



United States Department of the Interior

FISH AND WILDLIFE SERVICE
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To: Mike Piccirilli, Chief, Federal Aid, Southeast Regional Office
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From: Larry Williams, Field Supervisor, South Florida Ecological Services Office

Subject: Florida Fish and Wildlife Conservation Commission Assistance to the Lake Wales Ridge Prescribed Fire Strike Team: Amendment to Opinion

This memorandum transmits a second amendment (*changes to the first amendment designated by italicized text*) to the Fish and Wildlife Service's (Service) July 28, 2005, biological and conference opinions (Opinion), based on our review of the Service's proposal to continue funding the Florida Fish and Wildlife Conservation Commission's (FWC) assistance of the Lake Wales Ridge (LWR) Fire Cooperative Strike Team (Strike Team), *and to fund FWC's program to conduct helicopter burns on Lake Wales Ridge State Forest (LWRSF)*. The Opinion evaluates the potential effects of the covered activities on the species listed below in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act) (16 U.S.C. 1531 et seq.):

<i>Audubon's crested caracara</i> (<i>Polyborus plancus audubonii</i>)	<i>threatened</i>
Red-cockaded woodpecker (<i>Picoides borealis</i>)	<i>endangered</i>
Florida scrub jay (<i>Aphelocoma coerulescens</i>)	<i>threatened</i>
Florida grasshopper sparrow (<i>Ammodramus savannarum floridanus</i>)	<i>endangered</i>
Sand skink (<i>Neoseps reynoldsi</i>)	<i>threatened</i>
Blue-tailed mole skink (<i>Eumeces egregius lividus</i>)	<i>threatened</i>
Eastern indigo snake (<i>Drymarchon corais couperi</i>)	<i>threatened</i>
Highlands tiger beetle (<i>Cicindela highlandensis</i>)	<i>candidate</i>
<i>Florida bonneted bat</i> (<i>Eumops floridanus</i>)	<i>proposed</i>
<i>endangered</i>	
Snakeroot (<i>Eryngium cuneifolium</i>)	<i>endangered</i>
Short-leaved rosemary (<i>Conradina brevifolia</i>)	<i>endangered</i>
Scrub plum (<i>Prunus geniculata</i>)	<i>endangered</i>
Scrub mint (<i>Dicerandra frutescens</i>)	<i>endangered</i>
Scrub buckwheat (<i>Eriogonum longifolium</i> var. <i>gnaphalifolium</i>)	<i>threatened</i>
Scrub blazingstar (<i>Liatris ohlingerae</i>)	<i>endangered</i>
Sandlace (<i>Polygonella myriophylla</i>)	<i>endangered</i>
Pygmy fringe-tree (<i>Chionanthus pygmaeus</i>)	<i>endangered</i>
Pigeon wings (<i>Clitoria fragrans</i>)	<i>threatened</i>
Papery whitlow-wort (<i>Paronychia chartacea</i>)	<i>threatened</i>
Lewton's polygala (<i>Polygala lewtonii</i>)	<i>endangered</i>
Highlands scrub hypericum (<i>Hypericum cumulicola</i>)	<i>endangered</i>
Florida ziziphus (<i>Ziziphus celata</i>)	<i>endangered</i>

Florida perforate cladonia (<i>Cladonia perforata</i>)	endangered
Florida bonamia (<i>Bonamia grandiflora</i>)	threatened
Carter's mustard (<i>Warea carteri</i>)	endangered
Wide-leaf warea (<i>Warea amplexifolia</i>)	endangered
Britton's beargrass (<i>Nolina brittoniana</i>)	endangered
Avon Park harebells (<i>Crotalaria avonensis</i>)	endangered
Scrub lupine (<i>Lupinus aridorum</i>)	endangered
Garrett's mint (<i>Dicerandra christmanii</i>)	endangered
Wireweed (<i>Polygonella basiramia</i>)	endangered

The South Florida Ecological Services Office (SFESO) received an August 28, 2009, Biological Evaluation for continuation of existing financial support of the Strike Team from FWC through the Southeast Regional Office's Federal Aid Program with a request to include an additional action in the project description, expand the scope of habitat eligible to be treated under this agreement, expand the list of properties to be treated under this agreement, and re-evaluate the anticipated amount of take based upon the total number of acres treated. Additionally, since the July 28, 2005, biological opinion was signed, the Service added the Florida bonneted bat to the Federal candidate list on November 9, 2009.

The analysis carried out by the SFESO concluded the 2010 funding was "not likely to adversely affect" the Florida panther and Audubon's crested caracara, but it may "adversely affect" other listed and candidate species. The changes made to the scope of work and the new candidate species listing necessitated the evaluation of the following additional species not considered in the July 28, 2005, opinion: red-cockaded woodpecker (RCW), Florida grasshopper sparrow (FGSP), and Florida bonneted bat. *The first amendment was signed on June 17, 2010.*

The SFESO then received a March 14, 2013, Biological Evaluation for conducting helicopter burns in the LWRSF. Because previous consultations, conferences, and amendments cover other methods of prescribed burning on the property through the participation of the LWR Fire Strike Team, currently known as the Central Florida Ecosystem Support Team (CFEST), an amendment was needed to include helicopter burns. Therefore, this is a continuation of existing financial support of prescribed burning on the Ridge from FWC through the Southeast Regional Office's Federal Aid Program with a request to include an additional action in the project description, expand the total number of acres to be treated, and re-evaluate the anticipated amount of take based upon the total number of acres treated.

The analysis carried out by the SFESO concluded this year's funding was "not likely to adversely affect" the Florida panther, but it may "adversely affect" other listed and candidate species. The changes made to the scope of work necessitate the re-evaluation of the determination for the Audubon's crested caracara considered in the July 28, 2005, opinion and June 17, 2010, amendment.

This second amendment to our July 28, 2005, biological and conference opinion is based on information provided by FWC, The Nature Conservancy (TNC), the Florida Forest Service (FFS), and project information available in our files. It also includes data on the biology and

ecology of threatened and endangered species in the action area, previous biological opinions prepared for similar actions in the action area, the South Florida Multi-Species Recovery Plan (MSRP) (Service 1999), and other published and unpublished sources of information. A complete administrative record of this consultation is on file in the Service's SFESO in Vero Beach, Florida.

Amended Consultation History

The Service is funding, through FWC, a continuation of existing financial support for prescribed fire on the Lake Wales Ridge. The section 7 evaluation form for supporting CFEST for the 2004 project, dated August 9, 2004, stated that "Prescribed burns return function to overgrown scrub and sandhill communities. The proposed action has been determined to be ultimately beneficial to these plants because of the restorative and habitat-sustaining nature of the activity" and found that all effects of the Strike Team's [CFEST]program to assist with prescribed burns (including mowing firebreaks) would have "no effect" on the listed species present in burn areas or were "not likely to adversely affect" them, so no biological opinion was required. A new analysis for 2005 funding of the Strike Team [CFEST], carried out by the SFESO, concluded that funding provided in 2005 was "not likely to adversely affect" the Florida panther and bald eagle, but that it would "adversely affect" other listed and candidate species.

On October 26, 2009, the SFESO received a request from the Service's Jacksonville Field Office to review an August 28, 2009, Biological Evaluation for continuation of existing financial support of CFEST from FWC through the Southeast Regional Office's Federal Aid Program. Between late November and December 2010, electronic mail communication and telephone conversations occurred to discuss the details of the changes to be made to the scope of the project.

Additionally, since the July 28, 2005, biological opinion was signed, the Service added the Florida bonneted bat to the Federal candidate list on November 9, 2009. *The amended analysis for 2010 funding of CFEST, carried out by the SFESO, concluded that funding provided in 2010 was "not likely to adversely affect" the Florida panther and Audubon's crested caracara, but that it would "adversely affect" other listed and candidate species.*

The SFESO then received a March 14, 2013, Biological Evaluation for conducting helicopter burns in the LWRSF. Because previous consultations, conferences, and amendments cover other methods of prescribed burning on the property through the participation of CFEST, an amendment was needed to include helicopter burns in the scope of work, increase the number of acres to be treated, and re-evaluate the anticipated amount of take based upon the total number of acres treated. Between March and May, electronic mail communication and telephone conversations occurred to discuss the details of the changes to be made to the scope of the project.

BIOLOGICAL OPINION

AMENDED DESCRIPTION OF THE PROPOSED ACTION

In addition to the actions described in the July 28, 2005, biological opinion, the 2010 funding proposal incorporated measures to control invasive species; expanded the habitats to be treated to include flatwoods, dry prairie, and seepage slopes; and proposed a revision to the properties to be treated. Additionally, the total number of acres to be treated has been revised.

Because of expansion of the scope of duties beyond prescribed burning, the Strike Team will now be referred to as the Central Florida Ecosystem Support Team (CFEST). The CFEST will not only participate in prescribed burns and conduct fire-line preparation but will conduct invasive species control, promoting a more comprehensive resource management approach. Invasive plant species pose tangible threats of their own, often altering fire behavior within upland habitats. Invasive species to be treated include, but are not limited to, cogon grass (*Imperata cylindrica*), natal grass (*Rhynchospora repens*), guinea grass (*Panicum maximum*), Johnson grass (*Sorghum halepense*), Japanese climbing fern (*Lygodium japonicum*), Old World climbing fern (*Lygodium microphyllum*), rosary pea (*Abrus precatorius*), Chinese tallow (*Triadica sebifera*), Brazilian pepper (*Schinus terebinthifolius*), chinaberry (*Melia azedarach*), and other woody tree species. Imazapyr, Glyphosate, and Triclopyr will be the primary herbicides applied using foliar application with pump sprayers, frill and girdle application with pump sprayers, and cut stump application.

Herbicide treatments will be conducted only by staff trained to identify target invasives and listed plant species in the area in which they are working. Prior to beginning work, applicators will be briefed on the spatial occurrence of listed plants in the area to be treated. Mixing of chemicals should occur off-site to the greatest extent practicable. To reduce the chance of spray drift, backpack sprayer applications will not be conducted when wind speeds or gusts are greater than 5 miles per hour (mph). Droplet size will be large, sprayers will be operated with minimal pressure, and nozzles will be kept as low to the ground as possible. Cut stump applications will not be conducted when rain is forecast in the treatment area within 24 hours.

Control measures for invasive plants are an important element of an integrated approach to fire management and habitat restoration. The proposed application methods (spot treatments using backpack sprayers and cut-stump applications), when applied by trained staff, allow for targeted and judicious use of herbicides without impacts to listed plants and are widely used for resource management in natural areas. Likewise, activities associated with herbicide treatments are not likely to impact listed and candidate animal species other than having the potential for slight disturbance as a result of application. These herbicide treatments as proposed will have insignificant and discountable impacts to listed and candidate species. The proposed action is expected to be beneficial to these species because of the restorative and habitat-sustaining nature of the activity.

Other actions will be taken to avoid impacts to listed and candidate species, such as using rubber tire vehicles on the projects sites. CFEST members receive training in identification and

management of listed species of the LWR at the start of each fire season. Prescribed burns will be conducted within the fire return interval recommended by the Florida Natural Areas Inventory (FNAI) for the upland communities that these species inhabit. The CFEST coordinator will meet with the site's burn boss to ensure that the prescribed burn will be conducted so as to avoid or minimize adverse impacts to species and their habitat. During each prescribed burn briefing, there is discussion about useful actions to avoid impacts to listed species. Fire crewmembers supported by this project will be trained in: (1) identification of the species, (2) habitat needs that pertain to the health of the population, and (3) specific management practices that will avoid detrimental impacts to individuals and habitat. Staff will avoid placement of firebreaks through patches of listed plants. Care will be taken when walking through and traveling through habitat. Personnel will use caution to avoid running over listed and candidate species and burrows when operating vehicles during prescribed burns and during preparations. All vehicle use will be contained as much as possible to the burn unit perimeter roads.

Ring firing techniques that could entrap Florida scrub jays, RCWs, eastern indigo snakes, Florida bonneted bat, or other species inside a unit will not be used. High intensity fires will be used in an effort to completely top-kill patches of tall shrubs and sand pines. This will provide continuous areas of optimal habitat so jays will be less susceptible to avian predators. Lighting techniques that favor heterogeneous burns will be used to increase the likelihood that at least some patches of unburned scrub habitat will remain within burned jay territories. Since burning in the nesting season is necessary due to the lack of favorable burning conditions for scrub in other seasons, known jay nests along with a 50-foot (ft) buffer will be excluded from burn units.

The following actions will be taken when a burn is planned to be performed within the Florida scrub jay nesting season of February 15 to May 15 on project sites with small, remnant jay populations (five family groups or less): (1) monitoring will be performed in advance of a prescribed burn to delineate approximate territories and exact nest locations. The burn unit will then be designed to ensure that active nests are not burned, and less than 50 percent of a territory is burned; and (2) the CFEST coordinator will meet with the site's burn boss to ensure that the prescribed burn will be conducted so as to avoid or minimize adverse impacts to this species and its habitat.

RCW cavity trees will be protected by removing fuel loads around the perimeter of the trees prior to burning. Known occupied nest trees will be excluded from the areas to be burned. If an eastern indigo snake is observed inside the burn unit, ignition will cease and the snake will be allowed to leave the unit. If that is not successful, fire activities will be delayed to give the snake time to find refuge underground before burning is continued. If fire threatens to burn over an individual eastern indigo snake, crew members will attempt to extinguish the fire to avoid impacts to the snake. Care will be taken to not apply herbicides (chemicals) to Highlands tiger beetles and burrows. If any bat roost sites are discovered during the course of the project, crew members will notify the Service immediately. Care will be taken to avoid and minimize impacts to bats and roost sites, if discovered during project activities.

