

Wide-leaf Warea (*Warea amplexifolia*)

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

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

5-YEAR REVIEW

Species reviewed: Wide-leaf Warea (*Warea amplexifolia*)

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5-YEAR REVIEW
Wide-leaf Warea/*Warea amplexifolia*

I. GENERAL INFORMATION

A. Methodology used to complete the review: In conducting this 5-year review, we relied on available information pertaining to historic and current distributions, life history, and habitat of this species. The Service lead recovery biologist for this species conducted the review. Our sources include the final rule listing this species under the Act; the recovery plan; peer reviewed scientific publications; unpublished field observations by the Service, State, and other experienced biologists; unpublished survey reports; and notes and communications from other qualified biologists. The public notice for this review was published on September 27, 2006, with a 60-day public comment period. No comments were received for this species.

B. Reviewers

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

Lead Field Office - Jacksonville, FL, Ecological Services: Annie Dziergowski, 904-232-2580

Cooperating Field Office(s) - Vero Beach, FL, Ecological Services: Paula Halupa, 772-562-3909

C. Background

1. **FR Notice citation announcing initiation of this review:** 71 FR 56545, September 27, 2006
2. **Species status:** Declining (2006 Recovery Data Call). Without additional surveys and proper fire management on state and private lands, populations of this species will continue to decline. Development pressures on private land will result in the loss of existing populations.
3. **Recovery achieved:** 1 (0-25% recovery objectives achieved), 2006 Recovery Data Call
4. **Listing history:**
Original Listing
FR notice: 52 FR 15510
Date listed: April 29, 1987
Entity listed: Species
Classification: Endangered
5. **Associated rulemakings:** None

6. Review History:

Previous 5-year review for this species was noticed on November 6, 1991 (56 FR 56384). In this review, the status of many species were simultaneously evaluated with no in-depth assessment of the five factors, threats, etc. as they pertained to the individual species. The notices summarily listed these species and stated that no changes in the designation of these species were warranted at that time. In particular, no changes were proposed for the status of this species in this review.

Final Recovery Plan -1993

Recovery Data Call - 2006, 2005, 2004, 2003, 2002, 2001, 2000, 1999, and 1998.

- 7. Species' Recovery Priority Number at start of review (48 FR 43098):**
2C. The "2" indicated a high degree of threat and high recovery potential; the "C" reflects a high degree of conflict.

8. Recovery Plan:

Name of plan: *Warea amplexifolia* (Clasping Warea) Recovery Plan

Date issued: February 17, 1993

Name of plan: South Florida Multi-Species Recovery Plan (identifies recovery contributions for the South Florida Ecological Service's office work area)

Date issued: May 18, 1999

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 and the DPS policy is not applicable, the application of the DPS policy to the species listing is not addressed further in this review.

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?** New information on this species has been collected since the recovery plan was written in 1993. As a result, the recovery goals and criteria should be revised to address the recovery actions needed to reduce threats to this species.
- 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)?** Factor A (present or threatened destruction, modification or curtailment of its habitat or range) was identified as the primary threat affecting the species at the time of listing; however, this factor is not addressed in the recovery criteria. Based on new information, Factor E (other natural or manmade factors affecting its continued existence) should be included in the recovery criteria to address threats such as fire suppression and drought.

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 note 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.**

At the time of listing, 1987, the recovery criteria for *Warea amplexifolia* were written according to the information known at that time: "*Warea amplexifolia could be considered for reclassification from endangered to threatened status when 10 geographically discrete, self-sustaining populations are protected and managed for 10 years. Delisting could be considered when 20 such populations are protected and managed, and each has been monitored for at least 8 years. Recovery will require a minimum of 10 years (until 2003), if establishment of new populations is prompt and obviously successful.*"

The recovery criteria may be considered subjective or not measurable, since "discrete," "self-sustaining," and "protected" can be difficult to define. It is our recommendation to revise the current recovery plan to include objective and measurable recovery criteria, as well as new information on the biology of this species (refer to section C.1.a. and C.1.d. for additional information on this plant's status at existing sites).

