United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960

July 18, 2007

Memorandum

To: Jeffrey Weller, Chief of Planning and Permitting, Southeast Regional Office

From: Paul Souza, Field Supervisor, South Florida Ecological Services Office

Subject: Biological Opinion Addressing Effects of Amending Recovery Permit TE 096068-2 for Reed Noss' research on the Florida Grasshopper Sparrow Research

This document transmits the Fish and Wildlife Service's (Service) biological opinion based on our review of the proposed issuance of a revised recovery permit to conduct research on the endangered Florida grasshopper sparrow (*Ammodramus savannarum floridanus*) (FGS) throughout the species' current and historic range within DeSoto, Glades, Hardee, Hendry, Okeechobee, Polk, Highlands, Manatee, and Osceola Counties, Florida, in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act) (87 Stat. 884; 16 U.S.C. 1531 *et seq.*). Your June 22, 2006, request for formal consultation was received on June 26, 2006. This biological opinion supersedes a previous biological opinion on the issuance of the original permit number TE-096068.

We have identified two of the proposed amendments which we do not think should be permitted; these items have been omitted from the project description and are described below:

1. Collection of two rectrices (tail feathers) from all nestlings per brood at age 5 days or older in order to quantify sex ratio of nestlings using DNA analysis. We believe collection of two rectrices from an individual FGS nestling will have detrimental physiological and behavioral effects on the species that have not been quantified. The fact these effects have not been quantified does not in any way imply the effects are negligible. Likely detrimental effects include the additional energy requirements required to grow new feathers, potentially greater energy expenditure in flight, reduced flight capabilities that may result in greater vulnerability to predators, and others. While determining sex ratio of nestlings would provide additional information about FGSs than is currently unknown, we do not believe this information would contribute significantly to the recovery of the species because there would be no known means to manage or otherwise address unfavorable nestling sex ratio. We believe the potential detrimental impacts to sparrows and the increased risk of injury, though unquantified, outweighs the conservation value of the documenting the sex ratio;

2. Removal of two rectrices per bird from adults and juveniles in order to determine the birds' diet during the non-breeding season using stable isotope analysis. As discussed

TAKE PRIDE® IN AMERICA

above, we recognize detrimental physiological and behavioral effects of the removal of rectrices on FGSs, though we again are unable to quantify the degree of impact this will have on FGSs. Unlike the proposed genetic analysis, we recognize obtaining information about FGSs diet would provide potentially valuable in designing appropriate recovery strategies and habitat management plans. Our primary reservations about employing this method result from weighing the impacts to FGSs against the degree of certainty in the results.

This biological opinion is based on published literature, research reports, the permit application and subsequent correspondence, telephone conversations, field investigations, and other sources of information. A complete administrative record of this consultation is on file at the South Florida Ecological Services Office (SFEFO) in Vero Beach, Florida.

Consultation History

The Service's Southeast Regional Office received a recovery permit application from Dr. Reed Noss (Applicant) dated June 22, 2006 to amend his current permit TE096068-2.

On June 26, 2006, the SFEFO received a request from the Regional Office Recovery Permit Biologist for formal consultation.

On July 19, 2006, the SFESO contacted the Southeast Regional Office via email to concur that the proposed action was likely to adversely affect the listed species and initiated formal consultation.

On July 19, 2006, the SFEFO contacted the Applicant, via email, to request additional information.

On July 19, 2006, the Applicant provided additional project information to SFEFO via email.

On September 9, 2006, the Applicant provided additional information about feather collection to support proposed isotope analyses.

On February 25, 2007, the Applicant provided a revision to proposed methods involving feather removal via e-mail.

On March 15, 2007, the Service met with the Applicant to discuss proposed permit modifications and obtain additional information relating to the February 25, 2007 information that was provided.

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

Pursuant to section 10(a)(1)(A) of the ESA, the Service proposes to issue an amended recovery permit to the Applicants for take of FGSs that will occur as a result of a 5-year research and monitoring project that the Service plans to fund involving conducting breeding and non-breeding season FGS surveys, trapping and banding FGSs, locating and monitoring FGS nests, collection of blood feathers from nestlings, juveniles, and adults to determine sex ratio and to conduct stable isotope analysis, monitor nesting activity though the use miniature cameras, and conduct observations of FGSs.

The proposed research is designed to address three primary goals, listed here, in order of priority. These are to: (1) determine the timing, extent, and characteristics of natal dispersal, and document post-breeding movements by adult and juvenile FGSs, including the transition between breeding and non-breeding seasons; (2) develop and parameterize an individual-based population simulation model, and apply this model to investigate functional connectivity (*e.g.*, dispersal and use of habitat corridors or stepping stones) and the potential for habitat restoration and population reintroduction in the broader landscape surrounding Kissimmee Prairie Preserve State Park (KPPSP) and linking it to Avon Park Air Force Range (APAFR) and Three Lakes Wildlife Management Area (TLWMA); and (3) investigate FGS breeding ecology, including detailed empirical studies of habitat requirements and habitat use, nesting ecology, reproductive success in different habitats (or microhabitats), and high-resolution modeling of potential metapopulation structure and source-sink dynamics. These three primary goals are interrelated, and some of the specific project objectives will address more than one of the primary tasks. This biological opinion will only address those field components of the proposed research that have the potential to affect FGSs.

The specific objectives of the proposed research are to: (1) document, using mist-netting, color-banding, and miniature cameras, natal dispersal and post-breeding movements, movements of individuals between territories (or patches) of different habitat quality within the same territory cluster and determine if metapopulation or source-sink dynamics apply; (2) locate and monitor nests and document reproductive success of the FGS in various habitat types and microhabitats (*e.g.*, undisturbed dry prairie sites of variable vegetation structure and plant species composition, semi-restored dry prairie, improved pasture) within currently occupied breeding sites; (3) examine the potential relationship between demography and population density (*i.e.*, some habitat patches with nesting sparrows could be pseudo-sinks, with crowding into the few remaining areas of suitable habitat leading to poor reproductive success); (4) determine if the time since last fire, distance from habitat edges (including fences and trees), predation, or variables other than habitat near the nest are correlated with reproductive success or other demographic variables; (5) identify and map documented and potential wintering habitat and record locations of birds in these habitats; (6) investigate potential ecological linkages between the breeding and wintering seasons, such as seasonality of burn and winter resource abundance; (7) attempt to document empirically, using mist-netting, color-banding, and miniature cameras, and in collaboration with other researchers, dispersal among sites within and among the three main FGS populations (KPPSP, APAFR, and TLWMA). To accomplish the goals and objectives, the following tasks will be conducted.

Monitoring Adult Abundance Using Point Count Surveys

The Applicant will conduct monitoring of the FGS population using standardized point counts on KPPSP's established network of 162 point count locations (Mulholland and Small 2001). The point counts are located within approximately 14 focal study plots that cover approximately 7 percent of the prairie habitat on KPPSP. These plots will also serve as focal areas for other project components, including color-banding and resighting adult FGSs, nest-finding, and estimating reproductive success. The point count method used will be consistent with past monitoring on these plots (see Mulholland and Small 2001), which has been conducted annually since 1999.

Each plot, or point count group, is composed of 10 to 15 points spaced 300 to 400 meters (m) apart. Point count locations are permanently marked with numbered posts, and locations are recorded with a global positioning system (GPS). Observers travel on foot to each station within a plot. At each station, the observer stops, listens, and observes grasshopper sparrows for 5 minutes. All birds (not just singing males) heard and observed within 100 m of the point pole are marked on an aerial photograph. Notations on the maps identify adult and juvenile FGSs, singing and non-singing FGSs, bird movements, and counter-singing. Careful notes are recorded when more than one bird location is observed in an attempt to determine if just one bird is being observed in different locations or if there is more than one bird within the 100-m radius circle. If a FGS is observed or heard outside of 100 m, its location is recorded as well as notations to distinguish birds. FGS Birds observed outside of the 5-minute survey time are also noted on the data sheets, but are not considered during analysis of the standardized survey data.

Each point count station will be surveyed at least three times during separate sampling efforts in the period from approximately April 1 to June 30. To increase the chances of detecting all FGSs on the study plots, the surveys will be separated by 1 to 2 weeks in order to ensure that survey results are not biased by different behavior during different stages of the breeding cycle, as described in Vickery (1996).

Abundance estimates will be obtained from these surveys using distance sampling (Buckland et al. 2001). Distances from point count locations to individual birds may be estimated by observers in the field or determined from mapped locations of bird observations. Adult abundance will be estimated in selected intensive study plots during the breeding and winter seasons by detailed mapping of bird registrations. For the breeding season, registrations and other observations (*e.g.,* chasing, counter-singing) will be used to map territories (*i.e.,* spot-mapping technique [Gibbons et al.1996]). The Applicant will estimate adult sex ratio from mist-net capture data. For the winter season, mapped registrations will be correlated with use of fine-grained habitat features, as well as to determine movements and use of habitat across and among sites.

While these methods will be primarily applied at KPPSP, they may be extended to other study sites to aid other land managers or assist in off-site surveys.

Nest-finding

The Applicant will select plots in which to focus intensive nest-searching efforts, assisted by a thermographic imager (see Galligan et al. 2003). Observers will be trained in nest-searching techniques and identification of sparrow vocalizations and behavioral cues that will help to identify general areas where nests may occur. Nest searches will include use of behavioral cues, random searches, and systematic searches. Each survey type will focus within study plots where information about FGS locations is already known. Search maps of the plots will be maintained. Nesting activity, identified by adults carrying nest material, food, or fecal sacs, will be further investigated using a thermographic imager following methods described in Galligan et al. (2003). These potential sites will be marked when located via flagging (with the flag located a specified distance and direction from the nest and nesting areas) and recorded using GPS.

Systematic searches will employ two techniques, the sweep stick and rope-drag. The sweep stick technique was first described in Winter et al. (2004) as a means for finding nests of grassland passerines. Briefly, the method utilizes a lightweight stick or rod roughly 2 m in length. The researcher walks through the prairie and sweeps the stick back and forth along the top of the vegetation while walking haphazardly or on transects in an attempt to flush a female (incubating or brooding) from her nest. A larger surface area is covered and the probability of flushing females is increased compared to the researcher walking through the same area without the stick. Transects can be walked using one or multiple researchers.

