Cooley's Water-willow
(*Justicia cooleyi*)

5-Year Status Review:
Summary and Evaluation

Photo: Todd Mecklenborg - U.S. Fish and Wildlife Service

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

August 2024

STATUS REVIEW
Cooley's Water-willow (*Justicia cooleyi*)

GENERAL INFORMATION

Current Classification: Endangered

Lead Field Office: Florida Ecological Services Field Office, Todd Mecklenborg

Reviewers:

Lead Regional Office: Southeast Region, Carrie Straight

Florida Ecological Services Field Office, Vivian Negron-Ortiz

Date of original listing: August 28, 1989 (54 FR 31190; July 27, 1989)

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) evaluated the biology, habitat, and threats of the Cooley's Water-willow (*Justicia cooleyi*) to inform this status review.

The Service announced initiation of this review in the Federal Register on May 11, 2023 (88 FR 30324) with a 60-day comment period. We did not receive any public comments related to this species during the comment period. The primary sources of information used in this analysis were the 1989 final listing rule (54 FR 31190), the 1994 recovery plan, previous 5-year reviews (Service 2010, 2019), research project reports, peer reviewed scientific publications, unpublished field observations, and personal communications. This review was completed by the Service's Florida Ecological Services Field Office, Gainesville, Florida. All literature and documents used for this review are on file. All recommendations resulting from this review are the result of thoroughly evaluating the best available information on *J. cooleyi*.

FR Notice citation announcing the species is under active review: May 11, 2023 (88 FR 30324)

Species' Recovery Priority Number at start of 5-year review (48 FR 43098): 8. The "8" indicates a species with a moderate degree of threat and high recovery potential.

Review History: Previous 5-year reviews were completed in 2010 and 2019. These reviews recommended no change in status.

REVIEW ANALYSIS

Listed Entity

Taxonomy and Nomenclature

The taxonomy of the listed entity is still valid (Integrated Taxonomic Information System 2024). The species is currently identified as *Justicia cooleyi*, Monachino and Leonard - Cooley's Water-willow.

There is some debate on whether this species is a synonymy with *J. pringlei* according to University of South Florida Institute for Systematic Botany's Atlas of Florida Plants (http://florida.plantatlas.usf.edu/) and the Catalog of Life (https://www.catalogueoflife.org/). Together *J. cooleyi* (Florida), *J. pringlei* (Mexico and Guatemala), *J. galapagana* (Galapagos), and *J. saltensis* (South America) form a closely related group of species (Kiel et al. 2018) that are each difficult to determine morphologically. Based on the perceived lack of unique morphological characters, *J. cooleyi* was synonymized with *J. pringlei* (Daniel 2013). *Justicia cooleyi* is still a recognized, valid taxon found in the Flora of the Southern United States (Weakley and the Southern Flora Team 2024). The Service will continue to recognize the species as the originally listed entity until additional genetic and taxonomic research are available.

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 fish and wildlife. The definition limits listing DPS to vertebrate species of fish and wildlife and because this species is a plant, the DPS policy does not apply.

Recovery Criteria

Recovery Plans

Recovery plans are not regulatory documents and intended to provide guidance to the Service, states, and other partners on methods of minimizing threats to listed species and on criteria that may be used to determine when recovery is achieved. If the recovery criteria defined in the plan are still valid, meeting recovery criteria can indicate that the species no longer requires protections under the Act. However, when recommending whether a listed species should be delisted, the Service must apply the factors in section 4(a) of the Act (84 FR 45020).

Recovery Plan for Brooksville Bellflower (*Campanula robinsiae*) and Cooley's Water-Willow (*Justicia cooleyi*), June 20, 1994

"For Cooley's Water-willow, recovery would require at least 15 viable and self-sustaining populations, totaling at least 10,000 individuals. Population viability at recovery levels must be demonstrated for 10 consecutive years."

