

Florida Bonamia (*Bonamia grandiflora*)

**5-Year Review:
Summary and Evaluation**

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

5-YEAR REVIEW

Species reviewed: Florida bonamia (*Bonamia grandiflora*)

TABLE OF CONTENTS

I.	GENERAL INFORMATION	
A.	Methodology used to complete the review	1
B.	Reviewers	1
C.	Background	1
II.	REVIEW ANALYSIS	
A.	Application of the 1996 Distinct Population Segment (DPS) policy	2
B.	Recovery Criteria	3
C.	Updated Information and Current Species Status	4
D.	Synthesis	12
III.	RESULTS	
A.	Recommended Classification	13
B.	New Recovery Priority Number	13
IV.	RECOMMENDATIONS FOR FUTURE ACTIONS	13
V.	REFERENCES	13
	APPENDIX A	17
	APPENDIX B	20

5-YEAR REVIEW

Florida Bonamia/*Bonamia grandiflora*

I. GENERAL INFORMATION

- A. Methodology used to complete the review:** This review was completed by the 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reports provided as part of local and Federal government contracts; data and information available on the internet; unpublished data; and personal communications.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 26, 2007, 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 initiated in 2014 (79 FR 16366) and concluded in 2017 reaffirms the previous (2008) five factor analysis remains an accurate reflection of the current species status. 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, 904-232-2580

Cooperating Field Office – Vero Beach, FL, Ecological Services: Marilyn Knight, 772-562-3909

C. Background

1. **FR Notice citation announcing initiation of this review:** 72 FR 20866, April 26, 2007.
2. **Species status:** Decreasing (2007 Recovery Data Call). This determination is based on the fact that about 62 percent of known Florida bonamia 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. Any future loss or decline in Florida bonamia populations on unprotected private lands would result in a net decrease in the range-wide distribution and/or abundance of this species. Accordingly, the species is likely to decline in the future, even though a substantial number of populations are protected on public lands.
3. **Recovery achieved:** 3 (50-75% recovery objectives achieved), (2007 Recovery Data Call).

4. **Listing history**

Original Listing

FR notice: 52 FR 42068

Date listed: November 2, 1987

Entity listed: Species

Classification: Threatened

5. **Associated rulemakings:** None

6. **Review History:**

FWS conducted a five-year review for the Florida bonamia 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 Florida bonamia listing classification was found to be warranted.

1990, 1996, 1999 Recovery Plans (see below)

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

7. **Species' Recovery Priority Number at start of review (48 FR 43098):**

8. A recovery priority number of 8 means that the degree of threat to Florida bonamia is moderate and the recovery potential is high.

8. **Recovery Plan or Outline**

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

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 Florida bonamia 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 three criteria necessary to remove Florida bonamia from the list of threatened and endangered species: (1) the species is secure in Ocala National Forest (ONF) and that low-intensity monitoring must continue after delisting, (2) secure and monitor at least three sites in Highlands County; three sites in Polk County; and at least two sites in other counties; and (3) provide at least five years of demographic monitoring at each of the sites identified in numbers 1 and 2 above.

While we suspect that Florida bonamia is secure on the ONF (Recovery criterion 1), we do not have long-term demographic monitoring data to indicate populations will persist there under current management strategies. Florida Natural Areas Inventory (FNAI) staff recently began conducting rare plant surveys on the ONF, but additional and intensive long-term monitoring data are necessary to evaluate the security of Florida bonamia relative to timber harvest activities on the ONF. Recovery criterion 2 has been partially met because the minimum number of bonamia populations has been secured in each of the identified counties, but limited surveys occur at only a few locations identified in this criterion and they are insufficient for assessing long-term demographics. Similarly, criterion 3 has not been met because demographic monitoring efforts have not been initiated at any of the protected locations. The recovery plan did not provide specific guidance about the number of populations that should be monitored nor did it identify any particular level of demographic performance that had to be met or maintained during the monitoring period (e.g., number or rate of seedling recruitment, plant survival, etc.). Consequently, except for the length of

time monitoring should be conducted (five years) we have no other metrics to evaluate whether monitoring efforts have met the stated recovery criterion.

