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INVENTORY OF RARE AND ENDEMIC PLANTS AND RARE LAND AND RIVERINE VERTEBRATES OF SILVER RIVER AND SILVER SPRINGS

FINAL REPORT

September 2004

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FLORIDA
Natural Areas
INVENTORY

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Silver River. Brenda Herring, FNAI.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

ACKNOWLEDGMENTS

Florida Natural Areas Inventory (FNAI) conducted this survey of the Silver River, head springs, and associated wetland communities through a contract with the St. Johns River Water Management District. The assistance provided by the St. Johns River Water Management District and the Silver River State Park staff was instrumental for this project's success. We would like to especially acknowledge Chris Ware, Bob Epting, and Sonny Hall for their efforts with this project. Special thanks go to Travis Richardson and Hunter Neufeld who ferried us across the Silver Springs and Silver River. In addition, the Silver River State Park and Museum staff is also thanked for their help. Silver River State Park Manager- Robert LaMont was extremely helpful in providing information about the park, and providing resources (such as staff and equipment) to aid this survey. Many thanks are extended to the following state park staff: Darran Cheman and Rayne Hitt (Park Rangers) for making our first boat tour of the Silver River possible and for their vast information on the area. Park volunteer and all around naturalist, Mickey Summers, shared his amazing knowledge about the flora and fauna of the Silver River area, and his enthusiasm was contagious. Although we did not get to go out in the field with Art Carton (Park Ranger), he provided botanical answers before and during the survey. Much gratitude is extended to Jim Buckner (Botanist/Biologist) of Silver River State Park Museum for introducing us to the Silver River State Park and for always making time for us when we would come barreling into his office at the end of the day.

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EXECUTIVE SUMMARY

The St. Johns River Water Management District's (SJRWMD) Division of Water Supply Management contracted with the Florida Natural Areas Inventory (FNAI) to conduct a survey for rare and endemic plant and rare land and riverine vertebrates and rare wetland communities associated with Silver Springs in Marion County. The survey focuses on collecting data on locations and distributions of rare and endemic species as well as rare wetland communities listed by FNAI. This information will be utilized by SJRWMD in setting Minimum Flow and Levels (MFL) which serves to protect all aquatic natural resources including rare and endemic species and their associated natural communities.

Field surveys for rare and endemic species and rare wetland communities were conducted from March to June 2004. Covering a length of approximately 5.3 miles, the study area is defined as occurring from the head springs in Silver Springs Theme Park east to the confluence of the Silver River and Oklawaha River. The flora and fauna has been surveyed both in the head spring, spring-run stream and adjoining natural wetland communities. Three species of listed plants were recorded and included one Florida endemic species- pinkroot (*Spigelia loganioides*) and two rare non-endemic plants- Godfrey's privet (*Forestiera godfreyi*) and silver buckthorn (*Sideroxylon alachuense*). All three plant species are listed as State Endangered. Silver buckthorn is ranked as critically imperiled both at the global and state levels because of its extreme rarity. Godfrey's privet and pinkroot are considered imperiled at the global and state levels because of their rarity. Eight species of rare land and riverine vertebrates were observed and include: American alligator (*Alligator mississippiensis*), Suwannee cooter (*Pseudemys concinna suwanniensis*), limpkin (*Aramus guarauna*), little blue heron (*Egretta caerulea*), white ibis (*Eudocimus albus*), snowy egret (*Egretta thula*), yellow-crowned night-heron (*Nyctanassa violacea*), and osprey (*Pandion haliaetus*). Three non-listed endemic plant species were also observed-Florida bellflower (*Campanula floridana*), Florida cockspur (*Echinochloa paludigenea*), and springtape (*Sagittaria kurziana*). Six natural communities were documented within the study area and include blackwater stream, dome swamp, floodplain forest, floodplain swamp, spring-run stream, and upland mixed forest. The spring-run stream is the rarest of the six natural communities documented during the survey and is ranked imperiled at the global and state levels. On a worldwide basis, the status of the other five natural communities are more secure, but may be rare in parts of their range. A ruderal site was surveyed due to its ecotonal edge of a floodplain forest and the occurrence of rare plants.

This report contains brief descriptions of each of the rare endemic and non-endemic plants and rare land and riverine vertebrates, non-rare endemic plant species, and the rare natural communities that were documented. Included within each description of the plants and animals are specific characteristics of the species, information on related species, locations, and natural community designation. The rare natural community descriptions include information on plant associations and other distinguishing features. Attribute tables with detailed data on all of the rare species and non-rare endemic plant species, and natural community occurrences documented in association with Silver Springs are included as appendices.

INTRODUCTION

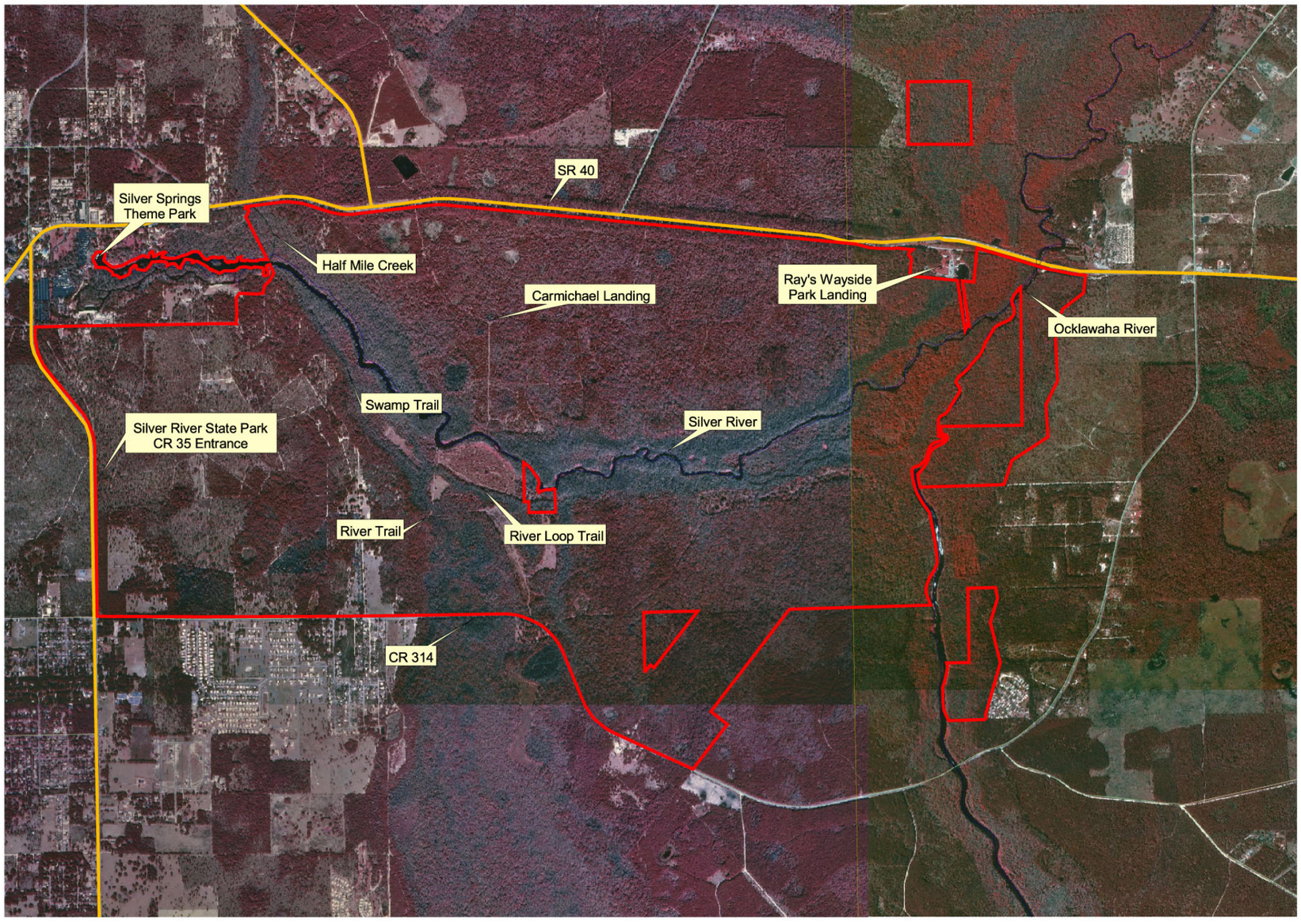
In 2004, SJRWMD, contracted with Florida Natural Areas Inventory (FNAI) to conduct a survey of rare plants and rare land and riverine vertebrates on the Silver River, head springs, and within the associated wetland communities. With the growing demands on water supplies, the hydrological health of the springs, spring-run stream, wetland communities and the rare and endemic flora and fauna that inhabit these areas could potentially be at risk. SJRWMD will establish a Minimum Flow and Level (MFL) for the Silver Springs and Silver River as a means to protect all of the natural resources that are associated with the springs. FNAI, which is part of Florida State University's Institute for Science and Public Affairs, was contracted to conduct this survey due to its mission to conserve Florida's biological diversity. FNAI maintains a statewide database on the status, distribution, and management of rare and endangered plant and animal taxa, exemplary natural communities, and managed areas.

The study area is situated in the west central portion of Marion County (Figure 1) and is located east of Ocala. The western extent of the survey started at the spring's boil or headwaters of the Silver River at the Silver Springs Theme Park and continued east for approximately 5.3 miles to the confluence with the Oklawaha River. All adjoining wetland communities north and south of Silver Springs and the Silver River were also surveyed. Access to the study area was made from several sites within the Silver River State Park and within the Silver Springs Theme Park. The managed areas, Marjorie Harris Carr Greenway and the Ocala National Forest, are east and southeast of the site.

With the state's acquisition of the Silver River property in 1995, staff biologists became involved in identifying the flora and fauna of the park. Department of Environmental Protection (DEP), Division of Recreation and Parks (DRP) biologist, Rosie Moholland, Silver River Museum biologist, Jim Buckner, Silver River State Park, ranger, Art Carton, and park volunteer naturalist, Mickey Summers, have been observing and tracking rare plants and animals within the park. Other notable botanists have surveyed portions of Silver Springs such as Dr. Robert Godfrey, Bob Simons, and Dr. David Hall. Until now, a rare and endemic plant, animal and wetland community inventory has never been completed within the Silver Springs area. By documenting the rare biota of the Silver Springs, Silver River, and the surrounding wetland communities, a baseline of biological information is made available to water and land managers and other interested individuals.

In order to maintain the ecological integrity of the Silver Springs area, inventories of rare plant and animal species are fundamental to document what species are present, but also to acquire knowledge about the current state of the habitat where they occur. Rare species locations, extent of coverage, and reproductive biology as well as any disturbance factors or threats to a population are all important aspects for land management. To gain this information, SJRWMD is funding such inventories and monitoring projects that are associated with wetland environments. Within the Silver Springs area, several excellent examples of wetland communities are known to occur. These communities provide habitat for a number of FNAI, state, and federally listed plant and animal species.

Figure 1. Silver River and Silver Springs Survey Site.



Silver River State Park Boundaries

State Road

County Road

N

W E

S

1 0 1 Miles

METHODS

Preliminary Methods

Before fieldwork began, several sources of information were gathered to provide a starting point for the rare and endemic plant, rare land and riverine vertebrates, and natural community survey. The FNAI Biological and Conservation Data System (BCD), University of Florida Herbarium records, and the *Atlas of Florida Vascular Plants* on line web site (http://www.plantatlas.usf.edu, Wunderlin and Hansen 2003) were searched for rare species and natural community types that are presently known to occur in Marion County. Search lists were then constructed that incorporated not only the tracked taxa, but also the habitat, best seasons in which to survey that species, the FNAI rank, and federal and state status (Tables 1 and 2). Thirty-four rare plant species (Table 1) and nine rare land and riverine vertebrate species (Table 2) were determined to potentially occur or have once occurred in the vicinity of Silver Springs in west central Marion County. Additional search lists were constructed for non-rare endemic vascular plants and associated wetland communities (Table 3) and for potential natural communities (Table 4). Information for the twenty-one non-rare endemic plants on the search list was derived from the *Report on the Rare and Endemic Species of the St. Johns River Water Management District Wetlands* (Johnson 2001). Supplementary to that report, a more current listing of endemic plants that are known to occur in wetland communities in Marion County was taken from the *Atlas of Florida Vascular Plants* web site (Wunderlin and Hansen 2003). The information for the search list of FNAI tracked wetland natural communities that are known to occur in Marion County (Table 4) was also derived from the *Report on the Rare and Endemic Species of the St. Johns River Water Management District Wetlands* (Johnson 2001) and the FNAI database. Sixteen potential natural community types, their description, and the FNAI ranking are presented in Table 4.

In addition to gathering known information on rare endemic and non-endemic plants, rare land and riverine vertebrate occurrences, non-rare endemic plants, and natural community data for the Silver Springs study site, other materials were secured before the fieldwork began. A plant and animal collecting permit was obtained from the DEP/DRP to allow collection of voucher specimens for any of the 34 potentially occurring rare plant species (Table 1) and nine potentially occurring rare land and riverine vertebrates (Table 2). Digital Orthophoto Quarter Quads (DOQQs) and United States Geological Service (USGS) topographic quads that cover the Silver Springs area were downloaded into ArcView software. Other shapefiles were obtained from FNAI's database, including managed area boundaries of Silver River State Park, and SJRWMD lands.

Numerous references were used during the Silver Springs survey. The primary references utilized were the following: *Aquatic and Wetland Plants of the Southeastern United States – Monocotyledons* (Godfrey and Wooten 1979), *Aquatic and Wetland*

Table 1. Search list for rare vascular plant species potentially occurring within and along the Silver River, head springs, and associated wetland communities. Marion County occurrence data was derived from the Florida Natural Areas Inventory (FNAI's) Database, University of Florida Herbarium records, and the online Atlas of Florida Vascular Plants (Wunderlin and Hansen 2003). Explanation sheet for ranks and legal status is included in Appendix 1 (FNAI 2002).

Name		**Rank**				**Community**	**Survey Times**
Latin name	**Common name**	**FNAI Global Rank**	**FNAI State Rank**	**Federal Status**	**State Status**	**FNAI Natural Community Type(s)**	**Best Survey Season**
Adiantum tenerum	brittle maidenhair fern	G5	S3	N	LE	Upland mixed forest	All year
Asplenium heteroresiliens	Wagner's spleenwort	G2	S1	N	N	Upland mixed forest	All year
Asplenium pumilum	dwarf spleenwort	G5	S1	N	LE	Upland mixed forest	All year
Asplenium verecundum	modest spleenwort	G1	S1	N	LE	Upland mixed forest	All year
Asplenium X *curtissii*	Curtiss' spleenwort	HYB	S1	N	N	Upland mixed forest	All year
Carex chapmanii	Chapman's sedge	G3	S3	N	LE	Hydric hammock, Floodplain forest	March-May

Table 1 (Continued).

