SOUTHWOOD DRI

HABITAT PRESERVE MANAGEMENT PLANS

Submitted to the Florida Fish and Wildlife Conservation Commission
As a Requirement of the 1999 Southwood Development Order

Prepared for

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1 INTRODUCTION

The purpose of this habitat management plan is to provide an overview of habitat management and mitigation issues for the whole Southwood Development of Regional Impact over its projected, 20-year construction-period. This document presents a conceptual plan for habitat-preserve management, methods of habitat-impact avoidance and resource protection, and proposed compensatory-mitigation for all phases of the Southwood project. The project will be constructed in many sub-phases. Very few of the sub-phases have undergone any site planning. As such, impact areas, preservation zone boundaries, and construction timetables, though based on the best available data, are all tentative. While the precise limits and acreages of wetland impacts and exact boundaries of habitat preservation areas are conceptual, the location and acreage of habitat preservation areas are correct. The general magnitude and locations of wetland impacts are also correct. Any references to City and County jurisdiction are based on the City-County boundary as of June 1999. These jurisdictions are expected to changes with proposed changes in the City-County boundary and potential, inter-local permitting agreements.

1.1 PROJECT OVERVIEW

The Southwood Development of Regional Impact (DRI) is a new community planned for development in Southeast Tallahassee, on land owned by The St. Joe Company (St. Joe). The developer will be a limited partnership between St. Joe and its wholly owned subsidiary, Arvida. The Southwood is a multi-use project that will contain the full range of residential types and densities, along with commercial, workplace and institutional uses. The project will include both active and passive recreational uses, and will be closely coordinated with the Capital Circle Office Center (CCOC).

1.2 PROJECT SITE HISTORY

The site has been the scene of human activity for hundreds of years, dating back to its use by the Apalachees in the pre-Colombian period. Later, the Spanish established missions in the vicinity and are believed to have actively cultivated and ranched the site. Other European settlers began to develop the site for agricultural purposes beginning in 1825. The circa 1830's map shown on the Application for Development Approval (ADA) cover shows portions of several plantations within the current Southwood development boundaries. By 1860, most land within the project tract was part of a few large plantations or farms. These operations are reported to have produced cotton, corn, dairy products, and wool (Johnson, 1998).

In more recent times and well into the 20th Century, the site was cultivated for cotton, tung oil, other crops, and livestock. Circa 1938 aerial photographs show several small farmsteads within the current development boundaries. The lumber and turpentine industries became more prevalent on the site after 1900. A railroad was operating on the current Tram Road right-of-way by 1897. Around 1933 the railroad was abandoned, and the tracks removed. By 1935, portions of the old railroad bed were in use as an unpaved, county road (Johnson, 1998). Part of the unpaved road's alignment appeared to following what today are forestry roads in the project's southeastern corner.

From 1948 to 1952, St. Joe Paper Company assembled a 9,600-acre holding that included the present DRI project site. Small farms were consolidated and converted into a cattle ranch and timberland. Pastureland constitutes most of the current development site, though active timberland occupies the northern, western, and southernmost portions of the property. By the late 1970's, the plantation included over 5,000 acres of improved pastureland and was one of the

major cattle operations in Leon County. Cattle ranching continues today, along with silviculture and active cultivation of forage and truck crops. Many of the site's drainage and agricultural structures have been only sporadically maintained or used during the last decade or two.

There are 270 acres of wetlands onsite, but virtually all wetlands and water features have been channeled, impounded, or otherwise manipulated or connected by an extensive system of ditches (Swanson et al., 1988). The numerous berms and ditches vary in both age and state of maintenance. They range from some that are known to have been constructed soon after St. Joe established the farm in the 1950's, to others that were probably constructed as part of the Antebellum plantations during the first half of the Nineteenth Century. Sporadic maintenance and use of drainage and berm structures coupled with erosion and sediment deposition has resulted wetland impacts and stressed wetlands in many locations.

On March 23, 1990, St. Joe Paper Company conveyed 273 acres adjoining Capital Circle to the Board of Trustees of the Internal Improvement Trust Fund as the site for a state office complex. This acreage had been included as part of a previous Southwood DRI proposal in 1988. The donation was made based on the Agreement for Land Donation and Development between St. Joe Paper Company and the Florida Department of General Services. Subsequently, DRI approval was granted for the CCOC with a projected build-out by 2012. The St. Joe Company maintained a drainage easement across the wetlands on this conveyed land. This drainage easement pre-dates and appears to supersede any conservation easements that may be granted as part of the Capital Circle Office Complex development process.

1.3 Listed Species Habitat Management and Mitigation Summary

Much of the mitigation for impacts to listed species habitat can be accomplished in the Shepherd Branch Mitigation Area and four, habitat preserves on site. The remainder of the mitigation can be accomplished in the offsite Oak Ridge Mitigation Area. Some listed species such as kestrels and fox squirrels can be accommodated by avoiding impacts to existing habitat onsite and restoring degraded habitat in the Shepherd Branch and Oak Ridge Mitigation Areas. Exhibit 1 shows conceptual preserve-area boundaries.

The Shepherd Branch Mitigation Area will be used on an acre-per-acre basis as habitat mitigation for the first 84 acres of gopher tortoise habitat impacted. After the canopy has been thinned and restoration activities have been initiated, gopher tortoises can be relocated to the Shepherd Branch Mitigation Area (once appropriate state agency permission and permits have been obtained). This area appears to have the capacity for eighty-four relocated tortoises. The Oak Ridge Mitigation Area will be used on an acre-per-acre basis for the remainder of the gopher tortoise habitat impacts. Once restoration activities have been initiated onsite, up to 180 tortoises can be relocated to the Oak Ridge Mitigation Area. Conservation easements must and will be placed upon these two mitigation areas before habitat impacts can occur. The timing of the impacts and conservation easements is governed by the specifications of the 1999 Southwood Development Order.

Impacts to listed plant and animal species habitat will be addressed by avoiding impacts to existing habitat and by providing restoration, long-term management, and preservation in several habitat areas onsite and in the Oak Ridge mitigation area. Specific habitat preservation and mitigation for gopher tortoises are detailed in Appendix A. Mitigation and habitat management plans for mitigation and preservation areas are given below.

The proposed Shepherd Branch Mitigation Area is located in the southeastern corner of the Southwood DRI/PUD. It is bounded on the south by Tram Road and to the east by a St. Joe Company pine plantation. Under the proposed development plan, the mitigation area will be bounded to the north by a school site and the west by an active-recreation park (ball fields, tennis courts, etc.). A north-south road is proposed to cross the eastern edge of the mitigation site along the DRI's eastern boundary. Almost all of the mitigation site will be located in a contiguous parcel west of the proposed, north-south boundary road.

The 166-acre site consists of about 84 acres of sand and slash pine plantations and 82 acres of forest, streams, and ponds. Sand pine occupies about 80% of the pine plantation areas. Some long leaf pines have recruited in the area, particularly in the slash pine plantations. Gopher tortoise densities are currently 1.0 tortoise per acre. Tortoise densities are likely to decrease dramatically as the pines mature. Over the past 10 years, tortoise density declines of 50% have been observed in the onsite, sand pine plantations south of Tram Road and West of Capital Circle (see Southwood Natural Features Inventory for discussion). It seems reasonable to conclude that similar declines will occur in the Shepherd Branch Mitigation Area unless the land management regime changes.

An area of open/green space containing stormwater management ponds will connect the Shepherd Branch Mitigation Area to the Central Park Preserve. There will be enough upland area in this open space for the zone to serve as a corridor for species like the fox squirrel and other small mammals. Wildlife crossings are proposed for the north-south boundary road in order to maintain habitat connections with the mitigation area and habitat to the east.

The Oak Ridge Mitigation Area is a 271± acre area located approximately 3 miles southwest of the Southwood site. The Oak Ridge area is approximately half longleaf pine plantation and half slash pine plantation. Gopher tortoise densities in the longleaf pine areas are about three tortoises per acre. Tortoise densities in the slash pine areas are almost one tortoise per acre. Exhibit 2 is a regional map showing the Oak Ridge Mitigation Area. Exhibit 3 shows vegetation and landuse on and around the Oak Ridge site. Exhibit 4 is a legal description of the Oak Ridge site parcels. The Oak Ridge Mitigation Area was described as a 265± acre site in Development Order documents. Upon completion of a legal description, the two parcels that comprise the Oak Ridge site were found to comprise 271± acres.

2 ONSITE HABITAT PRESERVES

The Southwood onsite habitat preserves consist of the Central Park Preserve, Eastern Preserve, Western preserve, and North Park Preserve (Exhibit 1). The Southwood project also includes two, habitat-mitigation areas. The first, the Shepherd Branch Mitigation Area is located within the Southwood DRI boundaries in the southeastern corner of the project (Exhibit 1). The second, the Oak Ridge Mitigation Area is located off site and outside of the DRI boundaries. The Oak Ridge site is situated approximately 3 miles southwest of the DRI site.

2.1 ONSITE PRESERVES PROVIDED AS HABITAT MITIGATION

The preservation of four, additional, onsite areas will also provide habitat mitigation. These preserves include the Central Park Preserve, Eastern Preserve, Western Preserve, and North Park Preserve (Exhibit 1). These preserves will be placed under conservation easement as part of the site-specific PUD approval process for the development units that abut the specific preserve areas.

Upland pasture areas in these preserves will be managed to maintain or improve their value as fox squirrel and kestrel habitat. The current habitats in these preserves are lakes, forested and herbaceous wetlands, woodland pasture, and open pasture areas. The woodland pasture areas typically have oak or oak and pine canopies. Fox squirrels currently utilize most of the upland areas in these preserves. Some areas appear to be utilized as kestrel foraging habitat, though no nest cavities have been identified. The goal of habitat preservation and management in these areas will be to maintain the open habitat characteristics that make these zones suitable fox squirrel and kestrel habitats. Management goals will also seek to maintain a supply of mast for fox squirrel forage and snags for kestrel perching and nesting. Specific kestrel and fox squirrel habitat mitigation and preservation areas are listed in Appendix B.

Per the requirements of the Southwood Development Order, a minimum of 60 acres of existing pine-oak canopy and pasture areas within the onsite-preserve boundaries (shown in Exhibit 1) will be maintained as fox squirrel and kestrel habitat and placed under appropriate, long-term management. These preserve areas will not be impacted by stormwater facilities, golf courses, bike paths, or other green space landuses though the preserves may be within or surround these landuses. Bike paths, picnic area, or other recreational facilities may adjoins preserve areas, but these facilities will not be placed under conservation easements and cannot be counted as part of the minimum-required 60 acres of preserve.

Non-preserve greenspace land uses will be contiguous with the preserves in many locations, and the effective habitat area should be significantly larger than 60 acres as a result. Potions of the forested wetland areas within the indicated preserves may also serve a kestrel and fox squirrel habitat. The onsite preserves and the Shepherd Branch Mitigation Area will also contain significant areas of local (city and county) and federal jurisdictional wetlands that will also be placed under conservation easements. Wetland mitigation and preservation areas together with mitigation and preservation actions are listed in Appendix C.

2.1.1 Long Term management Responsibilities

Long-term habitat-management activities on the onsite preserve areas will be the responsibility of the St. Joe / Arvida LP or the Community Development District. If responsibility is assigned to the Community Development District, a portion of the District's annual assessment fee will serve

as the funding source for long-term maintenance of the onsite habitat preserves. Otherwise, St. Joe / Arvida LP will be responsible for funding habitat-management and maintenance activities.

2.1.2 Habitat Management Procedures

Cattle grazing is a mechanism that helps maintain kestrel and fox squirrel habitat in suitable conditions. Once cattle are removed from the Southwood site, active management will be required to maintain the quality of the onsite habitat preserves. Active management includes the following procedures or actions:

- In existing unimproved-pasture and forested pasture areas, mechanical methods like mowing or roller-chopping will be used to maintain ground cover at or below a 25-centimeter height (as suggested by Stys (1993) for kestrel habitat management). Mowing in these areas should occur no more than once every two weeks during a typical, annual growing-season.

- In existing, improved pasture areas, mowing or roller-chopping will be used to maintain habitat conditions, and will occur at whatever frequency is necessary to maintain existing conditions.

- Supplemental planting of desirable, native vegetation may occur if the preserves begin to lose important habitat characteristics or if the vegetation would provide buffers, forage, refugia, or other beneficial functions.

- The preserve areas will not be sodded unless sod is necessary to control erosion. If grass is planted in existing pasture areas, non-invasive species must be used.

- Allowing for human safety and liability considerations, habitat management in this site will seek to maintain standing dead trees or snags to serve as kestrel nesting and perch sites.

- Invasive-exotic vegetation will be managed in both the upland and wetland areas of these preserves. Exotic vegetation is defined as species listed on the current Florida Committee on Invasive Plants list.

- In order to prevent impacts or encroachments on these preserve areas, an environmental literature packet will be distributed to buyers of newly constructed homes, homeowners associations, and relevant construction crews. This literature will describe the importance, function, and boundaries of the preserve and its resident species and the regulations and restrictions that apply to the preserve.

- Homeowners will be prohibited from dumping yard waste in preserve areas, unauthorized vegetation planting in preserve areas, and unauthorized mowing, trimming or clearing of preserve areas. Community Development District maintenance personnel will be instructed not to dump yard waste such as grass clippings in these areas. If yard waste is discovered in preserve areas, it will be removed as soon as possible.

- Wildlife crossings will be constructed under the roads listed below, to maintain the habitat connections between these preserves. Un-developed golf course areas and fairways will also provide greenspace corridors to facilitate habitat connectivity.

2.1.3 Kestrel Nest Boxes and Nest Sites

A minimum of ten kestrel nest boxes will be installed and maintained in the habitat preserves. Typical nest box plans are given in Styes (1993) and in Exhibit 5 of this report. Boxes will undergo routine maintenance checks at least twice annually. Missing or damaged boxes will be replaced or repaired and species other than kestrels will be removed during these checks. One maintenance check should occur in December (prior to the breeding season).

Nest boxes should:

- Be placed approximately 22 feet above the ground.
- Be placed on poles, snags (dead trees), or live trees.
- Be placed in close proximity to a potential roost tree.
- Be oriented so that the box entrance faces generally south.
- Have a clear, unobstructed flight-path to the box entrance.
- Be placed in and open area at least 150 feet from a forest edge.
- If placed in a live tree, be placed 14 to 20 feet above the lowest branch of the tree.

As stated above, habitat management in this site will seek to maintain standing dead trees or snags with allowances for human safety and liability considerations. Removal of nest boxes will be allowed if a sufficient number of potential nest sites are present in a preserve. A decision to remove nest boxes must be approved by City Growth Management and Florida Fish and Wildlife Conservation Commission.

