

**Everglades Bully**  
**(*Sideroxylon reclinatum* ssp. *austrofloridense*)**

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



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

**July 2023**

**STATUS REVIEW**  
**Everglades bully (*Sideroxylon reclinatum* ssp. *austrofloridense*)**

**GENERAL INFORMATION**

**Current Classification:** Threatened

**Lead Field Office:** Florida Ecological Services Field Office

**Review authors:** David Bender, Florida Ecological Services Field Office, and Caroline Aikins and Seth Carey, University of Georgia

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

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

**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. The authors evaluated the biology, habitat, and threats of the Everglades bully to inform this status review. In conducting this 5-year review, the authors relied on the best available information pertaining to historical and current distributions, life history, ecology, and habitat of this species. Much of the information is detailed in the listing rule (U.S. Fish and Wildlife Service (Service) 2017). Other sources for this status review include published and unpublished reports, field observations, and personal communications from recognized experts in the field. The Service published an announcement in the Federal Register requesting information on this species on May 13, 2022 (87 FR 29364) and a 60-day comment period was opened. We did not receive public comments for this species.

**FR Notice citation announcing the species is under active review:**

October 6, 2017 (82 FR 46691)

**Species' Recovery Priority Number at start of 5-year review ([48 FR 43098](#)):**

The Recovery Priority Number for the Everglades bully is a “9” indicating 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:

There are no known changes to the species' taxonomy at this time. The current accepted taxonomy for this subspecies remains *Sideroxylon reclinatum ssp. austrofloridense* (Integrated Taxonomic Information System 2021, Weakley and Southeastern Flora Team 2022).

#### Distinct Population Segment (DPS)

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 not a vertebrate, the DPS policy is not applicable.

### Recovery Criteria

#### Recovery Plan or Outline

There is no current recovery plan for this species.

### Biology and Habitat Summary

The Everglades bully (*Sideroxylon reclinatum ssp. austrofloridense*) is an evergreen perennial shrub endemic to south Florida. The Everglades bully currently has 14 extant populations on public and private lands in Miami-Dade and Monroe counties (Table 1). There is evidence that populations of Everglades bully are increasing within Everglades National Park (Bradley et al. 2013; Gann 2015; Lange, pers. comm. 2017), but insufficient survey data on private lands coupled with persistent threats to the species means it is unclear whether the overall species status is trending upwards.

**Table 1. Summary of the status and trends of the known occurrences of Everglades bully.**

Population	Ownership	Most Recent Population Estimate (Year)	Status	Trend
Everglades National Park	National Park Service	10,000 – 100,000 (2013) <sup>1,2,8</sup>	Extant	Increasing
Camp Everglades	Boy Scouts of America	Present <sup>2</sup>	Extant	Insufficient data
BCNP	National Park Service	17 (2013) <sup>1,2,10</sup>	Extant	Insufficient data

Population	Ownership	Most Recent Population Estimate (Year)	Status	Trend
Frog Pond	South Florida Water Management District	4 (2016) <sup>2</sup>	Extant	Insufficient data
Larry Penny Thompson Park	Miami-Dade County	73 (2005) <sup>2,7</sup>	Extant	Insufficient data
Nixon-Smilely Preserve	Miami-Dade County	0 <sup>2</sup>	Extirpated	-
Navy Wells Pineland Preserve	Miami-Dade County	4 (2011) <sup>4</sup>	Extant	Insufficient data
Sunny Palms Pineland	Miami-Dade County	2 (2011) <sup>4</sup>	Extant	Insufficient data
Florida City Pineland Preserve	Miami-Dade County	Present (2023) <sup>9</sup>	Extant	Insufficient data
Pine Ridge Sanctuary	Private	Unknown <sup>5</sup>	Extant	Insufficient data
Lucille Hammock	Miami-Dade County	11-100 (2007) <sup>1,2,3</sup>	Extant	Insufficient data
South Dade Wetlands	Miami-Dade County	Unknown (2007) <sup>1,2,3</sup>	Extant	Insufficient data
Natural Forest Community #P-300	Private	2-10 (2007) <sup>1,2</sup>	Extant	Insufficient data
Natural Forest Community #P-310	Private	11-100 (2007) <sup>1,2</sup>	Extant	Insufficient data
Quail Roost Pineland	Miami-Dade County	1 (2015) <sup>2,3</sup>	Extant	Insufficient data
Grant Hammock	Unknown	Unknown (Unknown) <sup>1</sup>	Extirpated	-
Key Largo	Unknown	No estimate (1948) <sup>6</sup>	Extirpated	-