Name		Rank				Community	Survey Times
Latin name	**Common name**	**FNAI Global Rank**	**FNAI State Rank**	**Federal Status**	**State Status**	**FNAI Natural Community Type(s)**	**Best Survey Season**
Cleistes divaricata	rosebud orchid	G4	S1	N	LT	Wet flatwoods, Bog, Floodplain swamp	April-June
Coelorachis tuberculosa	piedmont jointgrass	G3	S3	N	LT	Marsh, Pond margins	June-July
Digitaria floridana	Florida crabgrass	G1	S1	N	N	Upland mixed forest	September-October
Drosera intermedia	spoon-leaved sundew	G5	S3	N	LT	Depression marsh, Wet flatwoods	April-November
Euphorbia commutata	wood spurge	G5	S2	N	LE	Floodplain forest	February-April
Forestiera godfreyi	Godfrey's privet	G2	S2	N	LE	Upland mixed forest	February-March
Hartwrightia floridana	Hartwrightia	G2	S2	N	LT	Wet flatwoods, Baygall	September-November
Illicium parviflorum	star anise	G2	S2	N	LE	Baygall, Hydric hammock	All year

Table 1 (Continued).

Name		Rank				Community	Survey Times
Latin name	**Common name**	**FNAI Global Rank**	**FNAI State Rank**	**Federal Status**	**State Status**	**FNAI Natural Community Type(s)**	**Best Survey Season**
Litsea aestivalis	Pondspice	G3	S2	N	LE	Baygall, Hydric hammock, Depression marsh	February-April
Malaxis unifolia	green adder's mouth	G5	S3	N	LE	Upland mixed forest, Floodplain forest	February
Matelea floridana	Florida spiny-pod	G2	S2	N	LE	Upland mixed forest	April-August
Monotropsis reynoldsiae	pigmy pipes	G1Q	S1	N	LE	Upland hardwood forest	January-February
Najas filifolia	narrowleaf naiad	G1	S1	N	LT	Pond	All year
Parnassia grandifolia	large-leaved grass-of-parnassus	G3	S2	N	LE	Spring run stream edge, Floodplain swamp	November-January
Pecluma dispersa (*Polypodium dispersum*)	widespread polypody	G5	S2	N	LE	Upland mixed forest	All year
Pecluma plumula (*Polypodium plumula*)	plume polypody	G5	S2	N	LE	Upland mixed forest	All year

Table 1 (Continued).

Name		Rank				Community	Survey Times
Latin name	**Common name**	**FNAI Global Rank**	**FNAI State Rank**	**Federal Status**	**State Status**	**FNAI Natural Community Type(s)**	**Best Survey Season**
Pecluma ptilodon (*Polypodium ptilodon*)	swamp plume polypody	G5?	S2	N	LE	Upland mixed forest, Floodplain swamp	All year
Pteroglossaspis ecristata	giant orchid	G2	S2	N	LT	Scrub, Sandhill, Mesic flatwoods	July-September
Pycnanthemum floridanum	Florida mountain-mint	G3	S3	N	LT	Sandhill, Upland mixed forest	July-August
Salix floridana	Florida willow	G2	S2	N	LE	Bottomland forest, Floodplain swamp	April-October
Sideroxylon alachuense (*Bumelia anomala*)	silver buckthorn	G1	S1	N	LE	Hardwood hammock, Upland mixed forest	June
Sideroxylon lycioides (*Bumelia lycioides*)	gopherwood buckthorn	G5	S2	N	LE	Upland mixed forest, Floodplain forest	April
Spigelia loganioides	pinkroot	G2Q	S2	N	LE	Hydric hammock, Bottomland forest	April-June
Spiranthes brevilabris	small ladies'-tresses	G1	S1	N	LE	Wet flatwoods	April-June

Table 1 (Continued).

Name		Rank				Community	Survey Times
Latin name	**Common name**	**FNAI Global Rank**	**FNAI State Rank**	**Federal Status**	**State Status**	**FNAI Natural Community Type(s)**	**Best Survey Season**
Spiranthes floridana	Florida ladies'-tresses	G1	S1	N	N	Wet flatwoods	March-May
Thelypteris reptans	creeping maiden fern	G5	S2	N	LE	Upland mixed forest	All year
Vicia ocalensis	Ocala vetch	G1	S1	N	LE	Marsh, Spring run stream	April-May
Zephyranthes simpsonii	Simpson’s rain lily	G2G3	S2S3	N	LT	Wet flatwoods	January-April

Table 2. Search list for rare land and riverine vertebrates potentially occurring within and along the Silver River, head springs, and associated wetland communities. Marion County occurrence data was derived from the Florida Natural Areas Inventory (FNAI's) Database. Explanation sheet for ranks and legal status is included in Appendix 1 (FNAI 2002).

Name		**Rank**				**Community**	**Survey Times**
Latin name	**Common name**	**FNAI Global Rank**	**FNAI State Rank**	**Federal Status**	**State Status**	**FNAI Natural Community Type(s)**	**Seasons of Activity**
Accipiter cooperii	Cooper's hawk	G5	S3	N	N	Bottomland hardwood forest	Any season
Clemmys guttata	Spotted turtle	G5	S3?	N	N	Floodplain swamp	April-May; September-October
Crotalus adamanteus	Eastern diamondback rattlesnake	G4	S3	N	N	Floodplain swamp	March-October
Drymarchon couperi	Eastern indigo snake	G3	S3	N	LT	Floodplain swamp	Any season
Elanoides forficatus	Swallow-tailed kite	G5	S2	N	N	Floodplain forest, Floodplain swamp	April-October
Mustela frenata peninsulae	Florida long-tailed weasel	G5T3	S3	N	N	Floodplain forest, Floodplain swamp	April-October (Especially June-August)

Table 2 (Continued).

Name		Rank				Community	Survey Times
Latin name	**Common name**	**FNAI Global Rank**	**FNAI State Rank**	**Federal Status**	**State Status**	**FNAI Natural Community Type(s)**	**Seasons of Activity**
Picoides villosus	Hairy woodpecker	G5	S3	N	N	Deciduous forest, Floodplain swamp, Floodplain forest	Any season
Neofiber alleni	Round-tailed muskrat	G3	S3	N	N	Floodplain swamp	Any season
Ursus americanus floridanus	American black bear	G5T2	S2	N	LT (Does not apply in Baker and Columbia counties or the Apalachicola National Forest)	Floodplain forest, Floodplain swamp	Any season

Table 3. Search list for non-rare endemic vascular plant species potentially occurring within the Silver River, head springs, and associated wetland communities (Johnson 2001).

Name		Natural Community Types													
Latin Name	**Common name**	**Basin Marsh**	**Basin Swamp**	**Baygall**	**Black-water Stream**	**Bottom-land Forest**	**Depres-sion Marsh**	**Dome Swamp**	**Flood-plain Forest**	**Flood-plain Marsh**	**Flood-plain Swamp**	**Hydric Hammock**	**Marsh Lake**	**Spring-run Stream**	**Wet Prairie**
Bigelowia nudata ssp. *australis*	Pineland rayless goldenrod						X	X							X
Campanula floridana	Florida bellflower	X					X	X		X		X	X		
Carex vexans	Florida hammock sedge	X	X			X	X	X	X	X	X	X			
Carphephorus carnosus	Pineland chaffhead														X
Clematis baldwinii	Pine-hyacinth		X	X				X							
Coreopsis floridana	Florida tickseed						X								X
Coreopsis leavenworthii	Leavenworth's tickseed														X
Echinochloa paludigena	Florida cockspur							X					X	X	
Eupatorium mikanioides	Semaphore thoroughwort														X

Table 3 (Continued).

Name		Natural Community Types													
Latin Name	**Common name**	**Basin Marsh**	**Basin Swamp**	**Baygall**	**Black-water Stream**	**Bottom-land Forest**	**Depres-sion Marsh**	**Dome Swamp**	**Flood-plain Forest**	**Flood-plain Marsh**	**Flood-plain Swamp**	**Hydric Hammock**	**Marsh Lake**	**Spring-run Stream**	**Wet Prairie**
Hymenocallis palmeri	Alligator lily							X							X
Justicia angusta	Pineland waterwillow	X					X			X					
Lobelia feayana	Bay lobelia	X	X				X	X	X	X		X			
Lobelia homophylla	Pineland lobelia											X			
Lythrum flagellare	Florida loosestrife	X	X			X	X	X	X				X		X
Mecardonia acuminata spp. *peninsularis*	Axilflower	X					X						X		
Micranthemum glomeratum	Manatee mudflower				X								X		
Pluchea longifolia	Longleaf camphorweed	X	X	X		X	X	X	X	X	X	X	X		
Polygala rugellii	Yellow milkwort														X
Rorippa floridana	Florida watercress		X	X				X						X	
Sagittaria kurziana	Springtape													X	

Table 3 (Continued).

Name		Natural Community Types													
Latin Name	**Common name**	**Basin Marsh**	**Basin Swamp**	**Baygall**	**Black-water Stream**	**Bottom-land Forest**	**Depres-sion Marsh**	**Dome Swamp**	**Flood-plain Forest**	**Flood-plain Marsh**	**Flood-plain Swamp**	**Hydric Hammock**	**Marsh Lake**	**Spring-run Stream**	**Wet Prairie**
Tillandsia simulate	Airplant		X			X		X	X		X	X			

Table 4. Search list for natural communities potentially occurring within and along the Silver River and head springs. Explanation sheet for ranks and legal status is included in Appendix 1 (FNAI 2002).

Natural Wetland Community	Description	FNAI Global Rank	FNAI State Rank
Aquatic cave	- cavernicolous area permanently or periodically submerged; often characterized by troglobitic crustaceans and salamanders; includes high energy systems which receive large quantities of organic detritus and low energy systems.	G3	S3
Basin marsh	- large basin with peat substrate; seasonally inundated; temperate or subtropical; frequent fire; saw grass, cattail, buttonbush, or mixed emergents.	G4	S4
Basin swamp	- large basin with peat substrate; seasonally inundated, still water; subtropical or temperate; occasional or rare fire; vegetation characterized by cypress, black gum, bays and/or mixed hardwoods.	G4	S3
Baygall	- wetland with peat substrate at base of slope; maintained by downslope seepage, usually saturated and occasionally inundated; subtropical or temperate; rare or no fire; bays and/or titi and/or dahoon holly and/or red maple and/or mixed hardwoods.	G4	S4
Blackwater stream	- perennial or intermittent/seasonal watercourse characterized by tea-colored water with a high content of particulate and dissolved organic matter derived from drainage through swamps and marshes; generally lacking an alluvial floodplain.	G4	S3
Bottomland forest	- flatland with sand, clay or organic substrate; occasionally inundated; temperate; rare or no fire; water oak, red maple, beech, magnolia, tulip tree, sweet gum, bays, cabbage palm, and mixed hardwoods.	G4	S3
Depression marsh	- small rounded depression in sand substrate with peat accumulating toward center; seasonally inundated, still water; subtropical or temperate; frequent or occasional fire; maiden cane, fire flag, pickerelweed, other grasses and herbs, and mixed emergents, may be in concentric bands.	G4	S4
Dome swamp	- rounded depression in sand/limestone substrate with peat accumulating toward center; seasonally inundated, still water; subtropical or temperate; occasional or rare fire; pond cypress, and/or black gum, and bays, often tallest in center.	G4	S4
Floodplain forest	- floodplain with alluvial substrate of sand, silt, clay or organic soil; seasonally inundated; temperate; rare or no fire; diamond-leaf oak, overcup oak, water oak, swamp chestnut oak, blue palmetto, cane, and mixed hardwoods.	G4	S3
Floodplain marsh	- floodplain with organic, sand, or alluvial substrate; seasonally inundated; subtropical; frequent or occasional fire; maiden cane, pickerelweed, arrowhead, buttonbush, and mixed emergents.	G3?	S2
Floodplain swamp	- floodplain with organic or alluvial substrate; usually inundated; subtropical or temperate; rare or no fire; vegetation characterized by cypress, gums, and/or green ash.	G4	S4

Table 4 (Continued).

Natural Wetland Community	Description	FNAI Global Rank	FNAI State Rank
Hydric hammock	- lowland with sand/clay/organic soil, often over limestone; mesic-hydric; subtropical or temperate; rare or no fire; water oak, cabbage palm, diamond-leaf oak, red maple, bays, hackberry, hornbeam, black gum, blue palmetto, and hardwoods.	G4	S4
Marsh lake	- generally shallow, open water area within wide expanses of freshwater marsh; still water or flow-through; peat, sand or clay substrate; occurs in most physiographic regions; variable water chemistry, but characteristically highly colored, acidic, soft water with moderate mineral content (sodium, chloride, sulfate); oligo-mesotrophic to eutrophic.	G4	S4
Sinkhole lake	- typically deep, funnel-shaped depression in limestone base; occurs in most physiographic regions; predominantly without surface inflows/outflows, but frequently with connection to the aquifer; clear, alkaline, hard water with high mineral content (calcium, bicarbonate, magnesium).	G3	S3
Spring-run stream	- perennial watercourse with deep aquifer headwaters and characterized by clear water, circumneutral pH and, frequently, a solid limestone bottom.	G2	S2
Wet prairie	- flatland with sand substrate; seasonally inundated; subtropical or temperate; annual or frequent fire; beakrush, spike rush, wiregrass, pitcher plants, St. John's wort, mixed herbs.	G3	S2

Plants of the Southeastern United States – Dicotyledons (Godfrey and Wooten 1981), *Field Guide to the Rare Animals of Florida* (Hipes et al. 2000), *Field Guide to the Rare Plants of Florida* (Chafin 2000), *Florida Wetland Plants: an Identification Manual* (Tobe, et al. 1998), *Guide to the Natural Communities of Florida* (FNAI and FDNR 1990), *Guide to the Vascular Plants of Florida* (Wunderlin 1998), *Identification and Biology of Non-Native Plants in Florida's Natural Areas* (Langeland and Burks 1998), *Manual of the Vascular Flora of the Carolinas* (Radford et al. 1964), *Notes on Florida's Regulated Plant Index* (Coile 2000; Coile and Garland 2003), *The Ferns of Florida* (Nelson 2000), *Tracking list of rare, threatened, and endangered plants and animals and exemplary natural communities of Florida* (FNAI 2002), *Trees of Florida, A Reference and Field Guide* (Nelson 1994), *Trees, Shrubs, and Woody Vines of Northern Florida and Adjacent Georgia and Florida* (Godfrey 1988), and *Wild Orchids of Florida* (Brown and Folsom 2001).

A literature review revealed two important reports that are relevant to the Silver Springs study and provided background information on the site. A report entitled "*A Natural Areas Inventory of Marion County, Florida*" (Chicardi 1993) included countywide data, but also focused on the Silver Springs. A second reference, *Report on the Rare and Endemic Species of the St. Johns River Water Management District Wetlands* (Johnson 2001) provided information on all of SJRWMD's lands as well as specifically for Marion County.

