Highlands Scrub Hypericum
(Hypericum cumulicola)

5-Year Review:
Summary and Evaluation

U.S. Fish and Wildlife Service
Southeast Region
South Florida Ecological Services Office
Vero Beach, Florida

5-YEAR REVIEW
Highlands scrub hypericum/*Hypericum cumulicola*

I. GENERAL INFORMATION

A. Methodology used to complete the review: This review is based on monitoring reports, surveys, and other scientific and management information, augmented by conversations and comments from biologists familiar with the species. The review was conducted by an Archbold Biological Station (ABS) plant ecologist and finalized by the South Florida Ecological Services Office. Literature and documents used for this review are on file at the South Florida Ecological Services Office. All recommendations resulting from this review are a result of thoroughly reviewing the best available information on Highlands scrub hypericum. Public notice of this review was given in the Federal Register on April 26, 2007, with a 60-day public comment period. Comments and suggestions regarding the review were received from peer reviews from outside the Service (see Summary of peer review). Comments received were evaluated and addressed as appropriate.

B. Reviewers
Lead Region: Southeast Region, Kelly Bibb, (404) 679-7132

Lead Field Office: David Bender, South Florida Ecological Services Office, (772) 562-3909

C. Background

1. FR Notice citation announcing initiation of this review: April 26, 2007. 72 FR 20866.

2. Species status: Unknown (2007 Recovery Data Call). The status was reported as unknown due to the lack of information on population trends.

3. Recovery achieved: 2 (26-50% recovery objectives completed) (2007 Recovery Data Call).

4. Listing history:
Original Listing
FR notice: 52 FR 2234
Date listed: January 21, 1987
Entity listed: Species
Classification: Endangered

5. Associated rulemakings: N/A

6. Review History:
The Service conducted a five-year review for the Highlands scrub hypericum 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 Service 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 hypericum's listing classification was found to be warranted.
Final Recovery Plan: 1999
Recovery Data Call: 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007

7. Species' Recovery Priority Number at start of review (48 FR 43098): 2. A recovery priority number of "2" represents a high degree of threat and high recovery potential.

8. Recovery Plan or Outline:
Name of plan: South Florida Multi-Species Recovery Plan (MSRP)
Date issued: May 18, 1999
Dates of previous revisions: Recovery Plan for nineteen central Florida scrub and high pineland plants (revised). June 20, 1996; Recovery plan for eleven Florida scrub plant species. 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 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? No. The criterion of 20-90 percent probability of persistence over 100 years is too wide. Population stability is not a useful concept in a species such as Highlands scrub hypericum where healthy populations fluctuate in response to periodic fire. This species does not reproduce vegetatively, so the term "vegetative reproduction" should not be used in criteria.

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.

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.

Criteria for reclassifying Highlands scrub hypericum:

1. Enough demographic data are available to determine the appropriate numbers of self-sustaining populations and sites needed to ensure 20 to 90 percent probability of persistence for 100 years.

Demographic modeling suggests that periodic fire is necessary to sustain populations. However, demographic data have been collected from only two sites, so rangewide issues cannot yet be addressed.

2. When these populations, within the historic range of *H. cumulicola* are adequately protected from further habitat loss, degradation, fragmentation, and fire suppression.

Some populations have been protected but many have not; of the 66 occurrences, 35 remain unprotected. Exotic plant invasion is not a problem at most Highlands scrub hypericum sites but is of concern, especially in areas managed using mechanical treatments. Lack of fire and consequent habitat degradation is a problem for most populations. This species needs to receive prescribed fire every few decades and at least every 50 years (Quintana-Ascencio et al. 2003). This criterion addresses factors A and E.

3. When these sites are managed to maintain the rosemary phase of sandpine scrub to support *H. cumulicola*.

Highlands scrub hypericum occurs in 16 managed areas, most of which receive at least occasional prescribed fire. However, site-specific information and associated analysis

on past and planned fire regimes is not readily available. Most observers would agree that many sites are behind schedule in applying fire. Rosemary scrub may be threatened by too frequent fires (more than once in 15 years may cause local extirpation of Florida rosemary) or infrequent fires (longer than every 50 years may lead to decline of Florida rosemary). Mechanical treatments to manage Florida rosemary are not a good alternative because plants do not resprout and recovery by seedling recruitment following mechanical treatments has not been studied. This criterion addresses factor A.

