

Interim Core Map Documentation for the Neches River Rose-Mallow

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Draft Interim Core Map Developer: Compliance Services International (CSI) on Behalf of Bayer CropScience

Species Summary

The Neches River rose-mallow (*Hibiscus dasycalyx*; Entity ID 6617) is a dicotyledonous threatened plant found in New Mexico. The U.S. Fish and Wildlife Service (FWS) has assigned designated critical habitat designated critical habitat for Neches River rose-mallow. This species inhabits sloughs, oxbows, terraces, and sand bars of depressional or low-lying areas and is endemic to open wetland habitats in the East Texas Pineywoods ecoregion. Additional habitat information is provided in **Appendix 1**.

EPA Review Notes

The developers created this core map using the U.S. Environmental Protection Agency's (EPA) process available at: <https://www.epa.gov/endangered-species/process-epa-uses-develop-core-maps-pesticide-use-limitation-areas>. EPA reviewed the draft interim map and documentation and evaluated if: (1) the map and documentation are consistent with the agency's process; (2) areas included or excluded from the interim core map are consistent with the biology, habitat, and/or recovery needs of the species; (3) data sources are documented and appropriate; and (4) the GIS data and mapping process are consistent with the stated intention of the developer. EPA agrees that this map is a reasonable depiction of core areas for this species and was consistent with the agency's mapping process. This documentation was not prepared by EPA, and EPA may have edited this documentation for clarity or other purposes. Some views in this documentation may not necessarily be the views of EPA or its staff.

The core map developed for this species is considered interim and can be used to develop pesticide use limitation areas (PULAs). 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 expert feedback from FWS.

This core map does not replace or revise any range or designated critical habitat developed by FWS.

Description of Core Map

The core map for the Neches River rose-mallow is biological information type based on critical habitat that is supplemented by extant population location data buffered by 600 ft. The most recent Recovery Plan Outline from FWS includes a textual description of habitats, and the critical habitat listing document provides details on the known location sites used to develop this core map (See **Appendix 1** for more information). Other available known location information from the Global Biodiversity Information Facility (GBIF), iNaturalist, and NatureServe databases were not used for core map development, as they did not improve on the datasets used for core map development.

The core map developed in this document for the Neches River rose-mallow spans 5,393 acres (**Figure 1**). A

summary of acreage by National Landcover Database (NLCD 2021) land use type is provided in **Table 1**.

Based on the EPA's "best professional judgment classification" system, CSI has graded this core map as "average" (3) because the core map is developed from critical habitat with limited additions from a trusted known location data source (the U.S. Geological Survey (USGS) Protected Areas Database of the United States (PAD-US, USGS 2023)) and addresses and roads identified using Google Maps and U.S. Census Bureau data, respectively. More information about this classification system and its definitions can be found in the core map process document (EPA 2024).

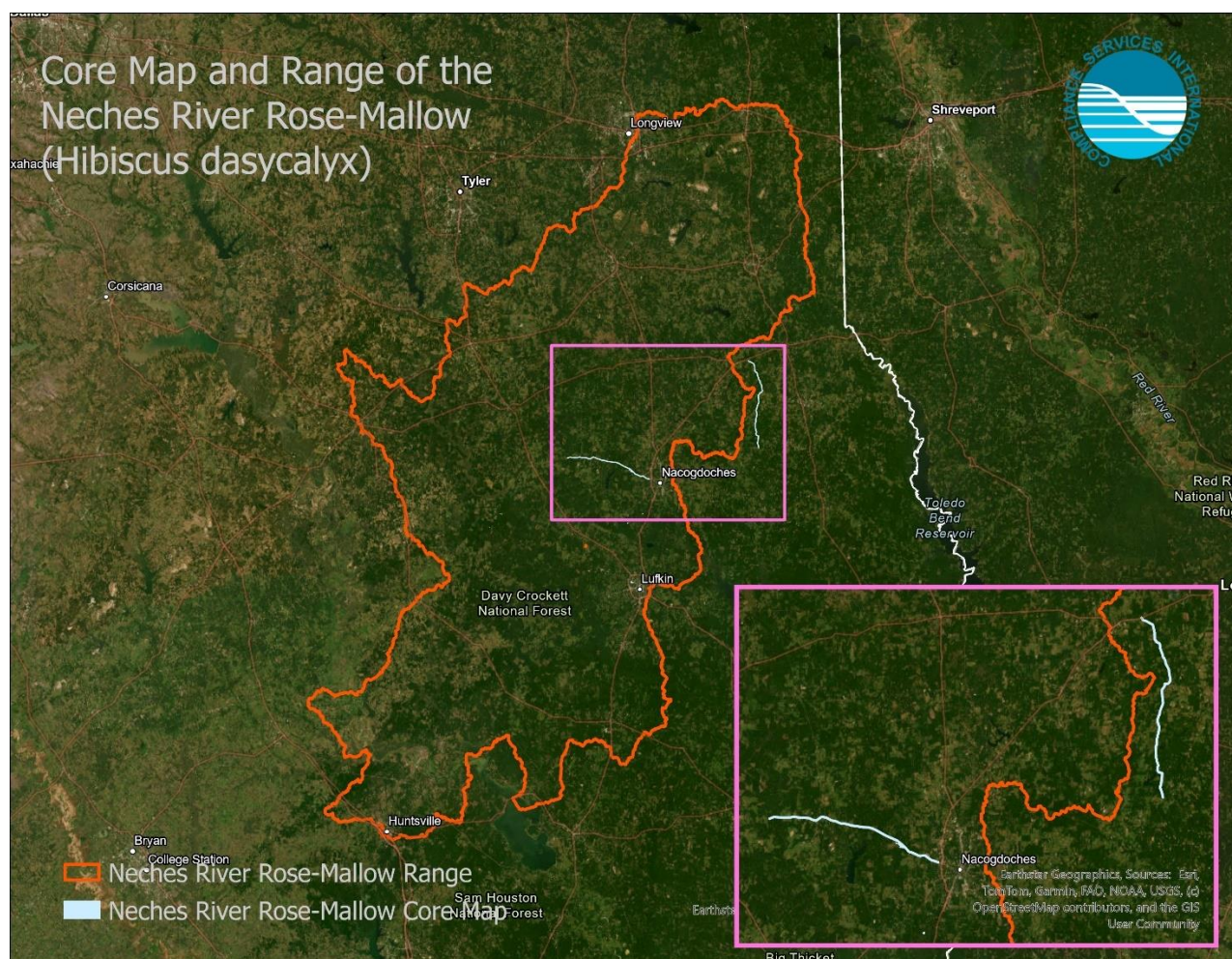


Figure 1. Interim core map for the Neches River rose-mallow (*Hibiscus dasycalyx*; Entity ID 6617). The core map spans 5,393 acres, while the range is 4,081,397 acres.

Table 1. Acres by National Land cover Database (NLCD 2021) class within the core map of the Neches River rose-mallow. Total core map area (based on NLCD pixel count): 5,392 acres¹.

NLCD_Land_Cover_Class	Acres	%
Hay/Pasture	1,454	17.8
Evergreen Forest	1,197	14.6
Mixed Forest	785	9.6
Developed, Open Space	417	5.1
Woody Wetlands	410	5.0
Developed, Low Intensity	351	4.3
Shrub/Scrub	312	3.8
Herbaceous	202	2.5
Developed, Medium Intensity	113	1.4
Open Water	54	0.7
Deciduous Forest	33	0.4
Developed, High Intensity	28	0.3
Emergent Herbaceous Wetlands	26	0.3
Barren Land	10	0.1

Evaluation of Known Location Information

There were four evaluated datasets with known location information:

- Descriptions of locations provided by FWS;
- Occurrence locations in iNaturalist;
- Occurrence locations in GBIF; and
- Occurrence locations in NatureServe.

