Blodgett's Silverbush
(*Argythamnia blodgettii*)

5-Year Review:
Summary and Evaluation

Photo by James Lange, formerly with
Fairchild Tropical Botanic Garden

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

5-YEAR REVIEW
Blodgett's silverbush (*Argythamnia blodgettii)*

I. GENERAL INFORMATION

A. Methodology used to complete the review:

In conducting this 5-year review, we relied on the best available information pertaining to historical and contemporary distributions, life history, habitats, and threats of this species. We announced initiation of this review and requested information in a published Federal Register notice with a 60-day comment period in 2021 (86 FR 37178). We received one public comment during the open comment period that expressed concern for the subspecies and the general threats of climate change and pollution, but no specific information was supplied with the comment. The comment was incorporated into the 5-year review, as appropriate. We used a variety of information resources, including monitoring reports, surveys, and other scientific and management information, augmented by conversations and comments from biologists familiar with the subspecies. Specific sources included: the final rule (81 FR 66842; U.S. Fish and Wildlife Service [Service] 2016) listing this plant under the Endangered Species Act of 1973, as amended (Act), peer reviewed scientific publications, and unpublished field observations by state, county, and other experienced biologists. The Service contracted this review to Fairchild Tropical Botanic Gardens (Fairchild) botanists. The Florida Ecological Services Field Office (FESFO) reviewed all sections of the document for accuracy and determined the recommendation for the review. Literature and documents used for this 5-year review are on file at the FESFO. All recommendations resulting from this review are a result of thoroughly reviewing the best available information on Blodgett's silverbush.

B. Reviewers

Lead Regional Office: Southeast Region, Carrie Straight, 404-679-7226

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C. Background

1. Federal Register Notice citation announcing initiation of this review

July 14, 2021, 86 FR 37178

2. Listing history

Original Listing
Federal Register Notice: 81 FR 66842
Federal Register Notice date: September 29, 2016
Effective listing date: October 31, 2016
Entity listed: Species
Classification: Threatened

3. **Associated rulemakings**
   Critical habitat proposed rule: October 14, 2022 (87 FR 62502).

4. **Review History**
   This is the first status review for Blodgett's silverbush.

5. **Species' Recovery Priority Number at start of review: 8**
   Degree of Threat: Moderate
   Recovery Potential: High
   Taxonomy: Species

6. **Recovery Plan**
   There is currently no approved recovery plan or outline for Blodgett's silverbush.

II. REVIEW ANALYSIS

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

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 DPSs to only vertebrate species of fish and wildlife. Because the species under review is a plant, the DPS policy is not applicable.

B. Recovery Criteria

There is no final approved recovery plan for this species.

C. Updated Information and Current Species Status

Information on the species' biology and status is thoroughly reviewed in the proposed and final listing rules (80 FR 58535 and 81 FR 66842; Service 2015 and Service 2016, respectively). The summary below is based on these documents and available new information.

1. Biology and Habitat

a. Summary of new information of species biology and life history

Blodgett's silverbush is an erect perennial herb or slightly woody shrub that grows up to 2 feet (ft) (0.6 meters [m]) tall. The leaves are ovate to elliptic, slightly toothed and hairy, and with three veins branching from the base. Multiple green, unbranched stems often sprout from the woody base (Florida Natural Areas Inventory [FNAI] 2000; Harding 2019). However, in the Florida Keys, especially in the Cactus Hammock area (National Key Deer Refuge) and Windley Fossil Reef Geological Key State Park, another growth form has been commonly observed by Fairchild staff. Here, most individuals have a single wooden stem (up to 0.4 inches [1 centimeter] thick) emerging from the base of the plant, with branches sprouting from the main stem (Wintergerst 2022a). Blodgett's silverbush has inconspicuous yellow-green flowers. The fruit is a three-parted capsule

containing three round black seeds (FNAI 2000). Plants flower and produce seeds all year with a peak from March to June (Possley et al. 2019).

Germination trials at Fairchild using Blodgett's silverbush seeds collected from a Miami-Dade County Environmentally Endangered Lands (EEL) pine rockland preserve showed that treating seeds with smoke solution substantially increased the germination rate. Smoke solution was produced by burning pine needles and guiding the smoke through water, leaving behind the water-soluble chemicals. Approximately 10 percent of untreated seeds germinated compared to 80 percent germination of seeds soaked in smoke solution (Possley et al. 2020). These results suggest that this species is highly dependent on fire to recruit seedlings in larger quantities. However, although Blodgett's silverbush occurs in fire-dependent pine rockland habitat, it can also be found in less fire-dependent habitats like coastal berms in the Florida Keys. It is unknown whether smoke is also a germination cue for seeds from these habitats.

Additional germination experiments conducted at Fairchild showed that seeds of Blodgett's silverbush are orthodox, meaning they survive desiccation and freezer storage at -0.4 degrees Fahrenheit (°F) (-18 degrees Celsius [°C]) for at least six months without losing viability (Possley et al. 2022a). Thus, ex situ seed banking is an option for conserving the species.

b. Abundance, population trends, demography

Overall, Blodgett's silverbush population trends remain poorly understood and accurately predicting current trends and demography is difficult, especially since populations can be ephemeral (Hodges and Bradley 2006). Furthermore, Blodgett's silverbush is an inconspicuous plant that is commonly overlooked.

At the time of listing, Blodgett's silverbush had been documented in 50 populations (20 extant, 15 uncertain, and 15 extirpated) in Miami-Dade and Monroe Counties (Service 2016). However, several of these populations are near each other, within NatureServe's (2020) 0.62-mile (1.0-kilometer [km]) distance to differentiate populations but occur on separate parcels or lands with different ownership and were thus treated as separate populations in the listing rule. The Service now uses NatureServe's (2020) 0.62-mile (1.0-km) distance to delineate populations. Therefore, populations in the listing rule (Service 2016) that are within 0.62 miles (1.0 km) of each other are now combined into single populations with subpopulations (Appendix A). Also, the Big Pine Key/National Key Deer Refuge population reported in the listing rule (Service 2016) has been split into three separate populations based on their distances of over 0.62 miles (1.0 km) apart.

In the listing rule (Service 2016), we considered a population to have an uncertain status if it had not been surveyed in 15 or more years and extirpated if the plants were not seen during a survey or if the habitat had been destroyed. However, we have no quantitative information on how long Blodgett's silverbush seeds may

persist in the soil seed bank (Service 2015), and observations from Fairchild botanists indicate they may form persistent soil seed banks (Wintergerst 2023). Therefore, in this review, we are considering a population or subpopulation extirpated if the habitat is developed or there is a negative survey more than five years old with a small (>100) or unreported number plants in the previous survey. A population or subpopulation is considered to have uncertain status if it has a negative survey within five years with presence recorded previously and habitat remaining or has not been observed in more than 15 years with presence recorded previously and habitat remaining. A population or subpopulation is considered extant if it has been observed on site in the previous 15 years.

Using this new population delineation and updated status categorization, we recognize 55 populations (26 extant, 15 uncertain, and 14 extirpated) in Miami-Dade and Monroe Counties (Table 1; Appendix A). This difference in population delineation reflects a reduction in the number of populations due to combining several from the listing rule, but also an increase from splitting the Big Pine Key/National Key Deer Refuge population into three separate populations. In addition to these delineation changes, the number of populations has increased due to five newly discovered populations, five population introductions, and four populations that were not reported in the listing rule (Appendix A). Additionally, the status of some populations has changed since the listing rule with six populations declining and one improving in status (Table 2; Appendix A).

Table 1. Current number of populations and subpopulations (in parentheses) of Blodgett's silverbush in each status category (extant, uncertain, and extirpated). Additional detail can be found in Appendix A. Note that a population may have more than one subpopulation with different statuses and the overall population status reflects the condition of the subpopulation with the highest status.

