycatchers on Fort Huachuca, the installation will take action to ensure that fire ignited on the training ranges does not spread to flycatcher habitat and will work with the USFWS to develop and implement a plan to prevent any take of flycatchers.

4. Fort Huachuca will promptly assess habitat suitability for flycatchers at Research, Development, Testing, and Evaluation (RDTE) survey points along the San Pedro River or in other areas. If suitable habitat occurs during the life of the project within 300 feet of a RDTE survey point, or a fire ignited at a RDTE survey point could reasonably spread to suitable habitat of the flycatcher, the installation will take all precautions to prevent take as follows:

a. Fort Huachuca will not authorize use of RDTE survey points located within 300 feet of suitable habitat of the southwestern willow flycatcher from April 1 to September 1 of each year.

b. If suitable habitat occurs adjacent to a RDTE survey point, but farther than 300 feet from it, Fort Huachuca will ensure that all precautions are taken to ensure fire is not ignited by personnel or activities at the RDTE survey point which then spreads to flycatcher habitat. Such precautions will include maintaining functional fire extinguishers with all vehicles and informing all personnel at RDTE survey points of the need to take action as necessary to prevent wildfire ignitions. Personnel should be especially careful with cigarettes.

5. Fort Huachuca will conduct comprehensive annual status surveys for southwestern willow flycatcher at all suitable habitats potentially affected by installation actions. This includes habitat on Fort Huachuca, at the Babocomari Cienega, if permission is obtained, and throughout the SPRNCA in cooperation with the BLM. Surveys will adhere to USFWS protocol (Sogge *et al*. 1997). Surveys will include documenting flycatcher population size and distribution; identity of nesting birds (if banded); number of nesting attempts, clutch sizes, hatching success, fledgling success; causes of nest loss or failure; breeding season length; and habitat use.

6. Fort Huachuca will monitor habitat conditions in the SPRNCA and any habitats acquired or for which easements/permission to enter are obtained. Aerial photos (1"=500 feet) were taken of the riparian corridor in November 2000, and will be repeated in 2004, and 2008, and vegetation maps constructed from each photo series within one year of obtaining the photographs. Resolution of the mapping effort will be sufficient to map vegetation patches as small as 10 acres. Vegetation typing will be by plant species composition and vertical structure/foliage density. Sufficient ground-truthing will be conducted to assure reasonable accuracy of the mapping effort. Vegetation mapping in 2004 and 2008 will be accompanied by a trend analysis to determine gains or losses in flycatcher habitat. If loss of flycatcher habitat occurs between surveys, the loss is attributable to activities of Fort Huachuca (including groundwater pumping), Fort Huachuca will reinitiate consultation.

7. Fort Huachuca will assist BLM or other land owners/managers of habitat on the Upper San Pedro River with flycatcher habitat management, or restoration on retired agricultural lands, grazed areas, and in other areas where flycatcher habitat has been degraded or lost. Assistance will take the form of funding and/or technical assistance. Projects could include, but are not limited to, working with the BLM and others to restore hydrology and riparian woodlands on retired agricultural or other previously disturbed lands in the floodplain; restoration of watershed condition by improved grazing management, removal of cattle, erosion control, or other measures in uplands adjacent to the San Pedro River; cowbird trapping and control; and protection of existing flycatcher habitat from fire or recreational impacts. All plans and agreements for funded projects will be coordinated with and approved by the USFWS and AGFD.

American Peregrine Falcon (Delisted; subject of national monitoring plan)

Objective 3. The peregrine falcon was delisted in 1999. However, Fort Huachuca plans to continue implementing agreed upon measures from the PBO to assist recovery efforts for the falcon.

1. Fort Huachuca will provide environmental awareness training to personnel. Personnel training in the Huachuca Mountains will, through the environmental awareness training, be made aware of the protected status of the peregrine falcon and these terms and conditions, but specific locations of peregrine falcon eyries will not be revealed unless absolutely necessary to protect the species.

2. Fort Huachuca will, in accordance with survey protocol (Ward 1994), conduct annual monitoring of potential peregrine falcon nest sites at Fort Huachuca early in the breeding season so that training and other activities can be designed or revised, as needed, to avoid or minimize adverse effects.

3. Within canyons containing active peregrine falcon eyries, the fort will minimize low-level helicopter flights within 1.0 mile of active eyries. Helicopter flights closer than 0.5 mile to active eyries will be prohibited.

4. If peregrine falcons are found nesting in Garden Canyon within 0.25 mile of the rappelling cliffs, rappelling will be halted or moved at least one mile from the nest until the nestlings fledge.

5. Fort Huachuca will establish a schedule and implement as soon as possible prescribed burns and/or fuels management to reduce fuel loading in installation woodlands, thereby reducing the potential for stand-replacing wildfires in peregrine falcon foraging and nesting habitat.

6. One of the objectives of fire suppression activities in the Huachuca Mountains will be protection of peregrine falcon nesting and foraging habitats. This objective will not in any way constrain the fire boss from taking any action as needed to protect life or property.

7. A Resource Advisor(s) will be on the fire during all suppression, prescribed fire, or managed natural fire activities in the Huachuca Mountains. Resource Advisors will be qualified biologists designated to coordinate peregrine falcon concerns and serve as an advisor to the fire boss. They will also serve as field contact representatives responsible for coordination with the USFWS. They will monitor fire suppression activities to ensure protective measures endorsed by the fire boss are implemented. Resource Advisors will be on call 24 hours.

8. Areas of significant human activity during fire suppression operations, prescribed fire, or managed natural fire in the Huachuca Mountains, including fire crew camps, landing strips, and equipment staging areas, will not be located within 1.0 mile of active peregrine falcon eyries, and areas disturbed during the fire will be kept to the minimum area possible and will be located in previously disturbed sites whenever possible.

9. Off-road vehicle activity during fire activities in the Huachuca Mountains will be kept to a minimum. Vehicles will be parked as close to roads as possible, and vehicles will use wide spots in roads or disturbed areas to turn around. If off-road travel is necessary, local fire-fighting units should go off-road first because of their prior knowledge of the area.
10. Use of tracked vehicles during fire activities in the Huachuca Mountains will be restricted to improving roads or constructing lines where a short distance of line might save a large area from fire.

11. Fort Huachuca will, to the extent possible, obliterate vehicle tracks made during fires in the Huachuca Mountains, especially those of tracked vehicles.

12. Patches of unburned vegetation within burned areas in the Huachuca Mountains will not be burned out as a fire suppression measure, except as needed to secure the fire perimeter or provide for fire fighter safety.

13. A mitigation/monitoring plan will be developed by the fort in coordination with the USFWS for each prescribed fire, managed natural fire, or fuels treatment that may adversely affect the peregrine falcon. The mitigation/monitoring plan will ensure that adverse effects to peregrine falcons and their habitat are minimized. The effects of fire activities and fuels treatment on the peregrine falcon and its habitat will also be monitored. The USFWS will approve mitigation/monitoring plans. Mitigation and monitoring for managed natural fire that may adversely affect the peregrine falcon will be coordinated with and approved by the USFWS as soon as possible after a decision is made to let a natural fire burn under controlled conditions.

14. Fort Huachuca will monitor take of peregrine falcons and document any disturbance of nest sites. The results of monitoring specified here and elsewhere in this section will be reported to the USFWS following established reporting requirements.

Mexican Spotted Owl (Threatened)

Objective 4. Implement these agreed measures from the PBO for the Mexican spotted owl.

1. Fort Huachuca will provide environmental awareness training to personnel. The environmental awareness training will include instructional/educational materials that will describe the protected status and sensitive nature of the Mexican Spotted Owl (MSO). Personnel training in the Huachuca Mountains will, through the environmental awareness training, be made aware of the protected status of the MSO and these mitigation measures, but specific locations of owl nests or Protected Activity Centers (PAC) will not be revealed unless absolutely necessary to protect the species.

2. Fort Huachuca will conduct annual monitoring of currently known PAC and surveys of potential MSO habitat at Fort Huachuca in accordance with USFWS survey protocol.

3. Fort Huachuca will develop in 2001 a species-specific management plan for the MSO that conforms to and complements the MSO Recovery Plan.

4. Areas within PAC treated to reduce occurrence of wildfire, prescribed fire or fuels management will be monitored, as described in the Recovery Plan, to determine effects of the treatment on known owl habitat components. If adverse effects are detected, treatments will be modified to reduce those effects as much as possible while still reducing the risk of wildfire.

5. Within canyons containing active MSO nests, or in canyons where occupancy or reproductive status is unknown, Fort Huachuca will minimize low-level helicopter flights within 1.0 mile of the nest, or the site

of the last previously known nest. Helicopter flights closer than 0.25 mile to active nests will be prohibited from March 1-August 31.

6. One of the objectives of fire suppression activities in the Huachuca Mountains will be protection of MSO PAC. This objective will not in any way constrain the fire boss from taking any action as needed to protect life or property.

7. A Resource Advisor(s) will be on the fire during all suppression, prescribed fire, or managed natural fire activities in the Huachuca Mountains. Resource Advisors will be qualified biologists with knowledge of the MSO and its habitat. The Resource Advisor will possess maps of all PAC and all potential nest/roost habitats in the project area and vicinity. Resource Advisor(s) will coordinate MSO concerns and serve as an advisor to the fire boss. They will also serve as field contact representatives responsible

for coordination with the USFWS. They will monitor fire suppression activities to ensure protective measures endorsed by the fire boss are implemented. Resource Advisors will be on call 24 hours.

8. If a MSO is encountered during the fire, the Resource Advisor will be advised immediately. The Resource Advisor will assess potential harm to the owl and advise the fire boss of methods to prevent harm. The Resource Advisor will maintain a record of any Mexican spotted owls encountered during suppression activities. The information will include for each owl the location, date, and time of observation and the general condition of the owl, and response to the fire and fire activities.

9. Areas of significant human activity during fire suppression operations, prescribed fire, or managed natural fire in the Huachuca Mountains, such as fire crew camps, landing strips, and equipment staging areas, will be located outside of PAC. Areas disturbed during fire suppression activities in the Huachuca Mountains, such as fire lines, crew camps, and staging areas will be rehabilitated, including the obliteration of fire lines to prevent their use by vehicles or hikers.

10. All fire suppression actions in PAC will occur, to the maximum extent possible, using “light on the land” methods, including not removing trees over 9 inches diameter at breast height (dbh) unless it is deemed necessary by the fire boss to prevent the fire from effecting additional PAC acres, or to protect life or property.

11. Patches of unburned vegetation within burned areas in the Huachuca Mountains will not be burned out as a fire suppression measure, except as needed to secure the fire perimeter or provide for fire fighter safety.

12. Off-road vehicle activity will be kept to a minimum during fire activities in the Huachuca Mountains. Vehicles will be parked as close to roads as possible, and vehicles will use wide spots in roads or disturbed areas to turn around. If off-road travel is necessary, local fire-fighting units should go off-road first because of their prior knowledge of the area.

13. Use of tracked vehicles during fire activities in the Huachuca Mountains will be restricted to improving roads or constructing lines where a short distance of line might save a large area from fire.

14. Fort Huachuca will, to the extent possible, obliterate vehicle tracks made during the fire activities in the Huachuca Mountains, especially those of tracked vehicles.
15. Fort Huachuca in coordination with the USFWS will develop a mitigation/monitoring plan for each prescribed fire, managed natural fire, or fuels treatment that may adversely affect the MSO. Prescribed fire and fuels treatment will be designed to protect MSO and their habitat. The mitigation/monitoring plan will contain the following, at a minimum:

a. Treatments/prescribed fire will not occur within a 100 acre area around spotted owl nest sites. This 100 area will include habitat that resembles the structural and floristic characteristics of the nest site. The 100 acre area will be protected by using topographic and other barriers, or through line construction. All line construction in PAC will occur outside the MSO breeding season, will not remove any trees larger than 9 inches dbh unless they pose a threat to the safety of fire fighters, and will only occur with a wildlife biologist from Fort Huachuca on site.

b. Treatments will enhance or retain owl habitat components, such as downed large logs greater than 12 inches in midpoint diameter, hardwoods, grasses, forbs, and shrubs, while still reducing the chance of wildfire. In regard to downed logs, this will be achieved by protecting 80-90 percent of the downed logs 12 inches diameter and greater, and hand-lining snags 18 inches dbh and greater for all managed natural fire actions within a PAC.

c. Treatments will produce a mosaic of habitat components within a PAC.

d. Prescribed or managed natural fire will be introduced in PAC in blocks of 100-acres or less, and only between September 1 and February 28, outside the MSO breeding season.

e. Prescribed or managed natural fire will be introduced into potential MSO nest/roost habitat only if at least two years of surveys, in accordance with USFWS protocol has been conducted, and for which one year of follow-up survey (four visits) has been conducted, if more than one breeding season has elapsed since the last survey to protocol and the action. Furthermore, introduction of fire into a PAC will only occur if the nest/roost site is known the year of the action, or for which nest/roost site information is less than three years old. If nest/roost information for a PAC is three years old or more, a 200-acre nest buffer will be deferred from treatment until the nest/roost can be located again or lack of occupancy documented.

f. All prescribed or managed natural fire will be suppressed if it is anticipated that the fire may burn out of prescription in the following 24 hours. Fort Huachuca may choose to suppress actions prior to this.

g. For prescribed or managed natural fire, Fort Huachuca will ensure that no more than 10 percent of the canopy of each PAC will be effected by gaps created by single or groups of trees crowning. Groups of trees that “crown out” will not exceed two acres in size.

h. Fort Huachuca will ensure that no more than two PAC per year on Fort Huachuca are affected by prescribed or managed natural fire. A PAC is considered affected if one or more acres of the PAC are burned to any degree. If prescribed or managed natural fires in one year are located in PAC(s) outside of the nest buffer, and are 1-10 acres in size, Fort Huachuca will discuss with the USFWS the option of allowing prescribed or managed natural fire to occur in one additional (or the same) PAC.

i. The effects of prescribed fire, managed natural fire, and fuels treatment on the owl and its habitat will be monitored. Such monitoring will include quantifying acres of 100-acre activity centers, PAC, and potential habitat affected by these activities.

j. The USFWS will approve mitigation/monitoring plans. Such plans will be developed prior to implementation of prescribed fire. Mitigation and monitoring for managed natural fire that may adversely affect the MSO will be coordinated with and approved by the USFWS as soon as possible after a decision is made to let a natural fire burn under controlled conditions.

16. If MSO are found nesting in Garden Canyon within 0.25 mile of the rappelling cliffs, rappelling will be halted or moved at least 0.25 mile from the active nest from March 1 through August 31, or until nestlings fledge.

17. Fort Huachuca will maintain permanent, all-weather signs near the trailhead of Scheelite Canyon and all other trails through canyons in which a PAC occurs (but signs should not be visible from any nearby road) that, at a minimum, informs visitors of the following:

a. The Canyon is home to sensitive species.
b. Visitors should stay on the trail and be as quiet and unobtrusive as possible.
c. Groups of visitors are limited to 12 or less.

d. Calling, hooting, or playing of taped recordings to elicit responses from or to locate owls is prohibited except with a special permit from the U.S. Fish and Wildlife Service.
e. Smoking is prohibited.

18. Fort Huachuca will monitor take of MSO and document any disturbance of owls or owl habitat. This and other monitoring required here will be reported to the USFWS following established reporting requirements.

Lesser Long-nosed Bat (Endangered)

Objective 5. Implement these agreed measures from the PBO for the lesser long-nosed bat.

1. Fort Huachuca will ensure that construction, upgrading, or maintenance of roads does not increase or facilitate public access to Manila Mine, Pyeatt Cave, or other day roosts identified during the life of the project.

2. In coordination with the USFWS, Fort Huachuca will consider installing bat gates with lockable, human access doors at Manila Mine, Pyeatt Cave, Upper Pyeatt Cave and other day roosts that may be identified during the life of the plan. Decisions to install gates and the design of the gates will be approved by the USFWS.

3. If bat gates are not installed, then from at least July 1 to October 31 Fort Huachuca will ensure that the alarm system is functional; access routes to day roosts are closed; access routes at the closures and the mine/cave sites are posted with the following information: no vehicle access, no entry into mines or caves, explanations that the closures are needed to protect sensitive species, and warnings that entry into the mines/caves could represent a violation of the Endangered Species Act.

4. If an annual increase in illegal entry into day roosts is noted, Fort Huachuca will take action to correct the problem. Corrective action could include bat gates.

5. Fort Huachuca will prohibit low-level helicopter flights within 350 feet of Pyeatt Cave, Manila Mine, or other day roosts identified during the life of the project from July 1 to October 31.

6. Prior to construction activities, pre-construction surveys will be conducted for paniculate agaves that may be directly affected by construction activities. If agaves are found during pre-construction surveys, the following measures will be implemented:

a. Disturbance will be limited to the smallest area practicable, damage to agaves will be avoided where possible, and projects will be located in previously disturbed areas whenever possible.

b. Vehicle use will be limited to existing routes and areas of disturbance except as necessary to access or define boundaries for new areas of construction or operation.

c. All workers will strictly limit their activities and vehicles to designated areas. Construction workers will be informed of these terms and conditions.

7. No seeding/planting of nonnative grasses or other plants will occur at Fort Huachuca that may alter fire frequencies in wildland areas.

8. Prescribed fire and managed natural fire will be planned to minimize adverse effects to lesser long-nosed bat forage plants and roosts. Measures will be developed to ensure the following:

a. The fire kills no more than 20 percent of agaves that are burned during prescribed fire or managed natural fire.

b. Fires in agave management areas will be actively suppressed unless the area is approaching its natural fire return interval of 10 years (that is, at least 8 growing seasons after last burning).

c. Prescribed fire will be prohibited in agave management areas where greater than half of those agaves are young age classes (agaves with four or fewer spiral courses of leaves).

d. A mitigation plan will be developed by Fort Huachuca in coordination with the USFWS for each prescribed or managed natural fire within 0.5 mile of a lesser long-nosed bat roost or in areas that support paniculate agaves. The mitigation plan will ensure those effects to lesser long-nosed bat roosts and forage plants are minimized, and will include monitoring of effects to forage plants. The USFWS will approve the plan. Mitigation and monitoring for managed natural fire will be coordinated with and approved by the USFWS as soon as possible after a decision is made to let a natural fire burn under controlled conditions.

e. A schedule for prescribed burns will be established and followed to reduce fuel loading in Fort Huachuca grasslands and woodlands, thereby reducing the potential for major wildfires in lesser long-nosed bat foraging and roosting habitat. This schedule will be coordinated and approved by the USFWS.

f. In regard to fire suppression, prescribed fire, or managed natural fire activities on the West or South Ranges, the following measures will be implemented:

(1) Fort Huachuca will continue the mutual aid agreements with local governments and the Memorandum of Understanding with the Coronado National Forest to provide assistance in fire suppression, if participating entities agree.

(2) One of the objectives of fire suppression, prescribed fire, and managed natural fire activities will be protection of lesser long-nosed bat foraging and roosting habitats. This objective will not in any way constrain the fire boss from taking any action as needed to protect life or property.

(3) A Resource Advisor(s) will be on the fire during all suppression, prescribed fire, or managed natural fire activities. Resource Advisors will be qualified biologists designated to coordinate lesser long-nosed bat concerns and serve as an advisor to the fire boss. They will also serve as field contact representatives responsible for coordination with the Service. They will monitor fire activities to ensure protective measures endorsed by the fire boss are implemented. Resource Advisors will be on call 24 hours.

(4) Areas of significant human activity during fire suppression operations, such as fire crew camps, landing strips, and equipment staging areas, will not be located from July 1 through October 31 within 0.25 mile of Manila Mine, Pyeatt Cave, Wren Bridge, or other roosts identified during the life of the project. Such areas will also be kept to the minimum area possible and will be located in previously disturbed sites whenever possible.

(5) Off-road vehicle activity during fire activities will be kept to a minimum. Vehicles shall be parked as close to roads as possible, and vehicles will use wide spots in roads or disturbed areas to turn around. If off-road travel is necessary, local fire-fighting units should go off-road first because of their prior knowledge of the area.

(6) Use of tracked vehicles during fire activities will be restricted to improving roads or constructing lines where a short distance of line might save a large area from fire.

(7) Fort Huachuca will, to the extent possible, obliterate vehicle tracks made during fires in the Huachuca Mountains, especially those of tracked vehicles.

(8) Patches of unburned vegetation within burned areas in the Huachuca Mountains shall not be burned out as a fire suppression measure, except as needed to secure the fire perimeter or provide for fire fighter safety.

9. Night-time training will not occur in agave management areas July 1 through October 31.

10. No nighttime use and no tracer fire will occur on live fire ranges 2, 3, and 4 from July 1 through October 31.

11. From July 1 - October 31, all nocturnal UAV operations at the Rugge-Hamilton and Pioneer sites will be above 500 feet above ground level, except for take-off and landings. Take-off and landing approaches at Rugge-Hamilton will be confined to the east and north and approaches at Pioneer will be confined to the north and west, away from agave management areas. Nocturnal rocket-assisted take-offs of UAVs from the Black Tower site will only occur from November through June. Rocket-assisted take-offs will be attended by fire crews due to the high probability of fire and potential adverse effects to agave communities.

12. Off-road vehicle travel will not occur in protected agave management areas or any other part of the West Range or South Range.

13. Pyrotechnics will not be used within 0.25 miles of protected agave management areas.

14. Fort Huachuca will fully implement as soon as possible the Agave Management Plan (Howell and Robinett 1996), with the exception of the recommendation to limit prescribed fire to the cool season (November through March). Alternatively, Fort Huachuca could rewrite the Agave Management Plan and implement that revised plan, if approved by the USFWS. In either case, the Agave Management Plan should evolve with monitoring data and research results. Any changes in future agave management will be reviewed and approved by the USFWS.

15. Fort Huachuca will (if funding is available) continue implementation of Integrated Training Area Management (ITAM), or will otherwise provide environmental awareness training to all military personnel that work in the field on the West or South Range. Environmental awareness training will include information on the status of the lesser long-nosed bat and these terms and conditions. Fort Huachuca will continue to implement Fort Huachuca Regulation 385-8, Range and Training Area Operations, to specify the completion of environmental awareness training (including protected resource identification) prior to the initiation of training or testing; and the responsibility of the unit commander to become familiarized with environmental policies and operational requirements.

16. Fort Huachuca will designate a point of contact at Range Control that will ensure that training activities comply with mitigation requirements.

17. Fort Huachuca will develop, as soon as possible, a species-specific management plan for the lesser long-nosed bat.

18. Fort Huachuca will conduct annual monitoring of known or potential lesser long-nosed bat roosts at Fort Huachuca so that training and other activities can be designed or revised, as needed, to avoid or minimize adverse effects.

19. Fort Huachuca will conduct monitoring of Palmer's agave populations on the West and South Ranges every five years. The objective of the monitoring will be to establish trends in bat forage resources.

20. Fort Huachuca will monitor take of lesser long-nosed bats, document any disturbance of roost sites, and document acres burned on the West or South ranges and whether such fire burned in agave

management areas. The results of this monitoring will be reported to the USFWS following established reporting requirements.

Sonora Tiger Salamander (Endangered)

Objective 6. Implement these agreed measures from the PBO for the Sonora tiger salamander.

1. Fort Huachuca will provide environmental awareness training to personnel. Environmental training of personnel working in upper Garden Canyon will include instructional/educational materials that will describe the protected status and sensitive nature of the Sonora tiger salamander and prohibitions on transport and release of live fish and salamanders, collection of Sonora tiger salamanders, and off-road vehicle activity.

2. Fort Huachuca will continue the mutual aid agreements with local governments and the Memorandum of Understanding with the Coronado National Forest to provide assistance in fire suppression, if participating entities agree.

3. Fort Huachuca will conduct annual monitoring of the upper Garden Canyon pond in June or early July (pre-monsoon) of each year to determine condition of the habitat and presence of aquatic salamanders according to protocol approved by the USFWS.

4. Fort Huachuca will develop, as soon as possible, a species-specific management plan for the Sonora tiger salamander.

5. Fort Huachuca will establish a schedule and implement as soon as possible prescribed burns and/or fuels management to reduce fuel loading in Fort Huachuca woodlands.

6. Exclosure fences or other barriers, such as boulders placed around the pond's perimeter, will be maintained at Upper Garden Canyon Pond, and the side road to the pond cabled, to prevent vehicles from driving through the habitat.

7. A closure to vehicle travel will be maintained for the life of the project at Gate No. 7.

8. Fort Huachuca amended part 4.i. of the "Fishing Facts" handed out to anglers to read: "i. Live fish and salamanders may not be transported or used as bait on Fort Huachuca. Capture, transport, or release of salamanders is strictly prohibited." This will continue to appear in bold. The "Fishing Facts" will be supplied to all persons obtaining fishing permits at Fort Huachuca.

9. A permanent all-weather sign is posted at Upper Garden Canyon Pond. The sign will be maintained and contain the following information at a minimum: 1. Fishing, use of nets, and capture or release of salamanders or fish is prohibited, and 2. Off-road vehicle use is prohibited.

10. One of the objectives of fire suppression activities will be protection of salamanders and the aquatic habitat at upper Garden Canyon pond, in Scotia Canyon, or other salamander localities possibly affected by fire at Fort Huachuca. This objective will not in any way constrain the fire boss from taking any action as needed to protect life or property.
11. A Resource Advisor(s) will be on the fire during all suppression, prescribed fire, or managed natural fire activities in the Huachuca Mountains. Resource Advisors will be qualified biologists designated to coordinate Sonora tiger salamander concerns and serve as an advisor to the fire boss. They will also serve as field contact representatives responsible for coordination with the USFWS. They will monitor fire activities to ensure protective measures endorsed by the fire boss are implemented. Resource Advisors will be on call 24 hours.

12. Areas of significant human activity during fire suppression operations, such as fire crew camps, landing strips, and equipment staging areas, will not be located on or adjacent to salamander breeding sites in Garden Canyon or at other sites identified during the life of the project. Such areas of human activities will also be kept to the minimum area possible and will be located in previously disturbed sites whenever possible.

13. Off-road vehicle activity during fire activities in the Huachuca Mountains will be kept to a minimum. Vehicles will be parked as close to roads as possible, and vehicles will use wide spots in roads or disturbed areas to turn around. If off-road travel is necessary, local fire-fighting units should go off-road first because of their prior knowledge of the area.

14. Use of tracked vehicles during fire activities in the Huachuca Mountains will be restricted to improving roads or constructing lines where a short distance of line might save a large area from fire.

15. Fort Huachuca will, to the extent possible, obliterate vehicle tracks made during fires in the Huachuca Mountains, especially those of tracked vehicles.

16. Patches of unburned vegetation within burned areas in the Huachuca Mountains will not be burned out as a fire suppression measure, except as needed to secure the fire perimeter or provide for fire fighter safety.

17. A mitigation/monitoring plan will be developed by Fort Huachuca in coordination with the USFWS for each prescribed fire, managed natural fire, or fuels treatment that may adversely affect the Sonora tiger salamander or its habitat on or off-post. Fire activities and fuels treatment will be designed to protect Sonora tiger salamanders and their habitat. The effects fire activities and fuels treatment on the Sonora tiger salamander and its habitat will be monitored. Mitigation/monitoring plans will be approved by the USFWS. Mitigation and monitoring for managed natural fire that may adversely affect the Sonora tiger salamander will be coordinated with and approved by the USFWS as soon as possible after a decision is made to let a natural fire burn under controlled conditions.

18. Fort Huachuca will monitor take of Sonora tiger salamanders, and document any disturbance of salamanders or salamander habitat. Results of this and other monitoring required herein will be reported to the USFWS pursuant to established reporting requirements.

Bald Eagle (Threatened)

Bald eagles occurring on Fort Huachuca are strictly transients. There have not been any issues of concern identified that are specific to bald eagles on the installation. Thus, management specifically for bald eagles is not warranted at this time. Management of other threatened and endangered species and watershed management on Fort Huachuca meets the needs of bald eagles using the installation.

Ramsey Canyon Leopard Frog (Subject of multi-agency Conservation Agreement)

Objective 7. Manage for permanent water with a minimum permanent pool depth of one meter in occupied aquatic habitats for the Ramsey Canyon leopard frog.

Objective 8. Monitor and maintain habitats free of nonindigenous predators and competitors for the Ramsey Canyon leopard frog.

Objective 9. Protect occupied and suitable waters from impacts of vehicle traffic.

Objective 10. Maintain or increase habitat heterogeneity (e.g. vegetative structure) for the Ramsey Canyon leopard frog.

Objective 11. Buffer habitats from catastrophic natural and human caused fires. Construct sediment traps above Tinker Pond in the main drainage by 2003 and the smaller, side drainage by 2004.

Objective 12. Remain an active participant in the Ramsey Canyon Leopard Frog Conservation Agreement and its implementation by the Ramsey Canyon Leopard Frog Conservation Team.

Huachuca Springsnail (Candidate)

Fort Huachuca will periodically survey springs to determine the presence or absence of the springsnail. The USFWS is assembling information on the status of the Huachuca springsnail population. When this assemblage is complete, Fort Huachuca will obtain the information, which may then be used to develop a conservation agreement. Fort Huachuca will participate as a partner in this effort, if it is deemed necessary for the springsnail, and if personnel and funding are available.

Management for the springsnail on Fort Huachuca is accomplished by protecting springs from damage by vehicles. Other broad management programs, such as fire management, watershed management, and water recharge, help maintain habitats for the Huachuca springsnail on Fort Huachuca.

Objective 13. Protect springs and surrounding upland vegetation on Fort Huachuca.

Objective 14. Participate in development of a conservation agreement if it is deemed necessary for future survival of the Huachuca springsnail.

Objective 15. Periodically monitor springs for presence or absence of Huachuca springsnails.

Lemon Fleabane (Candidate)

Lemmon fleabane is a prostrate perennial that grows in dense clumps (to 20 inches or more in diameter). It is known from crevices and ledges of west, south and north facing cliffs, and on vertical faces of large boulders along the canyon bottom. It is found on substrates of sandy silicate or granitic soils, and on limestone cliffs, between 6,300 and 6,600 feet above msl on at least two separate cliff faces in a single canyon. Its habitat ecology is poorly known, but numbers and distribution seem to be stable. Potential habitat may occur elsewhere on Fort Huachuca. Lemmon fleabane may not be susceptible to human disturbance due to its relatively inaccessible cliff habitat. Potential threats to some plants may include extended drought, rock falls, illegal rock climbing (Warren *et al*., 1991; SAIC, 1998a), and wildfire that burns in the canopy or crowns of trees near fleabane.

Recreational rappelling is prohibited on Fort Huachuca. Most or all known locations of Lemmon fleabane occur within a designated PAC for Mexican spotted owls. Therefore, adherence safeguards for this PAC will tend to minimize human-caused disturbance of fleabane or their habitat. Any authorized activities on cliff faces on Fort Huachuca should be preceded by surveys for Lemmon fleabane in the planned area of activity.

Objective 15. Compile all existing survey data and site information for Lemmon fleabane, as a basis for developing a conservation assessment, strategy and agreement with the USFWS, in case such an effort is determined worthwhile.

Listed Species Not Known to Occur on Fort Huachuca But with Potential Habitat Present on or Near Fort Huachuca

The PBO (USFWS, 1999) concurred with Fort Huachuca that the Army's actions, may affect, but are not likely to adversely affect, the spikedace, loachminnow, and Canelo Hills ladies' tresses.

Spikedace and Loach Minnow (Threatened)

Although these species do not currently occur in the San Pedro River, Army actions have the potential to affect recovery habitat in the river that is designated as Critical Habitat for both species. The PBO's concurrence is dependent on implementation of reasonable and prudent measures for the Huachuca water umbel and southwestern willow flycatcher. Implementation of these measures would remove threats to spikedace and loach minnow recovery habitat.

Objective 16. Implement reasonable and prudent measures for the Huachuca water umbel and southwestern willow flycatcher to remove threats to spikedace and loach minnow recovery habitat.

Canelo Hills Ladies' Tresses (Endangered)

Measures to protect listed species, fire management, and land stewardship in general on Fort Huachuca will protect the Canelo Hills ladies' tresses from possible threats, remote as they might be, from Army actions.

Northern Aplomado Falcon (Endangered)

The development of specific protective and management objectives for the northern aplomado falcon is dependent upon reestablishment of the species in Arizona. Habitat types on East and South ranges have a strong potential to support released or recolonizing aplomado falcons. Measures to protect listed species, fire management initiatives, the East Range Watershed Improvement Plan, and general management of the installation's natural resources will protect potential habitat for the northern aplomado falcon.

Jaguar (Endangered)

The development of specific protective and management objectives for the jaguar is dependent upon jaguars becoming more abundant within its historical range. Jaguars use a variety of habitats. Measures to protect listed species, fire management initiatives, the East Range Watershed Improvement Plan, and general management of the installation's natural resources will protect potential habitat for this species

Mexican Gray Wolf (Endangered)

The development of specific protective and management objectives for the Mexican gray wolf is dependent upon dispersing wolves from a reestablishment site or natural recolonization of its historical range. Because of the broad habitat requirements, most upland habitats of the installation may be suitable for wolves. Measures to protect listed species, fire management initiatives, and general management of the installation's natural resources will protect potential habitat for this species.

Chiricahua Leopard Frog (Proposed Threatened)

The development of specific protective and management objectives for the Chiricahua leopard frog is dependent upon discovery of this species on the installation. Previous surveys have not located any on the installation. Measures to protect listed species, fire management initiatives, the East Range Watershed Improvement Plan, and general management of the installation's natural resources will protect potential habitat for the Chiricahua leopard frog.

Gila Topminnow (Endangered)

The development of specific protective and management objectives is dependent upon successful reestablishment of the Gila topminnow to the area. Measures to protect listed species, fire management initiatives, adequate water management, the East Range Watershed Improvement Plan, and general management of the installation's natural resources will protect potential habitat for the Gila topminnow.

Desert Pupfish (Endangered)

The development of specific protective and management objectives for the desert pupfish is dependent upon reestablishment of the species to the installation. Measures to protect listed species, fire management initiatives, water management, the East Range Watershed Improvement Plan, and general management of the installation's natural resources will protect potential habitat for the desert pupfish.

Black-tailed Prairie Dog (Candidate)

Development of specific protective and management objectives for the black-tailed prairie dog is dependent upon reestablishment of the species on the installation. It occurred on or adjacent to Fort Huachuca land until 1938, and potential habitat still exists on the South and West Ranges. AGFD has been exploring the possibility of re-establishing black-tailed prairie dogs in Arizona since mid 1965. In 1995, they conducted a habitat assessment for prairie dogs on Fort Huachuca, and identified approximately 11,000 acres of potential habitat (Van Pelt and Belitsky, 1995). However, a decision to reestablish the species was not made at that time.
Since then, AGFD and the other 10 state wildlife agencies in the historic range of black-tailed prairie dogs developed and are implementing a Conservation Agreement. The intent is both to demonstrate that a cooperative, range-wide approach is necessary and sufficient to achieve long-term species conservation, as well as to preclude the need to federally list the species. Under the plan, a state working group must develop a management plan, and in Arizona this has included active participation by Fort Huachuca. The Arizona Working Group released in August 2001 a late draft *Interagency Management Plan for Black-tailed Prairie Dogs in Arizona* for public comment. This plan is neither a reestablishment proposal nor a decision, but obviously, prairie dog conservation and management cannot occur in Arizona unless the species is present. AGFD has a separate, detailed and deliberate 12-step process that must be completed for reestablishment of nongame wildlife and listed species in Arizona. They have not made a decision on whether to reestablish black-tailed prairie dogs in Arizona, but as a parallel process to the Arizona Working Group, AGFD initiated in March 1999 its 12-step process for evaluating the feasibility of reestablishing this species in Arizona

If reestablishment occurs on Fort Huachuca, active monitoring and management will be needed. Management is likely to involve designating areas for reestablishment, expansion and buffer areas, and prairie dog removal areas. Pre-release habitat improvement, such as prescribed burning, and other site preparation may be warranted. After release, management may involve removal of dispersing prairie dogs from predetermined areas where they are not compatible with other objectives.

Objective 17. Consult with the USFWS and AGFD and take appropriate action if new listed species are found on Fort Huachuca.

8.4.2.2.2 Alternative B - No Action

The No Action and Proposed Action alternatives are identical with regard to managing threatened, endangered, and candidate species within requirements of the Endangered Species Act, as established in the PBO (USFWS, 1999).

8.4.2.2.3 Alternative C - Other Management Options

There are no viable options with regard to managing threatened, endangered, and candidate species within requirements of the Endangered Species Act, as established in the PBO (USFWS, 1999). When ESMPs are complete, they will help Fort Huachuca meet its Endangered Species Act requirements and modifications will require consultation with the USFWS. Thus, there are few options with regard to management of these species and their habitat without considerable consultation and coordination.

Fort Huachuca is not required to specifically manage State-listed species. Thus, although Army regulations require consideration for these species, programs specifically for State-listed species are not required to be implemented. However, Fort Huachuca will continue to evaluate State-listed and other

sensitive species, and implement appropriate conservation actions when funding can be obtained. Funding priorities for these species are less than for federally-listed species.

8.4.3 Furbearer/Predator Management

No management specific to furbearers/predators is performed on the installation. No predator control program is planned, nor is the need for such a program anticipated. Under normal conditions, predators are an asset to a well managed wildlife program. Arizona law has 12-month seasons for coyote, cougar, and skunk, and an 8-month season on raccoon, bobcat, fixes, ringtail and badger. Sport hunting and

calling for predators, particularly for coyotes, are encouraged on the installation. Coyotes may present a problem to antelope in the area because of their low population level, which could be further reduced by predation. Coati hunting has not been open on Fort Huachuca since the mid-1990s because of a long-term research project on post, and because of the extremely low demand and interest in taking coati.