Field Survey Methods

Field surveys were conducted from March through June 2004. The search lists for rare plants and rare land and riverine vertebrates were utilized to set a survey priority for plants when they were in flower and fruit and for animals when they were typically most active. Locations of all historic records from FNAI's BCD of rare plants and rare land and riverine vertebrates were mapped and then visited in an effort to document whether the populations were still in existence and to also gain a better understanding of a given species habitat requirements. All available access points were utilized, such as paved and unpaved roads, off road vehicle (ORV) and all-terrain vehicle (ATV) trails/roads, firebreak plow lines, powerline clearings, and footpaths/trails. The surveys were conducted on foot, four-wheel drive vehicles, motorized boats and a canoe. From the land access points, numerous transects were walked from the upper edge of the floodplain forest to the river's edge. The head springs and spring-run stream were surveyed by boat and consisted of traveling from one side of the river to the other while also looking in the main channel. Emergent and submergent vegetation, riverine vertebrates, and spring boils were examined. Equipment used for the survey included: DOQQ aerial photographs, USGS topographic quad maps, Trimble GeoExplorer 3 datalogger/GPS unit, Magellan 330M GPS unit, numerous field guides, hand lens, flagging tape, binoculars, clip board with field forms, backpack, pens, pencils, highlighter pen, and a digital camera. The datalogger/GPS unit was utilized to capture all locations and attributes of rare and endemic plants, rare land and riverine vertebrates, non-rare endemic plants as well as natural communities.

Prior to taking the datalogger into the field, a data dictionary was created to facilitate entering and processing data. To supplement and backup datalogger-recorded data, manual field forms were completed in the field. Locational coordinates were also recorded with the Magellan 330M GPS unit to insure accuracy. This second GPS unit was especially useful when the datalogger had difficulty tracking an adequate number of GPS satellites. Both the field forms and data-logger have the following 14 attributes:

- Latitude and longitude
- Date
- Type (Rare plant, rare animal, non-rare endemic plant)
- Genus and species
- Tally by species (estimated number of individuals)
- Height (mostly used for woody species of plants) in inches or feet
- Area of coverage (mostly for herbaceous plants) in square feet
- Phenology of a plant (vegetative, dormant, flowering, fruiting, fertile, or flowering and fruiting)
- Distribution of plants (single, clumped, scattered, or widely scattered)
- Behavior of observed animals (basking, commuting, foraging, loafing)
- Primary disturbance (land clearing, road, ORV trail/road, ATV trail, clear-cut, trash dumping, old homesite, excavation, fire suppression, fire, firebreak, fence line, urban interface, pasture, old cultivated field, foot path, hog rooting, tree fall, road fill, ditching/hydrologic, retention pond, cemetery, powerline, pine plantation, flooding, cultivated, mowing, landfill, herbicide damage, boats).
- Natural community type
- Whether the area is ruderal
- Site name

Additional information was collected on the field form and later manually incorporated into the attribute table. General directions and comments as well as associated plants and animals (rare, introduced, or native) were some of the information that was written on the paper forms.

Characterization of Plant Communities

General observations were made for all plant communities visited and classifications were based on FNAI's *Guide to the Natural Communities of Florida* (FNAI and FDNR (1990). Factors utilized by FNAI and FDNR (1990) in their classification include geology, soil, hydrology, and fire frequency. Myers and Ewel (1990) also provided information on Florida plant communities. Attribute information was recorded with a GPS unit at all natural communities visited.

Post Field Survey

The datalogger files containing the 14 attributes for each rare species occurrence were downloaded regularly. The data were then exported onto an Excel spreadsheet. Once all

of the attributes were incorporated within the Excel spreadsheet, the data were then transferred into ArcView as an attribute table. Five shape files were created from the Silver Springs survey data and include rare endemic plants, rare non-endemic plants, rare land and riverine vertebrates, non-rare endemic plants, and natural communities. Within each of the given shapefiles, each species is represented by a different color and/or shape symbol (dot, square, triangle or asterisk) to distinguish each occurrence clearly. The printed version of these attribute tables are presented in Appendix 2 (rare endemic and non-endemic plants), Appendix 3 (rare vertebrates), Appendix 4 (non-rare endemic vascular plants), and Appendix 5 (natural communities). All of the data from the Attribute table and the field forms will be incorporated into the FNAI BCD where it will be stored and incorporated into the Natural Heritage Network.

RESULTS AND DISCUSSION

Three species of rare plants, eight species of rare land and riverine vertebrates, three species of non-rare endemic plants and six natural community types were recorded as occurring within the Silver Springs study site from March through June 2004 (Figure 2). The three species of rare plants included one Florida endemic species-pinkroot (*Spigelia loganioides*) and two listed non-endemic plant species- Godfrey's privet (*Forestiera godfreyi*) and silver buckthorn (*Sideroxylon alachuense*) (Table 5). Eight species of rare land and riverine vertebrates were observed and include: American alligator (*Alligator mississippiensis*), Suwannee cooter (*Pseudemys concinna suwanniensis*), limpkin (*Aramus guarauna*), little blue heron (*Egretta caerulea*), white ibis (*Eudocimus albus*), snowy egret (*Egretta thula*), yellow-crowned night-heron (*Nyctanassa violacea*), and osprey (*Pandion haliaetus*) (Table 6). None of the rare vertebrates were endemic to Florida. In addition to the rare plants and rare land and riverine vertebrates documented, three species of non-rare endemic plants were found: Florida bellflower (*Campanula floridana*), Florida cockspur (*Echinochloa paludigenea*), and springtape (*Sagittaria kurziana*) (Table 7). The following six natural community types were also documented – blackwater stream, dome swamp, floodplain forest, floodplain swamp, spring-run stream, and upland mixed forest (Table 8). The spring-run stream is the rarest of the six natural communities documented during the survey and is ranked imperiled at the global and state levels. On a worldwide basis, the status of the other five natural communities are more secure, but may be rare in parts of their range. A ruderal site was surveyed due to its ecotonal edge of a floodplain forest and the occurrence of rare plants. A map showing locations of all occurrences of rare plants and rare land and riverine vertebrates, non-rare endemic plants, and natural community types are presented in Figure 2.

Attribute and location information for each occurrence of rare plants and rare land and riverine vertebrates, non-rare endemic plants, and natural community types is provided in attribute tables located in Appendices 2, 3, 4 and 5. A detailed account of each of the rare plant and animal species is provided below and includes information on life history, occurrence within the Silver Springs survey site, habitat information such as associated species and general comments (Chafin 2000; Hipes et al. 2000). Additional information is also provided for each of the natural communities that were documented (FNAI and FDNR 1990).

Rare endemic and non-endemic plants

Forestiera godfreyi **(Godfrey's privet)** is a small deciduous shrub or tree in the olive family (Oleaceae). Some individuals are multi-stemmed and the branches can achieve heights from 8 to 30 feet tall. The leaves are oppositely arranged, oval in shape, have the upper margins toothed, while the lower edges are entire, the undersurfaces are pubescent, and are 1 to 3 inches long. The twigs and leaf petioles are also pubescent. Female and

Figure 2. Locations of rare endemic plants, rare non-endemic plants, rare land and riverine vertebrates, non-rare endemic plants, and natural communities documented within and along the Silver River and head springs.

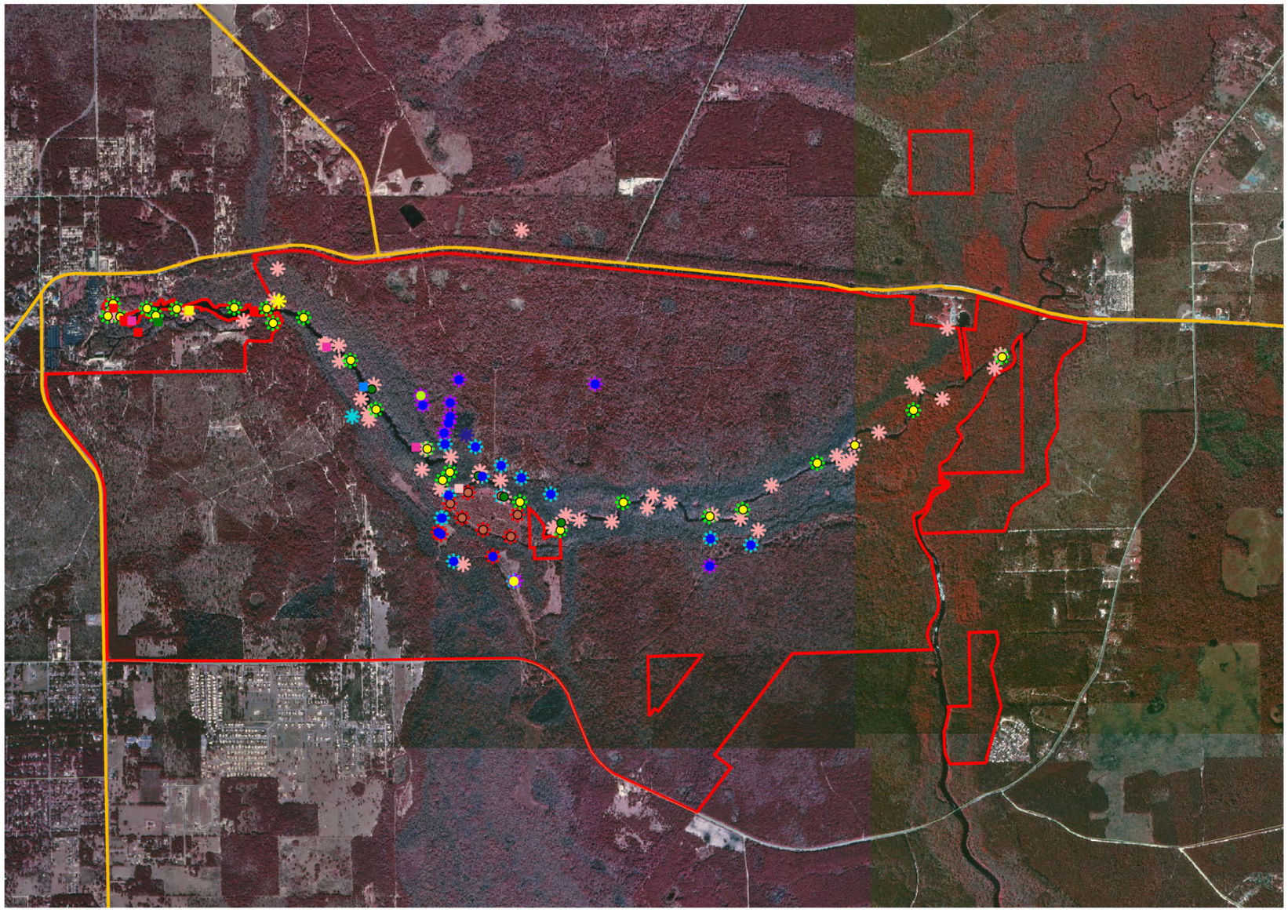


Table 5. List of rare endemic (bold) and non-endemic vascular plants documented within the Silver River, head springs, and associated wetland communities. Explanation sheet for ranks and legal status is included in Appendix 1 (FNAI 2002).

Name		**Rank**				**Community**
Latin name	**Common name**	**FNAI Global Rank**	**FNAI State Rank**	**Federal Status**	**State Status**	**FNAI Natural Community Types**
Forestiera godfreyi	Godfrey's privet	G2	S2	N	LE	Floodplain forest
Sideroxylon alachuense	Silver buckthorn	G1	S1	N	LE	Upland mixed forest
Spigelia loganioides	Pinkroot	G2Q	S2	N	LE	Ruderal type, Floodplain forest, Upland mixed forest

Table 6. List of rare land and riverine vertebrates documented within the Silver River, head springs and associated wetland communities.

Name		Rank				Community
Latin name	**Common name**	**FNAI Global Rank**	**FNAI State Rank**	**Federal Status**	**State Status**	**FNAI Natural Community Type**
Alligator mississippiensis	American alligator	G5	S4	LT(S/A)	LS	Stream-edge
Aramus guarauna	Limpkin	G5	S3	N	LS	Stream-edge
Egretta caerulea	Little blue heron	G5	S4	N	LS	Stream-edge
Eudocimus albus	White ibis	G5	S4	N	LS	Stream-edge, Floodplain swamp
Egretta thula	Snowy egret	G5	S3	N	LS	Stream edge
Nyctanassa violacea	Yellow-crowned night-heron	G5	S3	N	N	Stream-edge
Pandion haliaetus	Osprey	G5	S3S4	N	LS	Not Applicable (In flight)
Pseudemys concinna suwanniensis	Suwannee cooter	G5T3	S3	N	LS	Stream, Floodplain swamp

Table 7. List of non-rare endemic vascular plants documented within the Silver River, head springs and associated wetland communities.

Name		**Community**
Latin name	**Common name**	**FNAI Natural Community Types**
Campanula floridana	Florida bellflower	Ruderal type
Echinochloa paludigena	Florida cockspur	Floodplain swamp
Sagittaria kurziana	Spring tape	Spring-run stream

Table 8. List of natural communities documented within and along the Silver River and head springs. Explanation sheet for ranks and legal status is included in Appendix 1 (FNAI 2002).

Community	**Rank**		**Habitat Comments**
FNAI Natural Community Type	**FNAI Global Rank**	**FNAI State Rank**	**Description (bold text = listed species)**
Blackwater stream	G4	S2	Half-mile Creek forms from north of U.S. 40 and flows south emptying into the Silver River. The stream is sluggish and choked with aquatic weeds due to the run-off from U.S. 40. Several exotic plant species occur here: wild taro (*Colocasia esculenta*), water hyacinth (*Eichhornia crassipes*), and water lettuce (*Pistia stratiotes*).
Dome swamp	G4?	S3?	Isolated wetland dominated by pond cypress (*Taxodium ascendens*), blackgum (*Nyssa biflora*), green ash (*Fraxinus pennsylvanica*), and duckweed (*Lemna* spp.). Water levels are fairly deep.
Floodplain forest	G4	S3	Upslope from river and floodplain swamp; seasonally inundated; cabbage palm (*Sabal palmetto*), mixed hardwoods, and **pinkroot (*Spigelia loganioides*).**
Floodplain swamp	G4	S4	Bordering river and floodplain forest; usually inundated; bald cypress (*Taxodium distichum*), Carolina ash (*Fraxinus caroliniana*), green ash (*Fraxinus pennsylvanica*), and American elm.
Ruderal type	Not tracked	Not tracked	Old cultivated field; exposed limestone fragments; broomsedge (*Andropogon virginicus*), blue-eyed grass (*Sisyrinchium angustifolium*), **pinkroot (*Spigelia loganioides*),** and sand blackberry (*Rubus cuneifolius*).
Spring-run stream	G2	S2	Originating from the western-most portion of the survey site at the head springs of Silver Springs Theme Park and extending east to the confluence of the Oklawaha River; water is clear, blue-green in color and cold; submergent vegetation includes the non-rare, Florida endemic- spring-tape (*Sagittaria kurziana*), eel grass (*Vallisneria americana*) and money-wort (*Hydrocotyle* spp.); emergent plants includes state listed- cardinal flower (*Lobelia cardinalis*), sawgrass (*Cladium jamaicense*), wild rice (*Zizania aquatica*), and water hemlock (*Cicuta maculata*).
Upland mixed forest	G4	S4	Upslope from river, floodplain swamp, and floodplain forest; not inundated; cabbage palm (*Sabal palmetto*), mixed hardwoods, **pinkroot (*Spigelia loganioides*)**, and **Godfrey's privet (*Forestiera godfreyi*)**.

male reproductive parts are present in separate flowers on different plants. Both female and male flowers are arranged in small clusters and have no showy petals. Each female flower consists of 6 small bracts, 1 pistil, and 2 to 4 stamens that are not functional. Male flowers have 3 to 5 stamens that are showy, 4 to 5 sepals and 6 bracts that enclose each flower. Flowering occurs in late winter to early spring on the previous year's twigs. Fruits are deep blue drupes that sometimes have a waxy surface, and are 0.25 to 0.5 inches long with a diameter a little over 0.25 inches. Godfrey's privet is known to occur in upland hardwood forests and floodplain forests in association with exposed limestone. The range of distribution for Godfrey's privet is very small and disjunct occurring in only some west and north-central Florida counties with one documented population in South Carolina. FNAI ranks Godfrey's privet as imperiled globally and statewide (G2/S2); Florida Department of Agricultural and Consumer Services (FDACS) list it as endangered. A global and state ranking of G2/S2 means that Godfrey's privet is imperiled at the global and state level because of rarity (6 to 20 occurrences or less than 3000 individuals) or because of vulnerability to extinction due to some natural or human factor; see Appendix 1 (FNAI 2002).