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 above, we believe criterion 3 is unclear and could be revised to be more measurable.
 - 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)?** Yes.

C. **Updated Information and Current Species Status**

1. **Biology and Habitat**

a. **Abundance, population trends, demographic features, or demographic trends:** No systematic surveys have been conducted for this species throughout its range; therefore, we cannot confirm the occurrence records maintained by Florida Natural Areas Inventory (FNAI), a recent summary of these records on the Lake Wales Ridge (Turner *et al.* 2006), or historic records not recorded in the FNAI database. We have limited information on abundance and population trends on some public lands. Available data are provided below.

Rare plant surveys have been conducted periodically on the Lake Wales Ridge State Forest (LWRSF) since the late 1980s and the extent of surveys has increased as management activities and public property ownership have expanded (Weekley 1996, 1998; Cox 2003; Hardin and Schrift 2006; Clanton 2007). Intensive surveys began in 2005, principally on the Arbuckle tract of the LWRSF, where most rare plants are found (Clanton 2007). Over the past several years surveys have also been initiated on the Walk-in-the-Water and Hesperides tracts (Clanton 2007). As of 2007, about 2,900 individual plants had been documented on the LWRSF. Although the number of plants documented on the LWRSF has increased substantially since earlier surveys, this outcome is most likely a reflection of the increased survey effort. Furthermore, surveys are typically conducted in management units that have recently been managed (mechanically and/or by prescribed fire) (Clanton 2006), and Florida bonamia numbers would be expected to be greatest in these areas since

bonamia is known to respond positively to management – surveys would reflect high recruitment and resprouting that occurs following management. Nonetheless, it is apparent that there is a large population(s) of Florida bonamia on the LWRSF and many additional individuals are likely to be found as basic surveys expand into newly managed units where bonamia is known to occur but has not been inventoried (Clanton 2007).

Most surveys on the LWRSF have focused on finding plants and documenting abundance of Florida bonamia 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. Given the apparently large population of bonamia on the LWRSF and the positive response this species has had to ongoing management efforts, the Florida Division of Forestry (FDOF) does not anticipate the need to conduct more intensive demographic monitoring (Clanton 2007).

During a 1994 survey, Florida bonamia was found at 93 locations within the ONF (U.S. Forest Service 2005). Beginning in 1999, the U.S. Forest Service started systematic monitoring of bonamia at three locations. From 1999 to 2004, bonamia populations at these three sites followed anticipated “boom and decline” responses to management (site 1 ranged from 18 to 24 plants; site 2 ranged from 147 to 238 plants; and site 3 ranged from 15 to 26 plants) (U.S. Forest Service 2005). The large number of plants in site 2 was attributed to a short prescribed fire return interval (two to three years), whereas sites 1 and 3 are burned at longer return intervals (U.S. Forest Service 2005). FNAI recently completed surveys on 33 timber stands on the ONF (Jenkins *et al.* 2007). Results from this initial survey suggest that Florida bonamia is relatively common on surveyed areas, with populations ranging in size from an individual plant to more than 500 individuals. Repeated surveys will be required to determine the status of the Florida bonamia on the ONF (Jenkins *et al.* 2007).

The Nature Conservancy (TNC) has monitored Florida bonamia at Tiger Creek Preserve (TCP) and Saddle Blanket Scrub Preserve (SBSP) on the Lake Wales Ridge in central Florida. From 1991 to 1997 on TCP, when census efforts were consistent and comparable, numbers of individual plants nearly doubled (TNC 2006). From 1991 to 1996 on SBSP the number of bonamia also nearly doubled. At both sites, the number of individual plants recruited each year was dependent on time since fire and the highest number of recruits were observed one year post-burn (1992 and 1997) (TNC 2006). Beginning in 1998, the complete censuses that had previously been conducted were replaced with monitoring of permanent plots, but monitoring has not been conducted annually at either

site since then because of prescribed fires in 2002, 2004, and 2006 and because historic monitoring efforts indicate this species is relatively large and presumably stable at both TNC properties (B. Pace-Aldana, TNC, personal communication, 2008).