The trapping of furbearers and predators for recreation or routine management is not permitted on Fort Huachuca or other Federal lands in Arizona. Furbearer/predator management relative to nuisance animals and public health concerns are discussed in Section 8.10.1.1

8.4.3.1 Alternative A - Proposed Action

Goal. Manage furbearer populations to maintain ecosystem function.

Objective 1. Continue to permit the hunting of predators, particularly coyotes in antelope fawning areas, on Fort Huachuca.

Objective 2. Evaluate carnivore ecology and support research to better characterize their habitat use, disease transmission roles, and their potential to affect populations of specific prey species on Fort Huachuca.

8.4.3.2 Alternative B - No Action

The No Action and Proposed Action alternatives are similar with regard to management of furbearers and predators with exception of the Proposed Action's evaluation of carnivore ecology. This evaluation will allow for a better understanding of carnivore relationships on Fort Huachuca and supports the integrated, comprehensive approach to natural resources management of the Proposed Action.

8.4.3.3 Alternative C - Other Management Options

Fort Huachuca is not required to specifically manage nonfederally-listed species. Thus, limited control of predators through hunting, and researching predator impacts to antelope, are not required to be implemented. The installation could decide not to allow predator hunting or research of predator/big game relationships. The installation could increase control efforts, increase management specific to individual species of predators, or manage for increased numbers of predators. However, such management options are not biologically justifiable, nor likely to be a high priority given current compliance requirements and reductions in budgets and personnel.

8.4.4 Other Nongame Species Management

Although much of the species management on Fort Huachuca is directed towards listed species, primarily due to compliance requirements, these compliance-featured species comprise a small part of the installation biodiversity. Fortunately, measures for listed species also benefit many other species of plants and wildlife on the installation. Proper scoping and planning of projects targeted at a single species or natural resource objective can also incorporate benefits or protection for other species.

Special interest area habitat protection measures (Section 8.12), wildlife habitat programs (Section 8.3), wetlands management (Section 8.5), water quality management (Section 8.6), fire management (Section 8.11), and environmental awareness programs (Chapter 10) will benefit nongame species in general, consistent with ecosystem management strategies.

Goal 1. Use measures established for federally-listed species to conserve populations and habitat for other nongame species that use Fort Huachuca, especially species listed in Arizona's Native Plant Law, Wildlife Species of Concern in Arizona, or as sensitive species by other Federal agencies in the Fort Huachuca area.

Goal 2. Whenever appropriate within ecosystem management goals and budget limitations, develop management and conservation programs for other nongame species, especially species of concern considered likely to be proposed for listing in the near future.

8.4.4.1 Birds

Inventory and monitoring projects for birds are described in Section 7.2.1.1.2. Protection and management for the southwestern willow flycatcher and Mexican spotted owl (Section 8.4.2.2.1) and other threatened and endangered species are important to the management and protection of many avian species that use Fort Huachuca.

8.4.4.1.1 Alternative A - Proposed Action

Objective 1. Manage habitats that support neotropical migratory bird species that use Fort Huachuca.

Objective 2. Participate in implementing the Arizona Partners In Flight Bird Conservation Plan (Latta *et. al*. 1999) as part of the comprehensive North America Bird Conservation Initiative.

Objective 3. Use measures planned and implemented for federally-listed species to include protection and habitat for birds that occur on Fort Huachuca.

Objective 4. Continue to support research efforts, particularly on habitat relationships, of birds that occur on Fort Huachuca.

8.4.4.1.2 Alternative B - No Action

The No Action and Proposed Action alternatives are identical with regard to managing bird species on Fort Huachuca.

8.4.4.1.3 Alternative C - Other Management Options

Fort Huachuca is not required to specifically manage nonfederally-listed species. Thus, programs for birds in general are not required to be implemented. However, ecosystem functionality includes the assurance that these species are managed to the best of the ability of the installation. Most of Fort Huachuca's management programs have positive effects for nonfederally-listed species.

Fort Huachuca could establish intensive and extensive management programs for many bird species and their habitats. However, this cannot be supported by projected budgets and personnel.

8.4.4.2 Mammals

Inventory and monitoring projects for mammals are described in Section 7.2.1.1.1. Protection and management of threatened and endangered species are important to the management and protection of mammals in general on Fort Huachuca.

8.4.4.2.1 Alternative A - Proposed Action

Objective 1. Manage habitat through measures established for federally-listed species to also conserve populations of mammals that occur on Fort Huachuca.

Objective 2. Continue to support research efforts, particularly on habitat relationships and effects of management actions, on mammals that occur on Fort Huachuca.

8.4.4.2.2 Alternative B - No Action

The No Action and Proposed Action alternatives are identical with regard to managing mammal species on Fort Huachuca.

8.4.4.2.3 Alternative C - Other Management Options

Fort Huachuca is not required to specifically manage nonfederally-listed species. Thus, programs for mammals in general are not required to be implemented. However, most of Fort Huachuca's management programs have positive effects for nonfederally-listed species, including mammals.

Fort Huachuca could establish intensive and extensive management programs for many mammal species and their habitats. However, this option cannot be supported by projected budgets and personnel.

8.4.4.3 Reptiles and Amphibians

Inventory and monitoring projects for reptiles and amphibians are described in Section 7.2.1.1.4. Protection and management for the Sonora tiger salamander, Ramsey Canyon leopard frog (Section 8.4.2.2.1), and other threatened and endangered species are important to the management and protection of reptile and amphibian species on Fort Huachuca.

8.4.4.3.1 Alternative A - Proposed Action

Objective1. Use measures established for federally-listed or candidate species to include protection and habitat conservation for native reptiles and amphibians that occur on Fort Huachuca.

Objective 2. Apply information and follow recommendations in *Management of Amphibians of Fort Huachuca* (Sredl and Wallace, 2000a).

Objective 3. Continue to support research efforts, particularly on habitat relationships and effects of management actions, on reptiles and amphibians that occur on Fort Huachuca.

8.4.4.3.2 Alternative B - No Action

The No Action and Proposed Action alternatives are identical with regard to reptile and amphibian management on Fort Huachuca.

8.4.4.3.3 Alternative C - Other Management Options

Fort Huachuca is not required to specifically manage nonfederally-listed species. Thus, above programs for reptiles and amphibians in general are not required to be implemented. However, projects described for these species are also required for federally-listed species. Thus, as described in discussions of Other Management Options for federally-listed species, options are only available after consultation with the USFWS.

Fort Huachuca could establish intensive and extensive management programs for many reptile and amphibian species and their habitats. However, this option cannot be supported by projected budgets.

8.4.4.4 Invertebrates

Inventory and monitoring projects for invertebrates are described in Section 7.2.1.1.5. Management authority, including collecting over-sight, exists within AGFD for mollusks and crustaceans, but not for arthropods or other invertebrates. Protection and management for the Huachuca springsnail (Section 8.4.2.2.1) and other threatened and endangered species are important to the management and protection of invertebrates that use Fort Huachuca. Riparian and aquatic habitat protection would likely be most important for conservation of invertebrate diversity. This would help sustain populations and abundance and support their role in the food web and in critical ecological processes, such as pollination and biogeochemical recycling. The second most important goal likely is restoration and maintenance of ground cover in the form of standing vegetation and appropriate amounts of litter.

Invertebrate collecting is popular and well established on Fort Huachuca, particularly in riparian habitats. Collectors and their activities should be identified and regulated in an appropriate way, because they are often very visible, and they often occur in areas popular for other recreation. Preferred collecting areas also tend to be where their activities may affect integrity of ongoing research sites of Fort Huachuca and its cooperators investigating invertebrates, plants and riparian ecology.

8.4.4.4.1 Alternative A - Proposed Action

Objective 1. Use measures established for federally-listed species to provide protection for invertebrates that use Fort Huachuca.

Objective 2. Consistent with objectives in Section 7.2.1.1.5 for gathering species occurrence information from collectors, retain and publicize the requirement for written authorization for anyone to collect material on Fort Huachuca.

Objective 3. Develop and implement by 2003 a more formal, efficient application form and process for requesting, issuing and tracking invertebrate collecting permits on Fort Huachuca, so that more effective management of collection activities and the findings they generate ensue.

Objective 4. Cooperate, as appropriate, with the "Forgotten Pollinators" project of the Arizona-Sonora Desert Museum and its conservation and environmental awareness efforts in the upper San Pedro Valley.

8.4.4.4.2 Alternative B - No Action

The No Action and Proposed Action alternatives are similar with regard to invertebrate management on Fort Huachuca. However, the Proposed Action is more comprehensive than the No Action alternative particularly through the development and implementation of a formal process for requesting, issuing and tracking invertebrate collecting permits on Fort Huachuca.

8.4.4.4.3 Alternative C - Other Management Options

Fort Huachuca is not required to specifically manage nonfederally-listed species. Thus, programs for invertebrates in general are not required to be implemented. However, projects described for these species are also required for federally-listed species. Thus, as described in discussions of Other Management Options for federally-listed species, options are only available after consultation with the USFWS.

Fort Huachuca could establish intensive and extensive management programs for many invertebrate species and their habitats. However, this option cannot be supported by projected budgets.

8.5 Wetlands Management

Wetlands protection is required by the Clean Water Act and by Executive Order 11990, *Protection of Wetlands*. Wetlands at Fort Huachuca are confined to some springs and riparian areas surrounding some streams and ponds. Although the total wetland acreage is small, these areas are essential to the survival or well-being of many wildlife species. Riparian areas on Fort Huachuca provide some water storage and flood modulation, more perennial streamflow, shoreline stabilization, and greater biodiversity and conservation value per acre than any other vegetation type on post. The quality of watersheds affects the quality of downstream wetland plant and animal communities. Protection and maintenance of existing wetlands and riparian habitat and processes are the primary thrust of wetlands management on Fort Huachuca. Wetlands are described in Section 5.4.4.

Environmental review is the primary means of detecting threats to wetlands on the installation. The ENRD reviews actions that may affect wetlands. Reviews come from several sources: engineer work orders, military training plans, NEPA documentation, major construction plans, etc. If necessary, projects with potential impacts would be referred to the Corps of Engineers (Los Angeles District) to determine if jurisdictional wetlands are implicated, establish mitigation procedures, and/or obtain permits. Projects affecting wetlands require NEPA documentation (Chapter 13).

Activities in wetlands which require federal permits include but are not limited to: placement of fill material, ditching activities when the excavated material is sidecast, mechanized land clearing, land leveling, most road construction, and dam construction. The Corps of Engineers permit process may require coordination with the USFWS, AGFD, and the State Historic Preservation Office (SHPO) to allow for the assessment of potential impacts to protected species and historic properties. Under the Fish and Wildlife Coordination Act, AGFD works directly with the Corps of Engineers during the Clean Water Act permitting process.

Fort Huachuca Regulation 385-8, *Range and Training Area Operations*, provides protection of wetlands from military training damage. Protection is provided primarily by restricting military and privately

owned vehicles to established roadways, firebreaks, unimproved roads, and jeep trails, and by placing boulders, other barriers and signs to direct and constrain vehicles.

Other sections of this INRMP have provisions to protect wetlands. Provisions are found primarily within Section 8.4.2.2 - *Federal Listed/Proposed Species Management Programs*, Section 10.1 - *Military Personnel Awareness*, and Chapter 13 - *NEPA*.

8.5.1 Alternative A - Proposed Action

Goal: Manage wetlands to ensure "no net loss," per Executive Order 11990.

Objective 1. Use the environmental review process to protect wetlands and riparian areas early in the planning process.

Objective 2. Provide certified jurisdictional wetland delineation (and permit application, if necessary) if a project is planned in a suspected wetland.

Objective 3. Work with military personnel to ensure compliance with wetlands protection provisions within Fort Huachuca Regulation 385-8, using environmental awareness.

Objective 4. Provide physical barriers to protect wetland and riparian habitat, as needed.

Objective 5. Restore damaged streams (including banks) and degraded riparian habitats. Use cottonwood and willow cuttings to re-establish riparian vegetation.

Objective 6. Exclude horse grazing from riparian areas or manage them as special use pastures (limited seasonal use only). Install fencing along stream corridors to limit access by livestock.

Objective 7. Provide wildlife travel corridors connecting riparian and upland habitats.

Objective 8. Limit the number of road and utility crossings within riparian habitats.

Objective 9. Limit high-impact recreational facilities (buildings, picnic areas, camp grounds, motorized vehicle trails) that increase visitor use in ways that may destroy and degrade riparian areas.

Objective 10. In developed areas, control and purify stormwater runoff.

Objective 11. Use non-structural techniques to protect stream banks.

Objective 12. Provide hardened stream crossings and water access points (e.g., gravel pads) for livestock.

8.5.2 Alternative B - No Action

The No Action and Proposed Action alternatives are identical with regard to wetland management on Fort Huachuca.

8.5.3 Alternative C - Other Management Options

There are no management options contrary to the goal of "no net loss" since it is legally mandated. Using the above objectives and the management of threatened and endangered species (Section 8.4.2.2), Fort Huachuca is accomplishing maximum efforts to protect its wetlands and meet legal mandates.

8.6 Water Quality

Fort Huachuca has its own drinking and other-use water supply system and good quality surface and ground water (sections 3.5.2 and 5.4), and it intends to preserve that quality. Section 7.3 describes water quality monitoring.

AR 200-1 establishes the following objectives for water resources on Army lands:

X Conserve all water resources.
X Control or eliminate sources of pollution to surface or ground waters through conventional or innovative treatment systems.
X Demonstrate leadership in attaining the national goal of zero discharge of water pollutants.
X Provide drinking water that meets applicable standards.
X Cooperate with federal, State, and local regulatory authorities in forming and implementing water pollution control plans.
X Control or eliminate runoff and erosion through sound vegetative and land management practices.
X Consider nonpoint source pollution abatement in all construction, installation operations, and land management plans and activities.

Attainment of most of the above objectives is not the direct responsibility of Army installation natural resources programs, but some of them, especially the last two, are clearly natural resources and ecosystem management concerns.

Most water quality laws and regulations are not the management responsibility of the natural resources staff at Fort Huachuca, and are thus not within this INRMP. Groundwater management consists primarily of a monitoring program on Fort Huachuca. This program is not considered a natural resources program and is not included within this INRMP. Groundwater use, conservation, and management do, however, have direct implications for listed species management.

Erosion is not a significant, recognized threat to water quality on Fort Huachuca, largely due to limited permanent surface waters and the protection of the land around wetland areas. However, erosion from Fort Huachuca, particularly the East Range, may affect off-post waters. Implementation of the *East Range Watershed Improvement Plan* (SAIC, 1997) and general land management practices on the installation will enhance the installation's ability to protect on- and off-post water quality from sedimentation.

8.6.1 Alternative A - Proposed Action

Goal. Protect surface water quality in Fort Huachuca waters.

Objective 1. Consider nonpoint source pollution abatement in construction, installation operations, and land management plans and activities.

Objective 2. Implement the East Range Watershed Improvement Plan (SAIC, 1997).

8.6.2 Alternative B - No Action

The No Action and Proposed Action alternatives are identical with regard to protecting water quality on and off Fort Huachuca.

8.6.3 Alternative C - Other Management Options

Fort Huachuca is mandated, by regulation if not law, to consider nonpoint pollution in its activities. Thus, there are no viable options to the proposed action.

8.7 Land Rehabilitation and Maintenance

Land Rehabilitation and Maintenance (LRAM), a component of ITAM, involves repair of training-damaged lands and use of land construction technology to avoid future damage to training lands. LRAM uses technologies, such as revegetation and erosion control, to maintain training areas by preventing site degradation, minimizing soil erosion, and restoring or maintaining vegetative cover. These efforts are specifically designed to maintain quality military training lands, minimize long-term costs associated with land rehabilitation or additional land purchase, ensure compliance with environmental laws and regulations, and reduce erosion.

LRAM project funding is not based on environmental compliance, and it must directly support military land use. If environmental either Notices of Violation are pending or existing on a given site, the project is not eligible for LRAM funding. Likewise, if a degraded site is not affecting training capability, the project is not eligible for LRAM funding. However, if land is degraded through erosion and vegetative loss, and if it is either in noncompliance with environmental laws or not affecting training, it is eligible for environmental funding.

Many land reconstruction and rehabilitation projects have been implemented on the installation. However, LRAM, as part of the ITAM program at Fort Huachuca, began in 1992 with an erosion control/rehabilitation project in lower Garden Canyon. A brush control project was implemented on East Range to slow runoff, reduce sheet and rill erosion, and re-establish native grasses. Planning for several erosion control structures on the East Range occurred. Hardened tank crossings to stabilize certain stream channels have been constructed, and waterbar construction on certain firebreaks has reduced erosion in these areas.

As discussed in Section 1.5, an ITAM coordinator position was re-created and filled in 2001. Operational funding will continue to be requested to reinitiate ITAM and its components. Until reinitiation, erosion problems and associated projects will be addressed under general soil resources management on the installation. Fort Huachuca has developed the *Fort Huachuca East Range Watershed Improvement Plan* (SAIC, 1997). This plan is further discussed in Section 8.8.

8.7.1 Alternative A - Proposed Action

Goal. Rehabilitate and maintain lands to support military training on Fort Huachuca.

Objective 1. Reevaluate ecological restoration and revegetation techniques, as well as monitoring needs, to establish an adaptive management approach to land management.

Objective 2. Reinitiate LRAM on Fort Huachuca.

8.7.2 Alternative B - No Action

The No Action and Proposed Action alternatives are similar with regard to repair of training-damaged lands and the use of land construction technology to avoid future damage to training lands on Fort Huachuca. However, reinitiating the LRAM program under the Proposed Action would support the requirements of the Sikes Act for no loss in the capability of the lands to support the military mission, whereas the No Action alternative lacks support for this program. The Proposed Action is the most comprehensive alternative for land rehabilitation and maintenance on Fort Huachuca.

8.7.3 Alternative C - Other Management Options

The Sikes Act requires no loss in the capability of the lands to support the military mission. This, in turn, implies a legal requirement to maintain quality training lands. Thus, not maintaining the land in a condition, which supports the military mission leads to loss in that capability. However, the degree to which LRAM is used provides options. The non-use level of implementation currently occurring at Fort Huachuca could be expanded greatly to fully implement LRAM. A lesser degree of implementation is not possible. There are numerous other land rehabilitation and maintenance programs used by other agencies, but none are specifically designed to deal with the effects of military activities. They would be less effective.

8.8 Soil Resources Management

Several actions have been taken by Fort Huachuca to identify, monitor, and improve watershed conditions across the installation. These activities include mesquite root-plowing and upland revegetation, installation of erosion impoundment structures, implementation of land management guidelines,

modification of range use and training routines, and consultation with other federal agencies in the development of erosion reduction and groundcover restoration plans and practices. Several of these actions were under the ITAM program and improved watershed quality throughout the installation.

General erosion reduction and watershed improvement activities include: slope stabilization and revegetation, installation of gabion structures to increase recharge and reduce gully erosion and incision, mesquite (and other invasive woody species) root plowing, contour revegetation to reduce sheet and rill erosion on upland surfaces, and road erosion control to reduce roadbed incision and deterioration. The East Range, with the lowest elevation and precipitation (hottest and driest) and most degraded lands on Fort Huachuca, has the greatest need for soil and land surface restoration. However, grassland ranges of the West and South Ranges also have areas, primarily firebreaks, that need improvement.

The *Fort Huachuca East Range Watershed Improvement Plan* (SAIC, 1997), along with a site specific implementation plan being drafted in 2000-01, recommends general watershed improvement strategies and Best Management Plans, such as check dams, revegetation, and reseeding, to retard erosion on East Range. Check dams of brush and/or rock will be constructed to restore gullies to even ground and to slow the flow or rain run-off that accumulates during flood periods to prevent erosion on East Range (particularly gully erosion). This will substantially reduce the velocity of flood waters and transported sediment particles while retaining solids behind check dams.

Other erosion control measures being employed on the training ranges include scheduling training during the driest seasons (April through June) and allowing sufficient time for soils to dry after heavy rains before resuming training.

8.8.1 Alternative A - Proposed Action

Objective 1. Complete site specific planning, and implement the Fort Huachuca East Range Watershed Improvement Plan (SAIC, 1997).

Objective 2. Identify and prioritize West and South Range areas on the main installation that require types of repair and treatment.

8.8.2 Alternative B - No Action

The No action and proposed Action alternatives are similar for soil resources management on Fort Huachuca. However, several projects under the No Action alternative have been discontinued, such as mesquite root plowing. Site specific planning, implementation of the East Range Watershed Improvement Plan, and identification and prioritization of West and South Range sites requiring repair and treatment, may not occur under the No Action alternative. Thus, the Proposed Action is the most viable option available for management of soil resources on Fort Huachuca.

8.8.3 Alternative C - Other Management Options

Numerous options are available with regard to soil resources management on Fort Huachuca. These could range from not actively performing management activities to implementing much more intricate management planning and operations. Not completing site specific planning, not identifying and prioritizing West and South Range areas in need of repair, and not implementing the East Range Watershed Improvement Plan are options, but not ones that are prudent in terms of compliance and stewardship.

8.9 Cantonment Management

The cantonment (further described in Section 6.1.2) is an area of about 5,270 acres in the east-central portion of the main installation. There are 3,691 acres of modified lands for urban use (*e.g.* lawns, athletic fields, golf areas, landfill, playgrounds, parks) on the installation, which require annual maintenance, and 1,315 acres of semi-improved lands (*e.g.* ammunition storage, airfields, and heliports), which require periodic maintenance, but to a lesser degree than improved lands.

Grounds maintenance and landscaping within the cantonment at Fort Huachuca are accomplished by contract personnel. The ENRD, primarily through the forester, provides technical advice, oversight, and

supervision of all work. ENRD deals with those specific actions within the cantonment that directly support the natural resources program.

Fort Huachuca: An Historic Landscape Inventory Overview **(**Burt, 1998) was developed by the US Army COE Construction Engineering Research Laboratories under their *Guidelines for Documenting and Evaluating Historic Military Landscapes.* The overview found that Fort Huachuca retains a high level of integrity of its historic post area, and provided some genera; conceptual design and tree species planting recommendations.

A detailed landscape planting plan will be developed to provide guidance and consistency for landscaping different areas on post. The plan will be functional in nature, simple, informal in design, and compatible and complementary with adjacent surroundings and natural environment. Emphasis will be on native,

low-maintenance plants in accordance with a Presidential Memorandum (Office of the President, 1994) on the use of native species on federal lands.

Landscaping will use drought-tolerant plant species and xeriscaping principles. Whenever appropriate, native plants should be used to increase habitat for native wildlife species. Nonindigenous plant species that can outcompete native vegetation and become naturalized will not be used, as required by the Executive Order on *Invasive Species* (Office of the President, 1999). The use of native, drought-tolerant species decreases water use and maintenance activities. The installation forester dedicates considerable time to assisting Fort Huachuca personnel with selection, planning, and placement of landscaping as part of a self-help landscaping program. The forester also recommends new construction landscaping projects and inspects landscaping cantonment-wide on a regular basis. Section 8.4.2.2.1 (number 4), specifies conservation measures for the cantonment area relative to water conservation and recharge, including reduced watering, xeriscaping, and demolition of WWII-era buildings (USFWS, 1999). Fort Huachuca's policy on revegetation (Section 8.3.2.4) also enhances management efforts within the cantonment.

8.9.1 Alternative A - Proposed Action

Goal. Maintain an aesthetically pleasing cantonment landscape that maintains natural ecosystem functions as much as possible.

Objective 1. Develop a landscape planting plan for Fort Huachuca's cantonment area.

Objective 2. Provide professional advice to guide the grounds landscaping and maintenance program toward the use of native species, drought-tolerant, low maintenance species, and xeriscaping.

Objective 3. Reduce water use for irrigation as much as possible.

8.9.2 Alternative B - No Action

The No Action alternative would result in less emphasis on maintaining natural ecosystem functions in cantonment landscaping. The landscape planting plan for Fort Huachuca's cantonment area would not be developed, and water use may not be reduced to the extent that it would under the Proposed Action. The Proposed Action is the most prudent practice for responsible management of an aesthetically pleasing ecosystem aware cantonment area management program.

8.9.3 Alternative C - Other Management Options

In general, there are no legal requirements to manage developed grounds to the extent that is done at Fort Huachuca. However, there are requirements with regard to implementing measures included within the PBO (USFWS, 1999) that are related to cantonment management. Thus, there is no option, without consultation, but to implement these measures. There are other requirements (*e.g.*, Office of the President, 1994; AR 200-3) to use native species and reduce water usage for plantings and avoid and control invasive species (Executive Order 13112, Invasive Species). Thus, the grounds maintenance program could be scaled back, but not eliminated. On the other hand, it could be significantly increased, particularly if increases involved xeriscaping. However, considering budget cutbacks, grounds maintenance programs, except those tied to endangered species, are not likely to be significantly enhanced in the near future.

8.10 Pest Management (Native and Non-native Species)

Responsibility for cantonment pest management on Fort Huachuca is within DIS, Contract Management Division (CMD). The ENRD provides technical advice when requested. The Pest Management Inspector has been designated as the Installation Pest Management Coordinator.

The installation has a Pest Management Plan (Gabel, 1995) upon which most of the discussion below is based. This plan identifies and prioritizes pests and their destructive effects to determine particular levels of protection. The plan emphasizes pest management within the cantonment area.

Integrated pest management (IPM) is used at Fort Huachuca, and typically, a combination of IPM techniques is required to resolve a problem on a sustained basis. IPM includes the implementation and coordination of optimum sanitation, good structural design and maintenance of facilities, mechanical control, cultural control, biological control, and regulatory control.

Pest control efforts are implemented based on surveillance. Pest surveys are necessary to determine the type of pest, extent of problem, and pest management technique most appropriate for safe, effective, and economic control.

The Office of the President (1994) called upon heads of federal agencies to reduce the amount of pesticide use by using IPM practices. Fort Huachuca has a policy of only using chemical control when non-chemical techniques are inadequate or impractical. Furthermore, chemical control will not be used as a substitute for good sanitary practices or proper building maintenance.

Fort Huachuca (Gabel, 1995) recognizes ten categories of pests or undesirable vegetation that cause significant damage and require control or management. In order of priority, they are:

1. medically important arthropods (e.*g.*, ticks, mosquitoes, biting flies);
2. structural pests (*e.g.*, subterranean termites, carpenter bees, powderpost beetles, carpenter ants, decaying fungi);
3. stored products pests, occasionally found in food facilities and food-storage warehouses;
4. food facilities pests (*e.g*., cockroaches, ants, mice, rats);
5. residential pests (*e.g*., cockroaches, fleas, mice, wasps, bees, birds, spiders, ants);
6. turf and ornamental plant pests (*e.g.*, pine beetles, elmleaf beetles, bagworms, aphids, scales, spidermites);
7. bird pests (*e.g*., swallows, pigeons, English sparrows);
8. buildings pests (*e.g*., cockroaches, ants, crickets, mice, wasps, fleas);
9. outdoor rodent pests, occasionally found in and around family housing areas, food handling buildings, and improved grounds areas; and
10. broadleaf weeds, grass, and other undesirable vegetation.

8.10.1 Alternative A - Proposed Action

The Installation Pest Management Plan (Gabel, 1995) discusses many aspects of pest management that are not directly within the scope of this INRMP. Below discussions of animal and plant control are specific to the management of natural resources on the installation as opposed to those programs designed primarily for the cantonment area, generally dealing with arthropods and weeds. Responses to reports of pests are handled by both the CMD and ENRD.

8.10.1.1 Animal Control

The great wildlife diversity on Fort Huachuca, particularly where the cantonment area developed, contributes to complex and challenging issues of wildlife-human coexistence, public health and safety, and animal control. Skunks are common on Fort Huachuca, especially in areas immediately adjacent to the cantonment area. Nuisance animals such as skunks can be reservoirs for various diseases. Intentional (bird feeders, etc.) and unintentional (improper trash disposal) feeding of animals can exacerbate this problem. Skunks are live trapped from in and around the cantonment and are either euthanized for rabies surveillance or relocated to other nearby areas.

Wildlife feeding, trash, the occurrence of pets, etc., can draw species such as coyotes and lions into the cantonment area. These factors may also artificially increase densities of certain species and perhaps increase disease prevalence and likelihood of transmission within or among species. Conversely, routine relocation or removal of animals from the cantonment area may result in it becoming a wildlife "sink" that continually draws in wildlife. This could also result in impacts to species population structure and increased spread of disease over distance. The occurrence of these species in or near the cantonment increases the likelihood of interactions with other animals and people. Coyotes, in particular, also have an impact on antelope on Fort Huachuca, but dedicated control techniques have not been used for several years. Problems with predators are generally handled on a case-by-case basis. Rodent handling and control should routinely take into account risk for hantavirus. Plague has not been found in this area, but may occur.

Cliff swallows and bats can be a nuisance on the installation. Generally, swallows are problematic due to their nest building, nesting activities, and fecal deposits near the nest. Fort Huachuca uses a nest evaluation program to determine if it is necessary to remove nests. Nest removal is generally performed during the non-breeding season, and the area is treated with a compound to deter renesting. The primary swallow problem area is the airfield hanger. Several species of bats will roost in or on buildings and other structures. Handling reports of bats usually requires detection of how the animal accessed the structure and recommendations of some type of physical barrier to access.

Other problem species include great-tailed grackles, cowbirds, snakes, deer, javelina, bears, ringtails, raccoons, and pocket gophers. Grackles commonly harass people, and cowbirds are a problem for many species of birds due to their parasitic nesting habits. These and other species are dealt with on a case-by-case basis. Cowbirds feeding and movements have been studied in cooperation with the BLM in the San Pedro Riparian National Conservation Area.

Feral and/or stray cats and dogs can present predator-type problems and disease if they are uncontrolled. However, they are not much of a problem in the area as they are thought to readily fall prey to predators. Domestic animal control is the responsibility of the DPS.

Crayfish, bullfrogs, and nonnative salamanders (*e.g.*, waterdog, barred tiger salamander) create problems for several reasons. Crayfish affect nutrient flow and increase turbidity of ponds. Bullfrogs and crayfish are predators of sensitive native amphibians (such as leopard frogs), the eggs of salamanders, and to native fish where they occur. Mosquito fish are nonindigenous to installation fisheries and conflict with native amphibians as competitors and predators of amphibian eggs. In general, the occurrence of fish in several ponds is detrimental to populations and management of amphibians on the installation. Many of these species are difficult to control or eliminate.

Goal 1. Control pest animals to support the military mission, promote sustained ecosystem functionality, favor native species biodiversity, and add to the quality of life of the Fort Huachuca community.

Goal 2. Improve public health and safety, animal welfare, and urban wildlife conservation by reducing wildlife attractants (food, water or shelter) that draw or concentrate animals into residential and office areas of Fort Huachuca.

Objective 1. Respond to nuisance/pest wildlife reports on the installation in a coordinated, integrated manner and document the time dedicated to response.

Objective 2. Reassess the skunk trapping program to better define goals and justification and to develop a control policy that minimizes relocation that may exacerbate disease spread, but uses euthanasia as a last resort or when disease testing is warranted.

Objective 3. Develop and distribute policy and guidelines for wildlife feeding on the installation as part of housing regulations and broader education and environmental awareness programs.

Objective 4. Work with historic preservationists to develop appropriate techniques for historic structures, such as physical barriers and sealing access points that prevent use of the building as shelter by wildlife and potential damage from these animals.

Objective 5. Monitor population distribution and relative abundance for nonindigenous pests.

Objective 6. Investigate technical and managerial options regarding control of nonindigenous or problem species, such as vaccinate and release protocols for skunks, that emphasize prevention of risk to people, wildlife, and ecosystems.

8.10.1.2 Plant Control

Nonindigenous and/or noxious weeds pose threats to native habitats, endangered species, and plant community composition and diversity. More specifically, they threaten wetland ecosystems, complicate land restoration projects, alter wildland fire ecology, add to the cost of pest management, and in general, threaten ecosystem functionality. Fort Huachuca is dedicated to prevention of introduction of invasive

species as well as their control as per Executive Order 13112 on *Invasive Species*. Nonindigenous species of lovegrasses, tamarisk, bermuda grass and rabbits foot grass in riparian areas, and flannel mullein along roads are problem floral species for Fort Huachuca.

Goal. Control noxious invasive, nonindigenous plants to support the military mission, promote sustained ecosystem function, favor native species biodiversity, and add to the quality of life of the Fort Huachuca community.

Objective 1. Investigate control methods for specific nonindigenous species, such as lovegrass, bermuda grass, and rabbits foot grass.

Objective 2. Control tamarisk and flannel mullein by opportunistically hand-pulling or other treatment of individual plants.

Objective 3. Compile and maintain a reference list of best management practices, for preventing further spread of non-native plant species, that covers and applies to the land use and land management activities occurring on Fort Huachuca. Incorporate appropriate elements from this list as a component of all proposed actions.

Objective 4. Determine the distribution of and map noxious plant occurrence on Fort Huachuca.

Objective 5. Initiate general planning for non-native plant removal, so habitat restoration can occur as appropriate methods are found for effective removal of specific species.

8.10.1.3 Measures of Merit

In 1994 the Army approved the following three Measures of Merit that defined the course of Pest Management programs through the year 2000:

X Have a current pest management plan by the end of FY 97.
X Reduce pesticide use by 50% over a seven-year period (1994-2000).
X Have pesticide applicators certified within two years of employment by end of FY 98.

The Pest Management Plan is current. All chemicals used on Fort Huachuca are EPA-approved. Integrated pest management techniques (glue boards, screening, pruning, etc.) have enabled the installation to reduce its use of pesticides by over 50% compared to the base year. The installation understands both obvious and long term threats to both humans and ecosystem functions from pesticides. Applicators are contractors who meet certification requirements.

Goal. Meet Department of Army Measures of Merit for pest management programs on Army installations.

Objective 1. Annually review the Pest Management Plan (Gabel, 1995). Incorporate updates into the plan on a five-year cycle.

Objective 2. Emphasize integrated pest management techniques to continue to minimize the use of pesticides.

Objective 3. Ensure contractor personnel are State-certified applicators.

8.10.1.4 Environmental Considerations

The presence of endangered species or species of concern and their habitat, especially amphibian and invertebrate species, requires that special precautions be followed closely during any pest management activities that could affect these species. Wetlands require special precautions if pesticides are used in their vicinity.

Goal 1. Use pesticides in a manner to minimize impacts to sensitive animal and plant species and environmental risks to human health.

Objective 1. Follow precautionary statements on labels regarding contamination of water when pesticides are sprayed near wetlands.

Objective 2. Take special precautions during pest management activities that could affect endangered species or species of concern.

8.10.2 Alternative B - No Action

Pest management under the No Action and Proposed Action alternatives would be similar. However, issues such as response to nuisance/pest wildlife reports may be less coordinated; and reassessment of the skunk trapping program, development of wildlife feeding policies, monitoring of populations of non-

native pests, and investigating options regarding control of exotic or problem species would be less likely under the No Action alternative. Likewise, an investigation of control methods for specific non-native plant species, control of tamarisk and flannel mullein, and the preparation of map of noxious plant occurrence on Fort Huachuca probably would not occur under the No Action alternative. The Proposed Action represents the most viable and integrated program for pest management on Fort Huachuca.

8.10.3 Alternative C - Other Management Options

Some aspects of the animal control program (e.g., controlling bullfrogs, exotic salamanders, and predation on sensitive amphibians) are related to compliance with the Endangered Species Act, and although there may be different options to reduce predation, these reductions must be accomplished. Control of coyote predation could be far more intensive, but there are biological and financial questions regarding the need for and value of direct coyote control. Options for other programs range from elimination to high levels of control.

The control or elimination of invasive, non-native plants could be adjusted to other levels, but the 1999 Executive Order must be followed. Eventually, a non-control strategy would likely have legal ramifications in terms of these species effects on protected plant or animal species or wetland functions. The program currently places highest priority on riparian areas. This could be changed.

Control of exotic species and protection of moderately disturbed areas are two indirect means of managing training lands. Non-native species, such as lovegrasses, often invade disturbed areas and outcompete with native species for water and nutrients. They create conditions, which may be detrimental

to training and are unfavorable to the re-establishment of native species. An aggressive exotic species control program could increase the effectiveness of revegetation on the installation. However, the creation of such a program would require an increased budget, which is not likely. Complex research is needed to identify effective control measures that might be efficient and economical to apply on a large scale.

The Department of Defense, Department of Army, and Fort Huachuca are committed to achieving the three Measures of Merit discussed in Section 8.10.1.3. There are no alternatives to achieving an updated pest management plan or requiring applicators to meet certification requirements. There are many options within integrated pest management strategies to accomplish a reduction of pesticide use. However, the means used at Fort Huachuca have accomplished the goal of this Measure of Merit, so changes do not seem viable unless they improve either the efficiency or effectiveness of the program.

Considering laws requiring the protection of wetlands, there is no viable alternative to the objective to use caution when applying pesticides near wetlands. The same is true of measures taken to protect sensitive species.

Other pest management programs are either not an integral part of natural resources management (and thus not covered by this analysis), are required by human health regulations, or are optional (to either a lesser or greater degree of implementation) as they are quality of life-related programs. These will not be further discussed with regard to options.

8.11 Fire Management

Fire is a natural force in Arizona with periodic wildfires shaping native plant communities in the region. Fire suppression activities have nearly excluded fire as a natural feature, but on the installation, with regular human-caused fires from military activities, much of Fort Huachuca has burned on a regular basis.

Some areas have burned too frequently, others not at all, but much of the area is in good ecological condition as a result, at least in part, of periodic burning.

The installation recognized that one of the biggest threats to Fort Huachuca was ignition of a catastrophic wildfire from military activities. This prompted development of the *Fort Huachuca Fire Management Plan* (Robinett *et al*., 1997). The plan contains fire policy, direction, and prescription, as well as operational aspects of implementing management strategies, particularly managed or prescribed fire. The plan includes detailed discussions of fire effects, fuel types and fuel loads; prescribed fire management; delineation of burning areas; smoke management; training; and many other aspects of fire management on Fort Huachuca.