<sup>1</sup>Bradley et al. 2013

<sup>2</sup>Lange, pers. comm. 2017

<sup>3</sup>Possley, pers. comm. 2017

<sup>4</sup>Possley, pers. comm. 2011b

<sup>5</sup>FNAI, 2011

<sup>6</sup>Hodges and Bradley 2006

<sup>7</sup>Possley and McSweeney 2005

<sup>8</sup>Gann 2015

<sup>9</sup>Duncan 2023

<sup>10</sup>Lange et al. 2023

The Everglades bully grows in pine rocklands, marl prairies, and rockland hardwood hammocks, and is endemic to southern Florida. The species is reliant on soils high in calcium and microhabitats with lots of sunlight. Because of this, the Everglades bully is dependent on frequent wildfires to prevent hardwood encroachment and shading out by other plant species. In fact, pine rocklands and marl prairies as a whole are dependent on frequent fires in order to prevent their succession into fully hardwood habitats (Bradley and Gann 1999; Florida Natural Areas Inventory (FNAI) 2010; Everglades National Park (ENP) 2015; Service 2017).

The 14 known populations occur throughout Miami-Dade County including Everglades National Park (ENP) and an additional small population within Lostman's Pines region of Big Cypress

National Preserve (BCNP) in Monroe County (mainland only) (Table 1; Figure 1). The majority of the 14 populations are small and highly fragmented. The greatest number of Everglades bully are found in Long Pine Key and some adjacent areas in ENP, with the most recent data suggesting 10,000-100,000 plants and appears to be increasing (Gann et al. 2006, Gann 2015, Maschinski and Lange 2015). The other primary population segments are small patches surrounded by developments in Miami-Dade County and in Big Cypress National Reserve, 45 kilometers from the next nearest population in Long Pine Key. The Big Cypress population, however, only had 17 individuals during a 2013 survey, and it is unknown how many are currently extant in the area (Bradley et al. 2013). The Miami-Dade population is thought to exist in six tracts owned by the county and three owned privately. Possley and McSweeney (2005) observed approximately 73 plants at Larry and Penny Thompson Park, within the Richmond Pine Rocklands. Possley (pers. comm. 2011a; 2011b; 2017) found extant populations at Quail Roost Pineland (one plant), Navy Well Pineland Preserve (four plants) and Sunny Palms Pinelands (two plants). The species has been observed in pine rocklands at Pine Ridge Sanctuary, which is a private property, however its current population size is unknown (FNAI 2011; Bradley et al. 2013). A new population was discovered in Florida City Pineland Preserve with no more than 25 total plants, in two clusters (Duncan 2023). The subspecies has also been extirpated from Nixon-Smilely Preserve (Lange, pers. comm. 2017) and Key Largo, in the upper keys.

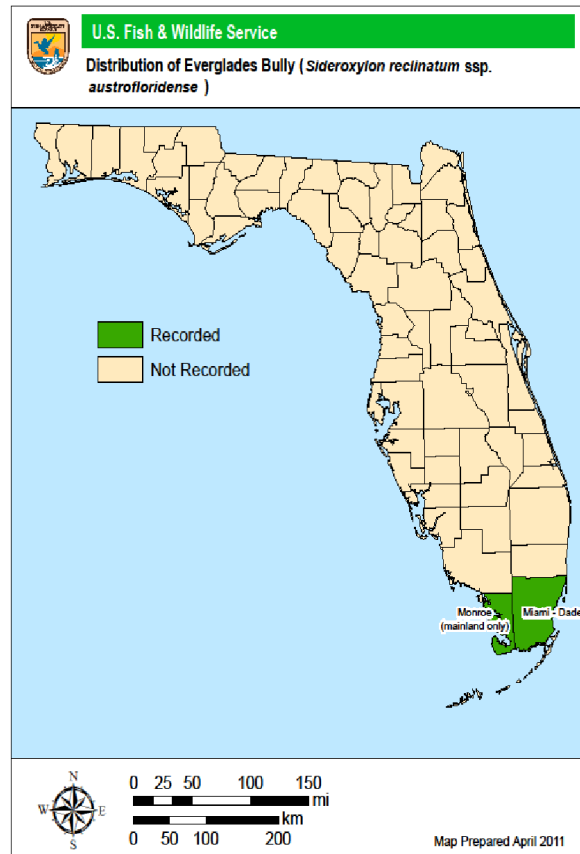


Figure 1. Historic and extant range of Everglades bully.