With the stick leading the advance through the vegetation, the probability of trampling of the nest and its surrounding vegetation during nest searching is reduced compared to systematic walking without the stick. The cryptic nature of FGS nests makes locating the nest extremely difficult even after a bird has been flushed. To further reduce potential of trampling nest and vegetation if a nest is not found within a short search of the flush site, the sweep stick method can be used in conjunction with the thermographic imager. Areas where birds flush during daytime systematic surveys can be re-visited at night with the thermographic imager to determine if an active nest exists in the area.

Winter et al. (2004) reported that there was no significant difference in rates of nest abandonment between nests found by behavioral observations and those found using systematic walking which usually utilized the sweep stick. Use of sweep sticks greatly increases the probability of locating a nest during incubation above the behavioral cue method. Nesting success estimates that include data from the incubation period (when natural impacts to nest success such as predation may be significant) are more accurate than estimates based only on data from the nestling stage alone. The likelihood of obtaining a larger sample size of nests to monitor is also increased above that which can be located through purely behavioral observations. The sweep stick method will allow researchers to monitor nests with minimal impact on the vegetative cover while gaining greater insight into nesting ecology of the species.

The standard rope-drag, also described in Winter et al. (2004), is a second type of systematic survey for finding nests of grassland passerines. This method involves the use of a long rope stretched between two observers who then drag it across the top of the vegetation in order to flush a bird from its nest. The site of flushing can then be marked and later searched for a nest. The rope can also be fitted with objects (*e.g.,* plastic bottles containing a few shells or rocks tied to the rope) spaced along its length to increase the noise factor as the rope skims across the vegetation. Widely and successfully used in short and mid-grass prairies (especially for waterfowl) and in pastures, it is advantageous for systematically covering large areas relatively quickly (thereby reducing disturbance compared to some other nest search techniques). In tall-grass prairie and denser vegetation types it has not been as effective as in the shorter stature vegetation types because the rope is too distant from the nest in the tall vegetation to cause flushing.

As in the sweep stick technique, the probability of trampling of the nest and its surrounding vegetation during nest searching is reduced compared to systematic walking without a rope. To further reduce potential of trampling nest and vegetation if a nest is not found within a short search of the flush site, the rope-drag method can be used in conjunction with the thermographic

imager. Areas where birds flushed during daytime systematic surveys using the rope-drag method can be re-visited at night with the thermographic imager to determine if an active nest exists in the area.

In addition to the standard rope-drag technique this study will also utilize a specialized rope-drag method. This alternate method utilizes a pole that is placed near a male's preferred perch, which delineates his territory boundary. Connected to the pole will be a 31 m rope with the attached plastic bottles containing pebbles to increase the noise disturbance when moved. Ropes and noise-making devices shall not be weighted to the extent that they significantly disturb vegetation when the rope passes over it. One researcher can then sample alone by dragging the rope across the top of the vegetation in a circle around the pole attempting to flush the incubating or brooding female. Upon flushing a bird, the location of the flush will be marked with a flag and dragging is then continued until the circle is complete. This method allows for a systematic search for incubating or brooding females within a specific male's territory thus providing a more focused area to search for the nest. Four complete sweeps with this method will cover roughly 65 percent of a male's average 1.8 ha (Delany et al. 1995) territory. Unlike walking transects with multiple people, this method requires only one person and, therefore, decreases the opportunity for trampling of nests. This method will be utilized only in moderate temperatures to decrease the amount of stress imposed on the FGSs and disturbance to their nests. As in the standardized rope-drag technique, areas where FGSs flushed during daytime systematic searches but nests were not found after a brief search can be re-visited at night with the thermographic imager to determine if an active nest exists in the area.

Each site will be investigated from approximately 3 hours before to 4 hours after sunrise and 2 hours before sunset until dark. Site visits will only be conducted when weather conditions are judged to not negatively impact nest success. Nest-searching and monitoring conducted prior to sunrise will be conducted using a thermographic imager, and will be conducted in such a manner that is not expected to result in flushing sparrows from nests. The researchers will be alert for evidence that this activity increases the risk of predation by nocturnal predators such as raccoons. Use of the imager will allow researchers to note thermal differences between nest and/or nestlings and the background vegetation temperatures. The imager can provide a radial search of up to approximately 4.3 m from the potential nest site. With the assistance of the thermographic imager, the task of searching for nests will become more time efficient and have a higher success rate than previously possible. It may also reduce the risk of damage to nests from observers by allowing observers to detect nests without disturbing surrounding vegetation.

Estimates of Reproductive Success

Once located as described above, nests will be checked to determine stage (eggs or chick) and egg or chick numbers, and then checked on a 2- to 3-day interval. Extreme caution will be taken not to disturb the nest or the vegetation around the nest. The Applicant will record data on nests only after egg laying commences, to the extent this can be determined, and taking care not to influence nest abandonment. Several non-terminal routes to each nest will be used to reduce the probability of depredation related to nest visits. Causes of nest failure will be recorded in the field when determinable. One or 2 days prior to fledging, nestlings will be banded with a numbered aluminum U.S. Geological Survey (USGS) band and unique combination of up to

three colored plastic leg bands to facilitate individual identification. Once the nestlings have fledged or the nest is depredated, the precise nest site will be recorded using GPS, and vegetative measurements will be taken at the nest site to characterize nesting habitat. Data on the distance from nests to habitat edge (to be defined by vertical features, such as tree lines and fences) and other features also will be collected. The Applicant will estimate reproductive success by monitoring all nests that are located from March through at least July, or until all young have fledged from each nest. Collection of these data will allow analysis of nest survival rates during each stage of the cycle, and will also allow investigation of habitat features correlated with successful and unsuccessful nests.

Monitor nests during the nestling stage using miniature cameras

A camera system will be deployed to monitor bird activity within FGS nests to obtain a unique data set that cannot be obtained by any other method. The primary objective of these cameras will be to examine FGS parental investment in relation to variation in habitat quality.

This technique will place a miniature, well-camouflaged camera within photographic range of the nest entrance to continuously document nesting activity over the specified period of camera operation, including parental visits to the nests, identification of adults visiting the nest (if color-banded), food load size (measured against bill length), potentially food type, and predation events. By placing cameras at nests located in habitats predicted to be of varying quality, nesting behaviors and predations may be more accurately documented than through simple nest checks. This knowledge will contribute to our assessment of habitat quality for nesting FGS.

To minimize any negative impacts to the FGS, cameras will only be placed nests during the incubation or nestling period (not during nest building, egg-laying); abandonment during the incubation and nestling periods is unlikely as the adults have a large investment at that time. The mini-cameras will be camouflaged to blend in with the natural surroundings of the nest site cameras shall be placed no closer than 0.3 m from the nest and all other components will be placed at a distance from the nest (at least 20 m from the nest) sufficient to not disturb the adults during data downloads or battery changes. Installation of cameras and equipment shall be conducted within 10 minutes or less to minimize the time that adults are flushed from the nest site and disturbance to adults and nestlings. No equipment shall be taller than the mean vegetation height in the vicinity of the nest. In addition, all equipment will be placed to maximize concealment. Camera and recorder maintenance activities should not occur more frequently than once per day, and every effort will be made to minimize the number of visits to nest areas and camera equipment. Observation of the adults will be made immediately following camera placement to insure they resume normal behavior. Observations will also be made during data downloads or changes of video tape and battery; if the adults show signs of agitation from the presence of researchers then these components will be moved further from the nest. Variability in responses to disturbance among species and individuals is well documented, and nest abandonment from camera disturbance is possible in FGS. If data from initial sampling indicates negative impact to nestling success, the activity will be halted immediately. All potential effects to FGSs or their nests resulting from the cameras or their placement shall be reported to the Service by the next workday.

Capture Methods

Besides the banding of nestlings in the nest, juveniles and adults will be captured virtually year-round, but with the method varying by time of year. During the non-breeding season, mist-net arrays consisting of up to 10 mist-nets set up in a line, will be used in conjunction with active FGS drives. The drives consist of several workers dragging a weighted rope across the vegetation and "herding" birds into the nets. During the breeding season, playbacks of tape-recorded FGS vocalizations will be used to lure singing males into mist-nets by eliciting a territorial response in the males. Juveniles and females may be captured using this technique as well, but at a much lower frequency (Paul Miller, KPPSP, personal communication, 2004). The Applicant will undoubtedly capture many bird species other than FGSs in nets, and this method will help identify and track co-occurring (and potentially competing) bird species year-round.

All captured FGSs will be banded with a numbered aluminum USGS band, and with a unique combination of up to three colored plastic leg bands. Non-target birds that are incidentally captured, including several sparrow species and another subspecies of grasshopper sparrow (*A. s. pratensis*) that overwinters in Florida, will be banded with only a USGS band. Efforts to band breeding male FGSs will be focused in study plots, but all males will be color-banded to facilitate identification and allow investigation of territory size, occupancy, and movements. Up to 200 individual FGSs may be banded each year, including nestlings.

Collect morphometric measurements of nestlings

Morphometric measurements of nestlings at age 5 days or older will be collected during the nest visit for banding nestlings. Measurements will include recording nestling weight, and collection of one additional measurement of nestling size, such as wing chord, tail feather length, bill length, tarsus length, or a similar measure. Collection of this data will allow for examination of nestlings size and parental investment in relation to different habitat types (*i.e.* time after fire and hydrological differences) and will help to evaluate habitat quality for nesting FGSs. The recording of such measurements, under these identified conditions is not believed to appreciably increase the level of take above that anticipated to occur during nestling banding. The direct measure of nesting habitat quality will contribute to habitat conservation and management objectives for recovery of the species.

Band Resighting and Mark-recapture Survival Analysis

During all project components, the Applicant will work to observe FGSs and determine whether any individuals that are observed are banded and identify the individual from its color-band combination. This resighting effort will focus on study plots where banding efforts are focused, but will also extend outside of plots. To conduct resightings, observers will approach FGSs that are seen, but only to the point where they can use binoculars or spotting scopes to determine whether the bird is banded. Efforts to identify all of the colored leg bands to allow identification of an individual FGS may involve prolonged observation or intentional flushing of the bird. Information obtained through resightings will provide supplementary information on FGS movements, dispersal, survival, and recruitment. Survival rates will be estimated for banded FGSs using a computer program called MARK.

Similar to the point count monitoring, capture, banding, and resighting efforts are expected to occur primarily on KPPSP, but may be extended to include other sites, including privately-owned lands and other public lands where FGSs occur.