Compliance Services International evaluated these four datasets before developing the core map. Overall, there were 10 usable research-grade observations found in iNaturalist². The GBIF dataset comprised 19 georeferenced observations, 11 of which were considered usable based on the criteria described below. The iNaturalist dataset was useful to validate the general accuracy of the Neches River rose-mallow range, but neither comprehensive nor precise enough to be used as a meaningful refinement of range in core map development. The GBIF dataset was entirely a subset of the iNaturalist data and was not used.

The FWS location information includes textual descriptions of areas of relevant occupancy that extend beyond the critical habitat boundaries; eight locations were identifiable using a combination of the U.S. Geological Survey Protected Areas Database of the United States (PAD-US), Google Maps, and U.S. Census Bureau data and contributed to the core map development process.

¹ This acreage is slightly different from the core map acreage (5,393) due to the pixelation of NLCD land cover. The core map is not developed from raster data.

² According to iNaturalist, an observation is designated as “research grade” if it 1) is verifiable with date, coordinates, photos/sounds, and not captive; 2) achieves community agreement defined as “more than 2/3 of identifiers needs to agree on the species level ID or lower;” and 3) “must pass a data quality assessment, which includes checks for accurate date and location, evidence of a wild organism, and clear evidence of the organism itself” (<https://help.inaturalist.org/en/support/solutions/articles/151000169936-what-is-the-data-quality-assessment-and-how-do-observations-qualify-to-become-research-grade->).

NatureServe public element occurrence (EO) data were also evaluated and are considered by CSI to of good quality for this species; however, these data were not considered for use in core map development because they do not represent more accurate location information than the designated critical habitat and known locations that were used.

Approach Used to Create Core Map

The core map was developed using EPA’s process for developing core maps for species listed by the FWS and their designated critical habitat (referred to as “the process”). This core map was developed by CSI using the four steps described in the process document:

1. Compile available information for a species;
2. Identify core map type from among the following defined types: critical habitat, range, and biological information. From EPA, summaries of each core map type are provided below (EPA 2024).
3. Develop the core map for the species; and
4. Document the core map.

For step 1, CSI compiled available information for the Neches River rose-mallow from FWS, as well as observation information available from various publicly available sources including iNaturalist, GBIF, and NatureServe. The information compiled for the Neches River rose-mallow is included in **Appendix 1**. Influential information that impacted the development of the core map includes a description of the species habitat from the Recovery Plan Outline:

- *‘All life stages of the plant... are found along sloughs, oxbows, terraces, and sand bars of depressional or low-lying areas in the Neches River floodplains, Mud Creek, or Tatanbogue Creek. This plant is endemic to the open, wetland habitats of the East Texas Pineywoods ecoregion. The canopy is open with little cover, allowing direct sunlight for the plant. Soils associated with these wetlands sites are hydric alluvial or sandy loams in the Inceptisol or Entisol orders’ (FWS 2018).*

For step 2, CSI used the compiled information including the species range, known locations, and habitat location information to determine the core map type. The known location data were compared to the range and critical habitat and found that known locations from larger databases (iNaturalist and GBIF) were too limited in extent compared to the critical habitat and supplementary sites to be used for core map development. Known location information from FWS was specific enough to easily identify supplementary sites from reliable data sources including the PAD-US dataset from USGS (2023) and a layer of roads from the U.S. Census Bureau (2020).

Although the Neches River rose-mallow would not be expected to be found on agricultural land (i.e., it is an “off-field” species), there is no agriculture in the area; therefore, no refinement was necessary to exclude cultivated land. When weighing this information together, CSI selected a critical habitat core map type, supplemented by extant observations in and near the species range. The critical habitat, PAD-US, U.S. Census Bureau, and Google Maps data sources described above were used to derive this core map.

For step 3, CSI used the best-available data sources to generate the core map. Data sources are discussed in the EPA’s core map process document. For this interim core map, CSI followed EPA’s decision framework to arrive at a core map type of critical habitat; this is because the Neches River rose-mallow has designated critical habitat that more accurately identifies critical areas for core map development than its much more

widespread range. **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

Other Known Observation Datasets

Datasets such as iNaturalist, GBIF, and NatureServe were considered but not used. NatureServe public EOs are viewable in their mapper as hexagons corresponding to locations where the species may have been observed. A refinement based on identifiable extant observation locations was selected in favor of these datasets, as it was usable without the need to buffer for positional uncertainty.

National Wetlands Inventory

Typically, it would be reasonable to refine a core map for a species with a large and/or unrefined range based on descriptions of its habitat, which can be mapped to land cover datasets such as the NWI. For the Neches River rose-mallow, the core map extent was small enough and based on critical habitat and precise location information such that a refinement based on national land cover datasets was not necessary. Therefore, no attempt was made to refine the core map using land cover datasets.

Appendix 1. Information compiled for the Neches River rose-mallow

1. Recent FWS documents

- Critical Habitat (2013) <https://www.federalregister.gov/documents/2013/09/11/2013-22083/endangered-and-threatened-wildlife-and-plants-designation-of-critical-habitat-for-texas-golden>.
- Recovery Outline (2018): https://ecos.fws.gov/docs/recovery_plan/Neches%20River%20Rose-Mallow%20Recovery%20Outline_Final_signed.pdf.

2. Background information

- Status: Federally listed as threatened in 2013.
- Resiliency, redundancy, and representation (the 3Rs) were not evaluated for this species.
- Habitat, Life History, and Ecology
 - 'All life stages of the plant (Figure 1) are found along sloughs, oxbows, terraces, and sand bars of depressional or low-lying areas in the Neches River floodplains, Mud Creek, or Tatanbogue Creek. This plant is endemic to the open, wetland habitats of the East Texas Pineywoods ecoregion. The canopy is open with little cover, allowing direct sunlight for the plant. Soils associated with these wetlands sites are hydric alluvial or sandy loams in the Inceptisol or Entisol orders. Proximity to a floodplain provides seasonal inundation of water in the winter months and is thought to be the key mechanism for seed dispersal. At a minimum, the soil surface dries out during the summer months. Typical native woody associates include *Carya aquatic*, *Cephalanthus occidentalis*, *Celtis laevigata* var. *laevigata*, *Fraxinus* sp., *Quercus lyrata*, *Q. nigra*, *Liquidambar styraciflua*, and *Salix nigra*' (FWS 2018).
 - 'Reproduction: The rose-mallow is a perennial plant and may be long-lived; however, life expectancy is unknown. Cross-pollination occurs (Blanchard 1976). The species may have high reproductive potential (fecundity) as it produces about 50 fruits per plant (Poole 2012, pers. comm., in 77 FR 55974). Fruits are capsules largely enclosed in the calyx prior to dehiscence, with pubescence composed of simple, stellate and glandular hairs. Seeds are locule, globose, and densely stellate-pubescent (Poole et al. 2007), but seed viability and survivorship are unknown. Potential pollinators may include bumble bees, Hibiscus bee, moths, and the scentless plant bug' (FWS 2018).
 - 'Precipitation: Plants need consistent amounts of rain to sustain reproductive function and growth. Precipitation is evenly distributed throughout the year. Average annual rainfall in the Pineywoods ranges from 40 – 60 in (98 – 152 cm)' (FWS 2018).

	Life Stage	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Life Stage	Budding												
Life Stage	Leafing												
Life Stage	Flowering												
Life Stage	Fruiting- seed set												
Life Stage	"dormant"												
Habitat	Dry – no standing water												
Habitat	Wet – standing water												

Figure 2. Habitat and Life Stages of the Neches River rose-mallow.