The current status is unknown because of private land access issues and lack of current surveys. The number of known extant populations (14) and its limited geographical distribution confirm the current recovery criteria have not been achieved for *J. cooleyi.*

Biology and Habitat Summary

Biology

Detailed descriptions of the species biology including morphology illustrations can be found in the recovery plan and previous 5-year reviews. The following summary is a brief field description of the basic biology. **Perennial herb** to 16 inches tall, with erect, square, hairy **stems** with few branches. **Leaves** to 2 inches long, opposite, short-stalked, ovate or lance-shaped, with long hairs and short, brown lines on the upper surface. **Flowers** in zigzag, usually 2-branched clusters on long stalks emerging from angle of leaf and stem. Flower about 0.5 inch long, dark pink with purple and white spots, glandular-hairy, 2-lipped with the lower lip 3-lobed; stamens 2, attached to the lip; sepals 4, linear; flower bracts linear, sepal-like. **Fruit** a capsule, about 0.5 inches long, hairy (Chafin 2000).

Habitat and Distribution

Justicia cooleyi is a perennial, rhizomatous, herbaceous plant that 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 1996). Additional information may be found in documents noted previously in the methodology use to complete review section.

The known distribution of the species is centered around the city of Brooksville in Hernando County and in the adjacent Citrus and Sumter counties. However, *J. cooleyi* was first collected by John K. Small and colleagues in 1925 and 1934 in a “low hammock” near Mascotte, in Lake County. The location is not precisely documented and may have been in the adjacent Hernando County with Mascotte being the closest town along State Road 50. In 1957, George R. Cooley collected specimens in north central Hernando County and Joseph V. Monachino and Emery C. Leonard (1959) recognized these specimens as a new species distinct from the other native water-willows in central Florida. Figure 1. illustrates the general spatial locations of the known populations in Citrus, Hernando, and Sumter counties.

The Florida Natural Areas Inventory’s 2023 Element Occurrence Records (hereafter EO or occurrences) database identify 18 *J. cooleyi* documented populations in Citrus, Hernando, and Sumter counties, Florida. Additional data that have been incorporated into this review were provided by Florida Forest Service (Werner, pers. comm. 2024) and Bok Tower Gardens (Peterson, pers. comm. 2024), which includes five populations present within the Withlacoochee State Forest that have not been assigned an EO designation yet. These five populations are naturally occurring populations. Two populations in the Withlacoochee State Forest (Headquarters [EO 15] and Tucker Hill Hammock) have recently been augmented by plants from the Baird Unit - SR 50 (EO 8) population impacted by a road widening project.