4. When monitoring programs demonstrate that populations of *H. cumulicola* on these sites support sufficient population sizes; those populations are stable and distributed throughout the historic range; and *H. cumulicola* are sexually or vegetatively reproducing at sufficient rates to maintain the population.

Repeated monitoring of Highlands scrub hypericum populations is occurring only on a few sites (see detail below). For most populations, population size, stability, or reproductive rates are not known. Population stability is not a reasonable target because populations fluctuate in response to fire and weather. Protected populations are distributed throughout most of the original range of the species. However, range-edge populations at Lizzie Lake and Hendrie Ranch are unprotected. The species does not reproduce vegetatively so that part of the criterion should be revised. This criterion addresses factor E.

Factors B and C are not relevant to this species.

C. Updated Information and Current Species Status

1. Biology and Habitat

a. Abundance, population trends (e.g., increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, family size, birth rate, age at mortality, mortality rate), or demographic trends:
Population Sizes – Element occurrence records (EORs) are compiled by the Florida Natural Areas Inventory (FNAI). Each EOR represents a species occurrence that is a minimum of 1 kilometer (km) from another occurrence of the same species, thus a large site may have multiple EORs associated with it. When EORs contain estimates of the number of individuals for Highlands scrub hypericum, these varied widely from a single plant to thousands of plants. Although multiple observations have been made on several EORs, it is difficult to generalize about population trends, in part because of a range of precision among observers and years. Among the changes evident in FNAI records are appearances, disappearances, huge increases, and huge decreases in the number of individuals in a given occurrence.

Highlands scrub hypericum is locally abundant at Archbold Biological Station (ABS), the properties of the Lake Wales Ridge Wildlife Environmental Areas

(LWRWEA) (including Lake Placid, Holmes Avenue, Lake Apthorpe, Gould Road, and Carter Creek), Lake June in Winter Scrub State Park, The Nature Conservancy's Saddle Blanket Lakes Preserve, and the Arbuckle tract of Lake Wales Ridge State Forest (LWRSF). Despite this list of large populations, most other populations of Highlands scrub hypericum are relatively small. Besides FNAI data, the only population size estimates were made in local patches in association with an analysis of genetic variation (Dolan et al. 1999, Menges et al. 2001). The median size for 34 populations was 539 individuals, most populations were smaller than 1,000 plants, the largest population was estimated to be greater than 300,000 plants, and the 25^{th}-75^{th} percentiles for population size were 130-4,000 plants (data summarized in Table 1 of Menges et al. 2001).

Population sizes of Highlands scrub hypericum vary considerably over time, being highest in the first decade after fire (Dolan et al. in revision). In addition, higher fecundity, survival, establishment, and population growth rates occur after fire than in unburned populations (Quintana-Ascencio et al. 2003). Fire return intervals less frequent than once every 50 years create substantial extinction risk (Quintana-Ascencio et al. 2003).

Small populations of Highlands scrub hypericum at sites such as Sunray Preserve in Polk County may be vulnerable to local extirpation, especially if fire suppression becomes a problem. Fragmented populations at developing sites such as Avon Park Lakes are also particularly vulnerable to local extirpation or population declines. Larger populations on protected, managed sites such as Carter Creek, Lake Apthorpe, Holmes Avenue, and Gould Road will be less threatened with extirpation. In all cases, the patchy distribution of Highlands scrub hypericum at several scales (within gaps, among gaps [preferring the largest gaps], and across the landscape) is a central point for conservation and management (P. Quintana-Ascencio, University of Central Florida, pers. comm. 2008a).

Trends in Population Sizes – Population trends can be gleaned from demographic research conducted by Pedro Quintana-Ascencio, with Eric Menges and Carl Weekley (ABS). Their work provides information on population trends at two sites.