## Threats (Five-Factor Analysis) Summary

The status of a species is determined from an assessment of factors specified in section 4 (a)(1) of the Act. A summary of the threats is provided below.

The primary threats to the species continue to be habitat loss and fragmentation, lack of fire management, climate change, sea level rise (SLR), invasive species, and reductions in genetic diversity due to small, isolated populations. These threats are detailed in the final listing rule for the subspecies (Service 2017).

*Habitat Destruction or Modification (Factor A):* Habitat loss, modification and changes to conditions inhospitable for Everglades bully remains the primary threat to the species (Factor A). Pine rocklands, the habitat of Everglades bully, is critically imperiled worldwide and had been reduced to 11% of its historical extent in southern Florida by 1996 (Kernan and Bradley 1996, FNAI 2010). The majority of uninterrupted pine rockland exists in Big Cypress National Reserve and Long Pine Key in Everglades National Park, while some sparse habitats are interspersed between developments in Miami-Dade County (Herndon 1998, Service 2017). Remaining pine rockland habitat in public or private unprotected areas are threatened by and expected to be developed, and habitat loss is exacerbated by inadequate fire management and the introduction of invasive species (Zwick and Carr 2006, Service 2017). Urbanization of the remaining pine rocklands is expected to further reduce the abundance and range of the species, reducing its resilience.

As habitat shrinks, it becomes more fragmented and exposes the species to edge effects and the negative impacts of fragmentation including exposure to sharp changes in light and temperature, stopping colonization between fragments, reducing pollination and propagule dispersal. Species richness has been found to be reduced with fragmentation in south Florida pine rocklands, and fragmented habitat suffers from edge effects that foster the proliferation of disturbance-adapted and invasive plants and negatively impact pollination and propagule dispersal (Laurence and Bierregaard 1997, Noss and Csuti 1997, Possley et al. 2008).

*Invasive Species:* Development activities are likely to increase the spread of invasive and disturbance-tolerant species. Invasion of non-native plants is one of the most powerful threats towards the conservation of pine rocklands and Everglades bully (Bradley and Gann 1999, Service 2017). There have been 277 taxa of non-native plants documented in south Florida pine rocklands (Service 1999), including *Schinus terebinthifolius* (Brazilian pepper) and *Melinis repens* (natal grass), which grow quickly and cover up native foliage and out-compete Everglades bully (Langeland and Craddock Burks 1998, Possley and Maschinski 2006, Service 2017). Non-native plants such as these may also alter the typically patchy, low-intensity fires of pine rockland and create hotter fires for longer periods (see below). Protected areas must manage for non-native invasions, but unmanaged areas nearby may act as a source for invasion (Bradley and Gann 1999).

*Fire Maintenance of Habitat:* Pine rockland habitats thrive off of frequent, low-intensity burns that prevent overgrowth and invasion by exotics and allow for native plants to recolonize and make use of the free space and raw material. Sites that lack natural or prescribed fire will develop a thick brush that chokes out the Everglades bully and blocks sunlight. It is well documented that fire is a crucial component to maintaining pine rockland habitat without which the habitat will transition into a community likely inhospitable to Everglades bully (Snyder et al. 1990, Bradley and Gann 1999; Maschinski et al. 2003 and references therein; FNAI 2010; ENP 2015). Unmanaged sites are also susceptible to outbreaks of large, intense natural or human-caused fires that may ravage the ecosystem and extirpate populations of Everglades bully. The establishment of dense patches of the non-native plants like *Neyraudia neyraudiana* and *Schinus terebinthifolius* have increased the intensity and burning periods of fires by providing additional fuels and increasing density and continuity of fuels to spread fire, which have negatively impacted Everglades bully, which thrived under patchily distributed, low intensity fire conditions (Loope and Dunevitz 1981, Zouhar et al. 2008; Service 2017). These longer duration more intense fires may result in plant death and reduced viability of seeds and roots in the soil minimizing the species' ability to recover from the fire.

*Overutilization (Factor B), Disease/Predation (Factor C), Inadequacy of Regulatory Protections (Factor D):* There is no indication that either overutilization (Factor B) or disease or predation (Factor C) is a significant threat to the species. Although Everglades bully is afforded some level of protection where it occurs on are on public conservation lands, especially Federal lands, existing regulatory mechanisms vary in strength and scope, and do not provide substantive protection of habitat at this time (Factor D). These protections have not led to a sufficient reduction of threats posed to the species to alleviate significant threats.