Within the action area, Florida perforate cladonia (*cladonia*) is known to occur on only three sites (Archbold, Lake Apthorpe Wildlife and Environmental Area (WEA), and the Arbuckle tract of the LWR State Forest); gaps where *cladonia* was completely burned must re-colonize from

nearby gaps that did not burn. Therefore, burn units that contain cladonia will be designed so as not to include more than 50 percent of the cladonia in a population. Furthermore, the remaining unburned 50 percent of the population will be left unburned until re-colonization is observed in the original burned unit. The CFEST will coordinate with the SFESO on these sites when cladonia is present in the unit to be burned, before proceeding with any prescribed fire activities.

The July 28, 2005, biological opinion did not consider potential impacts to habitats that support RCWs and FGSPs. The CFEST proposes to expand their action area to include flatwoods to provide habitat improvement to support RCWs and dry prairie to benefit FGSPs. Also, seepage slopes are added to the action area to support cutthroat grass (*Panicum abscissum*) community management. Amended Table 1, showing agencies that are potential applicants, is provided below.

In addition to the actions described in the June 17, 2010, amendment to the biological opinion, the 2013 funding proposal incorporated measures to conduct prescribed burns via helicopter on the LWRSF and proposed a revision to the total number of acres to be treated.

The LWRSF is located in four separate tracts on or near the ancient LWR in southeastern Polk County. This 26,590-acre (ac) state forest is part of the largest undeveloped piece of land on the LWR. It encompasses 19,074 ac of sandhill, scrub, Florida dry prairie, and wet flatwoods habitat, all of which have a “very high threat” status according to the 2011 Draft State Wildlife Action Plan (SWAP). These habitats are also considered priority upland habitats for the Florida Wildlife Legacy Initiative (FWLI) Terrestrial Goal to increase the use of fire as a management tool to support upland habitat conservation for the benefit of Florida’s Species of Greatest Conservation Need (SGCN) (FWLI website).

Historically, lightning-ignited landscape fires maintained optimal habitat characteristics for a wide variety of species in fire-dependent ecosystems throughout the state of Florida. Urban development has resulted in the fragmentation of Florida’s fire-dependent habitats, resulting in fire suppression (FWC 2011). The SWAP identified “incompatible fire management” as a major conservation threat to the sandhill, scrub, dry prairie, and wet flatwoods habitats in Florida (FWC 2011). The desired fire return intervals for the above listed plant communities on the state forest are: 7-30 years for scrub, 3-5 years for sandhill, 2-5 years for wet flatwoods, and 2-3 years for dry prairie. The lack of fire in these ecosystems results in oak hammocks and sand pine forests that shade out the listed plants and degrade wildlife habitat. This project plans to address the incompatible fire threat within LWRSF by returning fire to the landscape in order to create optimal habitat conditions for SGCN and reduce fuel loads to a safe level in the event of a wildfire or lightning strike.

Burning using a helicopter allows for larger burns to be completed in shorter periods of time while still keeping intensity down and providing for a mosaic burn. The helicopter burns will be planned for the first year of the grant, but if weather conditions and FFS burn restrictions during times of drought prevent this, they will be completed during the second year of the grant period.

The tracts within LWRSF and approximate acres to be burned via helicopter are as follows:

- a) *Arbuckle Tract*
 - a. *Livingston Creek (LC) Management Block – approx. 400 ac,*
 - b. *Bonnet Creek (BC) Management Block – approx. 600 ac,*
 - c. *Lake Arbuckle (LA) Management Block – approx. 950 ac,*
 - d. *Reedy Creek (RC) Management Block – approx. 800 ac*
- b) *Prairie Tract*
 - a. *Otter Slough and LWRSF boundary near Lake Kissimmee – approx. 1,100 ac*
- c) *Walk-in-Water Tract*
 - a. *East 4 Burn Unit – approx. 160 ac*

The burns proposed in this project (see Figures 1-4) will add 4,010 ac of scrub, sandhill, dry prairie, and wet flatwoods (natural pineland) to the acreage normally burned in LWRSF, providing the state forest's staff the opportunity to more than double the 23-year annual average of approximately 2,600 ac burned. These burns will be in addition to the burns planned by state forest staff annually. Burning all of the units by hand crews allows only 100-200 ac to be burned per day while burning with a helicopter allows 1,000-2,000 ac to be burned in a day, increasing the number of acres that can be burned in a year, given staff and burning condition constraints. The burns in LWRSF will help manage fuel loading, maintain wildlife openings, restore desired vegetation structure and successional stages, and make it easier to burn these tracts on an appropriate rotation in the future.

Depending on weather and fire conditions, this project proposes between three and six separate burns to cover the entire 4,010-ac area during the 2-year timeframe. Each burn will be completed over several different days and have a prescription written with input from Dwight Myers (FWC) and other FFS staff (Forest Area Supervisor, Plant Ecologist, Forester, Resource Administrator). All burns will be conducted by a certified burn manager and all appropriate authorizations and precautions will be taken. Each burn will be individually evaluated for notification of adjacent landowners, smoke hazards, and mop-up requirements.

Burns will be conducted by first lighting the “blackline” fires on the downwind side of the burn unit by the ground crews. Once adequate control lines have been established on the downwind side of the burn unit, the helicopter will begin dropping the incendiary devices (referred to as “ping-pong balls”) on the downwind side of the unit perpendicular to the wind. As the balls are dropped from the helicopter, small spot fires are ignited along the predetermined fire line. The helicopter will generally fly 20-70 feet (ft) above tree tops and 50-75 ft above ground. Ground crews will continue lighting the exterior control lines and stay ahead of (upwind of) the helicopter. This will continue through the unit until the entire unit has been covered. Communication between the ground crew and the helicopter crew is crucial in order to ensure that control lines remain slightly ahead of the progress of the helicopter and that the fire remains within the burn unit. Amended Table 1, showing agencies that are potential applicants, is provided below.

Amended Table 1. Potential Strike Team [CFEST] sites

Agency*	Site*	Acres
Archbold	Archbold Biological Station	5,200
Archbold	The Reserve	3,600
DEP-FPS	Lake June-in-Winter Scrub State Park	868
DEP-FPS	Highlands Hammock State Park	7,956
DEP-FPS	A.D. Broussard Catfish Creek Preserve State Park	8,300
DEP-FPS	Lake Kissimmee State Park	5,584
Polk County	Crooked Prairie	525
Polk County	Lakeland Highlands	605
Polk County	Hickory Lake Scrub	65
Polk County	North Walk in Water Creek	640
Polk County	Crooked Lake Sandhill	25
Polk County	SUMICA	4,035
Highlands County	Sun & Lakes Preserve	1,336
Audubon of Florida	Ridge Audubon Center	3
SWFWMD	Jack Creek	1,283
SFWMD	Lake Marion Scrub	1,866
Historic Bok Sanctuary	Pine Ridge Preserve	90
FWC	LWR WEA, Woolfenden (McJunkin) Scrub	623
FWC	LWR WEA, Mountain Lake Scrub	219
FWC	LWR WEA, Lake Apthorpe	810
FWC	LWR WEA, Carter Creek	5,959
FWC	LWR WEA, Henscratch	1,514
FWC	LWR WEA, Highland Park Estates	2,258
FWC	LWR WEA, Highlands Ridge	3,160
FWC	LWR WEA, Holmes Avenue	974
FWC	LWR WEA, Lake Blue	88
FWC	LWR WEA, Silver Lake	389
FWC	LWR WEA, Sun Ray	270
FWC	LWR WEA, Lake Placid Scrub	3,159
FWC	LWR WEA, Gould Road	212
FWC	LWR WEA, Royce Ranch	2,991
FFS	LWR State Forest, Arbuckle Tract	13,825
FFS	LWR State Forest, Walk-in-the-Water Tract	6,837
FFS	LWR State Forest, Hesperides South	919
FFS	LWR State Forest, Hesperides North	363

Agency*	Site*	Acres
FFS	LWR State Forest, Prairie Tract	4,873
TNC	Saddle Blanket Lakes Preserve	829
TNC	Sun Ray	9
TNC	Tiger Creek Preserve	4,823
Multiple (incl. Service)	Horse Creek/Snell Creek	5,635
Service	Carter Creek tract of LWR NWR	664
Service	Flamingo Villas tract of LWR NWR	1,292
Service	Lake McLeod tract of LWR NWR	65
Private/TNC	Hatchineha Ranch	350

*Definitions of agency and site acronyms and abbreviations:

Archbold - Archbold Biological Station

Brevard EEL - Brevard County Environmentally Endangered Lands Program

DEP-FPS - Florida Department of Environmental Protection, Florida Park Service

FFS - Florida Forest Service

FWC Florida Fish and Wildlife Conservation Commission

LWR NWR - Lake Wales Ridge National Wildlife Refuge

LWR WEA - Lake Wales Ridge Wildlife and Environmental Area

NWR - National Wildlife Refuge

Service - U.S. Fish and Wildlife Service

SFWMD - South Florida Water Management District

SWFWMD - Southwest Florida Water Management District

TNC - The Nature Conservancy

Other properties not listed in Amended Table 1 may be included in the action area. The CFEST may also work on properties in Okeechobee and Volusia Counties and along the central ridges of Florida, including the LWR, Mount Dora Ridge, Orlando Ridge, DeLand Ridge, Bombing Range Ridge, Winter Haven Ridge, Lake Henry Ridge, Lakeland Ridge, Gordonville Ridge, and any other ridges. For the purpose of this consultation, a ridge is defined as an ancient sand dune along the center of the peninsula of Florida with an elevation at or above 20 meters (m) located in Highlands, Lake, Marion, Osceola, Orange, Polk, Putnam, and Seminole Counties. With the expansion of the scope of work to include different habitat types, new properties, and new treatment types, up to 20,000 ac per year may be prepped, burned, and/or treated with herbicides as per this funding proposal. *Additionally, up to 4,010 ac may be burned using helicopter ignition on the LWRNF.*

AMENDED STATUS OF THE SPECIES AND CRITICAL HABITAT RANGEWIDE

Red-cockaded woodpecker

A complete discussion of the status of the species in south Florida and throughout its range can be found in the Service's South Florida MSRP (Service 1999) and Revised Recovery Plan (Service 2003), respectively. In addition, a 5-year review was completed in 2006 resulting in no change to the status of the species (Service 2006). These documents are incorporated here by reference. The following is a summary of the RCW biology.

Species Description

The RCW measures approximately 7-8 inches (in) (18-20 centimeters [cm]) in length with a wing span of 14-15 in (35-38 cm). The RCW is distinguished by its conspicuous white cheek patches, black cap and neck, and black and- white barred back and wings.

Life History

The RCW is a territorial, non-migratory, cooperative breeding species (Lennartz et al. 1987). It is unique in that it is the only North American woodpecker that exclusively excavates its roost and nest cavities in living pines. Each group member has its own cavity, although there may be multiple cavities in a cavity tree. The aggregate of cavity trees, surrounded by a 200-ft (61-m) forested buffer, is called a cluster (Walters 1990). Cavities within a cluster may be complete or under construction and either active, inactive, or abandoned. RCWs live in social units called groups. This family unit usually consists of a breeding pair, the current year's offspring and zero to four helpers (adults, normally male offspring of the breeding pair from previous years) (Walters 1990).

RCWs forage almost exclusively on live pine trees, although they will forage on recently killed pines (Franzreb 2004). Their prey consists of wood cockroaches, caterpillars, spiders, woodborer larvae, centipedes, and ants (Hanula and Horn 2004). Although they will use smaller pine trees as foraging substrate RCWs prefer pines greater than 10 inches in diameter at breast height (Hooper and Harlow 1986; Engstrom and Sanders 1997).

Population Dynamics

Reproductive rates, population density, and re-colonization rates may influence RCW population variability more than mortality rates, sex ratios, and genetic variability. RCWs exhibit relatively low adult mortality rates; annual survivorship of breeding adults is high, ranging from 72 to 84 percent for males and 51 to 81 percent for females (Lennartz and Heckel 1987; Walters et al. 1988; Delotelle and Epting 1992). Two studies (Francis Marion National Forest in South Carolina and central Florida populations) reported significantly different fledgling sex ratios than 50:50 (Gowaty and Lennartz 1985); however, other populations are reported to have an unbiased sex ratio (LaBranche 1992; Hardesty et al. 1997). The average number of fledglings produced per breeding

group in central Florida is 1.0, which is lower than that of other populations in the Southeast (DeLotelle and Epting 1992).

The availability of suitable cavity trees is a limiting factor for RCW populations. Use of artificial cavities can dramatically increase RCW populations because of the birds' ability to re-colonize unoccupied habitat made suitable by this management action (Copeyon 1990; Allen 1991). Significant population expansions have been documented where artificial cavity provisioning has been employed (Gaines et al. 1995; Franzreb 1999; Carlile et al. 2004; Doresky et al. 2004; Hagan et al. 2004; Hedman et al. 2004; Marston and Morrow 2004; Stober and Jack 2003).

