Interim Core Map Documentation for Apalachicola rosemary

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Developed by the U.S. Environmental Protection Agency, Office of Pesticide Programs

Species Summary

The Apalachicola rosemary (*Conradina glabra*; Entity ID 676) is an endangered terrestrial plant (dicot). There is no designated critical habitat for this species. This species is a narrowly distributed species that was originally restricted to a specialized habitat, the edges of steephead ravines, and possibly also to upland longleaf pine-wiregrass vegetation in the Florida panhandle, which includes portions of Gadsden and Liberty counties. Bloom time has not been fully documented, but the Apalachicola rosemary may be pollinated by insects or self-fertilized. Additional information is provided in **Appendix 1**. This species is currently included in the Herbicide Strategy.

Description of Core Map

The core map for the Apalachicola rosemary is based on the range. The available range layer is highly refined and represents areas important for this species' conservation. Based on information from the 2022 5-Year Review, the species currently consists of only one natural population on public land and three introduced sites from 1991, rights-of-way (ROW), and private silvicultural lands. No critical habitat has been designated for this species. **Figure 1** depicts the interim core map for the Apalachicola rosemary. The core map represents approximately 9,858 acres.

The Apalachicola rosemary is a narrowly distributed species that was originally restricted to a specialized habitat, the edges of steephead ravines, and possibly also to upland longleaf pine-wiregrass vegetation. At present, *C. glabra* is endemic to the xeric longleaf pine (Pinus palustris) communities (sandhill) east of the Apalachicola River. It also occurs on the upper steepheads in the transition to sandhills, edges of pine plantation, and highway and utility ROWs. Most favorable habitats are open areas with various degrees of cover, from bare sands to areas with other species growing nearby. Density appears to be greatest in sun or lightly shaded areas, but density declines, and plants appear to become less robust as areas become shadier.

Landcover categories within the core map area are included in **Table 1.** Landcover is predominantly evergreen forests, which are generally consistent with the habitat of this species.

The core map developed for the Apalachicola rosemary is considered interim. This core map will be used to develop pesticide use limitation areas (PULAs) that include the Apalachicola rosemary. This core map incorporates information developed by the U.S. Fish and Wildlife Service (FWS) and made available to the public; however, the core map has not been formally reviewed by FWS. This interim core map may be revised in the future to incorporate expert feedback from FWS. This interim core map has a "none" best professional classification because it consists of the species' range without additions or subtractions. There is confidence in the core map because the species' range is highly refined, represents areas important for this species' conservation, and contains all four known populations of this species. This core map does not replace or revise any range or designated critical habitat developed by FWS for this species.

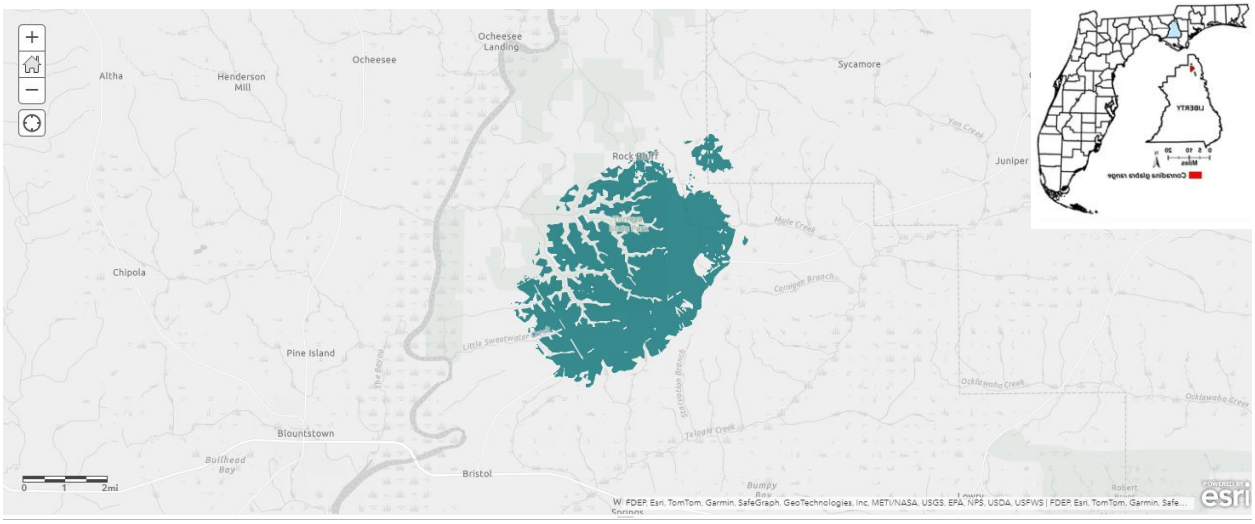

Figure 1. Interim core map for Apalachicola rosemary. Total acreage of the interim core map is approximately 9,858 acres.