Radio Telemetry

Up to 50 adult or recently fledged FGSs that are captured in mist-nets will be fitted with radio transmitter harnesses each year for studies of dispersal and other movements. The Applicant will use transmitter harnesses constructed of inelastic 68 kilogram-test black nylon bait-casting line that will be individually fitted to each bird. A short segment of cotton sewing thread will be inserted into the posterior end of the harness, and this will serve as a weak link, allowing the transmitter to break away after the thread deteriorates sufficiently. After fitting the harness to an individual bird, adjustment threads will be knotted and glued in place at the anterior end of the transmitter. In the event a battery expires prematurely or an FGS cannot be relocated after a long-distance dispersal event, the uncoated cotton "break-away" thread will deteriorate in humid Florida field conditions over time causing the radio transmitter to detach from the subject FGS.

Prior to attaching transmitters to FGSs, the Applicant or agent of the Applicant that will be conducting transmitter attachment shall conduct trial attachments of at least five transmitters on house sparrows (*Passer domesticus*) and observe the behavior for a period of 1 to 2 days. If any injuries result, additional attachments will be conducted until five sequential injury-free attachments have occurred. This measure is intended to ensure a sufficient level of proficiency in attaching transmitters, and should be conducted immediately prior to attaching transmitters to FGSs. The results of these attachments should be provided in writing to the SFESO prior to initiating attachment of transmitters to FGSs. Transmitters may initially only be applied to up to 10 individuals. These individuals should be monitored twice daily through telemetry to ensure that they are moving in a manner consistent with normal movements. These individuals should also be recaptured after 1 week to inspect them for any injuries resulting from the transmitter. All injuries should be reported to the SFESO by the next working day, and a determination will be made as to whether the injuries observed warrant re-fitting transmitters using the same method or whether they warrant the removal of transmitters from all individuals.

As radio transmitters near the end of their expected battery life, birds will be recaptured and thoroughly evaluated, and transmitters will be replaced or removed. Through replacement of transmitters, the Applicant hopes to be able to monitor individuals for long periods (up to 7 months). Transmitters will not be replaced on an individual if it appears to be in poor physical condition (indicated by small fat reserves, low body weight, and poor breast muscle development). Transmitters will also not be replaced if there is evidence of physical injury, including abrasions resulting from the transmitter or harness, excessive feather loss, or other injuries.

Once a transmitter is attached, radio-marked FGSs will be located approximately once every 1 to 2 days. Birds will be located mostly from the ground with standard telemetry receivers and directional antennae (generally from a vehicle with a mounted extender pole), and locations will be determined through triangulation. In addition, more precise locations may be recorded by single observers homing in on a radio-marked FGS and flushing the individual. When observers are not able to locate a radio-marked individual, the Applicant will attempt to locate it and track

it through a combination of extensive ground-based searches and aerial telemetry. Once an FGS is radio-marked, observers will continue to radio-track each individual, even if it leaves KPPSP. Obtaining permission to access privately-owned land to continue radio-tracking is the Applicant's responsibility.

The Applicant will attempt to remove all radio transmitters at the end of the study. Radio telemetry will allow the Applicant to document predation or mortality of FGSs that would not otherwise be detected. Any carcasses or remains of FGSs that are located during the course of the project will be immediately submitted to an appropriate veterinary facility for post-mortem examination to determine cause of death, and remains will be deposited in a public museum collection, such as the Florida Museum of Natural History, or similar facility.

The action area is defined as all areas within the range of the FGS to be affected directly or indirectly by the Federal action. The Service has determined the action area for this project is DeSoto, Glades, Hardee, Hendry, Highlands, Manatee, Okeechobee, Osceola, and Polk Counties (Figure 1).

STATUS OF THE SPECIES/CRITICAL HABITAT

The following discussion is summarized from the South Florida Multi-Species Recovery Plan (MSRP) (Service 1999), as well as from recent research publications and monitoring reports. A complete FGS life history discussion may be found in the MSRP. No critical habitat has been designated for the FGS.

Species/critical habitat description

The FGS is one of four North American subspecies of grasshopper sparrow, and is endemic to the dry prairie region of central and southern Florida. Based on declines in suitable habitat and population size, the National Audubon Society placed the FGS on its blue list in 1974. The FGS was listed as endangered by the State of Florida in 1977. The Service listed the FGS 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 FR 27495).

The FGS is a small, short-tailed, flat-headed sparrow averaging 13 centimeters (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 FGSs are whitish underneath, unstreaked, with a buff throat and breast. Juvenile FGSs have streaked breasts. The ventral color pattern resembles that of the Bachman's sparrow (*Aimophila aestivalis*). The rectrices of the FGS 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).

The FGS is marked with a longer bill and longer tarsi than the northern subspecies, *A. s. pratensis*. The FGS also has a much darker, blackish dorsum than *A. s. pratensis*, with more grayish flanks (T. Dean, Service, personal communication, 2002). Adult Henslow's sparrows (*A. henslowii*) and Le Conte's sparrows (*A. leconteii*) are similar in appearance to the FGS, but they both have ventral streaking, which is lacking in adult FGS (Stevenson and Anderson 1994).

And, although the juveniles of these three different subspecies would be difficult to distinguish visually from one another, only the FGS breeds in Florida. Therefore, there is no overlap in juvenile distribution.

During the breeding season, male and female FGSs can be distinguished in the hand by the presence of a cloacal protuberance in the male or a brood patch in the female. Gender may also be determined based on wing chord length and body weight, but this method is not reliable due to some degree of overlap between the genders. Female FGSs are generally smaller and proportionally heavier than males (Delany et al. 1994).

The FGS 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). FGSs sing while perched upon dead palmetto leaves, dead oak twigs, staggerbush (*Lyonia* spp.), and tarflower (*Befaria racemosa*) between 15 and 90 cm in height (Nicholson 1936; Delany et al. 1995). They may also sing from the ground (T. Dean, Service, personal communication, 2002).

Life history

FGSs 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. The dry prairies are relatively flat and are moderately to poorly drained. The soils typically consist of 0.3 to 1.0 m of acidic, nutrient-poor quartz sands overlying a high clay subsoil or organic hardpan (spodic horizon) (Florida Natural Areas Inventory [FNAI] and Florida Department of Natural Resources [FDNR] 1990; Abrahamson and Hartnett 1990). Both the heavy subsoil and hardpan reduce the movement of water below and above their surfaces (FNAI and FDNR 1990). Thus, dry prairies may become flooded for short periods during the rainy season, but remain dry for the remainder of the year. The water table in these prairies is normally found between several centimeters and a meter below the soil surface.

FGS habitat consists primarily of large, expansive patches of contiguous native dry prairie vegetation that have been regularly maintained with fire. Dry prairie vegetation is composed of a diverse variety of species, including grasses, forbs, and shrubs. Orzell and Bridges (2004) report that over 650 vascular plant taxa have been recorded within dry prairies. Habitat characteristics that are important for FGSs include high percentage of bare ground cover and low vegetation height (30 to 70 cm) (Delany et al. 1985). Both of these characteristics are maintained by frequent fire. Some dry prairies may be artifacts of clear-cutting, unnaturally frequent burning, livestock grazing, and alteration of hydrology (Abrahamson and Hartnett 1990).

When compared with habitat of other grasshopper sparrow subspecies, that used by *A. s. floridanus* is characterized by a larger percentage of shrub and bare ground, a smaller percentage of tall vegetation, and less litter (Delany et al. 1985). Because the sparrows are ground-dwelling birds, they usually require at least 20 percent bare ground for unrestricted movement and foraging, but

need enough vegetation to provide nesting cover (Whitmore 1979; Vickery 1996). Large areas of prairie habitat, possibly greater than 4,000 hectares (ha), are needed to maintain self-sustaining populations of FGSs (Perkins 1999, Perkins and Vickery 2001).

FGSs can be reproductively successful in pastures dominated by non-native sod-forming grasses that are in some cases (Mulholland and Small 2001). However, as pastures become intensively managed and native vegetation components and bare ground are eliminated, FGS populations may decrease or disappear (Delany and Linda 1994). Little is known about what characteristics of pastures dominated by non-native species may result in occupancy by FGSs. Field observations have revealed use of non-native habitats including bahia pastures with nearly 100 percent ground cover (T. Dean, Service, personal communication, 2002). FGS appear to prefer pasture sites containing some structural diversity, such as bunchgrasses (*Andropogon* spp., *Aristida* spp, *Schizacyrium* spp.), small shrubs (*Asimina* spp., *Myrica cerifera, Serenoa repens*, and others), and forbs (*Eupatorium* spp., *Solidago* spp., and others) (T. Dean, Service, personal communication, 2002). Appropriate management of bahia pastures to maintain grasshopper sparrow habitat remains largely unknown.

FGSs are secretive by nature, and have few behaviors or characteristics that enable them to be readily located or identified. They are almost exclusively terrestrial, spending nearly all of their time on the ground. During the breeding season, males perch, sing, and perform short territorial display flights for a few hours each day. Females are rarely seen, and can only be regularly observed when carrying food to nestlings. Outside of the breeding season, FGSs become much more secretive than during the breeding season, and generally do not vocalize or fly except in response to disturbance. In general, FGSs prefer to avoid disturbances by running along the ground and generally only fly if a potential predator approaches within 2 to 3 m. FGSs form pair bonds during the breeding season, but remain solitary for the remainder of the season, and rarely interact with other FGSs outside of the breeding season.

During the breeding season, FGSs form breeding aggregations within suitable habitat (Delany 1996), and individual male sparrows set up territories within the breeding aggregations. Territories tend to be widely and irregularly spaced, often with un-defended space between adjacent territories. Territories are rarely tightly-packed within a prairie area. Territory density has been shown to be related to the time since habitat has burned. Shriver (1996) and Shriver and Vickery (2001) report significant declines in territory density as time since fire increases, but see Delany et al. (2002). Delany et al. (1995) found mean breeding territory size for FGSs at APAFR to be 1.80 ha, with a maximum size of 4.82 ha. As the time since last fire increases, territories are reported to be established less frequently (Walsh et al. 1995), and FGS home ranges become larger (Delany et al. 1992). Male FGSs 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 FGSs exhibit strong site-fidelity to nesting territories, although individuals have been observed traveling as far as 4 kilometers (km) from the nesting territories during winter months. The majority of males (86 percent [Delany et al. 1995]; 100 percent [Dean 2001]) remain on the same territory in consecutive years.