The demography of Florida bonamia has not been extensively studied. Romano (1999) described the mating system as mixed and occasionally apomictic (production of seeds without pollination), but noted that pollinators were essential to ensure substantial seed production by self- and cross-fertilization. Number of stems per plant, stem length, seed weight, and seed dimensions and their ratios differed between Florida bonamia populations, but there was no obvious geographic pattern associated with these variables (Romano 1999). Hartnett and Richardson (1989) described basic demographics of this species when comparing effects of fire on plant and seed bank dynamics. Habitat disturbance (e.g., fire and mechanical) resulted in greater plant density, stem densities, seedling recruitment, flowering, and seed production than in habitat that had not been disturbed recently and that was considered successional mature (Hartnett and Richardson 1989). In another study evaluating pre- and post-burn response of bonamia, Weekley and Menges (2003) did not find a significant difference in the mean number of stems for pre- and post-burn individuals and found no evidence of increased recruitment. They did, however, confirm previous conclusions (Hartnett and Richardson 1989, Menges and Hawkes 1998) that Florida bonamia is a strong resprouter following fire. Additionally, they did note that unpublished data were available indicating a substantial increase in the number of seedlings within one year following a prescribed fire in a long unburned yellow sand scrub community and suggested that a more fine-scaled survey design may be needed to evaluate this finding more thoroughly.

Florida bonamia is currently represented in the Center for Plant Conservation's national collection of endangered plants at Historic Bok Sanctuary (HBS). Two hundred and six individuals representing five populations are included in this collection which includes both seed and individual plants rescued from areas previously destroyed by development. (C. Peterson, HBS, personal communication, 2008). HBS has evaluated seed germination of Florida bonamia under controlled conditions and found best results when seeds are scarified first and then soaked in water for 12 hours. Germination rates in these studies were 30-35 percent, but seed viability declined with age – eight-year old seeds had a six percent germination rate (C. Peterson, HBS, personal communication, 2008). Furthermore, propagation by cuttings was not found to be reliable. Success in transplantation efforts have been mixed with small plants having lower mortality rates than larger specimens.

b. Genetics, genetic variation, or trends in genetic variation: Florida bonamia has low genetic variability compared to other plants endemic to scrub in Florida (Romano 1999). This genetic homogeneity is likely the result of a small initial gene pool and/or strong selection in the harsh scrub environment (Romano 1999). However, some population markers and rare alleles were found in individuals indicating that there is a weak genetic structure to this species (Romano 1999). The observed genetic diversity was allocated primarily within rather than between populations. The weakness in genetic structure is likely the result of relatively recent habitat fragmentation and population isolation rather than any long-term effects of genetic drift. Inbreeding depression has been noted in one population (ONF) of Florida bonamia, but it was mild, and in general is not thought to detrimentally affect this species (Romano 1999).

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

d. Spatial distribution, trends in spatial distribution or historic range: Florida bonamia is found in herbaria with collection locations in Volusia and Marion counties south through Lake, Orange, Polk, Highlands, Hardee, and west to Hillsborough, Manatee, and Sarasota counties (Institute for Systematic Botany 2006). Of these records, three are historical (Sarasota County in 1878, Manatee County in 1916, and Volusia County in 1900) and no recent records exist. The South Florida multispecies Recovery Plan indicated that Florida bonamia was found in Charlotte, Hardee, Highlands, Hillsborough, Lake, Manatee, Marion, Orange, Osceola, and Polk counties (Service 1999). Florida bonamia has apparently been extirpated from Volusia and Sarasota counties. Relatively recent records from Charlotte and Osceola counties include locations not represented in herbaria.