Only one population of Godfrey's privet was documented within the Silver Springs survey site. Located in the vicinity of the River Trail south of the Silver River. The population was recognized as having twenty-five clumps with each clump having numerous stems. The plants ranged in height from 15 to 30 feet tall, with the stems erect to weeping in stature. A few plants had maturing fruits, but the majority of the individuals were vegetative. The natural community in which the population of Godfrey's privet was observed is classified as a floodplain forest, but it could also be classified as ecotonal in that it occurs between the floodplain forest and an old field or pasture. Exposed limestone is present, and calciphilic or calcium-loving plants were dominant such as the rare plant -pinkroot (*Spigelia loganioides*), as well as southern red cedar (*Juniperus virginiana*), cabbage palm (*Sabal palmetto*), sugar berry (*Celtis laevigata*), and small flower mock buckthorn (*Sageretia minutiflora*).

Three other species of *Forestiera* occur in Florida, and they occupy roughly the same counties with the exception of one species –Florida swamp privet (*F. segregata*) that is more typically found in coastal counties. Unlike Godfrey's swamp privet, the other three species of *Forestiera* bloom much later in the spring or summer. Although the two other *Forestiera* species –eastern swamp privet (*F. acuminata*) and upland swamp privet (*F. ligustrina*) have the same range of coverage in Florida, they can be distinguished from Godfrey's privet as follows: eastern swamp privet has pointed leaf tips (the other three species of Florida *Forestiera* have more rounded leaf tips), small teeth along the length of the leaf margin, under surface of leaf smooth, but veins can have hairs, and it occurs in wetlands; upland swamp privet occurs in the same type of habitats that Godfrey's privet occurs in, but it has twigs that have 2 parallel bands of hairs.

Sideroxylon alachuense **(Silver buckthorn)** is a small tree that is in the sapodilla family (Sapotaceae). Formerly this species was known as *Bumelia anomala*, but recent revisions have been made by Pennington (1990) to change the genus and by Anderson (1997 and 2000) to change the specific epithet. Silver buckthorn can grow up to 35 feet tall and has

crooked branches with green, sharp thorns when plants are mature. They have simple, alternately arranged leaves that are 1.5 to 3 inches long and have upper surfaces that are smooth, and are dark green in color. The under surfaces of the leaves are what stand out as the best diagnostic character for this species. The back of the leaves contrasts sharply with the front in having a dense covering of silver hairs, which gives the surface a high sheen. Flowers are arranged as clusters on spur shoots and each flower has 5 to 6 white petals. Flowering occurs from spring through early summer. Fruits are oblong shaped and black when fully mature. Silver buckthorn is known to occur in upland mixed forest that border floodplain forest that has exposed limestone at or near the surface. It is only known from three counties in North Central Florida (Alachua, Marion, and Orange), and has a very limited occurrence within the Okefenokee Swamp in southeast Georgia. FNAI gives this species a global and state ranking of G1/S1 and the Florida Department of Agricultural and Consumer Services (FDACS) lists it as endangered. A global and state ranking of G1/S1 means that silver buckthorn is critically imperiled at the global and state level because of extreme rarity (5 or fewer occurrences or less than 1000 individuals) or because of vulnerability to extinction due to some natural or human factor; see Appendix 1 (FNAI 2002). Silver buckthorn is the rarest of the rare plants documented during the Silver Springs survey.

Only one population of silver buckthorn was documented within the Silver Springs survey site. Five individuals were observed north of the Silver River in an area known as Carmichael Landing. The trees ranged in height from 25 to 35 feet tall and had numerous sucker sprouts directly under the trees. The plants were scattered, covering an area of approximately 10,000 square feet. A few of the trees were just starting to flower. The natural community in which the Silver buckthorn occurs is an upland mixed forest that appears to be situated both within and immediately next to a floodplain forest. The site appears to literally be on an elevated island. Exposed limestone is present, and calciphilic (the definition of "calciphilic" was established above) plants were dominant such as the rare plant -pinkroot (*Spigelia loganioides*), Shumard oak (*Quercus shumardii*), swamp chestnut oak (*Q. michauxii*), southern red cedar (*Juniperus virginiana*), cabbage palm (*Sabal palmetto*), sugar berry (*Celtis laevigata*), soap berry (*Sapindus marginatus*), small flower mock buckthorn (*Sageretia minutiflora*), and green dragon (*Arisaema dracontium*). Feral hogs were observed during every visit to this site and could potentially damage the health and well being of the silver buckthorn and pinkroot population.

Eight other *Sideroxylon* species occur in Florida, but only four of those species are currently known to occur within Marion County. The most commonly occurring of those four species- gum bully (*Sideroxylon lanuginosum*), differs from silver buckthorn in having new stem growth and the under surfaces of leaves that are covered with thick, dull, rusty-brown hairs. Another species- tough bully (*S. tenax*) strongly resembles gum bully, but the new stem growth and abaxial leaf surfaces are covered with shiny, rusty-brown hairs. It has been reported that some individuals of tough bully that grow on shell mounds in South Carolina and Georgia exhibit the same shiny, silvery hair feature that silver buckthorn displays. More research needs to be conducted to investigate whether tough bully could be an intermediate form of silver buckthorn. Two other *Sideroxylon*

species- Florida bully (*S. reclinatum*) and gopherwood buckthorn (*S. lycioides*) -both differ from silver buckthorn in having new stem growth and under surface of leaves that are either smooth or sparsely hairy with white to rusty-colored hairs. There are three subspecies of Florida bully, two of which have been recorded occurring in Marion County- subspecies *reclinatum* and subspecies *rufohirtum* (*rufotomentosum*). The subspecies *reclinatum* has few to no reddish to light brown colored hairs on undersurfaces of leaves, twigs, and floral parts and occurs in floodplain forests. The subspecies *rufohirtum* (*rufotomentosum*) contrasts sharply to the subspecies *reclinatum* in having dense copper-red colored hairs on leaves, twigs, and floral parts and occurs in higher and drier terrain such as sandhills and hammocks. The subspecies *rufohirtum* (*rufotomentosum*) is also the smallest of the *Sideroxylon* species only reaching heights up to 1 foot tall. The fourth species- gopherwood buckthorn (*S. lycioides*) is a listed species (G5/S2), and is most similar to Florida bully (*Sideroxylon reclinatum* ssp. *reclinatum*. The biggest differences between gopherwood buckthorn and Florida bully are that the former have leaves from 3 to 6 inches long and are broadest at the middle, whereas Florida bully has leaves that are only 0.5 to 3 inches long and are broadest at the tip.

Spigelia loganioides **(Pinkroot)** is a glabrous perennial herb in the logania family (Loganiaceae). This species was once recognized as *Coelostylis loganioides*. This plant produces one to several erect stems that are sparingly branched, up to 12 inches tall, and slightly woody at the base. The leaves are sessile, opposite, entire, oval to lanceolate, and 0.5 to 1.5 inches long and 0.6 inches wide. Flowers are in a terminal, leafy cyme containing few-flowers. The corolla is 0.5 inches long, funnelform with 5 triangular lobes, and is white with pale lavender lines. Fruit is a 2-lobed capsule about 0.2 inches wide. The flowering season is from April to June, and flowers open in the early portion of the afternoon. Pinkroot is found in bottomland and floodplain forests and hydric and mesic hammocks over limestone. It is a Florida endemic known only from Citrus, Levy, Marion, and Sumter counties. FNAI ranks pinkroot as imperiled globally and statewide (G2Q/S2); Florida Department of Agricultural and Consumer Services (FDACS) list it as endangered. A global and state ranking of G2Q/S2 means that pinkroot is imperiled at the global and state level because of rarity (6 to 20 occurrences or less than 3000 individuals) or because of vulnerability to extinction due to some natural or human factor but there is question as to whether it is a valid species; see Appendix 1 (FNAI 2002).

Twenty-four occurrences of pinkroot were documented within the Silver Springs study area. Most of the individuals observed were flowering, which enhanced field identification. It was locally common in the areas where it was observed. Pinkroot occurs north of the Silver River in the vicinity of Carmichael Landing, and south of the river along the River Trail. Populations of pinkroot were observed in ruderal, upland mixed forests, and floodplain forest community types. While the natural community types in which the pinkroot occurred varied in overall plant associations and position in the landscape, there were some similarities shared between the areas. All of the sites had exposed limestone, and given the three community types had exposed limestone present, there were some shared plant associations such as southern red cedar (*Juniperus virginiana*), cabbage palm (*Sabal palmetto*), sugar berry (*Celtis laevigata*), and small flower mock buckthorn (*Sageretia minutiflora*). Within the context of the three

community types, pinkroot occurred where there were openings or light gaps in the tree canopy. Pink root occurred within the upland mixed forest and floodplain forest portions of Carmichael Landing and the River Trail sites. It was documented both in the interior of the natural communities, but also occurred in great abundance along the open, grassy, edges of off-road vehicle roads and trails. The ruderal area in which pinkroot occurred along the south side of the Silver River in association with the River Trail was a former old pasture or field. This site is very open in terms of sun-exposure, but woody plants are re-colonizing the site. It is thought that this area may have been open for some time since there is evidence of Indian inhabitation. Possible threats to pinkroot within the Silver Springs survey site are proximity to established foot and off-road vehicle trails, and exotic plant and animal invasions, especially feral hogs.

Three other species of *Spigelia* occur in Florida, two in the panhandle and one in Dade and Monroe counties. The two Florida panhandle species include the rare gentian pinkroot (*S. gentianoides*) and the more common woodland pinkroot (*S. marilandica*). In addition to occurring outside of the Silver River survey site, these species differ primarily from pinkroot in that gentian pinkroot occurs in sandhills, and woodland pinkroot has a corolla that has a red exterior and yellow interior. A third species- West Indian pinkroot (*S. anthelmia*) is known to occur only in south Florida and is restricted to pine rockland natural communities.

Rare land and riverine vertebrates

REPTILES

***Alligator mississippiensis* (American alligator)**. While alligators were only documented twice, they are, in all likelihood, present throughout the Silver River survey area. The adjacent floodplain would be heavily utilized for nesting. The single biggest threat posed for alligators is the feral hog populations, which could dig up nests and eat the eggs within. The American alligator has a range-wide distribution throughout the southeastern Coastal Plain from North Carolina to Texas. It occurs throughout Florida, but is rare in the Keys. FNAI ranks the American alligator as G5T3/S3 and this species is listed as Federally Threatened by Similarity of Appearance (to more endangered crocodilians) and as a species of Special Concern with the state.

***Pseudemys concinna suwanniensis* (Suwannee cooter)** is a species of turtle that reaches a maximum length of 9 to12 inches. The primary habitats for this species are clear spring runs and larger springs of Gulf drainage systems. This is the largest and darkest colored species of cooter. Its ground color and carapace are black or nearly so with light head stripes, and the plastron is yellow with no markings. In young turtles, a pale "C" can be clearly seen on the carapace. In adults the "C" is vague. This is the only cooter species known to occur in the Silver River. However, there are similar species, which include the Florida redbelly turtle (*P. nelsoni*) which has a bright orange-red plastron. Suwannee cooters have a yellow plastron. Pond sliders (*Trachemys scripta*) also have a yellow plastron, but it is heavily infused with black spots and blotches, and they are more common in lakes, ponds, and other sluggish bodies of water. Pond sliders are also smaller with a length of 5 to 8 inches. This species of turtle was recorded in five

different locations from the head springs to approximately 0.6 mile downstream. The Suwannee cooters were observed basking along the edge of the Silver River and commuting within the stream channel. This is another species that would be adversely affected by feral hogs, and for the same reason as that for the alligator. This species, while native to Florida, is not native to the Atlantic drainage streams or stream systems, which Silver River is a part of. The range distribution of this species is from the Suwannee River north into the southern portion of Georgia. While the Suwannee cooter is an introduced species to Silver Springs, FNAI still has an interest in tracking this species at this site. Suwannee cooters are FNAI ranked as G5T3/S3 and are a species of Special Concern with the state. They have no federal status.

BIRDS

***Aramus guarauna* (Limpkin)** are wading birds that stand 26 inches tall, with a brown body that is impregnated with white "arrowhead" shaped markings on the upper back, neck and wings. These markings thin out from the neck to the torso. The bill is long and slightly down-curved. Limpkins eat frogs, insects, fish and especially snails. They nest in swampy forests, and other wetland communities supporting woody vegetation. They build their nests anywhere from ground level up to 45 feet high in trees. One limpkin was recorded foraging along the stream's edge approximately 0.3 mile east of the head spring. Limpkins could be confused with immature white ibis. Immature white ibis have brown backs and wings and their necks have a striated pattern of brown and white, not arrowhead shaped. As immature white ibis grow the brown wings develop large white patches that's never seen on limpkins. Also the bill of limpkins doesn't have the extreme downward curve of white ibises. Limpkins range throughout the St. Johns River system as well as the peninsula of Florida with disjunct populations in the central Panhandle. They range as far north as southeast Georgia. This species is classified as a G5/S3 and is considered a Special Concern species in Florida, and has no federal status.

