Recovery Plan for Florida grasshopper sparrow (*Ammodramus savannarum floridanus*)
https://www.fws.gov/verobeach/MSRPPDFs/FloridaGrasshopperSparrow.pdf

Original Approved: May 18, 1999
Original Prepared by: South Florida Ecological Services staff

AMENDMENT 1

We have identified best available information that indicates the need to amend recovery criteria for the Florida grasshopper sparrow (FGSP) since the recovery plan was completed. In this proposed modification, we synthesize the adequacy of the existing recovery criteria, show amended recovery criteria, and provide the rationale supporting the proposed recovery plan modification. The proposed modification is shown as an addendum that supplements the South Florida Multi-Species Recovery Plan (MSRP; USFWS 1999) by adding delisting criteria for the FGSP that were not developed at the time this recovery plan was completed. The original recovery objectives and the step-down outline are described on pages 4- 387 through 4-391 of the MSRP (USFWS 1999). Recovery plans are non-regulatory documents that provide guidance on how best to help recover subspecies.

For
U.S. Fish and Wildlife Service
Atlanta, Georgia

Approved: _____
Acting **Regional Director, U.S. Fish and Wildlife Service**

Date: 11/12/19

METHODOLOGY USED TO COMPLETE THE RECOVERY PLAN AMENDMENT

These proposed amendments to the recovery criteria were developed using the most recent and best available information for the subspecies. This information was prepared by the Service biologists and managers in the South Florida Ecological Services Field Office in order to develop the recovery criteria for the FGSP.

ADEQUACY OF RECOVERY CRITERIA

Section 4(f)(1)(B)(ii) of the Endangered Species Act (Act) requires that each recovery plan shall incorporate, to the maximum extent practicable, "objective, measurable criteria which, when met,

would result in a determination…that the species be removed from the list." Legal challenges to recovery plans (see Fund for Animals v. Babbitt, 903 F. Supp. 96 (D.D.C. 1995)) and a Government Accountability Audit (GAO 2006) also have affirmed the need to frame recovery criteria in terms of threats assessed under the five listing factors.

Recovery Criteria

The MSRP only provides downlisting criteria for the FGSP, and they can be found on page 4-387 of the document (https://www.fws.gov/verobeach/MSRPPDFs/FloridaGrasshopperSparrow.pdf).

Synthesis

The FGSP was listed as endangered in 1986 (51 FR 27492) due to habitat loss and degradation resulting from conversion of native vegetation to improved pasture and agriculture (Factor A). The MSRP and FGSP 5-Year Review (USFWS 2008) also identified habitat loss and degradation as the primary threat to FGSP and, while admitting that limited data on the biology, ecology, and management needs of the subspecies existed, suggested that appropriate habitat protection and management was the key to growing the FGSP population. Other threats identified in the MSRP included altered or unfavorable hydrology (Factor A) and predation (Factor C), and these still remain relevant to FGSP recovery. Since the MSRP was published, however, much has been learned about the FGSP's biology, ecology, habitat use, and additional factors contributing to the continued decline of the subspecies. The FGSP is currently threatened by Factors A, C, D, and E.

The historical range of the FGSP is not known with certainty, but there are records from Collier, Miami-Dade, DeSoto, Glades, Hendry, Highlands, Polk, Okeechobee, and Osceola counties (USFWS 1999). At present, the range of the FGSP is generally restricted to three management units under public ownership – Avon Park Air Force Range (APAFR), Kissimmee Prairie Preserve State Park (KPPSP), Three Lakes Wildlife Management Area (TLWMA) – and three known private ranches. This is a decline from the eight occupied locations documented by Delany et al. (2007) during their 2000 – 2004 surveys, around the time the FGSP began declining at most sites. Populations have declined to historic lows at all known sites, and as of 2018, there were only 23 estimated wild breeding pairs at sites where FGSP are being monitored (Hewett-Ragheb et al. 2018).