More recently, Turner *et al.* (2006) synthesized historic and current distribution (excluding Charlotte and Volusia counties) of bonamia and concluded that Florida bonamia was known from 66 locations, with each location representing a geographically discrete aggregation of plants. Twenty-five of these locations occurred on 19 parcels of land that were considered protected (Turner *et al.* 2006). Unfortunately, this accounting process differed from previous efforts because in some cases it assigned multiple locations within the same bounded land unit (e.g., conservation area) if individual plants were greater than one kilometer from each other. Conversely, previous accounting would have recorded only one location within a bounded land unit – essentially a presence/absence log. As a result, comparison of distribution records summarized at the time of listing and in the 1996 recovery plan versus those reported by Turner *et al.* (2006) are not useful in determining trends in spatial distribution or historic range.

Turner *et al.*'s (2006) assessment included locality records over the past 20 years and more recent observations and it is not evident from this database whether Florida bonamia is still found at each of the 66 locations. Therefore, without a comprehensive range-wide survey it is not possible to evaluate the spatial distribution and trends in spatial distribution of this species. Nonetheless, it is likely that some of the historic locality records on private lands have been lost due to habitat degradation (fire exclusion) and destruction. As a result, since its listing, the distribution of Florida bonamia has likely become more fragmented.

e. Habitat or ecosystem conditions: Florida bonamia evolved in fire-maintained white and yellow sand xeric vegetative communities, including rosemary scrub, oak dominated scrub, and sandhills (Service 1999, Weekley and Menges 2003, Menges *et al.* 2007). Because systematic range wide surveys have not been conducted, we have little information about habitat conditions for many of the known localities where bonamia occurs. This is especially true for locations that are in private ownership. Nonetheless, we suspect that habitat conditions on most unprotected, private lands are not optimal for the long-term persistence of bonamia because most landowners suppress naturally ignited fires and/or do not use prescribed fire. Fire suppression leads to changes in composition and structure within vegetative communities (Weekley and Menges 2003), which typically results in taller and denser vegetation that may shade-out Florida bonamia. However, there is anecdotal information indicating Florida bonamia may be more shade tolerant than previously thought (C. Weekley, Archbold Biological Station, personal communication, 2008) and this may extend the time that bonamia will persist in fire-excluded communities.

Twenty-five Florida bonamia populations occur on public lands (Turner *et al.* 2006), but we are not sure of the habitat conditions on most of these properties because annual monitoring of bonamia populations and/or their habitat is not conducted on most properties. We suspect that Florida bonamia habitat is degraded on some of these public lands, even where active management programs are in place. For example, although LWRSF is aggressively managing portions of the forest and has plans to expand management efforts (Clanton 2007, 2008; Malatesta 2008), portions of this conservation parcel that are known to contain Florida bonamia have not yet been integrated into the forest's management efforts (Clanton 2007).

On the ONF, Florida bonamia populations have been impacted by unregulated off-road vehicle use in some areas (WildLaw 2006). The extent of impacts are not fully known because the number of Florida bonamia populations on the ONF has not been quantified. Monitoring

may begin in the near future to evaluate impacts from off-road vehicle use (Duever 2008). The U.S. Forest Service recently implemented an access policy that established designated trails for off-road vehicle access and implementation of this policy is expected to eliminate about 487 miles of off-road trails and associated impacts (U.S. Forest Service 2007). The beneficial effects of this policy are not yet known because comprehensive Florida bonamia surveys have not yet been completed (Duever 2008).

The ONF actively manages sand pine timber on 35- to 60-year rotations and post-harvest site preparation typically includes roller chopping, followed, in some cases, by prescribed fire. These management activities are thought to mimic historical canopy-replacing fires which would have created openings suitable for Florida bonamia. However, evaluation of Florida bonamia response to these management prescriptions has not been undertaken and the effects of these intensive ground disturbing activities on Florida bonamia and their habitat are not well understood and need to be investigated.

