Pineland Sandmat
(Chamaesyce deltoidea ssp. pinetorum)

5-Year Status Review:
Summary and Evaluation

Photo Credit: Jennifer Possley, Fairchild Tropical Botanical Garden

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

August 2023

5-YEAR STATUS REVIEW

Pineland Sandmat *(Chamaesyce deltoidea ssp. pinetorum)*

GENERAL INFORMATION

Current Classification: Threatened

Lead Field Office: Florida Ecological Services Field Office

Review Authors: David Bender, Florida Ecological Services Field Office, (772) 559-5348

Samantha Hermann, Florida Ecological Services Field Office, (850) 769 0552

Mary Lou Hoffacker, Fabiola Lopez Avila, and Jared Bennett, University of Georgia

Reviewers:

Lead Regional Office: Atlanta Regional Office, Carrie Straight (404) 679-7226.

Date of original listing: November 6, 2017 (82 FR 46691; October 6, 2017)

Critical habitat/4(d) rule/ Experimental population designation/Similarity of appearance listing: Critical habitat final rule: October 14, 2022 (87 FR 62564)

Methodology used to complete the review:
In accordance with section 4(c)(2) of the Endangered Species Act of 1973, as amended (Act), the purpose of a status review is to assess each threatened species or endangered species to determine whether its status has changed and if it should be classified differently or removed from the Lists of Threatened and Endangered Wildlife and Plants (50 CFR 424.11). The U.S. Fish and Wildlife Service (Service) and the University of Georgia evaluated the biology, habitat, and threats of the pineland sandmat to inform this status review.

In conducting this 5-year review, the Service and the University of Georgia relied on the best available information pertaining to historical and current distributions, life history, ecology, and habitat of this species. Sources for this status review include the final listing rule, published and unpublished reports, field observations, and personal communications from recognized experts in the field. We announced initiation of this review in the Federal Register requesting information on this species on May 13, 2022 (87 FR 29364), with an extended comment period. We did not receive any comments during the comment period that we incorporated into this review. All recommendations from this review are the result of thoroughly evaluating the best available information on the pineland sandmat.

FR Notice citation announcing the species is under active review:
May 13, 2022 (87 FR 29364)

Species' Recovery Priority Number at start of 5-year review (48 FR 43098):
9. The Recovery Priority Number indicates that the entity is a subspecies with a moderate degree of threats and a high recovery potential.

Review History:
This is the first 5-year status review for this species.

REVIEW ANALYSIS

Listed Entity

Taxonomy and nomenclature:
Pineland sandmat was first described by Small (1905) and referred to it as *C. pinetorum.* Herndon (1993) included *C. pinetorum* within the *C. deltoidea* complex, which is composed of three other taxa, two occurring further north on the Miami Rock Ridge, and one occurring on Big Pine Key in the lower Florida Keys (Monroe County).

The Flora of North America Editorial Committee (2016) transfers *Chamaesyce deltoide*a and its subspecies to *Euphoriba deltoidea*. The online Atlas of Florida Vascular Plants (Wunderlin et al. 2023), NatureServe (2023), Integrated Taxonomic Information System (n.d.), and the Institute for Regional Conservation (IRC, n.d.) uses the scientific name *Euphorbia deltoidea* ssp. *pinetorum*. This new taxonomy is accepted by the Service and does not impact the status of the species. Until a rule is published with the correction, we will continue to reference the subspecies using the name as it was listed, *Chamaesyce deltoidea* ssp. *pinetorum*.

Distinct Population Segment (DPS) (61 FR 4722)
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 of a DPS to only vertebrate species. Because the species under review is a not a vertebrate, the DPS policy is not applicable.

Recovery Criteria

Recovery Plan or Outline
At the time of this review, recovery criteria for this species have not been finalized.

Biology and Habitat Summary

Pineland sandmat is a perennial herb endemic to the pine rocklands of southern Florida (Figure 1). The species is shade intolerant and relies on frequent fires to reduce shrub subcanopy and remove leaf litter from the ground (Bradley and Gann 1999). Little is known about the life history and reproductive activity of the pineland sandmat however, it is known that the plant reproduces sexually (Bradley and Gann 1999; Gann 2015). Seed dispersal for pineland sandmat is also unknown, but many seeds in the *Chamaesyce* species are explosively dehiscent, a ballistic dispersal mechanism which propels seeds far from the parent plant (Maschinski et al. 2003;

Gann 2015). Pineland sandmat is known to flower and fruit year-round and reaches peak fruiting in the fall (Wendelberger and Maschinski 2006). The pineland sandmat can tolerate partial submergence in freshwater for a portion of the year but is not tolerant to salinity. Herdon (1998) found that 88 percent of plants in the study survived more than three years, indicating a relatively long-lived plant taxon.