***Egretta caerulea* (Little blue heron)** are small wading birds standing 24 inches tall and when mature are dark blue with a purplish head and neck. This characteristic is more obvious in breeding individuals. The bill is bicolored with a dark gray tip and lighter gray base. Immature little blues have white bodies with blue-gray wing tips and the bicolored bill of adults. While adult little blue herons resemble no other species, the immature birds resemble great egrets (*Ardea alba*), snowy egrets (*Egretta thula*), and cattle egrets (*Bubulcus ibis*). Great egrets are taller, have yellow bills and completely white wings, and body. Snowy egrets are all white and have black bills and legs with yellow feet. Little blue herons have grayish-blue legs and feet. Cattle egrets differ from little blue herons by having yellowish bills, legs, and feet. Little blue herons were documented at three different localities foraging along the stream's edge. One near the head springs, the second approximately 0.3 mile downstream of the first, and the third about 0.06 mile upstream from Carmichael Landing. Little blues eat fish, aquatic invertebrates, and amphibians. They typically nest in rookeries with other egret and heron species. They build their nests in shrubs and trees that are growing in or very near bodies of water. Little blues are located throughout Florida, and the southeastern United States and also occur along the East Coast to about New Jersey. FNAI ranks this species as a G5/S4 and is considered a Special Concern species by Florida, but receives no

federal status. FNAI ranks this species as a G5/S4 and is considered a Special Concern species by Florida, and receives no federal status.

Egretta thula **(snowy egret)** are small wading birds that stand 24 inches tall with a completely white body, head, and neck. Their beak and legs are black, and their feet are yellow. One individual was recorded foraging on the edge of Silver River. Similar species include immature little blue herons, (see little blue heron account above for details) great egrets (*Ardea alba*) and cattle egrets (*Bubulcus ibis*). Like snowy egrets, great egrets have a completely white body, but have a yellow bill and black legs and feet. Cattle egrets have all white bodies with a yellowish bill, legs, and feet. During the breeding season, cattle egrets will also have yellow on their heads and backs. Snowy egrets eat aquatic invertebrates, fish, and insects. They nest in rookeries with other species of egrets and herons and typically build their nests in shrubs or low in trees (5 to 10 feet off the ground). Juvenile snowy egrets resemble the adults. This species is a year round resident throughout Florida, Gulf coast states, and the Baja peninsula. Snowy egrets are also summer residents in the Colorado River basin. Snowy egrets have an FNAI rank of G5/S3 and is a species of Special Concern within the state, and have no federal status.

Nyctanassa violacea **(yellow-crowned night-heron)** are small, but stocky wading birds standing 24 inches tall with a buffy-white crown, and a black nape and checks. The black checks are interrupted by a white oval. The neck, body and wings are gray with a modeled impression on the wings. One yellow-crowned night-heron was documented foraging on the edge of Silver River approximately 0.07 mile east of the River Trail. The only other bird that resembles this species, if only vaguely so, is the black-crowned night-heron, which has a black crown, head and nape. Yellow-crowned night-herons eat aquatic invertebrates, fish, and insects. They do their foraging at night or under dim light conditions. They aren't as gregarious as black-crowned night-herons, nesting singly or in small groups and may nest on the ground or up to 40 feet in a tree. This species is a permanent resident in north Florida south throughout the peninsula, and north along the coasts of South Carolina and Georgia, and west to Louisiana and Texas. Their summer range consists of southeastern states as well as Eastern Plains states as far north as southern Michigan. Yellow-crowned night-herons are listed by FNAI has G5/S3, and have no state or federal status.

Eudocimus albus **(white ibis)** are small wading birds that stand 25 inches tall with a salmon/red downward curved bill. The bill and face become an intense red during the breeding season. Immatures have brown wings and a modeling of brown and white feathers on the upper back and neck. Immature white ibis resemble limpkins except the downward curvature of their bill is more pronounced and there are no white "arrowheads" on their wings. Instead, there are white patches. As they age and mature the brown is replaced by all white, which takes about 2-3 years. White ibis were seen feeding along the stream edge and within the floodplain forest of the Silver River. This species eats aquatic invertebrates, and fish. White ibis nest in rookeries that can number in the 100s. They typically build their nest near water low in shrubs or trees. They rarely

nest on matted aquatic vegetation. This species is a year round resident of the entire state of Florida as well as the coasts of the Carolinas, Georgia, Alabama and west to Texas. White ibis are FNAI ranked as G5/S4, are a Special Concern species with the state, and receive no federal status. This species was relatively common on the Silver River.

Pandion haliaetus **(osprey)** are fish eating raptors that are dark brown above and have white napes and underside. This raptor is 22 to 25 inches in height with a 58 to 72 inch wingspan. Ospreys nest singly in or near fresh and salt water. The nest is built in trees, cliffs and on man-made platforms. The mated pair are monogamous and return to the same nest year after year adding new materials. Over time the nest can be quite large, large enough to support an average sized man. Juveniles resemble the adults except the dark back feathers are bordered with white. Ospreys are specialized piscivores (fish eaters). One individual was recorded flying over the Silver River looking for food. They are permanent residents in Florida, the coasts of Alabama, Mississippi, and Louisiana and the Baja peninsula. Their summer range is extensive in Canada and along the upper Atlantic coast. Ospreys are FNAI ranked as G5/S3S4 and are a species of Special Concern in Florida. They have no federal status.

Natural community types

Blackwater stream.
Locally referred to as "Half-mile Creek", this blackwater stream originates approximately 2 miles north of the Silver River. It is east of CR 35, and north of SR 40 and CR 326. This stream flows south terminating into the Silver River. The stream is only 15 to 20 feet wide, is slow moving, and turbid. The dominant plants observed along and within the stream were duckweed (*Lemna* spp.) and the exotic plant species: wild taro (*Colocasia esculenta*), water hyacinth (*Eichhornia crassipes*), and water lettuce (*Pistia stratiotes*). Healthy floodplain swamp occurs east and west of the blackwater stream. It appears that the blackwater stream is receiving all of the run-off and trash that is associated with SR 40. There were no rare plants or animals documented within the blackwater stream. FNAI ranks blackwater streams as G4/S2. A global ranking of "G4" is defined as being secure globally, but may be rare in parts of its range. Whereas a "S2" ranking means that the blackwater stream is imperiled at the state level because of rarity (6 to 20 occurrences or less than 3000 individuals) or because of vulnerability to extinction due to some natural or human factor; see Appendix 1 (FNAI 2002).

Dome swamp.
Only one dome swamp was documented within the Silver Springs survey site. Located north of the Silver River within the vicinity of Carmichael Landing, this isolated wetland covers approximately an eighth of an acre. Water levels were relatively deep during the visits made. The dome swamp had areas of open, tannic-colored water with the interior and edges dominated by large trees. Pond cypress (*Taxodium ascendens*), blackgum (*Nyssa biflora*), and green ash (*Fraxinus pennsylvanica*) were the dominant trees noted. There were no rare plants or animals documented within the dome swamp. A global ranking of G4?/S3? has been assigned by FNAI to dome swamps. The question mark on both the global and state ranks indicates that the assigned rank is temporary. The G4

ranking was explained in the blackwater stream description. As defined in the 2002 FNAI *Tracking List*, the S3 rank means an element is either very rare and local throughout its range (21-100 occurrences or less than 10,000 individuals), or found locally in a restricted range, or vulnerable to extinction from other factors; see Appendix 1 (FNAI 2002).

Floodplain forest.
Seventeen different sites were classified as floodplain forest within the Silver Springs survey area. Floodplain forests were documented occurring north and south of the Silver River upslope from floodplain swamp. The floodplain forests visited were dry for the most part, but the survey took place during a drought. Dominant plants observed include cabbage palm (*Sabal palmetto*), sweetgum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), box elder (*Acer negundo*), and southern red cedar (*Juniperus virginiana*). Two listed plants were documented occurring in this community type- Godfrey's privet (*Forestiera godfreyi*) and pinkroot (*Spigelia loganioides*). FNAI ranks floodplain forest as G4/S3. Those ranking definitions were referred to in the dome swamp discussion; also see Appendix 1. The exotic animals- feral hogs and monkeys -pose a threat to the health and well being of this community.

Floodplain swamp.
Forty-four different sites were designated as floodplain swamp within the Silver Springs survey area. Situated between the river and floodplain forests, floodplain swamp probably accounts for the largest area surveyed. Most sites visited were inundated and the ground consisted of deep muck. Some sites were a tangle of cypress knees and roots that were also hard to maneuver through. Large individuals of bald cypress (*Taxodium distichum*) occur throughout this natural community forming the dominant strata. Other commonly observed canopy trees were green ash (*Fraxinus pennsylvanica*), Carolina ash (*F. caroliniana*), American elm (*Ulmus americana*), and red maple (*Acer rubrum)*. Some sites visited had a depauperate understory with hardly any groundcover present; other areas were lush and had a diverse numbers of species. The most common herbaceous plants observed in floodplain swamp were lizard's tail (*Saururus cernuus*), savannah panicum (*Phanopyrum gymnocarpon*), Dixie iris (*Iris hexagona*), spring-run spiderlily (*Hymenocallis rotata*), millet beaksedge (*Rhynchospora miliacea*), giant sedge (*Carex gigantea*), and the Florida endemic- Florida cockspur (*Echinochloa paludigena*). There were no rare plants observed in floodplain swamp. FNAI ranks floodplain swamp as G4/S4. Those definitions were referred to previously; see Appendix 1. Potential threats to this community include exotic animals (feral hogs and monkeys), and activity relating to boating activity (trash dumping and bathroom visits).

Spring-run stream.
Twenty-four points were recorded along the 5.3 mile long spring-run stream or Silver River. This natural community description includes the spring boils and the channel that is south of the river. The spring-run stream originates from the western extent of the area surveyed at the Head Springs, which are located within the Silver Springs Theme Park. The spring-run stream disappears at its confluence with the Oklawaha River, which also marks the end of the survey site. The spring-run stream and springs can be best

characterized by their crystal clear, blue-aqua colored, cold waters. Fish and other aquatic animals are highly visible at great depths below. Within the main channel and along the outer edges of the stream there are underwater forests of submergent vegetation such as the Florida endemic- spring tape (*Sagittaria kurziana*), eel grass (*Vallisneria americana*), and moneywort (*Hydrocotyle* spp.). The stream edge has more diversity in numbers of plant species with the following emergents observed: the state listed threatened species- cardinal flower (*Lobelia cardinalis*), wild rice (*Zizania aquatica*), sawgrass (*Cladium jamaicense*), and water hemlock (*Cicuta mexicana*). There were no rare plants observed within the spring-run stream. FNAI ranks spring-run streams as G2/S2. This natural community is the rarest type that was surveyed in the Silver Springs study area. With the ranking of G2/S2, this community is both globally and state imperiled because of rarity (6 to 20 occurrences or less than 3000 individuals) or because of vulnerability to extinction due to some natural or human factor; see Appendix 1 (FNAI 2002). For the most part, the Silver River appears to be a healthy ecosystem, but there are some areas that warrant attention. Algae was observed growing in great profusion in the vicinity of the head springs. The source responsible for that alga growth is not known, but it is likely that nutrients are seeping into the aquifer from a nearby source. Another facet of the spring-run stream that needs to be looked at is the current excavation that is occurring along the canal within the Silver Springs Theme Park. There was no visible turbidity or erosion observed in this portion of the study area, but the stream warrants monitoring not only for water quality, but for archeological artifacts while this excavation is occurring. Other potential threats to the Silver River are from the impact of the boat traffic and the associated trash. A bigger and more long term concern is how the ever increasing growth of the population within the Ocala area and the demands on the local water resources will effect the Floridan aquifer, which will in turn effect the Silver River.

Upland mixed forest.

Ten different sites were designated as upland mixed forest within the Silver Springs survey area. Representing the drier end of the study site, this community is uphill from the river, floodplain swamp, and floodplain forest. Sites were visited both north and south of the Silver River. One of the highest quality upland mixed forest occurs north of the river in the vicinity of Carmichael Landing. A detailed description of the Carmichael Landing upland mixed forest has already been presented in the description of silver buckthorn (*Sideroxylon alachuensis*) and pinkroot (*Spigelia loganioides*). In addition to the afore-mentioned rare plants, an additional listed plant was surveyed for in the Carmichael upland mixed forest site-wood spurge (*Euphorbia commutata*). A historical record from 1985 suggests that it was once growing in the vicinity of the silver buckthorn population. The site was visited three times, and the wood spurge population appears to be no longer present. South of the river in the area between the Swamp and River Trails, another high quality upland mixed forest was recorded. The plant composition of this site was a little different from the Carmichael Landing site with more upland species present. Loblolly pine (*Pinus taeda*), sweet gum (*Liquidambar styraciflua*), persimmon (*Diospyros virginiana*), and southern red cedar (*Juniperus virginiana*) were dominant trees. Several plants of interest were documented here such as the Commercially Exploited- needle palm (*Rhapidophyllum hystrix*) and Solomon's seal (*Polygonatum*

biflorum), which is near its southern most range. It was hoped that pinkroot (*Spigelia loganioides*) would be present in this latter site, but none were located. FNAI gives upland mixed forest a global and state ranking of G4/S4. The definition of this ranking has been discussed earlier; also see Appendix 1. Potential threats to this natural community are off-road vehicle trails where some populations of pinkroot occur along the road edge, and exotic plants, cogon grass (*Imperata cylindrica*) and animals, feral hogs (*Sus scrofa*).

Ruderal community type.

Although this community type is not tracked or listed by FNAI, it warrants describing due to the presence of rare and endemic plants. There were only two ruderal sites visited within the Silver Springs survey area and they were along the River Trail and the River Loop Trail, which are south of the river. Basically these sites are designated "ruderal" due to having been disturbed in the past. Today they resemble old fields or pastures. Within the study area, they occur between floodplain forest and upland mixed forest. The sites are mostly dominated by herbs, but woody plants are spreading in from the adjoining floodplain forest. Broomsedge (*Andropogon virginicus*), the introduced species- centipede grass (*Eremochloa ophiuroides*), sand blackberry (*Rubus cuneifolius*), and the Florida endemic –Florida bellflower (*Campanula floridana*) are among the weedy plants that were observed in the site. Exposed limestone is present, and calciphilic plants were also present such as the rare plant -pinkroot (*Spigelia loganioides*), southern red cedar (*Juniperus virginiana*), cabbage palm (*Sabal palmetto*), sugar berry (*Celtis laevigata*), and small flower mock buckthorn (*Sageretia minutiflora*). In addition to pinkroot, another rare plant was searched for at the old field site based on an earlier reported occurrence. A large population of Florida crabgrass (*Digitaria floridana*) was reported occurring on this site in 1986 and 1993, but it was not located during this spring survey. Given the site was covered in a mass of vegetative grasses (mostly of which were centipede grass), either the Florida crabgrass had been choked out by the other vegetation, or it just wasn't visible because it wasn't flowering or fruiting yet. A more appropriate survey time for the Florida crabgrass would be in the fall during the reproductive period. The top threat to this old field site is the trail that surrounds the site because pinkroot is growing next to the trail.

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Ranks and Legal Status Definitions

Using a ranking system developed by The Nature Conservancy and the Natural Heritage Program Network, the Florida Natural Areas Inventory assigns two ranks to each element. The **global rank** is based on an element's worldwide status; the **state rank** is based on the status of the element in Florida. Element ranks are based on many factors, the most important ones being estimated number of Element occurrences, estimated abundance (number of individuals for species; area for natural communities), range, estimated adequately protected Eos, relative threat of destruction, and ecological fragility.