*Other Natural or Manmade Factors (Factor E) - Climate Change:* Climate change threatens to further restrict the habitat of Everglades bully through sea level rise, hurricanes, and drought. South Florida has seen 5 inches of SLR in the last 18 years, and various models have predicted anywhere from 1 to 8 feet in SLR by 2100 (Vargas-Moreno and Flaxman 2010, The Nature Conservancy 2011, Zhang et al. 2011, Park and Sweet 2015, Rahmstorf et al. 2015; University of Florida Geoplan Center 2015). As the sea level rises, the habitat of the Everglades bully will become wetter and more saline, changing the pine rockland habitat to mangrove and buttonwood habitat. More frequent storms and king tides will further threaten their habitat (Saha et al. 2011, Bradley et al. 2013). Rainfall from hurricanes is expected to increase in Florida in the future (Runkle et al. 2022). A study of pine rockland habitat response to Hurricane Wilma indicated varying responses but generally lower abundances of at-risk species (Bradley and Saha 2009). This study also noted that flooding and high salinities from storm surges might impact seed banks of at-risk species.

Climate change is also predicted to alter rainfall and raise temperatures in North America by the end of the century, increasing chances of drought and wildfire (Intergovernmental Panel on

Climate Change 2021). Temperatures have already risen more than 2°F since the beginning of the 20<sup>th</sup> century with projected increases in extreme precipitation events as well as extreme drought (Runkle et al. 2022). Everglades bully is at heightened risk to stochastic weather events due to their reduced and fragmented populations. Unusual storm, tide, or freezing events have the potential to extirpate populations and result in strong genetic drift.

*Additional Risks:* The small population sizes and isolation of many populations may put the species at higher risk of genetic bottlenecks reducing its ability to adapt to changing conditions. Isolation of populations also decreases the ability of the species to recover from catastrophic events that require recolonization after extirpations. The limited range of the subspecies also puts it at risk of a single catastrophic event impacting all populations, which reduces its long-term resiliency.

## **Synthesis**

The Everglades bully is an evergreen perennial shrub endemic to south Florida and currently known to exist in 14 populations in Miami-Dade and Monroe counties in southern Florida. An additional three populations are known to have been extirpated. The species is currently under threat from habitat loss and fragmentation, invasive plant species, altered fire regime, sea level rise, and lack of management on privately owned lands. The Service listed the Everglades bully as threatened in 2017 and populations continued to decline. While the Everglades bully continues to face the threats above, the persistence of populations in Everglades National Park (10,000-100,000 individuals, with evidence suggesting a growing population) means that the species is not at imminent risk of extinction. However, populations outside the park are small and highly fragmented. If some disturbance threatens the populations within the park, the species would be at risk of extinction as the fragmented populations outside of the park could be insufficient to ensure persistence. The Service recommends that the species maintains its status as threatened under the Act.

## **RECOMMENDED FUTURE ACTIVITIES**

### **Recovery Activities**

Through the course of this species status review, we recommend the following potential recovery activities.

Restoration and protection of the pine rocklands, marl prairies, and rockland hardwood hammock habitats is critical to maintain populations of the species. This will ideally include increased fire management coupled with physical removal of invasive species. Removal of dense, woody invasive flora will prevent heightened burn temperatures and longer burn times, both of which increase Everglades bully mortality. More frequent prescribed fires will prevent tree encroachment and the succession of pine rockland habitat into hardwood forest. Further, we

recommend working with private landowners to prevent the destruction of Everglades bully plants and to reintroduction.

### **Monitoring / Research Activities**

We recommend extensive surveys on public and private lands to better understand the population trends in those areas. Of 14 extant populations, only the ENP colony has been sufficiently surveyed. There have also been no genetic studies on the Everglades bully, presenting a gap in our understanding of the species and its allelic richness. Further research should be conducted on the species response to development and fragmentation, pesticide use, and stochastic events and sea level rise which are expected to increase in frequency with climate change

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## RESULTS/SIGNATURES

### U.S. FISH AND WILDLIFE SERVICE

#### Status Review of Everglades bully

##### 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.*

No change needed

##### FIELD OFFICE APPROVAL:

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

Approve \_\_\_\_\_

##### LEAD REGIONAL OFFICE APPROVAL:

Acting for:

Assistant Regional Director – Ecological Services, Fish and Wildlife Service

Approve \_\_\_\_\_