

Interim Core Map Documentation for Cooley's Water-Willow

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Interim Core Map Developer: U.S. Environmental Protection Agency (EPA), Office of Pesticide Programs

Species Summary

The Cooley's water-willow (*Lesquerella perforate* or *Justicia cooleyi*, Entity ID 744) is an endangered terrestrial plant (dicot). The U.S. Fish and Wildlife Service (FWS) has not designated a critical habitat for the Cooley's water-willow. The species exists in rich, mesic hardwood (calcareous hammocks) or hardwood pine forests and along adjacent roadsides in west-central peninsular Florida on the Brooksville Ridge in soils that range from moist to seasonally wet fine sandy loam to silty clay loam, usually underlain by limestone, occasionally with limestone outcroppings. The Cooley's water-willow flowers from October to December. Additional information on the species is provided in **Appendix 1**.

Description of Core Map

The core map for the Cooley's water-willow is based on biological information. The outer extent of this core map is defined by known extant locations and populations that FWS identified.

Figure 1 depicts the resulting interim core map for Cooley's water-willow. The size of this core map is approximately 12,776 acres. Landcover categories within the core map area are included in **Table 1**.

The core map developed for the Cooley's water-willow is considered interim. This core map will be used to develop pesticide use limitation areas (PULAs) that include the Cooley's water-willow. This core map incorporates information developed by 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 species expert feedback from FWS. This interim core map has an "limited" (2) best professional judgment classification to describe major uncertainties/limitations. The map is based on known locations described by FWS. This core map does not replace or revise any range or designated critical habitat developed by FWS for this species.

