

Interim Core Map Documentation for the Bracted Twistflower

Version 1

Review Completed: April 2026

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

Species Summary

The bracted twistflower (*Streptanthus bracteatus*; Entity ID #1678) is a threatened terrestrial plant (dicot). This species occurs only along the southeastern edge of the Edwards Plateau in central Texas. The Bracted twistflower blooms in the spring and is pollinated by leafcutter bees and other native bee species. A designated critical habitat for this species was established on April 11, 2023. Additional information is provided in **Appendix 1**.

Description of Core Map

The core map for the bracted twistflower is biological information based on the designated critical habitat developed by the U.S. Fish and Wildlife Service (FWS). During development of the critical habitat, FWS included all the element occurrences (EOs) for the bracted twistflower, and refined their designation based on physical or biological features necessary to support the bracted twistflower. FWS' critical habitat also excluded areas that were developed because these areas cannot support the bracted twistflower. However, EPA's review of the known locations found evidence that there are occurrences of bracted twistflower that exist outside of the critical habitat. For this reason, EPA included known location data from the Texas Parks and Wildlife Department (TPWD), which was then refined to exclude medium to high intensity developed areas. **Figure 1-1** depicts the interim core map for the bracted twistflower.

Figures 1-2—1-4 zoom in to the three representation areas (northeastern, central, western) of the interim core map. The total area of the interim core map represents approximately 2,000 acres. Landcover categories within the core map area are included in **Table 1**, which is predominantly evergreen forest and shrub/scrub.

The core map developed for the bracted twistflower is considered interim. This core map will be used to develop pesticide use limitation areas (PULAs) that include the bracted twistflower. 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 interim core map has a "limited" (2) best professional judgment classification because it consists of the species' critical habitat with limited additions or subtractions. The core map is based on the designated critical habitat, but EPA added known location data from TPWD within the last 25 years. Also, EPA removed areas of medium to high intensity development, as well as open water. In combination, the resulting critical habitat and known location data from TPWD contain most of the known location data from iNaturalist and the Global Biodiversity Information Facility (GBIF). This core map does not replace or revise any range or critical habitat developed by FWS for this species.

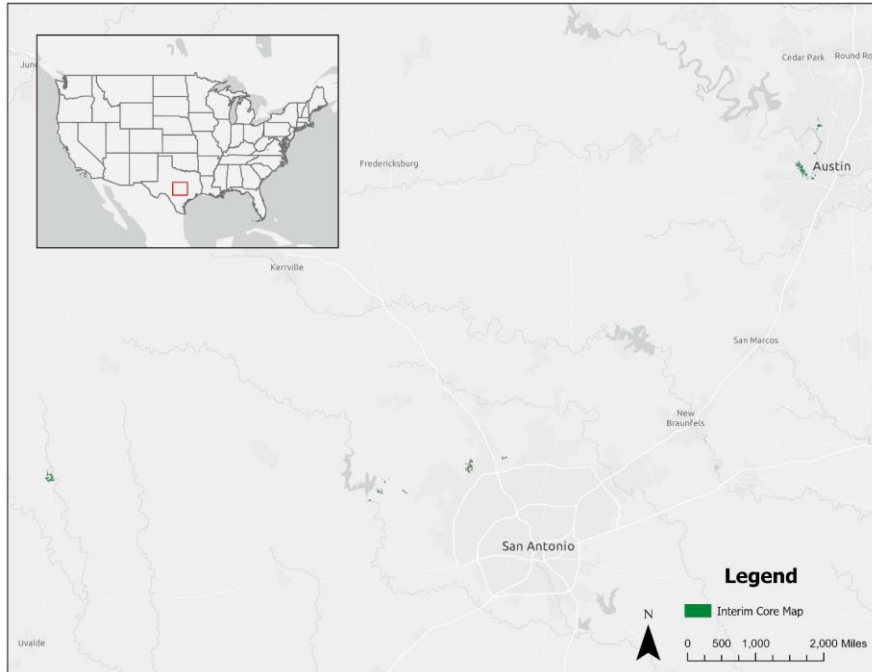


Figure 1-1. Interim core map for the bracted twistflower. The total acreage of the core map is approximately 2,000 acres.

