Scrub plum *(Prunus geniculata)*

5-Year Review:
Summary and Evaluation

U.S. Fish and Wildlife Service
Southeast Region
Jacksonville Ecological Services Field Office
Jacksonville, Florida

5-YEAR REVIEW
Scrub plum/*Prunus geniculata*

I. GENERAL INFORMATION

A. Methodology used to complete the review: This review was completed by the Jacksonville Field Office, Florida. None of the review was contracted to outside parties. All literature and documents used in this review are on file at the Jacksonville Field Office and are cited in the References section. We used peer-reviewed publications; interim and annual reports provided as part of local and Federal government contracts; data and information available on the internet; unpublished data; and personal communications. Public notice of this review was given in the Federal Register on April 16, 2008, and a 60-day comment period was opened. The draft of this document was distributed for peer review (see Appendix A) and comments received were addressed.

** a new 5-year review was initiated in 2014 (79 FR 56821) and concluded in in 2017 reaffirming the previous (2009) five factors analysis remains an accurate reflection of the current status. The Service is aware of more recent literature (Slapcinsky et al. 2010, Weekly et al. 2010, and Menges and Weekley 2013) that further confirms the information discussed in the previous review. Our new signature page is included on page 17.*

B. Reviewers

Lead Region – Southeast Region: Kelly Bibb, 404-679-7132

Lead Field Office – Jacksonville, FL, Ecological Services: Michael Jennings, 904-731-3093

Cooperating Field Office – Vero Beach, FL, Ecological Services: David Bender, 772-562-3909

C. Background

1. FR Notice citation announcing initiation of this review: 73 FR 20702, April 16, 2008.

2. Species status: Decreasing (2008 Recovery Data Call). Scrub plum is declining due to poor seedling recruitment and habitat loss. Few seeds are produced in the wild and mortality exceeds recruitment. About 51 percent of known scrub plum populations occur on unprotected private lands that are vulnerable to destruction or decline in the future if the properties are developed and/or continue to be unmanaged. Most unprotected populations are relatively small (Cox *et al.* 2004). Conversely, many of the largest known populations of scrub plum are found on public conservation parcels.

Any loss of scrub plum populations on unprotected private lands would result in a net decrease in the number of populations of this species. Consequently, scrub plum is likely to decline in the future because of loss of populations on private lands.

3. **Recovery achieved:** 3 (50-75% recovery objectives achieved)

4. **Listing history**
Original Listing
FR notice: 52 FR 2227
Date listed: January 21, 1987
Entity listed: Species
Classification: Endangered

5. **Associated rulemakings:** None

6. **Review History:** FWS conducted a 5-year review for the scrub plum in 1991 (56 FR 56882). In this review, the status of many species was simultaneously evaluated with no in-depth assessment of the five factors or threats as they pertain to the individual species. The notice stated that FWS was seeking any new or additional information reflecting the necessity of a change in the status of the species under review. The notice indicated that if significant data were available warranting a change in a species' classification, the Service would propose a rule to modify the species' status. No change in the scrub plum listing classification was found to be warranted.

Recovery Plans (see below): 1990, 1996, 1999

Recovery Data Call: 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, and 2008.

7. **Species' Recovery Priority Number at start of review (48 FR 43098):** 2
A recovery priority number of 2 means that the degree of threat to scrub plum is high and the recovery potential is high.

8. **Recovery Plan**

Name of plan: South Florida multi-species recovery plan (MSRP) (identifies recovery contributions for the South Florida Ecological Service's office work area)
Date issued: May 18, 1999

Name of plan: Recovery plan for nineteen Florida scrub and high pineland plant species.
Date issued: June 20, 1996

Name of previous plan: Recovery plan for eleven Florida scrub plant species.
Date issued: January 29, 1990

II. REVIEW ANALYSIS

A. Application of the 1996 Distinct Population Segment (DPS) policy

1. **Is the species under review listed as a DPS?** No. The Act defines species as including any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate wildlife. This definition limits listing DPS to only vertebrate species of fish and wildlife. Because the species under review is a plant, the DPS policy does not apply.

B. Recovery Criteria

1. **Does the species have a final, approved recovery plan containing objective, measurable criteria**? Yes.

2. **Adequacy of recovery criteria:**

   a. **Do the recovery criteria reflect the best available and most up-to-date information on the biology of the species and its habitat?** No. As indicated in section II.B.3. below, we believe criteria 1 through 3 are unclear or vague and should be revised to be more measureable.

   b. **Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria (and is there no new information to consider regarding existing or new threats)?** No. The recovery criteria generally identify the need to protect viable scrub plum populations. However, achieving these recovery criteria would require reducing or eliminating many of the threats facing scrub plum, but these needs are not specified in the criteria. For example, insect predation would likely have to be reduced or eliminated to help populations become viable, but the recovery criteria do not identify specific actions to deal with predation. Also, there is no mention of the rate or amount of recruitment necessary to achieve viability.

3. **List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information. For threats-related recovery criteria, please list which of the 5 listing factors are addressed by that criterion. If any of the 5 listing factors are not relevant to this species, please note that here.**

In this section we consider the recovery criteria provided in the Recovery Plan for Nineteen Florida Scrub and High Pineland Plant Species (Service 1996). The South Florida Multi-species Recovery Plan (Service 1999) is more current but it only addresses the recovery needs of scrub plum in South Florida and the contribution that portion of the species' range can provide to the species as a whole. Because the older, but broader recovery plan of 1996 addresses recovery needs of this species throughout its range, we consider it to be the authoritative source for recovery criteria.