Currently, dry prairie habitat on protected lands, which represents 67 percent of the dry prairie remaining (Delany et al. 2007), is being managed for FGSP; and one of the private ranches (Ranch) with FGSPs is currently implementing a management plan drafted by the Service that includes actions to benefit the FGSP. Management of FGSP habitat is a primary focus for lands within the Everglades Headwaters National Wildlife Refuge (EHNWR)-and Conservation Area (CA); however, this refuge is newly established (2012) and does not currently have lands occupied by FGSP. Though these actions in part address Factor A, they cannot fully mitigate for the loss of nearly all of the sparrow's native dry prairie habitat, and the remaining protected habitat may not be adequate to recover the subspecies (Kautz and Cox 2001).

The wild FGSP population is at a record low and is at high risk of extinction due to environmental, demographic, and genetic stochasticity (Shaffer 1981; Factor E). Low population densities can lead

to inbreeding and loss of genetic diversity, biased sex ratios, difficulty locating mates, and increased susceptibility to diseases (Dale 2001, Redford et al. 2011). Especially when coupled with events such as flooding, reduced food availability, and/or reduced reproductive success, small and isolated populations may experience severe declines or extirpation (Caughley and Gunn 1996). Additionally, low or isolated population densities may lead to increased likelihood of birds dispersing from breeding sites in search of conspecifics (Dale 2001). This was illustrated at the Ranch in 2016 when an isolated, paired male abandoned his female with an active nest to set up a territory 1 kilometer (km) (0.6 mile [mi]) away near a cluster of other males (Hewett-Ragheb and Miller 2016). This phenomenon was also observed with several males at KPPSP (Hewett-Ragheb and Miller 2016), which indicates that males may disperse from known breeding areas with low occupancy in search of other conspecifics.

Due to the severe population decline, the Service initiated a captive propagation program in 2015. The captive population was intended to boost productivity with the goal of releasing captive-reared FGSP to supplement the wild population. At the end of the 2019 breeding season, there were 102 FGSP in captivity. Due to the remarkable success of the captive propagation program, the Service, FWC, and conservation partners began releasing captive-reared birds to the wild at TLWMA in 2019. A total of 105 birds (43 females, 52 males, 10 unknown sex) were released between May and September of 2019 with the majority (88) of the birds being independent juveniles that were hatched in captivity in 2019.

Despite the severe population decline, FGSP do not appear to have experienced significant losses of genetic diversity (Delany et al. 2000, Mylecraine et al. 2008; Factor E). A more recent study found that genetic diversity at TLWMA was comparable to estimates from historical data, and that inbreeding coefficients have remained low over the last 100 years (Reece 2014). However, reductions in genetic diversity often lag several generations behind the time period of population reduction (Allendorf et al. 2012), and with such a small remnant wild population, entire genetic lines have likely been lost. The high genetic diversity remaining among FGSP may illustrate that there was substantial gene flow between sites historically (Delany et al. 2000) and/or that isolation has occurred relatively recently (Bulgin et al. 2003).

FGSP require relatively large tracts of treeless prairie (Factor A, as habitat suitability can shift radically – annually, seasonally, and even within seasons – largely due to variability in fire history and hydrology. Appropriate hydrology and frequent fire are necessary to maintain open prairie habitat and prevent encroachment of trees and overgrowth of woody vegetation (Platt et al. 2006). Delany et al. (2007) estimated that less than 45,000 hectares (111,197 acres) of potential FGSP habitat exists, which represents a 95 percent loss from pre-settlement estimates (Kautz et al. 1993). Loss of habitat (Factor A) was certainly a factor in the subspecies' decline to endangered status; however, habitat availability is not believed to currently limit population growth as populations have declined so low and large areas of seemingly high quality habitat are not currently occupied. Nevertheless, it remains possible that the quality of the current available habitat is suboptimal for the sparrow in ways that we are not presently detecting. Further research is necessary to reveal the subtleties of habitat quality, its response to past and present land management, and its effects on sparrow habitat selection and recruitment.

Although habitat loss and degradation continues to be a factor in the decline of the FGSP, adult

annual survival and productivity rates may be too low to halt or reverse the current population decline (Hewett-Ragheb et al. 2017). Though adult female survival appears to continue to decline, recent research indicates that adult male survival may be increasing (Hewett-Ragheb et al. 2018). Disease (Factor C) is currently hypothesized as a possible contributor in the overall and recent precipitous population decline, although additional research is needed to determine its potential role. The main cause of adult mortality appears to be predation, primarily by wintering raptors (Factor C; Dean 2001). However, reasons for the current continued steady decline in female adult survival remain unclear.