FNAI GLOBAL RANK DEFINITIONS

G1 = Critically imperiled globally because of extreme rarity (5 or fewer occurrences or less than 1000 individuals) or because of extreme vulnerability to extinction due to some natural or man-made factor.
G2 = Imperiled globally because of rarity (6 to 20 occurrences or less than 3000 individuals) or because of vulnerability to extinction due to some natural or man-made factor.
G3 = Either very rare and local throughout its range (21-100 occurrences or less than 10,000 individuals) or found locally in a restricted range or vulnerable to extinction from other factors.
G4 = Apparently secure globally (may be rare in parts of range)
G5 = Demonstrably secure globally
GH = Of historical occurrence throughout its range, may be rediscovered (e.g., ivory-billed woodpecker)
GX = Believed to be extinct throughout range
GXC = Extirpated from the wild but still known from captivity or cultivation
G#? = Tentative rank (e.g., G2?)
G#G# = Range of rank; insufficient data to assign specific global rank (e.g., G2G3)
G#T# = Rank of a taxonomic subgroup such as a subspecies or variety; the G portion of the rank refers to the entire species and the T portion refers to the specific subgroup; numbers have same definition as above (e.g., G3T1)
G#Q = Rank of questionable species – ranked as species but questionable whether it is species or subspecies; numbers have same definition as above (e.g., G2Q)
G#T#Q = Same as above, but validity as subspecies or variety is questioned.
GU = Due to lack of information, no rank or range can be assigned (e.g., GUT2).
G? = Not yet ranked (temporary)
HYB = Hybrid

FNAI STATE RANK DEFINITIONS

S1 = Critically imperiled in Florida because of extreme rarity (5 or fewer occurrences or less than 1000 individuals) or because of extreme vulnerability to extinction due to some natural or man-made factor.
S2 = Imperiled in Florida because of rarity (6 to 20 occurrences or less than 3000 individuals) or because of vulnerability to extinction due to some natural or man-made factor.
S3 = Either very rare and local throughout its range (21-100 occurrences or less than 10,000 individuals) or found locally in a restricted range or vulnerable to extinction from other factors.
S4 = Apparently secure in Florida (may be rare in parts of range)
S5 = Demonstrably secure in Florida
SH = Of historical occurrence throughout its range, may be rediscovered (e.g., ivory-billed woodpecker)
SX = Believed to be extinct throughout range
SA = Accidental in Florida, i.e., not part of the established biota
SE = An exotic species established in Florida may be native elsewhere in North America
SN = Regularly occurring, but widely and unreliably distributed; sites for conservation hard to determine

FEDERAL LEGAL STATUS
For official definitions and lists of protected species, consult the relevant federal agency.

Definitions derived from U.S. Endangered Species Act of 1973, Sec. 3. Note that the federal status given by FNAI refers only to Florida populations and that federal status may differ elsewhere.
LE Endangered: species in danger of extinction throughout all or a significant portion of its range.
LT Threatened: species likely to become Endangered within the foreseeable future throughout all or a significant portion of its range.
E(S/A) Endangered due to similarity of appearance to a species which is federally listed such that enforcement personnel have difficulty in attempting to differentiate between the listed and unlisted species.
T(S/A) Threatened due to similarity of appearance (see above).
PE Proposed for listing as Endangered species.
PT Proposed for listing as Threatened species.
C Candidate species for which federal listing agencies have sufficient information on biological vulnerability and threats to support proposing to list the species as Endangered or Threatened.
XN Non-essential experimental population.
MC Not currently listed, but of management concern to USFWS.
N Not currently listed, nor currently being considered for listing as Endangered or Threatened.

STATE LEGAL STATUS

For official definitions and lists of protected species, consult the relevant federal agency.

Animals: Definitions derived from "Florida's Endangered Species and Species of Special Concern, Official Lists" published by Florida Fish and Wildlife Conservation Commission, 1 August 1997, and subsequent updates.

LE Endangered: species, subspecies, or isolated population so few or depleted in number or so restricted in range that it is in imminent danger of extinction.

LT Threatened: species, subspecies, or isolated population facing a very high risk of extinction in the future.

LS Species of Special Concern is a species, subspecies, or isolated population which is facing a moderate risk of extinction in the future.

PE Proposed for listing as Endangered.

PT Proposed for listing as Threatened.

PS Proposed for listing as Species of Special Concern.

N Not currently listed, nor currently being considered for listing.

Plants: Definitions derived from Sections 581.011 and 581.185(2), Florida Statutes, and the Preservation of Native Flora of Florida Act, 5B-40.001. FNAI does not track all state-regulated plant species; for a complete list of state-regulated plant species, call Florida Division of Plant Industry, 352-372-3505 or see http://doacs.state.fl.us/~pi/5b-40.htm#.0055. (Coile 2000)

LE Endangered: species of plants native to Florida that are in imminent danger of extinction within the state, the survival of which is unlikely if the causes of a decline in the number of plants continue; includes all species determined to be endangered or threatened pursuant to the U.S. Endangered Species Act.

LT Threatened: species native to the state that are in rapid decline in the number of plants within the state, but which have not so decreased in number as to cause them to be Endangered.

PE Proposed for listing as Endangered.

PT Proposed for listing as Threatened.

N Not currently listed, nor currently being considered for listing.

Appendix 2. Attribute Table. List of rare endemic (bold) and non-endemic vascular plants that were documented within the Silver River, head springs, and associated wetland communities.

Name		Community	Field Comments									
Latin name	Common name	FNAI Natural Community	Tally (only when countable)	Height (1 ft. or taller)	Diameter (only woody species) (in.)	Area of Coverage (ft/2)	Phenology	Distribution	Primary Disturbance	Ruderal Natural Community	Site	Survey Date
Spigelia loganioides	Pinkroot	Ruderal Type	100	0	0	1000	Vegetative	Scattered	Old cultivated field	Yes	River Trail	31-Mar-04
Spigelia loganioides	Pinkroot	Floodplain Forest	100	0	0	1000	Flowering	Scattered	Off-road vehicle trail	No	River Trail	31-Mar-04
Spigelia loganioides	Pinkroot	Floodplain Forest	10	0	0	100	Flowering	Scattered	Foot path	No	River Trail	31-Mar-04
Spigelia loganioides	Pinkroot	Floodplain Forest	500	0	0	10000	Flowering	Scattered	Off-road vehicle trail	No	River Trail	31-Mar-04
Forestiera godfreyi	Godfrey's privet	Floodplain Forest	25	30	200 stems	1000	Fruiting	Clumped	Land clearing	No	River Trail	31-Mar-04
Spigelia loganioides	Pinkroot	Upland Mixed Forest	30	0	0	1000	Flowering	Scattered	Hog rooting	No	Carmichael Landing, north of river	07-Apr-04
Spigelia loganioides	Pinkroot	Upland Mixed Forest	100	0	0	10000	Flowering	Scattered	Hog rooting	No	Carmichael Landing, north of river	07-Apr-04
Spigelia loganioides	Pinkroot	Upland Mixed Forest	500	0	0	10000	Flowering	Scattered	Hog rooting	No	Carmichael Landing, north of river	07-Apr-04
Sideroxylon alachuense	Silver buckthorn	Upland Mixed Forest	5	35	3	2500	Bud	Scattered	Hog rooting	No	Carmichael Landing, north of river	07-Apr-04
Spigelia loganioides	Pinkroot	Upland Mixed Forest	100	0	0	1000	Flowering	Scattered	Hog rooting	No	Carmichael Landing, north of river	07-Apr-04
Spigelia loganioides	Pinkroot	Floodplain Forest	300	0	0	10000	Bud and flower	Scattered	Hog rooting	No	Carmichael Landing, north of river	08-Apr-04

Appendix 2. Attribute Table. List of rare endemic (bold) and non-endemic vascular plants that were documented within the Silver River, head springs, and associated wetland communities.

Name		Community	Field Comments									
Latin name	Common name	FNAI Natural Community	Tally (only when countable)	Height (1 ft. or taller)	Diameter (only woody species) (in.)	Area of Coverage (ft/2)	Phenology	Distribution	Primary Disturbance	Ruderal Natural Community	Site	Survey Date
Spigelia loganioides	Pinkroot	Floodplain Forest	100	0	0	1000	Bud and flower	Scattered	Hog rooting	No	Carmichael Landing, north of river	08-Apr-04
Spigelia loganioides	Pinkroot	Floodplain Forest	100	0	0	1000	Bud and flower	Scattered	Hog rooting	No	Carmichael Landing, north of river	08-Apr-04
Spigelia loganioides	Pinkroot	Floodplain Forest	300	0	0	10000	Flowering	Scattered	Off-road vehicle trail	No	South of river	08-Apr-04
Spigelia loganioides	Pinkroot	Floodplain Forest	100	0	0	10000	Bud and flower	Scattered	None	No	South of river	08-Apr-04
Spigelia loganioides	Pinkroot	Upland Mixed Forest	500	0	0	10000	Flowering	Scattered	Off-road vehicle trail	No	South of river	08-Apr-04
Spigelia loganioides	Pinkroot	Ruderal Type	500	1	0	10000	Flowering	Widely scattered	Old cultivated field	Yes	River Trail	26-Apr-04
Spigelia loganioides	Pinkroot	Floodplain Forest	500	1	0	5000	Flowering	Scattered	Off-road vehicle trail	No	South of river	26-Apr-04
Spigelia loganioides	Pinkroot	Floodplain Forest	300	0	0	20000	Bud and flower	Widely scattered	None	No	Camichael Landing, north of river	29-Apr-04
Spigelia loganioides	Pinkroot	Floodplain Forest	300	0	0	10000	Flowering	Widely scattered	Off-road vehicle trail	No	Camichael Landing, north of river	29-Apr-04
Spigelia loganioides	Pinkroot	Floodplain Forest	200	0	0	1000	Bud and flower	Widely scattered	Off-road vehicle trail	No	Camichael Landing, north of river	29-Apr-04
Spigelia loganioides	Pinkroot	Upland Mixed Forest	200	0	0	10000	Flowering	Widely scattered	Exotic species	No	North of river	29-Apr-04

Appendix 2. Attribute Table. List of rare endemic (bold) and non-endemic vascular plants that were documented within the Silver River, head springs, and associated wetland communities.

Name		Community	Field Comments									
Latin name	Common name	FNAI Natural Community	Tally (only when countable)	Height (1 ft. or taller)	Diameter (only woody species) (in.)	Area of Coverage (ft/2)	Phenology	Distribution	Primary Disturbance	Ruderal Natural Community	Site	Survey Date
Spigelia loganioides	Pinkroot	Upland Mixed Forest	500	0	0	10000	Flowering	Widely scattered	Hog rooting	No	Camichael Landing, north of river	05-May-04
Spigelia loganioides	Pinkroot	Upland Mixed Forest	500	0	0	10000	Flowering	Widely scattered	Hog rooting	No	Camichael Landing, north of river	05-May-04
Spigelia loganioides	Pinkroot	Upland Mixed Forest	100	0	0	1000	Flowering	Widely scattered	Hog rooting	No	Camichael Landing, north of river	06-May-04
Spigelia loganioides	Pinkroot	Ruderal Type	200	0	0	5000	Flowering	Widely scattered	Land clearing	Yes	South of river, north side of River Trail	20-May-04

Appendix 3. Attribute Table. List of rare land and riverine vertebrates that were documented within the Silver River, head springs, and associated wetland communities.

Name		Community	Field Comments				
Latin name	**Common name**	**FNAI Natural Community**	**Tally**	**Behavior**	**Primary Disturbance**	**Site**	**Survey Date**
Alligator mississippiensis	American alligator	Stream edge	3	Loafing, Basking	Hogs	Silver River	4/7/2004
Pseudemys concinna suwanniensis	Suwannee cooter	Stream edge, stream channel	1	Loafing, Basking	Hogs	Silver River	4/7/2004
Pseudemys concinna suwanniensis	Suwannee cooter	Stream edge, stream channel	1	Loafing, Basking	Hogs	Silver River	4/7/2004
Pseudemys concinna suwanniensis	Suwannee cooter	Stream edge, stream channel	7-10	Loafing, Basking	Hogs	Silver River	4/7/2004
Pseudemys concinna suwanniensis	Suwannee cooter	Stream edge, stream channel	7-10	Commuting	Hogs	Silver River	4/7/2004
Egretta caerulea	Little blue heron	Stream edge	2	Foraging	Boats	Silver River	4/7/2004
Pandion haliaetus	Osprey	N/A	1	Foraging	Boats	Silver River	4/7/2004
Aramus guarauna	Limpkin	Stream edge	1	Foraging	Boats	Silver River	4/7/2004
Pseudemys concinna suwanniensis	Suwannee cooter	Stream edge, stream channel	1	Loafing, Basking	Hogs	Silver River	4/7/2004
Egretta caerulea	Little blue heron	Stream edge	1	Foraging	Boats	Silver River	4/7/2004
Eudocimus albus	White Ibis	Stream edge, Floodplain swamp	2	Foraging	Boats	Silver River	4/7/2004
Egretta caerulea	Little blue heron	Stream edge	1	Foraging	Boats	Silver River	4/7/2004
Nyctanassa violacea	Yellow-crowned night-heron	Stream edge	1	Loafing	Boats	Silver River	4/7/2004
Aramus guarauna	Limpkin	Stream edge	1	Foraging	Excavation	Silver River	5/20/2004

Appendix 4. Attribute Table. List of non-rare endemic vascular plants that were documented within the Silver River, head springs, and associated wetland communities.