2.1.4 Onsite Preserve Management:

Table 2.1 provides a partial list of vegetation suitable for planting in the onsite preserves, mitigation areas, and undeveloped golf course margins. The following is a summary of preserve management and enhancement actions:

Central Park Preserve (onsite east and south of Central Park Lake)

- Designation of management entity with funding source.
- Understory and groundcover vegetation-management program designed to maintain fox squirrel and kestrel habitat value.
- Installation and maintenance of kestrel nest boxes.
- Wildlife crossing (dry culvert) under future east-west road crossing between Central Park Preserve and Eastern Preserve.
- Exotic vegetation management in uplands and wetlands
- Distribution of educational literature packets to buyers of newly constructed homes, homeowners associations, and construction crews. Literature will describe the importance, function, and boundaries of the preserve and its resident species and the regulations and restrictions that apply to the preserve.
- Posted signs identifying the preserve as a protected habitat-area.

Eastern Preserve (onsite north of Central Park Lake)

- Designation of management entity with funding source.

- Understory and groundcover vegetation-management program designed to maintain fox squirrel and kestrel habitat value.
- Installation and maintenance of kestrel nest boxes.
- Wildlife crossing (dry culvert) under future east-west road crossing between Central Park Preserve and Eastern Preserve.
- Exotic vegetation management in uplands and wetlands
- Distribution of educational literature packets to buyers of newly constructed homes, homeowners associations, and construction crews. Literature will describe the importance, function, and boundaries of the preserve and its resident species and the regulations and restrictions that apply to the preserve.
- Signs identifying the preserve as a protected habitat-area.

Western Preserve (onsite east of Capital Circle)

- Designation of management entity with funding source.
- Understory and groundcover vegetation-management program designed to maintain fox squirrel and kestrel habitat value.
- Installation and maintenance of kestrel nest boxes.
- Wildlife crossing (dry culvert) under Blairstone Road crossing that will connect southern and northern halves of preserve. Wildlife crossing (dry culvert) under Main Street road crossing that will connect southern edge of preserve to CCOC preserve.
- Exotic vegetation management in uplands and wetlands
- Distribution of educational literature packets to buyers of newly constructed homes, homeowners associations, and construction crews. Literature will describe the importance, function, and boundaries of the preserve and its resident species and the regulations and restrictions that apply to the preserve.
- Posted signs identifying the preserve as a protected habitat-area.

North Park Preserve (onsite west of Southwood Plantation Road)

- Designation of management entity with funding source.
- Understory and groundcover vegetation-management program designed to maintain fox squirrel and kestrel habitat value.
- Installation and maintenance of kestrel nest boxes.
- Distribution of educational literature packets to buyers of newly constructed homes, homeowners associations, and construction crews. Literature will describe the importance, function, and boundaries of the preserve and its resident species and the regulations and restrictions that apply to the preserve.
- Posted signs identifying the preserve as a protected habitat-area.

2.1.5 Undeveloped, Golf Course-Margins

The proposed golf courses will occupy approximately 225 acres. Per the Southwood Development Order, a minimum of 45 acres (in addition to the 60 acres of preserves) will not be developed and will be remain in the existing condition (usually as buffers along the edges of fairways). These un-developed areas are located in suitable fox squirrel and kestrel habitat areas. Understory and groundcover vegetation-management in these areas will be designed to maintain fox squirrel and kestrel habitat value. The following management actions will apply to these areas and relevant golf course personnel will be informed of these procedures:

- In existing unimproved-pasture and forested pasture areas, mechanical methods like mowing or roller-chopping will be used to maintain ground cover at or below a 25-centimeter height (as suggested by Stys (1993) for kestrel habitat management).

Mowing in these areas should occur no more than once every two weeks during a typical, annual growing-season.

- In existing, improved pasture areas, mowing or roller-chopping will be used to maintain habitat conditions, and will occur at whatever frequency is necessary to maintain existing conditions.
- Supplemental planting of desirable, native vegetation may occur if the preserves begin to lose important habitat characteristics or if the vegetation would provide buffers, forage, refugia, or other beneficial functions.
- The undeveloped areas will not be sodded unless sod is necessary to control erosion. If grass is planted in existing pasture areas, non-invasive species must be used.
- Allowing for human safety and liability considerations, habitat management in this site will seek to maintain standing dead trees or snags to serve as kestrel nesting and perch sites.
- Golf course maintenance personnel will be instructed not to dump waste such as grass clippings in these areas. If waste is discovered, it will be removed as soon as possible.
- Signs will be posted identifying the undeveloped areas as sensitive habitat areas with special management regimes.

2.2 LISTED SPECIES PROTECTION DURING CONSTRUCTION

Actions will be taken during construction of various phases and facilities to help ensure the safety of listed animal species. Actions will include:

- Prior to the commencement of clearing within 100 feet of a forested area (including forested pastures), a qualified biologist or environmental professional shall determine whether the area constitutes potential kestrel or fox squirrel nesting-habitat. If the area is determined to constitute potential nesting-habitat and clearing is to occur during nesting season, a qualified biologist or environmental professional will inspect the area for fox squirrel nests or kestrel cavities. Nest relocation will be permitted outside of kestrel nesting season or if a nest is determined to be abandoned. For purposes of this procedure, kestrel nesting-season should be considered to begin March 15 and end September 15. If a kestrel nest is observed and relocation proposed the Florida Fish and Wildlife Conservation Commission (FWC) should be contacted to determine the permits required before relocation can occur.
- If a fox squirrel nest is observed, an environmental professional will inspect the nest interior for young fox squirrels. If no young are present, the nest will be removed to discourage squirrels from returning to the impact area. If young are observed, a buffer area with a radius of approximately 75 feet will be cordoned off around the nest tree. No construction or clearing will occur in the buffer area until the young squirrels leave the nest. Any nest removal/relocation activities would first need to be coordinated with the FWC.
- Prior to the commencement of clearing in areas designated pre-construction gopher tortoise survey zones in Exhibit 1, a qualified biologist or environmental professional will locate and mark all active and inactive gopher tortoise burrows. All tortoises whose burrows will be disturbed by construction or clearing will be removed and relocated using accepted practices and according to the specifications of the permit

issued by FWC. Tortoises will be relocated to the suitable recipient-habitats such as the Oak Ridge or Shepherd Branch Mitigation Areas in the numbers and order listed in Appendix A. Relocation to any other sites would require prior approval from City of Tallahassee Growth Management. Any relocation will require additional permits from FWC.

- Best-management-practice procedure pamphlets and/or posted-notices will be provided to St. Joe / Arvida construction staff and contractors. These pamphlets will describe kestrels, fox squirrels, gopher tortoises, and indigo snakes, as well as their cavities, burrows, nests, and/or day beds. The literature will also list and explain protective actions, measures, and procedures to be followed during construction and list a contact(s) who can respond to questions regarding the procedures.

Table 2.1. Partial list of trees and shrubs suitable for planting in the onsite preserves and undeveloped golf course margins

Common name	Scientific name	Common name	Scientific name
Red maple	*Acer rubrum*	Wax myrtle	*Myrica cerifera*
Red buckeye	*Aesculus pavia*	Black Gum	*Nyssa sylvatica*
Paw paw	*Asimina triloba*	Hop hornbeam	*Ostrya virginiana*
River birch	*Betula nigra*	Slash pine	*Pinus elliottii*
American hornbean	*Carpinus caroliniana*	Spruce pine	*Pinus glabra*
Pignut hickory	*Carya glabra*	Longleaf pine	*Pinus palustris*
Atlas cedar	*Cedrus atlantica*	Loblolly pine	*Pinus taeda*
Hackberry	*Celtis laevigata*	Sycamore	*Platanus occidentalis*
Sugar berry	*Celtis laevigata*	Cottonwood	*Populus deltoides*
Buttonbush	*Cephalanthus occidentalis*	American plum	*Prunus americana*
Eastern redbud	*Cercis canadensis*	Chickasaw plum	*Prunus angustifolia*
Flowering dogwood	*Cornus florida*	Cherry laurel	*Prunus caroliniana*
American smoketree	*Cotinus coggygria*	Bradford pear	*Pyrus calleryana*
Mayhaw	*Crataegus opaca*	White oak	*Quercus alba*
Southern hawthorn	*Crataegus viridis*	Southern red oak	*Quercus falcata*
Common persimmon	*Diospyros virginiana*	Laurel oak	*Quercus laurifoliaa*
Carolina ash	*Fraxinus caroliniana*	Chestnut oak	*Quercus michauxii*
Green ash	*Fraxinus pennsylvanica*	Water oak	*Quercus nigra*
Loblolly bay	*Gordonia lasianthus*	Nuttall oak	*Quercus nuttallii*
Dahoon holly	*Ilex cassine*	Willow oak	*Quercus phellos*
Possum haw	*Ilex decidua*	Chinquapin oak	*Quercus pumila*
Gallberry	*Ilex glabra*	Shumard oak	*Quercus shumardii*
American holly	*Ilex opaca*	Live oak	*Quercus virginiana*
Yaupon holly	*Ilex vomitoria*	Sawtooth oak	*Querus acutissima*
Virginia willow	*Itea virginica*	Florida azalea	*Rhododendron austrinum*
Black walnut	*Juglans nigra*	Black locust	*Robinia pseudoacacia*
Eastern red cedar	*Juniperus virginiana*	Willows	*Salix* spp.
Sweetgum	*Liquidambar styraciflua*	Elderberry	*Sambucus canadensis*
Tuliptree	*Liriodendron tulipifera*	Pond cypress	*Taxodium ascendens*
Southern magnolia	*Magnolia grandiflora*	Bald Cypress	*Taxodium distichum*
Saucer magnolia	*Magnolia soulangiana*	American linden	*Tilia americana*
Star magnolia	*Magnolia stellata*	Winged elm	*Ulmus alata*
Sweet bay	*Magnolia virginiana*	Florida elm	*Ulmus americana floridana*
Flowering crab apple	*Malus spp*	Sparkleberry	*Vaccinium arboreum*
White mulberry	*Morus alba*	Blueberries	*Vaccinium* spp.
Red mulberry	*Morus rubra*		

3 SHEPHERD BRANCH AND OAK RIDGE MITIGATION AREAS MITIGATION AND MANAGMENT PLANS

The locations of the Shepherd Branch Mitigation Area and Oak Ridge Mitigation Area are shown in Exhibits 1, 2, and 3. Exhibits 1 and 3 also provide aerial photographs of the Shepherd Branch and Oak Ridge Mitigation Areas respectively. The Oak Ridge Mitigation Area consists of two parcels

Habitat restoration activities on the Shepherd Branch Mitigation Area will be the responsibility of the developer, St. Joe / Arvida L.P. Long term management of the Shepherd Branch Mitigation Area will be the responsibility of St. Joe / Arvida L.P. or the Southwood Community Development District. If the Community Development District assumes responsibility for long-term management, a portion of the District's annual assessment fees will serve as a dedicated funding source for this long-term maintenance. The developer, the Community Development District, or the National Forest Service will be responsible for habitat-restoration activities on the Oak Ridge Road Mitigation Area. One of the three will also be responsible for long-term maintenance of the site. If the Community Development District assumes responsibility for long term management, a portion of the District's annual assessment fees will serve as a funding source for this maintenance.

3.1 PROGRAM JUSTIFICATION AND OBJECTIVES

Southwood is a new community planned for development in southeast Tallahassee on land owned by The St. Joe Company (St. Joe). As part of the Development of Regional Impact (DRI) Application for Development Approval, St. Joe has committed to mitigation for impacts to state and federally listed wildlife and plant resources.

The Southwood DRI includes restoration and subsequent management of two former sandhill communities as mitigation for development impacts. Mitigation efforts described here are designed to restore and manage historic longleaf pine communities and the commensurate wildlife habitat that characterized the project area prior to existing land uses.

3.1.1 Proposed Mitigation Areas

Two mitigation project areas are proposed which, at a minimum, will satisfy provisions of the DRI Uniform Standard Rule using on- and off-site mitigation. The two proposed mitigation areas are presently planted in sand pine and slash pine and include:

- the 166 acre Shepherd Branch mitigation area, and
- the 271 acre Oak Ridge mitigation area.

The Shepherd Branch mitigation area is located in the southeastern corner of the Southwood DRI project area, Section 22, Township 1S Range 1E. It is bounded on the south by Tram Road and to the east by a St. Joe Company pine plantation. Under the proposed development plan, the mitigation area will be bounded to the north by a school site and the west by an active-recreation park (ball fields, tennis courts, etc.). A north-south road is proposed to cross the eastern edge of

the mitigation site along the project's eastern boundary. Almost all of the site will be located in a contiguous parcel west of the proposed, north-south boundary road.

The Oak Ridge Mitigation Area is a 271-acre offsite area located north of Oak Ridge Road and south of the Apalachicola National Forest. The site occupies most of the northeastern one-quarter of Section 12, Township 1 West, Range 2 South, and the northern one-quarter of Section 7, Township 1 East, Range 2 South (Exhibit 4). The mitigation site borders the National Forest along most of the northern boundary. Other, adjoining properties are pine plantations, a gun club shooting range, and low-density residential development. Community Road, a private sand road, bisects the mitigation site and provides access to a subdivision, the gun club, and National Forest land north of the site. The site is currently leased to a hunting club.

3.1.2 Mitigation Objectives

The primary objective of this mitigation effort is the development, management, and perpetuation of the long leaf pine - xeric oak communities that historically occurred in large expanses across Florida.

This plan proposes methods to sustain the future integrity of the longleaf pine sandhill communities to be restored and managed as part of the Southwood DRI by promoting or restoring historical patterns in forest ecosystem function, structure, and composition, especially surface fire regimes. The goals of this management plan are outlined below.

Goal #1. Maintain or enhance native plant and animal species, their communities, and the ecological processes that sustain them. Plan goals will be implemented through the development of specific management objectives. Under goal number one, management objectives include:

1. maintaining or enhancing individual native plant and animal species and communities,
2. reducing the threats to native plant and animal populations from introduced, non-native plants and animals, and
3. changing the structure of the forest by increasing the proportion of stand initiation and old-growth forests and decreasing the proportion of stands with dense, small-diameter trees. In addition, areas that are high in biological diversity, including shrublands, wetlands, and riparian corridors, will be maintained or enhanced.

Goal #2. Reduce the wildfire risk to forest and human communities. Under goal number two, management objectives include:

1. thinning forest stands and reducing forest fuels to reduce the risk of catastrophic wildfires,
2. maintaining or improving fuel breaks and fire access roads to enhance control of natural and prescribed fires, and
3. tracking fire conditions during prescribed burns in order to monitor the impacts of fire on biotic and abiotic resources.

3.1.3 Management Elements

The management plan defines areas of the forest that require different types and levels of management intervention. Moving forest ecosystem conditions closer to the natural range of variability will require major efforts to thin and open up the forest by selectively cutting trees and conducting prescribed burns on an on-going basis. Basic elements of the proposed management plan are outlined below. Identify and map different management areas, based on existing vegetation conditions and alterations. Tree species and densities, understory vegetation, and historic vegetation will provide criteria on which management plans will be based.