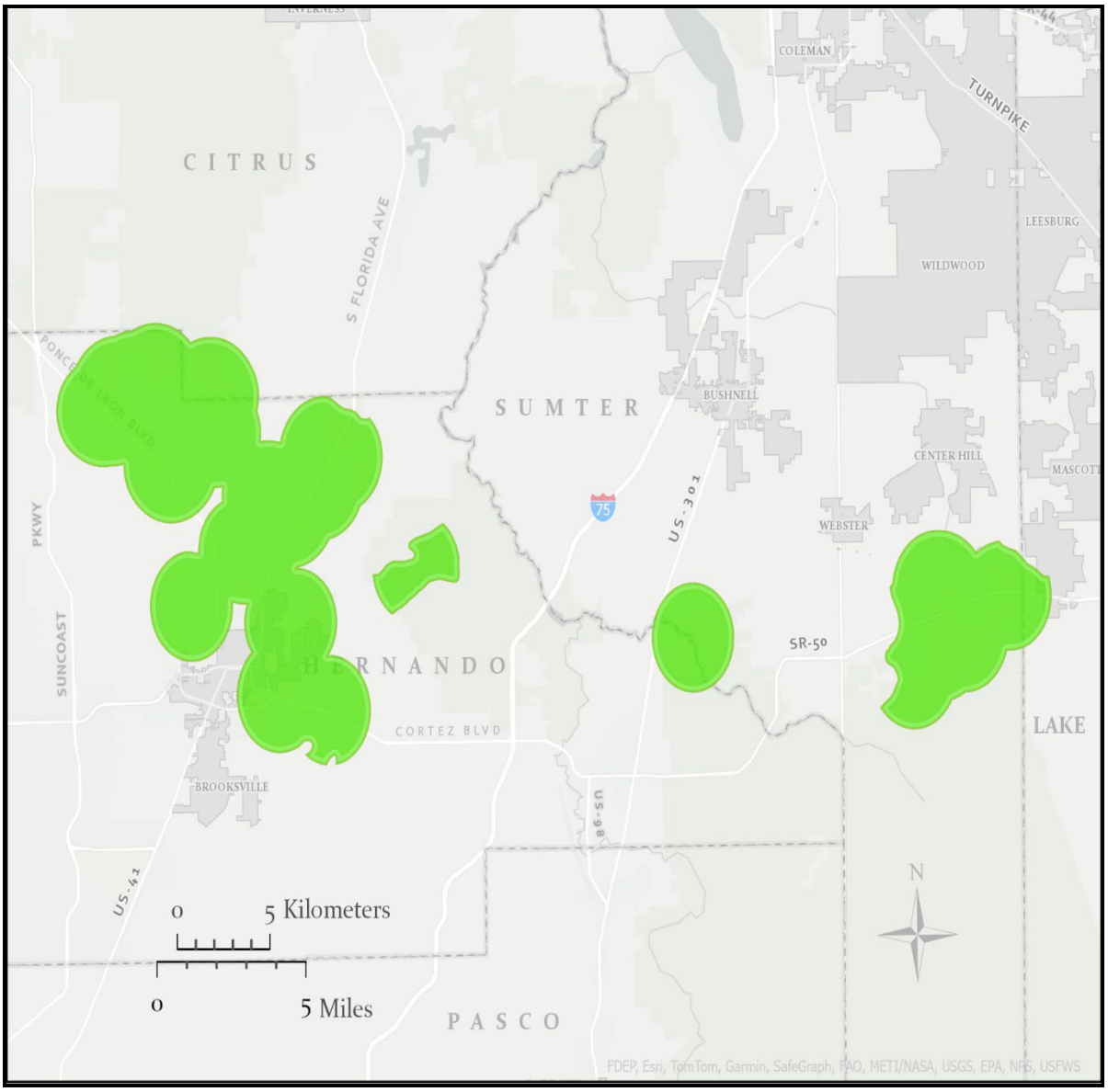

Figure 1. *Justicia cooleyi* populations in Citrus, Hernando, and Sumter counties, Florida.

The prior 5-year status review (2019) reported 11 extant populations, of which 10 occurred within the Withlacoochee State Forest (noted with asterisks in Table 1; Service 2019). These extant occurrences in the Withlacoochee State Forest were identified as Annutteliga, Cason, Headquarters, Croom (Hernando County); T.G. Lee, Baird - Island, Baird - North, Baird - SR 50, Baird - Cedar Lodge Hammock (Sumter County); and Citrus (Citrus County). Vulcan Mine was the only known extant population on private lands.

Population Status

As stated in the previous 5-year status reviews, precise populations estimates are not available for this species because very few surveys (systematic counts) have been conducted and habitat degradation is a major threat resulting from the large number of invasive plants occurring in

their habitat that continues to outcompete the native flora including *J. cooleyi*. Six of the populations from the Florida Natural Areas Inventory database are currently considered extirpated with an additional three population statuses unknown. Using the same population criteria as the 2019 5-year review – less than 0.6 miles separation and within the same mesic hammock is considered one population – 14 populations are currently considered extant (Figure 2). Population viability is unknown.