Of the five listing factors, habitat loss and destruction from development

and sand mining (Factor A) and other natural and manmade factors affecting its continued existence, such as fire exclusion (Factor E), are addressed in the recovery plan. Other natural factors such as drought have impacted areas occupied by *W. amplexifolia* and should be addressed during the revision of the recovery plan. Factors B, C, and D have not been documented as threats at this time.

C. Updated Information and Current Species Status

1. Biology and Habitat

- a. **Abundance, population trends, demographic features, or demographic trends:** The abundance and distribution of *W. amplexifolia* can vary year to year (Service 1999) depending on the frequency and timing of rainfall. This makes documenting trends in population numbers difficult. Research at Historic Bok Sanctuary (HBS) suggested that the amount of December rainfall may be related to the number of flowering plants the following year (HBS 1994). Germination may be low in *W. amplexifolia* when a dry December is followed by a relatively wet spring (Cox 2006). Research at HBS has also suggested that seed banking may be important in the life history of *W. amplexifolia* (HBS 1994). HBS found that plants grew from seeds that had been sown into experimental plots 2 to 4 years earlier. Research by Stout and Black (unpublished data) at Lake Griffin State Park (LGSP) also revealed that the seeds of *W. amplexifolia* could germinate after several years of seed banking. This further complicates the identification of trends, requiring long-term monitoring at several sites (Service 1999).

Monitoring of *W. amplexifolia* has only occurred at LGSP, the Pine Ridge Nature Preserve at HBS, and the Warea Tract (Flat Lake) at Seminole State Forest (SSF). Other public and private sites throughout Lake, Polk, and Osceola Counties have had random surveys but no long-term monitoring. Population sizes at these sites have varied in past years due to lack of rainfall and management. Overall, populations have declined, except at LGSP, where they appear to be stable (A. Bard, Florida Department of Environmental Protection (FDEP), personal communication, 2007).

LGSP, located in Lake County, has a 21-acre satellite parcel (LG3) that is currently being restored by removing hardwoods, planting wiregrass (*Aristida beyrichiana*), and controlling exotic plant species. In 1990, LG3 was surveyed and had 40 plants. After management practices were implemented by

FDEP in 1993, LG3 was surveyed and 800 plants were subsequently found. In July 1996, LGSP started removing oaks and found 45 plants, but also discovered the encroachment of natal grass (*Rhynchelytrum repens*), which reduces the amount of open sandy area *W. amplexifolia* can occupy. In 1999, Black (1999) looked at the effects of removing litter around plants and they appeared to respond favorably. In 2000, 251 plants were located at LG3. In 2003, the population was estimated at 300 plants. A. Bard (FDEP, personal communication, 2007) stated that the population at LGSP LG3 site appears to be stable (number of plants has not declined significantly) with few effects from the drought that is affecting other populations.

Reintroduction of *W. amplexifolia* took place at an additional site (LG1) at LGSP. This project used seeds from the plants at LG3. The first reintroduction occurred in 1986-1987. In 1988, 16 plants produced seeds. Unfortunately, no plants were located in the 1989 or 1990 surveys (FDEP 2004). FDEP attempted another reintroduction in 1997 utilizing seeds from LG3 (Black 1999). Half of the seeds were planted under nursery conditions to germination and then planted at the LG1 site, while the other half of the seeds were planted on-site. Results showed that the seedling success of reintroduced plants at LG1 of *W. amplexifolia* were similar to that of the seed source population at LG3 (Black 1999). In 1999, only two of the reintroduced seedlings emerged due to low rainfall that year. No recent survey information was collected to determine the population trends at the LG1 site.