Table 1. Percentage of Interim Core Map Represented by NLCD[2] Land Covers and Associated Example Pesticide Use Sites/Types.

Example pesticide use sites/types	NLCD Landcover (Value)	% of core map represented by landcover	% of core map represented by example pesticide use
Forestry	Deciduous Forest (29)	<1	~79
Forestry	Evergreen Forest (42)	78	~79
Forestry	Mixed Forest (43)	<1	~79
Agriculture	Pasture/Hay (81)	<1	<1
Agriculture	Cultivated Crops (82)	<1	<1
Mosquito adulticide, residential	Open space, developed (21)	2	~3
Mosquito adulticide, residential	Developed, Low intensity (22)	1	~3
Mosquito adulticide, residential	Developed, Medium intensity (23)	<1	~3
Mosquito adulticide, residential	Developed, High intensity (24)	0	~3
Invasive species control	Woody Wetlands (90)	3	~17

Example pesticide use sites/types	NLCD Landcover (Value)	% of core map represented by landcover	% of core map represented by example pesticide use
Invasive species control	Emergent Herbaceous Wetlands (95)	<1	~17
Invasive species control	Open water (11)	0	~17
Invasive species control	Grassland/herbaceous (71)	7	~17
Invasive species control	Scrub/shrub (52)	7	~17
Invasive species control	Barren land (rock/sand/clay; 31)	<1	~17
Total Acres	**Interim Core Map Acres**	**~9,858**	

Evaluation of Known Location Information

There are four datasets with known location information for this species:

- Descriptions of locations provided by FWS;
- Occurrence locations included in iNaturalist;
- Occurrence locations included in Global Biodiversity Information Facility (GBIF); and
- Occurrence locations included in NatureServe.

EPA evaluated these four sets of data to inform or support the core map. FWS provided the most refined descriptions of the occurrence information and confirmed that all known locations of extant populations are located within the range. iNaturalist had 42 research grade observations, which are consistent with the species range. GBIF's occurrence data predominately consisted of occurrences that had also been accounted for in iNaturalist. NatureServe included 7 documented areas, all of which were consistent with the location of the species range. **Appendix 1** includes more information on the available known location information.

Approach Used to Create Core Map

The core map was developed using the "Process EPA Uses to Develop Core Maps for Draft Pesticide Use Limitation Areas for Species Listed by the U.S. Fish & Wildlife Service (FWS) and their Designated Critical Habitats[3]" (referred to as "the process"). This core map was developed by EPA using the 4 steps described in the process document:

1. Compile available information for a species;
2. Identify core map type;
3. Develop the core map for the species; and
4. Document the core map.

For step 1, EPA compiled available information for the Apalachicola rosemary from FWS, as well as observation information available from various publicly available sources (including iNaturalist, GBIF and NatureServe). The information compiled for the Apalachicola rosemary is included in **Appendix 1**. Influential information that impacted the development of the core map included:

- The species range is highly refined;
- There is one known natural occurring population in FWS documentation and three introduced sites all of which are within the species' range; and
- Occurrence data from other sources are generally consistent with the species range location.

For step 2, EPA used the compiled information to identify the core map type. EPA compared known location data to the range and found that these known locations are consistent with the species range. Based on the narrow range that includes all occurrence data identified by FWS, EPA selected the range to use as the species core map. For step 3, EPA used the ECOS species range for Apalachicola rosemary.

Discussion of Approaches and Data that were Considered but not Included in Core Map

Alternative approaches and data not described in this document were not further explored in the development of this interim core map.

Appendix 1. Information Compiled for Species During Step 1

Recent FWS Documents

- Apalachicola rosemary (*Conradina glabra*) 5-Year Review: Summary and Evaluation (2022)
- Apalachicola rosemary (*Conradina glabra*) 5-Year Review: Summary and Evaluation (2017)
- Apalachicola rosemary (*Conradina glabra*) 5-Year Review: Summary and Evaluation (2009)
- Recovery Plan for Apalachicola Rosemary (*Conradina glabra*) (1994)
- Recovery Plan for Apalachicola Rosemary (*Conradina glabra*) Amendment (2019)

2. **Background information on Species**

- **Status:** Federally listed as endangered in 1993

- **Taxonomy**. FWS plant group 9: dicot flowering plants that require outcrossing with biotic pollination vectors.