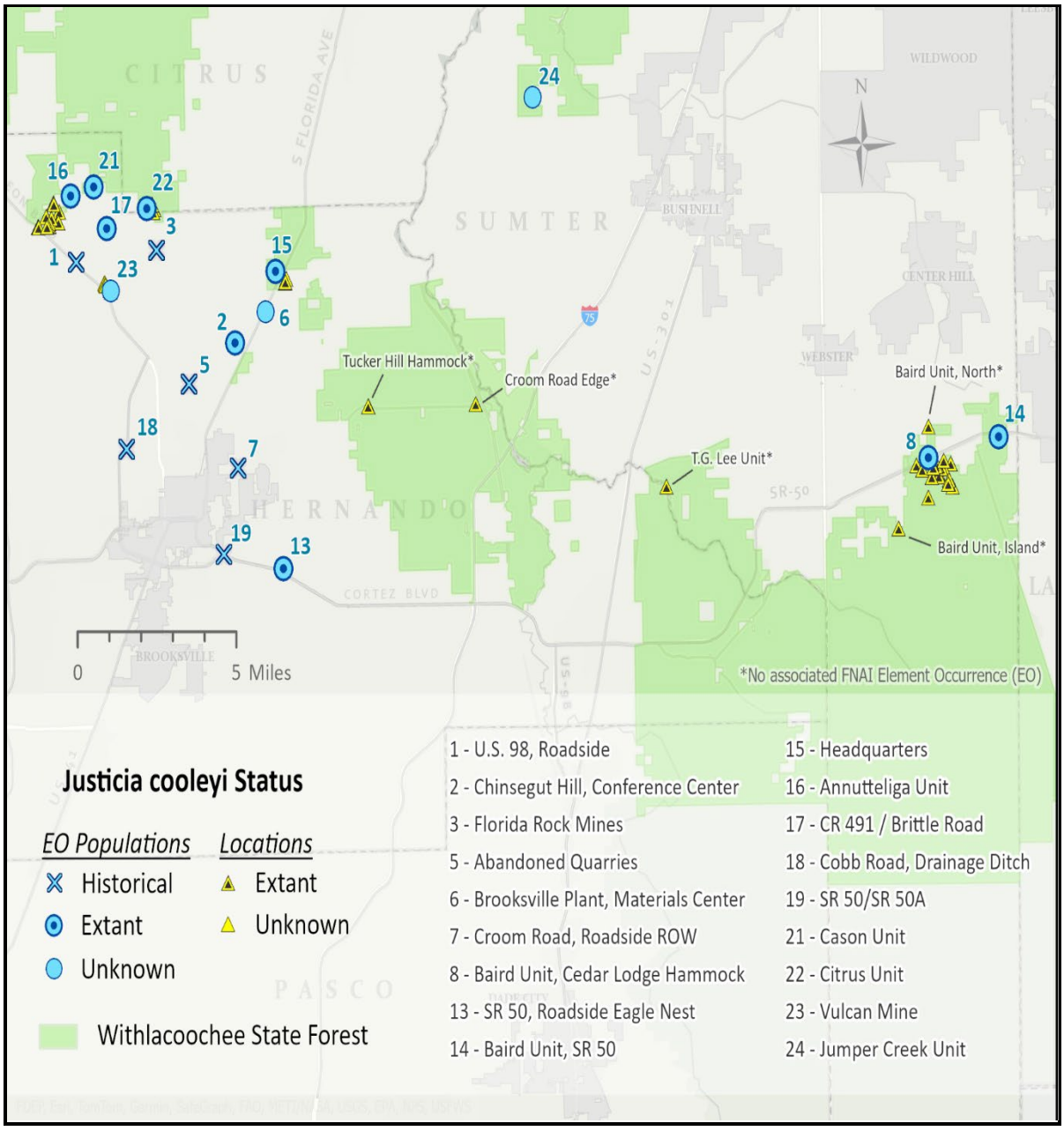

Figure 2. Documented *Justicia cooleyi* population locations (Historical and Extant) and the Withlacoochee State Forest boundaries.

Table 1 lists the known locations, date last observed, possible presences or estimate of individuals, and guesstimated population status. The eleven extant populations noted in the 2019 5-Year Status Review are marked with an asterisk (*) in Table 1 for comparison to this current 5-year review analysis. Additionally, three populations in Table 1 (EO 2, EO 13, and EO 17) were known but not reported in the 2019 5-Year Status Review. The populations with a double asterisk (**) in Table 1 were recently augmented and not considered separate populations.

Table 1. *Justicia cooleyi* populations (location name) and associated EO number, county of occurrence, last observation, and population estimates. Populations with asterisk (*) were noted as extant in previous 5-year review (2019). Populations with double asterisk (**) are recently augmented populations.