At LWRSF, Arbuckle Tract, Highlands scrub hypericum is monitored by Pedro Quintana-Ascencio and colleagues using 196 1 x 2 meter (m) quadrats randomly located in areas supporting the plant (Quintana-Ascencio et al. 2003, 2007). This study, ongoing since 1996, has now followed 3,276 plants (E. Menges, pers. obs. 2008). The use of permanent quadrats allows the inference of population trends from this sample. The population dynamics of Highlands scrub hypericum at LWRSF has been characterized by volatile changes, especially in roadside populations. Scrub populations subjected to fires generally show a sharp initial decline, as plants directly affected by fire

are killed. In most cases, there is a partial or full recovery of population size a few years after fire (Quintana-Ascencio et al. 2007). The overall trends through February 2008 (see Quintana-Ascencio et al. 2007, Figure 1 for trend data through 2006) show that 3 of 4 scrub populations are stable or fluctuating, while one population (oak scrub 2), which has not burned since before 1996, continues a steady decline. The two fairly stable rosemary scrub populations (one unburned since before 1996, one with two recent fires) have lower densities than in the late 1990s. Population trends in the five roadside populations remain more volatile. Four of these five populations show marked declines in the last several years (E. Menges, pers. obs. 2008).

Keith Clanton, Florida Division of Forestry (FDOF) (2007) provided this information on Highlands scrub hypericum at LWRSF: "A minimum of 409 individuals of *H. cumulicola* are known to occur on the LWRSF based on level 1 surveys conducted in 2006. *H. cumulicola* is present in other areas not surveyed (i.e., quantified and located with GPS) during 2006. Therefore, this estimation is known to be an underestimate of the total *H. cumulicola* population." Because FDOF surveys are incomplete (e.g., 423 plants were alive in quadrats studied by Quintana-Ascencio et al. in February 2008, more than the total FDOF estimate) and because FDOF data do not provide information on trends between repeat visits to the same points, they do not provide further information on population trends of Highlands scrub hypericum at LWRSF.

From ABS, Quintana-Ascencio et al. (2007) report data on population trends based on two completely censused populations, one in scrub and one along a sandy roadside. Updated through February 2008 (E. Menges, pers. obs. 2008), the trends suggest that the rosemary scrub site (last burned about 2000) is fairly stable. However, the roadside site has undergone a steep decline in the last four years.

Using more extensive ABS data, Eric Menges looked for trends across all 15 populations studied at ABS, using data collected from permanent rectangular quadrats (1.0 x 0.5 m). This represents a small subset of plants marked at ABS, but because most plants are marked opportunistically outside of quadrats, they cannot be used directly to assess population trajectories. Plant densities responded strongly to fire, peaking at 3-4 years post-fire. This pattern is also consistent with that reported by Dolan et al. (in revision) for one intensively studied population. Density trends over time were examined graphically in groups of populations with the same fire history. All groups showed declines in recent years since the last fire. However, trends over the entire study period (1994-2008) were more variable, with several groups showing cyclic increases and decreases in relation to fire. The overall trend cannot really be characterized except in relation to fire. An aggregate decline of study populations clearly reflects the lack of recent fires at ABS study sites.

Highlands scrub hypericum at Saddle Blanket Preserve is being mapped by Bea Pace-Aldana of The Nature Conservancy (pers. comm. 2008). The species occurs in approximately 75% of scrub patches at this site. Future monitoring should detect changes in presence/absence in response to fire management.

Although Highlands scrub hypericum also occurs at several other conservation sites on LWR, no other data on population trends are available. Cox (2002) suggests that Highlands scrub hypericum monitoring is also occurring at LWRWEA sites and at Hickory Lake Scrub. According to Mike McMillian and Kent Williges (Florida Fish and Wildlife Conservation Commission [FWC], pers. comm. 2008), there is no monitoring of Highlands scrub hypericum on FWC properties. According to Tabitha Biehl-Gabbard of Polk County (pers. comm. 2008), Highlands scrub hypericum does not occur at Hickory Lake Scrub. This agrees with other tabulations (e.g., Turner et al. 2006). Highlands scrub hypericum does occur in part of the proposed Sunray/Hickory Lake Addition (Turner et al. 2006), but is apparently not being monitored there.

