

U.S. FISH AND WILDLIFE SERVICE SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

Scientific Name:

Argythamnia blodgettii

Common Name:

Blodgett's silverbush

Lead region:

Region 4 (Southeast Region)

Information current as of:

03/26/2013

Status/Action

Funding provided for a proposed rule. Assessment not updated.

Species Assessment - determined species did not meet the definition of the endangered or threatened under the Act and, therefore, was not elevated to the Candidate status.

New Candidate

Continuing Candidate

Candidate Removal

Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status

Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species

Range is no longer a U.S. territory

Insufficient information exists on biological vulnerability and threats to support listing

Taxon mistakenly included in past notice of review

Taxon does not meet the definition of "species"

Taxon believed to be extinct

Conservation efforts have removed or reduced threats

___ More abundant than believed, diminished threats, or threats eliminated.

Petition Information

___ Non-Petitioned

X Petitioned - Date petition received: 05/11/2004

90-Day Positive:05/11/2005

12 Month Positive:05/11/2005

Did the Petition request a reclassification? **No**

For Petitioned Candidate species:

Is the listing warranted(if yes, see summary threats below) **Yes**

To Date, has publication of the proposal to list been precluded by other higher priority listing?
Yes

Explanation of why precluded:

Higher priority listing actions, including court-approved settlements, court-ordered and statutory deadlines for petition findings and listing determinations, emergency listing determinations, and responses to litigation, continue to preclude the proposed and final listing rules for this species. We continue to monitor populations and will change its status or implement an emergency listing if necessary. The Progress on Revising the Lists section of the current CNOR (<http://endangered.fws.gov/>) provides information on listing actions taken during the last 12 months.

Historical States/Territories/Countries of Occurrence:

- **States/US Territories:** Florida
- **US Counties:** Miami-Dade, FL
- **Countries:**Country information not available

Current States/Counties/Territories/Countries of Occurrence:

- **States/US Territories:** Florida
- **US Counties:** Miami-Dade, FL, Monroe, FL
- **Countries:**Country information not available

Land Ownership:

Varied, see Tables 1 and 2 (Bradley and Gann 1999, p. 6). The largest population is in private ownership at Big Munson Island (~100 acres [40.5 hectares (ha)]), which is owned by The Boy Scouts of America. Two-thirds of the occurrences are on public lands; one-third is on private lands (Table 2) (Bradley and Gann 1999, p. 6). Within Everglades National Park (ENP), plants occur in patches in an area covering about 450 acres (182.2 ha) of pine rockland (J. Sadle, ENP, pers. comm. 2008a). Blodgetts silverbush has not been fully inventoried on private lands in Miami-Dade County, but these are expected to be very limited in extent compared to the amount on public conservation lands.

Lead Region Contact:

ARD-ECOL SVCS, Victoria Davis, 404 679-4176, victoria_davis@fws.gov

Lead Field Office Contact:

S FL ESFO, Paula Halupa, 772-562-3909, paula_halupa@fws.gov

Biological Information

Species Description:

A. blodgettii is an erect suffrutescent perennial 1-6 dm tall, the stems and leaves covered with bifurcate hairs; leaves entire, oval to elliptic, sometimes slightly spatulate, 1.5-4 cm long, often colored a distinctive metallic bluish green, distinctly 3-nerved; staminate calyx 7-8 mm wide; sepals are lanceolate; petals broadly elliptic, shorter than sepals; pistillate sepals lanceolate to linear-lanceolate; petals broadly elliptic, shorter than sepals; pistillate sepals lanceolate to linear-lanceolate, 5-6 mm long; capsule 4-5 mm wide (Adapted from Small 1933) (Bradley and Gann 1999, p. 2). Reproduction is sexual; flowering and fruiting apparently takes place throughout the year (Bradley and Gann 1999, p. 3).

Taxonomy:

Hodges and Bradley (2006, p. 10) stated, The species was first described by Torrey in Chapman (1884) as *Aphora blodgettii* reporting it for South Florida, naming it after John Loomis Blodgett, physician and plant collector on Key West from 1838-1853. In an 1896 revision of the genus, Pax placed it in the genus *Ditaxis*. In 1897, Chapman placed it in the genus *Argythamnia* (spelling it *Argyrothamnia*). In 1903, Small placed it in the genus *Ditaxis* writing, In sandy soil, Key West. In 1914 Pax placed it in synonymy under *Ditaxis fendleri*, a plant of Colombia, Venezuela, Curacao, and Trinidad. Small (1933) retained it as *Ditaxis blodgettii*, treating it as a southern Florida endemic. Subsequent authors (Webster, 1967; Long & Lakela, 1971; Wunderlin, 1998; Wunderlin & Hansen, 2003) have retained it as a southern Florida endemic *Argythamnia blodgettii*.

The Integrated Taxonomic Information System (2011, p. 1) uses the name *Argythamnia blodgettii* and indicates that this species taxonomic standing is accepted. NatureServe (2010, 1) uses the name *A. blodgettii*. The online Atlas of Florida Vascular Plants (Wunderlin and Hansen 2008, p. 1) uses the name *A. blodgettii*. In summary, there is consensus that *A. blodgettii* is a distinct taxon. We have carefully reviewed the available taxonomic information to reach the conclusion that the species is a valid taxon.

Habitat/Life History:

On the mainland, Blodgetts silverbush grows in pine rockland and edges of rockland hammock (Bradley and Gann 1999, p. 3). In the Keys, this species grows in pine rockland, rockland hammock, coastal berm and on roadsides, especially in sunny gaps or edges (Bradley and Gann 1999, p. 3). Bradley and Gann (1999, p. 3) stated *A. blodgettii* is primarily a plant of open sunny areas in pine rockland, edges of rockland hammock, edges of coastal berm, and sometimes disturbed areas in close proximity to a natural area. Plants can be found growing from crevices on oolitic or Key Largo limestone or on sand. The pine rockland habitat where it occurs in Miami-Dade County and the Florida Keys requires periodic fire to maintain an open, sunny understory with a minimum amount of hardwoods. Bradley and Gann (1999, p. 3) indicated that this species does tolerate some degree of human-induced disturbance. It can often be found along disturbed edges of pine rockland, rockland hammock, and coastal berm, or in completely scarified pine rockland (Bradley and Gann 1999, p. 3).