Predation (Factor C) of eggs and nestlings during the breeding season is a significant threat to the FGSP population, and nest predation is the cause of most nest failures (Perkins et al. 2003, Hewett-Ragheb et al. 2017). Although nearly all predators are native animals with which the FGSP has evolved (Fletcher et al. 2010, Hewett-Ragheb et al. 2017), one non-native predator, the red-imported fire ant (RIFA; *Solenopsis invicta*), has been especially problematic for nestlings on grazed lands at the Ranch (Hewett-Ragheb and Miller 2016, Bowman and Windsor 2018). Nest predation by RIFAs appears to be very rare at TLWMA, which supports the largest known FGSP population, with only one confirmed predation record (Hewett-Ragheb et al. 2017). It is unknown if RIFAs are a significant source of nest failure at KPPSP or APAFR, but Fletcher et al. (2010) determined that they may be the most prevalent potential nest predator in FGSP habitat. RIFAs are associated with habitat disturbance (Tschinkel and King 2013) and habitat changes due to cattle grazing or altered hydrology may influence the role of RIFAs as significant nest predators in disturbed landscapes.

In response to the high rate of nest predation, the Service and the FWC began installing predator deflection fences in 2015 in an attempt to reduce this threat. By protecting nests with predator deflection fences, nest survival has increased (21-day adjusted mean nest survival; Hewett-Ragheb et al. 2018) from a low of 0.04 (range: 0.04 – 0.23; 2015 – 2018) for unfenced nests to a high of 0.57 (range: 0.20 – 0.57; 2015 – 2018) for fenced nests (Hewett-Ragheb et al. 2018). Though predator fences are effective at reducing mammalian and snake predation, they are ineffective at preventing predation of nestlings by RIFA. To combat this threat, the Service and the FWC began eradicating RIFAs around FGSP nests in 2016 by pouring nearly boiling water on ant mounds within about 50 – 165 feet of FGSP nests (Tschinkel and King 2007; Hewett Ragheb et al. 2018, Bowman and Windsor 2018) and by manually excavating RIFA colonies using a shovel (Bowman and Windsor 2018). Though these treatments do not completely eliminate nest predation by RIFAs, and treatments are limited by staff availability and nest site accessibility, the method appears to have greatly improved nest success were ant predation is a significant threat (Bowman and Windsor 2018, Hewett-Ragheb et al. 2018).

As FGSP are ground-nesters, in addition to predation, flooded nesting areas during the breeding season can reduce or prohibit reproductive efforts and success (Pranty 2000, Perkings et al. 2003, Hewett-Ragheb et al. 2017; Factor E), and can alter vegetative composition (Orzell and Bridges 2006; Factor A). For nests monitored at KPPSP over four breeding seasons (n=41, 2005-2008; Noss et al. 2008), flooding was the most common known cause of nest failure, although the cause of failure for most nests was unknown and probably was due to predation (Factor C). In 2016, historic rainfall at the start of the breeding season and three major storm events in 2017 caused widespread flooding that significantly reduced annual productivity at all known FGSP breeding

sites. In response to the devastating flooding, the Service and the FWC implemented several emergency actions to combat this threat which included collecting eggs, nestlings, and fledglings from endangered nest sites to be transported to captive breeding facilities; "lifting" nests prior to rain events to reduce risk of flooding; and removing nestlings from flood-prone nests, caring for them inside overnight, and then returning them to their natal nest the following morning (Hewett-Ragheb et al. 2017, Bowman and Windsor 2018). We also installed groundwater monitoring wells near breeding sites so that field crews could monitor the water table and respond to possible imminent flooding events. Though it is difficult to quantify, nest-lifting appears to have reduced nest failure from flooding due to the higher rates of nest success of lifted nests observed when coupled with the installation of predator deflection fences and RIFA treatments (Hewett-Ragheb et al. 2018, Bowman and Windsor 2018).