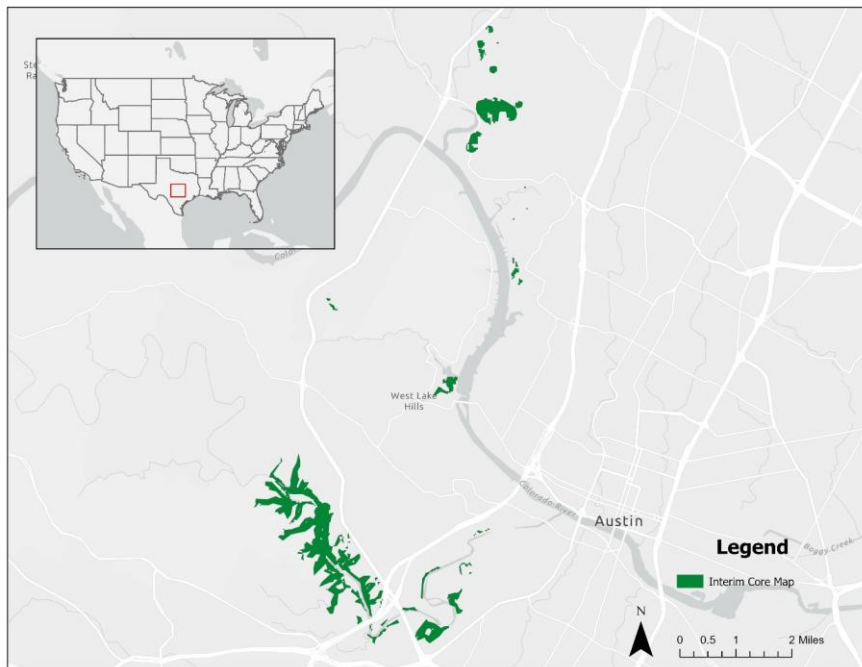


Figure 1-2. Interim core map of the bracted twistflower in the northeastern representation area.

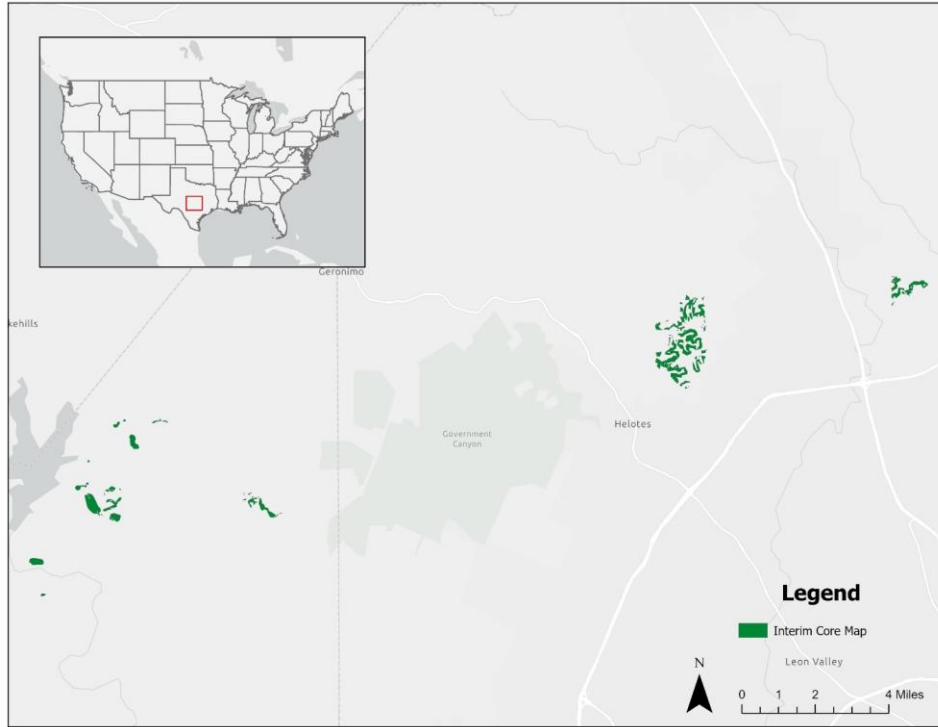


Figure 1-3. Interim core map of the bracted twistflower in the central representation area.