Broader scale quantitative surveys will be useful in the future in detecting demographic trends in Highlands scrub hypericum. A survey of rare species locations on conservation lands, completed in 2000, was later used to assess soil preferences (Menges et al. 2007). These data include GPS points and $\log_{10}$ density estimates from 20 species, 10 sites, 1,173 GPS points, and 2,577 species occurrences in Highlands County. These points included 442 occurrences of Highlands scrub hypericum at seven sites. Note that the scale for this project is considerably finer than that used by FNAI (Schultz et al. 1999) or Turner et al. (2006), leading to a higher number of occurrences. The Plant Ecology Lab at ABS plans to resample these points in 2011-2012 to provide an assessment of large-scale population trends.

In addition, ABS's Plant Ecology Lab has initiated a project (Population Dynamics of Endemic Plants) to add new GPS locations, together with estimates of absolute density, for rare plants in managed sites on LWR. Through February 2008, surveys have included five sites, 14 species, 402 species occurrences, and 4,541 counted individuals. These points currently include 8 points and 43 plants for Highlands scrub hypericum, all at Holmes Avenue Scrub (LWRWEA). These points will be resurveyed periodically, especially after management actions such as prescribed burning, mowing, and roller chopping. The number of new points added and the frequency of re-sampling will depend, in part, on funding.

Ecology and Life History – There has been as much published research on the ecology and life history of Highlands scrub hypericum as on any other Florida scrub species. The most practical finding from this research is that the long-term absence of fire will result in declining vital rates and population viability

(Quintana-Ascencio et al. 2003). In addition, mis-timed fire may cause declines in Highlands scrub hypericum. Poor recruitment at one ABS site occurred when a strong drought followed a 1999 burn (P. Quintana-Ascencio, pers. comm. 2008b). Although land managers cannot control drought, fires that precede forecast droughts should be avoided. Other factors that can cause population crashes include flooding in roads (Quintana-Ascencio et al. 2007) and frost damage (P. Quintana-Ascencio, pers. comm. 2008b).

b. Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding): Highlands scrub hypericum populations have a low amount of genetic (isozyme) variability but a high degree of genetic differentiation among populations (Dolan et al. 1999, Menges et al. 2001). A recent, detailed isozyme analysis at a single site showed that expected heterozygosity increased, and allele presence and allele frequencies showed marked shifts, following a 2001 fire that killed the aboveground population (Dolan et al. in revision). Populations became twice as differentiated after fire. This study demonstrates that seed banks can be genetic reservoirs, that rapid genetic change with disturbance can occur, and that fire can have positive effects on the genetics of Highlands scrub hypericum. Fire also altered the spatial genetic structure of this plant (Quintana-Ascencio et al. in preparation). Microsatellite markers have also been recently developed for Highlands scrub hypericum (Edwards et al. 2007). Although there is a fair amount of information on the genetics of Highlands scrub hypericum, there has not been research linking genetics with demographic performance.

c. Taxonomic classification or changes in nomenclature: No recent changes. The Integrated Taxonomic Information System (2008) was checked while conducting this review.

d. Spatial distribution, trends in spatial distribution (e.g., increasingly fragmented, increased numbers of corridors), or historic range (e.g., corrections to the historical range, change in distribution of the species' within its historic range): Continued conversion of Florida scrub and sandhill to agriculture, housing, and other developments is undoubtedly affecting the number and sizes of Highlands scrub hypericum populations. A recent analysis of land conversion on the LWR suggests that about 78% of upland habitats were lost by the 1980s (Weekley et al. 2008). By the early part of this century, about 87% of upland habitat was gone (Turner et al. 2006). Habitat losses were greatest on yellow sands and in the northern part of the Lake Wales Ridge (LWR) (Weekley et al. 2008). However, considerable habitat loss on the soil types favored by Highlands scrub hypericum (Menges et al. 2007) suggests that many populations have been extirpated.

Highlands scrub hypericum has a narrow distribution on the southern half of the LWR, primarily in Highlands County but also in Polk County. In general, its current distribution matches its historic distribution, although individual populations within its range have undoubtedly been lost to development. Early inventories of LWR endemic plants found this species at few sites—69 of 254 scrub sites surveyed by Christman (1988).