Status and Distribution

The Service identified the RCW as a rare and endangered species in 1968 and officially listed it as endangered in 1970 (Federal Register 35:16047). With passage of the Act in 1973, the RCW received the protection afforded listed species under the Act. No critical habitat has been designated for the RCW.

The precipitous decline of RCWs was caused by an almost complete loss of habitat. Approximately 920,000 (Costa 2001) to 1.5 million (Conner et al. 2001) groups of RCWs inhabited southeastern forests prior to European settlement. Fire-maintained old growth pine savannahs and woodlands that once dominated the southeast (92 million ac pre-European settlement; Frost 1993), on which the woodpeckers depend, no longer exist except in a few small patches (<3.0 million ac today; Frost 1993). Longleaf pine ecosystems, of primary importance to RCWs, are now among the most endangered ecosystems on earth (Simberloff 1993; Ware et al. 1993).

The current distribution of this non-migratory, territorial species (endemic to open, mature and old growth pine ecosystems) is restricted to the remaining fragmented parcels of suitable pine forest in 11 southeastern States; it has been extirpated in New Jersey, Maryland, Missouri, Tennessee, and Kentucky (Costa 2004). As of April 2003, approximately 14,500 RCWs were living in 5,800 known active clusters across 11 states (Service 2003). This is less than 3 percent of the estimated abundance at the time of European settlement.

Florida grasshopper sparrow

A complete discussion of the status of the species in south Florida and throughout its range can be found in the Service's South Florida MSRP (Service 1999). In addition, a 5-year review was completed in 2008 resulting in no change to the status of the species (Service 2008). These documents are incorporated here by reference. The following is a summary of the FGSP biology.

Species Description

The FGSP is one of four North American subspecies of the grasshopper sparrow, and is endemic to the dry prairie region of central and southern Florida. The FGSP is a small, short-tailed, flat-headed sparrow averaging 13 cm in total length (Vickery 1996). The top of its head is mostly blackish with a light median stripe. The remainder of its dorsum is mainly black, edged with

gray, and streaked with brown on the nape and upper back. Adult FGSPs are whitish underneath, unstreaked, with a buff throat and breast. Juvenile FGSPs have streaked breasts. The ventral color pattern resembles that of the Bachman's sparrow (*Aimophila aestivalis*). The rectrices of the FGSP are pointed, the lores are light gray to reddish-yellow, and the bend of the wing is yellow. Its bill is thick at the base, and its feet are flesh-colored (Vickery 1996).

During the breeding season, male and female FGSPs can be distinguished in the hand by the presence of a cloacal protuberance in the male or a brood patch in the female. The FGSP is most easily located and identified by its song, which is among the weakest of any North American bird (Stevenson 1978). Nicholson (1936) described it as being indistinct and as having a definite insect-like quality, which gave rise to the bird's common name (Sprunt 1954). The song starts as three low-pitched notes followed by a longer, higher-pitched "buzz" (Vickery 1996).

Life History

FGSPs are endemic to dry prairie habitats within central and southern Florida, and are strongly habitat-specific, occupying only the native, fire-maintained dry prairie vegetation community and a few semi-improved pasture sites that superficially resemble the dry prairie community and were presumably dry prairie prior to conversion to pasture. Barriers to movement include forested edges and even sparsely stocked pine flatwoods. Habitat characteristics that are important for FGSPs include a high percentage of bare ground cover and low vegetation height (30-70 cm) (Delany et al. 1985). Both of these characteristics are maintained by frequent fire. Large areas of prairie habitat, possibly greater than 4,000 hectares (ha) (9,884 ac), are needed to maintain self-sustaining populations of FGSPs (Perkins 1999; Perkins and Vickery 2001).

FGSPs form pair bonds during the breeding season, but remain solitary for the remainder of the season, and rarely interact with other FGSPs outside of the breeding season. During the breeding season, FGSPs form breeding aggregations within suitable habitat (Delany 1996), and individual male sparrows set up territories within the breeding aggregations. Delany et al. (1995) found mean breeding territory size for FGSPs at Avon Park Air Force Range (APAFR) to be 1.80 ha (4.45 ac), with a maximum size of 4.82 ha (11.91 ac). As the time since last fire increases, territories are reported to be established less frequently (Walsh et al. 1995), and FGSP home ranges become larger (Delany et al. 1992). Male FGSPs defend their territory boundaries from the time territories are established through incubation (Delany et al. 1995). After the young hatch, territory defense becomes less rigorous (Smith 1968). Adult FGSPs exhibit strong site-fidelity to nesting territories, although individuals have been observed traveling as far as 4 kilometers (km) (0.62 mile [mi]) from the nesting territories during winter months. The great majority of males (86 percent [Delany et al. 1995]; 100 percent [Dean 2001]) remain on the same territory in consecutive years.

Male FGSPs generally begin singing in mid-March. Their singing usually diminishes by late June, although they continue to sing through August (T. Dean, Service, pers. comm. 2002). FGSPs begin nest-building activities approximately 4 weeks after the onset of territorial singing (Vickery 1996). Nests are located on the ground in shallow (<3.2 cm deep) excavations in the sand substrate (Delany and Linda 1998a; Delany and Linda 1998b); the rims are level or slightly

above the ground. The nests are dome-shaped and constructed of narrow-leaved grasses and grass-like monocots, such as wiregrass, bluestems (*Andropogon* spp.), and yellow-eyed grass (*Xyris* spp.). Egg-laying is reported to begin as early as late March (McNair 1986) and breeding activities may extend into September (Vickery and Shriver 1995; Perkins 1999). Most nests contain 3-5 eggs with a mean of 3.71 (McNair 1986; Smith 1968). Perkins et al. (2003) report mean clutch sizes of 3.47 ($n = 17$) at APAFR, 3.56 ($n = 9$) at Three Lakes Wildlife Management Area (TLWMA), and 3.75 ($n = 4$) at Kissimmee Prairie Preserve State Park (KPPSP). Female FGSPs incubate their eggs for 11-12 days (Nicholson 1936). Perkins et al. (1998) reported that it takes an average of 13.5 days between the fledging of a successful nest and the first egg of a new attempt. If a nest is destroyed, the female may make a new one in approximately 10-12 days (T. Dean, Service, pers. comm. 2003). Considering the duration necessary to complete a single reproductive cycle, three to four successful clutches are possible within a single breeding season (Vickery 1996; Perkins 1999) and multiple clutches are common (Vickery 1996).

During the non-breeding season, FGSPs appear to expand their scope of movements. As determined through radio telemetry, the average home range size during the non-breeding season was 29.0 ha (71.7 ac), with individual home ranges varying from 1.0 to 173.6 ha (2.5 to 428.9 ac) (Dean 2001). In addition, nearly 40 percent of individuals used more than one spatially distinct home range during the course of the non-breeding season. These home ranges were not mutually exclusive, however, and home ranges of many different individuals overlapped (Dean 2001).

FGSPs forage on the ground or just above it. An examination of the contents of 10 stomachs of FGSPs from the Kissimmee prairie region found 69 percent “animal matter” (insects) and 31 percent vegetation (Howell 1932). Identified insects included grasshoppers, crickets, beetles, weevils, and moths and their larvae, with a few flies and bugs. Sedge seeds, as well as some star grass (*Hypoxis* spp.) seeds, composed most of the vegetation found in the diet (Service 1988). FGSPs switch to a seed-dominated diet during the non-nesting season, but still consume some animal matter (Vickery and Dean 1997).

Population Dynamics

FGSPs are capable of breeding during the first spring after hatching and are assumed to breed every year. Several studies (Shriver 1996; Perkins 1999) have suggested that not all singing males are paired, with as many as 15-23 percent of males identified as unpaired (Vickery and Perkins 2001). The difficulty of observing female sparrows makes accurate determination of sex ratios, pairing, or the lack of pairing, difficult.

Considering the number of potential nesting attempts and the productivity per nest, the maximum productivity per pair could reasonably be expected to exceed 13 young per pair each year, though this level of productivity is likely uncommon. Nest success (defined as fledging at least one young) rates are generally low, and nest success rates range between 11 and 38 percent. Accounting for the number of nesting attempts and observed nest success, Vickery and Perkins (2001) report an average annual productivity per pair of 2.8 to 3.5 young per year. Nest predation is the most common cause of nest failures, with snakes and mammals accounting for the majority of observed

depredations (Perkins 1999). The large reproductive potential combined with variability in predation and nest failure rates may result in widely varying reproductive success among years.

Estimates of annual adult male survival rates range between 0.24 and 0.83 for different populations and different years (Delany et al. 1993; Perkins and Vickery 2001). Average adult annual survival rates are 0.48-0.53 at APAFR and TLWMA, respectively. Delany et al. (1993) estimated a pooled annual survival rate of 0.59 at APAFR. These results suggest that annual adult survival rates are variable, with an average slightly above 50 percent. Juvenile survival rates have never been directly estimated, but Perkins and Vickery (2001) estimated the average juvenile survival rate to be 0.35 through indirect calculations. Results of a 3-year banding study indicate a mean life expectancy of 1.95 years for male birds that are at least 1 year old ($n = 48$) (Delany et al. 1993). The longevity record for FGSPs is 7 years (Dean et al. 1998; Miller 2005). Because there is no information on the survival and life expectancy of females, it can only be assumed female survival rates approximate those of males.

The main cause of adult mortality appears to be predation, primarily by wintering raptors (T. Dean, Service, pers. comm. 2002). Other predators known to take eggs or nestlings include the striped skunk (*Mephitis mephitis*), spotted skunk (*Spilogale putorius*), raccoon (*Procyon lotor*), longtailed weasel (*Mustela frenata*), foxes (*Urocyon* sp. and *Vulpes* sp.), cats (*Felis* spp.), feral hogs (*Sus scrofa*), snakes, and possibly armadillos (Vickery 1996).

Status and Distribution

Based on declines in suitable habitat and population size, the National Audubon Society placed the FGSP on its blue list in 1974. The FGSP was listed as endangered by the State of Florida in 1977. The Service listed the FGSP as endangered on July 31, 1986, due to habitat degradation and loss, primarily as a result of conversion of native dry prairie vegetation to improved pasture (51 Federal Register 27495). Critical habitat has not been designated for this species.

The current known range of the species is limited to Highlands, Okeechobee, Osceola, and Polk Counties. Early records for abundance and distribution of FGSPs are scarce, though it is believed that the species was once more numerous and widespread than it is today (Delany 1996). Because the FGSP is closely associated with dry prairie habitats, trends in the amount and condition of dry prairie habitat within central Florida probably mirror the trends in the rangewide FGSP population.

Aerial surveys of dry prairie habitat indicated that only 156,000 ha (385,482.8 ac) of dry prairie habitat existed in 1995 (Shriver and Vickery 1999), an 81 percent decrease from the 0.83 million ha estimated from 1967 (Davis 1967). FGSP habitat loss is due to conversion of dry prairie to improved pasture (Layne et al. 1977) and agricultural uses such as citrus groves (Davis 1967; Mealor 1972; DeSelm and Murdock 1993), pine plantations, exotic sod-forming grasses, row-crops, and, historically, eucalyptus (*Eucalyptus* spp.) plantations. Conversion of dry prairie to citrus groves may represent the single greatest threat to existing prairie remnants. Lack of burning may have degraded additional prairie habitat.

Since Delany's first efforts to assess FGSP populations rangewide in the early 1980s (Delany et al. 1985), surveys have recorded a general decline in the distribution and occurrence of FGSPs. Of the 14 sites where FGSPs have been documented to occur, only 5 remain occupied, and 4 of these are on public lands. In addition, recent surveys of private lands have failed to document FGSPs on other sites. Despite several survey efforts, there have been no records of FGSPs outside of the upper Kissimmee River basin since the early 1990s, and this represents a large reduction in the species' distribution. Additional surveys are needed to confirm this change in distribution.

Today, three large tracts of publicly-owned land contain the largest and most-studied populations of FGSPs. There is one population at KPPSP, which now includes the Ordway-Whittell Kissimmee Prairie Sanctuary (managed by the National Audubon Society until ownership was transferred in 2001). This preserve, acquired in 1996, has the largest contiguous block of dry prairie in public ownership (more than 12,000 ha [29,652.5 ac]) and the largest known population of FGSPs. It also provides a corridor between other protected sites. There is another population of FGSPs at TLWMA, which has approximately 2,500 ha (6,177.6 ac) of suitable, occupied habitat, and another disjunct patch of suitable habitat (861 ha [2,127.6 ac]) where FGSPs did not occur, but to which FGSPs were translocated in 2001 and 2002 (Dean and Glass 2001a). There are three populations at APAFR, which has approximately 2,400 ha (6,177.6 ac) of suitable FGSP habitat. Survey efforts during the 2003 breeding season failed to detect any FGSPs in one of the three population sites at APAFR (Bravo Range). One FGSP was detected during 2004 surveys, but the future of this population is quite tenuous.

Surveys for FGSPs have been conducted regularly at KPPSP since 1999 (Mulholland and Small 2001) at TLWMA since 1991 (Dean and Glass 2001b) and at APAFR since 1982 (Delany et al. 2001). Monitoring efforts from 1999 to 2004 indicate that the total population size at these three primary sites ranged from approximately 340 to 640 individuals, though the population sizes are variable among years. In 2003, surveys estimated the population size at these three sites at under 350 individuals, largely due to declines at APAFR and KPPSP. This was the lowest total population estimate recorded. The APAFR subpopulations have declined sharply since 1997, and these once large subpopulations are currently vulnerable to extirpation (Pranty and Tucker 2006; Delany et al. 2007). The TLWMA is State-owned and has maintained relatively stable numbers of FGSP within the last decade (Delany et al. 2007; Tucker and Bowman 2007). The subpopulations at KPPSP vary widely, and have generally declined in the last 5 years (Miller 2007).