HBS, located in Polk County, has 20 acres located within the Pine Ridge Nature Preserve that have been burned and managed. During the original survey in 2001, 100 plants were found. Eight plants were found in the fall of 2004, and no plants were found in 2005 or early 2006. As of fall 2006, HBS still had not seen a return of *W. amplexifolia* on their site (C. Peterson, HBS, personal communication, 2007), which most likely was attributable to the drought conditions in the area at the time.

The 112-acre Warea Tract (historically known as the Flat Lake site) at SSF, located in Lake County, had the highest number of *W. amplexifolia* plants in 2005 with 2,034 plants. Cox (2006) found that the weather conditions in winter 2004 and early spring 2005 were optimal for a good germination of seeds later in 2005. Because of a lack of rainfall in the winter of 2005,

only 53 plants were found in the 2006 survey. No prescribed burns have occurred at the Warea Tract since 2004 due to unfavorable weather conditions (i.e., droughts).

Other publicly owned sites, such as the Lake County Water Authority (LCWA) Ferndale Preserve property, the St. Johns River Water Management District (SJRWMD) Sugarloaf Mountain property, and the Florida Fish and Wildlife Conservation Commission (FFWCC) Mountain Lake Scrub property, historically had populations of *W. amplexifolia* on-site. Several of these sites have not been managed nor had recent surveys to determine if *W. amplexifolia* is still present. The Schofield Sandhill site, owned by Orange County and located in Lake County, supports a small population of *W. amplexifolia*; however, no recent surveys have been conducted to determine its status. There are other sites with known populations (i.e., Hills of Minneola, Castle Hill, and Lake Davenport) that exist on private lands. Hills of Minneola and Castle Hill are located in Lake County, Florida. Lake Davenport is located in Osceola County, Florida. Long-term monitoring has not occurred on these sites to determine population trends. The Castle Hill site has been permitted for development.

Based on the best available information *W. amplexifolia* occurs on three main public properties including LGSP, HBS, and Warea Tract at SSF. It was also known to occur on seven public and private properties mentioned above. However, we believe a full rangewide survey needs to be conducted on all known and potential sites to get a better idea where plants currently exist and to determine population size (see section IV. #4).

- b. **Genetics, genetic variation, or trends in genetic variation:**
No new genetic information is available for this species.
- c. **Taxonomic classification or changes in nomenclature:**
None. The Integrated Taxonomic Information System (ITIS 2007) was checked while conducting this review.
- d. **Spatial distribution, trends in spatial distribution, or historic range:** When listed in 1987, *W. amplexifolia* was only found at four locations, two on public lands (HBS Pine Ridge Nature Preserve in Polk County and LGSP in Lake County) and two on private lands (Haines City site in Polk County and Clermont site in Lake County). Historically, *W.*

amplexifolia was endemic to a small region of the central Florida peninsula (i.e., Lake County, western Orange County, extreme northwestern Osceola County, and northern Polk County) (Judd 1980). The current known range is now limited to Lake, Polk, and Osceola Counties. Of the four locations where the species was known, to occur at the time of listing, *W. amplexifolia* still occurs at HBS, LGSP, and the Clermont site (Castle Hill) but it no longer occurs on the Haines City site. The Castle Hill site in Lake County was permitted in 2005 for development. The Florida Native Plant Society and HBS collected seeds at the site prior to its development, and those seeds are now being stored at HBS in the National Collection for the Center for Plant Conservation.

Surveys conducted by Florida Natural Areas Inventory in 1991 and 1992 found *W. amplexifolia* on other public and private lands: Sugarloaf Mountain (SJRWMD), Ferndale Preserve (LCWA), Flat Lake (SSF-Warea Tract), Mountain Lake Scrub (FFWCC), Schofield Sandhill (owned by Orange County), Hills of Minneola (private), Castle Hill (private), and Lake Davenport (private) (USFWS 1999). Five of these sites are in Lake County, one in Polk County, and one in Osceola County. Most of these sites are found in remnant patches of sandhill communities along the northern Lake Wales Ridge in Lake County south into Osceola and Polk Counties.