Name		**Community**	**Field Comments**									
Latin name	**Common name**	**FNAI Natural Community Type**	**Tally (only when countable)**	**Height (1 ft. or taller)**	**Diameter (only woody species) (in.)**	**Area of Coverage (ft/2)**	**Phenology**	**Distribution**	**Primary Disturbance**	**Ruderal Type**	**Site Name**	**Survey Date**
Sagittaria kurziana	Spring tape	Spring-run stream	0	0	0	10000	Vegetative	Widely scattered	Algae growth	No	Head Springs	28-Apr-04
Sagittaria kurziana	Spring tape	Spring-run stream	0	0	0	10000	Vegetative	Widely scattered	Algae growth	No	Head Springs	28-Apr-04
Sagittaria kurziana	Spring tape	Spring-run stream	0	2	0	10000	Vegetative	Widely scattered	Algae growth	No	Silver River	28-Apr-04
Sagittaria kurziana	Spring tape	Spring-run stream	0	0	0	10000	Vegetative	Widely scattered	Algae growth	No	Silver River	28-Apr-04
Sagittaria kurziana	Spring tape	Spring-run stream	0	0	0	10000	Vegetative	Widely scattered	Algae growth	No	Silver River	28-Apr-04
Sagittaria kurziana	Spring tape	Spring-run stream	0	0	0	10000	Vegetative	Widely scattered	Algae growth	No	Silver River	28-Apr-04
Sagittaria kurziana	Spring tape	Spring-run stream	0	0	0	10000	Flowering	Widely scattered	Algae growth	No	Silver River	28-Apr-04
Sagittaria kurziana	Spring tape	Spring-run stream	0	0	0	10000	Flowering	Widely scattered	Algae growth	No	Silver River	28-Apr-04
Sagittaria kurziana	Spring tape	Spring-run stream	0	0	0	10000	Flowering	Widely scattered	Algae growth	No	Silver River	28-Apr-04
Sagittaria kurziana	Spring tape	Spring-run stream	0	0	0	10000	Flowering	Widely scattered	Algae growth	No	Silver River	28-Apr-04
Sagittaria kurziana	Spring tape	Spring-run stream	0	0	0	10000	Flowering	Widely scattered	Algae growth	No	Silver River	28-Apr-04
Sagittaria kurziana	Spring tape	Spring-run stream	0	0	0	10000	Flowering	Widely scattered	Algae growth	No	Silver River	28-Apr-04
Sagittaria kurziana	Spring tape	Spring-run stream	0	0	0	10000	Flowering	Widely scattered	Algae growth	No	Silver River	28-Apr-04
Sagittaria kurziana	Spring tape	Spring-run stream	0	0	0	10000	Flowering	Widely scattered	Algae growth	No	Silver River	28-Apr-04
Sagittaria kurziana	Spring tape	Spring-run stream	0	0	0	10000	Flowering	Widely scattered	Algae growth	No	Silver River	28-Apr-04
Sagittaria kurziana	Spring tape	Spring-run stream	0	0	0	10000	Flowering	Widely scattered	Algae growth	No	Silver River	28-Apr-04
Sagittaria kurziana	Spring tape	Spring-run stream	0	0	0	10000	Vegetative	Widely scattered	Algae growth	No	Silver River	28-Apr-04

Appendix 4. Attribute Table. List of non-rare endemic vascular plants that were documented within the Silver River, head springs, and associated wetland communities.

Name		Community	Field Comments									
Latin name	**Common name**	**FNAI Natural Community Type**	**Tally (only when countable)**	**Height (1 ft. or taller)**	**Diameter (only woody species) (in.)**	**Area of Coverage (ft/2)**	**Phenology**	**Distribution**	**Primary Disturbance**	**Ruderal Type**	**Site Name**	**Survey Date**
Sagittaria kurziana	Spring tape	Spring-run stream	0	0	0	10000	Vegetative	Widely scattered	Algae growth	No	Oklawaha River confluence	28-Apr-04
Sagittaria kurziana	Spring tape	Spring-run stream	0	0	0	10000	Flowering	Scattered	Algae growth	No	Silver River	07-Apr-04
Sagittaria kurziana	Spring tape	Spring-run stream	0	0	0	10000	Vegetative	Scattered	Algae growth	No	Silver River	07-Apr-04
Campanula floridana	Florida bellflower	Ruderal Type	0	1	0	5000	Flowering	Widely scattered	Off-road vehicle trail	Yes	River Loop Trail	26-Apr-04
Campanula floridana	Florida bellflower	Ruderal Type	0	1	0	10000	Flowering	Widely scattered	Off-road vehicle trail	Yes	River Loop Trail	26-Apr-04
Campanula floridana	Florida bellflower	Floodplain forest	0	1	0	2500	Flowering	Scattered	Off-road vehicle trail	No	River Loop Trail	26-Apr-04
Campanula floridana	Florida bellflower	Ruderal Type	0	1	0	5000	Flowering	Widely scattered	Off-road vehicle trail	Yes	River Loop Trail	26-Apr-04
Campanula floridana	Florida bellflower	Ruderal Type	0	1	0	5000	Flowering	Widely scattered	Off-road vehicle trail	Yes	River Loop Trail	26-Apr-04
Campanula floridana	Florida bellflower	Ruderal Type	0	1	0	5000	Flowering	Widely scattered	Off-road vehicle trail	Yes	River Loop Trail	26-Apr-04
Campanula floridana	Florida bellflower	Ruderal Type	0	1	0	5000	Flowering	Widely scattered	Off-road vehicle trail	Yes	River Loop Trail	26-Apr-04
Echinochloa paludigena	Florida cockspur	Floodplain swamp	0	3	0	100	Flowering & fruiting	Clumped	None	No	North of river	28-Apr-04
Echinochloa paludigena	Florida cockspur	Floodplain swamp	0	3	0	100	Flowering & fruiting	Clumped	None	No	North of river	28-Apr-04
Echinochloa paludigena	Florida cockspur	Floodplain swamp	7	3	0	200	Flowering & fruiting	Scattered	None	No	North of river	29-Apr-04
Echinochloa paludigena	Florida cockspur	Floodplain swamp	4	3	0	100	Flowering & fruiting	Clumped	None	No	North of river	29-Apr-04
Sagittaria kurziana	Spring tape	Spring-run stream	0	0	0	5000	Flowering	Scattered	Algae growth	No	Head Springs	20-May-04
Sagittaria kurziana	Spring tape	Spring-run stream	0	0	0	5000	Flowering	Scattered	Algae growth	No	Canal	20-May-04
Sagittaria kurziana	Spring tape	Spring-run stream	0	0	0	1000	Flowering	Silver River	Algae growth	No	Silver River	20-May-04

Appendix 4. Attribute Table. List of non-rare endemic vascular plants that were documented within the Silver River, head springs, and associated wetland communities.

Name		Community	Field Comments									
Latin name	Common name	FNAI Natural Community Type	Tally (only when countable)	Height (1 ft. or taller)	Diameter (only woody species) (in.)	Area of Coverage (ft/2)	Phenology	Distribution	Primary Disturbance	Ruderal Type	Site Name	Survey Date
Sagittaria kurziana	Spring tape	Spring-run stream	0	0	0	1000	Flowering	Silver River	Algae growth	No	Silver River	20-May-04

Appendix 5. Attribute Table. List of Natural communities that were documented within and along the Silver River and head springs.

Community	Habitat Comments				
FNAI Natural Community Type	**Field Description (bold text = listed species)**	**Primary Disturbance**	**Ruderal Type**	**Site Name**	**Survey Date**
Ruderal type	Old cultivated field; exposed limestone fragments; broomsedge, blue-eyed grass, **pinkroot,** and sand blackberry.	Old cultivated field	Yes	River Trail	31-Mar-04
Floodplain forest	Upslope from river and floodplain swamp; seasonally inundated; cabbage palm, mixed hardwoods, and **pinkroot**.	Off-road vehicle trail	No	River Trail	31-Mar-04
Floodplain forest	Upslope from river and floodplain swamp; seasonally inundated; cabbage palm, mixed hardwoods, and **pinkroot**.	Foot path	No	River Trail	31-Mar-04
Floodplain forest	Upslope from river and floodplain swamp; seasonally inundated; cabbage palm, mixed hardwoods, and **pinkroot**.	Off-road vehicle trail	No	River Trail	31-Mar-04
Floodplain forest	Upslope from river and floodplain swamp; seasonally inundated; cabbage palm, mixed hardwoods, **pinkroot,** and **Godfrey's privet**.	Land clearing	No	River Trail	31-Mar-04
Upland mixed forest	Upslope from river, floodplain swamp, and floodplain forest; not inundated; cabbage palm, mixed hardwoods, **pinkroot,** and **Godfrey's privet**.	Land clearing	No	River Trail	31-Mar-04
Spring-run stream	Originating from the western-most portion of the survey site at the Head Springs of Silver Springs Theme Park and extending east to the confluence of the Oklawaha River; water is clear, blue-green in color and cold; submergent vegetation includes spring-tape, eel grass and money-wort; emergent plants includes cardinal flower, sawgrass, wild rice, and water hemlock.	Algae growth	No	Silver River	06-Apr-04
Floodplain forest	Upslope from river and floodplain swamp; seasonally inundated; cabbage palm, and mixed hardwoods.	Boardwalk	No	Swamp Trail	06-Apr-04

Appendix 5. Attribute Table. List of Natural communities that were documented within and along the Silver River and head springs.

Community	Habitat Comments				
FNAI Natural Community Type	Field Description (bold text = listed species)	Primary Disturbance	Ruderal Type	Site Name	Survey Date
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, and American elm.	Boardwalk	No	Swamp Trail	06-Apr-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, and American elm.	Land clearing	No	South of river, west of Swamp Trail	06-Apr-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, and American elm.	None	No	South of river, west of Swamp Trail	06-Apr-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, and American elm.	None	No	South of river, west of Swamp Trail	06-Apr-04
Spring-run stream	Originating from the western-most portion of the survey site at the Head Springs of Silver Springs Theme Park and extending east to the confluence of the Oklawaha River; water is clear, blue-green in color and cold; submergent vegetation includes spring-tape, eel grass and money-wort; emergent plants includes cardinal flower, sawgrass, wild rice, and water hemlock.	Algae growth	No	Silver River	07-Apr-04
Upland mixed forest	Upslope from river, floodplain swamp, and floodplain forest; not inundated; cabbage palm, swamp chestnut oak, mixed hardwoods, and **pinkroot**.	Hog rooting	No	Carmichael Landing, north of river	07-Apr-04
Upland mixed forest	Upslope from river, floodplain swamp, and floodplain forest; not inundated; cabbage palm, swamp chestnut oak, mixed hardwoods, and **pinkroot**.	Hog rooting	No	Carmichael Landing, north of river	07-Apr-04
Upland mixed forest	Upslope from river, floodplain swamp, and floodplain forest; not inundated; cabbage palm, swamp chestnut oak, mixed hardwoods, and **pinkroot**.	Hog rooting	No	Carmichael Landing, north of river	07-Apr-04
Upland mixed forest	Upslope from river, floodplain swamp, and floodplain forest; not inundated; limestone exposed; cabbage palm, swamp chestnut oak, soapberry, sugarberry, mixed hardwoods, **pinkroot,** and **silver buckthorn**.	Hog rooting	No	Carmichael Landing, north of river	07-Apr-04

Appendix 5. Attribute Table. List of Natural communities that were documented within and along the Silver River and head springs.

Community	Habitat Comments				
FNAI Natural Community Type	**Field Description (bold text = listed species)**	**Primary Disturbance**	**Ruderal Type**	**Site Name**	**Survey Date**
Floodplain forest	Upslope from river and floodplain swamp; seasonally inundated; cabbage palm, swamp chestnut oak, mixed hardwoods, and **pinkroot**.	Hog rooting	No	Carmichael Landing, north of river	08-Apr-04
Floodplain forest	Upslope from river and floodplain swamp; seasonally inundated; cabbage palm, swamp chestnut oak, mixed hardwoods, and **pinkroot**.	Hog rooting	No	Carmichael Landing, north of river	08-Apr-04
Floodplain forest	Upslope from river and floodplain swamp; seasonally inundated; cabbage palm, swamp chestnut oak, mixed hardwoods, and **pinkroot**.	Hog rooting	No	Carmichael Landing, north of river	08-Apr-04
Floodplain forest	Upslope from river and floodplain swamp; seasonally inundated; cabbage palm, swamp chestnut oak, mixed hardwoods, and **pinkroot**.	Off-road vehicle trail	No	South of river	08-Apr-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, and American elm.	None	No	South of river	08-Apr-04
Floodplain forest	Upslope from river and floodplain swamp; seasonally inundated; cabbage palm, swamp chestnut oak, mixed hardwoods, and **pinkroot**.	None	No	South of river	08-Apr-04
Upland mixed forest	Upslope from river, floodplain swamp, and floodplain forest; not inundated; cabbage palm, swamp chestnut oak, mixed hardwoods, and **pinkroot**.	Off-road vehicle trail	No	South of river	08-Apr-04
Ruderal type	Old cultivated field; exposed limestone fragments; broomsedge, blue-eyed grass, dog fennel, sand blackberry, and **pinkroot**.	Old cultivated field	Yes	River Trail	26-Apr-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, and American elm.	None	No	South of river, between River Trail and Swamp Trail	26-Apr-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, and American elm.	None	No	South of river, between River Trail and Swamp Trail	26-Apr-04

Appendix 5. Attribute Table. List of Natural communities that were documented within and along the Silver River and head springs.

Community	Habitat Comments				
FNAI Natural Community Type	Field Description (bold text = listed species)	Primary Disturbance	Ruderal Type	Site Name	Survey Date
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, and American elm.	None	No	South of river, between River Trail and Swamp Trail	26-Apr-04
Floodplain forest	Upslope from river and floodplain swamp; seasonally inundated; cabbage palm, swamp chestnut oak, mixed hardwoods, and **pinkroot**.	Off-road vehicle trail	No	South of river	26-Apr-04
Ruderal type	Old cultivated field; exposed limestone fragments; broomsedge, blue-eyed grass, dog fennel, Florida bellflower, and sand blackberry.	Off-road vehicle trail	Yes	River Loop Trail	26-Apr-04
Ruderal type	Old cultivated field; exposed limestone fragments; broomsedge, blue-eyed grass, dog fennel, Florida bellflower, and sand blackberry.	Off-road vehicle trail	Yes	River Loop Trail	26-Apr-04
Floodplain forest	Upslope from river and floodplain swamp; seasonally inundated; cabbage palm, swamp chestnut oak, mixed hardwoods.	Off-road vehicle trail	No	River Loop Trail	26-Apr-04
Ruderal type	Old cultivated field; exposed limestone fragments; broomsedge, blue-eyed grass, dog fennel, Florida bellflower, and sand blackberry.	Off-road vehicle trail	Yes	River Loop Trail	26-Apr-04
Ruderal type	Old cultivated field; exposed limestone fragments; broomsedge, blue-eyed grass, dog fennel, Florida bellflower, and sand blackberry.	Off-road vehicle trail	Yes	River Loop Trail	26-Apr-04
Ruderal type	Old cultivated field; exposed limestone fragments; broomsedge, blue-eyed grass, dog fennel, Florida bellflower, and sand blackberry.	Off-road vehicle trail	Yes	River Loop Trail	26-Apr-04
Ruderal type	Old cultivated field; exposed limestone fragments; broomsedge, blue-eyed grass, dog fennel, Florida bellflower, and sand blackberry.	Off-road vehicle trail	Yes	River Loop Trail	26-Apr-04

Appendix 5. Attribute Table. List of Natural communities that were documented within and along the Silver River and head springs.

Community	Habitat Comments				
FNAI Natural Community Type	Field Description (bold text = listed species)	Primary Disturbance	Ruderal Type	Site Name	Survey Date
Spring-run stream	Originating from the western-most portion of the survey site at the Head Springs of Silver Springs Theme Park and extending east to the confluence of the Oklawaha River; water is clear, blue-green in color and cold; submergent vegetation includes spring-tape, eel grass and money-wort; emergent plants includes cardinal flower, sawgrass, wild rice, and water hemlock.	Algae growth	No	Head Springs	28-Apr-04
Spring-run stream	Originating from the western-most portion of the survey site at the Head Springs of Silver Springs Theme Park and extending east to the confluence of the Oklawaha River; water is clear, blue-green in color and cold; submergent vegetation includes spring-tape, eel grass and money-wort; emergent plants includes cardinal flower, sawgrass, wild rice, and water hemlock.	Algae growth	No	Head Springs	28-Apr-04
Spring-run stream	Originating from the western-most portion of the survey site at the Head Springs of Silver Springs Theme Park and extending east to the confluence of the Oklawaha River; water is clear, blue-green in color and cold; submergent vegetation includes spring-tape, eel grass and money-wort; emergent plants includes cardinal flower, sawgrass, wild rice, and water hemlock.	Algae growth	No	Silver River	28-Apr-04
Spring-run stream	Originating from the western-most portion of the survey site at the Head Springs of Silver Springs Theme Park and extending east to the confluence of the Oklawaha River; water is clear, blue-green in color and cold; submergent vegetation includes spring-tape, eel grass and money-wort; emergent plants includes cardinal flower, sawgrass, wild rice, and water hemlock.	Algae growth	No	Silver River	28-Apr-04

Appendix 5. Attribute Table. List of Natural communities that were documented within and along the Silver River and head springs.