The 1996 recovery plan lists four criteria necessary to reclassify the scrub plum from endangered to threatened status: (1) there are eight populations at four sites; (2) at least 10 years of demographic monitoring is conducted at one of these locations; (3) scrub plum is monitored at all locations; and (4) there must be protected locations in Highlands, Polk, and Lake counties. To delist the scrub plum, 20 populations must be present at 5 sites and there must be 10 additional years of monitoring.

Criterion 1 is vague and it is difficult to assess whether current conditions meet this objective. The term "population" has not been defined so it is not possible to determine whether a population is represented by an individual stem (one plant) or hundreds of stems. Similarly, criterion 1 refers to "sites" and it is not clear whether this refers to geographically distinct areas or whether two or more distinct populations of scrub plum could occur within the same area boundary and count as two sites. Furthermore, this criterion does not explicitly state that the eight populations must occur on managed conservation lands, but we assume this was the intent.

Despite the vagueness of criterion 1, there are sufficient data available to reasonably conclude that this criterion has been met. Knowing that each element occurrence record maintained by the Florida Natural Areas Inventory (FNAI) has a separation distance of at least 1.0 kilometer (NatureServe 2004) leads us to conclude that the known locality records likely represent spatially distinct scrub plum populations, regardless of the number of plants present. Consequently, we believe there to be at least 51 scrub plum populations on managed lands (Cox *et al.* 2004), which is substantially more than the requisite eight populations at four sites specified in the recovery plan. However, most inventoried populations on unprotected private lands contain fewer than 10 plants (Cox *et al.* 2004) and the viability of these small populations has not been evaluated. Finally, for the purpose of this assessment, we consider element occurrence records to be synonymous with the terms "population" and "site" as used in defining the recovery objectives and criteria in the 1996 recovery plan.

We believe the intent of recovery criterion 2 is to ensure that monitoring takes place over at least a 10-year period on one population of scrub plum and that the demographic monitoring demonstrates that the population is

viable. However, as written, this criterion only recommends that demographic monitoring be conducted, not that the results show a demographically viable population. Available data indicate that two scrub plum populations have been and/or are intensively monitored; Carter Creek South tract of the Lake Wales Ridge National Wildlife Refuge (LWRNWR) and The Nature Conservancy's (TNC) Tiger Creek and Longleaf Pine Preserves. Demographic monitoring has been ongoing for nine years on the Carter Creek tract. On Tiger Creek and Longleaf Pine Preserves, annual demographic monitoring was conducted from 1991 to 2001 and at five-year intervals thereafter. Given the duration of monitoring at TNC's preserves, we believe that the temporal portion of this criterion has been met. With respect to population status, available data indicate that these two populations have declined slightly. Population viability has not been evaluated at either site because data are lacking on seed germination and seedling recruitment. Consequently, we do not believe that criterion 2 has been fully met.

Criterion 3 requires that all populations be monitored. It is unclear whether "all populations" refers to the eight populations referred to in criterion 1 or all known populations at any particular time. In either case, available information suggests that demographic monitoring is limited to two populations - Carter Creek South tract and Tiger Creek/Longleaf Pine Preserves. Less intense monitoring is also conducted at five-year intervals on two populations within the Florida Division of Forestry's (FDOF) Lake Wales Ridge State Forest (LWRSF) (C. Weekley, Archbold Biological Station, personal communication, 2009). Because monitoring is limited to these populations, we believe that criterion 3 has not been met.

Criterion 4 stipulates that scrub plum be protected in Highlands, Polk, and Lake counties. As of 2006, each of these three counties contained at least two populations of scrub plum on public or private conservation lands or properties that were otherwise protected from development. As a result, we believe that criterion 4 has been met.

The 51 known populations on managed lands exceed the 20 populations recommended for consideration of delisting. However, as discussed above, the level of monitoring required for reclassification has not been met and, therefore, the more lengthy monitoring requirement for delisting has not been met.

C. Updated Information and Current Species Status

1. Biology and Habitat

a. Abundance, population trends, demographic features, or demographic trends: FNAI updated its records for scrub plum in the

summer of 2008 and confirmed 83 extant populations. These 83 populations contained from 1 to 10,200 plants (A. Johnson, Florida Natural Areas Inventory, personal communication, 2009). Forty-five populations contained 10 or more plants. The largest populations were found on Carter Creek South tract of the Lake Wales Ridge National Wildlife Refuge and on the Carter Creek tract of the Lake Wales Ridge Wildlife and Environmental Area with each estimated to contain as many as 3,000 individual plants. Two other conservation parcels are each estimated to contain between 700 and 1,000 plants and five others are believed to contain between 30 to 100 individual plants (A. Johnson, FNAI, personal communication, 2009).

Long-term demographic surveys have not been conducted within most scrub plum populations so assessments of population and demographic trends are not possible.

Surveys for scrub plum and other rare plants on the LWRSF have typically focused on finding plants and documenting abundance of scrub plum and have not included intensive efforts to evaluate demographic performance. Furthermore, repeated surveys have not been conducted in the same areas to assess population trends. Nonetheless, in prioritizing available funding and staff resources, the FDOF does not anticipate conducting more intensive demographic monitoring because scrub plum are relatively abundant and are apparently responding positively to ongoing management activities (Clanton 2007).