As of April 2008, FNAI recorded 66 EORs for Highlands scrub hypericum. Of these 66, FNAI identified 31 as being found in managed areas. GIS projections confirmed that 29 of these EORs fell within current managed areas boundaries (2 EORs were found just outside the edges of the Silver Lake Unit the LWRWEA). These 29 EORs were found in 16 managed areas: 17 EORs were found in ten LWRWEA, 3 each at ABS and LWRSF, 2 each at Lake June in Winter State Park, Fisheating Creek/Smoak Groves Conservation Easement, and single occurrences at Sunray and Saddle Blanket Preserve.

Information from Schultz et al. (1999, see their Table 3) summarized 76 EORs for Highlands scrub hypericum, of which 32 (42%) occurred in 10 areas protected or proposed for protection on LWR. These areas are Sunray (2 EORs), Trout Lake (1 EOR), Avon Park Lakes (1 EOR), Silver Lake (3 EORs), Carter Creek (4 EORs), Lake Apthorpe (4 EORs), Holmes Avenue (1 EOR), Lake June West (2 EORs), Highlands Ridge (5 EORs), and Gould Road (1 EOR) (Schultz et al. 1999, Table 4).

A summary by Turner et al. (2006) is based largely on FNAI data. It includes records in the same 16 conservation areas covered by FNAI EORs. The LWRWEA properties are listed and include 10 managed areas: Carter Creek, Gould Road, Highlands Park Estates, Highlands Ridge, Holmes Avenue, Lake Placid Scrub, McJunkin, Royce/Clements/Apthorpe, Silver Lake, and Silver Lake South. In addition, Turner et al. (2006) list Highlands scrub hypericum at four sites targeted for acquisition (Avon Park Lakes, Silver Lake Addition, Hickory Lake Scrub, Trout Lake). Turner et al. (2006, p. 62) list 43 records of Highlands scrub hypericum, with an extent of 954 km^2. About 22 sites are currently protected, and 29 will be protected under current conservation plans (Turner et al. 2006).

Among the 35 FNAI occurrences that are unprotected, two areas are notable. Highlands scrub hypericum at the Hendrie Ranch in southern Highlands County accompanies many listed plants and occurs in superb examples of rosemary scrub. This area is also at the edge of the range for Highlands scrub hypericum. Likewise, the disjunct population at Lizzie Lake is a range edge location for Highlands scrub hypericum. Because range-edge populations may be genetically different from populations in the central part of the range, they should be given consideration for protection.

A recent analysis of Florida scrub conservation progress (Turner et al. 2006) includes Highlands scrub hypericum among the 36 rare species of the LWR. This analysis confirmed that nearly all (98%) occurrences were on the LWR. Turner et al. (2006) calculated Highlands scrub hypericum as a species of high conservation concern; in fact, it was included in a list of eight species thought to require intensive management. Turner et al. (2006) recommended that integrated management planning and management protocols be developed for Highlands scrub hypericum and other species of the highest conservation concern.

e. Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem): Highlands scrub hypericum is found almost exclusively in upland areas with excessively-drained white sand soil (Judd 1980, Menges et al. 2007). It is found primarily in rosemary scrub but also in xeric scrubby flatwoods. These areas have fire return intervals of 5-30 years (Menges 2007) or 10-100 years (Myers 1990). The species is not found in all areas of suitable habitat (Quintana-Ascencio et al. 1998), probably because of dispersal limitations. Because of this, patch occupancy is more likely in larger and less isolated patches (Quintana-Ascencio and Menges 1996).

Within these types of Florida scrub, Highlands scrub hypericum is a gap specialist (Quintana-Ascencio and Morales Hernandez 1997) and a poor competitor with shrubs (Quintana-Ascencio and Menges 2000). In rosemary scrub, gap sizes are smallest in areas that have not burned in decades (Menges et al. 2008a). Shrinking gaps in long-unburned areas may be one explanation for the decline in population viability in Highlands scrub hypericum in the absence of fire (Quintana-Ascencio et al. 2003).

In addition, Highlands scrub hypericum grows in disturbed areas such as sandy roadsides that often occur adjacent to scrub populations. These roadside populations are demographically divergent from scrub populations: they are less stable with more variable life spans, earlier flowering, and higher fecundity (Quintana-Ascencio et al. 2007). These weedier tendencies could represent phenotypic plasticity or have a genetic basis. If the latter is true, then roadside genotypes might be able to invade scrub sites, perhaps to the detriment of adaptation to scrub conditions.