The sites owned by LCWA (Ferndale Preserve), SJRWMD (Sugarloaf Mountain), and FFWCC (Mountain Lake Scrub) need surveys to determine if plants are still present and if management activities (e.g., fire and removal of oaks) are needed. FDEP's Lake Louisa State Park currently does not have *W. amplexifolia* within the project boundaries. It is within the historic range and with restoration could provide suitable habitat.

Plants have also been found at the 80-acre Schofield Sandhill, which is owned by Orange County and located in Lake County. Orange County has plans to use the site as a well field. In addition, increasing development and expansion of roads could affect this population of plants. The Service's Partners for Fish and Wildlife program has been in discussion with Orange County to help with the management of this site.

Two private developments, Hills of Minneola and Lake Davenport, have set aside conservation areas (one 75-acre and two 40-acre tracts, respectively) where *W. amplexifolia* has

been documented. These properties both are in need of long-term management to support the plant populations.

- e. **Habitat or ecosystem conditions:** *W. amplexifolia* is endemic to the high pine (or sandhill) habitat (Myers 1990) that once covered the Lake Wales Ridge in Lake, Polk, Osceola, and Orange Counties. This habitat has a relatively high diversity of herbaceous ground cover that was maintained by patchy summer fires sparked by lightning (Myers 1990). *W. amplexifolia* grows well in open, sandy patches and does not tolerate shading by dense shrubs or trees. Although *W. amplexifolia* is a fire-adapted species, the timing of fires related to the plants survivorship and reproduction is not yet known (FDEP 2004).

The satellite parcel (LG3) at LGSP has been succeeding to xeric hammock from sandhill but with restoration, 5 acres of sandhill have been established. Hardwood removal by mechanical means and herbicide treatments in the late successional sandhill community have been conducted to help restore the areas for *W. amplexifolia* by creating open areas important for the growth and reproduction of this species. Wiregrass (*Aristida stricta*) has been planted at this site to restore the original understory (Bard 1996). A few exotic plant species are being treated with herbicide in areas where *W. amplexifolia* have been found. These invasive plants include Sprenger's asparagus fern (*Asparagus aethiopicus*), mimosa (*Albizia julibrissin*), and natal grass (FDEP 2004). FDEP has a management plan for LGSP that has goals and objectives to protect, enhance, and increase *W. amplexifolia* found on site.

The Warea Tract at SSF was formerly considered a sandhill community; however, years of fire suppression have allowed leaf litter to accumulate. In 2004, the northwest block of the tract was burned and as a result, some oaks were killed, leaf litter on the ground was reduced, and large patches of bare ground were opened up (Cox 2006). In 2005, after the burn, one of the largest populations of *W. amplexifolia* was found on the northwest block. No prescribed burns have occurred on the northeast block yet, but a burn is scheduled to take place in 2007.

Pine Ridge Nature Preserve, located at HBS, is composed of 100 acres of long-leaf/turkey oak ecosystem. *W. amplexifolia* has been located on 0.25 acre, and there is the potential to manage the adjacent 20 acres to support this plant. This site

was last burned in 2005. Since that time, no plants have been located. A 2006 management plan for this site includes plans to continue burning and monitoring this population.

Although there are public conservation lands (Sugarloaf Mountain, Ferndale Preserve, and Mountain Lake Scrub) that could support *W. amplexifolia*, these sites are not currently being managed for this species. Habitat conditions of the sandhill vary widely among these sites. Many are small parcels located in urban areas, are overgrown, and are in need of prescribed burns, which could be difficult due to their close proximity to residential areas. In addition, it should be noted that little is known about the microhabitat that *W. amplexifolia* requires at these sites.