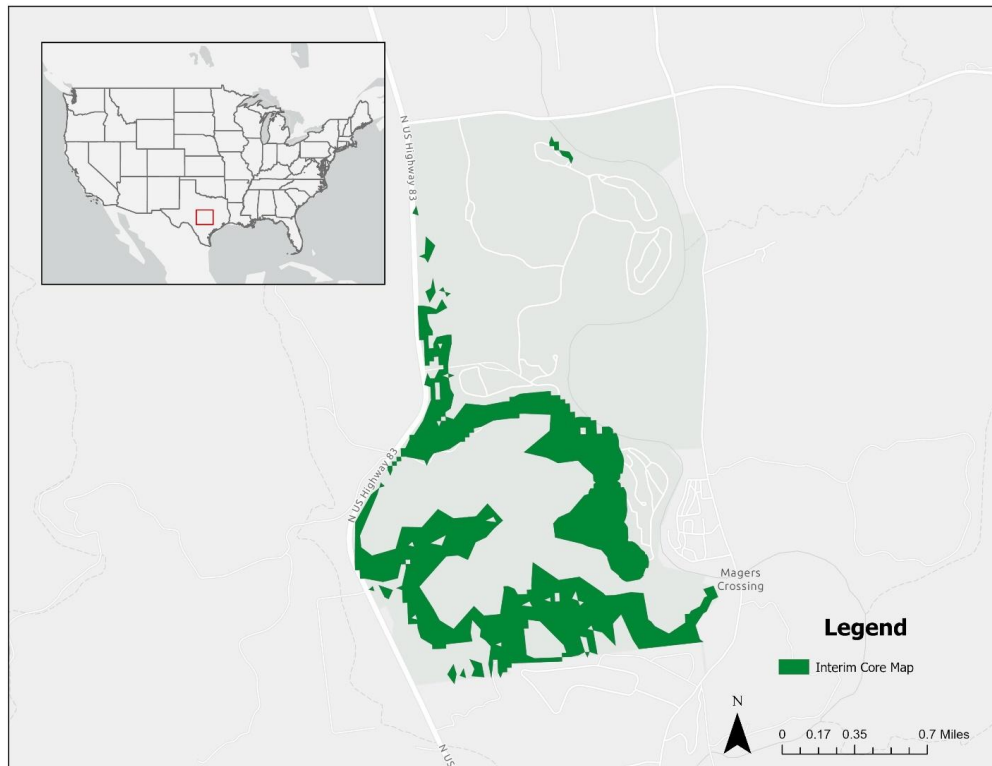


Figure 1-4. Interim core map of the bracted twistflower in the western representation area.

Table 1. Percentage of Interim Core Map Represented by NLCD¹ Land Covers and Associated Example Pesticide Use Sites/Types.

Example pesticide use sites/types	NLCD Landcover (Value)	% of core map represented by landcover
Forestry	Deciduous Forest (41)	1%
Forestry	Evergreen Forest (42)	84%
Forestry	Mixed Forest (43)	0%
Agriculture	Pasture/Hay (81)	0%
Agriculture	Cultivated Crops (82)	0%
Mosquito adulticide, residential	Open space, developed (21)	3%
Mosquito adulticide, residential	Developed, Low intensity (22)	3%
Mosquito adulticide, residential	Developed, Medium intensity (23)	0%
Mosquito adulticide, residential	Developed, High intensity (24)	0%
Invasive species control	Woody Wetlands (90)	1%
Invasive species control	Emergent Herbaceous Wetlands (95)	0%
Invasive species control	Open water (11)	0%
Invasive species control	Grassland/herbaceous (71)	0%
Invasive species control	Scrub/shrub (52)	8%
Invasive species control	Barren land (rock/sand/clay; 31)	0%
Total Acres	Interim Core Map Acres	~2,032 acres

Evaluation of Known Location Information

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

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

EPA evaluated these sets of data before selecting the type of and developing the core map. TPWD appeared to have the finest resolution of the known location data. Also, FWS’ 2023 Species Status Assessment (SSA), the 2023 Recovery Outline, and *Endangered and Threatened Wildlife and Plants: Threatened Species Status with Section 4(d) Rule for Bracted Twistflower and Designation of Critical Habitat* (herein referred to as, “2023 Critical Habitat Designation”) detailed known locations of this species. FWS described three representation areas (i.e., sectors within the species’ range where important constituents of genetic and ecological diversity occur) with 17 documented occurrences that are extant and extirpated. Currently, there are 14 extant populations, which have locations that are consistent with the interim core map. iNaturalist had 67 research grade observations. GBIF had 150 observations listed between 1849 and 2025. Occurrences in NatureServe were also included in the other two databases. The occurrences in public databases were consistent with the interim core map given