Location	EO #	County	Last Observed	Plants Recorded	Status
U.S. 98 Roadside	1	Hernando	1998	0	Extirpated
Chinsegut Hill Conf. Ctr. - FDEP	2	Hernando	2020	Unknown	Extant
Florida Rock Mines	3	Hernando	1959	0	Extirpated
Chinsegut Hill WEA	5	Hernando	1983	0	Extirpated
Brooksville Plant Materials Ctr.	6	Hernando	1995	Unknown	Unknown
Croom Road - Roadside ROW	7	Hernando	1992	0	Extirpated
*Baird Unit - WSF, Cedar Lodge Hammock (Merritt Pond Forest)	8	Sumter	2022	200+	Extant
SR 50 Roadside Eagle Nest	13	Hernando	2021	12	Extant
*Baird Unit - SR 50, WSF	14	Sumter	2022	Unknown	Extant
*Headquarters, WSF	15	Hernando	2024	~100	Extant
*Annutteliga Unit, WSF	16	Hernando	2024	~100	Extant
CR 491/Brittle Road, HCPW	17	Hernando	2021	500-1,000	Extant
Cobb Road Drainage Ditch	18	Hernando	2021	0	Extirpated
SR 50/SR 50A	19	Hernando	2021	0	Extirpated
*Cason Unit, WSF	21	Hernando	2022	Present	Extant
*Citrus Unit, WSF	22	Citrus	2023	Present	Extant
*Vulcan Mine	23	Hernando	2009	150+	Unknown
Jumper Creek Unit, WSF	24	Sumter	2008	?	Unknown
Tucker Hill Hammock, WSF		Hernando	2024	19	Extant
*Croom Road - Edge, WSF		Hernando	2020	?	Extant
*T.G. Lee Unit, WSF		Sumter	2015	?	Extant
*Baird Unit - North, WSF		Sumter	2015	?	Extant
*Baird Unit - Island, WSF		Sumter	2000?	50+	Extant
**Headquarters, WSF		Hernando	2024	103	Extant
**Tucker Hill Hammock, WSF		Hernando	2024	45	Extant

HCPW = Hernando County Public Works
FDEP = Florida Department of Environmental Protection
WEA = Florida Fish and Wildlife Conservation Commission Wildlife and Environmental Area
WSF = Withlacoochee State Forest

Extirpated Populations
Six populations are considered extirpated (Table 1). These extirpations were caused by direct habitat loss (conversion) and/or habitat degradation. In some locations lack of property owner permission (private lands) to conduct surveys has prevented the Service from validating the extirpation of the population. Six EO records have no data associated with them and are not included in Table 1 (EO's 4, 9, 10, 11, 12, and 20). These locations may have been merged into other EO records based on population distance criteria or did not meet the standard for an EO record.

Unknown Populations
Three populations have been classified as unknown for this review. Lack of current data and access issues preclude an exact population status for these three areas. Plants may still occupy habitat in or around the original data points; however, lack of current information precludes a status determination.

Extant Populations
Fourteen populations have been identified as extant for this review. Two additional locations are included in Table 1. that were recent population augmentations. These are not considered separate populations because of distance criteria (less than 0.6 miles separation and within the same mesic hammock). The lack of systematic plant counts either annually or periodically impedes our ability to determine the exact number of extant populations and a population's viability. Apart from the State Road 50 Roadside Eagle Nest (EO 13) population, the remaining 13 extant populations occur on public lands (Withlacoochee State Forest, Florida Department of Environmental Protection's Division of State Lands, and Hernando Public Works Department). Populations occurring on public lands greatly reduce the probability of direct habitat loss resulting from development or conversion to other land uses (agriculture), but habitat degradation remains a primary stressor to these locations because of invasive exotic plant species encroachment and negative impacts resulting from hog rooting that is prevalent in the habitat throughout the species range. The following population descriptions are a brief summary of what is currently known for each of these areas.

Chinsegut Hill Conference Center (EO 2)
The property is leased to Hernando County by the Florida Department of Environmental Protection's Division of State Lands. The population was first observed in 1977. No systematic counts have been accomplished for this population. The last observed record in 2020 indicated plants were present. Withlacoochee State Forest staff mapped two location points in 2019 on the westside of County Road 581 growing in the edge of a hammock and along the roadway easement. Over 1,000 plants were documented in 1995, but the area has a prevalence of invasive exotic plants. The area may no longer be capable of supporting the previous number of plants due to less suitable habitat conditions.

Baird Unit - Cedar Lodge Hammock (EO 8)
This population occurs within the Withlacoochee State Forest and was originally known as Merritt Pond Forest. Plants are scattered throughout the large mesic hammock and a flowering specimen was first collected in 1981. Most plants are found south of County Road 772. No systematic counts have been conducted by Withlacoochee State Forest staff but over 200

plants were observed in 2022. Invasive plant treatment is ongoing and feral hogs (*Sus scrofa)* are also a threat to this population.