8.11.1 Alternative A - Proposed Action

Goal 1. Implement the *Fort Huachuca Fire Management Plan* (Robinett *et al*., 1997).

Objective 1. Protect life (firefighter and public) as the first priority. Property, military training, and natural resources and historic properties (including endangered species protection) are second priority.

Objective 2. Assure that prescribed fires are compatible with approved military training, public safety, or resource management objectives.
Objective 3. Monitor wildfire, prescribed burning, and mechanical thinning effects on Fort Huachuca's soils, vegetation, listed species, etc. to improve ecosystem management, using pre- and post-treatment monitoring when feasible. Otherwise use pre-existing LCTA or other plots in or near burned or treated areas for remeasuring plot attributes.

Objective 4. Consider the use of prescribed fire in establishing ecosystem management strategies, particularly those determined to be partially or totally fire dependent, and strive for natural or historic fire return intervals when planning prescribed burns or managing wildland fire in natural plant communities.

Objective 5. Implement interagency (1979 National Wildfire Coordinating Group) prescribed fire qualification and certification standards. Train and maintain a qualified and adequate work force to plan and implement managed fire projects safely and effectively. Conduct each prescribed fire by qualified personnel in accordance with the Western Region Prescribed Fire Qualification System.

Objective 6. Incorporate public health and environmental quality considerations into the use of managed wildland fire.

Objective 7. Review the Fort Huachuca Fire Management Plan annually and formally evaluate and reaffirm the plan every three years. Monitor results from burns to assess the plan and make necessary revisions.

Objective 8. Allow fire in areas with burnable vegetation to occur at a reasonable return interval, except where occupied by human settlement. Areas below Charlie Break should be managed primarily by Fort Huachuca, while areas above Charlie Break should be managed primarily by the Coronado National Forest. (Charlie Break runs roughly from the junction of Training Areas N, R, and S southeast to a point on the south boundary of Training Area U (Figure 6.2.1)).

Objective 9. Immediately suppress fires occurring in areas of human settlement (*i.e*. administrative sites, historic structures).

Objective 10. Use prescribed burning, and managed natural of fires that occur near structures or in the grasslands and savannas outside of prescribed parameters in military training areas below Charlie Break. Ignitions started by tracer fire should be managed to consume fuels throughout the entire Small Arms Impact Range in a safe and prescribed manner.

Objective 11. Use unplanned ignitions and management-ignited prescribed burning, as well as suppression, when appropriate, above Charlie Break.

Objective 12. Reduce woody fuels above Charlie Break, subject to available funding and resources, using mechanical means, such as pruning and thinning, and prescribed fire.

Objective 13. Adopt and incorporate the Fire Management Plan into the Integrated Natural Resources Management Plan.

Objective 14. Assure that post-wide wildfire suppression activities include the following fire management measures to prevent fires and aggressively control nonprescription wildfires if they occur:

X provide fire suppression trucks on-site during live fire exercises when deemed necessary by the Range Control Officer;
X maintain required firebreaks;
X avoid firing activities during high hazard conditions, such as strong winds;
X avoid the use of tracers during high to extreme fire danger periods; and
X reduce the potential for adverse effects of fire suppression measures on listed and candidate species and their habitat by making a biologist or other qualified environmental specialist available to serve as a resource advisor to provide guidance to individuals in charge of fire suppression activities.

Objective 15. Implement requirements of the PBO (USFWS, 1999) related to threatened, endangered, and candidate species and fire management on Fort Huachuca (Section 8.4.2.2.1).

Goal 2. Implement prescribed (natural or ignited) fire management on Fort Huachuca. Implementation of prescribed fire should be contingent upon compatibility with military training, availability of funding and resources, and occurrence of correct burning conditions.

Objective 1. Develop a prescribed burn plan for each prescribed fire. Plans should include a description of the burn area, burn objectives, public safety issues, protection of sensitive features, range of expected results, weather and fuel conditions needed to achieve the desired fire behavior, containment procedures, pre-burn coordination (i.e., USFWS and the Coronado National Forest), monitoring plan, smoke management plan, and contingency plan.

Objective 2. Include the following goals for prescribed fire planning:

X reduce fuel loads in military training areas to reduce the possibility of catastrophic fires;
X maintain or improve wildlife habitat, including improving pronghorn antelope range away from firing ranges to reduce antelope foraging in burns near firing ranges;
X reduce the risk of catastrophic fires in habitats used by federally-listed threatened, endangered, and candidate species;
X decrease the likelihood of major fires in upper elevations that can cause an increase in erosion and

decrease in water infiltration/recharge of aquifers;
X re-establish the natural frequency/intensity of fires that would sustain flora and fauna biodiversity of Fort Huachuca;
X reduce the potential for fire to spread into the installation's urban interface areas; and
X minimize the threat of fire to the installation's historical buildings and archeological sites.

Objective 3. Assure that average fire return intervals reflect the intervals of the natural fire cycle. Burn intervals in grassland, oak savanna, and conifer forests should average 5-10 years. Burn intervals vary, but intervals shorter or longer than the average will be appropriate in some areas to meet management or military training objectives. Fire intervals in agave management areas should be once every 10-15 years.

8.11.2 Alternative B - No Action

The No Action and Proposed Action alternatives are similar with regard to implementing fire management strategies on Fort Huachuca. Generally, the Proposed Action represents a more comprehensive and integrated approach to fire management on Fort Huachuca than the No Action alternative.

8.11.3 Alternative C - Other Management Options

There are no viable options with regard to implementing fire management strategies for threatened, endangered, and candidate species within requirements of the Endangered Species Act, as established in the PBO (USFWS, 1999) without consultation with the USFWS. Thus, there are few options with regard to fire management as it relates to these species and their habitat without considerable consultation and coordination.

There are options with implementation of the Fire Management Plan as a whole. Portions of the plan not associated with sensitive species could be implemented to varying degrees. For example, fire break maintenance could be accomplished less frequently, additional fire breaks could be discontinued, or frequency of maintenance and/or number of firebreaks could be increased. However, the Fire Management Plan is Fort Huachuca's best option for achieving compliance and stewardship on the installation. Thus, not fully implementing the Fire Management Plan is an option that is not prudent in terms of compliance and stewardship.

8.12 Special Interest Area Protection

Designation of special protection status for unique or fragile areas is an important management tool. It is more cost effective to put use restrictions on some areas to minimize damage or disturbance than to mitigate damage or disturbance. Fort Huachuca has areas with special natural features. They harbor sensitive or unique wildlife species and/or have unique plant communities.

8.12.1 Alternative A - Proposed Action

Goal. Provide protection for areas of special ecological concern.

8.12.1.1 General Provisions

As part of project review and the NEPA process, the Environment and Natural Resources Division reviews proposed projects and activities at Fort Huachuca. Natural resources managers can identify concerns and recommend measures to minimize damage. Examples include avoiding sensitive species

and siting missions in areas suited to the mission needs and environmental considerations. See Chapter 13 for more information on the use of NEPA. Wetlands and historic properties sites are special interest areas, but programs for their protection are outlined in Section 8.5 and Chapter 12 respectively, so they are not included within this section. The same is true with threatened or endangered species habitat (discussed in Section 8.4.2), but special interest sites may also support these plant and animal species.

Objective 1. Use project review and the NEPA process to protect special interest areas.

Objective 2. Use GIS to identify areas of special interest to natural and historic properties managers, project planners, military planners, and personnel using Fort Huachuca.

8.12.1.2 Caves

Fort Huachuca has several caves and old mine entrances that are of special interest due to the species that use them, the cave formations and geology, and/or the historic and current human uses. Management of cave resources is primarily associated with the endangered lesser long-nosed bat and is discussed in Section 8.4.2.2. Fort Huachuca has an interagency agreement with the Coronado National Forest to cooperate on cave resource management, which includes providing standards and guidelines for cave management. Caves on the installation will eventually be evaluated under provisions of the Federal Cave Resources Protection Act of 1988.

Objective 3. Implement lesser long-nosed bat management measures that affect caves and mines on Fort Huachuca.

Objective 4. Continue the interagency agreement with the Coronado National Forest.

Objective 5. Evaluate installation caves under the Federal Cave Resources Protection Act.

Objective 6. Maintain a credible working relationship with regional chapters of the National Speleological Society for cave inventory, mapping, conservation, and public education.

Objective 7. Continue to accommodate appropriate levels and seasonal access for recreational caving, and require check-in and check-out procedures for all caving activity on Fort Huachuca.

8.12.1.3 Riparian Areas

Riparian areas are an invaluable ecosystem component at Fort Huachuca. They provide habitat for many species of wildlife, recreational areas for outdoor enthusiasts, and many other less obvious benefits to the installation and the region. Garden, Huachuca, and McClure canyons support most of the riparian habitat at Fort Huachuca, and there are also small but important areas in Cave Spring Canyon, Sawmill Canyon, and Blacktail Canyon. Section 6.2.3 - *Watershed Management Areas* discusses riparian areas, primarily on the West and South ranges, in the context of watersheds. Riparian area management is included in other installation plans, the East Range Watershed Management Plan (Section 8.8) and the Garden Canyon Plan (Section 8.12.1.5). Fire management (Section 8.11) and threatened, endangered, and candidate species management (Section 8.4.2) have many interrelated issues that affect management of riparian areas.

Objective 8. Implement management objectives detailed elsewhere in this plan that affect riparian areas on Fort Huachuca, with specific attention on the use and management of roads and firebreaks along riparian areas.

8.12.1.4 Agave Areas

Fort Huachuca's agave populations are important to a vast number of wildlife species that use the plants for food, water, or shelter. The most notable, because of its endangered status, the lesser long-nosed bat, forages on agave on the installation. Shortly after long-nosed bats were listed, Fort Huachuca began to monitor and protect the species and the agave it uses for forage. Research efforts such as Derdeyn (1989) and Howell (1992) followed, as did management efforts such as placing agave stands off-limits to vehicles and protecting agave areas from fires.

In 1995, an Agave Management Plan (Howell and Robinett) was drafted. The plan included further implementation of protection and research efforts already undertaken at the installation and management recommendations that were believed necessary for the long-term maintenance of stable agave populations on Fort Huachuca. These recommendations included appointing a coordinator, protection of additional sites and delineation of sites, implementing effective fire protection, and implementing a grazing plan. The plan also suggested further study of several features and issues associated with the agave on Fort Huachuca. This plan has been partially implemented on Fort Huachuca.

The PBO (USFWS, 1999) includes many mitigation measures, reasonable and prudent measures and subsequent terms and conditions, and conservation recommendations directly related to management of the lesser long-nosed bat but also related to management of agave areas on the installation (Section 8.4.2.2.1). Section 8.4.2.2.1 also discusses agave management as one of 18 general mitigation measures to reduce adverse effects of military activities on listed species and critical habitat.

Objective 9. Complete final version of and implement the Agave Management Plan in 2002 (Howell and Robinett, 1995). Review the plan periodically and amend as necessary and as indicated by adaptive management with the cooperation of USFWS and AGFD.

Objective 10. Implement measures, terms, conditions, and recommendations of the PBO (USFWS, 1999) for the lesser long-nosed bat that pertain to agave management and fire management.

8.12.1.5 Garden Canyon

Objective. Implement management recommendations from Garden Canyon Watershed, A Vision and A Mission (Shaw, 1999).

8.12.2 Alternative B - No Action

The No Action alternative represents a much less comprehensive program for management and protection of unique or fragile areas on Fort Huachuca. Those areas used by threatened or endangered species would receive protection via management for those species, which would continue under either alternative. However, other efforts, such as the evaluation of caves under the Federal Cave Resources Protection Act, the completion of and implementation of the Agave Management Plan, and the implementation of management recommendations from Garden Canyon Watershed, A Vision and A Mission (Shaw, 1999) would not occur under the No Action alternative. The Proposed Action is viable and a prudent option with regard to management and protection of special areas on the installation.

8.12.3 Alternative C - Other Management Options

Viable options with regard to protection of several special interest areas, such as roosting caves of the lesser long-nosed bat and agave areas, without significant consultation with the USFWS on the established PBO (USFWS, 1999) are limited. Management and protection of other caves, riparian areas, and Garden Canyon are not legally required. Thus, protection of these areas is not required. However, protection of special interest areas addresses concerns for ecosystem integrity, compliance, and stewardship on Fort Huachuca. Protection of these areas is Fort Huachuca's best option for achieving compliance and stewardship on the installation. Thus, not protecting special interest areas is an option that is not prudent in terms of compliance and stewardship.

8.13 Training Requirements Integration

Training Requirements Integration (TRI) is the direct interface between training requirements for land use and the capability of the land and its natural resources to support that training. TRI relies on LCTA and other monitoring programs to determine land capabilities. TRI includes rest-rotation of training lands and scheduling lands according to their carrying capacity to support specific missions. Fort Huachuca's ITAM program had not matured to the point of implementing TRI when ITAM was greatly reduced beginning in 1998. Section 1.5 discusses the fact that the Sikes Act requires no net loss in the capability of military installation lands to support the military mission of the installation. TRI, as a component of ITAM, is directly related to that ability on Fort Huachuca.

Presently the most effective means to assure missions are properly sited is the NEPA process. The nature of NEPA is conducive to siting missions on lands best suited for supporting them in a sustained fashion.

Restrictions on training are sometimes necessary for long-term sustainment of training and ecosystem protection. In the case of Fort Huachuca, these restrictions emphasize reducing impacts to native vegetation and providing protection for certain sensitive species and historic properties. Fort Huachuca includes environmental regulations that directly impact training in Fort Huachuca Regulation 385-8, *Range and Training Area Operations* (Fort Huachuca, 1994).

8.13.1 Alternative A - Proposed Action

Goal 1. Reinitiate TRI on Fort Huachuca as part of the ITAM program.

Goal 2. Integrate Fort Huachuca's training requirements for land use with the sustained capability of the land to support such use.

Objective 1. Site missions where natural resources can support them on a sustained basis.

Objective 2. Use training restrictions, when required, to protect sensitive natural resources and minimize damage to training areas.

8.13.2 Alternative B - No Action

The No Action and Proposed Action alternatives are similar with regard to the interface that occurs between training requirements for land use and the capability of the land and its natural resources to support that training. However, reinitiating the TRI component of ITAM under the Proposed Action

supports the requirements of the Sikes Act for no loss in the capability of the lands to support the military mission. The No Action alternative lacks support for TRI. The Proposed Action is the most comprehensive alternative to ensure that training requirements for land use and the capability of the land and its natural resources to support that training are accomplished on Fort Huachuca.

8.13.3 Alternative C - Other Management Options

Neither land-sustainment mission siting nor improved military planning is absolutely required for compliance. Therefore, both could be either degraded or enhanced. However, if mission siting does not take long-term mission sustainability into account, eventually (probably in the short-term in some cases) the capability of the land to support the military mission will be degraded, a violation of the Sikes Act.

Training restrictions are not imposed on Fort Huachuca without strong rationales, generally related to environmental compliance or human safety. Therefore, there are few viable options for removing most training restrictions. Additional training restrictions could be imposed, but only if it can be shown that they do not degrade the quality of military training at Fort Huachuca or that they are required for compliance or safety.

Protecting areas that have not yet become irreversibly damaged would be a cost-effective way of rehabilitating portions of the training area. Land may recover from 40% disturbance much faster than from 90% disturbance. Resting an area while remaining plants are still capable of producing seed would reduce the large expenditure on plant materials normally associated with revegetation projects. This could be implemented by periodically limiting access to selected sites.

9.0 NATURAL RESOURCES ENFORCEMENT

Many aspects of natural resources management require effective enforcement. Requirements, such as endangered species protection, protection of sensitive areas, hunting and fishing recreation, protection of historic properties, and wood cutting are very dependent upon effective environmental law enforcement.

9.1 Status

The Provost Marshal is the installation law enforcement official, including game warden, but specific Environmental Protection Officers (EPO) with dedicated natural resources duties were appointed by the Provost Marshal in 2000. Military Police (MP) personnel are given EPO duties on Fort Huachuca. Range enforcement before then was generally accomplished coincidental with other duties or in response to specific situations. No formal, comprehensive training specific to natural resources enforcement is given to those officers given EPO duties on Fort Huachuca.

Fort Huachuca has three types of enforcement jurisdiction, but is considered an exclusive legislative jurisdiction whether the Army owns the land or not. Portions of the installation have exclusive jurisdiction where federal commissions are required for officers. Portions have concurrent jurisdiction where laws are enforceable by federal- and State-commissioned personnel. Other portions have proprietary jurisdiction where only State commissions are recognized. These jurisdictional differences could create problems with enforcement, particularly proprietary areas where MP authority is questionable.

Fort Huachuca uses the Federal Magistrate Court to prosecute military and civilian offenders, who are issued DD Form 1805 citations. The Uniform Code of Military Justice is used for cases involving military offenders who are cited. In addition, a system for revocation of installation hunting and fishing privileges for convicted violators for one or more years is used on the installation. State and federal enforcement officers use District or State courts for case adjudication.

Fish size and bag limit violations and unauthorized motor vehicles being driven into barricaded sites or closed areas have been ongoing problems on the installation. Other enforcement issues that are of concern include the collection for commercial use of wildlife, primarily reptiles and butterflies but possibly others as well, controlling the use of caves during periods of closure due to requirements for endangered species, and controlling ORV activity and driving around traffic control devices into sensitive areas.

9.2 Professional Natural Resources Enforcement

Natural resources law enforcement is a highly specialized profession. The job is inherently dangerous as shown by officer mortality rates compared with other police officers nationwide.

There is a generally recognized requirement for a 40-hour-minimum annual refresher training for civilian enforcement officers. Less training exposes employers to liability risks in case of legally-debatable officer actions. The National Military Fish and Wildlife Association (NMFWA) offers annual training for experienced wardens. This one-week training uses highly qualified instructors, many of whom have national reputations. The course is open to Department of Defense civilian and military wardens and is

held on various military installations. This is the most commonly-used course by military installations for refresher training.

The best option for any civilian conservation officer or warden is to use the basic law enforcement course at the Federal Law Enforcement Training Center (FLETC) and the USFWS two week follow-up course to satisfy the need for basic training. However, FLETC is not an option for military personnel, due to FLETC restrictions. There may be additional training requirements to receive an Arizona Reserve Game Ranger commission.

There is a trend toward civilianization of natural resources enforcement on military installations, and there is also a trend toward establishing the natural resources enforcement function within natural resources organizations, as done in 49 of the 50 states.

The Sikes Act mandates that DoD installations employ adequate numbers of professionally trained natural resources personnel, including law enforcement personnel to implement the INRMP. The Act authorizes DoD to enforce all federal environmental laws, including National Historic Preservation Act, Archeological Resources Protection Act, Migratory Bird Treaty Act, Clean Water Act, and Endangered Species Act. DoD Directive 4715.3 (May 3, 1996) states, "*Professional natural and cultural resources staff shall oversee the enforcement of applicable laws as an integral part of an installation's conservation program*". Army Regulation 200-3 (28 February 1995), states, "*Whenever hunting, fishing, or trapping is allowed on Army installations, enforcement of natural resources laws and regulations will be in accordance with the installation Fish and Wildlife Cooperative Plan and will be performed by Natural Resources Law Enforcement professionals and/or Provost Marshal if practicable...*".

A natural resources law enforcement staffing and presence has been reestablished on Fort Huachuca starting in 2000. To help maintain such a presence, ENRD is proposing to implement a habitat use permit for users of installation natural resources, such as the large number of birders and hikers who annually visit Fort Huachuca and who currently pay no fee for their recreational opportunity. Part of the fees collected would be used to fund a dedicated natural resources enforcement person within DPS. This also could fund recurring civilian training for MP or civilian enforcement personnel, which has been a limiting resource for years, and help cover some specific vehicle and other operational equipment directly required for effective enforcement of all environmental laws. The habitat use permit is discussed further in Section 11.3. In early 2001, DoD Agricultural Funds were obtained by ENRD for EPO to purchase two All Terrain Vehicles outfitted for safe, effective backcountry patrols on Fort Huachuca.

Since 2000, active patrolling of training lands and enforcement of natural resources and historic properties laws by four MP Environmental Protection Officers has provided a clearer assessment of law enforcement needs for undeveloped areas of fort Huachuca. A civilian natural resource law enforcement officer, civil service or contract, would provide continuity in terms of:

- familiarity with remote areas of the installation and access to them,
- liaison with neighboring wildlife and public lands (USFS, BLM and NPS) law enforcement specialists, and
- knowledge of enforcement provisions for diverse state and federal wildlife and environmental laws.

Designated, full time, military EPO would still be needed to provide adequate patrol frequency and area coverage. At least five military personnel MP are considered necessary to maintain a sufficient law enforcement presence in all areas and times it is needed on Fort Huachuca training lands.

9.3 Alternative A - Proposed Action

Goal. Effectively enforce federal, State, and installation laws and regulations regarding natural resources and historic properties on Fort Huachuca.

Objective 1. Develop a plan for maintaining trained, professional natural resources enforcement on Fort Huachuca, using other military installation experiences.

Objective 2. Provide a natural resources law enforcement presence by funding a dedicated, professionally trained, enforcement officer through implementation of a habitat use permit.

Objective 3. Coordinate enforcement activities with other agencies and organizations, particularly the AGFD to ensure conformance with AGF Commission rules and allow possible revocation of state hunting and fishing privileges and state civil fines under Arizona Revised Statutes Title 17.

Objective 4. Use enforcement as an integral part of the overall natural resources program.

Objective 5. Provide professional natural resources law enforcement training to Fort Huachuca officers.

Objective 6. Acquire law enforcement commissions appropriate for all jurisdictions on Fort Huachuca.

9.4 Alternative B - No Action

The No Action alternative provides for minimal natural resources enforcement on Fort Huachuca. The Proposed Action delineates a comprehensive program for natural resources law enforcement consistent with requirements of the Sikes Act. The Proposed Action is the most viable option for natural resources law enforcement on Fort Huachuca as this requirement is ignored under the No Action alternative.

9.5 Alternative C - Other Management Options

The natural resources enforcement program is relatively new and still tentative at Fort Huachuca. Natural resources enforcement is inconsistent with 1997 revisions to the Sikes Act that requires professional enforcement of natural resources laws on military reservations. Thus, reduced program emphasis is not a viable option. The degree of implementation of professional natural resources law enforcement (number of officers) and extent of authority (full police powers or limited jurisdiction) has numerous options.

10.0 ENVIRONMENTAL AWARENESS

Conservation awareness is instrumental in creating conditions needed to manage natural resources well. Fort Huachuca's approach to awareness stresses education. It provides military personnel and the public with insights into Fort Huachuca's natural environment and conservation challenges. The more people know about the installation's unique natural resources, the more responsibly they can be expected to act toward them.

Education also promotes awareness of critical environmental projects and the rationale behind them. Activities such as fish stocking, erosion control, wildfire suppression, etc. can be accomplished with little conservation awareness effort since soldiers, recreationists, and the general public naturally support these easily understood efforts. However, issues such as protection of sensitive areas for little understood plant and wildlife species, restrictions on troop field operations, prescribed burning, permit fees and their uses, and seasonal access restriction require effective and ongoing conservation communication to get positive support and, perhaps more importantly, limits on types of activities, to avoid adverse reactions from various users. A conservation awareness program must be directed to both installation and external interests if it is to be effective.

Goal. Educate users to minimize impacts to the land and natural resources in order to maintain and enhance training and testing.

10.1 Military Personnel Awareness

Environmental Awareness is a component of ITAM that fosters a conservation ethic in those who use Fort Huachuca. The Environmental Awareness program on Fort Huachuca was initiated in 1992. The program developed, through the U.S. Army Corps of Engineers, Construction Engineering Research Laboratory, posters, Soldier's Handbooks and Cards, Leader's Handbooks and Cards, and Hazardous Materials Handler Cards. The environmental awareness video, *Fort Huachuca - Training and the Environment*, was produced in 1994, which was used for briefings of personnel new to Fort Huachuca. The ITAM program, including the Environmental Awareness component, was eliminated at Fort Huachuca in 1998.

The video for new person briefings occasionally continues to be used, but the installation lacks a distribution system for other environmental awareness materials. Fort Huachuca is developing a video-taped environmental briefing for visiting dignitaries. Environmental awareness information is conveyed to outdoor recreationists, primarily hunters and anglers, when they purchase licenses and permits from the Sportsman Center.

The PBO (USFWS, 1998), described in Section 8.4.2.2.1, contains environmental awareness implementation requirements relative to threatened, endangered, and candidate species. Environmental awareness requirements include but are not limited to distribution of educational materials to operational units; updating maps of protected resources; updating handbooks, cards, and videos; including materials that describe the protected status and sensitive nature of threatened, endangered, and candidate species in educational materials, etc.

10.1.1 Alternative A - Proposed Action

Goal. Educate military personnel and civilians associated with military testing and training to minimize impacts to the land and resources to maintain and enhance testing and training.

Objective 1. Reinitiate the Environmental Awareness component of the ITAM program on Fort Huachuca.

Objective 2. Complete the briefing for visiting dignitaries and other guests.

Objective 3. Implement Environmental Awareness objectives contained within the PBO (USFWS, 1999) (Section 8.4.2.2.1).

10.1.2 Alternative B - No Action

The No Action alternative includes the environmental awareness component of the ITAM program, however, it was discontinued and may remain so. The briefing for visiting dignitaries would probably not be completed under the No Action alternative. The Proposed Action alternative includes these projects or programs making this alternative a proactive and viable part of natural resources management on the installation. Requirements of the PBO would occur under both alternatives.

10.1.3 Alternative C - Other Management Options

In general environmental awareness is not specifically required for compliance, but many materials and programs are directly related to protected natural resources or historic properties, and the entire program is directed toward sustainment of the capability of the installation to support the military mission, as required by the Sikes Act. Thus, while there are many options for educating military users of the installation, the option to not educate these personnel is not viable. Materials used by Fort Huachuca are developed specifically for military personnel, based on experience on other military installations and Corps of Engineers laboratory studies of the effectiveness of these materials. It is questionable whether other materials and briefings could be developed with better cost vs. benefits.

Environmental awareness requirements specified in the PBO (USFWS, 1999) are required of Fort Huachuca to comply with the Endangered Species Act. Thus, while there are options to specific methods used, the option to not use education is not viable, and changes in the program would likely require consultation with the USFWS.

10.2 Public Awareness

Use of Media

Fort Huachuca's weekly newspaper, the *Huachuca Scout*, is the most efficient way for natural resources personnel to reach the Fort Huachuca community. This newspaper is used to explain programs and gain support for their implementation. Articles target a wide range of readers, but may be designed to appeal to specific categories of readers.

Natural resources personnel write seasonal articles for the *Huachuca Scout*, and staff writers also periodically cover natural resources programs. Examples of articles include updates on hunting and fishing, sensitive species issues and programs, and special events.

Other newspapers, such as the *Sierra Vista Herald*, occasionally use information about Fort Huachuca's natural resources programs. News releases and interviews with outside media are coordinated with the Public Affairs Office.

Fort Huachuca's natural resources program is seldom the subject of local television or radio coverage. However, it has been featured on some national television. Stories have been done on subjects, such as the annual lion track count, caves, and special filming projects of particular species of interest, such as coati and frogs. Fort Huachuca gets several requests annually for special consideration to film or write stories on unique species and other unusual subjects.

Special Events

Fort Huachuca's natural resources personnel go to extra efforts to spread the word regarding their programs using special events. Natural resources personnel participate in Earth Day activities by staffing a booth and distributing brochures as part of overall environmental program participation. The City of Sierra Vista sponsors an annual Wildlife Festival where natural resources personnel occasionally staff a table, and biologists who have conducted wildlife studies on Fort Huachuca are invited annually to give scheduled presentations to disseminate information to the public. Periodically presentations are given to officers wives clubs, military units, girl/boy scouts, and other groups by natural resources personnel.

Watchable Wildlife

Watchable wildlife is an important resource and activity on Fort Huachuca. There are many naturally occurring opportunities to observe wildlife, particularly birds, butterflies and wildflowers in and near Fort Huachuca. The installation is well known to the birding community as a prime location for many unusual species of birds. Fort Huachuca is listed in numerous guides to birding areas, bird checklists, birding brochures, and web sites. Garden Canyon and other canyons receive heavy nature study use due to their accessibility, diversity, and watchable wildlife value.

Youth Groups

Youth groups have been involved in various wildlife programs on Fort Huachuca. Scouts have used post projects for their conservation merit badges and Eagle Scout projects. Natural resources personnel have provided lectures and slide presentations on many conservation subjects over the years. Personnel reductions have limited the amount of effort that natural resources staff currently dedicates to youth groups.

10.2.1 Alternative A - Proposed Action

Goal 1. Provide an understanding of Fort Huachuca natural resources program to installation and surrounding communities.

Goal 2. Provide information to soldiers, civilian employees, and other installation users to improve their understanding of impacts of their activities on the environment.

Objective 1. Use the printed media, both on- and off-post, as an important part of natural resources management on Fort Huachuca.

Objective 2. After coordination with the Public Affairs Office, provide support to the electronic media in preparation of television or radio programs involving natural resources on Fort Huachuca. Use the Commanders Access Channel for television viewing on the installation.

Objective 3. Continue to participate in local events with natural resources significance, particularly those associated with Earth Day and the Sierra Vista Wildlife Festival.

Objective 4. Provide watchable wildlife opportunities within natural resources carrying capacities on Fort Huachuca.

Objective 5. Work with youth groups whenever possible.

10.2.2 Alternative B - No Action

The No Action and Proposed Action alternatives are identical with regard to providing natural resources information to the public.

10.2.3 Alternative C - Other Management Options

With the exception of efforts directed specifically toward public education regarding threatened, endangered, and candidate species described in the PBO (USFWS, 1999) none of the above projects are required. Reductions in threatened, endangered, and candidate species education programs would likely require consultation with the USFWS. Other programs could be reduced or expanded to any degree desired. Army policies and programs preclude total elimination of public awareness activities, but the degree of participation from natural resources personnel is optional. Personnel constraints largely restrict the option to significantly increase public awareness activities.

10.3 Professional Enhancement

Natural resources management on Fort Huachuca is involved with other professionals on other military installations and neighboring public lands. As a part of overall professional enhancement, natural resources personnel on Fort Huachuca provide information to others that may be interested in learning from experiences on the installation. For example, personnel have made presentations to other Defense natural resources managers at the Annual National Military Fish and Wildlife Association meeting.

10.3.1 Alternative A - Proposed Action

Goal. Sponsor and participate in opportunities to provide information regarding Fort Huachuca natural resources programs to conferences and meetings elsewhere.

Objective. Actively participate in training and professional development workshops, symposia, etc., such as the annual NMFWA meeting.

10.3.2 Alternative B - No Action

The No Action and Proposed Action alternatives are identical with regard to involvement of Fort Huachuca natural resources personnel with other professionals.

10.3.3 Alternative C - Other Management Options

None of the above projects is required. Thus, they can be reduced or expanded to any degree desired. Army policies promote the involvement of natural resources personnel with other professionals, but the degree of participation from natural resources personnel is optional. Personnel and budget constraints will limit significant increases in the time and money spent on these programs.

11.0 OUTDOOR RECREATION

Outdoor recreation and interpretive opportunities enhance the quality of life for military and civilian personnel. As such, Army lands with suitable natural resources are to be managed to allow outdoors recreational opportunities. For the purposes of this INRMP and to be consistent with DoD Directive 7400.4 and AR 200-3, outdoor recreation is defined as recreational programs, activities, or opportunities that depend on the natural environment. Examples include hunting, fishing, picnicking, bird-watching, off-road vehicle use, hiking and interpretive trails use, wild and scenic river use, and underdeveloped camping areas. Developed or constructed facilities and activities such as golf courses, tennis courts, horse riding stables, lodging facilities, boat launch ramps, and marinas are not included.

Other types of recreational opportunities exist at Fort Huachuca. Various types of indoor recreation are available in the cantonment are, as are other dispersed outdoor activities not included in the formal definition of "outdoor recreation." In the interest of being complete, these types of recreation are discussed below; however, management recommendations are not provided.

Goal 1. Provide sustainable opportunities to the Fort Huachuca community and the public to participate in high quality, safe outdoor recreation.

Goal 2. Develop and implement a Fort Huachuca Outdoor Recreation Plan for training lands and undeveloped areas.

Goal 3. Manage outdoor recreation consistent with needs of the Fort Huachuca military mission, and with carrying capacities of the natural resources.

Goal 4. Integrate recreation activities with natural resources stewardship and compliance.

11.1 Military Mission Considerations

The military mission has priority over outdoor recreation involving range access. If outdoor recreational activities are to continue to thrive on Fort Huachuca, this military mission priority must not be compromised. If recreational or management activities conflict with military activities, the military mission comes first.

11.2 Public Access

Public access is a long and widely known tradition on Fort Huachuca. There are many opportunities for the general public to participate in installation activities. Fort Huachuca has an open post policy, but MP manning at vehicle access gates was reinitiated in mid-2001 for force protection purposes. In maintaining a policy of public access, Fort Huachuca relies on a responsible public to adhere to restrictions placed on range access.

Department of Defense Directive 4715.3, *Environmental Conservation Program*, May 3, 1996, states, "*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 other considerations such as security, safety, and fiscal soundness. Opportunities for such access shall be equitably and impartially allocated*."

Paragraph 2-10 of Army Regulation 200-3, *Natural Resources -- Land, Forest, and Wildlife Management*, states that access by recreational users, ... *will be within manageable quotas, subject to safety, military security, threatened or endangered species restrictions, and the capability of the natural resources to support such use; and at such times as such access can be granted without bona fide impairment of the military mission, as determined by the installation commander*. This regulation further states that withholding public access must be substantiated by a statement in the Integrated Natural Resources Management Plan. Fort Huachuca's policies toward public access are within both the spirit and letter of Army and Defense policies.

11.2.1 Alternative A - Proposed Action

Goal. Provide access to Fort Huachuca for natural resources-based recreation, in accordance with Army policies.

Objective. Continue Fort Huachuca's policies toward appropriate public access, with restrictions based on specific requirements or management objectives.

11.2.2 Alternative B - No Action

The No Action and Proposed Action alternatives are identical with regard to public access to Fort Huachuca.

11.2.3 Alternative C - Other Management Options

It is difficult to increase access opportunities within constraints of the military mission, which is not land-use extensive, not range scheduling exclusive, nor inherently dangerous to nonmilitary users. Thus, access to recreational opportunities on the installation is the maximum possible with regard to ongoing military operations. There is the option to tighten recreational access policies, but unless either the mission or the threat assessment associated with access changes, this would have to be coordinated with signatory agencies of this INRMP.

11.3 Hunting and Fishing

Hunting on Fort Huachuca is open to active and retired military personnel, installation full time Civil Service employees, and their spouse and dependents. Guests are allowed to hunt on the installation only for upland small game under a guest hunter permit. Fishing on Fort Huachuca has been open to the public since 1986. Arizona licenses and tags and Fort Huachuca permit are required to hunt and fish on the installation.

Hunters must have proof of completion of an approved hunter education course (Arizona or other states) when obtaining Fort Huachuca permits. The AGFD Basic Hunter Education course is offered at Fort Huachuca's Sportsman Center three times annually. Education courses are taught by certified volunteers. Fort Huachuca and State permits are obtained five days/week (Wednesday - Sunday) from the Fort Huachuca Sportsman Center. In addition to permits listed below, a trout stamp is required to take trout in Arizona, including Fort Huachuca.

The types of Fort Huachuca hunting and fishing permits include hunting; fishing; combination; and short-term permits including a one-day hunting or fishing permit, a nine-day temporary fishing permit, a permit for any four months of fishing, a juvenile (9-13 years) fishing permit, and duplicate licenses.

Generally hunting seasons, bag limits, etc. on Fort Huachuca correspond with dates, etc. set by the State. Additional restrictions are sometimes necessary to accommodate requirements of military training missions. Hunters are required to sign-out with the MP Desk each time they go hunting. During deer general weapons hunts, hunters must sign-out and sign-in upon returning from hunting, and hunter control and a deer check station are conducted at the Sportsman Center for these three to four weeks. First time sign-out for a general deer hunt must be done in person. Following first time sign-out, hunters may sign-in and out by telephone. During the February general weapons javelina hunt, hunters sign-out through the MP Desk. Sign-in following hunting is not required for this hunt. Hunters harvesting a big game animal any time of year are required to check it at the designated Big Game Check Station on Fort Huachuca.

Big game tags and hunt permits are obtained through the AGFD using the State hunting regulations and application booklet. Fort Huachuca is within Game Management Unit 35A. In 2001, Fort Huachuca had 20 archery and 20 general weapons javelina tags, no antelope tags, 4 bear tags, 20 mule deer tags, and 210 white-tailed deer tags. Ten tags for white-tailed or mule deer were authorized for a pilot hunt for any hunter obtaining an AGFD Challenged Hunter Mobility/Access Permit (CHAMP), available to permanently disabled hunters. There has been an increase in demand for hunting on the installation due to higher demand for the limited number of tags available statewide off-post.

The number of hunters allowed in the field at any one time on Fort Huachuca is limited by Training or Game Management Area during general deer hunts. It has not been necessary to establish quotas on the number of hunters for other hunting seasons. During deer season, the Sportsman Center is open seven days/week. More detailed information on hunting regulations and procedures and game management maps on Fort Huachuca are in the *Fact Sheet for 2001-2002 Hunting Seasons on Fort Huachuca* (Appendix 11.3a). Fact sheets are updated annually, and hunting and fishing regulations are provided to sportsmen when purchasing permits.