Male FGSs generally begin singing in mid-March. Their singing usually diminishes by late June, although they continue to sing through August (T. Dean, Service, personal communication,

2002). Following summer burns, males may sing more frequently than they do in unburned areas (Vickery 1996; Shriver 1996; Shriver et al. 1996). Males may sing throughout the day, although they sing more frequently from sunrise to 9:00 a.m. and 15 minutes before sunset (Vickery 1996). FGSs have two distinctly different songs (Vickery 1996), and when establishing breeding territories, they are reported to sing the shorter primary song (Smith 1959); the sustained, or secondary song, is thought to play a role in attracting a mate and maintaining a pair bond (Vickery 1996).

FGSs begin nest-building activities approximately 4 weeks after the onset of territorial singing (Vickery 1996). Nests are located on the ground in shallow (less than 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 (*Aristida beyrichina*), bluestems (*Andropogon* spp.), and yellow-eyed grass (*Xyris* spp.). The outer diameter averages 10.3 cm, the inside diameter averages 6.9 cm, and the height averages 7.7 cm. The mean orifice width is 5.1 cm (Delany and Linda 1998a). Nests are typically shielded by dwarf shrubs (*i.e.*, saw palmetto [*Serenoa repens*]) and dwarf live oak, rather than grass clumps as reported for other subspecies, and nest opening directions are randomly oriented (Delany and Linda 1998a). Nests are placed within patches of dense vegetation, surrounded by an area of more open vegetation, possibly to provide visual shielding from potential predators while still allowing adults easy access to nests from the ground (Delany and Linda 1998b). When delivering food to nestlings, adults alight on the ground 2 to 5 m from the nest and proceed to the nest on foot.

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 three to five 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 TLWMA, and 3.75 (n = 4) at KPPSP. Eggs are white, smooth, slightly glossy, and lightly speckled and spotted with reddish-brown markings. These markings are generally sharp and well-defined, either scattered over the entire egg or concentrated toward the large end.

Female FGSs incubate their eggs 11 to 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 to 12 days (T. Dean, Service, personal communication, 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). Nesting activity late in the season regularly occurs, and Perkins (1999) reported a nest with eggs in late August that would not have fledged until mid-September. Breeding activity has been reported to increase following summer fires (Shriver 1996; Shriver et al. 1996; Shriver et al. 1999; Shriver and Vickery 2001).

FGS hatchlings are altricial and are brooded by the female for up to 9 days (Vickery 1996; Perkins et al. 1998). When young hatch, both male and female become more defensive to human and other intrusions (Smith 1963). Nonparental attendants have been reported for *A. s. pratensis* (Kaspari and O'Leary 1988), but complete information on their function or the extent of cooperative breeding is not available. This behavior has not been documented in FGSs.

Both parents continue to provide care after young fledge from the nest, though the amount of time they do so before the young become independent is poorly documented (Vickery 1996). In Florida, fledglings are reported to aggregate in loose flocks with no parental care 3 to 4 weeks after fledging (Vickery 1996). After juveniles leave the natal territory, little is known about their behavior, but the few recaptures of independent juveniles that were originally banded as nestlings suggest that juveniles may travel widely across the landscape (T. Dean, Service, personal communication, 2002; Miller 2005).

During the non-breeding season, FGSs 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, with individual home ranges varying from 1.0 to 173.6 ha (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). A FGS originally banded as a juvenile at OQ Range in APAFR was recaptured at KPPSP 6.5 years later, approximately 30 km from the original capture site. This bird is the first marked individual to leave one of the six extant populations and be recaptured in another, and this movement constitutes a record for overall distance traveled by an individual FGS (Miller 2005).

Barriers to movement include forested edges and even sparsely stocked pine flatwoods. One radio-marked FGSs crossed a forested slough that was at least 100 m wide, indicating that such features may not represent complete barriers to movement. However, during a radio telemetry study, FGS regularly encountered these features and only one individual ever ventured to cross one (Dean 2001). The width and density of the forested habitats certainly affect the likelihood of FGS movement across them.

FGSs forage on the ground or just above it. An examination of the contents of 10 stomachs of FGSs 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). FGSs switch to a seed-dominated diet during the non-nesting season, but still consume some animal matter (Vickery and Dean 1997).

Population dynamics

FGSs 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 to 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 depredation and nest failure rates may result in widely varying reproductive success among years.

Little is known about the timing, extent, or frequency of dispersal by juvenile sparrows, though most agree that juveniles are the most likely group to disperse (Vickery and Perkins 2001). This represents one of the most important remaining information gaps about FGS ecology. Genetics studies indicate little genetic differentiation among spatially distinct populations, suggesting either relatively regular movement of individuals among the disjunct populations, or recent isolation of the populations (Delany et al. 2000). In 2003, Miller (In Press) documented the first known dispersal between disjunct populations when a FGS originally banded as a juvenile on OQ Range in APAFR was recaptured at KPPSP. Besides this one observation, there are no empirical data available to calculate rates of dispersal among populations. The number of dispersing individuals may be too low to have a demographic effect on any of the populations, but may be sufficient to maintain genetic diversity (Delany et al. 2000).

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 and 0.53 at APAFR and TLWMA, respectively. Delany et al. (1993) estimated a pooled annual survival rate of 0.598 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 FGSs 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 that female survival rates approximate those of males.

Studies at APAFR and TLWMA have recorded several predation events for radio-marked adult FGS. Potential or probable predators include mammals, snakes, and birds (Perkins et al. 1998; Dean 2001). The main cause of adult mortality appears to be predation, primarily by wintering raptors (T. Dean, Service, personal communication, 2002). The majority of adult mortality probably occurs during the winter when migrant raptors occur in large numbers in central Florida. Red-shouldered hawks (*Buteo lineatus*) are the only common raptor that occurs in dry prairies during the breeding season and they do not regularly prey on birds (K. Meyer, University of Florida, personal communication, 1999). Loggerhead shrikes (*Lanius ludovicianus*) are known to prey on adult FGSs year-round, but FGSs are not common prey and are only rarely captured. 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 (*Dasypus novemcinctus*) (Vickery 1996).

Status and distribution

The current known range of the species is limited to Highlands, Okeechobee, Osceola, and Polk Counties. Early records for abundance and distribution of FGSs are scarce, though it is believed that the species was once more numerous and widespread than it is today (Delany 1996). Howell's (1932) observations of FGSs suggest that population numbers were greater during the early 1930s. Breeding colony size at that time was apparently three to 19 pairs, although precise survey data for the early 20th century are not available (Howell 1932; Smith 1968; McNair 1986). Apparently, FGS numbers were never constant or predictable. Nicholson (1936) noted that "grasshopper sparrows do not occupy all apparently suitable habitats, and the species fluctuates considerably in abundance from year to year." This is further supported in the final rule that added FGS to the list of endangered species, which stated that "The habitat needs of the species are specific, and its presence in any one area over a long term cannot be predicted or assured" (51 FR 27492).

Because the FGS 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 range-wide FGS population. Estimates of the historical and current extent of dry prairie within central Florida vary greatly. Florida dry prairie, the only place where FGS occur, is ranked as a G2 (globally imperiled) community type (FNAI and FDNR 1990; Grossman et al. 1994). Noss et al. (1995) considered ungrazed dry prairie of Florida to be an endangered ecosystem (greater than 98 percent habitat loss and continued threat). In central Florida, within the range of the FGS, there continues to be a reduction in area and fragmentation of high-quality dry prairie and an even greater reduction in the number of sites that have been consistently burned and that have minimal human disturbance (Cole et al. 1994; Bridges 1997).

Obtaining consistent estimates of historical and existing areas of dry prairie vegetation is difficult. Kautz et al. (1993), based upon calculations from an early vegetation map of Florida (Davis 1967), estimate that 0.83 million ha, or 5.9 percent, of pre-settlement Florida was covered with dry prairie. By 1989, they estimate that 0.56 million ha of dry prairie remained. Although this figure includes areas outside the historic range for dry prairie given in Davis (1967), it represents a loss of 0.27 million ha, or 33 percent, of the original area.

Aerial surveys of dry prairie habitat indicated that only 156,000 ha 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). FGS 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.

Delany et al. (2005) reported that efforts to identify dry prairie remnants through remote sensing indicated a remaining dry prairie area of 64,821 ha in Florida, with the majority of the remaining prairie occurring on conservation lands. Follow-up surveys of 12 privately-owned dry prairie areas failed to locate any FGSs that had not been previously documented. Delany (2006) conducted

additional detailed assessments of the habitat condition of dry prairie patches through helicopter surveys, and reported that 44,933 ha of dry prairie remained in a condition that represented potential FGS habitat, with 69 percent of this area occurring on existing conservation lands.

In general, endemic habitat specialists with restricted ranges, such as the FGS, are sensitive to many environmental factors, including hydrological changes and degradation or loss of habitat. Changes in hydrological management regimes that render nesting areas too wet during the nesting season may affect the FGSs ability to reproduce. Overgrazing may eliminate plant species necessary for foraging and reproduction, as well as limit the amount of available cover to conceal nests. In native dry prairies, lack of management or inappropriate fire management practices can lead to overgrown breeding areas or sites with woody plant invasion. These conditions can rapidly lead to habitat conditions that are unsuitable for FGSs.

Fire is the primary process that maintains native prairies. The natural fire-return interval for dry prairie communities is estimated to be 1 to 4 years (Abrahamson and Hartnett 1990) and most managed dry prairies are maintained on a 2- to 3-year burn rotation. The need for frequent and often intensive management of lands that support FGS will continue to make its status tenuous. Actions that occur over only 2 to 3 years, such as local increases in hydroperiod or lack of prescribed burning, may also significantly and detrimentally impact FGS populations.

Records of FGS occurrence and abundance are sparse, making accurate assessment of historic populations nearly impossible. Between 1927 and 1945, many sightings of FGS were recorded for Kenansville in Osceola County; Basinger and a location south of Fort Drum in Okeechobee County; and a site south of Lake Hicpochee and an area southeast of Immokalee in Hendry County. There appears to be a gap in FGS records between 1945 and the early 1960s. Records for the 1960s include a site north of Lake Okeechobee in Okeechobee County and a site south of Brighton in Glades County. In the early 1970s, records note a site west of Lake Okeechobee with no county specified and a site southwest of Kenansville (Service 1988).