Historical Range/Distribution:

A. blodgettii historically occurred from central and southern Miami-Dade County from Brickell Hammock (latitude ca. 25° 45.9) to southwestern Long Pine Key in Everglades National Park (latitude ca. 25° 24.2), and throughout the Florida Keys (Monroe County and Miami-Dade County) from Totten Key (latitude 25° 22.95) south to Key West (latitude 24° 32.52) (Bradley and Gann 1999, p. 2). Based upon Hodges and Bradley (2006, pp. 16-17) and data from The Institute for Regional Conservation (IRC) (K. Bradley, IRC, pers. comm. 2007), Blodgetts silverbush has been extirpated from the sites in Table 1 (Bradley and Gann 1999, p. 6).

Table 1. Extirpated occurrences of Blodgetts silverbush (Bradley and Gann 1999, p. 6).

Current Range Distribution:

A. blodgettii is currently known from central Miami-Dade County from Coral Gables (latitude 25° 43.45) and southern Miami-Dade County to southwestern Long Pine Key in Everglades National Park (latitude 25° 24.2), and the Florida Keys from Windley Key (latitude 24° 57.08) southwest to Big Pine Key (latitude 24° 38.52) (Bradley and Gann 1999, p. 3). Although we do not know the total extent of the former range, approximately 12 miles (19 kilometers) of habitat has been lost near the northern end of the range in Miami-Dade County and 43 miles (69 kilometers) has been lost in Monroe County (Bradley and Gann 1999, p. 3). More recently, Hodges and Bradley (2006, pp. 10, 43) indicated that species verified range extends from Miami-Dade County to Boca Chica Key.

Based upon Bradley and Gann (1999, p. 6), Hodges and Bradley (2006, p. 43), and data from IRC (K. Bradley, pers. comm. 2007), Blodgetts silverbush is extant at the sites in Table 2. However, the species may be extirpated (**) from the Charles Deering Estate, the Epmore Drive Pineland fragment, the Old Dixie Pineland, and S.W. 184 Street and 83 Avenue (K. Bradley, pers. comm. 2007). The NFC #317 site has been destroyed (K. Bradley, pers. comm. 2007). Indefinite occurrences (those which have not been verified lately) in Monroe County include Key West Golf Course, Boot Key, and Long Key State Park (Hodges and Bradley 2006, p. 43). Indefinite occurrences in Miami-Dade County are between Coconut Grove and Cutler, and between Cutler and Longview Camp (K. Bradley, pers. comm. 2007).

Table 2. Extant occurrences of Blodgetts silverbush (Bradley and Gann 1999, p. 6; Hodges and Bradley 2006, p. 43; J. Sadle, pers. comm. 2007, 2008a, 2008b, 2010, 2011). Roughly two-thirds of the known occurrences are on public or managed land.

The finding of a new, small occurrence approximately 0.9 mile (1.5 kilometers) from the Deer Hammock site (yet within Pine Block B) suggests that the range within ENP is larger than originally thought (J. Sadle, pers. comm. 2010).

Population Estimates/Status:

See Table 2 above (Bradley and Gann 1999, p. 6). In the Keys, Blodgetts silverbush is extant on nine islands, with three others of uncertain status (Hodges and Bradley 2006, p. 43). The largest population surveyed is on Big Munson Island and is estimated to be 8,000-9,000 plants (Hodges and Bradley 2006, p. 17). The population size in the Keys, excluding Big Pine, is estimated to be approximately 11,000 plants (Hodges and Bradley 2006, p. 17). Occurrences on Big Pine Key vary by location and are shown in Table 2 (Hodges and Bradley 2006, p. 43). According to data from IRC, the estimated population of Blodgetts silverbush in Miami-Dade County is 375-13,650 plants (i.e., total of low and high estimates from log₁₀ scale) (K. Bradley, pers. comm. 2007); however, this may be an overestimate of the actual population size because it was based upon a log₁₀ scale. In ENP, the current estimated population size is 1,000 plants (J. Sadle, pers. comm. 2008a, 2010).

The rounded global status of Blodgetts silverbush is considered to be G2, imperiled (NatureServe 2010, p. 1). Florida Natural Areas Inventory (FNAI) (2011, p. 1) considers it to be G2, imperiled globally because of rarity (6 to 20 occurrences or less than 3,000 individuals) or because of vulnerability to extinction due to some natural or man-made factor. The FNAI's element tracking summary data indicated a total of 31 element occurrence records in 2 counties, with 24 occurrences in management areas (FNAI 2008, p. 1). This species is listed as endangered by the State.

Threats

A. The present or threatened destruction, modification, or curtailment of its habitat or range:

Blodgetts silverbush has lost a substantial amount of its former habitat. This species is extirpated from 15 sites in Miami-Dade and Monroe Counties, mainly due to development (Table 1) (Bradley and Gann 1999, p. 6). Pine rocklands in Miami-Dade and Monroe Counties have lost nearly 90 percent of their area due to agricultural and residential development (OBrien 1998, p. 208). Development has reduced the coverage of pine rocklands from 130,358 acres (52,754 ha) to 15,256 acres (6,174 ha) (OBrien 1998, p. 208). Most of the ecosystems on the Keys have been impacted by humans, through widespread clearing of rockland hammocks in the 19th century for farming, or building of homes and businesses (Hodges and Bradley 2006, p. 6). Disruption of the historical fire regime in the pine rocklands has probably caused a decrease in the plant diversity on islands with that habitat (Hodges and Bradley 2006, p. 6).