Fort Huachuca manages up to seven ponds (Section 8.4.1.2) for warm water fisheries and seasonally stocked trout depending on water levels. Fort Huachuca fishing regulations are the same as the State with a few exceptions. The daily creel limit for largemouth bass, channel catfish, and rainbow trout is five. A 10-inch minimum size limit applies to largemouth bass and channel catfish, and there is no size limit on bluegill and sunfish. Other regulations include but are not limited to specific hours and allowing only artificial flies and lures for certain waters and no live bait allowed on the installation. Specifics of Fort Huachuca fishing regulations and procedures are in the *Fort Huachuca Fishing Facts 2001* (Appendix 11.3b).

Several other uses of Fort Huachuca besides hunting and fishing affect natural resources on the installation. Activities such as birding, nature photography, insect collecting, hiking, and caving, can have serious effects on the installation's natural resources (Section 11.4.1). These users currently do not pay a fee for their particular activity. Fort Huachuca will initiate a habitat use permit for all "unofficial" uses for the area past the paved road in Garden Canyon, the area above the upper picnic area in Huachuca Canyon, and for caving. These areas receive a high degree of use for recreational activities, which are having a significant impact on natural resources or have potential to impact sensitive species, such as the Mexican spotted owl and Huachuca water umbel. A fee schedule will be evaluated for implementation of the habitat use permit.

A Fort Huachuca hunting permit will suffice as a habitat use permit. However, a Fort Huachuca fishing permit will not suffice as a habitat use permit. Persons under 14 years old and school and scout groups will not need to purchase habitat use permits. Permits will be available at the Sportsman Center, and MWR will retain $1.00 for each license sold. The installation may explore the possibility of using a commercial vendor, such as WalMart or a KMart store, or selling habitat use permits through the mail, the

internet, or by telephone using credit cards, to better accommodate the schedules of commercial guides/users. Current Sportsman Center hours of operation do not fulfill the needs of some commercial users and individuals.

Potential funds generated from a habitat use permit are as follows:

Number Permits		5,000	7,500	10,000
Total Income	(Average of $10.00/permit)	$50,000	$75,000	$100,000

Funds collected via sales of a habitat use permit are authorized by the Sikes Act. These funds may be used only for fish and wildlife management on the installation. Monies accrued will be expended to support the wildlife program on Fort Huachuca as follows:

X fund a Conservation Officer position to fulfill multiple duties, such as enforcement, interpretive projects, support of the hunting and fishing program, and control non-consumptive uses;
X develop a computer system for selling Fort Huachuca and State permits, and maintain a web page for both public information and permit sales;
X improve the quality of wildlife related recreation in lower canyon areas, which are more accessible than higher elevations, and capable of safely accommodating more people;
X develop interpretive materials; and
X trail maintenance.

11.3.1 Alternative A - Proposed Action

Goal. Provide quality hunting and fishing opportunities on Fort Huachuca, within AGFD regulations and consistent with requirements of the military mission.

Objective 1. Use AGFD certified volunteers to perform State hunter education courses on Fort Huachuca.

Objective 2. Sell Arizona and Fort Huachuca hunting and fishing permits.

Objective 3. Prepare annual updates of the Fort Huachuca hunting fact sheet and update the fishing fact sheet as necessary.

Objective 4. Implement provisions of the annual hunting fact sheets and the fishing fact sheet.

Objective 5. Prepare a Habitat Use Permit Fact Sheet, and implement the sale of habitat use permits on Fort Huachuca by 2004.

11.3.2 Alternative B - No Action

The No Action and Proposed Action alternatives are identical with exception of preparing and implementing a Habitat Use Permit on Fort Huachuca. Thus, the Proposed Action presents a more proactive approach to managing the increasing number of public users of Fort Huachuca's natural resources.

11.3.3 Alternative C - Other Management Options

Additional hunting in terms of more lands and more access times is not consistent with the conduct of the military mission and, thus, is not a viable option. Reduced hunting, to include no hunting, is an option. Likewise, changes to Fort Huachuca's fishing program range from increasing fishing opportunities to reducing those opportunities or eliminating fishing on the installation. However, increasing fishing on Fort Huachuca is unlikely due to unresolved issues related to water usage by the installation. Changes in the hunting and fishing policy would have to be coordinated with the AGFD via changes to this INRMP, per the Sikes Act and AR 200-3. Changes in the system of controlling hunters are possible but only if security, safety, and nonconflict with the military mission are maintained.

Fort Huachuca could decide not to implement the sale of habitat use permits, or the system could be expanded to include more or all activities and areas outside of the cantonment area. However, concentrated use, particularly for birding, and impacts to natural resources commonly occur in the two areas proposed for the habitat use permit. Expanding the permit is not justified.

11.4 Other Natural Resources Oriented Outdoor Recreation

Fort Huachuca has a plethora of natural resources-related recreational activities other than hunting and fishing, ranging from more passive activities, such as picnicking, wildlife watching, and nature photography, to more active recreational outlets, such as bicycling, horseback riding, recreational shooting, and camping. These latter activities and sports are generally a responsibility of MWR. MWR Rents operates an outdoor recreation equipment rental center. Items rented include camping trailers, camping equipment, boats and motors, fishing equipment, bicycles, etc.

Horseback Riding

Horseback riding is a popular recreational activity at Fort Huachuca. The post maintains the Buffalo Corral horse riding stable. Horses can be rented by the hour or leased monthly, and privately owned horses can be boarded at the stables. Trail rides and riding lessons are offered through the MWR. Natural resources concerns with trail rides on the installation, especially overnight rides into canyon riparian areas, include the potential for horses to transport seeds of exotic plants and the potential for sensitive plants to be grazed by horses.

Off-Road Vehicles

All privately owned vehicles on Fort Huachuca are restricted to use of existing roads and graded firebreaks, therefore no Off-Road Vehicle (ORV) use per se is allowed. But the 1999 policy on ORV use on the installation does authorize any properly licensed and insured ORV (a motorized vehicle designed to be operated off existing roads) to operate on Fort Huachuca roadways and firebreaks, just like any other legal, private, motorized vehicle. Closed roads are referred to as those marked by signs or stakes. This policy, developed to meet an immediate need to minimize impacts on military firing, defined vehicles, roads and activities in qualitative terms, and by examples. Lack of specific, objective directives makes this policy very difficult to interpret, implement or enforce in the field with any consistency.

To effectively manage natural resource management, military training, outdoor recreation, and safety requirements, a follow up ORV policy and implementing regulation is needed that is geographically, or map, based. In effect, this will be a privately owned vehicle (motorized or muscle powered) recreational access map to help accommodate, regulate and manage vehicle routes. All Fort Huachuca roads and

firebreaks were digitized from recent aerial photographs, then traveled and conditions attributed by GPS in 2001, and new, digitized map and database is being completed. These GIS layers, along with other layers, will be used to develop a GIS product that can be the basis of implementable policy and regulation, sign placement, road closures, recommended routes for public use, and emergency vehicle access.

Camping and Picnicking

Camping and picnicking are popular activities at the following eight camping and picnicking areas on Fort Huachuca:

- X Lower Garden Canyon picnic area has ten sites with tables and grills and is open to self-contained recreation vehicle (RV) and tent camping. The area includes a comfort station, playgrounds, and a ramada for protection from sun and rain. There are also two smaller picnic areas and a perennial stream located in middle and upper Garden Canyon.
- X The Golf Course Pond has 12 picnic sites with tables, grills, and ramadas. RV camping is allowed, and a comfort station and softball field are available.
- X Additional sites for picnicking include Huachuca Canyon and Reservoir Hill.
- X The Apache Flats RV Park has 50 sites for RVs with electricity, picnic tables, grills, and a dump station. Showers, bathrooms, and laundry facilities are available.
- X The Girl Scout cabin in Split Rock Canyon and the Boy Scout cabin in Garden Canyon are available for rental through MWR.
- X The Sportsman Center has 24 sites with water and electrical hookups and a central dump site. These sites are used primarily for overflow and during trap shoots.

A permit from MWR is required for using any campground on Fort Huachuca. Permits cost are dependent upon group size and the area desired. Cabins in Split Rock and Garden canyons are rustic, and are available for rent.

The Apache Flats RV Park receives considerable use and is often filled to capacity. MWR wants to increase the Apache Flats Park by 50 spaces. No formal planning has occurred for this project, and if it comes to fruition, it will have to meet NEPA and other regulatory requirements before construction can begin.

Other unofficial camping and picnicking areas also receive intensive use. High levels of use often create problems, such as site degradation, including soil compaction; loss of vegetation; increased soil erosion; and increased wildfire risk. Fort Huachuca should adopt a policy to link the degree of individual site management to their intensity of use. Fort Huachuca's picnic areas have inherent risks that should be considered by MWR and users (e.g., the possibility of a lion/human interaction in a picnic area, problems that could occur from illegal feeding of wildlife at picnic sites). Signs that prohibit littering, wildlife feeding, and fires outside fireplaces or grills have been posted prominently in picnic sites. A general public awareness of issues associated with camping and picnicking areas on Fort Huachuca should allow sustainable use of these areas.

Birding

Southeastern Arizona is widely known as the number one birding region in the country, and Fort Huachuca is in the center of that region. The installation receives a large number of visitations by birders year-round. However, peak seasons for birding on Fort Huachuca are from April through mid-May and mid-July through mid-September. An estimated 8,000 trips/year by an estimated 5,000 individual birders

occur annually on Fort Huachuca. The number of birders visiting Fort Huachuca represents not only individuals but also organized groups, such as Audubon Society groups. In addition, at least five commercial birding companies and two or three local guides lead groups on birding tours on the installation. An estimated 1,000-2,000 trips of the 8,000 trips/year are guided.

The degree of use by birders raises concerns relative to the military mission and its natural resources. The more people using Fort Huachuca for unrestricted recreation, the more likely there will be conflicts with the military mission. In addition, there is some live-fire risk, particularly along the access route to Garden and Woodcutters Canyons.

Natural resources concerns involve the large number of people and the impacts of frequent, prolonged visitation. There are often hundreds to a few thousand people using an area of a few acres near active bird nests or along trails over the span of a year. For example, the federally-threatened Mexican spotted owl nests in a few locations close to trails on Fort Huachuca. These birds draw many birders to the area for the opportunity to observe such a rare species. The result of frequent, prolonged visitation often is nesting disturbance, trampling of vegetation, and creation of temporary trails to nests. These impacts may result in failed nesting, increased risks of predation, and erosion problems. Other problems associated with high numbers of people visiting birding areas include limited road access, damage to roads and parking areas, and lack of sanitation facilities for people using these areas.

Another issue with regard to the demand for birding is that it is currently impossible to interact with most of these users. Interaction could be in several forms, from providing environmental and natural resources protection information when they purchase permits, to providing interpretive messages at trailheads or presenting interpretive talks. Establishment of a habitat use permit (see Section 11.3) and using the funds to employ a Conservation Officer not only to control but to interface with Fort Huachuca natural resources users is a positive step in management of birders who use Fort Huachuca.

Caving

Caving the caves of Fort Huachuca is a popular activity. There are an estimated 100 people, ranging from very experienced to novices, who make an estimated 300 trips annually. Of the ten known caves on Fort Huachuca, two caves (Pyeatt and Indecision) receive about 95% of caving visits.

Cavers have experienced some limitations to their activities on Fort Huachuca over the years. In the early-1970s three caves (Upper Pyeatt, Pyeatt, and Indecision) and one mine (Manila) were fenced or gated to deter human use, mainly due to safety concerns. In the late 1980s, the lesser long-nosed bat was federally-listed. The lesser long-nosed bat uses Pyeatt Cave and Manila Mine primarily as night roosts. Due to the endangered status of the bat, fences/gates were removed from Pyeatt Cave and Manila Mine to return these roost sites to a more natural appearance and air exchange to promote bat access. However, chainlink fences were installed well away from the entrances but still providing reasonable access control and safety for people. Alarm systems were also installed at Pyeatt Cave and Manila Mine to alert authorities of illegal access, and roads leading to these sites were fenced and gated. Indecision Cave, although being very popular for caving, is not fenced or gated because of its remote location, the expense to fence it, and its nonuse by the endangered bat. Besides lesser long-nosed bat and safety issues, caves were fenced because of natural resources or historic properties impacts, such as disturbance, vandalism, and illegal collection of animals, crystals, and metals.

Cavers can visit Fort Huachuca's caves year-round with exception of Pyeatt, Upper Pyeatt, Cavalry and Indecision Caves and Manila Mine, which are closed April 15 to October 31 annually due to lesser long-nosed bat roosting. Only endangered species personnel with federal endangered species permits can access caves during this time. The PBO (USFWS, 1998) also specifies that the roads to Pyeatt Cave and Manila Mine be gated and locked from May 1 to October 31 annually. Cave openings will be signed with interpretive signs informing potential users of sensitive species issues and other restrictions.

The Military Police at Fort Huachuca control access to caves, and cavers must sign-out to enter cave sites even if they are not fenced. Fort Huachuca's policy toward caving with regard to natural resources is to allow recreational caving when it does not affect sensitive species and to control access at other times.

Hiking and Bicycling

Fort Huachuca provides many unique opportunities for hiking. The Huachuca Mountains are deceptively rough, rocky, and dry. High country weather conditions can change rapidly, and unreliable water sources make back country hiking in the mountains of Fort Huachuca a challenge to even experienced hikers. Fort Huachuca has a number of established hiking trails in Blacktail, Huachuca, and Garden Canyons. The *Trails of Fort Huachuca* (Forestry Section, 1986) is a comprehensive listing and guide to established hiking trails on Fort Huachuca. Most trails can be hiked in a day and vary from 0.5 - 3.0 miles in length with a total of 20.25 miles of established hiking trails on the installation. Hikers have many options from short hikes to combining several trails and roads for multi-day hikes with an abundance of dirt roads and jeep trails on the installation and the Coronado National Forest adjoining much of the western boundary of Fort Huachuca.

Trails are not maintained under any recurring maintenance. A limited amount of maintenance is done by Scout groups, and even that is infrequent. The goal of trail maintenance is minimal maintenance while keeping trails identifiable for hikers, fire fighters, and resources survey personnel. Two of the more popular trails have trail registries at the trailhead. Hikers are encouraged to register before departing and make remarks about unusual sightings, problems (*i.e.*, erosion, downed trees, safety issues) or other issues of importance upon completion of hikes.

Mountain biking on Fort Huachuca's dirt roads, jeep trails, and hiking trails has increased in popularity over the last several years. However, no specific problems or issues related to mountain biking have been identified. Mountain biking will be addressed under the revision of the ORV policy. If races or special biking events are planned, they will be coordinated with ENRD and other pertinent organizations by MWR.

Other Recreational Activities

Numerous fitness facilities are available at Fort Huachuca. These include baseball fields, running tracks, swimming pools, playgrounds, multiple court areas, and an 18-hole golf course.

The Sportsman Center provides skeet, trap, pellet gun, and archery ranges. A private organization, the Huachuca Mountain Bowhunters and Archers, also have an archery range on Fort Huachuca. The Sportsman Center hosts skeet and trap shooting events, family day shoots, and a paint ball course. Trap shooting is so successful that MWR has identified the need for two more trap ranges in addition to the four in place. The Sportsman Center retails guns, ammunition, hunting supplies, bait, etc. for hunters and anglers. Other outdoor recreation activities include nature study, butterfly collecting, photography, pictograph viewing, and general nature enjoyment.

11.4.1 Alternative A - Proposed Action

Goal. Coordinate development of recreational facilities and natural resources-based special events, such as trail rides, mountain bike events, etc., with the ENRD, using NEPA as appropriate.

Objective 1. Consider natural resources concerns while providing recreational horseback riding and trail riding opportunities on Fort Huachuca.

Objective 2. Implement Fort Huachuca's policy on off-road vehicles and augment it with map based specific road closures, other restrictions and guidelines, and recommended recreation routes.

Objective 3. Provide camping and picnicking opportunities at Fort Huachuca.

Objective 4. Sell permits for camping and picnicking on Fort Huachuca.
Objective 5. Adopt a policy linking site use intensity to degree of management and provide an awareness of issues associated with use of camping and picnicking areas on Fort Huachuca.

Objective 6. Provide opportunities for birding on Fort Huachuca while protecting the natural resources upon which birding is based.

Objective 7. Provide access control and install and maintain interpretive signs at all well known Fort Huachuca caves and mines.

Objective 8. Use the Military Police sign-out control system for cavers.

Objective 9. Review seasonal cave access dates with appropriate agencies, particularly the USFWS.

Objective 10. Maintain the Interservice Agreement with the USFS to utilize their expertise and resources in cave management.

Objective 11. Develop and maintain relationships with regional caving clubs to utilize their expertise to locate and map caves, clean-up caves, provide search and rescue, and educate other cavers.

Objective 12. Maintain existing hiking trails on Fort Huachuca through Scout groups, hiking clubs, or other volunteer activities.

Objective 13. Maintain rapport with hikers and other trail users to use knowledge of their experiences on Fort Huachuca's trails.

Objective 14. Monitor mountain biking use of the installation and include mountain bikes in Fort Huachuca's policy on ORVs.

11.4.2 Alternative B - No Action

The Proposed Action alternative provides for a much more active and comprehensive program for the management of outdoor recreation activities, other than hunting and fishing, on Fort Huachuca. The degree of use of the installation's natural resources has been steadily increasing and through initiatives and programs, such as the new off-road policy; providing access control and installing interpretive signs at caves and mines; and monitoring and maintaining rapport with hikers, mountain bikers, birders, and other users of the resources, the installation is taking a proactive management approach to these demands. The Proposed Action is the most viable alternative for management of the public's increasing demands on the installation's natural resources.

11.4.3 Alternative C - Other Management Options

There are many options available for outdoor recreation, but they must be consistent with the accomplishment of the military mission to be viable. They must also be consistent with the ecosystem management strategy employed to protect and use natural resources as well as overall goals for outdoor recreation on the military installation. The outdoor recreation program could be decreased or expanded to whatever level can be supported by Fort Huachuca.

12.0 HISTORIC PROPERTIES PROTECTION

Historic properties management at Fort Huachuca is provided in accordance with Section 106 and Section 110 of the National Historic Preservation Act (NHPA) (16 U.S.C. Section 470, as amended), the Archeological Resources Protection Act (16 U.S.C. Section 470aa-47011), the American Indian Religious Freedom Act (42 U.S.C.), the Native American Graves Protection and Repatriation Act (25 U.S.C. Section 3001 *et seq*.), Antiquities Act of 1906 (16 U.S.C.), Executive Order 11593 (*Protection and Enhancement of Cultural Environment*), (Executive Order 13007 (*Indian Sacred Sites*), Executive Order 13175 (*Consultation and Coordination with Tribal Governments*), DoD Directive 4710.1 (*Archeological and Historic Resources Management*, 1984), AR 200-4 (*Cultural Resources Management*), Executive Order 12898 (*Environmental Justice in Minority populations and Low-income Populations*), and National Environmental Policy Act (42 U.S.C.).

Management of Fort Huachuca's historic properties is a mission of the Environmental and Natural Resources Division, DIS, which has a full-time archeologist who is responsible for all aspects of historic properties management, including coordination with the Arizona State Historic Preservation Officer (SHPO), the Advisory Council on Historic Preservation, native American tribal organizations, and the public, as appropriate. The installation has an Integrated Cultural Resources Management Plan (ICRMP) (Van West *et al*., 1997), and much of the below discussion is taken from this plan. Other sources are specifically referenced. An existing draft of the ICRMP will be finalized by November, 2002.

12.1 Historic Properties

12.1.1 Historic Properties Inventory and Evaluation

Fort Huachuca has a large number of archaeological and historical sites and districts. Prehistoric archeological sites on Fort Huachuca are associated with larger drainages in the northern, southern, and eastern portions of the installation. Historic sites are clustered within the cantonment area or associated with old ranching homesteads on the East Range.

Undocumented surveys on Fort Huachuca may have occurred as early as 1884 or 1900; however, opinions vary on when the first survey occurred. Professional documentation of archeological resources on Fort Huachuca began in 1951 with a visit to the Garden Canyon Site; the first archeological testing and data recovery program began in 1964 at the Garden Canyon Site. More frequent use of surveys began in 1982.

Fort Huachuca has surveyed about 48,433 acres or 66% of the installation for archeological sites. There are 327 sites that include: 232 prehistoric sites, 39 historic sites, 55 sites with both prehistoric and historic components, and one site that is indeterminate or undatable. Figure 12.1.1a shows surveyed areas of Fort Huachuca. Three prehistoric sites in Garden Canyon and the old post area have been entered into the National Register of Historic Places. Of the remaining known archeological sites, seven have been evaluated as eligible for listing on the National Register, 227 are classified as potentially eligible for listing, 29 are ineligible for listing, and the significance of other sites has not been determined.

The survey effort is ongoing, but due to funding constraints, is driven by proposed actions. Evaluations of sites related to Apache Scout encampments have recently been completed. Uninventoried areas in the mountain areas of Fort Huachuca will be surveyed using a judgmental survey design. Uninventoried parcels in the cantonment and around Libby Army Airfield will be surface inspected. Uninventoried land

in open/operational areas are most amenable to survey and will have first priority for inventory due to training and testing activities in these areas. Parcels in the built-up areas will have second priority, and mountainous areas are lowest priority.

The goal of the historic properties survey is to inventory the sites on the installation, to evaluate those sites for significance, and to nominate sites that meet the significance criteria to the National Register of Historic Places, established by the National Historic Preservation Act. The old post area has a National Historic Landmark District that includes more than 86 buildings from the 1880s to the period just after World War I (Figure 12.1.1b). No other historic or architectural structures are currently identified as eligible for the National Register. However, in the future some structures may become more significant and warrant protection.

Eligibility of archeological sites for inclusion in the National Register of Historic Places (NRHP) is the principal criteria determining management prescriptions. Generally, sites fall into one of three categories with regard to NRHP eligibility.

X ***Eligible***: These sites have been determined eligible for the NRHP and therefore are subject to protection. They should not be affected without consultation per Section 106 of the NHPA and development of a plan to mitigate adverse effects.

X ***Ineligible***: These sites have been determined ineligible for the NRHP and do not require protection from adverse effects.

X ***Potentially eligible (intermediate)***: Further investigation is required to determine NRHP eligibility. Therefore, these sites are potentially eligible for the NRHP and require protection until determinations of eligibility can be made.

Altschul (1993) identified “red flag” and “yellow flag” resources on Fort Huachuca in relation to eligibility criteria. Potentially eligible sites that raise red flags are those at which data recovery would be extremely expensive or time consuming. All sites listed as eligible and potentially eligible for the National Register of Historic Places raise red flags. Sites that raise yellow flags are those at which avoidance might be more difficult than data recovery. Altschul (1993) lists yellow flag sites as potentially eligible sample significant sites, such as the nearly ubiquitous rock piles found on Fort Huachuca. Project managers can use Altschul’s red and yellow flag system to be alerted to the potential of historic properties concerns early in the planning process.

12.1.2 Management and Curation

The installation completed a *Cultural Resources Management Plan* (Van West *et al*., 1997), and is implementing it. There also is a draft of an Integrated Cultural Resources Management Plan. Once installation-wide inventory levels are deemed adequate, management efforts can shift to monitoring and mitigating specific impacts on a known set of resources. As such, the direction of management efforts at the

Figure 12.1.1a: Areas of Fort Huachuca Surveyed for Archeological Resources

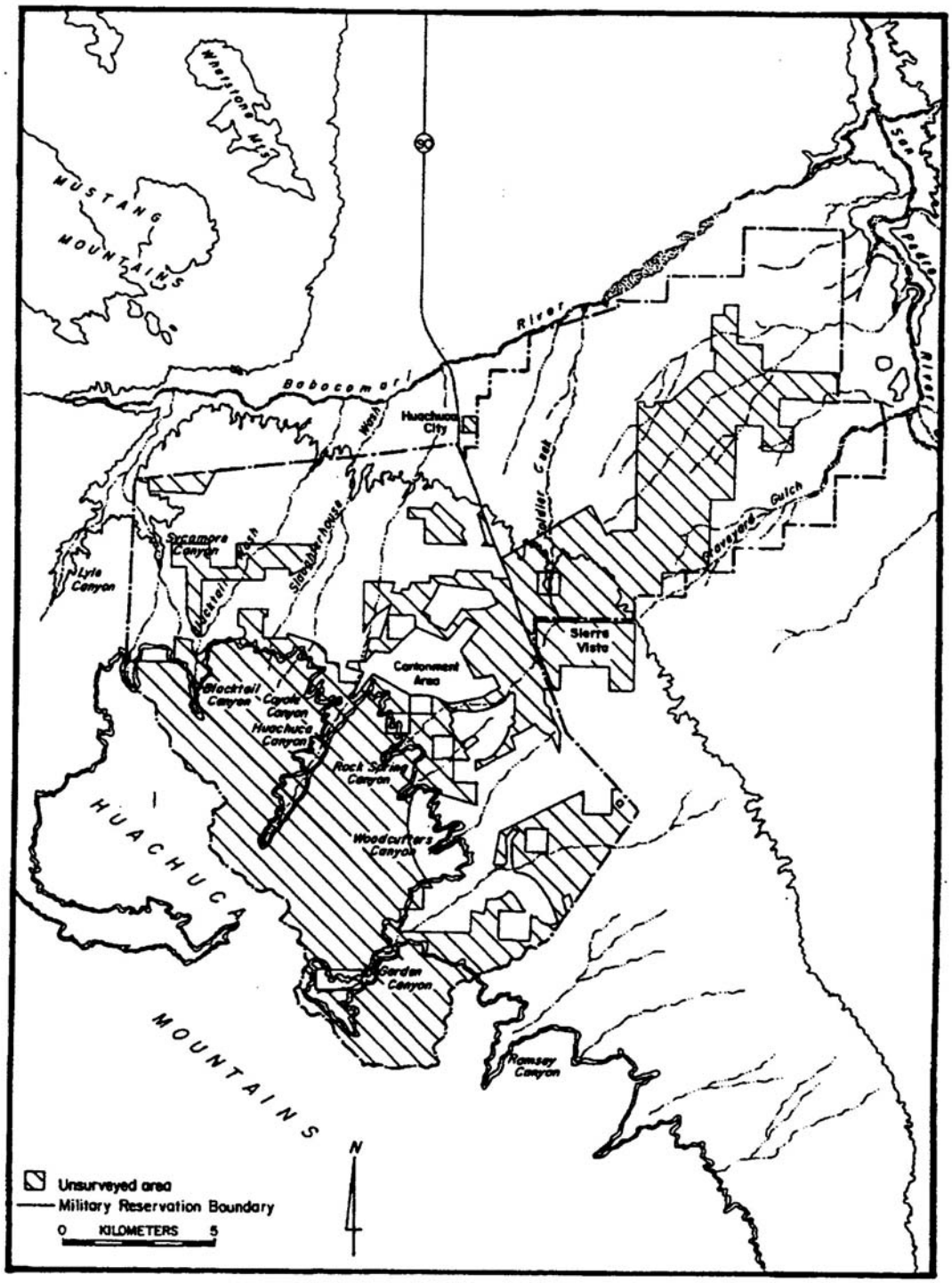
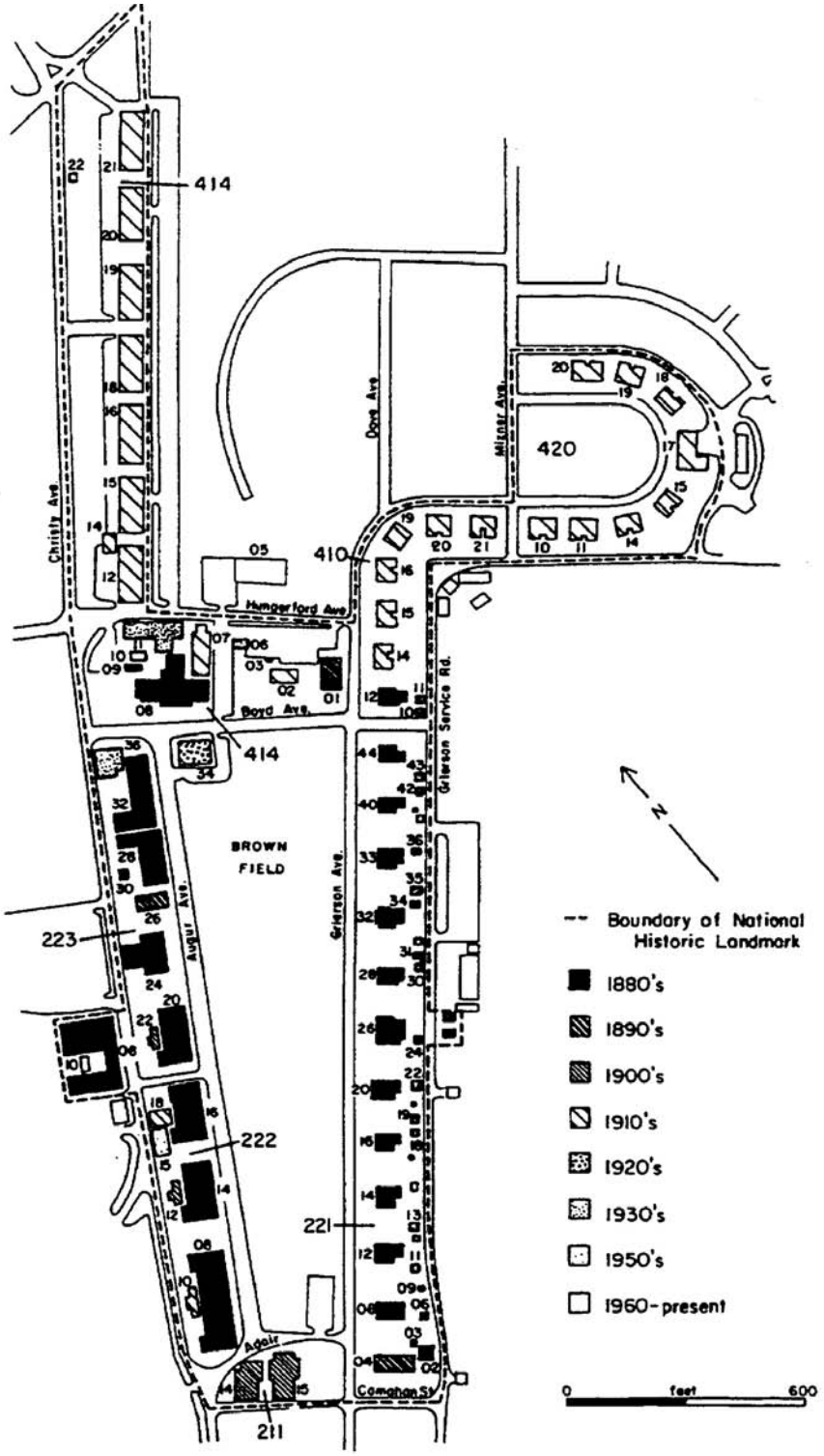


Figure 12.1.1b: Old Fort Area of Fort Huachuca



installation should be seen as a transition from exploratory identification, evaluation, and treatment of resources spread across Fort Huachuca, to a state in which a smaller, established set of sites and localities is monitored and treated in accordance with changing training and testing requirements. All archaeological sites and areas cleared for resources are recorded in a GIS database to facilitate management of these resources. This GIS layer will be made available to managers and project personnel, as necessary, while still providing adequate protection of specific site locations.

Fort Huachuca will develop a series of Treatment Plans specifically designed to address significant historic properties preservation and stewardship issues. Treatment Plans are envisioned to be integrated for the care of a particular historic property or class of historic properties and the information related to these historic properties. Development of three Treatment Plans is planned but has not been initiated.

A small museum and gift shop on Fort Huachuca provides interpretive services and information related to the history of the post and related subjects. A second museum, to be housed in the old magazine building (No. 22330) in the historic district, is in the planning stage with an opening date of 2002 or later. The St. Louis District, Corps of Engineers (COE) has been designated as a Mandatory Center of Expertise for the Curation and Management of Archeological Collections for the COE.

12.1.3 Relationships with the Military Mission

There are known and anticipated impacts to historic properties on Fort Huachuca including inadvertent impacts from Army training and testing, uncontrolled access, and unavoidable forces of natural deterioration. Archaeological historic properties within the installation are frequently located in areas which are advantageous or suitable for training and testing, which has resulted in site destruction and damage. In many cases, destroyed and damaged sites had been previously cleared for operational activities as they were sufficiently studied before their destruction. Much of this destruction occurred in previous decades during military training exercises. Efforts are now made to protect known sites as well as unsurveyed areas within the installation. Fort Huachuca has adopted the following levels of protection to address potential problems:

X physical measures focused on major impacts, such as erosion control structures at the garden Canyon Village Site, fencing to restrict access to pictographs, and fire suppression systems in vulnerable historic structures;
X operational and procedural changes to prevent alteration of sites, including training of personnel, designating sites near maneuver or bivouac areas as chemically contaminated zones or minefields during field exercises, and prohibition of off-road vehicle travel;
X pre-construction surface surveys for construction or redevelopment projects; and
X implementation of an active program for evaluating and rehabilitating historic buildings.

In addition to survey and inventory of sites, another goal of the historic properties program is to mitigate additional sites for unrestricted use by Fort Huachuca. Mitigation involves large-scale data recovery (surface collection and excavation) at archaeological or historic sites. Artifacts and other items collected in mitigation projects are curated at Fort Huachuca. Numerous archaeological mitigations have been conducted on the installation, and additional mitigations will be conducted as funding becomes available.

12.1.4 Consultation with Native Americans

Various laws and regulations require Fort Huachuca to consult with Native Americans regarding Army activities or sites within the installation. The National Historic Preservation Act (NHPA) requires that federal agencies must consult with the Advisory Council on Historic Preservation regarding any proposed action that has the potential to affect a property on, or eligible for, the National Register of Historic Places. This includes consultation with the SHPO and interested parties, including but not limited to Native Americans. Fort Huachuca has initiated ongoing consultation with 11 Native American tribes concerning both cultural and natural resources on the installation, and this is coordinated by the Post Archeologist.

The Archaeological Resources Protection Act (ARPA) requires that archaeological resources on public and Indian lands be protected. This includes notifying Indian tribes, in advance, of possible harm to sites with religious or cultural importance.

The Native American Graves Protection and Repatriation Act (NAGPRA) protects the ownership and control of native American human remains and related cultural items excavated or discovered on federal lands. If human remains are discovered during projects, work must stop, and a reasonable effort must be made to protect the discovery. Appropriate Native American groups must be notified, and the requirements of Section 106 of NHPA and NAGRPA must be followed for excavation and disposition of the remains. NAGPRA also requires a 30-day delay period after the discovery of human remains before project work in the area of the discovery can resume. Work may resume earlier if consultation and agreement occur.

The American Indian Religious Freedom Act (AIRFA) covers the protection of intangible, ceremonial, or traditional values and concerns not tied to specific cultural properties. Fort Huachuca must establish contact with interested Native American groups during the regular course of the NHPA Section 106 process.

Executive Order 13007 (Indian Sacred Sites) stipulates that if a federally-recognized tribe or representative of an Indian religion identifies a sacred site on Fort Huachuca, the installation commander must enter into consultation with that group or individual to provide access to and ceremonial use of the site and avoid adversely affecting the physical integrity of such sites. In addition, Executive Order 13175 (*Consultation and Coordination with Tribal Governments*) requires consultation and coordination with potentially affected Tribes.

12.2 Natural Resources Management Implications and Contributions

Natural resources management on Fort Huachuca has potential to affect historic properties, especially with respect to traditional cultural properties and resource uses. Conversely, historic properties management, traditional cultural properties, and scared sites on the post may affect natural resources management. The current perspective is that natural resource conservation activities and historic properties management are most likely to interrelate in riparian zones and bajadas on the East Range where erosion control and water conservation projects are planned, in agave stands within grasslands on the West and South Ranges, in oak woodlands along the base of the mountains, and up through canyons, particularly along riparian areas and near springs. The middle San Pedro is one of the best known locations for Paleoindian sites and locations of extinct Pleistocene fauna in North America. Paleoindian sites and Pleistocene megafauna have been recorded immediately south of Fort Huachuca, and bones of extinct animals have been found in Graveyard Gulch on Fort Huachuca. These findings and other faunal and botanical data reveal changes in climate, biodiversity, and habitat through time. These resources may

be instrumental in assessing long-term effects of land-use at the installation, as well as long-term climate change.

Natural resources practices with potential to adversely affect historic properties are outlined below.

X **Erosion control and site restoration**: Of all practices associated with natural resources management on Fort Huachuca, erosion control projects have perhaps the greatest potential to affect archeological sites. Projects involving excavation, earth moving, and fill deposition can damage or bury archeological sites. Generally, however, effects to archeological sites from reduced erosion are positive.

X **Prescribed burning**: Prescribed fire has some potential to affect archeological sites by denuding areas of vegetation and promoting erosion. Fire has greater potential to adversely impact historic archeological sites with significant surface features. Generally, prescribed burns would have positive effects for historic properties management if burning schedules can be coordinated to assist in archaeological inventory.

X **Firebreak maintenance**: Maintenance of firebreaks involves significant ground disturbance that can damage archeological sites and promote erosion. However, without firebreaks, the potential impacts from a large scale wildfire and subsequent erosion would be much greater.

X **Outdoor recreation programs**: Public access associated with hunting, fishing, and outdoor recreation activities has limited potential to increase the risk of vandalism to archeological sites.

Even with proper review, natural resources projects still have some potential to affect archeological sites through accidental discovery.

Natural resources management can be used to protect and sustain historic properties, traditional cultural properties, and sacred sites, especially agave stands, riparian areas and springs. Sensitive species management (Section 8.4.2.2.1) is used to maintain these species and their habitats, but also protects areas with archeological sites from damage. Erosion control projects (Section 8.8) can be planned to specifically protect sites from erosion, and erosion control protects both known and unknown sites downslope.