Currently, the second largest known FGSP population occurs at the Ranch; however, the Service recently received information about FGSP occurring on two additional private ranches near the known extant wild population. FGSP at the two state-managed properties (TLWMA and KPPSP) and the one federally-managed property (APAFR) are sufficiently protected under existing state and Federal regulations (Factor D). However, FGSPs on the private ranches are vulnerable to threats of habitat loss or degradation (Factor A) through lack of management practices that maintain FGSP habitat, predation from non-native RIFAs (Factor C), or through conversion to other land uses (Factor A). Some land-use changes will require consultation with the Service under section 7 or section 10 of the Act, but other land-use changes could be implemented without any regulatory input from the Service (e.g., converting pastures to row crops or citrus; Factors A and D).

AMENDED RECOVERY CRITERIA

Recovery criteria serve as objective, measurable guidelines to assist in determining when an endangered species has recovered to the point that it may be downlisted to threatened, or that the protections afforded by the Act are no longer necessary and the FGSP may be delisted. Delisting is the removal of a species from the Federal Lists of Endangered and Threatened Wildlife and Plants. Downlisting is the reclassification of a species from an endangered species to a threatened species. The term "endangered species" means any species (species, subspecies, or distinct population segment) which is in danger of extinction throughout all or a significant portion of its range. The term "threatened species" means any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Revisions to the Lists, including delisting or downlisting a species, must reflect determinations made in accordance with sections 4(a)(1) and 4(b) of the Act. Section 4(a)(1) requires that the Secretary determine whether a species is an endangered species or threatened species (or not) because of threats to the species. Section 4(b) of the Act requires that the determination be made "solely on the basis of the best scientific and commercial data available." Thus, while recovery plans provide important guidance to the Service, States, and other partners on methods of minimizing threats to listed species and measurable objectives against which to measure progress towards recovery, they are guidance and not regulatory documents.

Recovery criteria should help indicate when we would anticipate that an analysis of the species'

status under section 4(a)(1) would result in a determination that the species is no longer an endangered species or threatened species. A decision to revise the status of or remove a species from the Federal Lists of Endangered and Threatened Wildlife and Plants, however, is ultimately based on an analysis of the best scientific and commercial data then available, regardless of whether that information differs from the recovery plan, which triggers rulemaking. When changing the status of a species, we first propose the action in the *Federal Register* to seek public comment and peer review, followed by a final decision announced in the *Federal Register*.

Herein, we provide delisting criteria for the FGSP as the MSRP only developed downlisting criteria as discussed above.

Downlisting Recovery Criteria

We are not amending the existing downlisting criteria (please refer to page 4-387 of the MSRP).

Delisting Recovery Criteria

The FGSP will be considered for delisting when, in addition to the downlisting criteria, the following delisting criteria are met:

1. Twelve (12) FGSP populations are maintained, established, or discovered, that exhibit a stable or increasing trend as evidenced by natural recruitment and a stable age distribution. At least six (6) of those populations must be on lands protected via a conservation mechanism, and the overall population must be of sufficient size to be resilient to demographic, environmental, and genetic stochasticity (Factor A);
2. Populations are connected to the extent that genetic diversity can be maintained without the need for captive breeding or translocation (Factor E);
3. Predation and other sources of nest failure are reduced to a level such that nest protection is not necessary (Factor C); and,
4. It can be demonstrated that, in addition to the above criteria, loss of dry prairie habitat associated land use conversion, fire suppression, lack of natural disturbance, and woody vegetation encroachment is diminished or reversed such that enough habitat of suitable quality is protected for the species to remain viable for the foreseeable future (Factors A, D, and E).

Justification

The proposed delisting recovery criteria reflect the best available and most up-to-date information for the FGSP, while incorporating information still relevant from the MSRP. Furthermore, the delisting criteria were developed to reflect the subspecies' overarching recovery strategy, and are consistent with current goals, objectives, and known risk levels. Specifically, each delisting criterion ensures that the underlying causes of the decline and impediments to recovery will be addressed and mitigated.