Successful restoration of habitat on many public lands will take several years to achieve because multiple prescribed fires are necessary to get vegetative communities into early successional stages. On public lands that have only recently begun to implement prescribed fire, habitat conditions suitable for Florida bonamia persistence may take several more years. 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 funding and staffing increase in the future. 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).

f. Other: No additional information exists.

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 Florida bonamia on public land is habitat degradation due to fire suppression, although off-road vehicle use on the ONF is likely to result in adverse impacts. Florida

bonamia on private lands are also threatened long-term with fire suppression, but habitat destruction is a more immediate concern in many locations.

Recent range wide surveys have not been conducted for this species so evaluating threats due to fire suppression and habitat destruction is problematic because in many instances we do not know if previously identified populations still exist. Nonetheless, 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 Florida bonamia habitat in some areas.

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 Florida bonamia 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 Florida bonamia on non-conservation parcels in private ownership are threatened with habitat modification due to fire suppression.

Florida bonamia 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. Florida bonamia on each private parcel is vulnerable to this threat at any time, however, we are not aware of any imminent loss of Florida bonamia due to development.

b. Overutilization for commercial, recreational, scientific, or educational purposes: Overutilization is not currently thought to be a significant risk factor to Florida bonamia; however, TNC reported two occasions of unauthorized plant removal on TNC property since 1991 (TNC 2006).

c. Disease or predation: Florida bonamia may be affected by fungus, but no detailed investigations have been undertaken (Romano 1999). Insect herbivory has been observed, but is not thought to be a significant risk to Florida bonamia (Romano 1999).

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 Florida bonamia 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 51-4.005 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. Florida bonamia also occurs on private land owned by a research entity and conservation organization. Protection of Florida bonamia occurs through applicable State regulations requiring private landowner authorization to remove plants from private property. Because the Florida bonamia 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, Florida bonamia is protected on Refuge property.

Existing regulatory mechanisms appear adequate to protect Florida bonamia on State and federally owned lands. Furthermore, we believe Florida bonamia on private conservation parcels are adequately protected because The Nature Conservancy would not authorize removal or destruction of Florida bonamia 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 Florida bonamia.

On private properties, Federal or State laws provide little protection for Florida bonamia. Since the majority of extant Florida bonamia 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: The 1999 South Florida Multi-species Recovery Plan (Service 1999) indicated that competition with non-native vegetation (e.g., cogon grass) may have been a management concern at ONF. Although ONF has an exotic vegetation management program in place, this threat is not entirely controlled and it is possible that unknown bonamia populations within the ONF may be affected by cogon grass or other exotic vegetation. We suspect that there are other locations containing Florida bonamia that also contain exotic vegetation, but we did not find current literature indicating this to be a significant management problem.

D. Synthesis

The recovery criteria for Florida bonamia have not been met. Monitoring has occurred on several public lands but efforts thus far have been limited to distribution and abundance records. A few replicate surveys have been conducted in the same areas and these limited data provide some insight into response of Florida bonamia to management prescriptions. No demographic assessments have been conducted.

The status of Florida bonamia is largely unknown because repeated surveys have not been conducted at most known populations. However, available monitoring suggests that some populations may be in decline and others may be increasing, but this may be reflective of Florida bonamia's typical boom and subsequent decline following fire. Use of periodic prescribed fire appears to be essential in maintaining suitable habitat.

Sixty-six locality records existed for Florida bonamia in 2006, but the number of extant populations is not known because recent range wide surveys have not been conducted. Twenty-five locality records occur on public lands.

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. Florida bonamia on private land are also vulnerable to destruction due to urban development.

Overutilization for commercial, recreational, scientific, or educational purposes and disease or predation are not current threats to Florida bonamia.

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

In summary, Florida bonamia appears to be well represented on public conservation lands, but long-term and intensive monitoring have not been conducted to evaluate the status, trend, and current distribution. This uncertainty,

coupled with remaining threats to this species on private lands, indicates that Florida bonamia is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

III. RESULTS

- A. **Recommended Classification:** No change is needed
- B. **New Recovery Priority Number:** No change is needed

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, and the demographic performance levels/rates that should be met.