- f. **Other:** HBS has been working on seed germination studies at the Warea Tract since 2003. In 2005, a large number of plants flowered and produced over 16,500 seeds, which were collected. Subsets of the seeds were utilized in germination trials, and the remainder of the seeds became part of the HBS National Seed Collection. Two germination trials were conducted in 2006. The first trial involved 400 seeds being sown in the greenhouse and resulted in a 2 percent germination rate. The second trial involved 800 seeds sown then placed in the germinator for more constant and optimal conditions, which resulted in a 6.8 percent germination rate. Low germination rates are typical for this species. The low rate for the first trial could have been due to inconsistent winter greenhouse conditions. The second trial resulted in a more typical germination rate (Cox 2006). Survivorship of planted individuals from the trials had averages of 60 percent each year. HBS also found that seed viability was a factor when 2003-harvested seeds had low germination rates due to the loss of viability over time. Nine-year-old seed is the oldest seed that has germinated but at a low level. Though percent germination is typically 2 to 5%, germination rates can be extremely variable, from 0% to 84% in germination trials since 1996 (C. Peterson, HBS, personal communication, 2007). No clear pattern (seed source, harvest year, etc.) has emerged to explain the variability.

Seed appears most viable within the first 15 months after harvest. Viability declines each year after that time. Greenhouse-grown seedlings appear more robust as they form large rosettes and very large leaves, as compared with seedlings arising from seed fall from outdoor plants. However,

the seedling survival rate is lower with greenhouse grown seedlings, presumably due to high humidity levels, and the greenhouse-grown seedlings are more susceptible to fungal and white fly infestations. Flat Lake seeds showed a higher germination rate than Ferndale or Castle Hill in 2006, suggesting there may be viability differences per collection site (C. Peterson, HBS, personal communication, 2007).

Germination Trials in 2007 showed no difference in the use of liquid smoke vs. no liquid smoke in germination rates. Trials to compare germination rate vs. planting month were not performed in 2007 as planned (C. Peterson, HBS, personal communication, 2007).

Three populations are currently represented at the HBS seed storage facilities: Castle Hill, Flat Lake, and Ferndale Ridge. Castle Hill seed are also being cryogenically stored in liquid nitrogen at the National Center for Germplasm Research and Preservation in Fort Collins, CO. (C. Peterson, HBS, personal communication, 2007).

2. Five-Factor Analysis

- a. **Present or threatened destruction, modification or curtailment of its habitat or range:** Habitat destruction remains the greatest threat to *W. amplexifolia*. In the past, habitat loss occurred due to conversion to citrus, mining, or development. Only three populations (LGSP, SSF-Warea Tract, and HBS Pine Ridge Nature Preserve) are located on long-term protected sites where management is occurring. Although there are public conservation lands (Sugarloaf Mountain, Ferndale Preserve, and Mountain Lake Scrub) that could support *W. amplexifolia*, these sites are not currently being managed for this species. The Schofield Sandhill is owned by Orange County but encroachment by urban development and expansion of roads could limit this population's range. The two remaining populations (Hills of Minneola and Lake Davenport) occur on private property and are susceptible to destruction due to urban development.

Since the listing of this species, several sites occupied by *W. amplexifolia* have been lost to development. The most recent example is the Castle Hill site in Lake County, which was permitted for development in 2005. The landowner allowed HBS and the Florida Native Plant Society to collect seed from *W. amplexifolia* and other federally listed plants found at the

site prior to its development. Several other large developments (e.g., Hills of Minneola and Lake Davenport) have set aside conservation lands that contain *W. amplexifolia*. It is unknown if management will occur on these sites or if permanent conservation easements will apply. Without management, these populations will likely be lost.

The lack of management (i.e., prescribed fire and/or hardwood removal) has also led to habitat degradation of *W. amplexifolia*. Without natural caused or prescribed fires, oaks and other hardwoods will create a dense overstory making the habitat unsuitable for *W. amplexifolia*. At most, of the sites that contain this species or have suitable habitat, management needs to occur.