The demography of scrub plum is generally well understood based on research initiated in 1996 by Archbold Biological Station staff (Weekley and Menges 2001, 2002, 2007; Weekley *et al.* 2003; Menges *et al.* 2008), but lack of data on seed germination and seedling recruitment preclude a full understanding of the demographics of this species. From the various research efforts, we now know that scrub plum: (1) has a rare breeding system characterized by the presence of male and bisexual flowers on the same plant, (2) is partially self-incompatible and that inbreeding depression is high in self-compatible individuals, and (3) experiences high rates of fruit loss due to abortion and pre-dispersal predation. Recent research has also confirmed that scrub plum is long-lived and experiences low mortality, and populations persist for long periods in the absence of fire (Pace-Aldana *et al.* 2006; Menges *et al.* 2008; C. Weekley, Archbold Biological Station, personal communication, 2009). Current information also supports previous reports that this species is a strong postburn resprouter (Weekley *et al.* 2007, Weekley and Menges 2003, Menges *et al.* 2007) and that recruitment is low (Service 1999; Weekley and Menges 2003, 2007). Weekley and Menges (2008) are currently evaluating the effects of various land management treatments on a number scrub-endemic plants, including scrub plum.

Evaluating population trends for scrub plum is difficult because this species is long lived, experiences low non-seedling plant mortality, has low seedling recruitment, can persist for long periods in fire-excluded habitat, and vigorously resprouts and flowers following fire. The two long-term monitoring efforts described in the Recovery Criteria section above have shown the number of non-seedling plants to be in slight decline over the past 7 to 12 years (Pace-Aldana *et al.* 2006, Weekley *et al.* 2007), but, more alarmingly, recruitment into these populations is extremely low.

As described above, low recruitment appears to be one of the primary factors adversely affecting scrub plum and we believe this factor alone is sufficient to conclude that the demographic trend for this species is in decline. The cause for this poor demographic performance is not fully understood at this time, but pre-dispersal fruit predation and high rates of fruit abortion may be factors contributing to low recruitment (Weekley *et al.* 2007). We expect low recruitment to continue to adversely affect scrub plum in the foreseeable future.

b. Genetics, genetic variation, or trends in genetic variation: Recent research on the reproductive biology of scrub plum demonstrates that this species has partial gametophytic self-incompatibility (GSI) (Weekley *et al.* 2007). GSI in scrub plum is an S-RNase based incompatibility system whereby plants sharing the same S-alleles are cross-incompatible. The incompatibility reaction appears to be attenuated in some populations or individuals, thereby providing the opportunity for self-fertilization or for fertile crosses between individuals belonging to the same S-locus mating type. However, self-fertilization results in high rates of abortion, due presumably to inbreeding depression (C. Weekley, Archbold Biological Station, personal communication, 2009)

c. Taxonomic classification or changes in nomenclature: No new information exists.

d. Spatial distribution, trends in spatial distribution or historic range: The description of the spatial distribution of scrub plum provided in the Service's 1999 recovery plan accurately defined the historic distribution of this species (Service 1999). It includes Lake County, west and southwest of Lake Apopka; the southwest and northwest corners of Orange and Osceola counties, respectively; and Polk and Highlands counties, from the City of Lake Wales south to the Highlands County/Glades County border. Records maintained by the FNAI indicate this species occurs primarily on the Lake Wales Ridge (as defined by Weekley *et al.* 2008) (Turner *et al.* 2006). However, six records occur on sandy ridges that are adjacent to, but are not part of, the Lake Wales Ridge (Turner *et al.* 2006).

The number of populations of scrub plum has declined in recent years (Cox *et al.* 2004) but the overall geographic distribution of scrub plum does not appear to be substantially different than historic records indicate. However, populations in the northern part of the range (e.g., Lake County) seem to be more vulnerable to extirpation because there are fewer populations on protected public property (C. Weekley, Archbold Biological Station, personal communication, 2009). This portion of the range may actually contract in the future if additional populations are not protected.

e. Habitat or ecosystem conditions: Scrub plum evolved in fire-maintained white and yellow sand xeric vegetative communities, including rosemary and oak scrub, scrubby flatwoods, and sandhills (Service 1999, Weekley and Menges 2003, Menges *et al.* 2007). Menges (2007) described natural fire return intervals of 2-5 years in sandhill, 8-16 in scrubby flatwoods, 5-12 years in oak-hickory scrub, and 15-30 years in rosemary scrub and these intervals would likely maintain suitable habitat for scrub plum, although population fluctuations might be greater in the rosemary and oak scrub because plants probably senesce and decline in habitats with longer fire-return intervals.

The 2004 survey of element occurrence records found that the most robust plants were found in white xeric soils with exposed sand areas and predominately native vegetation (Cox *et al.* 2004). High quality habitat was typically found on recently burned public lands. Field notes accompanying the 2004 survey results suggest that many occurrence records on private lands were on small parcels that had few plants and were in degraded habitat (e.g., pastures, fence rows, overgrown, etc.). Habitat conditions on private lands probably have not improved since the 2004 survey, and in most instances have likely gotten worse with the continued exclusion of fire or other management efforts. Fire suppression leads to changes in composition and structure within vegetative communities (Weekley and Menges 2003). Fire exclusion typically results in taller and denser vegetation that may shade-out scrub plum leading to a decline in the number of stems, number of individual plants flowering, and general vigor of individual plants (as suggested by more lichen covered stems) (Menges *et al.* 2008, Cox *et al.* 2004). The overall health of scrub plum declines with increasing time since fire. Consequently, we believe that habitat conditions on unmanaged private lands are poor and will probably continue to decline in the future.