County	Extant	Uncertain	Extirpated
Miami-Dade	11 (9)	8 (10)	10 (7)
Monroe	15 (3)	7 (1)	4 (1)
Total	26 (12)	15 (11)	14 (8)

Table 2. Number of populations and subpopulations (in parentheses) of Blodgett's silverbush that changed status categories between the time of listing (2016) and this review (2023). Additional detail can be found in Appendix A. Note that a population may have more than one subpopulation with different statuses and the overall population status reflects the condition of the subpopulation with the highest status.

County	Extant to Uncertain (decline)	Extant to Extirpated (decline)	Uncertain to Extirpated (decline)	Uncertain to Extant (improve)
Miami-Dade	2 (0)	0 (0)	1 (1)	1 (0)
Monroe	2 (1)	1 (0)	0 (0)	0 (0)
Total	4 (1)	1 (0)	1 (1)	1 (0)

Miami-Dade County

Blodgett's silverbush is currently known from 11 extant populations in Miami-Dade County (Table 1). This includes two populations (West Biscayne and Seminole Wayside Park) introduced since listing and two populations introduced prior to listing (George N. Avery Pineland and John Kunkel Small Pineland) but unknown to the Service at the time of listing. The listing rule (Service 2016) included the Ned Glenn Nature Preserve population as uncertain and the Ned Glenn Pineland Preserve population as extant. These two populations are actually the same population, with the correct name of Ned Glenn Nature Preserve, and is considered extant at the time of this review (Appendix A).

Since listing (Service 2016) the following changes in population status have occurred. Of previously extant populations:

- two (Camp Choee and Camp Matecumbe, previously called Boystown Pineland) are now considered uncertain due to lack of recent surveys but remaining habitat

In addition to the 11 verified extant populations in Miami-Dade County, there are 9 populations with uncertain status (Table 1; Appendix A). Three of these uncertain populations (Southwest 134th Avenue and Southwest 224th Street, P-111, and Southwest 62nd Avenue and Southwest 106th Street) were documented after the listing rule (Service 2016) by Miami-Dade County's Department of Environmental Resource Management (DERM) on private lands that are designated Natural Forest Communities (NFCs) and/or have Miami-Dade County EEL covenants (DERM 2021). The survey dates on these reports are not available in some cases and most Blodgett's silverbush observations have not been recently verified; therefore, these populations are classified as uncertain.

Since listing (Service 2016) the following changes in population status have occurred. Of previously uncertain populations:

- one (Pine Ridge Sanctuary) has been confirmed extant
- one (P-317) is considered extirpated

We have identified 10 populations that are extirpated from Miami-Dade County (Table 1; Appendix A). One of these, the Totten Key population in Biscayne National Park, was mistakenly listed as occurring in Monroe County in the listing rule (Service 2016).

The current population size of extant Blodgett's silverbush populations in Miami-Dade County is approximately 9,152 plants, which is close to the estimated population size at the time of listing (8,985 plants; Service 2016). Notably, 8 of the 11 extant populations consist of fewer than 100 plants and only 3 (Larry and Penny Thompson Memorial Park, Camp Owaissa Bauer Area, and Long Pine Key in Everglades National Park) have over 1,000 plants (Appendix A).

Monroe County

In Monroe County, Blodgett's silverbush is currently known from 15 populations on 9 islands (Table 1; Appendix A). Two of these populations (Roadside Tavernier and Roadside Upper Matecumbe) have been identified for the first time since the species' listing (Service 2016). Two extant populations (Big Pine Key Roadside and the introduced population at the Key West Botanical Tropical Forest and Botanical Garden) and one extirpated population (Watson Blvd and Key Deer Blvd, National Key Deer Refuge) were unknown to the Service at the time of listing. Additionally, the Big Pine Key/National Key Deer Refuge population reported as extant in the listing rule (Service 2016) is now split into three separate populations, two of which are extant (Watson Hammock Area and Cactus Hammock/Long Beach Area) and one of which is uncertain (Koehn's Subdivision). Most of the Monroe County populations classified as extant at the time of listing (Service 2016) have been recently surveyed in detail, except for the Big Pine Key populations and Big Munson Island which were confirmed to be present, but no population estimates were made (Hunt 2022; Wintergerst 2022b; Appendix A).

Since listing (Service 2016) the following changes in population status have occurred. Of previously extant populations:

- two (North Key Largo and Koehn's Subdivision, National Key Deer Refuge) are now considered uncertain due to habitat remaining and a negative survey within one year for North Key Largo and a lack of recent surveys for Koen's Subdivision
- one (Lignumvitae Key Botanical State Park, Klopp Tract) is now considered extirpated due to a negative survey over 5 years ago and a small population estimate in the previous survey

At the time of listing, four Monroe County populations were listed as uncertain (Service 2016). This number has now increased to seven uncertain populations (Table 1; Appendix A) due to above mentioned status changes and splitting the Big Pine Key/National Key Deer Refuge population. Additionally, four populations are considered extirpated (Table 1; Appendix A), which is an increase from two at the time of listing (Service 2016).

The current population size of extant Blodgett's silverbush populations in Monroe County is approximately 11,885 plants, which is approximately 1,300 fewer plants than the estimated population size reported at the time of listing (13,200 plants; Service 2015 based on the Hodges and Bradley 2006 report). The difference is mostly attributed to the decline in the species at the two Naval Air Station Key West populations, between which over 1,400 plants were estimated to occur at the time of listing (Bradley and Hodges 2006; FNAI 2011, 2022; Service 2016), but only 106 plants were documented in early 2022 (Texas A & M University [TAMU] 2022). However, since the population on Big Munson Island is by far the largest with 8,000 to 9,000 plants according to Hodges and Bradley (2006) and there is no recent population estimate, the total number of plants in

Monroe County could change considerably depending on the current size of the Big Munson Island population. Additionally, many of the populations in Monroe County may have experienced impacts from Hurricane Ian in October of 2022, which passed over the Keys with tropical storm force winds after the most recent surveys occurred for this review. Notably, as of April 2022, 12 of the 15 extant populations consist of fewer than 100 plants and only 3 (Lignumvitae Key Botanical State Park - Island, Cactus Hammock/Long Beach Area in National Key Deer Refuge, and Big Munson Island) have over 1,000 plants (Appendix A).

c. Genetics

There have been no studies to date on the population genetics of Blodgett's silverbush.

d. Taxonomic classification or changes in nomenclature

The species name of Blodgett's silverbush has been changed multiple times since its first description by Torrey in Chapman (1884) as *Aphora blodgettii*. A thorough account of the taxonomic history can be found in the proposed listing rule (Service 2015). In 1967 Webster determined the species name to be *Argythamnia blodgettii* and agreed with Small (1933) who treated it as a southern Florida endemic. This nomenclature was used in the listing rule (Service 2016). However, in 2013, Ramirez-Amezcua and Steinmann suggested that Blodgett's silverbush belongs to the species *A. argothamnoides* which has a wider range and can be found in northern South America and adjacent Caribbean islands. In 2016 the Flora of North America Editorial Committee (Ramirez-Amezcua) agreed with this assessment and concluded that *A. argothamnoides* and *A. blodgettii* are morphologically indistinguishable. NatureServe (2022), and the Atlas of Florida Plants (Wunderlin et al. 2022) currently agree with this assessment, as does the Integrated Taxonomic Information System (2022), although it places the taxon in the genus *Ditaxis* (as *D. argothamnoides*). Some authorities continue to use *A. blodgetti* today, most notably the Flora of the Southeastern United States, which notes that "Given the substantial disjunction, it seems appropriately conservative to recognize *A. blodgettii* until more definitive work is done on its relationship to *A. argothamnoides*" (Weakley et al. 2022).