- b. **Overutilization for commercial, recreational, scientific, or educational purposes:** Not known as a threat at the time of listing or at present.
- c. **Disease or predation:** Not known as a threat at the time of listing or at present.
- d. **Inadequacy of existing regulatory mechanisms:** The 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 these plants (primarily from the standpoint of illegal harvest) on state and private lands. Only a few populations of *W. amplexifolia* are located on protected lands (LGSP, HBS, SSF) where they are being managed.

LGSP was acquired by the State of Florida in 1946 to conserve, protect, and manage the property for outdoor recreation under the Murphy Lands Act of 1937 (FDEP 2004). In 1968, the Board of Trustees of the Internal Improvement Trust Fund conveyed management authority of LGSP to the Division of Recreation and Parks under a lease due to expire in 2067. The unit management plan for LGSP under the requirements of Sections 253.034 and 259.032, Florida Statutes, Chapter 18-2, Florida Administrative Code, intends to be consistent with the State Land Management Plan. LGSP has an approved unit management plan in place to protect and monitor *W. amplexifolia* (FDEP 2004).

HBS is operated and maintained by the Bok Tower Gardens Foundation, a not-for-profit corporation dedicated to the

conservation and preservation of the gardens, which includes the Pine Ridge Nature Preserve.

The Warea Tract (Flat Lake) at SSF was acquired and is now managed by the State of Florida Division of Forestry as part of the Warea Archipelago project for the Conservation and Recreational Lands program. The Warea Tract is one of six sites in the Warea Archipelago project targeted for long-term preservation of the rapidly disappearing upland biodiversity of the northern Lake Wales Ridge. This tract is one of several permanent preservation sites consisting of High Pine Sandhill and associated ecosystems on the Lake Wales Ridge (Cox 2006).

Some of the populations occur on private lands with little to no protection. The Service's Partners for Fish and Wildlife program is working with several landowners in Lake County to manage and protect these populations.

e. **Other natural or manmade factors affecting its continued existence:**

Drought: HBS has determined that *W. amplexifolia* could be rainfall dependent. Since 2005, areas occupied or potentially occupied by this species have had drought-like conditions. The amount of rainfall in December may be related to the number of flowering plants the following growing season (HBS 1994). Germination may be low in *W. amplexifolia* when a dry December is followed by a relatively wet spring (Cox 2006).

Fire suppression: *W. amplexifolia* requires open sandy patches that have been controlled under natural conditions with fire. Where fire has been suppressed for long periods, pine and oak canopy cover increases and understory vegetation density reduces open sandy patches (Bard 1996). The majority of sites containing *W. amplexifolia* are degraded due to fire exclusion or lack of mechanical vegetative management. Except for LGSP, SSF-Warea Tract, and HBS, there are no plans to use prescribed fire or mechanical vegetative management techniques to maintain or enhance *W. amplexifolia* habitat.

Invasive plant species: As mentioned earlier in this review, invasive exotic plants like mimosa impact sites with *W. amplexifolia* at a localized level by out competing this plant or changing the community structure away from sandhill habitat. Invasives can be controlled with management at areas that are being restored for the growth and reproduction of this species.

Of the five listing factors, habitat loss and degradation (Factor A) and fire suppression and drought (Factor E) are the main threats to *W. amplexifolia*. Factors B, C, and D are not considered threats at this time.

D. Synthesis

The current recovery criteria for *W. amplexifolia* are not objective and measurable and not all currently known threats are addressed by recovery criteria. Consequently, the recovery plan should be revised to include objective and measurable recovery criteria and updated information about the species and its management needs.

W. amplexifolia has been known to occur at 10 sites throughout three counties (Lake, Polk, and Osceola) in Florida. With proper management, six of the protected sites could provide long-term benefits to this species. Long-term monitoring for this species has only occurred on LGSP, HBS, and SSF-Warea Tract. Populations are declining due to fire suppression and drought conditions at HBS and SSF-Warea Tract, but appear to be stable at LGSP. Additional public lands (Sugarloaf Mountain, Ferndale Preserve, and Mountain Lake Scrub) have habitat that need active management and long-term monitoring to support *W. amplexifolia*. Three remaining *W. amplexifolia* sites (Schofield Sandhill, Hills of Minneola, and Lake Davenport) occur on County or private property and these are susceptible to habitat degradation and destruction due to land use changes. The Castle Hill population has been permitted and will likely be completely eliminated from this site.

W. amplexifolia is thought to be affected by drought and fire suppression in the sandhill communities. Impacts from these threats are not well understood, but they are suspected in the recent declines in populations at SSF-Warea Tract and HBS where long-term monitoring is occurring.

In summary, *W. amplexifolia* continues to be threatened by habitat loss and degradation. New information suggests that fire suppression and drought may also adversely impact this species. Given the decline in the number of known *W. amplexifolia* populations and the fact that only a few sites are assured of long-term protection, this species remains in danger of extinction throughout all or a significant portion of its range.

III. RESULTS

III.A. Recommended Classification: No change is needed.

III.B. New Recovery Priority Number: No change is needed.

IV. RECOMMENDATIONS FOR FUTURE ACTIONS

1. Revise the current recovery plan to include objective and measurable recovery criteria that are related to reducing and/or eliminating threats to *W. amplexifolia* as well as updated information on the species distribution and biology.
2. Provide funding and technical support for further research on:
 - a. The effects of prescribed burning and other management tools on *W. amplexifolia*. Continue working with public land managers to increase the management on their sites.
 - b. Additional life history needs. Information is needed on how *W. amplexifolia* plants and seeds are affected by years of drought.
 - c. Genetic inbreeding depression. This information will help us determine what constitutes a stable population.
 - d. The most appropriate methodology to germinate seeds, grow seedlings, and successfully out-plant seedlings to native habitat.
 - e. The various pollinators (e.g., Hymenoptera and Lepidoptera), as well as how different ant species assist with seed dispersal.
3. Encourage non-Federal agencies to protect and manage habitat under the Partners for Fish and Wildlife Program.
4. Update the range-wide survey, that was completed by Dr. Jack Stout in 2000, on all known and potential sites occupied by *W. amplexifolia* and determine population size. Current distribution information is needed to determine where plants currently exist and to prioritize recovery actions.
5. Consider reintroduction and monitoring of *W. amplexifolia* on additional publicly owned lands with suitable habitat. Prior to reintroduction, research on the microhabitat needs of *W. amplexifolia* should be considered. Reintroduction of *W. amplexifolia* could help to increase the number of populations on protected sites and augment populations where needed.

V. REFERENCES

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**U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of Wide-leaf Warea (*Warea amplexifolia*)**


Current Classification: Endangered

Recommendation resulting from the 5-Year Review: No change

Review Conducted By: Annie Dziergowski

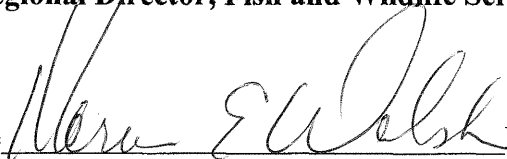
FIELD OFFICE APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service

Approve  Date 9/10/07
David L. Hankla

REGIONAL OFFICE APPROVAL:

for **Lead Regional Director, Fish and Wildlife Service**

Approve  Date 9/17/07

APPENDIX

Summary of peer review for the 5-year review of *Wide-leaf Warea (Warea amplexifolia)*

A. Peer Review Method: See B. below.

B. Peer Review Charge: On July 5, 2007, the following letter and Guidance for Peer Reviewers of Five-Year Status Reviews were sent via e-mail to potential reviewers requesting comments on the 5-year review. Requests were sent to Alice Bard (Department of Environmental Protection, Division of Recreation and Parks), Ann Cox (ECOLO-G Inc.), Dr. Dennis Hardin (Florida Division of Forestry, Plant Conservation), Beatriz Pace-Aldana (The Nature Conservancy), Cheryl Peterson (Historic Bok Sanctuary), and Dr. Jack Stout (University of Central Florida).

We request your assistance in serving as a peer reviewer of the U.S. Fish and Wildlife Service (Service) 5-year status review of the endangered Wide-leaf Warea (Warea amplexifolia). The 5-year review is required by section 4(c)(2) of the Endangered Species Act of 1973, as amended (Act) (87 Stat. 884; 16 U.S.C. 1531 et seq.). A 5-year review is a periodic process conducted to ensure the listing classification of a species as threatened or endangered on the Federal List of Endangered and Threatened Wildlife and Plants is accurate. The initiation of the 5-year review for the wide-leaf warea was announced in the Federal Register on September 27, 2006, and the public comment period closed on November 27, 2006. Public comments have been incorporated into the status review.

The enclosed draft of the status review has been prepared by the Service pursuant to the Act. In keeping with Service directives for maintaining a high level of scientific integrity in the official documents our agency produces, we are seeking your assistance as a peer reviewer for this draft. Guidance for peer reviewers is enclosed with this letter. If you are able to assist us, we request your comments be received in this office on or before August 14, 2007. Please send your comments to Annie Dziergowski at the address on this letter. You may fax your comments to Annie Dziergowski at (904)232-2404 or send comments by e-mail to Annie_Dziergowski@fws.gov.

We appreciate your assistance in helping to ensure our decisions continue to be based on the best available science. If you have any questions or need additional information, please contact Annie Dziergowski at (904)232-2580 extension 116. Thank you for your assistance.

Sincerely yours,

*David L. Hankla
Field Supervisor*

Enclosures

Guidance for Peer Reviewers of Five-Year Status Reviews
U.S. Fish and Wildlife Service, North Florida Ecological Services Office

July 5, 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 apparently not used by the Service.*
- 3. Not provide recommendations on the Endangered Species Act (ESA) 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 Annie Dziergowski, U.S. Fish and Wildlife Service, at 904-232-2580 extension 116, email: annie_dziergowski@fws.gov.

C. Summary of Peer Review Comments/Report

A summary of peer review comments is provided below. The complete set of comments is available at the North Florida Ecological Services Field Office, U.S. Fish and Wildlife Service, 6620 Southpoint Dr. South, Suite 310, Jacksonville, Florida, 32216.

The Services accepted all minor edits from peer reviewers. Overall reviewers felt the draft document adequately characterizes the known information on the status and threats of the listed populations. The following discussion is limited to where there was disagreement or additional information was provided.

Alice Bard, Florida Department of Environmental Protection, Division of Recreation and Parks, Orlando, Florida: Ms. Bard provided additional information on seed banking for subsection c. She also provided clarification on habitat conditions at Lake Griffin State Park. She also gave input that more research is needed on the microhabitat needs of this species. Numerous minor edits were suggested.

Beatriz Pace-Aldana, The Nature Conservancy, Babson Park, Florida: Ms. Pace-Aldana has asked for further clarification as to how we define a stable population. Numerous minor edits were suggested.

Cheryl Peterson, Historic Bok Sanctuary, Lake Wales, Florida: Ms. Peterson provided the Service with additional information on the germination studies that have been performed on this species. She also provided information on the populations of *W. amplexifolia* currently represented at HBS seed storage facilities.

D. Response to Peer Review:

Alice Bard, Florida Department of Environmental Protection, Division of Recreation and Parks, Orlando, Florida: All comments by Ms. Bard were incorporated. We did include the additional citation regarding seed banking. We did add the text she provided regarding needing more information on microhabitat of this species before we know if certain sites are suitable.

Beatriz Pace-Aldana, The Nature Conservancy, Babson Park, Florida: All comments by Ms. Pace Aldana were incorporated. We did provide a definition of how a stable population is determined.

Cheryl Peterson, Historic Bok Sanctuary, Lake Wales, Florida: All comments by Ms. Peterson were incorporated.