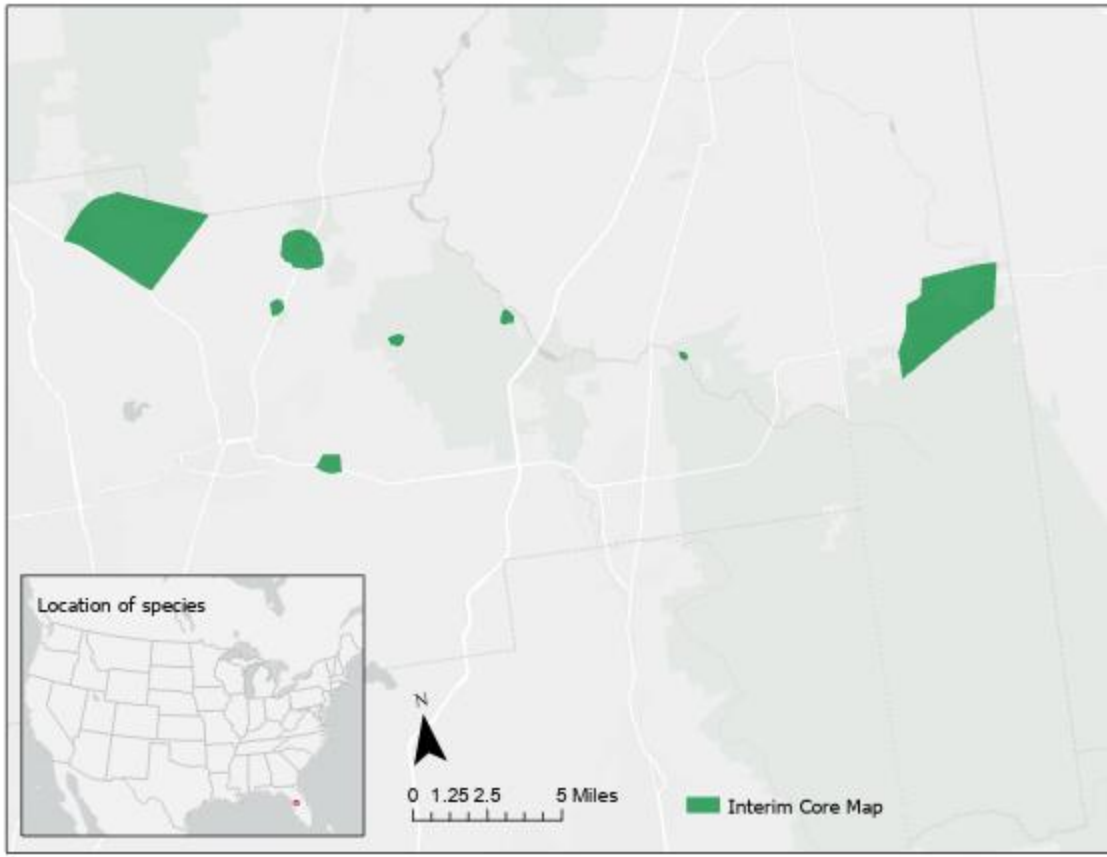


Figure 1. Interim core map for the Cooley's water-willow

Table 1. Percentage of Interim Core Map Represented by NLCD² 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 (41)	0%	38%
Forestry	Evergreen Forest (42)	36%	38%
Forestry	Mixed Forest (43)	2%	38%
Agriculture	Pasture/Hay (81)	22%	22%
Agriculture	Cultivated Crops (82)	0%	22%
Mosquito adulticide, residential	Open space, developed (21)	3%	5%
Mosquito adulticide, residential	Developed, Low intensity (22)	1%	5%
Mosquito adulticide, residential	Developed, Medium intensity (23)	1%	5%
Mosquito adulticide, residential	Developed, High intensity (24)	0%	5%
Invasive species control	Woody Wetlands (90)	23%	36%

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)	7%	36%
Invasive species control	Open water (11)	0%	36%
Invasive species control	Grassland/herbaceous (71)	2%	36%
Invasive species control	Scrub/shrub (52)	1%	36%
Invasive species control	Barren land (rock/sand/clay; 31)	3%	36%
Total Acres	Interim Core Map Acres	~12,776	

Evaluation of Known Location Information

There are four datasets with known location information:

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

EPA evaluated these four sets of data before selecting the type of and developing the core map. FWS appeared to have the finest resolution of the location information, providing a map that depicted the current known locations (**Figure A1-2 in Appendix 1**). Occurrences in iNaturalist, GBIF, and NatureServe did not support expanding the core map outside of these known locations. The occurrences from these public sources that appear outside the FWS range or known locations are within the range of uncertainty for public data points which are intentionally obscured to protect the species. Thus, these points were not included in the interim core map for Cooley’s water-willow due to the low number of occurrences and the uncertainty of the exact locations.

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”). EPA developed the core map 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
4. Document the core map

For step 1, EPA compiled available information for the Cooley’s water-willow from FWS, as well as observation information available from various publicly available sources (including iNaturalist,

NatureServe, and GBIF). The information compiled for the Cooley's water-willow is included in **Appendix 1**. Influential information that impacted the development of the core map included:

- There is no FWS designated critical
- Occurrences and known locations of the Cooley's water-willow are identified by FWS and all occur in west-central peninsular Florida on the Brooksville Ridge.

For step 2, EPA used the compiled information to identify the core map type including species range and known location information. The extant populations are identified by FWS within the species' range. Therefore, EPA based the core map on extant known locations identified by FWS. The entire range of the species was not used as the core map because the range contains areas where the species does not occur.

For step 3, EPA used the best available data sources to generate the core map. Data sources are discussed in the process document. **Appendix 2** provides more details on the GIS analysis and data used to generate the core map.

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

Approaches or datasets not described in this documentation were not further explored.

Appendix 1. Information Compiled for the Cooley's Water-Willow During Step 1

1. Recent FWS documents/links and other data sources

- Five Year Review (2024) (https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/16545.pdf)
- Five Year Review (2019) (https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/2764.pdf)
- Five Year Review (2010) (https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/1575.pdf)
- Recovery Plan (1994) (https://ecos.fws.gov/docs/recovery_plan/940620b.pdf)

2. Background information

- **Status:** Federally listed as endangered in 1989
- **Resiliency, redundancy, and representation** (the 3Rs)
 - No specific information provided in FWS documents.
- **Habitat (2024 Five Year Review)**
 - "...occurs in rich, mesic hardwood (calcareous hammocks) or hardwood pine forests and along adjacent roadsides in west-central peninsular Florida on the Brooksville Ridge. Soils range from moist to seasonally wet fine sandy loam to silty clay loam, usually underlain by limestone, occasionally with limestone outcroppings (Landry 1996¹)."
- **Pollinator/reproduction (2019 Five Year Review)**

¹ Landry, S. 1995. Monitoring plan for *Justicia cooleyi* at the USDA Plant Material Center, Hernando, Florida. Final report for Florida Statewide Endangered and Threatened Plant Conservation Program, Tallahassee, Florida.