Florida bonneted bat

Species Description

The Florida bonneted bat is a large free-tailed bat approximately 130-165 millimeters (mm) (5.1-6.5 in) in length (Timm and Genoways 2004), and the largest bat in Florida (NatureServe 2009). The body mass of the species averages 39.7 grams (g) (1.4 ounces [oz]) with a range from 30.2 g (1.1 oz) to at least 55.4 g (2.0 oz) in pregnant females (Belwood 1981; Belwood 1992; Timm and Genoways 2004; NatureServe 2009). Timm and Genoways (2004) found that males and females are not significantly different in size, and there is no pattern of size-related

geographic variation in this species. Fur is short and glossy with hairs sharply bicolored with a white base (Timm and Genoways 2004; NatureServe 2009). Color is highly variable from black to brown to brownish gray or cinnamon brown with ventral pelage paler than dorsal (Timm and Genoways 2004; NatureServe 2009). Leathery rounded ears are joined at the midline and project forward (NatureServe 2009).

Life History

Relatively little is known of the ecology of the Florida bonneted bat and long-term habitat requirements are poorly understood (Robson 1989; Robson et al. 1989; Belwood 1992; Timm and Genoways 2004). Recent information on foraging habitat has been obtained largely through acoustical surveys, designed to detect and record bat echolocation calls (Marks and Marks 2008a).

In general, open fresh water and wetlands provide prime foraging areas for bats (Marks and Marks 2008c). Bats will forage over ponds, streams, and wetlands and drink when flying over open water (Marks and Marks 2008c). During dry seasons, bats become more dependent on remaining ponds, streams, and wetland areas for foraging purposes (Marks and Marks 2008c). The presence of roosting habitat is critical for day roosts, protection from predators, and the rearing of young (Marks and Marks 2008c). For most bats, the availability of suitable roosts is an important limiting factor (Humphrey 1975). South Florida bats roost primarily in trees and manmade structures (Marks and Marks 2008a).

Major habitat types where this species is known to occur include dry prairie, freshwater marsh, wet prairie, and pine flatwoods (Marks and Marks 2008a). They have been known to roost in buildings, tree cavities, outcrops, and bat houses (Marks and Marks 2008a). The discovery of an adult for which the specimen tag says “found under rocks when bull-dozing ground” suggests this species may roost in rocky crevices and outcrops on the ground (Timm and Genoways 2004). It is not known to what extent such roost sites are suitable. Robson (1989) indicated Florida bonneted bats are closely associated with forested areas because of their tree-roosting habits. They roost singly or in groups of up to a few dozen individuals (NatureServe 2009). The Florida bonneted bat is not migratory (Timm and Genoways 2004; NatureServe 2009). However, there may be seasonal shifts in roosting sites because Belwood (1992) reported bonneted bats were found “during the winter months in people’s houses.”

Florida bonneted bats feed on flying insects (e.g., Coleoptera, Diptera, Hemiptera) (Belwood 1981; Belwood 1992; NatureServe 2009). They forage in open spaces and use echolocation to detect prey at relatively long range, roughly 3-5 m (10-16 ft) (Belwood 1992). Based upon information from G. T. Hubbell, Belwood (1992) indicates these bats leave their roosts to forage after dark, seldom occur below 10 m (33 ft) in the air, and produce loud, audible calls as they fly that are easy to recognize. Precise foraging and roosting habits and requirements are not known (Belwood 1992).

Population Dynamics

The Florida bonneted bat has a fairly extensive breeding season during summer months (Timm and Genoways 2004; NatureServe 2009). Pregnant females have been found in June through September (Marks and Marks 2008a). Timm and Genoways' (2004) examination of limited data suggests that this species may be polyestrous, with a second birthing season possibly in January - February. However, the Florida bonneted bat has low fecundity, producing a litter size of one (NatureServe 2009).

There is only one record of natural predation upon this species (Timm and Genoways 2004). A skull of one specimen was found in a regurgitated owl pellet in June 2000 at the Fakahatchee Preserve (Timm and Genoways 2004; C. Marks, pers. comm. 2006; Marks and Marks 2008a).

Status and Distribution

The Florida bonneted bat is recognized in Florida's Comprehensive Wildlife Conservation Strategy as one of Florida's species of greatest conservation need (FWC 2005). This species is listed as endangered by the FWC as the Florida mastiff bat (*Eumops glaucinus floridanus*) (*i.e.*, the previously-accepted taxonomic designation). The FNAI and NatureServe consider the global status of the Florida bonneted bat to be G1, critically imperiled (FNAI 2009; NatureServe 2009). The 2009 International Union for Conservation of Nature (IUCN) Red List of Threatened Species lists *Eumops floridanus* as critically endangered because "its population size is estimated to number fewer than 250 mature individuals, with no subpopulation greater than 50 individuals, and it is experiencing a continuing decline" (Timm and Arroyo-Cabralles 2008). On November 9, 2009, the Service added the Florida bonneted bat to the candidate species list. *On October 4, 2012, the status of the Florida bonneted bat was changed to proposed endangered.*

The Florida bonneted bat exists only in Florida (Timm and Genoways 2004; C. Marks and G. Marks, pers. comm. 2008). This species has one of the most restricted distributions of any bat species in the New World (Belwood 1992; Timm and Genoways 2004) and its global range is estimated at < 100-250 km² (40-100 mi²) (NatureServe 2009). Its current range includes Charlotte, Collier, Lee, Miami-Dade, Okeechobee, and Polk Counties (Timm and Genoways 2004; NatureServe 2009; Marks and Marks 2008b). Surveys conducted in the Kissimmee River area for the FWC recorded Florida bonneted bat calls at two locations (Marks and Marks 2008b; 2008c). The findings along the Kissimmee River are significant as it is the first time the species has been found north of Lake Okeechobee except in fossil records and effectively moves the known range 80 km (50 mi) north (Marks and Marks 2008b).

Although older literature lists Fort Lauderdale as an area where the species occurred (Belwood 1992), none of the recent specimens examined by Timm and Genoways (2004) were from Broward County. However, Hipes et al. (2001) included Broward County as part of the range. Marks and Marks (2008a) did not record any Florida bonneted bat calls in the Fort Lauderdale area; surveys were conducted in Long Key Park, Miramar Pinelands, and the Plantation area. No calls were recorded on the east coast of Florida north of Coral Gables (Marks and Marks 2008a).

Overall, based upon all available historic and current surveys, the species exists within a very restricted range (Timm and Genoways 2004; Marks and Marks 2008a).

Results of the range-wide survey indicate that the Florida bonneted bat is a rare species with limited range and low abundance (Marks and Marks 2008a). Based upon results of both the range-wide study and survey of select public lands, the species has been found at twelve locations (Marks and Marks 2008b), but the number and status of the bat at each location is unknown. Marks and Marks (2008a) state “it is possible that the entire population of Florida bonneted bats may number less than a few hundred individuals.” Marks and Marks (2008a) base this upon the small number of locations where calls were recorded, the low numbers of calls recorded at each location, and the fact that the species forms small colonies. Results of the 2006-2008 acoustical range-wide survey indicate that of 5,016 calls recorded and analyzed, only 79 (1.6 percent) were from Florida bonneted bats (Marks and Marks 2008b).

Audubon's crested caracara

In addition to the assessment below, a 5-year review was completed in 2009 resulting in no change to the species designation (Service 2009). No critical habitat has been designated for this species. The 5-year review builds upon the detailed information in the MSRP for this species and is located at http://www.fws.gov/ecos/ajax/docs/five_year_review/doc2507.pdf

Species Description

The caracara is a large raptor with a crest, naked face, heavy bill, elongated neck, and unusually long legs. It is about 50 to 64 cm long and has a wingspan of 120 cm. The adult is dark brownish black on the crown, wings, back, and lower abdomen. The lower part of the head, throat, upper abdomen, and under tail coverts are white, the breast and upper back are whitish, heavily barred with black. The tail is white with narrow, dark crossbars and a broad, dark terminal band. Prominent white patches are visible near the tips of the wings in flight. The large, white patches in the primaries and the white tail, broadly tipped with black, are both very conspicuous in flight and can be recognized at a long distance (Bent 1961).

Juveniles have a similar color pattern but are brownish and buffy, with the breast and upper back streaked instead of barred. Subadults resemble adults but are more brownish in color. Adults have yellow-orange facial skin and yellow legs. Facial skin of juveniles is pinkish in color, and the legs are gray (Layne 1978). Full adult plumage is obtained sometime after 3 years of age (Morrison 1997). There is no evidence of sexual dimorphism, the sexes being similar in color and size; however, gender can be determined surgically or through genetic analysis (Morrison and Maltbie 1999).

*A caracara's feet and flight behavior are also notable. Their feet are clearly those of a raptor; however, their talons are flatter, enabling caracaras to run and walk more easily than other raptors. Caracaras are terrestrial and often forage by walking for extended periods on the ground (Morrison and Humphrey 2001). Bent (1938) noted the caracara's flight pattern resembles that of a northern harrier (*Circus cyaneus*), but caracaras fly faster and more*

gracefully. Caracaras are strong fliers and may reach speeds of 40 mph. They have also been observed soaring in large circles at great heights (Howell 1932).

Life History

Caracaras are resident, diurnal, and non-migratory. Adult caracaras may be found in their territory year-round. Territories average approximately 3,000 ac (approximately 1,200 ha), corresponding to a radius of 1.2 to 1.5 mi (2.0 to 2.5 km) surrounding the nest site (Morrison and Humphrey 2001). Foraging typically occurs throughout the territory during nesting and non-nesting seasons.

The Florida caracara population historically inhabited native dry or wet prairie areas containing scattered cabbage palms, their preferred nesting tree. Scattered saw palmetto, and low-growing oaks (*Quercus minima*, *Q. pumila*), and cypress (*Taxodium distichum*) also occur within these native communities. Over the last century, many of the native prairie vegetation communities in central and south Florida have been converted to agricultural land uses, and frequently replaced by improved and unimproved pasture dominated by short-stature, non-native, sod-forming grasses. Morrison and Humphrey (2001) hypothesize that the vegetation structure of open grasslands (short-stature vegetation, scattered shrub cover, and nest trees) may be preferred by the caracara, due to its tendency to walk on the ground during foraging activities. The short vegetation stature and relatively simple vegetation structure may directly facilitate foraging by caracaras and provide less cover for predators. Consequently, caracaras appear to benefit from management actions such as prescribed burning that maintain habitat in a low stature and structurally simple condition. These activities reduce vegetation cover and may facilitate the observation and capture of prey. Within agricultural lands, regular mowing, burning, and high-density grazing may maintain low vegetative structure, an important habitat characteristic of the caracara's nest stand area (Morrison and Humphrey 2001). Regular prescribed burning maintains habitat in a favorable condition in native dry prairies. These field observations are consistent with the territory compositional analyses that indicate non-random selection of improved and semi-improved pastureland use.

Morrison and Humphrey (2001) characterized caracara distribution, reproductive activity, and land use patterns within a 21,000-km² area in south-central Florida. Comparisons of caracara territories to randomly selected areas and available habitat within the study area revealed caracara home ranges contained higher proportions of improved pasture and lower proportions of forest, woodland, oak scrub, and marsh. Territory size was inversely related to the proportion of improved pasture within the territory. In addition, breeding-area occupancy rate, breeding rates, and nesting success were consistently higher on private ranch lands during the study. Although it is unclear exactly which management activities best promote habitat utilization by caracaras, the mowing, burning, and grazing activities associated with improved pastures serve to maintain the short vegetation structure they appear to favor. The scattered cabbage palms that are often present within improved pastures to serve as shade for cattle provide nesting substrate for caracaras.

Additional investigations into habitat suitability for caracara (Morrison et al. 2006) indicate that maintaining heterogeneity which includes specific land cover types as well as small (less than 1 ha or 2.47 ac) of freshwater wetlands, is critical in maintaining suitable habitat for the crested caracara in Florida. The proportion of six vegetation and land cover types (i.e., cabbage palm-live oak hammock, grassland, improved pasture, unimproved pasture, hardwood hammocks and forest, and cypress/pine/cabbage palm) and two types of water (i.e., lentic and lotic) were determined to be the most important criteria for predicting habitat suitability for caracara. Most known nest locations (72.9 percent) in the study were present on improved pasture although that habitat type only comprised 12.5 percent of the entire study area. Caracara appear to be exploiting pastures, ditches, and impounded wetlands that have replaced the historic land cover as shown by the high occurrence of improved and unimproved pastures and lotic waters in caracara home ranges (Morrison et al. 2006).

Caracaras are highly opportunistic in their feeding habits, eating carrion and capturing live prey. Their diets include insects and other invertebrates, fish, snakes, turtles, birds, and mammals (Layne 1978). Live prey also include rabbits (*Sylvilagus floridanus*), young opossums (*Didelphis marsupialis*), rats (*Rattus* spp.), mice, squirrels (*Sciurus* spp.), frogs, lizards, young alligators (*Alligator mississippiensis*), crabs, crayfish, fish, young birds, cattle egrets (*Bubulcus ibis*), beetles, grasshoppers, maggots, and worms (Bent 1961; Layne et al. 1977; Morrison 2001). Scavenging at urban dumps has also been observed (Morrison 2001).