Information related to species-specific habitat quality is not typically collected by land managing agencies except in instances where there is research interest or specific funding available to do so. Consequently, there is little information available to specifically evaluate scrub plum

habitat conditions on most managed public lands. We do know that habitat management efforts on many public lands are ongoing, but in many cases the extent and magnitude of management prescriptions are not sufficient to effectively restore and/or maintain xeric upland habitats. Undoubtedly, scrub plum habitat is degraded on some public lands, even where active management programs are in place. Successful restoration of xeric vegetative communities on many public lands will take several years to achieve because multiple prescribed fires are necessary to achieve the desired vegetative structure of early successional stages. On public lands that have only recently begun to implement prescribed fire, habitat conditions for scrub plum may take several more years to become suitable. Elsewhere, some public land managers do not currently have the resources to implement effective habitat management programs (Howell *et al.* 2003, Service 2006) even though 98 percent of evaluated public lands were determined to be appropriately managed (Florida Department of Environmental Protection 2007). However, less than 25 percent of public land managers have been ranked as having an excellent prescribed burn program (Howell *et al.* 2003). On most public lands, scrub habitat is likely to continue to degrade unless resources are available so land managers can continue to conduct appropriate management. Furthermore, some scrub conservation lands on the Lake Wales Ridge may not be managed in the near future because there are multiple private landowners with inholdings. These patchworks of private and public land make use of prescribed fire as a management tool difficult (R. Bowman, Archbold Biological Station, personal communication, 2007).

2. Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms)

a. Present or threatened destruction, modification or curtailment of its habitat or range: The most pervasive threat to scrub plum on public land is habitat degradation due to fire suppression. Most land managing agencies in Florida are not able to use prescribed fire at the rates, frequency, and/or intensity needed to restore and maintain most of Florida's fire-adapted ecosystems (R. Mulholland, Florida Department of Environmental Protection, personal communication, 2007; Service 2006). Consequently, the difficulties land managing agencies currently face in implementing prescribed fires probably have resulted in the degradation of scrub plum habitat in some areas.

Scrub plum on private lands is also threatened long-term with fire suppression, but habitat destruction is a more immediate concern in many locations. Except for several privately owned conservation parcels, most other private landowners are unlikely to use habitat management techniques such as prescribed fire to maintain or enhance scrub plum habitat. At present, there are no incentives available that would encourage

private landowners to undertake prescribed fire, especially for those who own relatively small parcels embedded in urban matrices. As a result, we believe that many locality records for scrub plum on non-conservation parcels in private ownership are threatened with habitat modification due to fire suppression.

Scrub plum that occur on non-conservation private lands also are vulnerable to destruction due to urban development, such as construction of roads; installation of utilities and other infrastructure; and residential, commercial, and industrial construction. Scrub plum on each private parcel is vulnerable to this threat at any time. Several populations are located in areas previously platted for residential development and these populations are at greatest risk, especially when economic conditions improve and residential construction resumes at is historic pace. One small population is imminently threatened by land clearing for commercial development. In 2006, the Service issued an incidental take permit for two fossorial skinks on about 45 acres in west-central Lake County. Several hundred scrub plum plants were also found on this parcel along with six other federally listed plants (Service 2005). The entire parcel has not yet been developed but as land clearing proceeds individual plants will be destroyed.

b. Overutilization for commercial, recreational, scientific, or educational purposes: Overutilization is not currently thought be a significant risk factor to scrub plum.

c. Disease or predation: Recent research conducted over a one-year period at one location indicated that about 61 percent of scrub plum fruit/seeds are lost to insect predation (Weekley *et al.* 2007). Grasshoppers were responsible for partially eating the fruit to get to the seed, and the grub of a weevil (*Conotrachelus nenuphar)* has been identified as a new scrub plum seed predator (Weekley *et al.* 2007). High rates of pre-dispersal fruit and seed predation greatly reduce the number of germinable seeds (C. Weekley, Archbold Biological Station, personal communication, 2009).

d. Inadequacy of existing regulatory mechanisms: Florida Administrative Code 5B-40 (Preservation of Native Flora in Florida) provides the Florida Department of Agriculture and Consumer Services with limited authority to protect scrub plum from illegal harvest on State and private lands. However, this regulatory mechanism does not prevent destruction of habitat due to land use changes on private lands. Title 62D-2.013 of the Florida Administrative Code (FAC) prohibits the removal, destruction, or damage of plants from Florida Department of Environmental Protection, Division of Recreation and Park's properties. Titles 68A-15.004 and 68A-17.004 FAC prohibit the destruction or

removal of any protected State plant from any Wildlife Management Area or Wildlife and Environmental Area, respectively, without the written consent of the land manager, FWC, Executive Director of the FWC, or fee title holder of private property managed by the FWC. Title 5I-4.005 FAC prohibits the destruction, injury or disturbance of plants on lands managed by the Florida Department of Forestry. Title 40E-7.537 FAC prohibits the destruction or removal of any native plant on lands owned by Florida's Water Management Districts. Scrub plum also occurs on private land owned by a research entity and conservation organization. Protection of scrub plum occurs through applicable State regulations requiring private landowner authorization to remove plants from private property. Because the scrub plum is listed as an endangered species by the State of Florida, these protective regulations apply to this species on the above mentioned State properties and private properties.

The National Wildlife Refuge System Administration Act (NWRAA) represents organic legislation that set up the administration of a national network of lands and water for the conservation, management, and restoration of fish, wildlife, and plant resources and their habitats for the benefit of the American people. Amendment of the NWRAA in 1997 required the refuge system to ensure that the biological integrity, diversity, and environmental health of refuges be maintained. Therefore, scrub plum is protected on Refuge property.

Existing regulatory mechanisms appear adequate to protect scrub plum on State and federally owned lands. Furthermore, we believe scrub plum on private conservation parcels are adequately protected because The Nature Conservancy would not authorize removal or destruction of scrub plum except for scientific or educational purposes. Even then, we anticipate that TNC would seek research permits from the Service to evaluate potential impacts resulting from proposed research or educational projects involving scrub plum.