- Flowers October to December
- **Taxonomy (2025 Five Year Review)**
 - perennial, rhizomatous, herbaceous plant
- **Relevant Pesticide Use Sites (2019 and 2025 Five Year Review)**
 - Herbicides are used to eradicate invasive weeds in areas where the Cooley's water-willow is found, and it is recommended in the 2019 Five Year Review that this be done outside of the reproductive cycle. The impact of the herbicides on the Cooley's water-willow is not entirely known, but it is noted in the 2025 Five Year Review that it does not appear to be negatively impacting at least one of the known populations.
- **Recovery Criteria/Objectives (1994 recovery plan)**
 - "It should be noted that there is a fundamental lack of basic biological (i.e., distributional, ecological, reproductive, systematic) knowledge about these species, which make it difficult to set "objective, measurable criteria which, when met, would result in a determination. . . that the species be removed from the list" of endangered and threatened plants (Endangered Species Act, as amended 1988, section 4(t)(1)(B)(ii))."
 - "...a plausible recovery criterion might be to attain at least 15 viable and self-sustaining populations, totalling at least 10,0000 individuals. Population viability at recovery levels must be demonstrated for 10 consecutive years."
- **Recovery Actions (1994 recovery plan)**
 - "Develop management plans for populations on current managed areas (includes collection of biological/systematic data and control of exotics for all sites)."
 - "Protect additional lands containing the species through purchase, conservation easements, or other means."
 - "Conduct surveys to find new populations of the species."
 - "Augment existing cultivated populations, including possible establishment of a germ plasm bank."
 - "Develop plans for possible (re)introduction of plants into suitable habitats (includes 10-year monitoring of existing and/or reintroduced populations)."

3. Description of Species Range

- **Figure A1-1** depicts the FWS range. The range was last updated on April 24, 2022. The total acreage of the range is around 66,317 acres.



Figure A1-1. FWS range for the Cooley's water-willow. The total acreage of the range is around 66,317.

4. **Critical Habitat**

- FWS has not designated a critical habitat for this species (<https://ecos.fws.gov/ecp/species/4653>)

5. **Known Locations**

- Known Locations Described in FWS Five Year Reviews. The known locations are depicted in **Figure A1-2**.