Populations and Distribution

There are 20 known extant populations found in Miami-Dade County on the southern portion of the Miami Rock Ridge. The total population estimate for this species is 16,500-153,000 plants, with the majority occurring on Long Pine Key (Table 1; Appendix 1). Of the twenty populations, one occurs on federal lands, (encompassing 60-65% of the total known plants), one population occurs on IRC lands (plant estimation unknown), and nine populations occur on Miami-Dade County property (20-26% of the total known plants). These populations on public lands are offered some protections to the species. The remaining nine populations, (totaling 10-20% of the known plants) are privately owned.

The populations of pineland sandmat in Everglades National Park (ENP) and Sunny Palms Pineland appear to be increasing. One population (Palm Drive Pineland) is possibly extirpated (Possley, pers. comm. 2017). There is insufficient data to categorize the 17 remaining identified populations (Appendix 1). There is a historical record of pineland sandmat at Larry and Penny Thompson Park that was recorded in error (IRC n.d., Possley, pers. comm. 2017). The current range of this species is similar to its historical range, although approximately 98% of the species' habitat outside of ENP has been lost due to development (Kernan and Bradley 1996).

Figure 1. Map highlighting Miami-Dade County, which includes the known historic and current range of pineland sandmat.

Table 1. Summary of the twenty pineland sandmat populations, ownership, and status. Detailed information for each population is provided in Appendix 1.

Property Owner	Number of Populations Extant	Number of Populations Possibly Extirpated
National Park Service	1	0
Miami-Dade County	8	1
Institute for Regional Conservation	1	0
Private	9	0

Threats (Five-Factor Analysis) Summary

The status of pineland sandmat is determined from an assessment of factors specified in section 4 (a)(1) of the Act, including: Factor A: the present or threatened destruction, modification, or curtailment of its habitat or range; Factor D: the inadequacy of existing regulatory mechanisms; and Factor E: other natural or manmade factors affecting its continued existence. Factor B: overutilization for commercial, recreational, scientific, or educational purposes; and Factor C: disease or predation; are not known threats to this species. All the threats listed in the rulemaking (Service 2017) continue to negatively impact the species and are summarized below.

The primary threat to the species is direct and indirect impacts to habitat suitability. Extensive land modification for development throughout the species historic range has led to habitat loss, fragmentation, and alterations that render the habitat unsuitable for pineland sandmat (Factor A). Due to land modifications, suitable habitat for pineland sandmat outside of protected areas is limited, severely fragmented, isolated, and degraded. These characteristics contribute to the species low resiliency (ability to withstand stochastic events), low redundancy (ability to recover from catastrophic events), and low representation (low genetic dispersal).

Non-native species have significantly affected pine rocklands habitat dynamics (Bradley 2006; Bradley and Gann 1999; Bradley and Saha 2009; Bradley and van der Heiden 2013). The management of invasive species in the pine rocklands, particularly in Miami-Dade County, is complicated due to the severe fragmentation of pine rockland habitat that are surrounded by dense urban development. The establishment of non-native plants like *Neyraudia neyraudiana* and *Schinus terebinthifolius*, not only alter habitat dynamics unfavorably for native herbaceous vegetation (Loope and Dunevitz 1981) but can also increase the intensity of fires by providing additional fuels and increasing density and continuity of fuels to spread fire. Pineland sandmat thrive with periodic disturbance from low intensity fire regimens. More intense fires may result in plant death and reduced viability of seeds and roots in the soil minimizing the species' resiliency (Factor A, D, and E).