Criterion 1. Restoring populations on public or other protected lands and having multiple populations and sufficient habitat distributed across the current and historical range of the subspecies will provide the representation and redundancy necessary to assure the subspecies as a

whole is resilient to predation, shifts in habitat suitability, disease, stochastic events, and other biological or environmental stressors. The populations need to be large enough and robust enough to be ecologically and demographically functional across the geographic range of the subspecies.

Criterion 2. Having connected populations will allow for gene flow between populations, reduce the frequency of genetic drift, and protect the genetic diversity of the subspecies. Having a genetically robust population will maximize the fitness of the subspecies such that it is healthy, resilient, adaptive, and able to respond to biological and environmental stressors affecting the population across the geographic range of the subspecies.

Criterion 3. Providing a long-term solution to address the extremely low nest success by significantly reducing the threat of predation of FGSP eggs and nestlings by native and non-native species is needed such that the subspecies is self-sustaining without the need for continued intervention to protect nests and nesting FGSPs. Expanding the range and distribution of the population will ensure the subspecies is resilient to environmental stressors such as flooding without the need for intense, invasive, population-wide management. Currently, nest survival for unprotected nests is not sufficient to reverse the population decline and the subspecies is heavily conservation-reliant for its continued persistence.

Criterion 4. Ensuring sufficient habitat is protected in the foreseeable future to provide functional connectivity among populations while maintaining sufficient landscape distribution of the population as a whole will ensure redundancy and resiliency to demographic, environmental, and genetic stressors across the geographic range of the subspecies. Providing appropriate fire and hydrologic regimes will ensure habitat of suitable vegetation composition and structure is available by preventing encroachment of woody vegetation and maintaining large expanses of open prairie habitat necessary to recover the subspecies. In addition, mechanical removal of trees and woody vegetation from dry prairie habitat will increase both the suitability and extent of suitable habitat available for FGSP.

Together, these recovery criteria cover threats related to functional and actual habitat loss, genetic diversity, and productivity and nesting success; all of which are likely drivers of the FGSP's population demographics, size, and the subspecies' long-term persistence.

Rationale for Amended Recovery Criteria

The existing criteria for the FGSP on page 4-387 in the MSRP (USFWS 1999) (https://ecos.fws.gov/docs/recovery_plan/sfl_msrp/SFL_MSRP_Species.pdf) included only downlisting criteria. With these proposed amendments, delisting has been clearly defined with measurable, objective criteria in keeping with the recovery strategy and goals outlined in the MSRP. These criteria address what is necessary to ensure resiliency, redundancy, and representation by addressing factors that threaten the species. In achieving these criteria, we expect the FGSP to have a low probability of extinction for the foreseeable future and have stable populations needed for long-term recovery. We will work together with our partners to strategically and efficiently implement the new criteria.

ADDITIONAL AMENDED RECOVERY ACTIONS AND IMPLEMENTATION SCHEDULE

Amended recovery actions

The following amended recovery actions and revised priority implementation numbers are recommended to parallel with the current strategic vision for recovery of the FGSP and to reflect the importance of these actions to the implementation of that strategy:

Original recovery action*: S2.3. Develop a captive propagation plan for the Florida grasshopper sparrow following DOI guidelines, and implement as warranted.* An estimated 600 adult Florida grasshopper sparrows (1996 census) exist in the wild. In the event of further declines in the size or distribution of the Florida grasshopper sparrow, a captive population may provide the difference between survival and extinction for this species. The captive propagation plan should identify specific demographic thresholds that would trigger the establishment of captive populations, facilities that could support a captive propagation program, protocols for selecting and capturing individuals for a captive population, reintroduction protocols, and criteria that clearly state when the captive propagation program could be ended.

Revised recovery action: *S2.3. Implement a captive propagation program following DOI guidelines and produce and release enough Florida grasshopper sparrows to maintain a stable or increasing wild population.* Due to a continued precipitous decline of the Florida grasshopper sparrow population, the Service initiated a captive-propagation program in 2015 to augment the wild population via release of captive-reared birds. The Service and the Florida Fish and Wildlife Conservation Commission, in consultation with our partners on the Florida Grasshopper Sparrow Working Group, drafted a *5-Year Strategic Vision - a recovery implementation strategy* (last updated 9 April 2019) to direct the recovery actions for the Florida grasshopper sparrow, including captive breeding and release of captive-reared birds to stabilize and grow the wild population while seeking ways to improve wild vital rates. Unless cessation criteria identified in the strategic vision document are reached, captive breeding and releases should continue as identified in the aforementioned recovery implementation strategy.

Original recovery actions: *S3. Conduct research to determine the basic biological needs of the Florida grasshopper sparrow.* Although considerable research has been done on the biology and ecology of the Florida grasshopper sparrow, more information is necessary before the Florida grasshopper sparrow can be properly managed and effects of habitat management actions assessed.

Revised recovery action: S3. *Conduct research to determine the basic biological needs of the Florida grasshopper sparrow.* Although considerable research has been done on the biology and ecology of the Florida grasshopper sparrow, more information is necessary so the Florida grasshopper sparrow can be properly managed, and effects of habitat and population management actions can be thoroughly assessed. This will be achieved by implementing the specific research recovery actions (Actions 14 through 18) as outlined in the *5-Year Strategic Vision - a recovery implementation strategy* (last updated 9 April 2019).

Revised Implementation Schedule

The following priority numbers have been revised to reflect the importance of those actions to the implementation of the current FGSP recovery plan.

Task Number: S2.3.
Original Priority Number: 3
Revised Priority Number: 1

Task Number: S3. (S3.1 - S3.3)
Original Priority Number: 2
Revised Priority Number: 1

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APPENDIX – SUMMARY OF PUBLIC AND PARTNER COMMENTS RECEIVED

Summary of Comments

We published a notice of availability in the Federal Register on August 6, 2019 (84 FR 38284) to announce that the draft amendment to the Florida Grasshopper Sparrow Recovery Plan was available for public review, and to solicit comments by the scientific community, State and Federal agencies, Tribal governments, and other interested parties on the general information base, assumptions, and conclusions presented in the draft revision. An electronic version of the draft amendment was posted on the Service's Species Profile website (https://ecos.fws.gov/docs/recovery_plan/Florida%20Grasshopper%20Sparrow%20Recovery%20Plan%20Amendment.pdf). We also developed and implemented an outreach plan that included (1) publishing a news release on our national webpage (https://www.fws.gov/news/) on August 5, 2019, (2) sending specific notifications to Congressional contacts in all Florida Districts, and (3) sending specific notifications to key stakeholders in conservation and recovery efforts. These outreach efforts were conducted in advance of the *Federal Register* publication to ensure that we provided adequate notification to all potentially interested audiences of the opportunity to review and comment on the draft amendment.

We received 18 comments in total, 12 from a State governmental agency, five from a Federal governmental agency, and one from a non-governmental agency. We have considered all substantive comments; we thank the reviewers for these comments, and to the extent appropriate, we have incorporated the applicable information or suggested changes into the final revised recovery plan. Below, we provide a summary of comments received and provide responses to the comments. We also provided copies of all comments received during the formal public comment period to all relevant Federal agencies for their consideration prior to implementation of the final recovery plan, in accordance with section 4(f)(5) of the Act.

Comment 1: In the second-last paragraph on page three, we suggest acknowledging that hydrology, in addition to fire, helps keep the dry prairie open.

Response: We updated the recovery plan amendment to further acknowledge the role of hydrology in maintaining open dry prairie habitat.

Comment 2: In the last paragraph on page three, more recent data do not suggest a monotonic decline in adult survival, as 2018 survivorship was better than previous years.

Response: We updated the recovery plan amendment to include recent data on FGSP adult survivorship.

Comment 3: We recommend including information in this paragraph that underscores how low nest success has been in the absence of nest protection. Adult survival has been acceptable in some years, but nest success has been consistently low. We also recommend that you include a summary of recent nest protection efforts (*e.g.*, fencing, red-imported fire ant treatments) in this paragraph.

Response: We included additional information to the recovery plan amendment.

Comment 4: The first criterion does not specify the temporal scale by which population trends are measured. Also, in addition to having multiple populations, it is important that at least some of the populations, or at least the population as a whole, is of sufficient size to be resilient to demographic, environmental, and genetic stochasticity and potential catastrophes.

Response: We do not currently have a good measure of what a stable or increasing trend for this subspecies would be, how much suitable habitat will be enough to recover the subspecies, or the specific time frames needed to achieve the criteria. Therefore, we described these metrics in the delisting criteria more broadly. If and when, in the future, we are able to better define those metrics, we will either identify those targets in a recovery implementation strategy or revise the criteria to include more specific numbers for those metrics. We added language to capture the importance of resiliency to specific factors.

Comment 5: In the third criterion, it is unclear whether nest protection includes nest lifting as well as nest fencing and fire ant treatments. We want to increase productivity to the point that neither nest protection nor nest lifting are necessary in the future.

Response: The criterion has been revised to clarify that the subspecies should not be conservation-reliant in order to be self-sustaining.

Comment 6: On page 6, we recommend expanding the justification to discuss the need to address the alarmingly low nest success observed in the absence of nest protection.

Response: We expanded the justification to emphasize the need for broader solutions to address the extremely low nesting success of unprotected nests.

Comment 7: On page 6 under Criterion 4, the first sentence mentions "across the geographic range of the subspecies," highlighting that the arrangement of populations on the landscape is an important consideration. Populations must be close enough together for genetic exchange but not so close together that all populations are susceptible to a single catastrophic event. The latter point is not currently addressed in the revised criteria.

Response: We expanded the justification discussion to underscore the importance of population distribution to the functional viability and resiliency of the FGSP population.

Comment 8: In the Justification section, you may wish to mention why disease is not incorporated into the criteria. For example, there currently is no evidence that disease is driving current declines, but research will continue to evaluate the potential role of disease.

Response: The potential role of disease in the FGSP population decline was discussed as a current hypothesis in need of further research in the recovery plan amendment (page 4). Disease is currently a research priority action identified in the *5-Year Strategic Vision - a recovery implementation strategy* (last updated 9 April 2019). We included the revised recovery action (S3) to highlight our focus on the identified specific research recovery actions (page 8).

Comment 9: The commenters noted that the standards for downlisting the subspecies

appear stronger and more detailed than delisting standards, and they do not give a measurable definitions for stable or increasing trend?

Response: We agree and the recovery plan amendment has been updated to clarify that the downlisting criteria are a minimum threshold that must be achieved before the delisting criteria can be applied. Please also see the response to a similar comment, Comment 4, regarding the metrics and definitions for "stable and increasing trend."

Comment 10: Additionally, recovery criteria 3 and 4 don't appear to be objective and measurable. At what level of predation will nest protection not be necessary? FGSPs have a fast life history, suggesting that nest predation or at least nest failure may have been relatively high historically. At (approximately) what level will the Service determine that nest protection is not necessary?

Response: We have provided additional detail in the justification sections for Criteria 3 and 4 to address this comment. Please also see the response to a similar comment, Comment 7, regarding predation and nest protection.

Comment 11: For criteria 4, how much suitable quality habitat is necessary to be protected? Is it possible to demonstrate that loss of habitat is diminished or reversed without having a conservation (or regulatory) mechanism in place? It seems that the Service could determine how many individuals a population would have to contain to remain viable and then calculate how many acres would have to be protected with appropriate habitat management plans to carry enough viable populations. Maybe, "At least ## acres of dry prairie (or suitable FGSP) habitat at each of ## (i.e., 12) distinct locations (i.e., populations) are implementing measures to maintain fire at an appropriate intensity, frequency, and seasonal timing, reduce woody encroachment and avoid development for the foreseeable future."

Response: Please see responses to similar comments, Comments 4 and 7, regarding habitat conservation and population viability.

Comment 12: We recommend the Service consider taking this opportunity to update and prioritize actions in the recovery plan to reflect changes that have occurred since 1999. For example, captive propagation has risen in importance due to precipitous declines since that time.

Response: We agree and we have added a section to address this comment and revised two recovery actions, S2.3 and S3, to reflect the changes in the recovery strategy since 1999. We also revised their priority numbers in the FGSP recovery plan implementation schedule accordingly (see "Additional amended recovery actions and implementation schedule" in this amended recovery plan; page 8).