Before the Florida Fish and Wildlife Conservation Commission (FWC), formerly the Florida Game and Freshwater Fish Commission, began conducting surveys for the FGS in the 1980s, the historic sightings identified above gave little insight into FGS abundance (Delany et al. 1985, Stevenson and Anderson 1994). Since that time, more detailed survey information has become available, and at least cursory information on abundance was provided in most subsequent reports of FGS occurrence. However, thorough and consistent surveys were not regularly conducted at occupied sites until the early 1990s.

During 1980 to 1982, the FWC conducted surveys of previously recorded FGS locations and searched other areas of potential habitat (Delany et al. 1985). Of the seven sites where FGS had been previously reported, only one was found to support FGSs during the 1980 to 1982 surveys. Additional searches of potential habitat that has not been previously surveyed for FGSs documented their presence in six additional locations (Delany and Cox 1986). Additional surveys were conducted in 1984 and documented sparrows at these same sites, but also recorded FGSs at one new site and found FGSs at one site where they had been absent in 1982 surveys, for a total of nine occupied sites (Delany and Cox 1986). Assuming that all males recorded during these surveys were mated, a minimum total population size of 282 individuals resulted (Delany and Cox 1986).

In 1989 to 1992, the same sites where FGSs had been recorded during 1984 were again visited by FWC personnel. Only three of the sites still supported FGSs, two of which were on public lands (Delany and Linda 1994). All six abandoned sites were pasture that had been improved for cattle grazing or sod production. The three occupied sites, some of which had been managed to support cattle grazing, had been burned at 2- to 3-year intervals. Fires may have preserved the suitability of these habitats. Several additional areas of potential FGS habitat were also surveyed during 1989 to 1992 and FGSs were found at two new sites, including an additional population on public lands (Echo Range on APAFR), for a total of five sites. These early surveys provided good information on FGS occurrence and distribution, but did not accurately represent abundance at each site since surveys of available habitat were not comprehensive where FGSs were located (M. Delany, FWC, personal communication, 2005).

Since the 1989 to 1992 surveys, occasional surveys of limited sites have been conducted whenever opportunities arise. These surveys have resulted in the discovery of five additional properties where FGSs occurred. Nesting FGSs were located on a site in Okeechobee that was proposed for development in 1992 (Turner and DeLotelle 1992), but FGS surveys have not been conducted on the site since 1992. One additional small population of FGS was located in 1997 (Delany et al. 1999) on APAFR (Bravo Range) and one population was found on private lands in 2001 (Biological Research Associates 2001). FGSs were also documented on a private ranch immediately adjacent to the area occupied by FGSs on TLWMA (Perkins and Vickery 2001) and these birds are presumed to be functionally part of the TLWMA population. A small population of FGSs were also reported on the National Audubon Society's Ordway-Whittell Kissimmee Prairie Sanctuary in the early 1990s, and FGSs on the site were intensively monitored from 1993 to 1999 (Shriver 1996; Perkins 1999).

Since the early 1990s, several additional sites where FGSs had occurred have been abandoned. On the Ordway-Whittell Kissimmee Prairie Sancuary, hydrologic impacts that resulted from installation of a dyke on adjacent property artificially flooded the site starting in 1996. By 1999, the FGS had been extirpated. Since acquisition by the Florida Department of Environmental Protection, restoration of adjacent habitat to establish a corridor between the property and the larger prairies of the KPPSP has improved habitat and FGSs were recorded again in 2002. However, breeding activity has not been documented since then. Surveys conducted by FWC and Service staff in 2002 of Bright Hour Ranch in DeSoto County where FGSs were reported by Delany and Linda (1994) failed to locate FGSs and they are presumed to be extirpated from this site (Service, unpublished data).

In 2001 to 2002, Vickery and Perkins (2002) conducted FGS surveys on some private lands that had been identified as potential FGS habitat and where they could gain access in an attempt to locate additional FGS populations. These surveys failed to locate any additional sparrow populations. In 2002 to 2004, Delany et al. (2005) also conducted surveys on private properties that had been identified as potential FGS habitat, and again, these surveys failed to locate additional FGS populations.

Since Delany's first efforts to assess FGS populations range-wide in the early 1980s (Delany et al. 1985), surveys have recorded a general decline in the distribution and occurrence of FGSs. Of the 14 sites where FGSs 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 FGS on other sites. Despite several survey efforts, there have been no records of FGSs 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 FGS. 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) and the largest known population of FGS. It also provides a corridor between other protected sites. There is another population of FGS at TLWMA, which has approximately 2,500 ha of suitable, occupied habitat, and another disjunct patch of suitable habitat (861 ha) where FGSs did not occur, but to which FGSs were translocated in 2001 and 2002 (Dean and Glass 2001a). There are three populations at APAFR, which has approximately 2,400 ha of suitable FGS habitat. Survey efforts during the 2003 breeding season failed to detect any FGSs in one of the three population sites at APAFR (Bravo Range). One FGS was detected during 2004 surveys, but the future of this population is quite tenuous. Efforts to improve habitat suitability conducted in 2005 at APAFR included mechanical treatment of woody vegetation and removal of pine plantations adjacent to dry prairie sites. These efforts will result in a larger area of potential FGS habitat through continued restoration and maintenance.

Surveys for FGSs 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 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. In 2004, estimates of the overall population were higher than in 2003 at TLWMA and KPPSP, while APAFR populations remained essentially unchanged (P. Miller, DEP, personal communication, 2004; J. Tucker, Archbold Biological Station, personal communication, 2004; S. Glass, FWC, personal communication, 2004). In 2005, FGS population size estimates were down from 2004 at TLWMA and KPPSP, and were again relatively unchanged at APAFR. (P. Miller, personal communication 2005; J. Tucker, personal communication 2005; M. Delany, FWC, personal communication, 2005).

FGS numbers have remained relatively stable at TLWMA since monitoring was initiated in 1991, although a population decline was documented during 1996 to 1998 (Dean and Glass 2001b). The FGS population reached a recorded low of 168 birds in 1998, down from a high count in 1993 of 220 individuals. By the year 2000, the population had rebounded to 280. Reasons for the population decline and subsequent recovery are unknown and may simply represent a normal range of variability in the population. Surveys conducted in 2004, revealed 124 singing males in the primary population, and 6 to 7 singing males in the translocation area (Steve Glass, FWC, personal communication 2005,). If a 1:1 sex ratio is applied to the singing males, the current FGSs population at TLWMA is estimated at 262 birds. In 2005, 114 males

were detected in the primary population, and 2 males were reported in the translocation area for a total estimated population size of 232 individuals (M. Delany personal communication 2005). In 2006, 112 males were recorded in the primary population, and 1 to 2 males were recorded in the translocation area, for a population estimate of 228 individuals (Tina Hannon, FWC, personal communication 2006).

The total population size reported at APAFR during 2002 was 162 sparrows (Delany 2002) distributed between three disjunct populations (Bravo, Echo, and Delta Trail Area-OQ Ranges), with the largest of the three (Echo Range) supporting over 100 sparrows. In 2003, the FGS population at APAFR declined significantly. Archbold Biological Station personnel conducted monitoring in 2003 and, before the completion of the second of three survey repetitions, surveyors were alarmed by the small number of sparrows they were hearing. After completing the second of three rounds of the surveys, a total of seven male FGSs had been detected. After all routine surveys had been completed, as well as additional intensive surveys, a total of 12 male sparrows had been detected. No sparrows were detected in the smallest population (Bravo Range) and the remaining 24 sparrows were distributed between two populations (Delta Trail Area-OQ and Echo Ranges).

The FGS populations have been in decline at APAFR since the late 1990s (Delaney et al. 2001). Between 1997 and 2002, the population on Bravo Range declined from 43 to 8 individuals, the population on Echo Range declined from 142 to 104 individuals, and the population on Delta Trail Area-OQ Range declined from 113 to 50 individuals. The total population on APAFR in 2002 was 162 individuals, half of the total population estimated in 1997 (298 FGSs). However, the declines in FGS populations at APAFR detected during the 2003 breeding season were all over 80 percent, which is significantly greater in magnitude than declines in previous years (T. Dean, Service, personal communication, 2003). Based on annual survival rates reported by Perkins and Vickery (2001) of 48.2 to 53.3 percent, the rate of decline during 2003 at APAFR is consistent with complete reproductive failure and nearly double the normal adult mortality rate.

In 2004 and 2005, the FGS populations at APAFR remained relatively stable with 3 to 4 males in the Delta Trail-OQ Range area, and 8 to12 males in the Echo Range area. (J. Tucker, personal communication 2006). A total of 11 males were recorded on APAFR in 2006, with 6 occurring in Echo Range and 5 on OQ Range (J. tucker personal communication 2006).

Concurrent with the decline at APAFR, the FGS population at KPPSP declined by 44 percent in 2003, from 234 in 2002 to 129 singing males (P. Miller, DEP, personal communication, 2003). This is the first year there has been a significant decline at KPPSP since monitoring was initiated in 1999. Surveys conducted in 2004, revealed 107 singing males in the primary prairie site where the point-count arrays are established (up from 87 in 2003) (Paul Miller, DEP, personal communication 2005). Because the entire site was not surveyed, the 107 birds represent the minimum population size. If a 1:1 sex ratio is applied to the singing males, the minimum FGS population at KPPSP is estimated at 214 birds. During 2005, only 68 males were recorded on standardized surveys (P. Miller personal communication 2005), which equates to a total minimum population estimate of 176 individuals. In 2006, a total of 72 male FGSs was recorded on surveys, but this total includes 10 males detected on a new survey plot that was established in

2006 and had not been previously surveyed. Comparing only the results from those plots that have been surveyed consistently in recent years yields a total of 62 males and a minimum population estimate of 124 individuals. This is the lowest population estimate recorded in consistent surveys since they were established.

Although declines of such magnitude may have been a normal part of the biology of the FGS, the combination of population fluctuation, the currently reduced distribution and amount of available habitat, and smaller population size may threaten the persistence of this subspecies. No one has thoroughly screened FGS for diseases or blood parasites; however, the prevalence of West Nile Virus, Eastern Equine Encephalitis, and St. Louis Encephalitis are on the rise in Florida and should be considered. In February 2006, a radio-tagged Florida grasshopper sparrow died at KPPSP as a result of a species of *Mycobacterium*, which causes tuberculosis (S. Terrell, Disney's Animal kingdom, personal communication 2006). The species of mycobacterium has not yet been identified, and the prevalence of this disease remains unknown.