More recent information from Morrison (Associate Professor of Biology, Trinity College, pers. comm. 2005) indicates that wetland-dependent prey items comprise about 64 percent of the total diet (Service 2004). Mammals make up about 31 percent of the diet, with the majority of this being carrion.

The birds also closely follow mowers in pastures and tractors plowing fields, in order to capitalize on prey that may be exposed. Agricultural drainage ditches, cattle ponds, roadside ditches and other shallow water features also provide good foraging conditions for caracaras (Morrison 2001). Within native habitats, caracaras regularly scavenge in recently burned areas, and forage along the margins of wetlands within dry prairie communities.

These raptors hunt on the wing, from perches, and on the ground (Service 1989). They will also regularly patrol sections of highway in search of carrion (Palmer 1988). They may be seen feeding on road kills with vultures. However, caracaras are dominant over vultures and may occasionally chase the larger vultures from the road kill (Howell 1932).

Although adult caracaras are generally territorial, and therefore, primarily occupy their territories, large groups of individual caracaras are occasionally encountered (Layne 1978). Oberholser (1974) attributes this to the birds' carrion-feeding habit, although Morrison (Associate Professor of Biology, Trinity College, pers. comm. 2005) has noted that juvenile caracaras are nomadic. Caracaras are capable of moving long distances. Between the time when young birds leave the natal territory, and when subadults establish a territory, each individual may traverse a large portion of the species' range in Florida. Adults will also occasionally leave their territory and travel great distances, primarily outside of the breeding

season. The caracara's movement capability and nomadic character during subadult years may be the cause of occasional observations of caracaras far outside their breeding range. Caracaras have been observed in the Florida Keys and into the panhandle of Florida (Bay County), as well as in other states, though some of these may have been escaped individuals (Layne 1996). There appears to be no migration or genetic exchange between the Florida population and other populations of the northern caracara.

Routine observation and radio-telemetry monitoring suggest there are several "gathering areas" in south-central Florida that may be important to caracaras during the first 3 years after leaving their natal territory, before first breeding (Morrison 2001). Relatively large numbers of caracaras (up to 50) have been observed along the Kissimmee River north of SR 98; south of Old Eagle Island Road in northern Okeechobee County; south of SR 70, west of Fort Pierce; and south of SR 70 in Highlands County, and on the Buck Island Ranch, for example. These gathering areas are regularly but not continually used by subadult and non-breeding caracaras and generally consist of large expanses of improved pasture; however, the particular habitat values of these areas have not yet been evaluated.

Morrison (1999) reported breeding pairs of caracaras seem to be monogamous, highly territorial, and exhibit fidelity to both their mate and the site. The age at first breeding has been documented as 3 years (Nemeth and Morrison 2002). Details of breeding behavior in the caracara have been documented by Morrison (1997, 1999). The initiation of breeding is marked by several behavioral changes, including the pair perching together near the nesting site, preening and allopreening, and sharing food. Caracaras are one of the first of Florida's raptors to begin nesting. Although breeding activity can occur from September through June, the primary breeding season is considered to be November through April. Nest initiation and egg-laying peak from December through February.

Caracaras construct new nests each nesting season, often in the same tree as the previous year. Both males and females participate in nest building. Nests are well concealed and most often found in the tops of cabbage palms (Morrison and Humphrey 2001) although nests have been found in live oaks (*Q. virginiana*), cypress (first record, Morrison et al. 1997), Australian pine (*Casuarina* spp.), saw palmetto, and black gum (*Nyssa sylvatica*). Caracaras usually construct their nests 4 to 18 m above the ground; their nests primarily consist of haphazardly woven vines trampled to form a depression (Bent 1938; Sprunt 1954; Humphrey and Morrison 1997). Caracaras vigorously defend their nesting territory during the breeding season (Morrison 2001).

Clutch size is two or three eggs, but most often two. Incubation lasts for about 31 to 33 days (Morrison 1999) and is shared by both sexes. Ordinarily only one brood is raised in a season, but around 10 percent of the population (annually) may raise a second brood. The young fledge at about 7 to 8 weeks of age, and post-fledgling dependency lasts approximately 8 weeks.

Population Dynamics

The great majority of caracara breeding territories occur on private lands in Florida, primarily within the ranchlands of central Florida. This fact makes monitoring the population and

determining territory occupancy and nesting effort or success very difficult. Consequently, estimates of the caracara population in Florida have been based on counts of caracaras along roadsides (Heinzman 1970; Layne 1995). These roadside counts also have the potential to be strongly affected by the presence of non-territorial juvenile and sub-adult birds during the period when they are nomadic. Because the occurrence and density of caracaras is not evenly distributed within the region they occupy (due to congregation and nomadic individuals), these roadside surveys are probably unreliable for estimating the overall population.

Status and Distribution

The caracara's perceived decline, as described in historic literature, is attributed primarily to habitat loss (Layne 1996). This perceived decline and the geographic isolation of the Florida population eventually resulted in the caracara's listing as threatened in 1987 (52 FR 25232). In particular, the caracara was listed as threatened because its primary habitat, dry prairie, had been greatly eliminated or modified for agriculture and residential development. It was also listed because existing regulatory mechanisms did not adequately prevent the destruction or modification of the caracara's habitat, which is mainly located on private land.

Morrison and Humphrey (2001) stated that no data are available on historic abundance, habitat use, or nest distribution by caracaras in Florida. The size of Florida's caracara population remains in question. Accurate counts become difficult because of limited access to areas of suitable habitat and because of the bird's behavior and limited detectability (Humphrey and Morrison 1997). Heinzman (1970) published the results of a 4-year road survey (1967-1970), which suggested fewer than 100 individual caracaras at 58 localities remained in Florida. Stevenson (1976) concurred with this estimate in 1974. Layne (1995) monitored caracara distribution and population status in Florida from 1972 to 1989. Based on roadside surveys, he estimated that the adult portion of the population was stable with a minimum of about 300 birds in 150 territories. The immature portion of the population was estimated to be between 100 and 200 individuals, bringing the total statewide population to between 400 and 500 birds. However, given continued landscape change in areas where caracaras have been known to occur, and the fact that not all the probable breeding range has been adequately surveyed for breeding pairs, estimating this population's size remains difficult.

In addition to presumed population declines related to habitat loss, direct human-caused mortality may also be a factor to be considered in the recovery of the species. In the past, large numbers of caracaras were killed in vulture traps (Service 1989). Individuals may also be caught in leg-hold traps used to control mammalian predators (Morrison 1996). Road mortalities are a significant cause of caracara decline. Morrison (2003) identifies highway mortalities as a major cause of juvenile mortalities with young birds especially vulnerable within the first 6 months after fledging.

The Florida population of caracaras is isolated and habitat-specific. Therefore, it may be susceptible to environmental catastrophes and potentially reduced reproductive rates because of demographic accidents such as skewed sex ratios or disproportionate age-related mortality. Low numbers may also reduce the genetic viability through loss of heterozygosity, thereby increasing vulnerability to environmental stresses. The location of many of the occupied

territories on private land, and the inaccessibility of these territories to surveyors, makes it difficult to census the caracara and detect changes in its population size and distribution. This difficulty increases the possibility of not detecting a population decline that could result in extinction.

The major threat to this population remains habitat loss. Large areas of native prairie and pasturelands in south-central Florida have been converted to citrus operations, tree farms, other forms of agriculture, and real estate development and this loss has accelerated in the past few decades (Morrison and Humphrey 2001). However, historical conversion of forested habitats to pasture has not been adequately documented as partially offsetting losses to caracara habitat, so a full accounting of historic habitat changes is lacking. The current threat of habitat loss persists as changes in land use continue. Florida's burgeoning human population has also increased the number of motor vehicles and the need for roads. The increase in traffic as well as the caracara's predisposition for feeding on road-killed animals has probably increased the number of caracaras killed or injured as a result of vehicle strikes.

Cattle ranching and extensive pastures appear to be compatible with caracara survival. Inadequate information is available to assess current caracara use of native wet and dry prairie communities, but these communities are likely the primary communities that caracaras occupied in the historic Florida landscape. The number of territories occurring in improved or unimproved pasture can be expected to increase if sufficiently large overgrown pastures are reclaimed and/or new pastures or restored native prairies are created from other agricultural land uses. The conversion of pasture to citrus (Cox et al. 1994), sugarcane, and residential development is also cause for concern. Recognizing the conservation value of cattle ranches and enlisting landowner cooperation in the preservation and management of these lands are critical elements in recovery of the caracara.

Lack of habitat management is also a potential threat to caracaras in some areas, and can result in habitat degradation to the point where it is no longer suitable for occupancy. In particular, encroachment of woody shrubs and trees into open dry prairies, pastures and similar habitats will result in some reduction in habitat suitability. Complete clearing of large areas that includes removal of cabbage palms and other trees may also reduce the suitability of habitat, but generally only when very large areas are completely cleared.

While there is inadequate evidence available to conclude that the caracara population in Florida has declined significantly, loss of habitat is threatening remaining caracara territories at an increasing rate. The limited distribution of caracaras and a lack of opportunities for expansion of the distribution make this species vulnerable to reductions in habitat quality and other increasing threats within its range.

Information for all other species provided in the “Status of the Species/Critical Habitat within the Action Area” section of the July 28, 2005, opinion remains unchanged.

AMENDED ENVIRONMENTAL BASELINE

The environmental baseline includes the effects of past and ongoing human and natural factors leading to current status of the species and their habitats.

Status of the Species/Critical Habitat within the Action Area

Red-cockaded woodpecker – The RCW populations that occur in the action area are part of the South-Central Florida Recovery Unit, one of two recovery units that do not contain a primary or secondary core population because the Federal land base is not large enough to support populations of this size. The RCW populations in this recovery unit are necessary for the recovery of the species and are important in that the among-population genetic variation is great and at least one unique allele has been identified (Haig et al. 1996). Translocation among populations within this unit is likely to be necessary for long-term maintenance of genetic variation (Service 2003).

APAFR in Highlands and Polk Counties is considered an essential support population for one of the largest remaining populations in the South-Central Florida Recovery Unit (Service 2003). Additional properties in the recovery unit that are considered essential support populations include: Hal Scott Preserve in Orange County, Ocala National Forest that extends into Lake County, and TLWMA in Osceola County (Service 2003). Other properties in the action area that are also managed for RCWs are the KICCO Cooperative Area in Polk County, Platt Branch Mitigation Park in Highlands County, and Bull Creek-Triple N Ranch and Disney Wilderness Preserve in Osceola County. Several private properties in the action area may also have RCWs but data on these populations are limited.

APAFR supported 23 potential breeding groups in 2008 (Knight pers. comm. 2008). In 2008, Hal Scott Preserve reported 9 active clusters and 8 potential breeding groups, Ocala National Forest had 18 active clusters and 16 potential breeding groups, Bull Creek- Triple N Ranch reported 8 active clusters and 8 potential breeding groups, and Disney Wilderness Preserve reported 7 active clusters and 6 potential breeding groups (Folk pers. comm. 2009). TLWMA reported 47 active clusters and 45 potential breeding groups in 2009, but the population is not yet stable or increasing (Knight pers. comm. 2009). Only one of these properties, APAFR, is listed as a potential CFEST site in Amended Table 1.

Florida grasshopper sparrow – The FGSP is limited to the prairie region of south-central Florida from Highlands, Okeechobee, Osceola, and Polk Counties (Pranty and Tucker 2006). The majority of birds are known to occur in several subpopulations on three public management units: two to three on APAFR, two at TLWMA, and an undefined number at KPPSP (Pranty and Tucker 2006; Perkins et al. 2008). In addition, one site is located on private lands, and the KPPSP and TLWMA populations include sparrows that are on adjacent, high quality prairie on private land.

APAFR is located in Highlands and Polk Counties along the one of the central ridges, east of Avon Park, Florida. Owned and managed by the Department of Defense, this site supports two

to three subpopulations of FGSP within approximately 4,200 ha (10,378 ac) of dry prairie habitat in Echo, Bravo, and Delta/OQ Ranges. These populations occupy the remaining large patches of native dry prairie or prairie-like habitat at APAFR. The subpopulations have declined sharply since 1997, and these once large subpopulations are currently vulnerable to extirpation (Pranty and Tucker 2006; Delany et al. 2007). The Bravo/Foxtrot site has had zero and near zero population estimates in the last 5 years.

The total population estimate for APAFR during 2002 was 144 sparrows distributed between the three populations with the largest population (92 sparrows) reported for Charlie/Echo Range (Bowman and Tucker 2006). In 2003, the FGSP population at APAFR declined significantly with a total of 12 male sparrows and 1 additional bird of unknown sex detected. No sparrows were detected in the smallest population (Bravo Range) and the remaining birds were distributed between the other two populations (Delta/OQ and Charlie/Echo Ranges) (Bowman and Tucker 2003). During the 2004 breeding season, 15 male sparrows were detected with only one of those being detected at Bravo Range (Delany et al. 2005). The FGSP populations on OQ range have declined to a very low level. In 2004, the population estimate based on Walsh et al. (1995) was zero although two birds were observed outside the counting survey point during the breeding season. The estimate for OQ range in 2007 was six birds, assuming each singing male was paired with a female. Archbold Biological Station researcher, James Tucker, believes this assumption is not valid (pers. comm. 2008). Based on his observation, it is likely that only one pair was present in OQ in 2007 (J.Tucker, pers. comm. 2008). No nests were documented in OQ Range in 2007, but one nest may have been present (Bowman and Tucker 2007).

Dry prairie habitat has been maintained within the three populations primarily through the application of prescribed fire. However, because most prescribed fires are conducted in winter or early spring, the growth of trees and shrubs in patches within dry prairies and along the perimeter of the prairies may have increased. The result has been a reduction in suitability for FGSP (Bowman and Tucker 2006, Bowman and Tucker 2007). These APAFR subpopulations on the ridge comprise a large percentage of the remaining known population of FGSP, so the lands included in the action area are very important for the maintenance of the species.

TLWMA is located off the ridge in Osceola County, Florida and contains about 4,000 ha (9,884 ac) of dry prairie habitat. This site is State-owned and has maintained relatively stable numbers of FGSP within the last decade (Delany et al. 2007; Tucker and Bowman 2007). The FGSP subpopulations at KPPSP vary widely, and have generally declined in the last 5 years (Miller 2007). This site is located off the ridge in Okeechobee County and consists of approximately 19,000 ha (46,950 ac) of dry prairie habitat (Perkins et al. 2003). The proposed management actions in FGSP habitat will ultimately benefit the species.

Florida bonneted bat – The only counties within the action area where the Florida bonneted bat has been documented are Okeechobee and Polk Counties. Florida bonneted bat calls were recorded along the Kissimmee River in 2008 in these counties at two locations, KICCO and Platt's Bluff, in the Kissimmee River WMA (Marks and Marks 2008b, 2008c). The Platt's Bluff finding is 85 km (53 mi) northeast of the nearest previously recorded location, which was in Telegraph Swamp within the Babcock Ranch in Charlotte County (Marks and Marks 2008b).

Other stationary and roving acoustical surveys of select public lands in the southwest region of Florida by FWC in 2007-2008 did not produce any additional occurrences (Morse 2008). The bat was only found at Babcock Webb and Kissimmee River WMA, but was not found at Chassahowitzka, Hilochee, or Hickory Hammock WMAs or during surveys along the LWR (Morse 2008; Marks and Marks 2008b). It was not found elsewhere in Highlands, Okeechobee, or Polk Counties (Marks and Marks 2008c; 2008d). Of 673 calls recorded and analyzed at the Kissimmee River WMA, only 10 (1.4 percent) were from the Florida bonneted bat (Marks and Marks 2008c). As a result of this study, more work is recommended for the Kissimmee River area and areas north of the KICCO WMA to determine the northern extent of the species' range (Marks and Marks 2008b). Although it is possible that additional locations may be found with more survey work, it is unlikely that large numbers of individuals will be found.

Results of the range-wide survey indicate that the Florida bonneted bat is a rare species with limited range and low abundance (Marks and Marks 2008a). Based upon results of both the range-wide study and survey of select public lands, the species has been found at 12 locations (Marks and Marks 2008b), but the number and status of the bat at each location is unknown. Marks and Marks (2008a) state that total population size may be less than a few hundred individuals based upon the small number of locations where calls were recorded, the low numbers of calls recorded at each location, and the fact that the species forms small colonies.

Audubon's crested caracara – Audubon's crested caracara is a resident, non-migratory species that occurs in Florida, as well as the southwestern U.S. and Central America. Its range in Florida consists of St. Johns River marshes in Brevard County and the major prairie ecosystem originally present within Highlands, Glades, Polk, Osceola, Okeechobee, Hardee, DeSoto, Indian River, St. Lucie, and Martin Counties (Davis 1967; Morrison 2006). The current range remains similar with some expansion of sightings into neighboring counties, but distribution is patchy (Morrison 2006; Root and Barnes 2007).

Although Service records do not show any observations of Audubon's crested caracara on LWRSF, observations have occurred adjacent to the property, and it is included on the species list for the LWRSF. The Prairie Tract of the LWRSF is located along the western edge of Lake Kissimmee and contains potential habitat for the caracara. However, the closest known communal roost/gathering areas are on the eastern side of Lake Kissimmee and the Kissimmee River (Dwyer 2010).

Caracara have been observed flying, perching, and feeding on the APAFR, which is east of and adjoining the Arbuckle Tract of LWRSF on a portion of its boundary (U.S. Air Force [USAF] 2012). At the time that the APAFR Integrated Natural Resources Management Plan was written, no nesting activity had been observed, but one breeding territory had been identified near the main base south of the runway (USAF 2012). One to three territories may occur along the Kissimmee River, which lies along the eastern boundary of APAFR (USAF 2012). However, the majority of caracara nest sites are found on private lands, and it is likely that over 80 percent of all caracara habitat in Florida is privately owned (Morrison 1996; Morrison and Humphrey 2001). Therefore, the action area comprises a very small percentage of the total subspecies' range.

Information for all other species provided in the “Status of the Species/Critical Habitat within the Action Area” section of the July 28, 2005, opinion remains unchanged.

Amended Factors Affecting Species Habitat within the Action Area

Much of the action area consists of scrub, sandhill, and limited areas of other vegetation on publicly- and privately-owned conservation lands on the LWR, primarily in Highlands and Polk Counties. The most important factor influencing the species covered by this biological opinion and their habitats was, until the 1990s, destruction and degradation due to agricultural and residential development. In response, the State of Florida, the Service, and other parties including local governments, TNC, and Archbold Biological Station conducted carefully-designed land acquisition programs during the 1990s, resulting in a network of conservation lands. As a result, conservation concern has shifted to completing land acquisitions by making small purchases (typically single lots in undeveloped subdivisions) and to management of the conservation lands. Incomplete land acquisition in unbuilt subdivisions creates problems of potential home or other construction within flammable scrub vegetation and may greatly restrict the use of prescribed fire.

By far the largest management concern for conservation lands is fire and its management. At some sites, the proximity of housing or other land uses severely limits the use of prescribed fire even as the presence of overgrown vegetation increases the threat of destructive wildfire. Research and monitoring over the past 15 years, as explained in background information on individual species, has done a great deal to elucidate suitable fire return intervals and intensities for the LWR’s listed plants. Research on Florida scrub jays has similarly clarified suitable vegetation structure for Florida scrub jays and their responses to fire. As a result, nearly all conservation lands in the action area have suitable fire management plans for their listed species, and fire prescriptions can confidently be made to benefit those species over a period of 2 to about 30 years.

The use of prescribed fire for habitat restoration and maintenance is strongly encouraged by recovery plans for all of the species covered by this plan, except that the Florida perforate cladonia requires special attention due to its extremely limited distribution and its vulnerability to fire. In addition, we recommend special attention be given to scrub lupine because of its limited distribution as stated in the July 28, 2005, opinion. Construction of firebreaks is essential for carrying out prescribed fire programs, and their creation and maintenance can both create opportunities for, and destroy listed plants and the Highlands tiger beetle. A number of the plants colonize such bare, open areas, as does the beetle.

On conservation lands, exotic pest plant threats are mostly manageable (with serious concern for Old World climbing fern and somewhat less concern over several grasses, including cogon grass (*Imperata cylindrica*) and Natal grass. Unauthorized use of all-terrain vehicles or dumping is a serious concern at several sites, including the Flamingo Villas unit of LWR NWR and parts of the LWR WEA. As a result, trash removal, surveys to ensure that contaminants are not present in trash, and fencing and other measures to manage public access are quite important for the management of these lands.

AMENDED EFFECTS OF THE ACTION

This section includes an analysis of the direct and indirect effects of the proposed action on the species and/or critical habitat and its interrelated and interdependent activities.

Detailed planning of fires is the responsibility of land managers, not the CFEST, and planning and fire prescriptions adopted by management agencies for their conservation lands will be followed. Because essentially all of the vegetation in the LWR area is highly fire-adapted, biological conservation problems that could be caused by excessively intense or excessively frequent fires are modest, and these risks are minimized by the careful planning that will be required before the CFEST will participate in a burn, as well as by precautions that the CFEST itself will employ, as described in the Description of the Proposed Action section, below. In particular, although the best time to conduct fires in Florida scrub jay habitat is during nesting season, care will be taken to avoid burning nests.

Red-cockaded woodpecker – This species occurs in open old growth pine habitats, which include sand hills and flatwoods. The pines must be of sufficient size to accommodate the nests that individuals excavate within inactive heartwood. In addition to suitable nest trees, RCW habitat consists of open pine canopies, little pine or hardwood mid-story, and abundant herbaceous groundcover for forage. Hardwood encroachment resulting from a long absence of fire typically results in abandonment of the areas by the woodpeckers. Thus, prescribed fire is critical for the creation and preservation of suitable habitat for this species.

Nesting season is April through June, which coincides with the growing season (*i.e.*, April through July), the optimal period recommended for prescribed fire. Growing season fires are most effective for hardwood reduction and establishment of herbaceous groundcover. Adult and juvenile RCWs can avoid flames and smoke by fleeing the area. Protection of nest trees can be provided by limiting fire intensities around the trees by establishing firebreaks or cutting down surrounding vegetation. However, there is the potential that birds may be injured or killed, and nests or cavity trees may be destroyed during prescribed burns as a result of the fire. Also, adults and juveniles can typically avoid the flames and smoke but may leave the area temporarily due to disturbance from fire activities and herbicide treatment. Overall, some short-term negative impacts are anticipated from the proposed action. However, the long-term effects of the proposed action are expected to be beneficial.

Florida grasshopper sparrow – Habitat loss and degradation are major factors contributing to the status of the FGSP (Delany et al. 1985). Dry prairies, the major habitat of FGSP, are restricted to south-central Florida and are characterized as treeless expanses dominated by bunch grasses and scattered low shrubs (Abrahamson and Hartnett 1990). Frequent fire is required to maintain dry prairies. FGSP are extremely habitat specific, relying on dry prairie habitat. The CFEST occasionally assists with prescribed fire at APAFR and KPPSP. There may be temporary disturbance to birds due to fire line maintenance and construction and herbicide treatment, especially during the peak of nesting season. Birds may be injured or killed and nests may be lost as a result of fire or vehicle use associated with management activities. Overall, there will be short-term impacts including temporary loss of habitat. However, the long-term effects of the proposed action are expected to be beneficial.

Florida bonneted bat – This species occurs in Polk and Okeechobee Counties and is known to forage along wetlands and open water and roost within pine flatwoods and other habitats. Specific natural roost sites are unknown. Bats may be disturbed by fire pre-treatment and herbicide application. Because it is thought they roost in tree hollows and in dead palm fronds, bats may be injured or killed during prescribed fire or fire-related activities.

Audubon's crested caracara – This subspecies occurs in the prairie area of the south-central portion of the Florida, primarily in a five-county area north and west of Lake Okeechobee, including Glades, DeSoto, Highlands, Okeechobee, and Osceola counties. It historically used dry or wet prairie areas with scattered cabbage palms (*Sabal palmetto*), but now often uses improved or semi-improved pasture (Service 1999; Layne 1996; J. Morrison, University of Florida, pers. comm. 1996). Cabbage palms are used as nesting sites in open habitats with low ground cover and low density of tall or shrubby vegetation. Most nesting activity during the winter dry season with a peak in January and February, although nesting may occur throughout the year (Humphrey and Morrison 1997). There may be temporary disturbance to birds due to fire line maintenance and construction, helicopter use, and smoke from prescribed burns, especially during the peak of nesting season. Birds may be injured or killed and nests may be lost as a result of fire or vehicle use associated with management activities. Overall, there will be short-term impacts including temporary loss of habitat. However, the long-term effects of the proposed action are expected to be beneficial.

Information for all other species provided in the Effects of the Action section of the July 28, 2005, opinion remains unchanged.

AMENDED CONCLUSION

Amended Listed Species/Critical Habitat

After reviewing the status of the *Audubon's crested caracara*, RCW, FGSP, Florida scrub jay, eastern indigo snake, blue-tailed mole skink, sand skink, Avon Park harebells, Britton's beargrass, Florida bonamia, Carter's mustard, Florida perforate cladonia, Florida ziziphus, Garrett's mint, Highlands scrub hypericum, Lewton's polygala, papery whitlow-wort, pigeon wings, pygmy fringe tree, sandlace, scrub blazing star, scrub buckwheat, scrub lupine, scrub mint, scrub plum, short-leaved rosemary, snakeroot, wide-leaf warea, and wireweed, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the Service's provision of funds to the FWC to fund the activities of the CFEST, as proposed, is not likely to jeopardize the continued existence of any of these species. No critical habitat has been designated for these species, therefore, none will be affected.

Amended Candidate Species

After reviewing the current status of the Highlands tiger beetle and the Florida bonneted bat, the environmental baseline for the action area, the effects of the proposed funding, and the cumulative effects, it is the Service's conference opinion that funding FWC to assist the CFEST, as proposed, is not likely to jeopardize the continued existence of the *Highlands tiger beetle* (a candidate species) and the *Florida bonneted bat* (a species proposed for listing).

AMENDED AMOUNT OR EXTENT OF TAKE ANTICIPATED

These take statements address the *four* species added to the list of species to be considered (RCW, FGSP, Florida bonneted bat, and *Audubon's crested caracara*) and supersede take statements for all other species previously addressed in the July 28, 2005, opinion.

Approximately 4,010 ac per year of additional habitat may be burned via helicopter on LWRSF, with a cumulative total of potentially 24,010 ac per year treated throughout the action area as per amendments 1 and 2 to the July 28, 2005, opinion.

Red-cockaded woodpecker – The Service anticipates up to 15 RCWs may be harassed by herbicide application and prescribed fires, as a result of human *and helicopter* activity associated with conducting the burns and applying herbicides and as a result of the fires themselves (smoke, noise, heat, etc.). Prescribed fires with CFEST participation will be planned carefully to minimize the possibility of take of this species. In cases where habitat occupied by RCWs is burned, careful planning and conservation measures, such as identification of cavity trees and raking or burning around cavity trees prior to conducting the prescribed burn, will minimize the risk of losing nest trees and birds. However, there remains a possibility prescribed fire could accidentally destroy one or more cavity trees or injure or kill birds. APAFR is the only potential property to be treated listed in Amended Table 1 that is occupied by RCWs. APAFR reported 23 potential breeding groups in 2008. However, other properties may be treated that are not specifically defined in Amended Table 1. The estimated number of potential breeding groups on all of the properties that are known to be occupied in the counties where CFEST will work is 110 on approximately 212,000 ac (FWC unpublished data 2004; Knight pers. comm. 2008, 2009; Folk pers. comm. 2009). Up to 3,000 ac, or 1.6 percent, of the occupied habitat is proposed for treatment by CFEST annually. If spatially distributed equally across the landscape, then no more than two potential breeding groups might be affected per year. However, potential breeding groups are not evenly distributed. Therefore, the Service anticipates the possible destruction of as many as four occupied nests, with each nest containing up to four eggs or four chicks, and as many as eight adult birds (breeders and helpers). The incidental take is expected to be in the form of *harassment and direct mortality or injury*.

Florida grasshopper sparrow – The Service anticipates incidental take of FGSPs will be difficult to detect because FGSPs are very secretive. In addition, determining the presence or absence of all individuals, especially females, fledglings, and nests, cannot be reliably achieved, and finding a dead or impaired specimen or a disturbed or destroyed nest is unlikely. We do have some information on rough population estimates based on point-count surveys of singing male FGSPs. Estimates from the 1997 breeding season yielded a total of less than 1,000 individuals (Delany et al. 1999). From 1998 to 2005, FGSP populations (except one site) declined by 58 to 96 percent (Delany et al. 2007). The FGSP occupied approximately 49,000 ac of habitat in 2007 (Delany et al. 2007). *Between 2005 and 2012, FGSP populations experienced a 61 percent decline (FWC, Department of Environmental Protection, and Archbold Biological Station, unpublished data).* Estimates of territory size are not robust and cannot be used reliably to determine density. Without density estimates, take must be based on acreage of habitat impacted rather than number of individual birds affected. The following level of take of this species can be anticipated as a result of the proposed action because fires will destroy any FGSP nests and their contents located within the burned area during growing season fires.

The Service anticipates FGSPs may be harassed by herbicide application and prescribed fires, as a result of human *and helicopter* activity associated with conducting the burns and applying herbicides and as a result of the fires themselves (smoke, noise, heat, etc.). Take may occur on as many as 11,100 ac per year of dry prairie habitat proposed for treatment. However, *it is highly unlikely that all of this habitat is occupied by FGSPs.* Population distribution is generally clumped, and the FGSP is a grassland interior species. Habitat up to 400 m from forest edges is likely to serve as a population sink (Perkins et al. 2003). All nests on occupied habitat are expected to be destroyed by growing season fires, with each nest containing three to five eggs or four chicks. However, the Service believes the loss of nests and the productivity associated with the nests will be compensated by the improved habitat conditions and by successful post-fire nesting by FGSP because adult reproductive sparrows are not expected to be injured or killed by these management actions.

Adult FGSPs will be displaced temporarily during the fire and will seek refuge in suitable habitat outside the burn unit. Prescribed fires with CFEST participation will be planned carefully to minimize the possibility of take of this species. Some take would occur naturally with wildfires, and fire is necessary for the species. Without fire, habitat would become unsuitable to support FGSPs. Any burns conducted during the growing season can take nests, fledglings, and post-fledged young, but growing season burns are necessary to maintain habitat for the species. Therefore, there remains a possibility that prescribed fire or vehicle use could accidentally destroy nests. However, survival rates are naturally low for this species, and birds often re-nest after failed attempts. Take associated with prescribed burns may also be partially compensatory rather than fully additive. In other words, mortality may occur as a result of predation or some other cause in the absence of prescribed fire. Also, measures such as timing of prescribed burns and percent of habitat patches burned in a year will be taken to reduce impacts. The incidental take is expected to be in the form of *harassment and direct mortality or injury.*

Florida bonneted bat – The possibility exists that harassment to Florida bonneted bats may occur during herbicide application and prescribed fires from associated human *and helicopter* activity and smoke, heat, and noise from the fire. However, it is difficult to estimate how many bats may be disturbed because little is known about their natural roost sites. It is thought this species may roost in tree hollows and in dead palm fronds. Where roost sites occur in natural habitat, adults and especially young may be vulnerable to fire. Roost sites may be destroyed by fire and bats may be injured or killed during prescribed fire or fire-related activities. Therefore, the Service anticipates one colony of bats may be injured or killed during prescribed fire and associated preparation. The incidental take is expected to be in the form of *harassment and direct mortality or injury.*

Florida scrub jay – The Service anticipates up to 320 Florida scrub jays may be harassed by herbicide application and prescribed fires, from human *and helicopter* activity associated with conducting the burns and applying herbicides and as a result of the fires themselves (smoke, noise, heat, etc.). Although this bird is relatively easy to census, it is possible all nests will not be found during fire planning. In the unlikely event nests are destroyed, finding nest remnants after the fire would be nearly impossible. Therefore, measuring take is inherently difficult. Prescribed fires with CFEST participation will be carefully planned to minimize the possibility of

take of this species, and most fires conducted in scrub will be in overgrown vegetation that will not have active scrub jay territories or nests. Up to 24,010 ac may be burned per year. Because most of the habitat is overgrown, we anticipate only 20 percent, or *approximately* 4,800 ac, may be occupied. If so, then up to 192 territories may be impacted, based on an average territory size of 25 ac. However, because scrub jays are patchily distributed on the landscape, it is not anticipated that 100 percent of the 4,800 ac is occupied. Assuming that one-third of this habitat is occupied, then up to 64 territories may be impacted. Groups sizes range from two to eight adult birds. Using the mid-point of these data, a group size of 5, up to 320 adult birds may be harassed. In cases where scrub inhabited by scrub jays is burned, careful planning and conservation measures will minimize the risk of losing nests. However, there remains a possibility that prescribed fire could accidentally destroy one or more nests, so the Service anticipates the possible destruction of as many as 21 occupied nests, with each nest containing up to four eggs or two chicks. The incidental take is expected to be in the form of *harassment and direct mortality or injury*.

Eastern indigo snake – The Service anticipates incidental take of the eastern indigo snake will be difficult to detect for the following reasons: (1) wide-ranging distribution, not restricted to specialized habitats, (2) patchy distribution within suitable habitats, and (3) suitable habitat may not be occupied. However, the Service anticipates incidental take of the indigo snake associated with conducting prescribed fires and herbicide treatment on as much as 24,010 ac per year. Juvenile indigo snakes may be more vulnerable to management actions because they are less likely to use underground refugia and often rely on above-ground vegetation for cover. Due to the lack of surveys, in conjunction with the wide-ranging activity and use of a variety of habitat types by the indigo snake, it is difficult to determine the exact number of snakes that will be taken. Layne and Steiner (1996) determined the average home range for female indigo snakes to be 19 ha (47 ac) and overlapping male home ranges to be 75 ha (185 ac) on Archbold Biological Station. However, these home range estimates are derived from studies conducted in very good habitat, but much of the habitat to be treated in the proposed project is thick, overgrown, and in need of management. If indigo snakes were present on all of the 24,010 ac that may be burned, then there could be up to 510 female and 130 male snakes present. However, because we do not think that all of the 24,010 ac are occupied by the species and because adult indigo snakes are able to escape and find refugia during prescribed fires and preparation work for fires, we anticipate that no more than 240 snakes will be harassed and that no more than 24 snakes will be injured or killed. The incidental take is expected to be in the form of *harassment and direct mortality or injury*.

Blue-tailed mole skink – The Service anticipates incidental take of the blue-tailed mole skink will be difficult to detect for the following reasons: (1) its fossorial behavior, with individuals usually just beneath the surface of loose sand; (2) low density within suitable scrub and similar habitats within its limited range; and (3) apparently suitable habitat may not be occupied. However, the Service anticipates incidental take of the blue-tailed mole skink associated with conducting prescribed fires and herbicide application. Burns will primarily occur in scrub, scrubby flatwoods, yellow sand scrub, and sandhill. Blue-tailed mole skinks inhabit open sand within scrub, but also inhabit litter and shaded areas. Because skinks are patchily distributed across the landscape and prescribed fires do not burn all habitat, many skinks are likely to survive fires. Much of the habitat proposed for burning is low quality, containing dense scrub vegetation that may not be suitable for skinks. Therefore, it is likely that only a portion of the area to be treated is inhabited by skinks.

Up to 24,010 ac may be burned per year. Because most of the habitat is overgrown and skinks are patchily distributed, we anticipate that only 20 percent, or *approximately* 4,800 ac, may be occupied. Because of their biology, we do not have population estimates for skinks. Therefore, determining an estimate of the number of individuals that may be taken is difficult. We anticipate take associated with 100 percent of the blue-tailed mole skinks occupying the habitat on no more than 4,800 ac per year. The incidental take is expected to be in the form of *harassment and direct mortality or injury* and is not expected to result in significant negative impacts to the population over time.

Sand skink – The Service anticipates incidental take of the sand skink will be difficult to detect for the following reasons: (1) its fossorial behavior, with individuals usually just beneath the surface of loose sand; (2) low density within suitable scrub and similar habitats within its limited range; and (3) apparently suitable habitat may not be occupied. However, the Service anticipates incidental take of the sand skink associated with conducting prescribed fires and herbicide application. Burns will primarily occur in scrub, scrubby flatwoods, yellow sand scrub, and sandhill. Sand skinks inhabit open sand within scrub. Because skinks are patchily distributed across the landscape and prescribed fires do not burn all habitat, many skinks are likely to survive fires. Much of the habitat proposed for burning is low quality, containing dense scrub vegetation that may not be suitable for skinks. Therefore, it is likely that only a portion of the area to be treated is inhabited by skinks. Up to 24,010 ac may be burned per year. Because most of the habitat is overgrown and skinks are patchily distributed, we anticipate that only 20 percent, or *approximately* 4,800 ac, may be occupied. Because of their biology, we do not have population estimates for skinks. Therefore, determining an estimate of the number of individuals that may be taken is difficult. We anticipate take associated with 100 percent of the sand skinks occupying the habitat on no more than 4,800 ac per year. The incidental take is expected to be in the form of *harassment and direct mortality or injury* and is not expected to result in significant negative impacts to the population over time.

Highlands tiger beetle – The Service anticipates incidental take of the Highlands tiger beetle will be difficult to detect for the following reasons: (1) small body size of adults; (2) larva living below the surface; and (3) adults are not present year round. However, the Service anticipates incidental take of the tiger beetle associated with conducting prescribed fires. Much of the habitat proposed for burning is of low quality containing dense scrub where tiger beetles are not expected to occur. Because tiger beetles are patchily distributed across the landscape, adults are not present year round, and prescribed fires do not burn all habitat, many tiger beetles are likely to survive fires. According to surveys conducted in 2005, tiger beetles occurred on nearly 10 to 14 of the 44 proposed treatment sites listed in Table 1 (Knisley 2005). Population estimates of approximately 1,100 tiger beetles were reported on these combined sites (Knisley 2005). It is difficult to determine the number of individuals that would be injured or killed during the project due to numerous factors. We do not have a current population estimate of each site or assessment of current habitat conditions; many areas targeted are likely thick vegetation and may not be inhabited by beetles, which prefer open, scrub and sandhill conditions. Beetles, if present, may be patchily distributed. Also, factors associated with the burn (*e.g.*, seasonality of the burn, if site is burned in entirety, nature of the fire prescription, etc.) will affect the extent of injury or mortality. Burns conducted during the period of adult activity (mid-May through July) in areas

with adults may cause some mortality (Knisley 2005). Due to the wide array of factors associated with beetle distribution, habitat conditions, and timing of prescribed fire, we estimate that up to 360 beetles may be taken. The incidental take is expected to be in the form of *harassment and direct mortality or injury*.

Audubon's crested caracara – The Service anticipates the proposed action may result in incidental take in the form of harassment including disturbance that does not result in loss of reproductive productivity. Allowable disturbance may be behavioral modification of adult or juvenile caracaras such as foraging disruption due to helicopter operation in the vicinity or smoke produced by the prescribed burns. Prescribed fires with CFEST participation will be planned carefully to minimize the possibility of take of this subspecies. Up to 4,010 ac may be burned via helicopter per year, of which, less than 1,100 ac (all on the Prairie Tract) are suitable for caracara. Because less than 27 percent of the habitat proposed for helicopter burning is suitable for caracara and minimum caracara territory sizes are generally just over 1,000 ac (Humphrey and Morrison 1997), we anticipate up to one nesting pair of Audubon's crested caracara adults may be harassed by helicopter burns and by the fires themselves (smoke, noise, heat, etc.) each year. Juvenile caracaras (fledgling stage or older) may also be disturbed annually by the action. Because the maximum number of fledglings produced is three, up to three juveniles may be harassed. We do not anticipate adult or juvenile caracaras will be killed by this action. We also anticipate caracara foraging habitat will be improved by the proposed action. Furthermore, this habitat may be used as foraging areas for other nearby caracara territories.

The Service will not refer the incidental take of any migratory bird or bald eagle for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. §§ 703-712), or the Bald Eagle Protection Act of 1940, as amended (16 U.S.C. §§ 668-668d), if such take is in compliance with the terms and conditions (including amount and/or number) specified herein.

AMENDED EFFECT OF THE TAKE

In the accompanying biological/conference opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

The prohibitions against taking the species found in section 9 of the ESA do not apply until the Highlands tiger beetle or Florida bonneted bat is listed. However, we advise Federal Aid to consider implementing the reasonable and prudent measures that are already part of the proposed action. If this conference opinion is adopted as a biological opinion following a listing or designation, these measures, with their implementing terms and conditions, will be nondiscretionary.

AMENDED REASONABLE AND PRUDENT MEASURES

The Service is not aware of any reasonable and prudent measures that can be implemented to minimize take of the RCW, Florida scrub jay, eastern indigo snake, blue-tailed mole skink, sand skink, Highlands tiger beetle, Florida bonneted bat, or *Audubon's crested caracara* beyond those that are already part of the proposed action. However, the Service believes the following reasonable and prudent measure(s) are necessary and appropriate to minimize impacts of incidental take of FGSPs.

The CFEST will consult with FGSP biologist or the land manager during prescribed fire planning to determine occupancy of habitat. When conducting prescribed burns in occupied habitat, measures will be taken to minimize adverse effects to FGSPs by reducing the proportion of habitat to be burned annually (*i.e.*, not all habitat in an occupied patch will be burned in a single year), as long as the entire habitat patch is burned over a 2- to 3-year rotation. The timing of growing season burns will be considered also to minimize adverse effects.

AMENDED TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the ESA, Federal Aid must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline the required reporting and monitoring requirements. These terms and conditions are non-discretionary:

- 1) An annual report of the CFEST's activities will be provided to specify the properties where burns were conducted, detailing burn units and subunits burned, including maps and the acreage of each burn. The report will also include, in as much detail as possible, any effects to listed species documented before, during, or after the burns. These reports will be submitted to the Endangered Species Program Supervisor at the SFESO by December 31 of each year during which any burns have taken place; and
- 2) Upon locating a dead, injured, or sick specimen of RCW, FGSP, Florida scrub jay, eastern indigo snake, blue-tailed mole skink, sand skink, Highlands tiger beetle, or Florida bonneted bat, initial notification must be made to the nearest Service Law Enforcement Office (Fish and Wildlife Service; 9549 Koger Boulevard, Suite 111; St. Petersburg, Florida 33702; 727-570-5398). Secondary notification should be made to the FWC, South Region; 3900 Drane Field Road; Lakeland, Florida 33811-1299; 800-282-8002. Care should be taken in handling sick or injured specimens to ensure effective treatment and care, or in the handling of dead specimens to preserve biological material in the best possible state for later analysis as to the cause of death. In conjunction with the care of sick or injured specimens or preservation of biological materials from a dead animal, the finder has the responsibility to carry out instructions provided by Law Enforcement to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed.
- 3) No more than 25 to 50 percent of a patch of occupied FGSP habitat will be burned annually, as long as all habitat in that patch will be burned within the recommended 2- to 3-year rotation. If not feasible to burn only 25 to 50 percent of a patch at a time, a separate consultation will be necessary to evaluate impacts of the burn. If feasible, all growing season burns in dry prairie habitat will be conducted prior to June 28, because densities of FGSPs tend to increase on areas that are burned in the summer if this condition is met (Perkins et al. 2009).

AMENDED REINITIATION NOTICE

This concludes formal consultation and conference on the action outlined in the request. As provided in 50 CFR § 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency

action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

You may ask the SFESO to confirm the conference opinion as a biological opinion issued through formal consultation if the Highlands tiger beetle or Florida bonneted bat is listed. The request must be in writing. If the Service reviews the proposed action and finds that there have been no significant changes in the action as planned or in the information used during the conference, the Service will confirm the conference opinion as the biological opinion on the project and no further section 7 consultation will be necessary.

After listing of the Highlands tiger beetle or the Florida bonneted bat as endangered or threatened and any subsequent adoption of this conference opinion, Federal Aid shall request reinitiation of consultation if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect the species or critical habitat in a manner or to an extent not considered in this conference opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the species or critical habitat that was not considered in this conference opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

The incidental take statement provided in this conference opinion does not become effective until the species is listed and the conference opinion is adopted as the biological opinion issued through formal consultation. At that time, the project will be reviewed to determine whether any take of the species has occurred. Modifications of the opinion and incidental take statement may be appropriate to reflect that take. No take of the species may occur between the listing of the tiger beetle or Florida bonneted bat and the adoption of the conference opinion through formal consultation, or the completion of a subsequent formal consultation.

If you have any questions, please contact Marilyn Knight at 772-469-4297, or Dana Hartley at 772-469-4236.

cc: electronic only
FWC, Tallahassee, Florida (Laura Morse)
Service, Atlanta, Georgia (Diana Swan)
TNC, Babson Park, Florida (Tricia Martin)

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Figure 1. 2013 map of proposed burn units in Lake Wales Ridge State Forest.

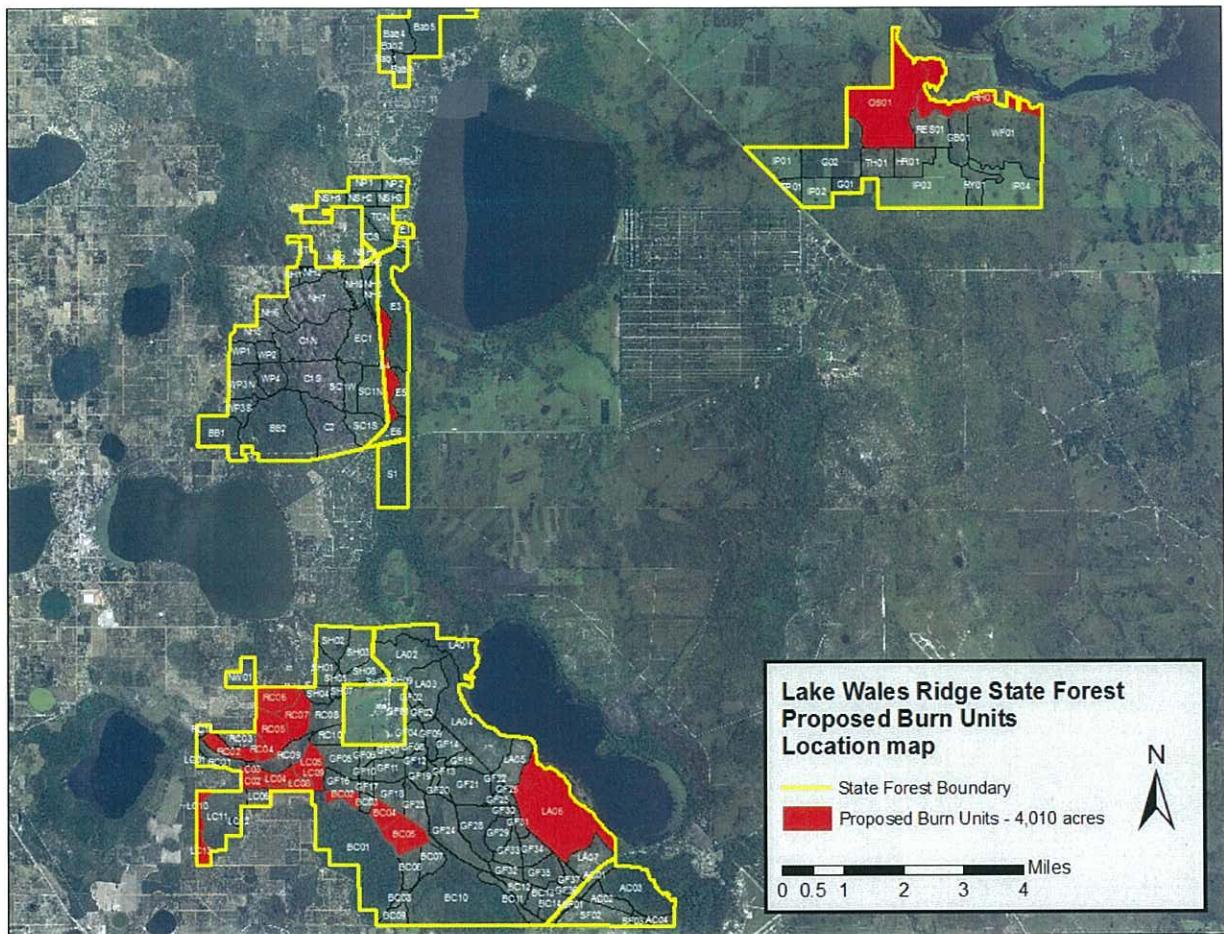


Figure 1. Arbuckle Tract proposed burn areas. LC units (400 acres), BC units (600 acres), LA unit (950 acres), and RC units (800 acres)

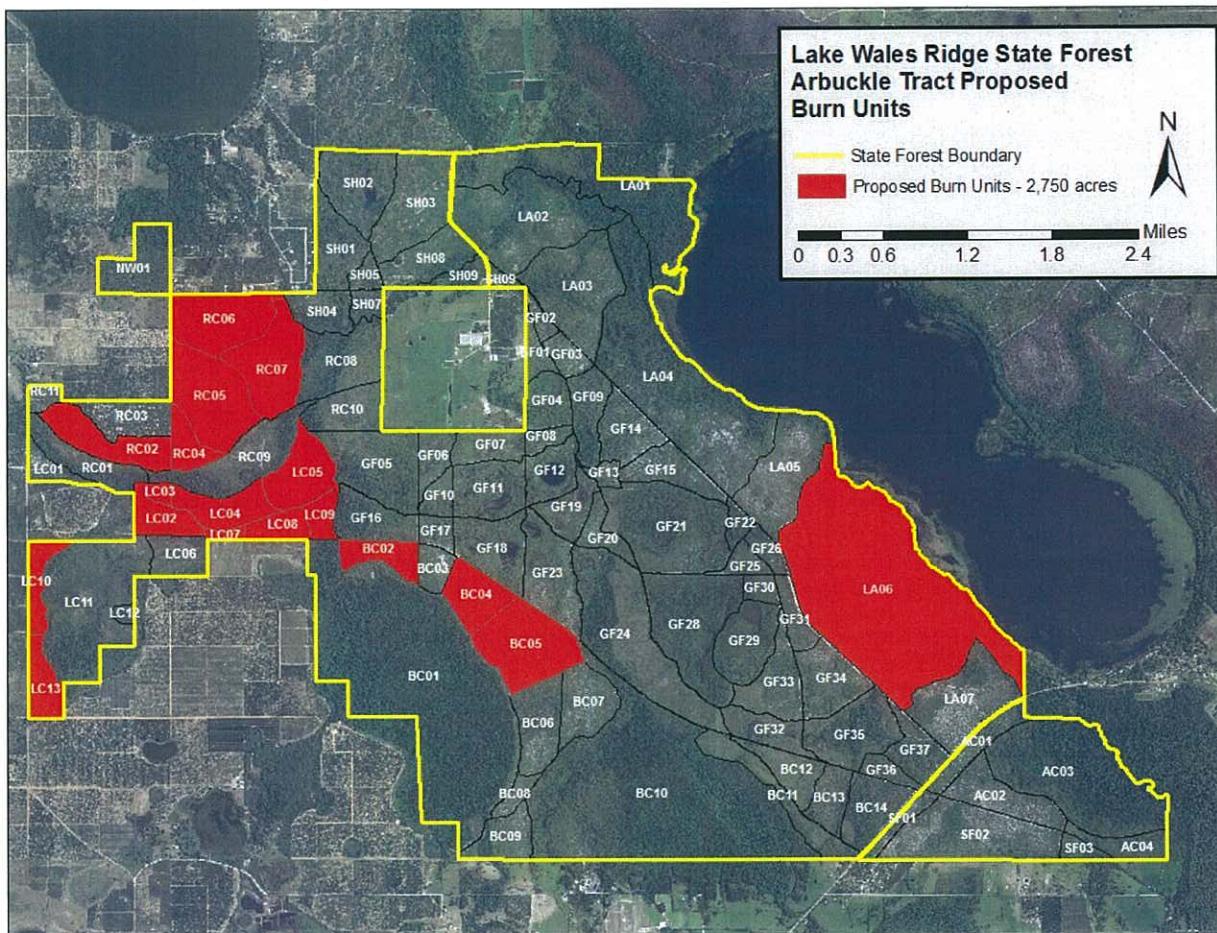


Figure 2. Walk-in-Water Tract proposed burn unit (160 acres).



Figure 3. Prairie Tract burn units (1,100 acres).