Habitat loss continues to occur in its range, and most remaining suitable habitat has been negatively altered by human activity. Outside of ENP, only about one percent of the Miami Rock Ridge pinelands have escaped clearing, and much of what is left is in small remnant blocks isolated from other natural areas (Herndon 1998, p. 1). As a result, some opportunities exist to conserve this plant on private land in Miami-Dade County, but there is little opportunity to acquire more conservation lands. Conservation of privately-owned pine rocklands in Miami-Dade County is largely a matter of County government cooperation with private landowners, and the County offers incentives for landowners to maintain their natural forest communities.

The trend of habitat development in Monroe County, while a major historical factor, is now temporarily reduced. Change in percent population for Monroe County from April 1, 2000 to July 1, 2009 was -8.1 percent (<http://quickfacts.census.gov>). Monroe County has limits on development and considerable areas of natural vegetation have been set aside. Still, all vacant land in the Keys is projected to be developed by 2060, including lands not necessarily accessible by automobile (Zwick and Carr 2006, p. 14). Similarly, in Miami-Dade County, significant conversion of lands in the southern portion of the County is projected between now and 2060 (Zwick and Carr 2006, p. 14). Overall, the population in Miami-Dade County is expected to increase from more than 2.4 million people to more than 4.0 million (Zwick and Carr 2006, p. 20).

It is assumed that this plant must be conserved almost entirely on existing public and private conservation lands. Given the small number of plants at most sites and the species restricted range, it is not clear that existing populations are large enough to persist. Persistence of Blodgetts silverbush on conservation lands throughout its range will likely be largely dependent upon the implementation and success of management measures, including prescribed fire and exotic plant control.

Climatic changes, including sea level rise, are major threats to south Florida, including this species and its habitat. The Intergovernmental Panel on Climate Change (IPCC) reported that the warming of the world's climate system is unequivocal based on documented increases in global average air and ocean temperatures, unprecedented melting of snow and ice, and rising average sea level (IPCC 2007, p. 2; 2008, p. 15). Sea-level rise is the largest climate-driven challenge to low-lying coastal areas and refuges in the sub-tropical ecoregion of southern Florida (U.S. Climate Change Science Program [CCSP] 2008, pp. 5-31, 5-32). The long-term record at Key West shows that sea level rose on average 0.088 inches (0.224 cm) annually between 1913 and 2006 (National Oceanographic and Atmospheric Administration [NOAA] 2008, p. 1). This equates to approximately 8.76 inches (22.3 cm) over the last 100 years (NOAA 2008, p. 1).

IPCC (2008, p. 28) emphasized it is very likely that the average rate of sea-level rise during the 21st century will exceed that from 1961 to 2003 (i.e., 0.071 inches [0.18 cm] per year), although it was projected to have substantial geographical variability. Partial loss of the Greenland and/or Antarctic ice sheets could result in many feet (several meters) of sea-level rise, major changes in coastlines, and inundation of low-lying areas (IPCC 2008, pp. 28-29). Low lying islands and river deltas will incur the largest impacts (IPCC 2008, pp. 28-29). Because dynamic ice flow processes in ice sheets are poorly understood, timeframes are not known; however, modeling indicates that more rapid sea-level rise on century timescales cannot be excluded (IPCC 2008, p. 29). According to CCSP (2008, p. 5-31), much of low-lying, coastal south Florida will be underwater or inundated with salt water in the coming century.

IPCC (2008, pp. 3, 103) concluded that climate change is likely to increase the occurrence of saltwater intrusion into coastal aquifers as sea level rises and that sea-level rise is projected to extend areas of salinisation of groundwater and estuaries, resulting in a decrease of freshwater availability for humans and ecosystems in coastal areas. Beginning sometime between the 1930s and the 1950s, increased salinity of coastal waters contributed to the decline of cabbage palm forests in southwest Florida (Williams *et al.* 1999, pp. 2056-2059), expansion of mangroves into adjacent marshes in the Everglades (Ross *et al.* 2000, pp. 9, 12-13), and loss of pine rockland in the Keys (Ross *et al.* 1994, pp. 144, 151-155). Hydrology has a strong influence on plant distribution in these and other coastal areas (IPCC 2008, p. 57). Such communities typically grade from salt to brackish to freshwater species. In the Keys, not only are elevation differences

between such communities very slight (Ross *et al.* 1994, p. 146), but the horizontal distances are small as well. Human developments will also likely be significant factors influencing whether natural communities can move and persist (IPCC 2008, p. 57; CCSP 2008, p. 7-6). Hodges and Bradley (2006, p. 6) stated that sea level rise will continue to impact natural areas of the Keys and the trend of upland habitat reduction will undoubtedly impact Blodgetts silverbush (and other taxa) in the Keys.

The Nature Conservancy (TNC) (2010, p. 1) used high-resolution digital elevation models derived from highly accurate Light Detection and Ranging (LIDAR) remote sensing technology to predict future shorelines and distribution of habitat types for Big Pine Key based on sea level rise predictions ranging from the best-case to worst-case scenarios described in current scientific literature. In the Florida Keys, TNC models predicted that sea level rise will first result in the conversion of habitat, and eventually the complete inundation of habitat. In the best-case scenario, a rise of 7 inches (18 cm) would result in the inundation of 1,840 acres (745 ha) (34 percent) of Big Pine Key and the loss of 11 percent of the islands upland habitat (TNC 2010, p. 1). In the worst-case scenario, a rise of 4.6 feet (140 cm) would result in the inundation of about 5,950 acres (2,409 ha) (96 percent) and the loss of all upland habitat (TNC 2010, p. 1).

Similarly, using a spatially explicit model for the Keys, Ross *et al.* (2009, p. 473) found that mangrove habitats will expand steadily at the expense of upland and transitional habitats as sea level rises. Most of the upland and transitional habitat in the central portion of Sugarloaf Key is projected to be lost with a 0.7-foot (0.2 m-) rise in sea level; a 1.6-foot (0.5-m) rise in sea level can result in a 95 percent loss of upland habitat by 2100 (Ross *et al.* 2009, 473). Furthermore, Ross *et al.* (2009, pp. 471-478) suggest that interactions between sea-level rise and pulse disturbances (e.g., storm surges or fire [see Factor E]) can cause vegetation to change sooner than projected based on sea level alone.