Outside of public lands, much of the additional suitable FGS habitat is found on a few large, private cattle ranches. These ranches support FGSs, but the extent of the population there is largely unknown. Large conservation easements have been obtained on the Bright Hour Ranch in DeSoto County and at Fish-Eating Creek in Glades County. Although the habitat at Fish Eating Creek is in good condition and within the extant range of the FGS, surveys have not documented FGSs utilizing either conservation easement (Vickery and Perkins 2001; Service unpublished data). The future of the dry prairie landscape is currently dependent upon the management and protection of native rangelands on cattle ranches in south-central Florida. Conversion of native prairie vegetation for agricultural or development purposes continues to occur, and continues to pose a threat to the FGS.

Habitat management, development, and land conversion are of serious concern on private lands. The open vegetative dry prairie community preferred by FGS was historically maintained by lightning-induced fires. These fires occurred primarily during the summer growing season between June and August. Many of the remaining dry prairies are ecologically degraded due to fire suppression. Deviation in fire intensity, fire return interval, and seasonality from the natural fire regime of frequent growing-season burns is perhaps the most significant management factor determining vegetation structure and composition of dry prairie communities (Dye 1997; Bridges 1997). Loss of groundcover species, changes in pine density and recruitment, invasion of non-constituent oaks, and excessive shrub growth have been documented from dry prairies with long periods (circa 35 years) of fire exclusion (Dye 1997). When dry prairie is frequently burned, saw palmetto is typically of small stature and sparsely distributed, but it tends to increase in stature and density when fire is absent or infrequent. Although fire is beneficial to the FGS and necessary to maintain its habitat, FGS densities decline 2 or more years following a burn event (Vickery and Shriver 1995).

Some ranchers use prescribed burns to improve pasture lands for cattle (Vickery and Shriver 1995). Native central Florida rangelands (*i.e.,* dry prairies and flatwoods) are typically burned by ranchers annually or biennially during the winter or early spring months to stimulate forage growth, nutrition, and palatability for cattle during the lean winter months (Abrahamson and Hartnett 1990; Sullivan 1994). Ranchers also burn native pastures to maintain openness, reduce

shrub cover, reduce fuel accumulations, and improve wildlife habitat (Abrahamson and Harnett 1990). In addition to fire, rollerchopping may be used to alter the vegetative composition and structure within prairie habitats. Roller chopping in winter may initially produce the fastest reduction of shrub cover and increased herbaceous growth (Fitzgerald et al. 1995). However, the remaining biomass is greater after roller chopping than after a burn. It is important to note roller chopping cannot fully replace the function of fire, since wiregrass is dependant on summer fires to complete its reproductive cycle. Allowing wiregrass to bloom results in greater seed production, which may increase winter forage for the FGS. In addition, roller chopping disturbs the soil, thereby producing conditions that increase invasion by exotic invasive species.

ENVIRONMENTAL BASELINE

Status of the species within the action area

Since the action area includes the current and historical range of the FGS, the information contained in the section titled *Status of the Species* and the subsection titled *Status and Distribution* establishes the status of the species within the action area for the FGS. The information from these sections are incorporated here by reference.

No critical habitat has been designated for the FGS.

Factors affecting species environment within the action area

In addition to the range-wide threats previously identified, monitoring and research efforts underway at KPPSP, APAFR, and TLWMA are expected to harass the FGS populations at those locations. Recovery permit TE697819-2, authorizes monitoring, research, and disease screening at KPPSP and other sites and states that injury or mortality will not exceed three FGS per year for 2 years at that site. Recovery Permit 824723-5 states that injury or mortality will not exceed one FGS at APAFR per year. FWC personnel will routinely conduct research and monitoring activities involving FGSs that may result in harassment as authorized under a Cooperative Agreement between the Service and the FWC pursuant to section 6 of the Act.

Prescribed burning is regularly conducted within FGS habitat on all three of the public properties that support FGS populations and this prescribed burning is important to maintain habitat in a condition suitable to FGS. Growing-season prescribed burning and naturally-ignited fires during the growing season within occupied FGS habitat may destroy FGS nests, but also results in nearly immediate improvements in habitat quality that allows FGS to re-nest shortly following fires. Growing season prescribed burning is currently applied at TLWMA and KPPSP. Prescribed burning outside of the FGS nesting season also maintains habitat in a favorable condition, but does not affect FGS nesting. Areas that are not burned at least every 2 to 3 years may not remain suitable for FGS occupancy and land managers that do not burn prairie habitat for 4 or 5 years render these unburned areas unsuitable for FGS.

A biological opinion issued in 2003 for a landfill project in Osceola County states that incidental take associated with that project will not exceed 10 FGSs. These individuals were considered a subpopulation of birds identified at TLWMA. In association with this project, 13.3 ha of

occupied FGS habitat adjacent to TLWMA were placed under conservation easement. The placement of habitat under a conservation easement adjacent to larger parcels already under protection and management benefited the FGS by removing future threats of habitat loss due to conversion or succession and increased the effective size and genetic diversity of the protected population at TLWMA. Larger population sizes typically correspond to increasing probabilities of persistence when considered in the context of population viability (Vickery and Perkins 2001; Vickery and Perkins 2002).

Ongoing military training activities at APAFR may result in some impacts to FGS, and several consultations have been completed or are underway at APAFR. These actions include beneficial habitat management intended to improve conditions for FGS.

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. All activities authorized by the Service under section 10(a)(1)(A) of the Act must meet permit issuance criteria at 50 CFR 17.22 and 17.32. All activities considered must be justified in relation to enhancement of survival and recovery, effects to the wildlife species, peer review, and qualifications of permittees. By definition, authorized activities should benefit species recovery with minimal adverse effects by qualified permittees.

Factors to be considered

Conducting point count surveys and observations of FGSs in accordance with survey and monitoring protocols, including efforts to resight banded FGSs and identify color-bands, may result in disturbance to birds. Potential adverse effects include incidentally flushing FGSs when moving among point counts, flushing FGSs as a result of observers approaching to conduct observations, and interruption of normal behavior. Observers will endeavor to avoid disturbance to FGSs whenever possible and to minimize the duration of disturbance.

Searching for nests and nest monitoring may result in adverse effects to FGS adults, young, and eggs. These activities are expected to incidentally disturb FGSs and interfere with normal behavior patterns. Nest searching and nest monitoring may affect FGSs by increasing the risk of nest abandonment, failure, and depredation due to disturbance of adults, preventing adults from attending to eggs or young that are in the nest through the presence of an observer in the area, a very small risk of accidental damage to nests or nest contents resulting from the presence of an observer, and increased risk of depredation due to human activity concentrated around nest sites and possible human scent trails or other cues that potential predators may exploit. Observers will minimize the duration that they are at or near nest sites and will access nest locations for monitoring through several non-terminal routes to minimize increasing depredation. Use of the thermal imager during nest-finding and nest monitoring will aid in minimizing effects to FGSs by allowing observers to locate and/or monitor nests without directly disturbing the nest and nest site.

To minimize any negative impacts to the FGS, mini-cameras will only be placed and maintained at nests during the incubation or nestling period (not during nest building, egg-laying); abandonment during the incubation and nestling periods is unlikely as the adults have a large investment at that time. However, if data from initial sampling indicates negative impact to nestling success, the activity will be halted immediately.

Prior to attaching transmitter harnesses to FGSs, the Applicant or agent of the Applicant that will be conducting transmitter attachment shall conduct trial attachments of at least five transmitters on house sparrows and observe the behavior for a period of 1 to 2 days. If any injuries result, additional attachments will be conducted until five sequential injury-free attachments have occurred. This measure is intended to ensure a sufficient level of proficiency in attaching transmitters, and should be conducted immediately prior to attaching transmitters to Florida grasshopper sparrows. The results of these attachments should be provided in writing to the SFESO prior to initiating attachment of transmitters to Florida grasshopper sparrows. Transmitters may initially only be applied to up to 10 individuals. These individuals should be monitored twice daily through telemetry to ensure that they are moving in a manner consistent with normal movements. These individuals should also be recaptured after 1 week to inspect them for any injuries resulting from the transmitter. All injuries will be reported to the SFESO by the next working day, and a determination will be made as to whether the injuries observed warrant re-fitting transmitters using the same method or whether they warrant the removal of transmitters from all individuals.

Analysis for effects of the action

Beneficial Effects – Results of from this research will help assess the status of the FGS population and identify threats to the species. Investigation of the ecology of the FGS, its habitat use, nesting success, and dispersal capability will allow managers to address potential limiting factors and better manage for conditions that will sustain and recover the species.

Adverse Effects – Handling and monitoring of the FGS may result in incidental injury or death of individuals. While this type of effect is uncommon with proper training or experience in handling of birds, the potential for such injuries or deaths remains.

Species' response to the proposed action

Although the Applicant does not anticipate any injury or mortality of FGS, the capture and handling of this species may result in injury or mortality of some individuals. Capture and banding of FGSs, including banding of nestlings in the nest, will result in adverse effects to FGSs. Potential adverse effects include harassment, injury, or death of FGSs caught in the mist-nets; harassment, injury, or death of nestlings as a result of handling and banding; harassment, injury, or death resulting from physical impairment due to the presence of bands and transmitter harnesses; as well as, harassment of individuals within 610 m feet of the mist-net arrays that are not caught in mist-nets. During capture, visual inspection, camera instillation and collection of morphometric data, individuals may be harmed through physical injury, behavioral modification, physiological stress, and increased predation risk, possibly resulting in death. No additional visits and disturbance to the nest will occur above what is currently authorized.

All personnel involved in the project will be trained by experienced biologists to remove birds safely from mist-nets, safely apply transmitter harnesses, properly handle sparrows, and collect other data. Handling time will be kept to a minimum (10 minutes or less for most birds, no bird will be held for more then 10 minutes) and all birds will be immediately released back into the wild. Mortality is expected to be two percent (4 birds) or less per year of the total number of birds captured, transmitter harnessed and banded over the 5-year life of the permit. Although the expected mortality may be as great as two percent (4 birds) annually, this level of mortality is unlikely. The expected level of mortality resulting from these studies over the life of the permit is expected to equate to less than one percent of the estimated FGS population size.