- **Develop restoration plans appropriate for each management area necessary for the conversion of the area to the natural long leaf pine - xeric oak community. These plans may include burning, mechanical cutting and removal, thinning, herbicide application, planting, or any combination of these.**

- **Apply forest management techniques to perpetuate the historic long leaf pine and xeric oak communities and control non-native species, including cogon grass and Chinese tallow trees. Continued management will rely on fire management.**

The initial implementation of the plan is expected to begin in the spring of 2000, and is intended to restore forest ecosystem conditions to within the natural range of variability exhibited by natural long leaf pine communities. Once the forest is returned to more natural conditions, ongoing management will then maintain desired forest conditions.

3.1.4 Plan Organization

This management plan provides objectives, rationale, and methods for the restoration and subsequent management of longleaf pine communities in the proposed mitigation areas that are part of the Southwood DRI. The plan is organized into five sections, listed below.

- **This first section of the management plan provides an overview of the project background, proposed mitigation areas, and the management objectives and goals.**
- **The second section of the plan presents the three components of the management planning process: descriptions of historical, existing, and desired ecological conditions. Once historical and existing conditions are characterized, they can be contrasted to assess the nature and degree of departure from conditions that existed prior to extensive human influence. The third component is the description of desired future conditions that resource managers hope to achieve by targeted management and monitoring programs.**
- **In Section 3.0, restoration and management considerations are addressed.**
- **Methods and implementation of the management plan are described in Section 4.0.**
- **Summary and conclusions are presented in Section 5.0.**

3.2 HISTORIC, EXISTING, AND DESIRED SITE CONDITIONS

Native longleaf pine communities, commonly referred to as sandhill communities, are the focus of mitigation efforts for the Southwood DRI. These communities dominated the landscape in the mitigation areas prior to existing agricultural uses and efforts to restore them rely heavily on an understanding of how the community functions.

3.2.1 Background

From 1948 to 1952, St. Joe Paper Company assembled a 9,600-acre holding, including the Southwood project area. The cut-over timber and farmland were converted into a cattle ranch and pastureland occurs over most of the project area. Cattle ranching continues today, along with active row crop cultivation and silviculture. There are over 300 acres of wetlands, but virtually all wetlands and water features have been altered or connected by an extensive system of ditches (Swanson et al. 1988).

Human activities in the project area date back hundreds of years, to the Apalachee culture in the pre-Colombian period. Later, the Spanish established missions in the vicinity and are believed to have actively cultivated and ranched the site. In more recent times and well into the 20th century, the site was cultivated for cotton, other cash crops, and livestock. Lumber and turpentine industries were also active, and a railroad ran along the southern perimeter near what is now Tram Road.

The project area was formerly dominated by a longleaf pine ecosystem that also once occupied a major part of the southeastern United States, including peninsular Florida. Pre-European settlement longleaf pine forests may have extended up to 60,000,000 acres (Boyer 1990, Simberloff 1993, Frost 1993). However, current estimates of remaining longleaf pine forests are about 3,000,000 acres (Dennington and Farrar 1983, Engstrom et al. 1996). Therefore, many efforts are underway to re-establish longleaf pine on upland sites (Moser 1996, Landers et al. 1995, USDA 1993b) and this mitigation project seeks to accomplish the same.

3.2.2 Role of Fire in Structuring Vegetation Communities

Sandhill communities are sandy, rolling lands similar in appearance to scrub but dominated by open stands of longleaf pines, which are among the tallest pines in Florida. The groundcover in sandhills is composed of wiregrass, ferns, and many species of flowering plants, producing an open, park-like appearance. Early Florida settlers reportedly could travel from coast to coast in a horse and wagon travelling over sandhills, which were then a very widespread plant community. Because sandhills generally burn more frequently than scrub, they have few of the hardwoods or shrubs common to scrub communities. Some of the most interesting wildlife in Florida, including red cockaded woodpeckers, gopher tortoises, and gopher frogs, live in sandhills.

Fire influences animal habitat by creating snags and other coarse woody debris and creating a mosaic of different types of wildlife habitat. Mortality of living biomass affects forest overstory and understory productivity and vegetation patterns. Fire affects cycling of nutrients through rapid chemical and physical turnover of carbon and nutrients stored in both living and dead biomass.
In addition, historic fire regimes have produced distinctive frequencies in temporal components and distinctive clusters in spatial components of ecosystems (Holling 1992). Low-intensity

surface fires tend to create finer-scale patches in forest architecture (e.g., a greater variety of patch types, smaller patch size, and more widely dispersed patches) than crown fires. Locations or periods with frequent surface fires produce a more open overstory because of mortality of seedlings. Locations or periods with fewer surface fires tend to show both increased overstory recruitment and more extensive patches of dense forest overstory.

Furthermore, increases in the landscape homogeneity of forests (an increase in densities of small- and medium-diameter trees and a decrease in large-diameter trees) can result in more extensive fires; especially those that are stand destroying (Swetnam 1990, Covington and Moore 1992). Changes in fuel loads and landscape patterns of forest stands are especially critical considerations along the urban-wildland interface of developments where houses are often located in or along the margins of forested areas.

In addition to ecosystem considerations, recent changes in forest stand structure and tree density in forests have direct implications for human values and safety. Fire control has been the great paradox of land management efforts over the past century. By becoming as effective as we have at suppressing fires in recent decades, we have exacerbated the problem when fires do occur. Predominantly low-intensity surface fires have been replaced in many areas by high-intensity crown fires that can devastate large areas of forests and adjacent homes.

3.2.3 Historic Vegetation and Wildlife Communities

Historically, the predominant vegetation association on the Shepherd Branch and Oak Ridge mitigation project areas was the longleaf pine-dominated sandhill community. The sandhill community is a unique forest ecosystem known for stands of longleaf pine (*Pinus palustris*) and wiregrass (*Aristida stricta*), with scattered turkey oak (*Quercus laevis*) and bluejack oak (*Quercus incana*). The thick, fire-insulating bark of pine and mature oak trees are fire adaptations.

Many herbaceous species, such as wiregrass produce seed following stimulation by fire during the growing season. In natural longleaf pine forests, intervals between burns were 3-4 years. When fire is suppressed, longleaf pine sandhills will succeed to mesic hardwood forests. Although the specific types of hardwood forests that invade are determined by the seed supply, all of these forests are characterized by higher shading, greater litter accumulation and less herbaceous ground cover than are present in longleaf pine forests. Some fire-dependent plant species occurring in longleaf pine sandhill communities are listed in Table 3.1.

Many wildlife species are dependent on Florida's sandhill communities (Table 3.1). These include the federally endangered red-cockaded woodpecker (*Picoides borealis*) and the state-endangered Florida mouse (*Podomys floridanus*). Other animals include the gopher tortoise (*Gopherus polyphemus*) and Sherman's fox squirrel (*Sciurus niger shermanii*), both of which are listed as "species of special concern" in Florida. These animals are important to the longleaf pine ecosystem because they serve important ecological functions such as seed dispersal and nest cavity construction. The gopher tortoise is considered a "keystone species" because its burrows provide refuge to many other species of vertebrates and invertebrates that, in turn, serve other important roles in the sandhills.

Table 3.1. Examples of fire-dependent plant and animal species.	
ANIMALS	PLANTS
Red-cockaded woodpecker	Longleaf pine
Scrub jay	Wiregrass
Gopher tortoise	Pine lily
Bobwhite quail	Cutthroat grass
Sherman's fox squirrel	Big pine partridge pea

The major threat to animals of the sandhill ecosystem is that much of the habitat has been destroyed or degraded through mismanagement (Hay-Smith and Tanner 1999). One method forest managers use to restore or rehabilitate the longleaf pine ecosystem is the re-introduction of summer fires to the sandhills of Florida. However, fire is a successful restoration tool only when sufficient ground cover of grass and pine needles is present as a fuel source. Some of the negative aspects of fire suppression include (Hay-Smith and Tanner 1996):

- loss or alteration of native plant and animal species composition,
- disruption of an ecosystem's functioning (e.g., mineral cycling, plant and animal succession),
- alteration of a plant community's general appearance,
- reduction of flowering and production of plants
- possible uncontrolled wildfires devastating natural areas, homes, and buildings, and
- introduction of non-native species, e.g. cogon grass and Chinese tallow.

In stands that have been excluded from fire for 15-30 years, lack of ground fuel greatly restricts the fire intensity and its ability to spread. Because of this, restoration methods such as forest herbicide applications may be valuable. Mechanical thinning is proposed for some areas as well.

3.2.4 Present Day Vegetation and Wildlife Communities

The clearing, cultivation and ditching that have occurred over many years of agricultural use have substantially influenced existing vegetation and wildlife resources. Land developed as pine plantation, pastureland, cropland, and similar agricultural uses now represents almost three-quarters of the entire Southwood project area, replacing previous vegetation associations. Uplands with significant live oak or other tree canopies are being incorporated into tracts planned for low intensity uses so that much of their functional and aesthetic value may be retained.

Importantly, exotic species such as cogon grass (*Imperata cylindrica*) and Chinese tallow (*Sapium sebiferum)* are a management concern in both mitigation areas. Cogon grass has taken hold in the Shepherd Branch mitigation area and continues to spread. Chinese tallow is less conspicuous at the present time.

3.2.5 Vegetation

The 166-acre Shepherd Branch mitigation area consists of about 84 acres of sand and slash pine plantations and 82 acres of forest, streams, and ponds. Sand pine occupies about eighty percent of the pine plantation areas. Some longleaf pines have recruited into the area, particularly in the slash pine plantations. Acres of predominantly longleaf, slash, and sand pine communities are listed in Table 3.2 for both of the proposed mitigation areas.

The Oak Ridge mitigation area consists of approximately 135 acres of longleaf pine and 136 acres of slash pine plantation. The slash pine plantation consists of a fairly dense cover of pine, oak, and shrubs. The longleaf pine area has an open canopy and extensive coverage by wire grass (*Aristida stricta*). Panhandle golden aster is also present on site. Though the site is still open, cover by briars (*Rubus* spp.) appears to be increasing. Briar and other shrub coverages are likely to increase with the continued absence of fire.

Table 3.2. Acres of longleaf, slash, and sand pine on the proposed Shepherd Branch and Oak Ridge mitigation areas.

SPECIES	SHEPHERD BRANCH	OAK RIDGE
Longleaf pine	-	135 acres
Slash pine	17 acres	136 acres
Sand pine	67 acres	-

Descriptions of wetlands, waterbodies, and uplands in the mitigation areas are addressed in detail in the Natural Features Inventory (NFI) portion of the DRI prepared for the Southwood project and are not discussed here. Brief summary descriptions of the more xeric pine and oak communities, however, are provided in the following sections.

Areas dominated by xeric oak species are characterized by white sandy, well-drained soils with a canopy predominantly of oak. This community type occurs on only 4 acres of the entire Southwood DRI property. Oak species include sand live oak (*Quercus geminata*) and scrub oak (*Quercus minima*). Sand pine, scrub hickory (*Carya floridana*) and sparkleberry are also present. Groundcover species include prickly pear cactus (*Opuntia sp.*), blackberry, reindeer moss (*Cladonia* sp.), and an abundance of foliose and crustose lichens.

Twenty-six percent (826 acres) of the Southwood project area is comprised of pine plantation. The pine plantation on the west side of the site is composed of slash pine that ranges from 2-10 ft. in height. On the south side of the site is a sand pine plantation with trees that are 10-12 ft. tall. Pine plantations (39 acres) occur with a mix of scrub (*Quercus inopina*), sand post (*Quercus margaretta*) and laurel oaks, scrub hickory and sparkleberry. Broom grass (*Andropogon sp.*), grapevine, prickly pear cactus, golden aster (*Pityopsis graminifolia)*, Panhandle golden aster (*Pityopsis flexuosa*), and bear grass (*Yucca filamentosa*) are common as understory and groundcover species.

The following listed plant species occur or potentially occur in the mitigation areas.

Panhandle golden aster (*Pityopsis flexuosa*): this plant is located in the pineland areas adjacent to and immediately north of Tram Road. It is anticipated that within the next ten years, the young sand pine plantations that dominate these areas will degrade to the condition of the sand pine

areas south of Tram Road. The areas south of Tram Road and west of Capital Circle are characterized by very little groundcover and near canopy closure and are not likely *Pityopsis* habitat.

Kral's yellow-eyed grass (*Xyris longisepala*): though ADA sufficiency comments identified this species' potential to occur onsite, this species was not identified in any of the field survey efforts.

One federally listed plant species, the Panhandle golden aster *(Pityopsis flexuosa)* was observed. Presence of this species was indicated in the 1988 DRI studies and was confirmed in the current field survey. The species was observed in the sandy communities located north of Tram Road and south of the Southwood estate house. A positive identification was made through the remaining inflorescence. Due to the significant soil change between the north and south portions of the site, it is anticipated that this species is limited to the southern half in areas that are not in pasture. No other listed plant species were sighted in association with xeric pine communities on the site.

3.2.6 Wildlife

Vertebrate species occurring or potentially occurring in the Southwood DRI mitigation areas, based on the Natural Features Inventory, are described in the following paragraphs. The primary species of interest in both mitigation areas are gopher tortoises and associated commensals, fox squirrels, and kestrels. Surveys were done to look for evidence of red cockaded woodpeckers, but none were found and the mitigation areas are not considered appropriate habitat for the birds.

Gopher Tortoises. Gopher tortoise densities are currently 1.0 tortoise per acre in the Shepherd Branch mitigation area. Tortoise densities are likely to decrease dramatically as the pines mature. Over the past 10 years, declines of 50% have been observed in the onsite, sand pine plantations south of Tram Road and West of Capital Circle. It seems reasonable to conclude that similar declines will occur in the Shepherd Branch Mitigation Area unless the land management regime changes.

Observations suggest that the number of abandoned gopher tortoise burrows and deep armadillo burrows in the areas west of Capital Circle is greater than would be expected in good habitat conditions. These areas are slash pine and sand pine plantations with canopy closure approaching 90 percent and with sparse ground cover. Active gopher tortoise burrows are located in or adjacent to gaps in the canopy where ground cover is noticeably greater. When the typical habitat west of Capital Circle is analyzed using habitat suitability indices discussed by Cox, et al. (1987), these habitats score very low, suggesting the habitat is marginal for gopher tortoises. This, taken together with field observations of little groundcover and large numbers of abandoned burrows, suggests that the gopher tortoise population west of Capital Circle is in significant decline.

The mitigation areas were converted to pine plantations approximately three to five years ago. The low canopy closure under current conditions affords favorable gopher tortoise habitat. However, continued normal tree growth will result in substantial canopy closure and reduced forage such that gopher tortoise densities are likely to fall well below levels denoting significant habitat (more than 0.4 gophers per acre) within 5 to 10 years.

Cogon grass is also becoming a serious problem in the Oak Ridge mitigation area and can be expected to cause future declines in tortoise populations. A comparison of surveys in the pine

plantations west of Capital Circle from the 1988 and 1998 ADA applications provides support for this contention.