Taxonomy

- 'The genus *Hibiscus* naturally hybridizes in the nursery trade. The *Hibiscus* species at several rose-mallow sites contain individuals that may be products of crosses between the rose-mallow and two congeners, the *H. laevis* or *H. moscheutos*. Hybridization has been noted at the Cherokee County site (Banta 2017, Miller 2016). Previous genetic studies conducted by Mendoza (2004) and Warnock (1995) did not specifically investigate hybridization. The University of Texas – Tyler (UT-Tyler) published research identifying the relatedness between rose-mallow and its congeners (Banta 2017, Norrell 2017). Their research suggests that *H. dasycalyx* and *H. laevis* are more closely related than *H. dasycalyx* and *H. moscheutos*. Banta (2017) found that *H. dasycalyx* is a separate taxon, but that hybridization with *H. laevis* is occurring, presenting a pervasive threat. Ecological niche modeling found that rose-mallow is predicted to generally be closer to the banks of waterways than its congeners. It is found in very flat, broad, frequently-flooded areas with highly erodible alluvial deposits (Banta 2017). Given this data, the Service does not question the validity of the species, and accepts that the rose-mallow is a genetically and ecologically distinct species' (FWS 2018).
- Relevant Potential Pesticide Use Information
 - 'Herbicide Application: Rose-mallow is susceptible to both direct and indirect effects from herbicide application.' (FWS 2018).

Recommended Management Actions and Timeframes for Rose-mallow (G. Grant; March 23, 2015)

Activity	Jan	Feb	Mar	Apr	May	June	July	Aug
Mow	YES	YES	YES	NO	NO	NO	NO	NO
Burn	YES	YES	YES	NO	NO	NO	NO	NO
Broadleaf Herbicide (2, 4-D)	YES	YES	NO	NO	NO	NO	NO	NO
Nonselective Herbicide (Glyphosate)	YES	YES	NO	NO	NO	NO	NO	NO
Grass Herbicide (Sethoxydim/Flauzifop)	YES	YES	YES	YES	YES	YES	YES	YES

- Relevant Recovery Criteria and Actions
 - Minimum Viable Population (FWS 2018)

'To guide what is needed for the conservation of the species, we relied upon Pavlik's 1996 Minimum Viable Population (MVP) analysis tool. Based on this analysis, best known scientific information on the species' life history, best known scientific information on the species' reproductive characteristics, and input from species experts, we concluded in 2012 that at least 10 viable populations of the rose-mallow, each containing an average of about 1,400 individuals, was the conservation goal of the species (77 FR 56002).'

3. Range

- Historic and Current Range: The natural geographic range is within Trinity, Houston, Harrison, and Cherokee counties, Texas, on SH ROWs, as well as private and Federal lands (FWS 2018).

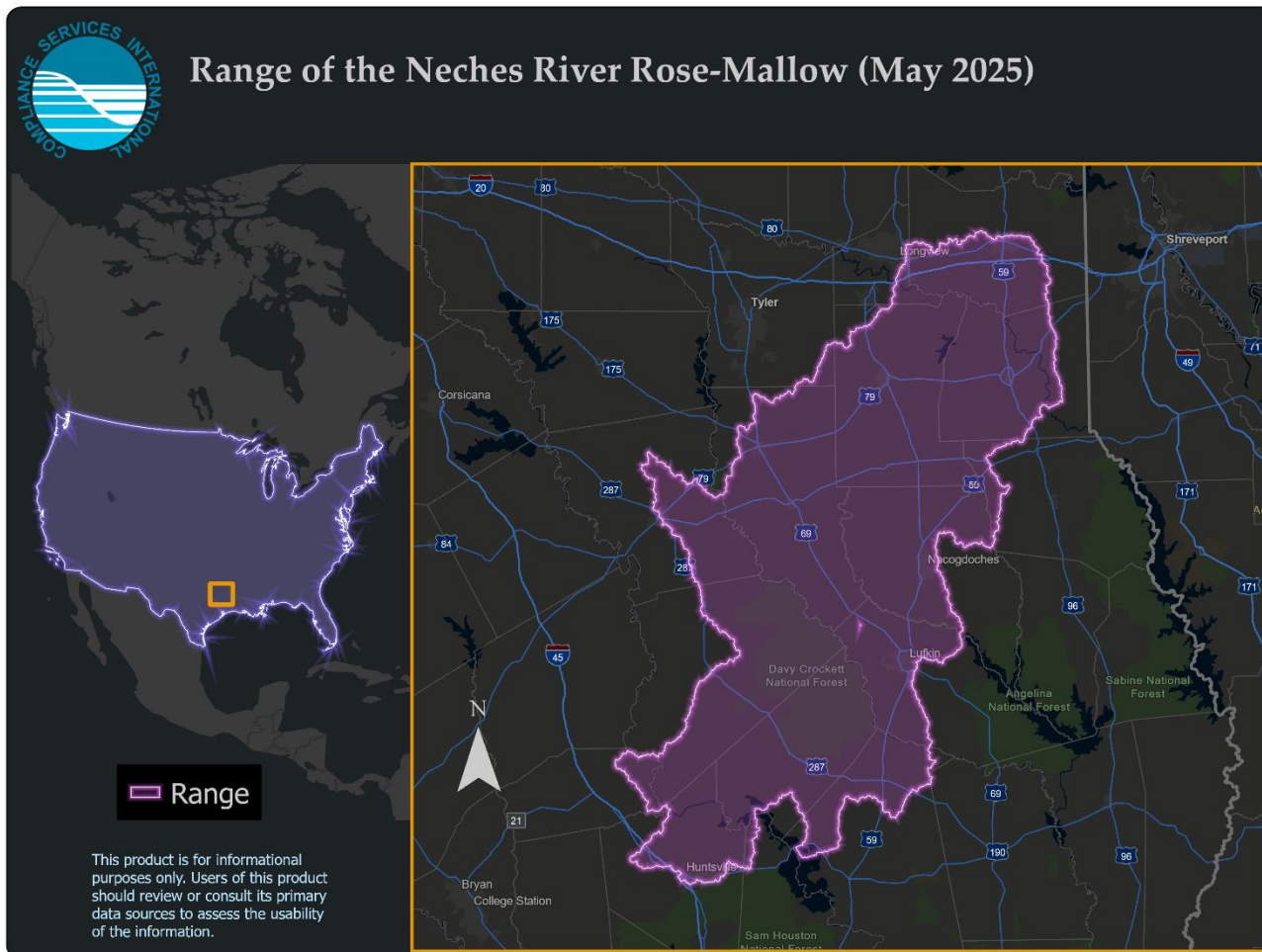


Figure 3. Range of the Neches River rose-mallow (FWS 2025).

4. Description of Critical Habitat (FWS, 2013)

- Critical habitat designated in 2013.
- Designated habitat includes approximately 166.5 ac (67.4 ha) of critical habitat for the Neches River rose-mallow in Cherokee, Houston, Trinity, Harrison, and Nacogdoches Counties, Texas (**Figure 4; Figure 5**).
- The primary constituent element of the physical or biological features essential to the conservation of *Hibiscus dasycalyx* is intermittent or perennial wetlands within the Neches, Sabine, and Angelina River floodplains or Mud and Tantabogue Creek basins that contain:
 1. Hydric alluvial soils and the potential for flowing water when found in depressional sloughs, oxbows, terraces, side channels, or sand bars; and.
 2. Native woody or associated herbaceous vegetation, largely with an open canopy providing partial to full sun exposure with few to no nonnative species.