The capture, handling, transmitter harnessing, and monitoring of the FGS will help identify threats to the species. Investigation of the ecology of the FGS, its habitat use, nesting success, and dispersal capability will allow managers to address potential limiting factors and better provide conditions that will sustain and recover the species.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

The action area includes several counties in a rapidly growing state, and we can expect urban, agricultural, and industrial development throughout the action area to continue. This can be predicted from the existing zoning and county land use plans. Any residential developments that may affect listed species would be subject to regulation under either section 7 or 10 of the Act and would be considered a Federal action. However, considerable residential developments may also occur in select counties within the action area that have no existing regulatory mechanisms to include Service involvement.

FGSs are difficult to locate and distributional surveys have not assessed sparrow status on all private lands in the action area. It is likely small populations of sparrows have been undetected in the past and will be undetected in the future. Shriver and Vickery (1999) estimated approximately 155,805 ha of suitable habitat remains in all of central Florida. The South Florida Water Management District (District) estimates that between 2,833 and 4,047 ha of pasture and/or dry prairie habitat has been converted to other uses between the years of 1990 to 1995 in Okeechobee County alone (K. Butts, District, personal communication, 2002). These areas were not surveyed for the presence of the FGS, and the effects of these conversions are not known. It is likely that conversions from dry prairie to other habitats have occurred in other counties within the range of the FGS without surveys and this trend of land use conversions within the range of the FGS is reasonably likely to continue. Continued loss of dry prairie habitat reduces the likelihood that FGSs will survive and recover in the wild.

Management practices in KPPSP and TLWMA continue to improve and managers at these sites are seeking to restore the dry prairie within their boundaries (*e.g.*, through prescribed burning, habitat restoration, and hydrological restoration) resulting in better habitat for FGS population expansion. Any actions at APAFR affecting FGSs will require section 7 consultation.

Overall, the status of the FGS is tenuous. Its populations on protected lands have experienced recent, severe declines and the pattern of conversion or degradation of habitat under private ownership is likely to continue. This will likely result in the loss of small undocumented populations of FGS and continued reduction in the species distribution. Regarding the currently proposed action, adverse effects will occur. This permit and subsequent research on the FGS will lead to an improved understanding of the natural history and biology of this endangered species. It is imperative we understand the causes behind the recent population decline so we can address future management options for the FGS. Identification of limiting factors is an essential first step in improving habitats for FGS and in working to achieve recovery. Research resulting from the issuance of the proposed permit could also lead to modification of current land management strategies for the maximum benefit of the species. The net effect of the proposed permit is beneficial.

CONCLUSION

After reviewing the status of the FGS, 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 issuance of a recovery permit to conduct research, as proposed, is not likely to jeopardize the continued existence of the species. No critical habitat has been designated for this species; therefore, none will be affected.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without a special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns such as breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns, which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are nondiscretionary and must be undertaken by the Service so that they become binding conditions of any grant or permit issued to the Applicant, as appropriate, for the exemption in action 7(o)(2) to apply. The Service has a continuing duty to regulate the activity covered by this incidental take statement. If the Service (1) fails to assume and implement the terms and conditions or (2) fails to require the Applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. To monitor the impact of incidental take, the Applicant must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement.

AMOUNT OR EXTENT OF TAKE

The Service anticipates that incidental take resulting from trapping, handling, camera monitoring, banding nestlings and adults, and attaching and subsequent presence of radio transmitters may result in harassment of up to 200 individual FGSs per year and injury or death of up to two percent of banded FGSs (4 birds) per year over 5 years. Incidental take resulting from nest searching and nest monitoring may result in harassment of up to 200 FGSs, and may result in the loss of up to 5 eggs or nestlings per year over 5 years due to abandonment or accidental damage. We expect the annual level of adult take and nest abandonment will be far less than the amount authorized in the permit. The expected level of take resulting from these studies over the life of the permit is expected to equate to less than one percent of the estimated FGS population size.

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

EFFECT OF THE TAKE

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

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take of FGSs:

1. Ensure Applicants are appropriately qualified or trained to conduct the proposed research and

2. Ensure Applicants incorporate appropriate minimization measures into field research protocols.

TERMS AND CONDITIONS

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

(1) The Service shall specify annual reporting requirements in the permit. Those reporting requirements that are normally outlined in the section 10(a)(1)(A) permit will satisfy the reporting/monitoring requirements pursuant to section 7 of the Act and its implementing regulations.

(2) The Service shall include the following condition in the permit: Upon locating a dead, injured, or sick specimen, initial notification must be made within 24 hours to the nearest Service Law Enforcement Office (Fish and Wildlife Service; 9549 Koger Boulevard, Suite 111; St. Petersburg, Florida 33702; 727-570-5398), and the Endangered Species Program supervisor at the SFESO (1339 20th Street, Vero Beach, Florida 32960-3559; 772-562-3909). 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) The Service shall specify as a condition of the permit that all FGS captures will employ standard techniques, such as mist-netting, as outlined in the description of the proposed action or the permittee shall first receive Service approval for any other techniques. Mist-nets shall be constantly attended by qualified personnel at a rate of no more than two mist-nets per person and all FGSs captured shall be immediately removed from nets.

(4) The Service shall specify as a condition of the permit that no more than two leg bands shall be applied on each leg without obtaining prior permission from the Service.

(5) The Service shall specify as a condition of the permit that prior to attaching transmitter harnesses to FGSs, the applicant or agent of the Applicant that will employ the techniques and trials as outlined in the description of the proposed action or the permittee shall first receive Service approval for any other techniques.

(6) The Service shall specify as a condition of the permit that ropes and noise-making devices used during systematic surveys shall not be weighted to the extent that they significantly disturb vegetation when the rope passes over it.

(7) The Service shall specify as a condition of the permit that nest-searching and monitoring conducted prior to sunrise will be conducted using a thermographic imager, and will be conducted in such a manner that is not expected to result in flushing sparrows from nests.

(8) The Service shall specify as a condition of the permit that placement of cameras at a nest will employ the techniques as outlined in the description of the proposed action.

(9) The Service shall require the Applicant and designated agents acting on behalf of the Applicant to furnish resumes or summary of qualifications demonstrating their ability to safely conduct the proposed research. Only those individuals who can demonstrate that they have sufficient experience and training with FGSs will be permitted to conduct the proposed research.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to further minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

No conservation recommendations are prescribed.

REINITIATION NOTICE

This concludes formal consultation on this action as outlined in the request. As required by 50 CFR 402.16, reinitiation of formal consultation is required if:

1. The amount or extent of incidental take is exceeded.
2. New information reveals effects of the 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.
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.

If you have any questions, please contact Mark Salvato at 772-562-3909, extension 340.

LITERATURE CITED

Abrahamson, W.G. and D.C. Hartnett. 1990. Pine flatwoods and dry prairies. *In* R.L. Myers and J.J. Ewel (eds.), Ecosystems of Florida, p. 103-129. University of Central Florida Press, Orlando, Florida.

Biological Research Associates. 2001. Results of Florida grasshopper sparrow surveys on the Amelia Project, Okeechobee County, Florida. Unpublished report.

Bridges, E.L. 1997. Vegetation analysis of selected dry prairie/treeless flatwoods sites for GIS vegetation mapping on Avon Park Air Force Range, Florida. Unpublished report to the Air Force.

Buckland, S.T., D.R. Anderson, K.P. Burnham, J.L. Laake, D.L. Borchers, and L. Thomas. 2001. Introduction to Distance Sampling: Estimating Abundance of Biological Populations. Oxford University Press, Oxford, UK.

Cole, S., T. Hingten, and K. Alvarez. 1994. Vegetative characteristics of contiguous dry prairie on two soil types in Hardee County; X-1-D. Unpublished annual research report to Florida Park Service.

Davis, J.H., Jr. 1967. General map of the natural vegetation of Florida. Institute Food and Agricultural Sciences Circular S-178. Agricultural Experiment Station, University of Florida, Gainesville.

Dean, T.F. 2001. Non-breeding season ecology of Florida grasshopper sparrows and Bachman's sparrows in central Florida dry prairies. M.S. thesis, University of Massachusetts, Amherst.

Dean, T.F., M.F. Delany, E.W. Chapman, and P.D. Vickery. 1998. Longevity and site fidelity of Florida grasshopper sparrows. Journal of Field Ornithology. 69(1):51-54.

Dean, T.F. and S.L. Glass. 2001a. Translocation of Florida grasshopper sparrows on Three Lakes Wildlife Management Area to establish a new population. Unpublished Report.

Dean, T.F. and S.L. Glass. 2001b. Management plan for Florida grasshopper sparrows on Three Lakes Wildlife Management Area, Osceola County, Florida.

Delany, M.F. 1996. Florida grasshopper sparrow. *In* J.A. Rodgers, Jr., H.W. Kale II, and H.T. Smith (eds.), Rare and endangered biota of Florida, Volume V: Birds, p. 128-136. University Press of Florida, Gainesville, Florida.

Delany, M.F. 2002. Spatial analysis of Florida grasshopper sparrow distribution on Avon Park Air Force Range 1996-2001. Unpublished report to the Avon Park Air Force Range, Avon Park, Florida. 16 pp.

Delany, M.F. 2006. Assessment of hurricane effects on Florida grasshopper sparrow populations and habitat. Preliminary report to Florida Game and Fresh Water Fish Commission, Tallahassee, Florida.

Delany, M.F., C.T. Moore, and D.R. Progulske, Jr. 1993. Survival and longevity of adult male grasshopper sparrows. Proceedings of the annual conference of the Southeast Association Fish and Wildlife Agencies 47:366-369.

Delany, M.F., C.T. Moore, and D.R. Progulske, Jr. 1994. Distinguishing gender of Florida grasshopper sparrows using body measurements. Florida Field Naturalist 22(2):48-51.

Delany, M.F., C.T. Moore, and D.R. Progulske, Jr. 1995. Territory size and movements of Florida grasshopper sparrows. Journal of Field Ornithology 66(2):305-309.

Delany, M.F., C.T. Moore, and J.M. Hamblen. 1992. Florida grasshopper sparrow management needs. Final report to Florida Game and Fresh Water Fish Commission, Tallahassee, Florida.

Delany, M.F., H.M. Stevenson, and R. McCraken. 1985. Distribution, abundance, and habitat of the Florida grasshopper sparrow. Journal of Wildlife Management 49(3):626-631.

Delany, M.F. and J.A. Cox. 1986. Florida grasshopper sparrow breeding distribution and abundance in 1984. Florida Field Naturalist 14(4):100-104.

Delany, M.F., C.T. Moore, and D.R. Progulske. Jr. 1995. Territory size and movements of Florida grasshopper sparrows. Journal of Field Ornithology 66(2):305-309.