Until further work is conducted to address the apparent discrepancies in taxonomy, the Service will continue to use the taxonomy of the current listed entity (*Argythamnia blodgettii*), which includes Blodgett's silverbush populations found in Miami-Dade and Monroe Counties, Florida.

e. Distribution and trends in spatial distribution

Blodgett's silverbush is endemic to South Florida and only occurs in Miami-Dade and Monroe Counties. Historically its distribution ranged from Brickell Hammock in central Miami-Dade County along the Miami Rock Ridge to southwestern Long Pine Key in Everglades National Park and throughout the Florida Keys from North Key Largo to Key West (Figures 1 and 2; Bradley and Gann 1999). Prior to listing, the range of Blodgett's silverbush in Miami-Dade County had contracted by around 12 miles (19 km) at the northern end compared to the historical

distribution (approximately 42 miles [68 km] northeast to southwest) (Bradley and Gann 1999). The extirpation of the Totten Key population in Biscayne National Park prior to listing also reduced the southeastern range by approximately 15 miles (24 km). Since listing the range of extant populations has not changed and is currently estimated to be 30 miles (48 km) from northeast to southwest in Miami-Dade County (Figure 1), though populations are now smaller and more isolated.

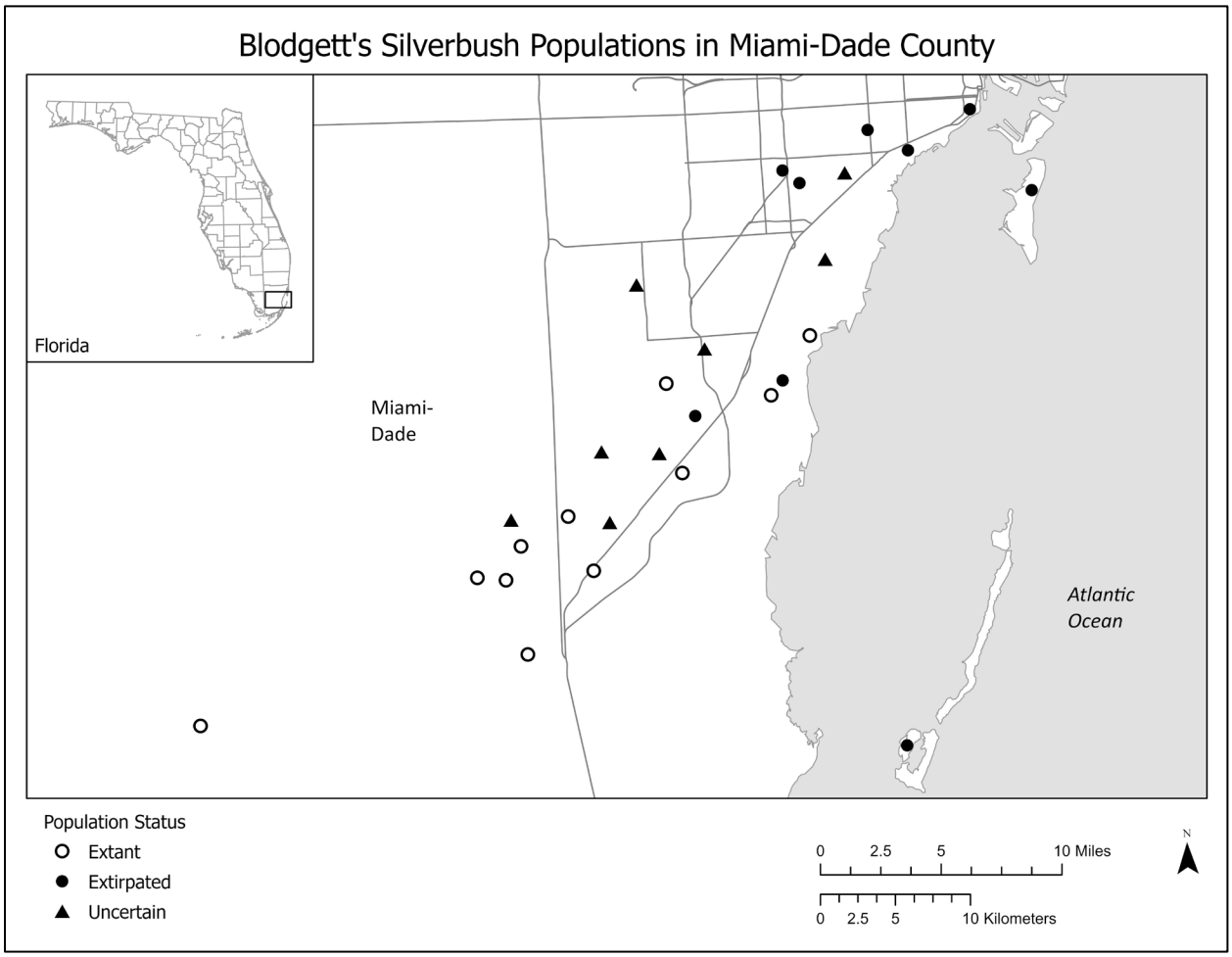

Figure 1. Distribution and status of Blodgett's silverbush populations in Miami-Dade County.

The range of Blodgett's silverbush in Monroe County has also contracted prior to and since listing. Prior to listing, Blodgett's silverbush ranged approximately 110 miles (176 km) from North Key Largo to Key West (Appendix A), though only located in isolated areas. With the extirpation and uncertainty of the Key West and Stock Island populations, the range contracted 5 miles (8 km) in the south by the time of listing. However, after listing, a small population was introduced at the Key West Tropical Forest and Botanical Garden on Stock Island, expanding the range back south by another 2 miles (3.2 km). After listing, the range in the northern Keys contracted 20 miles (32 km) with the uncertainty of the North Key Largo and John Pennekamp Coral Reef State Park populations (Appendix A). The

current range of extant populations is now estimated to be 87 miles (140 km) in the Florida Keys of Monroe County, which is approximately 80 percent of the range in the county before listing (Figure 2).