Fox squirrels. Although many of the forested pasture areas on site are potential fox squirrel habitat, only areas around mast-producing trees provide habitat for fox squirrels. During fallow periods in the summer, many pasture and crop areas support a dense growth of sickle pod (*Senna obtusifolia*). This ruderal plant likely impedes fox squirrel movement across these areas. Because of these factors, the true area of potential fox squirrel habitat on site is somewhat less than the area that one would calculate based on FLUCCS mapping alone.

Southeastern American Kestrel *(Falco sparverius paulus*). An American kestrel *(Falco sparverius)* was reported in a 1988 survey of the site. An individual was also sighted in March 1998 during a site visit with Florida Game and Fish Commission staff. This individual was assumed to be the southeastern American kestrel subspecies *(Falco sparverius paulus*). This assumption was made based on the belief that the American kestrel subspecies would not be present during late March. A kestrel was sighted in mid-October 1998 and several kestrels have been sighted in November 1998. No attempt has been made to determine subspecies for these late 1998 sightings. The Southwood site is not in a region Cox et al. (1994) identify as strategic conservation area or regional habitat area for the southeastern American kestrel.

The southeastern American kestrel is assumed to forage on the Southwood DRI site on the basis of the March 1998 sighting. No nesting cavities have been identified on site. Much of the forested pastureland and open pastureland containing or adjacent to forestland, hedgerows, or isolated trees is suitable foraging habitat for kestrels. However, based on Stys (1993), actual foraging area is probably limited to low ground cover areas (less than 25 cm.) within 50 meters of a perch site. During the summer, heavy growth of sickle pod probably limits the proportion of the area otherwise suitable for foraging, which can actually serve as foraging habitat. Understory growth may limit foraging habitat value of some of the forested pasture as well.

As in the case of the fox squirrel, the true area of potential kestrel habitat on site is somewhat less than the area that one would calculate based on FLUCCS mapping alone.

Florida pine snake (*Pituophis melanoleucys mygitus*). Individuals were observed along two gopher tortoise transect lines in the pine plantations north of Tram Road. Its primary prey, the southeastern pocket gopher *(Geomys pinetis)* is also found here. The Florida pine snake is a State-listed (special concern) sub-species associated with sandhill or oak scrub communities.

Red cockaded woodpecker (*Picoides borealis*). A ten consecutive-day survey of potential red cockaded woodpecker habitats detected no presence of red cockaded woodpeckers on site. Potential red cockaded woodpecker habitat is extremely limited, as this species requires stands of mature, or old-growth pines for nesting and foraging. Pine plantations, which encompass 826 acres of the property and areas defined as 410-Coniferous Forest-Uplands, are in various stages of growth; all areas of cut-over plantations (approximately 360 acres) north of Tram Road and east of Capital Circle have very low potential to support this species.

Other potentially suitable habitat for this species occurs primarily in isolated areas in pine plantations west of Capital Circle, but commercial timber operations and lack of old-growth stands of pines greatly reduces the potential for populations to occur in these areas as well. Excavations and bark removal areas in a live, longleaf pine south of the estate house were thought to be the result of pileated woodpecker foraging (Woods, personal communication).

Florida black bear (*Ursus americanus floridanus*). Sufficient habitat is not available on the site to sustain a Florida black bear population for any length of time. It is possible, though unlikely, that black bear could be a rare transient visitor because of their wide ranging habits and documented presence in the Apalachicola National Forest and surrounding area and any potential habitat on site is fragmented. The onsite areas are isolated from potential offsite-habitat areas by large expanses of sand pine plantation that are not suitable bear habitat. As such, it is extremely unlikely that this project site supports black bears.

Eastern indigo snake (*Drymarchon corais couperi*). This species occupies a wide range of habitat types, though the principal focus on protecting its habitat in Florida is closely related to protection of habitat for gopher tortoises and their burrow commensals. Habitat for this species generally overlaps with habitats where gopher tortoise burrows were found on the southern end of the property, but mixed hardwood-pine and upland forests also could support the eastern indigo snake.

Gopher frogs (*Rana capito*). This species, another common inhabitant of gopher tortoise burrows, has not been documented on the site, but could possibly occur. Adequate habitat for gopher frogs may exist in temporary wetlands near Shepherd Branch, and around active tortoise burrows in pine plantations adjacent to Shepherd Branch. Gopher frogs have been documented in proximity to the Shepherd Branch system south of Tram Road.

Florida mouse (*Podomys floridanus*). It is assumed that this species occurs onsite based on the distribution of the species to the east. In the habitats present on the Southwood site, the Florida mouse should be expected to occur as a gopher tortoise burrow-commensal. No specific studies have been conducted to establish whether the Florida mouse does or does not occur on this site and no future surveys are currently planned.

3.2.7 Desired Conditions

The desirable habitat for both mitigation areas is the longleaf pine - xeric oak habitat that existed in these areas prior to development. The desired conditions of this habitat management plan are those that will maintain or enhance native plant and animal species and the ecological processes that sustain them as part of the longleaf pine community.

As part of this plan, the Shepherd Branch mitigation area will have connections to the Central Park Preserve via areas of open/green space containing stormwater management ponds. There will be enough upland area in this open space for the zone to serve as a corridor for species like the fox squirrel and other small mammals. Wildlife crossings are proposed for the north-south boundary road in order to maintain habitat connections with the mitigation area and habitat to the east.

Desired conditions for wildlife will be those which:

- improve and maintain gopher tortoise and commensal species habitat,
- restore and maintain kestrel habitat, and
- restore and maintain fox squirrel habitat.

Success criteria by which proposed mitigation may be measured include:

- appropriate canopy coverage and composition,
- appropriate groundcover composition and cover, and
- control of exotic or invasive plant species. At any given time there shall be no more than 10% areal cover by invasive exotic species and no more than 1% areal cover by exotic shrubs or trees of seed-bearing size. This should not be construed that exotic vegetation invasions be allowed to persist. Rather, this should be interpreted to mean invasions of up to 10% areal cover arising between vegetation-management events should not constitute failure of the mitigation program.

Habitat in the north-central part of the Southwood project area is planned for a golf course and low-density residential development. Both uses can retain important habitat elements for kestrel nesting, perching and foraging, and for fox squirrel use, with nominal management. No conservation designation should be necessary unless the new surveys identify southeastern kestrel nests that would warrant a buffer zone for nest protection.

Young pine plantations in areas near Tram Road are undergoing rapid succession to a community with closed canopy and reduced ground cover, thereby greatly reducing their value as habitat for gopher tortoises and commensals. Population densities are expected to fall below the 0.4 per acre guideline denoting significant habitat so as to suggest that off-site mitigation would be preferred over on-site protection.

3.3 RESTORATION AND MANAGEMENT CONSIDERATIONS

The former, existing, and proposed conditions have been described for each of these mitigation areas in previous sections of this document. In this section, restoration and management considerations relevant to the mitigation efforts are addressed. These considerations focus on the importance of habitat heterogeneity as part of the restoration and management scheme.

3.3.1 Vegetation Communities

Native plants and animals of Florida flatwoods have evolved in the presence of frequent burning in many pine forest types. Shrubs such as saw palmetto, pawpaw, yaupon, sweetleaf, sumac, and blackberry all respond vigorously to periodic burning. Other species are limited by fire. Exclusion of fire for the first 10 or 15 years in pine plantations may, therefore, have drastic effects on the development of the forest as an ecosystem.

Although management for timber is generally for mature, single-aged forests, uneven-aged timber management produces a forest more similar to the pre-settlement forests (Engstrom et al. 1996). The original longleaf pine stands are believed to have varied greatly in their age-class distribution and structure (Schwartz 1907, Wahlenberg 1946) due to numerous small-scale disturbances (such as lightening strikes and varying intensity of fires) (Platt et al. 1988, Engstrom et al. 1996). Before European settlement, fires probably occurred as frequently as every 1-10 years (Chapman 1932a,b, 1950a,b, Christensen 1981, 1988). Some of the advantages of fires were discussed previously and are summarized here.

Fires are known to:

- promote flowering of herbaceous species and fruit production of woody species,
- improve the nutritional quality of plants for both wild and domestic animals,
- enhance nutrient cycling of some elements and elevate soil pH,
- help maintain required habitat conditions for fire-adapted plant and animal species,
- result in a more heterogeneous and diverse habitat, and
- prevent wildfire conditions from developing (i.e., vast accumulation of highly flammable, dead vegetation).

Numerous studies show that mature pine stands have few juveniles and that there is an inverse relationship between juvenile growth and overstory density (Pessin 1938, 1939, Heyward 1939, Smith 1955, Boyer 1963, 1974). Furthermore, the heavy longleaf pine seeds fall close to the source tree (Croker and Boyer 1975). Recently, it has been shown that shelterwood methods, which result in different age class distributions and variable sized disturbance gaps are an appropriate method for regeneration (Croker and Boyer 1975, Neel 1993, Farrar 1993, 1996, Rudolph and Conner 1996).

Using shelterwood methods, a first cut is made and prescribed burning is used to prepare the site for seedling establishment. The stand is thinned heavily, leaving only the best-formed trees to provide seed for regeneration. The remaining trees are left until harvest or burning. In addition, herbicide applications may be used to suppress the growth of midstory oaks while encouraging the understory growth of wiregrass and longleaf seedlings.

Burning, mechanical thinning, and herbicide applications, in addition to plantings, will provide an integrated approach necessary for the successful restoration of the sandhill community to the Shepherd Branch and Oak Ridge mitigation areas. Continued management will focus on burning but may also include continued thinning and herbicide use.

3.3.2 Wildlife

In the Southeastern Coastal Plain, clear cutting is the most common technique used in timber harvesting. No other management practice has more immediate and dramatic effects on animals and their habitats. For example, clear cutting typically excludes from a site all birds and mammals that feed and nest in crowns of trees. The degree of impact depends on the age, plant species present, stocking density, and size and shape of the stands removed. In northern Florida, approximately 40 percent of the breeding forest bird species are cavity-nesters, and clear cutting has drastic effects on local populations of these birds. Competition among animals for nesting cavities is intense; thus, clear-cut, short-rotational management systems represent potential limiting factors for these species. Whenever possible, snags and trees with cavities should be left standing to fulfill the requirements of cavity-dwelling species of wildlife.

The length of time required for growing pines to dominate a site also depends on the intensity of site preparation. This is an extremely important point in determining the species of wildlife that will be supported. When the pines are young and the sparse crowns allow sunlight through, the plantation may typically be used by wildlife species that live in early successional habitats. These include bobwhites, cottontails, cotton rats, and sparrows. Young forests also supply abundant foods for deer and turkeys. These habitats and animals decline as the pine stand approaches crown closure. After closure and before thinning or burning occurs, a pine plantation provides few food plants and little more than escape and nesting cover for many wildlife species.

In general, high-intensity site preparation speeds forest development and diminishes wildlife habitat. An ecological study comparing high intensity with low intensity site preparation demonstrated that, after nine years, low-intensity sites had a well-developed grass/palmetto understory and little shrub growth. The understory supported a large number of insects, which in turn supported a variety of insect-feeding animals, including opossums, armadillos, and shrews. In comparison, high-intensity site preparation had a greater degree of crown closure and a more developed shrub layer. This greatly reduced the amount of ground forage, and the site supported some animals that prefer more open grounds level conditions, namely rabbits, bobwhites, and cotton rats.

Although site preparation techniques such as cultivation and fertilization may reduce the total understory, scientists have found that the proportion of desirable understory forage plants is sometimes greatly increased. After 12 years, prepared sites provided better deer habitat than non-prepared sites. The scientists concluded that intensive pine culture can be compatible with maintaining deer habitat. Other site preparation techniques can help wildlife also. In addition, the piling of debris to form windrows provides food and cover for deer, bobwhites, and cottontails.

A noteworthy point related to site conversion involves pine plantations that have been planted on "old-field" sites. Old-field sites are those formerly under agricultural cultivation. In general, old-field sites yield greater pine growth and less understory growth than previously non-cultivated sites. Development of understory vegetation is typically minimal in old-field plantations due to the lack of seeds in the soil. The lack of structural diversity of vegetation layers in old-field plantations results in low within-stand diversity generally thought to be less attractive to wildlife than plantations on previously forested sites. Generally, when considering a variety of wildlife species, less intensive levels of site preparation are probably more favorable than more intensive levels.

This management plan specifically addresses restoration of longleaf pine habitat for gopher tortoises although restoration efforts are expected to benefit these species in general. Wildlife species and their associated habitat that which occur or may occur in the proposed mitigation areas are listed in Table 3.3. Impacts to gopher tortoise habitat, mitigation for impacts, and anticipated timing of mitigation and impacts are presented in the Appendices.

Prior to restoration of longleaf pine habitat, the existing habitat proposed for mitigation will provide poor gopher tortoise habitat. To accommodate the need for immediately suitable habitat for gopher tortoise relocations from other areas, large areas of sand pine and existing longleaf pine communities will be mechanically thinned, as described in Section 4. Restoration of longleaf pine shall be coordinated with the need to accommodate gopher tortoise relocations.

Table 3.3. Species occurring or likely to occur in the Shepherd Branch or Oak Ridge mitigation areas for the Southwood project. State and Federal status of listed species and typical habitat are also listed. T=threatened; E=endangered; SSC=Species of Special Concern; NL=not listed; UR=under review for listing. .

SPECIES	SCIENTIFIC NAME	HABITAT	FEDERAL	STATE
Mammals				
Florida Mouse	*Podomys floridanus*	xeric uplands, including sandhill, scrub, xeric pine flatwoods	NL	SSC
Sherman's Fox Squirrel	*Sciurus niger shermanii*	sandhills and xeric pine flatwoods	NL	SSC
Birds				
Red Cockaded Woodpecker	*Picoides borealis*	63-130 year old longleaf pine, 62-149 year old loblolly, slash, and others	E	T
Southeastern American kestrel	*Falco sparverius paulus*	secondary cavity nesters in longleaf pine snags, sand pine, turkey oak	NL	T
Amphibians				
Gopher Frog	*Rana capito*	sandhill,scrub, xeric uplands, gopher tortoise commensal	NL	SSC
Reptiles				
Gopher Tortoise	*Gopherus polyphemus*	sandhills, scrub, coastal strand, xeric hammocks, ruderal	NL	SSC
Florida Pine Snake	*Pituophis melanoleucus mugitus*	sandhills, scrub, coastal strand, xeric hammocks, ruderal	NL	SSC
Eastern Indigo Snake	*Drymarchon corais couperi*	swamps, hammocks, flatwoods, uplands, ruderal	T	T
Plants				
Panhandle golden aster	*Pityopsis flexuosa*	sandhills	NL	E
Kral's yellow-eyed Grass	*Xyrix longisepala*	karst sinkholes and margins of sandhill ponds	NL	E

4 MANAGEMENT METHODS

This management plan presents a methodology designed to shift forest structure and processes closer to the historical range of variability. The plan proposes to use a combination of silvicultural and prescribed fire treatments to achieve this goal.