The most northern portion of this population occurs within the Florida Department of Transportation State Road 50 right-of-way. A road-widening project on State Road 50 impacted a portion of this population. A collaborative plant "rescue" effort with Florida Department of Transportation, Florida Forest Service and Bok Tower Gardens was accomplished in 2022 by salvaging the individuals occurring within the Florida Department of Transportation State Road 50 right-of-way and translocating individual plants to augment existing populations in Withlacoochee State Forest. The plants recipient sites were the Headquarters (EO 15) and Tucker Hill Hammock populations.

SR 50 Roadside Eagle Nest (EO 13)
Located on private property, the population was first observed in 1995 at the base of an active bald eagle nest. It occurs in habitat that is very degraded with a large coverage of exotic plants. The population historically was around the base of a swamp chestnut oak (*Quercus michauxii*) near a large pine tree (*Pinus palustris*) with an active bald eagle nest near a wet depressional area. The plants now occur west of the original location sparsely scattered throughout an area dominated with exotic ground cover (*Nephrolepis cordifolia*) on residential lots. A total of 12 individual plants were observed by Service staff (Tiffany Lane, Todd Mecklenborg) in 2021 when collecting leaf samples for a genetic analysis project.

Baird Unit - SR 50 (EO 14)
The population occurs adjacent and within the Florida Department of Transportation State Road 50 right-of-way in the Withlacoochee State Forest and was first observed in 1990. No systematic surveys have been performed. The Florida Department of Transportation has been managing the exotic vegetation within their right-of-way by mowing (5 to 10 inches in height) along with herbicide treatments, which does not appear to be negatively affecting the population.

Headquarters (EO 15)
The Withlacoochee State Forest Headquarters population was first observed in 1990. Roughly 100 plants were observed in 2024 at 11 locations. Most of the plants occur on the east side of US Highway 41 and have expanded their footprint onto the adjacent private land. No systematic counts have been performed. Over grazing by deer, feral hog disturbance, and invasive exotic plants have been a cause for concern for this area. Invasive plant treatment has occurred annually since 2009. This population was a recipient site for plants that would have been impacted by the road widening at the Baird Unit - SR 50 (EO 8) population in 2022. The augmentation effort is intended to increase the population's resiliency.

Annutteliga Hammock Parcel (EO 16)
Florida Natural Areas Inventory records include plants growing in a hardwood hammock with areas of extensive rock outcrops and on the private lands along Parsons Road. First documented in 1992, an estimated 100 plants occur in 22 locations. Hog rooting and invasive exotic plants are a serious threat to this population. On-going invasive plant treatment has occurred since 2013.

CR 491/Brittle Road (EO 17)
The property is owned by Hernando County Public Works with the population occurring in a narrow strip along the roadway on the west side of Brittle Road in the adjacent hammock. The habitat suitability is very good and not currently threatened by invasive plants or hog rooting. The plants occur in a low area near an ephemeral drainage feature resulting from the roadway culvert, which receives runoff from the higher elevation on the east side of Brittle Road. First observed in 1992, Service staff observed between 500 to 1,000 plants during a research effort in 2021.

Cason Unit (EO 21)
Occurring in the Withlacoochee State Forest, the population was first documented in 2009. No systematic surveys have been accomplished, but plants are known to be present. Plants occur in a narrow strip of hardwood hammock between pine plantations. Invasive plants and feral hogs are a threat along with off-road vehicle disturbance. Periodic invasive species management has been implemented since population discovery.

Citrus Unit (EO 22)
Also a population within the Withlacoochee State Forest, this area was first noted to exist in 2006. No systematic plant counts have been conducted; however, 13 locations have been mapped. The plants occur in remnant upland hardwood hammocks on a former cattle ranch. Invasive plant treatments have been on-going since 2009. Feral hogs are also a threat.

Tucker Hill Hammock (EO not assigned)
This is a small population of no more than 19 plants in the Withlacoochee State Forest. Invasive plant treatment is on-going and feral hogs are a threat. This was a recipient site for the plants that would have been impacted by a roadway right-of-way improvement project at the Baird Unit - SR 50 (EO 8) in 2022. The augmentation effort is intended to increase the population's resiliency.