A range wide survey should be conducted to determine the size and location of extant Florida bonamia populations and assessment of historic locality records.

Demographic monitoring of Florida bonamia populations should be initiated on public lands. Level 2 monitoring (Menges and Gordon 1996) includes sufficient detail to evaluate trends in population status over time.

Management activities should be implemented on public lands that contain Florida bonamia, including prescribed fire at return intervals and intensities necessary to restore and/or maintain the various xeric vegetative communities that support this species.

An assessment of mechanical vegetation management (e.g., roller chopping, mowing, gyro-tracking, logging, and chain-saw felling) is needed to evaluate the response of Florida bonamia to various management alternatives. These data should be collected concurrently with level 2 monitoring.

Future land acquisition or other conservation measures should be taken to protect large Florida bonamia populations on unprotected lands. Protection should target bonamia populations that are sufficiently large, or could be large if adequately managed, as to be self-sustaining and viable long-term.

Given the relatively large number of unprotected Florida bonamia populations, efforts should be explored to encourage private landowners to conserve and manage property known to contain this species.

V. REFERENCES

- Clanton, K. 2006. Lake Wales Ridge State Forest plant monitoring and management 2004-2005. E-9-13 final report 2004-2005. Florida statewide endangered and threatened plant conservation program, Florida Department of Agriculture and Consumer Services, Division of Forestry, Tallahassee, Florida.
- 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.
- Clanton, K. 2008. Lake Wales Ridge State Forest plant monitoring and management plan development. Florida Plant Conservation Program, Florida Division of Forestry, Tallahassee, Florida.
- Cox, A.C. 2003. Lake Wales Ridge State Forest plant monitoring and management 2003-2004. E-9-13 final report 2003-2004. Florida statewide endangered and threatened plant conservation program, Florida Department of Agriculture and Consumer Services, Division of Forestry, Tallahassee, Florida.
- Duever, L. 2008. Survey, monitoring, and roadside habitat characterization of *Bonamia grandiflora* on Ocala National Forest. Proposal submitted to the Florida Department of Agriculture and Consumer Services.
- Florida Department of Environmental Protection. 2007.
<http://www.dep.state.fl.us/lands/landmgmt/default.htm>. Accessed April 27, 2007.
- Hardin, E.D. and A.M. Schrifft. 2006. Florida statewide endangered and threatened plant conservation program E-9-13 final report 2004-2005. Florida Department of Forestry, Tallahassee, Florida.
- Hartnett, D.C. and D.R. Richardson. 1989. Population biology of *Bonamia grandiflora* (Convolvulaceae): effects of fire on plant and seed bank dynamics. American Journal of Botany 76:361-369.
- 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.
- Institute for Systematic Botany. 2006.
<http://www.plantatlas.usf.edu/maps.asp?plantID=1223>, Last updated June 24, 2006, accessed July 16, 2008.
- Jenkins, A.M., P.K. Diamond, and G.E. Schultz. 2007. United States Forest Service: rare plant monitoring Apalachicola National Forest and Ocala National Forest. Florida

Natural Areas Inventory final report for contract #AG428353428340010. U.S. Forest Service, Tallahassee, Florida.

Malatesta, A. 2008. Habitat enhancement in endangered ecosystems at Lake Wales Ridge State Forest, Walk in the Water tract. E-9-15 final report 2007. Florida statewide endangered and threatened plant conservation program, Florida Department of Agriculture and Consumer Services, Division of Forestry, Tallahassee, Florida.

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. and C.V. Hawkes. 1998. Interactive effects of fire and microhabitat on plants of Florida scrub. *Ecological Applications* 8(4):935-946.

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.

Romano, G.B. 1999. Reproductive biology and population molecular genetics of the scrub morning glory *Bonamia grandiflora*. PhD. dissertation, University of Florida, Gainesville.

The Nature Conservancy [TNC]. 2006. 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]. 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]. 2006. Excel spreadsheet containing questionnaire responses received from conservation land managers. On file, Jacksonville Field Office, Florida.