Methods to restore and manage former longleaf pine habitat in the Shepherd Branch and Oak Ridge mitigation areas rely on several. This section outlines both general and specific management actions for the mitigation areas. General management prescriptions will be applied to both mitigation areas. Initial restoration relies primarily on:

- **prescribed burns, and**
- **mechanical thinning.**

In addition to initial restoration efforts, successful regeneration of longleaf pine requires silvicultural treatments that increase survival, height growth, and reduce the grass stage of longleaf pine. These understory treatments include:

- **herbaceous vegetation control using herbicides,**
- **planting larger, containerized seedlings, and**
- **applying a fungicide called benomyl to the root system of longleaf pine.**

4.1 PLAN IMPLEMENTATION: OVERVIEW

Coarse-scale management protocols for the Oak Ridge and Shepherd Branch mitigation areas are described in this section. These protocols rely on two primary treatments for both short-term and long-term management. First, because of abundant regeneration in the past several years and high tree densities in many stands, planted sand pine forest structure must be restored to a more historical condition before surface fires can be re-introduced. Silvicultural methods will be used to thin trees to reduce fuel loads that promote crown fires. Second, prescribed fire will be used both to further reduce tree seedling numbers in stands and to restore fire as a key ecosystem process. An overview of these strategies is presented in Table 4.1.

While the treatments and options outlined in this plan are both ecologically and operationally sound, there are two major factors that must be considered before application of the recommended treatments. The first of these is the possible response of citizens to thinning and prescribed fires in the mitigation areas. Fires have been very limited in these forests in the recent past, and may be upsetting for people to see in what they perceive to be relatively healthy forest ecosystems. Public education regarding elements of the plan presented here will, therefore, be critical to its successful implementation.

Table 4.1. Proposed restoration and preservation strategies for longleaf pine communities in the proposed Shepherd Branch and Oak Ridge mitigation areas as part of the Southwood DRI.

GUIDING MANAGEMENT PHILOSOPHY	LAND MANAGEMENT PRACTICES	PUBLIC ACCESS/ PASSIVE USE LEVELS	FACILITIES DEVELOPMENT
RESTORATION			
Restore impacted areas to native or natural conditions to achieve overall objective. Restore native habitat for endangered and threatened species. Restore native fire regime. This is a transitional management designation.	Prescribed burns. Mechanical thinning. Non-native species removal. Longleaf pine plantings. Introduction of forest gaps.	Resource-based with nonintrusive land altering recreational uses During restoration, management strategies can be implemented. Once restoration is completed, management should continue to be consistent with preservation management strategies.	None to moderate depending on site characteristics. Facilities may include: • trail head, • hiking trails, • interpretive center, • parking area.
CONSERVATION: non-intrusive			
Protect longleaf pine - xeric oak community through maintenance and enhancement of native plant and animal species, their communities, and the ecological processes that sustain them. Increase age and size diversity of pine stands and manage for endemic and listed species.	Prescribed burns. Non-native species removal. Maintenance of forest gaps. Conservation easements, signs, education brochures.	Uses may include: • hiking, • canoeing, • bird watching, • wildlife watching.	None to minimal. Facilities should be consistent with existing features, e.g. trails should be part of existing corridors and edges.

A second major consideration related to the use of prescribed fire in the mitigation areas will be current regulations concerning air quality. Smoke management is a major concern for all efforts to restore historical fire processes and may limit the ability of forest managers to use fire as a management tool. Any fire event has the potential to temporarily degrade air quality, impair visibility, and expose the public to pollutants (Ottmar et al. 1995). Current regulations concerning particle emissions from fires are based on the Environmental Protection Agency's "PM10 standard," which is the grams of particulate matter 10 micrometers or smaller in diameter per ton of fuel consumed. Periods of burning for specific treatment units will need to be based upon when the PM10 standard can be met or when wind conditions will limit smoke over more heavily populated areas. Such conditions also will need to be coordinated with other weather and fuel prescriptions for burning.

A major consequence of these prescription constraints is that prescribed burn windows will need to be highly flexible and defined by qualified prescribed fire and smoke management specialists. There may be greater flexibility in the amount of particulate emissions allowed from prescribed fires in coming years (Babbitt 1996).

4.2 PLAN IMPLEMENTATION: COARSE SCALE

Four primary treatments to guide overall management efforts in the Oak Ridge and Shepherd Branch mitigation areas have been identified. These treatments are assigned to forest stands based on both landscape characteristics and current forest conditions. These coarse-scale treatments will be modified by specific stand-level management prescriptions for forest stands. The four treatment classifications are based on existing vegetation, level of management intervention needed, and level of management intervention possible in different areas (Table 4.2).

The four treatments are:

- **thinning,**
- **prescribed burning,**
- **herbicide and fungicide applications, and**
- **supplemental planting.**

These treatments will be applied to four different habitats, based on existing conditions:

- **dense longleaf pine areas - thinning of longleaf pines followed by prescribed fire in areas with dense stands of small- to medium-diameter trees,**
- **planted sand pine with some longleaf pine - removal of sand pines, followed by prescribed fire.**
- **sand pine with longleaf pine and cogon grass - removal of sand pine and oak trees, followed by prescribed fire in areas that include more open stands with lower tree density, followed by planting of longleaf pine and herbicide applications, and**
- **dense sand pine - removal of sand pine and oak trees, followed by prescribed fire in areas that include more open stands with lower tree density, followed by planting of longleaf pine and herbicide applications.**

Table 4.2. Proposed multi-age pine management strategies in the Shepherd Branch and Oak Ridge mitigation areas as part of the Southwood DRI.
THINNING
1. Thinning triggered when basal area exceeds 80 square feet per acre or canopy is closed. 2. Thinning to reduce basal areas to 50 to 70 square feet per acre/ or 25 - 75 trees/acre. 3. Thin for irregular (random) spacing of pines. 4. Thin all sizes of pines leaving 1/3 over 17 in. dbh, 1/3 between 11 and 17 in. dbh, and 1/3 between 5 and 11 in. dbh. 5. Retain all snags as well as old, suppressed, and dying trees that may become snags.
PRESCRIBED BURN
• Thinning will be followed by fall burn to prepare seedbed. • Fire regimes will range from 1 - 12- year intervals (three-year interval most common). • Expand growing season fires as possible. Attempt to achieve 33% spring fires, 17% summer fires, and 50% winter fires by the year 2000. • No special fire regimes in small regeneration openings.
OPENINGS/GAPS
Openings greater than or equal to 1/4 acre in size will be created throughout the forest, increasing heterogeneity in the forest.
REGENERATION AND SUPPLEMENTAL PLANTINGS
Pines will regenerate continuously in small openings throughout the forest. Created openings for regeneration up to 1/4 acre or more in size. No set amount of regeneration at any given time - sufficient regeneration to perpetuate pine trees. No special site-preparation anticipated, however some areas planned for prescribed burns may require several fire treatments before regeneration is expected. When planting is necessary, pines will be planted at 360 seedlings/acre in longleaf pine communities. No special fire regimes for small regeneration sites. All pines should be regenerated under prescribed burning regimes although some experimentation may be necessary. Any modification of fire regime will include entire block.
UNDERSTORY MANAGEMENT
1. Herbicide Application. Applications of hexazinone at rates ranging from 0.84 to 1.68 kg/ha to remove competition and thereby decrease length of time of longleaf seedlings in grass stage without damaging longleaf pine seedlings. 2. Non-native Vegetation Control. Exotic vegetation, such as cogon grass and Chinese tallow, will be identified and treated. Treatment may include herbicides, burns, and/or physical removal (see Table 4.3).
WILDLIFE
Thin several 20 acre sand pine and longleaf pine stands to provide immediate habitat for gopher tortoise relocations. Slash pine areas can be cleared and planted with longleaf pine. Maintained kestrel boxes or adequate kestrel nesting snags. Kestrel boxes should be installed and maintained at a density of one per 10 hectares until sufficient nest snags are present within the mitigation area. There will be a sufficient number of snags when there is a density of dead or dying trees (greater than 24 centimeters diameter-breast-height) of at least one tree per 8 hectares. Adequate kestrel feeding perches.
CONSERVATION MEASURES
1. Conservation easement. 2. Designation of management entity with funding source. 3. If feasible, conveyance of area to third party management entity such as Apalachicola National Forest 4. Posted signs identifying the area as a protected, habitat-mitigation area with restricted access.
MONITORING
Accurate records will be kept of management activities and acres in each management, including burning, thinning, planting, and wildlife counts. Photo documentation will occur on a semi-annual basis. Permanent locations will be established, including at an off-site location to provide a panoramic view of the project.

4.2.1 Thinning

Areas to be thinned have closed canopy and high density of generally small-diameter trees of slash and sand pine at the Shepherd Branch and Oak Ridge mitigation areas. The areas will be identified based on aerial photograph interpretation and field observations.

The development of understory vegetation, without thinning and burning, is inhibited due to the lack of light penetration through the pine crowns, the root competition for water and nutrients, and the heavy accumulations of organic litter that ties up nutrients. Thinning opens up the pine canopy of plantations, which allows understory and midstory vegetation development that is extremely important for many wildlife species. In general, thinning as early in plantation development and as often as possible is favorable both for wildlife and for forest health and productivity.

The first treatment covers stands that will need forest structure restored to a more historical condition before prescribed fire can be implemented. Treatments in these areas will rely on application of uneven-aged tree selection to thin stands (e.g., Long 1998). Uneven-aged treatments are used to maintain longleaf pine regeneration in stands, but at lower levels than at present.

Few trees with a diameter at breast height (DBH) larger than 12 inches will be cut. Larger-diameter trees (approximately 20 inches DBH) are generally absent from the mitigation areas, as noted earlier. Most trees larger than 12 inches will be left to grow into dominant overstory trees in the future. Larger-diameter trees left in stands should facilitate conversion of some stands to old-growth forest conditions in the future. In addition, sand pine and oaks other than turkey oak will be removed from stands in preference to longleaf pine to promote longleaf pine in stand canopies.

4.2.2 Prescribed Fire

The second treatment for the mitigation areas is for those portions amenable to immediate treatment with prescribed fires. These areas have lower stand densities and fewer trees in small-diameter classes. Prescribed fires will maintain and promote open stands through mortality of seedlings, saplings, and other smaller diameter trees. Prescribed fires are critical components for ecosystem management in these areas, since they will restore and reinvigorate related ecosystem processes and promote more diversity in landscape patterns. Prescribed fires on the margins of the forest-grassland ecotone also will be used to maintain forest and grassland community patterns across the landscape.

Variability in historic fire frequencies and spatial patterns will guide application of prescribed fires in stands. The best fire history data near the forest-grassland ecotone suggest a range of fire intervals from 5 - 10 years for these areas. The use of the concept of historical range of variability in fire patterns will allow managers flexibility in annual burn plans, since the range of intervals between fires will be a target for burning and not the mean fire intervals or other central tendencies seen in fire histories. Variation in stand structure resulting from differences in fire behavior will mimic past landscape diversity. We expect that in areas with dense patches of trees, some canopy will burn, increasing the heterogeneity of forest stands.

Burning schedules are extremely important in the development of habitat conditions favorable for various wildlife species. A one- to two-year burning schedule keeps the understory open and creates habitat favorable for bobwhites. A three- to five-year burning schedule allows for

development of browse and cover plants, thereby favoring deer and turkeys. A three- to five-year schedule also allows the accumulation of sufficient fuel to support the next prescribed burn, and is most compatible with timber production.

Burns are often conducted in the winter shortly after a rain, although there is some evidence that summer burns were historically more common and may be better for wildlife due to the "patchy" nature of these burns. A day with a slow, steady wind is desirable. Keeping the blocks of land to be burned relatively small will allow the burn to be stopped any time that conditions become dangerous. The areas to be burned should be surrounded by natural barriers or plowed fire breaks.

A burn is always begun by setting the fire on the downwind side of the site so that the fire will burn slowly back into the wind. Such a fire is considered safe provided the wind does not change direction. The upper surface layer of pine needles and grass will fuel the fire, but the lower organic layer should be moist enough to resist burning. A slow, steady wind will help to spread the heat before it rises into the tree crowns, and will facilitate a backfire. After burning, follow-up observations are necessary to prevent flare-ups from smoldering stumps or logs.

A less-intensive management alternative will be used in some parts of the mitigation areas. However, a longer-term solution for these areas is to eventually manage them as a prescribed natural fire management zone, where naturally ignited wildfires will be allowed to burn under prescribed conditions. A prescribed natural fire zone would be established in these areas only after treatments of other stands on its periphery have been completed. Treated areas on the margins of the prescribed natural fire zone will act as buffers for control of wildfires that ignite naturally in the prescribed natural fire zone area in the future. After a lightning ignition in this area, and as long as prescribed weather and fuel conditions persist, natural fires (including crown fires) would be allowed to burn.

In these and other stands, treatment prescriptions will likely need to be modified before any treatment implementation. For example, overall stand conditions as averaged from all plots within a stand may suggest an open forest with low tree density and few small diameter trees that would need to be thinned before a prescribed fire treatment. However, local patches in the stand may have closed canopies with high tree densities that could increase the possibility of crown fires during prescribed fire treatments. In these cases, management staff may want to thin trees in these areas before application of prescribed fire treatments. These decisions will, of course, need to be made by foresters and prescribed fire specialists in charge of treatment implementations. Relatively localized crown fires must be anticipated as part of the heterogeneity of the fire regime that will be restored in these forest ecosystems.

4.2.3 Understory Vegetation Management Considerations

During the implementation of management prescriptions like prescribed fire and thinning consideration will be given to conditions that exist in different areas of the forest, as outlined below for understory vegetation and wildlife.

Successful artificial regeneration of longleaf pine (*Pinus palustris*) depends both on first-year survival and the length of time trees remain in the grass stage after outplanting (Lauer, 1987). Longleaf seedlings can remain in the grass stage with little or no height growth for a period of 1-7 years (Nelson et al. 1985); therefore, silvicultural practices have been studied to remove a large percentage of the planted stock out of the grass stage in 2-4 years. Once out of the grass stage,

longleaf pines are no longer susceptible to brown-spot needle blight, a disease that causes defoliation and reduces plant vigor, thus extending the grass stage of longleaf pines (Kais et al. 1986).

4.2.4 Herbicide Applications

One of the most effective silvicultural treatments applied to reduce the grass stage of longleaf pine is herbaceous vegetation control using herbicides. Nelson et al. (1985) showed that weed control treatments shortened the time seedlings were in the grass stage by approximately 1 year, decreasing the time period during which a serious brown-spot needle blight infection could develop. The study also showed that trees with 2 years of herbicide applications were approximately 3 feet taller and 0.5 inch greater in diameter while broadcast or banded showed no effects (Nelson et al. 1985).

The herbicide treatment plan to eradicate undesirable/nuisance vegetation throughout the Shepherd Branch and Oak Ridge mitigation areas will be carried out following established guidelines. The treatment will be conducted with U.S. Environmental Protection Agency approved contact herbicides, which will be applied at labeled rates by a state licensed commercial applicator. The herbicide will be applied on foot with low volume backpack sprayers and the herbicide mixtures will contain a biodegradable indicator dye. The combination of the backpack application/dye herbicide mixture will provide greater control of over spray and ensure full coverage of target species, primarily cogon grass.