Fire is a crucial component to maintaining pine rockland habitat, without which the habitat will transition into a community likely inhospitable for pineland sandmat (Snyder et. al 1990, Bradley and Gann 1999; Maschinski et al. 2003; FNAI 2010; ENP 2015). The lack of fire regimens in the past has allowed some pine rocklands to succeed into rockland hammocks which alters the canopy ratio and impacts low-lying, shade intolerant plants, like pineland sandmat. Suppression of natural fire and limitations of prescribed fire in proximity to urban landscapes have created

unnatural fire regimes that result in inappropriate conditions for many of the endemic pine rockland species (Service 2017). Fire suppression also increases fuel load and may result in fire burning hotter for a longer period (as described above) which can negatively impact native species (Factor A, D, and E).

Although pineland sandmat is afforded some level of protection where it occurs on public conservation lands, especially ENP, existing regulatory mechanisms vary in strength and scope, and do not provide substantive protection of species or habitat at this time (Factor D; see Service 2017 for detailed discussions). The current protections have not led to a sufficient reduction of pressures posed to the species to alleviate significant threats.

The species also experiences stressors from human activity and inadequate management (Factor E). Seasonal mowing may delay or inhibit reproduction of pineland sandmat, decreasing the species representation. Studies have shown that shorter plants (that have been mown) do not fruit as often (Maschinski et al. 2007). The recreational use of off-road vehicles (ORV) poses a threat to pineland sandmat and similar pine rockland species. ORVs have been known to indirectly impact species by degrading suitable habitat and causing direct mortality of plants (Bradley and Gann 1999).

Several studies have noted potential climatic change will impact pine rockland habitat through sea level rise, variability in precipitation and temperature that can cause shifts in vegetation types, increases in freezing conditions, and increase in intensity and frequency of storm and fire events (Wanless et al. 2008; Wear and Greis 2012; Intergovernmental Panel on Climate Change 2021; Runkle et al. 2022). By 2100 direct losses of pine rockland plant populations are expected due to habitat loss and modification from sea level rise (Vargas-Moreno and Flaxman 2010, Zhang et al. 2011, Park and Sweet 2015, Rahmstorf et al. 2015; University of Florida Geoplan Center 2015). Additionally, changes in regional hydrology may have impacts on the pine rockland habitats. Increased and longer-duration hydroperiods in the areas inhabited by endangered pine rockland species may lead to a reduction in the amount of suitable habitat, a potential reduction in the area occupied, and a reduction in the number of individuals found (Factors A, D, and E).

Synthesis

The pineland sandmat is a perennial herb endemic to the pine rocklands of southern Florida. It is currently found in southern Miami-Dade County along the southern edge of the Miami Rock Ridge. There are 20 known populations, with a total estimated population of 16,500-153,000 individuals. The most predominate population is within Everglades National Park on Long Pine Key and contain 10,000-100,000 individuals (60-65%). Of the 20 populations 11 populations (80-90% of the estimated population) have some protections; however, one of those populations may already be extirpated indicating protections alone may not be sufficient for population viability. The populations having no protection have significantly lower estimated population numbers and are at high risk of extirpation. Although approximately 98% of the species' habitat outside of Everglades National Park have been lost due to heavy development, the species current range appears similar to its historic range. Habitat that is not protected will likely continue to degrade due to a combination of development pressures, inadequate land management, and climate change. Pineland sandmat thrives under short, low intensity burning conditions, which decreases canopy cover and invasive species encroachment. Responses of the

species and the pine rockland habitat to hydrological alterations and climate change are largely unknown. With the dynamic range and scope of ongoing threats and the current condition of the species, pineland sandmat continues to meet the definition of a threatened species.

RECOMMENDED FUTURE ACTIVITIES

This species does not have a final recovery plan. During this status review, we have identified the following potential recovery activities which are included below.

Recovery Activities

- Conserve pine rocklands and suitable habitat through purchase of land or conservation easements.
- Develop habitat management plans for the extant populations including a 3-7 year fire regime with summer fires preferred to winter and removal of exotic species.
- Establish partnerships with private landowners to promote conservation easements and landowner agreements within remaining populations and habitat.
- Identifying and restore patches of pine rockland habitat outside the Everglades National Park that may allow for pineland sandmat to begin to recolonize less populated areas and assist in connectivity.