The Science and Technology Committee of the Miami-Dade County Climate Change Task Force (MDCCCTF) (2008, p. 1) recognizes that significant sea level rise is a very real threat to the near future for Miami-Dade County. In a January 2008 statement, the MDCCCTF (2008, p. 2-3) warned that sea-level is expected to rise at least 3-5 feet (0.9 1.5 m) within this century. With a 3-4 foot (0.9 1.2 m) rise sea level (above baseline) in Miami-Dade County: Spring high tides would be at about + 6 to 7 feet; freshwater resources would be gone; the Everglades would be inundated on the west side of Miami-Dade County; the barrier islands would be largely inundated; storm surges would be devastating; landfill sites would be exposed to erosion contaminating marine and coastal environments. Freshwater and coastal mangrove wetlands will not keep up with or offset sea level rises of two feet per century or greater. With a five foot rise (spring tides at nearly +8 feet), Miami-Dade County will be extremely diminished, (MDCCCTF 2008, pp. 2-3).

In summary, all known occurrences are at some risk to habitat loss and modification. Extant occurrences on private land are threatened by development. Most occurrences are in low-lying areas and will be affected by rising sea level. Overall threat level of habitat loss from development is moderate, since many sites are protected. Overall threat level of habitat loss from sea-level rise is currently low, but expected to become severe in the future.

B. Overutilization for commercial, recreational, scientific, or educational purposes:

None known.

C. Disease or predation:

None known. While grazing by Key deer (*Odocoileus virginianus clavium*) can impact herbaceous species during times of food stress, Key deer do not appear to feed on this taxon, probably due to toxicity (Hodges and Bradley 2006, p. 11). Therefore, disease and predation do not appear to be current threats.

D. The inadequacy of existing regulatory mechanisms:

The Florida Department of Agriculture and Consumer Services designated Blodgetts silverbush as endangered under Chapter 5B-40, Florida Administrative Code. This listing provides little or no habitat protection beyond the States Development of Regional Impact process, which serves to disclose impacts from projects, but provides no regulatory protection for State-listed plants on private lands. Without local or county ordinances preventing the destruction of the plant, conservation does not occur. Since many sites are protected, overall threat level is moderate.

E. Other natural or manmade factors affecting its continued existence:

Exotic plant taxa have significantly affected pine rocklands. As a result of human activities, at least 277 taxa of exotic plants are now known to have invaded pine rocklands throughout south Florida (Service 1999, p. 3-175). A few of these exotic plants include the *Schinus terebinthifolius* (Brazilian pepper), *Neyraudia reynaudiana* (Burma reed) and *Melaleuca quinquenervia* (melaleuca). *Lygodium microphyllum* (Old World climbing fern) is rapidly spreading and may become a serious problem (Volin *et al.* 2004, p. 445). Nearly all of the extant occurrences are threatened by exotic plant species (Table 2) (Bradley and Gann 1999, p. 6; Hodges and Bradley 2006, p. 43; K. Bradley, pers. comm. 2007).

In a recent study to better understand the location and extent of invasive exotic plants and rare native plants along roadways in Miami-Dade and Monroe Counties, 88 of 121 (73 percent) total target exotic plant species were found in at least one road segment (Gordon *et al.* 2007, p. 10). Of the 16,412 road segments surveyed, 6,264 (38 percent) contained at least one exotic plant species; some segments contained more than one species of invasive exotic plant (and as many as 15) (Gordon *et al.* 2007, pp. 10-11). In Miami-Dade County, the most frequent naturalized invasive exotic plants recorded were Brazilian-pepper, *Tribulus cistoides* (punctureweed), and *Pennisetum purpureum* (napier grass) (Gordon *et al.* 2007, p. 11). In Monroe County, the most frequent invasive exotic plants recorded were Brazilian-pepper, *Leucaena leucocephala* (white leadtree) and punctureweed (Gordon *et al.* 2007, p. 11).

While this plant is not entirely limited to fire-maintained pine rocklands, fire suppression threatens the survival of Blodgetts silverbush. Pine rocklands need regular fires to prevent hardwood encroachment and excessive accumulations of litter. Under natural conditions, lightning fires typically occurred at 3- to 7-year intervals. With fire suppression, hardwoods eventually invade pine rocklands and shade out understory species like Blodgetts silverbush. Fire suppression has reduced the size of the areas that burn and habitat fragmentation has prevented fire from moving across the landscape in a natural way. Thus, many pine rocklands are gradually becoming tropical hardwood hammocks. Fire suppression threatens the Blodgetts silverbush at more than half of its remaining sites (Table 2) (Bradley and Gann 1999, p. 6; K. Bradley, pers. comm. 2007). The staff at NKDR is beginning to monitor the response of rare plants, including Blodgetts silverbush, to prescribed fire after years of fire suppression on the Refuge (Anderson 2010, slide 20). They have noted an increase in Blodgetts silverbush post-fire. Approximately 20 plants were recorded in the monitored area prior to the burn, and 342 plants were detected 4 months post-fire (Anderson 2010, slide 20).

Exotic species have also altered the type of fire that occurs in pine rocklands. Historically, pine rocklands had an open, low understory where natural fires remained patchy with low temperature intensity, thus sparing many native plants such as Blodgetts silverbush. The current density of exotic plant overgrowth throughout the range of Blodgetts silverbush may no longer allow the species to be conserved through fire. Dense growth can create intense fire temperatures and longer burning periods. Pine rockland plants cannot tolerate these extreme conditions. Given the current conditions, exotic plant control may require an alternate method, such as hand chopping followed by spot herbicide treatment, which requires extensive labor and is very costly. This method may not be feasible for publicly owned lands, because of the acreage and staffing and budget constraints.