Numerous provisions of this INRMP benefit historic properties management on Fort Huachuca. These include *Integrated Training Area Management* (Section 1.5), *Soil Resources Management* (Section 8.8), *Special Interest Area Protection* (Section 8.12), *Military Personnel Awareness* (Section 10.1), *Enforcement* (Chapter 9), and *NEPA Implementation* (Chapter 13).

12.2.1 Alternative A - Proposed Action

Goal. Implement this INRMP in a manner consistent with the protection of historic properties at Fort Huachuca.

Objective 1. Implement provisions of the Integrated Cultural Resources Management Plan that relate to natural resources management.

Objective 2. Consider natural resources projects when planning historic properties surveys and use results of historic properties surveys to plan natural resources projects, particularly via increased geographic information system applications.

Objective 3. Avoid or mitigate adverse effects to historic properties from natural resources and their management through proper review and planning. Submit proposed projects as part of NEPA review to the archeologist for approval, determinations of effect, and Section 106 consultation, as necessary.

Objective 4. Take the following protective measures upon discovery of sites.

X Cease ground disturbing activities immediately and report to the archeologist upon discovery of potential cultural deposits.
X Consider alternatives for moving the project to another location.
X If remains are determined by the archeologist to be natural, do no further investigation and resume the project. Protect the site until such time that it is determined ineligible for the NRHP if remains are determined to be cultural.

Objective 5. Use natural resources conservation techniques and projects to protect and sustain historic properties sites.

12.2.2 Alternative B - No Action

The No Action and Proposed Action alternatives are identical with regard to historic properties management on Fort Huachuca.

12.2.3 Alternative C - Other Management Options

There are few viable options with regard to protection of historic properties during implementation of this INRMP. Laws and regulations require surveys and protection or mitigation of significant historic properties sites on federal lands. Procedures are detailed, and the Proposed Action follows these procedures. Deviations from the Proposed Action would require, at a minimum, consultation with the SHPO.

The use of natural resources to protect historic properties has options in terms of scope of these projects. The potential to protect sites using active erosion control and site marking is almost unlimited. Thus, the number of projects could be increased or decreased.

13.0 NATIONAL ENVIRONMENTAL POLICY ACT IMPLIMENTATION

The National Environmental Policy Act (NEPA) was created to disclose environmental concerns with human activities and resolve them to the best degree possible. Implementing NEPA regulations (AR 200-2, *Environmental Effects of Army Actions*) require mitigation of damage to the environment. NEPA was not legislated to stop actions. Rather, it was crafted to identify environmental problems, providing an opportunity to resolve them using planning at early stages of project development.

13.1 Responsibilities and Implementation

13.1.1 Responsibility

The Environmental and Natural Resources Division, DIS, has primary responsibility for NEPA implementation at Fort Huachuca. One person is assigned NEPA as the primary duty. The NEPA Coordinator is not only responsible for ensuring that NEPA documentation is provided for projects, training missions, and other governmental actions, but a considerable amount of time is spent preparing NEPA documentation for organizations on Fort Huachuca. The process of reviewing and preparing NEPA documentation often involves direct coordination with various professionals within natural resources on the installation. Coordination may also include other natural resources partners, particularly those listed in Chapter 2 of this INRMP.

13.1.2 NEPA Documentation

The most common NEPA document prepared for projects which impact natural resources is a Categorical Exclusion (CX), often with an attached Record of Environmental Consideration (REC). This simple documentation generally works well for routine projects, such as vehicle decontamination exercises, borrow sites, small digging projects, and similar projects where natural sites are not damaged.

Environmental Assessments (EAs) are required when conditions for a CX are not met. This can happen when a new military exercise or range is planned, when the action involves a wide geographic area, or when wetlands or other sensitive plant communities may be involved. Examples include major erosion control projects, new military missions, or range construction. EAs require the Commander's approval, publishing a Finding of No Significant Impact (FNSI), and waiting 30 days for public comment.

If an FNSI is not appropriate, the following options are available:

X Modify the action to remove significant impacts.
X Mitigate significant adverse impacts.
X Drop the action.
X Publish a Notice of Intent to prepare an Environmental Impact Statement.

The EA with this INRMP provides current, comprehensive NEPA documentation for the natural resources program as a whole.

13.1.3 Mitigation

Mitigation is required by NEPA and AR 200-2 when a proposed action already affects the environment. Mitigation is an excellent way to either consider less damaging options or provide means to off-set damage to the environment. Below are five general mitigation tactics:

Avoidance: Avoid adverse impacts on natural resources by not performing activities that would result in such impact. Confine construction to areas where no significant impact would occur to natural resources.

Limitation of action: Reduce the extent of an impact by limiting the degree or magnitude of the action. Minimize impacts of construction projects by arranging timing, location, and magnitude of actions so that they have the least impact on natural resources.

Restoration of the environment: Restore the environment to its previous condition or better. This could involve reseeding and/or replanting an area with native plants after it has been damaged by construction projects.

Preservation and maintenance operations: Design the action to reduce adverse environmental effects. This could involve actions such as monitoring and controlling pollution, contamination, disturbance, or erosion caused by construction projects that would impact natural resources.

Replacement: Replace the resource or environment that will be impacted by construction projects. Replacement can occur in-kind or otherwise, on-site, or at another location. This could involve creation of the same type or better quality habitat for a particular impacted fish or wildlife species or creation of habitat for another species.

Mitigation that is identified in a FNSI is a Class 1 “must fund” for environmental purposes. This provides a reliable mechanism to fund mitigation included in NEPA documents.

13.2 NEPA and Natural Resources Management

The NEPA Coordinator, coordinating with various natural resources elements, uses NEPA to ensure its activities (as described in this INRMP) are properly planned, coordinated, and documented. The Coordinator also uses NEPA to identify problems associated with other organizations’ projects that affect Fort Huachuca’s natural resources when there is opportunity to review such projects.

Siting range-related projects is perhaps the most basic decision that requires input from natural resources personnel. If this phase is done within the cooperative spirit of NEPA, most other environmental problems are generally resolved with relative ease. Decisions such as specific siting or mission planning should be cooperatively discussed prior to preparing NEPA draft documents.

An important offshoot of proper NEPA implementation is that projects are often enhanced by the effort. Siting is one of the most common examples of project enhancement. When natural resources managers understand mission/project requirements in terms of land features and requirements, they often not only offer more potential site options to mission or project planners, but also offer alternatives to avoid future environmental conflicts.

13.2.1 Alternative A - Proposed Action

Goal 1. Use NEPA to identify projects and activities on Fort Huachuca which might impact natural resources, and work with project planners to resolve issues early in the planning process.

Goal 2. Use NEPA to ensure this INRMP is documented according to the spirit and letter of NEPA.

Goal 3. Help Fort Huachuca comply with NEPA.

Objective 1. Document effects of implementation of this INRMP through an EA that is embedded in this document.

Objective 2. Reference this INRMP/EA in descriptions of affected environment to reduce verbiage in other NEPA documents.

Objective 3. Ensure mitigation is budgeted for and funded by project proponents.

Objective 4. Establish a process to accommodate early scoping of proposed plans and actions prior to the public comment period.

13.2.2 Alternative B - No Action

The No Action and Proposed Action alternatives are virtually identical with regard to NEPA documentation on Fort Huachuca. However, the No Action alternative would not document the effects of implementation of this INRMP nor would it allow the use of this INRMP/EA to reduce verbiage in other NEPA documents. Thus, the No Action alternative provides a less comprehensive program, with regard to NEPA implementation, than the Proposed Action.

13.2.3 Alternative C - Other Management Options

There are few viable options with regard to NEPA documentation with regard to this INRMP. Laws and regulations require the use of NEPA, and the Department of Army specifically requires an EA for INRMPs. Procedures are detailed, and the proposed action follows these procedures. Fort Huachuca could have chosen to prepare a separate Environmental Assessment for this INRMP rather than a combined document. However, this would not have changed the outcome of the analysis.

This EA could have been prepared only considering the preparation of the INRMP, which would require individual NEPA documentation for each project as it is implemented. This option would be far more costly. The option to not prepare NEPA documentation for natural resources projects is not legally viable. The option to prepare an Environmental Impact Statement was viable, but there was no reason that one would be required.

14.0 UNRESOLVED ISSUES

Some issues involving Fort Huachuca are not easily resolved. This section deals with these issues. The first steps to tough issue resolution are admission that answers are not readily available and a willingness to keep working toward resolution.

14.1 Nature Based Tourism

Fort Huachuca provides many opportunities for outdoor recreation. Issues related to the types and amount of outdoor recreation desired by the public on Fort Huachuca, and potential and realized impacts of that recreation on the installation's natural resources are discussed in Chapter 11. Birding is probably the most controversial outdoor recreation activity occurring on Fort Huachuca. Several factors that contribute to concerns over birding on Fort Huachuca include the region's widely known abundance of species, its rare and unusual species, the number of people, individually and in tour groups, drawn to the area and specifically to Fort Huachuca, and the impacts they are having on installation resources. Other outdoor recreational pursuits, such as caving, mountain biking, horseback riding also present natural resources concerns, though not to the degree of birding. Nor do these pursuits receive the type of commercial promotion that birding does on the installation.

Fort Huachuca does not have a system or the funding to accommodate sustainably the degree of use by birders and other members of the nature based tourism community. Implementation of the habitat use permit and use of those funds to support natural resources management programs, which would also support birding, is a positive step in accommodating recreationists while providing for the resource. Changes in policies, procedures, and management processes are likely as the installation attempts to accommodate increased nature based tourism while maintaining military training and testing options.

14.2 Nonindigenous Species Control

Nonindigenous animal species, such as waterdogs, barred tiger salamanders, and mosquito fish, and nonindigenous plant species, such as Lehmann's lovegrass, tamarisk, flannel mullein, and others, create problems on Fort Huachuca for a variety of reasons. Nonindigenous flora and fauna also can introduce nonindigenous parasites and diseases that may be detrimental to native species. Nonindigenous animals affect sensitive native species by increased predation, disease, parasitism, and competition. Control or elimination of these species is complicated by the fact that control methods probably also would have adverse effects on native species. Nonindigenous plants often outcompete native species and once established can become quite hardy and spread rapidly. Lehmann's lovegrass is the primary nonindigenous plant on Fort Huachuca. Its use as a soil stabilizer and its propensity to grow well in southeastern Arizona's climate have made Lehmann's lovegrass widespread on the installation. Control of a particular grass, such as Lehmann's lovegrass, is very difficult without affecting other more desirable species.

Control of nonindigenous animals and plants is possible, but in many cases, risks to the environment are perhaps worse than the presence of the nonindigenous species. Therefore, prevention of further spread or introductions will remain important. In many cases, more research and understanding of individual species as well as more definitive control methods are needed before effective control or prevention can take place. Fort Huachuca will continue to investigate possible control methods and use the best scientific

data regarding this issue. Prevention efforts will include education, regulation, operational procedures, and land management practices.

14.3 Water Use Issues

There are two underlying unresolved issues with regard to water resources of the Upper San Pedro Basin. The first is the role of regional volcanism on groundwater resources, which is the subject of scientific debate. There is not adequate scientific data to prove long-held assumptions or support definitive conclusions regarding the complexities of local hydrology.

The second unresolved issue is the effect of groundwater usage upon surface flows of the San Pedro River. This issue has been particularly controversial for Fort Huachuca and other groundwater users in the San Pedro Basin. There has been considerable speculation regarding these issues, which have been contested in both scientific and legal forums (USDC, 1995). Given this level of controversy, it is doubtful that questions regarding long-term impacts of regional groundwater usage on surface water resources can be answered conclusively. Scientific investigations into the cause and effect are ongoing, and as additional information becomes available, portions of this plan related to these issues will be adjusted accordingly. However, since this INRMP focuses on natural resources management and surface water hydrology on the installation, most projects within this plan are unaffected by this controversial issue. The installation is currently addressing the issue of water usage and its effects in ways such as:

- developing a Water Management Plan to reduce usage and loss within the water distribution system;
- constructing enhanced wastewater treatment and recharge facilities; and
- using effluent for irrigation where appropriate, and increasing the efficiency of irrigation systems.

15.0 IMPLEMENTATION

This plan is only as good as Fort Huachuca's capability to implement it. This INRMP was prepared with a goal of 100% implementation. Below is described the organization, personnel, and funding needed to implement programs described in chapters 7-13.

15.1 Organization

The DIS, which ultimately has the responsibility of implementing this plan, operates under a number of legal and political concerns, policies, and budgetary constraints. The need to address threatened and endangered species issues and successfully manage the natural resources while supporting the military mission are the basis for prioritizing management recommendations.

The Natural Resources Program, DIS at Fort Huachuca can implement much of this INRMP and fulfill goals and policies established in Chapter 1. Other organizations identified in Chapter 2 are also capable of implementing their portions of this INRMP with no organizational changes, although they may elect to make changes during 2001-2005 for improved operating efficiency.

15.2 Personnel

"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."[5]

15.2.1 Inhouse Staffing and Management Structure

The following staffing is available to implement this INRMP at Fort Huachuca:

Directorate of Installation Support

Ecologist	1	GS-12
NEPA Coordinator	1	GS-12
Wildlife Biologist	2	GS-11
Forester	1	GS-09
Natural Resources Technician	1	Contract position
Cultural Resources Manager/Archeologist	1	GS-12
Environmental Protection Assistant	1	GS-06
Environmental Engineer	1	GS-12
Environmental Specialist/Stormwater Manager	1	GS-09
ITAM Coordinator	1	Contract position

Above personnel lists do not include personnel within MWR nor does it include the proposed Natural Resources Law Enforcement Officer position (see Chapter 9 and Section 11.3).

15.2.1.1 Alternative A - Proposed Action

[5] DoD Instruction 4715.3, Environmental Conservation Program, 2 May 96.

Goal. Provide the staffing of natural resource management professionals required to effectively manage natural resources on Fort Huachuca (Department of Army, 1995).

Objective. Provide staffing for the Fort Huachuca natural resources program as indicated in the above list and discussion.

15.2.1.2 Alternative B - No Action

The No Action and Proposed Action alternatives are identical with regard to staffing of DIS on Fort Huachuca.

15.2.1.3 Alternative C - Other Management Options

The above staffing plan is not excessive in terms of staffing at comparable military installations in the nation. Other management options range from zero to much larger staffing. Staffing at significantly lower levels than listed above would undoubtedly lead to noncompliance with federal laws and regulations. Thus, this is not a viable option. Staffing at higher levels would increase the scope and quality of natural resources management on Fort Huachuca with impacts as briefly discussed in Other Management Options sections throughout this INRMP.

15.2.2 Personnel Training

Fort Huachuca's natural resources organization has a goal to continually improve the efficiency and effectiveness of natural resources management activities through professional development and information exchange.

15.2.2.1 Alternative A - Proposed Action

Goal. Provide for the training of natural resources personnel (Department of Army, 1995).

Objective 1. Maintain staff technical knowledge of management strategies and their implementation, at the current state of the art, through training and participating in, or hosting, workshops, research presentations, and other activities of regional, interstate, and international professional natural resources research and conservation programs. Specifically, Fort Huachuca plans to send at least one person (and perhaps more) to each of the following annual workshops or professional conferences:

National Military Fish and Wildlife Association annual workshop
North American Wildlife and Natural Resources Conference
Society of American Foresters/DoD Natural Resources annual meeting
The Wildlife Society Annual Meeting
Partners in Flight national, regional, and State meetings (when in conjunction with other listed meetings)
TRADOC training sessions

Objective 2. Routinely disseminate information among natural resources experts to ensure maximum benefits of adaptive management and research efforts.

Objective 3. Evaluate other, more specialized, conferences/workshops for their usefulness, and decisions on participation will be made based on appropriateness to ongoing projects and funding availability. Training that is especially useful includes forestry workshops (smoke management and ecological prescribed burning), ecosystem restoration workshops, GPS training, LCTA training, basic and advanced

GIS training, Watchable Wildlife workshops, riparian restoration and protection training, endangered species training, ARPA enforcement workshops, and various law enforcement classes.

Objective 4. Encourage membership in The Wildlife Society, Society of American Foresters, and National Military Fish and Wildlife Association, which have some of the best scientific publications in their professions.

Objective 5. Review technical and scientific literature as a necessary commitment to maintain professional standards.

15.2.2.2 Alternative B - No Action

ENRD personnel have taken advantage of some of these training and professional development opportunities in the past. However, without implementation of this INRMP and future funding for training, attendance at many of these programs would not be possible.

15.2.2.3 Alternative C - Other Management Options

Most of the proposed training is specifically targeted toward natural resources managers on military installations. Professional management of natural resources is required by the Sikes Act. This implies continuing training to maintain professional skills. Thus, while there are many other options to acquire training for natural resources managers at Fort Huachuca, the option to not train is not viable. Most other training options would not be as specific to the needs of installation personnel as outlined in the proposed action.

15.2.3 External Assistance

The rapid development of natural resources management and the many provisions within this INRMP combined with Army personnel cutbacks have resulted in the highest need ever for outside assistance with natural resources programs on Fort Huachuca. The installation has used its partnerships in a variety of ways, but particularly for wildlife research, fire management, natural resources planning, and others. The growth of environmental compliance requirements has increased many of these needs and added considerably to the need for partners in other areas, especially including on-the-ground personnel support.

15.2.3.1 Alternative A - Proposed Action

Goal 1. Provide external specialized skills and resources to support Fort Huachuca natural resources management.

Goal 2. Provide external personnel to assist with the management of the Fort Huachuca natural resources program.

Objective 1. Implement external support projects and agreements described in appropriate sections of this INRMP.

15.2.3.1.1 Personnel Assistance

The Intergovernmental Personnel Act of 1972 (IPA) provides a means to conduct research or obtain other personnel assistance at Fort Huachuca. IPA is a system whereby a federal (or state) agency borrows other federal or state agency personnel for a limited period to do a specific job. The installation pays the borrowed employee's salary and administrative overhead. There are two advantages: personnel are

directly supervised by Fort Huachuca, and no manpower authorizations are required. Fort Huachuca is using IPA through a Interservice Support Agreement with the USFS for fire control assistance.

Another "borrowed personnel" option is through the Oak Ridge Institute of Science and Education (ORISE). ORISE involves colleges and universities and a management and operating contractor for the U.S. Department of Energy. The program offers students, post graduates, and associate degree graduates opportunities to gain experience in their respective fields. Stipends are equivalent to salaries for employees hired with similar educational backgrounds, and a 30% overhead is added. The normal limit on individual ORISE personnel is three years. Installations may assist in the selection of ORISE personnel. Fort Huachuca is not using ORISE in its natural resources program.

The Student Conservation Association provides another personnel option. This nonprofit national organization has a cooperative agreement with the Department of Army that provides for internships for students and recent graduates to obtain experience in their fields of study.

Volunteers are an occasional source of personnel assistance at Fort Huachuca. Scouts can sometimes be accommodated, and there are occasional other volunteers. Projects that would be ideal for volunteers are the removal of tamarisk and flannel mullein and removal of excess internal fencing, both labor-intensive tasks requiring little experience.

Objective 2. Continue using IPA through the ISA with the USFS.

Objective 3. Develop the option to use ORISE for personnel assistance.

Objective 4. Maintain the option to use the Student Conservation Association for assistance with field projects.

Objective 5. Use volunteers as an opportunistic source of assistance for routine tasks and projects.

15.2.3.1.2 University Assistance

Universities are an excellent source of research assistance. Fort Huachuca has used several universities in recent years to help with specialized needs, particularly the University of Arizona.

Objective 6. Use cooperative agreements with universities to assist with implementation of this INRMP.

15.2.3.1.3 Contractor Support

Contractors give the installation access to a wide variety of specialties and fields. Contractors are involved in projects such as tree pruning, plan preparation, historic properties management, erosion control, surveys, wildlife monitoring and research, NEPA documentation, aerial photography, and similar activities.

Objective 7. Use contractors to assist with implementation of this INRMP.

15.2.3.1.4 Other Agency Support

Fort Huachuca recognizes the importance of cooperating with federal and State agencies. Sections 2.2, 2.3, 2.4, and 2.5 identify other agencies and organizations with which Fort Huachuca has cooperatively worked in recent years.

Objective 8. Use State and federal agencies, particularly this INRMP's signatory partners, the USFWS and AGFD, and the NRCS and USFS, to assist with implementation of various aspects of this INRMP.

15.2.3.2 Alternative B - No Action

The No Action alternative has a similar strategy for external assistance as the Preferred alternative, but there would be fewer projects involved.

15.2.3.3 Alternative C - Other Management Options

External support projects are discussed in other sections of this INRMP. Other Management Options are discussed in these sections.

15.3 Data Storage, Retrieval, and Analysis

The capability to store, retrieve, and analyze data is central to professional management of natural resources, and it is essential to implementing the adaptive management aspect of ecosystem management. Fort Huachuca is committed to providing efficient, cost-effective systems for data storage and analysis.

Goal. Store, analyze, and use data is an efficient, cost-effective manner.

15.3.1 Microcomputer System

Microcomputers are essential to the routine operation of efficient natural resources management organizations. The volume of data is too substantial to handle without computers, and routine administrative tasks are accomplished considerably more efficiently with computers.

Personal microcomputers are available to all professional personnel within the Environmental and Natural Resources Division. Employees have personal E-mail addresses and Web access.

15.3.1.1 Alternative A - Proposed Action

Objective 1. Statistically analyze and store data using the Natural Resources Technician in the Environmental and Natural Resources Division for use by Fort Huachuca personnel and other regional partners.

Objective 2. Upgrade hardware and software as needed during the next five years.

15.3.1.2 Alternative B - No Action

Microcomputers are in place at Fort Huachuca and are being used to monitor, plan, and implement various aspects of the natural resources program. The No Action alternative is virtually identical to the Proposed Action alternative, although under the No Action alternative, the degree of microcomputer use for analysis would be less and upgrades to hardware and software may not occur.

15.3.1.3 Alternative C - Other Management Options

Fort Huachuca either could shut down its microcomputer systems for natural resources management, or it could neglect to upgrade existing hardware and software. Either option would quickly reduce the quality of the natural resources program, and the installation would soon be technologically separated from other

military installations and commands. Fort Huachuca has modern microcomputer hardware and software. Additional expenditures could be made, but it is questionable whether they would significantly improve the quality of programs considering the needs of the natural resources program and the computer expertise of individual personnel. Many options are available for analyzing and storing data ranging from highly sophisticated to outdated. Fort Huachuca's system meets the needs of the natural resources program.

15.3.2 Geographic Information System

A GIS supports the natural resources program. This computer system presents multiple layers of resource data in a graphic summary format to allow maximum utilization of training areas and reduce training impacts on the environment. In addition, it provides for the generation of data reports on any selected layer. The Advanced Resources Technology Lab at the University of Arizona has developed or is obtaining extensive data layers regarding Fort Huachuca soils, vegetation, topography, geology, training areas, and special features involving natural resources management programs. Database development will continue during 2001-2005. Most use of GIS has been the production of maps.

15.3.2.1 Alternative A - Proposed Action

Objective 1. Develop an installation network linked to or containing University of Arizona GIS databases for Fort Huachuca, and provide GIS databases via ArcView® (a personal computer-based GIS) and ArcIMS (a web based GIS) to all pertinent Environmental and Natural Resources Division personnel.

Objective 2. Attach tabular data to spatial data layers, such that a "point and click" provides such data on the spot, with essential buffers and safeguards that protect confidential information and sensitive natural and cultural resource sites.

Objective 3. Make more use of the analytical capabilities of the GIS to provide natural resources management options.

Objective 4. Create user-friendly interfaces and a spatial decision support system to enable a wider use of GIS databases specific to the needs of installation users.

15.3.2.2 Alternative B - No Action

The use of a GIS would continue at Fort Huachuca under the No Action alternative, but further development of the system to include an installation network linked to University of Arizona GIS databases, point and click accessibility to data, additional analysis capabilities, and furthering user-friendly interfaces may not occur. Thus, the No Action alternative is much less comprehensive than the Proposed Action alternative with regard to GIS implementation.

15.3.2.3 Alternative C - Other Management Options

There are almost limitless options with regard to the rapidly evolving GIS field, ranging from no use of the technology to massive expenditures on numerous software, hardware, and data acquisition options. The GIS is very advanced, and database development is progressing. The degree of growth over the long-term depends on available program funding.

15.3.3 Remote Imagery

The oldest aerial photographs of Fort Huachuca were taken in about 1935, but these have been used very little for natural resources management on the installation. Remote imagery is now used for vegetation

and fuel load mapping, and landscape scale classification of land cover changes since 1974. It is in use also for investigations toward mapping and calculation seasonally of herbaceous biomass (both green and senescent) in grasslands and daily of course scale, fine fuel moisture content, as well as for change detection of ground cover and erosion risk.

The most recent aerial photos were taken in 1996. They are color photos, 30 meter resolution digital orthophotographs of Fort Huachuca.

Current remote imagery is probably adequate for most Fort Huachuca needs during 2001-2005. Satellite imagery should be an economical way to monitor changes in the landscape of Fort Huachuca, except for a PBO requirement to retake aerial photographs in 2003 of riparian and adjacent habitat areas off post along the San Pedro and Babocomari Rivers, for repeat vegetation mapping and trend analysis.

15.3.3.1 Alternative A - Proposed Action

Objective. Use current remote imagery and/or update remote imagery as needed for improved decision-making for military activities, environmental management, and natural resources and historic properties management and protection.

15.3.3.2 Alternative B - No Action

The No Action and Proposed Action alternatives are identical with regard to remote imagery on Fort Huachuca.

15.3.3.3 Alternative C - Other Management Options

There are many options with regard to the rapidly evolving remote imagery field, ranging from no use of the technology to massive expenditures on data layers. The proposed action continues the use of state-of-the-art technology, and it is difficult to justify an enhanced effort beyond what is proposed. No use or significantly less use options for remote imagery are possible, but considering the requirement to maintain the quality of training lands and to comply with environmental laws, these options would ultimately require an even greater expenditure to monitor land conditions using more personnel-intensive methods.

15.4 Project/Program Summary

Goals and objectives within this INRMP, when listed, can be used to monitor the effectiveness of natural resources management at Fort Huachuca. Appendix 15.4 contains a list of goals and objectives for this INRMP in the order items appear. The list does not include a priority system for two reasons:

X The Sikes Act requires implementation of this INRMP, making it difficult to justify priorities for implementation, which implies priorities for compliance. Federal agencies are required to comply with all federal laws, not a priority listing of these laws.

X Many projects or programs affect obviously high priority species/communities/ecosystems/etc. (federally-listed species, wetlands, etc.) and at the same time affect species/communities/ ecosystems/etc. that prior to the passage of the Sikes Act amendments, were not priorities (*e.g.*, nonlisted species, noncritical habitat). It is often difficult to separate the benefactors of many programs. Riparian area protection and management is a good example.

15.5 Implementation Funding Options

Unlike most functions within the Department of Defense, natural resources management relies on a variety of funding mechanisms, some of which are self-generating and all of which have different application rules. Below are general discussions about different sources of funding to implement this INRMP.

Fort Huachuca, TRADOC, the USFWS, and Arizona Game and Fish Commission recognize that year-to-year congressional appropriations for the implementation of the Army's mission or changes in the Fort Huachuca mission resulting from Base Realignment and Closure (BRAC) or Force Drawdown may reflect different priorities. If these priorities require deferral, redirection, or cancellation of planned projects or plans, Fort Huachuca, in consultation with TRADOC, will determine which projects or plans should be implemented first. In every case, Fort Huachuca and TRADOC will ensure that constraints on the military mission are minimized and avoided wherever possible.

15.5.1 Environmental Program Requirements

Most projects described in this INRMP, exclusive of ITAM, are budgeted using the Environmental Program Requirements (EPR) Report. Below are sources of funds within the EPR system as well as some limited funding sources outside the EPR system:

15.5.1.1 Sikes Act Funds (non EPR)

Sikes Act funds are collected via sales of licenses to hunt or fish. They are authorized by the Sikes Act and regulated via AR 200-3, Chapter 6. These funds may be used only for fish and wildlife management on the installation where they are collected. They cannot be used for recreational aspects of fish and wildlife management. They have no year-end (unobligated funds carry over on 1 October).

Fort Huachuca generates about $Number annually from hunting and fishing permits. MWR retains a $1.00 administration fee for each license sold. Moneys accrued from the sale of Sikes Act permits will be expended to support the wildlife program on Fort Huachuca. Collections and disbursements will be accounted for in accordance with guidance provided for the appropriation titled "*Wildlife Conservation , Military Reservations*", Army Account 21X5095 (Army Regulation 37-100 and 37-108). Funds generated will be spent, administered, and accounted for using the Fort Huachuca financial accounting system.

15.5.1.2 Agricultural Funds (non EPR)

Agricultural funds are derived from agricultural leases on installations. They are centrally controlled at Department of Army and Major Command levels with no requirements for spending where they were generated. AR 200-3 (Chapter 2) outlines procedures for collection and spending these funds. They are primarily intended to offset costs of maintaining agricultural leases, but they are also available for preparing and implementing INRMPs. These are broadest use funds available exclusively to natural resources managers.

Fort Huachuca is technically authorized to request agricultural funds from TRADOC since there is no requirement for funds to be generated at spending installations. However, due to base closures and other factors, agricultural funds are decreasing, so it is unlikely that Fort Huachuca will be able to effectively compete for them during 2001-2005.

15.5.1.3 Environmental Funds (EPR)

Environmental funds are a special subcategory of Operations & Maintenance (O&M) funds. They are set aside by the Department of Defense for environmental purposes but are still subject to restrictions of

O&M funds. Compliance with laws is the key to getting environmental funding. Environmental funds are most commonly used for projects to return to compliance with federal or State laws, especially if noncompliance is accompanied by Notices of Violation or other enforcement agency actions.

"Must fund" classifications include mitigation identified within *Findings of No Significant Impact* and items required within Federal Facilities Compliance Agreements. This INRMP is a Federal Facilities Requirement Agreement, and some projects and programs within it are used to mitigate various military activities. In addition, 1997 amendments to the Sikes Act require implementation of INRMPs, which make implementation of this INRMP a priority for funding.

Table 7 below lists environmental projects associated with implementation of this INRMP:

Table 7: Environmental Projects*

Project	FY 01	FY 02	FY 03	FY 04	FY 05	Totals
Comply with BO (Lesser long-nosed Bat Monitoring) 0H	35	35	40	40	40	$190
Comply with BO (Monitor Spotted Owl & Peregrine Falcon) 0H	25	20	40	40	50	$175
Comply with BO (Aquatic Species Management) 0H	30	30	35	35	35	$165
Comply with BO (Umbel & Flycatcher Monitoring in SPRNCA) 0H	50	50	55	100	140	$395
Comply with BO (Agave Mgmt) OH	80	50	50	90	90	$360
Implement INRMP 2H	140	150	150	150	185	$775
Implement ESMP (Management of Candidate Species) 2H	60	30	30	30	30	$180
Implement ESMP (Exotic Lehmann Lovegrass) 2H	95	95	100	50	50	$390
Implement ESMP (Biological Assessment) 2H	10	10	10	10	10	$50
Implement ESMP (Subsurface Survey) 2H	400	100	100	100	100	$800
Implement ESMP (Mountain Front Recharge) 2H	150	400	150	150	150	$1,000
Comply with BO (Water Management Plan) 0H	400	50	50	50	50	$600
Comply with BO (Water Conservation Program) 0H	400	300	300	300	200	$1,500

Project	FY 01	FY 02	FY 03	FY 04	FY 05	Totals
Comply with BO (Upper San Pedro Partnership) 0H	500	500	500	500	500	$2,500
Comply with BO (Protect SWWF Critical Habitat in SPRNCA) 0H	300	300	325	325	325	$1,575
Comply with BO (Fire Mgmt) 0H	120	120	120	160	160	$680
Comply with BO (MOA with US Forest Service) 0H	25	25	25	25	30	$130
Stormwater Pollution Prevention Plan (SWP3) 0H	10	10	10	10	10	$50
SWP3 Implementation & Best Management Practices 1H	100	100	100	100	100	$500
Master Plan EA/EIS 2H	0	100	75	25	25	$225
EIS Mitigation Monitoring 2H	50	45	45	45	45	$230
Totals	$2,980	$2,520	$2,310	$2,335	$2,325	$12,470

* Funding in thousand of dollars.

Priority codes[6]:

Class 0 - Recurring required projects.

Class 1 - Projects that are currently out of compliance with deadlines or conditions established by legally-mandated requirements (whether or not there has been an inspection by a regulatory authority); that have received an enforcement action from a federal, State, or local authority; or that have signed a compliance agreement or received a consent order.

Class 2 - Projects that are not currently out of compliance (e.g., deadlines or conditions have been established by legally-mandated requirements, but deadlines have not passed or conditions are not in force) but will be if projects are not implemented in sufficient time to meet established deadlines in the future.

Class 3 - Projects that are not required or do not specifically have established deadlines by legally-mandated requirements but are needed to address overall environmental goals and objectives and to sustain environmental stewardship.

High - Project is critical to the environmental and natural resources program in the year or years funds are requested.
Medium - Project is important to the environmental and natural resources program in the year or years funds are requested.
Low - Project would be advantageous to the environmental and natural resources program in the year or years funds are requested.

The above table indicates environmental funding as of Summer 2001. Projects specifically for NEPA, pest management, cantonment area management, and historic properties management are not included in this listing**.**

Thus, the total Environmental Fund budget for this INRMP is estimated at $12,470,000 for 2001-2005. These estimates will be adjusted as needed each year.

15.5.2 Training Funds

[6] *Policy and Guidance for Identifying U.S. Army Environmental Program Requirements, Support for Planning, Budgeting and Execution of the Army Environmental Program, Environmental Program Requirements (EPR) Report.* Headquarters, Department of the Army, Office of the Director, Environmental Programs.

Fort Huachuca is a Category II installation with regard to ITAM implementation and funding (Office of the Deputy Chief of Staff for Operations and Plans, 1995). ITAM funding requests are not submitted via the EPR process. Instead, the 5-year ITAM Work Plan is used to channel ITAM funding requests from Fort Huachuca, through TRADOC and the Army Training Support Center, to ODCSOPS. Fort Huachuca reinitiated ITAM in January 2001, and Table 8 shows the budget received in FY01 and required for FY 02 through FY 05:

Table 8: ITAM Funding*

Project	FY 01	FY 02	FY 03	FY 04	FY 05	Totals
LRAM	0	210	750	750	750	$2,460
EA	0	15	50	25	25	$115
TRI	0	15	25	25	25	$90
LCTA/GIS	0	60	175	200	200	$635
Totals	$0	$300	$1,000	$1,000	$1,000	$3,300

* Funding in thousand of dollars.

Thus, the total ITAM budget for this INRMP is estimated at $3,300,000 for 2001-2005. These estimates will be adjusted as needed each year.

15.6 INRMP Implementation Costs

Below is a summary of funding avenues and dollars required for implementation of this INRMP.

TABLE 9: INRMP IMPLEMENTATION COSTS

Type Funds*	FY 99	FY 00	FY 01	FY 02	FY 03	Totals
Sikes Act	9	11	12	12	13	$57
Environmental	2,980	2,520	2,310	2,335	2,325	$12,470
ITAM	0	300	1,000	1,000	1,000	$3,300
Totals	$2,989	$2,831	$3,322	$3,347	$3,338	$15,827

* Funds in thousands of dollars.

Thus, total five-year funding to implement this INRMP will be $15,827,000.

Non-appropriated funds are used to defray outdoor recreation costs, exclusive of hunting and fishing programs, associated with this INRMP. However, these costs are not included within this plan.

15.7 Command Support

Command support is essential to implementation of this Plan. Many high priority projects for natural resources management within the next five years require command support. This Plan has the support of the Fort Huachuca Commander and other personnel in command positions who are needed to implement this INRMP. The Command is dedicated to implementation of this Plan as required by the Sikes Act and

other federal laws. Just as importantly, the Command is dedicated to maintaining and improving the military mission at Fort Huachuca, along with the land and natural resource base for supporting that mission. Implementation of this Integrated Natural Resources Management Plan is a means to that end.

16.0 ENVIRONMENTAL CONSEQUENCES

This section assesses the reasonably foreseeable environmental consequences related to implementing the INRMP to manage natural resources at Fort Huachuca. The assessment below is organized by resource area (as presented in Chapter 5), and includes other specific natural resources-related program areas. The assessment considers implementation of the selected management measures in their entirety (as presented in Appendix 15.4 for the proposed alternative). Cumulative effects are discussed in Section 16.11. Findings and conclusions are presented in Section 16.12.

As discussed in Section 1.6.4, Alternatives, the EA addresses three alternatives:

a. the Proposed Action with full implementation of the INRMP,
b. the No Action alternative, which represents management of natural resources per status quo, and
c. the Other Management Options (OMO) alternative, which uses management strategies not included within the INRMP.

The impact on various systems in the affected environment will be assessed using these three alternatives.

The Proposed Action alternative and the No Action alternative would not have significant negative environmental consequences compared to existing conditions. The OMO alternative could have a wide range of environmental consequences, from very positive to very negative, on various components of the Fort Huachuca environment. The three alternatives differ in their ability to proactively manage natural resources, support the military mission, mitigate environmental impact from the Army mission, and comply with environmental laws. One example of an OMO is an approach that emphasizes reaction to problems to achieve compliance with laws. This approach would emphasize reactions and responses to current needs to support the military mission, as well as site-specific reactions to environmental compliance needs, rather than a proactive, ecosystem approach to natural resources management. Survey and monitoring of natural resources, and long term programs, would be lower priority. Another example would include managing resources to the exclusion of the military mission and public recreation. Such an approach may be beneficial to the ecosystem, but would not achieve other program objectives.