Translocations of Highlands scrub hypericum to degraded sites undergoing restoration may be a way to increase its distribution and local population sizes. Ongoing restoration work includes introducing seeds and transplants into degraded scrub and pasture, respectively (Menges et al. 2008b). Field seed germination of Highlands scrub hypericum is low (<2%) and restricted to open sites, consistent with its habitat preferences in more pristine scrub. Of eight species transplanted, Highlands scrub hypericum suffered the greatest

mortality due to transplant shock (Menges et al. 2008b). Subsequent initial transplant survival (four months) was also relatively low (about 40%).

f. Other: Other relevant research includes the experiments of Hawkes (2004) showing that Highlands scrub hypericum germination is higher with soil crusts present, suggesting that this species may be vulnerable to vehicle disturbance or trampling. In contrast, the presence of ground lichens appears to have a negative effect on recruitment of Highlands scrub hypericum (Hawkes and Menges 2003), although these effects were slight given low rates of germination. Allelopathy from Florida rosemary may limit recruitment of Highlands scrub hypericum as well (Hunter and Menges 2002, Hewitt and Menges in press). In scrub, Highlands scrub hypericum occurs mainly in gaps (Quintana-Ascencio et al. 2003, Dolan et al. in revision). These results suggest that recently burned, untrampled sites with inter-shrub gaps will provide the best conditions for recruitment in this species.

2. Five-Factor Analysis

a. Present or threatened destruction, modification or curtailment of its habitat or range: Habitat for Highlands scrub hypericum continues to be developed for agriculture, housing, and other uses. This is likely reducing the number and size of populations of this species on unmanaged lands, which constitute 35 of 66 FNAI EORs. The most recent estimate of the loss of xeric upland habitat on the LWR is 87% (Turner et al. 2006). Even on protected lands, Highlands scrub hypericum may be threatened by habitat modifications due to lack of fire (see Factor E). The effect of mechanical surrogates or pre-treatments for fire, which are widely used by land managers on the LWR, on Highlands scrub hypericum is not fully known, although one study (Weekley et al. 2007) suggests that fire alone is most effective in maintaining this species.

b. Overutilization for commercial, recreational, scientific, or educational purposes: We have no evidence of overutilization at this time.

c. Disease or predation: We have no information on disease affecting Highlands scrub hypericum. Herbivory has been reported for this species by Brudvig and Quintana-Ascencio (2003), but there is no indication that it has a strong impact on population dynamics.

d. Inadequacy of existing regulatory mechanisms: The Endangered Species Act (Act) protect plants only when they occur on federally-owned lands or when a federal nexus is involved. Florida's "Preservation of Native Flora of Florida" law (Rule Chapter 5B-40 of the Florida Administrative Code under authority from the Florida Statutes, Chapters 581.185, 581.186, and 581.187) protect plants only when they occur on state-owned lands. This law allows for collection of plants on state-owned lands by permit only and only

for scientific and educational purposes.

Highlands scrub hypericum is listed as endangered by the State of Florida on the Regulated Plant Index (Florida Department of Agriculture and Consumer Services Rule 5B-40). This law regulates the taking, transport, and sale of listed plants. Property owners are not prohibited under this law from destroying populations of listed plants nor are they required to manage habitats to maintain populations.

No protection exists outside of federal property, and no coordination of land management on protected sites for this species has been implemented. Existing regulatory mechanisms are inadequate to protect this species.