U.S. Forest Service. 2005. 2005 annual monitoring and evaluation report, national forests in Florida. Tallahassee, Florida.

U.S. Forest Service. 2007. Biological assessment – botany. Route designation in the sand pine scrub ecosystem – effects on endangered, threatened, and sensitive plant species. U.S. Department of Agriculture, Ocala National Forest, Lake George and Seminole Ranger Districts. Silver Springs, Florida.

Weekley, C.W. 1996. *Bonamia grandiflora* monitoring report #1. Florida Division of Forestry, statewide endangered and threatened plant conservation program. Tallahassee, Florida.

Weekley, C.W. 1998. *Bonamia grandiflora* monitoring report #2. Florida Division of Forestry, statewide endangered and threatened plant conservation program. Tallahassee, 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.

WildLaw. 2006. Unclassified OHV Routes in the Apalachicola and Ocala National Forests: Inventory, Maps and Recommendations. WildLaw, Tallahassee, Florida.

U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of Florida bonamia (*Bonamia grandiflora*)

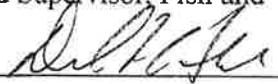
Current Classification: Threatened

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

Review Conducted By: Michael Jennings


FIELD OFFICE APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service

Approve  Date 8/20/08

REGIONAL OFFICE APPROVAL:

Lead Regional Director, Fish and Wildlife Service

Approve  Date 8/28/08

ACTING Assistant Regional Director
Ecological Services

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 Florida bonamia (*Bonamia grandiflora*)

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 Florida bonamia biology, ecology, or conservation; (2) they had recently conducted research or monitoring of bonamia related to biology, ecology, or conservation; or (3) they had knowledge of bonamia biology, ecology, or conservation because of their current professional position.

Prospective peer reviewers were notified electronically on May 20, 2008, and asked of their willingness to participate in the peer review and whether they would be able to complete their review by June 27, 2008, and follow peer review guidance (see B below).

Four prospective peer reviewers were notified: Mike Jenkins, Florida Department of Agriculture and Consumer Services; Amy Jenkins, Florida Natural Areas Inventory; Cheryl Peterson, Historic Bok Sanctuary; and Carl Weekley, Archbold Biological Station.

B. Peer Review Charge: See Appendix B.

C. Summary of Peer Review Comments/Report

Mr. Jenkins provided updated information about Florida bonamia populations on the Lake Wales Ridge State Forest.

Ms. Jenkins provided updated information on occurrence records in Orange County. She also indicated that the Florida Natural Areas Inventory had recommended to the Ocala National Forest that effects of off-road vehicle use needed to be evaluated.

Ms. Peterson included additional information about the National Collection and updated our understanding of *ex situ* seed germination experimentation.

Mr. Weekley provided extensive comments and recommendations on the distribution of Florida bonamia, soil and habitat preferences of bonamia, and site-specific information about this species on the Lake Wales Ridge State Forest. In general, Mr. Weekley concluded that the 5-year review overlooked several relevant sources of information and therefore did not provide an accurate account of the current distribution of this species. Mr. Weekley provided specific comments which are summarized below.

Mr. Weekley questioned why the Service's 1999 South Florida Multi-species Recovery Plan was not included as a previous recovery plan in the General Information section of the 5-year review. Under the Recovery Criteria section, Mr. Weekley indicated that the recovery criteria cited in the review did not specify objectives of monitoring and suggested that reference to bonamia being "secure" on the Ocala National Forest was not supported by monitoring data in the 5-year review. Mr. Weekley agreed with conclusions in the 5-year review that the existing recovery plan did not adequately specify demographic parameters that should be monitored to evaluate the status of Florida bonamia.

In the Updated Information and Current Species Status section, Mr. Weekley suggested that information on historic and current distribution of Florida bonamia be included similar to the 1999 recovery plan, and that additional sources of site-specific monitoring were available and should be included to better evaluate the current distribution and document probable declines in the distribution of this species. Mr. Weekley indicated that the discussion of Florida bonamia distribution and abundance on the Lake Wales Ridge State Forest was inaccurate and provided updated information. He agreed with the conclusion that additional and repeated surveys would be needed on the Ocala National Forest to evaluate long-term trends. Mr. Weekley questioned whether increases in population size on The Nature Conservancy's property literally doubled, as indicated in the text of the 5-year review and whether surveys were conducted consistently during the reporting period. He suggested that increases noted on TNC property could have resulted from intensive fire management programs on the properties and that the status of bonamia on these sites should be evaluated with more intense monitoring efforts. In our discussion of demography and genetics of Florida bonamia, Mr. Weekley pointed out that we omitted reference to Romano's thesis and the data provided therein. He also indicated that the 5-year review should discuss the contraction of bonamia's range and indicate how many occurrence records occur on protected public lands. In this regard, Mr. Weekley disagreed with the 5-year review's conclusion that Florida bonamia distribution is fragmented but represented throughout its historic range. Mr. Weekley indicated that Florida bonamia occurs in both white and yellow sand xeric vegetative communities where fire return intervals are short and long, respectively. He also suggested that the 5-year review could provide more complete information about habitat conditions if local land managers were consulted. Although Mr. Weekley agreed with our conclusion that fire-suppressed vegetative communities may result in shading of Florida bonamia, he indicated that it may be more shade tolerant than previously believed.

Under the Five-Factor Analysis section, Mr. Weekley agreed that habitat degradation and fire suppression were pervasive threats to Florida bonamia. He also agreed that bonamia is threatened on non-conservation lands and suggested that more information is needed on the distribution of bonamia on private property. He suggested that opportunities be explored to encourage private landowners to conserve this species. Mr. Weekley found the discussion of inadequacy of existing regulatory mechanisms to be interesting but concluded none of them adequately protected Florida bonamia. He noted that feral hogs are known to damage other vegetation and suspects that they may also impact Florida bonamia but he indicated that he had no documentation to support this assertion.

In the Synthesis section, Mr. Weekley suggested that we explicitly describe the type of monitoring that is occurring and compare that with the level of monitoring that is needed to evaluate demographic performance of Florida bonamia. He indicated that most monitoring is insufficient and no monitoring is conducted to evaluate demographics. Mr. Weekley also commented that we have insufficient data to make inferences about the status of most Florida bonamia populations. Mr. Weekley suggested that we list the public lands where bonamia is known to occur. Finally, Mr. Weekley indicated that not only was fire suppression a threat to Florida bonamia but also the inadequate application of prescribed fire was.

In the Recommendation for Future Actions section, Mr. Weekley questioned why the 5-year review did not incorporate the objectives identified in the 1999 South Florida Multi-species

Recovery Plan. In addition, he suggested that any objectives must provide evidence that populations are self-sustaining and indicated this can only be accomplished if monitoring is sufficiently rigorous and include evaluation of demographic performance.

D. Response to Peer Review

In response to Mr. Jenkins' comments, we revised the 5-year review to include updated information on Florida bonamia populations on the Lake Wales Ridge State Forest.

We included new locality information and extirpation records provided by Ms. Jenkins for Orange County.

Mr. Weekley's comments were broad and comprehensive and added extensively to the value of the 5-year review. We addressed most of Mr. Weekley's comments and recommendations by reviewing current literature and incorporating new or updated data, where available. Comments and recommendations that we did not address are discussed below.

We did not adopt the recovery criteria identified in the South Florida Multi-species Recovery Plan because it only addressed the recovery needs of Florida bonamia 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 addressed recovery needs of this species throughout its range, we considered it to be the authoritative source for recovery criteria. However, we acknowledge that more intensive monitoring is needed to effectively evaluate demographic performance of Florida bonamia and assess long-term trends and have modified the 5-year review accordingly. We have not included site-specific information about where locality records exist for Florida bonamia because that information is available in Turner *et al.* (2006).