The mitigation areas are expected to have a viable wire grass seed source, so the use of any herbicide that has any residual properties will be used only if deemed necessary for a secondary control method. Herbicide applications to target species will occur during the peak-growing season at the site. Subsequent controlled burns will eliminate dead biomass and will be followed up with a final herbicide treatment to ensure control of any resprouting of target species. Specific management strategies for the use of herbicides in the control of exotic species are presented in Table 4.3.

Table 4.3. Proposed herbicides for the treatment of nuisance vegetation in the Shepherd Branch and Oak Ridge Mitigation Areas.

HERBICIDE	TREATMENT	TARGET SPECIES	APPLICATION
Roundup	* label	cogon grass	foliar (use Kinentic for surfactant)
Velpar (liquid/granular) "hexazinone"	label	oaks	basal
Garlon 4	label	Chinese tallow	basal (use citrus base oil for dilution)
Arsenal (liquid)	** label	cogon grass	foliar (mix with roundup and kinetic)

* First treatment will be within the maximum labeled rate.

** If deemed necessary, will be combined in solution with Roundup for a secondary treatment application.

4.2.5 Planting

Several studies have shown that planting larger root collar diameter (RCD) and containerized seedlings will increase survival, initiate height growth, and reduce the grass stage of longleaf pine. In Lauer's (1987) study, he planted seedlings with RCDs ranging from 3/16 inch to 13/16 inch. Results show seedlings size had a significant effect on the height (average of all trees) and the percentage of seedlings out of the grass stage at the end of both the second and third year.

According to Lauer (1987), brown-spot needle blight damage increased when planting seedlings with root collar diameters less than 7/16 in. In addition, trees with initial RCDs greater than 7/16 in. had acceptable growth with at least 87% out of the grass stage after 3 years.

Longleaf pine is difficult to regenerate and a seedling survival study was conducted at five locations in Georgia, experimenting bare-root and containerized seedlings. Boyer (1984) concluded that the survival of containerized seedlings during the first year was far superior to that of bare-root nursery stock. Even though containerized seedlings cost 2 to 3 times that of bare-root seedlings, planting containerized seedlings will pay off in the future with increased survival and height growth.

4.2.6 Fungicide Root Treatment that Controls Brown-Spot Needle Blight

Brown-spot needle blight is the most important disease of longleaf pine, which extends the year's longleaf remains in the grass stage. Kais (1986) found that benomyl root treatments provided effective brown-spot disease control during the 3-year period, which in turn stimulated rapid height growth. Kais (1986) also concluded that a 5-percent benomyl root treatment prior to outplanting of longleaf pine seedlings should be the most effective, efficient, and safe treatment for the control of brown-spot needle blight in southern longleaf pine plantations.

4.2.7 Additional Considerations

In addition to growth and survival of longleaf pine, non-native plant species, listed species, and forest gaps are addressed as part of this management plan.

4.2.7.1 Non-native Plant Species

The introduction of non-native species in recent decades presents a major challenge when planning for prescribed burns. These species (most often forbs and grasses) can displace native species and can greatly impact the structure and function of native ecosystems. Completion of ongoing mapping of non-native species is a high priority, as is monitoring of:

(1) the success of the integrated pest management strategies used to reduce non-native species,
(2) the impacts of fire on non-native plants, and
(3) the effectiveness of best management practices in preventing the further introduction and/or spread of non-native species.

At least two non-native species occur within the mitigation areas: cogon grass and Chinese tallow. These species should be carefully monitored after burning, as they are all invaders of

disturbed areas. Timing of prescribed burns, as indicated above, should help to control the spread of these species.

4.2.7.2 Threatened and Endangered Plant Species

Panhandle golden aster (*Pityopsis flexuosa*) and Kral's yellow-eyed grass (*Xyris longisepala*) occur or are likely to occur in the mitigation areas. Only *Pityopsis* has been found in the mitigation areas.

4.2.7.3 Openings and Gaps

Recommended treatments for forest gaps appear in Table 4.2. The first group includes those to be thinned, both to remove excess biomass and ladder fuels and to restore forest structure to a historical range of variability before prescribed fires. Roughly 10% of the stands should be open.

4.2.7.4 Wildlife Management Considerations

One of the main goals of this plan is to maintain or enhance native plant and animal species and communities. Therefore, ensuring that wildlife species, communities and habitats are maintained or enhanced is a fundamental consideration for implementation of the plan.

There is abundant evidence that wildlife species respond individually to changes in their environment (Hejl et al. 1995, Raphael et al. 1988). Different wildlife species have different habitat needs. Any change in a forest stand will benefit some species and disadvantage others. In order to deal with this dilemma, Hejl et al. (1995) suggest maintaining a sufficient variety of habitats so that all native wildlife species can survive in a landscape. For birds, Hejl et al. are particularly concerned with the loss of early-successional habitat, old-growth forest, snags and burned areas. These are the types of habitat that are generally least abundant in the mitigation areas.

Prescribed fires can also have negative impacts on certain species and individuals. Fire may result in direct losses to individuals, as well as localized decreases in food and cover and increased fragmentation. On a large scale, this can result in starvation, increased vulnerability to predators, decreased reproductive success, and decimation from exposure (Patton, 1992). Also, the potential indirect impacts to aquatic wildlife (such as increased potential for soil runoff into streams and locally decreased shading) should not be ignored. However, given the scale proposed here, effects on individuals and populations are expected to be negligible and short term. The long-term benefits of creating greater habitat and forage diversity, increasing forage abundance, and elevating forage nutrient content outweigh the potential negative impacts.

Thinning forest stands can also have negative impacts to wildlife similar to those of prescribed fire. Falling trees occupied by nesting birds or other wildlife species can result in direct losses of individuals. Thinning large areas (several hundreds of acres) can result in decreased food and cover for some species and thus the potential for increased vulnerability to predator and weather exposure. However, these impacts are expected to be negligible and minimized through pre-harvest walk throughs and small-scale thinning. Stands that are not burned or thinned will help to maintain historical range of variability related to wildlife habitat and ensure systemwide habitat diversity.

4.3 MONITORING

Photographic documentation is the final element in a complete mitigation-monitoring plan. The purpose is to establish a permanent record of the overall appearance and revegetation establishment.

Photo documentation will occur on a semi-annual basis. Permanent locations will be established, including at an off-site location to provide a panoramic view of the project.

Successful monitoring is based on sequential and overlapping frames, photo alignment with previous years photo images, and compass bearing coordinates to ensure exact locations. Annual monitoring reports are prepared for submittal to the regulatory agencies. This documentation is key to the ultimate measure of success of the mitigation.

4.4 TIMEFRAME FOR PLAN IMPLEMENTATION

The plan defines different areas of the forest that require different types and levels of management intervention. Moving forest ecosystem conditions closer to the natural range of variability will require major efforts to thin and open up the forest by selectively cutting trees and conducting prescribed burns on an on-going basis. These principal tools will be complemented with many other kinds of management actions such as wildlife habitat enhancement, weed control, erosion control, restoration of hydrologic flows, reintroduction of native species, and management of visitor use.

The initial phase of implementation of the plan is expected to begin in the spring of 2000 and to continue for several years. This initial effort will strive to restore forest ecosystem conditions to within the natural range of variability.

Once the forest is returned to more natural conditions, ongoing management will then be needed to maintain desired forest conditions. Prescribed fires will be used episodically to maintain open stand conditions and promote related ecosystem processes. At such time, historical patterns in fire regimes will guide timing and spatial patterns of prescribed fires. Prescribed fires should occur at a range of sizes, from small patchy fires to larger fires.

4.5 PUBLIC PARTICIPATION

Restoration and management of the longleaf pine ecosystem is the overall goal of this habitat management plan. Recognizing that humans are an integral part of the natural environment and that people cannot be excluded from either the development or the implementation of management plans for their public lands, the following public participation and education efforts may be implemented:

- **forest management web site information,**
- **utility bill inserts,**
- **newsletter mailings and placement of notices at trailheads and in other locations around the community,**
- **articles in the Home Owners Association newsletter,**
- **family and adult educational programming and field trips,**
- **presentations to neighborhood groups, homeowner associations, and community groups, and**
- **information booths at community festivals.**

5 CONCLUSIONS

A total of 344 acres of former longleaf pine habitat in south Leon County is proposed as mitigation for impacts resulting from the development of the Southwood project. The proposed mitigation areas have been converted to planted sand and slash pine, although various oaks have also recruited into the sites. The densely planted forests and increased canopy cover have shaded out characteristic ground cover species such as wiregrass. In some instances, extensive site preparation or invasion by non-native cogon grass has reduced the ability of the longleaf pine community to recover without active management.

This mitigation plan proposes to use burning, thinning, and other silvicultural techniques to restore former longleaf pine habitat and manage it in a way that maintains or enhances native plant and animal species, their communities, and the ecological processes that sustain them. These same management activities will also reduce the wildfire risk to forest and human communities.

For most areas, slash and sand pine plantations will be thinned and then burned as frequently as they will carry a fire (approximately every 2 - 5 years). Burning shall occur during the growing season when possible. The fire will suppress hardwood growth, improve longleaf regeneration, and increase wiregrass recovery. Hardwood snags will be left as wildlife habitat. Supplemental plantings of longleaf pine will be made randomly in areas where longleaf densities are low or non-existent. Once the restoration has been completed, natural fire conditions will be simulated to maintain the communities.

Wildlife will also benefit from the proposed habitat management plan. Primary management actions such as thinning and burning are expected to increase the variability of disturbance, temporally and spatially, which will increase habitat heterogeneity and therefore wildlife diversity. As a result, habitat for wildlife of interest, especially gopher tortoises and associated commensals, is expected to increase under the proposed management plan.

6 LITERATURE CITED

Babbitt, B. 1996. To take up the torch: the hidden risks of fire exclusion; how and why we must return the flame to its rightful place in the West. In: W.W. Covington and P.K. Wagner (eds.). Proceedings of a conference on adaptive ecosystem restoration and management. General Tech. Rep. RM-GTR-278:89-91. U.S.DA, Forest Service.

Boyer, W.D. 1963. Development of longleaf pine seedlings under parent trees. Research Paper SO-4. U.S.Department of Agriculture., Forest Service, Southern Forest Experiment Station, New Orleans.

Boyer, W. D. 1974. Impact of prescribed fires on mortality of released and unreleased longleaf pine seedlings. Research Note SO-128. U.S.Department of Agriculture, Forest Service, Southern Forest Experiment Station, New Orleans.

Boyer, W. D. 1990. Growing-season burns for control of hardwoods in longleaf pine stands. Research Paper SO-256. U.S.Department of Agriculture., Forest Service, Southern Forest Experiment Station, New Orleans.

Chapman, H.H. 1932a. Is the longleaf type a climax? *Ecology* 13:328-334.

Chapman, H. H. 1932b. Some further relations of fire to longleaf pine. *J. For.* 30:602-604.

Chapman, H. H. 1950a. Lightning in the longleaf. *Am. For.* 56(1):10-11, 34.

Chapman, H. H. 1950b. Longleaf yellow pine owes its existence to fire. *Coastal Cattleman* 16(1):10-13.

Christensen, N. L. 1981. Fire regimes in southeastern ecosystems. pp. 112-130 In H. A. Mooney, T. M. Bonnickson, N. L. Christensen, J. E. Lotan, and W. A. Reiners (eds.) Fire regimes and ecosystem properties. General Technical Report WO-26. U.S.Department of Agriculture., Forest Service, Washington, D.C.

Christensen, N. L. 1988. Vegetation of the Southeastern Coastal Plain. pp. 317-364 In M. G. Barbour, and W.D. Billings (eds.) North American Terrestrial Vegetation. Cambridge: Cambridge Univ. Pr.

Covington, W.W., and M.M Moore. 1992. Postsettlement changes in natural fire regimes: implications for restoration of old-growth ponderosa forests. In: M.R. Kaufmann, W.H. Moir, and R.L. Bassett, technical coordinators. Old-growth forests in the southwest and rocky mountain regions. Proceedings of a workshop, March 9-13, 1992, Portal, Arizona. General Technical Report RM-213:81-99. U.S. Department of Agriculture, Forest Service,

Cox, J., R. Kautz, M. MacLaughlin, and T. Gilbert. 1994. *Closing the Gaps in Florida s Wildlife Habitat Conservation System.* Florida Game and Fresh Water Fish Commission, Office of Environmental Services. Tallahassee, FL.

Cox, James, Douglas Inkley and Randy Kautz. 1987. *Ecology and Habitat Protection Needs of Gopher Tortoise (Gopherus Polyphemus) Populations Found on Lands Slated for Large-Scale Development in Florida.* Florida Game and Freshwater Fish Commission. Tallahassee, FL. Nongame Wildlife Program Technical Report No. 4.

Croker, T.C., and W.D. Boyer. 1975. Regenerating longleaf pine naturally. Research Paper SO-105. U.S.Department of Agriculture., Forest Service, Southern Forest Experiment Station, New Orleans.

Dennington, R. W. and R. M. Farrar. 1983. Longleaf pine management. Forestry Report R-8-FR-3. U.S. Department of Agriculture, Forest Service, Southern Region, Atlanta.

Engstrom, R. T., L. A. Brennan., W. L. Neel., R. M. Farrar, S. T. Lindeman, W. K. Moser, and S. M. Hermann. 1996. Silvicultural practices and red-cockaded woodpecker management: a reply to Rudolph and Conner. *Wildl. Soc. Bull.* 24(2):334-338.

Farrar, R. M. 1993. Growth and yield in naturally-regenerated pine stands. pp. 311-335 In S. Hermann (ed.) Proc. Of the Tall Timbers Fire Ecology Conference, No. 18, The Longleaf Pine Ecosystem: Ecology, restoration and management. Tallahassee, Fl: Tall Timbers Research Station.

Farrar, R. M. 1996. Fundamentals of Uneven-aged Management in Southern Pine. W. K. Moser and L. A. Brennan (eds.) Tallahassee, FL: Tall Timbers Research Station Misc Pub 9.

Frost, C. C. 1993. Four centuries of changing landscape patterns in the Longleaf Pine ecosystem. pp. 17-43 In S. Hermann (ed.) Proc. Of the Tall Timbers Fire Ecology Conference, No. 18, The longleaf Pine Ecosystem; Ecology, Restoration and Management. Tallahassee, FL: Tall Timbers Research Station.

Hay-Smith, L. and G.W. Tanner. 1999. Restoring longleaf pine sandhill communities with an herbicide (http://www.wec.ufl.edu/range). School of Forest Conservation and Resources, Univ. of Florida, Gainesville FL.

Hejl, S. J., R. L. Hutto, C. R. Preston and D. M. Finch. 1995. Effects of silvicultural treatments in the Rocky Mountains. Pages 220-244 in T. E. Martin and D.M. Finch, editors. Ecology and management of neotropical migratory birds. Oxford University Press, New York.