e. Other natural or manmade factors affecting its continued existence: Inappropriate fire regime, mechanical treatments, damage from vehicles and pedestrian trampling, and invasive exotic species threaten the continued existence of Highlands scrub hypericum. The main habitat for Highlands scrub hypericum, Florida rosemary scrub, may be threatened by too frequent fires (more than once in 15 years may cause local extirpation of Florida rosemary) or infrequent fires (longer than every 50 years may lead to decline of Florida rosemary). Infrequent fires are probably the greatest threat on both managed sites and unmanaged sites, although specific data are lacking. Competition from shrubs (Quintana-Ascencio and Morales-Hernandez 1998), the negative effects of ground lichens on recruitment (Hawkes and Menges 2003), and allelopathic inhibition of seed germination from Florida rosemary (Hunter and Menges 2002, Hewitt and Menges in press) will cause fire-suppressed sites to have declining populations of Highlands scrub hypericum. Mechanical treatments to manage Florida rosemary are not a good alternative because plants do not resprout and recovery by seedling recruitment following mechanical treatments has not been studied. Because Highlands scrub hypericum germination is higher with soil crusts present (Hawkes (2004), vehicle disturbance or trampling could threaten some populations with extirpation. Exotic species (particularly cogon grass [*Imperata cylindrica*] and feral hogs [*Sus scrofa*]) are potential problems on sites that support Highlands scrub hypericum, but these effects have not been documented.

D. Synthesis - Highlands scrub hypericum is protected on 31 of 66 EORs, but remaining unprotected populations are in imminent danger of decline and extirpation. Unprotected habitat continues to be developed for agriculture, housing, and other uses. This is likely reducing the number and size of populations of this species. The most recent estimate of the loss of xeric upland habitat on the LWR is 87% (Turner et al. 2006). On the 16 managed areas that include the protected occurrences, better land management is needed to ensure that protected populations remain extant. Appropriate management includes avoiding fire suppression, avoiding fires before forecast droughts, creation of gaps, and avoiding damage by vehicles or pedestrian trampling to plants and to the cryptobiotic soil crust, which may facilitate seedling emergence. Inappropriate fire regimes remain a

significant threat. Most scrub sites supporting Highlands scrub hypericum are not burned frequently enough to support viable populations and mechanical pre-treatments or surrogates may not provide the same benefits as fire. Exotic species invasion and herbivory are potential threats but have not been directly implicated as causing population declines. Due to these ongoing threats mentioned above, this species continues to meet the definition of endangered under the Act.

III. RESULTS

A. Recommended Classification:

__X__ **No change is needed**

IV. RECOMMENDATIONS FOR FUTURE ACTIONS

Data Needs

- Detailed demographic data from two sites, along with data comparing roadside and scrub populations can provide the basis for population viability analyses of these sites. An analysis based on ABS data has been published (Quintana-Ascencio et al. 2003) and some demographic analyses for LWRSF have also appeared (Quintana-Ascencio et al. 2007). These datasets should be continued, in part to provide a basis with which to compare population trends in other sites.

- For most other managed areas, data need to be collected on population sizes (Level 2 monitoring). Using a protocol used by ABS in its project on "Population Dynamics of Endemic Plants" is recommended. GPS units are used to mark the centers of 5 m radius circular plots (located randomly as well as in crucial patches of listed plants). Careful counts of the numbers of plants are made in these plots. Plots are periodically revisited, especially after management activities. Simple accumulations of GPS points cannot substitute for Level 2 data in providing data on population sizes and population trends.

- Data on management activities (e.g., fire, mechanical treatments) should be gathered in management units where Level 2 monitoring is being done. These can serve to link information specific to those units (including population size and trends) with detailed demographic models that are keyed to management (e.g., fire).

- More data needs to be collected on the response of Highlands scrub hypericum to management activities such as roller chopping, mowing, gyro-tracking, logging, and chain-saw felling. To the extent that responses are dissimilar to post-fire responses, fire-based population viability models will need to be adjusted.

- A metapopulation model will be necessary to determine the number of self-sustaining populations to ensure persistence. Full metapopulation models require information on population dynamics within populations, the number and distribution of populations, and dispersal among populations (for plants, mainly seed dispersal). The last information is

lacking for Highlands scrub hypericum. A conservative metapopulation scenario could be simulated using no or very limited dispersal.

- Although prior research has established that genetic variation in Highlands scrub hypericum is very low, it is not known whether this low genetic variation, inbreeding depression, or other genetic factors affect demography. A study examining how inbreeding and low genetic variation affected demographic performance could be helpful in designing introductions or augmentations if intensive restoration is required for this species.

Implementation of Recovery Actions

- Although many populations of Highlands scrub hypericum are protected, additional protection is needed. Land purchase or conservation easement of key parcels (e.g., Hendrie Ranch, Lizzie Lakes) would protect important populations.