Several occurrences exist near roads and road maintenance is a particular concern to each of these occurrences (Table 2) (Bradley and Gann 1999, p. 6; Hodges and Bradley 2006, pp. 11-15; K. Bradley, pers.

comm. 2007). Clearing of vegetation along roads and the use of herbicides could impact populations; coordination needs to exist with road maintenance crews to prevent impacts (Hodges and Bradley 2006, pp. 11-15). Road enhancements (e.g., paving) or other infrastructure projects (e.g., underground cable, sewer and water lines) may also threaten some roadside populations (Hodges and Bradley 2006, pp. 11, 15). Illegal dumping is identified as a problem at two sites (Hodges and Bradley 2006, pp. 11, 13). Since Blodgetts silverbush (and 10 other rare species) are included in an Important Rare Plant Area (IRPA) on Big Pine Key, management along this FDOT right-of-way could improve (Gordon et al. 2007, pp. 2, 68).

Given the species narrow range and the small number of individuals at many sites, Blodgetts silverbush is vulnerable to natural disturbances, such as hurricanes. Storm surges associated with hurricanes result in inundation of habitat with saltwater for varying durations. In 2005, the Keys were impacted by three hurricanes (Katrina, Rita, and Wilma), and vegetation in many areas was top-killed due to salt water inundation (Hodges and Bradley 2006, p. 9). Storm surges may pose a threat to the population at Cactus Hammock on National Key Deer Refuge; however, hurricanes may also ultimately help this species by creating canopy gaps where this species thrives (Hodges and Bradley 2006, p. 12). According to the National Oceanographic and Atmospheric Administration, Miami-Dade County, the Keys, and western Cuba are the most storm-prone areas in the Caribbean so this threat is expected to continue.

The species occurs in a restricted range, and many occurrences are small and isolated. As a result, threats associated with small population size ensue. These include potential vulnerabilities from environmental (catastrophic hurricanes), demographic (potential episodes of poor reproduction), and genetic (potential inbreeding depression) threats.

In summary, Blodgetts silverbush is vulnerable to a wide array of natural and human factors, including: fire suppression, exotic plants, road maintenance and other infrastructure projects, illegal dumping, hurricanes and extreme weather events, storm surges, small and isolated occurrences, and restricted range. Overall threat level from fire suppression and invasive exotic species is moderate because some of the sites are not affected by these threats. Overall threat level from road maintenance and improvements, infrastructure, herbicide use, and illegal dumping is moderate because these threats do not occur at every site. Overall threat level from small population size, isolated locations, and restricted range is unknown.

Conservation Measures Planned or Implemented :

In 1979, Miami-Dade County enacted the Environmentally Endangered Lands Covenant Program, which reduces taxes for private landowners of pine rocklands and tropical hardwood hammocks who agree to not develop their property and manage it for a period of ten years (Service 1999, p. 3-177). Miami-Dade County also purchases natural forest communities, including tropical hammocks and pine rocklands. No similar system exists in Monroe County, where a significant amount of pine rockland is still in private ownership (Service 1999, p. 3-177).

The Miami-Dade Forest Resources Program has regulatory authority over pine rocklands and tropical hardwood hammocks and is charged with enforcing regulations that provide partial protection on the Miami Rock Ridge (Service 1999, p. 3-177). This includes authority over all natural forest communities in the county, including county- and city-owned parcels (Service 1999, p. 3-177). In the Keys, most regulatory authority is found in the local comprehensive plan, which is enforced by the Department of Community Affairs (Service 1999, p. 3-177).

In cooperation with the Service and IRC, Miami-Dade County funded a project to map the existing natural forest communities and inventory rare and sensitive plant species on these lands. In 2005, the Service funded a project with IRC to determine the distribution and population size of five candidate plants in the Keys, including Blodgetts silverbush; this project has been completed (Hodges and Bradley 2006, pp. 1-78). As a result, Blodgetts silverbush has been documented throughout the Keys (extant on nine islands, with three others of uncertain status), its range in the Keys has been verified (Miami-Dade County to Boca Chica Key),

and a population estimate in the Keys has been provided.

In 2007, the Service funded IRC to implement conservation activities associated with three candidate plant species: Blodgetts silverbush, *Brickellia mosieri* (Florida brickell-bush), and *Linum carteri* var. *carteri* (Carters small-flowered flax) on pine rockland fragments in Miami-Dade County in private ownership. The objective of this project is to restore suitable habitat and reintroduce and establish new populations of the plants in pine rocklands. This project was expanded in 2008 to include conservation actions on public lands. Working with a variety of partners, the IRC is making progress with prescribed fire, plant cultivation, and reintroduction to select sites (Bradley and van der Heiden 2013, pp. 2-6). In February 2009, IRC began cultivation of 92 cuttings using germplasm obtained from Larry and Penny Thompson Park (Bradley and van der Heiden 2013, pp. 3, 5). As of May 2009, a total of 86 plants had been planted, 36 at IRCs John Kunkel Small Pineland and 50 on a private landowners (Massin) property (Bradley and van der Heiden 2013, p. 3). However, success at both sites has been limited, most likely due to drought conditions (Bradley and van der Heiden 2013, p. 3). As of May 2009, only 5 of 36 plants at John Kunkel Small Pineland and 2 of 50 at the Massin property remained (Bradley et al. 2009, p. 3). In 2012 only 2 plants remained at John Kunkel Small Pineland, and the status of the plants at the Massin property is unknown because access to the property is no longer available after it underwent foreclosure in 2011 (Bradley and van der Heiden 2013, p. 3). In 2009, IRC successfully conducted its first prescribed fires, burning two IRC-owned sites (K. Bradley, pers. comm. 2009; Bradley 2010, p. 3). In addition to being major successes ecologically, the burns helped build experience and relationships with partner agencies (Bradley 2010, p. 3).

In October 2010, the Service funded IRC to conduct 6 to 12 additional prescribed burns on private and public lands to assist in the conservation and recovery of federally endangered plants and Federal candidate animals and plants, including Blodgetts silverbush (Bradley 2010, pp. 1-10). Planning is underway; prescribed fires have not yet been conducted.