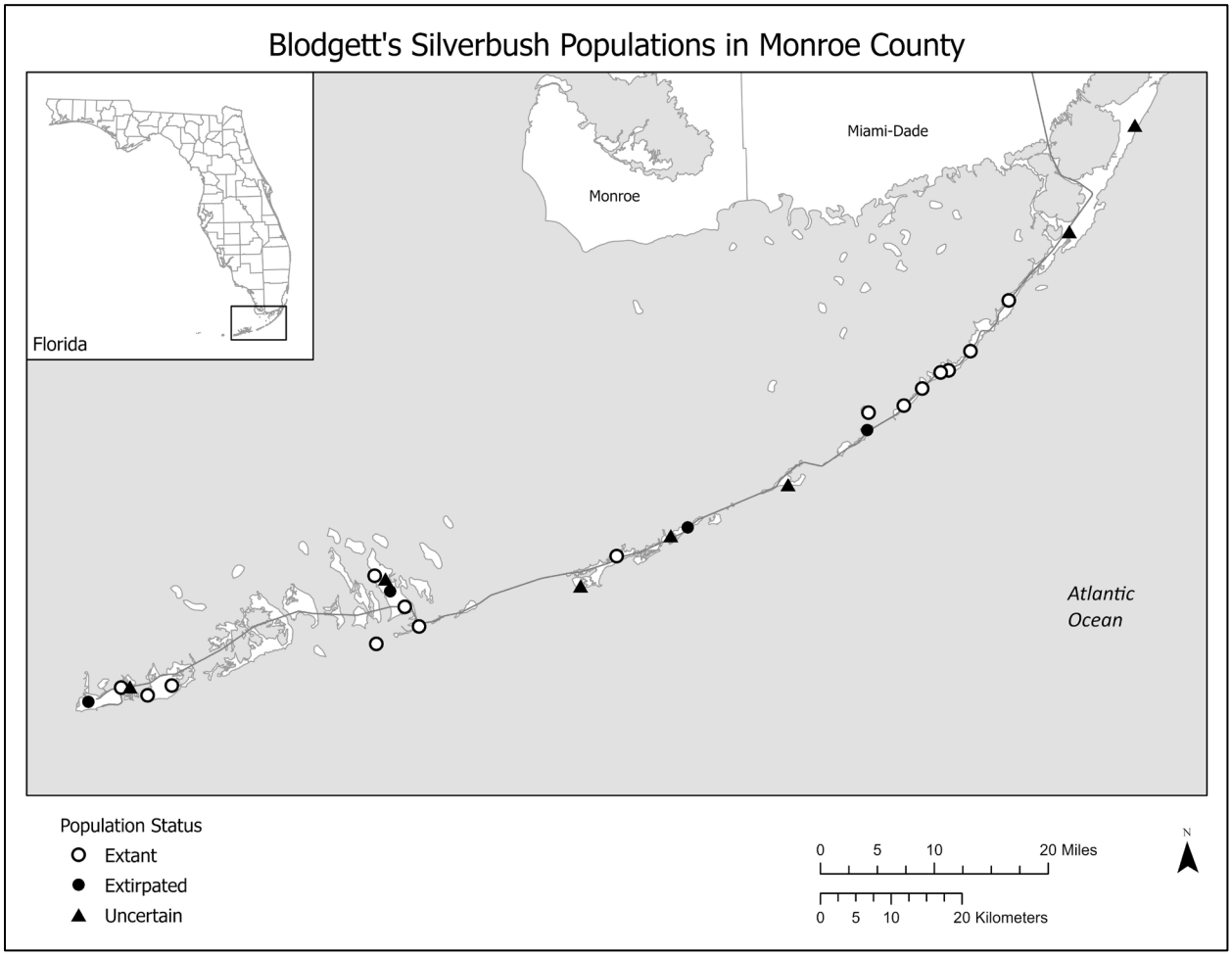

Figure 2. Distribution and status of Blodgett's silverbush populations in Monroe County.

f. Habitat or ecosystem conditions

The distribution of habitat within Blodgett's silverbush historical range remains fragmented. In Miami-Dade County, Blodgett's silverbush grows primarily in pine rockland, sometimes in disturbed pine rockland, and rarely in rockland hammock; whereas in Monroe County it grows in pine rockland, rockland hammock, coastal berm, and roadsides (Bradley and Gann 1999). Pine rocklands are categorized as critically imperiled globally and statewide; rockland hammock are globally and statewide imperiled; and coastal berm are globally vulnerable and statewide imperiled (FNAI 2010). Extensive land clearing for human population growth, development, and agriculture has altered, degraded, or destroyed millions of acres of these once abundant ecosystems.

Most remaining pine rocklands occur on public conservation lands, with extensive habitat management plans. However, non-native plant species and lack of fire

remain a threat to the maintenance of the habitat even to protected areas. Conducting prescribed fires is difficult due to the wildland-urban interface in Miami and in the National Key Deer Refuge and few private landowners have the means and/or desire to implement prescribed fire on their property. Nevertheless, Miami-Dade County Parks and Recreation staff were able to burn several of their conservation lands on a fire-return interval of approximately three to seven years. This is especially important for Blodgett's silverbush since fire has been shown to be crucial for successful seedling recruitment in at least one preserve in Miami-Dade County (Possley et al. 2022a).

Blodgett's silverbush tolerates human disturbance and sometimes might even benefit from it since disturbances often create the sunny gaps within the habitat that it prefers. Especially in the Florida Keys, an accumulation of plants can often be found along trails, on roadsides, and along the edges of preserves that are maintained by mowing (Wintergerst 2022b). At Windley Key Fossil Reef Geological Site, Blodgett's silverbush grows in the bottoms of abandoned rock quarries (Bradley and Gann 1999; Wintergerst 2022b) and in Dove Creek Hammock some plants have been found within an old dump site (Wintergerst 2022b). However, in contrast to populations in protected conservation areas they are not adequately protected and are constantly threatened by development.

g. Augmentation, Introductions, Safeguarding

Seminole Wayside Park and West Biscayne Pineland. In 2019, 153 Blodgett's silverbush plants were extracted from the impacted area of Camp Owaissa Bauer Addition EEL Preserve surrounding a Miami-Dade transportation project and brought to the Fairchild nursery for rehabilitation (Possley et al. 2019). Of these, only 57 percent survived. Forty-six of the surviving plants were translocated into two locations at Seminole Wayside Park and EEL Addition and 42 surviving plants were translocated to two locations within West Biscayne Preserve (Possley et al. 2019). Both receiving locations are within the species' range. The survival rate of translocated plants at Seminole Wayside Park and EEL Addition after 27 months was 40 percent and after one year, evidence of natural seedling recruitment was observed (Possley et al. 2022a). In early 2022, the Seminole Wayside EEL Addition experienced a fire, burning one of the two introduced patches of Blodgett's silverbush. Four months after the burn, 10 out of 13 plants in the burned area had resprouted and the number of seedlings increased sharply, with 80 seedlings in the burned area versus 6 seedlings in the unburned area (Possley et al. 2022a). This observation supports that seed germination of Blodgett's silverbush is highly dependent on fire (Possley et al. 2019).

University of Florida's Tropical Research and Education Center. An introduction at the University of Florida's Tropical Research and Education Center in Homestead was conducted in 2021 using 30 plants donated by Fairchild which were grown from seed collected from rescued plants at the Camp Owaissa Bauer EEL Addition in 2019. The Tropical Research and Education Center is located

within the species' range. There are approximately 15 plants remaining (Martin 2022).

Institute for Regional Conservation's George N. Avery Pineland and John Kunkel Small Pineland. In 2008 and 2009, a total of 36 Blodgett's silverbush plants were introduced at John Kunkel Small Pineland, but by 2012 only 2 plants remained (Gann 2022). In 2022, eight plants were reported at the site (Seaholtz 2022). Around the same time (2008-2009), an unknown number of Blodgett's silverbush plants were installed at George N. Avery Pineland, and in 2018 only one plant was observed (Gann 2022). In 2022, one plant was still present (Seaholtz 2022). Both receiving locations are within the species' range, though the source of the plant material is unknown.

Key West Tropical Forest and Botanical Garden. The population of Blodgett's silverbush that was introduced to Key West Tropical Forest and Botanical Garden on Stock Island currently has fewer than ten plants (Table 1; Woodmansee 2022). The garden is within the species' range, though details about the introduction (e.g., number or type of material installed, source of material, date of introduction) are unknown. The garden also maintains around 25 Blodgett's silverbush plants in cultivation at their on-site nursery (Woodmansee 2022).

Safeguarding. Seeds of Blodgett's silverbush are stored at the National Laboratory for Genetic Resource Preservation in Fort Collins, Colorado. Currently there are 166 seeds from three Miami-Dade preserves (Fuchs Hammock, Larry and Penny Thompson Memorial Park, and Camp Owaissa Bauer) collected in 2015 and 402 seeds from Everglades National Park (Deer Hammock) collected in 2007 (Fairchild 2022a). At Fairchild's seed bank there are 400 seeds from Camp Owaissa Bauer Addition (collected 2018-2019) and 6,200 seeds collected ex situ from plants of the same preserve in 2019 (Fairchild 2022b). No seeds from Monroe County are currently safeguarded in any seed banks.

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

The purpose of a 5-Year Review is to recommend whether a listed taxon continues to warrant protection under the Act and, if so, whether it should be reclassified (from threatened to endangered or from endangered to threatened). This task requires that the analysis of the threats to the species be performed while assuming that the species is not receiving the regulatory protections, funding, recognition, and other benefits of listing. Summaries of ongoing applications of Act protections may shed light on some future activities that constitute threats to the species. However, the analysis under Factor D (Inadequacy of Existing Regulatory Mechanisms) focuses on the adequacy of existing alternative (i.e., non-Act) mechanisms to address the continuing and foreseeable threats.

a. Present or threatened destruction, modification or curtailment of its habitat or range:

Blodgett's silverbush continues to experience destruction and modification of its habitat and range through those direct threats described in the final listing rule including habitat loss, fragmentation, degradation, and associated pressures from increased human population (Service 2016). All documented extirpations have been caused by habitat loss associated with development, which is the primary threat to Blodgett's silverbush habitat. With the increasing fragmentation caused by development, maintenance of the remaining habitat using prescribed fire is limited due to the proximity of urban areas. Thus, habitat degradation on public and private lands has caused the many extirpations and uncertainties, though the species may be able to return in some areas from the seed bank if habitat is restored.