Heyward, F. 1939. The relation of fire to stand composition of longleaf pine forests. *Ecology* 20:287-304.

Holling, C.S. 1992. Cross-scale morphology, geometry, and dynamics of ecosystems. Ecological Monographs 62:447-502.

Kais, A.G. 1986. Pruning of longleaf pine seedlings in nurseries promotes brown spot needle blight. Tree Planters' Notes. 29(l):3-4.

Landers, J. L., D. H. Van Lear, and W. D. Boyer. 1995. The longleaf pine forests in the Southeast: requiem or renaissance? *J For.* 93(11):39-44.

Lauer, D.K. 1987. Seedling Size Influences Early Growth of Longleaf Pine. Tree Planters Notes 38(3) 16-17.

Long, 1998, after City of Boulder Forest Ecosystem DRAFT Management Plan. February, 1999. Open Space Department, Boulder, Colorado.

Moser, W. K. 1996. Extension Workshops on Longleaf Pine Management in the Southeastern United States: The View form an NGO. In: R. Beck and J. Johnson (eds.) Proc. Of the 1996 Meeting of IUFRO Working Group 6.06.03 Forestry Extension. Freising, Germany. In press.

Neel, W. L. 1993. An ecological approach to longleaf forestry. pp. 311-335 In S. Hermann (ed.) Proc. Of the Tall Timbers Fire Ecology Conference, No. 18, The Longleaf Pine Ecosystem: Ecology, restoration and management. Tallahassee, FL: Tall Timbers Research Station.

Nelson, L.R., B.R. Zutter, and D.H. Gjerstad. 1985. Planted Longleaf Pine Seedlings Respond to Herbaceous Weed Control using Herbicides. South. J. Appl. For. 9(4): 236-240.

Ottmar et al., 1995 after City of Boulder Forest Ecosystem DRAFT Management Plan. February, 1999. Open Space Department, Boulder, Colorado.

Patton, 1992 after City of Boulder Forest Ecosystem DRAFT Management Plan. February, 1999. Open Space Department, Boulder, Colorado.

Pessin, L. J. 1938. The effect of vegetation on the growth of longleaf pine seedlings. *Ecol Monogr.* 8:115-149.

Pessin, L. J. 1939. Density of stocking and character of ground cover as a factor in longleaf pine reproduction. *J. For.* 37:255-258.

Platt, W. J., G. W. Evans, and S. L. Rathbun. 1988. The population dynamics of a long-lived conifer (Pinus palustris). *Am. Nat.* 131(4):491-525.

Raphael, M. G., K. V. Rosenberg, and B. G. Marcot. 1988. Large-scale changes in bird populations of douglas-fir forests, northwest California. In: J. A. Jackson, editor. Bird conservation 3. University of Wisconsin.

Rudolph, D. C., Conner, R. N. 1996. Red-cockaded woodpeckers in silvicultural practice: Is even-aged silviculture preferable to uneven-aged? *Wildl. Soc. Bull.* 24(2):330-333.

Schwartz, G. F. 1907. The longleaf pine in virgin forest. J. Wiley, New York.

Simberloff, D. S. 1993. Species-area and fragmentation effects on old-growth forests: prospects for longleaf pine communities. pp. 1-13 In S. Hermann (ed.) Proc. Of the Tall Timbers Fire Ecology Conference, No. 18, The Longleaf Pine Ecosystem: Ecology, restoration, and management. Tallahassee FL: Tall Timbers Research Station.

Smith, L. F. 1955. Development of longleaf pine seedlings near large trees. *J. For.* 53:289-290.

Stys, B. 1993. *Ecology and Habitat Protection Needs of the Southeastern American Kestrel (Falco sparverius paulus) on Large-Scale Development Sites in Florida.* Florida Game and Freshwater Fish Commission. Tallahassee, FL. Nongame Wildlife Technical Report No. 13.

Swanson, H.R., A. Hatim, T.A. Greene, S.M. Hodges, K.K. Kebart, R. Lewis, K. McWilliams, and W.S. Ross. 1988. *Environmentally Sensitive Areas of Leon County, Florida.* Leon County Department of Public Works. Tallahassee, FL

Swetnam T.W. 1990. Fire history and climate in the southwestern United States. In: Krammes, J.S., technical coordinator. Effects of fire management on southwestern natural resources. GTR RM-191:6-17. U.S. Department of Agriculture, Forest Service.

USDA (U.S. Department of Agriculture). 1993b. Draft environmental impact statement for the management ofthe red-cockaded woodpecker and its habitat on national forests in the southern region. U.S. Department of Agriculture, Forest Service, Southern Region, Atlanta.

Wahlenberg, W. G. 1946. Longleaf pine: its use, ecology, regeneration, protection, growth, and management. Charles Lathrop Pack Foundation, Washington, D. C.

7 EXHIBITS

North

0 650' 1300'

Legend

- Post Development 100yr Flood Line
- DRI Project Boundary
- Wetland Line
- Drainage Easement
- Conservation Easement

Notes:

All drainage easements shall conform to city of Tallahassee requirements.

Discharges to wetland features shall be minimized. Discharge points into conservation easements will be encumbered with a drainage easement. Site specific information will be provided during environmental permitting including mitigation of impacts due to discharge structures.

Pond sizes and locations are based on available two foot contour maps. These may change once site specific information is provided.

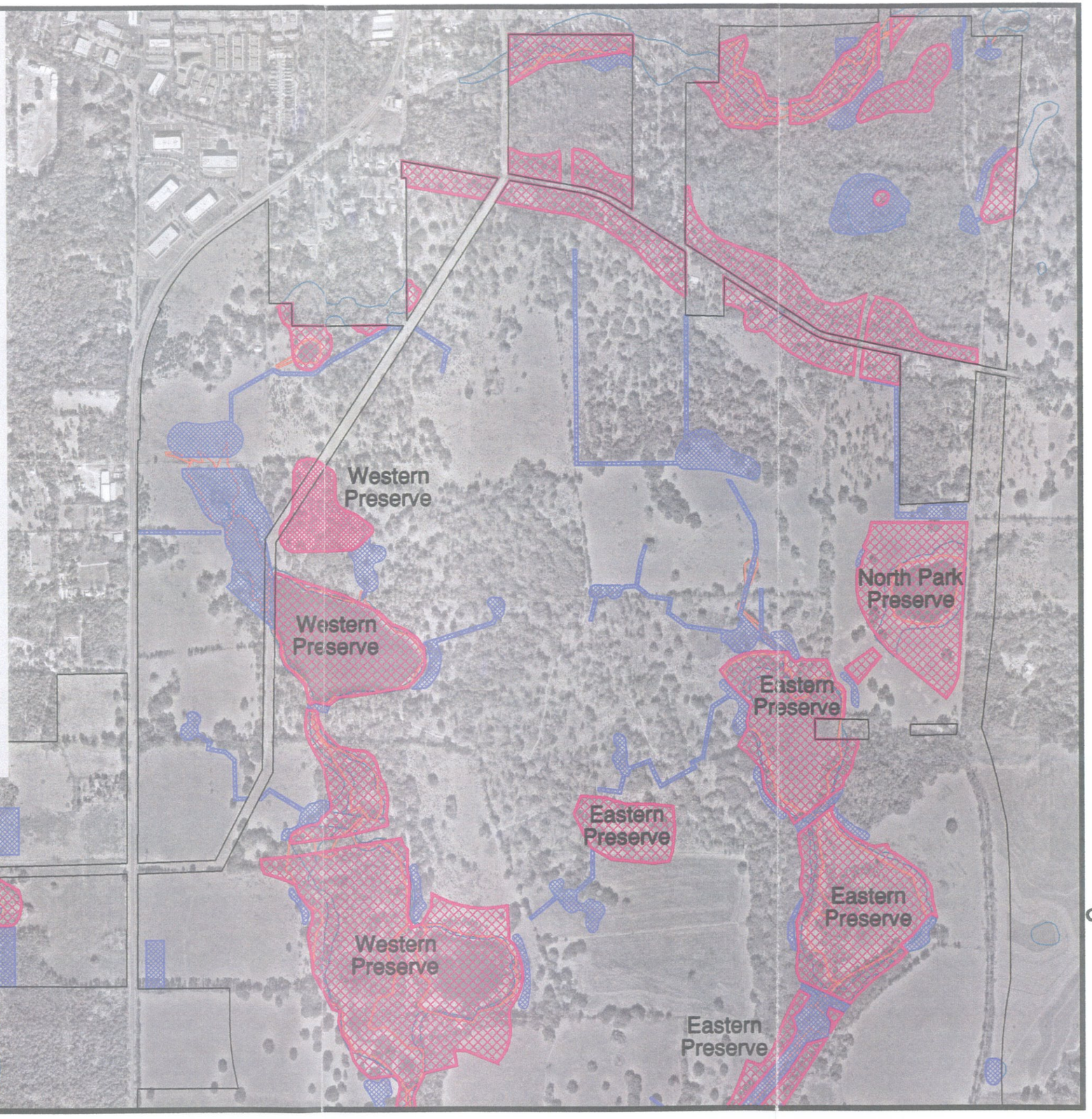
Drainage easements are shown schematically. The intent is to encumber land use areas with drainage easements large enough to allow unattenuated flows though a parcel from the upstream parcel. Calculated flows are documented in the basin and pond accounting records. Actual locations and sizes will be provided during the preliminary platting phase of permitting.

Ponds and easements are regional and shall provide stormwater benefits to the contributing basin.

Storm water attenuation shall be provided in existing wetlands consistent with the model output of the SFMP.

All easements are shown conceptual. Defined boundaries will be provided on PUD, Final Development Plans / Preliminary Plats.

The Central Park, Eastern, Western, and North Park Preserves combined shall include a minimum of 60 acres of upland habitat in conservation easements.



ARVIDA a St JOE company

PBSJ

Southwood

Habitat Management Plan

August 1999

CONCEPTUAL CONSERVATION & DRAINAGE EASEMENTS

Exhibit 1
1 of 2

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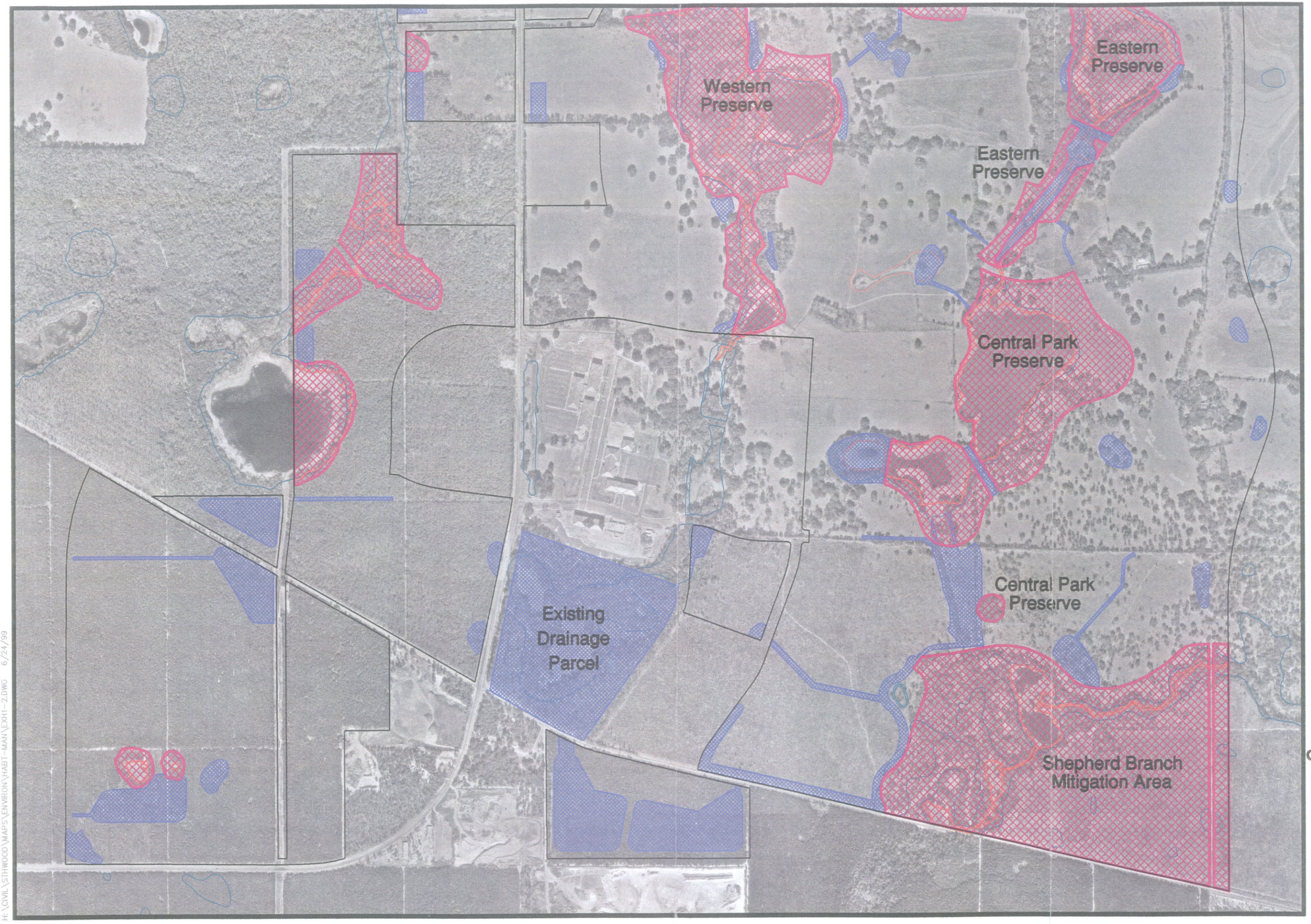

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Southwood
Habitat Management Plan
August 1999

CONCEPTUAL CONSERVATION & DRAINAGE EASEMENTS

Exhibit 1
2 of 2

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MITIGATION SITE LOCATION MAP