The Services Coastal and Partners for Fish and Wildlife programs are also pursuing similar habitat restoration projects, which could help improve the status of the species. In 2009, \$400,000 of stimulus funding was allocated to the IRC for habitat restoration in Miami-Dade County through the Coastal program as part of the Pine Rockland Initiative (D. DeVore, Service, pers. comm. 2010). In addition, the Coastal program provided \$100,000 to IRC for a two-year project that will help restore pine rocklands in the Keys (D. DeVore, pers. comm. 2010). The Partners for Fish and Wildlife program is also supporting similar habitat restoration projects in Miami-Dade County and the Keys.

The FDOT collaborated on and funded a study of the approximately 650 miles (1,046 kilometers) of FDOT roadway in Miami-Dade and Monroe counties (District 6) (Gordon *et al.* 2007, pp. 1, 3). The study was conducted by The University of Florida, in collaboration with IRC and the FNAI to survey and map exotic and rare native plants along FDOT right-of-ways within Miami-Dade and Monroe counties and to create a database that can be updated to reflect future activities and conditions (Gordon *et al.* 2007, pp. 1, 3). As part of this study 13 IRPAs were identified, which could help guide the management of rare plants in the FDOT right-of-ways; Blodgetts silverbush was found on one IRPA on Big Pine Key (Gordon et al. 2007, pp. 2, 68). Gordon et al. 2007 (pp. 75-78) also included best management practices and aides to species identification for IRPAs.

Summary of Threats :

There are approximately 22 extant occurrences of Blodgetts silverbush, 12 in Monroe County and 10 in Miami-Dade County; 4 sites may be recently extirpated (Table 2) (Bradley and Gann 1999, p. 6; Hodges and Bradley 2006, p. 43; K. Bradley, pers. comm. 2007). Blodgetts silverbush is threatened by habitat loss, which is exacerbated by habitat degradation due to fire suppression, the difficulty of applying prescribed fire to pine rocklands, and threats from exotic plants. Remaining habitats are fragmented. Climatic changes, including sea level rise, are current and long-term threats; these factors are expected to continue to impact pine rocklands and ultimately, substantially reduce the extent of available habitat, especially in the Keys. Threats

such as road maintenance, road enhancement, infrastructure, and illegal dumping threaten some occurrences. The species is vulnerable to natural disturbances, such as hurricanes, tropical storms, and storm surges. Blodgetts silverbush occurs in a restricted range, and many occurrences are small and isolated. We find that this species is warranted for listing throughout all its range, and, therefore, find that it is unnecessary to analyze whether it is threatened or endangered in a significant portion of its range.

For species that are being removed from candidate status:

_____ Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing Decisions(PECE)?

Recommended Conservation Measures :

Prevent further destruction or degradation of existing pine rocklands and hammocks (Service 1999, p. 3-191). Acquire available fragments, promote conservation easements and landowner agreements, work with private landowners, and enforce regulatory protection of pine rocklands (Service 1999, p. 3-191).

Prevent degradation of existing preserves containing pine rocklands and hammock edges that support this species (Service 1999, p. 3-192). Work with Federal, State, county, and municipal agencies and non-governmental organizations to prevent further degradation of existing preserves from exotic plant species, fire exclusion, anthropogenic fires, unauthorized site uses, illegal dumping, improper siting of facilities (including interpretive trails), collecting of plants, hydrologic modifications including drainage, flooding and salt-water intrusion, and herbicides (Service 1999, p. 3-192).

Restore existing degraded pine rocklands through active management (e.g., where possible restore natural connections, natural fire regimes, and areas impacted by anthropogenic fires, unauthorized site uses, illegal dumping) (Service 1999, p. 3-192).

Monitor populations on a regular basis to track trends within the population and changes in management needs (Hodges and Bradley 2006, p. 19).

Design and implement a coordinated system of informing maintenance crews about populations of Blodgetts silverbush occurring along roads and rights-of-way (Hodges and Bradley 2006, p. 19). Raise awareness among maintenance workers and contractors.

Evaluate the use of herbicide application along roadside populations.

Conduct studies involving reproductive biology or life history (Hodges and Bradley 2005, p. 19). Ephemeral populations of this species present challenges; little is known about long-term continuity of population sizes (Hodges and Bradley 2005, p. 19). Reproductive biology studies would provide information on effects of unnatural disturbance and mosquito spraying on pollinators (Hodges and Bradley 2006, p. 19).

Use prescribed fire and incorporate monitoring into plans to determine the effectiveness of the prescription; monitor the health of the community and species that occur with Blodgetts silverbush (Bradley and Gann 1999, p. 4).

Consider a plan of action to establish a Florida Keys pine rockland core conservation area and ex-situ conservation of this species (Ross et al. 2009, p. 477)

Priority Table

Magnitude	Immediacy	Taxonomy	Priority
High	Imminent	Monotypic genus	1
		Species	2
		Subspecies/Population	3
	Non-imminent	Monotypic genus	4
		Species	5
		Subspecies/Population	6
Moderate to Low	Imminent	Monotype genus	7
		Species	8
		Subspecies/Population	9
	Non-imminent	Monotypic genus	10
		Species	11
		Subspecies/Population	12

Rationale for Change in Listing Priority Number:

Magnitude:

There are approximately 22 extant occurrences of Blodgetts silverbush, 12 in Monroe County and 10 in Miami-Dade County; however, 4 sites may be recently extirpated (Table 2). This species is threatened by habitat loss and degradation, in part due to fire suppression and the difficulty of using prescribed fire. Climatic changes, including sea level rise, are long-term, present, and future threats that will ultimately substantially reduce the extent of habitat. Exotic species are a threat at nearly all extant sites (Table 2); however, to a certain extent, land managers are aware of this problem and often have some resources available to combat this problem. Threats such as road maintenance and enhancement, infrastructure, and illegal dumping threaten some populations. Blodgetts silverbush is vulnerable to natural disturbances, such as hurricanes, tropical storms, and storm surges; however, some storms may also ultimately help this species by creating canopy gaps (Hodges and Bradley 2006, p. 12). At this time, we consider the magnitude of threats to be moderate.