In Miami-Dade County, 10 of the 11 extant populations occur on public or private conservation lands. The other extant population/subpopulation is on the powerline easement owned by Florida Power and Light, which borders the Ludlam Pineland EEL Preserve, within the larger Deering Estate Area population (Table 1). In Monroe County, 10 of the 15 extant populations are on public lands and within designated conservation areas, 3 are growing along roadsides managed by Florida Department of Transportation, and 2 are on privately-owned land (the Florida Keys/Marathon International Airport and on Big Munson Island, owned by the Boy Scouts of America) (Appendix A). Even though 20 of the 26 extant populations occur on conservation or protected lands, they are still at risk of habitat loss or degradation. For example, at least one population on public conservation land has been extirpated due to development and eight populations and one subpopulation on public or private conservation lands have declined in size, likely due to habitat degradation (Appendix A). The decline of the largest population at the Naval Air Station Key West on Boca Chica Key from over 1,000 plants in 2004 (FNAI 2011) to 11 plants in 2022 is most likely attributed to encroachment from dense undergrowth (TAMU 2022).

Fire suppression is a primary cause of habitat degradation in pine rockland preserves and is likely to suppress Blodgett's silverbush seed germination (Possley et al. 2019). Fragmentation has also impacted the management of pine rockland habitat, as urbanization has encroached into native areas, leaving small habitat fragments that are increasingly difficult to burn. Habitat management with use of controlled burns remains a vital way to maintain pine rockland habitat. Without proper fire management, cover of hardwoods increase, along with invasion by non-native exotic plants, causing deterioration of ideal habitat for Blodgett's silverbush. Hardwoods and non-native invasive plants directly compete with Blodgett's silverbush for space, light, water, and nutrients. Although the species can tolerate some human disturbance and sometimes even seems to benefit from it if these disturbances create canopy openings (e.g., trails in within preserves or mowing along roadsides), five populations and four subpopulations are now extirpated due to development or significant disturbance

of its habitat. Other populations growing on private property remain at high risk of extirpation due to development or disturbance and roadside populations in Monroe County are vulnerable to impacts from road maintenance projects such as herbicide application, grading, and resurfacing.

b. Overutilization for commercial, recreational, scientific, or educational purposes:
Overutilization was not identified as a potential threat in the final listing rule (Service 2016) and is not known to be a current threat.

c. Disease or predation:
Disease and predation were not identified as potential threats in the final listing rule (Service 2016) and are not known to be current threats.

d. Inadequacy of existing regulatory mechanisms:
Generally, managing agencies have limited regulatory tools. The Act prohibits the removal of federally listed threatened and endangered plants or the malicious damage of such plants on areas under federal jurisdiction, or the destruction of endangered plants on non-federal areas in violation of state law or regulations or in the course of any violation of a state criminal trespass law. The Act does not provide protection for plants on non-federal lands unless it is in violation of state law.

At the state level, the Florida Department of Agriculture and Consumer Services (FDACS) lists Blodgett's silverbush (included as *Argythamnia blodgettii* – Blodgett's wild-mercury) as endangered on the Regulated Plant Index (5B-40 Florida Administrative Code). Florida Statute 581.185 protects endangered plant species from willful destruction and harvest on both public and private lands. State regulations require both written permission from the owner or their legal representative and a permit issued by FDACS to collect or remove plants or parts of plants listed as endangered on the Florida Regulated Plant Index from any property (Section 3), but these regulations can be waived by private landowners and public agencies for land clearing associated with agriculture, fire control, mining, or construction (Section 8). Listing by the State does not provide any direct habitat protection. For example, in 2019, the population of Blodgett's silverbush in Camp Owaissa Bauer EEL Preserve was impacted by the widening of Krome Avenue, a major North-South Florida State Road in the western edge of Miami-Dade County's urban corridor (Possley et al. 2019). Although, as a consequence of the law, plants were rescued and relocated into two Miami-Dade County preserves, it did not protect the species or its habitat at its original location. Additionally, Title 62D-2.013 of the Florida Administrative Code prohibits the removal, destruction, or damage of plants from Florida Department of Environmental Protection, Division of Recreation and Park properties. This regulation provides protection for the populations that occur on state park lands but does rely on public adherence to the Code since monitoring is limited.

Some populations of Blodgett's silverbush occur in Miami-Dade County preserves that are in designated NFCs. The County developed this legal protection for its natural areas in 1984, with additional fragments incorporated in 1997. The NFC regulations limit development to 10 percent of a hammock and 20 percent of a pineland site, with remaining forest to be preserved (Miami-Dade County Code, Chapter 24-49.2). Additionally, the Conservation Element of Miami-Dade County's Comprehensive Development Master Plan (CDMP) includes requirements for the protection of forested areas as well as listed plant and animal species. These requirements are typically implemented and enforced through zoning approvals and permits issued by Miami-Dade County. No permit can be issued (and no development order can be approved) that is inconsistent with the CDMP.

Monroe County offers some disincentives for developing land where Blodgett's silverbush is present, in the form of a mitigation fee. However, it does not offer protection for the loss of plants or habitat.

Existing regulatory mechanisms do not adequately prevent the development of sites with Blodgett's silverbush or minimize the threat of habitat degradation, as several private properties have been developed or altered and others are at-risk and no protections facilitate management of appropriate habitat. Because this plant occurs in habitat which is desirable for development along Florida's southeastern coast and Florida Keys, this species remains vulnerable to development pressures where it occurs on private property. In conclusion, there are no existing regulatory measures that reduce the threat of loss/reduction of populations via removal/destruction of plants on private property. It has only limited protections if the species was not protected under the auspices of the Act; therefore, existing regulatory mechanisms are inadequate to protect this species.

e. Other natural or manmade factors affecting its continued existence: Several natural and manmade factors affect the continued existence of Blodgett's silverbush, such as nonnative, invasive plants; potentially incompatible management practices; effects of pesticide use on pollinators; climate change and sea level rise; and stochastic events. Additionally, isolated, small populations increase the vulnerability of the species to all of the threats. A detailed discussion of these factors is available in the final listing rule (Service 2016) and new information related to climate and climate-related threats are included below. Collectively, these threats have occurred in the past, are impacting the species now, and will continue to impact the species in the future.

Climate Change. Climate change presents a variety of threats to Blodgett's silverbush and its habitat. Florida's average annual temperature has risen more than 2˚F since 1900 and estimates project further increases between 2.3-11.4˚F by 2100, depending on the greenhouse gas emission rates and the region in Florida (Runkle et al. 2022). In addition, it is predicted that south Florida will experience drier summers (Sun et al. 2015; Runkle et al. 2022). Higher temperatures and

changes in precipitation patterns could alter relative humidity levels and evapotranspiration rates, leading to the potential for more frequent and intense droughts and wildfire events. Although Blodgett's silverbush has evolved to grow in habitats that experience frequent fire, prolonged periods of record high temperatures associated with droughts contribute to dry conditions that are driving hotter, more intense wildfires than would naturally occur. Intense wildfires can cause drastic changes in species composition, changes in tree density, and potentially kill Blodgett's silverbush (Possley et al. 2022a).