On private properties, Federal or State laws provide little protection for scrub plum. Since the majority of extant scrub plum populations occur on unprotected private lands, we conclude that existing regulatory mechanisms are inadequate to protect this species.

e. Other natural or manmade factors affecting its continued existence: Scrub plum produce few viable seeds and recruitment is extremely low (Weekley *et al.* 2007; B. Pace-Aldana, TNC, personal communication, 2008). Loss of seeds due to inbreeding depression reduces the number of germinable seeds. These effects may be exacerbated by habitat fragmentation and fire exclusion (C. Weekley, Archbold Biological Station, personal communication, 2009).

D. Synthesis

All recovery criteria for scrub plum have not been met. Long-term monitoring has not been undertaken on most public lands and the two populations that have been monitored demonstrate low mortality but little or no recruitment. Annual demographic monitoring continues at only one location.

Two monitored scrub plum populations are in decline because there is no, or very little, seedling recruitment. The long-term prognosis is not good if mortality continues to exceed recruitment.

About one half of the known scrub plum populations occur on managed lands (public and private conservation lands) and half are on private lands. Most known large populations are protected on conservation lands. Only six populations occur off of the Lake Wales Ridge.

Existing threats include habitat degradation on both public and private lands due to fire suppression and/or application of fire at incorrect intervals or intensity. Scrub plum on private lands is also vulnerable to destruction due to land use changes.

Overutilization for commercial, recreational, scientific, or educational purposes is not currently believed to be a threat to scrub plum.

Existing regulatory mechanisms do not adequately protect scrub plum on private lands. Consequently, existing regulatory mechanisms represent a current threat to this species.

In summary, scrub plum is a long-lived shrub that requires periodic fire to remain vigorous. It appears to be well represented on public conservation lands and two long-term monitoring efforts indicate populations are declining and that recruitment and mortality are low. Mortality exceeds recruitment in monitored populations and continuation of this trend will result in additional population declines. All scrub plum populations on private lands are threatened with habitat destruction and degradation. Rarity of seedling recruitment, habitat degradation, and habitat loss currently pose serious threats to this species. Consequently, scrub plum continues to be in danger of extinction throughout all or a significant portion of its range.

III. RESULTS

A. **Recommended Classification:** No change is required

B. **New Recovery Priority Number:** No change is required

IV. RECOMMENDATIONS FOR FUTURE ACTIONS

Revise the recovery criteria to establish measureable goals for demographic monitoring, including but not limited to: the number of populations that should be monitored, the demographic parameters that should be measured, the demographic performance levels/rates that should be met, and the timeframe within which these levels/rates should be attained/maintained.

Continue demographic monitoring on the Carter Creek tract of the LWRNWR and reinitiate demographic monitoring on TNC's Tiger Creek and Longleaf Pine Preserves. Conduct Level 2 (see Menges and Gordon 1996) monitoring on multiple sites using populations in different habitats and with different management regimes.

Conduct a rangewide survey of genetic diversity in scrub plum. Such a survey could help in identifying populations that might be targeted for acquisition or included as a propagule source for creation of new populations on sites undergoing restoration.

Evaluate breeding system to identify S-locus and assay S-allele diversity within populations to assess the degree of self-incompatibility and role of inbreeding depression in seed viability.

Implement management activities on public lands that contain scrub plum, including prescribed fire at return intervals and intensities necessary to restore and/or maintain the various xeric vegetative communities that support this species.

Purchase or otherwise protect large scrub plum populations on unprotected lands. Protection should target scrub plum populations that are sufficiently large, or could be large if adequately managed, as to be self-sustaining and viable long-term.

Explore opportunities to encourage landowners to conserve and manage property known to contain this species.

V. REFERENCES

Clanton, K. 2007. Lake Wales Ridge State Forest plant monitoring and management report, 2007 final report from 1/2007 through 12/2007. Florida Plant Conservation Program, Florida Division of Forestry, Tallahassee, Florida.

Cox, A.C., A.F. Johnson, S. Kane, and L.G. Chafin. 2004. Status survey for scrub plum, *Prunus geniculata*. Final report, Division of Forestry, Florida Department of Agriculture and Consumer Services Contract #008474, Tallahassee, Florida.

Florida Department of Environmental Protection. 2007. http://www.dep.state.fl.us/lands/landmgmt/default.htm. Accessed April 27, 2007.

Howell, W., B. Malloy, and G. Brock. 2003. Land management review team findings: 1997-2003. Office of Environmental Service, Division of State Lands, Department of Environmental Protection, Tallahassee, Florida.

Menges E.S. 2007. Integrating demography and fire management: an example from Florida scrub. Australian Journal of Botany 55:262-272.

Menges, E.S. and D.R. Gordon. 1996. Three levels of monitoring intensity for rare plant species. Natural Areas Journal 16:227-237.

Menges, E.S., C.W. Weekley, S.I. Hamzé, and R.L. Pickert. 2007. Soil preferences for federally-listed plants on the Lake Wales Ridge in Highlands County, Florida. Florida Scientist 70:24-39.

Menges E.S., C.W. Weekley, and G.L. Clarke. 2008. Sandhill restoration studies and experimental introduction of *Ziziphus celata* at Lake Wales Ridge National Wildlife Refuge. Final report, Florida Fish and Wildlife Conservation Commission, Tallahassee, Florida.