Croom Road - Edge (EO not assigned)
Discovered within the Withlacoochee State Forest in 2020, less than five plants were found on the edge of Croom Road growing among Bahia grass directly adjacent to the roadway pavement. Viability is unknown.

T.G. Lee Unit (EO not assigned)
Found in 2015 within the Withlacoochee State Forest, no systematic surveys have been performed, but plants are known to be present. Invasive plants and feral hogs are a threat to this population.

Baird Unit - North (EO not assigned)
Also found in 2015 within the Withlacoochee State Forest, no systematic surveys have been performed, but plants are known to be present. Invasive plants and feral hogs are a threat to this population.

Baird Unit - Island (EO not assigned)
More than 50 plants were observed by Withlacoochee State Forest staff in the early 2000s. The population occurs in a mesic hammock with scattered rock outcrops within the Withlacoochee State Forest and possibly on adjacent private land. Current plant presence is unknown, but the habitat is thought to be suitable.

Population Augmentation
There have been several plant translocations for population augmentations that have been accomplished since 2021. Plants were "rescued or salvaged" from the Baird Unit - SR 50 (EO 8) population in the Withlacoochee State Forest resulting from roadway improvement along State Road 50 in Sumter County. The recipient sites were the Headquarters (EO 15) and Tucker Hill Hammock populations also within the Withlacoochee State Forest.

Additional translocations occurred from seedling germination trials of plants propagated at Bok Tower Gardens in 2022 and 2024. The seed source was from County Road 491/Brittle Road (EO 17) population. The recipient site for the plantings occurred at Headquarters (Host Residence location) in 2023 and in the same population nearby (Hiking Trail location) in 2023. The Tucker Hill Hammock population was also a recipient site for additional plants in 2024. Approximately 128 individuals were planted during these efforts. Monitoring and invasive species control are on-going.

Genetic Analysis
As part of a research grant funded by the Service, genetic analysis of 146 individuals from 10 populations was performed on the genus *Justicia*. The analysis showed that one of the *J. cooleyi* populations from Hernando County may be genetically unique from others, and a high level of genetic structure may be present in the species. The authors suggest this work also demonstrated that *J. cooleyi* is indeed a true Florida endemic, and most likely not a naturalized, non-native species despite the fact that the species' closest relative is *J. galapagana* endemic to the Galapagos Islands (Kiel et al. 2018).

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 this assessment is detailed below. Generally, there is no indication that Factors B, C, D, and E pose a significant threat for the species. Factor A (habitat degradation) remains an ongoing threat.

Factor A. The present or threatened destruction, modification, or curtailment of its habitat or range.
Habitat degradation, and to a lesser degree habitat destruction, remain serious stressors to this species. The six population extirpations were attributed to habitat loss and degradation. Thirteen of the 14 extant populations reside on public lands, so habitat destruction (direct conversion to another land use) is less likely than if the populations occurred on private lands. Habitat degradation remains prevalent in all the populations because of the numerous invasive exotic plant species present and the widespread range of feral hogs. Off-road vehicle impacts have been identified in previous 5-year reviews; however, this does not appear to be a significant threat currently.

The Withlacoochee State Forest staff continues to conduct exotic species control within as many populations as possible given the agency's staff and budget constraints. The Service will continue to provide recovery action funds to the Withlacoochee State Forest through section 6 funding for these activities and explore other potential funding sources as opportunities become available. The Service's Coastal program is currently collaborating with Bok Tower Gardens and Withlacoochee State Forest by providing grant funding for genetic studies, phylogenetic analysis, population genetic analysis, collection and seed storage for germplasm storage along with population augmentations, introductions, and surveys.

Factor B. Overutilization for commercial, recreational, scientific, or educational purposes.
This factor has not been identified as a threat to the species.

Factor C: Disease or predation.
This factor has not been identified as a threat to the species.

Factor D: The inadequacy of existing regulatory mechanisms.
Florida's "Preservation of Native Flora of Florida" law (Rule Chapter 5B-40 of the Florida Administrative Code provides the Department of Agriculture and Consumer Services with limited authority to protect plants only when they occur on state-owned lands primarily from illegal harvest. This law allows for collection of plants on state-owned lands by permit only and only for scientific and educational purposes. Coupled with protection afforded by the Act, the existing regulatory mechanisms are adequate to protect this species.