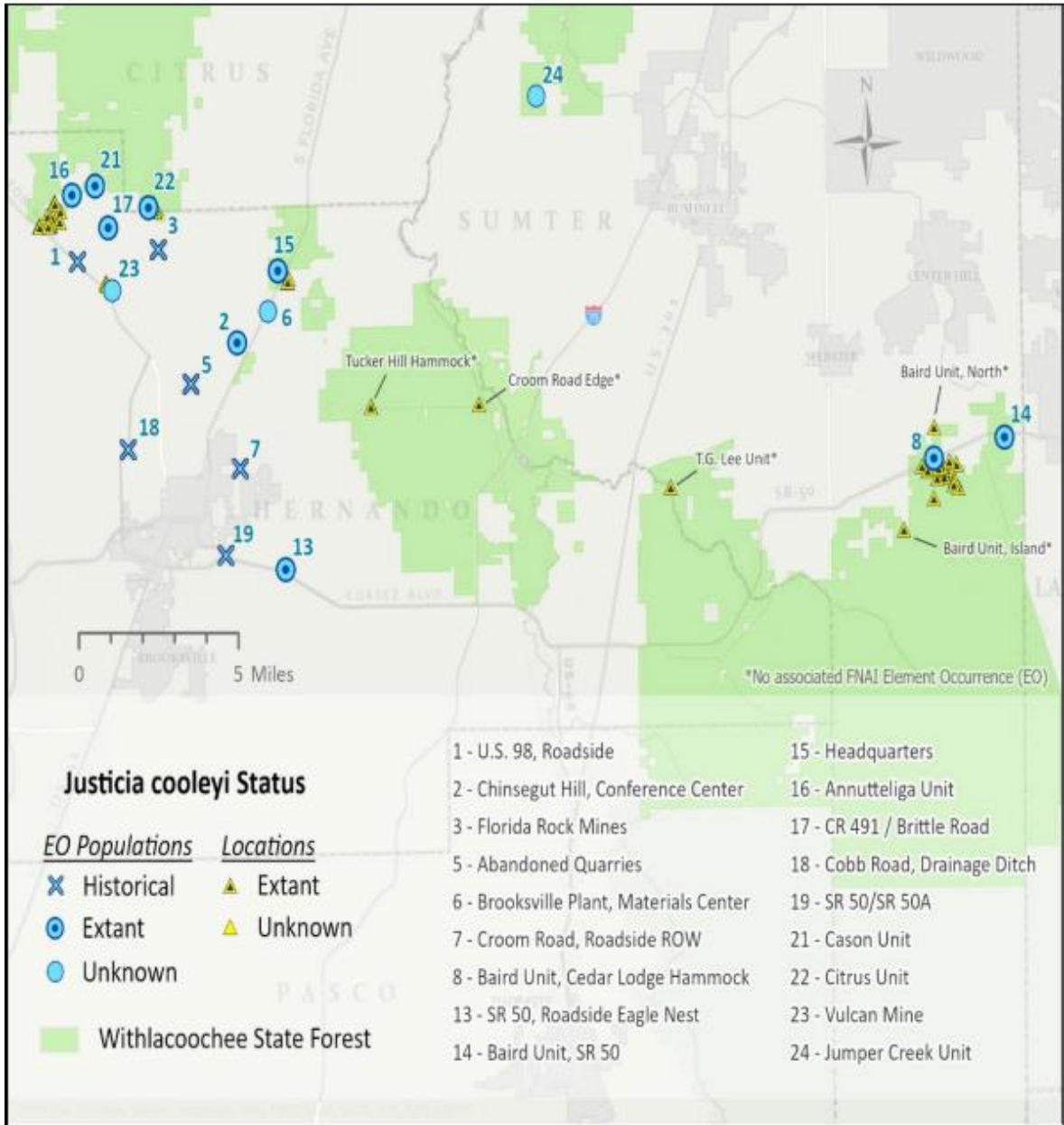


Figure A1-2. Known location information from FWS. Map reproduced from most recent FWS 5-year review (2024).

Occurrences Included in Public Databases

EPA queried iNaturalist, GBIF, and NatureServe.

iNaturalist (available [here](#)) had six research grade observations for this species. One of the observations occurred outside the FWS range, south of Tampa, FL.

GBIF (available [here](#)) included seven occurrences. Of the seven occurrences, only four had coordinates.

Occurrences in NatureServe were consistent with other occurrence data (linked [here](#)).

The occurrences that appear outside the FWS range or known locations are within the range of uncertainty for public data points which are intentionally obscured to protect the species. Thus, these points were not included in the interim core map for the Cooley's water-willow due to the low number of occurrences and the uncertainty of the exact locations.

Appendix 2. GIS Data Review and Method to Develop Core Map

This core map was created based on biological information, including FWS known locations. There was no critical habitat. EPA referenced **Figure A1-2** above to identify extant known locations and populations and use those to then manually draw the borders of the interim core map.

1. Dataset References and Software

- Software used: ArcGIS Pro 3.2
- FWS Species Range – last updated on April 25, 2022
- Known location information from FWS map from most 2024 5-year review

2. Datasets Used in Core Map Development

All datasets used in core map development are described in EPA's process document.

3. Core Map Development

- EPA started with the species' range to develop the core map. After reviewing the FWS documentation noted above in Appendix 1, the map was further refined to known extant locations and populations since there was sufficient known location information readily available in the FWS documentation. The known extant locations and populations used are found in **Figure A1-2** above, which is from the FWS 2024 5-year review.
- The process of manually identifying extant locations and populations, manually identifying their location in ArcGIS, and manually drawing the polygon that make up the core map is described below.
 - First, identify the locations and populations in **Figure A1-2** to use in the core map development. Use only known extant populations (blue circle with black dot in the center icon) and extant locations (yellow triangle with black dot in the center icon) from **Figure A1-2** to draw the polygons that make up the core map. The unknown or historical locations or populations are not used.
 - To determine the exact locations of the extant populations and locations, reference the roads and borders (state forest and county) included in **Figure A1-2**. Then, in ArcGIS Pro, use the range to help narrow down the general area the known locations and populations occur. Then, identify the borders of the Withlacoochee State Forest and the surrounding county borders and roads. Do so by visually comparing **Figure A1-2** and the map in ArcGIS pro and matching up the roads and borders.
 - Once the exact locations are identified, manually draw the polygons using ArcGIS Pro by using roads and borders (state forest and county) as reference points. First, for drawing the polygons, identify extant locations and populations that are found closely grouped together and can be combined into the same polygon. Some extant

locations and populations are isolated and will need their own polygon. Once the grouped and individual locations/populations are determined, manually draw the individual polygons using the roads and borders as reference points and ensure all extant locations and populations are captured in the polygons. Eight total polygons were drawn and make up the core map.