NatureServe. 2004. Element Occurrence Data for Rare and Endangered Species in the United States and Canada, metadata http://www.natureserve.org/prodServices/biotics/HDMSDoc/hdms_dx/NatureServe_EO_Metadata_09-2004.html. Accessed November 24, 2008.

Pace-Aldana, D. Gordon, and J Slapcinsky. 2006. Monitoring of scrub plum (*Prunus geniculata*) on the Lake Wales Ridge, in Annual research report 2006 – a compilation of research conducted or supported by The Nature Conservancy in Florida.

Turner, W.R., D.S. Wilcove, and H.M. Swain. 2006. State of the scrub: conservation progress, management responsibilities, and land acquisition priorities for imperiled species of Florida's Lake Wales Ridge. Archbold Biological Station, Lake Placid, Florida.

U.S. Fish and Wildlife Service [Service]. 1987. Final rule, endangered and threatened wildlife and plants; determination of endangered or threatened status for seven Florida scrub plants. Federal Register 52:2227.

U.S. Fish and Wildlife Service [Service]. 1990. Recovery plan for eleven Florida scrub plant species. Atlanta, Georgia.

U.S. Fish and Wildlife Service [Service]. 1996. Recovery plan for nineteen Florida scrub and high pineland plant species. Atlanta, Georgia.

U.S. Fish and Wildlife Service [Service]. 1999. South Florida multi-species recovery plan. Atlanta, Georgia.

U.S. Fish and Wildlife Service [Service]. 2005. Enviornmental assessment for sand skink and bluetail mole skink on 75 acres in Lake County, Florida. On file, Jacksonville Field Office, Jacksonville, Florida.

U.S. Fish and Wildlife Service [Service]. 2006. Excel spreadsheet containing questionnaire responses received from conservation land managers. On file, Jacksonville Field Office, Florida.

Weekley, C.W. and E.S. Menges. 2001. Demography, floral biology and breeding system of scrub plum (*Prunus geniculata*), a federally listed endangered plant. Annual report to the U.S. Fish and Wildlife Service, Jacksonville, Florida.

Weekley, C.W. and E.S. Menges. 2002. Demography, floral biology and breeding system of scrub plum (*Prunus geniculata*), a federally listed endangered plant. Annual report to the U.S. Fish and Wildlife Service, Jacksonville, Florida.

Weekley, C.W. and E.S. Menges. 2003. Species and vegetation responses to prescribed fire in a long-unburned, endemic-rich Lake Wales Ridge scrub. Journal of the Torrey Botanical Society 130(4):265-282.

Weekley, C.W. and E.S. Menges. 2007. Reproductive biology of scrub plum (*Prunus geniculata*), a Lake Wales Ridge Endangered Shrub. Interim report, U.S. Fish and Wildlife Service, Jacksonville, Florida.

Weekley, C.W. and E.S. Menges. 2008. Further demographic research on Lake Wales Ridge endemic plants. Report to Endangered and Threatened Plant Conservation Grants Program, Division of Plant Industry, Florida Department of Agriculture and Consumer Services, Tallahassee, Florida.

Weekley, C.W., E.S. Menges, and M.A. Ricky. 2003. Demography, floral biology and breeding system of scrub plum (*Prunus geniculata*), a federally listed endangered plant. Annual report to the U.S. Fish and Wildlife Service, Jacksonville, Florida.

Weekley, C.W., E.S. Menges, E.F. Niclen, and D.N. Zaya. 2007. The reproductive biology and seed ecology of scrub plum (*Prunus geniculata*), a Lake Wales Ridge endangered shrub. Final report grant agreement 401516G075. Fish and Wildlife Service, Jacksonville, Florida.

Weekley, C.W., E.S. Menges, and R.L. Pickert. 2008. An ecological map of Florida's Lake Wales Ridge: a new boundary delineation and an assessment of post-Columbian habitat loss. Florida Scientist 71(1):45-64.

U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of Scrub Plum *(Prunus geniculata)*

Current Classification: Endangered

Recommendation resulting from the 5-Year Review: No change needed.

Review Conducted By: Michael Jennings

FIELD OFFICE APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service

Approve _____ Date 5/19/09

REGIONAL OFFICE APPROVAL:

Acting
Lead Regional Director, Fish and Wildlife Service

Approve _____ Date 5-11-09

FY 2017 APPROVAL*
Lead Field Supervisor, U.S. Fish and Wildlife Service

Approved _____ Date 12/21/2017

* In 2014, Southeast Region Field Supervisors have been delegated authority to approve 5-year reviews that do not recommend a status change.

Field Supervisor signature on this document reflects:

1. ✓ We have no new information received, no new public comments, and the original five factor analysis remains an accurate reflection of the current species status.

2. ____ We have obtained a small amount of new information that we have summarized in Addendum 1, received no new public comments, and the original five factor analysis remains an accurate reflection of the current species status.

APPENDIX A
Summary of peer review for the 5-year review of scrub plum (*Prunus geniculata*)

A. Peer Review Method: Prospective peer reviewers were identified if they met one or more of the following criteria: (1) they had recent scientific publications related to scrub plum biology, ecology, or conservation; (2) they had recently conducted research or monitoring of scrub plum related to biology, ecology, or conservation; or (3) they had knowledge of scrub plum biology, ecology, or conservation because of their current professional position.

Prospective peer reviewers were notified electronically on March 3, 2009, and asked of their willingness to participate in the peer review and whether they would be able to complete their review by April 10, 2008, and follow peer review guidance (see B below).

Three prospective peer reviewers were notified: Carl Weekley, Archbold Biological Station; Amy Jenkins, Florida Natural Areas Inventory; and Michael Jenkins, Florida Division of Forestry. All three provided comments.