Florida Forest Service protect and manage the forest resources of Florida, including Withlacoochee State Forest, ensuring that they will be available for multiple public uses, including timber, recreation and wildlife habitat. The State Forest is designated as part of the Environmentally Endangered Lands program. One of the Forest strategies includes: "Restore and manage healthy forests and native ecosystems, ensuring the long-term viability of populations and species listed as endangered, threatened or rare, and other components of biological diversity including game and nongame wildlife and plants" (Florida Forest Service 2014).

Factor E: Other natural or manmade factors affecting its continued existence.
The Service is not aware of any climate change information specific to the habits or habitat of *J. cooleyi* that would indicate what potential effects climate change and increasing temperatures and rainfall or extended drought conditions may have on this species.
The National Climate Assessment (NCA 2014) reports that the average precipitation has decreased in central Florida since 1900; however, heavy downpours are increasing in frequency and intensity since 1970. Future projected precipitation changes in seasonality for central Florida indicate 0 to +10% in winter, 0 to -10% in spring, -10 to -20% in summer, and +10 to +20% in fall will occur. Statewide annual rainfall is projected to increase from 0 to +20% by 2100. Sea level rise resulting from a warming climate and hotter water temperatures will not directly affect this species since it occurs in noncoastal areas. However, sea level rise in the range of 0.3-1.2 m (1-4 ft) by 2100, is expected to impact coastal Florida (Runkle et al.,

2022). Although this will not directly impact the species, this may change the influence of land use and population growth to the inland portions of the state where this species does occur.

Consecutive dry days are expected to increase 10 to 20% for most of Florida. Predictions of increased drought frequency, intensity, and duration could result in plant losses due to prolonged drought conditions. The Service has no evidence that climate changes observed to date have had any adverse impact on the species or its habitat, nor is there information suggesting that the species will not be able adapt to predicted changes in weather conditions.

Synthesis

Justicia cooleyi is a relatively small perennial herbaceous plant occupying mesic hardwood hammocks or hardwood pine forests in west-central peninsular Florida on the Brooksville Ridge. The known distribution is centered around the city of Brooksville in Hernando County and in the adjacent Citrus and Sumter counties. Fourteen populations have been identified as extant for this review. The exact number of extant populations or their viability is uncertain due to the lack of systematic plant counts for most of the populations. Thirteen of the 14 extant populations occur on public lands (Withlacoochee State Forest, Florida Department of Environmental Protection's Division of State Lands, and Hernando Public Works Department). Two populations have been augmented to increase their resiliency and potentially improve the population genetics as well. Habitat degradation remains the main threat to this species throughout its range (Factor A) that is compounded by the isolated, narrow geographic distribution and small number of extant populations on public lands. Currently, there is no available information to indicate how or if climate change may threaten the persistence of the species (Factor E). Because of the ongoing threats and small population sizes, the Service has determined *Justicia cooleyi* continues to meet the definition of endangered under the Act.

RECOMMENDED FUTURE ACTIVITIES

A. Determine if *J. cooleyi* is a valid species, specifically, if it's a synonym of *J. pringlei*.

B. Perform systematic surveys at known locations to determine viability and population trends.

C. Collaborate with land managers to increase beneficial habitat management in occupied habitat.

D. Provide funding to Withlacoochee State Forest for invasive exotic species habitat management in occupied habitat.

E. Expand surveys to included potential suitable areas for detection of new populations and potential introductions to increase resiliency on public lands.

F. Continue to support research on:
   - Effects of mowing and predator control,

- Life history needs,
- Microhabitat requirements, and
- Increased genetic understanding.

G. Increase transplant experiments, long-term seed viability trails, and optimizing germination protocols.

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RESULTS / SIGNATURES

U.S. Fish and Wildlife Service
Status Review of Cooley's Water-willow (*Justicia cooleyi*)

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

Approve NICOLE COLANGELO Digitally signed by NICOLE COLANGELO Date: 2024.08.19 19:10:21 -04'00'

* Since 2014, Field Supervisors in the Region have been delegated authority to approve 5-year reviews that do not recommend a status change. In the Florida Ecological Services Field Office, the Classification and Recovery Division Manager has delegated authority to approve 5-year reviews that do not recommend a status change.