Imminence :

Since many occurrences of this species are on public conservation lands, we consider the overall threat of habitat loss due to development to be non-imminent. Sea level rise is currently occurring and has resulted in the loss of pine rocklands. However, this is considered a long-term threat since we do not have evidence that it is currently affecting any population. Exotic plant species and lack of fire currently threaten the majority of occurrences. However, land managers, private landowners, and volunteers are making efforts to control exotics and implement fire, where possible. Road maintenance and associated problems are currently occurring at some sites. Overall, we consider the threats to be non-imminent at this time.

Yes Have you promptly reviewed all of the information received regarding the species for the purpose of determination whether emergency listing is needed?

Emergency Listing Review

No Is Emergency Listing Warranted?

No. At this time, the species occurs on multiple conservation lands. With proper management, some threats to this species can be removed or reduced.

Description of Monitoring:

The Service funded an inventory in the Keys in 2005 (Hodges and Bradley 2006, pp. 1-78), but monitoring for this species is not being actively or regularly conducted.

The Service completed a project with IRC and Miami-Dade County to map public and many private natural forest communities for the Countys geographic information system. This project provided a list of plant species for each site (information incorporated in Table 2 and text). The project will enable the County to manage information on pinelands and detect changes in their extent. Information from this project suggests that some of the larger public pinelands (e.g., Larry and Penny Thompson Park) are in good condition. Other pinelands may be difficult to burn because of excessive growth of vegetation.

Fairchild Tropical Botanic Garden (FTBG) and Miami-Dade County are working on a fire monitoring protocol for Miami-Dade County Preserves (J. Maguire, Miami-Dade County, pers. comm. 2008). The draft protocol suggests three levels of monitoring, focusing on rare species, vegetation structure, and diversity (Possley and Maschinski 2007, p. 4). Blodgetts silverbush is one of several indicator species to be used in the monitoring transects. Currently, FTBG has GPS locations for two separate populations at Larry and Penny Thompson Park; however, additional population size estimates are not available (J. Maschinski, FTBG, pers. comm. 2007).

Jimi Sadle (pers. comm. 2010), botanist at ENP, indicates that the current population estimate at ENP is 1,000 plants. This population is periodically monitored while conducting other research activities. When previous unrecorded occurrences are found within ENP, location information and population estimates are recorded (J. Sadle, pers. comm. 2010).

Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment:

none

Indicate which State(s) did not provide any information or comment:

Florida

State Coordination:

The Service requested new information (observations, data, reports) regarding the status of this plant or any new information regarding threats to this species and its habitat from: Florida Department of Agriculture and Consumer Services, National Park Service, Service (National Wildlife Refuges), Florida Department of Environmental Protection, Miami-Dade County, Florida Fish and Wildlife Commission, FNAI, IRC, Historic Bok Sanctuary, The Nature Conservancy, FTBG, Archbold Biological Station, NatureServe, Miami University, University of Central Florida, Florida International University, University of Florida, Princeton, members of the Rare Plant Task Force, botanists, and others. In total, the previous assessment was sent to approximately 200 individuals. Few comments were received.

The State of Florida does not specifically list plants in its State Wildlife Action Plan.

No new data or comments were received from the State for this assessment. Information and data previously provided have been incorporated into this assessment.

Literature Cited:

- Anderson, C. 2010. Prescribed fire returns to NKDR, presented at the 2010 Pine Rockland Conference. Miami, Florida. February 10-13, 2010.
- Bradley, K.A. 2007. Email to Paula Halupa. The Institute for Regional Conservation. Miami, Florida. March 6, 2007.
- Bradley, K.A. 2009. Email to Paula Halupa. The Institute for Regional Conservation. Miami, Florida. July 15, 2009.
- Bradley, K. 2010. The pine rockland initiative prescribed burn program: a multi-species recovery effort. Proposal submitted to the South Florida Ecological Services Endangered Species Recovery Program. The Institute for Regional Conservation. Miami, Florida. May 28, 2010.
- Bradley, K.A., J. Freedman, and K. Samelson. 2009. Candidate Plant Conservation on Pine Rockland Fragments in Miami-Dade County. The Institute for Regional Conservation. Report submitted to the U.S. Fish and Wildlife Service, Vero Beach, Florida.
- Bradley, K.A., and G.D. Gann. 1999. Status summaries of 12 rockland plant taxa in southern Florida. The Institute for Regional Conservation. Report submitted to the U.S. Fish and Wildlife Service, Vero Beach, Florida.
- Bradley, K.A., and C. van der Heiden. 2013. Candidate plant conservation on pine rockland fragments in Miami-Dade County. The Institute for Regional Conservation. Report submitted to the U.S. Fish and Wildlife Service, Vero Beach, Florida.
- DeVore, D. 2010. Telephone conversation with Paula Halupa. U.S. Fish and Wildlife Service, South Florida Ecological Services Office. Vero Beach, Florida. March 24, 2010.
- Florida Natural Areas Inventory. 2008. FNAI Element Tracking Summary. Tallahassee, Florida. October 29, 2008.
- Florida Natural Areas Inventory. 2011. FNAI Element Tracking Summary. Tallahassee, Florida. April 7, 2011. http://www.fnai.org/PDF/Element_tracking_summary_201103.pdf [Accessed: April 16, 2011]
- Gordon, D.R., G.D. Gann, S.E. Green, K.A. Bradley, A.M. Jenkins, and S. Travis. 2007. Mapping of invasive exotic plants and rare native plants on Florida Department of Transportation District 6 right-of-way in Miami-Dade and Monroe Counties, Florida. Final report to the Florida Department of Transportation District 6 under cooperative agreement 404278-1-32-07. University of Florida, Gainesville, Florida.
- Herndon, A. 1998. Life history studies of plants endemic to South Florida. Final report to the National Park Service under cooperative agreement number CA5280-5-9019. October 1, 1995 to April 30, 1998.
- Hodges, S.R., and K.A. Bradley. 2005. Distribution and population size of five pine rockland endemic plants of the Florida Keys. The Institute for Regional Conservation. Status Report submitted to U.S. Fish and Wildlife Service, Vero Beach, Florida.
- Hodges, S.R., and K.A. Bradley. 2006. Distribution and population size of five candidate plant taxa in the Florida Keys: *Argythamnia blodgettii*, *Chamaecrista lineata* var. *keyensis*, *Indigofera mucronata* var. *keyensis*, *Linum arenicola*, and *Sideroxylon reclinatum* subsp. *austrofloridense*. The Institute for Regional Conservation. Final Report Contract Number 401815G011, submitted to U.S. Fish and Wildlife Service, Vero Beach, Florida.