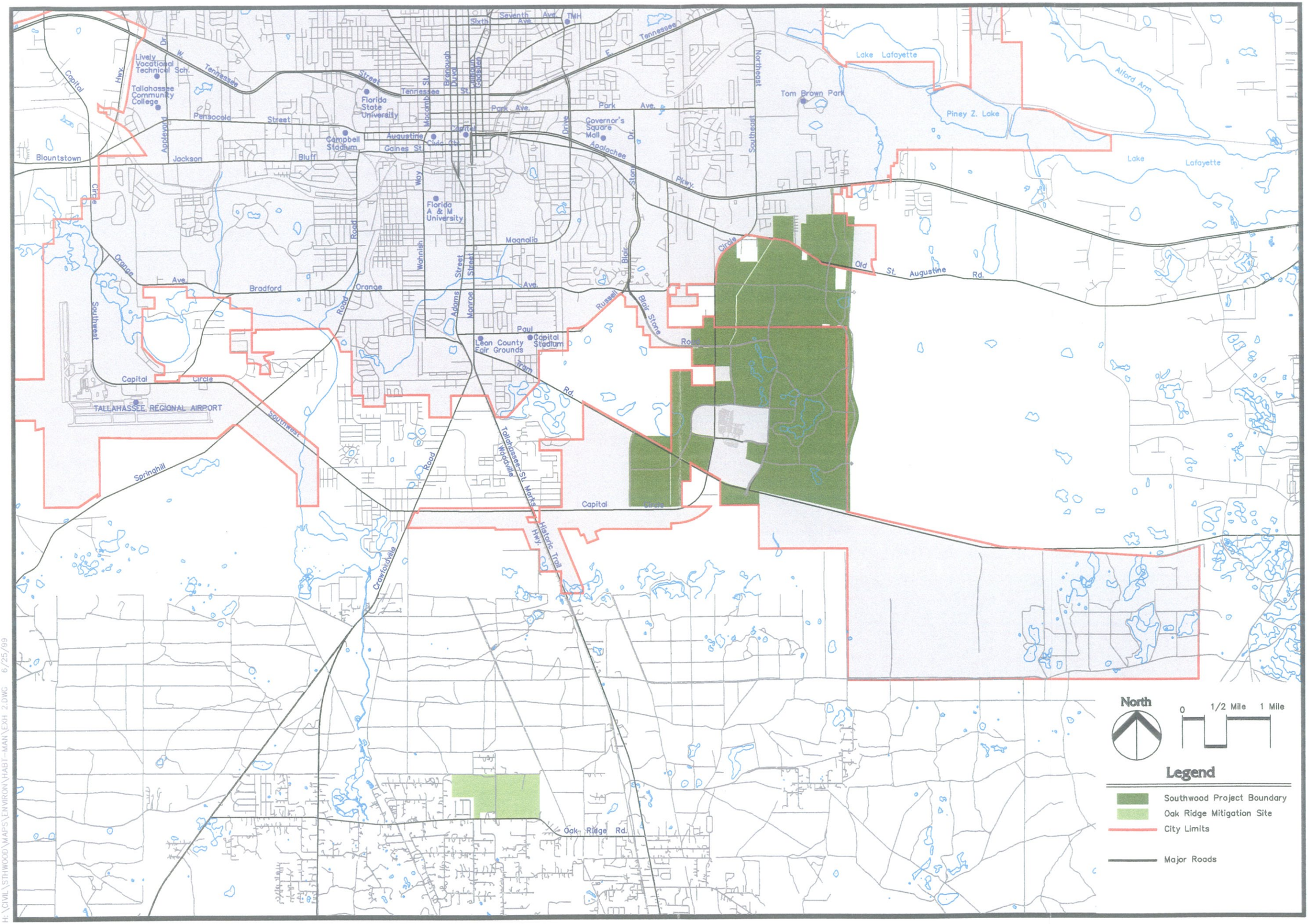

Exhibit 2

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North

0 250' 500'

Legend

441 – Pine Plantation
4414 – Longleaf Pine Plantation
814 – Roads
Land Use Boundary
Property Boundary

NATIONAL FOREST

NATIONAL FOREST

NATIONAL FOREST

COMMUNITY ROAD

4414

4414

441

441

441

OAK RIDGE ROAD

814

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Habitat Management Plan

August 1999

OAK RIDGE MITIGATION AREA VEGETATION AND LAND USE

Exhibit 3

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Exhibit 4
Oak Ridge Mitigation Area Legal Description

Allen Nobles & Associates, Inc.

PROFESSIONAL LAND SURVEYING, MAPPING
CIVIL ENGINEERING & STRUCTURAL ENGINEERING

2720 Pablo Avenue
Tallahassee, Florida 32308
Phone: (850)-385-1179
Fax: (850)-385-1404

E-mail: mail@anasurveyors.com

April 22, 1999
ANA Project No. 3562

Oak Ridge Road Mitigation Sites

Section 7, Township 2 South, Range 1 East

The Northwest Quarter of Section 7, Township 2 South, Range 1 East, Leon County Florida as recorded in Deed Book 120 at page 45 of the Public Records of Leon County, Florida; containing 159.66 acre, more or less.

Section 12, Township 2 South, Range 1 West

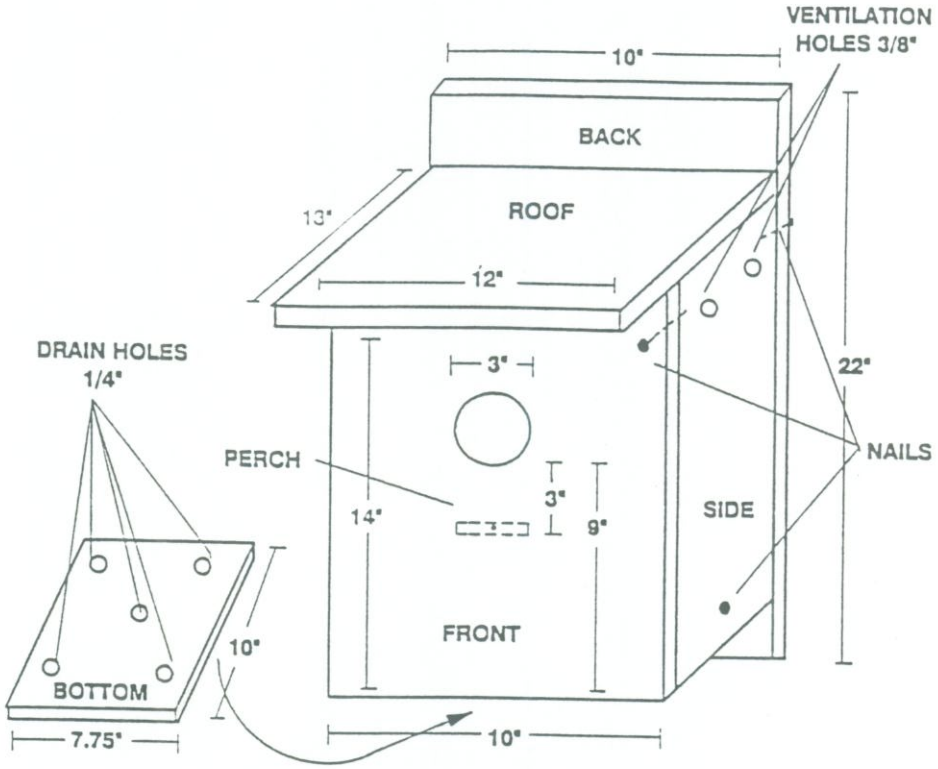
The North Half of the Northeast Quarter of Section 12, Township 2 South, Range 1 West, Leon County, Florida and the Southeast Quarter of the Northeast Quarter of said Section 12 less the South 364.3 feet of the East 957 feet of the Northeast Quarter of said Section 12, also less the existing right-of-way of Community Road on the easterly boundary of said Section 12; containing 111.75 acres, more or less.

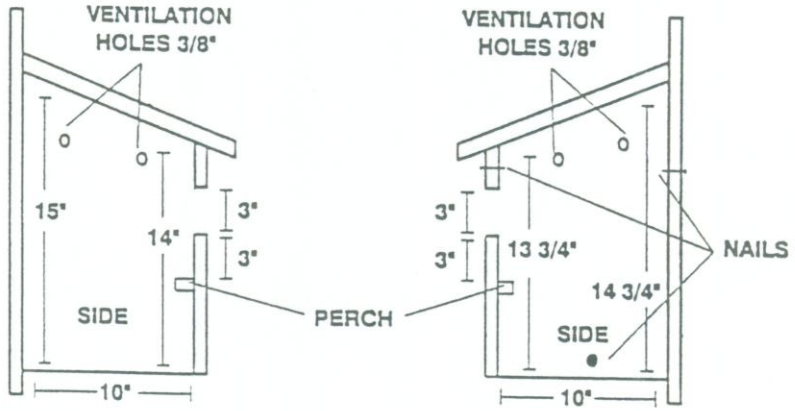
Allen K Nobles, PSM
Florida Number 3562

Exhibit 5
Kestrel Nest Box Construction Plans

Kestrel Nest Box Construction Plans

Kestrel Nest Box Design (from Styes, 1993). Half of the entrance cut-out is used for an inside perch and attached with a screw. Two nails at the top of one side act as hinges to swing the side open for cleaning. A single nail is used at the bottom to secure the side shut. Use 1-inch thick wood for construction





8 APPENDICIES

Appendix A. Conceptual Gopher Tortoise Mitigation and Relocation Matrix.

Habitat Area	Impacted Tortoises (number)	Location of Mitigation	Area of Mitigation (acres)	Mitigation Activities Anticipated to Begin	Impacts Anticipated to Begin	Tortoise Relocation Site
Area 1	4	Oak Ridge Mitigation Area – slash pine management zone (offsite)	4	2000 or 2001	2002 or 2003	Oak Ridge Mitigation Area – slash pine management zone (offsite)
Area 2	108	Shepherd Branch Mitigation Area (habitat area 1)	38	Summer 1999	2000 or 2001	Shepherd Branch Mitigation Area (habitat area 1)
		Oak Ridge Mitigation Area – slash pine management zone (offsite)	70	2000 or 2001		Oak Ridge Mitigation Area – slash pine management zone (offsite)
		Oak Ridge Mitigation Area (offsite) – longleaf pine preservation zone	8	2000 or 2001		
Area 3	27	Shepherd Branch Mitigation Area (habitat area 1)	27	Summer 1999	Fall 1999	Shepherd Branch Mitigation Area (habitat area 1)
		Oak Ridge Mitigation Area (offsite) – longleaf pine preservation zone	41	Fall 1999		
Area 4	8	Oak Ridge Mitigation Area – slash pine management zone (offsite)	8	Summer 1999	2001 or later	Oak Ridge Mitigation Area – slash pine management zone (offsite)
		Oak Ridge Mitigation Area (offsite) – longleaf pine preservation zone	16	2000 or 2001		
Area 5	3	Oak Ridge Mitigation Area – slash pine management zone (offsite)	3	2006 or later	2010 or later	Oak Ridge Mitigation Area – slash pine management zone (offsite)
		Oak Ridge Mitigation Area (offsite) – longleaf pine preservation zone	6	2000 or 2001		
Area 6	101	Oak Ridge Mitigation Area – slash pine management zone (offsite)	51	2006 or later	2010 or later	Oak Ridge Mitigation Area – slash pine management zone (offsite)
		Oak Ridge Mitigation Area (offsite) – longleaf pine preservation zone	64	2000 or 2001		
Area 7	24	Shepherd Branch Mitigation Area (habitat area 1)	19	Summer 1999	Late Summer 1999	Shepherd Branch Mitigation Area (habitat area 1)
TOTAL	**359**		**355**			

** Relocation will require coordination with and permits from Florida Fish and Wildlife Conservation Commission.

Appendix A. Continued

Gopher Tortoise Habitat Areas	
Habitat Area	**Description and Location**
Area 1	Pine plantation south of Shepherd Branch
Area 2	Pine plantation northwest of Shepherd Branch
Area 3	Pine plantation north of Shepherd Branch
Area 4	Pasture south of estate house
Area 5	Pine plantation north of Tram Road, west of Capital Circle
Area 6	Pine plantation south of Tram Road, west of Capital Circle
Area 7	Pine plantation south of Tram Road, east of Capital Circle

Appendix B. Southwood Kestrel and Fox Squirrel Mitigation Matrix.

	WETLAND MITIGATION					
	Mitigation Areas	**Total Area (acres)**	**Habitat Preservation & Management (acres)**	**Enhancement** (Acres)	**Anticipated Beginning of Mitigation Activities**	**Actions**
1.	Shepherd Branch Mitigation Area	166	82	84	Late summer 1999	Pine forest restoration; forest and wetland habitat preservation and management. Entire area will be placed under conservation easement as one unit
2.	Oak Ridge Mitigation Area	271±	135	136	2000	Pine forest restoration; longleaf pine forest preservation and management. Entire area will be placed under conservation easement as one unit
3.	Central Park Preserve				2000 to 2008	Forest and field preservation and management
4.	Eastern Preserve				2000 to 2008	Forest and field preservation and management
5.	Western Preserve				2000 to 2008	Forest and field preservation and management
6.	Total of 3,4 & 5	60	60	0		Portions of preserves will be placed under conservation easement as part of the individual PUD (and preliminary plat) approval process for lands adjacent to preserves
7.	North Park Preserve	22	22		2010 or later	22 ac. for kestrel habitat, 5 ac. for fox squirrel habitat. Preserve will be placed under conservation easement as part of the individual PUD (and preliminary plat) approval process for adjacent land
	Total Area of Mitigation	519	299	220		
	Undeveloped golf course out-of-bounds	at least 45 ac.	At least 45 ac.		2001	This area will not be impacted and will be managed like the preserve areas listed above

Appendix C. Southwood Wetland Mitigation Options In Order of Preference.

	WETLAND MITIGATION			
	Mitigation Areas	**Restoration** (Acres)	**Enhancement** (Acres)	**Actions**
1.	W4, W6, W7, W9, W10A, W10B, W13, W14, W15, W16, W24, W25, W26, W27, W28, W31	0	185±*	Removing cattle (passive enhancement)
2.	W6, W7, W10A, W13, W15, W16, W24, W25, W27, W28, W32	0	160±*	Correcting erosion problems within wetland and/or preventing excessive sediment deposition in wetland (passive enhancement)
3.	W17, W18	0	1.1	Removing and preventing off-road vehicle use
4.	W7	22.7	0	Hydrologic restoration, possible enhancement through removal of invading pines and replanting of marsh vegetation
5.	W6	22.3	0	Hydrologic restoration (passive enhancement)
6.	W10A	0	15.6	Planting littoral zone
7.	W10B	0	7.9	Planting littoral zone
8.	W4	0	3.2	Planting littoral zone
9.	W9	1.1	0	Wetland re-construction using hydrologic restoration, grading, planting
10.	W31	0.3	0	Reconstructing and planting littoral zone
	Total Area	**46.4**	**147±**	
	TOTAL AREAS BY TYPE OF MITIGATION	**Total Area Available** (Acres)	**Typical Mitigation Ratio ****	
	Total Hydrologic Restoration	45.0	3:1	
	Total Other Restoration	1.4	3:1	
	Total Active Enhancement (planting)	26.7	6:1	(does not include areas undergoing restoration and planting)
	Total Passive Enhancement Alone (cattle removal, vehicle exclusion, water quality improvements)	120±	20:1	(includes areas undergoing only passive enhancement)
	Total	**193±**		
	WETLAND IMPROVEMENTS IN STORMWATER TREATMENT AREAS (not formal mitigation)			
	Wetland	**Acres**		**Actions**
	W11	3.1		Hydrologic restoration, planting littoral zone, removing cattle
	W29	4±		Reconstructing and planting littoral zone, decreasing sediment input, removing cattle
	W30	5±		Planting littoral zone, decreasing sediment input, removing cattle

* = Includes areas undergoing other forms of enhancement or restoration

** = mitigation ratio is area (ac.) improved to area (ac.) impacted)