The INRMP provides guidelines for managing natural resources with a course of action to improve the conservation of Fort Huachuca's land and natural resources. The INRMP allows flexibility in management options as more information becomes available from ongoing and planned monitoring and studies. To the extent that Fort Huachuca can implement adaptive management under this INRMP, the Proposed Action can minimize negative and other undesired impacts of natural resources management decisions and activities. It can also increase effectiveness in achieving goals that improve environmental conditions and processes.

The Fort Huachuca INRMP is a dynamic, adaptive document that focuses on a 5-year planning period, and is based on past and present actions. Short-term management practices included in the plan have been developed without compromising long-range goals and objectives. Because the plan will be reviewed annually and undergo a major update at least every five years, additional environmental analyses may be required if new management measures are developed at any time.

16.1 Impacts Common to the Alternatives

No discernible adverse effects were identified or anticipated for any of the three alternatives for the following resource areas: Physiography and Topography, Geology, and Climate.

Under any of the three alternatives, no changes to Fort Huachuca land uses or land use patterns would occur. Because land uses would not be expected to change on Fort Huachuca as a result of any of the alternatives, land use patterns in the surrounding area would not be affected.

All facilities would continue to be maintained and operated in accordance with required permits and capabilities of the systems. The demand for utilities and roads would not be expected to change; and therefore, none of the alternatives would adversely affect facilities.

Under any of the three alternatives, population, housing, and economic conditions would continue in the same manner. Potential effects are not anticipated because none of the three alternatives would involve any activities that significantly change socioeconomic resources.

16.2 Air Quality

An air pollutant is any contaminant present in the atmosphere in sufficient quantities to be detrimental to the public's well being, human health, plant or animal life, or property. Criteria air pollutants are defined as those pollutants for which the federal government has established air quality standards or criteria for outdoor concentrations to protect public health. The air quality of a region is evaluated on the basis of National Ambient Air Quality Standards (NAAQS) for five criteria air pollutants: particulate matter smaller than 10 microns (μm) in diameter (PM_{10}), sulfur dioxide (SO_2), ozone (O3), carbon monoxide (CO), and nitrogen oxides (NO_x). The directly emitted criteria air pollutants are CO, NO_x, SO_2 and suspended particulate matter (PM_{10}). Ozone is a secondary air pollutant resulting from photochemical reactions involving nitrogen oxides (NO_x) and reactive organic gases.

This section identifies current ambient air quality conditions, and policies affecting the Fort Huachuca area, which is located in the Southeast Arizona Air Quality Control region. This region also encompasses the counties of Cochise, Graham, and Santa Cruz. The air quality for the region of influence, which includes Fort Huachuca and the general vicinity, is of primary concern in this EA. The superior air quality in the vicinity of Fort Huachuca is related to favorable wind patterns and a lack of typical major sources of air pollution, such as heavy industry and fossil fuel power plants. Sources of air pollutants in the area include aircraft (military and private), private and military vehicles, and gas heating emissions. Because of these favorable conditions, Fort Huachuca is within an area of air quality attainment for all criteria air pollutants.

Impacts on air quality can be divided into both short-term and long-term. Short-term impacts are usually associated with construction and grading activities, and long-term impacts are typically associated with build-out conditions. Most long-term emissions would be due to increased vehicle use. Reactive organic gas emissions are associated with storing and dispensing fuel used in the operation of project-related training activities and heavy vehicle transportation. A determination of significant impact on air quality could result if either of the following criteria were met:

- Activities would release criteria pollutants that would exceed the federal primary and secondary standards for pollutant species adopted by the State of Arizona.
- Activities are not in conformity with Section 176 of the Federal Clean Air Act for federal actions.

On November 1993, the EPA published the general conformity Final Rule in the Federal Register (58 FR 63214). The purpose of the rule, titled "Determining Conformity of General Federal Actions to State or Federal Implementation Plans" is to ensure that all federal actions conform to the state implementation plan (SIP) applicable to the project site. The applicable regulations are cited in 40 CFR 6, 51 Subpart W, and 93. A "federal action" is defined as any activity engaged in by a federal agency, department, or other entity licensed, permitted, funded, or otherwise supported by a federal entity. "Conformity to SIP" is defined as conformity to a SIP's purpose of eliminating or reducing the severity and number of violations of the NAAQS and achieving expeditious attainment of such standards.

Because of the general conformity rule, federal actions must be evaluated to assess whether emissions associated with the action will interfere with an area's air quality improvement plan. The general conformity rule applies only to federal actions that may emit a criteria pollutant for which an area has been designated as non-attainment or maintenance. While there are areas within Cochise County that are in non-attainment for PM_{10} (near Douglas), emissions from Fort Huachuca do not contribute to the non-attainment of the area. Since the area within which activities will occur is an attainment area, the activities associated with the Proposed Action or any of the alternatives will not result in a violation of the general conformity rule. The procedural requirements of the General Conformity Rule are not applicable to the Proposed Action or alternatives because they would occur entirely within a NAAQS attainment area

16.2.1 Alternative A - Proposed Action

Two categories of activities may have a contribution to air quality impacts if the Proposed Action is implemented. Both categories of activity would result in temporary, transient impacts to local, and possibly regional, air quality. The first involves ground disturbances that may be associated with watershed restoration activities. These include such tasks as revegetation or surface water or runoff management. Each of these will result in temporary, transient impacts to local air quality. The impacts are anticipated to result from wind-borne dust resulting from ground disturbance and the resulting soil loosening and liberation. Ground disturbance may result from grading, ripping, root plowing, trenching or other earthmoving activities involved in native grass seeding, tree planting, or surface water and runoff management. None of these ground-disturbing activities is anticipated to result in significant impacts to regional air quality due to the minor, temporary and transient nature of occasional fugitive dust.

The second category of temporary, transient air quality impact may result from a program of applying prescribed fire to vegetation at Fort Huachuca. Ignition of grass and woody shrubs would produce smoke and airborne ash. All prescribed burns at Fort Huachuca are coordinated through the state smoke management coordinator. This joint federal-state coordination program was established to reduce the impacts of prescribed fire on regional air quality, thus the burns will not have a significant impact on regional air quality. Permits are issued for each prescribed burn during an allowable period, only if conditions are favorable for the burn.

16.2.2 Alternative B - No Action

The No Action is anticipated to produce the same two categories of air quality impacts, fugitive dust and smoke. However, the watershed management and prescribed fire program currently in effect at Fort Huachuca is neither integrated nor regularly scheduled. Therefore the No Action would result in much less fugitive dust and smoke. An exception to this potential impact would result if the No Action alternative resulted in catastrophic wildfire on Fort Huachuca. In such an event, the amount of temporary

smoke and ash would be much greater than any single event of the Proposed Action, and would not be managed through the state smoke management coordinator. During and following such a fire, fugitive dust and ash from the remains of the fire would likely be wind-borne for several months, depending on the time of year of the catastrophic wildfire.

16.2.3 Alternative C - Other Management Options

OMO could vary between the two previously described options, but ultimately would be similar to the No Action impacts. Two examples are described with their impact on air quality:

Implement the watershed program without prescribed fire: Ultimate outcome is likely to be similar to the No Action.

Implement Prescribed Fire without other components of the watershed management program: Ultimate outcome is likely to result in more fugitive dust from loss of ground cover on the East Range, and longer period between prescribed fires in some areas due to sparse vegetation.

16.3 Soils

16.3.1 Alternative A - Proposed Action

Beneficial effects would be expected. The Proposed Action includes an integrated program for the planning, maintenance, and repair of Army lands. Brief periods of increased erosion would appear during damaged sites' maintenance and rehabilitation activities, but these would be relatively minor compared to erosion control benefits. There may be slight increases in erosion during initial aspects of maintenance of trails, roads, firebreaks and other projects that disturb the soil. However, the plan includes provisions to minimize erosion during and following these actions, such as soil stabilization using structures and vegetation. The Proposed Action has evolved over decades of active and successful management on Fort Huachuca. Funding for LRAM, which offers effective protection and mitigation for damages incurred to soils because of the Army mission, would improve under the Proposed Action.

16.3.2 Alternative B - No Action

Slightly beneficial effects would be expected to continue under the No Action alternative. However, the No Action offers a less comprehensive program for the control and repair of damaged soils than the Proposed Action. By failing to implement comprehensive soil resource management, impacts on soils associated with erosion and sedimentation on Fort Huachuca would be expected to continue. The No Action implements less intensive soil resource monitoring, conservation measures, and plans of action to prevent or minimize potential soil problems related to erosion and sedimentation prior to their occurrence. Implementation of the No Action would involve reactive management to problems after their occurrence, or specific event-driven prevention measures, rather than managing the resource comprehensively to prevent impacts or to minimize the extent of unavoidable impacts.

16.3.3 Alternative C - Other Management Options

Other options could range from intensive erosion control programs that would provide relatively good soil protection, to virtually no erosion control or damage prevention. Partial implementation of erosion control programs and not funding LRAM offer a less comprehensive program for the control and repair of damaged soils than the Proposed Action. Less than full implementation of the INRMP would emphasize repairing highly visible and disruptive damage rather than preventing or minimizing such damage to soils.

The potential for Fort Huachuca soils (and associated vegetation) to be negatively affected exists under this alternative, whereas the Proposed Action would be beneficial.

16.4 Water Resources

The INRMP includes brief descriptions of surface and groundwater monitoring. Water quality is a concern to natural resources staff, but is not directly a natural resources program responsibility within the Army environmental program. Rather, due to water quality laws, it is considered a compliance program within the ENRD at Fort Huachuca. Groundwater resource management by ENRD staff encompasses conservation, effluent reuse and aquifer recharge. Because groundwater management is a regional issue, it is discussed further in the Cumulative Impacts section of this chapter.

The INRMP describes programs that have an impact on surface water quality and groundwater use and conservation. Discussions below relate to these programs, but not the water quality and conservation program as a whole.

16.4.1 Alternative A - Proposed Action

Beneficial effects would be expected. The Proposed Action includes an integrated program for planning, evaluating effects, managing and repairing of eroding lands. The Proposed Action describes projects to evaluate and, if needed, minimize and repair sedimentation from eroded land. Brief periods of increased sedimentation are likely during repair and construction activities. These should be more than compensated for by including natural resources implications in military project planning, and the resulting reduction in sedimentation from use of established roads, firebreaks, and repair of eroded sites. Return of LRAM funding would improve the Proposed Action's effects on water. The Proposed Action has been developed over decades of management to deal with threats to water quality at Fort Huachuca. The Proposed Action allows variability in dealing with problems to meet project objectives and maintain water quality. Implementation of the Proposed Action would positively affect groundwater through such programs as xeriscaping (less water use), enhanced aquifer recharge, and land application of treated effluent (reduction in pumping of potable water).

16.4.2 Alternative B - No Action

Slightly beneficial effects would be expected to continue. However, the No Action offers a less comprehensive program than the Proposed Action for control and repair of damaged areas, which

contribute the most sediment to waterways. Minimal implementation of ITAM would reduce planning capabilities of the program, so that emphasis would be on repairing highly visible and disruptive damage rather than preventing or minimizing sedimentation resulting from ongoing military activities. Consequently, sedimentation of surface waters would be greater than under the Proposed Action. Reactive management could reduce water quality monitoring, which could lead to a degradation of watershed water quality.

16.4.3 Alternative C - Other Management Options

OMO likely would provide less protection of water quality and mitigation of sedimentation than the Proposed Action. The other options are not developed specifically to manage Fort Huachuca's military activity impacts on watersheds, particularly if LRAM funding is obtained. The other options range from

intensive, traditional, erosion control programs that would provide relatively good stream protection from sediments, to virtually no erosion control, which would have negative effects on Fort Huachuca's surface water quality over the next five years. Implementation at levels less than the Proposed Action offers less comprehensive control and repair. Consequently, sedimentation of surface waters would be greater than under the Proposed Action. A lower level of implementation would probably achieve compliance with laws, but it would not provide as high a level of protection to watersheds.

16.5 Biological Resources

16.5.1 Alternative A - Proposed Action

Beneficial effects would be expected. The Proposed Action would provide a much more comprehensive management program for faunal and floral resources at Fort Huachuca on an integrated basis. The INRMP uses an ecosystem management strategy to achieve biological diversity conservation, in accordance with the Department of Defense Biodiversity Initiative (The Keystone Center, 1996). It emphasizes the use of native species and the monitoring and control of invasive species, as emphasized on the Presidential memorandum to the heads of federal agencies (Office of the President, 1994) and Executive Order 13112, *Invasive Species*.

Management options selected within the INRMP are the result of decades of on-the-ground management of biological resources on Fort Huachuca as well as countless consultations with local and regional resource management professionals. The INRMP Proposed Action represents the best professional judgment of Fort Huachuca natural resources personnel, as well as those of cooperating partner agencies. The plan includes specific actions to manage the basin and range, semi-arid ecosystem of Fort Huachuca, including wildlife habitat improvement, wildlife population management, cantonment area habitat improvement, protection of special interest natural areas, and an integrated approach to pest management. These programs include monitoring a variety of plants and animals, wetlands protection, grassland rehabilitation and restoration, and forest ecosystem management to maintain and improve wildlife habitat. Means to reduce nonpoint pollution of surface waters are also included. Implementation of this INRMP would provide a methodology to help ensure compliance with laws and regulations affecting biological resources at Fort Huachuca.

The INRMP also provides a means to use biological resources for a variety of human uses, a major tenet of ecosystem management. These uses include military activities and a variety of outdoor recreational uses, including birding, hunting, fishing, camping, and others.

16.5.2 Alternative B - No Action

Slightly beneficial effects would be expected to continue. However, the No Action would be less effective than the Proposed Action because it would foster a less proactive approach to natural resources management. Implementation of this alternative would emphasize responses to current needs to support the military mission as well as site-specific responses to environmental compliance. Surveys and monitoring of natural resources, as well as long-term programs, would be lower priority. This type of management would probably achieve compliance with laws, but it would not provide as many benefits to biological resources.

16.5.3 Alternative C - Other Management Options

The OMO, as a total package, would likely produce a lesser degree of ecosystem-wide benefits, or be detrimental to some biological resources. Below are a few examples of other options and their likely effects:

- Fort Huachuca's forest resources could be managed for commercial production. This would not meet stewardship goals, support biological diversity, or satisfy requirements of threatened and endangered species management because additional roads needed for logging, and reduction of forest canopy, would reduce important habitat and increase erosion.
- Fort Huachuca could be managed for maximum production of game species. This could reduce biological diversity, especially those species that require unique habitats, because habitat requirements of some game species are much different from those of other, often unique, species.
- Fort Huachuca could be managed primarily for maximum protection of nongame species, which could improve conditions for these species somewhat but at a significant cost in terms of human enjoyment of these species. For example, to provide maximum protection, all public access to areas supporting these species might be denied, thus eliminating any potential for disturbance or harassment of individuals.
- Fort Huachuca could allow exotic invasive species to go uncontrolled. This would reduce biological diversity and would be detrimental to native species of vegetation because native species are often outcompeted by nonindigenous species.
- Fort Huachuca landscapes could be more intensively managed for human-related aesthetic qualities, such as closely manicured lawns and precisely trimmed vegetation. This would reduce the amount of wildlife habitat for most native species, increase risks involved with more pesticide/herbicide use, reduce wetlands and associated species, and encourage the spread of exotic plant and animal species.

The OMO likely would produce a less-balanced effect on biological resources than the Proposed Action. However, the degree of effect would be dependent upon objectives of natural resources management and the degree of implementation applied.

The OMO could include greatly increased survey and research efforts and increased management activities, which would probably be more beneficial than the Proposed Action. However, a much higher level of funding would be required to implement such a program, which is unlikely.

16.6 Historic Properties and Cultural Resources

Compliance with the NEPA requires consideration of "important historic, cultural, and natural aspects of our national heritage" but provides no specific definition of these "aspects." Based on statutory requirements, "Historic Properties and Cultural Resources" for this NEPA analysis are considered to include the following:

- Historic properties, as defined in the NHPA.
- Sacred sites, as defined in Executive Order 13007, to which access is provided under the AIRFA.
- Cultural items, as defined in the NAGPRA.
- Archeological resources, as defined in the ARPA.
- Historic and prehistoric resources, as defined by the Antiquities Act.
- Sites that are scientifically significant, as defined by the Archeological and Historic Data Preservation Act.
- Collections, as defined in 36 CFR Part 79, Curation of Federally-Owned and Administered Collections.

As of 2001, prehistoric and historic archeological sites have been recorded on 48,443 surveyed acres of Fort Huachuca (66% of the installation has been surveyed). Of the 328 sites, 234 are prehistoric sites, 39 are historic, and 55 are both prehistoric and historic. Historic considerations include associations of structures or locations with the Apache Scouts and Buffalo Soldiers. A comprehensive description and database for these sites is contained in the 1997 draft *Cultural Resources Management Plan* (CRMP) *for Fort Huachuca Military Reservation Arizona*. An Integrated Cultural Resources Management Plan (ICRMP) is being finalized at this time and will provide guidelines for managing these properties.

16.6.1 Alternative A - Proposed Action

The proposed implementation of the INRMP would be beneficial to the protection of historic, prehistoric, and traditional cultural properties. The INRMP includes steps to protect such sites from damage during implementation of this plan. Ground-disturbing natural resources projects in unsurveyed areas must have site-specific surveys prior to implementation. The review of projects by the archeologist and the NEPA process are used to ensure protection of known and potential historic properties while implementing the INRMP.

The United States has a unique legal relationship with Indian tribal governments as set forth in the Constitution of the United States, treaties, statutes, executive orders, and court decisions. Since the formation of the Union, the United States has recognized Indian tribes as nations under its protection. Executive Order 13175 establishes regular and meaningful consultation and collaboration with Indian tribal governments. Fort Huachuca provides a process that permits elected officials and other representatives of Indian tribal governments to provide meaningful and timely input on actions or policies that might be of tribal interest, such as those actions that affect sacred or Indian cultural sites. Furthermore, Fort Huachuca supports the 1999 DoD Annotated American Indian and Alaska Native Policy.

Implementation of the INRMP will help preserve the Native American heritage in the Fort Huachuca area through the protection of historic properties while implementing natural resources programs. There are no significant direct or indirect impacts to any human populations that would result from the Proposed Action. Fort Huachuca would address, however, any project-specific issues regarding disproportionate or environmental effects on, or direct or indirect impacts to Native Americans should they emerge, and use best environmental management practices to ensure compliance with applicable regulatory requirements.

16.6.2 Alternative B - No Action

The No Action would have slightly beneficial effects on cultural resources. It would not have significant direct or indirect impacts to Native American tribes or related prehistoric or cultural properties. Although Fort Huachuca still must comply with laws and policies related to historic properties, No Action would result in fewer efforts to use natural resources management activities to protect related historic properties, although Fort Huachuca would still be required to comply with laws and policies related to historic properties. The No Action alternative would probably somewhat enhance site-specific surveys prior to implementation of projects because more of Fort Huachuca would remain unsurveyed under this alternative. However, the amount of site-specific survey would be lessened as a result of fewer natural resources-related projects under this alternative.

Fort Huachuca would address, however, any project-specific issues regarding disproportionate or environmental effects on, or direct or indirect impacts to Native Americans should they emerge, and use best environmental management practices to ensure compliance with applicable regulatory requirements.

16.6.3 Alternative C - Other Management Options

The OMO would have no negative effects on historic properties because Fort Huachuca would still have to comply with laws and policies related to historic properties. Some of the options are potential undertakings and could require site-specific historic properties surveys in unsurveyed areas. The amount of survey would be determined by the number of ground disturbing projects proposed for unsurveyed areas.

Fort Huachuca would address, however, any project-specific issues regarding disproportionate or environmental effects on, or direct or indirect impacts to Native Americans should they emerge, and use best environmental management practices to ensure compliance with applicable regulatory requirements.

16.7 Outdoor Recreation

16.7.1 Alternative A - Proposed Action

Management options selected within the INRMP are the result of decades of on-the-ground management of recreational activities on Fort Huachuca. The INRMP Proposed Action represents the best judgment and opinions of Fort Huachuca natural resources personnel, as well as those of cooperating partners. The proposed implementation of the INRMP would provide integrated management of outdoor recreation associated with natural resources at Fort Huachuca. The INRMP supports Army and Defense policies on public access for outdoor recreation. However, implementation of the INRMP could have an impact on certain groups of recreationists. Implementation of a habitat use permit for all “unofficial” uses, primarily birding and caving, would require some additional planning, coordination, and expense for these users. If the current, increasing trend in nature-based tourism continues, and as the effects of that tourism are

further studied and quantified, it may be necessary to develop limits for these types of recreation users based on carrying capacity.

Implementation of the INRMP, particularly the habitat use permit, would have an overall positive effect on natural resources-related outdoor recreation. It would provide additional funding for plant and wildlife monitoring and management. Such funds would support not only the hunting and fishing program but also habitat enhancement for threatened, endangered, and other sensitive species. These funds would also support nonhunting and nonangling recreational uses by providing good quality habitat conditions for recreational activities involving nongame species. Enforcement efforts resulting from the habitat use permit would have positive effects on the overall environment by enhancing outdoor experiences for visitors through educational efforts and by minimizing abuses of natural resources.

16.7.2 Alternative B - No Action

No Action would have slightly beneficial effects on outdoor recreation. However, recreational activities as a whole would be managed under a less integrated approach. The habitat use permit system would not be implemented. Nature-based tourism would not be studied or quantified, resulting in a management scheme focused on reactive management with regard to these issues, rather than one that anticipates recreation-based impacts. Additional funding generated by the habitat use permit would not be available, which would limit enhancement of the fish and wildlife program, threatened and endangered species habitat-related projects, and natural resources enforcement.

16.7.3 Alternative C - Other Management Options

There are many options available for outdoor recreation, but they must be consistent with accomplishment of the military mission to be viable. They must also be consistent with the ecosystem management strategy employed to protect and use natural resources as well as overall goals for outdoor recreation on the military installation. The OMO, as a total package, would likely produce a lesser degree of coordinated efforts, which allows numerous activities to occur simultaneously. However, the program could be decreased or expanded to whatever level can be supported by Fort Huachuca.

16.8 Environmental Justice

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations*, directs federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental impacts of their program, policies, and activities on minority or low income populations in the surrounding community.

This Executive Order:

- requires federal agencies to identify disproportionately high adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations;
- promotes greater public participation of low-income and minority groups in federal programs related to health or the environment;
- promotes enforcement of all health and environmental statues in geographic areas with low-income or minority populations; and
- promotes improved research and data collection relating to the health and environmental conditions of low-income or minority populations.

The ethnic diversity within Cochise County population is comprised of 5% African-American, 2% Asian and Pacific Islanders, 1% Native American, 12% other, and the remaining 80% as unspecified white/Caucasian. About 31% of the population distributed among the various race identifiers, are also of Hispanic origin.

The ethnic diversity within the City of Sierra Vista population is comprised of 16% Hispanic, 11% African-American, 4% Asian and Pacific Islanders, 1% Native American, 6% other, and the remainder as unspecified white/Caucasian. Census data also indicates that none of the neighborhoods adjacent to, or within 1 mile of, Fort Huachuca have populations with a majority (>50%) of either non-white or low-income residents (U.S. Bureau of the Census, 2000).

16.8.1 Alternative A - Proposed Action

Implementation of the INRMP will not result in significant direct or indirect impacts to any human populations. There are no disproportionate impacts to minority or low-income populations as a result of the Proposed Action. Fort Huachuca would address, however, any project-specific issues regarding disproportionate adverse health or environmental effects on minority or low-income groups, or disproportionate adverse health or environmental effects on children. Should they occur, best environmental management practices will be used to ensure compliance with applicable regulatory requirements.

16.8.2 Alternative B - No Action

No Action would not create any advantage or disadvantage for any group or individual and would not be expected to create disproportionately high or adverse human health or environmental effects on minority or low-income populations or communities within or surrounding Fort Huachuca. Fort Huachuca would address, however, any project-specific issues regarding disproportionate adverse health or environmental effects on minority or low-income groups, or disproportionate adverse health or environmental effects on children. Should they occur, best environmental management practices will be used to ensure compliance with applicable regulatory requirements.

16.8.3 Alternative C - Other Management Options

The implementation of OMO addressed within the INRMP would have no significant direct or indirect disproportionate impacts to minority or low-income populations. Fort Huachuca would address, however, any project-specific issues regarding disproportionate adverse health or environmental effects on minority or low-income groups should they occur, and use best environmental management practices to ensure compliance with applicable regulatory requirements.

16.9 Protection of Children

Executive Order 13045, *Protection of Children from Environmental Health Risks and Safety Risks* (April 21, 1997) recognizes a growing body of scientific knowledge demonstrating that children may suffer disproportionately from environmental health risks and safety risks. These risks appear because children's bodily systems are not fully developed; because they eat, drink, and breathe more in proportion to their body weight; because their size and weight may diminish protection from standard safety features; and because their behavior patterns may make them more susceptible to accidents.

The President directed each federal agency to make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children. The President also directed each federal agency to ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health or safety risks.

16.9.1 Alternative A - Proposed Action

Children are generally not exposed to natural resources management activities on Fort Huachuca. The exception may be children who participate in outdoor recreation on the installation. The Proposed Action alternative would not have a disproportionate environmental health risk or safety risk to children. Fort Huachuca would address, however, any project-specific issues regarding disproportionate adverse health or environmental effects on children and use best environmental management practices to ensure compliance with applicable regulatory requirements.

16.9.2 Alternative B - No Action

The No Action would not be expected to create disproportionately high or adverse human health or environmental effects on children. Fort Huachuca would address, however, any project-specific issues

regarding disproportionate adverse health or environmental effects on children and use best environmental management practices to ensure compliance with applicable regulatory requirements.

16.9.3 Alternative C - Other Management Options

The OMO would not have a disproportionate environmental health risk or safety risk to children. Fort Huachuca would address, however, any project-specific issues regarding disproportionate adverse health or environmental effects on children and use best environmental management practices to ensure compliance with applicable regulatory requirements.

16.10 Transboundary Issues

No impacts to the Mexican side of the international boundary are anticipated from this action, regardless what alternative is selected. The actions would occur downstream and down gradient of the international boundary.

16.11 Cumulative Impacts

Cumulative impacts are defined in the CEQ regulations (40 CFR 1500-1508) as those impacts attributable to the Proposed Action and alternatives combined with other past, present or reasonably foreseeable future impacts regardless of the source or agency causing them. This cumulative impact analysis looks at the impacts of the Proposed Action and alternatives in connection with related past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. However, to be considered, a cumulative impact must occur in a common locale or region, not be localized, impact a particular resource in a similar manner, and be long-term (short-term impacts would be temporary and would not typically contribute to significant cumulative impacts).

16.11.1 Analysis of Cumulative Impacts

Analysis of cumulative impacts requires the evaluation of a broad range of information that may have a relationship to the Proposed Action and alternatives. A good understanding of the politics, sociology, economics, and environment of the region is key to this analysis, as is an accurate evaluation of factors that contribute to cumulative impacts. The most common regional and local environmental concerns voiced during previous public scoping activities included: trends relating to water resources, trends affecting ecological resources (particularly federally-listed species and their habitats), population growth and economic activity in the Fort Huachuca/Sierra Vista area, and the resulting implications on water and ecological resources in the region.

All resource areas were examined to determine how the Proposed Action and alternatives might contribute to regional trends or environmental conditions. Impacts from the Proposed Action and alternatives were determined to have no substantial contribution (and no significant impact) to regional trends or conditions or the environment for the following resources: noise, transportation, public services, utilities, energy, public hazards, health, and safety. These areas are not discussed further from a cumulative impact perspective.

16.11.2 Air Quality

As mentioned in section 16.2, the regional air quality is generally good and meets the federal standards as an air quality attainment area. Regional contributors to air quality reductions include Fort Huachuca; Apache Nitrogen; commuter automobile traffic; unspecified contributions from Mexico associated with mining and agriculture; prescribed vegetation burns by the USFS, BLM, NPS, and private land managers; and fugitive dust and vegetation-burning associated with private and commercial land development. None of the alternatives will contribute significantly to declines in regional air quality. Again the exception to this would be in the event of an unplanned, catastrophic wildfire, which may have temporary but significant impact. Implementation of the Proposed Action has been determined to be the optimum management action to prevent such an occurrence starting on Fort Huachuca.

16.11.3 Soils

Maintenance of soils is regionally important for multiple reasons. Loss of soils through wind or water erosion leads to a reduction in the quality and quantity of vegetation cover. Less vegetation results in more erosion, which either ends up as sediment in the San Pedro River bed, or leaves the area in muddy water flowing in the river. This muddy water has different impacts on life in the river and the shape of the

river channel. Clearer water is usually more beneficial to riparian species. Soil erosion and loss of integrity could significantly affect the capability of the land to support the Fort Huachuca military mission, and could have detrimental effects on neighboring areas, such as the SPRNCA. The Proposed Action would protect soils to the greatest extent possible and still allow the completion of the current mission, minimizing the potential for cumulative effects. Cumulative effects to soil integrity would be more obvious in areas intensively used for training. Implementation of the LRAM component of ITAM and other soil related management practices within the INRMP would significantly minimize cumulative effects of lesser soil management programs. Both the No Action and the OMO would contribute less to the management and maintenance of soils in the region, and result in more sediment in the river than the Proposed Action. However, none of the alternatives, if implemented, would have a significant impact on regional soil conditions.

16.11.4 Hydrology and Water Resources

Groundwater

The cumulative impacts on water resources in the region are important to the sensitive wildlife and habitat of the USPB watershed. Factors potentially affecting the region's riparian ecosystems through impacts to groundwater include: increased residential and economic development; increased agricultural pumping; water use along the river, both human and natural; potential pollution in Mexico; and cones of depression from well withdrawals. Current groundwater pumping in the Sierra Vista subwatershed exceeds natural recharge. A consensus of scientific opinion concludes that continued and projected aggregate pumping may impact portions of the Upper San Pedro River, and thereby, may threaten listed species and their critical habitat. The PBO estimates that total groundwater pumping within the subwatershed is approximately 9,400 acre-feet annually. This contributes to an estimated annual deficit of approximately 7,000 acre-feet. The 1999 PBO attributes 5,121 acre-feet of groundwater pumping within the Sierra Vista subwatershed to Fort Huachuca's presence, which represents 54% of groundwater pumping in subwatershed. Since the PBO, Fort Huachuca has reduced its water pumpage by 512 acre-feet, or 1,843 acre-feet for the year 2000. Additionally, Fort Huachuca and the City of Sierra Vista are pursuing methods to increase annual recharge to the regional aquifer. Both the City of Sierra Vista and Fort Huachuca are constructing effluent recharge basins that will recharge approximately 3,250 acre-feet annually once completed in 2002. Additional projects to reduce the deficit pumping are in planning and will be announced as development allows.

In the 1999 Memorandum of Agreement between the U.S. Army and the USFWS, Fort Huachuca committed to supporting the Upper San Pedro Partnership (USPP) goals of sustaining base flows in the San Pedro River and addressing the indirect, interrelated, and interdependent effects of Fort Huachuca's presence in the region, and the cumulative effects from all sources on threatened and endangered species along the San Pedro River. The USPP consists of the following federal, state, and local agencies and non-governmental organization: Fort Huachuca, BLM, USFS, NPS, USGS, ARS, ASLD, ADWR, ADEQ, Arizona Association of Conservation Districts, Cochise County, Sierra Vista, Huachuca City, Bisbee, Tombstone, Hereford Natural Resource Conservation District, and The Nature Conservancy. Fort Huachuca, the City of Sierra Vista, and other USPP members are actively exploring and pursuing methods to effectively manage water resources within the region.

The Proposed Action is anticipated to contribute to groundwater through increases in recharge as a result of slowing storm runoff, detaining small quantities of urban runoff for wildlife use and recharge, and reducing destructive erosion which can lead to lowering groundwater levels. Contributions to improved groundwater quality are also anticipated. These include maintaining natural soil-aquifer treatment for infiltrating, recharging stormwater, by reducing erosion of those soils through which the water can infiltrate. Both the No Action and the OMO would contribute less through natural resources management to retention of stormwater and recharge of groundwater in the region. However, none of the alternatives, if implemented, would have a significant impact on regional groundwater aquifers or supply.

Surface Water

Regional surface water issues involve water quality in the San Pedro River, and secondarily its tributary the Babocomari River. The scope of this issue regionally includes impacts of potential water quality degradation on aquatic wildlife. Pollutant releases occurred historically in the USPB because of intense rainstorms causing breach or emergency release from tailings or holding ponds, or release of sewage or mining wastes, and severely impacted surface waters in the San Pedro River. Parts of the river are impaired under Section 303d of the Clean Water Act, according to the EPA, and the parameters of concern are fecal coliform, nitrates and turbidity. The historic pollutant and holding pond releases were not wastes or facilities associated with Fort Huachuca, and the installation has neither such sewage lagoons nor landfill facilities to fail structurally. Erosion from Fort Huachuca, particularly degraded land on the East Range, is a potential source of sediments and turbidity in the Babocomari and San Pedro River channels. Fort Huachuca has completed a Stormwater Pollution Prevention Plan (SWPPP) for all activities that involve the disturbance of one or more acre. Best Management Practices for erosion control and stormwater management are included in the SWPPP. Conformance with the erosion control requirements in the plan will reduce potential water quality impacts to below a level of significance.

The Proposed Action would further protect regional surface waters from sedimentation to the greatest extent possible while still allowing completion of the current mission, thus minimizing the potential for cumulative effects. Implementation of the LRAM component of ITAM and other erosion prevention practices within the INRMP would minimize any cumulative effects of less active land and runoff management. Active conservation of vegetation cover on the land, via reductions of fuel load and catastrophic wildfire risk in forests, and management and restoration of grasslands, will reduce stormwater runoff and soil erosion into regional surface waters. Increased riparian protection and improved road maintenance practices in riparian areas also are expected to minimize sediment movement into the San Pedro and Babocomari Rivers. The No Action and the OMO would contribute somewhat less in the way of natural resources management to surface water protection in the region. However, with the SWPPP already in place, none of the alternatives, if implemented, would have a significant impact on regional surface water.

16.11.5 Biological Resources

Vegetation

Conservation and management of vegetation is regionally important for multiple reasons. Forest vegetation provides habitat for listed species that require very large areas of suitable forest cover and structure to maintain viable populations, most notably federally threatened Mexican spotted owls. These same forests have accumulated increased woody fuel load for decades from fire suppression. Wildland fire is therefore an increasing regional threat in scale and severity. Catastrophic wildfire is the primary threat to persistence and recovery of the owl. Wildfire is also a significant public safety concern, particularly in the wildland urban interface along the eastern side of the Huachuca Mountains. Encroachment of woody species throughout grasslands in the USPB is a factor in regional decreases in the amount and ecological functioning of native grasslands, as well as their fragmentation into more disconnected and smaller patches.
Prescribed fire is used on public and private land to maintain grasslands, and smoke management is a regional interagency coordination effort for air quality.

Fort Huachuca maintains a Memorandum of Understanding with the USFS for mutual aid in suppressing major fires. The fire crew funded under this arrangement is also available, when not on a fire, to help with pruning, thinning and other fuel load reduction treatments on post. Such treatments can reduce risk of fire spread onto adjacent lands. Fuel load mapping and fire effects research and monitoring actions on post are designed to provide information applicable to regional wildland fire planning and management needs. Grassland restoration on post, and use of prescribed fire for grassland management, is proposed to optimize the amount, and sustain the ecological integrity and functions, of native grassland. Smoke management coordination as aspects of regional air quality is addressed in section 16.11.2. However, Fort Huachuca grassland land restoration efforts can not offset loss of grassland acreage from development of private land in the USPB.

Beneficial impacts on these regional vegetation trends and issues are expected from the Proposed Action. Both the No Action and the OMO would contribute less to the management and maintenance of grassland, woodland and forest communities in the region. Neither of these latter alternatives, if implemented, would be expected to have a significant impact on regional vegetation conditions or trends.

Nonindigenous, Invasive Species

Another regional biological resource issue is the intrusion of nonindigenous species into the area, and the accompanying displacement of vulnerable native species. Some nonindigenous species have shown the ability under current conditions to outcompete native species. These include fish species in the San Pedro River, bullfrogs, crayfish, grasses (e.g., Johnsongrass, Bermuda grass and Lehmann's lovegrass), and tamarisk. Several programs introduced by Fort Huachuca address these concerns. The Proposed Action includes preventive measures against introductions of some nonindigenous species, controlling persistence or spread of others, and removal of individuals in specific sensitive locations, usually riparian or wetland. Experimental investigation and treatments of Lehmann lovegrass, its ecological effects, and its response to fire at the grassland community level are anticipated to refine approaches taken to control its spread. Signs and environmental awareness efforts are expected to increase public understanding of threats and issues surrounding unauthorized release of nonindigenous species and their unintentional spread. The Proposed Action is expected to have some beneficial impact on invasive, nonindigenous species regionally. The No Action and the OMO would not be expected to have any significant regional impact on these issues.

Wildlife

The Proposed Action, in concert with other land and water conservation actions in the United States and Mexico portions of the Upper San Pedro Basin, are expected to benefit riparian habitat in the Upper San Pedro River watershed. The action is anticipated to help preserve wildlife corridors between the Huachuca Mountains and the San Pedro River, which is recognized as increasingly important in the midst of ecological fragmentation in the UPSB. A reduction of 4,000 acre-feet of groundwater pumping per year is anticipated through other fort water management actions, equivalent to an availability of approximately 5 cubic feet per second of river flow annually. This availability may not show up as in-channel flow, because it could be intercepted by riparian vegetation or held as bank storage in the alluvial aquifer. In combination with other habitat management activities by other federal agencies, the acreage, spatial distribution and ecological integrity of riparian habitat should increase in the Upper San Pedro watershed and the rest of the Huachuca Mountains.

The Proposed Action, in combination with mid to upper elevation forest conservation actions in the isolated mountains of southeastern Arizona and northeastern Sonora, are expected to benefit both migratory birds and larger, dispersing animals that require more forest habitat to sustain viable populations than a single mountain range provides. The Upper San Pedro Valley is a major neotropical migrant bird corridor. Woodlands and forest habitats in the Huachuca Mountains are considered an unquantified, but important, habitat resource for migrating birds. Proposed forest management, snag and nest tree protection, and wildfire management for natural resource benefits should sustain biologically and structurally diverse habitat for migrating or dispersing wildlife among the Huachuca Mountains and adjacent ranges. Proposed forest habitat management actions to improve and increase wild turkey habitat is anticipated as an important step in interagency plans to reestablish turkey in other mountain ranges in southeastern Arizona.

The Proposed Action for conservation of native grasslands are expected to benefit other species of neotropical migrant birds, as well as to provide wintering habitat for several sensitive bird species. The Proposed Action is not anticipated to have any significant impact on larger wildlife species that require large expanses of grasslands to maintain viable populations. The No Action would not be expected to have any significant regional impact on regional wildlife issues, but the OMO would be anticipated to have slight beneficial impacts for population viability of some species.

Endangered and Protected Species

Cumulative impacts to listed and candidate species on Fort Huachuca and in the greater region (including the Patagonia Mountains, Canelo Hills, and SPRNCA) are the result of the complex interactions of several different trends. The fort's water resource use and conservation as discussed above is a factor in the overall future of local ecological processes and habitats that support protected species. It addresses both groundwater and local riparian concerns, and will provide an important long-range contribution to the overall proper functioning of the region's ecosystem, particularly that of the SPRNCA. This NCA is designated Critical Habitat for a number of species (bird, plant, and fish), and serves as a significant international migratory bird corridor in the Southwest.

Because of Fort Huachuca's activities, the Army's unintended impact on ecological resources is diminishing. This positive trend will continue and strengthen under the Proposed Action. Implementation of the Proposed Action would benefit the fort's efforts to improve regional groundwater conditions and support recovery of listed and candidate species. However, regional population growth and economic activity not associated with the fort (and resulting increases in private groundwater consumption in the Sierra Vista subwatershed) may overshadow and offset these efforts.

In the larger regional and international context, Fort Huachuca's contribution to cumulative impacts on listed and protected species has been positive for many years. Fort Huachuca serves as a federal

protectorate of several federally-listed, candidate and protected species and their habitats on post. Both independently and together, various components of the Proposed Action are expected to have beneficial impacts on habitat protection and management efforts for listed species on the fort and in the region. The No Action and the OMO would be expected to have no significant impact on regional endangered species or their critical habitat.

16.11.6 Historic Properties and Cultural Resources

Cultural resources within the Upper San Pedro Basin, and specifically the Hereford to Benson area, encompass sites spanning approximately 12,000 years, from the Paleoindian Period to the present. Numerous excavation sites document the extent and characteristics of these past cultures located in both the river valley and on Fort Huachuca. Three Clovis mammoth kill sites have been found and excavated within 30 miles of the fort.

The area holds a prominent position in the cultural history of the southwestern United States. In addition to the prehistoric and protohistoric cultures, Fort Huachuca holds special historic significance for the Apache, Apache Scouts, and African American Buffalo Soldiers. Many cultural sites at Fort Huachuca have high scientific value and provide excellent opportunities for public education and interpretation.

Prehistoric archaeological sites on Fort Huachuca, and the region, tend to be associated with the canyons and larger drainages. Historic sites tend to be clustered within the developed area of the Fort Huachuca, along the San Pedro River, or associated with old mines or ranching homesteads.

Numerous sites, both prehistoric and historic, are considered “eligible” or “potentially eligible” for listing in the National Register (Statistical Research Inc., 1995). Evaluation and listing of sites will be a long-term effort, given the large number of sites and limited resources. Cultural resource sites on Fort Huachuca are generally better protected and in better condition than nearby sites off the installation. As an active military facility, a large number of operational activities (training, maneuver, equipment testing, live fire, and facilities management) can potentially disturb cultural resources. Because most of the installation is also generally open to public recreational use, the public also presents some potential for alteration of sites. In addition, natural events such as flooding, silt deposition, erosion, and wildfire can damage cultural resources. Finally, particularly with respect to the pictograph sites and historic buildings, ongoing weathering and gradual deterioration must be addressed.

Some INRMP activities target reducing or reversing stream entrenchment and down cutting through erosion control measures. The specific locations for some of these ground-disturbing activities have not yet been surveyed for cultural or historic resources because the exact site layout for these facilities has not been determined. Prior to any site-specific construction, a site-appropriate survey will be conducted under the direction of the Post Archaeologist. If any sites of archaeological significance are discovered during earth-moving activities associated with construction, all activity will stop immediately pending a review by the Post Archaeologist. Sites either will be bypassed or mitigated, as determined by the Post Archeologist in consultation with the State Historic Preservation Officer and representatives of the affiliated Native American tribes. Following the watershed improvement projects aimed at reducing erosion and slowing the storm runoff from the fort, down-gradient sites both on and off the fort will be better protected from loss through erosion.

Current land development off the installation is not required to meet the same standards to detect and preserve or mitigate historic and cultural sites. Given the rate of local development in the region, some sites and associated artifacts are undoubtedly lost. Activities associated with INRMP activities will neither contribute to nor slow this land development.

Given the precautions that will be taken, and that little activity will occur in the vicinity of the historic landmark district on the fort, it is unlikely that the activities associated with the implementation of the INRMP, or any of the alternatives, will have a significant impact on regional historic or cultural resources.

16.11.7 Socioeconomic

Population growth in the Sierra Vista area has resulted in relatively low-density housing and commercial development similar to many other communities in Arizona. The off-post developed areas have expanded quite rapidly in recent years, converting large stretches of previously undeveloped grassland primarily used for grazing and recreational activities to low density residential areas. Approximately 1000 acres of land is projected to be developed in the Sierra Vista area within the next 10 years. On post, by contrast, the total developed area is less extensive than during the peak WW II years, because many of the structures from that era no longer exist. Due to external pressure for land, 333 acres of fort land has or may transfer to non-federal entities between 2001 and 2003. An additional 150 acres of fort land, primarily grassland, may be developed for fort projects over the next several years.

Based on the 2000 census, population growth in the region was slower than anticipated. Sierra Vista was 57th in terms of growth in the State and Huachuca City actually lost population. Future growth of the region, which is estimated at approximately 2% per year, will result in continuing expansion of the off-post, urbanized area unless significant changes in the planning and zoning policies of Cochise County, Sierra Vista, and Huachuca City occur. Within Fort Huachuca's boundaries, the installation will continue to plan its future land uses. Regardless of which alternative to the Proposed Action is selected for implementation, this growth in the local community is anticipated to continue.

Fort Huachuca currently has a civilian payroll of approximately $146 million. This action is not anticipated to increase the fort's civilian payroll or have an impact on regional sales.

16.12 Findings and Conclusions

Analysis of the different implementation options is summarized in the table below.

Table 10: Summary of Potential Environmental Consequences

Resource Area*	Environmental Consequence		
	Other Management Options	No Action	Proposed Action
Physiography/Topography	Variable	No Effect	No Effect
Geology	Variable	No Effect	No Effect
Soils	Variable	Slightly Beneficial	Beneficial
Water Resources	Variable	Slightly Beneficial	Beneficial
Climate	Variable	No Effect	No Effect
Biological Resources	Variable	Beneficial	More Beneficial
Historic Properties	Variable	Beneficial	More Beneficial
Outdoor Recreation	Variable	Beneficial	More Beneficial
Environmental Justice	Variable	No Effect	No Effect
Protection of Children	Variable	No Effect	No Effect
Cumulative Effects	Variable	Beneficial	More Beneficial

* Resource areas in this column are those presented in Chapter 5.0 - Affected Environment, and selected other natural resources related programs within the INRMP. Cumulative Effects (see Section 16.9) have been added to this table.

No Effect: Actions have no known demonstrated impacts.
Beneficial: Actions have apparent beneficial effects. (Note: The terms “slightly” or “more” added for comparison purposes.)
Variable: Actions could have a wide range of effects.

Adoption of the No Action alternative would mean that this Fort Huachuca INRMP would not be implemented, and current natural resource management practices at Fort Huachuca would continue “as is.” As shown, no significant or adverse effects would be expected. However, under No Action, environmental conditions at Fort Huachuca would not benefit from management measures associated with implementing the proposed INRMP. While the analysis of existing (*i.e.*, baseline) conditions identifies no serious environmental concerns, current natural resources management practices provide for less comprehensive conservation, management, and restoration of Fort Huachuca’s natural resources. This condition conflicts with Fort Huachuca’s underlying need to train soldiers in a realistic natural setting while simultaneously meeting mission requirements and complying with environmental regulations and policies. Therefore, implementation of the No Action alternative is not favored.

Other Management Options were fully considered and evaluated. The Other Management Options were not selected because they were economically unfeasible, ecologically unsound, or incompatible with requirements of the military mission.

The Proposed Action has evolved over decades of active and successful management on Fort Huachuca lands. The Proposed Action alternative represents the best judgment and opinions of natural resources management professionals, and is based on many years of experience with managing the natural resources on the installation and the best scientific knowledge available. Potential environmental consequences associated with implementing the INRMP would result in either no effects or beneficial effects for resource areas. Compared to both alternatives, environmental conditions at Fort Huachuca would improve as a result of implementing the INRMP.

Implementing the Fort Huachuca INRMP would not significantly impact the environment. Potential impacts on wildlife habitat will be minimized by full implementation of restorative and proactive wildlife management provisions in the INRMP. The plan would reduce impacts to soil, water, and biological resources, and thereby avoid violations of federal and State laws, including the Sikes Act, Endangered Species Act, Clean Water Act, and NEPA. Full implementation would allow the Army to manage its natural resources at Fort Huachuca in a proactive manner to meet current and future conservation needs.

Implementing the INRMP or any of the alternatives does not constitute a major Federal action significantly affecting the quality of the environment and therefore an Environmental Impact Statement will not be prepared. A Finding of No Significant Impact will be published.

16.3 Distribution List

Comments from the public on the Proposed Action are welcome. Address comments to:

Commander, U.S. Army Garrison,
Environmental and Natural Resources Division
ATTN: ATZS-ISB (Ms Kent)
Fort Huachuca, Arizona 85613-6000

Copies of this document are available at the Sierra Vista and Benson Public Libraries and at the U.S. Army Garrison Public Affairs Office at Fort Huachuca, telephone number (520)533-2752. Copies may be reviewed or obtained at the Environmental and Natural Resources Division Office at Fort Huachuca, telephone number (520)533-3120.

Interested parties and individuals who have been mailed copies of this EA are listed below.

United States Department of the Interior
Bureau of Land Management
San Pedro National Riparian Conservation Area
1763 Paseo San Luis
Sierra Vista, Arizona 85635

United States Department of the Interior
U.S. Fish and Wildlife Service
Arizona Ecological Services Field Office
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U.S. Fish and Wildlife Service
Arizona Ecological Services
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Arizona Game and Fish Department
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Arizona State Land Department
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Environmental Protection Agency, Region IX
Office of Federal Activities CMD-2
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Director
Arizona Department of Water Resources
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Cochise County Board of Supervisors
1415 West Melody Lane, Building B
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City of Sierra Vista
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Sierra Vista, Arizona 85635

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Friends of the San Pedro, Inc.
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ACRONYMS

ACTS	Army Compliance Testing System
ADEQ	Arizona Department of Environmental Quality
ADWR	Arizona Department of Water Resources
AEC	Army Environmental Center
AEROSTAT	radar system drug surveillance balloon
AGFD	Arizona Game and Fish Department
AIRFA	American Indian Religious Freedom Act
ARPA	Archaeological Resources Protection Act
ARS	Agricultural Research Service
ASA	Army Security Agency
ASLD	Arizona State Land Department
AZ ANG	Arizona Air National Guard
AZ ARNG	Arizona Army National Guard
BLM	Bureau of Land Management
BO	Biological Opinion
CEQ	Council on Environmental Quality
COE	U.S. Army Corps of Engineers
CX	Categorical Exclusion
DA	Department of the Army
DIS	Directorate of Installation Support
DoD	Department of Defense
DPS	Directorate of Public Safety
DRMO	Defense Reutilization and Marketing Office
EA	Environmental Assessment
ECAS	Environmental Compliance Assessment System
ENRD	Environmental and Natural Resources Division
EPA	Environmental Protection Agency
EPO	Environmental Protection Officer
EPR	Environmental Program Requirements
ESA	Endangered Species Act
ESMP	Endangered Species Management Plan
FLPMA	Federal Land Protection and Management Act
FNSI	Finding of No Significant Impact
GIS	Geographic Information System
GPS	Global Positioning System
ICRMP	Integrated Cultural Resources Management Plan
INRMP	Integrated Natural Resources Management Plan
IPA	Intergovernmental Personnel Act
IPM	Integrated Pest Management
ISA	Interservice Support Agreement
ITAM	Integrated Training Area Management
LAAF	Libby Army Airfield
LCTA	Land Condition Trend Analysis
LRAM	Land Rehabilitation and Maintenance
LSPB	Lower San Pedro Basin
MCA	Military Construction Army
MO ANG	Missouri Air National Guard

MP	Military Police
MWR	Directorate of Moral, Welfare, and Recreation
NAGPRA	Native American Graves Protection and Repatriation Act
NEPA	National Environmental Protection Act
NHPA	National Historic Preservation Act
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
OMO	Other Management Options
O&M	Operations & Maintenance
ORISE	Oak Ridge Institute of Science and Education
ORV	Off-Road Vehicle
PAC	Protected Area Center
PAO	Public Affairs Office
PBO	Programmatic Biological Opinion (and its amendments)
PMO	Provost Marshal Office
RATO	Rocket-assisted takeoff
REC	Record of Environmental Consideration
RU	Recovery Units
SHPO	State Historic Preservation Office
SJA	Staff Judge Advocate
SPRNCA	San Pedro Riparian Natural Conservation Area
STRATCOM	U.S. Army Strategic Communications Command
TRADOC	U.S. Army Training and Doctrine Command
TRI	Training Requirements Integration
UAV	Unmanned Aerial Vehicles
USAICS	U.S. Army Intelligence Center and School
USAIC&FH	U.S. Army Intelligence Center and School and Fort Huachuca
USASC	U.S. Army Signal Command
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geologic Survey
USPB	Upper San Pedro Basin
WSCA	Wildlife Species of Concern in Arizona
WWTP	Waste Water Treatment Plant

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN AND ENVIRONMENTAL ASSESSMENT U.S. ARMY INTELLIGENCE CENTER AND FORT HUACHUCA, ARIZONA

APPENDICES

APPENDIX 2.3.1.1: Items of Cooperation Between the U.S. Fish and Wildlife Service, Arizona Game and Fish Department, and the U.S. Army Intelligence Center and Fort Huachuca, Arizona

PURPOSE: The purpose of this document is to specifically list items to be provided by the Arizona Game and Fish Department (AGFD), U.S. Fish and Wildlife Service (USFWS), and Fort Huachuca for cooperative implementation of the Fort Huachuca Integrated Natural Resources Management Plan. Items not specifically listed will generally be the responsibility of Fort Huachuca unless the other agencies agree to assist with their implementation.

AUTHORITY: In accordance with the authority contained in Title 10, U.S. Code, Section 2671, and Title 16, U.S. Code, Section 670 the Department of Defense, the Department of Interior, and the State of Arizona, through their duly designated representatives whose signatures appear on the Fort Huachuca Integrated Natural Resources Management Plan, specifically approve the Integrated Natural Resources Management Plan and the below specific items of cooperation among the three agencies.

MUTUAL AGREEMENT:

X Persons hunting or fishing the lands or waters of Fort Huachuca shall be required to obtain special Fort Huachuca hunting or fishing licenses unless exempt by Fort Huachuca regulations. Funds derived from the sale of these licenses will be used exclusively for the implementation of the fish and wildlife portions of the Fort Huachuca Integrated Natural Resources Plan in accordance with Army regulations and the Sikes Act. Fees charged shall be established by the installation in accordance with Army regulations. Persons guilty of violating the requirement for these special licenses may be prosecuted under 10 USC 2671(c).

X Persons hunting or fishing the lands of Fort Huachuca must purchase State licenses, tags, and stamps as required by AGFD, unless exempt by AGFD regulations. The AGFD agrees that military personnel stationed in Arizona for a period of thirty days immediately preceding the date of application for a license may purchase hunting and fishing licenses at resident prices.

X A Federal waterfowl stamp is required for hunting waterfowl as prescribed by Federal laws.

X All hunting and fishing on Fort Huachuca will be in accordance with federal and State fish and game laws.

X Representatives of the AGFD and the USFWS will be admitted to the installation at reasonable times, subject to requirements of military necessity and security. Such personnel may use U.S. Army transportation on a nonreimbursable basis, to include aircraft, for wildlife related functions on Fort Huachuca provided such transportation is available without detriment to the military mission.

X The AGFD and USFWS shall furnish technical assistance for development and implementation of professionally sound natural resources programs on Fort Huachuca provided funding for such support is available.

X Fort Huachuca shall furnish assistance and facilities to the AGFD and/or USFWS for mutually agreed upon natural resources research projects. It shall be the policy of the Commanding General, Fort Huachuca to encourage and support research conducted by the participating agencies. To this end, suitable land areas, animals, facilities, and personnel may be made available at the Commanding General's discretion, when requested, providing the proposed

studies are compatible with, and in no way limit, accomplishment of the military mission.

X No nonindigenous species of fish or wildlife will be introduced on Fort Huachuca lands except under extraordinary circumstances and without prior written approval of the Army, AGFD, and the USFWS.

X The AGFD shall establish season and bag limits for harvest of game species on Fort Huachuca. Fort Huachuca may make special requests for such regulations according to procedures established by AGFD. Requests for regulations not in accordance with those established statewide will be based on data specific to Fort Huachuca or designed to meet Fort Huachuca's training schedules.

X Hunting and fishing on Fort Huachuca will be authorized and controlled by the installation commander in accordance with locally published installation regulations promulgated in compliance with applicable Federal and State laws, Army regulations, military requirements, and the Integrated Natural Resources Management Plan.

X Fort Huachuca will operate biological check stations to collect harvest data required by AGFD and Fort Huachuca. The AGFD may collect additional data on fish or wildlife resources at Fort Huachuca with approval of Fort Huachuca for access to training lands.

X Public access for hunting and fishing is approved under a system of controls established by Fort Huachuca in cooperation with AGFD. Should there be a need for quotas on the number of hunters permitted on a daily or seasonal basis for reasons of safety or recreational carrying capacity, such quotas will not be instituted prior to consultation with the AGFD.

X Hunting and fishing will be allowed only in areas where there is no conflict with military training activities and no unreasonable safety hazard to participants, military personnel and dependents, or Army civilian employees. Certain areas will be closed to hunting and fishing, including, but not limited to, impact areas containing unexploded ordnance.

X Fort Huachuca has three enforcement jurisdictions. Most of the installation has exclusive jurisdiction where federal commissions are required for officers. Portions of Fort Huachuca have concurrent jurisdiction where laws are enforceable by federal- or State-commissioned personnel, and other portions have proprietary jurisdiction where only State commissions are recognized. Enforcement will be a joint responsibility of Fort Huachuca, the AGFD, and the USFWS.

X Fort Huachuca agrees to cooperate with USFWS and AGFD for management of threatened or endangered species occurring on or near the installation. Such efforts will comply with Federal and State laws and applicable Army regulations.

X The AGFD and the USFWS will provide technical and professional advice on all matter concerning wildlife and fish management when necessary.

X Fort Huachuca has the option to directly transfer funds to the AGFD and USFWS for implementation of this Integrated Natural Resources Management Plan.

X It is understood that implementation of this INRMP requires certain latitude with regard to professional decisions. However, Fort Huachuca agrees that any land use change that significantly impacts natural resources must include modification of this INRMP in addition to any other environmental compliance requirements.

LIMITATIONS:

The military mission of Fort Huachuca supersedes natural resources management and associated recreational activities, and such activities must be compatible with the military mission. However, where there is conflict between the military mission and provisions of the Endangered Species Act, the Sikes

Act, or any other law associated with natural resources conservation, such conflicts will be resolved according to statutory requirements.

REQUIRED REFERENCES:

X Nothing contained in this agreement shall modify any rights granted by treaty to any Native American tribe or to members thereof.

X The possession of a special permit for hunting migratory game birds will not relieve the permittee of the requirements of the Migratory Bird Stamp Act, as amended.

X This INRMP is a Federal Facilities Compliance Agreement.

X As required by the Sikes Act, the following agreements are made:

(1) This Fort Huachuca Integrated Natural Resources Management Plan is the planning document required by the Sikes Act, as amended. This Plan contains those items specifically required by law. In the event the Sikes Act is amended after this INRMP is signed, this plan will be amended to conform with the new requirements within the Sikes Act, if needed.

(2) This plan will be reviewed by the AGFD, USFWS, and Fort Huachuca on a regular basis, but not less often than every five years.

(3) No land or forest products from land on Fort Huachuca will be sold under Section 2665 (a) or (b), Title 10 USC and no land will be leased on Fort Huachuca under Section 2667 of such Title 10 unless the effects of such sales or leases are compatible with the purposes of the Integrated Natural Resources Management Plan, and reviewed by signatory agencies of the INRMP.

(4) With regard to implementation and enforcement of the Fort Huachuca Integrated Natural Resources Management Plan, neither Office of Management and Budget Circular A-76 nor any successor circular thereto applies to the procurement of services that are necessary for that implementation and enforcement, and priority shall be given to the 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 or wildlife.

(5) The Fort Huachuca Integrated Natural Resources Management Plan is not, nor will be treated as, a cooperative agreement to which chapter 63 of title 31, United States Code applies.

(6) This Integrated Natural Resources Management Plan will become effective upon the date subscribed by the last signature and shall continue in full force for a period of five years or until terminated by written notice to the other parties by any of the parties signing this agreement. This agreement may be amended or revised by agreement between the parties hereto. Action to amend or revise may originate with any of the other participating agencies.

APPENDIX 5.6.1 Nomenclature of Biotic Communities Known or Expected to Exist on Fort Huachuca

APPENDIX 5.6.2 Flora of Fort Huachuca

APPENDIX 5.6.3 Special Status Species Documented within Fort Huachuca and Special Status Species Found within Ten Miles of Fort Huachuca

APPENDIX 11.3a Fact Sheet for 2001-2002 Hunting Seasons on Fort Huachuca

APPENDIX 11.3b Fort Huachuca Fishing Facts 2001

APPENDIX 15.4 Project/Program Summary

Chapter 7. Inventory and Monitoring

General Goal 1. Inventory Fort Huachuca natural resources and regularly monitor resources that are indicators of overall ecosystem integrity, habitat conditions, capability of lands to support military missions, status of sensitive species or communities, and other special interests.
General Goal 2. Analyze inventory and monitoring data to implement an adaptive management strategy, using landscape level monitoring protocols.
General Goal 3. Develop computer databases, linked to a geographic information system, for the wide variety of flora and fauna information collected on the installation.

Goal. Provide land managers and trainers with long-term assessments of changes in vegetative cover and botanical and wildlife composition under varying levels and types of use, and maintain floral and faunal databases.

Objective. Maintain an active LCTA or other comprehensive natural resource monitoring program on Fort Huachuca.

Goal. Incorporate flora species of Fort Huachuca as part of the natural resources baseline data.

Objective 1. Update the flora inventory (including herbarium mounts) as new species are found during natural resource surveys and monitoring, site-specific surveys, sensitive plant species surveys, and other projects.

Objective 2. Develop and maintain a computerized plant checklist.

Objective 3. Monitor distribution and abundance of Lehmann lovegrass (*Eragrostis lehmanniana*) near small arms firing ranges, according to Section 7 informal consultation 16 June 1998.

Goal 1. Monitor federally-listed threatened or endangered plant species on Fort Huachuca during 2001-2005.
Goal 2. Monitor areas critical to federally-listed plant and animal species.
Goal 3. Monitor other special status plant species on Fort Huachuca during 2001-2005 to the degree possible with available funding.

Objective 1. Inventory and monitor Huachuca water umbel populations at Fort Huachuca and on the SPRNCA, as required by the PBO and as specified in the agreed protocol.

Objective 2. Document any destruction or adverse modification of Critical Habitat.

Objective 3. Fund and participate in studies of the hydrology of the Upper San Pedro River Basin.

Objective 4. Prepare annual reports on survey results for the USFWS.

Objective 5. Periodically monitor the Lemmon fleabane populations in Scheelite Canyon.

Objective 6. Monitor Palmer's agave populations on the West and South ranges every five years, and establish trends in bat forage resources.

Objective 7. Conduct pre-construction surveys. See Appendix B of the PBO (pp. 10-13).

Objective 8. Ensure training and recreational activities do not adversely affect Agave Management Areas (AMA).

Objective 9. Plan fire management activities to minimize adverse effects in AMA.

Goal. Maintain baseline database on wetlands resources and riparian habitat at Fort Huachuca.

Objective 1. Use site-specific surveys to evaluate wetland resources, including jurisdictional status, if any wetland impacts are proposed.

Objective 2. Document any loss of wetlands.

Goal 1. Incorporate fauna species of Fort Huachuca as part of the natural resources baseline data.
Goal 2. Monitor animal take, collection and harvest activities on Fort Huachuca to document levels of take, detect large changes in populations or distribution, and document new species occurrence.

Objective 1. Monitor hunter harvested big game.
Objective 2. Cooperate with the AGFD for annual antelope surveys, and use AGFD survey data on other big game species for surrounding areas for relative abundance and sex and age ratios.
Objective 3. Support annual lion track count sessions with conservation community volunteers.
Objective 4. Track and support on and off-installation research that monitors other non-federally-listed mammals.
Objective 5. Add to the small mammal baseline inventory using observations and data from other field projects. Compile and analyze all data from past dedicated and incidental inventories.
Objective 6. Conduct habitat-specific, small and medium-sized mammal inventories. Monitor black-tailed prairie dog numbers and location if they are reestablished on Fort Huachuca.
Objective 7. Automate the hunter check-in/out data collection system.
Objective 8. Continue to add to the avian baseline inventory of species occurrence and habitat affinities by using incidental observations and data from cooperative research and other field projects.
Objective 9. Encourage other independent research efforts over the next five years.
Objective 10. Implement the amphibian management plan for Fort Huachuca (Sredl et al, 2000a).
Objective 11. Monitor populations and habitat of herpetofauna in the Huachuca Mountains and riparian areas on Fort Huachuca, along with distribution of the nonindigenous, invasive crayfish.
Objective 12. Continue to add to the amphibian and reptile baseline inventory using observations and data from other field projects. Continue to support a long-term research project on western box turtles using a study area on the installation.
Objective 13. Continue to provide written scientific collecting authorization for appropriate, sustainable types and levels of collecting, to collectors who can demonstrate affiliation with bonafide scientific, educational or interpretive entities. Unaffiliated collectors who can demonstrate a record or provide references from previous collecting and scientific collaboration, and an intent that their collection will go to scientific or educational purposes, may also be authorized to collect invertebrates on Fort Huachuca as appropriate.
Objective 14. Continue to collect inventory data on butterflies from outside sources. Continue to require collectors to provide a written list of species documented on the installation and where the specimens and collecting records ultimately will be deposited, to have a permit renewed.
Objective 15. Develop an invertebrate species list using observations and data from other field projects.
Objective 16. Investigate the development of a more formal invertebrate monitoring program, particularly for taxa, such as butterflies, that may be indicators of plant species diversity or ecological functions.

Goal 1. Monitor federally-listed threatened or endangered animal species on Fort Huachuca during 2001-2005.
Goal 2. Monitor WSCA animal species known Fort Huachuca during 2001-2005 to the degree possible with available funding.

Objective. Maintain a comprehensive sensitive animal species list for Fort Huachuca.

Objective 1. Fund comprehensive annual status surveys for southwestern willow flycatcher at all suitable habitats potentially affected by Fort Huachuca actions, including riparian vegetation that is potential habitat, Babocomari Cienega (if permission is obtained), and in the SPRNCA in cooperation with the BLM.

Objective 2. Monitor habitat conditions in the SPRNCA and any habitats acquired or for which easements or permission to enter are obtained.

X Take aerial photos of the riparian corridor in 2000, 2004, and 2008 and construct vegetation maps from each photo series within one year of obtaining the photographs.

X Conduct ground-truthing to assure reasonable accuracy of the mapping effort and provide trend analyses of the 2004 and 2008 efforts to determine gains or losses in flycatcher habitat.

Objective 3. Prepare annual reports of the southwestern willow flycatcher for the USFWS.

Objective 4. Conduct annual reproductive monitoring of known Mexican spotted owl Protected Area Centers and survey potential habitat at Fort Huachuca, in accordance with USFWS survey protocol.

Objective 5. Monitor take of Mexican spotted owls and document any destruction or adverse modification of Critical habitat (*e.g*. from fires).

Objective 6. Prepare annual monitoring reports of the Mexican spotted owl for the USFWS.

Objective 7. Conduct annual monitoring of known or potential lesser long-nosed bat roosts on Fort Huachuca.

Objective 8. Monitor Palmer's agave populations on the West and South ranges every five years to establish trends in bat forage resources, according to protocol approved by the USFWS.

Objective 9. Monitor "take" of lesser long-nosed bats and document any disturbance of roost sites.

Objective 10. Prepare annual monitoring reports of the lesser long-nosed bat for the USFWS.

Objective 11. Conduct annual monitoring of potential peregrine falcon nest sites at Fort Huachuca early in the breeding season.

Objective 12. Monitor "take" of peregrine falcons and document any disturbance of nest sites.

Objective 13. Prepare annual monitoring reports of the peregrine falcon for the USFWS.

Objective 14. Annually monitor the Upper Garden Canyon pond in March-April for Sonora tiger salamander breeding activity, and if not detected then, monitor in June or early July (pre-monsoon) to determine condition of the habitat and the presence of aquatic salamanders, according to protocol approved by the USFWS.

Objective 15. Monitor "take" of Sonora tiger salamanders and document any disturbance of salamanders or salamander habitat.

Objective 16. Prepare annual monitoring reports of the Sonora tiger salamander for the USFWS.

Objective 17. Monitor Ramsey Canyon leopard frog populations often enough each year to detect presence, reproduction, and metamorphosis of tadpoles.

Objective 18. Inventory remote springs not surveyed for springsnail.

Objective 19. Monitor Huachuca springsnail populations on Fort Huachuca as needed.

Goal 1. Use soil parameters to manage military activities, protect soil stability, rehabilitate training lands, and conserve wildlife habitat.

Objective 1. Use site-specific soil testing for natural resources programs, such as erosion control.

Objective 2. Use soil inventory data to make decisions regarding land use, restoration options, and wildlife habitat management options.

Goal 2. Monitor general soil condition, erosion, and effects of erosion control.

Objective 1. Identify and characterize erosion sites, and digitize data for GIS analysis.

Objective 2. Perform pre- and post-treatment monitoring of erosion sites.

Goal 3. Enhance applications of land surface map data for management decisions.

Objective. Develop a digitized geomorphic surface map of the installation.

Goal. Use fire history data from Fort Huachuca to improve natural resources management.

Objective 1. Continue collecting fire history data.

Objective 2. Digitize fire history and mapping data for GIS entry and analysis.

Goal. Monitor effects of fire and fuels management on Fort Huachuca ecosystems.

Objective 1. Monitor fire suppression and prescribed fire activities via an on-site natural resource advisor.
Objective 2. Develop and test protocols for monitoring effects of fires and fuel reduction treatments (pruning and thinning) on populations, habitat components, and ecological processes in affected watersheds.
Objective 3. Develop monitoring plans for all fire and fuel treatment activities that may adversely affect federally-listed species.
Objective 4. Coordinate monitoring with the USFWS, USFS, NPS, AGFD, and ADEQ.

Chapter 8. Natural Resources Management

Goal 1. Manage forest resources outside the cantonment area under requirements of the installation fire management strategy, to enhance desired ecological processes and benefit wildlife populations.
Objective 1. Continue to sell fuelwood and other wood or plant permits to help manage forest resources, reduce ladder fuels, and provide useful forest products to the local community.
Objective 2. Maintain sufficient dead and down wood in all canyon bottoms, especially in riparian vegetation, to provide for wildlife habitat requirements.
Objective 3. Maintain reasonable density of snags throughout all forest types to provide for wildlife habitat requirements.
Goal 2. Maintain an aesthetically pleasing cantonment area using principles of urban forestry and xeriscaping.
Objective 1. Implement the Presidential Memorandum on *Environmentally and Economically Beneficial Practices on Federal Landscaped Grounds* (Office of the President, 1994).
Objective 2. Use xeriscaping to minimize water use and improve cantonment landscaping.
Goal 3. Develop in 2002 a geographically based Forest, Woodland, and Urban Forestry Management Plan that is consistent and integrated with the installation fire management plan and with cantonment area tree planting and landscaping guidelines.
Objective. Map and digitize specific fuel load reduction, pruning and wood cutting treatment areas, and planting sites, along with area-specific guidelines for prescriptions.

Goal. Manage lands used for grazing to avoid ecosystem degradation.
Objective. Implement the Grazing Management Plan (Bemis, 1993) on Fort Huachuca.

Goal 1. Use ecological functions and landscape level planning to adjust limiting factors and promote priority endemic species.
Goal 2. Base species management priorities on conservation needs as defined by global, regional, and local abundance; distribution and threats; population trends; importance of areas to species; potential for population and/or habitat management; and human interests.

Goal. Provide supplemental sources of water for wildlife, especially to mitigate loss of natural water sources.

Objective 1. Assess the appropriateness of specific water devices and locations on Fort Huachuca, using current information on benefits versus potential risks, such as increased predation.
Objective 2. Where water devices are appropriate, use the lowest maintenance design available.
Objective 3. Use volunteers to maintain and inspect devices that are appropriate to keep functional.

Goal. Manage woody vegetation to maintain soil stability, reestablish or maintain native herbaceous cover, improve wildlife habitat, and maintain ecosystem functionality.
Objective 1. Design and plan fuel hazard reduction while providing wildlife habitat benefits.

Objective 2. Investigate restoration techniques for scrub grassland (semidesert grassland) that may include a combined management strategy of prescribed burning, selective herbicide use, and reseeding with native species.
Objective 3. Investigate reinitiating regeneration cutting of mountain mahogany.
Objective 4. Investigate reinitiating mesquite root plowing and revegetation.

Goal. Use prescribed fire to maintain or enhance ecosystem functionality, reduce woody vegetation encroachment in grasslands, and reduce risk of catastrophic wildfires.
Objective. Implement prescribed burning as specified in the *Fort Huachuca Fire Management Plan* (Robinett *et al*., 1997) and the Programmatic Biological Opinion (USFWS, 1999). Because fire can favor some nonindigenous invasive species such as Lehmann's lovegrass, fire frequency or return interval for a given area should be about 10-12 years.

Goal. Use native species to restore soil and vegetative cover following soil disturbance, as well as on lands degraded from past land use activities.
Objective 1. Develop a revegetation manual detailing planting seasons, seed sources, sites in need of revegetation, seeding and planting techniques, and monitoring methods.
Objective 2. Improve seeding and revegetation techniques.

Goal. Improve wildlife access to grassland habitats.
Objective 1. Remove unnecessary internal fences, abandoned wire, and other man-made materials using volunteer efforts and service projects when feasible.
Objective 2. Replace the bottom wire on boundary fences with smooth wire to allow easier animal passage, and modify remaining fences to other applicable wildlife design guidelines where appropriate.
Objective 3. Build any new fencing to wildlife design guidelines where appropriate.

Goal. Manage game species to produce harvestable surpluses on a sustained basis.
Objective 1. Update and implement annual harvest and management plans for game species.
Objective 2. Establish a schedule for cooperative review and analysis with AGFD, on a rotating basis, so that game species plans are comprehensively revisited approximately every three years.

Goal. Manage game fish to produce harvestable surpluses on a sustained basis (to the greatest extent possible considering budget limitations).
Objective 1. Explore alternatives to stocking rainbow trout for the put-and take fishery.
Objective 2. Continue periodic stockings of warm water species in appropriate ponds close to the cantonment area and in small to medium sized drainage areas.
Objective 3. Seek professional fisheries management guidance for installation ponds from AGFD.
Goal. At a minimum, sustain residential or migratory populations of endangered, threatened, or candidate species and their habitats at current levels, with the long term goal of conserving and recovering listed species and their habitats in accord with specific Recovery Plans and the Endangered Species Act.

Goal 1. Implement the proposed mitigation measures identified in the PBO (USFWS, 1999).
Goal 2. Support recovery and evaluate establishment of candidate, proposed and listed species when feasible and within DoD guidelines that do not jeopardize the military mission.
Objective 1. Fort Huachuca will designate a management representative (point of contact) within the Range Control office to improve assurances that operations will be conducted in compliance with environmental requirements.
Objective 2. The representative will ensure compliance with mitigation measures by installation users, have authority to halt activities that may be in violation of such measures, and coordinate with ENRD.

Objective. Fort Huachuca will implement the East Range Watershed Improvement Plan (SAIC, 1997) or more detailed plans, which identified watershed improvement strategies and best management plans, such as check dams, revegetation, and reseeding actions, to retard erosion on the East Range. Other erosion control measures proposed on the training ranges include scheduling training during the driest seasons (April through June), when possible, and allowing sufficient time for soils to dry after heavy rains before resuming training.

Objective. Implement water conservation measures identified in the PBO (USFWS, 1999).

Objective. Implement water recharge and effluent reuse projects identified in the PBO (USFWS, 1999), and continue to support hydrologic research in the subwatershed.

Objective. Continue to periodically monitor and survey for listed and candidate species.

Objective. Continue to request funds to implement the ITAM program.

Objective 1. Continue Mutual Aid Agreements for wildfire suppression or management for natural resource benefits.
Objective 2. Continue to fund the USFS for additional wildfire protection, vegetation management, and suppression support.
Objective 3. Restrict range activities to prevent wildfires.

Objective 1. Update and implement the Agave Management Plan (Howell and Robinett, 1995), including a well designed, long term monitoring and data management program.
Objective 2. Identify and designate significant agave stands according to specific criteria for defining and mapping them.
Objective 3. Implement all protection measures and adhere to all training restrictions.

Objective. In addition to existing range management procedures, implement the following procedures to enhance compliance with management protocols.

X revise and implement Fort Huachuca Regulation 385-8, *Range and Training Area Operations*, to specify the completion of environmental awareness training (including protected resource identification) prior to the initiation of training or testing and the responsibility of unit commanders to become familiar with environmental policies and operational requirements;

X revise and implement Fort Huachuca Regulation 385-8 to prohibit vehicular entry into protected agave management areas;

X implement policies to specify limits to range access during certain seasons to minimize effects on agave plant populations, riparian zones, erodible soils, and any areas identified for non-use for purposes of restoration, reseeding, recovery, or protection;

X provide unit commanders with a checklist of required activities prior to initiation of training or testing, including environmental awareness training, familiarization with protected or restricted areas, provision of fire suppression equipment, and assurance by the appropriate environmental office that the testing or training activity is in compliance with NEPA and ESA requirements; and

X implement erosion control measures to reduce erosion throughout the installation (*i.e*. gabions, runoff control structures, revegetation) where appropriate and as funding becomes available.

Objective. Implement the following recreation management measures to reduce the risk of accidental fire, human disturbance, or direct mortality to federally-listed threatened, endangered, and candidate species:

X install and maintain exclosure fencing or other barriers, such as boulders, around known populations of Huachuca water umbel to prevent accidental crushing of individual plants by persons or vehicles;

X improve the current off-road vehicle policy by developing a map based regulation that shows areas, roads and firebreaks as open or closed to unauthorized motorized vehicles;

X protect ponds inhabited by the Sonora tiger salamander and other amphibians from disturbance by vehicles, including recreational vehicles;

X develop a regulation on Fort Huachuca to address issues relating to recreation on the installation; and

X upgrade the entry alarm system and protection barriers at caves where lesser long-nosed bats are known to roost to prevent disturbance during the roosting period.

Objective 1. The Range Control Officer, who is responsible for distributing educational materials to operational units, will meet annually with personnel from the ENRD to verify the location of protected resources and restricted areas.
Objective 2. Annually update maps delineating protected resources and restricted areas as needed by the Range Control Officer in cooperation with ENRD personnel to reflect the most recent survey data and other information. These maps will be provided to operational units prior to initiation of training or testing activities.
Objective 3. Update environmental awareness handbooks, cards, and videos to comply with current status and knowledge of listed, proposed, and candidate species at and near Fort Huachuca. Use a two-year update cycle, because of the number of protected species known or with potential to occur near Fort Huachuca.

Objective 1. Continue to monitor federally-listed threatened and endangered species, including annual monitoring programs for the Mexican spotted owl, lesser long-nosed bat, Huachuca water umbel, and Sonora tiger salamander. Continue to monitor the delisted American peregrine falcon under the national management plan developed to sustain the species.
Objective 2. Monitor *Agave palmeri* populations on Fort Huachuca no less than once every five years.
Objective 3. Periodically survey for other species, including candidate species, with potential to occur on Fort Huachuca, as appropriate.
Objective 1. Complete and support dissemination of the Alternative Future Scenarios Planning Study.
Objective 2. Conduct additional investigations into the connectivity of the Fort Huachuca/Sierra Vista well fields and San Pedro River flows.
Objective 3. Continue to study potential effects of groundwater pumping and identify appropriate measures to reduce impacts.
Objective 4. Make results of all investigations available to the USFWS and regional hydrological researchers and seek consultation with the USFWS as appropriate if significant changes in the current understanding of regional groundwater resources are found.

Objective 1. Coordinate with the USFWS and AGFD, as necessary, to develop studies on federally-listed threatened, endangered, and candidate species and their habitats that occur on Fort Huachuca.
Objective 2. Monitor off site research on federally-listed threatened, endangered, and candidate species and their habitats that occur on Fort Huachuca and use results of these research projects to improve management programs on Fort Huachuca.

Objective 3. Attend various symposia, workshops, and conferences that include research and management of federally-listed threatened, endangered, and candidate species that occur on Fort Huachuca and use information to improve management programs on Fort Huachuca.

Objective. Complete the INRMP and obtain USFWS and AGFD approval of the Plan by 2001.

Objective. Coordinate with the USFWS and AGFD, as necessary, to develop endangered species management plans by 2002 for federally-listed threatened, endangered, and candidate species and their habitats that occur on Fort Huachuca as of 2001.

Goal 1. Implement reasonable and prudent measures and terms and conditions for species with potential to be adversely affected by Fort Huachuca actions.
Goal 2. Implement conservation recommendations, if funding is available, for species with potential to be adversely affected by Fort Huachuca actions.

Objective 1. Implement measures from the PBO for the Huachuca water umbel.
Objective 2. Implement measures from the PBO for the southwestern willow flycatcher.
Objective 3. The peregrine falcon was delisted in 1999. However, Fort Huachuca plans to continue implementing agreed upon measures from the PBO to assist recovery efforts for the falcon.
Objective 4. Implement these agreed measures from the PBO for the Mexican spotted owl.
Objective 5. Implement these agreed measures from the PBO for the lesser long-nosed bat.
Objective 6. Implement these agreed measures from the PBO for the Sonora tiger salamander.
Objective 7. Manage for permanent water with a minimum permanent poll depth of one meter in occupied aquatic habitats for the Ramsey Canyon leopard frog.
Objective 8. Monitor and maintain habitats free of non-native predators and competitors for the Ramsey Canyon leopard frog.
Objective 9. Protect occupied and suitable waters from impacts of vehicle traffic.
Objective 10. Maintain or increase habitat heterogeneity (e.g. vegetative structure) for the Ramsey Canyon leopard frog.
Objective 11. Buffer habitats from catastrophic natural and human caused fires. Construct sediment traps above Tinker Pond in the main drainage by 2003 and the smaller, side drainage by 2004.
Objective 12. Remain an active participant in the Ramsey Canyon Leopard Frog Conservation Agreement and its implementation by the Ramsey Canyon Leopard Frog Conservation Team.
Objective 13. Protect springs and surrounding upland vegetation on Fort Huachuca.

Objective 14. Participate in development of a conservation agreement if it is deemed necessary for future survival of the Huachuca springsnail.
Objective 15. Periodically monitor springs for presence or absence of Huachuca springsnails.
Objective 16. Compile all existing survey data and site information for Lemmon fleabane, as a basis for developing a conservation assessment, strategy and agreement with the USFWS, in case such an effort is determined worthwhile.
Objective 17. Implement reasonable and prudent measures for the Huachuca water umbel and southwestern willow flycatcher to remove threats to spikedace and loach minnow recovery habitat.
Objective 18. Consult with the USFWS and AGFD and take appropriate action if new listed species are found on Fort Huachuca.

Goal. Manage furbearer populations to maintain ecosystem function.
Objective 1. Continue to permit the hunting of predators, particularly coyotes in antelope fawning areas, on Fort Huachuca.

Objective 2. Evaluate carnivore ecology and support research to better characterize their habitat use, disease transmission roles, and their potential to affect populations of specific prey species on Fort Huachuca.

Goal 1. Use measures established for federally-listed species to conserve populations and habitat for other nongame species that use Fort Huachuca, especially species listed in Arizona's Native Plant Law, Wildlife Species of Concern in Arizona, or as sensitive species by other Federal agencies in the Fort Huachuca area.
Goal 2. Whenever appropriate within ecosystem management goals and budget limitations, develop management and conservation programs for other nongame species, especially species of concern considered likely to be proposed for listing in the near future.

Objective 1. Manage habitats that support neotropical migratory bird species that use Fort Huachuca.
Objective 2. Participate in implementing the Arizona Partners In Flight Bird Conservation Plan (Latta *et. al*. 1999) as part of the comprehensive North America Bird Conservation Initiative.
Objective 3. Use measures planned and implemented for federally-listed species to include protection and habitat for birds that occur on Fort Huachuca.
Objective 4. Continue to support research efforts, particularly on habitat relationships, of birds that occur on Fort Huachuca.

Objective 1. Manage habitat through measures established for federally-listed species to also conserve populations of mammals that occur on Fort Huachuca.
Objective 2. Continue to support research efforts, particularly on habitat relationships and effects of management actions, on mammals that occur on Fort Huachuca.

Objective1. Use measures established for federally-listed or candidate species to include protection and habitat conservation for native reptiles and amphibians that occur on Fort Huachuca.
Objective 2. Apply information and follow recommendations in *Management of Amphibians of Fort Huachuca* (Sredl and Wallace, 2000a).
Objective 3. Continue to support research efforts, particularly on habitat relationships and effects of management actions, on reptiles and amphibians that occur on Fort Huachuca.

Objective 1. Use measures established for federally-listed species to provide protection for invertebrates that use Fort Huachuca.
Objective 2. Consistent with objectives in Section 7.2.1.1.5 for gathering species occurrence information from collectors, retain and publicize the requirement for written authorization for anyone to collect material on Fort Huachuca.
Objective 3. Develop and implement by 2003 a more formal, efficient application form and process for requesting, issuing and tracking invertebrate collecting permits on Fort Huachuca, so that more effective management of collection activities and the findings they generate ensue.
Objective 4. Cooperate, as appropriate, with the "Forgotten Pollinators" project of the Arizona-Sonora Desert Museum and its conservation and environmental awareness efforts in the upper San Pedro Valley.

Goal: Manage wetlands to ensure "no net loss," per Executive Order 11990.

Objective 1. Use the environmental review process to protect wetlands and riparian areas early in the planning process.
Objective 2. Provide certified jurisdictional wetland delineation (and permit application, if necessary) if a project is planned in a suspected wetland.
Objective 3. Work with military personnel to ensure compliance with wetlands protection provisions within Fort Huachuca Regulation 385-8, using environmental awareness.
Objective 4. Provide physical barriers to protect wetland and riparian habitat, as needed.

Objective 5. Restore damaged streams (including banks) and degraded riparian habitats. Use cottonwood and willow cuttings to re-establish riparian vegetation.
Objective 6. Exclude horse grazing from riparian areas or manage them as special use pastures (limited seasonal use only). Install fencing along stream corridors to limit access by livestock.
Objective 7. Provide wildlife travel corridors connecting riparian and upland habitats.
Objective 8. Limit the number of road and utility crossings within riparian habitats.
Objective 9. Limit high-impact recreational facilities (buildings, picnic areas, camp grounds, motorized vehicle trails) that increase visitor use in ways that may destroy and degrade riparian areas.
Objective 10. In developed areas, control and purify stormwater runoff.
Objective 11. Use non-structural techniques to protect stream banks.
Objective 12. Provide hardened stream crossings and water access points (e.g., gravel pads) for livestock.

Goal. Protect surface water quality in Fort Huachuca waters.
Objective 1. Consider nonpoint source pollution abatement in construction, installation operations, and land management plans and activities.
Objective 2. Implement the East Range Watershed Improvement Plan (SAIC, 1997).

Goal. Rehabilitate and maintain lands to support military training on Fort Huachuca.
Objective 1. Reevaluate ecological restoration and revegetation techniques, as well as monitoring needs, to establish an adaptive management approach to land management.
Objective 2. Reinitiate LRAM on Fort Huachuca.

Objective 1. Complete site specific planning, and implement the Fort Huachuca East Range Watershed Improvement Plan (SAIC, 1997).
Objective 2. Identify and prioritize West and South Range areas on the main installation that require types of repair and treatment.

Goal. Maintain an aesthetically pleasing cantonment landscape that maintains natural ecosystem functions as much as possible.
Objective 1. Develop a landscape planting plan for Fort Huachuca's cantonment area.
Objective 2. Provide professional advice to guide the grounds landscaping and maintenance program toward the use of native species, drought-tolerant, low maintenance species, and xeriscaping.
Objective 3. Reduce water use for irrigation as much as possible.

Goal 1. Control pest animals to support the military mission, promote sustained ecosystem functionality, favor native species biodiversity, and add to the quality of life of the Fort Huachuca community.
Goal 2. Improve public health and safety, animal welfare, and urban wildlife conservation by reducing wildlife attractants (food, water or shelter) that draw or concentrate animals into residential and office areas of Fort Huachuca.
Objective 1. Respond to nuisance/pest wildlife reports on the installation in a coordinated, integrated manner and document the time dedicated to response.
Objective 2. Reassess the skunk trapping program to better define goals and justification and to develop a control policy that minimizes relocation that may exacerbate disease spread, but uses euthanasia as a last resort or when disease testing is warranted.
Objective 3. Develop and distribute policy and guidelines for wildlife feeding on the installation as part of housing regulations and broader education and environmental awareness programs.

Objective 4. Work with historic preservationists to develop appropriate techniques for historic structures, such as physical barriers and sealing access points that prevent use of the building as shelter by wildlife and potential damage from these animals.
Objective 5. Monitor population distribution and relative abundance for nonindigenous pests.
Objective 6. Investigate technical and managerial options regarding control of nonindigenous or problem species, such as vaccinate and release protocols for skunks, that emphasize prevention of risk to people, wildlife, and ecosystems.

Goal. Control noxious invasive, nonindigenous plants to support the military mission, promote sustained ecosystem function, favor native species biodiversity, and add to the quality of life of the Fort Huachuca community.

Objective 1. Investigate control methods for specific nonindigenous species, such as lovegrass, bermuda grass, and rabbits foot grass.
Objective 2. Control tamarisk and flannel mullein by opportunistically hand-pulling or other treatment of individual plants.
Objective 3. Compile and maintain a reference list of best management practices, for preventing further spread of non-native plant species, that covers and applies to the land use and land management activities occurring on Fort Huachuca. Incorporate appropriate elements from this list as a component of all proposed actions.
Objective 4. Determine the distribution of and map noxious plant occurrence on Fort Huachuca.
Objective 5. Initiate general planning for non-native plant removal, so habitat restoration can occur as appropriate methods are found for effective removal of specific species.

Goal. Meet Department of Army Measures of Merit for pest management programs on Army installations.

Objective 1. Annually review the Pest Management Plan (Gabel, 1995). Incorporate updates into the plan on a five-year cycle.
Objective 2. Emphasize integrated pest management techniques to continue to minimize the use of pesticides.
Objective 3. Ensure contractor personnel are State-certified applicators.

Goal 1. Use pesticides in a manner to minimize impacts to sensitive animal and plant species and environmental risks to human health.

Objective 1. Follow precautionary statements on labels regarding contamination of water when pesticides are sprayed near wetlands.
Objective 2. Take special precautions during pest management activities that could affect endangered species or species of concern.

Goal 1. Implement the *Fort Huachuca Fire Management Plan* (Robinett *et al*., 1997).

Objective 1. Protect life (firefighter and public) as the first priority. Property, military training, natural resources, and historic properties (including endangered species protection) are second priority.
Objective 2. Assure that prescribed fires are compatible with approved military training, public safety, or resource management objectives.
Objective 3. Monitor wildfire, prescribed burning, and mechanical thinning effects on Fort Huachuca's soils, vegetation, listed species, etc. to improve ecosystem management, using pre- and post-treatment monitoring when feasible. Otherwise use pre-existing LCTA or other plots in or near burned or treated areas for remeasuring plot attributes.
Objective 4. Consider the use of prescribed fire in establishing ecosystem management strategies, particularly those determined to be partially or totally fire dependent, and strive for natural or historic fire return intervals when planning prescribed burns or managing wildland fire in natural plant communities.

Objective 5. Implement interagency (1979 National Wildfire Coordinating Group) prescribed fire qualification and certification standards. Train and maintain a qualified and adequate work force to plan and implement managed fire projects safely and effectively. Conduct each prescribed fire by qualified personnel in accordance with the Western Region Prescribed Fire Qualification System.
Objective 6. Incorporate public health and environmental quality considerations into the use of managed wildland fire.
Objective 7. Review the Fort Huachuca Fire Management Plan annually and formally evaluate and reaffirm the plan every three years. Monitor results from burns to assess the plan and make necessary revisions.
Objective 8. Allow fire in areas with burnable vegetation to occur at a reasonable return interval, except where occupied by human settlement. Areas below Charlie Break should be managed primarily by Fort Huachuca, while areas above Charlie Break should be managed primarily by the Coronado National Forest. (Charlie Break runs roughly from the junction of Training Areas N, R, and S southeast to a point on the south boundary of Training Area U (Figure 6.2.1)).
Objective 9. Immediately suppress fires occurring in areas of human settlement (*i.e*. administrative sites, historic structures).
Objective 10. Use prescribed burning, and managed natural of fires that occur near structures or in the grasslands and savannas outside of prescribed parameters in military training areas below Charlie Break. Ignitions started by tracer fire should be managed to consume fuels throughout the entire Small Arms Impact Range in a safe and prescribed manner.
Objective 11. Use unplanned ignitions and management-ignited prescribed burning, as well as suppression, when appropriate, above Charlie Break.
Objective 12. Reduce woody fuels above Charlie Break, subject to available funding and resources, using mechanical means, such as pruning and thinning, and prescribed fire.

Objective 13. Adopt and incorporate the Fire Management Plan into the Integrated Natural Resources Management Plan.
Objective 14. Assure that post-wide wildfire suppression activities include the following fire management measures to prevent fires and aggressively control nonprescription wildfires if they occur:

X provide fire suppression trucks on-site during live fire exercises when deemed necessary by the Range Control Officer;
X maintain required firebreaks;
X avoid firing activities during high hazard conditions, such as strong winds;
X avoid the use of tracers during high to extreme fire danger periods; and
X reduce the potential for adverse effects of fire suppression measures on listed and candidate species and their habitat by making a biologist or other qualified environmental specialist available to serve as a resource advisor to provide guidance to individuals in charge of fire suppression activities.

Objective 15. Implement requirements of the PBO (USFWS, 1999) related to threatened, endangered, and candidate species and fire management on Fort Huachuca (Section 8.4.2.2.1).

Goal 2. Implement prescribed (natural or ignited) fire management on Fort Huachuca. Implementation of prescribed fire should be contingent upon compatibility with military training, availability of funding and resources, and occurrence of correct burning conditions.
Objective 1. Develop a prescribed burn plan for each prescribed fire. Plans should include a description of the burn area, burn objectives, public safety issues, protection of sensitive features, range of expected results, weather and fuel conditions needed to achieve the desired fire behavior,

containment procedures, pre-burn coordination (i.e., USFWS and the Coronado National Forest), monitoring plan, smoke management plan, and contingency plan.

Objective 2. Include the following goals for prescribed fire planning:

X reduce fuel loads in military training areas to reduce the possibility of catastrophic fires;
X maintain or improve wildlife habitat, including improving pronghorn antelope range away from firing ranges to reduce antelope foraging in burns near firing ranges;
X reduce the risk of catastrophic fires in habitats used by federally-listed threatened, endangered, and candidate species;
X decrease the likelihood of major fires in upper elevations that can cause an increase in erosion and decrease in water infiltration/recharge of aquifers;
X re-establish the natural frequency/intensity of fires that would sustain flora and fauna biodiversity of Fort Huachuca;
X reduce the potential for fire to spread into the installation's urban interface areas; and
X minimize the threat of fire to the installation's historical buildings and archeological sites.

Objective 3. Assure that average fire return intervals reflect the intervals of the natural fire cycle. Burn intervals in grassland, oak savanna, and conifer forests should average 5-10 years. Burn intervals vary, but intervals shorter or longer than the average will be appropriate in some areas to meet management or military training objectives. Fire intervals in agave management areas should be once every 10-15 years.

Goal. Provide protection for areas of special ecological concern.

Objective 1. Use project review and the NEPA process to protect special interest areas.

Objective 2. Use GIS to identify areas of special interest to natural resources and historic properties managers, project planners, military planners, and personnel using Fort Huachuca.

Objective 3. Implement lesser long-nosed bat management measures that affect caves and mines on Fort Huachuca.

Objective 4. Continue the interagency agreement with the Coronado National Forest.

Objective 5. Evaluate installation caves under the Federal Cave Resources Protection Act.

Objective 6. Maintain a credible working relationship with regional chapters of the National Speleological Society for cave inventory, mapping, conservation, and public education.

Objective 7. Continue to accommodate appropriate levels and seasonal access for recreational caving, and require check-in and check-out procedures for all caving activity on Fort huachuca.

Objective 8. Implement management objectives detailed elsewhere in this plan that affect riparian areas on Fort Huachuca, with specific attention on the use and management of roads and firebreaks along riparian areas.

Objective 9. Complete final version of and implement the Agave Management Plan in 2002 (Howell and Robinett, 1995). Review the plan periodically and amend as necessary and as indicated by adaptive management with the cooperation of USFWS and AGFD.

Objective 10. Implement measures, terms, conditions, and recommendations of the PBO (USFWS, 1999) for the lesser long-nosed bat that pertain to agave management and fire management.

Objective. Implement management recommendations from Garden Canyon Watershed, A Vision and A Mission (Shaw, 1999).

Goal 1. Reinitiate TRI on Fort Huachuca as part of the ITAM program.

Goal 2. Integrate Fort Huachuca's training requirements for land use with the sustained capability of the land to support such use.

Objective 1. Site missions where natural resources can support them on a sustained basis.

Objective 2. Use training restrictions, when required, to protect sensitive natural resources and minimize damage to training areas.

Chapter 9. Law Enforcement

Goal. Effectively enforce federal, State, and installation laws and regulations regarding natural resources and historic properties on Fort Huachuca.

Objective 1. Develop a plan for maintaining trained, professional natural resources enforcement on Fort Huachuca, using other military installation experiences.

Objective 2. Provide a natural resources law enforcement presence by funding a dedicated, professionally trained, enforcement officer through implementation of a habitat use permit.

Objective 3. Coordinate enforcement activities with other agencies and organizations, particularly the AGFD to ensure conformance with AGF Commission rules and allow possible revocation of state hunting and fishing privileges and state civil fines under Arizona Revised Statutes Title 17.

Objective 4. Use enforcement as an integral part of the overall natural resources program.

Objective 5. Provide professional natural resources law enforcement training to Fort Huachuca officers.

Objective 6. Acquire law enforcement commissions appropriate for all jurisdictions on Fort Huachuca.

Chapter 10. Awareness

Goal. Educate users to minimize impacts to the land and natural resources in order to maintain and enhance training and testing.

Goal. Educate military personnel and civilians associated with military testing and training to minimize impacts to the land and resources to maintain and enhance testing and training.

Objective 1. Reinitiate the Environmental Awareness component of the ITAM program on Fort Huachuca.

Objective 2. Complete the briefing for visiting dignitaries and other guests.

Objective 3. Implement Environmental Awareness objectives contained within the PBO (USFWS, 1998) (Section 8.4.2.2.1).

Goal 1. Provide an understanding of Fort Huachuca natural resources program to installation and surrounding communities.

Goal 2. Provide information to soldiers, civilian employees, and other installation users to improve their understanding of impacts of their activities on the environment.

Objective 1. Use the printed media, both on- and off-post, as an important part of natural resources management on Fort Huachuca.

Objective 2. After coordination with the Public Affairs Office, provide support to the electronic media in preparation of television or radio programs involving natural resources on Fort Huachuca. Use the Commanders Access Channel for television viewing on the installation.

Objective 3. Continue to participate in local events with natural resources significance, particularly those associated with Earth Day and the Sierra Vista Wildlife Festival.

Objective 4. Provide watchable wildlife opportunities within natural resources carrying capacities on Fort Huachuca.

Objective 5. Work with youth groups whenever possible.

Goal. Sponsor and participate in opportunities to provide information regarding Fort Huachuca natural resources programs to conferences and meetings elsewhere.

Objective. Actively participate in training and professional development workshops, symposia, etc., such as the annual NMFWA meeting.

Chapter 11. Outdoor Recreation

Goal 1. Provide sustainable opportunities to the Fort Huachuca community and the public to participate in high quality, safe outdoor recreation.
Goal 2. Develop and implement a Fort Huachuca Outdoor Recreation Plan for training lands and undeveloped areas.
Goal 3. Manage outdoor recreation consistent with needs of the Fort Huachuca military mission, and with carrying capacities of the natural resources.
Goal 4. Integrate recreation activities with natural resources stewardship and compliance.

Goal. Provide access to Fort Huachuca for natural resources-based recreation, in accordance with Army policies.

Objective. Continue Fort Huachuca's policies toward appropriate public access, with restrictions based on specific requirements or management objectives.

Goal. Provide quality hunting and fishing opportunities on Fort Huachuca, within AGFD regulations and consistent with requirements of the military mission.

Objective 1. Use AGFD certified volunteers to perform State hunter education courses on Fort Huachuca.
Objective 2. Sell Arizona and Fort Huachuca hunting and fishing permits.
Objective 3. Prepare annual updates of the Fort Huachuca hunting fact sheet and update the fishing fact sheet as necessary.
Objective 4. Implement provisions of the annual hunting fact sheets and the fishing fact sheet.
Objective 5. Prepare a Habitat Use Permit Fact Sheet, and implement the sale of habitat use permits on Fort Huachuca by 2004.

Goal. Coordinate development of recreational facilities and natural resources-based special events, such as trail rides, mountain bike events, etc., with the ENRD, using NEPA as appropriate.

Objective 1. Consider natural resources concerns while providing recreational horseback riding and trail riding opportunities on Fort Huachuca.
Objective 2. Implement Fort Huachuca's policy on off-road vehicles and augment it with map based specific road closures, other restrictions and guidelines, and recommended recreation routes.
Objective 3. Provide camping and picnicking opportunities at Fort Huachuca.
Objective 4. Sell permits for camping and picnicking on Fort Huachuca.
Objective 5. Adopt a policy linking site use intensity to degree of management and provide an awareness of issues associated with use of camping and picnicking areas on Fort Huachuca.
Objective 6. Provide opportunities for birding on Fort Huachuca while protecting the natural resources upon which birding is based.
Objective 7. Provide access control and install and maintain interpretive signs at all well known Fort Huachuca caves and mines.
Objective 8. Use the Military Police sign-out control system for cavers.
Objective 9. Review seasonal cave access dates with appropriate agencies, particularly the USFWS.
Objective 10. Maintain the Interservice Agreement with the USFS to utilize their expertise and resources in cave management.
Objective 11. Develop and maintain relationships with regional caving clubs to utilize their expertise to locate and map caves, clean-up caves, provide search and rescue, and educate other cavers.
Objective 12. Maintain existing hiking trails on Fort Huachuca through Scout groups, hiking clubs, or other volunteer activities.
Objective 13. Maintain rapport with hikers and other trail users to use knowledge of their experiences on Fort Huachuca's trails.

Objective 14. Monitor mountain biking use of the installation and include mountain bikes in Fort Huachuca's policy on ORVs.

Chapter 12. Historic Properties Protection

Goal. Implement this INRMP in a manner consistent with the protection of historic properties at Fort Huachuca.

Objective 1. Implement provisions of the Integrated Cultural Resources Management Plan that relate to natural resources management.

Objective 2. Consider natural resources projects when planning historic properties surveys and use results of historic properties surveys to plan natural resources projects, particularly via increased geographic information system applications.

Objective 3. Avoid or mitigate adverse effects to historic properties from natural resources and their management through proper review and planning. Submit proposed projects as part of NEPA review to the archeologist for approval, determinations of effect, and Section 106 consultation, as necessary.

Objective 4. Take the following protective measures upon discovery of sites.

X Cease ground disturbing activities immediately and report to the archeologist upon discovery of potential cultural deposits.

X Consider alternatives for moving the project to another location.

X If remains are determined by the archeologist to be natural, do no further investigation and resume the project. Protect the site until such time that it is determined ineligible for the NRHP if remains are determined to be cultural.

Objective 5. Use natural resources conservation techniques and projects to protect and sustain historic properties sites.

Chapter 13. National Environmental Policy Act Implementation

Goal 1. Use NEPA to identify projects and activities on Fort Huachuca which might impact natural resources, and work with project planners to resolve issues early in the planning process.

Goal 2. Use NEPA to ensure this INRMP is documented according to the spirit and letter of NEPA.

Goal 3. Help Fort Huachuca comply with NEPA.

Objective 1. Document effects of implementation of this INRMP through an EA that is embedded in this document.

Objective 2. Reference this INRMP/EA in descriptions of affected environment to reduce verbiage in other NEPA documents.

Objective 3. Ensure mitigation is budgeted for and funded by project proponents.

Objective 4. Establish a process to accommodate early scoping of proposed plans and actions prior to the public comment period.

Chapter 15. Implementation

Goal. Provide the staffing of natural resource management professionals required to effectively manage natural resources on Fort Huachuca (Department of Army, 1995).

Objective. Provide staffing for the Fort Huachuca natural resources program as indicated in the above list and discussion.

Goal. Provide for the training of natural resources personnel (Department of Army, 1995).

Objective 1. Maintain staff technical knowledge of management strategies and their implementation, at the current state of the art, through training and participating in, or hosting, workshops, research presentations, and other activities of regional, interstate, and international professional natural resources research and conservation programs. Specifically, Fort Huachuca plans to send at least one person (and perhaps more) to each of the following annual workshops or professional conferences:
National Military Fish and Wildlife Association annual workshop
North American Wildlife and Natural Resources Conference
Society of American Foresters/DoD Natural Resources annual meeting
The Wildlife Society Annual Meeting
Partners in Flight national, regional, and State meetings (when in conjunction with other listed meetings)
TRADOC training sessions

Objective 2. Routinely disseminate information among natural resources experts to ensure maximum benefits of adaptive management and research efforts.

Objective 3. Evaluate other, more specialized, conferences/workshops for their usefulness, and decisions on participation will be made based on appropriateness to ongoing projects and funding availability. Training that is especially useful includes forestry workshops (smoke management and ecological prescribed burning), ecosystem restoration workshops, GPS training, LCTA training, basic and advanced GIS training, Watchable Wildlife workshops, riparian restoration and protection training, endangered species training, ARPA enforcement workshops, and various law enforcement classes.

Objective 4. Encourage membership in The Wildlife Society, Society of American Foresters, and National Military Fish and Wildlife Association, which have some of the best scientific publications in their professions.

Objective 5. Review technical and scientific literature as a necessary commitment to maintain professional standards.

Goal 1. Provide external specialized skills and resources to support Fort Huachuca natural resources management.

Goal 2. Provide external personnel to assist with the management of the Fort Huachuca natural resources program.

Objective 1. Implement external support projects and agreements described in appropriate sections of this INRMP.

Objective 2. Continue using IPA through the ISA with the USFS.

Objective 3. Develop the option to use ORISE for personnel assistance.

Objective 4. Maintain the option to use the Student Conservation Association for assistance with field projects.

Objective 5. Use volunteers as an opportunistic source of assistance for routine tasks and projects.

Objective 6. Use cooperative agreements with universities to assist with implementation of this INRMP.

Objective 7. Use contractors to assist with implementation of this INRMP.

Objective 8. Use State and federal agencies, particularly this INRMP's signatory partners, the USFWS and AGFD, and the NRCS and USFS, to assist with implementation of various aspects of this INRMP.

Goal. Store, analyze, and use data is an efficient, cost-effective manner.

Objective 1. Statistically analyze and store data using the Natural Resources Technician in the Environmental and Natural Resources Division for use by Fort Huachuca personnel and other regional users.

Objective 2. Upgrade hardware and software as needed during the next five years.

Objective 1. Develop an installation network linked to or containing University of Arizona GIS databases for Fort Huachuca, and provide GIS databases via ArcView® (a personal computer-based GIS) and ArcIMS (a web based GIS) to all pertinent Environmental and Natural Resources Division personnel.

Objective 2. Attach tabular data to spatial data layers, such that a "point and click" provides such data on the spot, with essential buffers and safeguards that protect confidential information and sensitive natural and cultural resource sites.
Objective 3. Make more use of the analytical capabilities of the GIS to provide natural resources management options.
Objective 4. Create user-friendly interfaces and a spatial decision support system to enable a wider use of GIS databases specific to the needs of installation users.

Objective. Use current remote imagery and/or update remote imagery as needed for improved decision-making for military activities, environmental management, and natural resources and historic properties management and protection.

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN
ENVIRONMENTAL ASSESSMENT
FORT HUACHUCA, ARIZONA

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Brigadier General, US Army
Commander, US Army Intelligence Center
and Fort Huachuca

(Individual, original signatures are on file with the Environmental and Natural Resources Division at Fort Huachuca.)

FINDING OF NO SIGNIFICANT IMPACT
IMPLEMENTATION OF INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN AT FORT HUACHUCA, ARIZONA

Title of the Proposed Action: Implementation of Integrated Natural Resources Management Plan, U.S. Army Intelligence Center and Fort Huachuca, Arizona.

Introduction: Preparation and implementation of this Integrated Natural Resources Management Plan (INRMP) are required by Public Law 105-85, the Sikes Act Improvement Act of 1997 (16 U.S.C. 670 *et seq.*), Department of Defense Instruction 4715.3 (*Environmental Conservation Program*), Army Regulation 200-3 (*Natural Resources - Land, Forest, and Wildlife Management*), and Army Memorandum (21 March 1997), *Army Goals and Implementing Guidance for Natural Resources Planning Level Survey (PLS) and Integrated Natural Resources Management Plan (INRMP)*. This INRMP has been prepared with an embedded, fully interated Environmental Assessment which satisfies the requirements of AR 200-2 and AR 200-3. It was prepared in compliance with the National Environmental Policy Act (NEPA) (Public Law 91-190, 42 U.S.C. 4321-4347, as amended) and the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (40 CFR 1500-1508).

Description of the Proposed Action: The U.S. Army Intelligence Center and Fort Huachuca proposes to implement an Integrated Natural Resource Management Plan (INRMP) at Fort Huachuca, Arizona for the period 2001-2005 to manage natural resources, support the military mission, provide outdoor recreation opportunities, and comply with various environmental laws. The purpose of the INRMP, 2001-2005, in part, is to avoid or reduce unintended environmental effects of the military mission on the training lands and local ecosystems. Implementation will be integrated into ongoing operations over the five-year period using both inhouse and external personnel. The primary thrust of the program will be to survey and monitor natural resources and implement programs to conserve and manage them in a proactive manner, complying with environmental laws and regulations.

Other Alternatives Considered: The Other Management Options (OMO) alternative was considered. Virtually every major natural resources program at Fort Huachuca (fish and wildlife, forestry, pest management, fire management, etc.) has options other than ones selected for the INRMP. Individual project options create almost countless potential combinations, each of which could be an alternative to the proposed action. Various laws, compliance documents, Army Regulations, etc. prohibit the implementation of many of these possibilities.

The No Action alternative was considered as required by NEPA. This alternative represents no change to current management practices for natural resources on Fort Huachuca. Compliance with laws and executive orders on endangered species, water quality, federal land management, outdoor recreation, wetlands, etc., as well as Department of Defense and Department of Army policies, would continue as directed. Under the No Action alternative, natural resource management activities and projects would occur, but planning, coordination, and execution would not be integrated at a programmatic level or ecosystem scale.

Alternative Considered but Rejected: The Compliance Alternative action was considered and rejected. Under this alternative, only those portions of the INRMP required to maintain compliance with the Programmatic Biological Opinion, requirements of the Endangered Species Act (ESA), and other laws would be implemented. Compliance with laws, such as the ESA, Clean Water Act, and NEPA, would ensure implementation of some programs but would ignore other programs within the INRMP. The Compliance Alternative is not in compliance with the Sikes Act.

Anticipated Direct and Indirect Environmental Effects: The Proposed Action and the No Action would not have significant environmental consequences. The OMO could have a wide range of environmental consequences, ranging from very positive to very negative on various components of the Fort Huachuca environment. The three alternatives differ in their ability to proactively manage natural resources, support the military mission, mitigate environmental damage due to the Army mission, and comply with environmental laws. The only impacts identified were temporary increases in soil erosion and resulting sedimentation of surface waters during land rehabilitation, wildlife habitat manipulations, prescribed burning, and maintenance of firebreaks. No adverse effect is expected to occur to any federally-listed threatened or endangered plant or animal species.

Anticipated Cumulative Effects: Neither the No Action nor the Proposed Action would add significantly to ongoing activities in the region that have the potential to significantly impact the human environment. Both proceed from the perspective of reducing environmental impacts of current and past military activity at Fort Huachuca. The Proposed Action would be more beneficial to land management activities in the region than the other two alternatives. These activities include protecting soils and water quality while still allowing the completion of the current mission. The monitoring of biological resources is a major program within the Proposed Action that would provide quantitative data regarding cumulative impacts to vegetative resources and wildlife in the region. Most cumulative effects on flora, fauna, and soil resources in the region are anticipated to result from private commercial activities off the installation, not from natural resources management on Fort Huachuca.

Findings and Conclusions: It is concluded that implementation of the U.S. Army Intelligence Center and Fort Huachuca Integrated Natural Resources Management Plan is not a major federal action that would significantly affect the quality of the environment within the meaning of Section 102(2)(c) of the NEPA of 1969, as amended. Accordingly, the preparation of an Environmental Impact Statement for this proposed action is not required.

Public Comment: The Army invites interested or affected parties to review and comment on the FONSI within 30 days of publication by writing to: Commander, U.S. Army Intelligence Center and Fort Huachuca; ATTN: ATZS-ISB (Kent); Fort Huachuca, Arizona 85613-6000. For copies of this document, please call (520) 533-3120.

Approved by:

OCT 11, 2001

JAMES A. MARKS
Brigadier General, U.S. Army
Commanding General
U.S. Army Intelligence Center and Fort Huachuca

Date

(Original signature is on file with the Environmental and Natural Resources Division at Fort Huachuca.)