Sea Level Rise. Sea level rise, saltwater intrusion, and storm intensification are also anticipated impacts of climate change and increasing threats to south Florida and Blodgett's silverbush. By 2100, it is predicted that sea levels in south Florida and the Keys will rise between 2.13 ft (0.64 m) and 7.12 ft (2.17 m) (Sweet et al. 2022). Based on this, areas supporting Blodgett's silverbush (e.g., coastal Miami, Florida Keys) will likely become partially or completely inundated by 2100. For example, approximately 75 percent of land mass in the Florida Keys is predicted to be inundated at 1.9 ft (0.59 m) of sea level rise (The Nature Conservancy 2011) and 94 percent of the Keys would be inundated at 5.9 ft (1.8 m) of sea level rise (Zhang et al. 2011).

Sea level rise and saltwater intrusion have been found to reduce pine rockland acreage in the lower Keys (Ross et al. 1994) and will have impacts on other habitats as well. Prior to surface inundation, Blodgett's silverbush habitats may undergo vegetation shifts triggered by changes to hydrology, increased salinity, and more frequent storm surge and king tide events (S. Saha et al. 2011). Even if high tide or surge flooding is infrequent, most pine rocklands, rockland hammocks, and coastal berms in the Florida Keys will still slowly degrade and shift to buttonwood/mangrove or marsh habitats (Ross et al. 2009; A. Saha et al. 2011), making some sites unsuitable for Blodgett's silverbush.

Hurricanes and Extreme Weather Events. Hurricane rainfall and intensity are expected to increase as the climate warms (Runkle et al. 2022). Given the small, isolated populations and restricted range of Blodgett's silverbush in locations prone to storm influences, nearly all known populations are at substantial risk from hurricanes and storm surges. Although this species naturally occurs in an area historically affected by hurricanes and has evolved to persist under such disturbances, an increase in storm intensity and its impacts could negatively affect populations. Hurricane winds and debris can cause mortality by defoliation, mechanical injury, or uprooting of individuals, leading to irreversible desiccation. Storm surge physically washes away plants and substrate and leads to salinization of soils. These pulses of salinization will exacerbate saltwater intrusion and accelerate habitat modification and loss. Blodgett's silverbush may have experienced these disturbances historically but had the benefit of more abundant and contiguous habitat to buffer populations from extirpation. With much of the historical habitat having been destroyed or modified, smaller populations are particularly vulnerable to local extirpations due to these events. The impacts of

Hurricane Ian, which passed over the Keys with tropical storm force winds in October of 2022, have not yet been assessed and may have negatively impacted Blodgett's silverbush populations, especially in the Lower Keys.

D. Synthesis:

Blodgett's silverbush is an erect perennial herb or slightly woody shrub native to pine rocklands in the southern Florida. Blodgett's silverbush is still found in both Miami-Dade and Monroe Counties, though its range has contracted. Currently, there are an estimated 26 confirmed extant populations and 15 populations with uncertain status which have not been surveyed for more than 15 years even though potential habitat remains. The majority of extant populations (20 out of 26) have fewer than 100 individuals, and the remaining 6 have over 1,000 individuals, all of which occur on protected conservation land. Approximately 77 percent (20 out of 26) of Blodgett's silverbush extant populations occur on protected conservation lands. However, all populations continue to be threatened by habitat loss, fragmentation, inadequate habitat management (prescribed fires), nonnative plant invasions, development, and other anthropogenic disturbances. The species' limited distribution and small, isolated populations also renders it vulnerable to sea level rise, increased storm surge and tides, saltwater intrusion, and increased hurricane intensity from climate change. Existing regulatory mechanisms are inadequate to protect the species from these threats. Due to the limited and isolated populations and above ongoing threats, this species continues to meet the definition of threatened under the Act.

III. RESULTS

A. Recommended Classification:

____ **Uplist to Endangered**
____ **Delist** (*Indicate reasons for delisting per 50 CFR 424.11):*
____ *Extinction*
____ *Recovery*
____ *Original data for classification in error*
__X__ **No change is needed**

IV. RECOMMENDATIONS FOR FUTURE ACTIVITIES

Recovery Activities

- For populations in pine rockland habitat (all populations in Miami-Dade County, except Fuchs Hammock Preserve, and the National Key Deer Refuge populations in Monroe County), ensure that prescribed fire is frequent enough to maintain the open, sunny habitat required by Blodgett's silverbush and to promote seed germination.
- For populations in hammock or other areas where fire is not feasible (Fuchs Hammock Preserve and most of the Monroe County populations), clear dense undergrowth regularly.
- Continue invasive species removal at conservation areas with Blodgett's silverbush.

- Acquire or pursue conservation agreements for populations or subpopulations on non-conservation private lands that are extant (Ludlam Florida Power and Light Easement and Marathon International Airport) and uncertain (Camp Choee, Country Ridge Estates, Epmore Drive Pineland, Boot Key, Big Munson Island, and Stock Island Golf Course), if it is determined that Blodgett's silverbush is extant.
- Bank seeds from wild populations, with a focus on those that are not yet represented or are under-represented in storage (see section II.C.1.g., above for which populations are represented). Efforts should be especially concentrated on collecting seeds from populations of the Florida Keys, which are currently not represented in any seed banks.
- Consider augmenting known extant natural and introduced populations or subpopulations with fewer than 10 individuals (George N. Avery Pineland, Pine Ridge Sanctuary, John Kunkel Small Pineland, Tavernier Roadside, Green Turtle Hammock, Key Tree Cactus Preserve, National Key Deer Refuge – Watson Hammock Area, and Key West Tropical Forest and Botanical Garden).

Monitoring/Research Activities

- Initiate long-term, detailed demographic studies in a subset of populations which includes the geographic range of the species and a variety of habitat types, including pine rockland, rockland hammock, coastal berm, and disturbed areas.
- Conduct range-wide surveys at uncertain and extirpated populations and adjacent parcels with potential habitat to determine the status of populations and/or to fine-tune population size estimates. Repeat every 5-10 years.
- Survey Blodgett's silverbush populations after storms since population sizes could change substantially due to more open habitat.
- Re-test seeds that Fairchild has banked at 5 years, to determine how long viability is retained in storage and repeat tests every 5 years thereafter.
- Conduct germination experiments with seeds collected in the Florida Keys to determine if germination requirements are different to mainland populations and populations in the Florida Keys.
- Further research on the reproductive biology and life history of Blodgett's silverbush (e.g., pollinators).
- Conduct genetic research to determine the amount of genetic variation between populations from the mainland and the Florida Keys, and between Florida populations and those of *Argythamnia argothamnoides* populations across the Caribbean and northern South America.

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U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of Blodgett's silverbush (*Argythamnia blodgettii*)

Current Classification: Threatened

Recommendation resulting from the 5-Year Review:

____ Uplist to Endangered
____ Delist
____ *The species is extinct*
____ *The species does not meet the definition of an endangered or threatened species*
____ *The listed entity does not meet the statutory definition of a species*
_X_ No change needed

Review Conducted By: Heather Hitt, Florida Ecological Services Field Office, Vero Beach

FIELD OFFICE APPROVAL:

Division Manager, Florida Classification and Recovery, Florida Ecological Services Field Office, Fish and Wildlife Service

Approve LOURDES MENA Digitally signed by LOURDES MENA Date: 2023.03.03 13:54:10 -05'00' Adobe Acrobat version: 2022.003.20310

LEAD REGIONAL OFFICE APPROVAL:
Acting for:
Assistant Regional Director – Ecological Services, Fish and Wildlife Service

Approve AARON VALENTA Digitally signed by AARON VALENTA Date: 2023.03.08 08:06:17 -05'00'

APPENDIX A

Summary of the status of the known Blodgett's silverbush populations. Population trends are unknown for all listed populations due to lack of consistent surveying. Citations for the date last surveyed and status are provided in superscript letters with a key after the table. Alternate shading indicates single populations. If the status of a population or subpopulation changed from the time of listing to the time of this review, the status in both columns is bolded. A plus sign (+) indicates a population or subpopulation not previously reported in the listing rule (Service 2016), a double plus sign (++) indicates a newly discovered population or subpopulation, and a triple plus sign (+++) an introduced population or subpopulation. Populations are generally arranged from north to south. NFC = Natural Forest Community, EEL = Environmental Endangered Lands, IRC = Institute for Regional Conservation, NKDR = National Key Deer Refuge.

Population	**Subpopulation**	**County, Key**	**Land Ownership**	**Previous Population Estimate (Year)**	**Status at Time of Listing (2016)**	**Current or Most Recent Population Estimate (Year)**	**Current Status**
Miami Downtown	Brickell Hammock	Miami-Dade	Unknown	0 (1937)[a]	Extirpated	N/A (developed)	Extirpated
Miami Downtown	South of Miami River	Miami-Dade	Unknown	0 (1913)[a]	Extirpated	N/A (developed)	Extirpated
Coral Gables Area	N/A	Miami-Dade	Unknown	0 (1967)[a]	Extirpated	N/A (developed)	Extirpated
Crandon Park	N/A	Miami-Dade	County	>10 (2005)[b]	Extirpated	0 (2015)[c]	Extirpated
Coconut Grove	N/A	Miami-Dade	County	0 (1901)[a]	Extirpated	N/A	Extirpated
Tropical Park	N/A	Miami-Dade	County	~20 (2005)[b]	Extirpated	0 (2015)[c]	Extirpated
Southwest 56th Street and Southwest 72nd Avenue	N/A	Miami-Dade	Unknown	0 (1975)[a]	Extirpated	N/A (developed)	Extirpated
Gifford Arboretum Pineland	N/A	Miami-Dade	Private – University of Miami	>10 (1999)[a]	Uncertain	0 (2022)[d]	Uncertain
Camp Matecumbe (Boystown Pineland)	N/A	Miami-Dade	County	~30 (2005)[b,e]	**Extant**	N/A	**Uncertain**
Deering Estate Area	Subtropical Horticulture Research Station+	Miami-Dade	U.S. Department of Agriculture	10 (2009)[f]	Not Reported	0 (2022)[f]	Uncertain
Deering Estate Area	Ludlam Florida Power and Light Easement	Miami-Dade	Private – Florida Power and Light	7 (2015)[c]	Extant	15 (2022)[g]	Extant
Deering Estate Area	Deering Estate at Cutler	Miami-Dade	County	Present (1991)[b]	Uncertain	N/A	Uncertain
Deering Estate Area	Deering Estate South Addition+	Miami-Dade	County	0 (2006)[h]	Not Reported	N/A	Extirpated
Camp Choee (P-397)	N/A	Miami-Dade	Private (NFC) – Girl Scout Council of Tropical Florida	>3 (2005)[b,e,i]	**Extant**	N/A	**Uncertain**

Population	Subpopulation	County, Key	Land Ownership	Previous Population Estimate (Year)	Status at Time of Listing (2016)	Current or Most Recent Population Estimate (Year)	Current Status
Southwest 184th Street and Southwest 83rd Avenue	N/A	Miami-Dade	Private	>100 (1999)[a]	Extirpated	0 (2015)[j]	Extirpated
Larry & Penny Thompson Memorial Park	N/A	Miami-Dade	County	6 (2005)[b,e]	Extant	5,720 (2008)[g]	Extant
Ned Glenn Nature Preserve	N/A	Miami-Dade	County	>100 (1999)[a]	Extant	13 (2015)[g]	Extant
Caribbean Park	N/A	Miami-Dade	County	0 (1998)[a]	Extirpated	N/A (developed)	Extirpated
Castellow Hammock	Castellow Hammock Park	Miami-Dade	County	Present (1991)[b,k]	Uncertain	N/A	Uncertain
Castellow Hammock	Castellow Hammock parcel 28+	Miami-Dade	County	Present (1991)[b,k]	Not Reported	N/A	Uncertain
Castellow Hammock	Castellow Hammock parcel 31	Miami-Dade	County	30-50 (1995)[b,e]	Uncertain	N/A	Uncertain
Castellow Hammock	Castellow Hammock parcel 33	Miami-Dade	County	~12 (1995)[b]	Uncertain	N/A	Uncertain
Southwest 134th Avenue and Southwest 224th Street++	N/A	Miami-Dade	Private (EEL Covenant)	Present (Before 2018)[m]	No Data	N/A	Uncertain
George N. Avery Pineland+++	N/A	Miami-Dade	Private – IRC	Unknown (2008-2009)[n]	No Data	1 (2022)[n]	Extant
Camp Owaissa Bauer Area	Camp Owaissa Bauer	Miami-Dade	County	>1,000 (1999)[a]	Extant	892 (2009)[g]	Extant
Camp Owaissa Bauer Area	Camp Owaissa Bauer Addition	Miami-Dade	County	>100 (1999)[a]	Extant	377 (2014)[g]	Extant
Camp Owaissa Bauer Area	Southwest 264th Street and Southwest 172nd Avenue++	Miami-Dade	Private (EEL Covenant)	Present (Before 2018)[m]	No Data	N/A	Uncertain
Camp Owaissa Bauer Area	Southwest 172nd Avenue and Southwest 266th Terrace++	Miami-Dade	Private (EEL Covenant)	Present (Before 2018)[m]	No Data	N/A	Uncertain

Population	Subpopulation	County, Key	Land Ownership	Previous Population Estimate (Year)	Status at Time of Listing (2016)	Current or Most Recent Population Estimate (Year)	Current Status
Camp Owaissa Bauer Area	Country Ridge Estates	Miami-Dade	Private (NFC)	>100 (1999)[a]	Uncertain	N/A	Uncertain
P-111[++]	N/A	Miami-Dade	Private (NFC)	Present (Before 2018)[m]	No Data	N/A	Uncertain
Southwest 62nd Avenue and Southwest 106th Street[++]	N/A	Miami-Dade	Private (EEL Covenant)	Present (Before 2018)[m]	No Data	N/A	Uncertain
Hattie Bauer Hammock Area	Orchid Jungle	Miami-Dade	Private	Present (1930)[a]	Extirpated	N/A (developed)	Extirpated
Hattie Bauer Hammock Area	Hattie Bauer Hammock	Miami-Dade	County	Present (1993)[k]	Not Reported	N/A	Uncertain
Hattie Bauer Hammock Area	Palms Woodlawn Cemetery	Miami-Dade	Private	Present (1992)[a]	Extirpated	N/A (developed)	Extirpated
Hattie Bauer Hammock Area	Naranja	Miami-Dade	Private	Present (1974)[b,e]	Extirpated	N/A (developed)	Extirpated
Hattie Bauer Hammock Area	Old Dixie Pineland	Miami-Dade	Private	>100 (1999)[a]	**Uncertain**	0 (2022 - developed)[o]	**Extirpated**
Hattie Bauer Hammock Area	P-247[++]	Miami-Dade	Private (NFC)	Present (Before 2018)[m]	No Data	N/A	Uncertain
Hattie Bauer Hammock Area	Epmore Drive Pineland Fragment	Miami-Dade	Private	>10 (1999)[a]	Uncertain	N/A	Uncertain
West Biscayne[+++]	Tropical Research and Education Center Pineland[+++]	Miami-Dade	University of Florida	30 (2021)[p]	No Data	(~15) 2022[p]	Extant
West Biscayne[+++]	West Biscayne Pineland[+++]	Miami-Dade	County	42 (2019)[q]	No Data	N/A	Extant
Seminole Wayside Park and Addition[+++]	N/A	Miami-Dade	County	46 (2019)[r]	No Data	18 (2022)[r]	Extant
Pine Ridge Sanctuary	N/A	Miami-Dade	Private (NFC, EEL covenant) – Glancy Family	>10 (1992)[a]	**Uncertain**	1 (2022)[s]	**Extant**