B. Peer Review Charge: See Appendix B.

C. Summary of Peer Review Comments/Report:

Mr. Weekley

Mr. Weekley provided a comprehensive review of the scrub plum 5-year review. In the Update Information and Current Species Status section, he indicated that surveys by Cox focused on private lands and small, remnant populations and did not include most large populations in public ownership. Therefore, he believes the anticipated future loss of small populations on private lands may not be as alarming as indicated. Mr. Weekley thought that the review's discussion of changes in the species' distribution might confuse readers because he did not believe that the range of the species was likely to change substantially, only that some populations within the range might be lost. He also indicated that loss of populations on private lands is inevitable, but with proper management, populations should not decline on public lands. Mr. Weekley concluded his comments on this section by indicating that the scrub plum is well protected on public lands and recommended that the 5-year review summarize where the plant occurs in other sections of the review.

In the discussion of recovery criteria in section II.B.3., Mr. Weekley recommended that the 5-year review include the recovery criteria described in the Service's 1999 South Florida Multi-species Recovery Plan (MSRP) because those criteria incorporate information not included in the 1996 recovery plan. Mr. Weekley also indicated that the text of the 5-year review used several terms interchangeably and this created confusion. In this section, Mr. Weekley restated that the Cox survey was biased toward small populations in private ownership and referenced additional information he provided on the number of plants found at several public parcels. Mr. Weekley also provided data on annual survival of scrub plum at two locations where he is conducting long-term research. He indicated that viability of scrub plum populations cannot be assessed

currently because data are lacking on the seed germination and seedling recruitment. Finally, Mr. Weekley clarified where he has been collecting long-term monitoring data.

Mr. Weekley thought section C.1.a was confusing because it mixed distribution and status information. He thought that the Cox survey was problematic for use in evaluating population sizes because the areas inventoried by Cox were not well described. Mr. Weekley thought certain portions of this section were confusing because of the interchangeable use of several terms. He believed that population estimates provided by other sources underestimated the scrub plum population on the LWRSF and believed there to be at least 600 more plants than reported by others. Mr. Weekley suggested that more intensive demographic monitoring is needed on the LWRSF to evaluate population viability and that the size of extant populations is not a good indicator of viability because even large populations will decline if mortality exceeds recruitment. Mr. Weekley contended that FDOF's assertion that scrub plum populations are responding positively to management is not supported by data and believes more demographic monitoring should occur on the LWRSF rather than less or none. Mr. Weekley noted that while much is known about scrub plum demography, vital statistics on seed germination and seedling recruitment are still missing. He also pointed out that available data supported the 5-year review's statement about reproductive compatibility/incompatibility, but that these results require further evaluation. Mr. Weekley indicated that the second to last paragraph of this section was confusing. In the last paragraph, he suggested that inclusion of information from the MSRP would be useful. In closing comments to this section, Mr. Weekley indicated that better data were needed on low recruitment rates.

In section C.1.b., Mr. Weekley provided alternative text to strengthen this section.

In section C.1.d., Mr. Weekley indicated that scrub plum populations have been lost within the historic range but this should not be confused with a reduction in the range of the species. He indicated that one of the biggest potential threats to scrub plum was habitat loss in the northern portions of its range. He also indicated that two of the six populations that are not located on the Lake Wales Ridge are protected and that a couple of the off-ridge records seem doubtful. Mr. Weekley thought that our effort at quantifying loss of habitat and scrub plum populations was not straightforward and recommended more concise language be used.

In section C.1.e., Mr. Weekley indicated that we incorrectly listed the fire return intervals for scrubby flatwoods. Elsewhere, Mr. Weekley indicated that he was not particularly concerned about the poor condition of scrub plum habitat in private ownership because previously he suggested that most scrub plum populations in private ownership were small. Instead, he indicated that he had concerns for proper management of protected public lands.

For section C.2.a., Mr. Weekley provided a location where he believed scrub plum was imminently threatened with destruction.

In section C.2.c., Mr. Weekley indicated that he had additional data on scrub plum seed predation, but that these data were less detailed than what was already provided in a previous report.

Mr. Weekley provided alternative language for most of section C.2.e.

In the Synthesis section (II.D), Mr. Weekley again suggested we include information regarding recovery criteria from the 1999 MSRP. He also clarified the implications of self- and partial cross incompatibility with respect to reproductive success of scrub plum. He indicated that the mating system may not be limiting in all situations, and may actually be beneficial in some circumstances. As a result, Mr. Weekley recommended that discussion of the breeding system not be included in the Synthesis section.

In section IV, Recommendation for Future Actions, Mr. Weekley indicated that more intense demographic monitoring was needed on more conservation parcels instead of the presence/absence/abundance monitoring we recommended. He also recommended two additional actions that he thought were necessary to conserve scrub plum in the future. These included conducting a rangewide survey of genetic diversity and evaluating extant scrub plum populations on unprotected sites to determine if there are areas that should be prioritized for acquisition. Of the two, he thought that the genetic assessment was more important task to be undertaken.

Mr. Jenkins

Mr. Jenkins felt that the information provided in the document was appropriate and provided one additional summary of field surveys conducted by the FDOF on the LWRSF.

Ms. Johnson

Ms. Johnson provided the Florida Natural Areas Inventory's updated database for scrub plum occurrence records.

D. Response to Peer Review:

Mr. Weekley

We agree with Mr. Weekley's comments on the Updated Information and Current Species Status section and have modified this section and other appropriate sections accordingly.