- **Resiliency** - Low

- **Redundancy** - Low

Based on information from the 2022 5-Year Review, the species currently consists of one natural population on public land and three introduced sites from 1991, ROWs, and private silvicultural lands. The population on public land reportedly contains most of the known plants and is found at the Sweetwater Creek Tract (SCT) portion of Torreya State Park (shown in Figure 2 above). (5-Year Review, 2022). The SCT population of C. glabra was estimated to be about 89,815 plants as of 2009. (5-Year Review, 2022). Approximately 46 plants are estimated to be on ROWs near the SCT. (5-Year Review, 2022). Two of the three reintroduced populations at the Nature Conservancy's Apalachicola Bluffs and Ravines Preserve (ABRP) have more than 600 individuals, a third has fewer than 75. (5-Year Review, 2022). Additional private sites in the area surrounding the SCT reportedly have populations of C. glabra that have not been characterized.

- **Representation** - Low

Conradina glabra is a narrowly distributed species that was originally restricted to a specialized habitat, the edges of steephead ravines, and possibly also to upland longleaf pine-wiregrass vegetation. (Recovery plan, 1994). "The entire range of C. glabra is found in Liberty County, FL. The range has not changed since listing, although it was reintroduced within its original range at three TNC sites in 1991. Most of the population occurs on approximately 3,632 acres (Pruner and Schmidt 2017) of land managed by the Florida Department of Environmental Protection, Florida Park Service."

- **Habitat Description**

At present, *C. glabra* is endemic to the xeric longleaf pine (Pinus palustris) communities (sandhill) east of the Apalachicola River. It also occurs on the upper steepheads in the transition to sandhills, edges of pine plantation, and highway and utility ROWs. (5-Year Review, 2022). Most favorable habitats are open areas with various degrees of cover, from bare sands to areas with other species growing nearby. (5-Year Review, 2022). Density appears to be greatest in sun or lightly shaded areas, but density declines, and plants appear to become less robust as areas become shadier. (5-Year Review, 2022).

- **Relevant Life History Information:**

"Demographic studies: Bladow et al. (2017) measured size structure, survival, growth, and recruitment in three re-introduced sites at The Nature Conservancy's Apalachicola Bluffs and Ravines Preserve, FL (The Nature Conservancy's ABRP) and three natural sites located at the SCT, and quantified inbreeding depression in two natural sites. Demographic projections predicted that re-introduced populations would grow at least as fast as the naturally occurring populations. Seed set was < 50% in both reintroduced and natural populations. Inbreeding depression was strong in one introduced and one wild population, and predicted to affect population growth rates only if selfing were to increase substantially. Overall, evidence identifies re-introduction as a successful conservation approach for C. glabra." (5-Year Review, 2017, p. 7)

"Reproduction: Conradina glabra, like most plants, reproduces both sexually and asexually. Clonal growth (clonal reproduction, vegetative reproduction), which results in offspring genetically identical to the parent and potentially physiologically independent of the parent, has been observed in the field (V. Negrón-Ortiz, 7/25/2017, pers. observ.; Spector and Bente 2009). Floral observations indicate that C. glabra is potentially gynodioecious (has both female and hermaphrodite plants) (Gray 1965). Gray (1965) observed one population near TSP displaying some degree of male sterility: the anthers were observed malformed or were well formed but the pollen was aborted. Outcrossing in hermaphrodites is promoted by protandry (V. Negrón-Ortiz, pers. observ.). Protandry refers to a temporal separation in male and female functions of bisexual flowers; in this case, the pollen is shed before the stigma becomes receptive. Current data is needed to verify if gynodioecy is present." (5-Year Review, 2017, p. 8)

- **Ecology**

"The various habitats where this species might have occurred are unknown because of the timing of its taxonomic description and the conversion of habitat for silviculture practices (Gordon 1996, Shinners 1962). At present, Apalachicola rosemary is endemic to the xeric longleaf pine communities (sandhill) east of the Apalachicola River. It also occurs on the upper steepheads in the transition to sandhills, edges of pine plantation, and highway and utility rights-of-way. Most favorable habitats are open areas with various degrees of cover, from bare sands to areas with other species growing nearby. Density appears to be greatest in sun or lightly shaded areas, but it decreases as areas become shadier with mature planted pine (Negrón-Ortiz, 2009, pers. observ.)." (5-Year Review, 2017, p. 12)