Community	Habitat Comments				
FNAI Natural Community Type	**Field Description (bold text = listed species)**	**Primary Disturbance**	**Ruderal Type**	**Site Name**	**Survey Date**
Spring-run stream	Originating from the western-most portion of the survey site at the Head Springs of Silver Springs Theme Park and extending east to the confluence of the Oklawaha River; water is clear, blue-green in color and cold; submergent vegetation includes spring-tape, eel grass and money-wort; emergent plants includes cardinal flower, sawgrass, wild rice, and water hemlock.	Algae growth	No	Silver River	28-Apr-04
Spring-run stream	Originating from the western-most portion of the survey site at the Head Springs of Silver Springs Theme Park and extending east to the confluence of the Oklawaha River; water is clear, blue-green in color and cold; submergent vegetation includes spring-tape, eel grass and money-wort; emergent plants includes cardinal flower, sawgrass, wild rice, and water hemlock.	Algae growth	No	Silver River	28-Apr-04
Spring-run stream	Originating from the western-most portion of the survey site at the Head Springs of Silver Springs Theme Park and extending east to the confluence of the Oklawaha River; water is clear, blue-green in color and cold; submergent vegetation includes spring-tape, eel grass and money-wort; emergent plants includes cardinal flower, sawgrass, wild rice, and water hemlock.	Algae growth	No	Silver River	28-Apr-04
Spring-run stream	Originating from the western-most portion of the survey site at the Head Springs of Silver Springs Theme Park and extending east to the confluence of the Oklawaha River; water is clear, blue-green in color and cold; submergent vegetation includes spring-tape, eel grass and money-wort; emergent plants includes cardinal flower, sawgrass, wild rice, and water hemlock.	Algae growth	No	Silver River	28-Apr-04

Appendix 5. Attribute Table. List of Natural communities that were documented within and along the Silver River and head springs.

Community	Habitat Comments				
FNAI Natural Community Type	**Field Description (bold text = listed species)**	**Primary Disturbance**	**Ruderal Type**	**Site Name**	**Survey Date**
Spring-run stream	Originating from the western-most portion of the survey site at the Head Springs of Silver Springs Theme Park and extending east to the confluence of the Oklawaha River; water is clear, blue-green in color and cold; submergent vegetation includes spring-tape, eel grass and money-wort; emergent plants includes cardinal flower, sawgrass, wild rice, and water hemlock.	Algae growth	No	Silver River	28-Apr-04
Spring-run stream	Originating from the western-most portion of the survey site at the Head Springs of Silver Springs Theme Park and extending east to the confluence of the Oklawaha River; water is clear, blue-green in color and cold; submergent vegetation includes spring-tape, eel grass and money-wort; emergent plants includes cardinal flower, sawgrass, wild rice, and water hemlock.	Algae growth	No	Silver River	28-Apr-04
Spring-run stream	Originating from the western-most portion of the survey site at the Head Springs of Silver Springs Theme Park and extending east to the confluence of the Oklawaha River; water is clear, blue-green in color and cold; submergent vegetation includes spring-tape, eel grass and money-wort; emergent plants includes cardinal flower, sawgrass, wild rice, and water hemlock.	Algae growth	No	Silver River	28-Apr-04
Spring-run stream	Originating from the western-most portion of the survey site at the Head Springs of Silver Springs Theme Park and extending east to the confluence of the Oklawaha River; water is clear, blue-green in color and cold; submergent vegetation includes spring-tape, eel grass and money-wort; emergent plants includes cardinal flower, sawgrass, wild rice, and water hemlock.	Algae growth	No	Silver River	28-Apr-04

Appendix 5. Attribute Table. List of Natural communities that were documented within and along the Silver River and head springs.

Community	**Habitat Comments**				
FNAI Natural Community Type	**Field Description (bold text = listed species)**	**Primary Disturbance**	**Ruderal Type**	**Site Name**	**Survey Date**
Spring-run stream	Originating from the western-most portion of the survey site at the Head Springs of Silver Springs Theme Park and extending east to the confluence of the Oklawaha River; water is clear, blue-green in color and cold; submergent vegetation includes spring-tape, eel grass and money-wort; emergent plants includes cardinal flower, sawgrass, wild rice, and water hemlock.	Algae growth	No	Silver River	28-Apr-04
Spring-run stream	Originating from the western-most portion of the survey site at the Head Springs of Silver Springs Theme Park and extending east to the confluence of the Oklawaha River; water is clear, blue-green in color and cold; submergent vegetation includes spring-tape, eel grass and money-wort; emergent plants includes cardinal flower, sawgrass, wild rice, and water hemlock.	Algae growth	No	Silver River	28-Apr-04
Spring-run stream	Originating from the western-most portion of the survey site at the Head Springs of Silver Springs Theme Park and extending east to the confluence of the Oklawaha River; water is clear, blue-green in color and cold; submergent vegetation includes spring-tape, eel grass and money-wort; emergent plants includes cardinal flower, sawgrass, wild rice, and water hemlock.	Algae growth	No	Silver River	28-Apr-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, and American elm.	None	No	North side of river	28-Apr-04
Spring-run stream	Originating from the western-most portion of the survey site at the Head Springs of Silver Springs Theme Park and extending east to the confluence of the Oklawaha River; water is clear, blue-green in color and cold; submergent vegetation includes spring-tape, eel grass and money-wort; emergent plants includes cardinal flower, sawgrass, wild rice, and water hemlock.	Algae growth	No	Silver River	28-Apr-04

Appendix 5. Attribute Table. List of Natural communities that were documented within and along the Silver River and head springs.

Community	Habitat Comments				
FNAI Natural Community Type	**Field Description (bold text = listed species)**	**Primary Disturbance**	**Ruderal Type**	**Site Name**	**Survey Date**
Spring-run stream	Originating from the western-most portion of the survey site at the Head Springs of Silver Springs Theme Park and extending east to the confluence of the Oklawaha River; water is clear, blue-green in color and cold; submergent vegetation includes spring-tape, eel grass and money-wort; emergent plants includes cardinal flower, sawgrass, wild rice, and water hemlock.	Algae growth	No	Silver River	28-Apr-04
Spring-run stream	Originating from the western-most portion of the survey site at the Head Springs of Silver Springs Theme Park and extending east to the confluence of the Oklawaha River; water is clear, blue-green in color and cold; submergent vegetation includes spring-tape, eel grass and money-wort; emergent plants includes cardinal flower, sawgrass, wild rice, and water hemlock.	Algae growth	No	Oklawaha River confluence	28-Apr-04
Blackwater stream	Half-mile Creek forms from north of U.S. 40 and flows south emptying into the Silver River. The stream is sluggish and choked with aquatic weeds due to the run-off from U.S. 40. Several exotic plant species occur here: wild taro (Colocasia esculenta), water hyacinth (Eichhornia crassipes), and water lettuce (Pistia stratiotes).	Ditching & hydrologic alterations	No	North of river	28-Apr-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, and American elm.	None+G65	No	North of river, east of stream	28-Apr-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, and American elm.	None	No	North of river, east of stream	28-Apr-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, and American elm.	None	No	North of river	28-Apr-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, and American elm.	None	No	North of river	28-Apr-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, and American elm.	None	No	North of river	28-Apr-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, and American elm.	None	No	North of river	28-Apr-04

Appendix 5. Attribute Table. List of Natural communities that were documented within and along the Silver River and head springs.

Community	Habitat Comments				
FNAI Natural Community Type	Field Description (bold text = listed species)	Primary Disturbance	Ruderal Type	Site Name	Survey Date
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, and American elm.	None	No	North of river	28-Apr-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, and American elm.	None	No	North of river	28-Apr-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, and American elm.	None	No	North of river	28-Apr-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, American elm, and Florida cockspur.	None	No	North of river	28-Apr-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, American elm, and Florida cockspur.	None	No	South of river	28-Apr-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, American elm, and Florida cockspur.	None	No	South of river	28-Apr-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, and American elm.	None	No	North of river	28-Apr-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, American elm, and Florida cockspur.	None	No	South of river	28-Apr-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, and American elm.	None	No	North of river	28-Apr-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, and American elm.	None	No	West of river	28-Apr-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, and American elm.	None	No	North of river	28-Apr-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, and American elm.	None	No	North of river	28-Apr-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, American elm, and Florida cockspur.	None	No	South of river	28-Apr-04

Appendix 5. Attribute Table. List of Natural communities that were documented within and along the Silver River and head springs.

Community	Habitat Comments				
FNAI Natural Community Type	**Field Description (bold text = listed species)**	**Primary Disturbance**	**Ruderal Type**	**Site Name**	**Survey Date**
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, American elm, and Florida cockspur.	None	No	South of river	28-Apr-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, American elm, and Florida cockspur.	None	No	South of river	28-Apr-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, and American elm.	None	No	North of river	28-Apr-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, and American elm.	None	No	Camichael Landing, north of river	28-Apr-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, American elm, and Florida cockspur.	Off-road vehicle trail	No	Camichael Landing, north of river	29-Apr-04
Floodplain forest	Upslope from river and floodplain swamp; seasonally inundated; cabbage palm, swamp chestnut oak, mixed hardwoods, and **pinkroot**.	Off-road vehicle trail	No	Camichael Landing, north of river	29-Apr-04
Floodplain forest	Upslope from river and floodplain swamp; seasonally inundated; cabbage palm, swamp chestnut oak, mixed hardwoods, and **pinkroot**.	Off-road vehicle trail	No	Camichael Landing, north of river	29-Apr-04
Upland mixed forest	Upslope from river, floodplain swamp, and floodplain forest; not inundated; cabbage palm, swamp chestnut oak, mixed hardwoods.	Exotic species	No	North of river	29-Apr-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, and American elm.	None	No	North of river	29-Apr-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, and American elm.	None	No	North of river	29-Apr-04
Upland mixed forest	Upslope from river, floodplain swamp, and floodplain forest; not inundated; cabbage palm, swamp chestnut oak, mixed hardwoods, and **pinkroot**.	Hog rooting	No	Camichael Landing, north of river	05-May-04
Upland mixed forest	Upslope from river, floodplain swamp, and floodplain forest; not inundated; cabbage palm, swamp chestnut oak, mixed hardwoods, and **pinkroot.**	Hog rooting	No	Camichael Landing, north of river	05-May-04

Appendix 5. Attribute Table. List of Natural communities that were documented within and along the Silver River and head springs.

Community	Habitat Comments				
FNAI Natural Community Type	**Field Description (bold text = listed species)**	**Primary Disturbance**	**Ruderal Type**	**Site Name**	**Survey Date**
Dome swamp	Isolated wetland dominated by pond cypress, blackgum, green ash, and duckweed. Water levels are fairly deep.	None	No	Camichael Landing, north of river	05-May-04
Upland mixed forest	Upslope from river, floodplain swamp, and floodplain forest; not inundated; cabbage palm, swamp chestnut oak, mixed hardwoods, and **pinkroot.**	Hog rooting	No	Camichael Landing, north of river	06-May-04
Spring-run stream	Originating from the western-most portion of the survey site at the Head Springs of Silver Springs Theme Park and extending east to the confluence of the Oklawaha River; water is clear, blue-green in color and cold; submergent vegetation includes spring-tape, eel grass and money-wort; emergent plants includes cardinal flower, sawgrass, wild rice, and water hemlock.	Algae growth	No	Head Springs	20-May-04
Spring-run stream	Originating from the western-most portion of the survey site at the Head Springs of Silver Springs Theme Park and extending east to the confluence of the Oklawaha River; water is clear, blue-green in color and cold; submergent vegetation includes spring-tape, eel grass and money-wort; emergent plants includes cardinal flower, sawgrass, wild rice, and water hemlock.	Algae growth	No	Canal in Silver Springs Theme Park	20-May-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, and American elm.	None	No	South of river	20-May-04
Spring-run stream	Originating from the western-most portion of the survey site at the Head Springs of Silver Springs Theme Park and extending east to the confluence of the Oklawaha River; water is clear, blue-green in color and cold; submergent vegetation includes spring-tape, eel grass and money-wort; emergent plants includes cardinal flower, sawgrass, wild rice, and water hemlock.	Algae growth	No	Silver River	20-May-04

Appendix 5. Attribute Table. List of Natural communities that were documented within and along the Silver River and head springs.

Community	Habitat Comments				
FNAI Natural Community Type	**Field Description (bold text = listed species)**	**Primary Disturbance**	**Ruderal Type**	**Site Name**	**Survey Date**
Spring-run stream	Originating from the western-most portion of the survey site at the Head Springs of Silver Springs Theme Park and extending east to the confluence of the Oklawaha River; water is clear, blue-green in color and cold; submergent vegetation includes spring-tape, eel grass and money-wort; emergent plants includes cardinal flower, sawgrass, wild rice, and water hemlock.	Algae growth	No	Silver River	20-May-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, and American elm.	None	No	South of river	20-May-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, and American elm.	None	No	South of river	20-May-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, and American elm.	None	No	South of river	20-May-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, and American elm.	None	No	North of river	20-May-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, and American elm.	None	No	South of river	20-May-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, and American elm.	None	No	South of river	20-May-04
Floodplain forest	Upslope from river and floodplain swamp; seasonally inundated; cabbage palm, swamp chestnut oak, mixed hardwoods.	None	No	North of river	20-May-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, and American elm.	None	No	North of river	20-May-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, and American elm.	None	No	South of river	20-May-04
Floodplain swamp	Bordering river and floodplain forest; usually inundated; bald cypress, Carolina ash, pumpkin ash, and American elm.	None	No	North of river, south of Ray's Wayside Park Boat Landing	20-May-04
Ruderal type	Old cultivated field; exposed limestone fragments; broomsedge, blue-eyed grass, dog fennel, and sand blackberry.	Land clearing	Yes	South of river, north side of River Trail	20-May-04

Appendix 5. Attribute Table. List of Natural communities that were documented within and along the Silver River and head springs.

Community	Habitat Comments				
FNAI Natural Community Type	**Field Description (bold text = listed species)**	**Primary Disturbance**	**Ruderal Type**	**Site Name**	**Survey Date**
Floodplain forest	Upslope from river and floodplain swamp; seasonally inundated; cabbage palm, swamp chestnut oak, mixed hardwoods.	Exotic species	No	South of river, south side of River Trail	20-May-04