We slightly revised section C.1.a., but have not made all the revisions suggested by Mr. Weekley. As written this section addresses the abundance, population trend, demographic features and demographic trends for scrub plum. We agree that the Cox survey results have limited utility. As mentioned above, we have modified this document to reduce use of interchangeable terms. We revised the population estimates for the LWRSF based on information provided by Mr. Weekley. We agree with Mr. Weekley that demographic monitoring is needed on the LWRSF but we only restated that the FDOF will reduce their monitoring efforts. We have no control over prioritization of funding and staff by other agencies. We agree with Mr. Weekley that population size is not an indicator of population viability. We rechecked the 5-year review to ensure we did not make this inference. We revised the document to clearly indicate that data on seed germination and seedling recruitment were

lacking. We acknowledge Mr. Weekley's statement that additional research is needed on reproductive compatibility. We revised the second to the last paragraph to reduce confusion. We concur with Mr. Weekley's assessment that better information is needed on low recruitment rates.

The recovery criteria described in the MSRP represent targets set by the Vero Beach Ecological Services Office to assist in the recovery of scrub plum, but these recovery criteria do not reflect the Service's recovery criteria for the species throughout its listed range. While we acknowledge some of the MSRP's criteria are more current, we cannot consider them in this 5-year review because they do not represent recovery criteria for the scrub plum throughout its range. We have modified the text to clarify use of terms and have limited use of multiple terms having the same meaning. We have modified section C.1.a. to include distribution and abundance information provided by Mr. Weekley. We used information provided by Mr. Weekley on survival rates and locations where Mr. Weekley has been collecting long-term monitoring data to revise appropriate sections of this 5-year review. We modified section C.1.a to capture the fact that seedling germination and recruitment are limiting factors in our ability to evaluate viability of scrub plum populations.

We agree that the text provided by Mr. Weekley for section C.1.b. is more thorough and have included it verbatim in the revised 5-year review.

Mr. Weekley is correct in his analysis that scrub plum populations have been lost and that the loss of populations does not necessarily reflect a decrease in the range of the species. We have revised appropriate sections of the 5-year review to make sure we do not misstate this fact. We agree that scrub plum is not adequately protected in the northern portion of its range and that remaining populations are fragmented. We also agree that two of the scrub plum populations that are not located on the Lake Wales Ridge are protected on public property. Mr. Weekley did not provide data or other information to support his claim that records for scrub plum populations that are not located on the Lake Wales Ridge are questionable. At this time we have no other information to support or refute his assertion. We substantially revised the last two paragraphs of this section in an effort minimize speculation and to state the obvious facts of the spatial distribution of scrub plum.

We corrected the fire return interval period for scrubby flatwoods in section C.1.e. as recommended by Mr. Weekley. We agree that management of public lands is important for the conservation of scrub plum, particularly since most large populations occur on public lands.

For section C.2.a., we contacted Mr. Weekley to identify the type of threat faced by scrub plum and to confirm that the threat was imminent. We subsequently revised section C.2.a. to reflect this threat.

We did not include reference to additional seed predation information because the referenced material did not add any additional information to the 5-year review.

We accepted Mr. Weekley's revisions to section C.2.e.

We previously discussed our rationale for not including recovery criteria from the 1999 MSRP. We agree with Mr. Weekley's comments on the scrub plum mating system and removed that discussion from the Synthesis section.

We agree with Mr. Weekley's recommendation to conduct more intensive demographic monitoring on additional scrub plum populations on public conservation lands. Our original text was in error and we subsequently made the suggested changes. We also agree that genetic evaluation of gametophytic self-incompatibility in scrub plum would increase our knowledge and potentially help with conservation of this species. We opted to include this measure because Mr. Weekley indicated that genetic tools are currently available at low cost to complete this task. However, we did not include his recommendation to survey extant populations because surveys, albeit incomplete, were finished in 2004.

Mr. Jenkins

We made the edits recommended by Mr. Jenkins and reviewed the survey information he provided. We incorporated applicable information into pertinent sections of the document.

Ms. Johnson

We revised section C.1.a. of the 5-year review to incorporate new data provided by Ms. Johnson.

APPENDIX B

Guidance for Peer Reviewers of Five-Year Status Reviews

U.S. Fish and Wildlife Service, North Florida Ecological Services Office

March 6, 2007

As a peer reviewer, you are asked to adhere to the following guidance to ensure your review complies with Service policy.

Peer reviewers should:

1. Review all materials provided by the Service.

2. Identify, review, and provide other relevant data that appears not to have been used by the Service.

3. Not provide recommendations on the Endangered Species Act classification (e.g., endangered, threatened) of the species.

4. Provide written comments on:
   - Validity of any models, data, or analyses used or relied on in the review.
   - Adequacy of the data (e.g., are the data sufficient to support the biological conclusions reached). If data are inadequate, identify additional data or studies that are needed to adequately justify biological conclusions.
   - Oversights, omissions, and inconsistencies.
   - Reasonableness of judgments made from the scientific evidence.
   - Scientific uncertainties by ensuring that they are clearly identified and characterized, and that potential implications of uncertainties for the technical conclusions drawn are clear.
   - Strengths and limitation of the overall product.

5. Keep in mind the requirement that we must use the best available scientific data in determining the species' status. This does not mean we must have statistically significant data on population trends or data from all known populations.

All peer reviews and comments will be public documents, and portions may be incorporated verbatim into our final decision document with appropriate credit given to the author of the review.

Questions regarding this guidance, the peer review process, or other aspects of the Service's recovery planning process should be referred to Mike Jennings, U.S. Fish and Wildlife Service, at 904-731-3093, email: michael_jennings@fws.gov.