- **Relevant Pesticide Use Sites**
    - The use of the herbicide, hexazinone, in timber regeneration areas was mentioned as a possible threat to C. glabra populations (Recovery Plan, 1994)
    - Populations of C. glabra along highway and utility ROWs may be impacted by the use of herbicides in forestry or road right-of-way maintenance applications. (Recovery Plan, 1994)
    - "Management of rights-of-way: This recovery action is ongoing and conducted primarily by the Florida Department of Transportation (FDOT) and Florida Gas and Transmission. Spot application of moderately toxic herbicide Garlon 4 is used to treat exotic shrubs or trees at Torreya State Park (TSP)." (5-Year Review, 2017, p. 4)
    - "Most of the remaining population of C. glabra is now protected under ownership by the State of Florida and managed by the Florida Park Service. The private land east of SCT where C. glabra likely occurred has been recently cut. In addition, herbicide was applied to the entire tract, limiting the likelihood of C. glabra persistence in the treated area (M. Maples, Florida State Parks, 9/12/2017, pers. comm.)." (5-Year Review, 2017, p. 13)

- **Threats**

"Conradina glabra is an extremely rare species and endemic to a small geographic range in Liberty County, FL. It is extremely vulnerable to threats because of its limited current distribution. The main threat for this species is habitat modification. Conversion of land for silviculture uses continues to threaten any individuals not currently on protected lands. It is unclear how the use of prescribed fire to manage the habitats this species occurs in impacts its viability. Overcollection is not a threat, and no problems have been detected with disease or predation. Because of the limited distribution of the species in the panhandle of Florida, increases in extreme tropical storms associated with climate change could cause a catastrophic decline in the only protected population. Additionally, increased temperatures and periodic drought could increase the intensity and risk of wildfire, which may reduce viability of the species." (5-Year Review, 2022, p. 11)

- **Reclassification Criteria**

"The Sweetwater Creek Tract population is assessed as resilient.
Five additional populations are: 1) discovered or reintroduced within the historic range of the species, and 2) under long-term protection. These populations must be resilient." (Recovery Plan Amendment, 2019 p. 3)

- **Delisting Criteria**

"Threat reduction and management activities (e.g., compatible silviculture practices, fire return interval and intensity, and restoration) have been implemented to a degree that the long-term resiliency of all six C. glabra populations and habitat is demonstrated over multiple prescribed burn cycles." (Recovery Plan Amendment, 2019 p. 4)

- **Recovery Actions**

"An in-depth C. glabra inventory across the species' historic sites and on new locations is conducted where appropriate habitat exists.
The effects of prescribed fire and forest management practices on long-term persistence of C. glabra (survival, growth and reproduction) in the sandhill community is assessed and a standardized monitoring technique is in place.
The contribution of sexual reproduction and clonal propagation to population maintenance is assessed via research related to (1) in-situ soil seed bank, seed viability, and seedling recruitment (in-situ seed germination, seedling survival and growth), and (2) genetic composition and clonality.
A living collection of viable germplasm is maintained at botanical gardens and other Service approved facilities for research, recovery, and public outreach." (Recovery Plan Amendment, 2019 p. 6)

3. **Description of Species Range**

"The entire range of C. glabra is found in Liberty County, FL. The range has not changed since listing, although it was reintroduced within its original range at three TNC sites in 1991. Most of the population occurs on approximately 3,632 acres (Pruner and Schmidt 2017) of land managed by the Florida Department of Environmental Protection, Florida Park Service. Because the SCT population Figure 2. Map of the sampling locations at SCT. Numbers correspond to individual sandhills and results. Map from ABG 2021 report. 7 prior to the alteration of its range is unknown, we are unable to analyze current changes in its historical range." (5-Year Review, 2022 p. 6)

Figure A1-2 depicts the Sweetwater Creek tract map of the Apalachicola rosemary occurrences. This map was last updated Aug. 29, 2017, and has an area between 2,471- 3,632 acres.