Monitoring/Research Activities

- Establish a monitoring program to better understand population trends and to determine effectiveness of the fire prescription and mowing regimens on pineland sandmat.
- Research species demographics such as life history and ecology with an emphasis on understanding impacts of inappropriately timed mowing on the species ability to fruit.
- Evaluate the viability of the 730 pineland sandmat seeds that Fairchild Botanical Gardens collected (Lange, pers. comm. 2016) to determine longevity of ex situ conservation efforts.
- Continue monitoring rare plants at Long Pine Key to determine population trends. It is important to determine effects (positive or negative) from Everglades restoration and other hydrologic changes.
- Map the extant populations of pineland sandmat and identify remaining suitable habitat within the species range.

Outreach Activities

- Increase public awareness and appreciation for native plants and habitats through outreach and education.
- Attend public events when appropriate to improve the communities understanding of management techniques and policies, such as prescribed fire, in pine rockland habitats.

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RESULTS / SIGNATURES

U.S. FISH AND WILDLIFE SERVICE
Status Review of Pineland Sandmat

Status Recommendation
On the basis of this review, we recommend the following status for this species. A 5-year review presents a recommendation of the species status. Any change to the status requires a separate rulemaking process that includes public review and comment, as defined in the Act.

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist *(Indicate reasons for delisting per 50 CFR 424.11)*:
____ *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

FIELD OFFICE APPROVAL:

Acting for:
Division Manager, Florida Ecological Services Field Office, Fish and Wildlife Service

Approve NICOLE COLANGELO Digitally signed by NICOLE COLANGELO Date: 2023.08.18 13:32:59 -04'00'

LEAD REGIONAL OFFICE APPROVAL:

Acting for:
Assistant Regional Director – Ecological Services, Fish and Wildlife Service

Approve AARON VALENTA Digitally signed by AARON VALENTA Date: 2023.08.18 11:28:31 -04'00'

Appendix 1

Summary of the status and trends of the known occurrences of the pineland sandmat.

POPULATION	OWNERSHIP	MOST RECENT POPULATION ESTIMATE	STATUS	TREND
Everglades National Park	National Park Service	10,000 – 100,000 (2011)[3]	Extant	Increasing
Florida City Pineland	Miami-Dade County	33 (2009)[4,5]	Extant	Insufficient data
Navy Wells	Miami-Dade County	1,000-10,000 (2007)[1,4,5]	Extant	Insufficient data
Navy Wells #2	Miami-Dade County	1000-10,000 (2007)[1,4,5]	Extant	Insufficient data
Navy Wells #39	Miami-Dade County	>500 (2013)[1,4,5]	Extant	Insufficient data
Palm Drive Pineland	Miami-Dade County	0 (2012)[1,4,5]	Possibly Extirpated	Insufficient data
Pine Ridge Sanctuary	Private	10-100 (2011)[2,4,5]	Extant	Insufficient data
Rock Pit #39	Miami-Dade County	419 (2012)[4,5]	Extant	Insufficient data
Seminole Wayside Park	Miami-Dade County	614 (2015)[4,5]	Extant	Insufficient data
Fuchs Hammock Addition	Miami-Dade County	20 (2011)[5]	Extant	Insufficient data
Sunny Palms Pineland	Miami-Dade County	1,001-10,000 (2015)[4,5]	Extant	Increasing
John Kunkel Small Pineland	Institute for Regional Conservation	Present (2006)[4,5]	Extant	Insufficient data
Natural Forest Community [NFC] #P330	private	11-100 (2007)[1,4,5]	Extant	Insufficient data
Natural Forest Community #P338	private	1,001-10,000 (2007)[1,4,5]	Extant	Insufficient data
Natural Forest Community #P339	private	11-100 (2007)[1,4,5]	Extant	Insufficient data
Natural Forest Community #P347	private	11-100 (2007)[1,4,5]	Extant	Insufficient data
Natural Forest Community #P411	private	101-1,000 (2007)[1,4,5]	Extant	Insufficient data
Natural Forest Community #P413	private	11-100 (2007)[1,4,5]	Extant	Insufficient data
Natural Forest Community #P416	private	11-100 (2007)[1,4,5]	Extant	Insufficient data
Natural Forest Community #P445	private	1,001-10,000 (2007)[1,4,5]	Extant	Insufficient data

[1]Bradley, pers. comm. 2007
[2]FNAI 2011
[3]Gann 2015
[4]Lange, pers. comm. 2017
[5]Possley, pers. comm. 2017