- Better land management is needed to ensure that protected populations remain extant. Recommend land management plans that address four main threats: avoiding fire suppression, avoiding fires occurring before forecast droughts, creation of gaps, and avoid trampling of Highlands scrub hypericum and the cryptobiotic soil crust that may facilitate its seedling emergence.

- Restoration activities have the potential to increase the number of sustainable populations. Challenges include low survival of transplants, variable recruitment from sown seeds, and potential interference by weeds. Conduct additional applied research that could lead to successful introductions or augmentations of populations.

Revision of Recovery Plan

- The recovery plan should be revised to incorporate new information, relate goals to fire management, and provide more specific criteria for the persistence of populations. Criteria for reclassification should be modified.

V. REFERENCES

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U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of Highlands scrub hypericum *(Hypericum cumulicola)*

Current Classification __Endangered__
Recommendation resulting from the 5-Year Review

____ **Downlist to Threatened**
____ **Uplist to Endangered**
____ **Delist**
__X__ **No change is needed**

Appropriate Listing/Reclassification Priority Number, if applicable _____

Review Conducted By __Dr. Eric Menges, Archbold Biological Station___

FIELD OFFICE APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service

Approve _____ Date 7-8-08

The lead Field Office must ensure that other offices within the range of the species have been provided adequate opportunity to review and comment prior to the review's completion. The lead field office should document this coordination in the agency record.

REGIONAL OFFICE APPROVAL:

The Regional Director or the Assistant Regional Director, if authority has been delegated to the Assistant Regional Director, must sign all 5-year reviews.

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

Approve _____ Date 9/5/08

The Lead Region must ensure that other regions within the range of the species have been provided adequate opportunity to review and comment prior to the review's completion. If a change in classification is recommended, written concurrence from other regions is required.

Cooperating Regional Director, Fish and Wildlife Service

_____Concur _____ Do Not Concur

Signature_____ Date_____

Summary of peer review for the 5-year review of Highlands scrub hypericum (*Hypericum cumulicola*)

A. Peer Review Method: The Service conducted peer review. Two peer reviewers were selected by the Service. Individual responses were requested and received from each of the peer reviewers.

B. Peer Review Charge: See attached guidance.

C. Summary of Peer Review Comments/Report: One reviewer suggested more emphasis on the wording of recovery criteria in a revision of the recovery plan. The reviewer suggested recommending a study linking genetics (including inbreeding) with "survival and fitness of the species". The reviewer pointed out an apparent discrepancy in the numbers of element occurrences. This reviewer had questions about how the data from Turner et al. (2006) corresponded to the FNAI element occurrences. Finally, the reviewer wanted the status review to suggest that criteria for delisting be included in the revised recovery plan. The second reviewer did not make any suggestions for revision.

D. Response to Peer Review: In response reviewer comments, several modifications were made. The status review now makes suggestions for a revised recovery plan that would add more recent scientific information, incorporate fire regimes into recovery criteria, provide more specific criteria for the recovery of populations, and provide criteria for de-listing.

Reviewer's comments on the genetics of Highlands scrub hypericum are thoughtful. Additional text now addresses genetics. Revisions mention that no research has been accomplished to link genetics and demographic performance (addressing survival and fitness of the species) and that this research could be useful if augmentation or introductions of this species are contemplated.

The information about FNAI element occurrences has been reworded to be more specific and clearer. The information that the reviewer asked for related to the Turner et al. (2006) summary cannot all be obtained because Turner et al. (2006) lists managed areas for each species but not the breakdown of each record (for Highlands scrub hypericum, 43) by each managed area. The status review was reworded to be clearer and information was added on the four sites targeted for acquisition for which Turner et al. (2006) reports occurrences of Highlands scrub hypericum.

Guidance for Peer Reviewers of Five-Year Status Reviews

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

February 20, 2007

As a peer reviewer, you are asked to adhere to the following guidance to ensure your review complies with U.S. Fish and Wildlife Service (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 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 the Service must use the best available scientific data in determining the species' status. This does not mean the Service 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 the Service's 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 Cindy Schulz, Endangered Species Supervisor, South Florida Ecological Services Office, at 772-562-3909, extension 305, email: Cindy_Schulz@fws.gov.