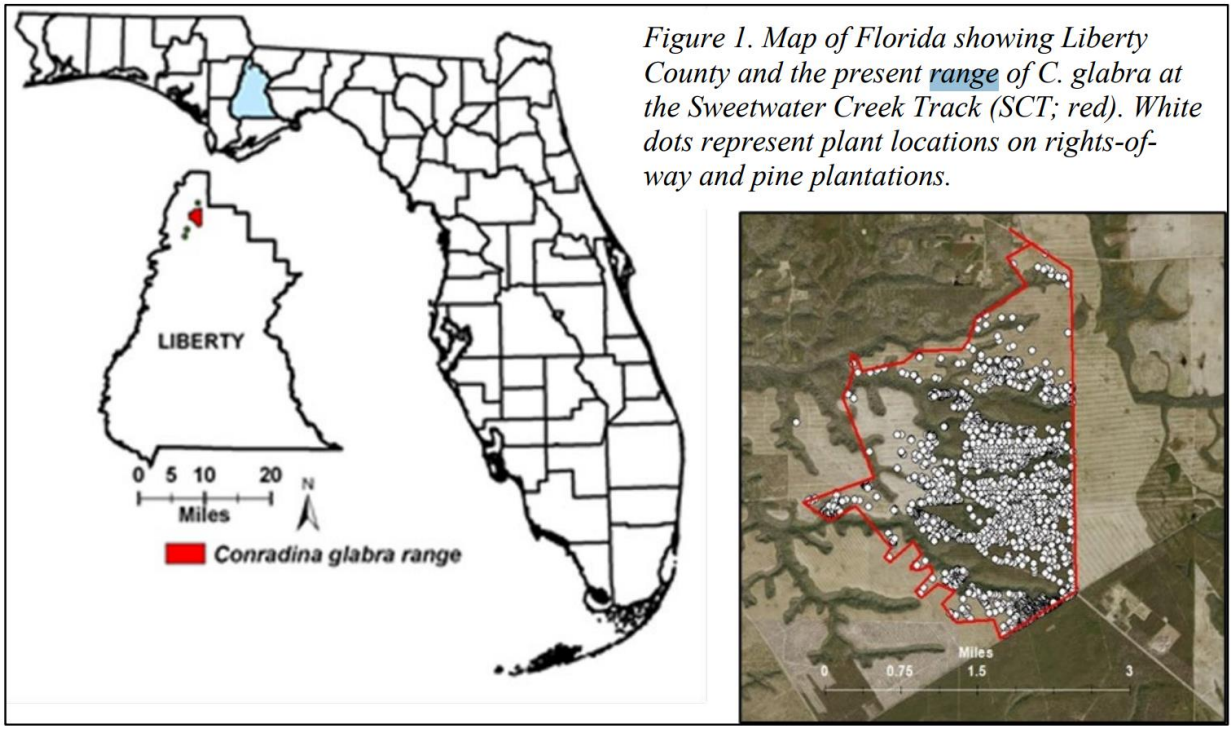

Figure A1-2. Map of Apalachicola rosemary range.

4. **Critical Habitat**

There is no designated critical habitat for this species.

5. **Known Locations**

- Occurrences Described in FWS Documents

"The species is currently known from only one natural population on public land, from three introduced sites in 1991, rights-of-way, and private silvicultural lands. The population on public land, which contains most of the plants, is found at the SCT, Torreya State Park (TSP; Fig. 1). At SCT, C. glabra covers an area between 1,000 ha (2,471 acres, Spector and Bente 2014; Fig. 1) to 1,470 ha (3,632 acres, Pruner and Schmidt 2017). This area was prepared by a bulldozer scraping topsoil and remaining vegetation into linear berms called windrows, planted in slash pine (Pinus elliottii), with 500-700 stems per acre of sand pine (Pinus clausa), and then logged in the late 1980s (Spector and Bente 2009). Despite this severe alteration of habitat, SCT contains the majority of C. glabra. The estimated number of plants (or ramets) in 2009 for 102 ha was about 89,815 (Spector 2009); whereas the estimated number of plant clumps in 2017 was > 100,000." (5-Year Review, 2022 p. 5)

Extant populations:

- Sweetwater Creek Tract: estimated number of plant clumps in 2017 was > 100,000. (5-Year Review, 2022 p. 5)

Expanded range populations (Bath-SI):

- The estimated number for ROWs near the SCT is about 46+ plants. (5-Year Review, 2022 p. 5)

- Two of the three reintroduced populations at the Nature Conservancy's Apalachicola Bluffs and Ravines Preserve (ABRP) have more than 600 individuals, a third has fewer than 75. (5-Year Review, 2022 p. 5)

- **Occurrences Described in iNaturalist** (https://www.inaturalist.org/observations?subview=table&taxon_id=160836):
  - iNaturalist includes 42 observations consistent with the indigenous range (all in found in Liberty County, FL)

- Occurrences Described in GBIF: https://www.gbif.org/
  - Almost all observations listed are also included in iNaturalist

- Occurrences Described in NatureServe: https://explorer.natureserve.org/pro/Welcome
  - NatureServe has several documented locations consistent with the indigenous range (all in found in Liberty County, FL). These occurrences are consistent with other occurrence data.