Intergovernmental Panel on Climate Change. 2007. Summary for policymakers, In: Climate Change 2007: the Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor, and H.L. Miller, Editors]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Intergovernmental Panel on Climate Change. 2008. Climate Change and Water [B.C. Bates, Z.W. Kundzewicz, S. Wu, and J.P. Palutikof, Editors]. Technical Paper of the Intergovernmental Panel on Climate Change. Intergovernmental Panel on Climate Change Secretariat, Geneva, Switzerland.

Integrated Taxonomic Information System. 2011. ITIS standard report page: *Argythamnia blodgettii* <http://www.itis.gov/servlet/SingleRpt/SingleRpt> (Accessed March 23, 2011).

Maguire, J. 2008. Email to Paula Halupa. Miami-Dade Parks and Recreation Department. Miami, Florida. January 31, 2008.

Maschinski, J. 2007. Email to Paula Halupa. Fairchild Tropical Botanic Garden. Coral Gables, Florida. March 12, 2007.

Miami-Dade County Climate Change Task Force, Science and Technology Committee. 2008. Statement on sea level in the coming century. January 17, 2008. Miami-Dade County, Florida.

National Oceanographic and Atmospheric Administration. 2008. Sea Levels Online (Mean sea level trend 8724580 Key West, Florida). National Ocean Service, Center for Operational Oceanographic Products and Services. Online [<http://tidesandcurrents.noaa.gov>]. [Accessed October 17, 2008].

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. <http://www.natureserve.org/explorer>. (Accessed: March 23, 2011).

O'Brien, J.J. 1998. The distribution and habitat preferences of rare *Galactia* species (Fabaceae) and *Chamaesyce deltoidea* subspecies (Euphorbiaceae) native to southern Florida pine rockland. *Natural Areas Journal* 18:208222.

Possley, J., and J. Maschinski. 2007. Draft proposal. Fire monitoring protocol for Miami-Dade County Preserves. Fairchild Tropical Botanic Garden. Center for Tropical Plant Conservation. Coral Gables, Florida.

Ross, M.S., J.F. Meeder, J.P. Sah, P.L. Ruiz and G.J. Telesnicki. 2000. The southeast saline Everglades revisited: 50 years of coastal vegetation change. *Journal of Vegetation Science* 11:101112.

Ross, M.S., J.J. O'Brien, and L. da Silveira Lobo Sternberg. 1994. Sea-level rise and the reduction in pine forests in the Florida Keys. *Ecological Applications* 4:144-156.

Ross, M.S., J.J. O'Brien, R.G. Ford, K. Zhang, and A. Morkill. 2009. Disturbance and the rising tide: the challenge of biodiversity management on low-island ecosystems. *Frontiers in Ecology and the Environment* 7(9): 471478.

Sadle, J. 2007. Email to Paula Halupa. Everglades National Park. Homestead, Florida. November 29, 2007.

Sadle, J. 2008a. Email to Paula Halupa. Everglades National Park. Homestead, Florida. December 15, 2008.

Sadle, J. 2008b. Email to Paula Halupa. Everglades National Park. Homestead, Florida. February 2, 2008.

Sadle, J. 2010. Email to Paula Halupa. Everglades National Park. Homestead, Florida. January 28, 2010.

Sadle, J. 2011. Email to Paula Halupa. Everglades National Park. Homestead, Florida. January 31, 2011.

The Nature Conservancy. 2010. Initial estimates of the ecological and economic consequences of sea level rise on the Florida Keys through the Year 2100. The Nature Conservancy, Florida Chapter, Altamonte Springs.

U.S. Climate Change Science Program. 2008. Preliminary review of adaptation options for climate-sensitive ecosystems and resources. A Report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research. [Julius, S.H., J.M. West (eds.), J.S. Baron, L.A. Joyce, P. Kareiva, B.D. Keller, M.A. Palmer, C.H. Peterson, and J.M. Scott (Authors)]. U.S. Environmental Protection Agency, Washington, DC.

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

Volin, J.C., M.S. Lott, J.D. Muss, and D. Owen. 2004. Predicting rapid invasion of the Florida Everglades by Old World Climbing Fern (*Lygodium microphyllum*). *Diversity and Distributions* 10:439-446.

Williams, K.L., K.C. Ewel, R.P. Stumpf, F.E. Putz and T.W. Workman. 1999. Sea-level rise and coastal forest retreat on the west coast of Florida. *Ecology* 80:2045-2063.

Wunderlin, R. P., and B. F. Hansen. 2008. Atlas of Florida Vascular Plants (<http://www.plantatlas.usf.edu/>). [S. M. Landry and K. N. Campbell (application development), Florida Center for Community Design and Research.] Institute for Systematic Botany, University of South Florida, Tampa. [Accessed: April 16, 2011]

Zwick, P.D., and M.H. Carr. 2006. Florida 2060. A population distribution scenario for the State of Florida. A research project prepared for 1000 Friends of Florida. Prepared by the Geoplan Center at the University of Florida, Gainesville, Florida.

Approval/Concurrence:

Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve:



07/15/2013

Date

Concur:



10/28/2013

Date

Did not concur:

_____ Date

Director's Remarks: