AVON PARK AIR FORCE RANGE

Final Environmental Assessment

Implementation of the Integrated Natural Resources Management Plan

January 2004

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ACRONYMS & ABBREVIATIONS

AAFCEE	Air Force Center for Environmental Excellence
ACC	Air Combat Command
AF	Air Force
AFB	Air Force Base
AFI	Air Force Instruction
APAFR	Avon Park Air Force Range
APYA	Avon Park Youth Academy
AUY	Animal Unit Year
AvPCI	Avon Park Correctional Institution
BLM	Bureau of Land Management
BMP	Best Management Practice
CAMP	Corrective Action Management Plan
CCF	Hundred cubic feet
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
DBH	Diameter at Breast Height
DEP	Department of Environmental Protection
DERP	Defense Environmental Restoration Program
DFC	Desired Future Condition
DoD	Department of Defense
EA	Environmental Analysis
EO	Executive Order
EPA	Environmental Protection Agency
ERP	Environmental Restoration Program
ESP	Endangered Species Plan for APAFR
FFWCC	Florida Fish and Wildlife Conservation Commission
FNAI	Florida Natural Areas Inventory
FNST	Florida National Scenic Trail
FGS	Florida Grasshopper Sparrow
FSJ	Florida Scrub Jay
FY	Fiscal Year
FONSI	Finding of No Significant Impact
GIS	Geographical Information System
HMU	Habitat Management Unit
INRMP	Integrated Natural Resources Management Plan
IPM	Integrated Pest Management
IRP	Installation Restoration Program

LSA	Landscape Association
LAMA	Landscape Association Management Area
LQG	Large Quantity Generator
M	Thousand
MAJCOM	Major Command
MBF	Thousand board feet
MCF	Thousand cubic feet
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
NQI	Natural Floristic Quality Index
OHV	Off highway vehicle
OWS	Oil-Water Separator
PETS	Proposed, Endangered, Threatened or Sensitive species
PL	Public Law
RCRA	Resource Conservation and Recovery Act
RCW	Red-cockaded woodpecker
RPM	Remedial Project Manager
RQW	Rescue Wing
SCORP	State Comprehensive Outdoor Recreation Plan
SFWMD	South Florida Water Management District
SWPPP	Storm Water Pollution Prevention Plan
T&E	Threatened and Endangered Species
USC	United States Code
USDA	US Department of Agriculture
USDI	US Department of Interior
USFWS	US Fish and Wildlife Service

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FINDING OF NO SIGNIFICANT IMPACT

NAME OF PROPOSED ACTION. Implementation of an Integrated Natural Resources Management Plan (INRMP) for Avon Park Air Force Range (APAFR), Florida.

DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES. The Proposed Action involves implementation of an INRMP that includes management standards and guidelines designed to restore, enhance, and protect the health and integrity of APAFR ecosystems. Included in the INRMP would be standards for the management of wildlife and fish, forest resources, threatened and endangered species habitat, outdoor recreation, rare plant communities, wetlands, watershed protection, rangeland cattle grazing, and infrastructure. This INRMP would represent a shift away from a traditional "resource program"-based approach to one based on ecosystem landscape associations. Preparation and implementation of the INRMP is required by the Department of Defense (DoD), Department of the Air Force (AF), and the Sikes Act (US Code 670a, as amended). Implementation of the INRMP will fulfill APAFR's obligation to care for the lands entrusted to it as well as to provide realistic, natural settings for military training.

In addition to the Proposed Action, the Air Force evaluated two alternatives: (A) continued use of the current INRMP (the no action alternative); and (B) conservation and restoration of native vegetation and communities.

SUMMARY OF ENVIRONMENTAL CONSEQUENCES. This Environmental Assessment (EA) analyzes potential environmental consequences associated with the alternatives. Resource areas evaluated in detail include: Earth Resources, Water Resources, Biological Resources, Air Quality, Land Use, Hazardous Materials and Waste, Cultural Resources, Visual and Recreational Resources, Socio-economics and Environmental Justice.

Earth Resources. Impacts on the soils and geology of APAFR would not be significant from any of the alternatives, although management practices that continue to disturb the ground surface, such as timber harvesting, road maintenance, military operations and wildlife habitat improvements,

would likely continue. In all alternatives, erosion, sedimentation and ground disturbance would be mitigated through road maintenance and repair and use of Best Management Practices (BMPs). Water Resources. The Proposed Action seeks to restore the altered hydrology of some areas of APAFR through specific standards for the closure and/or repair of specific roads, restoring native communities, limiting ground disturbance, and use of BMPs. Implementation of the Proposed Action would have a positive effect on the hydrology of APAFR and benefit the native plant communities. The no action alternative would likely have a negative impact on the hydrology if current practices continue and human alterations to the environment are not addressed. Alternative B would likely benefit the hydrology through its focus on restoring native vegetation and limiting management activities such as forest and range management.

Biological Resources. Impacts to vegetation and ground cover would occur under all alternatives, typically from forest and range management activities. The Proposed Action would have fewer impacts to vegetation than the no action alternative through the use of standards to minimize ground disturbance in some communities, restore native species, and the use of fire on shorter intervals to mimic natural processes. In the Proposed Action, more acres would be under uneven-aged management, and slightly fewer acres in pine plantations, than in the no action alternative. Alternative B would have the least impacts to vegetation, once the pine plantations are removed and restored to native species, and would more likely resemble the historic landscape. None of the alternatives would have an adverse impact on wildlife and fish resources. All alternatives have a focus on restoring and improving habitat for threatened and endangered species at APAFR. In addition, all alternatives manage game species to allow human use (consumption) at levels that will not result in long-term ecological degradation of the wildlife resource. Alternative B may benefit wildlife more due to its lack of roads and interior fences and less fragmentation of habitat.

Air Quality. APAFR has an active and high profile prescribed burning program to restore habitat and plant communities and for rangeland and forest management. Even with an extensive burning program, smoke management has not been an issue at APAFR and does not impact the Class II air quality classification of the area. The Proposed Action and Alternative A would not significantly impact the air quality of the area. Alternative B, in which burns would likely occur over a larger

area, has the potential to put more smoke and particular matter in the air, but not at a level which would alter the Class II air quality Classification or put air quality in non-attainment status.

Land Use. None of the alternatives would impact the military mission at APAFR, and all would most likely benefit the mission by providing excellent training opportunities. Both the Proposed Action and the no action alternative have a focus on ecosystem management and provide healthy ecosystems that in turn provide good training areas. Alternative B has a higher potential to provide more remote and realistic settings due to the removal of roads, fences, plow lines and pine plantations. The Proposed Action and no action alternatives maintain the grazing program at an optimal level to produce goods and revenue and maintain the condition of herbaceous layers. Under both alternatives, cattle grazing is used to reduce fuel loads and maintain installation and target area fences. While cattle grazing does cause impacts from trampling and browsing vegetation, adding fertilizer and methane to the ecosystem, and compacting the soil around cattle feeders and in corrals, the impacts are not significant. Alternative B eliminates cattle grazing and thus eliminates these impacts, but would result in taller herbaceous layers that would add to the fuel load and require more frequent use of prescribed fire.

Hazardous Materials and Waste Management. None of the alternatives would have any impact on hazardous waste at APAFR. Any petroleum products, solvents, or other hazardous materials used during management activities would be disposed of in accordance with established AF procedures and federal and state regulations.

Cultural Resources. Under all alternatives, management practices such as timber harvesting, road reconstruction, prescribed burning, and habitat improvements may impact prehistoric and historic resources. However, APAFR adheres to federal mandates of the National Historic Preservation Act that requires all potentially impacted cultural resources be evaluated to determine their significance prior to implementing any actions that would damage or destroy these resources. APAFR has an ongoing effort to survey and identify all cultural resource sites, and thus all alternatives offer a high degree of protection of these resources.

Visual Resources and Recreation. Public recreation at APAFR centers on hunting and fishing. None of the alternatives would significantly impact outdoor recreation at APAFR, with the possible except of Alternative B, which would be expected to impact hunting with dogs. The reduction in roads and plow lines in Alternative B would reduce the amount of access to hunters who need to follow and catch their dogs. However, any reduction in the number of these hunters would not be significant and would likely be compensated by a corresponding increase in still hunters.

Socioeconomics/Environmental Justice. The Proposed Action and the no action alternative continue the level of production of goods and services as in past years. Revenue generating programs such as timber, grazing and recreation operate at an optimum level under these two alternatives and would not significantly impact the economic conditions of the area. Residents who use APAFR for recreation, mainly hunters, have a "sense of place" attached to APAFR and are expected to continue to recreate on APAFR as they have in the past. Alternative B would most likely impact socioeconomic conditions by moving away from even-aged management toward an uneven-aged system of forest management, eliminating the grazing program, displacing cattlemen to other areas, and reducing revenues for APAFR. This action would not result in a disproportionate adverse effect on minority persons or low-income populations.

Conclusion. Based on the findings of the EA conducted in accordance with the requirements of the National Environmental Quality Act, the Council of Environmental Quality regulations, and AF Instruction 32-7061, codified in 32 Code of Federal Regulations Part 989, and after careful review of the potential impacts, I conclude that implementation of the Proposed Action does not represent a major federal action with significant impacts to the human or natural environment. Therefore, a Finding of No Significant Impact is warranted, and an Environmental Impact Statement is not required.

W. Uhle, Jr. — 7 Mar 2004

WILLIAM W. UHLE, Colonel — Date
USAF Chairperson, 20 FW
Environmental Leadership Board

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EXECUTIVE SUMMARY

This Environmental Assessment (EA) analyzes the potential environmental effects of three alternatives for the management of natural resources at Avon Park Air Force Range (APAFR), Florida.

This environmental analysis process is designed to:

- Ensure the public is involved in the process and is fully informed about the potential environmental effects.

- Help decision makers take environmental factors into consideration when making their decisions.

Environmental Impact Analysis Process

This EA has been prepared by the United States Air Force (Air Force), 18th Air Support Operations Group (ASOG), in accordance with the requirements of the National Environmental Policy Act (NEPA) of 1969, the Council of Environmental Quality regulations implementing NEPA, and 32 Code of Federal Regulations, Part 989, *The Environmental Impact Analysis Process.* In October 2003, APAFR came under the command of the 20th Fighter Wing, Shaw Air Force Base, South Carolina.

Purpose and Need for the Proposed Action

The purpose of the Proposed Action is to implement an Integrated Natural Resources Management Plan (INRMP) for the APAFR, Florida

The Sikes Act of 1960 and Department of Defense (DoD) and Air Force regulations require the preparation of an INRMP for each military installation, and mandate that each plan be reviewed

at least every 5 years. The current INRMP for Avon Park was implemented in 1997, and took the first steps toward an ecosystem approach to resource management. The Air Force began review and revision of the INRMP in 2002 with the intent of moving even closer to ecosystem-based management of the natural resources.

Proposed Action and Alternatives

The Proposed Action involves implementation of the INRMP and management standards and guidelines designed to restore, enhance, and protect the health and integrity of APAFR ecosystems. Included in the INRMP are standards for the management of wildlife and fish, forest resources, threatened and endangered species habitat, outdoor recreation, rare plant communities, wetlands, watershed protection, rangeland cattle grazing, and infrastructure. This INRMP represents a shift away from traditional "resource program"-based approach to one based on ecosystem landscape associations. The Sikes Act (USC 670c, as amended) and DoD and Air Force directives require the development and implementation of an INRMP. Implementation of the INRMP will fulfill APAFR's obligation to care for the lands entrusted to it as well as to provide realistic, natural settings for military training. This EA considers the environmental impacts resulting from three proposed alternatives: Under the Proposed Action, the AF would implement ecosystem-based management of areas with specific management standards. Under Alternative A (the No Action Alternative), continued use of the current INRMP would occur. Under Alternative B, conservation and restoration of native vegetation and communities would occur.

1.0 PURPOSE AND NEED FOR THE PROPOSED ACTION

1.1 INTRODUCTION

The United States Air Force (AF), 20th Fighter Wing at Shaw Air Force Base, South Carolina proposes to revise its current Integrated Natural Resources Management Plan (INRMP).

This environmental assessment (EA) has been prepared to analyze the potential environmental consequences associated with the Proposed Action and alternatives in accordance with the requirements of the National Environmental Policy Act (NEPA); the Council on Environmental Quality (CEQ) regulations and 32 Code of Federal Regulations (CFR), Part 989, *Environmental Impact Analysis Process.*

1.2 BACKGROUND

An interdisciplinary team was formed to identify and map the ecological conditions on APAFR to conform to the national ecological classification system of the National Hierarchical Framework of Ecological Units (ECOMAP 1993). This approach identified the Landscape Associations and Landtype Phases found on APAFR, and management units were based on these ecosystems. For each landscape association, a desired future condition (DFC) was described, accompanied by a set of management standards to achieve those conditions. The Proposed Action is to use these DFCs and standards to manage the resources on APAFR.

The following issues were identified as significant to management of the resources at APAFR:

- What ecological communities should be restored and maintained at APAFR and what methods and management practices should be used?

- How should we manage at the landscape level to maintain biodiversity, species richness, and hydrological integrity and reduce fragmentation of habitats?

- How should we manage cypress and mixed hardwoods stands?

- How should we manage natural stands of longleaf and south Florida slash pine?

- Should we manage for a sustainable native seed harvest program?

- How should we manage and protect riparian and wetland areas?

- How should special botanical, geological, scenic, or historic areas be protected and managed?

- How should we manage existing pine plantations?

- How do we manage for an intact, diverse understory component?

- Is the forest management program sustainable?

- How should we control/eradicate invasive exotic plants?

- What methods should be used to control the encroachment of woody species on roadside shoulders?

- How should we manage habitat for proposed, endangered, and threatened plant species?

- What is the role of livestock grazing in maintaining vegetative communities, and how should grazing impacts be managed?

- What fire regimes and fire return intervals are appropriate for each ecosystem, and what firing techniques can be used to achieve these?

- How should we manage firelines?

- How should we manage feral hogs and other invasive exotic animals on APAFR?

- How should we achieve habitat and population goals of proposed, endangered, and threatened species, game, and nongame species without adding constraints to the military mission?

- How should we manage recreation use on APAFR?

- What level and type of interpretive services should APAFR be providing to the public, and what methods should be used for educating the public about management practices?

- How should we manage recreational trails, including the Florida National Scenic Trail (FNST), at APAFR?

- What would be an appropriate and reasonable access for the public?

- How do we maintain a realistic, natural military training environment?

- How can we ensure access to high explosive areas for required management activities?

- How should we manage the natural resources in closed areas, considering safety issues?

- How will continued urban encroachment affect lands surrounding APAFR?

- What is an appropriate level of goods and services that APAFR should be contributing to the local economy (commercial harvesting, recreation user days, etc)?

- How can Geographical Information Systems (GIS) help achieve current and future natural resource management objectives?

- How can GIS be used as a tool to resolve issues between military use and quality resource maintenance?

1.3 PURPOSE AND NEED FOR THE ACTION

Under the Proposed Action, the Air Force would revise its current INRMP and implement ecosystem-based management of areas with specific management standards. Implementation is required to provide natural resources protection and management as mandated by federal laws and DoD and AF policy and regulations.

Development and implementation of an INRMP is required for all DoD installations. Natural resources management programs are directed towards ensuring continued access to land and air space required to accomplish the military mission by maintaining these resources in a healthy condition.

1.4 REGULATORY COMPLIANCE

A variety of laws, regulations, and executive orders (EOs) apply to Federal actions and form the basis of this analysis. NEPA requires Federal agencies to consider potential environmental consequences of Proposed Actions and enhance the environment through well-informed Federal decisions. CEQ was established under NEPA to implement and oversee Federal policy in this process. Other related Federal regulations include 32 CFR 989; *Environmental Impact Analysis Process* and EO 11514, *Protection and Enhancement of Environmental Quality*. There is a host of additional laws, EOs and regulations pertaining to management and protection of natural resources. These are contained in Appendix A.

1.5 ORGANIZATION OF THE EA

This EA assesses the potential impacts of the Proposed Action and alternatives, including the No Action Alternative, on potentially affected environmental resources. Chapter 1.0 provides background information relevant to the Proposed Action and discusses its purpose and need. Chapter 2.0 describes the Proposed Action and alternatives. Chapter 3.0 describes baseline conditions (i.e., the conditions against which the potential impacts of the proposed and action and alternatives are measured) for each of the resource areas. Chapter 4.0 describes potential environmental impacts of the Proposed Action and alternatives on these resources. Chapter 5.0 includes an analysis of potential cumulative impacts and any irreversible and irretrievable commitments of resources. Chapter 6.0 contains references used for the preparation of the EA and a glossary. Chapter 7.0 lists persons and agencies contacted. Chapter 8.0 lists the preparers. Appendix A contains a list of relevant laws. Appendix B describes the planning process. Appendix C contains the natural subsections and their landscape associations at APAFR and the Landscape Association Management Areas for APAFR. Appendix D lists invasive species found at APAFR. Appendix E contains listed species found at APAFR. Appendix F contains a summary of public involvement.

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2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

2.1 DEVELOPMENT OF ALTERNATIVES

This chapter summarizes the alternatives that were developed as potential management strategies for APAFR. It describes the alternative development process, considers alternatives in detail, and compares alternatives.

Needs identified through the development of issues, goals, objectives, Landscape Association Management Areas (LAMAs), DFC standards, and internal review were instrumental in developing alternatives. These alternatives represent ways of revising an INRMP that address both these needs and the purpose of an INRMP as directed by the Sikes Act of 1960 and by AFI 32-7064. LAMAs are listed in Appendix C.

There are countless alternatives for managing any given piece of land. However, we can only study a limited number of those alternatives. Alternatives were developed by considering a full range of reasonable management options, the military mission, and internal and public input. It is important that the alternatives be implementable and span a full range of possibilities. Three alternatives merited detailed study because they represent rational management of natural resources in the context of the military mission.

Alternatives were developed using a set of DFCs that respond to the issues. The DFCs were applied on the ground using ecological units (LAMAs) based on Landscape Associations (see Appendix B, “The Planning Process”). Each LAMA contains a goal and a description of what that unit will look like at some future time perhaps 40-50 years into the future. By following the goals, objectives, and standards in the INRMP, each 5-year planning cycle will draw APAFR closer to that DFC. The Interdisciplinary Team developed 14 DFCs. Not all alternatives contain all LAMAs.

Three preliminary alternatives were developed. The three alternatives provide a reasonable range of alternatives based on the issues, the military mission, and the current condition of the land and resources. All alternatives meet federal requirements in 32 CFR 989 and NEPA.

2.2 PROPOSED ACTION

The Air Force proposes to implement an ecosystem approach to land management by allocating land uses based on the appropriateness of that use in the ecosystems present. This alternative provides for a set of 14 LAMAs on APAFR based on land type associations and phases. They offer a mix of current conditions that range from approximating the natural landscapes to highly impacted areas devoted to the military mission.

Adaptive management would be emphasized in restoring and maintain native ecosystems and providing for balanced human use. Forested areas would move toward a diverse patch size structure in longleaf and slash pine. Selected natural pine forests and north Florida slash pine plantations would continue to be managed for timber resources and would provide a source of revenue. Cattle grazing would continue.

2.2.1 Protected Areas

Riparian areas, locations of rare plant species, cultural resources sites, the Blue Jordan Swamp, and Sandy Point Wildlife Refuge would be protected for their ecological, historical, and/or educational values.

2.2.2 Floodplains/Wetlands

Some wetlands, such as Arbuckle Creek Marsh and floodplain, would not be available for commercial timber management.

2.2.3 Endangered Species

Endangered species populations and habitat would be managed to enhance the populations and move toward recovery of the species. The existing Endangered Species Plan (ESP) for APAFR (Plan for the Management of the Florida Grasshopper Sparrow, Florida Scrub-Jay, and the Red-Cockaded Woodpecker at Avon Park Air Force Range 2000) would govern Florida Grasshopper Sparrow (FGS), Florida scrub-jay (FSJ), and Red-cockaded woodpecker (RCW) management.

2.2.4 Forest Management

Areas would be defined where commercial timber can be managed. Some plantations would be converted to scrub or longleaf natural pine stands to meet endangered species mandates. Some pine plantations, especially those on highly disturbed sites, would continue to exist.

2.2.5 Cattle Grazing

Cattle grazing would continue on the existing outleases. Some restrictions on where cattle feeders may be placed would be implemented.

2.2.6 Infrastructure

Some roads identified as having severe erosion problems would be a priority for repair. Durden Grade and parts of Echo Springs Road would be closed completely and allowed to revegetate. Interior fences for cattle grazing allotments would be maintained. Hog-proof fences would be installed around some sensitive areas.

2.2.7 Invasive Species Control

Management actions to control invasive species would be implemented.

2.2.8 Integrated Pest Management

Pest species would be managed in accordance with AF directives.

2.3 ALTERNATIVES CONSIDERED BUT ELIMINATED

The planning team received many comments and suggestions during the planning process. The Interdisciplinary Team, comprised of program managers for natural resources, discussed all suggestions. The comments and suggestions influenced the development of alternatives. Also identified were alternatives not considered in detail. These included:

2.3.1 Deactivate The Range And Eliminate Military Use Of The Area

This alternative was not considered in detail because it is outside the scope of natural resources planning, and because APAFR has been identified as essential to the military training mission.

2.3.2 Leave The Land Uncontrolled And Allow Natural Processes To Shape The Landscape

This suggestion was too risky as uncontrolled wildfires have the potential to damage adjacent land and resources; invasive exotics need to be aggressively controlled or they will out compete native species; and the economic potential it would forego would be significant. It ignores the human component of the ecosystem. Historic and current use of the area has influenced the composition, structure, and function of the ecosystems, and this use can be managed in a way that maintains and restores ecosystems to a sustainable level.

2.3.3 Close The Installation To Public Use

While the military mission goes hand-in-hand with management of natural resources at APAFR, there is no need to ban recreational use of these lands. Large areas of APAFR can provide benefits to the public through recreational use without conflicting with the military mission.

2.4 ALTERNATIVES

2.4.1 Alternative A

Under Alternative A, the No Action Alternative, current management of resources under the current INRMP would continue. No Action does not imply that there is no management action; instead, it implies that there is no change in management direction from what is currently in the INRMP for APAFR.

The current plan is based on traditional resource management programs (forest management, agricultural outleasing for grazing, recreation, fire management, fish, and wildlife management). It discusses an ecosystem approach to land management, but allocates land uses based on the needs of the resource management programs, not on the ecosystems present. Much of the current direction comes not from the INRMP but from the ESP, which gives specific direction on creating and maintaining habitat and populations of threatened and endangered species. The current plan contains no direction on managing feral hogs on the installation or identifying natural areas for protection.

2.4.1.1 Protected Areas

There would be no areas specifically identified and protected for their ecological, historical, and/or educational values.

2.4.1.2 Floodplains/Wetlands

Commercial timber management may occur in floodplains and wetlands.

2.4.1.3 Endangered Species

FGS, FSJ, and RCW populations and habitat would be managed to enhance the populations and move toward recovery of the species.

2.4.1.4 Forest Management

The entire installation is considered open and suitable for commercial timber management. Some plantations will be converted to scrub or longleaf natural pine stands to meet endangered species mandates. Some pine plantations, especially those on highly disturbed sites, will continue to exist.

2.4.1.5 Cattle Grazing

Cattle grazing would continue on the existing outleases.

2.4.1.6 Infrastructure

The current road system would continue to be open and maintained. No roads would be scheduled to be closed or obliterated. Interior fences for cattle grazing allotments would be maintained.

2.4.1.7 Invasive Species Control

Management actions to control invasive species would be implemented.

2.4.1.8 Integrated Pest Management

Pest species would be managed in accordance with AF directives.

2.4.2 Alternative B

Management emphasis would be on conserving the native flora and fauna communities of APAFR and restoring the native species to approximately their historic conditions, or presettlement extent. This alternative takes an ecosystem management approach because it is based on the landscape associations present at APAFR and seeks to restore ecosystems at the landscape level.

2.4.2.1 Protected Areas

Floodplains and wetlands, locations of rare plant species, cultural resources sites, the Blue Jordan Swamp, and Sandy Point Wildlife Refuge would be identified and protected for their ecological, historical, and/or educational values.

2.4.2.2 Floodplains/Wetlands

Wetlands would not be available for commercial timber management.

2.4.2.3 Endangered Species

FGS, FSJ, and RCW populations and habitat would be managed to enhance the populations and move toward recovery of the species.

2.4.2.4 Forest Management

APAFR would move to an uneven-aged silvicultural system. Pine plantations would be clear-cut and restored to native longleaf and slash natural pine stands. Old growth of all forest types will increase.

2.4.2.5 Cattle Grazing

No cattle grazing would be permitted.

2.4.2.6 Infrastructure

Approximately 32% of the roads would be closed and allowed to revegetate. Those roads and tank trails needed for military training would be maintained as part of the range operation. Interior fences around grazing allotments would be removed and improved pastures would be restored to natural vegetation.

2.4.2.7 Invasive Species Control

Management actions to control invasive species would be implemented.

2.4.2.8 Integrated Pest Management

Pest species would be managed in accordance with AF directives.

Figure 2-1. Proposed Action, Ecosystem Based Management

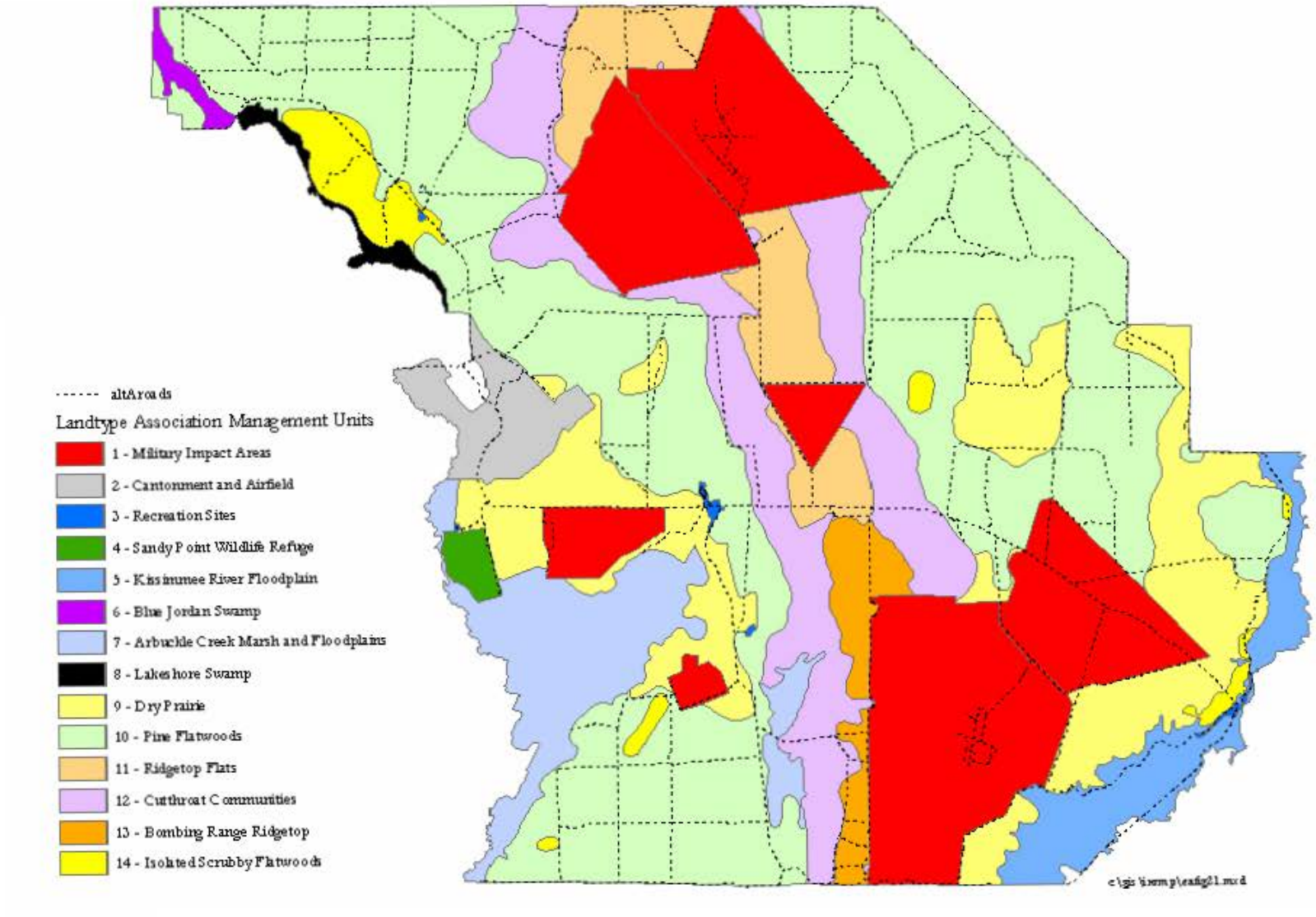


Figure 2-2. Alternative A, the No Action Alternative

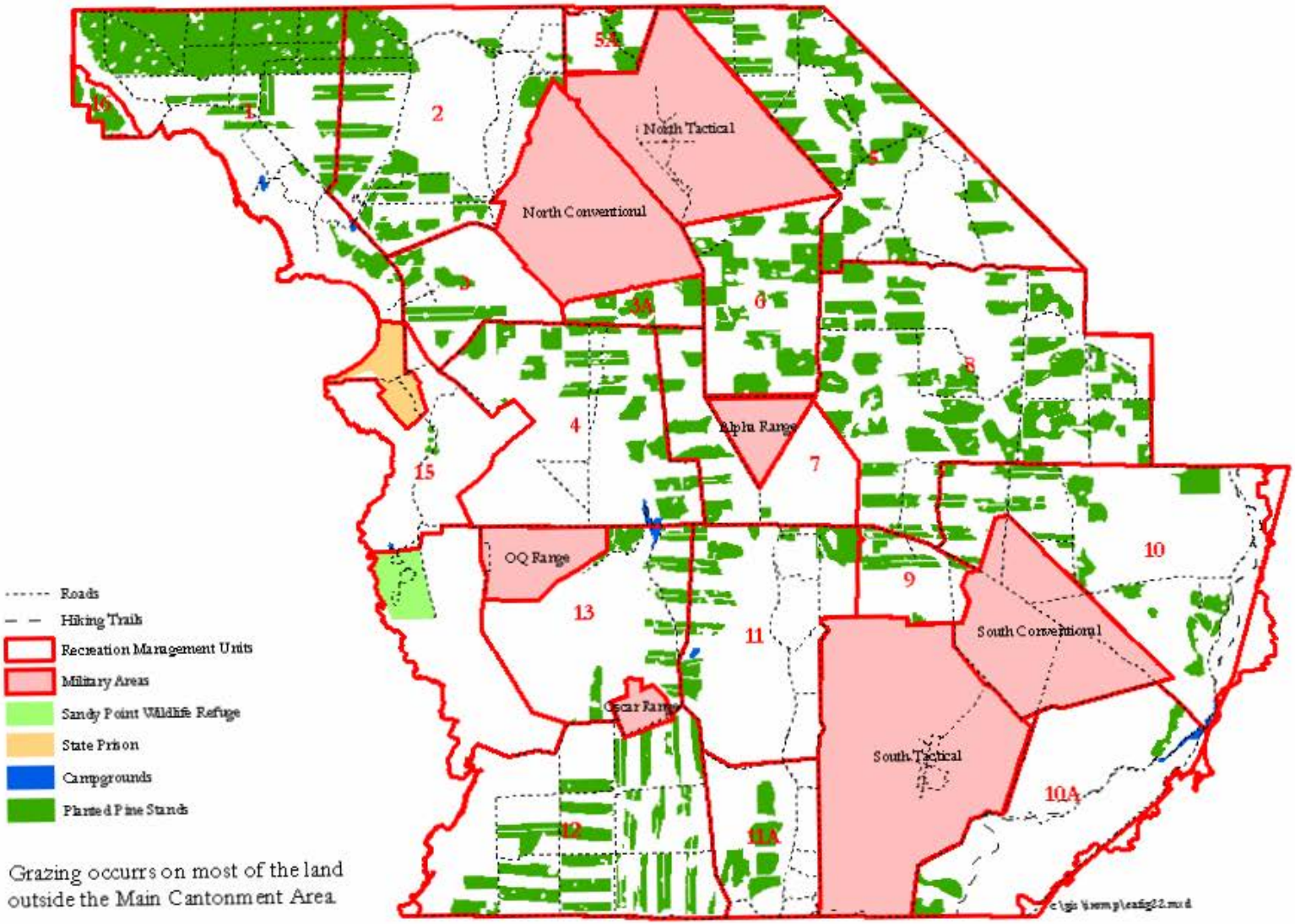
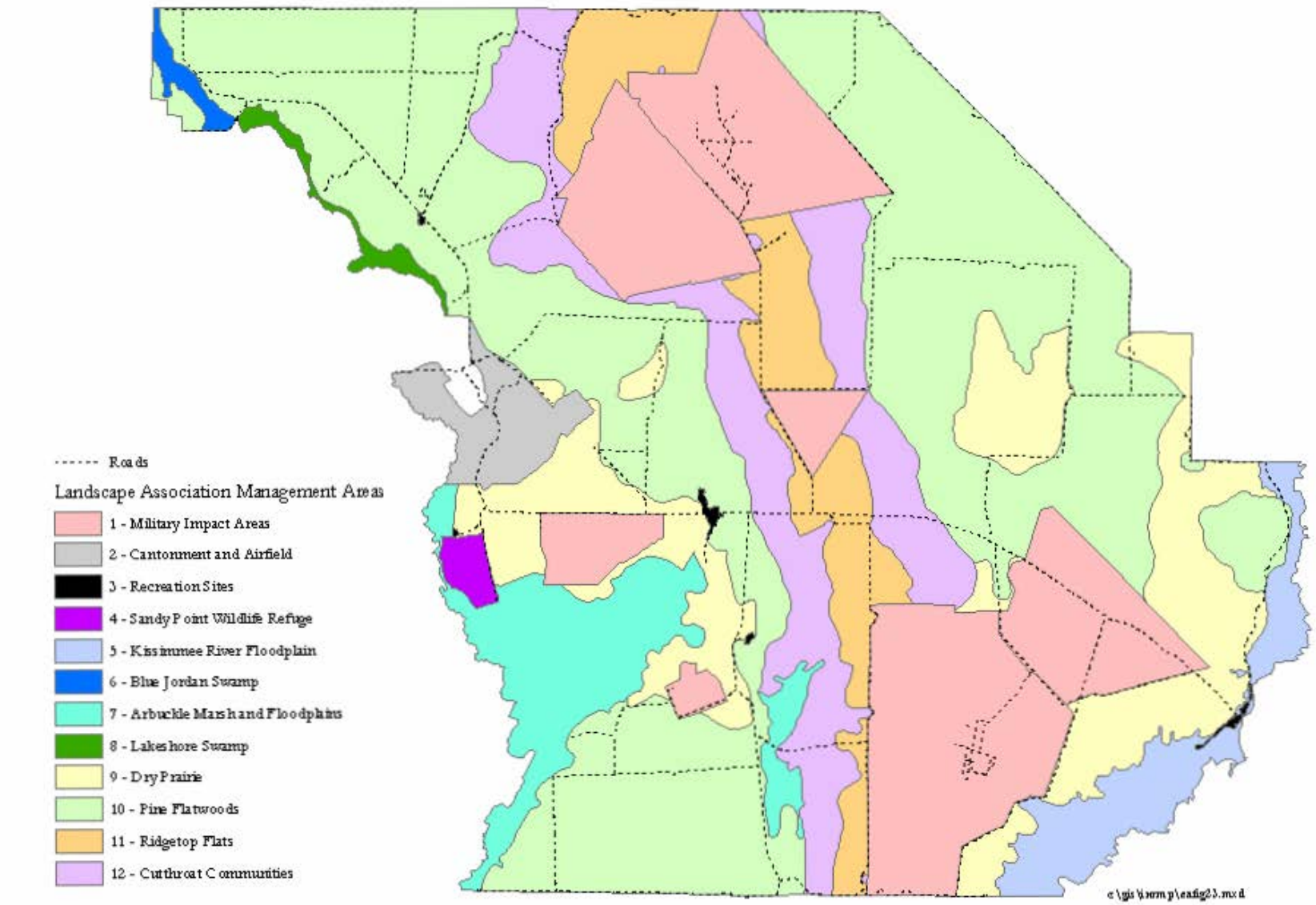


Figure 2-3. Alternative B, Conservation/Restoration of Native Ecosystems Alternative



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3.0 AFFECTED ENVIRONMENT

This chapter describes the current conditions of the resources potentially affected by the Proposed Action or that may affect the Proposed Action. In compliance with guidelines contained in NEPA and CEQ regulations, the description of the affected environment focuses on those environmental resources potentially subject to impacts.

3.1 LOCATION

APAFR occupies 106,073 acres in southeastern Polk and northeastern Highlands Counties. The APAFR is approximately 95 miles east of Tampa and 70 miles southwest of Orlando. The city of Avon Park is located 9 miles to the west.

APAFR lies within the Osceola Plain, Bombing Range Ridge, and Okeechobee Plain physiographic provinces. The Osceola Plain, which underlies most of the APAFR, is characterized by nearly level sandy plains with scattered shallow depressions and drainageways; elevations range from 60-70' mean sea level (msl). The Bombing Range Ridge, which runs north-south through the center of APAFR, rises from the Osceola Plain and reaches elevations of 125-145' msl. The Kissimmee River and its bordering wetlands are located on the southeast border of the APAFR and lie within the Okeechobee Plain. The deep, circular lakes typical of these physiographic areas are the surface expression of underlying sinkholes. Other significant topographic features include Lake Arbuckle and Arbuckle Creek on the western border.

3.2 EARTH RESOURCES

3.2.1 Soils

A detailed soil survey performed in 1983 and mapped onto black and white aerial photos at a scale of (1:1,320) by the USDA Natural Resources Conservation Service identified 35 soil series (40 mapping units, including pits river spoil, etc.) on the study area. Six of the seven soil orders (Brown et al. 1990) in Florida occur at APAFR and they are listed with the percentage they

comprise of the soil base: Alfisols (9%), Entisols (22%), Histosols (6%), Inceptisols (4%), Mollisols (1%) and Spodosols (50%). Approximately 8% of the remaining total includes miscellaneous categories (pits, spoil, etc.). Also included within this 8% is the St. Johns-Basinger-Placid mapping unit which includes more than one soil order, hence this necessitates artificial placement within the miscellaneous category. Spodosols are the dominant soils of Florida and at APAFR and are characterized by a subsurface zone called a spodic (organic) horizon layer.

The soils at APAFR range from excessively well-drained, with the highest water tables varying from 2.6 feet (0.8 meters) to more than 9.8 feet (three meters), to very poorly drained with maximum water table varying from two feet (0.6 meters) to less than 0.8 feet (0.25 meters). The drainage characteristics of the respective soil types represented at Avon Park are in Table 3-1. In addition there are published soil surveys for both Polk (Ford et al. 1990) and Highlands (Carter et al. 1989) counties.

The Polk County Soil Survey identifies 12 naturally occurring soil associations of which 5 are found at APAFR. The Archbold-Satellite soil association is categorized as an upland soil association consisting of nearly level and gently sloping, moderately well drained and somewhat poorly drained soils that are sandy throughout. Two soil associations, the Smyrna-Myakka-Immokalee and the Malabar-Eau Gallie-Valkaria, include nearly level, poorly drained soils. The Smyrna-Myakka-Immokalee soil association is sandy throughout, whereas the Malabar-Eau Gallie-Valkaria soil association includes sandy soils, some of which are underlain by loamy material. Together, these two soil associations cover the greatest areal extent of the Polk County portion of APAFR. The Samsula-Hontoon soil association consists of nearly level, very poorly drained organic soils, some of which are overlain by sand. The floodplains of Lake Arbuckle, Arbuckle Creek, and Blue Jordan Swamp are mapped as the Samsula-Hontoon Soil association. Kittaw-Kaliga-Chobee soil association consists of nearly level, very poorly drained, loamy and mucky soils that are subject to flooding and are mapped at APAFR along the Kissimmee River.

The Highlands County Soil Survey identifies nine soil associations in Highlands County and maps eight of these within APAFR. The Satellite-Archbold-Pomello soil association includes

nearly level or gently sloping, somewhat poorly drained or moderately drained sandy soils, some of which have an organic-stained subsoil. This soil association occurs in two distinct areas at APAFR on the highest elevations of the Bombing Range Ridge and in an upland area along the escarpment above the floodplain of the Kissimmee River. It is essentially equivalent to the Archbold-Satellite soil association of the Polk County survey.

All of the soil associations mapped for Highlands County that are known to occur in flatwoods or sloughs are mapped on the APAFR (Fig 3-1). The following associations consist of nearly level, poorly to very poorly drained sandy soils, some with an organic-stained subsoil or underlain by loamy material: Myakka-Immokalee-Smyrna, Felda-Hicoria-Malabar, Basinger-Valkaria-Placid, and Oldsmar-Eau Gallie-Pomona soil associations. The Myakka-Immokalee-Smyrna soil association is mapped for the greatest areal extent in the Highlands County portion of APAFR. The Basinger-Valkaria-Placid soil association is confined at APAFR to drainages emptying into the Kissimmee River in the southeastern portion of APAFR. Kaligo-Tequesta-Gator soil association is a nearly level, very poorly drained association with soils that have an organic layer underlain by loamy material and is restricted in occurrence at APAFR to the floodplain of Arbuckle Creek and the Kissimmee River floodplain.

The Samsula-Hontoon-Sanibel soil association consists of nearly level, very poorly drained soils; most organic with a sandy substratum, but some with only a thin organic surface layer. This association is confined to the Arbuckle Creek-Morgan Hole marsh system and “Long Cypress Slash.”

Another soil association mapped within the Highlands County portion of APAFR is the Basinger-St. Johns-Placid association, which is labeled as a cutthroat (*Panicum abscissum*) seep soil association in Highlands County (Carter et al. 1989). These soils are nearly level, poorly drained or very poorly drained sandy soils, some with an organic-stained subsoil. There are only eight regions, all rather linearly shaped areas mapped as this soil association in Highlands County, of which three occur at least partially within APAFR. In the Polk County Soil Survey there is not an equivalent cutthroat soil, rather, cutthroat areas are either mapped as Basinger or

Myakka. These same mapping units in Highlands County are used only for areas lacking cutthroat grass.

Of particular note are several soil subgroups that are principally Floridian in range. All soil series at APAFR are restricted (endemic) to peninsular Florida. This distinction indicates that perhaps environmental and edaphic conditions (i.e. hyperthermic conditions) in peninsular Florida differ enough from the remainder of the coastal plain that peninsular Florida natural communities should be recognized as distinct.

The Bureau of Land Management (BLM) is responsible for leasing minerals under both acquired lands (land purchased by the federal government) and public domain status lands (lands that have always been held by the federal government). There are no acres of public domain status lands on APAFR, and no acres involved with outstanding and reserved minerals. Sandy clay has been commonly used as a road surfacing material on APAFR, as well as shell from spoil along the Kissimmee River canal. During the 1940s and 50s, DoD dug sandy clay from pits (commonly called “borrow pits”) as surfacing material as the road system grew. In addition, during the 1970s and 80s, material was dredged from shallow ponds to create permanent “cattle ponds” in the area. This material was used as road surfacing. Spoil from the Kissimmee River canal, composed mostly of shell, has also been and currently continues to be used as road surfacing material.

3.2.2 Minerals and Energy Resources

Mineral resources at APAFR can be divided into locatable, leasable and salable resources. Locatable minerals are “hardrock minerals” such as gold, silver, copper, lead, zinc and titanium found on public domain status land. Leasable minerals include energy minerals such as oil, gas, coal, geothermal, and other specific minerals such as phosphate, sodium and potassium that are found on both public domain and acquired status lands. Salable minerals include common varieties of minerals such as building stone, clay, gravel, limestone, shell and sand. APAFR does not currently lease or sell minerals.

Figure 3-1. Soils of Avon Park Air Force Range

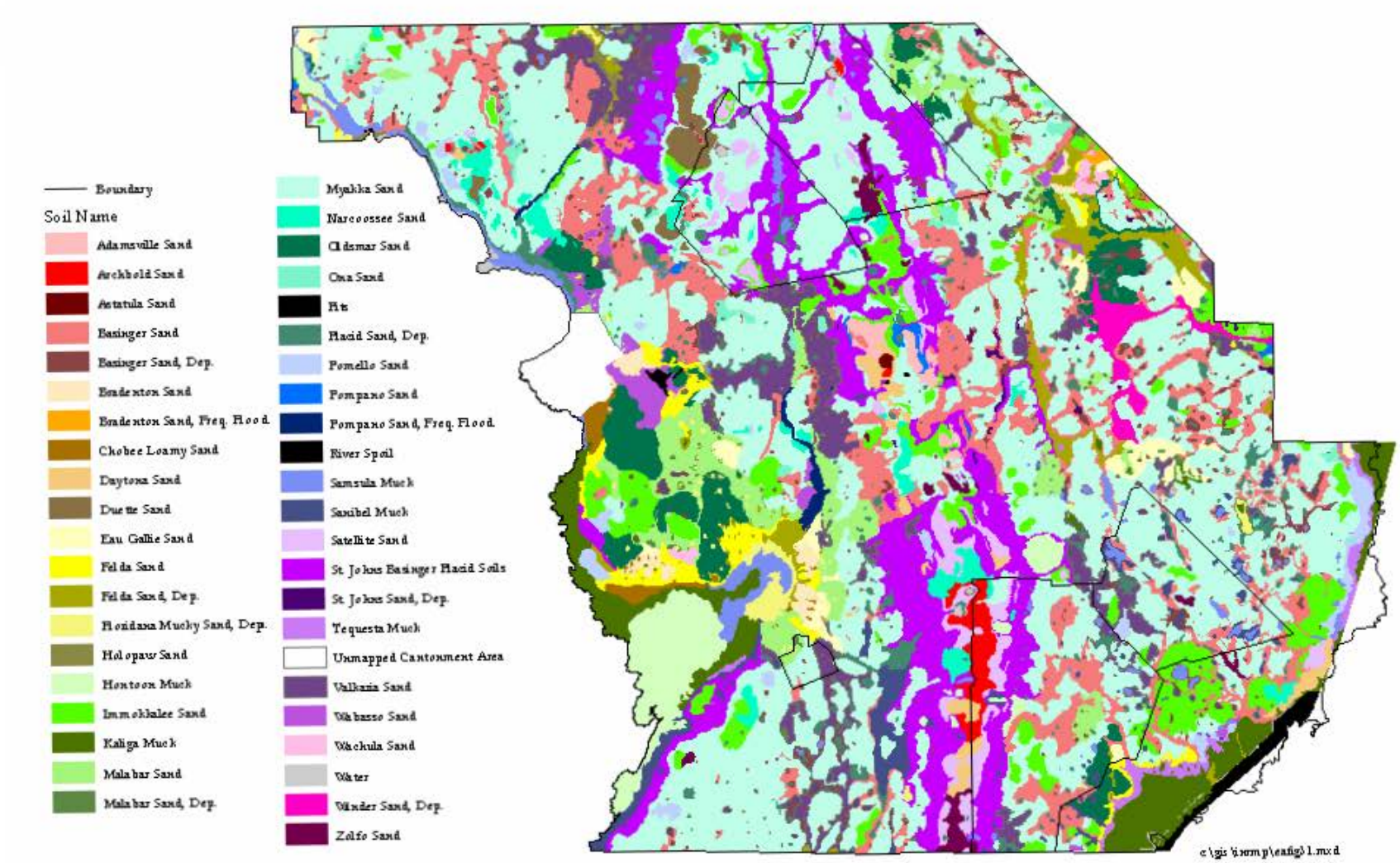


Table 3-1. Drainage classes and soil classification for APAFR

Drainage Class/ Soil Type	Soil Order	Soil Classification	% of Total
Excessively well drained			
Astatula sand	Entisol	Typic Quartzipsamments	.03
SUBTOTAL			.03
Moderately well drained			
Archbold sand	Entisol	Typic Quartzipsamments	.62
Pomello sand	Spodosol	Arenic Haplohumods	.90
Duette sand	Spodosol	Grossarenic Entic Haplohumods	.67
Daytona sand	Spodosol	Entic Haplohumods	.72
SUBTOTAL			2.92
Somewhat poorly drained			
Adamsville sand	Entisol	Aquic Quartzipsamments	.41
Zolfo sand	Spodosol	Grossarenic Entic Haplohumods	.57
Narcoossee sand	Spodosol	Entic Haplohumods	1.51
Satellite sand	Entisol	Aquic Quartzipsamments	1.77
SUBTOTAL			4.26
Poorly drained			
Oldsmar sand	Spodosol	Alfic Arenic Haplaquods	3.00
Ona sand	Spodosol	Typic Haplaquods	.60
Pompano sand	Entisol	Typic Psammaquents	.17
Wabasso sand	Spodosol	Alfic Haplaquods	.79
Wauchula sand	Spodosol	Ultic Haplaquods	.16
St. Johns sand, depressional	Spodosol	Typic Haplaquods	.14
Valkaria sand	Entisol	Spodic Psammaquents	4.48
Bradenton sand, frequently flooded	Alfisol	Typic Ochraqualfs	.04
Bradenton sand	Alfisol	Typic Ochraqualfs	.46
Felda sand	Alfisol	Arenic Ochraqualfs	1.13
Eau Gallie sand	Spodosol	Alfic Haplaquods	1.08
Basinger sand	Entisol	Spodic Psammaquents	9.46
St. Johns-Basinger-Placid soils			9.08
Malabar sand	Alfisol	Grossarenic Ochraqualfs	3.24
Myakka sand	Spodosol	Aeric Haplaquods	35.18
Immokalee sand	Spodosol	Arenic Haplaquods	4.92
SUBTOTAL			73.95

Table 3-1. Drainage classes and soil classification for APAFR (continued).

Drainage Class/ Soil Type	Soil Order	Soil Classification	% of Total
Very poorly drained			
Chobee loamy sand	Mollisol	Typic Argiaguolls	.36
Holopaw sand	Alfisol	Grossarenic Ochraqualfs	.15
Tequesta muck	Alfisol	Arenic Glossaqualfs	.47
Kaliga muck	Alfisol	Terric Medisaprists	2.83
Sanibel muck	Inceptisol	Histic Humaquepts	1.57
Floridana mucky sand, depressional	Mollisol	Arenic Argiaquolis	.62
Hontoon muck	Histosol	Typic Medisaprists	2.45
Basinger sand, depressional	Entisol	Spodic Psammaquents	1.99
Felda sand, depressional	Alfisol	Arenic Ochraqualfs	1.63
Malabar sand, depressional	Alfisol	Grossarenic Ochraqualfs	.24
Samsula muck	Histosol	Terric Medisaprists	1.60
Winder sand, depressional	Alfisol	Typic Glossaqualfs	.71
Placid sand, depressional	Inceptisol	Typic Humaquepts	2.15
Pompano sand, frequently flooded	Entisol	Typic Psammaquents	.26
SUBTOTAL			17.05
Miscellaneous			
Arbuckle Creek Assoc.			0.00
River spoil			.43
Pits			.06
Unidentified (water)		.	.20
Unclassified area in Cantonment			1.07
SUBTOTAL			1.77

3.3 WATER RESOURCES

APAFR is located within the Kissimmee River drainage basin that covers the eastern third of Polk County and northern half of Highlands County. In general, this river basin is considered to be poorly drained and is characterized by shallow channels with broad floodplains and sluggish flow during periods of sparse rainfall. The lakes and swamps that exist within this river basin provide storage for floodwater, thereby reducing flood crests and velocities that lower the potential destructiveness of severe floods (Fig 3-2).

Surface water flow at APAFR is derived primarily from storm water runoff. The average annual precipitation in the APAFR area is about 53 inches. Rainfall accounts for all of the precipitation. Rainfall during the 4-month wet season of June through September accounts for about 59% of the total annual amount. Surface water hydrology at APAFR is divided by the Bombing Range Ridge, a gently sloping sand ridge that runs north to south for the entire length of the property. The ridge creates two watersheds, one east of the ridge and the other west of the ridge. Both watersheds have runoff from the ridge to low, flat areas, with low runoff rates and extensive areas of wetlands. The eastern watershed lacks defined water courses with water moving primarily by overland flow. Overland flow is aided in some locations by fragmented sloughs. The overland flow empties into the Kissimmee River either directly from AF property or from AF property on to private land, then into the Kissimmee River. The western watershed functions similarly with overland flow, but differs by having some defined water courses consisting of creeks and continuous sloughs that empty into Lake Arbuckle or Arbuckle Creek directly from AF property.

Rivers and creeks fall into Rosgen's (1999) stream classifications of C, E, and F at the Level I classification. Stream classifications of DA (anastomosed) are also found when creeks flow through certain swamps and marshes. Few rivers and creeks have been field inspected for Level II classification and those only by casual observations. Generally, Arbuckle Creek is an E5 with C5 occurring when one side of the creek has been diked; Morgan Hole Creek has E5, C5 and F5 classifications; and the Kissimmee River is an F5 due to channelization.

Storm water runoff from the developed portion of APAFR is collected by a system of earthen and concrete drainage ditches and canals in the cantonment which discharge into Arbuckle Marsh and Arbuckle Creek. These drainage ditches and canals receive runoff from four identified outfalls within the maintenance area of APAFR and approximately three outfalls from the cantonment area. A sanitary sewer overflow, built in 1942, was at the time connected to a disposal plant and sludge bed located in the vicinity of Building 244. No evidence of any of these facilities currently exists and therefore it is strongly believed that this sanitary sewer overflow does not exist. Storm water sampling of outfalls was completed in December 2002 .

Jurisdictional wetlands comprise 54,262 acres of APAFR and include communities such as wet flatwoods, cutthroat seepage slopes, swamps, marshes and ponds. Low lying wetlands and floodplains are associated with the river and creek drainageways on APAFR including Kissimmee Marsh in the southeast along the Kissimmee River floodplain, Tick Island Marsh in the east, Deadins Pine Swamp in the northwest, the Morgan Hole Creek marsh-swamp complex between Arbuckle Creek and Morgan Hole Creek in the southwest and Long Cypress off the west edge of the Bombing Range Ridge. Other surface water features include numerous lakes and ponds located on the flatland prairie in the eastern portion of APAFR. Many of these are little more than small, shallow, circular depressions that contain water only on an intermittent basis (McGill 1987). Submarine Lake, Little Lake and a few unnamed lakes on the Bombing Range Ridge contain water throughout the year.

APAFR lacks a formal assessment of the condition of the two watersheds and their associated wetlands. Improvements such as roads, disklines, ditches, tank trails, fencelines, and bedded pine plantations are suspected of either impeding or accelerating overland water flow and consequently affecting the continuous water courses. The Kissimmee River was deliberately channelized, resulting in a loss of some of its floodplain. The southern part of the River was restored in the 1990s; the northern part of the floodplain is scheduled to be restored in 2006. Arbuckle Marsh was diked in two locations with the objective of raising the water level for waterfowl habitat. This objective is now abandoned and the headgates are now left open to allow natural flows as much as possible. The dikes also have several breeches. Impacts from the existing dikes have not been assessed.

Approximately 27%, or 28,380 acres, of the entire APAFR is located within the 100-year floodplain. The portions of the APAFR that are located within the 100-year floodplain are primarily located along the Kissimmee River and Arbuckle Creek.

APAFR is located in the southern east-central Florida groundwater basin. There are three aquifer systems underlying APAFR: the surficial aquifer, intermediate aquifer and the Floridan Aquifer. The surficial aquifer system, which consists generally of sand, clayey sand, and shell is under

unconfined conditions and is approximately 125'-200' thick. The water table in the surficial aquifer is shallow, typically about 4' below land surface. Groundwater levels in the surficial aquifer very seasonally with rainfall amounts. Shallow (20'-40' deep) small diameter wells in the surficial aquifer are used for water supply at APAFR campgrounds and for cattle watering. Hydraulic conductivity has been found to range from 5' to 30' per day. Recharge to the surficial aquifer is mainly by precipitation.

The intermediate aquifer system includes all water bearing units and confining units between the overlying surficial aquifer system and underlying Floridan aquifer system. The intermediate aquifer system is composed of heterogeneous calcareous clay and limestone separating the surficial aquifer from the underlying Floridan aquifer, and is approximately 200' thick.

The Floridan aquifer underlies the intermediate aquifer system and is the principal source of water in the area, including the major potable wells. The top of the Floridan aquifer is considered to be the top of the first persistent carbonate sequence below the silts and clays of the intermediate aquifer system. The Floridan Aquifer is composed of the Ocala Group and the Avon Park Limestone. These carbonate units contain highly permeable zones that are capable of producing sufficient water supplies.

All of the APAFR potable water supply is provided by four water supply wells. They are located in the cantonment area. These wells are owned by the State of Florida and are operated and maintained by the Avon Park Correctional Institution (AvPCI) that supplies APAFR with potable water at a nominal charge that is derived on a per capita basis.

AvPCI is the principal user of potable water from these wells. Prior to October 1993, the AvPCI and APAFR had a combined daily use of approximately 300,000 gallons or 108 million gallons annually. In 1994, the combined daily use for AvPCI and APAFR was approximately 275,000 gallons per day or 100 million gallons annually. AvPCI water records indicate that APAFR currently uses approximately 25,000 gallons per day or 9 million gallons annually. Outside the cantonment area, the water supply comes from wells in the surficial aquifer, mentioned above, for campgrounds and cattle watering.

The AvPCI operates the wastewater treatment system located on AvPCI property. This facility was redesigned and rehabilitated by AvPCI in 1986 to replace the original wastewater treatment plant built by APAFR in 1942. The treatment plant has a maximum treatment capacity of 500,000 gallons per day, with an average treatment of approximately 320,000 gallons per day. All treated wastewater is discharged to the rim canal that drains through DoD property to Arbuckle Creek. In the cantonment area, the wastewater collection system still uses the original gravity flow piping; however, portions of the system have been updated with lift stations and force mains to increase efficiency.

The Florida Department of Environmental Protection (DEP) classifies the Kissimmee River, Morgan Hole Creek, Lake Arbuckle and Arbuckle Creek as Class III water bodies. Class III water bodies must meet water quality criteria established to protect recreation and a healthy, well balanced population of fish and wildlife.

Water quality in surface water bodies in APAFR have been rated as good by the South Florida Water Management District (SFWMD). High calcium content has been noted in Arbuckle Creek, which is probably due to the limestone and dolomite in the area. The SFWMD is sampled surface water quality for creeks on APAFR in 2002. Results for the dry season indicate good water quality, while the wet season data has yet to be analyzed (Ritter 2002). Water sampling found fecal coliform exceeding state levels on selected stream locations on APAFR during a sampling period of 1994-96. These levels were not of immediate concern because the same sampling also determined these levels to drop to acceptable levels farther down stream. Also, these levels were acceptable when leaving APAFR, which is the primary concern of the SFWMD.

Groundwater in the area of APAFR is generally high in iron content, highly colored and moderately to highly acidic (SFWMD 1988). The surficial aquifer is classified as Class G-II, indicating total dissolved solids concentrations of less than 10,000 milligrams per liter (mg/l). Although SFWMD has rated the surficial aquifer in the area as highly susceptible to groundwater

contamination, limited sources of contamination and minimal use of the surficial aquifer for a water supply does not make this a concern for APAFR.

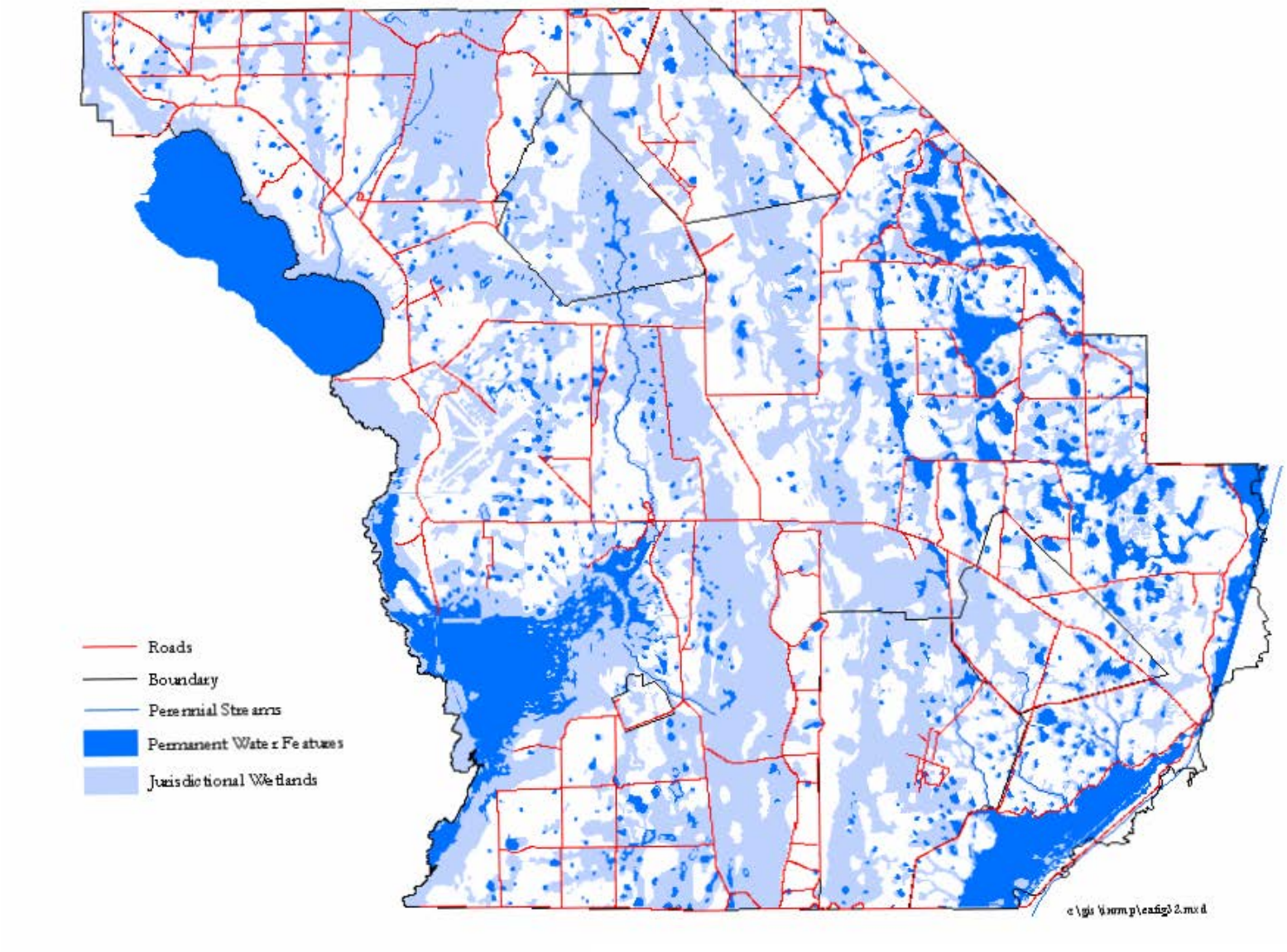
Water quality of the surficial aquifer has been rated by SFWMD as generally good. The water quality in the southeastern portion of Polk County is within Florida DEP primary and secondary drinking water standards. The intermediate aquifer in this portion of Polk County has low susceptibility to groundwater contamination due to the thick overlying confining beds and deep surficial deposits.

The potable water quality of the Floridan Aquifer is affected by many factors including the degree of mineralization of the water determined by the composition and solubility of the rock through which the water flows. Median water quality of the Floridan Aquifer is generally good. The water is primarily a calcium bicarbonate type for both the upper and lower Florida Aquifers, and is within the Florida DEP primary and secondary drinking water standards. The upper and lower Floridan Aquifers are both classified as Class G-II aquifers.

The water supply wells at APAFR are in the Florida Aquifer. Bateriological, pH, and residual chlorine analysis are conducted monthly on the four water supply wells and the water distribution system. Bacteriological and pH results have consistently been within Florida DEP standards (USAF 1995c). The drinking water treatment plant is monitored daily for chlorine residual, and a free chlorine residual of at least 0.2 mg/l is maintained.

The Water Quality Act of 1987 (Section 402(p)) requires the operators of federal installations which discharge storm water associated with industrial activity to obtain permits under the National Pollutant Discharge Elimination System (NPDES) to control the quality of storm water discharge. The State of Florida issues permits for storm water discharges under this program. APAFR has a State NPDES Permit issued by the Florida DEP in August 2001, which will be in effect until August 2006. APAFR has prepared a Storm Water Pollution Prevention Plan (SWPPP).

Figure 3-2. Wetland Features of Avon Park Air Force Range



3.4 BIOLOGICAL RESOURCES

3.4.1 Insects and Diseases

Generally, insects and diseases have not had a significant impact upon the forest resources on the APAFR. Primary insects are the Ips engraver beetle, black turpentine beetle, ambrosia beetle, and the southern pine sawyer. The southern pine beetle has not yet been noted in this area of the state. Pine trees that have been stressed from fire, lighting, too much or too little water, etc. are likely candidates for insect attack. These insect outbreaks are usually isolated and short-lived. However, lighting strikes and prescribed burns occasional damage large acres making it necessary to salvage the trees and reduce the impact. Other insect damage occasionally observed in the pines is from the redheaded sawfly and pine tip moth. Several species of wood borers and caterpillars are common in the various hardwoods but have very little impact.

Diseases are also not of major concern to the forest resources. In the pines, pitch canker is the most prevalent. Pitch canker does not usually cause mortality but reduces growth and wood quality. Trees infected with this disease are usually selected out during normal silvicultural operations. Some other noted diseases in the pines are needle cast, cone rust, red heart and annosus root rot.

Common diseases in hardwoods are leaf blister and slime flux.

3.4.2 Vegetation

It is useful to think of natural landscapes as representing broad repeating patterns of associated natural communities that share certain processes and are correlated with landform and soil on a larger scale than the individual natural community type. These repeating patterns are referred to as landscape associations, and form a basic framework for understanding regional community and species diversity patterns within natural sections.

There has been a long history of vegetation classification in the Western United States utilizing the “habitat type” concept pioneered by Rexford Daubenmire, beginning in 1952. By 1987, most of the Western United States had been the subject of habitat type classifications, each designed for a

particular region. This process is ongoing, and has been expanded to include more detailed studies of ecological processes and how each habitat type responds to management (e.g., fire ecology of specific habitat types). The more recent habitat type classifications include detailed studies of the vegetation — environmental relationships of rather narrow regions, with the classification based on intensive sampling of the specific region of concern. These concepts were used to study the landscape associations of APAFR.

In the past five years or so, there has been a more widespread recognition of the usefulness of landscape associations to define land units which have management significance. One recent application is by the U.S. Forest Service. In the "Revised Land and Resource Management Plan for the National Forests in Florida" (1999), landtype associations (equivalent in concept and scale to the landscape associations used at APAFR) were defined for each of the forests. In this system, landtype associations occur at a scale from 10 to 250 square miles, slightly broader than that used at APAFR. A similar system is also being utilized in the western United States as an intermediate level between the ecoregions and subregions of the national and regional classification systems and the definition of specific habitat types.

In classifying the ecosystems of APAFR, four natural subsections of the National Hierarchical Framework of Ecological Units were identified (Ecomap 1993). APAFR lies within the Humid Temperate Domain, Subtropical Division, Outer Coastal Plain Mixed Forest Province, and the Atlantic Coastal Flatwoods section. This section is broken down into four subsections on APAFR. The four subsections of Osceola Plain, Bombing Range Ridge, Kissimmee River Valley, and Floodplain Swamps and Marshes were further broken down into 12 Landscape Associations (LSAs) to delineate the ecosystems of APAFR (Bridges 2001). The level of most concern to resource managers is the level below subsection level, the landscape association. A brief description of each landscape associations at APAFR follows.

Within the Osceola Plain subsection, landscape associations include:

1a). Sandy acidic flatwoods with small circular depressions. The predominant natural community is mesic flatwoods, or mesic longleaf pine savannah with extensive areas of wetland pine savannah,

wet prairies, depression marshes, and dome swamps. Open-canopied longleaf pine flatwoods dominate, with slight sandy rises having small patches of scrubby flatwoods, and broad areas of slightly less xeric sands with dry-mesic sandy flatwoods grading into typical mesic longleaf pine. The landscape is covered with scattered wetlands known as depression marshes and dome swamps.

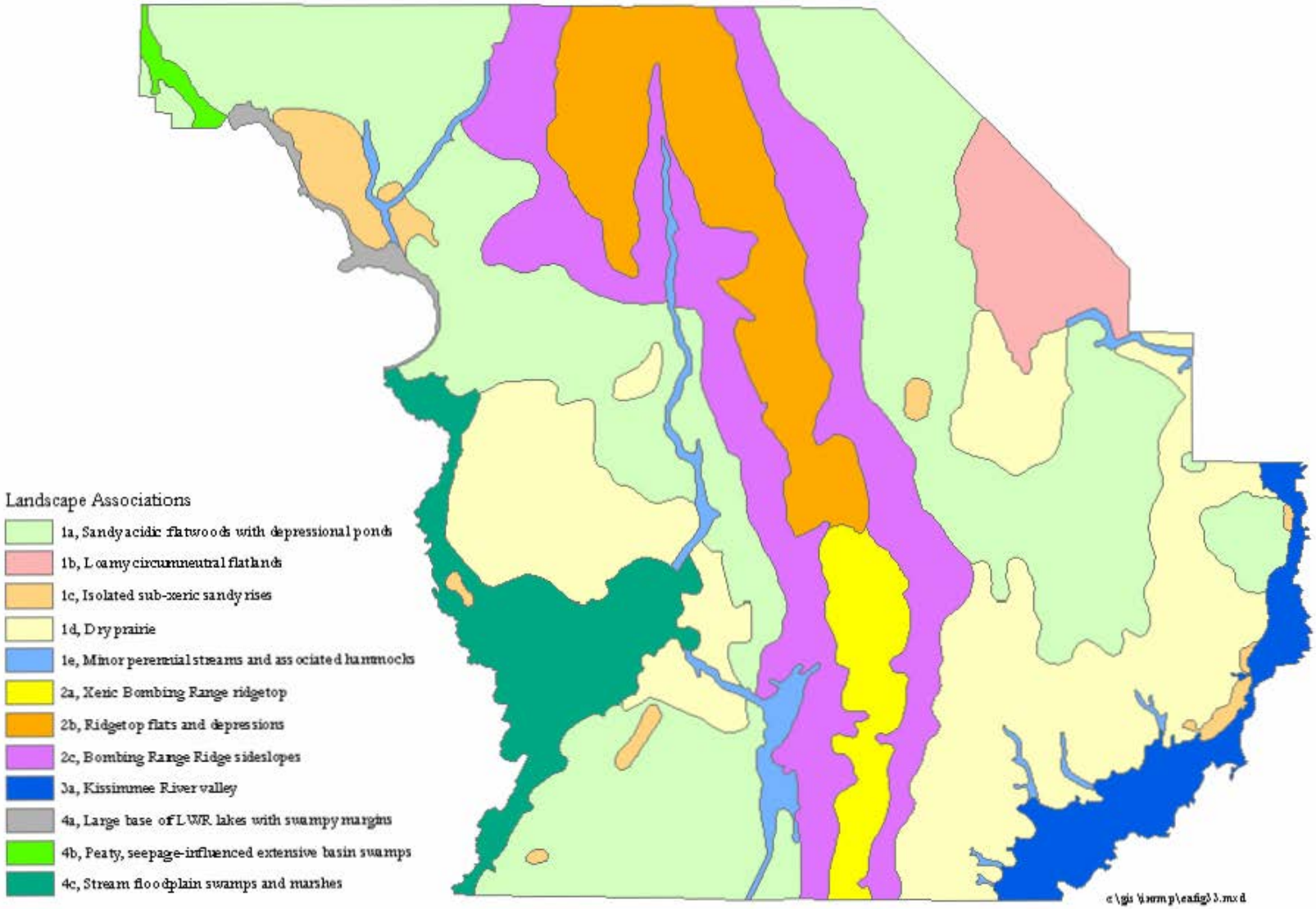
1b). Loamy circumneutral flatwoods. Predominant upland vegetation type is mesic longleaf pine savannah with fewer areas of wet flatwoods and wet prairies than the acidic flatwoods association. Drainageways are characterized by deep herbaceous marshes with some flow to them with scattered stands of wetland trees (swamp black gum, sweet bay) in the deepest parts. Ecotonal areas between the flatwoods and drainageways have “sweet flatwoods” of scattered slash pine and cabbage palms with a distinct calciphilic herbaceous flora.

1c). Isolated sub-xeric sandy islands. Usually associated with the upper edges of escarpments to large drainage features, these islands are small areas of better drained sandy soils containing scrubby flatwoods, grading downslope to dry-mesic sandy flatwoods. Vegetation patterns include patches of dense scrub oaks and fetterbushes, with or without scattered longleaf or slash pine.

1d). Dry prairie. Basically distinguished by the generally treeless landscape, the area represents moisture zones from dry-mesic to wet prairie. Higher areas will have a dry- mesic sandy prairie type and few wetlands plants; in wetter areas there is an increase in wet-mesic species such as toothache grass and coastal-plain yellow-eyed grass. Wet prairie areas within the dry prairie matrix are common, with many depression marshes easily recognized on the landscape. Some depression are cypress dominated, and a very few may have other trees dominant.

1e). Perennial streams/sloughs and adjacent hammock fringes or ecotonal seepage areas. These areas are incised, usually rather linear, creek valleys and other drainage features of sufficient size and protection from fire to have some associated hardwood hammocks and/or swamp forests. The smaller stream floodplains are dominated by live oak. Slightly wetter floodplains have more of a hydric hammock vegetation with a mixture of oaks. Longer inundated swamps are also found, sometimes dominated by pond cypress.

Figure 3-3. Landscape Associations of Avon Park Air Force Range



The Bombing Range Ridge subsection consists of landscape associations of:

2a). Bombing Range ridge xeric ridgetops. The most recent section geologically, the predominant vegetation types is true “scrub”, represented by sand pine scrub, oak scrub, and some areas of rather open sandy oak and rosemary scrub. Interspersed with these scrub areas are scrubby flatwoods and a small but significant areas of longleaf pine-turkey oak sandhill.

2b). Bombing Range ridge ridgetop flats and depressions. This area consists of alternating narrow, north-south oriented xeric ridges and broad swales between these ridges, mostly supporting cutthroat grass communities. The north-south ridges contain oak scrub, intermediate areas have scrubby and mesic flatwoods, and the broad flats have cutthroat grass lawns and occasional seepage slopes. Deep peaty depression marshes with cutthroat grass margins are scattered through the area.

2c). Bombing Range ridge sideslopes. This association is characterized by the overwhelming domination of the groundcover by cutthroat grass, one of the very few sod-forming native grasses of the eastern United States. The driest cutthroat communities are farthest upslope, with the wettest seepage slopes present mid-slope. On lower slopes, cutthroat seepage slopes transition to typical mesic to wet flatwoods or wet prairies. Occasional bayheads dominated by loblolly pine are found in areas protected from frequent fire.

3). Kissimmee River Valley: This subsection is considered as a single landscape association on APAFR. The vegetation mosaic has been extremely altered by reduced hydroperiod and channalization of the Kissimmee River. Deep marshes exist near the south end of APAFR and in the deeper slough, however much of the floodplain is now occupied by shallow, infrequently flooded marshes. Generally, sawgrass marshes occupy the deepest zones, with patches of pickerelweed and arrowhead in the intermediate marshes. The shallow zones are now dominated by broomsedge and wax myrtle.

Two landscape associations are found in Floodplain Swamps and Marshes:

4a). Large lakes at eastern base of the Lake Wales Ridge with swampy margins. Lake Arbuckle is a large, open water body, but has a rather broad band of deep lakeshore marsh ringing it. A band of cypress-dominated swamp forest is characteristic, as well as a deeply inundated hydric hammock zone above the swamp forest. On higher islands in this zone, protected from fire, are small areas of natural mesic hammock.

4b). Seepage influenced extensive basin swamps. Like other basin swamps found at the base of the eastern slope of the Lake Wales Ridge, the Blue Jordan Swamp is a deeply inundated sweet bay dominated bay swamp, and is the only example of this association on APAFR. In some areas there are fringing mesic and hydric hammocks, with some seepage species in the ground cover. Small seepage areas can be found at the junction between this association and the adjoining upslope pine plantations. The hydric hammock and mesic hammock margins are significant due to the slight seepage effects in these communities, the only case where there are slightly seepy hammocks on APAFR. Several plant species are restricted to this association with APAFR, most at or near the southern limit of their range.

3.4.3 Endangered and Threatened Plants

There are 13 Florida Natural Areas Inventory (FNAI) listed plants known to occur on APAFR (see Table 3-2). Seven of these thirteen plants are federal category two plants currently under review for possible listing as federally protected plants. High-quality ecotones, seepage slopes, wet prairies and wetland pine savannas in recently burned sites (burned within three years) were more intensively surveyed for rare plants, since these habitats consistently revealed new and interesting rare plants. Two previous rare plant surveys focused on scrub (Christman 1988) and the xeric uplands at APAFR (DeLaney 1993). In addition, field surveys have uncovered locations for three plants that should be added to the FNAI "Special Plant List." These are as follows: Cuban savanna beaksedge (*Rhynchospora brachychaeta*), tropical baldrush (*Rhynchospora eximia*) and net or forked fern (*Dicranopteris flexuosa*). Although not rare in Florida, the following plants are either very habitat specific or rarely encountered in central Florida and therefore should be considered by the APAFR

staff as sensitive plants: long-tubercle spikerush (*Eleocharis tuberculosa*), northern bayberry (*Myrica heterophylla*), white fringed orchid (*Platanthera blephariglottis* var. *conspicua*), few-flower beakrush (*Rhynchospora oligantha*) and crow-poison (*Zigadenus densus*).

There are a few plants which in the past had been considered to be either protected or rare plants (*Commelina gigas*, see Wunderlin et al. 1982); (*Chrysopsis sp. nov., Garberia heterophylla, Ilex ambigua, Lupinus cumulicola, Sabal etonia,* & *Selaginella arenicola,* see DeLaney 1993). *Commelina gigas* is a form of *Commelina diffusa*, which is presumably native to the Old World tropics, but which so far has been found only in peninsular Florida (Edwin Bridges, pers. comm.). For further discussion on this species which has been recognized as *Commelina diffusa* var. *gigas*, see Faden (1993). However, Bridges (pers. comm.) does not see the merit of recognizing a named variety of the introduced Commelina diffusa without further study in its native Old World tropics range. *Chrysopsis sp. nov.* (see DeLaney 1993) is simply variation within the peninsular Florida endemic *Chrysopsis scabrella,* which is common in scrub and scrubby flatwoods on APAFR and within central Florida (Bridges, pers. comm.). All of the above listed plants considered by DeLaney (1993) as protected species are common and widespread in Florida scrub habitats, and are listed only because of their inclusion in Chapter 5B-40, F.A.C. as threatened plants by the Florida Department of Agriculture.

These plants should not be considered as rare in Florida, at least several dozen other species of APAFR flatwoods and wetland habitats are also included in Chapter 5B-40, F.A.C. For example, nearly every fern and orchid at APAFR is on the Department of Agriculture listing of protected plants of Florida.

Table 3-2. List of Rare, Threatened, or Endangered Plants Known to Occur on APAFR

Scientific Name	Common Name	Federal Status	State Status	Global Rank	State Rank
Aristida rhizomophora*	**Florida threeawn**	**N**	**N**	**G2**	**S2**
Asclepias curtissii	**Curtiss' milkweed**	**N**	**LE**	**G3**	**S3**
Clitoria fragrans	**Pigeon-wing**	**LT**	**LT**	**G3**	**S3**
Coelorachis tuberculosa*	**Piedmont jointgrass**		**N**	**G3**	**S3**
Gymnopogon chapmanianus*	**Chapman's skeletongrass**	**N**	**N**	**G2**	**S2**
Hartwrightia floridana	**Hartwrightia**		**LT**	**G2**	**S2**
Hypericum edisonianum*	**Edison's ascyrum**		**LT**	**G2**	**S2**
Justicia angusta*	**Everglades water willow**	**N**	**N**	**G2**	**S2**
Lechea cernua	**Nodding pinweed**	**3C**	**LE**	**G3**	**S3**
Lilium catesbaei*	**Southern red lily**	**N**	**LT**	**G4**	**S3**
Matelea floridana*	**Florida spiny-pod**		**LE**	**G2**	**S2**
Ophioglossum palmatum	**Hand fern**	**3C**	**LE**	**G2**	**S2**
Panicum abscissum	**Cutthroat grass**		**LT**	**G2**	**S2**
Platanthera integra*	**Yellow fringeless orchid**	**3C**	**LT**	**G3G4**	**S3S4**
Polygonella basiramia	**Hairy jointweed**	**LE**	**LE**	**G3**	**S3**
Pteroglossaspis ecristata*	**A wild coco**		**LT**	**G3G4**	**S2**
Rhynchosia cinerea*	**Brown-haired snoutbean**	**3C**	**N**	**G3**	**S3**
Rhynchospora decurrens*	**Decurrent beakrush**		**N**	**G3G4**	**S2**
Schizachyrium niveum*	**Scrub bluestem**		**N**	**G1**	**S1**
Stillingia sylvatica ssp. tenuis*	**A queen's delight**		**N**	**G4G5T2**	**S2**

* = denotes the 13 FNAI listed plants not previously recorded in the FNAI data-base prior to this inventory.

Federal Status: N=none; LE=federally endangered; LT=federally threatened; 3C=plants that have been proven to be more abundant or widespread than previously thought

State Status: N=none; LE=state endangered; LT=state threatened

Global Rank: G1=critically imperiled globally, 1-5 populations; G2=imperiled globally, 6-20 populations; G3=very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (e.g., a single physiographic region) or because of other factors making it vulnerable to extinction, 21-100 populations; G4=apparently secure globally, though it may be quite rare in parts of its range, 100-1000 populations; G5=demonstrably secure globally, though it may be quite rare in parts of its range; 1000+ populations.

T#=the rank of a subspecies or variety; as an example, G4T1 would apply to a subspecies or variety with an overall species rank of G4, but the subtaxon with a rank of G1.

State Rank: S1=critically imperiled in the state, 1-5 populations; S2=imperiled in the state, 6-20 populations; S3=rare or uncommon in the state, 21-100 populations; S4=apparently secure in the state, 100-1000+ populations

The plant species accounts which follow in the text are arranged into three major groupings based upon the rarity or habitat fidelity of these plants within various geographic/political regions. Globally significant plants are considered here to include those with a global rank of either G1, G2 or G3, and plants ranked as G3 or S3. State rare plants are here considered to be those with a global rank of either G3G4 or G4, and a state rank of S1 or S2. Regionally rare plants are here considered to include those with a global rank of G3G4 or G4 and a state rank of S3 or S4. In addition plants at APAFR which are not rare in Florida but are either habitat specific or rarely encountered in central Florida comprise the final section of plant species accounts. One should note that several of the global rankings particularly those for some of the G2 and G3 plants should probably be reranked as G3 and G4 respectively. Many of these global ranks were assigned years ago and do not reflect additional population and distribution information collected in recent years.

Globally Significant Plants

Aristida rhizomophora (*Poaceae*): Two populations of Florida threeawn have been located on APAFR, both from frequently burned undisturbed longleaf pine flatwoods. It can be locally abundant, forming large clumps, and is a fire-dependent perennial grass. Flowering is strongly influenced by fire and prescribed growing season burns which stimulate profuse flowering.

Asclepias curtissii (*Asclepiadaceae)*: There is only one occurrence of Curtiss' milkweed on APAFR. This perennial milkweed is restricted to scrubs and scrubby flatwoods throughout most of peninsular Florida from Clay County south to Collier and Broward counties.

Clitoria fragrans (*Fabaceae: Leguminosae*): Pigeon-wing, a federally threatened plant occurs in sandhills at APAFR. It has been found in Highlands, Orange and Polk counties (Wunderlin et al. 1980), and has been reported as extirpated from Dade and possibly Palm Beach counties in south Florida (DeLaney 1993). It is a subshrubby, perennial herb.

Coelorachis tuberculosa (*Poaceae*): Piedmont jointgrass a perennial grass, is a federal category two grass which occurs in wet prairies bordering upland depression ponds and sandy margins of depressional marshes where it occurs in central Florida.

Gymnopogon chapmanianus (*Poaceae*): This small clump-forming perennial graminoid is very common and characteristic of dry sandy flatwoods and scrubby flatwoods on the base. It flowers profusely following burning. It occurs at essentially every scrubby flatwoods and in dry cutthroat grass upland communities on the base, where it is often locally abundant.

Hartwrightia floridana (*Asteraceae*): Wunderlin et al. (1982) reports two populations of Florida hartwrightia on APAFR. Field surveys have revealed that APAFR contains the largest known number of reproducing, viable populations occurring within intact habitat (based on FNAI data base and field visits by the auhtor to all known populations as of 1994) for this near Florida perennial endemic, federal category two plant. It is found at APAFR in the seepage slopes, wet pine flatwoods, wet prairie and edges of baygalls associated with the Bombing Range Ridge. There are well over 100+ populations with over 1,000 plants each on the base, easily over 90% of the entire worldwide abundance of this species.

Hypericum edisonianum (*Hypericaceae*): This distinctive semi-woody shrub has the most restricted geographic range of any member in the genus Hypericum (Adams 1957). It is currently known from four contiguous counties in south-central Florida (Highlands, Glades, Desoto and with the APAFR collection, now from Polk County). The type specimen was orginially cited in error from Desoto County (Adams 1957), since it is actually from Highlands County. In 1995 Bridges and Orzell reinstated Desoto County into the overall range of this species, having collected specimens from eastern Desoto County. The only Polk County record is that discovered by Orzell in 1994 from APAFR and it represents the first record from the Osceola Plain. *Hypericum edisonianum* can be locally abundant, forming thick stands an acre or more in extent in sandy depressional ponds, open prairies, and pine flatwoods. Edison's ascyrum is a federal category two plant.

Justicia angusta (*Acanthaceae*): There is considerable taxonomic disagreement regarding the Everglades water willow. Some botanist segregate it as a variety of *J. ovata*, while others consider it as a species. In the forthcoming Flora of Florida it will be treated as a species by Wunderlin. Nonetheless *Justicia angusta* is not restricted in distribution to peninsular Florida as previously believed, but rather it is found from Franklin, Wakulla and Leon counties in the Florida panhandle and from Lafayette and Duval counties south to Dade County. It should not be listed as an FNAI special plant. At APAFR it is apparently restricted to the wet calcareous flatwoods in Polk County.

Lechea cernua (*Cistaceae*): Nodding pinweed, a small shrublike perennial herb, is a central peninsular Florida endemic ranging from Seminole, Lake and Hernando counties south to Collier and Broward counties. It is one of the most commonly encountered scrub species, always found on deep sands.

Matelea floridana (*Asclepiadaceae*): Florida spiny-pod is a near Florida endemic having recorded outside of Florida from south Georgia. At present its occurrence at APAFR range is somewhat dubious, since Edwin Bridges and Steve Orzell have only seen vegetative material from a hydric hammock in Polk County. No specimens were collected since the material was only vegetative.

Ophioglossum palmatum (*Ophioglossaceae*): Hand fern was first collected at APAFR and noted by Wunderlin et al. (1982), where it was reported as epiphytic on Sabal palmetto in a hydric hammock, from a population consisting of four plants. Attempts by previous botanists to relocate the APAFR population within the presumed collection site, Eight Mile Hammock in Polk County, have thus far failed.

Panicum abscissum (*Poaceae*): Over 9,000 acres of the base are mapped on the GIS base vegetation map as cutthroat grass communities. Endemic to central- and south-central Florida, this rhizomatous perennial, fire-dependent grass occurs as a community dominant in many seepage slopes, and some wet prairies, wet flatwoods and pond margins. APAFR contains the

largest contiguous areas of habitat dominated by cutthroat grass and maintained in overall good to excellent natural quality anywhere in Florida.

Polygonella basiramia (*Polygonaceae*): Hairy jointweed is a federally endangered plant. Christman and Judd (1990) list hairy jointweed as occurring in scrubs on the Central Ridges and nearby Bombing Range Ridge in Polk and Highlands counties. Hairy jointweed, an annual, disperses and colonizes new scrubs better than other scrub endemics. It ranges from the southern tip of the Lake Wales Ridge to Venus to the vicinity of Lake Pierce in Polk County. This federally endangered species is protected at Highlands Hammock and Lake Arbuckle State Parks, Archbold Biological Station, and Saddle Blanket Lakes Scrub Preserve. Hairy jointweed is common in the scrubs on the APAFR, and one of only two Central Florida scrub endemics that occur on the Bombing Range Ridge.

Rhynchosia cinerea (*Fabaceae: Leguminosae*): Brown-haired snoutbean, a perennial prostrate, non-climbing vine occurs in sandy uplands and pinelands where it is endemic to peninsular Florida from Clay County south to the Florida Keys in Monroe County. This legume is not particularly rare at APAFR, and perhaps does not warrant listing as an FNAI special plant.

Rhynchospora brachychaeta (*Cyperaceae*): A delicate filiform, rhizomatous, perennial sedge forming loose, diffuse colonies, often hidden in dense groundcover. This significant plant discovery was uncovered by Edwin Bridges during field surveys on the base. The total range of Cuban savanna beaksedge includes Florida, western Cuba, Hispaniola, Puerto Rico, Belize, and Nicaragua. It is apparently common nowhere, or is overlooked by most collectors (Bridges 1994). It was collected from an open, frequently burned wetland longleaf pine savanna (wet flatwoods) in southeastern Polk County on the base. Otherwise, there is only one other historical collection in the United States from Gulf County in the Florida panhandle, collected in 1955 (Bridges 1994). It is easily overlooked, but should be sought in wetland pine savannas throughout Florida.

Schizachyrium niveum (*Poaceae*): This distinctive, perennial, endemic clump-forming scrub grass was listed by Christman and Judd (1990) from a total of only 31 sites on white sand scrubs that total about 3,700 hectares from Lake Wales to Venus in Highlands and Polk counties. It appears to be one of the rarer of the Central Ridge scrub endemics. The only protected population known to Christman and Judd (1990) was at Archbold Biological Station where it occurs within scrubs that total about 100 hectares. Field surveys in 1994 by Orzell and Bridges have located new populations of scrub bluestem at Lake Arbuckle State Forest and Highlands Hammock State Park, not previously noted by Christman and Judd (1990). DeLaney (1993) was the first botanist to find scrub bluestem on APAFR, the first record of it off the Lake Wales Ridge. Scrub bluestem is a federal category two grass.

State Rare Plants

Dicranopteris flexuosa (*Gleicheniaceae*): This widespread tropical fern is known in the United States from only seven collections, of which six are from Florida (AL: Mobile County in 1913; FL: Osceola County in 1947, Hillsborough County in 1955, Bay County in 1984, Palm Beach County in 1988, Volusia County in 1992, and Polk County in 1994 at APAFR). It also occurs in Mexico, Central America and South America (Nauman 1993). Plants in Florida tend to be depauperate when compared to tropical populations; individual leaves are smaller and plants seldom form dense thickets (Nauman 1993). Plants may not persist very long, however, as evidenced by Alabama and some Florida populations that are no longer extant (Nauman 1993).

Pteroglossaspis ecristata (*Orchidaceae*): Wild coco, a perennial terrestrial orchid is found in a variety of habitats on the coastal plain from North Carolina south through Florida and west to Louisiana (Bridges 1986). In central Florida it appears to be most common in scrubby flatwoods and sandy dry-mesic flatwoods, sometimes dry prairie, and perhaps sandhills. Wild coco is a federal category two plant.

Rhynchospora decurrens (*Cyperaceae*): There is some question as to the correct name for what Edwin Bridges and Steve Orzell (at present) are referring to as *Rhynchospora decurrens* from peninsular Florida. This robust, densely cespitose, rather large clump-forming sedge is locally

abundant in some wet prairies and shallow marshy, depressional ponds on APAFR. Although it is a federal category two plant, it is commonly encountered in depressional marshes and is rather widespread in peninsular Florida.

Rhynchospora eximia (*Cyperaceae*): Tropical baldrush, an annual, rather widespread tropical species occurs in the West Indies, southern Mexico through Central and South America to southern Brazil, and in Africa (Bridges 1994). In the United States it had only been collected four times in southwestern Florida (Charlotte and Lee counties), the last collection made by Orzell and Bridges in 1990 (Bridges 1994). In southwestern Florida it occurs in black sedge (*Schoenus nigricans*) dominated high brackish marshes at the ecotone between wet pine flatwoods and buttonwood and black mangrove-dominated coastal salt flats (Bridges 1994). It is possible that this sedge, and its relatively rare habitat, have declined due to fire suppression in the adjacent flatwoods and the invasion of the exotic shrub, Brazilian pepper (*Schinus terebinthifolius*) (Bridges 1994). At APAFR this sedge occurs sporadically in the groundcover matrix of a calcareous wet flatwoods in southeastern Polk County at a single site. It is one of the rarest sedges in the genus Rhynchospora in the United States. *Psilocarya schiedeana* is the formerly accepted scientific name.

Stillingia sylvatica ssp. *tenuis* (*Euphorbiaceae*): Queen's delight is one of two subspecies of *Stillingia* that are known to occur at APAFR. Plants with red stems and smaller leaves that grow in calcareous flatwoods, which are extremely limited in extent at APAFR are here referred to as var. *tenuis*. The variety *tenuis* had previously been thought to be endemic to Dade County (Rogers 1951) however close examination of recent collections from calcareous flatwoods in south-central Florida indicates that the distinctive characteristics of this variety occur sporadically north to Polk County. The taxonomic status of this variety may be in question due to some intergradation with var. *sylvatica* in central Florida flatwoods (Edwin Bridges, pers. comm.). Queen's delight is a federal category two plant.

<u>Regionally Rare / Habitat Specific Plants</u>

Eleocharis tuberculosa (*Cyperaceae*): This sedge is rather common in the Florida panhandle and northeast Florida in seepage influenced habitats. In central Florida it is has been collected from Lake, Orange and Polk counties. At APAFR it is locally dominant in a herbaceous boggy ecotone bordering Blue Jordan Swamp near the northern boundary of the base.

Lilium catesbaei (*Liliaceae*): This perennial lily ranges from southeastern Virginia to Florida and west to Lousiana on the coastal plain. Southern red lily is a rather common species in wet prairies, wet flatwoods, and seepage slopes throughout nearly all of Florida; and should probably not be considered as a rare plant on the FNAI special plant list. It is most frequently encountered at APAFR in undisturbed frequently burned flatwoods and sometimes in seepage slopes.

Myrica heterophylla (*Myricaceae*): Southern bayberry a semi-evergreen broadleaf shrub is known from only three counties in peninsular Florida, two of these represented only by the populations at APAFR in Polk and Highlands counties. It grows at APAFR in seepage slopes, edges of baygalls and in wet flatwoods with some seepage influence. Southern bayberry sprouts readily following burning in its habitats, which are fire-maintained communities.

Platanthera blephariglottis var. *conspicua* (*Orchidaceae*): White fringed orchid reaches its southern limit in Highlands County. In the Florida panhandle this orchid is not rare but is uncommon, whereas in peninsular Florida it is currently rather rare, despite the fact that it has been historically recorded from numerous central Florida counties. It is currently known from at least three populations at APAFR in Polk and Highlands counties. A Polk County population north of Smith Road near the old Bravo target area, growing in a seepage slope and downslope wet prairie, had an estimated population exceeding 500 flowering plants (and countless vegetative plants) on 3 September 1994, making this the largest extant population currently known in central Florida and perhaps in the state.

Platanthera integra (*Orchidaceae*): The only APAFR population of yellow fringeless orchid occurs along Durden Road. Despite the fact that this perennial orchid is rather widespread, occurring sporadically in the southeastern United States, it is not common except in frequently

burned wet pine savannas and pitcher plant bogs on the southeastern US coastal plain. In Florida it is very rare outside of the panhandle region where it occurs in fire-maintained pine savannas, wet prairies, seepage slopes and hillside seepage bogs. It is exceedingly rare in peninsular (historical from Orange and Osceola counties and extant in Highlands County) and north Florida (Nassau and Duval counties) and highly habitat restricted. The only known extant population in central Florida is the population at APAFR in Highlands County, which represents the southernmost record. On 17 September 1994 the author counted a total of some 171 plants (most in peak flowering condition) in a wet wiregrass prairie and adjacent seepage influenced roadside ditches through the wet prairie habitat. This is undoubtedly one of the largest extant populations of this orchid in Florida and certainly the largest population currently documented in all of north and peninsular Florida. The population was first discovered by Mr. Scott Penfield of the APAFR staff in 1993.

Rhynchospora oligantha (*Cyperaceae*): The APAFR record for few-flower beakrush is the first for this sedge in the Florida peninsula, with the nearest known locations being in Nassau County, Florida (on the Georgia border), a distance of some 330 km. Few-flower sedge occurs in the Florida panhandle region from Leon County westward in a somewhat contiguous range which is approximately 430 km from APAFR.

Zigadenus densus (*Liliaceae*): Only one population of crow-poison, a bulbous perennial, is known from APAFR, in a seepage slope south of Kissimmee Road in Highlands County. Crow-poison reaches its southern limit in Highlands County. It is recorded from several central Florida counties but is not common in central Florida, where it occurs in mostly in burned wet pine savannas and seepage communities.

3.4.4 Invasive Exotic Plants and Animals

Invasive or exotic plants can be spread into an area by vehicles, horses, livestock or foot traffic. Invasive, non-native weeds can arrive on tire treads, the soles of boots and the hoofs of wildlife and livestock to gain a foothold in areas they were not previously found. APAFR currently has

populations of Japanese climbing fern, cogon grass and old world climbing fern. These populations occur mainly along roads and fences. Herbicides are applied by hand to control areas of exotic plants.

Invasive exotic animals can be introduced by humans. They have the potential to compete with native wildlife as well as having a destructive impact on native plant communities. Feral hogs were introduced by early European settlers and have become acclimated to this location. Hunting and trapping are the two primary methods used to manage feral hog populations.

3.4.5 Timber

APAFR has approximately 37,122 acres of forest cover, including 16,700 acres of slash pine plantations, 7,370 acres of longleaf pine, 7,252 acres of south Florida slash pine, 800 acres of sand pine and 5,000 acres of cypress and mixed hardwoods. The pine flatwoods are maintained by frequent fires which keep oak encroachment to a minimum. Fire also is important understory diversity.

Longleaf and slash pine are found on areas only a few feet higher than the adjoining swamps and marshes. The Pine Flatwoods are variable. They can be classified as either hyrdric, mesic or xeric. The overstory is either longleaf pine, south Florida slash pine or a mixture of both species. The understory is extremely diverse and variable depending on the degree of wetness. Saw palmetto and wiregrass are two of the primary species. There are also many species of grasses, sedges and shrubs.

Cypress and hardwood stands are found in low lying areas and as stringers adjacent to pine stands. Bald cypress dominates the water sheds along Lake Arbuckle and Arbuckle Creek. Pond Cypress is primarily found in depressional ponds scattered throughout the installation. Other wetland areas are dominated with an overstory of sweet bay and black gum. Other common hardwoods are loblolly bay, red bay, holly, red maple, ash and various oaks. Due to the sensitivity of wetlands, only selective cypress stands have received silvicultural treatment.

Sand pine is found in the xeric or scrubby flatwoods along the ridge section of the installation where fire is uncommon. The understory is generally open and dominated with scrub oaks and shrubs. When market conditions are favorable, sand pine can be utilized for pulpwood and ply logs.

APAFR habitats are often manipulated through the use of timber sales. Timber sales alter the habitat to a desired condition. Proper silviculture promotes forest health, provides forest products to the local economy, provides for regeneration of the forest stands and maintains diversity of forest vegetation. Table 3-3 summarizes timber and reforestation program for the past five years.

Table 3-3. Past 5-year Annual Timber and Reforestation

	FY 97	FY 98	FY 99	FY 00	FY 01	Five Year Average
Volume Sold (tons)	28,712	12,898	36,665	22,142	31,972	26,478
Acres Sold for:						
Thinning	1,213	1,223	714	890	1,045	1,017
Clearcutting	359	175	1,262	484	610	578
Longleaf Restoration						
Shelterwood						
Seedtree						
Group Selection						
T & E Species			82	223	247	110
Salvage		175	0	247	320	148
Acres Reforested by:						
Planting Longleaf			78		8	17
Planting Slash			226	325	285	167
Natural Longleaf Regen						
Natural Slash Regen						

3.4.6 Wildlife and Fish

The APAFR offers the wildlife enthusiast extraordinary opportunities to view, study and appreciate nature. One can see a variety of wild orchids, watch families of birds and inspect underground burrows that shelter more than 300 animal species.

The range's healthy ecosystems provide a bounty of wildlife, including game species, Non-game species, aquatic mammals, amphibians, reptiles and more. APAFR is home to numerous threatened or endangered species. Management activities are focused on three keystone species: Florida grasshopper sparrow (FGS), Florida scrub-jay (FSJ), and red-cockaded woodpecker (RCW). The AF developed a management plan for these three species in 2001. The US Fish & Wildlife Service (USFWS) and the Florida Fish and Wildlife Conservation Commission (FFWCC) have accepted this plan.

The Florida subspecies of the grasshopper sparrow is found only in the prairies of central Florida. Research is currently being conducted to determine the status of the FGS (*Ammodramus savannarum floridanus*) on the Range. The minimum population estimate during 2001 was 152 FGSs (52 on Delta Trail/OQ Range, 92 on Charlie/Echo Range, and 8 on Bravo/Foxtrot Range). There is evidence of an overall decline in abundance.

RCWs (*Picoides borealis*) are unique among woodpeckers in that they make their cavities only in mature living pines. Resin around the cavities acts as a deterrent to predators. Each cavity tree is painted with a white band to aid in recognition and to provide protection during management activities such as prescribed burning. The RCW population at the Range has remained relatively stable at 21 active clusters since the onset of a population study in 1994. Population stability is primarily due to aggressive management for the species, including prescribed burning, artificial cavity creation, recruitment cluster establishment, and translocation. Despite intensive management, 2001 was the first year in which increases in the number of active clusters were recorded. Active clusters increased from 21 to 22. The population goal set by the ESP is 68 active clusters within 45 years. The USFWS recovery plan for the RCW recommends that each RCW group be provided with 200 to 300 acres of quality habitat. Currently, no single uninhabited longleaf pine stand at APAFR meets the USFWS criteria of "quality habitat."

FSJ (*Aphelocoma coerulescens*) are found only in patches of scrub oaks that are periodically burned. FSJ population structure and demography have been studied on the Range since 1992. During the entire duration of the study the FSJ population declined by 22 breeding pairs from 85

groups to 63 groups in 1999. This dramatic decline was associated with extremely high winter mortality of both juvenile and adult FSJ. Two-thirds of all FSJ at APAFR occur on the Bombing Range Ridge, a heterogeneous mixture of xeric oak scrub, sand pine scrub, pine flatwoods and dry prairie. Another significant population of FSJ occurs on an adjacent ridge about three to four miles east of the Bombing Range Ridge. Recent implementation of FSJ habitat enhancement should provide the birds with more suitable habitat.

A variety of other fauna are found on the Range. Gopher tortoises (*Gopherus polyphemus)* can be found in any of the plan communities ranging from pine flatwoods to scrub. The Florida mouse (*Podomys florianus*) and the eastern indigo snake (*Drymarchon corais* couperi) often utilize the burrows of the tortoises.

Bachman's sparrow (*Aimophila aestivalis*) is abundant in both the lightly forested and unforested native flatwoods throughout the Range. Crested caracaras (*Polyborus* plancus) are found at the spoil mounds along the Kissimmee River. The brown-headed nuthatch (*Sitta pusilla)* and Sherman's fox squirrel (*Sciurus niger Sherman*) are occasionally seen in the heavily wooded pine forest and plantations throughout the Range.

Bald eagles (*Haliaeetus leucocephalus*) are regularly sighted from the observation tower overlooking Lake Arbuckle and the Orange Hammock area. In the spring and summer, swallow tailed kites are often seen near the cypress areas east of Arbuckle Marsh and in Long Cypress. Bluebirds (*Sialia sialis*)are easily observed near the 100 nesting boxes located along many of the Range's roads.

The diverse uplands communities support a wide variety of animal species. White-tailed deer (*Odocoileus virginianus*), wild turkey (*Meleagris gallopavo*), raccoons (*Procyon lotor*), red-shouldered hawks (*Buteo lineatus*) and a host of other wildlife species abound.

Arbuckle Marsh is home to numerous wetland species, including alligators (*Alligator mississippiensis*), several turtle species, otters (*Lutra canadensis*), black-crowned night herons (*Nycticorax nycticorax*), wood storks (*Mycteria americana*), great blue herons (*Ardea herodias*, little blue herons (*Egretta caerulea*), Great egrets (*Casmerodius albus*), snowy egrets (*Egretta thula*) and several *species of ducks.*

Numerous streams, canals, natural lakes and man-made impoundments provide a niche for black bass (*Micropterus salmoides floridanus*), bluegill (*Lepomis macrochirus*), warmouth (*Chaenobryttus gulosus*), shellcracker (*Lepomis microlophus*) and various catfish species. Three ponds are managed for catfish production, with channel catfish (*Ictalurus punctatus*) annually released and maintained with fish feeders.

3.5 AIR QUALITY

National Ambient Air Quality Standards are set by the Environmental Protection Agency (EPA) to promote a level of air quality sufficient to protect public health and public welfare issues. The Florida DEP is responsible inventory, monitoring, and regulation of air quality.

Areas that are known, or can be assumed, to meet air quality standards are divided into air quality classes. In Class I areas, very little additional air pollution is allowed. In Florida, the closest Class I areas to Avon Park are Chassahowitzka Wilderness Area on the Chassahowitzka National Wildlife Refuge and Everglades National Park in south Florida. Class II areas allow a moderate level of additional air pollution to accommodate industrial/urban development. APAFR is a Class II area and has consistently met the standards for the six EPA criteria pollutants monitored: carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter and sulfur dioxide. It is estimated that the average natural background visual range for the eastern United States varies from 65 miles to 121 miles. Average background visual range across the APAFR is estimated to vary from three to five miles due more to the flat topography than to visibility degradation.

3.6 LAND USE

3.6.1 Fire

Fire management at APAFR includes wildland fire suppression, permitted wildfires, and a prescribed fire program. Wildfire ignitions are managed with the proper suppression response, and can include direct suppression, containment or monitoring. When possible, wildfire is used to accomplish prescribed burning objectives, but decisions are made to provide the suppression alternative that results in safety, least cost and resource loss.

Prescribed fire is the primary management tool for maintaining plant communities at APAFR. In previous decades, dormant season back fires (cool fires) on a three year rotation were employed to encourage pine regeneration, but they resulted in shrub growth and hardwood encroachment. APAFR now uses a combination of dormant and growing season burns on a two to three year rotation. Dormant season burns are done primarily for cattle forage requirements and fuel reduction in forested areas; growing season burns are used for ecological restoration, to reduce shrub and hardwood encroachment and for wildlife habitat improvement.

Approximately 25,000 acres are burned annually (Table 3-4). Growing season burns comprise about 30% of the total acreage; however, fire managers hope to increase growing season burns to roughly half of the total burned acreage.

Table 3-4. Summary of Fire Activity on APAFR

Wildfire Causes by acre	1998	1999	2000	2001
Mission Activity	5,053.9	3,718.3	3,927.2	4,230.3
Lightning	1,804.3	236.9	4,745.3	828.7
Escaped Prescribed Burns	0.0	2,994.9	170.1	325.4
Miscellaneous	0.0	41.3	167.2	0.0
Total Number of Wildfires	23	61	103	52
Total Acres of Wildfires	6,858.2	6,991.4	9,009.8	5,384.4
Total Acres of Prescribed Fire	20,531.8	18,111.9	23,502.4	18,155.7

3.6.2 Infrastructure

Infrastructure is defined as shared improvements that are used by a variety of people and benefit more than one program. Infrastructure consists of roads, bridges, buildings, fences and other structures that are maintained by APAFR. Infrastructure is inventoried in three different functional areas: 1) Cantonment Area, 2) Impact Areas and 3) Management Units. The cantonment area houses the workers and equipment at APAFR. Most of the cantonment area is off limits to the recreating public. Impact areas serve the military and are always off limits to the recreating public. Management Units are all other lands. They serve the military as well as the recreating public. Off-road travel is not permitted for either the military or the recreating public, except by quail hunters during quail season.

Figure 3-4 Paved asphalt road

Cantonment Area: The cantonment area is approximately 2,811 acres. It has 5.5 miles of asphalt roads, no shell roads and no unimproved roads. It contains a small number of buildings, approximately 11 acres of vehicle and equipment parking lots, little landscaped area (mostly grass lawns), 2 refueling stations, 4 deep wells that supply potable water, 1 water treatment plant, 1 waste water treatment plant and 7 miles of fences. There are numerous ditches, canals, pipelines and culverts that area designed to carry storm water runoff away from the improvements. Adjacent to the cantonment area are AvPCI and the Avon Park Youth Academy

(APYA). The infrastructure for these facilities is not included because they are not located on AF property.

Impact Areas: There are eight impact areas totaling 21,020 acres. There are 1.4 miles of asphalt roads, 6.9 miles of shell roads and 11.9 miles of unimproved roads. There are numerous water dips made of broken tile as well as culverts that are designed to allow flowing water to cross over or under roads. There are 45 miles of fences.

Figure 3-5 Improved shell road

Management Areas: There are 14 Landscape Association Management Areas (LAMAs). Two of the management units are temporarily off limits to the recreating public due to safety reasons. Outside of the Military Impact Areas, there are 26.3 miles of asphalt roads, 61.8 miles of shell roads and 128.4 miles of unimproved roads available for use by the public, contractors, permittees and DoD personnel. There are two bridges, numerous water dips made of broken tile and numerous culverts, all designed to allow flowing water to cross over or under roads. There is one building used for general storage. There are 186 miles of fences.

Figure 3-6 Unimproved dirt road

3.6.3 Rangeland Grazing

Of APAFR's 106,073 acres, 96,836 acres are leased for cattle; only the cantonment area around the runway and the active ranges of Bravo and Charlie, and impact areas within Echo and Foxtrot ranges are excluded. Cattle grazing was reintroduced at APAFR after WWII in support of the military mission. Heavy grazing and frequent, uncontrolled burning resulted in poor rangeland condition until rangeland improvements were implemented in 1978. These improvements centered on breaking large lease areas into small, multiple-pasture units to allow for quicker recovery of vegetation (Table 3-5).

Table 3-5. Cattle Leases and Pastures

Lease #	Acreage	# Pastures
1	6,295	6
2	14,251	7
3	20,966	10
4	8,107	8
5	625	5
6	15,545	5
7	6,319	7
8	9,229	5
9	15,545	7

Current stocking on the installation is 3,345 animal unit years (AUYs). Total of all leases is 4,081 AUYs. The annual income from the nine leases is $144,036.00. All of the leases expire in either 2007 or 2008.

3.7 HAZARDOUS MATERIALS AND WASTE

Hazardous materials on APAFR include cleaning solvents, corrosives, compressed gases, pesticides, and paints and thinners. They are used and temporarily stored at operational areas throughout APAFR but primarily in the industrial complex next to the Auxiliary Airfield.

APAFR is regulated under the requirements of the Resource Conservation and Recovery Act (RCRA) and has been classified as a large quantity generator (LQG).

All underground petroleum storage tanks have been removed from the property. Only above-ground tanks are currently used on the facility. Current tanks include two tanks owned by the Florida Army National Guard (FLARNG), one by the AF and one by the Sebring Airport Authority.

Four oil-water separators (OWS) exist on the property. One services the AF Vehicle Maintenance area. Three separators service the FLARNG; one services the maintenance building and steam cleaning area, and the other two service the parking area runoff.

The AF Environmental Restoration Program (ERP) is mandated by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA, commonly referred to as the “Superfund” Act) and the Superfund Amendments and Reauthorization Act of 1986 (SARA). The Sections that pertain to the ERP are as follows:

- Section 120 of CERCLA (Federal Facilities)
- Section 211 of SARA (Defense Environmental Restoration Program)

Presidential Executive Order 12580 delegates specific responsibilities of the President under CERCLA to the DoD as the lead agency. The ERP, formerly IRP (Installation Restoration Program) is the primary subcomponent of the Defense Environmental Restoration Program (DERP). The objectives of the AF ERP are included in the overall objectives of the DERP: "…identification, investigation, research and development, and cleanup of contamination from hazardous substances, pollutants, and contaminants" (SARA Section 211). A final objective, closeout, is added to emphasize the importance of completing the ERP. Closeout implies that all necessary actions have been taken, documented, and accepted by the appropriate authorities. By meeting these objectives, the AF will protect the public and the environment. When investigations show that a site does not pose a significant threat to the public health or the environment, the No Action alternative is selected and the site is closed out under ERP. A Decision Document is prepared for each site closure to describe the decision-making process and provide a formal record of the decision.

The APAFR property has been divided into eight categories based on current knowledge of the environmental conditions at the Range:

- Areas of known contamination where required response actions have not yet been implemented
- Areas where waste disposal activities such as accumulation, burial or burning have taken place
- Areas where no storage, release, or disposal (including migration) has occurred
- Areas of known contamination with removal and/or remedial action underway
- Areas that are unevaluated or that require further evaluation
- Areas where all remedial action has been taken
- Areas of contamination below action levels
- Areas where only storage has occurred

The ERP is managed by Headquarters, Air Combat Command (ACC), Langley AFB, Virginia. The ACC major command (MAJCOM) Headquarters for APAFR, Florida is responsible for executing the ERP for all ACC installations, including APAFR. Headquarters ACC validates the

program documents received from the Range, awards funds to the Service Agency (US Army Corps of Engineers, Omaha District), and manages the projects awarded for each environmental contractor. The Corps of Engineers assists the Range in preparing environmental cost estimates, requests proposals from the environmental contractors, performs contract negotiations, requests authority to award funds, and manages the projects awarded for each site. The Remedial Project Manager's (RPM) responsibility is to submit the necessary program documents to Headquarters ACC for their validation. As time permits, the RPM reviews the scopes and proposals prior to contract award. In addition, the RPM manages the project funds awarded for each ERP site.

Currently, there are 66 ERP sites regulated by the EPA and the Florida DEP. Almost one-half of these sites are classified as Munitions Burial Sites while the remaining sites are classified as landfill, petroleum site, point source waste pit, non-point source area, and munitions-related. To date, there are seven sites listed in the Corrective Action Management Plan (CAMP) as requiring No Further Action. While the sites range from the beginning of the investigation phase (Preliminary Assessment) through the Site Inspection phase, Remedial Investigation phase, Feasibility Study phase and Remedial Design phase, several sites aren't projected for Remedial Action until the year 2014.

3.8 CULTURAL RESOURCES

APAFR is divided into three land use zones: the Main Cantonment area, the Active Impact areas, and the Buffer Zones. In 1942, the federal government acquired the property, which at that time consisted of 107,059 acres. The State of Florida Bureau of Prisons opened AvPCI, a minimum-security prison camp, in 1951 on the Main Cantonment area, which it continues to operate to this day. APAFR also shares its facilities with FLARNG, which conducts air and ground operations training, and APYA a county youth correctional facility.

The primary goal of the APAFR Cultural Resources Management Program is to manage the cultural resources of the APAFR in a way that supports the operations and missions of the range and all its users, yet is adequate to meet the requirements of the law and the needs of the

resources. The secondary goal of the program is to promote the research potential of APAFR's cultural resources. APAFR is unique in terms of cultural resources management. The range is located in an area of Florida in which little archeological research has been conducted. There is much confusion and debate over what occurred in this area during prehistory, but it has already been demonstrated that archeological sites located on APAFR have a rich potential to answer some of those questions. Therefore, it is important to maximize any opportunity for archaeological fieldwork for the benefit of research as well as compliance requirements.

By 1995, only 3,677.6 acres, or 3.5% of the total area of APAFR, had been surveyed and inventoried for cultural resources. In 1995, 1996, 1997, and 1998 an additional 6,521.4 acres (6.15%), 5,976 acres (5.63%), 3,099.5 acres (2.92%), and 5,700 acres (5.37%) respectively were surveyed and inventoried for cultural resources. In 1999 and 2001, an additional 1,925 acres (1.8%) and 2,811 acres (2.65%) were inventoried for cultural resources. A 1996 historic building survey, which recorded several structures dating to World War II, was revised in 1999 to include all the structures on base that date to WWII in the list of potentially significant resources. At this stage of the program, a total of 29,710.5 acres (28%) of APAFR have been inventoried for cultural resources. The recorded resources include 30 structures and 136 archeological sites. The resources provide evidence of land use and human habitation ranging from the late Paleo-Indian/Early Archaic period (12,000 years BP) through World War II.

The resource types include World War II structures and target complexes, historic homestead sites, artifact scatters, shell and earth middens, turpentine distillery sites, Seminole War forts, prehistoric earthworks and dugout canoes.

3.9 RECREATION AND VISUAL RESOURCES

APAFR has the potential to offer a wealth of aesthetic and recreational opportunities to residents of its surrounding counties. APAFR does not offer the highly developed recreation experiences that some tourists and long-distance travelers seek; instead, the focus is on dispersed, resource-

based recreation such as hunting, birdwatching, hiking, fishing and primitive camping. Birdwatchers come from several other countries to see some or all of the special endemics, some listed as Threatened or Endangered which can be observed on the Range. For many local residents, Avon Park is their place of choice for picnicking, camping, boating, fishing, and other general recreational activities. During the hunting seasons, local residents share this "sense of place" with hunters from many parts of Florida, as well as other states, who also have strong attachments to the Avon Park landscape. Approximately 40,000 visitor-days of public recreation are experienced annually.

Of the installation's 106,073 acres, approximately 82,800 acres may be made available for recreation. Some areas are off-limits to the public, notably the Military Target Impact Areas and Areas 4 and 6 on the Public Recreation Map (Figure 3-7). Camping is allowed in four areas totaling approximately 160 acres; hiking occurs on 36 miles of trails; fishing occurs on approximately 5,025 acres of lakes and ponds and along 24 miles of rivers, streams and canals; and approximately 130 miles of roads provides driving and sightseeing pleasure. Throughout the year, the public can purchase recreation permits that allow them to fish, camp, hike and birdwatch. Sales of these recreation permits generated $15,000 in 2001.

Hunting continues to be the primary recreational use of APAFR. Approximately 20,000 hunter-days of use were recorded in 2001. Hunting permit sales currently generate $240,000 annually. Annual harvests during recent years (1999-2001) for primary game species included 481 white-tailed deer; 1,075 wild hogs; 875 bobwhite quail; and 350 wild turkeys. Hunting deer using dogs, a strong cultural attachment in the south, occurs at APAFR with approximately 1,000 "dog hunters" engaging in this activity. Opportunities to hunt cannot support the current demand, and hunter numbers are limited to 2,000 permits a year, drawn by lottery. Permit holders are allowed to bring guests most weekends.

Wildlife observation and nature study is increasing at APAFR. A 30-foot observation tower at Lake Arbuckle is a popular site year-round for birdwatchers and organized groups. The 600-acre

Sandy Point Wildlife Refuge, closed to hunting, is also popular, receiving a number of visits per year.

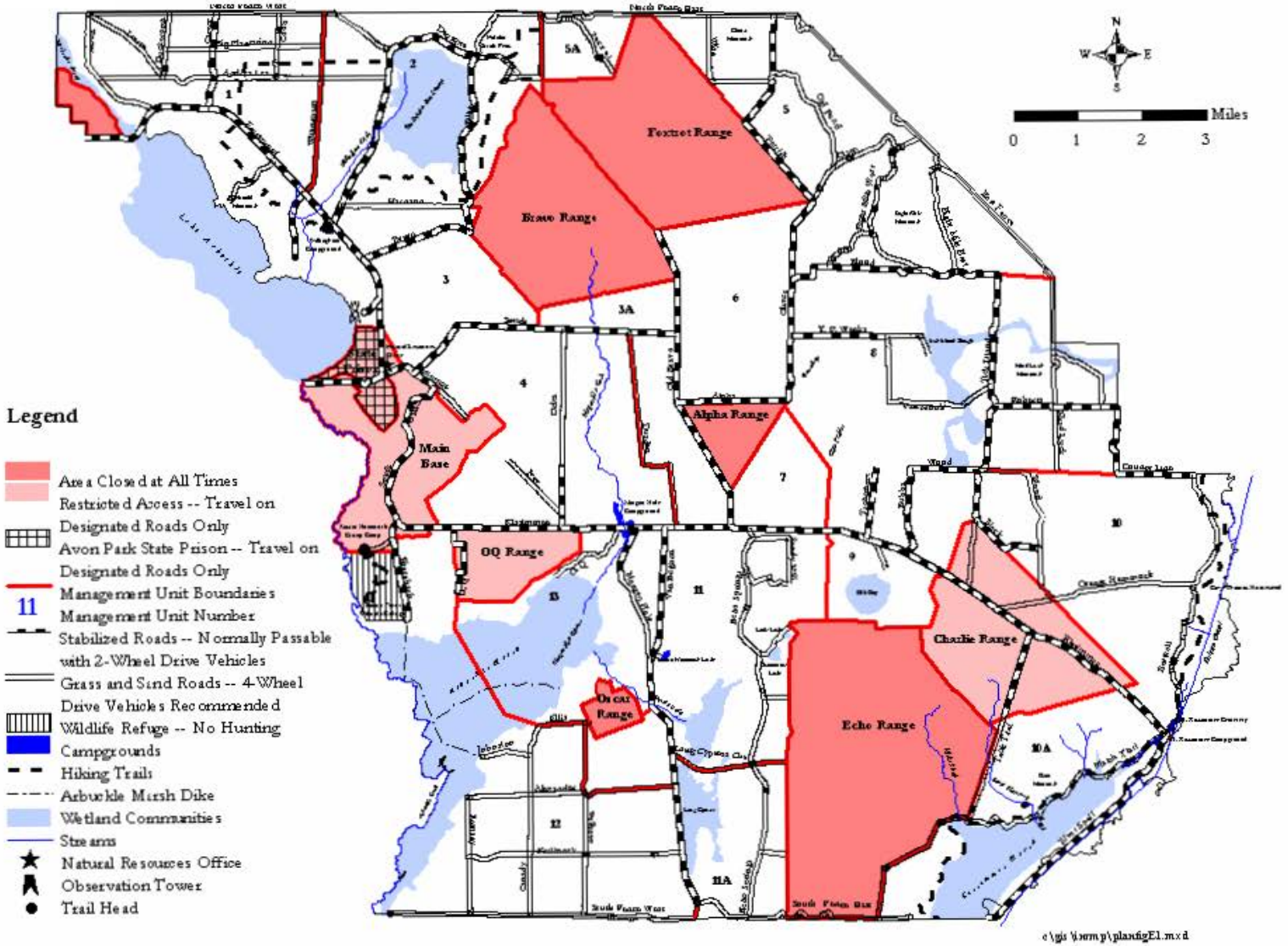
APAFR offers environmental education and interpretive programs and tours to non-profit groups and local schools, and participates in local fairs and special events in the community. In 2002, about three tours and presentations were accomplished. APAFR also produces informative and interpretive brochures to educate the public about management practices they may see while visiting the range.

APAFR lies within a region characterized by a mosaic of open savannah, forests, lakes, land devoted to agriculture, and agricultural land becoming converted to retirement communities. Forests are generally natural stands of slash and longleaf pine or planted pine plantations. These pinelands may have shrubby understories, usually galberry or palmetto, or understories of grasses and herbs. Where fire has been frequent, the understory is low and viewers can see well into the interiors of stands. Where fire has been suppressed and not fully replaced by prescribed burning, the understory is dominated by tall shrubs and views are restricted.

APAFR contains the largest area of sand pine-scrub in central Florida. These areas have a dense shrub layer and fairly open tree canopy with several temporary openings. These openings allow some middle distance views but the low relief of the area usually restricts views to the foreground area.

Wetlands typically have overstories of cypress, gum, or bay, and tall shrubby understories. Where these occur as stringers or domes in pinewoods, they provide visual variety. Savannahs and prairies provide open, treeless vistas that convey a sense of space and provide middle distance views and, in a few cases, views of far distance.

Figure 3-7. Public Recreation Map



3.10 SOCIO-ECONOMICS/ENVIRONMENTAL JUSTICE

APAFR lies in the heart of Florida's growing retirement communities. Polk and Highlands Counties lie in the State's Planning Region 7 (composed of Desoto, Hardee, Okeechobee, Highlands and Polk counties). In this region, population estimates from the 2000 Census reflect a 23.5% increase in population levels from the 1990 Census, for a population level of 15,982,378. The 2000 Census indicates a population of 87,366 for Highlands County, a 27.7% increase since 1990. Polk County, with a higher population of 405,382 from the 2000 Census, experienced only a 19.4% increase from 1990 (2001 Florida Statistical Abstracts, Tables 1.12, 1.14, 1.16, and 1.20).

The population of Highlands County has a median age of 50, well above the state average of 38.7 years; and 33% of Highlands County's population is 65 and older. Estimates show Highlands County to be 83% white, 9.3% black, 12% Hispanic, 1% Asian, and 0.4% Native American. Polk County, on the other hand, is a much younger population with a median age of 38.6 years, with only 18% of the population being 65 and over. Polk County census data show it to be 79.5% white, 13.5% black, and 9.5% Hispanic. Asian and Native Americans make up less than 1% of the county population, at 0.9% and 0.3% respectively (2001 Abstracts, Tables 1.31, 1.32, 1.33, 1.37, and 1.38).

The per capita personal income in 1999 for Highlands and Polk Counties was $23,734 and $23,294 respectively, both below the State average of $27,781. The estimated percentage of poor persons in 1997, the most recent year statistics are available, showed 16.4% in Highlands and 16.6% in Polk County, both above the state average of 14.4%. The unemployment rate for the two counties is also higher than the state average of 3.6%: for Highlands County it is 5.5% and for Polk County it is 4.7% (2001 Abstracts, Tables 5.10, 5.48, and 6.11).

For the school year of 1999-2000, the State of Florida reported a high school graduation rate of 62.3%, with a drop-out rate of 4.6%. While both counties showed a drop-out rate of 5.9%, Highlands County graduated 64.7% of its high school students, while Polk County's graduation

rate was 55.3% (2001 Abstracts, Table 4.80). This could reflect the types of jobs readily available in Polk County: the highest employment industries are Manufacturing and Construction, followed by Transportation, Communications and Public Utilities. In Highlands County, the employment centers on Agriculture/Forestry/Fishing industries, with the largest number of people by far engaged in agriculture instead of forestry and fishing (2001 Abstracts, Table 6.05).

Counties containing DoD lands receive 40% of receipts from revenue generated by the forest management program to defray loss from property taxes. Table 3-6 shows the total amount of receipts that went to Highlands and Polk Counties for the 10-year period from 1991-2001. These funds are usually split somewhat evenly between the two counties, and are earmarked for schools and roads.

For many people, APAFR is central to their way of life. Socioeconomic effects range from jobs and employment to recreation, life styles and the psychological benefits of having access to the natural world. Hunting, fishing, wildlife viewing and hiking contribute to the well being of the local population as well as creating close ties to the land and a sense of place.

There are no federally-recognized Indian tribes or Indian reservation trust lands on APAFR.

Table 3-6. Receipts to Counties from APAFR for 1991-2001

Year	40% Receipts to Counties ($)
1991	6,936
1992	24,683
1993	50,619
1994	51,422
1995	40,597
1996	16,414
1997	69,928
1998	5,500
1999	104,506
2000	0
2001	51,228
Total	**421,833**

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4.0 ENVIRONMENTAL CONSEQUENCES

This chapter assesses the potential environmental consequences of the proposed INRMP alternatives for each of the resource areas discussed in Chapter 3.0. The environmental impact analysis process is designed to focus analysis on those environmental resources that could potentially be affected by the implementation of an INRMP.

4.1 EARTH RESOURCES

Analysis of the potential impacts to earth resources focuses on the potential to directly or indirectly alter, deplete or degrade this resource.

Proposed Action

Even with efforts to rehabilitate selected roads and disk lines, soil erosion impacts to vegetation, wetlands and surface water bodies will continue to occur along 246 miles of roads and 1,799 miles of disk lines under the Proposed Action. Annual disking of fire lanes and fence lines repeatedly exposes bare soil increasing the potential for soil erosion. Surface water run-off often transports soil from along disk lines and deposits soil at other down-slope sites. At the erosive sites, the vegetation may be dislodged, whereas at deposition sites vegetation may be subject to repeated burial by soil. Topography, soil structure and biogeochemical soil properties are permanently altered at both sites and can permanently alter species composition of the plant communities. Wetlands and recharge areas for seepage slopes have been and continue to be impacted by soil erosion and deposition. The Proposed Action intends to minimize local erosion problems at some site-specific locations and implement preventative measures to control or abate erosion. Once corrective and preventative measures are implemented, they should have an overall positive impact on prevention of soil erosion.

Alternative A

The effects of this alternative on the soil resource would be similar to those described in the Proposed Action, but greater. Under Alternative A no site-specific soil erosion mitigation measures or corrective measures would be implemented. As a result soil erosion would occur unabated and without implementation of corrective measures.

Alternative B

Under this alternative, the removal of nearly 80 miles of roads and nearly 1,433 miles of disk lines might cause a short-term increase in soil erosion as the roadbeds are restored. However, upon completion of removal of fence lines and disk lines, soil erosion is expected to be eliminated from closed roads and rehabilitated disk lines. Alternative B, when fully implemented, would result in the least amount of long-term potential for soil erosion.

4.1.1 Minerals and Energy Resources

Proposed Action

The Proposed Action does not extract locatable or leasable minerals. This alternative also does not lease or sell salable minerals. It continues to use spoil from the Kissimmee River canal for road surfacing material. This use will continue until 2006 when the river channel is restored. No impacts occur with the current use of spoil.

Alternative A

The effects of Alternative A would be the same as for the Proposed Action.

Alternative B

Under this alternative, with the reduction of roads, the demand for road surfacing material will decline. Currently APAFR acquires road surfacing material from other off-installation sources as well as the river spoil. Assuming that the proportion of supply from these sources stays the same,

there will be decreased demand from the river spoil. No impacts occur with a decrease in use of spoil.

4.2 WATER RESOURCES

This analysis focuses of the potential for the Proposed Action and alternatives to change the water quality on the APAFR.

4.2.1 Surface Water Hydrology

Proposed Action

The Proposed Action improves surface water quality by restoring the natural hydrology in small, localized areas. These quality improvements are usually targeted for infrastructure facilities (roads, firebreaks) that wash out and temporarily prohibit vehicle travel. Quantifying the extent of these improvements is difficult because APAFR lacks a wide inventory of known locations of excessive surface flows or floodplain obstruction. The improvements are likely to be small in scale. The exception is restoring part of the Kissimmee River to a natural channel with a restored floodplain.

The Proposed Action maintains wetlands by land management practices (e.g., prescribed burns, proper grazing) that encourage desirable wetland vegetation and allow the vegetation to slow and filter surface water. This maintains existing good water quality status in adjacent surface water bodies (i.e., streams, creeks, rivers, ponds and lakes). This same filtering process will occur in the Kissimmee River as the natural channel is restored, floodplain is reestablished, and riparian vegetation is established. The Proposed Action proposes no projects that will disturb wetlands.

The Proposed Action retains most of the infrastructure (i.e., roads, tank trails, disk lines and fence lines) and most of the activities (e.g., military training, forestry and grazing) that have the potential to affect surface water quality. The Proposed Action recognizes localized areas with

excessive surface water runoff and recommends corrective action to a limited extent. These actions focus on infrastructure and include pulling ditches adjacent to currently abandoned roads and tank trails, and stabilizing or closing roads, tank trails, fence lines, and disk lines. The actions take place on landscape associations that have erosive soils on slopes. They include the Ridgetop Flats, Bombing Range Ridgetop, Cutthroat Communities, and Dry Prairie Landscape Associations. Also, the Proposed Action places additional culverts and low water crossings in the Pine Flatwoods, Dry Prairies, and Kissimmee River Floodplain Landscape Associations to enhance natural waterflow.

Floodplains are also altered by the infrastructure at APAFR by either indirectly diking floodplains with above grade roads or draining with existing ditches. This infrastructure is already in place. The Proposed Action improves floodplain quality by installing low water crossing and culverts. The Proposed Action has no new projects in floodplains.

The Proposed Action only mildly addresses the minor contributors located upslope that accelerate overland water flow that, when taken collectively, cause concern downslope. These minor upslope contributors include bedded pine plantations, most disklines, cattle trails, most fencelines, and temporarily exposed soil from prescribed burns. While BMPs are employed upslope, the downslope areas still receive the impact to the point where land management is hampered. The Proposed Action treats the down slope areas by modifying roads with low water crossings, culverts, stabilizing, or abandoning them.

In summary, the Proposed Action improves the surface water quality by taking action on locations with easily identifiable surface water flow problems. Many of these locations are also where land management is hampered (vehicles are denied access) such as cutthroat seep slopes.

Alternative A

Alternative A improves surface water hydrology, but less than the Proposed Action It retains the current infrastructure as does the Proposed Action. Alternative A also improves roads that wash

out by repair, additional culverts, and low water crossings. BMPs are also employed for upslope practices. Alternative A lacks closure and stabilization to roads, disklines, and tank trails. Wetlands are maintained. No projects are proposed in wetlands or floodplains. Water quality remains good.

Alternative B

Alternative B improves surface water quality by restoring much of the natural hydrology nearly installation wide (the exceptions are the Cantonment/Airfield and Recreation Sites Landscape Associations). Improvements are made by closing 60% of the roads, 54% of the disk lines and 80% of the fencelines and allowing them all to revegetate. Quantifying the extent of the improvement is difficult to determine as the installation lacks an inventory of known locations of excessive surface flows or floodplain obstruction. The effects of the improvements are probably larger in scale than the other actions because they remove so much infrastructure. Short term effects may actually be negative for surface water quality flows due to obstructed culverts, channelization of below grade infrastructure, and breached roads contributing sediment. Over time, however, natural drainage patterns will emerge after above-grade infrastructure is breached/revegetated and below-grade infrastructure is revegetated and trapping sediment. Wetlands will be reconfigured by natural surface water flows with Alternative B, but it is anticipated that there will be no net loss to wetlands. Wetlands will continue to slow and filter overland water flow and maintain the current good surface water quality. Floodplains will also be reconfigured as infrastructure is washed away in high flood events.

Alternative B addresses the minor contributors located upslope that accelerate overland water flow that, when taken collectively, cause concern down slope. These include bedded pine plantations, disk lines, cattle trails and fence lines. These minor contributors will not be maintained (bedded pine plantations removed), and will therefore revegetate, allowing for a more natural hydrology.

4.2.2 Ground Water Hydrology

Proposed Action

The Proposed Action has negligible impacts, either positive nor negative, in any of the three aquifers found at APAFR. Water is drawn from the surficial aquifer for cattle watering and recreational campground showers and hand pumps. Grey water from the showers is returned to the surficial aquifer via drain fields. Water quality is expected to remain good for all three aquifers.

Alternative A

Alternative A has the same consequences as the Proposed Action.

Alternative B

Alternative B has slightly less water use from the surficial aquifer with the absence of cattle. With a more natural hydrology, surface water will be retained longer on the landscape resulting in more ground water recharge. The extent of recharge is negligible with seasonal fluctuations overriding any effects of additional recharge. Water quality is expected to remain good for all three aquifers.

4.3 BIOLOGICAL RESOURCES

4.3.1 Insects and Disease

Proposed Action

The Proposed Action would have little effect on insects and disease and their management at APAFR. Insect and disease outbreaks would be controlled when appropriate, especially when they threaten other resources or adjacent property. The network of roads, disklines and plowed lines may contribute to the spread of insects and disease as insects and diseases can be carried into an area on vehicles, on the soles of boots, or even by horse hooves. Insects, fungi and other

pathogens can be transported into wider areas and spread at a faster rate than they might by natural processes. On the other hand, the fragmentation of the landscape by pine plantations that contain a species of pine different from the surrounding natural pine areas may serve to break up the area into smaller landscapes and prevent some insects or diseases from being carried throughout an area. Roads and firelines may also make it easier to establish boundaries for the control of some insect outbreaks. In general, insect and disease outbreaks at APAFR have not been a management concern.

Alternative A

Effects of this alternative would be similar to the Proposed Action. The existing pine plantations, and even the roads and firelines that separate them, may act as barriers to some insect and disease outbreaks and make control of outbreaks easier to manage.

Alternative B

This alternative would have greater effects on the management of insect and disease problems. Under Alternative B, once the pine plantations have been removed and the native vegetation restored at its natural variations in density, the forested parts of the landscape would be more homogeneous in regards to species composition. Thus, an insect or disease infestation could travel faster and spread over more of the landscape than in the other two actions. In addition, the reduction in roads (80 miles removed) and firelines (1,433 miles removed) in this alternative would mean fewer barriers for insects and disease to cross and may contribute to the spread of an outbreak.

4.3.2 Vegetation

Proposed Action

In order to describe and explain some of the impacts of the alternatives, some background ecological information is presented herein. The intact native ground cover vegetation of pine savanna-flatwoods and various prairie habitats throughout the southeastern United States has

been documented in the ecological literature as harboring some of the highest species diversity on a small-scale level, unmatched elsewhere in North America. The species richness of the pine savanna-flatwoods/dry prairie landscape is exceptionally high, with quantitative sampling at APAFR documenting some of the highest figures as yet recorded: up to 49 species in $1m^2$, 118 species in 100 m^2, and 170 species in 1,000 m^2 (Bridges & Orzell, unpublished data). Additionally, the ground cover of pine flatwoods and prairies in central Florida contains an exceptionally rich endemic flora. This distinctive native flora is heliophytic (sun-loving), predominately perennial, and fire-evolved. In southeastern pine-wiregrass ecosystems, the ground cover vegetation has profound ecological and evolutionary significance because it provides the fine fuels that facilitate periodic fire and thereby sustain the exceptional biodiversity found in the native pine savannas.

Human activities can cause or create artificial disturbances to the ecosystem. The effects of human disturbance activities vary considerably due to the type of disturbance, frequency of disturbance, duration of the disturbance event and the type of natural community in which the disturbance occurs. Although natural disturbances such as wildfires, floods, droughts, freezes and wind storms (i.e. hurricanes) are characteristic of south-central Florida ecosystems, the effects of man-caused disturbances do not necessarily mimic those of natural disturbances. Implementation of any management activities, whether they follow an ecosystem management approach or not, inevitably result in impacts to the native vegetation. For most of these management activities, the disturbance can be minimized or controlled by utilizing a variety of innovative strategies and techniques. The effects of natural resources management proposed at APAFR are discussed for each program (burn, forestry, rangelands, outdoor recreation and endangered species).

Burn Program

Historically, fire caused by frequent lightning storms occurred throughout the landscape. Indigenous peoples and European settlers also used fire. Today, prescribed burning is the primary management tool used by APAFR staff. Currently, prescribed fire is used at APAFR to maintain natural communities, restore altered areas, reduce wildfire hazard, produce grazing

forage, promote forestry and maintain or improve endangered species habitat. Prescribed burning exerts a profound effect upon the vegetation composition and structure on nearly all the plant communities found on the base.

The effect of fire on the vegetation varies with seasonality, burn frequency and firing technique. The Proposed Action proposes, in general, to allow wildfires to burn in a controlled manner, to increase growing season burns, to increase fire frequency in some areas and to use fire for habitat restoration and maintenance. The effects of these guidelines are discussed below. The control of wildfires should not negatively impact the natural vegetation because the firebreaks and roads already in place reduce the necessity to disturb vegetation by plowing new fire lanes. Prescribed burning of 22,000 acres annually with an emphasis on growing season burning should mimic more of a natural fire frequency and seasonality. Restoration of summer burning in long unburned scrub communities for FSJ habitat maintenance should act to restore these communities by reducing the height of woody vegetation and creating open bare sandy areas. An increase in fire frequency to biennial fires for RCW and FGS habitat maintenance should increase overall native species diversity and aid in maintaining a low stature shrub component in pinelands and prairies. The use of fire to maintain and restore habitat for PETS plants should enhance populations of rare plants and suppress competitive woody invasion in sensitive habitats.

At a more detailed level, lightning or growing season burning (late March thru early July) is known to have specific effects on the vegetation in certain plant communities. A greater emphasis on growing season burning will promote flowering and fruiting of the native ground cover in seepage slopes, prairies and pinelands. Growing season burning will also aid in suppression of the woody component in seepage slopes, prairies, and pinelands. It is expected that the higher intensity of growing season burns proposed in the Proposed Action might kill or damage some older pines and reduce pine reproduction in natural pine stands. Using prescribed fire in the early part of the growing season in April and early May, when conditions are dry can favor mortality of woody invasion (wax myrtles, etc.) in wetlands, wet prairies and seepage slopes thereby enhancing restoration of altered examples of these community types.

The type of fire, hotter head fire or cooler back fire, can have different effects. Allowing head fires as proposed in the Proposed Action, to naturally burn into hammocks and the pre-settlement pineland-prairie boundary will mimic natural fires and arrest woody expansion. The continuation of cool, back burning of pine plantations in the dormant season should reduce pine needle scorch and pine mortality. However, because these cool fires merely scorch or top-kill shrubs they ultimately increase the density and stature woody species and favor shade tolerant plants at the expense of native sun-loving ground cover species, thereby reducing the overall species diversity.

There are a number of variables related to prescribed burning which may be difficult or impossible to control but which could affect the vegetation response. For many of these variables we do not have sufficient historical data to predict the effects. These variables include differences in burning intensity, weather conditions at the time of the burn, rainfall (deluge or drought) following burning and perhaps others. Any or all of these variables could have a major effect on vegetation growth and result in changes that may persist for long periods. For example, burning dry prairie vegetation during early winter months when followed by a hard frost after the wiregrass is re-sprouting can cause mortality of some wiregrass clumps (Bridges, unpublished data from APAFR sampling). Also, burning very late in the growing season, when inundating rains submerge re-sprouting wiregrass, can cause high mortality of wiregrass and other perennial grasses (Bridges, unpublished data from APAFR sampling). Because some of these are variables are uncontrollable, it is expected that some of these effects will occur as a result of prescribed burning as outlined under the Proposed Action.

Forestry Program

Impacts from the forestry program at APAFR can be categorized into the management activities occurring in the intensively managed pine plantations or those activities occurring in the native pinelands.

Similar types of disturbance occur to native ground cover when natural pinelands are converted to managed pine plantations and when existing plantations are clearcut and replanted. Under the Proposed Action, no new pine plantations are proposed but some existing plantations will be replanted. Therefore, the impacts to the native ground cover that occur in pine plantations are relevant. The condition and quality of ground cover in pine plantations is largely a function of the amount of site disturbance from site preparation methods such as roller chopping, disking, bedding, and disturbance during planting, burning regime (fire frequency, season of fire, type of firing, etc.) and the density of the pine overstory (degree and magnitude of shading). On APAFR, all pine plantations were roller-chopped and some plantations were bedded. Plantations were initially protected from fire and burned with cool backfires predominately during the winter on a three- to five-year fire-return interval. Site preparation methods, burning regime, and pine overstory density have altered the structure and species composition of the native ground cover. As a result, there is a wide variation in the condition and quality of the ground cover vegetation in the pine plantations found at APAFR. In some plantations the ground cover vegetation is largely intact whereas in others the ground cover is disturbed.

Specific data on the effect of pine plantations on ground cover vegetation at APAFR is presented in Bridges (1999). This study found that there was an average of twice as much bare ground and up to 137% more litter value in plantation plots as compared to native vegetation plots. Table 4-1 summarizes the differences in ground cover species between native plots and plantations by calculating the percent cover change in the pine plantations from the average for each species. Table 4-1 shows that several species declined in pine plantations. These were mostly perennial grasses or grass-like monocots, with 9 of the 18 species showing at least 50% cover decline in plantations. The decline of two species, wiregrass (*Aristida beyrichiana*) (10.9 % absolute decline) and runner oak (*Q. minima*) (10.4% absolute decline) is noteworthy. Other declining species include fall-flowering herbs in the Aster plant family with basal rosettes and saw palmetto (*Serenoa repens*). There was an increase in gallberry holly (*Ilex glabra*).

A Natural Floristic Quality Index (NQI) devised in Bridges (1999) showed that plantations have, on average, a 26% lower quality value than native vegetation sites. A 26% decrease in ground

cover values has implications for ecosystem management and restoration. Plantations also had lower natural quality ratings than natural pine stands indicating that site preparation reduces natural quality in plantations. Although the total floristic composition of the plantations was not very different from the native sites, the cover values for individual species indicated increasing dominance of species with lower natural quality values. Differences in species composition are more apparent in cover and frequency values between native and plantation sites. When pine plantations are clearcut, roller-chopped, and replanted as outlined in the Proposed Action, there will be a continual decline in overall native ground cover diversity. A final report summarizing the effects of pine plantation management at APAFR is expected to elucidate and discuss additional impacts caused by site preparation techniques.

Under the Proposed Action, A natural pinelands will be subject to uneven-aged management. Recent studies by Bridges (1999) demonstrate that even in natural pinelands, canopy cover, density and basal area of pines have direct implications for species diversity and natural quality of the groundcover layer. This study suggests that tree canopy, density and basal area should be a central consideration in natural pineland management in the Proposed Action. A summary of the results and potential implications of this study for pineland management are described below.

At even relatively low values of tree density and basal area, the NQI of the native ground cover begins to decline. At 40 trees per acre there is a 5% decline in NQI, and at 80 trees per acre a 10% decline. These declines with density can be attributed to the increase in cover of saw palmetto, and the correlated decline in grass and forb diversity. The decline in NQI as basal area increases is somewhat more gradual and subtle, indicating that perhaps having a few larger trees in the area is not as detrimental as having several smaller trees. Nevertheless, there is a gradual decline in NQI, beginning at even ten square feet per acre of basal area and quite apparent by 50 square feet per acre and beyond. Given that declines in the NQI are apparent even at 40 trees per acre, for optimal biodiversity preservation, large areas should not be managed for much higher tree densities than this value. Large areas should reflect that some areas will be treeless, some with sparse canopy and some with dense canopy.

Table 4-1. Ground cover differences between control (native vegetation) and experimental (pine plantation) plots at Avon Park Air Force Range, Florida

Based upon a comparision of coverage average percent differences between control (native vegetation plots) and experimental plots (pine plantation plots) without regard to canopy density, hydrology, or differences between plot sets. Only those species with an average cover over 0.1% in either control or pine plantations are shown, and only differences of >10%. Plants listed as declining are those with a decreasing cover trend, however these plants can still be found and may even be locally abundant in some pine plantations but overall their average cover values decline in plantations. Source: Bridges (1999).

Decreasers in pine plantations	
100%	*Pinus palustris* (long leaf pine)
99%	*Juncus scirpoides* (needle-pod rush)
90%	*Panicum abscissum* (cutthroat grass)
83%	*Elephatophus elatus* (tall elephant's foot)
78%	*Carphephorus paniculatus* (hairy chaffhead)
78%	*Ctenium aromaticum* (tooth-ache grass)
74%	*Quercus minima* (runner oak)
71%	*Liatris tenuifolia var. quadriflora* (blazing star)
61%	*Andropogon virginicus var. decipiens* (broomsedge)
58%	*Sorghastrum secundum* (lop-sided Indian grass)
58%	*Myrica cerifera* (wax-mrytle)
56%	*Aristida rhizomophora* (Florida three-awn)
55%	*Pityopsis graminifolia* (golden-aster)
55%	*Eragrostis elliottii* (lovegrass)
54%	*Andropogon ternarius var. cabinisii* (silver bluestem)
53%	*Aristida beyrichiana* (wiregrass)
52%	*Hypericum reductum* (St. John's wort)
50%	*Befaria racemosa* (tar flower)
45%	*Dichanthelium strigosum var. glabrescens* (panic grass)
44%	*Vaccinium myrsinites* (shiny blueberry)
37%	*Schizachyrium stoloniferum* (creeping bluestem)
35%	*Rhynchospora fascicularis* (a beakrush)
34%	*Paspalum setaceum* (crown grass)
23%	*Euthamia tenuifolia* (flat-topped goldenrod)
22%	*Xyris caroliniana* (Carolina yellow-eyed grass)
19%	*Serenoa repens* (saw-palmetto)
17%	*Aristida purpurascens var. tenuispica* (a wiregrass)
15%	*Stillingia sylvatica* (queens delight)
10%	*Pterocaulon pycnostachyum* (blackroot)

Table 4-1. Ground cover differences between control (native vegetation) and experimental (pine plantation) plots at Avon Park Air Force Range, Florida (continued).

Increasers in pine plantations	
2407%	*Andropogon glomeratus var. glomeratus* (bushy bluestem)
303%	*Amphicarpum muhlenbergianum* (blue maidencane)
276%	*Xyris elliottii* (Elliot's yellow-eyed grass)
184%	*Andropogon virginicus var. virginicus* (broomsedge)
170%	*Syngonanthus flavidulus* (bantam-buttons)
142%	*Aristida spiciformis* (bottlebrush three-awn)
123%	*Ilex glabra* (gallberry)
122%	*Dichanthelium portericense* (a panic grass)
115%	*Gaylussacia dumosa* (dwarf huckleberry)
114%	*Andropogon virginicus var. glaucus* (little chalky bluestem)
91%	*Axonopus furcatus* (big carpetgrass)
82%	*Hedyotis uniflora* (flat-toped bluet)
80%	*Eupatorium recurvans* (coastal-plain thorough-wort)
78%	*Lachnocaulon anceps* (bog-buttons)
48%	*Eleocharis baldwinii* (Baldwin's spikerush)
22%	*Lyonia lucida* (fetterbush)
15%	*Andropogon brachystachyus* (short-spike bluestem)
15%	*Dichanthelium encifolium var. unciphyllum* (a panic grass)
14%	*Rhexia mariana* (meadow-beauty)
14%	*Erigeron vernus* (white-topped fleabane)
13%	*Carphephorus carnosus* (pineland chaffhead)

These canopy cover effects are somewhat determined by spatial scale, the distribution of patches or clumps of trees within larger stands of pines. In plantations, for example, the spatial pattern of trees is relatively uniform and predictable, with thinning having mostly been done in a systematic pattern. This results in most areas within a single plantation having a relatively narrow range of tree density values, unless there has been some major disturbance within a particular plantation.

In addition to average tree density, patchiness should be considered. Unlike pine plantations which are typically of uniform density, most natural pine stands on APAFR, and in general in central Florida, are distinctly clumped into clusters of varying sizes, with large spaces between the clumps having few mature trees. Pre-settlement data and early photos of virgin stands

suggest that the patchiness of tree density now visible on the landscape is an integral part of the natural system. Consequently, natural pinelands should not be managed for uniformity of stand structure and density. However, under the Proposed Action, uneven-aged management will result in some stands that exceed density thresholds with the potential to seriously impact the ground cover biodiversity. Attention to patchiness might result in the following situation: In a 100-acre block of flatwoods, there could be 20 acres with an average of 100 trees per acre, 20 acres with 50 trees per acre, and 60 acres with 16 trees per acre and still have a total density less than 40 trees per acre. In this case, there would likely be a lower quality groundcover in the denser parts of the stands, but high quality groundcover in the majority of the block which has a much less dense canopy layer.

The following statistics, adapted from Bridges (2000), give some idea of the range of values present in the pre-settlement witness tree data at APAFR. Note that these values specifically exclude areas of "prairie" (having no witness trees) and those where witness trees were absent in one or more quadrants (those points bordering extensive prairies and marshes). Based on section corners (4 trees measured per point, the "point-centered quarter" standard sampling method), the APAFR data gives values of:

Mean pine density (trees/acre) (at points with witness trees in all quadrants) - 41
Median density (trees/acre) - 25.6
Range of density values calculated (trees/acre) - 0.1 to 319
Mean diameter - 11 inches (note - excludes all trees below 4 inch diameter)
Mean basal area (square feet per acre) - 21.2
Median basal area (square feet per acre) - 14.1
Range of basal area values calculated (square feet per acre) - 0.1 to 91

Another way of looking at the same data is to calculate the mean pine density at APAFR based on the mean distance to the nearest pine over the entire data set, which for all section corners and midpoints would give a pine density of 13 trees per acre, or using the median distance giving a pine density of 37 trees per acre. Note that the median density based on the individual sample points (25.6) is midway between these two values. Therefore, the pre-settlement data indicate an optimal average pine density in areas supporting pines as about 25 trees of greater than four

inches diameter per acre, with individual stands varying around this mean, with the majority of stands being between 13 and 37 trees per acre. One could assume that if pine densities are kept between 13-37 trees per acre, then they likely would not be significantly different from those under which the ecosystem was functioning and may have evolved.

In addition to pine density and canopy cover issues there are impacts associated with harvesting activities as proposed in the Proposed Action. Harvesting equipment can disturb vegetation, primarily by crushing or dislodging plants. This impact is typically temporary, and plants recover unless the site is severely impacted. Collecting and transporting trees to logging ramps can injure or top kill vegetation. Dragging trees over bare ground creates soil disturbances. These effects are generally limited. However, repeated disturbance to the point that trails are established can act to accentuate damage. Forest harvesting creates approximately five acres of skid trails and ten acres of ramps per 1,000 acres of forest harvested. Both skid trails and ramps are utilized by subsequent operations. If the site is sufficiently disturbed, this may enable adventive, exotic and other low NQI plants to colonize areas.

Efforts to decrease or minimize impacts from forest management under the Proposed Action include careful planning and coordination of skid trails and ramps with the staff ecologist, limiting logging during wet periods of the year when sites are mostly susceptible to damage, maintaining thinning regimes that minimize tree densities, focusing forest management activities to those sites most suitable for tree growth and minimizing the use of mechanical site preparation for forest regeneration. Periodic thinning of pine plantations significantly reduces the negative effects of canopy cover on the ground cover vegetation and more frequent use of prescribed fire will result in reduced degradation to the native ground cover.

Rangeland Program

Impacts from grazing can occur at both the individual plant and the population/community levels:

Individual plant-level. Overgrazing by domestic cattle can potentially eliminate individual plants from specific sites. By maintaining the health of the key forage component, the health and viability of individual plants within the plant community are maintained. In general, over-grazing is minimized through grazing leases that prevent vegetation from being grazed below eight inches in height. With multiple pastures in each lease, grazing generally occurs approximately 20% or less of any given year in any one area throughout the installation. This system of limiting grazing at a specific grass height combined with long recovery periods has promoted growth and expansion of the grassland resources since its implementation in 1994. In addition the even distribution of animals, spatially and temporally, throughout pastures lessens negative impacts on individual plants. Cattle producers (lessees) are required to provide an adequate mineral/molasses feeders to properly distribute animals. Typically, heavy grazing occurs around supplemental feeders and water ponds. In the Proposed Action, flexible grazing periods that favor shorter grazing durations in individual pastures should diminish these impacts by reducing the time on site at supplemental feeding locations. Impacts are further decreased in the Proposed Action by locating feeders in already disturbed sites and away from sensitive habitats, whenever possible. APAFR staff also move feeders so that an area is impacted fewer times over a year.

Population/community level impacts. Prior to 1978 there were negative grazing impacts to the below listed grasses at APAFR:

Creeping bluestem (*Schizachyrium stoloniferum*)
Shortspike bluestem (*Andropogon brachystachyus*)
Chalky bluestem (*Andropogon glomeratus* var. *glaucopsis {capillipes*})
Lopsided indiangrass (*Sorghastrum secundum*)
Maidencane (*Panicum hemitomon*)
Little blue maidencane (*Amphicarpum muhlenbergianum*)

Since 1978, depending on the type of multiple grazing pasture strategy applied and the cooperation of the cattle lessee, there have been increases in the populations of these grasses.

Under the Proposed Action populations of select native and adventive grasses may be affected (Table 4-2). Some of these are decreaser grasses (noted with a “D”), plant species present in

undisturbed native vegetation that decline with continued disturbance, such as heavy defoliation, fire and drought (Jacoby 1989). These species should increase or at least maintain their current populations. Some of the grass species listed in Table 4-2 are increasers (noted with an "I"), plant species of the original vegetation that increase, at least for a time, under continued disturbance (Jacoby 1989). The Propsed Action assumes that these plant populations would not be negatively impacted by livestock grazing. However under the Proposed Action, in some areas, increaser grass species may decrease due to livestock grazing. Some of the grass species listed in Table 4-2 are adventive (noted with an "A"). These are plant species that were absent in undisturbed portions of the original vegetation of a specific range site and can invade or increase following disturbance or continued heavy grazing (Jacoby 1989). Adventive plants are typically introduced in shell or clay road material brought in from off site, via animal or wind transport. Alternatively, they may actually be present in the seed bed but not germinate unless the ground is disturbed. Under the Proposed Action, the grazing impact should maintain these plants at their current population levels.

The following grasses are preferentially grazed by domestic livestock up to approximately six weeks after sites have been burned. Under the Proposed Action these plants should not decrease.

Wiregrass (*Aristida beyrichiana {Aristida stricta}*)
Corkscrew three-awn (*Aristida gyrans*)
Longleaf three-awn (*Aristida palustris*)
Slim-spike three-awn (*Aristida purpurascens* var. *purpurascens*)
Slim-spike three-awn (*Aristida purpurascens* var. *tenuispica*)
Rhizomatous three-awn (*Aristida rhizomophora*)
Bottlebrush three-awn (*Aristida spiciformis*)
Toothache grass (*Ctenium aromaticum*)

Certain plants not grazed by cattle may be provided an opportunity to increase through a reduced basal area of the grazed plants. Before 1978, severe grazing pressure may have reduced these plant populations. From 1978 until present, these populations may have increased. The Proposed Action may allow the populations of the plants listed in Table 4-3 to increase or remain stable. All of the plants listed in Table 4-3 are native to south-central Florida.

Table 4-2 Native and Adventive Grass Species Affected by the Proposed Action at Avon Park Air Force Range

Classification	Common Name	Scientific Name
I	Bushy bluestem	*A.glomeratus var.glomeratus*
I	Hairy bushy bluestem	*Andropogon glomeratus var. hirsutior*
D	Big bushy bluestem	*Andropogon glomeratus var. pumilus*
	Elliott's bluestem	*Andropogon gyrans var gyrans*
	Slim bluestem	*Andropogon gyrans var. stenophyllus*
D	Long-beard bluestem	*Andropogon longiberbis*
D	Silver bluestem	*Andropogon ternarius var. cabanisii*
D	Splitbeard or silver bluestem	*Andropogon ternarius var. ternarius*
D	Tracy's bluestem	*Andropogon tracyi*
D	Little chalky bluestem	*Andropogon virginicus var. glaucus*
I	Broomsedge	*Andropogon virginicus var. virginicus*
I	Broomsedge	*Andropogon virginicus var. decipiens*
A	Tropical or flat-joint carpetgrass	*Axonopus compressus*
I	Common carpetgrass	*Axonopus fissifolius*
A	Big carpetgrass	*Axonopus furcatus*
	Pitted bluestem	*Bothriochloa pertusa*
	Wrinkled jointgrass	*Coelorachis rugosa*
I	Florida jointtail	*Coelorachis tuberculosa*
A	European bermudagrass	*Cyndodon dactylon*
I	Large barnyardgrass	*Echinochloa crusgalli*
I	Rough barnyardgrass	*Echinochola muricata*
A	India goosegrass	*Eleusine indica*
I	Pan-american balsamscale	*Elyonurus tripsacoides*
I	Thalia lovegrass	*Eragrostis atrovirens*
I	Elliott lovegrass	*Eragrostis elliottii*
I	Teal lovegrass	*Eragrostis hypnoides*
I	Coastal lovegrass	*Eragrostis virginica*
A	Centipedegrass	*Eremochloa ophiuroides*
D	Saltmarsh fingergrass	*Eustachys glauca*
D	Pinewoods fingcrgrass	*Eustachys petraca*
D	Southern cutgrass	*Leersia hexandra*
	Long-awn muhly	*Muhlenbergia capillaris*
I	Cutthroat grass	*Panicum abscissum*
D	Beaked panicum	*Panicum anceps*
I	Fall panicum	*Panicum dichotomiflorum var. dichotomiflorum*
I	Gaping panic grass	*Panicum hians*
I	Panic grass	*Panicum longifolium*
A	Guineagrass	*Panicum maximum*
A	Torpedo grass	*Panicum repens*

Table 4-2 Native and Adventive Grass Species Affected by the Proposed Action at Avon Park Air Force Range (continued).

Classification	Common Name	Scientific Name
D	Redtop panicum	*Panicum rigidulum*
I	Bluejoint panicum	*Panicum tenerum*
I	Sour paspalum	*Paspalum conjugatum*
I	Mudbank paspalum	*Paspalum dissectum*
I	Seashore paspalum	*Paspalum distichum*
D	Florida paspalum	*Paspalum floridanum*
I	Field paspalum	*Paspalum laeve*
A	Bahia grass	*Paspalum notatum var. saurae*
I	Early paspalum	*Paspalum praecox*
I	Water paspalum	*Paspalum repens*
I	Thin paspalum	*Paspalum setaceum*
A	Vaseygrass	*Paspalum urvillei*
	Sugarcane plumegrass	*Saccharum giganteum*
	India cupscale	*Sacciolepis indica*
	American cupseale	*Sacciolepis striata*
I	Knotroot foxtail	*Setaria geniculata*
I	Sand cordgrass	*Spartina bakeri*
	Pineywoods dropseed	*Sporobolus junceus*
D	Eastern gama grass	*Tripsacum dactyloides*
A	Paragrass	*Urochloa mutica*

I – Increaser – Plants that increase in relative abundance with continued disturbance.

D – Decreaser – Plants that decrease in relative amount with continued disturbance.

A – Adventive – Plants that are initially absent but will invade and increase following disturbance.

IN – Invasive - Plants that will invade disturbed areas

Table 4-3 Plant Species Population Which May Increase or Remain Stable with Implementation of the Proposed Action at Avon Park Air Force Range

Common Name	Scientific Name
Milkweed	*Asclepias cinerea*
Large-flower milkweed	*Asclepias connivens*
Florida milkweed	*Asclepias feayi*
Sandhill milkweed ;	*Asclepias humistrata*
Few-flower milkweed	*Asclepias lanceolata*
Longleaf milkweed	*Asclepias longifolia*
Savannah milkweed	*Asclepias pedicellata*
Butterfly-weed	*Asclepias tuberosa subsp. rolfsii*
Whorled milkweed	*Asclepias verticillata*
Flag pawpaw	*Asimina obovata*
Reticulate pawpaw	*Asimina reticulata*
Partridge pea	*Chamaescrista fasciculata*
Wild sensitive Plant	*Chamaecrista nictitans var. aspera*
Hairy spurge	*Charnesyce hirta*
Tropical broomspurge	*Chamaesyce hypericifolia*
Hyssop-leaf broomspurge	*Chamaesyce hyssopifolia*
Spotted broomspurge	*Chamaesyce maculata*
Matted broomspurge	*Chamaesyce serpens*
Jointed flatsedge	*Cyperus articulatus*
Poorland flatsedge	*Cyperus compressus*
Baldwin flatsedge	*Cyperus croceus*
Marshland flatsedge	*Cyperus distinctus*
Slender flatsedge	*Cyperus haspan*
Yellow flatsedge	*Cyperus flavescens*
Sheathed f1atsedge	*Cyperus haspan*
Epiphytic f1atsedge	*Cyperus 1anceolatus*
Leconte's f1atsedge	*Cyperus lecontei*
Alabama swamp flatsedge	*Cyperus ligularis*
Nash's flatsedge	*Cyperus nashii*
Rusty flatsedge	*Cyperus odoratus*
Wetland retrorse flatsedge	*Cyperus ovatus*
Texas sedge	*Cyperus polystachyos*
Low f1atsedge	*Cyperus pumilus*
Pine barren f1atsedge	*Cyperus retrorsus*
Pale marsh flatsedge	*Cyperus stenolepis*
Straw-colored flatsedge	*Cyperus strigosus*
Four-angle flatsedge	*Cyperus tetragonus*
Slender fimbry	*Fimbristylis autumnalis*
Carolina fimbry	*Fimbristylis caroliniana*
Hurricane-grass	*Fimbristylis cymosa*
Tall fimbry	*Fimbristylis dichotoma*
Ditch fimbry	*Fimbristylis schoenoides*
Marsh fimbry	*Fimbristylis spadicea*

Table 4-3 Plant Species Population Which May Increase or Remain Stable with Implementation of the Proposed Action at Avon Park Air Force Range (continued).

Common Name	Scientific Name
Coastal plain umbrella sedge	*Fuirena longa*
Dwarf unbrella-sedge	*Fuirena pumila*
Southern umbrella-sedge	*Fuirena sciropoidea*
Florida hartwrighthia .	*Hartwrightia floridana*
Pennywort	*Hydroctyle ranunculoides*
Marsh pennywort	*Hydroctyle umbellata*
Whorled pennywvort	*Hydroctyle verticillata*
Gallberry	*Ilex glabra*
Piedmont sumpweed	*Iva microcephala*
Short-leaf flatsedge	*Kyllinga brevifolia*
Fragrant flatsedge	*Kyllinga odorata*
Thin-leaf flatsedge	*Kyllinga pumila*
Flatsedge	*Kyllinga squamulata*
Bloodroot	*Lachnanthes caroliniana*
Chapman's gayfeather	*Liatris chapmanii*
Garbers's gayfeather	*Liatris garberi*
Blazing star	*Liatris gracilis*
Spiked gayfeather	*Liatris spicata*
Blazing star	*Liatris tenufolia var. quadiflora*
Gopher apple	*Licania michauxii*
Awnedhemicarpha	*Lipocarpha aristulata*
American lipcarpha	*Lipocarpha maculata*
Dwarf-bu1lrush	*Lipocarpha micrantha*
Coastal staggerbush	*Lyonia fruticosa*
Maleberry	*Lyonia ligustrina*
Fetterbush	*Lyonia lucida*
Wax myrtle	*Myrica cerifera*
Northern bayberry	*Myrica heterophylla*
Common plantain	*Plantago major*
Southern plantain	*Plantago virginica*
Dense-flower smartweed	*Polygonum densiflorum*
Hairy smartweed	*Polygonum hirsutum*
Mild or Swamp water-pepper	*Polygonum hydropiperoides*
Dotted smartweed	*Polygonum punctatum*
Rabbit tobacco	*Pterocaulon pycnostachyum*
Pale meadow-beauty	*Rhexia rnariana*
Nash's meadow-beauty	*Rhexia nashii*
Nuttall's meadow-beauty	*Rhexia nuttallii*
Cliliate meadow-beauty	*Rhexia petiolata*
Hastate-leaved Dock	*Rumex hastatulus*
Fiddle dock	*Rumex pulcher*
Grass-leaf arrowhead	*Sagittaria graminea*

Table 4-3 Plant Species Population Which May Increase or Remain Stable with Implementation of the Proposed Action at Avon Park Air Force Range (continued)

Common Name	Scientific Name
Bull-tongue arrowhead	*Sagittaria lancifolia*
Commond arrowhead	*Sagittaria latifolia*
Hooded pitcher-plant	*Sarracenia minor*
Cuban bulrush	*Scirpus cubensis*
Netted nutrush	*Scleria reticularis*
Saw greenbrier	*Smilax bona-nox*
Corkwood	*Stillingia aquatica*
Queen's delight	*Stillingia sylvatica var. sylvatica*
Marsh queen's-delight	*Stillingia sylvatica var. tenuis*
Coastal-plain yellow-eyed grass	*Xyris ambigua*
Short-leaf yellow-eyed grass	*Xyris brevifolia*
Carolina yellow-eyed grass	*Xyris caroliniana*
Florida bog yellow-eyed grass	*Xyris difformis var. floridana*
Elliott's yellow-eyed grass	*Xyris elliottii*
Fringed yellow-eyed grass	*Xyris fimbriata*
Savannah yellow-eyed grass	*Xyris flabelliformis*
Common yellow-eyed grass	*Xyris jupical*
Tall yellow-eyed grass	*Xyris platylepis*
Acid-Swamp yellow-eyed grass	*Xyris serotina*
Small's yellow-eyed grass	*Xyris smalliana*

The following plant species have specific adaptations or characteristics that allow them to increase under moderate to heavy grazing pressure. The Proposed Action assumes that if grazing was the only management activity occurring, these populations could remain the same or decrease. However, other human caused disturbances, such as timber harvesting, outdoor recreation or military mission activities may cause these populations to continue to occur on disturbed sites.

Blue hyssop (*Bacopa caroliana*)
Common begger-ticks (*Biden alba* var. *radiata*)
Spanish needles (*Bidens bipinnata*)
Bur-marigold smooth beggar-ticks (*Biden laevis*)
Yellow or horrid thistle (*Cirsium horridulum*)
Nattali's thistle (*Cirsium nuttalii*)
Tread softly, stinging nettle (*Cnidoscolus stimulosus*)

Poor Joe (*Diodia teres*)
Virginia buttonweed (*Diodia virginiana*)
Baldwin's spikerush (*Eleocharis baldwinii*)
Soft or lamp rush (*Juncus effusus* subsp. *solutus*)
Moonflower tropical morning-glory (*Ipomea alba*)
Spanish daisy (*Helenium amarum*)
Camphor-weed (*Heterotheca subaxillaris*)
Common frog-fruit (*Phyla nodiflora*)
Broomweed, Common wireweed (*Sida cordifolia*)
Pantropic fanpetal (*Sida cordifolia*)
Indian hemp (*Sida rhombifolia*)

Plants listed below are native invaders. Under the Proposed Action, these species will continue to persist in disturbed sites such as on dredge spoil area near the Kissimmee River and along some roads. They may also appear on disturbed soils around cattle feeders. However, mitigation measures as noted in the Proposed Action should minimize or eliminate these invasions.

Ragweed (*Ambrosia artemisiifolia*)
Groundsel (*Baccharis glomeruliflora*)
Groundsel false willow (*Baccharis halimifolia*)
Small dog-fennel (*Eupatorium capillifolium*)
Dangle-pod (*Sesbania emerus*)
Bladderpod (*Sesbania vesicaria*)
Small-fruit seedbox (*Ludwigia microcarpa*)
Serrate-leaf blackberry (*Rubus argutus*)
Sand blackberry (*Rubus cuneifolius*)
American nightshade (*Solanum americanum*)
Soda-apple (*Solanum capsicoides*)
Black or divine nightshade (*Solanum nigrescens*)
Coast sandspur (*Cenchrus incertus*)

Three plants — tropical soda apple (*Solanum viarum*), cogon grass (*Imperata cylindrica*), and smut grass (*Sporobolus indicus*) — are highly invasive and adventive and will be actively controlled with herbicide to reduce population numbers. Under the Proposed Action, biological controls that have received approval from the FDA will be considered as a possible management tool.

Landscape Level Grazing Impacts on Vegetation. Livestock grazing at APAFR impacts vegetation on a landscape level. The major landscape level impacts are created by fencelines that fragment the landscape and their maintenance.

Although no new fences are proposed there are some 244 miles of fencelines used to reduce the impact of herbivory on the native forage. Fencelines and associated firebreaks fragment the landscape by creating breaks that do not always conform with the natural mosaic of plant communities. “Edge effects,” strips of overgrown woody vegetation (pine regeneration, palmettos and various shrubs), develop because fires either do not burn next to the fences, or burn too cool to suppress woody growth. Furthermore, the dissection of the property into pastures can dictate whether or not to burn a particular pasture so as to prevent overgrazing of burned portions within any given pasture in a lease unit. This can influence when a certain pasture within a lease unit is burned in relationship to other pastures within the same lease unit that are proposed for burning during that year. Fencelines and the firebreaks that protect them can potentially become disturbance avenues for establishment of weedy and in some cases exotic plants. Overgrown fencelines, as well as those cleared of woody vegetation by scraping or root-raking, fragment the natural vegetation mosaic and disrupt landscape-level ecological processes.

Livestock can act as vectors for adventive, exotic and other low natural quality plants. Plant seeds may be dispersed at a landscape level by dung deposition, hide attachment and outside feed sources such as hay. To reduce the potential for an exotic to invade APAFR, all cattle are quarantined for 21 days in tame pastures adjacent to the cattle lease cow pens. Because of the quarantine, exotic introductions should be contained and controlled to the area within the cow pens. Dispersal potential is also limited by the size of the grazing area. Currently there are nine grazing leases which range in size from 630 to 23,278 acres. With the possible exception of tropical soda apple (*Solanum viarum*), there currently is not any evidence that seed dispersal of native plants by cattle has had an overall negative consequence on the APAFR ecosystem. However in the last 5 years, there has been an increase in the number of sites where cogon grass (*Imperata cylindrica*) has been found. This exotic is grazed by livestock and may have been

historically kept somewhat in check by heavy grazing which is no longer allowed on the installation.

The removal of forage biomass by grazing animals may also affect fire behavior by reducing the intensity of fire in some plant communities and thereby favoring shrubby growth over herbaceous vegetation.

The results of vegetation monitoring of the effect of livestock grazing at APAFR on dry prairie vegetation (Bridges 2000b) are inconclusive to date because they are based upon a single sampling event. This long-term study is on-going with preliminary results expected in a few years following more sampling and a longer exclosure time frame.

Native Seed Harvest Program

Under the Proposed Action native seed harvesting would continue and the demand for native seed is expected to continue to increase in the future. Quantitative vegetation sampling to monitor the effects of seed harvesting on the species composition of non-forested pine flatwoods and wet prairies at APAFR began in 1998. Preliminary results indicate that seed harvesting has little effect on species diversity, with perhaps a slight increase in native species diversity due to removal of some of the dominant grasses and saw-palmetto (*Serenoa repens*) biomass. However, the attribution of effects is compounded by the severe drought of 2000-2001, which quantitative vegetation sampling at APAFR has documented as reducing cover of dominant grasses in long-term monitoring plots not subject to seed harvest. On wetter soil sites, the compaction of soil by harvesting equipment seems to have a more direct effect than removal of biomass and seed. While mesic pine savanna-flatwoods seem minimally affected by the equipment, in the wetter plots of wet prairies, vehicle tracks can remain for 2-4 years and result in a decrease in perennial grass cover. On-going vegetation monitoring should further quantify any vegetation impacts from native seed harvesting. Under the Proposed Action, efforts to minimize any undesirable impacts to the vegetation include limiting potential harvest sites to drier sites, leaving ample unharvested biomass intact at harvested sites, harvesting during dry conditions, and oversight of the harvesting operations by APAFR staff.

Outdoor Recreation Program

Outdoor recreation vehicle use has the potential to affect vegetation. The clay or shell used to stabilize road surfaces directly alters the local soil chemistry and favors establishment of off-site plant species which may in turn encroach into nearby intact natural vegetation. Driving on unimproved roads during times of soil saturation can disturb or remove protective vegetative cover. Under the Proposed Action, these effects should be lessened by taking some preventative measures. Drainage improvements (installing culverts) and closure of some roads to recreationlists during times of high water should reduce impacts.

Off-road driving has the greatest potential to impact natural areas and sensitive plant communities. A variety of users, including but not limited to recreationalists, AF staff, contractors, loggers and cattlemen, require periodic off-road access. To avoid getting stuck, users often drive around the outer edges and sensitive ecotone margins of depression ponds and wetlands causing rutting and compaction of soil and disturbing adjacent plant communities. Repeated use of off-road routes can result in the development of new trails. The most sensitive vegetation areas to off-road vehicles are seepage slopes, wet prairies and wet pinelands. Ironically, these are also some of the most species-rich plant communities at APAFR. To lessen the impact of off-road driving on plant communities, driving is restricted to designated roads and trails for recreationalists year-round, except for quail hunters during small game season (January—February).

Recreational improvements, such as campgrounds, picnic areas and hiking trails, affect vegetation, primarily through surface trampling and soil compaction. These facilities impact approximately 100 acres on APAFR, but do not impact sensitive vegetative resources.

Wildlife management projects can also impact vegetation resources. This is primarily through management of game, non-game and endangered species populations or through various habitat manipulations for wildlife.

Failure to control or reduce population levels of feral hogs has had a profound impact on the natural areas and vegetative communities at APAFR. Feral hogs were introduced by early explorers and settlers and have since become serious ecological pests. Rooting and feeding activities of feral hogs continues unabated throughout APAFR. Feral hog rooting has altered the species composition and structure of nearly all the types of plant communities found on APAFR. Vegetation is often killed directly from uprooting of plants.

Hog rooting at APAFR is especially prevalent in hammocks, seepage slopes, wet prairies and wet pinelands. Native ground cover of prairies, seepage slopes and pinelands dominated by long-lived perennial grasses is often replaced with a patchwork of sparse annual weedy plants and barren or denuded areas, with areas perennial grasses reduced to scattered clumps. These rooted sites have a reduced fine fuel load of perennial grasses and tend to carry fire poorly. Ultimately, this reduced fire carrying capacity may result in changes to the overall structure and physiognomy of the vegetation.

Populations of proposed, endangered, threatened, and sensitive species (PETS) and sensitive plants are also being adversely impacted by feral hog rooting. Monitoring within the last five years shows marked declines of some localized populations of orchids. In particular, one species of orchid is threatened with extirpation from APAFR due primarily to hog rooting. Long-term monitoring of permanent vegetation plots will aid in determining the impact of feral hog rooting on various plant communities. Under the proposed action, additional management of the feral hog population is proposed as well as measures to hog proof certain sensitive vegetation areas.

Endangered Species Management

Management activities for the three federally listed birds (RCW, FGS, and FSJ) have potential to cause positive and negative impacts to the native vegetation. Negative impacts are mostly associated with the methods used to improve habitat. Furthermore, habitat conversions (e.g., conversions from natural sand pine forests to oak scrub) are not recommended under the Proposed Action and thereby greatly reduce landscape level vegetation impacts.

Under the Proposed Action, management actions (no roller chopping) within the FGS HMU areas will also afford protection to the native vegetation. The creation of treeless corridors of prairie habitat > 250 meters wide between occupied locations of FGS should positively impact the ground cover prairie vegetation.

FSJ habitat management will have both positive and negative effects on the natural vegetation. The use of prescribed burning to maintain optimal habitat should benefit the native xeric grasses and forbs. However, mechanical control of woody vegetation, especially that of oaks, has the potential to alter the composition and structure of some oak-dominated scrubs. In habitat that has been invaded by off-site oak their removal should benefit restoration of the original scrub vegetation. Timber operations to thin overstory trees in FSJ habitat has the potential to cause soil disturbance (e.g., rutting and compaction) in otherwise intact vegetation and may affect the ground cover vegetation in various ways depending upon the type of disturbance. Under the Proposed Action, limiting the number and size of pines to those greater than 20' in height not exceed 10 trees per acre should favor more natural pine stands. Where FSJ occur in isolated xeric communities, maintaining open corridors in the pine flatwoods at least 109 yards wide between FSJ scrub patches with no more than 30 trees per acre should positively affect the ground cover vegetation. The elimination of some 50 acres of pine plantation in the southwestern portion of the base for FSJ habitat will enhance any vegetation restoration efforts. Many of the sites proposed for FSJ habitat improvement using timber operations and mechanical measures also harbor PETS and as such are subject to habitat alteration. In general FSJ habitat improvement benefits PETS plants but the means to accomplish the habitat improvement may in some cases negatively impact PETS.

Under the Proposed Action, management for RCW is generally positive on the natural vegetation. Areas of overgrown sandhill habitat, such as that east and west of Frostproof Road and north of Degagne Grade and that east of Billig Grade and west of Bravo Range, have been identified for logging treatments to benefit FSJ. Sand pine and overgrown scrub oaks will be removed in these areas to benefit RCW. If these logging treatments are carefully executed they should also benefit PETS plants.

Burning RCW and potential RCW habitat every two to three years to maintain a low density of hardwoods in the mid- and overstory should also benefit ground cover vegetation (see burn program section). Within RCW clusters and recruitment stands, no rotation age for longleaf will be established and old-growth pine stands will be promoted. Limiting timber harvesting, native seed harvesting, and other habitat management activities, except for prescribed burning, within active clusters during the nesting season should promote diversity and aid in maintenance of the native vegetation.

Under the Proposed Action, some 400 acres of North Florida slash pine plantations will be clearcut within the planning period and replanted to longleaf pine for RCW. When replanted in longleaf pine, the pine will be managed under an uneven-aged silviculture system. Both of these activities should allow for restoration of the pine flatwoods ecosystem. Natural stands that have low or no stocking will not be replanted but allow natural regeneration using selected management practices thereby reducing the use of potentially harmful site preparation techniques.

Alternative A

As discussed above, the management of natural resources can cause unnatural disturbances to the environment. The degree and extent of the impacts can be controlled to some extent by using the proper management strategies and techniques. However, historically, management programs considered economics over ecosystem health. As a result, impacts to vegetation resulting from implementation of the no-action alternative would be similar to the Proposed Action with the exception that all actions would be controlled by economic concerns with little or no regard to management strategies or techniques to reduce impacts. Endangered species management would continue as directed by federal law. The native seed harvest program would continue, although the current management plan contains no direction on how and where seed should be harvested.

Alternative B

The focus of Alternative B is to restore the native plant communities as close as possible to the pre-settlement landscape. In most areas, with the exception of the Military Impact Areas, there would be little to no evidence of human influences on the landscape. Natural areas, PETS and native plant communities would show substantial improvements if this alternative was implemented.

There would not be any cattle grazing. Therefore, all the direct effects of grazing would be eliminated. Indirect effects of grazing would be eliminated when interior fences were removed and roads closed. Some 67.6 miles of interior fenceline would be removed allowing for rehabilitation and eventual restoration of landscape-level ecological proceses to larger parcels than is currently attainable. About 79.7 miles out of the total 246.1 current miles of roads would be closed. Once closed, these roads would need to be restored and re-vegetated to reduce direct impacts to vegetation (disrupting hydrology, changing soil chemistry, etc.) and the indirect impacts from fragmentation. Without a grazing program, fires might occur more frequently and might burn hotter (due to more fine fuels on ground), thereby benefiting the natural vegetation.

All firebreaks and disklines would be removed except those needed specifically for the prescribed fire program. A total of 1,433.9 miles of firelines out of the current 1,799.1 miles would be removed, leaving 365.2 miles of firelines. Removal of firelines would allow fire to spread un-impeded across larger parcels of land thereby restoring landscape level processes to the ecosystem. The acreage burned each year would be greater than 20,000 – 35,000 acres/year currently achieved. With a shorter fire interval the shrub and pine regeneration would be reduced, thereby more closely mimicking a natural fire regime. Natural areas would benefit from this more natural fire regime. Edge effect would be reduced and all the pine plantations would be clearcut and their associated impacts would gradually disappear as part of restoration efforts.

Under Alternative B, habitat for PETS plants would be improved and the number of acres of habitat may increase. However, feral hog populations might be expected to increase to due

reduced access for hunters. Efforts to control feral hog populations would have to be aggressively pursued to prevent damage to natural vegetation.

Eventually, pine plantations would all be clearcut. Although this would take a number of years, plantations would be allowed to regenerate naturally or re-planted with native longleaf or south Florida slash pine using only hand-planting after cutting. All North Florida slash pine and North Florida slash pine regeneration would be eliminated, thereby reducing the acreage impacted by this off-site tree. Thinning, shelterwood and single-tree selection would be permitted. Therefore, more acreage would be restored to its original state with longleaf pine. APAFR would move toward more uneven-aged stands of natural pines stands maintained by the random hotter wildfires and more frequent growing-season burns. Overall, the forested condition would return to more of a pine savanna-flatwoods landscape characteristic of the pre-settlement pine densities.

Scrubby flatwoods and oak scrub would be maintained at a lower stature due to more frequent and hotter fires. Fire frequency in the scrubby flatwoods would be increased to maintain FSJ habitat and thereby benefit the xeric fire-adapted plants. Fire would occur more often in cutthroat seeps than the pine flatwoods.

No use of fertilizer or herbicides would be permitted on APAFR with possible exceptions for controlling invasive exotic plants. Over time, there should be fewer exotic species due to less ground-disturbing activities. However, those invasive exotics which are adapted to non-disturbance areas, such as climbing ferns (*Lygodium* spp.), would still be a problem, but not more than in any other alternative.

Public recreation vehicle access would be limited by a lack of roads; however, hunters could continue to travel on foot on closed roads.

Under Alternative B, the land at APAFR would potentially be increasingly valued by the public. As the population of Florida increases and development occurs on private lands, the value of public lands will likely increase. Land with intact ecosystems will especially increase in value to

the public because there will be fewer and fewer examples of "natural" Florida communities remaining.

4.3.3 Timber

Proposed Action

Natural forested areas would move towards a diverse uneven-aged stand structure. These natural pine stands would have no set rotation age and would be thinned or harvested by individual or group selection. Harvesting would be done manually by chainsaws and mechanically by feller-bunchers and skidders. Logs would be transported by semitruck. The small openings created by individual or group selection would mimic natural disturbances or tree mortality and create a patchy mosaic of forest cover. Pine density in these natural stands would be highly variable. Over time, uneven-aged management would permit trees to reach maturity and provide a supply of high quality plylogs and sawtimber. A strategy would be developed for approximately 7,000 acres of former pine plantations that are not planned to be replanted as plantations.

Pine plantations would continue to be managed for fiber production following BMPs and guidelines to minimize impacts. Approximately 14,000 acres of existing pine plantations would continue to be managed as even-aged stands. Primary forest products offered for sale would be pulpwood, posts and pole-size timber. Harvesting methods would be the same as in natural pine stands but with higher intensity. Plantations would be replanted mechanically with seedlings. Site preparation may include roller chopping.

Revenue generated would be used to support the Forest Management Program and related environmental program expenses. This alternative would maintain the level of revenue-generating timber harvest that has occurred over the past two to three decades. Pine plantations in artificially-shaped blocks will continue to fragment the habitat for some species of wildlife, birds and amphibians, but pine plantations, especially young ones, provide early successional habitats that many species utilize (Wear and Greis 2001). The current system of roads provides

permanent access to all pine plantations and natural stands and would not require the construction of temporary roads for logging or skidding.

Alternative A

This alternative is similar to the Proposed Action. Natural forested areas would move towards a diverse uneven-age stand structure as described in the Proposed Action. Thinning and harvesting of these natural stands by individual or group selection would occur, and would mimic natural disturbances or tree mortality and create a patchy mosaic of forest cover. Harvesting methods and equipment would be the same as those mentioned under the Proposed Action. Pine density in these natural stands would be highly variable. Over time, uneven-aged management would permit trees to reach maturity and provide a supply of high quality plylogs and sawtimber.

Approximately 14,000 acres of pine plantations would continue to be managed for fiber production as described in the Proposed Action, using similar harvesting methods and equipment as in the Proposed Action. Forest products offered for sale would continue to be pulpwood, posts and pole-size timber. Approximatley 7,000 acres of former pine plantations are not planned to be replanted as pine plantations and would be taken out of commercial forest production; this alternative has no land use allocation for what to do with these acres.

Alternative B

Natural forested areas would move towards a diverse uneven-aged stand structure. Overtime, the entire forested area of APAFR would be natural pine, mixed pine, and pine/hardwood stands, and would reflect the historic landscape. The forest would be less fragmented and function as a large contiguous block of public forested land. For some area-sensitive wildlife species such as the Florida black bear, these large blocks of forested land act as refuges from the fragmented urbanized and agricultural areas (Wear and Gries 2001). The removal of some roads, disklines and fencelines would reduce the fragmentation even more. However, these roads, disklines and fencelines also act as barriers to wildfire and prescribed fire. Without them, wildfires and prescribed fires have the potential to cover larger areas and become hotter. This may mimic the

natural fire regime but will lead to greater pine mortality in natural stands. Larger, growing season burns would return the structure of the understory to an open, park-like landscape with a predominance of grasses and herbs (Robbins and Myers 1992). Woody shrubs and oak hammocks would occur but be held in check by the hot, growing season fires. Fire-intolerant wetland species such as titi would disappear from the drier areas where they have encroached because fires have been suppressed in the past.

Pine plantations would be clearcut and converted to natural timber stands or left as open prairie or unforested flatwoods. Timber stocking would be less due to more intensive fires in these areas. A reduction in roads under this alternative would mean that more temporary roads would be needed in the future to access natural stands for thinning and harvesting and would increase the cost of harvesting. Harvesting and thinning methods and equipment would be the same as with the Proposed Action; however, the intensity would be less, and there would be no replanting as a pine plantation. Some replanting may be done but the effect would be to mimic natural stands and seedlings would be planted in curves or circles to avoid the “row” effect of a plantation. Initially, income from forest products would be greater during the first two decades as pine plantations are harvested. After the pine plantations have been removed, revenue from forest products would be much less. Program expenses, personnel salaries, and other program expenses would have to be supported by appropriated funds. As timber revenues decline, environmental program funds would become limited and program managers would have to cope with declining budgets. Acquiring full-time staff positions would be more difficult, and some current positions could be unfunded, terminated or converted to temporary positions. In the long run, revenue from forest products would rise again as more mature trees grow throughout the installation, producing high quality sawtimber.

4.3.4 Wildlife and Fish

Proposed Action

This action is consistent with the mission of APAFR wildlife management program which is to manage wildlife and wildlife habitat based on the concept that production of wildlife does not

conflict with the military mission. This alternative supports the management of wildlife and the habitat on which they depend by managing each ecosystem for its specific communities and habitats.

Throughout the state of Florida, urban and agricultural land uses dissect the landscape and result in loss of habitat and fragmentation of habitat. This fragmentation has created "islands" of forests and natural communities, surrounded by cities, housing developments, citrus groves and transportation corridors. Wildlife species vary in their ability to adapt or utilize these altered habitats. Some species benefit from the creation of the "edge effect" that separates these altered habitats from forested or undeveloped habitats; other species are harmed through loss of habitat and the isolation caused by this fragmentation of large areas of habitat into smaller ones (Graham 2001). In general, wildlife species that can tolerate or adapt to these altered habitats are not the rare or endangered species of concern. Habitat generalists such as mice, squirrels, chipmunks, shrews, bats, turtles, frogs, raccoons, opossum, foxes and coyotes can utilize a mosaic of habitats. However, even within these species there are some species that specialize in a particular habitat. For example, the gopher frog (*Rana areolata*) prefers to use the burrows of the gopher tortoise. Larger mammals such as predators require larger, undisturbed and less fragmented habitats. Fragmentation results in increased acreage of edge habitat, long regarded as having a positive effect on wildlife because studies indicate that the number of species generally increases near edge habitats (Graham 2001). However, this benefit can be offset under highly fragmented conditions by the loss of habitat for a number of rare species.

APAFR is fortunate to have landscapes where the impact of human use is much less than in other parts of Florida; it is noted as an existing conservation area for many species of concern (Cox et al. 1994). However, a network of roads exists that fragments the landscape. This network consists of paved roads, improved roads, and unimproved roads and tank trails. Roads fragment an area by changing the landscape structure, decreasing the interior area of habitats, creating edge, dissecting forest patches, and modifying animal behavior and dispersal (Gucinski et al. 2000). Road-avoidance behavior is common among larger mammals, and to smaller mammals and amphibians roads represent barriers that cannot be crossed. Reptiles and amphibians,

because they tend to be habitat specialists, generally avoid the exposure of crossing such open areas, and even some small and medium size mammals do not cross open areas such as power lines and unimproved roads because of dense matted grass (Graham 2001). Studies indicate the effect of roads extend up to 330' into habitat areas next to roads. This alternative maintains the network of roads currently existing at APAFR, and recommends the closure of a small number of miles of roads, mainly to restore hydrologic processes and protect the watershed. These roads will continue to fragment the landscape. However, because APAFR receives far less influence from human use than the landscapes in the rest of the region, impacts to wildlife species from roads and human uses is far less than surrounding lands, and these impacts do not represent impacts to the populations of these species.

Alternative A

As in the Proposed Action, the impacts of this alternative would not have significant impacts on wildlife species, especially those that are habitat generalists and are not area-sensitive. In this alternative, the current network of roads remains and all roads remain open. This may result in a greater effect than the propsed action, since some roads are not recommended for closure. Those roads, specifically Durden Grade and Echo Springs Road, would remain open and continue to impact the hydrology, vegetation and habitat of their immediate area. Wildlife, especially reptiles, amphibians and songbirds, that use the area would continue to experience loss of habitat and effects from those roads, extending up to 330' into the habitat. These effects are not likely to cause a reduction in the population of these species. For the rest of the area, the effects of the road system on wildlife habitat would be similar to those of the Proposed Action.

Alternative B

Generally, overall wildlife values would improve with the implementation of this alternative. Fewer roads, less improved pastures, and fewer pine plantations would be beneficial to habitat diversity and wildlife diversity. Habitats, both forested and open, would be less fragmented and wildlife species would be able to forage, disperse, and exchange genetic material with other individuals of their species over a wider area. Fewer roads would result in less traffic that would

reduce traffic/wildlife encounters, and less areal extent of habitat affected by the influence of roads. Roads substantially hinder movement of amphibians (Graham 2001). Because the south is a center of amphibian biodiversity for the United States (Trani 2001), the reduction in roads and firelines in this alternative would benefit amphibian species and contribute to their conservation in the south. Road-avoidance behavior in larger mammals would be less than in the other two alternatives. Pastures would be allowed to revert to the natural vegetation types that would provide cover for a variety of species. Pine plantations would be phased out and the natural habitat types would return to provide cover for nesting, resting and feeding.

Wildlife species native to the ecosystems of APAFR would benefit from the restoration of pine plantations to native forest species. Pine plantations are used by a variety of wildlife species that are habitat generalists. Restoration of these pine plantations to native forest species would not affect these wildlife species because, as generalists, they are able to use a variety of habitats. Overall, the reduction in the amount of roads, fences and firelines would be of more benefit to these species than a reduction in the amount of pine plantations.

For area-sensitive species that need large areas of interior forested land or undisturbed habitat, this alternative would be beneficial.

4.3.5 Endangered Species

Protection of endangered species is given priority over other commodity production management activities. Management of T&E species at APAFR is focused on RCW, FSJ, and FGS. Monitoring of these species has been contracted to Archbold Biological Station, Lake Placid, Florida. Habitat management methods include prescribed fire and mechanical brush removal with feller-bunchers, shredder implements, and roller-choppers. Management practices for these species include annual population surveys, habitat enhancement projects and habitat maintenance through mid-story removal, prescribed fire, and control of invasive exotics. Management practices can have detrimental effects on wildlife species, and mitigation measures are designed to minimize these effects. For example, prescribed burning could result in the loss of a cavity

tree to fire; mitigation measures would include raking around the tree before setting the burn, and ensuring that burn parameters (e.g., flame height, direction of burn) are designed to reduce this possibility. Prescribed fire also has the potential to burn up the nests of some species. This sometimes may result in the loss of individuals or a reduction in habitat quality, but would not necessarily reduce the population or impact the ability of the Range to support those species.

Proposed Action

Red-cockaded woodpecker

The habitat and management would change very little with the implementation of this alternative. Over time this adaptive ecosystem management alternative would improve the habitat for RCW recovery, but the population may continue to be insecure (Cox et al. 1994). As selected, managed slash pine is replaced with patch size longleaf and prescribed burning is implemented on a frequent, 18 month interval (when possible), regular pattern RCW habitat will continue to develop. Under this alternative, pine plantations continue to exist, reducing the former extent of RCW habitat. This alternative would benefit the RCW and even improve the amount and quality of habitat, but the population would still be limited by quality habitat being taken up in pine plantations.

Florida scrub-jay

APAFR is one of five conservation areas with sufficient habitat to maintain populations of the FSJ (Cox et al. 1994). FSJ is an extreme habitat specialist, utilizing only xeric scrub and scrubby flatwoods communities (US Air Force 2000). APAFR contains approximately 18,584 acres of FSJ habitat in the FSJ HMU, representing 17.5% of the land base of APAFR, enough to support 168 FSJ groups. The July 2000 census showed only 47 FSJ groups at APAFR, indicating a need to actively create and maintain FSJ habitat. This alternative would have little effect or initiate little change to the current habitat and management techniques currently implemented at APAFR. With this alternative in place, APAFR would continue to manage habitat and monitor the results. Restoring and maintaining native ecosystems will benefit FSJ habitat. Selected managed pine stands, natural regeneration adjacent to managed pine stands, and overgrown scrub resistant to fire will be removed by mechanical treatment, using equipment such a hydro-axe.

Overall, this alternative will benefit APAFR in attaining the recovery goals for FSJ. As with all alternatives, military training can cause direct mortality to some individuals and destroy nests and foraging habitat. APAFR has consulted with the USFWS to permit some level of take due to military activities.

Florida grasshopper sparrow

Overall, bird species that are dependent on open habitats like prairies, savannahs and grasslands are declining in the eastern and southern United States. A study of the FGS in 1994 showed only nine sites in Florida (Cox et al. 1994), but the current status of FSG throughout its range is not accurately known. Only six FGS sites are definitely known. Because of the limited options available to this species, providing adequate habitat is a priority concern. Habitat loss and fragmentation of high-quality prairie habitat continues to be a concern for managing this species (Bridges and Reese 1999). Pine species are slowly encroaching on many open areas of APAFR. Under the Proposed Action, pine regeneration would be removed from open habitats, ponds and sloughs and this may contribute to providing better quality habitat for the FGS.

This alternative contains specific standards for enhancing and maintaining FGS habitat and would have a positive effect on the species. The focus of managing landscape associations on a landscape-level scale would benefit the FGS. Since this alternative emphasizes adaptive ecosystem management and most of the FGS habitat is located within the active military activity area, impacts to FGS resulting from this alternative would be beneficial. The Proposed Action includes standards to create corridors of at least 250’ width between known locations of FGS. These corridors can act as travel lanes for some species and connect otherwise isolated habitats (Graham 2001). In this regard, the Proposed Action would enhance FSG habitat. On the other hand, studies have documented that roads and linear corridors such as power lines can affect an area extending up to 330’ or more into adjoining habitats (Graham 2001).

The continued presence of fencelines and a powerline, however, provide perches for predators such as hawks and other raptors and lessens the value of surrounding habitat for FGS. Under this

alternative, no interior fences are planned for removal and these would continue to lessen the value of adjoining grassland habitat for the FGS.

Alternative A

Red-cockaded woodpecker

The effects of this alternative would be similar to the Proposed Action. The current plan does not incorporate specific standards for RCW management, and thus may offer a less formalized protection than the Proposed Action though the ESP provides protection. The existence of pine plantations would continue to limit the extent of RCW habitat. This alternative will benefit the RCW and even improve the amount and quality of habitat, but the population would still be limited by quality habitat being taken up in pine plantations.

Florida scrub-jay

The current plan does not contain specific standards for the protection of the FSJ and habitat augmentation. However, the ESP provides direction of the protection of FGS, RCW and FSJ. Incorporating these protection measures into the INRMP, as done in the Proposed Action, would provide a higher level of protection by institutionalizing them in DoD direction.

Florida grasshopper sparrow

Impacts of this alternative would have similar effects as the propsed action. The current plan does not contain specific standards for the protection of the FGS; instead, the ESP provides direction of the protection of FGS, RCW and FSJ. Incorporating these protection measures into the INRMP, as done in the Proposed Action, would provide a higher level of protection by institutionalizing them in DoD direction. In addition, the current plan contains no direction to address the encroachment of pine species into open areas. Because of this lack of standards in the current plan, Alternative A may offer less protection to the FGS than the Proposed Action and provide lower-quality habitat as pine regeneration continues unchecked. The ESP, however, provides this alternate protection and no adverse impacts to the FGS would be expected. As in the Proposed Action, many interior fences, as well as a powerline, exist near FGS habitat and may contribute to predation on FGS. Studies have documented that roads and linear corridors

such as power lines can affect an area extending up to 330’ or more into adjoining habitats (Graham 2001).

Alternative B

Red-cockaded woodpecker

This alternative would manage forest areas under an uneven-aged system. Native longleaf and slash pine would be restored to their former sites. This type of forest management would be beneficial to RCW habitat. The change from plantations to natural uneven-aged management would provide suitable forage and increase the total amount and quality of habitat available to the RCW. While pine plantations do provide a degree of forage habitat; foraging watches conducted at APAFR indicated that RCWs used native pine stands 70% of the time, even when pine plantations comprised a majority of the available foraging habitat. Also, existing sand pine and north Florida slash, which has spread from existing plantations would be removed and allowed to naturally re-vegetate in long leaf pine.

Florida scrub jay

This alternative would benefit FSJ habitat by increasing habitat suitable for the recovery of the FSJ. Pine plantations would eventually be restored to their former native communities. Some pine plantations presently restrict travel corridors allowing the birds to establish interaction between territories. Some areas would still require human manipulation of the environment to keep an adequate number of acres available to enhance recovery of the species.

Florida grasshopper sparrow

This alternative could benefit the recovery of the FGS. Fencerows in grassland habitats can increase predators by offering perching sites, thereby reducing the value of the habitat to the FGS (Graham 2001). Fences used for predatory perches may be a limiting factor to FGS recovery. The reduction in interior fences proposed by this alternative would be beneficial to the FGS. Removal of pine plantations would potentially benefit the FGS by returning some land to unforested status and provide more open areas.

4.3.6 Other Species of Concern

Besides the three focal bird species covered in the ESP, a number of other species of management concern are found at APAFR. These species are listed in Appendix E. In general, the habitat needs of many of these species are met through managing for the three focal bird species. In addition, the goal of managing ecosystems to allow ecological processes to maintain the natural landscape will benefit most of these species. As mentioned previously, management practices can impact wildlife species, and mitigation measures will be taken to minimize those impacts. Much information has been collected about the species at APAFR, and information gleaned from past studies is used to manage for a variety of rare species and minimize potential impacts.

Bald Eagle: Federal status - threatened.
Two active nests are known at APAFR. Approximately two young are produced per year. Monitoring of bald eagle populations and nests is conducted in-house by APAFR staff.

Crested Caracara: Federal status - threatened.
Generally found along the spoil banks associated with the Kissimmee River. The population at APAFR is estimated at less than ten individuals. A study of crested caracara foraging ecology, habitat use, and reproductive biology took place at APAFR from 1993-1996.

Wood Stork: Federal status – endangered.
There are no known nesting sites at APAFR, but wood storks are seen scattered throughout the installation, generally near drying ponds and roadside ditches.

Florida Sandhill Crane: State status – threatened.
APAFR has both resident and migrant populations.

Shermans fox squirrel: State status – species of special concern.
Prime habitat for the fox squirrel is longleaf pine-turkey oak forests with open understory. They can move easily between isolated longleaf pine habitats as long as those habitats are not too

isolated, and can utilize intermediate habitats to some extent. The status of the Shermans fox squirrel at APAFR was investigated from 1996-98 through a contract study with the University of Florida.

Florida Mouse: State status – species of special concern.

The Florida mouse is common in the scrub and sandhill habitats that are slowly being lost in Florida.

Gopher Tortoise: State status– species of special concern.

Relatively common throughout the installation, the gopher tortoise is of concern because over 300 other species use gopher tortoise burrows. Some of these other species, such as scarab beetles, are obligate commensals, requiring the burrows of gopher tortoises.

Indigo Snake: Federal status – threatened.

The indigo snake can be found throughout the installation. The home range of an indigo snake can extend up to a square mile, so indigo snakes are particularly affected by roads that fragment their habitat and may be susceptible to increased mortality from roadkill because they range so widely.

Gopher Frog: State status – species of special concern.

The gopher frog is relatively common in ephemeral ponds throughout the scrub sites, and is a commensal of the gopher tortoise.

Proposed Action

The ecosystem management approach of this alternative should benefit most of the wildlife species at APAFR. By allowing ecological processes to maintain the landscape, habitat integrity and ecosystem health would be improved and would benefit those species of special concern. Several of the goals, objectives, and standards included in this alternative focus on restoring ecological processes where practical, restoring hydrology that has been altered, protecting

wetlands and protecting, restoring and maintaining populations of native plant and wildlife species.

HMUs are set to provide habitat for the three focal endangered bird species, and the habitat needs of these species benefit many of the other species of concern. Under this alternative, some areas of APAFR are allocated to Management Areas with goals related to protecting natural areas and public education/interpretation, such as the Blue Jordan Swamp and Sandy Point Wildlife Refuge, instead of multiple use. Wetlands, such as the Arbuckle Marsh, Kissimmee River valley and Lake Arbuckle lakeshore swamp, are allocated to Management Areas with emphasis on preserving natural communities, restoring native species and providing conditions for the recovery of listed species that require wetland habitats. These allocations may offer a higher degree of protection for some of these species of concern, and provide better quality habitat, than the current situation through standards that improve soil and water quality, restore native species and control invasive exotic species.

In this alternative, the road system as it currently exists would continue in the future, with the exception of 3.8 miles of road. This alternative includes specific standards to close some sections of Durden Grade and Echo Springs Road, and this could reduce sedimentation and erosion, improve water quality and restore hydrological processes. The existence of a network of roads would continue to effect the hydrology, fragmentation and commitment of some acreage to roads instead of quality habitat.

Managing all natural pine stands under an uneven-aged silvicultural system may provide more habitat for those species that use the longleaf pine-turkey oak habitat, longleaf pine-wiregrass habitat, longleaf pine-cutthroat grass habitat and scrub habitat. This alternative also includes a standard to minimize ground disturbing activities in those areas identified in the FNAI, which would benefit several species of concern by keeping ground cover intact, promoting the biodiversity of the understory.

Alternative A

The current INRMP does not identify areas of critical habitat or delineate HMUs; instead, this is accomplished by a separate ESP. The ESP has the force of an interagency agreement and governs how the three endangered bird species are managed, and how they will continue to be managed. However, because these agreements are not formalized in the INRMP through goals, objectives and standards, this alternative may offer slightly less protection to other species of concern than the Proposed Action offers.

As with the Proposed Action, this alternative is not expected to have significant impacts on these other species of concern. In this alternative, the current network of roads remains and all roads remain open. This will continue to fragment habitats for some species such as the fox squirrel and indigo snake. These effects are not likely to cause a reduction in the population of these species.

Alternative B

In general, other wildlife species of concern may benefit more under this alternative than in the Proposed Action and Alternative A. Fewer roads, less improved pastures and fewer pine plantations would be beneficial to habitat diversity and wildlife diversity. Habitats, both forested and open, would be less fragmented and wildlife species would be able to forage, disperse and exchange genetic material with other individuals of their species over a wider area. Fewer roads would result in less traffic that would reduce traffic/wildlife encounters, and less areal extent of habitat effected by the influence of roads. Because of its large home range (up to 1 square mile), the indigo snake would likely benefit from this alternative more than the Proposed Action or Alternative A. As mentioned previously, roads substantially hinder movement of amphibians, and the reduction in roads and firelines in this alternative would benefit amphibian species and contribute to their conservation in the south. Road-avoidance behavior in larger mammals would be less than in the other two alternatives. Pastures would be allowed to revert to the natural vegetation types that would provide cover for a variety of species. Pine plantations would be

phased out and the natural habitat types would return to provide cover for nesting, resting, and feeding.

Other wildlife species of concern that utilize APAFR would benefit from the restoration of pine plantations to native forest species. Pine plantations are not generally used by wood storks, crested caracaras, Florida sandhill cranes or bald eagles; these species prefer more open, wetland habitats. Restoration of these pine plantations to native landscape associations may provide more areas of suitable habitat to other species of concern.

4.3.7 Exotic Wildlife Species

The impact of exotic species of insects, arthropods and animals on native ecosystems is of great management concern. Over 2,000 arthropod species and more than 360 exotic insects have become established in the U.S. (Graham 2001), the red imported fire ant being one of the most well-known (and most disliked). Few studies have documented the effects of these arthropods and insects on wildlife. Furthermore, at least 50 exotic wildlife species have become established in the south, roughly 8% of the total 625 wildlife species in the south.

Of great concern at APAFR is the population of feral hogs. Descendants of the domestic swine brought over for farming and sport hunting purposes, feral hogs are a major factor in altering habitats at APAFR. The rooting of feral hogs may damage sensitive forest habitats, disturb sensitive and rare plant species and impair water quality of wetlands and steams by removing vegetation and exposing bare soil to erosion. Feral hogs often tear apart rotting logs that provide habitat and cover for reptiles, amphibians and insects, and destroy the nests of ground-nesting birds such as turkeys, ruffed grouse and quail (Graham 2001), although this behavior is minimal at APAFR. Finally, feral hogs can carry wildlife diseases such as brucellosis and pseudorabies that can be spread to other animals. Brucellosis can also be a human health hazard.

Proposed Action

The Proposed Action contains specific standards for the control and management of feral hog populations, including the installation of hog-proof fences around areas of specific concern, continued hunting with special hunts in impact areas and live trapping and removal. While complete eradication is probably an unattainable goal, this alternative attempts to focus on reducing the feral hog population through increased hunting. This alternative may substantially reduce the feral hog population.

Alternative A

This alternative does not contain specific standards for the control of feral hog populations. Currently, hunters are encouraged to take feral hogs and there is no bag limit on hogs. While this alternative would not increase the feral hog population, it would decrease it to a lesser extent than the Proposed Action.

Alternative B

This alternative would have only slight effects on the feral hog population. A reduction in the amount of roads may result in less hunting pressure on feral hogs, as fewer hunters may want to walk into an area to hunt hogs and have to transport the meat back out. Feral hogs would continue to be hunted, however, since they are highly prized for their meat. A reduction in the number of interior fences may allow feral hogs to move more easily from one area to another. Under this alternative, there may be a slight increase in the feral hog population, but it would not be significant. APAFR would continue to manage the population to reduce their numbers.

4.4 AIR QUALITY

Proposed Action

The Proposed Action would have little effect on air quality, and would not affect the Class II air quality classification of APAFR. This alternative proposes no increase in activities that would increase air pollution. Activities that would occur, such as timber harvesting, prescribed burning, field research, recreational motorized vehicles and maintenance of roads would add exhaust gases to the air from equipment and vehicles as well as dust from physical disturbance of soil, but pollution from vehicles and equipment is usually very localized and temporary, and any increase in pollutants would be negligible. Timber harvesting would temporarily reduce the photosynthesis rate in the harvested area, briefly reducing the storage rate for atmospheric carbon, but the areal extent of harvesting operations at APAFR is small and the vegetation is quickly replaced. Cattle grazing would have only a minor effect on the amount of methane in the immediate area. Smoke from prescribed burning and wildfires would have the largest effect on air quality. This alternative proposes to prescribe burn approximately 21,000 acres per year. In some ecosystems the fire return interval may be more frequent or some areas may be burned hotter to remove hardwoods, this would not cause an overall increase in the amount of particulate matter in the atmosphere. This would increase the levels of particulate matter, carbon monoxide and other gases in the area, but at a small scale and of a temporary nature and dispersed across the installation.

Alternative A

This alternative would be similar to the Proposed Action in that the effects on air quality would be temporary and negligible, and not affect the Class II air quality classification. As in the Proposed Action, this alternative does not propose any increases in activities that would increase air pollution. Timber harvesting, road construction and reconstruction, field research and motorized vehicle use for recreation would be at the same levels as in the Proposed Action. Prescribed burning would occur on about 21,000 acres per year. While prescribed burning adds to the levels of particulate matter, carbon monoxide and other gases in an area, it occurs on a small scale at APAFR, and is of a temporary nature and dispersed across the installation.

Alternative B

The effects of this alternative on air quality would be similar to the other actions in that the effects would be temporary and negligible. This alternative proposes an increase in prescribed burning over the 21,000 acres proposed in the Proposed Action and Alternatives A, and the burns would consists of larger acreage due to fewer barriers. Impacts on air quality from burning under this alternative would be increased levels of particulates and carbon monoxide, although of a temporary nature and not affecting the Class II air quality classification. Effects of timber harvesting, road maintenance, field research and motorized vehicle use for recreation would be similar to the Proposed Action for the first few years, but over time the effects would be much less due a decrease in the amount of roads, fences, and disklines to maintain, and eliminating clearcutting once the plantations have been replaced with natural stands. Eliminating cattle grazing would reduce the methane in the area.

4.5 LAND USE

4.5.1 Fire

Under all of the alternatives, prescribed fire burn plans and wildfire suppression actions need to consider the system of roads and disklines used to get to the fire and also used for fuel breaks and patrolling. In all alternatives, wildfire suppression crews may need to use unimproved or closed roads to get to wildfire or to build a firebreak around a fire if necessary. Prescribed fire and wildfire suppression relies on in-house resources consisting of personnel, light brush trucks (engines), ATVs and tracked dozers with plows. Fire crews training on the installation perform the same work as in-house resources with like personnel and equipment. External assistance in response to larger or more complex wildfires may expand to various specialists and additional equipment (including air operations) that are common to such wildfire incidents. In general, smoke management has never been an issue at APAFR, for either effects on human health or visibility, due to the low population density of the surrounding agricultural lands.

Proposed Action

Wildfire

The Proposed Action proposes the use of a full range of wildfire suppression tactics, from complete suppression to allowing a wildfire to burn under certain conditions to achieve management objectives for an area. Suppression response would depend on a number of criteria, including safety, weather conditions, fuels, available personnel and the needs of the particular ecosystem where the wildfire is burning. A road system of 242 miles would provide access to all areas of the installation for fire crews.

Prescribed fire

Approximately 21,000 acres per year would be prescribe burned under this alternative. Prescribed fire would be the primary tool used to mimic the natural processes that maintain the ecosystems at APAFR. In some ecosystems the fire return interval may be more frequent, or some areas may be burned hotter to remove hardwoods. This alternative would have little effect on the prescribed fire program. A road system of 246 miles provides access for prescribed burning crews to set, patrol, and control prescribed burns. A system of 1,799 miles of firebreaks (disked or plowed) would be used to protect various resources from fire and to contain prescribed fires into areas of roughly 300 acres each. While this allows for easy control of burns, it may also take crews longer to burn a large area because they will be required to set more fires along roads and firebreaks.

Alternative A

Wildfire

This alternative also proposes the use of a full range of wildfire suppression tactics, from complete suppression to allowing a wildfire to burn under certain conditions to achieve management objectives for an area. Suppression response would depend on a number of criteria, including safety, weather conditions, fuels, available personnel and the needs of the particular ecosystem where the wildfire is burning. The existing road system of approximately 246 miles of roads would provide access to all areas of the installation for fire crews.

Prescribed Fire

Approximately 21,000 acres per year would be prescribe burned under this alternative. Prescribed fire would be the primary tool used to mimic the natural processes that maintain the ecosystems at APAFR. This alternative would not provide specific direction on burning each of the ecosystems at APAFR; in general, the fire return interval is two to three years for most of the installation. Similar to the Proposed Action, this alternative would have little effect on the prescribed fire program. The existing road system (246 miles) would provide access for prescribed burning crews to set, patrol, and control prescribed burns. A system of 1,799 miles of firebreaks (disked or plowed) would be used to protect various resources from fire and to contain prescribed fires into areas of roughly 300 acres each. While this allows for easy control of burns, it may also take crews longer to burn a large area because they will be required to set more fires along roads and firebreaks.

Alternative B

Wildfire

This alternative proposes the use of a full range of wildfire suppression tactics, from complete suppression to allowing a wildfire to burn under certain conditions to achieve management objectives for an area. Suppression response would depend on a number of criteria, including safety, weather conditions, fuels, available personnel and the needs of the particular ecosystem where the wildfire is burning. Under this alternative there would be fewer roads available to fight wildfires, adding to the complexity of controlling wildfires, but in emergencies fire crews may use unimproved or closed roads (if passable) in order to reach a wildfire quickly. With fewer roads to act as barriers, wildfires would have a greater potential to spread farther and quicker and a greater potential to escape from the installation. The number of escape routes offered by roads would be reduced, and crews would possibly need to construct temporary escape routes.

Prescribed fire

Under this alternative, much more than 21,000 acres would be burned each year. Prescribed fire would be used not only to maintain some ecosystems but also to restore some ecosystems to their

native vegetation. Removal of some roads (about 80 miles) and disklines (about 1,433 miles) would result in fires moving unimpeded across larger parts of the landscape. Fewer roads would mean less access to all areas of the installation for setting, patrolling and controlling prescribed burns, and a reduced number of ready-made escape routes. Applying prescribed fire may be more complex, since without firebreaks and disklines it will be necessary to rely on natural barriers and type changes, and may require more personnel. Some areas would need to have light fires run through them first before the larger landscape is allowed to burn so that these areas would not be burned as hot as the rest. With no cattle grazing, prescribed fires would likely be more frequent and hotter (due to more fine fuels on the ground). Fire intervals in several ecosystems would be shorter. This alternative would have more of an effect on the prescribed fire program than the other actions. Larger areas would be burned, and they would be burned more often, increasing smoke management concerns, escape possibilities and complexity of burns.

4.5.2 Infrastructure

Proposed Action

The transportation system is necessary to protect, develop, and manage the resources at APAFR. Activities which affect the transportation system are road and bridge construction, reconstruction, maintenance and closure. Since no new roads are permitted, road construction would not occur in any alternative. The Proposed Action recommends the closing of 3.8 miles of road (Sandy Point Wildlife Refuge, Durden Grade), mainly due to severe erosion problems and to protect natural resources. Repair and reconstruction of roads with erosive gullies and sedimentation problems, such as Sandy Hill Road, Echo Springs Road, Durden Grade and others would occur under this alternative. Reconstruction consists of rebuilding an existing road to a specific traffic or maintenance level and can include blading road surfaces, repairing drainage structures, replacing surfacing and reshaping roadways, reshaping ditches, or adding material to bring a road back up to natural ground elevations in order to keep the road drainable. In addition, a number of roads and unimproved roads are identified that would require stabilization with rock or tile, especially at low water crossings. Because this alternative contains specific standards and

guidelines on closure or repair of certain roads, this alternative would have a higher cost of road maintenance than the other two alternatives.

Many of the existing roads were built for forest management purposes, and this system of transportation would meet the needs of timber harvesting into the future. Uneven-aged silvicultural systems would require more road reconstruction than even-aged systems, because areas would be entered more frequently under uneven-aged management and more area would be traversed per volume harvested compared to evenaged systems. However, at APAFR, the road system is expected to remain open for management activities and there should be no need to close and revegetate roads leading into natural pine stands. No new roads would be constructed.

This alternative would maintain the current amount of fencelines, a total of 244.1 miles of interior and boundary fences (Table 4-4). It also would maintain the current system of 1,799.1 miles of firelines. These firelines are in place to protect plantations, recreation areas, Military Impact Areas, adjacent land and other resources.

Table 4-4. Miles of Roads, Fences, and Firebreaks by Alternative

	Proposed Action	Alternative A	Alternative B
Roads	242.3	246.1	166.4
Fencelines	244.1 (199.8 Interior)	244.1 (199.8 Interior)	111.9 (67.6 Interior)
Firelines	1,799.1	1,799.1	365.2

Alternative A

In many ways, this alternative is similar to the Proposed Action. The current road system of 246.1 miles would be maintained. No roads are planned to be closed. Unlike the Proposed Action, however, this alternative would not include repair or closure of specific roads and theoretically the cost of road repair and maintenance could be lower in this alternative.

Alternative B

This alternative proposes a reduction of 79.7 miles of roads. While this would create a less fragmented landscape, it would require that closed roads be posted, gated or have a barrier erected to keep the recreating public from using them, and there would be a cost involved in this, especially for gates or barriers. A reduced road system would mean that sometimes land managers, researchers, military personnel and the public could not drive into an area but would have to walk in. Because of this, this alternative contains the highest degree of protection for natural resources, vegetation, wildlife and natural areas. It would require the construction/reconstruction of temporary logging roads into natural pine stands since under uneven-aged silvilculture, these areas would be entered more frequently for thinning and harvesting, although the harvested area would be of a smaller extent than previous pine plantations.

Under this alternative, no grazing is permitted and 132.2 miles of interior fences around pastures would be eliminated. This would have an initial high cost, but over time this alternative would be less expensive, from an infrastructure point of view, to maintain than the other two alternatives. In addition, this alternative proposes a reduction from 1,799 miles of firelines down to 365.2 miles. Again, there would be an initial high cost of rehabilitating the 1,433 miles of firelines that would not be maintained, but over time this alternative would have fewer infrastructure maintenance costs than the other alternatives.

4.5.3 Rangeland and Grazing Management

Proposed Action

Maintenance and establishment of improvements to implement grazing have potential for impacts. During the plan period the following improvements would be maintained:

Fences	244.1 miles
Cattle Guards	74 units
Cattle pens	10 units
Tame Pasture	1,436 acres

Fences consist of four- to five-strand barbed wire on pressure treated wooden posts. They are constructed on a cleared right-of-way approximately 40’ wide. Maintenance would consist of replacement of wire and posts as necessary. Under this alternative, fencelines would be periodically mowed to protect fences from fire and to control brush. In areas where heavy vegetation build-up occurs, they would be periodically disked, however, efforts would be made throughout the plan period to reduce disking so that areas in the right-of-way are restored. Where brush has invaded fencelines, selective herbicides would be applied. Approximately 600 acres are impacted by fences. Cattle guards are installed where fences intersect roadways. Cattle guards have no impact on vegetative communities since they are in sites already impacted by roads. Ten cattle pens have been installed to facilitate cattle handling. Routine maintenance to ensure their serviceability would be performed. Approximately 30 acres are impacted by cattle pens. Tame pastures have been established on 1,436 acres. These pens are used to temporarily hold cattle. The pens are periodically mowed for brush control and fertilized and limed to maintain the desired species. These sites are permanently altered and would remain this way into the future.

Under this alternative, the revenue generated by the grazing program would continue to accrue to APAFR, at generally the same level of $175,000/year. The grazing program would continue to provide funds for the maintenance of interior and boundary fences, and to control invasive exotic plants. Improved pastures would continue to have applications of lime and fertilizer. Hunters, visitors and DoD personnel would continue to see cows on the landscape.

Alternative A

The effects of Alternative A on the grazing program would be similar to the Proposed Action, but the current plan does not contain specific management standards for cattle grazing. Under current management, standards and guidelines for grazing cattle are contained in the outleasing agreement that each cattle permittee signs. In addition, permittees use Cattle Grazing BMPs to reduce erosion and sedimentation where cattle have access to streams and where cattle tend to congregate, such as corrals or pens.

Under Alternative A, grazing would continue at its current level. The grazing program currently generates about $175,000 per year, and would continue at roughly this same amount each year. The grazing program would continue to fund interior and boundary fence maintenance and the control of invasive exotic plants. The grazing program contributes to the local economy through the production of beef, employment of ranch hands by the permittees and the purchase of local goods and equipment by both permittees and environmental staff.

Alternative B

Under this alternative, the grazing program would be eliminated. Revenue generated from the program would be lost. The grazing program currently provides funds for the control of invasive exotic plants, and without the revenue generated by this program the installation would need to find alternative funding for the control of invasive exotics. The grazing program also pays for the maintenance of interior fences and boundary fences. Under this alternative, 67.6 miles of interior fencelines would be removed, thus decreasing the amount of fence maintenance. However, without the revenue generated by the grazing program, the installation would have to find alternative ways to pay for the maintenance of all boundary fences a substantial cost.

Under Alternative B, the system of rotating cows through different pastures depending on height of the herbaceous layer would disappear. This would cause some herbaceous species to profilerate, mainly those species that cows prefer to graze, and they would obtain more height growth. In those areas seeded with non-native grasses such as Bahia grass, these grasses would continue to occupy the site and without cows to graze them would most likely outcompete some of the native grasses. Under this alternative, no herbicides would be used to control brush along fencelines, and brushy undergrowth would have to be removed by prescribed fire or mechanical means. This would increase the cost of fence maintenance. While herbicides could continue to be used to control invasive exotic plants, the grazing program would no longer fund herbicide application and the installation would have to develop alternative funding for exotic species control.

Without grazing, there would be no need to maintain, lime or fertilize the 1,436 acres of tame pasture, reducing costs to the installation. Hunters, visitors and DoD personnel would no longer see cows on the range, or their associated facilities: cattle feeders, corrals, fences, etc. Because the presence of cows is associated with the influence of humans on the environment, removing the cows may create a feeling of being farther away from civilization and contribute to a sense of being in a remote, natural area where one does not encounter the works of man. Cows would no longer be adding nutrients to the soil through manure, and the amount of methane in the local atmosphere, already quite small, would be reduced.

4.6 HAZARDOUS MATERIALS AND WASTE

None of the alternatives would have any impact on hazardous waste at APAFR. Any petroleum products, solvents, or other hazardous materials used during management activities would be disposed of in accordance with established AF procedures and federal and state regulations.

Proposed Action

The Proposed Action does not introduce any new or additional amounts of petroleum products nor generate any new or additional amounts of hazardous waste. The Proposed Action does not add or remove any storage facilities for petroleum products nor add or remove any temporary storage or collection facilities for hazardous waste.

Alternative A

The effects of Alternative A would be the same as the Proposed Action.

Alternative B

Alternative B is the same as the Proposed Action with regards to use, storage and collection facilities. This alternative slightly reduces the risk of potential hazardous material spills and leaks from heavy equipment associated with the grazing and forestry programs. The reduced risk

results from no longer using the equipment for the nonexistent grazing program and reducing the use of heavy equipment for the changed forestry program.

Alternative B adversely affects the ERP by eliminating access roads to five of the 66 ERP sites. Vehicular travel is required to properly monitor these sites. Monitoring these sites is required by RCRA. At a minimum, four wheel drive would be required either on what was an existing road or by cross country travel. If roads to these sites are closed, this alternative has the potential to cause impacts from cross country travel such as damaging vegetation, rutting and erosion of soils, and destroying habitat and cover for small mammals, reptiles, amphibians and insects. There is a potential for additional work with heavier vehicles and more frequent trips. Temporary roads to some of the sites may be required.

4.7 CULTURAL RESOURCES

Cultural resources would be protected under all alternatives. All project areas are surveyed for cultural resources prior to any earth-disturbing activities, and archeological sites are evaluated for significance.

Proposed Action

The greatest threat to cultural resources is plowlines and disklines used for wildfire suppression and prescribed burning. For the most part, the existing 1,799 miles of firelines have been surveyed for archeological resources, and these areas do not pose a risk of damaging the sites. This alternative proposes that no new roads, fencelines or firelines be constructed.

Cultural resources can also be damaged by wildfires, or extremely hot prescribed fires. Prescribed burning can protect heritage resources by reducing the fuel load, especially in areas that do not burn frequently. Reducing fuel loads protects historic structures from wildfires, and protects surface artifacts from fire damage from high intensity fires that occur when fuel loads

are high. Prescribed fire can also aid in removing vegetative cover and uncovering heritage resources, but this also has a downside; exposed heritage resources may be easy prey for looters.

This alternative limits ground disturbing activities in areas identified in the FNAI, thereby protecting any heritage resources that may be in these areas. Cattle grazing would continue under this alternative. Cattle grazing has the potential to alter the integrity of archeological sites from trampling and compaction, creation of cattle paths, feeding areas and fences.

Alternative A

This alternative would be similar to the Proposed Action in the potential damage that prescribed fire can have on cultural resources, as well as cattle grazing. Effects on cultural resources would be the same as from the proposed acdtion. Looting and vandalism of cultural sites is not a problem on APAFR.

Alternative B

This alternative would increase protection of cultural resources by reducing the amount of roads, fencelines and firelines. Although the area of roads, fences and firelines has already been disturbed and has been surveyed for archeological sites, the simple lack of access into these areas under this alternative will help prevent looting and vandalism of cultural resources in the future.

Under this alternative, however, there would be a greater potential for larger, hotter wildfires and prescribed fires due to a lack of roads and firelines as barriers. This could damage cultural resources if fuel loads are high, although over time fuel loads would be reduced to the point where fire could be returned to approximately its historical role.

4.8 RECREATION AND VISUAL RESOURCES

4.8.1 Recreation

Proposed Action

The Proposed Action will have little overall impacts, beneficial or detrimental, to outdoor recreation at the APAFR. APAFR would continue to provide the maximum outdoor recreation opportunities to military personnel and the general public based upon the constraints of the military mission and the ability of the resources to support this general level of outdoor recreation. Camping, fishing, hunting and hiking opportunities would generally remain at the same level or increase due to a general increase in the population and the demand for satisfying outdoor activities.

The 2000 Statewide Comprehensive Outdoor Recreation Plan (SCORP) for Florida reports that for their planning region 7, Central Florida (Highlands, Polk, Okeechobee, Desoto, and Hardee Counties) the federal government provides 106,160 acres of the 289,924 total acres (or 37%) for outdoor recreation. Only the state offers more acres, at 145,981 acres (2000 SCORP, Table 5.13). APAFR has the potential to play a major role as a provider of recreation in this region, but demand for recreation has generally been met by the other providers: state, counties, municipalities, and private. The 2000 SCORP noted only two activities where demand is expected to exceed supply: bicycle riding, with a projected increase in 574,116 user days by 2010, and freshwater fishing, with a projected increase of 117,976 user days by 2010 (2000 SCORP, Table 5.14). Under this alternative, bicycles would be permitted on roads, but no specific bicycle trails would be provided. This alternative would provide numerous fishing opportunities and thus could contribute to meeting the projected increase in demand for freshwater fishing.

The hunting program, which is the major outdoor recreation activity at APAFR, would continue to issue around 2,000 hunt permits per year. The general public would see little or no change as a result of the Proposed Action. Nationwide, participation in hunting is declining and has been doing so for several years. Cordell (1999) projects a decrease in hunting from today's level of

roughly 19 million participants to only 16.5 million by 2050, a decline in participation of 11% nationally. In the south, participation in hunting is projected to decline by 35% over the next 50 years (Bowker et al. 1999). For Florida residents, a decrease in the number of places to hunt, plus an increase in hunting fees, may be likely reasons for the decline in hunting. The "urbanization" of Florida and increases in population will not only result in fewer people living in rural areas, but will reduce the amount of areas available for hunting. The 2000 SCORP report documents a recent trend of large landowners to close their land to hunting by the general public and leasing them only to hunt clubs. As the available hunt opportunities outside of APAFR decline, hunting demand on APAFR could experience an increase. However, since participation in hunting is declining overall, any increase in APAFR would be slight.

This alternative has the potential to increase ecotourism opportunities through the possibility of providing a variety of trails. APAFR offers some of the most natural settings in Central Florida. The restoration of the Kissimmee River, when eventually accomplished, may also provide more opportunities for ecotourism as canoeists, boaters and hikers seek out the opportunity to experience the river in its originial channel. In addition, heritage tourism, which involves viewing and learning about historic and prehistoric sites, is one of the fastest growing recreational activities in America (Betz et al. 1999), and APAFR contains several sites that could be interpreted for the public. At present, demand for these activites is low.

Alternative A

Impacts associated with the no action alternative would be similar to the Proposed Action. This alternative is expected to meet current demand. However, the current plan does not address bicycle trails or the potential for creating them at APAFR, and may not meet future demand for this particular activity as well as the Proposed Action. INRMPs, of course, cover a period of only five years, and therefore are not expected to meet long term demand; however, bicycle trails are not addressed in the current plan. The discussion related to the hunting program under the Proposed Action applies equally to this alternative; there are no expected impacts or changes to the hunting program.

Alternative A has the potential to provide more ecotourism opportunities, from wildlife viewing to cultural resource tourism, but the current plan does not provide direction on offering these opportunities. At the present time, demand for these opportunities is low.

Alternative B

Even though this alternative seeks to restore ecosystems to their historic conditions, the DFCs of the outdoor recreation facilities would remain the same as in the proposed acdtion. There is a greater potential for impacts to the outdoor recreational resources under this alternative. A reduction in the number of roads, fences and firelines would reduce vehicular access to some parts of APAFR and require visitors to proceed on foot. Under this alternative, roads and bridges not needed to support military operations would be closed and/or obliterated or allowed to revert to a vegetative condition naturally. Since the outdoor recreation program depends on providing hunters, campers, fishers, and hikers transportations corridors to access areas of recreation, the lack of road maintenance could be detrimental to the outdoor recreation program. Some user groups would be affected more than others. For example, hunters who hunt deer using dogs prefer a network of trails that allow them to follow their dogs, coordinate the hunt, and catch their dogs. Fewer roads and firelines would hinder their activity, and some hunters who use dogs may stop hunting at APAFR and look for alternative hunting venues. A lack of roads and firelines would also reduce opportunities for those disabled users who are not able to walk very far into the woods.

Under this alternative, pine plantations would slowly be supplanted by uneven-aged stands of native pine species. Combined with a reduced number of roads, fences and firelines, this would create more homogeneous landscapes at APAFR and provide more of a sense of remoteness and naturalness. Some visitors, such as hunters, hikers and wildlife observers, may prefer these settings. Cordell (1999) reports wildlife viewing as one of the three fastest growing activities. Wildlife that utilize large undisturbed areas would be favored. Some game species, such as white-tailed deer, turkey and quail would benefit and might increase in abundance, providing more hunt opportunities for hunters.

Cordell et al. (1999) reports that the major recreational activity engaged in by Americans is walking. Roughly 94% of the population engages in some form of walking as a recreational activity. The next highest participation rates are in viewing and learning activities, such as birdwatching, wildlife viewing and sightseeing, participated in by 76% of the population. Participation in these activities is increasing, and increasing at a rate faster than that of population growth, which is 13%. Participation in viewing and learning activities is projected to increase by 97% nationally, and up to 120% in the south. In Florida, the increasing age of the population may be a contributing factor to this increase in participation rates. Alternative B, by providing large areas of very natural, remote settings, has the potential to offer more opportunities for wildlife viewing in the future. However, an infrastructure of roads, trails and observation decks would be needed to provide these opportunities, and Alternative B offers less infrastructure to accomplish this.

4.8.2 Visual Resources

Currently the Range contains a variety of visual resources, ranging from large landscape-wide viewsheds down to tiny microcosms. Most visitors experience the Range's views from the roads, seeing such scenes as large open prairies dotted with cypress domes. Another typical long view might be through thinned pine plantations or open flatwoods through which one can see layers of longleaf pines, palmettos, and wiregrass or cutthroat grass lawns. The top of the ridge offers especially long and varied views of topographic changes and the changes in vegetation that goes with them. Along the Arbuckle dike one can see over wide-open marshes and the water birds that make it their home. Many of these long views are modified or disrupted by human-influenced features such as the planted pine stands and the heavy-equipment activity associated with timber operations; the presence of herds of cattle in a natural environment and the fences that control them; and military training facilities and operations.

Medium and small views might be taken in by visitors walking the foot trails or along dirt roads intended for access by AF personnel vehicles. The FNST takes visitors through the arching tunnels of the oak hammocks. Along the loop trail, visitors might see into dense hardwood

swamp vegetation or the remains of a cattle operation of the last century. Even smaller visual assets include tiny plants growing on the top of a stump, or thousands of hatpins lining a grassy road. Unusual scenes like pitcher plants or sundews growing along a human-made ditch can be seen. These smaller scale visual resources are occasionally disrupted by human activities and features as one passes through the landscape, but can be less obvious than in large scale viewsheds.

Proposed Action

Under this Alternative, the standards and objectives aimed at resources management will improve several viewsheds by reducing the number of obvious human-influenced features. Most notable would be the conversion of selected planted pine stands to endangered species habitat and the removal of mineral feeders from a set distance from foot trails. The standards for application of fire should result in more open flatwoods landscapes through which visitors may view wider expanses, and ensure healthier vegetation and flowering plants in the medium and small-scale views. Views of the marsh from the dike would be reduced when that structure is removed, but the marsh will visually improve for having less human-constructed features in it. Wetlands would open out once water flow is improved, adding new long viewsheds to road vistas.

Alternative A

Under the No Action alternative, visual assets will not be controlled or preserved because there are no specific standards in the current plan that will prevent additional human-made disruptions or fragmentation of the viewsheds from occurring. Visual resources may not be considered in the planning or execution of management activities. Unregulated application of fire many not maintain landscape health as desired and may allow vegetation to enclose some viewsheds. Hydrologic flow may continue to be restricted or altered by roads, modifying wetland health and changing the quality of the views across them. Medium- and small-scale visual assets may deteriorate due to increased human-made disruptions or poor vegetative health.

Alternative B

Under this alternative, large viewsheds would be improved by the complete removal of planted pine stands and cattle in the native environment, and by the minimization of fencelines and other human-made disruptions. Fragmented landscapes would gain continuity and wetlands would be restored to more natural flow conditions, opening up landscapes further. Fire would open flatwoods and improve long-range vistas. However, the removal of roads may reduce access to long views off the roads. Short dirt roads once useful for foot travel or slow driving would be closed, limiting access to medium and small scale views. Views along hiking trails would not change except where flatwoods would be opened by landscape-scale fires.

4.9 SOCIOECONOMIC RESOURCES

Proposed Action

Current social and recreation uses of APAFR would continue under this alternative. Local residents, and those from south and central Florida who travel to APAFR to hunt, would continue to visit the installation and to hunt their favorite locations. Increases in recreational demand would likely keep pace with the increase in Florida's population, but no particular increase would be expected for APAFR. Active recreation use of APAFR would be expected to continue at its current relatively low level.

The social value of having native ecosystems present on the landscape may play a larger role in how Floridians regard and value APAFR. The key to this social value is understanding the difference between active-use value and passive-use value. Active-use value applies to the goods and services used for engaging in a recreational activity such as hunting, fishing, or wildlife viewing as well as the enjoyment gained from direct participation in that activity. Passive-use value, on the other hand, is the satisfaction that people get just from knowing that something exists (like a wilderness area or a whooping crane) even though they may never see it; this is usually referred to as "existence" value. Passive-use value also includes the satisfaction people derive from making something available to others and to posterity, or allowing future generations the opportunity to experience something (in this case, a natural Florida ecosystem). A growing

body of scientific literature in the 1980s and 1990s suggest that natural areas provide substantial passive-use value to Americans (Vincent et al. 1995). Ignoring these passive-use values can underestimate the benefits associated with natural areas, and managers should strive to take them into account in any social analysis.

Bengston and Fan (1999) found that people do assign passive-use values to natural resources, and for unroaded or natural areas, the passive-use value often exceeds the active use value of the area. APAFR represents an outstanding collection of natural areas and ecosystems of Florida, and is one of the few places where those ecosystems are relatively undisturbed by human activity. Because of this, the value of the ecosystems and natural areas at APAFR has a high social value.

Polk and Highlands Counties receive 40% of the revenue generated at APAFR. This money is earmarked to be used for roads and schools. For FY2001, this amounted to $51,228, roughly divided between the two counties. The amount received each year varies greatly and depends on the amount of timber harvested. Under this alternative, receipts to counties would continue at approximately the same levels as in the past, and would likely continue into the future as pine plantations are harvested and replanted for future years. Recreational use, particularly hunting, would continue at the same levels, contributing to the local economy through the purchase of hunting supplies and equipment. Opportunities to develop ecotourism resources may expand as restoration of the Kissimmee River proceeds in the future, when a restored river may attract more canoeists, boaters, and fishermen.

Alternative A

Under this alternative, the current social and recreation uses of APAFR would continue. Local residents, and those from south and central Florida who travel to APAFR to hunt, would continue to visit the installation and to hunt their favorite locations. As in the Proposed Action, no particular increase would be expected for APAFR except that which may accompany the normal increase in the population level. Active recreational use of APAFR would be expected to continue at its current relatively low level.

The discussion of active-use and passive-use values mentioned under the Proposed Action applies to Alternative A as well. For most of Florida's population, the passive-use value of APAFR's ecosystems may be greater than the active use value gained from the small amount of Florida residents who actually use APAFR.

Economically, this alternative would be similar to the Proposed Action. Receipts to counties from harvesting pine plantations would continue at roughly the same levels as in the past as pine plantations are harvested and replanted for future years. Recreational use, particularly hunting, would continue at the same levels, contributing to the local economy through the purchase of hunting supplies and equipment.

Alternative B

This alternative differs from the Proposed Action and Alternative A in that it focuses even more on the passive-use values of conserving intact native ecosystems of Florida. This alternative offers the highest passive-use value by conserving those ecosystems that are presently at APAFR and by restoring areas to their native vegetation. This alternative would offer Floridians a large block of public lands with intact, functioning native ecosystems, something that would increase in value as the rest of the agricultural lands surrounding APAFR become more developed and urbanized with roads, homes and other structures.

The social and recreation uses of APAFR would continue as at present. Local residents, and those from south and central Florida who travel to APAFR to hunt, would continue to visit the installation and to hunt their favorite locations. Under this alternative, approximately 80 miles of roads would be closed. This may make APAFR less attractive to some hunters who would not be able to drive right to the location where they like to hunt. Rather than walk into the area they wish to hunt, some hunters may opt to hunt elsewhere. A reduction in roads would also affect those hunters who use dogs, since a network of roads is necessary to release and catch the hunting dogs. The reduction in the number of these hunters would be slight and it is expected that other hunters would fill in behind them.

Focusing on conserving and restoring the native ecosystems may increase opportunities for ecotourism as the population of the state increases and more people become interested in the chance to view and experience the natural world, or Florida "as it once was." Combined with the eventual restoration of the Kissimmee River, the restoration of the native ecosystems may engender a reputation for APAFR's having some of the best examples of natural areas in the state.

This alternative would have a larger effect on the economic receipts to counties than the other two alternatives. For the first several years, receipts to counties would remain at current levels as the pine plantations are harvested. Eventually, perhaps two or three decades from now, the pine planations would all be harvested and these areas would be managed as natural pine stands under uneven-aged management. Receipts to counties would drop drastically as timber revenues fall. Selective cutting of pine from the natural pine stands would continue as at present, although this makes up a small percentage of the timber harvesting. Revenue would drop as the pine plantations are all cut and timber is harvested only from natural stands. Over time, revenue would increase again as the trees in the natural stands are allowed to grow to sawtimber size. At some future point, the revenue from cutting high quality plylogs and sawtimber from the natural stands would increase to a point where their value is higher than that of pulpwood or posts, and receipts to counties would begin to rise again, although not to the same level of revenue produced by the pine plantations.

4.10 ENVIRONMENTAL JUSTICE

During the analysis, none of the alternatives showed any identifiable effects or issues specific to any minority or low-income population or community. Usually, environmental justice is not an issue unless the percent of minority population or low-income population exceeds twice the state average. Based on the 2000 Census Data, Florida consists of 36.5% minority and 14.4% low-income populations. Both Polk and Highlands Counties have a percentage of minority or low-income populations that are less than twice the state average. This demographic information

indicates that these counties are not qualified as environmental justice communities. Changes in management activities, including reducing the road system or augmenting the hunting program, would have the same effect on all groups of people who use APAFR, including minorities and different cultures. No civil rights effects associated with age, race, creed, color, national origin, or sex were identified in the analysis.

5.0 CUMULATIVE EFFECTS AND IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

5.1 CUMULATIVE EFFECTS

This section provides: 1) a definition of cumulative effects, 2) a description of past, present, and reasonably foreseeable actions relevant to cumulative effects, 3) an assessment of the nature of interaction of the Proposed Action or alternatives with other actions, and 4) an evaluation of cumulative effects potentially resulting from these interactions.

5.1.1 Definition Of Cumulative Effects

CEQ regulations stipulate that the cumulative effects analysis within an EA should consider the potential environmental impacts resulting from "the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions" (40 CFR 1508.7). Recent CEQ guidance in *Considering Cumulative Effects under the National Environmental Policy Act* (CEQ 1997) affirms this requirement, stating that the first steps in assessing cumulative effects involve defining the scope of the other actions and their interrelationship with the Proposed Action or alternatives. The scope must consider geographic and temporal overlaps among the Proposed Action and other actions. It must also evaluate the nature of interactions among these actions. Cumulative effects are most likely to arise when a relationship or synergism exists between a Proposed Action and other actions expected to occur in a similar location or during a similar time period. Actions overlapping with, or in close proximity to, the Proposed Action would be expected to have more potential for a relationship than those more geographically separated. Similarly, actions that coincide, even partially, in time would tend to offer a higher potential for cumulative effects.

To identify cumulative effects the analysis needs to address three fundamental questions:

1. Does a relationship exist such that affected resource areas of the Proposed Action might interact with the affected resource areas of past, present, or reasonably foreseeable actions?

2. If one or more of the affected resource areas of the Proposed Action and another action could be expected to interact, would the Proposed Action affect or be affected by impacts of theother action?

3. If such a relationship exists, then does an assessment reveal any potentially significant impacts not identified when the Proposed Action is considered alone?

5.1.2 Past, Present And Reasonably Foreseeable Actions

The scope of the cumulative effects analysis involves both the geographic extent of the effects and the time frame in which the effects could be expected to occur. For this EA, the cumulative effects analysis is limited to the boundaries for the APAFR. Actions not occurring within or near this location are not considered in the analysis. The scope of the cumulative effects analysis also involves identifying other relevant actions in the effected area. Beyond determining that the geographic scope and time frame for the actions interrelate to the Proposed Action, the analysis employs the measure of "reasonably foreseeable" to include or exclude other actions.

Proposed Action

The AF, which has occupied the lands of the APAFR, has implemented numerous natural resources actions which influence the current natural condition of the installation.

Natural resources management activities, includinig cattle grazing, forest management and recreational activities, including hunting, have all occuried since 1945. Cattle grazing, a common land use activity in Florida, was practiced by previous landowners, but suspended during World War II. It was re-institued in the late 1940's. In 1951, the AF implemented a Cooperative Agreement with the FFWCC, thus opening the installation for public hunting. A forest management program was implemented in 1966, with reforestation activities focusing on establishment of pine plantations. The AF developed management plans for all these activities,

but it was not until 1997 that an INRMP was developed and implemented. That plan was the first attempt to implement an integrated management strategy, based on the DoD ecosystem-based management policy.

Future actions with the potential to impact this action would be driven by changes in laws, agency policies or other changes that would influence land management activities implemented under this plan. At this time there are no such known actions proposed.

5.2 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

NEPA requires that environmental analysis include identification of any irreversible and irretrievable commitments of resources which would be involved in the Proposed Action should it be implemented. Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that the uses of these resources have on future generations. Irreversible effects primarily result from the use or destruction of a specific resource (e.g., energy and minerals) that cannot be replaced within a reasonable time frame. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action (e.g., extinction of a T&E species or the disturbance of a cultural site).

For the Proposed Action, most resource commitments are neither irreversible nor irretrievable. Most impacts are the direct result of management activities (e.g. prescribed burning) that may have both long- and short-term effects, however, those effects are dynamic and will change as management practices change. As these management practices are designed to perpetuate natural ecological processes, the long-term viability of the natural condition of the APAFR is protected.

5.3 THE RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

This discussion focuses on the balance or trade-offs between what is being gained or lost in the short-term and long-term.

One of the major benefits of uneven-aged timber management is to produce high quality saw timber in the long run. It may take two or three decades to fully implement uneven-aged silviculture, and in the short term there is a loss of revenue from forgoing the economic return that even aged management can bring through thinning, clear cutting, and forest products such as poles, posts and pulpwood. Uneven-aged management can produce these products, of course, over the short term through thinning and group selection, but not to the same economic extent that even-aged management does. For the Proposed Action, uneven-aged management will be applied to natural pine stands and other forested lands not in pine plantations. In the short term, economic benefits will be returned from existing pine plantations; no drop in revenues compared to past years is expected.

In the long term, restoring the hydrology and natural plant communities to achieve a functioning, healthy ecosystem with its full complement of species is, without doubt, the most rational path to follow. Following this path will mean a short term reduction in amount of timber harvested from natural pine stands as they come under uneven-aged management; reduction in future timber potential of slash pine plantations converted to longleaf or natural stands; benefits of increased T&E species such as FSJ and RCW to achieve recovery; and the benefits of managing for a healthy ecosystem instead of sustained production of goods and services for human benefit.

5.4 UNAVOIDABLE ADVERSE IMPACTS

As with any land management systems where humans attempt to impose their will upon nature, there will be some unavoidable adverse impacts, mainly related to past actions on the landscape that are difficult and costly to restore. For example, some plantations are on land so highly disturbed that it would be economically unfeasible to attempt restoration; this land will continue to be highly disturbed and experience a loss of species diversity. Existence of pine plantations will continue to represent barriers or fragmentation to some species and limit their movement or range. Similarily, roads, fences, and firelines will continue to allow invasive exotic species to gain access to more areas of land. It is possible that some species could disappear from parts of their range (the "blinking out of species" that ecologists refer to) because we do not have the resources to preserve every location of PETS plants and are forced to make choices in which to expend resources on. Ordnance activity may continue to "take" individuals of some endangered species, but should not impact the existing population as a whole. Hydrology of the Kissimmee River will continue to be altered into the future and will continue to affect the composition of plant communities, moving away from the original composition of the area before the river was channelized. Until the river is restored to its original channel throughout its length, the hydrology of the marshes and floodplains once associated with an influenced by the river will continue to be in an altered state, as will the constructed channel and spoil piles. In the long term, restoring the river will help return the natural hydrology of APAFR and the Kissimmee River Valley.

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6.0 GLOSSARY

A

Active cluster. A specific RCW cluster that is occupied in a given survey year. A cluster is determined to be active when there are nesting or roosting RCWs present, or when one or more cavity trees exhibit fresh pitch wells and resin flows, reddish under-bark appearance, and/or fresh chipping is present at the cavity entrance.

Access. The opportunity to approach, enter, or make use of public lands.

Adaptive management. The process of implementing policy decisions as scientifically driven management experiments that test predictions and assumptions in management plans, using the resulting information to improve the plans.

Age class. One of the intervals, commonly ten years, into which the age range of trees is divided for classification or use.

Agricultural land improvements. Improvements that add potential value to an agricultural outgrant such as irrigation features, fences, cattle guards, water developments, livestock enclosures, and other nonstructural improvements such as seeding, fertilizing, and vegetation management.

Agricultural outleasing. The use of DoD lands under a lease to an agency, organization, or person for growing crops or grazing animals.

Air Quality Standard. The prescribed level of pollutants in the air that cannot be exceeded legally during a specified time in a specified geographical area.

Annual Growth. The growth produced in one year.

Appropriate suppression response. The range of options for managing a wildland fire to contain and control the fire as soon as reasonably and economically possible, considering the values threatened, expected fire behavior, and cost of the suppression effort.

ARPA permit. A permit based on the Archeological Resources Protection Act (ARPA) that allows archeological research by qualified professional archeologists.

B

Basal area. The cross-sectional area of a stand of trees measured at breast height. The area is expressed in square feet per acres and is a measure of stocking density.

Best Management Practice (BMP). A practice, or a combination of practices, that is determined to be the most effective and practical means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals. APAFR adopts the State of Florida BMPs, 1993 edition.

Biodiversity. The variety of life in an area, including the variety of gene pools, species, plant and animal communities, ecosystems, and the processes through which individual organisms interact with one another and their environments.

Borrow. Excavation (as in borrow pit) of soil material for use as road surfacing.

C

Canopy. The more or less continuous cover of branches and foliage formed collectively by the crowns of adjacent trees and other woody growth.

Cavity. A hole or hollow place in a tree.

Class I airshed. An area designated for the most stringent protection from degradation of air quality.

Clearcutting. A method of regenerating an even-aged stand in which a new age class develops in a fully exposed microclimate after removal, in a single cutting, of all trees in the previous stand. Regeneration is from natural seeding, direct seeding, planted seedlings, and/or advance reproduction. Harvesting may be done in groups or patches (group or patch clearcut) or in strips (strip clearcut).

Commercial forest land. Land under management capable of producing at least 20 cubic feet of merchantable timber per acre in a year. It must be accessible and programmed for silvicultural prescriptions. The smallest area for this classification is 5 acres. Roadside, streamside, and shelterbelt strips of timber must have or be capable of producing a crown width of at least 120 cubic feet to be classified as a commercial forest.

Consumptive use. A use of resources that reduces the supply.

Cooperative Agreement. A written agreement between an AF installation and one or more outside agencies (federal, state or local) that coordinates planning strategies. It is a vehicle for obtaining assistance in executing and implementing natural resources program objectives.

Critical habitat. Any air, land, or water area and constituents thereof that the USFWS has designated as essential to the survival and recovery of an endangered or threatened species or a distinct segment of its population.

D

DFC – Desired Future Condition; it is a description of the landscape at the point in time when the goals for it have been achieved. This description is written in terms of physical and biological processes, the environmental setting, and the human experience.

E

Ecological Classification System (ECS). A hierarchical system used to help organize and coordinate the classification of ecological types and ecological units to make comparisons. Classification is ecologically based and integrates existing resource data such as climate, topography, geology, soil, hydrology, and vegetation. The system includes many levels: domain, division, province, section, subsection, landtype, landtype association, landtype phase, and site.

Ecosystem. An association of interactive organisms and their environment perceived as a single entity.

Ecosystem management. A method for sustaining or restoring natural systems and their functions and values. It is goal driven, and it is based on a collaboratively developed vision of desired future conditions that integrates ecological, economic, and social factors. It is applied within a geographic framework defined primarily by ecological boundaries.

Ecotone. A transition or junction zone between two or more naturally occurring diverse plant communities.

Endangered Species. Any species of animal or plant that is in danger of extinction, as identified by the Secretary of the Interior as endangered in accordance with the Endangered Species Act of 1973.

Endangered Species Plan for APAFR (ESP). A plan for managing the three focal endangered bird species at APAFR, developed jointly by APAFR, the US Fish and Wildlife Service, and the Florida Fish and Wildlife Conservation Commission in 2000.

Environmental Analysis (EA). An analysis of all actions and their predictable short- and long-term environmental effects, which include physical, biological, and socioeconomic factors and their interactions; a concise public document required by NEPA regulations.

Even-aged stand. A stand of trees containing a single age class in which the range of tree ages is usually less than 20 percent of rotation.

Even-aged structure. A stand structure in which trees of essentially the same age grow together. Clearcut, shelterwood, and seed-tree cutting methods produce even-aged stand structure.

Exotic Species. Any non-native species whose introduction does or is likely to cause economic or environmental harm or harm to human health. This status can be applied to native plants that are not native to a particular ecosystem. Any plant or animal not native or indigenous to a region, state, or country.

F

Fireline. A natural or constructed barrier utilized to stop or check fires that may occur, or to provide a control line from which to work.

Floodplain. Lowland or flat areas adjoining inland and coastal waters, including areas on offshore islands, which are prone to flooding.

Florida National Scenic Trail (FNST). A long-distance hiking trail providing both recreation and protection of nationally significant historic, natural, or cultural qualities. The FNST will eventually extend 1,300 miles across Florida, linking greenways in wild and rural parts of the state.

Forest land. Land on which forest trees of various sizes constitute at least 10% of the area. This category includes open land that is capable of supporting trees and is planned for forest regeneration and management.

Forest management. Developing, conserving, and protecting forest resources to ensure that they provide sustained yield and multiple use.

Forest products. Plant materials in wooded areas that have commercial value, such as sawlogs, poles, posts, pine needles, cordwood, Christmas trees, and similar wood or chemical products.

Fuels. Living or dead plant material that will burn when weather conditions are correct.

G

Game. Any species of fish or wildlife for which state or federal laws and regulations proscribe hunting seasons and bag or creel limits.

Genetic variability. A range of phenotypes for a particular character. Genetic variability arises initially by mutation and is maintained by sexual reproduction. Such variation is the raw material for natural selection to act upon, ensuring that the best-adapted variants are most likely to reproduce.

Geographic Information Systems (GIS). A computer-based technology characterized by specific hardware and software that permits the simultaneous storage, management, and analysis of data, along with its geographic location; a spatial database management system.

Grazing Land. Land with vegetative cover that consists of grasses, herbs, and shrubs valuable as forage.

Grazing systems. Specialized methods of grazing management (the manipulation of livestock grazing to accomplish a desired result) that define systematically recurring periods of grazing and deferment for pastures or management units.

Group selection. The cutting method that describes the silvicultural system in which trees are removed periodically in small groups resulting in openings that do not exceed two acres in size. This leads to the formation of a large uneven-aged stand in the form of a mosaic of age class groups.

Growing season fire. The application of prescribed fire during the growing season. In south Florida the growing season extends from March through mid-June. The season varies from year to year based on weather factors.

Guideline. A suggested line of action or management practices.

H

Habitat. The sum total of biotic and abiotic conditions comprising a specific environment where an organism or biological community normally lives or occurs.

Habitat Management Unit (HMU). The desired future demographic configuration of an endangered or threatened population.

Heritage resource. A site, structure, object, or group of sites or structures used or created by people in the past.

I

Inactive cluster. A cluster site where there are no RCWs present and when none of the cavity trees exhibit active resin wells.

Installation. Military base or camp, including all lands, buildings, runways, etc.

Integrated Natural Resources Management Plan (INRMP). A plan based on ecosystem management that describes and delineates the interrelationships of the individual natural resources elements in concert with the mission and land use activities affecting the basic land management plans. Defines the natural resources elements and the activities required to implement stated goals and objectives for those resources.

Integrated Pest Management (IPM). A planned program incorporating continuous monitoring, education, record-keeping, and communication to prevent pests and disease vectors from causing unacceptable damage to resources, property, operations, or the environment. IPM includes methods such as habitat modification, biological control, genetic control, cultural methods, mechanical control, physical control, regulatory control, and the judicious use of least-hazardous pesticides.

Interdisciplinary Team (IDT). A group of individuals with skills from different resources assembled to identify and resolve issues and problems.

Intermediate thinning. Any removal of trees from an even-aged stand between the time of its formation and the regeneration cutting.

Intermittent pond. A pond that contains water a portion of the year under typical climatic conditions.

Irregular shelterwood harvest. A harvest designed to establish regeneration under the protection of an overstory of seed trees. A portion of the seed trees remain indefinitely, leaving a two-aged stand.

L

Landscape. An area composed of interacting ecosystems that are repeated because of geology, landform, soils, climate, biota, and human influences throughout the area. Landscapes are generally of a size, shape, and pattern that are determined by interacting ecosystems.

Landtype. An intermediate level in the ecological classification system based on landform, natural vegetative communities, and soils.

Landscape association (LSA). A group of landtypes. Landtypes in the association are sufficiently homogeneous to be considered as a whole for modeling the future outputs and effects of planned management activities. Landscape associations may not follow watershed boundaries and are defined on the basis of general similarities in geology, climate, landform, and vegetation.

Landscape Association Management Area (LAMA). An area with similar management objectives and a common management prescription. At APAFR, these management areas are based on actual landscape association, hence the name.

Land-Use Regulation. A document that prescribes the specific technical actions or land use and restrictions with which lessees, permittees, or contractors must comply. It derives from the grazing or cropland management plan and forms a part of all outleases, land use permits, and other contracts.

Livestock. Domestic animals kept or raised for food, by-products, work, transportation, or recreation.

M

Management Area. An area selected for management of an emphasized natural resource, and common management objectives.

Management Indicator Species (MIS). A particular type of plant or animal whose presence in a certain location or situation is a sign or symptom that particular environmental conditions are also present.

Midstory. A middle canopy layer of smaller trees that occurs under an overstory of trees. These trees are usually of a different species than the large trees and can grow in almost total shade.

Mitigation. Actions taken to avoid, reduce, eliminate, or rectify the impact of a management practice.

Multiple Use. The management of all the various renewable resources of an area so that they are utilized in the combination that will best meet the needs of the American people; making the most judicious use of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in the use to conform to changing needs and conditions; that some lands will be used for less than all of the resources; harmonious and coordinated management of the resources, without impairment of the productivity of the land with consideration being given to the relative values of the various resources, and not necessarily the combination of uses that will give the greatest dollar return or the greatest unit output.

N

Native American Graves Protection and Repatriation Act (NAGPRA) of 1990. This act, effective only on Federal or tribal lands, concerns repatriation of human remains, funerary objects, sacred objects, and items of cultural patrimony in existing collections. Consultation is required before excavations that may affect these or after the inadvertent discovery of these following the date of enactment.

Native Seed Harvest Program. A management activity to harvest seeds of certain native grasses to provide to other agencies and organizations for restoration activities.

National Environmental Policy Act (NEPA) of 1976. An act to declare a national policy that will encourage productive and enjoyable harmony between humankind and the environment, to

promote efforts that will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of humanity.

Naval stores. The original source of turpentine and rosin. The raw material, gum, is extracted from chipped faces on mature slash and longleaf pine. The gum naval stores industry has been largely replaced by the production of modern synthetic materials.

Nonstocked. Commercial forest land less than 16.7% stocked with growing stock trees.

Native vegetation. Indigenous species that are normally found as part of a particular ecosystem; a species that was present in a defined area prior to European settlement.

"No Funds" Service Contract. An agreement by which a party performs a land management service for a consideration other than funds.

Non-commercial Forest land. Land not capable of yielding forest products of at least 20 cubic feet per acre in a year because of site conditions. The classification also includes productive forest land on which mission requirements, accessibility, or non compatible uses preclude forest management activities.

O

Objectives. Specific intermediate targets, the accomplishment of which enables the program to approach achievement of the goals.

Off-site. A term referring to species not normally found on a certain site under natural conditions. An off site species may have been placed on the site or may have encroached on the site because of a change in natural conditions of the site.

Old-growth forest. Ecosystems distinguished by old trees and related structural attributes. Specific attributes vary according to forest type, climate, site conditions, and disturbance regime.

Overstory removal. The final stage of harvest in the irregular shelterwood, shelterwood, or seed-tree methods where all or a portion of the overstory trees are removed to allow the understory to grow.

P

PETS. An acronym for Proposed, Endangered, Threatened or Sensitive plant or animal species for listing pursuant to the Endangered Species Act.

Prescribed Fire. Fire ignited by DoD personnel, or cooperating personnel, that is burning under conditions specified in an approved plan to dispose of fuels, control unwanted vegetation, stimulate growth of desired vegetation, change successional stages, etc., to meet wildlife, recreation, timber, or ecological objectives.

Prescription. A set of practices selected and scheduled for application on a specific area to attain multiple use and other goals and objectives.

Primary zone. A component of the special management zone around streams and riparian areas that has significant timber harvesting restrictions and varies in width from 35 to 200 feet.

Public domain land. Original holdings of the United States that were never granted or conveyed to other jurisdictions or required by exchange for other public domain lands.

R

Range Operations Control Center (ROCC). Office responsible for coordinating missions and issuing clearance into closed areas of APAFR.

Rare. Plant or animal species that are uncommon in a specific area. All endangered, threatened, and sensitive species can be considered rare, but the converse is not true.

Recreation Visit. A unit of measure of recreation use reflecting 1 person visiting an area for 4 hours.

Recruitment cluster. A recruitment stand that has been provisioned with at least 4 artificial RCW cavities, either inserts or drilled cavities or a combination of both.

Recruitment stand. A stand of trees at least 10 acres that is identified as potential nesting habitat required to meet the population goal on a management unit for RCWs. Recruitment stands are located between ¼ mile and ¾ mile from a cluster site. Foraging habitat is required for recruitment stands.

RCW group. Normally, a breeding pair of RCWs, plus helpers, living as a family group. Group size can vary from a mated pair to as many as nine individuals but averages about three birds.

Reforestation. The natural or artificial regeneration of an area to protect watersheds, prevent soil erosion, improve wildlife habitat and other natural resources, produce timber and other wood products, and restore function to a particular type ecosystem.

Regeneration. The renewal of a tree crop, whether by natural or artificial means; also the young crop itself. Includes planting, seeding, and preparing the ground for seeding as well as natural seeding.

Relict trees. A pine tree which is left over from the original forests that were harvested of high-quality RCW cavity trees: presence of red-heart fungus at average cavity height, 14 inches DBH or larger, high ratios of heartwood to sapwood, and large, flat-topped crowns with large limbs.

Restoration. The reestablishment of native plant cover in an area to predisturbance conditions.

Riparian Area. The area including a stream channel, lake, or estuary bed, the water itself, and the plants that grow in the water and on the land next to the water.

Rotation age. The planned number of years between the regeneration of a forest stand and its final cutting at a specified age of maturity.

S

Salvage. Removal of trees that are dead, dying, or in imminent danger of being killed by injurious agents.

Salvage of dead stands. Removal of all dead trees in a stand. This does not include removal of a tree posing a safety hazard or the removal of trees to halt the spread of injurious agents.

Savannah. A flat, almost treeless grassland.

Sawtimber. Trees suitable in size and quality for producing logs that can be processed into dimension lumber.

Scoping. The process by which DoD determines the extent of analysis necessary for an informed decision on a Proposed Action.

Sensitive species. Plant or animal species that are susceptible or vulnerable to activity impacts or habitat alterations; species appearing on the Federal Register as proposed for classification and are under consideration for official listing as endangered or threatened species; or those on an official State list.

Seral stage. The stage of succession of a plant or animal community that is transitional. If left alone, the seral stage will give way to another plant or animal community that represents a further stage of succession

Shelterwood method. A method of establishing a new stand by gradually removing the existing trees so new seedlings or sprouts become established under the protection of the remaining trees. Normally, this is done in two separate harvests during a 5-to-10 year period.

Silviculture. The art and science of controlling the establishment, composition, and growth of forests.

Site Preparation. Preparation of ground surface before planting or natural regeneration.

Smoke Management. The appraisal, specifications, scheduling and execution of a prescribed burning operation so as to mitigate possible impacts from the smoke it produces.

Snag. A standing dead tree used by wildlife for nesting, roosting, perching, courting, and food gathering.

Stand. A community of trees possessing sufficient uniformity in composition, age arrangement, and condition as to be distinguishable from trees in adjoining areas.

Standard. A requirement that precludes or imposes limitation on resource management practices and uses, usually for resource protection, public safety, or addressing an issue.

State Historic Preservation Officer (SHPO). The official, appointed or designated pursuant to Section 101(b)(1) of the National Historic Preservation Act of 1966, as amended, charged with administering the State Historic Preservation Program.

Stewardship. Moral obligation for the careful and responsible management of the land and resources held in trust. This includes the restoration and maintenance of ecosystem integrity while allowing for ecologically acceptable levels of sustainable multiple uses.

Sustainability. The ability to maintain a desired condition or flow of benefits over time.

T

Tenant Organization. A military organization assigned to an installation without host responsibilities.

Targets. Planned results to be achieved within a stated period of time.

Thinning. Cutting made in an immature stand, primarily designed to accelerate the annual growth of the remaining trees, but also by suitable selection to improve the average form of the remaining trees.

Threatened Species. Any species of plant or animal that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

Timber Stand Improvement (TSI). Silvicultural treatments applied to existing stands to improve their quality, composition, condition, or rate of growth (such as pruning, thinning, releasing, and prescribed burning).

U

Understory. Vegetation growing under a more-or-less continuous cover of branches and foliage formed by the upper portion of adjacent trees and other woody growth.

Uneven-aged management. The application of a combination of actions needed to simultaneously maintain continuous high forest cover, recurring regeneration of desirable species, and the orderly growth and development of trees through a range of diameter or age classes to provide a sustained yield of forest products. Cutting is usually regulated by specifying the number or proportion of trees of particular sizes to retain within each area, thereby maintaining a planned distribution of size classes. Cutting methods that develop and maintain uneven-aged stands are single-tree selection and group selection.

Urban Interface. An area characterized by an intermingling of residential private land with DoD lands.

V

Vegetation management. The management of vegetation by practices such as grazing, prescribed burning, herbicide use, timber harvesting, and tree planting or removal to meet wildlife, visual, timber, recreational, watershed or other management objectives.

Viable population. A population that has adequate numbers and dispersion of reproductive individuals to ensure the continued existence of the species population on the planning area.

Viewshed. A viewshed is a portion of a landscape visible from one or more vantage points.

Visual Resource. The composite of basic terrain, geologic features, water features, vegetative patterns, and land-use effects that typify a land unit and influence the visual appeal the unit may have for visitors.

W

Watchable Wildlife Area. Areas identified under the Watchable Wildlife Program as suitable for passive recreational uses such as bird watching, nature study, and other nonconsumptive uses of wildlife resources.

Watershed. The total area above a given point on a stream that contributes water to the flow at that point.

Wetland. Areas that are inundated by surface water or groundwater with a frequency sufficient to support, and under normal circumstances do or would support, a prevalence of vegetation or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands include swamps, bogs, marshes, and similar areas such as mud flats, natural ponds, sloughs, potholes, river overflows, and wet meadows.

Wildland fire. Any fire not ignited as a prescribed fire. A wildland fire may in certain conditions be managed for resource benefits. All other wildland fires must be suppressed, but the full range of suppression responses is allowable.

Wildlife and Fish user-day (WFUD). A unit of measure that represents one person hunting or viewing wildlife for a 12-hour period or fishing for a 4-hour period.

Wildlife structure. A site-specific improvement of a wildlife or fish habitat.

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APPENDIX A RELEVANT LAWS AND REGULATIONS

National Historic Preservation Act of 1966 (NHPA)

Resource Conservation and Recovery Act of 1976 (RCRA)

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)

Clean Water Act (CWA)

Clean Air Act (CAA)

Migratory Bird Treaty Act

Endangered Species Act Of 1973 (ESA)

Executive Order (EO) 11514, Protection and Enhancement of Environmental Quality

Executive Order (EO) 11644, ORV Management

Executive Order (EO) 11988, Floodplain Management

Executive Order (EO) 11989, ORV Management

Executive Order (EO) 11990, Protection of Wetlands

Executive Order (EO) 12898, Environmental Justice

Executive Order (EO) 13186 Responsibilities of Federal Agencies to Protect Migratory Birds

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APPENDIX B THE PLANNING PROCESS

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Step 1 – Identify the Issues

Issues, both those from the public and from management concerns, drive the development of the plan. Clearly defined and well-framed issues are used to develop the goals, objectives, and standards that give purpose to the Plan. An Interdisciplinary Team (IDT) first brainstormed a list of issues at APAFR, the issues were framed as questions to be answered, and then reviewed by an internal group of stakeholders: military commanders, resource professionals, and Major Command representatives. The list of issues included those raised by the public in the past, adjacent landowners, other federal and state agencies, and non-governmental organizations. Some of those issues included:

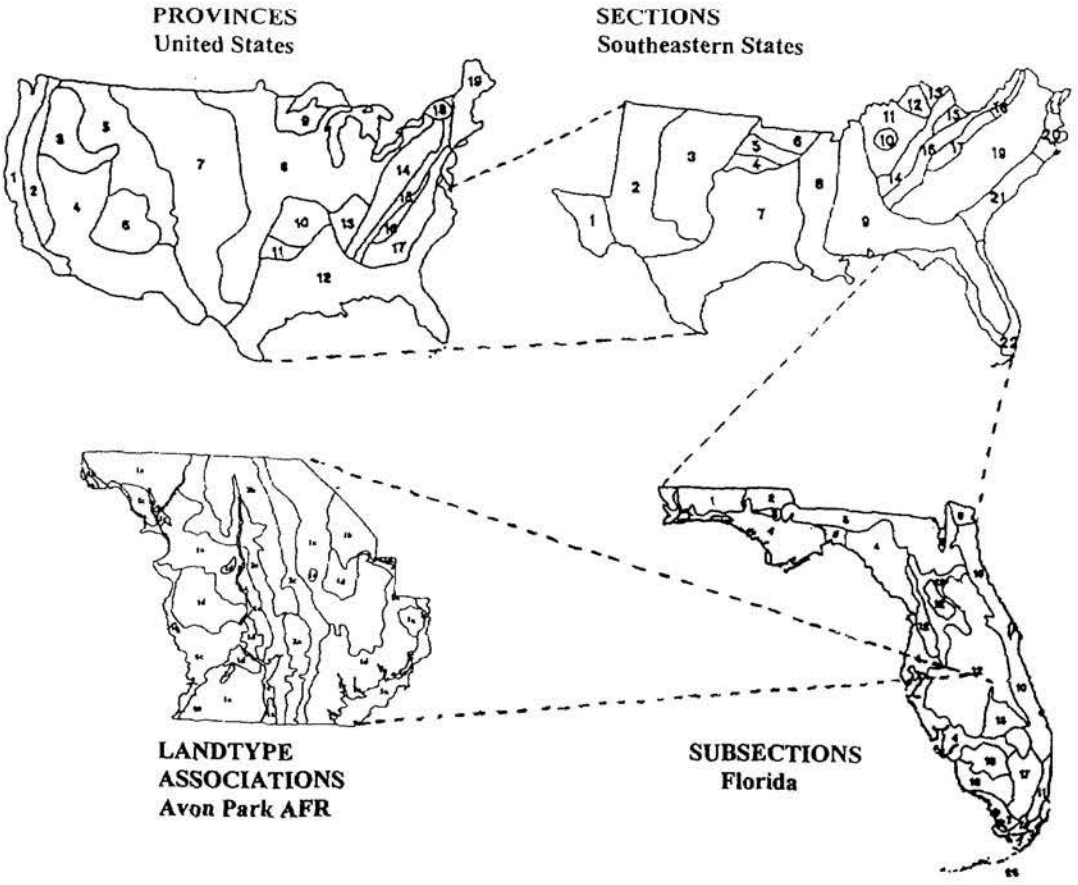
- What ecological communities should be restored and maintained at APAFR and what methods and management practices should be used?
- How should we manage at the landscape level to maintain biodiversity, species richness, and hydrological integrity and reduce fragmentation of habitats?
- How should we manage natural stands of longleaf and slash pine?
- What is the role of cattle in maintaining vegetative communities, and how should their impacts to ground cover be managed?
- What fire regimes and fire return intervals are appropriate for each ecosystem, and what strategies can be used to achieve these?
- How should we achieve habitat and population goals of Proposed, Endangered, and Threatened species and game and nongame species without adding constraints to the military mission?
- How do we maintain a realistic, natural military training environment?
- How should we manage the natural resources in closed areas?
- How will continued urban encroachment effect lands surrounding APAFR?
- What would be an appropriate and reasonable access for the public?

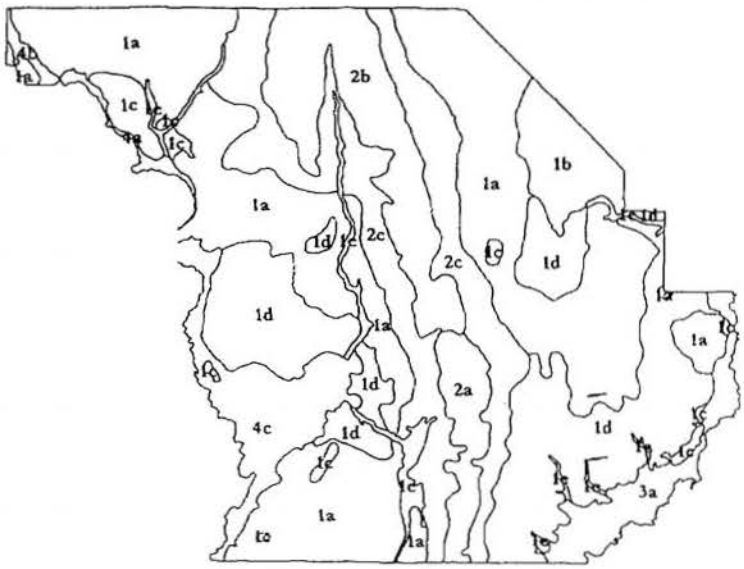
Step 2 – Prepare Ecological Classification System

An ecological classification system is a systematic procedure, within a hierarchical framework, for delineating, naming, and describing units of land with management significance and ecological integrity.

The purpose of a classification system is to stratify land into homogeneous resource units, facilitating the development of desired future conditions and their allocation to Management Areas.

The hierarchy of units is portrayed below with the United States being subdivided into *provinces*, the Southeastern states into *sections*, Florida into *Subsections*, and APAFR into *landtype associations*, the latter unit being the most useful for resource planning purposes. The system also provides a means of describing land capability and predicting resource response to management activities. Below the landtype association, but not shown, are three other units – *landtype, landtype phase*, and *site*. These units are most useful during project planning and implementation.





LANDTYPE ASSOCIATIONS of Avon Park Air Force Range

1. Osceola Plain Natural Subsection
    a. Osceola Plain sandy acidic flatwoods with small circular depressions
    b. Osceola Plain loamy circumneutral flatlands
    c. Osceola Plain isolated sub-xeric sandy rises
    d. Osceola Plain dry prairie
2. Bombing Range Ridge Natural Subsection
    a. Xeric Bombing Range ridgetop
    b. Ridgetop flats and depressions
    c. Bombing Range Ridge sideslopes
3. Kissimmee River Valley Natural Subsection
    a. Kissimmee River Valley
4. Major Floodplain Swamps and Marshes Natural Subsection
    a. Large lakes at the eastern base of the Lake Wales Ridge with swampy margins
    b. Peaty, seepage influenced extensive basin swamps
    c. Stream floodplain swamps and marshes

Step 3 – Develop Desired Future Conditions

A Desired Future Condition is an expression of resource goals that have been set for a unit of land.

Associated with the goals of each desired future condition is a narrative description of the landscape at the point in time when the goals set for it have been achieved. This description is written in terms of physical and biological processes, the environmental setting, and the human experience.

In the planning process, several desired future conditions are developed to provide alternative ways of resolving the issues. For this particular process, the interdisciplinary team developed a set of 15 desired future conditions. Shown below is an example of a desired future condition and the landtype association to which it is applied. Each landtype association may have one or more desired future conditions, depending on the management goals, the military mission, and management constraints. Not all desired future conditions are appropriate for all landtype associations.

Desired Future Condition 4

Goal: To maintain a predominantly natural environment where special aquatic, biotic, historic, or scenic values can be preserved and interpreted for public enjoyment. To provide a place for visitors to view and study wildlife in their natural habitat, where no hunting is permitted. To provide habitat for endangered species.

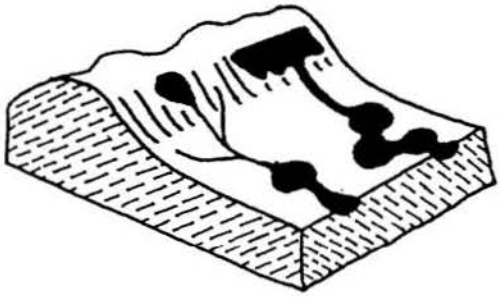
Narrative Description: In this area, ecosystems are in near-natural condition. Natural forces predominate and may have been supplemented by management activities intended to replace interrupted natural forces such as fire. The area provides mid-sized patches of old growth, mainly in cypress domes and bay swamp communities. Sweet bay and cypress dominate the basin swamps.

Hiking trails provide the only access into the interior of the area. Visitors are likely to encounter other people on foot engaging in dispersed activities such as hiking, birdwatching, and nature study. Opportunities exist to interpret the natural world to the public and provide watchable wildlife experiences.

Water, soil, and air are in near pristine condition. There may be heritage resource sites, predominantly along the river. These may be degraded by natural forces – storms, fire and root growth – but management activities have little effect. The visitor sees little evidence of vegetation management activities except those applied for ecosystem restoration, and no military training activity.

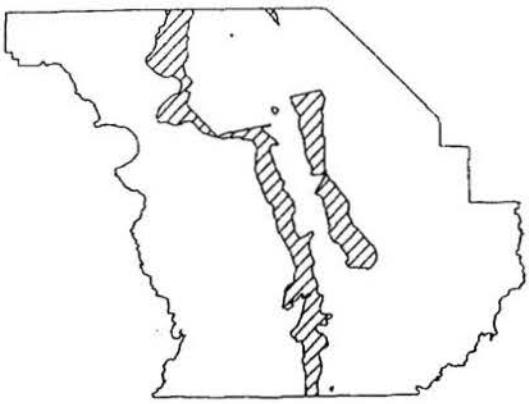
Step 4 – Define Management Areas

When a desired future condition is applied to the landscape (or portion thereof), it is called a Landscape Association, or, in many agencies, a Management Unit or Area. The following diagram illustrates the process of creating these Landscape Associations.



Desired Future Condition 12 **PLUS** **Landscape Assocation 2c**

EQUALS



Management Area 12: Cutthroat Communities

Step 5 – List Management Standards

A management standard is a requirement which focuses or constrains the application of management practices and the use of forest resources for the purpose of achieving the goals described in the desired future condition.

Standards are measurable and capable of being monitored. Their attainment is mandatory. Where a standard needs to be qualified (using terms such as generally, normally, where possible, and where appropriate), the qualifying circumstances and exceptions need to be fully described.

A standard may take one of three forms:

- **Forest health standard** - which is a general parameter and an associated indicator whose value characterizes an aspect of forest health within the desired future condition.

Example: Turbidity is a parameter of water quality. Its value may be stated through the use of an indicator such as Nephelometric Turbidy Units. Expressed as a standard, one would say that in Desired Future Condition X, "management practices will not result in a turbidity level that exceeds 29 NTUs above the natural background level."

- **Management practice standard** – which is a requirement imposed on a management practice for the purpose of meeting the goals of a desired future condition or to mitigate the impact of a management practice or resource use on other resources.

Example:" Mechanical site preparation, fertilization, herbidice and insecticide application, plowed firelines, and timber access roads will not be permitted within primary riparian management zones."

- **Resource use standard** – which is a requirement that focuses or constrains the use of forest resources by the public.

Example: "Camping is permitted only in designated campsites."

Installation-wide Standards

The interdisciplinary team developed a list of standards for each desired future condition. Some standards relating to the implementation of management practices were found to be the same regardless of the desired future condition; these standards were consolidated into a section labeled "Installation-wide Standards". Standards which varied from one desired future condition to another were placed under each Landscape Association they applied to.

Following are some installation-wide standards developed for APAFR:

Fire -4: Severely eroded disk lines will be rehabilitated.

Heritage Resources –1: The use of metal detectors is prohibited.

Infrastructure -1: No new roads, fences, or plowed firelines will be constructed.

Range Management -2: Cattle feeders will not be placed within 200' of a road or trail.

Recreation -3: Camping is permitted only in designated campgrounds and campsites.

Vegetation -14: Locations of cogon grass will be herbicided at least 3 times per year.

Wildlife –22: Within Florida scrub jay territorial habitats, pine trees greater than 20' in height will not exceed 10 trees per acre.

Standards Specific to Landscape Associations

Many standards and guidelines pertain just to specific ecosystems or plant communities. For each Landscape Association at APAFR, a set of management standards and guidelines were developed to indicate how management is different in each of these areas. These standards take precedence over the Installation-wide standards because they are meant to achieve a specific condition or to protect a specific value associated with that Landscape Association.

Below are examples of standards for Landscape Association 4, Sandy Point Wildlife Refuge. In general, Installation-wide standards apply to this area, but they are supplement with these specific sandards.

Landscape Association 4
Sandy Point Wildlife Refuge

Access
4.1 –Roads are closed to privately owned vehicles.

Fire
4.2 –Schedule prescribed fire during spring growing season to promote an open understory.

4.3 –Suppress all fire in the 2-acre xeric shrub area.

Infrastructure
4.6 –The southern road through Sandy Point Wildlife Refuge will be obliterated.

4.7 –Culverts will be removed from the main administrative road and low water crossings will be installed.

Range Management
4.9 –Cattle feeders are permitted only in oak hammocks and will be 200' away from hiking trails.

Step 6 – Prepare Alternatives

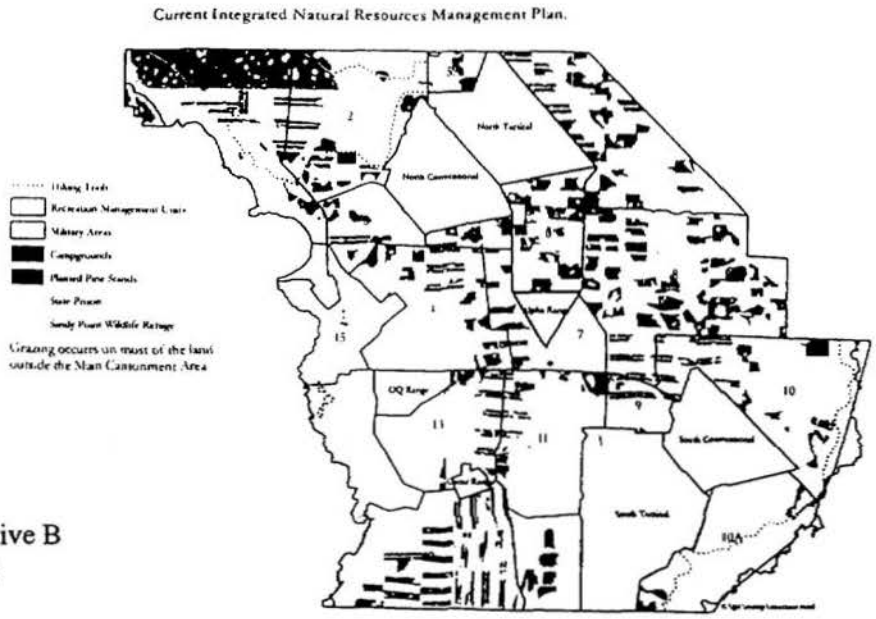
An alternative is a set of goals and objectives that is designed to respond to issues in a particular manner.

Goals area expressed for each Landscape Association (with their associated desired future conditions) while objectives are expressed as resource outputs and proposed management practices. For each alternative, Landscape Associations are applied to each ecosystem in a unique combination. There are two types of alternatives – the "no action" and the "issue responsive" or action alternatives. Any particular alternative will most likely contain some but not all of the desired future conditions that were developed at the beginning of the process.

The "No Action" Alternative

The purpose of the no action alternative is to reflect the existing allocation of Management Areas or Units on APAFR. It also reflects the existing levels of outputs and management practices and estimates the possible outputs in the future is current INRMP allocations and practices were to continue. It is, basically, the status quo.

Shown below is a map that portrays, hypothetically, the arrangement of desired future conditions as they might exist on APAFR under the current INRMP.

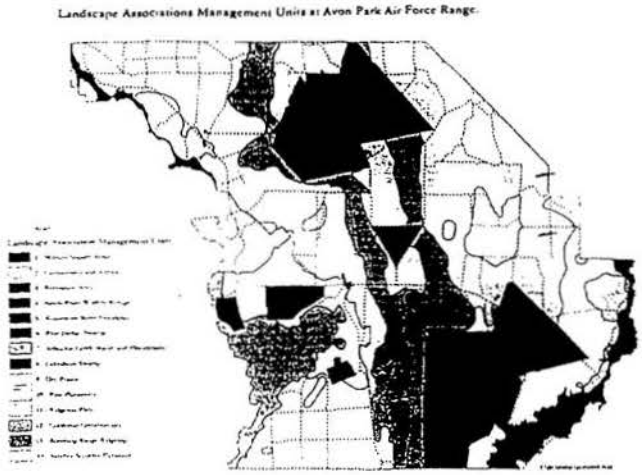


Alternative B
APAFR

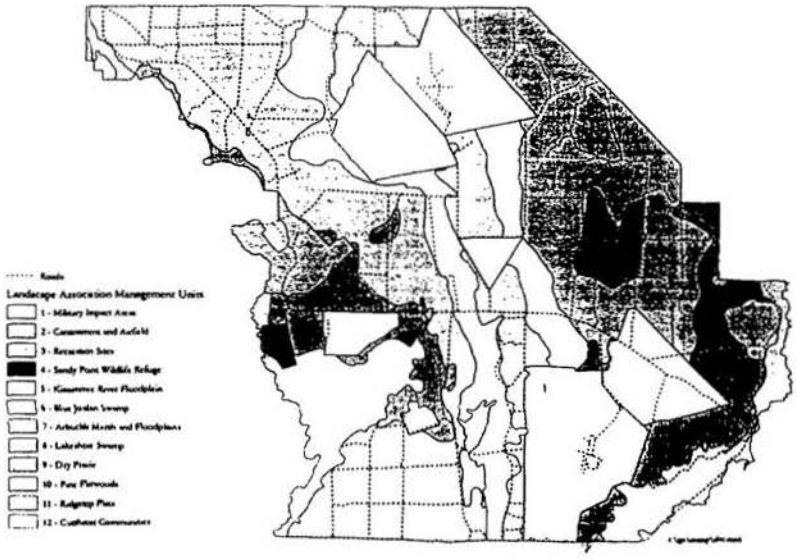
The "Issue Responsive" Alternatives

Also sometimes referred to as the "action" alternatives, these reflect unifying themes that respond to the issue in different ways. The themes were translated into alternatives by allocating desired future conditions to landscape associations in a manner that best satisfied the requirements of the themes.

PROPOSED ACTION: ECOSYSTEM MANAGEMENT



ALTERNATIVE C: PRESERVATION OR RESTORATION OF NATIVE ECO-SYSTEMS THEME



Step 7 – Conduct Analysis

These alternatives became the basis for the analysis of environmental effects within the environmental assessment (EA). From this set of described alternatives, the deciding official will select a preferred alternative that best meets the needs of achieving the mission of APAFR.

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APPENDIX C NATURAL SUBSECTIONS AND THEIR LANDSCAPE ASSOCIATIONS AT AVON PARK AIR FORCE RANGE

Table B-1. The Landscape Associations of APAFR

1. Osceola Plain Natural Subsection

a. Sandy acidic flatwoods with small circular depressions landscape association

b. Loamy circumneutral flatlands landscape association

c. Isolated sub-xeric sandy rises landscape associaiton

d. Dry prairie landscape association

2. Bombing Range Ridge Natural Subsection

a. Xeric ridgetop landscape association

b. Ridgetop flats and depressions landscape association

c. Ridge sideslopes landscape association

3. Kissimmee River Valley Natural Subsection

a. Kissimmee River Valley landscape association

4. Major Floodplain Swamps and Marshes Natural Subsection

a. Large lakes at the eastern base of the Lake Wales Ridge with swampy margins landscape association

b. Peaty, seepage influenced extensive basin swamps landscape association

c. Stream floodplain swamps and marshes landscape association

LANDSCAPE ASSOCIATIONS OF APAFR BY NATURAL SUBSECTION

1. Osceola Plain Natural Subsection

1a. Sandy acidic flatwoods with small circular depressions landscape association

Physiography: Mostly the Osceola Plain lying west of the Bombing Range Ridge, with a smaller area northeast of the Ridge, generally above the 65 foot contour line. More common association further northward and eastward in Polk and Osceola counties.

Soil Associations: Characterized by the Smyrna - Myakka - Immokalee soil association of the Polk County soil survey and the Myakka - Immokalee - Smyrna association of the Highlands County soil survey. Most common soil series arranged along a gradient from driest to wettest include Immokalee, Myakka, Smyrna, Basinger, and Placid, with Myakka occupying the greatest extent.

Natural Community Types Present: The predominant natural community is mesic flatwoods, or mesic longleaf pine savanna, with extensive areas of wetland pine savanna, wet prairies, depression marshes, and dome swamps (usually pond cypress dominated). Slight sandy rises support small areas of dry-mesic sandy to scrubby flatwoods, but these are very minor in total extent.

Identifying Natural Features: Easily identified by the very low topographic relief, and mostly internal drainage pattern, with few herbaceous sloughs connecting the depressional wetlands. Examination of soils indicate acidic soil conditions from top to bottom of the soil profile, and from driest to wettest areas in the landscape association.

Vegetation Mosaics: The predominant vegetation type is open-canopied longleaf pine flatwoods, where very slight variations in elevation produce distinct soil-correlated moisture zones. Very slight sandy rises have small patches of scrubby flatwoods (sometimes referred to as “scrub” when trees are absent), broader areas of slightly less xeric sands have “dry-mesic sandy

flatwoods", grading into typical mesic longleaf pine flatwoods on broader flats. A wet-mesic flatwoods zone often occurs where there is a broad ecotone to wetlands, and wet flatwoods areas occur in slight depressional areas. The landscape is covered with scattered mostly isolated wetlands, known as depression marshes and dome swamps.

Topography: Extremely flat, poorly drained plains, with little overall slope and few to no streams or large drainage features. Small shallow depressions are very abundant, but these depressions are no more than 5 feet deep, with the edges of the depression falling only a few inches in elevation from the flat plain.

Hydrologic Units: Mostly consists of poorly drained Spodosols, with much seasonal variation in water table. Most of the landscape is saturated to or very near the soil surface, or shallowly inundated, at the height of the rainy season, but water tables retreat in the dry season so that only the center zones of the depression marshes and dome swamps have water near or above the surface during the driest periods.

Original Land Surveys: This landscape association is often referred to as "Third rate pine" on the 1855-1859 public land surveys. It is distinguished from prairie associations by the presence of pines as witness trees for section corners, although these are often at long distances from the corners, indicating an open pine savanna landscape.

Potential subdivisions or questions: There may or may not be differences between areas with dome swamps in the depressions rather than depression marshes. There seems to have been a significant increase in the cypress dominance of depressions between 1941 and the present, which tends to indicate that at least some dome swamps may have formed from former depression marshes with less frequent or intense fire.

1b. Loamy circumneutral flatwoods landscape association

Physiography: That area of the Osceola Plain consisting of flat, poorly drained plains dissected by numerous shallow, mostly herbaceous dominated, flowways and open marshy drainageways,

generally with relatively few isolated depression marshes and dome swamps in comparison to the previous association. This association is found mostly in the northeastern part of APAFR, associated with draingeways flowing north and east to the Kissimmee River.

Soil Associations: Mostly included in the Malabar - EauGallie - Valkaria soil association of the Polk County soil survey. Not differentiated in the Highlands County part of APAFR, but could compare to the Felda-Hicoria-Malabar soil association, in part. More variable in soil gradients from dry to wet than the acidic flatwoods, and the circumneutral subsoil areas outcrop only in parts of the area. Two typical gradients occur from dry to wet, one which is similar to the previous association until the drainageways are reached (Immokalee - Myakka - Smyrna - Basinger - Felda - Winder), and one which reflects areas with loamy subsoils which distinguish this landscape association (Immokalee - EauGallie - Oldsmar - Malabar - Felda - Winder).

Natural Community Types Present: The predominant upland vegetation type is mesic longleaf pine savanna, generally with less areas of wet flatwoods and wet prairies than the acidic flatwoods association. Drainageways are characterized by deep herbaceous marshes, with slight flow rather than being depression marshes, and with scattered stands of wetland trees (swamp black gum, *Nyssa sylvatica* var. *biflora* and sweet bay, *Magnolia virginiana*) in the deeper centers of the drainages. Ecotonal areas between the flatwoods and drainageways have “sweet flatwoods”, with scattered slash pine and cabbage palms, and a distinct calciphilic herbaceous flora.

Identifying Natural Features: Most easily recognized by the drainage pattern, with numerous flowways which have deeper areas resembling basin marshes, and which downstream merge into herbaceous sloughs. Soils are more variable, but with a significant portion of the area having loamy to sandy clay, circumneutral, subsoil layers.

Vegetation Mosaics: The community type of the inter-drainage flats is generally mesic longleaf pine savanna, with areas of wetland slash pine or slash pine - cabbage palm (*Pinus elliotti* var. *densa - Sabal palmetto*)savannas in lower areas. These are broken by shallow connected drainage ways with open herbaceous marsh vegetation, so shallow as to be more like wet prairies in

composition. As drainageways deepen, more deeper vegetation zones, including sawgrass (*Cladium jamaicense*) zones, become more common. Occasional mesic and hydric hardwood hammocks are found where drainageways offer natural fire protection. At the ecotones between the mesic and hydric areas in this association, just below the saw palmetto (*Serenoa repens*) zone in most cases, there is often an area of increased soil pH, with central to South Florida calciphilic plant species being more evident.

Topography: Mostly consists of a very dissected low plain, almost giving the effect of islands of upland in a matrix of wetland strands and sloughs. Has a much more defined drainage pattern than is typical for the Osceola Plain, often with a shorter ecotonal area between flatwoods and deeper wetlands, which can consist of short, rather abrupt slope rather than a gradual decline.

Hydrologic Units: The "upland" areas are composed of poorly drained Spodosols and Alfisols, with much seasonal fluctuation in water tables. The presence of many defined drainageways may move water off of these areas a bit faster than in the landscape association which has mostly isolated depression marshes. The drainagways have flowing water for most of the year.

Original Land Surveys: This landscape association seems transitional between "Third rate pine" and "Prairie" on the 1855-1859 public land surveys. From near the northeast border of the base, most of area between the base boundary and the Kissimmee River floodplain was mapped as "Prairie" on the original land surveys. On APAFR, there seemed to be an interdigitation of prairie and pineland within this association, with most of the areas as pineland except for Sections 27, 28, 33, and 34, T32S, R31E. The transition to a mostly prairie landscape within this association seems to roughly correlated with the eastern border of the base.

1c. Isolated sub-xeric sandy islands landscape association

Physiography: Consists of small areas of better drained sandy soils on the Osceola Plain, usually associated with the upper edges of the escarpments to large drainage features, such as the Kissimmee River, Arbuckle Creek, and Lake Arbuckle. Similar areas are also found associated

with streams on the east side of the Kissimmee River and on the west side of the Kissimmee River along US 98 to the south of APAFR

Soil Associations: Corresponds to the Archbold - Satellite soil association, in part, in the Polk County soil survey (although neither of these soils is usually present). Corresponds to the Satellite- Archbold - Pomello association in Highlands County, in part. The most common soil series of this association is Pomello, a moderately well drained soil, with some areas of Duette and Narcoossee soil series. The outer fringes of this association tend to grade into Immokalee and Myakka soils.

Natural Community Types Present: The most common community type is Scrubby Flatwoods, grading downslope to dry-mesic sandy flatwoods. Many of these areas are mapped by other systems as “Oak Scrub” or even “Sand Pine Scrub”. However, they do not precisely fit the definition of either scrub or scrubby flatwoods, but have more characteristics in common with scrubby flatwoods than scrub. Treeless areas in this association differ from typical scrubby flatwoods only in the absence of a pine canopy, and can be thought of as a treeless variant of this community.

Identifying Natural Features: Easily recognized as small areas of with the presence of scrub oaks, mixed with ericaceous shrubs, with or without a pine canopy, not associated with the Bombing Range Ridge. The presence of herbaceous species indicative of seasonally saturated soils serves to easily distinguish this association from true scrub, which has open patches of excessively drained white sandy soil and does not support any wetland herbs Also, this association lacks the narrow scrub endemic plant or vertebrate species, including such widespread and characteristic species as garberia, (*Garberia heterophylla*), scrub bay (*Persea borbonia* var. *humilis)*, and the Florida scrub lizard (*Sceloporus woodi*). Also, in contrast to scrub, there are few to no white sandy openings within this association except along cleared roadsides. Openings tend to be vegetated by wiregrass and other grasses.

Vegetation Mosaics: Current vegetation includes patches of dense scrub oaks and fetterbushes on the highest elevations, with or without scattered longleaf or slash pine. Some areas long

protected from fire could become invaded by sand pine. Lower elevations surrounding the patches grade into dry-mesic sandy flatwoods.

Topography: The scrubby flatwoods patches occur on very slight rises within the dry prairie matrix, often only a few feet above the surroundings. They often appear more elevated due to the taller groundcover - shrub layer, but the rise is only a few feet. Overall, there seems to be a very slight elevational rise from the upslope side, but a substantial elevation drop (from 5 to 20 feet) at the downslope side of patches of this association. The patches tend to be more concentrated near the drainage escarpments of major streams and lakes and at high points along the Kissimmee River escarpment.

Hydrologic Units: Presumably, the proximity of a major drainage feature serves to more quickly lower the water table after rain events, and therefore reduces the duration of soil saturation, even though a spodic layer (hardpan) is present in these soils at depths from 35 to 42 inches. Therefore, these are the best drained sites off of the Bombing Range Ridge on APAFR, even though they have a seasonal water table to within a few feet of the surface.

Original Land Surveys: These areas area mostly too small to have been delineated on the 1855-1859 public land surveys, although one area on the east side of Lake Arbuckle was noted as “third rate scrub” and a few “scrub and hammock” areas were noted along the Kissimmee River Escarpment.

1d. Dry prairie landscape association

Physiography: Consists of flat areas of the Osceola Plain with depression marshes and few surface drainage features, generally found southeast of the Bombing Range Ridge (mostly in Echo and Charlie Ranges on APAFR), and west of the Ridge just north of Arbuckle Marsh. More extensive on the east side of the Kissimmee River in Okeechobee County.

Soil Associations: Corresponds to the Malabar - EauGallie - Valkaria soil association of the Polk County soil survey, in part. In Highlands County, corresponds to the Oldsmar - EauGallie -

Pomona soil association and part of the Felda - Hicoria - Malabar soil association. Typical soil gradient from dry to wet within this landscape association is EauGallie - Oldsmar - Malabar - Hicoria - Bradenton - Felda. There are also areas mapped as Spodosols (Myakka to Basinger) within APAFR on the Echo Range portion of this association.

Natural Community Types Present: The predominant natural community type is "dry prairie", which actually represents moisture zones from dry-mesic to wet prairie, linked together only in being generally treeless. Variation in moisture results in several distinct herbaceous communities within this association, basically with the ground cover composition similar to that of dry-mesic sandy, mesic, wet-mesic, and wet flatwoods. Depression marshes within this association are similar in composition to those of the acidic Osceola Plain flatwoods association.

Identifying Natural Features: Basically distinguished by the generally treeless landscape, and by a tendency to have more area with Alfisols than Spodosols. The treeless condition seems to be a long term pattern, as discussed under "Original Land Surveys".

Vegetation Mosaics: The highest areas within this landscape have a dry-mesic sandy prairie type, with some open sand present during the year of burning, and few wetland plants. The typic dry prairie has a mixture of wetland and upland plants, the most conspicuous of these species being the co-occurrence of dwarf live oak (*Quercus minima*) and Elliott's yellow-eyed grass (*Xyris elliottii*). As wetter areas are reached, there tends to be an increase in such wet-mesic species as toothache grass (*Ctenium aromaticum*) and coastal-plain yellow-eyed grass (*Xyris ambigua*). Wet prairie areas within the dry prairie matrix are common, and there are many depression marshes which are easily recognized. Some depressions are cypress dominated, and a very few have other trees dominant. The calciphilic fringe present in the loamy circumnetural flatwoods landscape association is absent from this association, despite the similar soil composition.

Topography: Developed on flat plains, generally below the 65 foot elevation contour, with many small shallow depressions. It is unclear why this association is lower than elevation than the other Osceola Plain associations, but it may be due to the proximity of major drainages to these areas (Arbuckle Creek and Marsh, Kissimmee River).

Hydrologic Units: Similar hydrology to the acidic flatwoods association, but perhaps holding water slightly longer during wet periods due to the loamy to clayey subsoils and generally lower landscape position. Poorly developed surface drainage features, and developed on poorly drained Alfisols and Spodosols.

Original Land Surveys: A very surprising result of examination of the 1855-1859 public land surveys is that most of the extensive areas of this landscape association in the current landscape were mapped as "Prairie" in the original surveys. Prairie was actually somewhat more extensive in the 1850's than in the present day. Most surveyors drew the boundary between prairie and pineland on the original land survey plats, and this was confirmed by the presence or absence of witness trees for the section corners and section line midpoints. Surveyors were also careful to note when they transited from pineland to prairie. Based on these facts, we can assume that the extent of prairie delineated by the original land survey is a fairly accurate picture of the landscape of the 1850's. Since there had been no widespread logging in central Florida as of that date, we can assume that this represents the best picture available of the extent of prairie in the pre-settlement landscape. Frequent fires would have been required to maintain this extent of open prairie, and with reduction of fire frequency and intensity, even within APAFR and much more so in the surrounding areas, some of this landscape has been invaded by pines.

1e. Minor perennial streams/sloughs, and adjacent hammock fringes and/or ecotonal seepage areas landscape association

Physiography: Incised, usually rather linear, creek valleys and other drainage features in the Osceola Plain, of sufficient size and protection from fire to have some associated hardwood hammocks and/or swamp forests. Examples on APAFR include Morgan Hole Creek, Willingham Branch, some other small tributaries of the Kissimmee River in the southeast part of the base, Tomlin Gully, and perhaps Long Cypress Slash.

Soil Associations: These areas are mostly too small to be mapped at the soil association level. Specific soils are sometimes rather specific to this association, such as Anclote - Basinger

association, frequently flooded, and Placid, frequently flooded. The Long Cypress Slash is mapped as the Samsula - Hontoon - Sanibel soil association.

Natural Community Types Present: Very variable, highly dependent on the size of the stream and floodplain, and the duration of the hydroperiod of the draingeway. The smaller stream floodplains are dominated by live oak, which indicate the short duration of flood events. Slightly wetter floodplains have more of a hydric hammock vegetation, with a mixture of live oak (*Quercus virginiana*), swamp laurel oak (*Quercus laurifolia*), and cabbage palm (*Sabal palmetto*). Longer indundated swamps are found in some areas. Long Cypress Slash is a linear flowway with a very long hydroperiod, dominated by pond cypress (*Taxodium ascendens*). Some drainageways have ecotonal seepage areas above the drainageway, and some have mesic hammock fringes above the active floodplain.

Identifying Natural Features: Usually large enough features to be designated as perennial (soils blue line) streams on topographic maps, with an associated forested narrow floodplain.

Vegetation Mosaics: Sometimes this association has a rather gradual transition to herbaceous dominated flowways in the upper reaches of the stream valley. There also are sometimes several narrow vegetation zones between the upper edge of the drainageway-associated topographic drop and the stream channel, including seepage areas, mesic hammock, hydric hammock, swamp forest, and the stream channel.

Topography: Relatively (for an Osceola Plain feature) deeply incised draingeways, usually with five feet or more of elevation drop from the top of the sideslope to the stream channel

Hydrologic Units: The unifying feature of this association is frequent flooding from overbank flow, as opposed to the depression-basin hydrology of other Osceola Plain associations. Flooding may be very short duration in some systems, and much longer in others. Some areas may be rather sandy and dry when water levels are low.

Original Land Surveys: Most of the 1855-1859 public land surveys were careful to indicate when stream channels were crossed, and to indicate the width of the channel along the section lines. However, the delineation of the routes taken by streams between the section lines were not always accurate, since these would have sometimes been difficult to distinguish from a distance. Many of these features were also too small to have been crossed by many section lines. Long Cypress Slash existed as a deep cypress stand in the 1850's, as in the present day.

Possible subdivisions: There may be one than one association represented here, but they have been lumped for convenience and due to their small extent. Possible subdivisions include creek floodplains, mesic hammock fringes, ecotonal slight seepage areas, and swamp forest strands.

2. Bombing Range Ridge Natural Subsection

2a. Xeric ridgetop landscape association

Physiography: Consists of that portion of the Bombing Range Ridge with few depressions or wetlands, (these small and rather isolated) - seems to be restricted to the southern third of the ridge, all in Highlands County, extending from near the southern border of APAFR to just north of Little Lake. It is presumed that this part of the ridge is the geologically most recent section, and consequently is the least dissected portion of the Ridge.

Soil Associations: Corresponds to the Satellite - Archbold - Pomello association in the Highlands County soil survey. The soils of this association are almost exclusively, from driest to least dry, Archbold, Satellite, and Pomello, except for a few small rather isolated depression ponds and two permanent water lakes.

Natural Community Types Present: This is the only landscape association on APAFR where the predominant vegetation type is true “scrub”, which is represented by sand pine scrub, oak scrub, and some areas of rather open sandy oak and rosemary (*Ceratiola ericoides*) scrub. Interspersed with the scrub areas are areas of scrubby flatwoods, and a small but significant area of longleaf pine / turkey oak sandhill. There are very few areas of cutthroat grass (*Panicum abscissum*)

communities interspersed in the scrub - scrubby flatwoods matrix on this part of the Bombing Range Ridge.

Identifying Natural Features: The rather narrow xeric ridgetop with few to no interspersed cutthroat grass communities is characteristic of this association. This is generally not the highest part of the Bombing Range Ridge, but is the consistently best drained due to its narrow width.

Vegetation Mosaics: This association is a mosaic of scrub and scrubby flatwoods communities. The current pattern on APAFR shows more tree and shrub cover, and less open sand, than that of the 1943 aerial photos. The only high quality example of longleaf pine sandhill on APAFR (and one of the few remaining quality examples in all of Highlands County) occurs in this association. It is found on the southern part of the Bombing Range Ridge at APAFR, and grades into scrubby flatwoods.

Topography: Almost flat to slightly rolling ridgetop, with a gradual increase in elevation northward. Only the upper slope of the sloping portion of the ridge on both the east and west side are within this association, with the sideslope association beginning with the upslope end of cutthroat grass communities. The ridgetop is punctuated by a few small depressions, two of which (Little Lake and Submarine Lake) are permanent water bodies.

Hydrologic Units: Mostly well drained to excessively drained deep sandy soils, with the water table several feet below the soil surface, even in the wet season, except for the few small depressions.

Original Land Surveys: The 1855-1859 public land surveys often noted the presence of this high sandy ridge. Most of the area within this association corresponds to the area shown as forested on the original land surveys. This is in contrast to only scattered patches shown as forested to the north of this association. This could reflect the fact that more patches of sand pine and longleaf pine sandhills were present than of scrub oak.

2b. Ridgetop flats and depressions landscape association

Physiography: Consists of the area of the Bombing Range Ridge with fewer xeric areas, and more wetlands. It often consists of alternating narrow, north-south oriented xeric ridges and broad swales between these ridges mostly supporting cutthroat grass communities. This association is found mostly on the Polk County side of the ridge and the northern part of the Highlands county portion of the ridge.

Soil Associations: Correlates with the alternating areas of the Satellite - Archbold - Pomello and Basinger - St. Johns - Placid soil associations of the Highlands County soil survey. In Polk County, consists of the mapped areas of the Archbold - Satellite soil association and the adjacent areas of the Smyrna - Myakka - Immokalee soil association, which are not differentiated in the Bombing Range Ridge subsection from the surrounding Osceola Plain landscape. There is much alternation of xeric, mesic, and hydric soil types in this association, in an undulating landscape pattern. A typical soil catena from dry to wet in this association would be Satellite - Immokalee - Myakka - Basinger - St. Johns - Placid - Hontoon, with Pomello, Narcoossee, and Pompano soils also common. Only a few areas within this association have the extremely xeric Archbold and Astatula soils.

Natural Community Types Present: Very variable, consisting of narrow, usually linear northwest to southeast trending ridges of oak scrub, intermediate areas of scrubby and mesic flatwoods, and broad flats with cutthroat grass lawns and occasional seepage slopes. Several deep peaty depression marshes are also found in this association, usually with cutthroat grass margins. Sand pine stands are found on the highest and broadest areas of deep sandy ridges.

Identifying Natural Features: The alternating bands of xeric and wetland communities at high elevations (almost all over 115 feet elevation) distinguish this association, which mixes the communities of the xeric ridgetop association of Highlands County with those of the Bombing Range Ridge sideslopes association. In some cases in this association oak scrub is found adjacent to and at a *lower* (rather than higher) elevation than the adjacent cutthroat grass communities.

Vegetation Mosaics: Complex, due to variation in hydrology and soil types, and the dissection of the landscape which results in variation in fire frequency and intensity over short distances. A key species in shaping the vegetation pattern is cutthroat grass, which has a broad hydrological tolerance in this association, and dominates the groundcover of several community types.

Topography: Developed on relatively flat areas of the ridgetop of the Bombing Range Ridge, where the ridge is so wide as to be somewhat poorly drained in many areas. There is an undulating pattern of short, abrupt ridges in some areas, with about 5 feet of local relief over short distances. There are broad shallow depressions on the ridgetop which support nearly permanent water bodies. This association tends to stop at the end of the upper slope portion of the Ridge escarpment, where the sideslope association begins.

Hydrologic Units: Very variable, from a few areas of excessively drained sandy soils, rather large expanses of moderately well drained to somewhat poorly drained scrubby flatwoods and dry-mesic sandy flatwoods, seepage-influenced cutthroat grass lawns and seepage slopes, and shallow basins fed by a combination of runoff and seepage which support peaty margined depression marshes. There is much alternation of xeric, mesic, and hydric soil types, in an undulating landscape pattern.

Original Land Surveys: The most notable result of examination of the 1855-1859 public land surveys for this association is that only a few rather small areas are indicated as “scrub” or “spruce (= sand pine)” dominated. These tend to correlate rather well with the largest areas of sand pine and oak scrub within this association at present. Much of the remainder of this landscape was open pineland, with enough bearing trees to mark most section corners. The original notes for this area have not been examined, and they could shed more light on the distribution of pine versus oak scrub within this association.

2c. Ridge sideslopes landscape association

Physiography: Occurring only on the east and west slopes of the Bombing Range Ridge, generally from about two-thirds of the way up the slope, all the way to the slope base and

slightly beyond into the seepage-influenced flats at the base of the slope. A similar association likely once occurred on the Lake Wales Ridge and perhaps on other central Florida ridges. However, due to long-term fire suppression, these other ridges have much different vegetation, and mostly lack the open, herbaceous seepage slopes characteristic of this association on the Bombing Range Ridge.

Soil Associations: The Highlands county soil survey delineates a particular soil association, Basinger - St. Johns - Placid, to accommodate the variation present in this landscape association. This is also the specific soil mapping unit used in Highlands County to map the majority of the land in this association, with a few of the wettest depressions being mapped as Hontoon or Sanibel soils. This association is not differentiated in the Polk County soil survey, and this landscape association is just mapped as part of the Smyrna - Myakka - Immokalee soil association. Within Polk County, the most common soil catena of this association would be, from least wet to wettest, Myakka - Smyrna - St. Johns - Basinger - Sanibel.

Natural Community Types Present: This association is characterized by the overwhelming domination of the groundcover by cutthroat grass, one of the very few sod-forming native grasses of the eastern United States. There is more area of cutthroat grass cover in this landscape association than anywhere else in its range. Twelve distinct cutthroat grass seepage slope zones have been defined in this association, as well as cutthroat grass dominated mesic flatwoods, wet flatwoods, and wet prairies (Orzell and Bridges 1995, Bridges and Orzell 1994, 1995a, 1995b, 1998a). The only other major community in this association are occasional bayheads in areas protected from frequent fire or with deeper peat soils, these mostly dominated by loblolly bay (*Gordonia lasianthus*).

Identifying Natural Features: This association is recognized by the presence of cutthroat grass in association with the sideslopes or slope base of the Bombing Range Ridge. It can easily be recognized on color aerial photos by the distinctive tan color of cutthroat grass, often with linear striations parallel to the slope corresponding to variation in seepage slope zones. Peaty flowways, sometimes with defined channels, are occasionally found draining these areas perpendicular to the slope of the ridge.

Vegetation Mosaics: In general, the driest cutthroat communities tend to be the ones furthest upslope, with the wettest seepage slopes present near mid-slope. On the lower slope, there is a gradual transition from cutthroat seepage slopes to typical mesic to wet flatwoods or wet prairies in most areas. However, in other areas there is a broad band of cutthroat dominated flatwoods at the lower slope or slope base. There are sometimes large seepage-influenced bayheads associated with the slope base at APAFR, the two largest of these are the Deadens Pine Swamp and Bills Bay. Along the base of some areas of the slope at APAFR (particularly evident on the west edge of Echo Range and the south edge of Bravo Range) there is a curious line of peaty small depression marshes, with nearly permanent standing water, surrounded by cutthroat grass.

Topography: This association has the greatest topographic relief of any landscape association at APAFR. Where it is best developed, there is a 40 to 50 foot drop in elevation within a distance of less than a mile within this association. The slope is evident in some areas, although it is never more than a few percent slope. The regular sideslope is broken by mostly cutthroat grass dominated drainageways perpendicular to the slope. The cutthroat grass communities at the slope base are quite flat, and appear much like the Osceola Plain topographically.

Hydrologic Units: This association is more hydrologically influenced by diffuse lateral groundwater seepage than any other association on APAFR, and in present-day conditions, than any other association in all of peninsular Florida. More obligate seepage-dependent species are found in this association than in any other area of Florida south of Clay County. This seepage hydrologic regime is in stark contrast to the perched and apparent surface hydrology of the surrounding Osceola Plain. There is much less variation in water table between dry and wet seasons within this association, with the most extreme seepage slopes being saturated to the surface year round but never with more than a few inches of surface water.

Original Land Surveys: Most of this association was not noted as distinct on the 1855-1859 public land surveys. However, it should be noted that the Deadens was indicated as a “Bay & Pine Swamp” on the original surveys, indicating its long term forested condition, and that it was not just a seepage slope or cutthroat flatwoods which had been more recently invaded by trees.

Bills Bay and the other major bayheads on the east slope of the ridge also show as forested on the original land surveys.

Potential subdivisions: There is so much variation in landform within this association that several subdivisions are possible. There may be differences in conditions between the east and west sides of the slope, between the sideslopes and the slope base, and between the relatively steep slopes of the southern half of the Ridge and the relatively gentle slopes of the north half. There may also be differences between areas with distinct slope features, such as the lines of peaty depression marshes at the slope base, or areas with forested wetlands at the slope base (such as the Deadens Pine Swamp) at APAFR.

3. Kissimmee River Valley Natural Subsection

Physiography: The Kissimmee River floodplain, and the slope break to the floodplain, including the mesic and hydric hammocks associated with the floodplain escarpment, but not the xeric hammocks and scrubby flatwoods immediately adjacent to the upland edge of the escarpment (these are included in Osceola Plain isolated sub-xeric sandy islands landscape association 1c.). The Kissimmee River floodplain has a pronounced escarpment within APAFR.

Soil Associations: The Kissimmee River floodplain is mapped as the Kaliga - Tequesta - Gator soil association in Highlands County and the Nittaw - Kaliga - Chobee soil association in Polk County. The escarpment is not mapped at the soil association level, however, the most typically associated soils are Felda and Basinger.

Natural Community Types Present: The channelization of the Kissimmee River has greatly altered the composition of the floodplain marshes. There are still some deep marshes near the south end of APAFR, and in the deeper sloughs near the Kissimmee River, however, most of the floodplain is now occupied by shallow, infrequently flooded marshes. One hypothesis is that each vegetation zone has been moving waterward since channelization, and that this process may reverse when the “ditch” is filled and the floodplain is reclaimed by the river. The outer marsh zones should be mostly sand cordgrass (*Spartina bakeri*), with few to no shrubs (i.e., no wax

myrtle, *Myrica cerifera*) or trees. The treeline at the edge of the floodplain is mostly live oak, with an open understory due to occasional (pre-channelization) flooding of this zone.

Identifying Natural Features: The flat river floodplain is rather apparent, and the live oak escarpment is clearly recognizable on topographic maps, aerial photos and in the field. The side tributaries are not included in this association, above their lower reaches which are flooded by the Kissimmee River backwaters.

Vegetation Mosaics: The vegetation mosaic in this association has been extremely altered by the effects of channelization and reduced hydroperiod. Generally, sawgrass (*Cladium jamaicense*) marshes occupy the deepest zones, with patches of pickerelweed (*Pontederia cordata*) and arrowhead (*Sagittaria lanceolata*) in intermediate marshes. There is much patchiness due to the clonal nature of the dominant marsh species. The shallow zones of the marsh would have been mostly sand cordgrass, but with reduced hydroperiod much of this area is now dominated by broomsedge (*Andropogon virginicus* var. *virginicus*), big carpet grass (*Axonopus furcatus*), and wax myrtle. Oaks have also invaded into the shallow marsh edges, however, the original line of larger live oaks at the historical floodplain edge is usually discernable, particularly on 1943 aerial photographs. Occasional deep depression marshes are found within the shallow marsh edges, and some hydric hammocks are found where side tributaries meet the floodplain.

Topography: Includes most area below the 50 foot contour along the Kissimmee River. This will later be compared to the estimated historical 100-year floodplain line established by SFWMD to correlate this elevation. A few mesic hammocks are found immediately above this line where there is some natural protection from fire, particularly when scrubby flatwoods areas are found immediately west of the escarpment. The actual escarpment elevation is rarely more than 5 feet.

Hydrologic Units: Characterized as being influenced by a major river floodplain, with frequent flood events of long duration, and with much of the floodplain having standing water for most of the year. The historical 100-year floodplain elevation would fall *within*, rather than at the waterward edge of, the zone of live oak dominance. Flooding has been much reduced at the marsh edges by channelization of the river.

Original Land Surveys: Most surveyors of the 1855-1859 public land surveys make it quite clear when they reach the floodplain of the Kissimmee River, calling much of it “deeply inundated marsh”, “River bog and marsh”, and “Impracticable saw grass marsh”. There are few references to trees, only in a few areas were willow and maple trees used as bearing trees.

Potential Subdivisions: Although at present this Natural Subsection is considered as a single landscape association for APAFR, it could possibly be divided into three landscape associations:

- Kissimmee River floodplain marsh association
- Kissimmee River escarpment fringing oak hammock association
- Kissimmee River escarpment sand ridges (scrubby flatwoods, xeric hammock) (now included within association 1c. Osceola Plain sub-xeric ridges)

4. Major Floodplain Swamps and Marshes Natural Subsection

4a. Large lakes at the eastern base of the Lake Wales Ridge with swampy margin landscape association

Physiography: Consists of large lakes which lie entirely within the Osceola Plain, but which are influenced by proximity to the eastern base of the Lake Wales Ridge. These include Lake Arbuckle on APAFR, and also include Lake Weohyakapka, Lake Istopoga, and Lake Rosalie. These lakes lack the sandy margins of Lake Wales Ridge Lakes, but instead have swampy margins. The large lakes of the Kissimmee Chain of Lakes to the north (south to Lake Kissimmee and Tiger Lake) are similar in some ways, but are not included in this association.

Soil Associations: The lake proper is not mapped in the soil survey, but the associated margin is mapped as the Samsula - Hontoon soil association, which characterizes the deep organic soil margin of the lakeshore swamps. The most common soil types mapped in this association on APAFR are Samsula (most characteristic), and Placid and Myakka, depressional.

Natural Community Types Present: Lake Arbuckle is a large, open water body. It currently has a rather broad band of deep lakeshore marsh, however, no marshy margin is present on the 1941-1943 aerial photography, which may indicate that the lakeshore marsh is the result of lowering and regulation of water levels. A band of deeply inundated cypress (*Taxodium distichum*) swamp forest, with some red maple (*Acer rubrum*), is characteristic. Some areas along the lake have a deeply inundated hydric hammock zone above the swamp forest, and higher islands in this zone, naturally protected from fire, have some small areas of natural mesic hammock.

Identifying Natural Features: This lake type is recognized by the swampy margin, usually having a cypress dominated swamp forest, with no exposed sandy margins. The particular characteristics of this association may also be influenced by the proximity of these lakes to the base of the Lake Wales Ridge, and the contribution of diffuse seepage and seepage-fed streams (i.e. - Livingston Creek, Blue Jordan Swamp) to the water sources for the lake.

Vegetation Mosaics: Rather easily defined concentric zones of vegetation with decreasing inundation from the lake, beginning with deep lakeshore marsh, cypress swamp forest (inundated for 3 feet or more at high lake stages), hydric hammocks, mesic hammock, and a gradual to abrupt transition to Osceola Plain acidic flatwoods or sub-xeric sandy rises associations.

Topography: A large, northwest to southeast oriented lake basin, with tributary streams, and Arbuckle Creek as a large stream outlet. Rather little elevation drop to the lake on the east side (ca. 10 to 15 feet from the Osceola Plain elevation), but with a more pronounced drop on the western (Lake Wales Ridge)side, up to 50 feet drop within a 1600 foot distance.

Hydrologic Units: Almost all of this landscape association is inundated during the summer wet season. During the dry season, most of the hydric hammock and swamp forest fringe is above the lake level, but the lakeshore marsh is inundated year-round.

Original Land Surveys: There are some mentions of “bay and cypress” trees along the margin of Lake Arbuckle in the 1855-1859 public land survey, and some areas are called “third rate swamp”. More interesting is the fact that no lakeshore marsh zone is mentioned in these surveys,

nor is lakeshore marsh evident on 1941-1943 aerial photography. The existence of the marsh may be due to lowering and regulation of water levels in these lakes.

4b. Peaty, seepage influenced extensive basin swamps landscape association

Physiography: Extensive basin swamps generally found at the base of the eastern slope of the Lake Wales Ridge, with the only example on APAFR being Blue Jordan Swamp. Another example near the base of the Lake Wales Ridge is Weokyakapka Creek. Blue Jordan Swamp is related to the Lake Marion Creek, Reedy Creek, Snell Creek, and Davenport Creek swamps, which occur further north in Polk and Osceola counties, but not as rich in hydric hammock species as these drainages.

Soil Associations: Corresponds to the Samsula - Hontoon soil association of the Polk County soil survey. The most common soil type mapped is Hontoon (Typic Medisaprists), a deep muck soil series.

Natural Community Types Present: The most common community type of this association is a deeply inundated sweet bay (*Magnolia virginiana*) dominated bay swamp. There are some strands of cypress in the deeper areas. In some areas there are fringing mesic and hydric hammocks, with some seepage species in the ground cover. Occasionally, small seepage areas are found at the junction between the upslope pine plantations and this association. Several plant species are restricted to this association within APAFR, most at or near the southern limit of their range.

Identifying Natural Features: Swampy draingeways with more bay than cypress dominance, generally due to more influence of diffuse lateral groundwater seepage than extensive flooding. This is perhaps due to the proximity of these swamps to the eastern edge of the Lake Wales Ridge.

Vegetation Mosaics: There is a mixture of zones of sweet bay and cypress dominance within Blue Jordan Swamp, with the cypress zones presumably corresponding to the deeper, more

distinct flowways. The hydric hammock and mesic hammock margins are significant due to the slight seepage effects in these communities, the only case where there are slightly seepy hammocks on APAFR. There may have once been open seepage slopes associated with this margin, but only tiny fragments indicating the former species of this community remain.

Topography: On the western side, and the southwest side within APAFR, there is only a about a five foot drop from the surrounding Osceola Plain acidic flatwoods to Blue Jordan Swamp. However, only a half-mile due west of the base boundary the Lake Wales Ridge rises over 20 feet immediately above Blue Jordan Swamp. There seem be some depressional areas within the swamp which hold water for long periods.

Hydrologic Units: This association is characterized by a combination of diffuse seepage and surface water drainage hydrology. This combination has produced deep peat soils which are permanently saturated or inundated, and provide a constantly moist and humid microclimate. This association is perhaps the closest that the Lake Wales Ridge comes to effecting the natural vegetation of APAFR, by its large hydrologic contribution to this swamp.

Original Land Surveys: The 1855-1859 public land survey refers to Blue Jordan Swamp as a "low, inundated bay swamp", which is its current composition.

4c. Stream floodplain swamps and marshes landscape association

Physiography: Major streams and associated swamps and marshes which are primarily fed by surface runoff, with little seepage influence. Stream valleys which are mostly marshy with scattered cypress swamps and hydric hammock fringes. Arbuckle Creek and its associated Arbuckle Marsh is the only example on APAFR.

Soil Associations: The primary soil association mapped for this landscape association in the Highlands County soil survey is Kaliga - Tequesta - Gator with the deeper marsh and swamp areas mapped as Samsula - Hontoon - Sanibel soil association. The most common soil series mapped are Kaliga, Samsula, Chobee, and Hontoon.

Natural Community Types Present: The predominant natural community types of this association are deep basin marsh, floodplain swamp forest, and blackwater stream. There are hydric and mesic hammock fringes in the upper part of the creek valley, just south of the entrance to APAFR. There was much less cypress and much more sawgrass dominance in Arbuckle Marsh in the 1850's and the 1940's than at present, indicating that this marsh should be considered very closely associated with the stream floodplain of Arbuckle Creek. The outer zones of Arbuckle Marsh have been greatly changed by altered hydrology, but probably very gradually merged into the surrounding Osceola Plain dry prairie association on the north and east sides of the marsh.

Identifying Natural Features: This stream floodplain type is intermediate between the small stream/slough type on the Osceola Plain (1e) and the Kissimmee River Valley. It is separated from the Kissimmee River Valley by having less seasonal variation in water levels, and from the small stream valleys by having long periods of extensive overbank flooding. All streams are somewhat different from each other in this part of Florida, which is relatively depauperate in surface streams due to the low topographic relief.

Vegetation Mosaics: This type of stream floodplain does not support a continuous floodplain forest or swamp, but rather has large marshy areas and only isolated strands of cypress swamp and other forest types. Originally, sawgrass marsh was probably the most common vegetation within the floodplain, but this has been altered by the construction of a dike across Arbuckle Marsh and the alteration of floodplain hydrology at APAFR. Hydric hammocks were rather restricted along the length of the Arbuckle Creek floodplain at APAFR.

Topography: This association is a broad and rather flat stream valley, dropping only about one foot per mile. All of the stream valley and associated hammocks lies below the 55 foot contour, and most is below the 50 foot contour by the southern boundary of the base. There is a slight seepage slope above the floodplain edge in the southwest portion of the base.

Hydrologic Units: This association is characterized by frequent, long-term flooding, with much of the marsh areas having nearly permanent inundation. Some of the hydric hammocks and

cypress swamps are above the creek water level during the winter dry season, and at these times the creek retreats to its channel in a few places.

Original Land Surveys: The 1855-1859 public land surveys show the predominant vegetation type in most of this association to be “Impracticable saw grass swamp”, indicating an open marsh condition for most of the area. No cypress is indicated in Arbuckle Marsh except at the very southern end near where it meets Arbuckle Creek. Cypress is common along the creek from this point southward. Just south of the entrance to APAFR there is “second rate swamp” indicated, the only swamp in these townships not considered “third rate”. Presumably, this may be due to this area having larger cypress trees, or having a mixture of oaks and other trees with the cypress.

Potential subdivisions: At first glance, one may be tempted to divide Arbuckle Marsh and Arbuckle Creek into two separate associations, but examination of original land survey records and even aerial photographs from 1941-1943 indicate that these two merged together much more imperceptibly than at present. Therefore they were combined into this association. It is possible that the escarpment hammocks and seepage slopes could be recognized as a separate association.

LANDSCAPE ASSOCIATION MANAGEMENT AREAS

LAMA 1: Military Impact Areas

This area includes all active air-to-ground targets and ranges.

LAMA 2: Cantonment and Airfield

This area includes the buildings and grounds of the former base and the airfield, and includes the rim canal that is the boundary. This area is where urban forestry programs will be emphasized.

LAMA 3: Recreation Sites

This includes all campgrounds on APAFR.

LAMA 4: Sandy Point Wildlife Refuge

This is an area of the Range where hunting has been prohibited since the 1950s and is used by the public for wildlife viewing, hiking, and nature study.

LAMA 5: Kissimmee River Floodplain

This area of marsh ecosystems and live oak hammocks is greatly influenced by the hydrology of the Kissimmee River, which has been restored in part to its original channel and part is still channelized. The spoil banks act as an effective barrier for this part of the Range.

LAMA 6: Blue Jordan Swamp

This is a unique swamp ecosystem that has experienced very little influence from humans, containing the only known populations of some rare plant species and is an outstanding example of a swamp ecosystem.

LAMA 7: Arbuckle Creek Marsh and Floodplain

This floodplain marsh covers an extensive portion of the land base and is a major component of surface hydrology on APAFR. Included are the headwaters of the Morgan Creek and Tomlin Gully drainages.

LAMA 8: Lakeshore Swamp

Lake Arbuckle is a key topographical feature of Polk County. The lake governs the hydrology of parts of APAFR.

LAMA 9: Dry Prairie

Dry prairies are representative of south central Florida and this ecosystem is a significant component of APAFR. Several plant and animal species have evolved to utilize the open environment of the prairies.

LAMA 10: Pine Flatwoods

This is an area of native slash and longleaf pine primarily in large patches. It is within Red cockaded-Woodpecker (RCW) Habitat Management Units (HMUs) and rotation ages are 100 years for slash pine and 120 years for longleaf. Natural longleaf and slash pine stands are managed under unevenage management.

LAMA 11: Ridgetop Flats

This is the high, flat ridgetop of the Bombing Range Ridge, a topographic feature of south central Florida. RCW and Florida scrub-jay (FSJ) management is emphasized and forest range from sand pine to slash and longleaf, with a diverse patch structure.

LAMA 12: Cutthroat Seeps

This area of the mid-slope on Bombing Range Ridge contains a dominant ground cover of cutthroat grass with slash and longleaf in natural stands and plantations.

LAMA 13: Bombing Range Ridgetop

This is an area dedicated to the FSJ and primarily maintained in scrub habitats. It is located on the ridgetops of the Bombing Range Ridge on the southern portion of the Range.

LAMA 14: Isolated Scrubby Flatlands

These slight sandy rises are scattered across the APAFR landscape and are comprised of a unique mix of scrubby flatwoods, sandhills, sand pine scrub, oak scrub, and longleaf pine natural stands and slash plantations.

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APPENDIX D INVASIVE EXOTIC SPECIES AT APAFR

Category I	
Scientific Name	**Common Name**
Casuarina glauca	Suckering A. pine
Dioscorea bulbifera	Air-potato
Eichhornia crassipes	Water-hyacinth
Eugenia uniflora	Surinam-cherry
Hydrilla verticillata	Hydrilla
Hymenachne amplexicaulis	West Indian marsh grass
Imperata cylindrica	Cogon grass
Lantana camara	Lantana
Ligustrum sinense	Chinese privet
Lygodium japonicum	Japanese climbing fern
Lygodium microphyllum	Old World climbing fern
Macfadyena unguis-cati	Cat's-claw vine
Melaleuca quinquenervia	Melaleuca
Nephrolepis multiflora	Asian sword fern
Panicum repens	Torpedo grass
Pistia stratiotes	Water-lettuce
Psidium cattleianum	Strawberry guava
Rhodomyrtus tomentosa	Downy rose-myrtle
Ruellia brittoniana	Mexican petunia
Schinus terebinthifolius	Brazillian pepper
Solanum viarum	Tropical soda apple
Syngonium podophyllum	Arrowhead vine
Tradescantia spathacea	Oyster plant
Urochloa mutica	Para grass
Category II	
Scientific Name	**Common Name**
Althernathera philoxeroides	Alligator weed
Limnophila sessiliflora	Asian marshweed
Phoenix reclinata	Senegal date palm
Pteris vittata	Chinese brake fern
Rhynchelytrum repens	Natal grass
Sansevieria hyacinthoides	Bowstring hemp
Urena lobata	Ceasar's weed
Xanthosoma sagittifolium	Elephant ear

Category I: Invasive exotics that are altering native plant communities by displacing native species, changing community structures or ecological functions, or hybridizing with natives.

Category II: Invasive exotics that have increased in abundance or frequency but have not yet altered Florida plant communities to the extent shown by Category I species.

APPENDIX E LISTED SPECIES AT AVON PARK AIR FORCE RANGE

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TABLE E-1: LIST OF RARE, THREATENED OR ENDANGERED ANIMALS AT APAFR.

SCIENTIFIC NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	GLOBAL RANK	STATE RANK
Birds					
Ammodramus savannarum	Florida grasshopper sparrow	LE	LE	G4T1	S1
Aphelocoma coerulescens	Florida scrub jay	LT	LT	G5T3	S3
Picoides borealis	Red-cockaded woodpecker	LT	LT	G2	S2
Grus Canadensis pratensis	Florida sandhill crane	LT		G5T2G3	S2S3
Polyborus plancus	Crested caracara	LT	LT	G5	S2
Aimophila aestivalis	Bachman's sparrow			G3	S3
Mycteria americana	Wood stork	LE	LE	G4	S2
Haliaeetus leucocephalus	Bald eagle	LE	LT	G3	S2S3
Pandion haliaetus	Osprey		LS	G5	S3S4
Elanoides forficatus	American swallow-tailed kite			G5	S2S3
Athene cunicularia floridana	Florida burrowing owl		LS	G5T3	S3
Falco sparverius paulus	Southeastern American Kestrel		LT	G5T3T4	S3
Ajaia ajaja	Roseate spoonbill		LS	G5	S2S3
Rostrhamus sociabilis	Snail kite	LE	LE	G4T1	S1
Sterna antillarum	Least tern		LT	G4	S3
Mammals					
Felis concolor coryi	Florida panther	LE	LE	G4T1	S1
Podomys floridanus	Florida mouse		LS	G3	S3
Sciurus niger sherman	Shermans fox squirrel		LS	G5T2	S2
Ursus americanus floridans	Florida black bear		LT	G5T2	S2
Sorex longirostris longirostris	Southeastern shrew			G5T5	S4
Neofiber alleni	Round-tailed muskrat		C2	G3	S3
Mustela frenata peninsuiae	Florida long-tailed weasel		3C	G5T3	S3

SCIENTIFIC NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	GLOBAL RANK	STATE RANK
Reptiles and Amphibians					
Drymarchon corais couperi	Eastern indigo snake	LT	LT	G4T3	S3
Gopherus polyphemus	Gopher tortoise		LS	G2	S2
Sceloporus woodi	Florida scrub lizard			G3	S3
Pituophis melanoleucus mugitus	Florida pine snake		LS	G5T3	S3
Rana areolata	Gopher Frog		LS	G5	S3
Neoseps reynoldsi	Sand skink	LT	LT	G2	S2
Alligator mississippiensis	American alligator	LTSA	LS	G5	S4
Eumeces egregious lividus	Blue-tailed mole skink	LT	LT	G4T2	S2
Arachnids					
Sosippus placidus	Lake Placid Wolf spider				
Insects					
Anomala eximia	Archbold anomala scarab beetle				
Aphodius troglodytes	Aphodius tortoise scarab beetle				
Asaphomyia floridensis	Florida asaphomyian tabinid fly				
Cicindella scabrosa	Scrub tiger beetle		G1	S1	
Copris gopheri	Copris tortoise commensal scarab				
Serica frosti	Frost's spring cerican scarab				
Trigonopeltastes floridana	Scrub palmetto flower scarab				
Trox howelli	Caracara commensal scarab				
Cicindela highlandensis	Highlands Tiger beetle	C			

TABLE E-2. LIST OF RARE, THREATENED, OR ENDANGERED PLANTS KNOWN TO OCCUR ON APAFR.

SCIENTIFIC NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	GLOBAL RANK	STATE RANK
*Aristida rhizomophora**	Florida threeawn	N	N	G2	S2
Asclepias curtissii	Curtiss' milkweed	N	LE	G3	S3
Clitoria fragrans	Pigeon-wing	LT	LT	G3	S3
*Coelorachis tuberculosa**	Piedmont jointgrass		N	G3	S3
*Gymnopogon chapmanianus**	Chapman's skeletongrass	N	N	G2	S2
Hartwrightia floridana	Hartwrightia		LT	G2	S2
*Hypericum edisonianum**	Edison's ascyrum		LT	G2	S2
*Justicia angusta**	Everglades water willow	N	N	G2	S2
Lechea cernua	Nodding pinweed	3C	LE	G3	S3
*Lilium catesbaei**	Southern red lily	N	LT	G4	S3
*Matelea floridana**	Florida spiny-pod		LE	G2	S2
Ophioglossum palmatum	Hand fern	3C	LE	G2	S2
Panicum abscissum	Cutthroat grass		LT	G2	S2
*Platanthera integra**	Yellow fringeless orchid	3C	LT	G3G4	S3S4
Polygonella basiramia	Hairy jointweed	LE	LE	G3	S3
*Pteroglossaspis ecristata**	A wild coco		LT	G3G4	S2
*Rhynchosia cinerea**	Brown-haired snoutbean	3C	N	G3	S3
*Rhynchospora decurrens**	Decurrent beakrush		N	G3G4	S2
*Schizachyrium niveum**	Scrub bluestem		N	G1	S1
*Stillingia sylvatica ssp. tenuis**	A queen's delight		N	G4G5T2	S2

* = denotes the 13 FNAI listed plants not previously recorded in the FNAI data-base prior to this inventory.

Federal Status: N=none; LE=federally endangered; LT=federally threatened; C=Candidate species for federal listing; 3C=plants that have been proven to be more abundant or widespread than previously thought

State Status: N=none; LE=state endangered; LT=state threatened

Global Rank: G1=critically imperiled globally, 1-5 populations; G2=imperiled globally, 6-20 populations; G3=very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (e.g., a single physiographic region) or because of other factors making it vulnerable to extinction, 21-100 populations; G4=apparently secure globally, though it may be quite rare in parts of its range, 100-1000 populations; G5=demonstrably secure globally, though it may be quite rare in parts of its range; 1000+ populations.

T#=the rank of a subspecies or variety; as an example, G4T1 would apply to a subspecies or variety with an overall species rank of G4, but the subtaxon with a rank of G1.

State Rank: S1=critically imperiled in the state, 1-5 populations; S2=imperiled in the state, 6-20 populations; S3=rare or uncommon in the state, 21-100 populations; S4=apparently secure in the state, 100-1000+ populations

GLOBALLY SIGNIFICANT PLANTS

Aristida rhizomophora (Poaceae)
Asclepias curtissii (Asclepiadaceae)
Clitoria fragrans (Fabaceae: Leguminosae)
Coelorachis tuberculosa (Poaceae)
Gymnopogon chapmanianus (Poaceae)
Hartwrightia floridana (Asteraceae)
Hypericum edisonianum (Hypericaceae)
Justicia angusta (Acanthaceae)
Lechea cernua (Cistaceae)
Matelea floridana (Asclepiadaceae)
Ophioglossum palmatum (Ophioglossaceae)
Panicum abscissum (Poaceae)
Polygonella basiramia (Polygonaceae)
Rhynchosia cinerea (Fabaceae: Leguminosae)
Rhynchospora brachychaeta (Cyperaceae)
Schizachyrium niveum (Poaceae)

STATE RARE PLANTS

Dicranopteris flexuosa (Gleicheniaceae)
Pteroglossaspis ecristata (Orchidaceae)
Rhynchospora decurrens (Cyperaceae)
Rhynchospora eximia (Cyperaceae)
Stillingia sylvatica ssp. tenuis (Euphorbiaceae)

REGIONALLY RARE / HABITAT SPECIFIC PLANTS

Eleocharis tuberculosa (Cyperaceae)
Lilium catesbaei (Liliaceae)
Myrica heterophylla (Myricaceae)
Platanthera blephariglottis var. conspicua (Orchidaceae)
Platanthera integra (Orcchidae)
Rhynchospora oligantha (Cyperaceae)
Zigadenus densus (Liliaceae)

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APPENDIX F SUMMARY OF PUBLIC INVOLVEMENT

Public Comments on Draft INRMP, Draft EA, and Draft FONSI and Responses

Summary of Public Involvement

Public Involvement is a key part of the planning process for any federal or state agency. Public comment helps identify how people want public lands managed and what form of goods, services, and environmental conditions they might expect from them. Issues brought up by the public, by other federal agencies, and by adjacent landowners guide the need to change current management strategies.

August, 2002 – Preliminary stakeholder meeting held to gather input on issues, concerns and opportunities to be addressed in the revision of the Integrated Natural Resources Plan. Other federal and state agencies, military operations, tribal governments, and cooperators and partners contributed input on the planning process, issues, and goals for the Revised Plan.

August, 2002 – Environmental Flight developed a mailing list of interested parties, other federal and state agencies, tribal governments, and cooperators. A presentation at the Restoration Advisory Board meeting informed local citizens and other agencies that APAFR is revising its INRMP and seeking input.

November, 2002 – Articles in the local newspapers of record (Highlands Today, Sebring, and the News Sun, Avon Park) informed the public of the planning process and management alternatives and seeking input on how they think the natural resources of APAFR should be managed.

November, 2002 – A public workshop was held in the city of Avon Park to provide information to the public about the Integrated Natural Resources Plan, preliminary alternatives for management of those natural resources, and to solicit input.

December 2002 – Draft INRMP, EA and FONSI completed and sent to printer.

January, 2003 – Draft copy of the Revised Plan is provided to other federal and state agencies, tribal governments, and partners for comment.

January, 20023– Press Release sent to newspapers to notify the public that the Draft Integrated Natural Resources Plan for APAFR has been completed and the Draft INRMP and Draft Environmental Assessment is available for a 30-day review and comment.

Coordination with Other Public Planning

Coordination with Federal, State, Local and Tribal governments occurred throughout the planning process. Affected government agencies were contacted during the scoping period and the Florida State Clearinghouse was notified of activities for circulation among State agencies. A preliminary stakeholder meeting was held to discuss the direction of the planning process and to seek input on the issues.

Public Comments and APAFR Responses

Resp. #	Name	Organization or Agency
1	Kevin Porteck	HQ AFCEE
2	Kent Wimmer	Florida Trail Association
3	James Slack	US Fish and Wildlife Service
4	Bobbie C. Billie	Seminole Nation
5	James Sabo	ACC/CEOO
6	William H. Harding	Florida Army National Guard
7	Reed Bowman	Archbold Biological Station
8	Dr. Terry Bayshore	HQ AFCEE
9	Mary Huffman	The Nature Conservancy

Resp #	Com #	Name	Comment	Response
0000: General Comments on INRMP				
3	2	Slack, J.	Comment: Guidance in the SAIA specifies that time frames for specific actions should be identified. While time frames do appear in the discussions of monitoring the standards and guidelines, we recommend you incorporate them into resource goals and objectives as well. We also recommend that you consider incorporating additional objectives that establish a closer link with the standards and guidelines that you propose.	Response: The INRMP has a life span of 5 years, and as stated on page 2-1 of the Goals and Objectives chapter, all objectives are designed to be achieved within the 5-year planning period. Timeframes in the Monitoring Plan are designed to ensure we are making progress towards achieving the objectives within that time. In addition, Table 5-1 links goals and objectives with their time frames for accomplishment.

3	12	Slack, J.	Comment: We recommend APAFR include ongoing and planned research involving federally-listed species and those species considered rare or imperiled. APAFR has a long history of supporting innovative research and management involving this type of activity. Inclusion in the INRMP will demonstrate APAFR's commitment to aiding conservation of listed species.	Reponse:Annually, APAFR conservation budget funds numerous studies on rare species and plant community research. APAFR does indeed have a long history of supporting and funding innovative research on rare or imperiled species and plant communities. There have been numerous studies on animals such as the crested caracara, snail kite, RCW, Florida scrub-jay, Florida grasshopper sparrow, bald eagle, indigo snake, Florida scrub lizard, herpetogaunal studies, and many other studies. We have included a sentence in the document to emphasize this commitment. Botanical studies on rare plants and their communities are on-going. These include community-level research on seepage slopes, dry prairie, xeric uplands and the Kissimmee River marshes. In addition, APAFR has funded studies and publications on several plants recognized as "new to science". The biodiversity program contributes to the Florida of Florida project by donating herbarium specimens. This program also assists graduate students and other researchers with studies on Florida plants and natural communities. Plant community research funded and conducted in the region have resulted in completion of two community characterizations published in the South Florida Multi-Species Recovery Plan by the USFWS.
3	14	Slack, J.	Comment: Will the ESP be included as an Appendix?	Response: No. Endangered Species Plan for APAFR is incorporated by reference (INRMP, page 1-4).
3	15	Slack, J.	Comment: Do you plan to provide more introductory information about the Range? Chapter 3 of the draft EA provides all the basic stuff.	Response: Much of the introductory and background information on the Range, as well as the natural resource programs, appears in the EA instead of the INRMP in order to streamline the INRMP.

5	2	Sabo, J.	Comment: No Forest Management Component Plan is included in the INRMP Appendices as required by AFI 32-7064,8.1.2. Recommend that you include this component plan with the following items (see respondent letter #5).	Response: Individual resource component plans have not been included because all of the requirements for each program have been integrated throughout the document in goals, objectives, standards and guidelines.
5	5	Sabo, J.	Comment: A copy of the Grounds Maintenance Statement of Work should be included as a Component Plan attachment in the INRMP Appendices.	Response: Grounds Maintenance work program is included in the Pest Management Plan, Appendix E. Standards regarding Grounds Maintenance also appear in LAMA 2, Cantonment and Airfield.
6	1	Harding, W.	Comment: INRMP and EA covers need to have implementation period on them.	Response: Implementation dates have been added to each cover.
6	2	Harding, W.	Comment: A couple of new terms are used: DFC and LAMA. There is no mention of the current terminology of management units as ground military training areas. What terminology will tenants, such as the FLARNG, use as training areas for ground maneuver and field exercises?	Response:The Recreational Management Units or Management Units are purposely omitted from the IRNMP because land management is defined by landscapes, not activity or program. One of the objectives under the INRMP Goal #1 is to develop a user's guide for planning military training. The user's guide will designate training areas. In the interim, current Recreational Management Units are used to designate training areas.
6	8	Harding, W.	Comment: Pictures of high profile protected plant and animal species would make the INRMP more public-friendly for those individuals that may not be familiar with the species.	Response: This is an excellent point. Good quality photos can add to a document, but the IDT felt photos were not necessary for the target audience of this INRMP.

7	2	Bowman et al	Comment: It appears that achieving optimal conditions for silviculture takes precedence over ecosystem management. For example, pine plantations are maintained on a strictly winter burning regime. This fire regime is not consistent with natural fire regimes and results in dramatically different ground cover composition in pine plantations.	Response: The pine plantations must be burned in winter, because a growing season burn would likely destroy them; for this reason, in pine plantations we do not seek to mimic the natural fire regimes but to use fire to reduce woody vegetation and reduce competition, and to promote more sunlight reaching the forest floor for herbaceous species. Pine plantations are crucial to the continued management of APAFR and important to the local economy.
7	3	Bowman et al	Comment: INRMP states that off-site pines will be replaced by native species, but does not state that these will be planted in ecologically appropriate sites. We believe there are some ecosystems in which pine plantations should not exist, such as dry prairies. We belive that the forestry program should stive to achieve a forest structure that is similar in density and distribution to historical conditions. Restocking suitable areas to native, site-specific pines should be emphasized more heavily in the INRMP.	Response: Off-site pines will be harvested and these sites will be allowed to revegetate naturally. Except for the pine plantations, which are primarily there for income production, natural stands are managed on an uneven-aged management structure with no rotation age. We believe that this best represents historical conditions.
7	4	Bowman et al	Comment: Pine plantations should not isolate scrub patches and thereby reduce dispersal probability for the Florida scrub-jays. Ecologically informed, long-term planning is essential for an even-aged approach to be successful. In part, that will epend on long-term planning for endangered species. To mitigate the long-term impact of clearcuts on foraging habitat for RCWs, we agree with the recommendation in the Recovery Plan that suggests clearcuts not exceed 25 acres, and this recommendation should be integrated into the INRMP.	Response:Pine plantations identified in the approved ESP have or will be harvested for scrub jay management. Within a half mile radius of active RCW colonies, the minimum requirements for tree density and size for management will be met. According to our inventory data, there is enough natural timber to meet these requirements and plantation management should not be a factor. Also, 25 acres clearcuts are considered small for commercial forestry operations. We intend to plan ahead and promote natural stands for future benefit of the RCW.

8	1	Bayshore, T.	Comment: Recommend the draft INRMP be organized to follow AFI 32-7064 INRMP Outline in Attachment 2. The INRMP is to include the appropriate Operational Component Plans to meet the management of natural resources.	Response:This INRMP integrates all aspects of the the former Component Plans into the goals, objectives, desired future conditions, and standards and guidelines. The INRMP outline in Attachement 2 is a suggested guide, not a requirement.
8	2	Bayshore, T.	Comment: The ESP should be updated and included in the Final IRMP appendix. Suggest the projects in the ESP be linked to goals, objectives and management strategies in the INRMP.	Response: We have taken the approach of incorporating document by reference instead of increasing the size of the INRMP by adding more appendices. The projects and requirements of the ESP have been translated directly into management standards and practices in the INRMP.
8	3	Bayshore, T.	Comment: To support program and project justifications, recommend discussing in the text of the INRMP the existing cooperatives agreements, compliance agreements, Terms and Conditions of USFWS Biological Opinions, and include copies in the Appendices. NR projects are not outlined by fiscal year for budgeting the 5 year INRMP.	Response: A discussion of cooperative agreements has been added to the Special Uses section of Chapter 3.
8	4	Bayshore, T.	Comment: Suggest noting cooperative natural resources management with other entities. Also, suggest identifying opportunition to leverage USAF and federal and state agency conservation program resources.	Response: The IDT feels this is includes in the new discussion added in Chapter 3 under Special Uses.
8	5	Bayshore, T.	Comment: Recommend linking the INRMP to supporting the current APAFR Range Management Plan (or CRP, Pest Mgmt Plan, BASH Plan). Need to highlight the natural resources constraints on APAFR such as restricted use of multiple launch rocket systems training in any habitat management unit.	Response: A Range Management Plan for APAFR currently does not exist. Both the Pest Management Plan and the BASH Plan are appendices in the INRMP, and are also integrated through standards and guidelines in the LAMAs.

8	6	Bayshore, T.	Comment: Recommend including a section on GIS systems and how it support developing and implementing the INRMP, CRP, Cultural Resources Plan, etc. The current GIS section needs a discussion on data standard: UTM zone, projection, spheroid, accuracy of GPS, etc.	Response: A standard has been added under GIS in Chapter 3 relating to accuracy standards.
8	7	Bayshore, T.	Comment: Recommend that a GIS map be included for each LAMA noting the natural resources management actions/projects (as well as Cultural resources mgt.) and proposed range development projects.	Response: The IDT considered this approach of adding an individual GIS map to each LAMA, but instead chose to display all the LAMAs on one map at the front of the chapter.
8	8	Bayshore, T.	Comment: Suggest discussing the impacts of natural resources program activities on the recovery of T&E species.	Response; The effects of the projects and actions included in the INRMP are discussed in the Draft EA under the alternatives.
8	9	Bayshore, T.	Comment: There is no monitoring of landscape associations for changes. Ecotonal areas between the flatwoods and drainageways have "sweet flatwoods" with scattered slash pine and cabbage palms, and a distinct calciphilic herbaceous flora. Why are these dominant species not monitored for changes to the community?	Response:APAFR currently funds long-term vegetation monitoring of several vegetation types including the calcareous habitats and their associated unique assemblage of plants.
8	10	Bayshore, T.	Comment: Recommend identifying the duties and responsibility of key personnel.	Response: The IDT felt these did not need to be included in a 5-year INRMP, since they are available in other documents.
8	11	Bayshore, T.	Comment: Suggest adding an Outreach Section to layout the efforts to exchange natural resources and range management information with public and local communities.	Response: The IDT feels this would naturally be a part of any cooperative and partnership work governed by cooperative agreements.

8	12	Bayshore, T.	Comment: There is little discussion on monitoring other than the three key listed species plus photo points prior to a burn. What about monitoring other conservation elements for indication of ecosystem health?	Response: Monitoring is both costly and labor intensive. The IDT decided to focus monitoring efforts on those items which would answer the questions "Did we do what we said we would do?"(implementation) and "Does what we did achieve our objectives?" (effectiveness).
8	13	Bayshore, T.	Comment: Neighboring land use is not addressed. Need to discuss APAFR land uses with surrounding public and private land uses. Recommend a discussion on working with local communities to ensure adjacent land uses are compatible.	Response; The IDT feels this would be covered under collaborative and partnership efforts discussed in the Special Uses section of Chapter 3.
8	14	Bayshore, T.	Comment: Need a section on safeguarding sensitive information, such as archaeological data, etc.	Response: This is already in Chapter 3.
8	15	Bayshore, T.	Comment: Replace "Integrated Plan" with "INRMP" throughout the document for consistency.	Response: This change has been made.
8	16	Bayshore, T.	Comment: Elaborate on off-road vehicle control of military and land users. Suggest further discussion of range regualtions applying to these activities.	Response: The IDT feels this was adequately covered in the INRMP. The IDT included a military liasion from Range Operations to ensure military training needs were integrated into the development of the INRMP.
8	17	Bayshore, T.	Comment: Feral hog control and eradication: recognize the need to consider eradicating the exotic species to minimize its impacts on training lands and recovery of natural ecosystems.	Response: Eradication of feral hogs is not feasible. We will continue to implement management activities to control populations to minimize their impacts on native vegetation.

8	18	Bayshore, T.	Comment: Discuss the Range Officer's involvement in the recreation, timber sales, and grazing program management.	Response: The Range Operations Officer's liasion was a member of the IDT, so the Range Operations Officer was involved with the development of the INRMP. The Range Operations Officer's decision making role comes into play on a daily basis when training needs effect these programs. The IDT felt this day-to-day activity was not applicable to a programmatic planning document.
8	19	Bayshore, T.	Comment: Target areas requiring EOD escort put CEV personnel at great risk, consider excluding these areas from biological monitoring and inventory. Monitoring and inventory in target areas requiring an EOD escort is not worth the risk to CEV personnel. Write off these areas as being 100% dedicated to training.	Response: Agreement to conduct monitoring and inventory in these areas was covered in the ESP agreed to in 2000. Air Force contractors also require access to these areas; it is not only CEV which needs access.
8	20	Bayshore, T.	Comment: Early chapters in the Draft INRMP note that cattle grazing is allowed for the benefit of reducing fire load, but the landscapes section states the purpose of the land area is to provide forage for cattle. Recommend rephrasing to state that fire management is achieved by grazing.	Response:Cattle grazing is a tool used at APAFR for fuel reduction. However, it does not achieve all the fire management objectives.
8	21	Bayshore, T.	Comment: Discussion on recreation and timber sales in outlying areas needs to emphasize that these lands currently serve as safety buffers and are reserved for future military training. Recreation and timber sales are allowed to the extent they are compatible with current training activities.	Response:Military activities are coordinated with environmental activities through weekly scheduling meetings. Natural resource needs and objectives can generally be accomplished by scheduling these activities around the military training activities.
8	22	Bayshore, T.	Comment: The recreation, timber sales, and grazing sections need discussions on how the range operations officer has positive control over the presence of personnel on the range.	Response: The IDT is well aware of our mission to support military training by providing a realistic training environment. The INRMP simply provides guidance on managing natural resources, and does not attempt to frame the sphere of control of Range Operations.

8	23	Bayshore, T.	Comment: Does the urban forestry program include an inventory in the cantonment area? I suggest adding an objective of eventually replacing non-native invasive exotics or high maintenance plantings with low maintenance native species.	Response: Since we have no military housing we do not have an inventory of the cantonment area. However, almost all existing tree species are native low maintenance trees. Several exotic understory species are common and are being addressed through our invasive exotic control program. Additional funding would greatly enhance this program.
9	1	Huffman, M.	Comment: In general, The Nature Conservancy is in agreement with APAFR staff that Alternative A provides the best "next step" management plan for the overall site. Our staff review found the documents to be very concise, addressing demography, habitat requirements, nesting performance and survival for the three targeted species.	Response: Thank you for your comment. Note: In the original draft reviewed Alternative A was the Proposed Action.
9	2	Huffman, M.	Comment: The proposal to work outside the boundaries of APAFR on adjacent or nearby lands to assure the long-term viability of those species reflected well on the agency's efforts to work collaboratively with resident, agency and organization partners to protect these species.	Response: Thank you for your comment.
0000v: Summary				
3	13	Slack, J.	Comment: Major goals listed in executive summary: use terminology consistent with the landscape associations you later identify.	Response: the wording has been changed to reflect this.
6	3	Harding, W.	Comment: INRMP Executive Summary does not summarize the integration of military components into natural resources management.	Response: Integrating military components into the INRMP is too detailed for the Executive Summary. The Executive Summary highlights the more common concern of scheduling military activities with natural resource management activities, and to a lesser extent minimize ecological impacts by military training.

7	1	Bowman et al	Comment: We strongly urge that the phrase "ecologically sustainable" be added to the sentence in the fourth paragraph of the Executive Summary on blending the needs of the people with the health of the environment.	Response: The IDT felt that maintaining healthy, functioning ecosystems implies that they would be ecologically sustainable.

001-1: Introduction, Mission, Purpose and Need

1	1	Porteck, K.	Comment: For AFIs and DODIs, include their title (in italics) for the first time referenced. Its really not a good idea to quote the 'February 2001 Draft', recommend just quoting the AFI w/o a date. Also, DODI 7310.5 was recently superceded by DoD FMR 7000.14-R, Volume 11A, Chapter 16.	Response: These changes have been made.
7	22	Bowman et al	First paragraph in Introduction: the numbers don't add up; how can the majority be this when most of the 61,000 acres used for plantations is non-native north Florida slash?	Response: 61,000 acres are not used for north Florida slash pine production. This total acreage is combined with all forested types such as hardwoods, natural pine stands, sand pine, pine plantations, and cypress. Slash pine is considered by some botanists as being native of this area. Just because the seed source came from north Florida it is not safe to assume it is non-native. Wunderlin does not recognize south Florida slash pine and north Florida slash pine as different species.

001-3: The Planning Process

001-4: Relationship to Other Documents

4	6	Billie, Bobbie C.	Comment: Reference is made to the Cultural Resources Management Plan for APAFR. Has this plan been finalized?	Response: Yes, it was finalized in 1998.

001-5: Plan Structure

001-6: Issue Summary

002-1: Goals and Objectives

1	2	Porteck, K.	Comment: I would like to see your INRMP serve as a foundation for potential conservation easements and land acquistions on surrounding lands such as through the Coop. Agreement we're working on with TNC. I strongly recommend a well-crafted objective statement that we could refer to as justification in an acquisition.	Response: An objective has been added as well as wording to this effect under Installation-wide standards for Special Uses.
002-1-1: Goal 1				
3	16	Slack, J.	Comment: Goal 1, objective on completing a Users Guide: by when will it be completed?	Response: INRMP objectives are designed to be achieved or completed within the 5-year planning horizon. Additionally, the Monitoring Plan in Table 5.1 indicates this item will be completed and available by the 5 year mark.
002-1-2: Goal 2				
7	5	Bowman et al	Comment: The only way to assess whether application of prescribed fire in maintaining and restoring the landscape is to develop and implement a detailed pre- and post-fire monitoring program that incorporates information about pre-fire fuel and habitat conditions, fire prescriptions and conditions at the time of ignition, accurately depicted spatial extent of the fire and variation in fire intensity.	Response: We do need to assess our prescribed fire efforts through pre-and post-monitoring to see if we are meeting our objectives, and APAFR does this monitoring regularly.
7	23	Bowman et al	Comment: Objective #5: complete a study to determine best method to regenerate pine in slash pine plantations. This is unclear. Regenerate to slash pine native to specific site? Regeneration should reflect whatever species of pine existed historically on site.	Response: In specific areas we are removing disc lines around pine plantations and allowing them to become a component of the natural timber community. The objective of this study is to determine what is the best way to manage these sites which are primarily located in sensitive areas.
002-1-3: Goal 3				

3	9	Slack J.	Comment: The population target for Florida grasshopper sparrows specified in Goal 3 (50 pairs) is lower than that identified in the current Endangered Species Plan, but it is not clear what management changes result in the lower target. A population size of 50 pairs is considered sufficient to remain viable. However, there is potential for three grasshopper sparrow populations of this size on APAFR.	Response: You are correct. Population goals for the Florida grasshopper sparrow have been revised to agree with the ESP's goals (i.e, the average of the sum of the past five years).
7	6	Bowman et al	Comment: We feel that 50 breeding pairs of FGS is too low a population goal because it ignores restoration of potential dry prairie habitat that is today unoccupied, most likely because the open prairie has been fragmented by pine plantations.	Response: The Recovery Plan for FGS recommends 50 breeding pairs to have a viable population, and APAFR seeks to maintain at least that level. However, the population goal has been changed to reflect the population goals listed in the ESP, which is the average of the sum of the past 5 years.
7	7	Bowman et al	Comment: We also wonder if the acreage proposed to be restored and maintained for endangered species is based simply on the areal extent of the endangered species HMUs? How is this number calculated?	Response: The HMUs have been taken directly out of the ESP for APAFR, developed jointly by APAFR, the USFWS, and the State Wildlife and Fish Commission.
7	24	Bowman et al	Comment: Objective # 5, restore and maintain habitat for 65,579.4 acres of PETS. Are these the HMUs? Specify location of acreage. How this will be accomplished needs to be defined: remove off-ste pine and replant to native species (or not at all in dry prairie)? Burn? Chop?	Response: This number does reflect the acres in HMUs. How this habitat will be restored and maintained is reflected in the standards and guidelines integrated throughout the document.
002-1-4: Goal 4				
3	3	Slack, J.	Comment: Goal 4 specifies a variety of resource use objectives, but does not include objectives related to game, wildlife, or fish populations or utilization. We encourage you to identify objectives and expand discussion of managing sustainable comsumptive fish and wildlife populations.	Response: We have added a brief discussion to the Installation-wide paragraph under "recreation" to show that APAFR does emphasize a game management program and that hunting is the largest recreational activity on APAFR.

3	4	Slack, J.	Comment: The objective concerning Florida scrub-jay population size increases under Goal 4 may be more appropriate under Goal 3, and should be bounded by time or population size in recognition of the fact that this level of growth will not be achievable indefinitely.	Response: We agree that this objective should be listed under Goal 3. We have amended the objectives to include a time frame.
3	17	Slack, J.	Comment: Goal 4, objective of clearcutting an average of 100 acres of slash pine each year to meet ESP goals. Make sure this term (ESP) is previously defined.	Response: The term "ESP" is identified on page 1-4 of the INRMP.
3	18	Slack, J.	Comment: clearcutting of slash pine plantations identified in the ESP as being in scrub jay habitat will be maintained as scrub: are all of these within HMUs?	Response: Yes, these are the slash pine plantations identifed as being in the scrub-jay habitat to be maintained as scrub.

7	8	Bowman et al	Comment: Goal 4 should include caveats that regeneration will occur by planting when those areas are identified as critical foraging habitat for future recruitment clusters of RCWs. Waiting for natural regeneration will further increase the time the habitat is left unsuitable for RCWs. In addition, we wonder how the proposed acreages for clearcutting and replanting were determined and how are these distributed through APAFR and within the range of endangered bird species?	Response: When funding become available natural stands will be expanded with artificial regeneration. However, understory components are extremely important and consideration must address impacts from shading to sensitive areas. Our intent is to ensure sustainability of the forest management program to generate income for APAFR. Until such time that income can be indefinitely guaranteed by the Air Force, managing approximately 16,000 acres for commercial timber production is necessary. To improve hydrological compatibility with the ecosystem, plantations are no longer bedded, and seedlings planted are from a seed source within the region. A rating system is currently being devised to indicate if canopy closure is affecting the understory. Pine plantations have been significantly reduced from the original 22,000 acres planted between 1966 and 1976. To maintain an income of $350,000 to $450,000, at least 16,000 acres of pine plantations are needed. This allows us to conduct uneven-aged management with natural pine stands. If planted pine acres are reduced, more intensive management of the remaining acres will be necessary in order to generate the same level of income.
7	25	Bowman et al	Comment: Objective 3: Replant 300 acres of slash pine plantations per year using a central Florida seed source. You should plant pine species that historically existed on site (i.e., longleaf when applicable).	Response: Longleaf pine does not grow well in wet sites, even though this is common, and it is extremely susceptible to pine saw fly, especially in this area. Longleaf pine performs well in dry sites and deep sandy soils such as the Red Hills area of north Florida, but not as well in our shallow soils with a spodic horizon close to the surface. Longleaf pine desires conditions where it can produce a deep root system without being in saturated conditions. Slash pine has a shallower root system and will out-perform longleaf where soils are more saturated. With over 60% of our installation delineated as jurisdictional wetland, slash pine will substantially out-perform longleaf pine. It is also easier to plant and usually has better survival.

7	26	Bowman et al	Comment: The majority of RCW clusters should be burned during the growing season (mid April-June).	Response: We do try to achieve more growing season burning in RCW habitat areas. We are often limited by staffing, weather conditions, and obtaining burn authorizations from the State during the summer, but our goal is to achieve more growing season burns.
002-1-5: Goal 5				
3	6	Slack, J.	Comment: We are aware of hydrological restoration work being conducted on APAFR as part of the Kissimmee River Restoration project. We encourage you to include a discussion of this work in the plan, even though it may primarily be the responsibility of another agency.	Response: Restoration activities that could directly affect our installation are not currently scheduled during this planning period.
8	39	Bayshore, T.	Comment: Objective in Goal 5: "Develop a study of all disk lines in Military Impact Areas to determine their effectiveness". Isn't it the plan to reduce or avoid the use of disk lines which can contribute to erosion and increased O&M costs?	Response: The IDT hopes to examine all the disk lines in Impact Areas to see if some of them are not needed and can be removed. Of those that it might be appropriate to remove, those having erosion problems or are costly to maintain would be among the first to remove.
002-1-6: Goal 6				
002-1-7: Goal 7				
002-1-8: Goal 8				
1	3	Porteck, K.	Comment: Goal 8, with the objectives to conduct archeological surveys, does not belong in the INRMP. We have an integrated Cultural Resources Management Plan for that. In the INRMP, we discuss cultural resources only in the context of natural resources management.	Response: These objectives have been deleted from the INRMP. The Cultural Resources Plan for APAFR is incorporated by reference.

4	5	Billie, B.	Comment: Page 2-4, Goal 8: are the 5 sites existing sites or yet to be discovered sites? If they are existing sites the direction in the letter from the Florida State Historic Office was no additional work is required.	Response: The 5 sites evaluated per year can be either sites that are currently identified, or sites identified in future surveys. The "direction" from the letter is poorly worded and confusing, but was meant to mean no future work in support of the Environmental Assessment is needed, not future work at APAFR.
002-1-9: Goal 9				
3	5	Slack, J.	Comment: Under Goal 9, growing season burns are emphasized. However, the plan also specifies that at least 50% of prescribed burns in rcw clusters be conducted during the winter, and prescribed fires in pine plantations should be conducted in winter. Considering the acreage targets (22,000 acres/year), EOD considerations, seasonality goals, and LAMA standards, not all of the targets appear to be achievable.	Response: APAFR has been burning roughly 21,000 acres per year for the past few years, and we feel that 22,000 acres/year is achievable, even with a emphasis on growing season burns.
3	19	Slack, J.	Comment: objective to utilize wildfire suppression tactics that achieve natural resource objectives: Should this be a guideline? Is it measurable?	Response: Although it is not measurable, we feel it offers managers both direction and flexibility; an integrated approach allows us to achieve more than one objective by the same action.
002-1-10: Goal 10				
003-Installation-wide S&G				
3	20	Slack, J.	Comment: Under the Sikes Act, are you equating standards with objectives? Do you distinguish between standards and guidelines?	Response: Objectives state what it is we want to achieve; standards are the methods we use to achieve them. We do make a distinction between standards and guidelines: standards are requirements that restrict or limit management practices; guidelines give managers direction but allow flexibility for practical reasons involving weather, budget, staffing level,etc.
003-ACC				

003-FIR				
2	1	Wimmer, K.	Comment: Request that you add an additional FIRE standard as follows: "Rehabilitate the Florida National Scenic Trail when negatively impacted by fire lines".	Response: We agree. A standard has been added that states "Rehabilitate the Florida National Scenic Trail when negatively impacted by plow lines for wildfire suppression."
7	9	Bowman et al	Comment: We do not believe FIR-7 is consistent with ecosystem management.	Response: Pine plantations will be burned with winter burns so that they are not destroyed by hot fires in the growing season.
003-GIS				
6	7	Harding, W.	Comment: GIS is a tremendous tool. The INRMP needs more GIS maps and data delineating field features, roads, protected species, critical habitats, cultural resources, cemeteries, forestry, prescribed burning compartments, military maneuver and impact areas, and ranges.	Response: All of that information is available to natural resource staff and military training personnel. The IDT felt it was not necessary to include maps of all these resources in a programmatic document.
003-HER				
8	0	Bayshore, T.	Global change: change "heritage resources" to "cultural resources"	Response: The term heritage resources includes a much broader range of resources and is the accepted term today for most federal agencies managing these resources.
003-INF				
3	21	Slack, J.	Comment: INF-1 should this be for disk lines?	Response: No. This standard refers to our existing system of roads, fences and plowed firelines as adequate, and no new ones are needed.
003-IND				
003-MIL				
003-RGM				

003-REC				
2	2	Wimmer, K.	Comment: Request that you insert "and other recreational activities" after "current management practices" to help insure that hunters are aware of the possible presence of non-hunters on the FNST.	Response: This change has been made.
003-SPU				
3	22	Slack, J.	Comment: Suggest an installation-wide standard of "Minimize impacts of special uses on mission, resources, and other ongoing programs."	Response: Comment not added. Special uses (past, present and future) are assessed for impacts via the NEPA process. This process is automatic and can function independent of the INRMP if the special use is not identified in the INRMP.
003-VEG				
3	23	Slack, J.	Comment: Veg -4: Recommend establishing additional limits on this action to address runoff/water quality concerns, and to assure consistency with other resource objectives.	Response: Because this standard does not permit broadcast application, we felt additional limits were not necessary.
7	10	Bowman et al	Comment: We note that VEG-7 is inconsistent with LAMA 10 standard 10.24 for pine flatwoods. 10.24 states that pine regeneration between plantations (regardless of whether it is of native pine or pines from the plantation) will be managed the same as adjacent plantations, which of course means only winter burning. Veg-7 states that pine regeneration will be mechanically removed. If pine species are planted appropriately, there should be no need to remove that regeneration and no need to establish different fire regimes for plantations and their regeneration.	Response: Experience has shown us that it is extremely difficult and time consuming to manage the small strip between the plantations on a different fire regime. Since these areas are small in size, we have decided to eliminate one of the disc lines between the two blocks and manage the entire area as a pine plantation. This will reduce time spent on discing and we will be able to concentrate our burning efforts on more important habitats. This is referring to natural pine regeneration from an adjacent pine plantation in suitable habitat that has regenerated in areas such as sand pine, where prescribed fire has not been able to totally eliminate these seedlings. Young pines will be removed to prevent shading of the understory.
003-WTR				
8	26	Bayshore, T.	Comment: Shouldn't this be non-point source, i.e., sediment in runoff?	Response: Non-point source pollution has been added to this sentence.

003-WIL

3	7	Slack, J.	Comment: WIL-1 reports that the three focal species included in the endangered species management plan will be managed in accordance with the existing plan. This would require that personnel be allowed access to high-explosives impact areas for monitoring, which includes monitoring the Florida grasshopper sparrow. Previous letters to the Service indicated that this level of access could not be guaranteed.	Response: You are correct. Monitoring of bird species in high-explosives areas occurs whenever EOD personnel are at APAFR and allow us escorted entry. Some population monitoring has occurred this way, although not for those parts of the H-E areas where the Florida grasshopper sparrow exists. Standard 1.24 in LAMA 1, Military Impact Areas, directs us to accomplish this monitoring whenever possible by working with EOD personnel.
3	8	Slack, J.	Comment: WIL-3 indicates that areas in close proximity to sites occupied by focal endangered species will be managed in the interests of that species. This statement conflicts with LAMA 9, standard 9.12, which suggests that existing pine plantations in dry prairies will stay in rotation for commercial production. Pine plantations within dry prairies are detrimental to Florida grasshopper sparrows.	Response: These existing pine plantations were identified in the Endangered Species Management Plan for APAFR to remain in commercial production. Additionally, those existing pine plantations are in areas that do not contribute to grasshopper sparrow habitat, are marginal habitat, or are small corners of a plantation that extends into the dry prairie association. As agreed to in the ESP, these areas would not significantly contribute to grasshopper sparrow habitat or recovery.
3	11	Slack, J.	Comment: Additional information is needed concerning the management of T&E species on APAFR. There is little mention of how APAFR will manage Audubon's crested caracara, bald eagle nest sites, indigo snakes, and others. Listed plants must also be addressed. This information is necessary to complete consultation on the INRMP.	Response:A section on the management of these other species of concern has been added to the document.
7	11	Bowman et al	Comment: We urge that goals WIL 2-4 be applied with insight and reason. For example, in some scrubby flatwoods, an open canopy of longleaf pine, if that cover is less than 15%, poses no negative consequences to FSJ, but may provide a necessary dispersal corridor for RCWs.	Response: These installation-wide standard are straight out of the ESP for APAFR, which we have been following since 2000. We hope we can apply them fairly and with reason.

7	12	Bowman et al	Comment: We disagree that a strict adherence to a ranking system for the three endangered bird species is an effective means to resolving management conflicts. Rankings should be tempered by habitat needs.	Response: Again, this ranking criteria is straight out of the ESP developed jointly by APAFR, the USFWS, and the State Wildlife and Fish Commission. While it is difficult to make choices that involve more than one endangered species, we will continue to give priority to the species at greatest risk.
7	13	Bowman et al	Comment: We regret that the section of FGS and the ESP for this species do not discuss the potential for establish new populations of this species at APAFR. We believe there is much potential, but currently unoccupied, FGS habitat at APAFR. We view the conflict between silviculture and this critically endangered species as one that should be resolved in favor of the bird.	Response: At APAFR, a multiple use management approach is taken. We attempt to reach a balance between all the needs of the ecosystem and the uses that occur here. In the HMUs delineated in the Endangered Species Plan for APAFR, management does favor the focal bird species. Outside of those HMUs, management practices are less constrained in order to achieve a range of other natural resource objectives.
7	14	Bowman et al	Comment: As the FSJ population increases, the need to avoid burning in nesting habitat should be decreased. Fires in fire-maintained scrub tend to be patchy and jays readily renest following the loss of a nest. If the frequency of fire is delayed or the seasonality skewed towards non-growing season fires, the potential costs in not attaining appropriate habitat conditions would far exceed the relatively small benefits of not incidentally burning up a few nests.	Response: APAFR attempts to use fire to maintain the ecosystems that the FSJ uses. Typically that means fire is not as frequent there as in other ecosystems at APAFR. Other management practices can be used to achieve habitat conditions as well.
7	15	Bowman et al	Comment: For RCWs, we believe that timber harvesting during the nesting season should also be excluded from any existing inactive recruitment clusters and their associated foraging habitat. WIL-45 suggest recruitment clusters will occur in plantations. Current rotations are too frequent to produce trees suitable for artifical cavity construction. We also suggest the INRMP differentiate between the terms "cluster" and "territory".	Response: WIL-45 actually states that preference for cavity inserts will be given to natural pine stands, thus most recruitment clusters will occur in natural pine stands. The terms RCW cluster and recruitment cluster have been included in the glossary.

7	27	Bowman et al	Comment: Under the FGS sparrow standards, add population growth to currently un-iinhabited prairies as a goal.	Response: Habitat Management Areas have been set up for the FGS and APAFR works to maintain that habitat for the sparrow. We intend to focus on maintaining and enhancing those HMUs before we consider changing our management practices on lands that are not inhabited by the FGS.
7	28	Bowman et al	Comment: Under the FSJ standards, add to WIL-25 at the end of the sentence, "except within foraging range of active RCW clusters."	Response: APAFR plans to adhere to the Endangered Species Plan for APAFR. Habitat identified for the FSJ will be managed in the interest of that species.
7	29	Bowman et al	Comment: Under the RCW standards, add to WIL-40 the wording "or nearby inactive clusters and their associated foraging habitat" after 'active clusters' and 'during the nesting season'.	Response: At this time, we do not see a need to limit or restrict those management activities in the areas you suggested during nesting season, since there would be no nests in those areas.
8	29	Bayshore, T.	Comment: Standard WIL-10: If MRLS training during this period (nesting season) is mission essential, natural resource personnel should work with the USFWS to resolve conflicts.	Response: MLRS training may be mission essential, but there are many alternative training areas that could be used during those months instead of FGS habitat.
7	30	Bowman et al	Comment: WIL-45: This currently makes no sense. Pine plantations do not provide suitable nesting sites currently (which is part of the larger problem). As such, no inserts are installed in planted pine. Small longleaf pine stands sandwiches by plantations will be used, though.	Response: Pine plantations are managed for timber production and will not be used for cavity boxes or augmentation. Due to the importance of forest management income, cavity boxes and augmentation should only be considered in areas where there is enough natural timber to meet the minimum requirements for RCW habitat.
8	31	Bayshore, T.	Comment: Feral hogs should be managed to eliminate the population. You can not talk about natural ecosystems when you have wild hogs due to their destructive habits. Can not have it both ways. Also I have not seen anywhere in the INRMP anything about mitigating damage to training lands caused by hogs.	Response: Eradication of feral hogs is not feasible. We utilize hunting and trapping as methods for control.

9	3	Huffman, M.	Comment: We encourage "frequent" burning using a fire return interval of every 1-3 years as opposed to the "occasional" burns recommended by APAFR staff (page 39, 5.2.5.1 Management Within HMUs.	Response: This recommendation, on page 39 of the Endangered Species Plan for APAFR, does emphasize the application of frequent, hot fires to maintain FGS HMUs. The statement you refer to pertains specifically to the Delta/OQ HMU and states that burning will occur primarily in the winter months but may occur "occasionally" in the spring and summer months to help improve habitat and prolong the breeding season. While this direction has been incorporated into the new INRMP, we have also included an emphasis on growing season burns when possible, as well as a standard in the Dry Prairies landscape association Management Area to burn the prairies on a 2 year interval, and most of the FGS HMU is in this habitat.
004-1: LAMA S&G				
5	1	Sabo, J.	Comment: Insert a detailed GIS map after each write-up of the standards and guidelines section. The individual maps will provide a better understanding of the locations for the various natural and cultural resource prescriptions.	Response: The IDT considered this approach of adding an individual GIS map to each LAMA, but instead chose to display all the LAMAs on one map at the front of the chapter.
3	23	Slack, J.	Comment: Fire standard 1.2: are there any control lines/unit boundaries within ranges or between adjacent ranges? Is this consistent with the ESP?	Response: There are control lines within the ranges. These are usually roads, targets, fencelines or natural barriers.
004-LAMA 1				
7	16	Bowman et al	Comment: In LAMA 1, standard 1.14: we question why we should replant pine plantations adjacent to occupied FGS habitat.	Response: This standard states that pine plantation on dry prairies within military impact areas will be harvested and NOT replanted, except for those on OQ range and the south end of Echo Range. These will continue to exist because we do not count military impact areas to acreage of FGS habitat; although the bird may occur there, we do not actively manipulate the habitat for them because it is dedicated to target impact areas.

8	34	Bayshore, T.	Comment: Standard 1.12 - why is this different then what is in AFI 32-7064 Chapter 10.2 and chapter 13.2.2?	Response: The IDT felt it was sometimes important to include direction in the standards and guidelines to clarify or emphasize that this management practice or tool to be available to manager.
8	35	Bayshore, T.	Comment: Specify major BMPs from the COE Section 404 permit.	Response: The IDT decided to incorporate many of the BMPs by reference, thus eliminating the requirement to add more information in the appendices.
004-LAMA 2				
004-LAMA 3				
4	7	Billie, B.	Comment: It has been stated earlier that you will not identify cultural sites to the public (page 3-3). Who interprets our Indigenous burial grounds? Will this increase the looting by advertising our grounds? There is confusion over earlier statement on page 3-3 that locations of sites will not be divulged to the public.	Response: Page 3-3 describes the APAFR policy of not divulging the location of sites to the public, and this applies installation-wide. However, the standard in LAMA 3, Recreation Sites, refers to those sites within Recreation Areas such as campgrounds that are already well known to the public and interpreting them is a chance to educate the public about cultural and historic resources. The only Heritage Resource sites that will have postings and interpretive signs are those resources that are already plainly visible, such as cattle dip vats, cisterns, building foundations, debris piles, tram lines, etc. Many of these are located in areas with a high volume of visitation. In the case of all Indigenous sites, there is nothing apparent to the average observer that there is a site there, and so there is no reason to post explanatory signs.
4	8	Billie, B.	Comment: There is confusion over earlier statement on page 3-3 that locations of sites will not be divulged to the public.	Response: The standard in LAMA 3, Recreation Sites, refers to those sites within Recreation Areas such as campgrounds that are already well known to the public and interpreting them is a chance to educate the public about cultural and historic resources.
004-LAMA 4				

7	17	Bowman et al	Comment: Section 4.3, page 4-17: Why suppress fire in any xeric oak scrub? Jays occur in this area.	Response: One of the goals of this area is to maintain representative samples of all the ecosystems that occur at APAFR so that visitors can see and learn about them. Although jays may occur here, enhancing habitat for the FSj is not one of the goals of this area.
004-LAMA 5				
8	37	Bayshore, T.	Comment: Standard 5.5 - because why?	Response: The IDT felt it was not necessary to add in the reasons behind every standard, in the interest of brevity.
004-LAMA 6				
004-LAMA 7				
3	24	Slack, J.	Comment: Infrastructure standard 7.7: should completion of this study be in the objectives?	Response: Yes. It is listed as an objective under Goal 5.
004-LAMA 8				
004-LAMA 9				
3	25	Slack, J.	Comment: Rangeland Grazing standard 9.10: these treatments do not appear to encourage FGS. Please explain how.	Response: The FGS currently uses these improved pastures as habitat, and these treatments will maintain the improved pastures in this state.
3	26	Slack, J.	Comment: We encourage removal of pine plantations from prairies, except where used to buffer public uses from military activities.	Response:There are very few pine plantations on the dry prairies, and those that remain were agreed to as part of the Endangered Species Plan for APAFR. In the FGS HMU, only two pine plantations remain. Most of the plantations in the dry prairie are either in flatwoods areas interspersed in the dry prairies or as buffers around Impact Areas.

3	27	Slack, J.	Comment: Standard 9.21 - there were 2 of these enclosures south of the road; one directly behind the small arms range.	Response:Only one of the two exclosures proximal to OQ Range (the small arms range) is being used in a long-term vegetation monitoring project to determine the effects of livestock grazing. The fence surrounding one of the exclosures was removed due to confounding effects from past land use in this exclosure rendering it unsuitable given the existing experimental design.
7	18	Bowman et al	Comment: Dry Prairies, page 4-28. We do not think that pine plantations interspersed in former dry prairie is a viable approach to ecosystem management. This seems to be in conflict with standard 9.16 which seeks to maintain the prairie-pineland boundary. Pine plantations should be eliminated within the prairie areas and only natural pine regeneration be allowed.	Response:Some pine plantations will continue to exist on the dry prairies as per the Endangered Species Plan for APAFR. Most of these plantations function as either buffers for Impact Areas or are in flatwoods areas that are interspersed through the dry prairies.
7	19	Bowman et al	Comment: Desired future condition, Ridgetop flats, pg. 4-32: an additional future desired condition should be a distribution and desnity of pines that reflects historical conditions. As previously mentioned, this might require eliminations of pine plantations and restocking of low density native pinelands.	Response:According to the historic timber survey conducted in 1918, there was 25% more timber volume on the installation in 1918 than there is currently today, including the plantations.
7	31	Bowman et al	Comment: Standard 9.26: catfish ponds will be stocked and managed. Aren't catfish supposed to be monitored and controlled? Why restocking?	Response: Catfish are a game species and APAFR actively manages for game. You may have this confused with the armored catfish, which is a non-native exotic species that we attempt to eliminate from the range.
004-LAMA 10				
3	28	Slack, J.	Comment: Fire standard 10.3: why is RCW burning objective different?	Response: RCW burning objectives are different because habitat needs should achieve more grasses and less brush and woody material.
004-LAMA 11				

7	20	Bowman et al	Comment: DFC description, bullet statement 6: we believe this statement is backwards, the northern half of the Ridgetope Flats section is RCW habitat and thus had a frequent fire regime and less woody vegetation. The southern half of the section is primarily scrub-jay habitat and had less frequent fire and more woody vegetation. In this section, it should state that fire should occur every 2-3 years in RCW habitat and every 10-15 years in jay habitat.	Response:The document has been corrected.

004-LAMA 12

6	5	Harding, W.	Comment: Alt. A indicates Durden Grade and parts of Echo Springs Road will be closed completely and allowed to revegetate. This may have a negative impact to the FLARNG training and other ground units.	Response: The IDT discussed this at length. It was agreed that the short length of the closed road, combined with the number of alternate routes available, would result in no negative impacts to military training needs.
8	38	Bayshore, T.	Comment: Standard 12:7 - signage may expose small sites to vandalism by drawing attention to the features. Cultural resources manager should evaluate the benefit.	Response. Agreed. In general, those sites along the loop trail are well known to the public. The Archaelogist would be the best person to determine which sites would benefit from interpretation to the public.

004-LAMA 13

004-LAMA 14

005-1: Monitoring

7	21	Bowman et al	Comment:More details should be provided about how the item to be measured specifically relates to the monitoring question. For example, measuring the number of acres burned per year will not answer the question, "Is the use of fire maintaining and restoring the system?" Also, there is no mention of adaptive management feedback loops and how failure to meet a specific goal would effect the proposed management. Lastly, the monitoring section should address access to HE areas for monitoring.	Response: We feel that monitoring our prescribed burning program to see if we are achieving the objectives will tell us if we are able to mimic the natural fire regimes as well as possible given other uses of the land today that we manage for and restore the species composition and structure. Access to HE areas for monitoring is a part of both the Endangered Species Plan and the INRMP.
006- Glossary				
7	32	Bowman et al	Comment: Several acronyms need to be added.	Response: We have added several acronyms that appear in the INRMP to this list.
7	33	Bowman et al	Comment: Add a definition of Cluster to the glossary.	Response: We have added this definition to the glossary.
APP A: HMA maps				
APP B: Range Management Guidelines				
1	4	Porteck, K.	Comment: We have difficulty in the Air Force with the term “Range Management” as it applies to livestock grazing, since 99.9% of Air Force personnel think the term refers to Bombing Range management. Suggest you consider changing the title to “Livestock Grazing Program Guidelines”.	Response: This change has been made and the program is now referred to as “Rangeland and Grazing Management”.
APP C: Landscape Associations At APAFR				
APP D: Listed Species				

3	10	Slack, J.	Comment: Appendix 2 of the INRMP species listed as C2. The Service no longer maintains this official designation. The C2 designation should be removed, or identified as former C2 species. In addition, the Highlands tiger beetle (Cicindela highlandensis) is now classified as a candidate species.	Response: We assume you are referring to Appendix D, Listed Species at APAFR. The designation of C2 has been removed. The Highlands Tiger beetle has been added.

APP E: Pest Management & Exotics

APP F: Public Rec Map

3	3	Wimmer, K.	Comment: Request that the map in Appendix F include in its legend a clearer indication of the Florida National Scenic Trail. Although "Hiking Trails" appears in the legend, there is no further indication as to which hiking trail is where. More description in the legend as well as on the map should be developed to distinguish the different trails within Avon Park.	Response: This change has been made to the map that appears in the INRMP.

APP G: Monitoring Task Sheets

APP H: Project Implementation Work Plans

APP I: BASH Plan

ENVIRONMENTAL ASSESSMENT

EA-000: General Comments on EA

3	1	Slack, J.	Comment: We endorse your selection of the preferred alternative described in the EA, and agree that the proposed action is most consistent with the provisions required in the SAIA, though Alternative C may increase the benefit to some federally-listed species.	Response: Thank you for your comment. Note: In the original draft reviewed, Alternative C was the Conservation/ Restoration alternative.

6	4	Harding, W.	Comment: Should not Alternative A in the EA be identified as the "preferred alternative" consistent with NEPA?	Response: The terminology used in the EA correctly refers to Alternative A as the Proposed Action. It is only in a decision document, such as the FONSI, where an alternative is identified as the "preferred alternative". In the case of the FONSI for the INRMP, we continue to refer to Alternative A as the proposed action, although it could also be referred to as the preferred alternative.
6	6	Harding, W.	Comment: Alternative C in the FONSI states 60% of the existing road system will be closed. That should be 32% based on the figures provided.	Response: The FONSI does not state the % of existing road system closed for Alternative C. Chapter 2, Alternatives, Alternative C does incorrectly state 60% of the roads being closed. Correction made to 32% as per data in road summary, Chapter 4, Environmental Consequences, Infrastructure. Note: In the original draft reviewed, Alternative C was the Conservation/ Restoration alternative.

EA-001: Intro, Purpose and Need

EA-002: Alternative descriptions

4	1	Billie, B.	Comment: Page 15 - first paragraph: Protected areas. There are no areas specifically identified and protected for their ecological, historical or educational value. I am concerned about this paragraph because there are Indigenous Human Remains located on APAFR. At that time I understood that these areas would be protected from any disturbance.	Response: You are correct. Those areas are protected by federal law, although their locations are not identified to the public on maps. This paragraph describes the current situation (Alternative B) in which no specific areas are formally designated and protected for their ecological, historical, or educational values, although all areas that possess these values are considered and protected on an action-by-action basis. There are Indigenous Human Remains located on APAFR and these locations are protected from any disturbance and always will be, regardless of the management alternative selected.

EA-003: Affected Environment

4	2	Billie, B.	Comment: You do not state what laws you intend to follow or what kind of research you intend to permit at these sites. We oppose any research at Indigenous Burial Grounds.	Response: Federal laws that we are required to follow are listed on page 1-4 of the INRMP and also at the end of Chapter 4 of the EA. They include the American Antiquities Act, ARPA, AIRFA, and NAGPRA. These laws are discussed and outlined in more detail in the Cultural Resource Management Plan for APAFR. Likewise, the kinds of research desired and permitted are also outlined in the CRMP. Research at burial grounds of any kind is strictly prohibited.
5	3	Sabo, J.	Comment: Draft EA, section 3.3, military operations: Insert at the end of the first sentence "by providing a more realistic training environment through vegetative management operations".	Response: This change has been made.
5	4	Sabo, J.	Comment: Draft EA, section 3.3, rangeland management: Insert at the end of the second sentence "in support of the military mission".	Response: This change has been made.

EA-004: Effects

4	3	Billie, B.	Comment: Who evaluates the significance of an archeological site?	Response: A trained archeologist performs all evaluations of sites for significance. In the case of APAFR, the archeologist at Moody AFB, Georgia oversees the archeological work at APAFR.

EA-005: Preparers

EA-006: List of Recipients

EA-007: Glossary

EA-008: References

APP A: The Planning Process

APP B: Landscape Associations at APAFR

APP C: Invasive Species

APP D: Listed Species

APP E: Summary of Public Involvement

Illustrations

Tables

ENVIRONMENTAL ASSESSMENT

EA-000: General Comments on EA

3	1	Slack, J.	Comment: We endorse your selection of the preferred alternative described in the EA, and agree that the proposed action is most consistent with the provisions required in the SAIA, though Alternative C may increase the benefit to some federally-listed species.	Response: None required. Note: In the original draft reviewed, Alternative C was the Conservation/ Restoration alternative.
6	4	Harding, W.	Comment: Should not Alternative A in the EA be identified as the "preferred alternative" consistent with NEPA?	Response: Both CEQ Regulations 40 CFR 1500-1508 "Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act"and 32 CFR 989 "Environmental Impact Analysis Process" allow for distinguishing the proposed action separately from the alternatives. The preferred alternative is the proposed action
6	6	Harding, W.	Comment: Alternative C in the FONSI states 60% of the existing road system will be closed. That should be 32% based on the figures provided.	Response: The FONSI does not state the % of existing road system closed for Alternative B. Chapter 2, Alternatives, Alternative B does incorrectly state 60% of the roads being closed. Correction made to 32% as per data in road summary, Chapter 4, Environmental Consequences, Infrastructure. Note: In the original draft reviewed, Alternative C was the Conservation/ Restoration alternative. Alternative C is Alternative B in this final EA.

EA-001: Intro, Purpose and Need

EA-002: Alternative descriptions

4	1	Billie, B.	Comment: Page 15 - first paragraph: Protected areas. There are no areas specifically identified and protected for their ecological, historical or educational value. I am concerned about this paragraph because there are Indigenous Human Remains located on APAFR. At that time I understood that these areas would be protected from any disturbance.	Response: You are correct. Those areas are protected by federal law, although their locations are not identified to the public on maps. This paragraph describes the current situation (Alternative B) in which no specific areas are formally designated and protected for their ecological, historical, or educational values, although all areas that possess these values are considered and protected on an action-by-action basis. There are Indigenous Human Remains located on APAFR and these locations are protected from any disturbance and always will be, regardless of the management alternative selected.

EA-003: Affected Environment

4	2	Billie, B.	Comment: You do not state what laws you intend to follow or what kind of research you intend to permit at these sites. We oppose any research at Indigenous Burial Grounds.	Response: Federal laws that we are required to follow are listed on page 1-4 of the INRMP and also at the end of Chapter 4 of the EA. They include the American Antiquities Act, ARPA, AIRFA, and NAGPRA. These laws are discussed and outlined in more detail in the Cultural Resource Management Plan for APAFR. Likewise, the kinds of research desired and permitted are also outlined in the CRMP. Research at burial grounds of any kind is strictly prohibited.
5	3	Horan, G.	Comment: Draft EA, section 3.3, military operations: Insert at the end of the first sentence "by providing a more realistic training environment through vegetative management operations".	Response: Refererences to military operations have been deleted.
5	4	Horan, G.	Comment: Draft EA, section 3.3, rangeland management: Insert at the end of the second sentence "in support of the military mission".	Response: This change has been made.

EA-004: Effects

4	3	Billie, B.	Comment: Who evaluates the significance of an archeological site?	Response: A trained archeologist performs all evaluations of sites for significance. In the case of APAFR, the archeologist at Moody AFB, Georgia oversees the archeological work at APAFR.

EA-005: Preparers

EA-006: List of Recipients

EA-007: Glossary

EA-008: References

APP A: The Planning Process

APP B: Landscape Associations at APAFR

APP C: Invasive Species

APP D: Listed Species

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