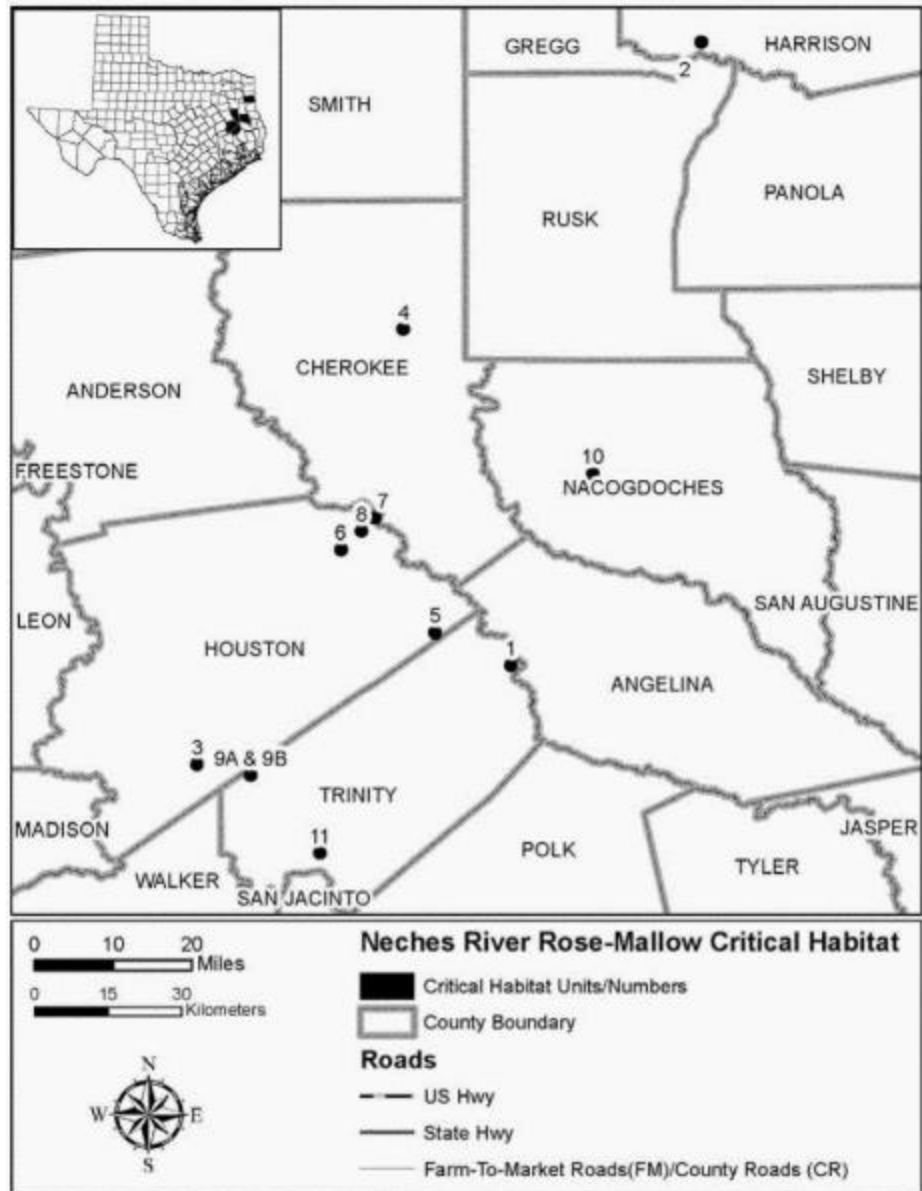


Figure 4. Index Map. Critical Habitat for *Hibiscus dasycalyx* (Neches River rose-mallow). Copied from the critical habitat listing document (FWS 2013).

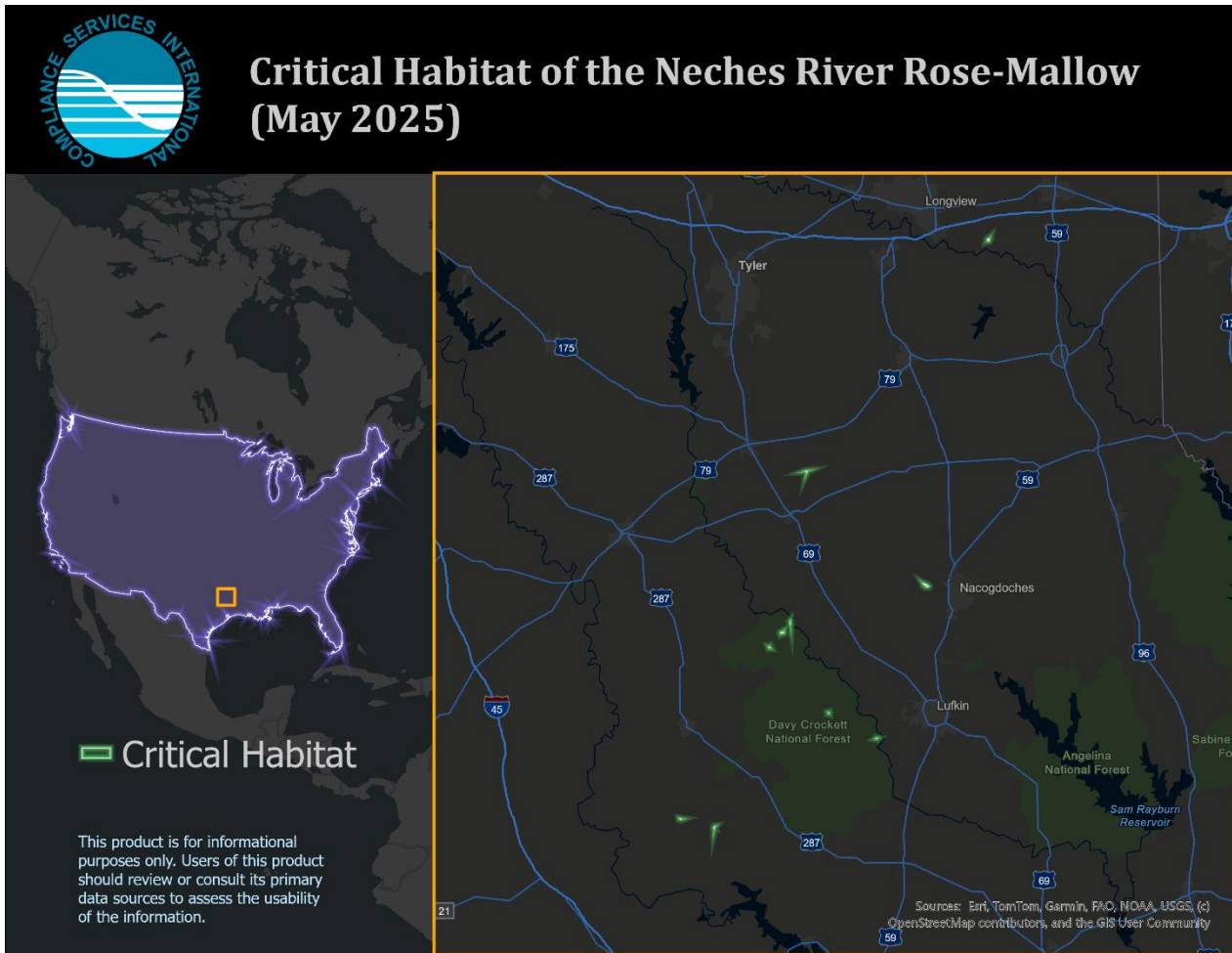


Figure 5. Critical habitat of the Neches River rose-mallow (FWS 2025).

5. Known Locations

- See 'Current Range' section for known location information.
- 'To date, there are 8 natural, extant sites within the species' geographic range with planned introductions on Federal and private property (Table 1; see section regarding Introductions). Most of the sites were visited as recently as 2016 or 2017. The species has also been introduced on Federal, private, and county property, both within and outside of the species natural geographic range. Sites in Harrison County, Champion, and Camp Olympia have not been observed in the last 20-30 years. The Service considers these three sites extant as they still contain the physical and biological features essential to the rose-mallow. Details about the population status can be found in Table 1' (FWS 2018).

Table 2. The extant populations within the geographic range of the Neches River rose-mallow (from the 2018 Recovery Outline).

Site	County	Land Ownership	First Date Observed	Last Date Observed	Population status
Highway 94 ROW/Boggy Slough	Trinity	State	1955	August 2016	Plants were collected in 2014 by Banta and students as part of ongoing genetics work. In August 2015, 2 plants were observed in right-of-way (ROW); 6-7 additional plant sites found on the property. The Critical Habitat (CH) unit is being choked out by vegetation (B. Kartye, A. Miller, J. Reid). In 2016, large survey efforts on private land and ROW found numerous plants. Plants were identified in the CH unit, however, none were found along the tree line as in the past.
Harrison County***	Harrison	Private	1980?	(2016)	The Sabine Mining Company (SMC) using best location information describing CH unit 2 of Final Listing Rule to conduct 3 years of surveys for the site for presence/absence of plant. One of those sites, the South Hallsville No. 1 Mine, Permit 33H in Harrison and Rusk counties, was most recently visited by the Service, Railroad Commission of Texas, SMC in 2016. This site was originally designated as critical habitat in 2013 as CH unit 2 (77 FR 56004). The 2016 survey was conducted to facilitate the Permit 33H renewal process. The SMC committed to completing 3 survey events of the renewal areas, specifically in areas of suitable habitat. SMC identified 4 areas of suitable habitat, however rose-mallow plants have not been located during the 2014 or 2016 survey effort. An additional survey is underway to compile a total of 3 survey events (Blackland Environmental 2017).

Lovelady	Houston	Private	1991	June 22, 2017	As of April 2016, site was inundated with water. A survey was conducted in July 2016 where there were 6 large polygons mapped and plants counted; all part of one large population. Herbivory was noted on some plants. Samples were also collected by University of Texas (UT) - Tyler as part of ongoing genetics research. Site was visited in June 2017 by Service, Texas Parks and Wildlife Department (TPWD), The Land Conservancy (TLC), and Mercer Arboretum and Botanic Gardens (Mercer) to survey population and discuss site as potential reintroduction efforts (see reintroduction section for more detail).
Highway 204 ROW/Mud Creek	Cherokee	State	1992	July 2016	Aerial spraying by contractors along ROW damaged 3-4 plants in 2013. Site visited by TxDOT and Service biologists in July 2016. Evidence of hybridization present. Samples were also collected from this site in April 2016 by UT-Tyler as part of ongoing genetics research.
Davy Crockett NF, Compartment 55	Houston	Federal	2000	2016	Found by USFS biologists in 2000. Sites relocated in 2002 and 2005. Monitored since. Large survey effort in 2011 by Service, TPWD, U. S. Forest Service (USFS) – found plants. Drought occurred in 2011, but plants still seemed healthy despite climate conditions and herbivory. Heavy rains in 2015 made site inaccessible for survey counts. Site inundated with water. Concerns with herbicide by an adjacent landowner (P. Loos). Site visited in June/July 2017; plants in flower but stunted. In July 2017, USFS treated Chinese tallow; post-treatment monitoring has not been conducted (T. Philipps, pers. comm. 2017).
Davy Crockett NF, Compartment 11 (introduced)	Houston	Federal	2004	2016	Introduced in 2004. Surveyed in 2006, 2010, and 2011. Surveyed most

Cont.

site)					recently by Peter Loos, USFS, and Service in 2016. Plants were not observed; site may be extirpated due to failure of dam, resulting in alteration of the hydrology and increased sedimentation at site. Other species, including loblolly pine, have invaded the rose-mallow habitat, resulting in out-shading.
Davy Crockett NF, Compartment 20 (introduced site)	Houston	Federal	2000	2016	Introduced in 2000. Surveyed in 2002, 2006, 2010, and 2011. Surveyed most recently by Peter Loos, USFS, and Service in 2016. Plants seemed healthy, with obvious signs of reproduction.
Davy Crockett NF, Compartment 16 (introduced site)	Houston	Federal	2000	2016	Introduced in 2000. Surveyed in 2002, 2003, 2006, 2010, and 2011. Surveyed most recently by Peter Loos, USFS, and Service in 2016. Plants were present, but some impacted by herbivory.
Champion***	Trinity	Private	1996	2001	Hundreds of plants in 1997; about 300-400 plants in 2001. The site has not been located or re-verified since 2001.
Mill Creek Gardens (introduced site)	Nacogdoches	Private	1995	July 6, 2017	In coordination with the landowner, we accessed the site in July 2016 and July 2017. In 2016, the site had hundreds of plants within the spillway or wet, depression area. Vegetation in the spillway was thick and full of water due to heavy rains. Observed 1-2 plants that didn't look like pure rose-mallow (Miller 2016b). In 2017, the site was also very wet, but there were many flowering plants. Some plants had herbivory damage, but most were in good condition. We only noticed a few plants that looked like potential hybrids. Site might need maintenance work in future.
Camp Olympia***	Trinity	Private	1977	1992	This site was designated as CH unit 9 in 2011 since it had the physical and biological features essential to rose-mallow. However, site has not been observed since 1992. TPWD is undertaking work near the Camp

					Olympia site on Lake Livingston, as part of a Reservoir Fish Habitat Partnership grant. These plantings are part of a fisheries enhancement project. Through the Section 7 consultation process, the Service requested that TPWD survey all shoreline within and adjacent to the planting area, as records indicate an occurrence for rose-mallow from 1992. TPWD surveyed areas along the bank in 2015 and 2016. All surveys were completed jointly by TPWD and Trinity River Authority biologists during the June to August blooming period. Several <i>Hibiscus</i> species were observed, but they were not identified as rose-mallow nor to the species level.
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***Sites that have not been observed in 20-30 years but are considered extant.

- Introduced Populations (From the 2018 Recovery Outline)

Eight introduced populations have been identified since critical habitat was designated. Information regarding these populations is as follows:

The Collins Academy, in Jefferson, Marion County, Texas (private)

The Service learned of this introduction in September 2014 (L. Gray, pers. comm., 2014). Rosemallow was planted at the Port Jefferson History and Nature Center in 2013. The status of this reintroduction is unknown.

Winston 8 Ranch, Nacogdoches County, Texas (private)

This site is in Nacogdoches County on private land. The Service's Partners for Fish and Wildlife (PFW) program initiated this introduction in 2014 with about 200 plants.

Frank Morris Park in Lufkin, Angelina County (City of Lufkin)

This site was originally found in 2014 along one section of the pond's perimeter by the Service's PFW biologist. An observation by U.S. Forest Service (USFS) biologist in June 2016 found that plants had migrated from their original location along the edge of the pond, to large clumps of individual plants in front of the ponds covered observation deck. The total area covers between 2-3 acres.

East Texas Plant Materials Center (U.S. Department of Agriculture (USDA), Natural Resource Conservation Service (NRCS) – federal)

Plants were propagated from seeds collected from the SH 204/Mud Creek population in Cherokee County in 2015. Seeds were grown out and plants were placed in a wetland pond at the PMC. Shadow (2018) reported that plants were stable and the population did not appear to have any hybrids (A. Shadow, pers. comm. 2018).

Keith-Weiss Park, Harris County, Texas (City of Houston)

The Service became aware of this site on July 20, 2017, from a botanist at Mercer Arboretum and Nature Center (Mercer). The Service was unaware of this planting and was not asked to participate in the planning process.

Demonstration Garden, in Center, Texas, Shelby County (state ROW)

Rose-mallow was planted along the edge of a small cypress swamp on Farm-to-Market Road (FM) 1545 in Shelby County. The source for this population is unknown. The status of plants at this site is also unknown.

Douglass, Texas – along Highway 21, Nacogdoches County (private)

The U. S. Army Corps of Engineers' (USACE) records indicate that more than 1/3 acres of wetlands were impacted without a permit to construct a parking lot and recreation area at the Old Spanish Trail Restaurant on Highway 21 in Douglass, Texas. To mitigate the impacts, the applicant offered to restore 2.21 acres on-site and additional acres off-site. As part of this planting effort, Dr. David Creech of SFA planted about 100 rose-mallow plants along the riparian edge. The landowners have not been contacted since 2011. However in June 2016, the site was healthy, with many flowers in bloom (D. Creech, pers. comm. 2016).

Gayle Mize Garden, Stephen F. Austin State University, Nacogdoches County (public)

This demonstration garden was planted in 2012, with stock plants from the Hibiscus Preserve (Lovelady) in Houston County. A second colony of rose-mallow is growing at the north end of the Pineywoods Native Plant Center, in a rainwater catchment basin. A third population was planted at the Pineywoods Native Plant Center marsh by the horticultural facility; this area is burned annually (D. Creech, pers. comm. 2018).

- GBIF: <https://www.gbif.org/species/3152550>
 - GBIF includes seventy-nine occurrence records; nineteen of which are georeferenced (Figure 6). Eleven of these had usable coordinate data based on these criteria:
 - U.S. only (excludes Mexico)
 - Latitude and longitude precision were both 3+ decimal places.
 - Coordinate uncertainty values no greater than 30 km³.
 - Relative recency (2010-present)
 - Must include date information.
 - No “preserved specimen” observations; only “human observation.”
 - The eleven usable coordinates were mapped against the species range to evaluate their utility in representing species extent (**Figure 7**). It was observed that all the usable GBIF coordinates are originally sourced from iNaturalist, which had the same number of records⁴. Therefore, the GBIF dataset was not used for core map development.

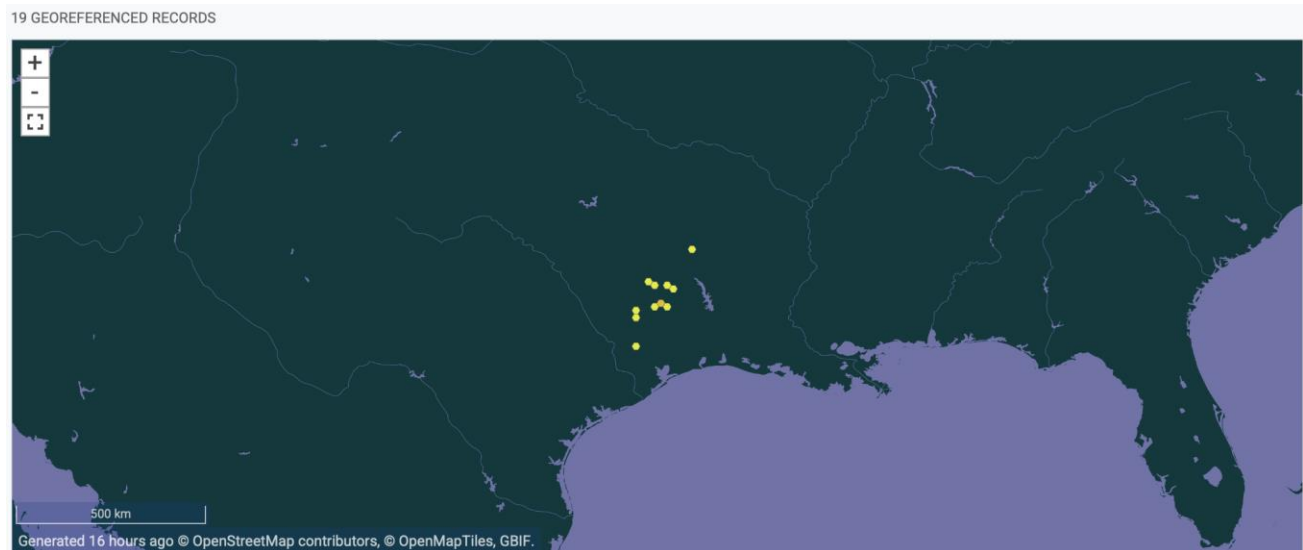


Figure 6. GBIF occurrences for the Neches River rose-mallow (GBIF 2025).

³ For “obscured” observations, public positional accuracy (PPA) represents the diagonal of a 0.2 x 0.2 arc cell. See the iNaturalist geoprivacy page for more details on this and related terms [What is geoprivacy? What does it mean for an observation to be obscured? : iNaturalist Help](#).

⁴ The data downloaded directly from iNaturalist had one less usable data point because its positional uncertainty was larger than the threshold value, while GBIF showed it as less than the threshold value. Therefore, this distinction was not considered and the GBIF dataset is considered identical to the iNaturalist dataset.

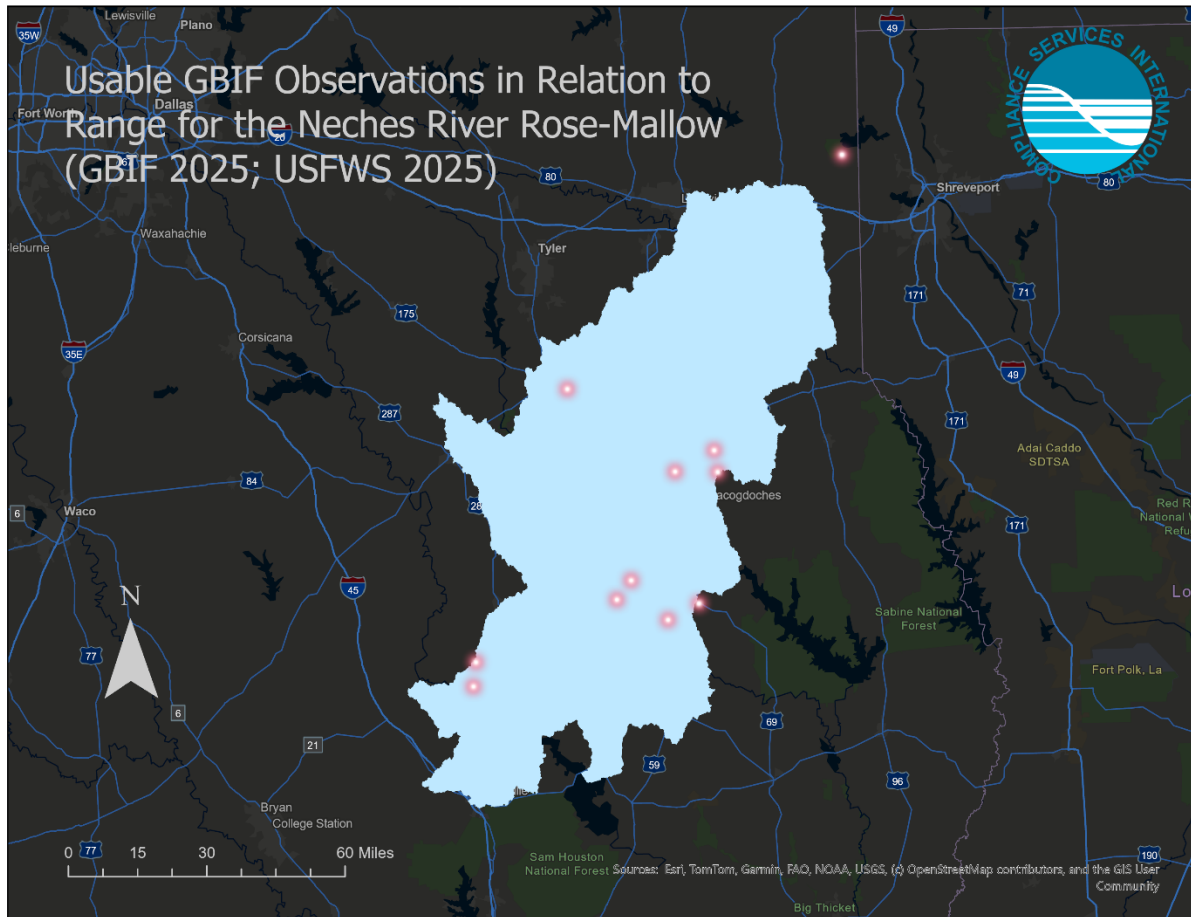


Figure 7. Usable GBIF occurrences (pink) in relation to the Range of the Neches River rose-mallow (GBIF 2025; FWS 2025).

- iNaturalist: https://www.inaturalist.org/observations?taxon_id=163764
 - iNaturalist includes fifteen total observations (**Figure 8**), ten of which are research-grade with usable coordinate data based on these criteria:
 - U.S. only (excludes Canada)
 - Latitude and longitude precision were both 3+ decimal places.
 - Relative recency (2010-present)
 - Observation description did not include the text “intentionally incorrect.”
 - Public positional accuracy (PPA) value no greater than 30 km⁵
 - This resulted in the exclusion of one record.
 - Locations are consistent with GBIF, which is expected because all the GBIF observations are imported from iNaturalist.
 - One iNaturalist location is just outside of the range of the Neches River rose-mallow; however, all the observations intersect the range when accounting for the PPA uncertainty value (**Figure 9**).
 - The iNaturalist data are useful in providing insight into where the species is more commonly found. When buffered, these data are not more precise than the known location data available from FWS documentation.

⁵ For “obscured” observations, public positional accuracy (PPA) represents the diagonal of a 0.2 x 0.2 arc cell. See the iNaturalist geoprivacy page for more details on this and related terms [What is geoprivacy? What does it mean for an observation to be obscured? : iNaturalist Help](#).

Neches River Rosemallow

Location

Go

Filters



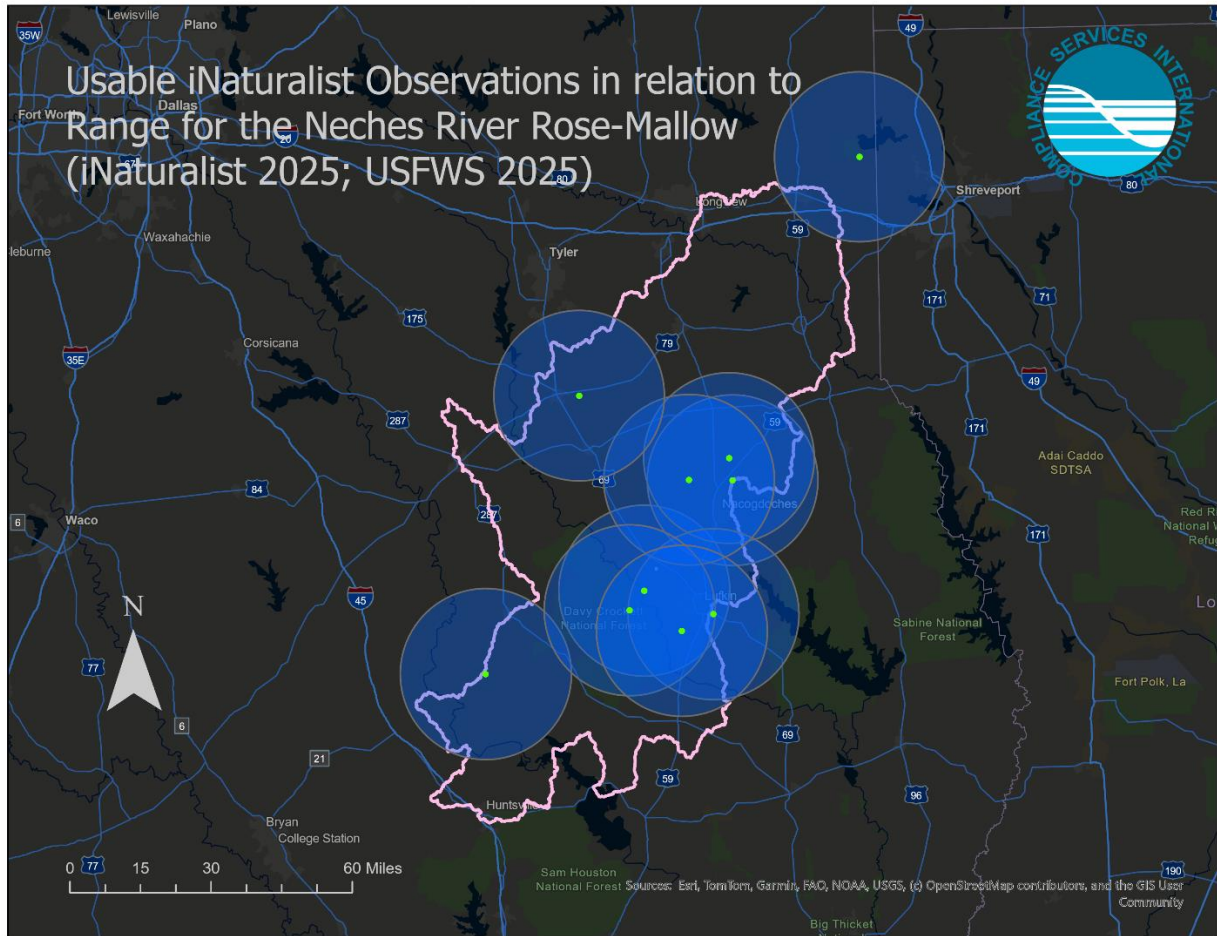


Figure 9. Usable iNaturalist observations, buffered by PPA, for the Neches River rose-mallow in relation to species range (iNaturalist 2025; FWS 2025).

- NatureServe Explorer: <https://explorer.natureserve.org/>
 - Available public occurrence information from NatureServe Explorer aligns with the information from iNaturalist and GBIF.
 - EOs were generally consistent with the range; however, these observations were not as precise as the known occurrence data published in FWS documentation and therefore did not factor into the development of the core map.

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

The core map for this species is based on critical habitat, expanded to include some known extant sites that are catalogued in the FWS recovery outline document (FWS 2018). The non-critical habitat features of the core map are based on known observations; point and linear datasets were buffered to a fixed arbitrary distance of 600 ft without further biological refinement.

1. References and Software

- Software used: ArcGIS Pro version 3.2.
- U.S. Census Tiger/Line Roads: <https://www2.census.gov/geo/tiger/TIGER2024/ROADS/>.
- U.S. Geological Survey (USGS)'s Protected Areas Database of the United States, PAD-US (2024): <https://www.sciencebase.gov/catalog/item/652d4fc5d34e44db0e2ee45e>.
- FWS Critical Habitat (2013): <https://www.federalregister.gov/documents/2013/09/11/2013-22083/endangered-and-threatened-wildlife-and-plants-designation-of-critical-habitat-for-texas-golden>
- FWS Recovery Outline (2018): https://ecos.fws.gov/docs/recovery_plan/Neches_River_rose-mallow_Recovery_Outline_Final_signed.pdf.
- FWS Species Range and Critical Habitat (2025): <https://ecos.fws.gov/ecp/species/1441>.

2. Datasets Used in Core Map Development

2.1. Range and Critical Habitat

The range for this species was last updated by FWS on August 23, 2023, and its critical habitat was designated on Sept. 11, 2013. Shapefile including species ranges and critical habitats for all listed species were downloaded from the FWS ECOS website on May 5, 2025. The shapefiles were converted to feature classes stored in a file geodatabase and reprojected to WKID #102008 ("North America Albers Equal Area Conic").

1. Using an ArcGIS Web Map the species was queried based on the ECOS listed "Entity ID" of 6617 and exported as a feature class to a temporary file geodatabase as a standalone Entity ID-specific layer.
2. The area of the range was calculated automatically by loading it into the software (ArcGIS Pro version 3.2) and reading its area from the attribute table ("Shape_Area"), then converting its units (square meters) into acres with a conversion factor of 0.000247105.

This shapefiles were added to an ArcGIS Pro map and compared against the known observation datasets. The critical habitat was used to form the basis of the core map but was supplemented with other observation data.

2.2. FWS Recovery Outline (2018)

Review of the species' status included examination of site locations identified in the 2018 recovery outline document. FWS has identified sites where the species is known to occur, that are extant outside areas of critical habitat and important to the species' continued survival (**Table 2**). First, attempts were made to identify these sites in the PAD-US dataset as described below. The resulted in the identification of just one out of eight non-critical habitat sites.

Next, sites were identified using Google Maps. When the site could be identified this way, addresses were noted and manually converted into coordinates to facilitate the creation of a spatial data layer. Five additional sites were identified this way.

Two additional sites from the recovery outline could not be found this way:

- Douglass, Texas – along Highway 21, Nacogdoches County (private) The U. S. Army Corps of Engineers' (USACE) records indicate that more than 1/3 acres of wetlands were impacted without a permit to construct a parking lot and recreation area at the Old Spanish Trail Restaurant on Highway 21 in Douglass, Texas. To mitigate the impacts, the applicant offered to restore 2.21 acres on-site and additional acres off-site. As part of this planting effort, Dr. David Creech of SFA planted about 100 rose-mallow plants along the riparian edge. The landowners have not been contacted since 2011. However in June 2016, the site was healthy, with many flowers in bloom (D. Creech, pers. comm. 2016).
- Demonstration Garden, in Center, Texas, Shelby County (state ROW) Rose-mallow was planted along the edge of a small cypress swamp on Farm-to-Market Road (FM) 1545 in Shelby County. The source for this population is unknown. The status of plants at this site is also unknown.

2.3. U.S. Geological Survey (USGS) Protected Areas Database of the United States (PAD-US)

According to USGS, PAD-US is “America’s official national inventory of U.S. terrestrial and marine protected areas that are dedicated to the preservation of biological diversity and to other natural, recreation and cultural uses, managed for these purposes through legal or other effective means. PAD-US also includes the best available aggregation of federal land and marine areas provided directly by managing agencies, coordinated through the Federal Geographic Data Committee Federal Lands Working Group.”

In the case of the Neches River rose-mallow, the PAD-US dataset was queried for known site locations identified in FWS documentation that are outside of the species’ designated critical habitat areas. Only one site—Frank Morris Park in Lufkin, Texas—was found this way. The site was identified using the following query and incorporated into the map according to the procedure detailed in **Appendix 2** Section 3.

- Unit_Nm LIKE '%Morris Frank%' And State_Nm = 'TX'

2.4. U.S. Census Tiger/Line: Roads

The descriptions of the observations in Douglass, Texas (“along Highway 21 in Nacogdoches County”) and Center, Texas (“along the edge of a small cypress swamp on Farm-to-Market Road (FM) 1545 in Shelby County”) were not usable as observable points, but rather as identifiable linear features. To represent these features of the core map, shapefiles of roads and highways in Nacogdoches and Shelby counties were obtained from the U.S. Census website and loaded into a Geographic Information System (GIS). Highway 21 and FM1645 were manually identified, and linear features selected that adequately spanned the distances that would capture the sites as described in the FWS Recovery Outline document. These lines (roads) were exported as standalone layers and buffered to 600 ft to conservatively represent the distance the species may have been found from the edge of the road. Note that this distance is not based on species-specific information, as none could be identified—it is only intended to be conservative.

3. Creating the Core Map

3.1. Defining Extent

The core map for the Neches River rose-mallow was developed using a combination of critical habitat and other extant sites identified in PAD-US, by address, or identified roadside/highway right-of-way (ROW).

The extent used for core map development was created as follows:

1. Import the species critical habitat as a feature class named “NRRM_CH.” Choose to export this layer—and all subsequent layers—into the preferred projection (WKID #102008).
2. Import the PAD-US dataset. Use the combined “Proclamation, Marine, Fee, Designation, Easement” layer to query for Morris Frank Park (Unit_Nm LIKE '%Morris Frank%' And State_Nm = 'TX'). Export

as a standalone feature class named "Morris_Frank_Park".

3. For the following extant population sites, which were identified using Google maps, populate an empty points feature class ("NRRM_sites") using the coordinates identified below:
 - Collins Academy, Jefferson, Marion County TX (32.761429, -94.350117)
 - Winston 8 Ranch Nacogdoches County TX (31.526185, -94.714759)
 - Frank Morris Park Lufkin Angelina County TX (31.351420, -94.752933)
 - East Texas Plant Materials Center (31.502556, -94.763453)
 - Keith-Weiss Park Harris County Texas (29.892126, -95.344186)
4. Use the Pairwise Buffer tool to buffer the previous layer ("NRRM_sites") by 600 ft to account for positional uncertainty and save as a new layer ("NRRM_sites_pb600ft").
5. Import a layer of roads and highways from the U.S. Census Bureau for Nacogdoches and Shelby, TX counties. Identify Highway 21 and FM 1645 roads (linear features) to represent the extant sites located with those respective counties. Save each as "Hwy21_Douglass" and "FM1645" respectively.
6. Use the Pairwise Buffer tool to buffer the previous layers ("Hwy21_Douglass" and "FM1645") by 600 ft and save as new standalone layers, "Hwy21_Douglass_pb600ft" and "FM1645_pb600ft".
7. Use the Merge tool to merge the following layers into a single layer, "NRRM_merge".
 - NRRM_CH
 - Morris_Frank_Park
 - NRRM_sites_pb600ft
 - Hwy21_Douglass_pb600ft
 - FM1645_pb600ft
8. Use the Pairwise Dissolve tool to dissolve the previous layer ("NRRM_merge") into a feature class with a single shape, saved as "NRRM_merge_pd".
9. (Optional) Export the previous layer ("NRRM_merge_pd") into a feature class with a file name recognizable as the core map of the Neches River rose-mallow, "Neches_River_rose_mallow_CoreMap".

3.2. Cultivated Lands-based Refinement

The Neches River rose-mallow is not expected to be found in agricultural areas, so a refinement to exclude areas of agriculture would have been appropriate. However, it was observed that the output from the last geoprocessing step above ("NRRM_merge_pd") contained no cultivated land according to NLCD. Therefore, the step of removing cultivated areas > 25 acres was considered unnecessary and thus was not performed.

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Documents

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