Population	Subpopulation	County, Key	Land Ownership	Previous Population Estimate (Year)	Status at Time of Listing (2016)	Current or Most Recent Population Estimate (Year)	Current Status
Fuchs Hammock	Fuchs Hammock Preserve	Miami-Dade	County	12 (2008)[g]	Extant	50 (2015)[j]	Extant
Fuchs Hammock	Fuchs Hammock Addition[+]	Miami-Dade	County	Present (2006)[h]	Not Reported	N/A	Uncertain
John Kunkel Small Pineland[+++]	N/A	Miami-Dade	Private – IRC	36 (2009)[n]	No Data	8 (2022)[n]	Extant
Everglades National Park (Long Pine Key)	N/A	Miami-Dade	U.S. National Park Service	~1,000 (2008)[t]	Extant	(~2,000) 2015[t]	Extant
Biscayne National Park (Totten Key)	N/A	Miami-Dade	U.S. National Park Service	Present (1904)[u]	Extirpated	0 (2004)[u]	Extirpated
P-317	N/A	Miami-Dade	Private (NFC)	>10 (1999)[a]	**Uncertain**	N/A (possibly developed)[i]	**Extirpated**
North Key Largo (beneath power lines)	N/A	Monroe, Key Largo	County – Utility Easement Assigned to Florida Keys Electric Cooperative	Present (2014)[v]	**Extant**	0 (2022)[w]	**Uncertain**
John Pennekamp Coral Reef State Park[+]	N/A	Monroe, Key Largo	State of Florida	Present (1997)[k]	Not Reported	N/A	Uncertain
Dove Creek Hammocks, Florida Keys Wildlife and Environmental Area	N/A	Monroe, Key Largo	Florida Fish and Wildlife Conservation Commission	>100 (2005)[u]	Extant	46 (2022)[x]	Extant
Tavernier Roadside[++]	N/A	Monroe, Key Largo	Florida Department of Transportation	N/A	No Data	2 (2022)[x]	Extant
Snake Creek Hammocks, Florida Keys Wildlife and Environmental Area	N/A	Monroe, Plantation Key	Florida Fish and Wildlife Conservation Commission	>1,000 (2005)[u]	Extant	63 (2022)[x]	Extant
Windley Key Fossil Reef Geological State Park	N/A	Monroe, Windley Key	State of Florida	>100 (2005)[u]	Extant	25 (2022)[x]	Extant

Population	Subpopulation	County, Key	Land Ownership	Previous Population Estimate (Year)	Status at Time of Listing (2016)	Current or Most Recent Population Estimate (Year)	Current Status
Upper Matecumbe Roadside[++]	N/A	Monroe, Upper Matecumbe Key	Florida Department of Transportation	N/A	No Data	17 (2022)[x]	Extant
Upper Matecumbe	Green Turtle Hammock Preserve[+]	Monroe, Upper Matecumbe Key	City of Islamorada	Present (1967)[b,e]	Not Reported	7 (2022)[x]	Extant
Upper Matecumbe	Key Tree Cactus Preserve[+]	Monroe, Upper Matecumbe Key	City of Islamorada	Present (1967)[b,e]	Not Reported	2 (2022)[x]	Extant
Upper Matecumbe	Upper Matecumbe Key	Monroe, Upper Matecumbe Key	Unknown	Present (1967)[b,e]	Extirpated	N/A (possibly developed)	Extirpated
Lignumvitae Key Botanical State Park (Island)	N/A	Monroe, Lignumvitae Key	State of Florida	>1,000 (2005)[u]	Extant	(~1,000) 2016[y]	Extant
Lignumvitae Key Botanical State Park, Klopp Tract	N/A	Monroe, Lower Matecumbe Key	State of Florida	>100 (2000)[z]	**Extant**	0 (2005)[u]	**Extirpated**
Long Key State Park	N/A	Monroe, Long Key	State of Florida	Present (1999)[aa]	Uncertain	N/A	Uncertain
Crawl Key, Forestiera Hammock	N/A	Monroe, Crawl Key	County	~10 (1982)[b,e]	Uncertain	N/A	Uncertain
Vaca Key[+]	N/A	Monroe, Vaca Key	Unknown	Present (1909)[a]	Not Reported	N/A (possibly developed)	Extirpated
Blue Heron Hammock	Blue Heron Hammock, Florida Keys Wildlife and Environmental Area	Monroe, Marathon, Vaca Key	Florida Fish and Wildlife Conservation Commission	>100 (2005)[u]	**Extant**	0 (2022)[x]	**Uncertain**
Blue Heron Hammock	Marathon International Airport[++]	Monroe, Vaca Key	Private – Florida Keys/Marathon International Airport	N/A	No Data	53 (2022)[x]	Extant
Boot Key	N/A	Monroe, Boot Key	Private – Azurite Corp. LTD of Florida	Present (1998)[u]	Uncertain	N/A	Uncertain
Watson Hammock Area, NKDR	N/A	Monroe, Big Pine Key	U.S. Fish and Wildlife Service	2 (2006)[b,u]	Extant	3 (2022)[x]	Extant
Koehn's Subdivision, NKDR	N/A	Monroe, Big Pine Key	U.S. Fish and Wildlife Service	~200 (2005)[b,u]	**Extant**	N/A	**Uncertain**

Population	Subpopulation	County, Key	Land Ownership	Previous Population Estimate (Year)	Status at Time of Listing (2016)	Current or Most Recent Population Estimate (Year)	Current Status
Watson Blvd and Key Deer Blvd, NKDR[+]	N/A	Monroe, Big Pine Key	U.S. Fish and Wildlife Service	Present (1982)[b,e]	Not Reported	0 (2005)[b]	Extirpated
Big Pine Key Roadside (Mile Marker 31)[+]	N/A	Monroe, Big Pine Key	Florida Department of Transportation	10-20 (2007)[b, e]	Not Reported	56 (2022)[x]	Extant
Cactus Hammock/ Long Beach Area, NKDR	N/A	Monroe, Big Pine Key	U.S. Fish and Wildlife Service	~2,000 (2006)[b,u]	Extant	Present (2022)[x]	Extant
Big Munson Island	N/A	Monroe, Big Munson Island	Private – Boy Scouts of America	8,000-9,000 (2006)[u]	Extant	Present (2022)[bb]	Extant
Runway 25, Naval Air Station Key West	N/A	Monroe, Boca Chica Key	U.S. Department of Defense	~1,000 (2004)[u]	Extant	11 (2022)[cc]	Extant
Weapons Hammock, Naval Air Station Key West	N/A	Monroe, Boca Chica Key	U.S. Department of Defense	~100 (2006)[u]	Extant	95 (2022)[cc]	Extant
Stock Island Golf Course	N/A	Monroe, Stock Island	Private – Key West Golf Club Development Inc.	Present (1981)[u]	Uncertain	0 - Incomplete Survey (2005)[u]	Uncertain
Key West Tropical Forest and Botanical Garden[+++]	N/A	Monroe, Stock Island	Private	N/A	No Data	2-10 (2022)[dd]	Extant
Key West Cemetery	N/A	Monroe, Key West	City of Key West	Present (1965)[u]	Extirpated	0 (2005)[u]	Extirpated

a) Bradley and Gann 1999
b) FNAI 2022
c) Possley 2015
d) Possley 2022a
e) FNAI 2011
f) Possley et al. 2022b
g) Possley et al. 2008-2022
h) Bradley 2006-2008
i) Miami-Dade County 2022
j) Lange 2015
k) Gann et al. 2001-2022
l) Wintergerst 2022c
m) DERM 2021
n) Gann 2022
o) Possley 2022b
p) Martin 2022
q) Possley et al 2019
r) Possley et al. 2022a
s) Frade 2022
t) Gann 2015
u) Hodges and Bradley 2006
v) Wilders et al. 2014
w) Kolterman 2022
x) Wintergerst 2022b
y) Lange 2016
z) Gann and Duquesnel 2000a
aa) Gann and Duquesnel 2000b
bb) Hunt 2022
cc) TAMU 2022
dd) Woodmansee 2022