Delany, M.F., J.T. Giesel, and D.A. Brazeau. 2000. Genetic variability among populations of the Florida grasshopper sparrow. Journal of Wildlife Management 64(3):631-636.

Delany, M.F., P.B. Walsh, B.Pranty, and D.W.Perkins. 1999. A previously unknown population of Florida grasshopper sparrows on Avon Park Air Force Range. Florida Field Naturalist 27(2):52-56.

Delany, M.F. and S.B. Linda. 1994. Characteristics of occupied and abandoned Florida grasshopper sparrow territories. Florida Field Naturalist 22(4):106-109.

Delany, M.F. and S.B. Linda. 1998a. Characteristics of Florida grasshopper sparrow nests. Wilson Bulletin 110:136-139.

Delany, M.F. and S.B. Linda. 1998b. Nesting habitat of Florida grasshopper sparrows at Avon Park Air Force Range Florida Field Naturalist 26:33-39.

Delany, M.F., S.B. Linda, B. Pranty, and D.W. Perkins. 2002. Density and reproductive success of Florida grasshopper sparrows following fire. Journal of Range Management 55:336-340.

Delany, M.F., V. Rumancik, and J.O. Garcia. 2001. Population monitoring and habitat management of the Florida grasshopper sparrow at Avon Park Air Force Range and regional habitat mapping and distribution. 3rd Quarterly report to Avon Park Air Force Range.

Delany, M.F., M. B. Shumar, and M. E. McDermott. 2005. Florida Grasshopper sparrow distribution, abundance and habitat availability. Population monitoring and habitat management of the Florida grasshopper sparrow at Avon Park Air Force Range and regional habitat mapping and distribution. 8th Quarterly report to Avon Park Air Force Range.

DeSelm, H.R. and N. Murdock. 1993. Grass-dominated communities. *In* W.H. Martin, S.G. Boyce, and A.C. Echternacht (eds.), Biodiversity of the southeastern United States upland terrestrial communities, pp. 87-141. John Wiley & Sons, Inc., New York, New York.

Dye, R. 1997. Turning back the clock: mesic flatwoods & dry prairie restoration in successional systems. Abstracts for first annual conference, Society for Ecological Restoration, Coastal Plain Chapter, May 16-17, 1997. Gainesville, Florida.

Fitzgerald, S.M., J.M. Wood, and G.W. Tanner. 1995. Small mammal and plant responses to rehabilitation of a dry prairie grassland association using fire and roller chopping applied in two seasons. Project GFC-86-025. Florida Game and Fresh Water Fish Commission – Nongame Wildlife Program, Tallahassee, Florida.

Florida Natural Areas Inventory [FNAI] and Florida Department of Natural Resources [FDNR]. 1990. Guide to the natural communities of Florida; Tallahassee, Florida.

Galligan, E.W., G.S. Bakken, and S.L. Lima. 2003. Using a thermographic imager to find nests of grassland birds. Wildlife Society Bulletin 31: 865-869.

Gibbons, D.W., D. Hill, and W.J. Sutherland. 1996. Birds. Pages 227-259. *In* W.J. Sutherland, editor. Ecological census techniques: a handbook. Cambridge University Press, Cambridge, U.K.

Grossman, D.H., K.L. Goodin, and C.L. Reuss (eds.). 1994. Rare plant communities of the conterminous United States: an initial survey. The Nature Conservancy, Arlington, Virginia.

Howell, A.H. 1932. Florida bird life. Coward-McCann, New York, New York.

Kaspari, M. and H. O'Leary. 1988. Nonparental attendant in a north temperate migrant. Auk 105:792-793.

Kautz, R.S., D.T. Gilbert, and G.M. Mauldin. 1993. Vegetative cover in Florida based on 1985-1989 Lansat thematic mapper imagery. Florida Scientist 56:135-154.

Layne, J.N., J.A. Stallcup, G.E. Woolfenden, M.N. McCauley, and D.J. Worley. 1977. Fish and wildlife inventory of the seven-county region included in the central Florida phosphate industry area wide environmental impact study. U.S. Department of Commerce, National Technical Information Service. PB-278 456, Volume I.

McNair, D.B. 1986. Clutch information for the Florida grasshopper sparrow from zoological collections. Florida Field Naturalist 14(2):48-49.

Mealor, W.T., Jr. 1972. The open range ranch in south Florida and its contemporary successors. Ph.D. dissertation, University of Georgia, Athens.

Miller, P.C. 2005. Long distance dispersal of a Florida grasshopper sparrow. Florida Field Naturalist 33(4):123-124.

Mulholland, R. and P.E. Small. 2001. 1999-2001 Florida grasshopper sparrow monitoring report, Kissimmee Prairie Preserve State Park. Final report to Kissimmee Prairie Preserve State Park.

Nicholson, W.H. 1936. Notes on the habits of the Florida grasshopper sparrow. Auk 53:318-319.

Orzell, S. and E.L. Bridges. 2004. Floristic composition of dry prairies in south-central Florida. Abstract. Florida Dry Prairie Conference Book of Abstracts. October 5-7, 2004. Chateau Elan, Sebring, Florida.

Perkins, D.W. 1999. Breeding ecology of Florida grasshopper and Bachman's sparrows of Central Florida. M.S. thesis, University of Massachusetts, Amherst.

Perkins, D.W. and P.D. Vickery. 2001. Annual survival of an endangered passerine, the Florida grasshopper sparrow. Wilson Bulletin. 113(2):211-216.

Perkins, D.W., P.D. Vickery, T.F. Dean, and M.S. Scheuerell. 1998. Nesting records and reproductive success of Florida grasshopper sparrows (*Ammodramus savannarum floridanus*). Florida Field Naturalist 26(1): 7-17.

Perkins, D.W., P.D. Vickery, and W.G. Shriver. 2003. Spatial dynamics of source-sink habitats: Effects on rare grassland birds. Journal of Wildlife Management 67(3):588-599.

Shriver, W.G. 1996. Habitat selection of Florida grasshopper (*Ammodramus savannarum floridanus*) and Bachman's sparrows (*Aimophila aestivalis*). M.S. thesis, University of Massachusetts, Amherst.

Shriver, W.G. and P.D. Vickery. 1999. Aerial assessment of potential Florida grasshopper sparrow habitat: conservation in a fragmented landscape. Florida Field Naturalist. 27(1):1-9.

Shriver, W.G. and P.D. Vickery. 2001. Response of breeding Florida grasshopper and Bachman's sparrows to winter prescribed burning. Journal of Wildlife Management. 65(3):470-475.

Shriver, W.G., P.D. Vickery, and D.W. Perkins. 1999. The effects of summer burns on breeding Florida grasshopper and Bachman's sparrows. Studies in Avian Biology. 19:144-148.

Shriver, W.G., P.D. Vickery, and S.A. Hedges. 1996. Effects of summer burns on Florida grasshopper sparrows. Florida Field Naturalist 24(3):68-73.

Smith, R.L. 1959. The songs of the grasshopper sparrow. Wilson Bulletin 71(2):141-152.

Smith, R.L. 1963. Some ecological notes on the grasshopper sparrow. Wilson Bulletin 75(2):159-165.

Smith, R.L. 1968. Grasshopper sparrow. *In* A.C. Bent (ed.), Life histories of North American cardinals, grosbeaks, buntings, towhees, finches, sparrows, and allies, Part two, pp. 725-745. U.S. National Museum Bulletin 237. Smithsonian Institution Press, Washington, D.C.

Sprunt, A., Jr. 1954. Florida bird life. Coward-McCann, Inc., New York, New York.

Stevenson, H.M. 1978. Endangered Florida grasshopper sparrow. *In* H.W. Kale (ed.), Rare and endangered biota of Florida. Volume two: Birds, pp. 15-16. University of Florida Press, Gainesville, Florida.

Stevenson, H.M. and B.H. Anderson. 1994. The birdlife of Florida. University Press of Florida, Gainesville, Florida.

Sullivan, J. 1994. Kuchler Type, Palmetto Prairie. http://www.fs.fed.us/database/feis.

Turner, D.A. and R.S. DeLotelle. 1992. Cypress energy project. Florida Grasshopper Sparrow mitigation and management plan. Unpublished report. Black & Veatch, Inc., Kansas City, Missouri.

U.S. Fish and Wildlife Service (Service). 1988. Recovery plan for the Florida grasshopper sparrow. Fish and Wildlife Service; Atlanta, Georgia.

U.S. Fish and Wildlife Service (Service). 1999. South Florida multi-species recovery plan. Fish and Wildlife Service; Atlanta, Georgia.

Vickery, P.D. 1996. Grasshopper sparrow (*Ammodramus savannarum*). *In* A. Poole and F. Gill, II (eds.), Birds of North America, No. 239. The Academy of Natural Sciences, Philadelphia, Pennsylvania, and The American Ornithologists' Union, Washington, D.C.

Vickery, P.D. and D.W. Perkins. 2001. Population viability analysis for the Florida grasshopper sparrow. Report submitted to U.S. Fish and Wildlife Service, Vero Beach, Florida.

Vickery, P.D. and D.W. Perkins. 2002. Conservation genetics and population viability of the Florida grasshopper sparrow. Unpublished report to U.S. Fish and Wildlife Service; Vero Beach, Florida.

Vickery, P.D. and T.F. Dean. 1997. Florida grasshopper sparrow winter ecology project annual report 1996-1997 field season. USGS Cooperative Agreement #14-16-009-1575. Unpublished report submitted to Avon Park Air Force Range, Florida.

Vickery, P.D. and W.G. Shriver. 1995. Reproductive success and habitat use of the Florida grasshopper sparrow (Ammodramus savannarum floridanus). Report submitted to U.S. Fish and Wildlife Service, Vero Beach, Florida.

Walsh, P.B., D.A. Darrow, and J.G. Dyess. 1995. Habitat selection by Florida grasshopper sparrows in response to fire. Proceedings of the Annual Conference SEAFWA 49:340-347.

Whitmore, R.C. 1979. Short-term changes in vegetation structure and its effects on grasshopper sparrows in West Virginia. Auk 96:621-62.

Winter, M., S.E. Hawks, J.A Shaffer, and D.H. Johnson. 2004. Guidelines for finding nests of passerine birds in tallgrass prairie. Prairie Naturalist 35(3):197-211

Figure 1. Action Area and the three public properties that support FGS populations.