¹ Dewitz, J., 2023, National Land Cover Database (NLCD) 2021 Products: U.S. Geological Survey data release, <https://doi.org/10.5066/P9JZ7AO3>

the resolution and positional accuracy of the data and did not support expanding the core map beyond the area in Figure 1. **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”² (referred to as “the process”). This core map was developed by EPA and was developed using the four 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 bracted twistflower from FWS as well as observational information available from various publicly available sources (including TPWD, iNaturalist, GBIF). The information compiled for the bracted twistflower is included in **Appendix 1**. Influential information that impacted the development of the core map included:

- Current existing populations occur in locations consistent with the critical habitat.
- The species’ critical habitat is highly refined.
- Occurrence data provided by TPWD
- Urban and residential development is the most significant threat to the bracted twistflower.

For step 2, EPA used the compiled information to identify the core map type, including the species range, critical habitat, and known location information. EPA compared known location data to the range and critical habitat and found that the FWS known locations of currently existing (extant) populations are consistent with the location of the critical habitat. TPWD occurrences of the bracted twistflower included locations outside of its critical habitat. Therefore, EPA based the interim core map on the critical habitat developed by FWS supplemented by the known locations provided by TPWD. EPA then refined the core map to exclude areas of medium to high intensity development since these areas significantly threaten this species. Open water areas were also excluded from the critical habitat and TPWD known locations because the bracted twistflower does not grow on open water. The entire species’ range was not used as the interim core map because the range is much larger than the areas where known locations occur and contains habitat that is not suitable for the bracted twistflower.

For step 3, EPA used the critical habitat and species information provided by FWS and known location information provided by TPWD for the bracted twistflower. EPA downloaded the critical habitat from FWS’s Environmental Conservation Online System (ECOS) (<https://ecos.fws.gov/ecp/>).

² Dated 2024, available online at: <https://www.epa.gov/endangered-species/process-epa-uses-develop-core-maps-pesticide-use-limitation-areas>

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

EPA considered using Geographic Information System (GIS) datasets that describe canopy cover since the reproductive output of the bracted twistflower is highest in areas where woody plant coverage is 50% or less. However, this approach was not used because adding the tree canopy dataset would have increased uncertainty in the results (i.e., add areas that are unsuitable habitat for the bracted twistflower) without providing substantial benefit.

Appendix 1. Information Compiled for Species

1. Recent FWS Documents/Links

- [Species Status Assessment for Bracted Twistflower \(*Streptanthus bracteatus* A. Gray\)](#) (January 1, 2023).
- [Endangered and Threatened Wildlife and Plants; Threatened Species Status with Section 4\(d\) Rule for Bracted Twistflower and Designation of Critical Habitat](#) (April 11, 2023).
- [Recovery Outline *Streptanthus bracteatus* \(Bracted Twistflower\)](#) (June 2, 2023).

2. Background information (Source: 2023 Species Status Assessment)

- Status: Federally listed as threatened on April 11, 2023
- Resiliency, redundancy, and representation (the 3Rs)
 - The minimum viable population size (MVP) is at least 1,800 mature individuals. FWS reported that there were only four moderately resilient element occurrences (EOs) with potential populations at 50% of the MVP level. There is also another protected EO (Ullrich) that is considered viable, but the potential population is only estimated at approximately 27% of the MVP level. All other EOs are currently considered too small, far below the MVP, lost to development, or have not been seen in recent years. Therefore, the overall species resilience is low.
 - There are three representation areas of bracted twistflower: northeast, central, and west areas. The northeast and central areas have a moderate degree of redundancy with ten EOs ranked in high to medium condition. However, in these areas, there are four EOs in low condition that are nearly extirpated, and two EOs already extirpated in the northeast area. The west area only has one EO ranked in medium condition, but that EO hasn't reported a population pulse in recent years, and the other EO in the western area is ranked in low condition. With only two of the three representational areas exhibiting redundancy, the overall species redundancy is considered low.
 - At the species level, the bracted twistflower has adequate genetic and ecological representation. However, some of the EOs, particularly those with small population sizes, have low genetic diversity and inbreeding.
- **Habitat, Life History, and Ecology (Source: 2023 Species Status Assessment)**
 - **Habitat:** "Bracted twistflower inhabits juniper-oak woodlands of the Edwards Plateau of central Texas." It is likely that the bracted twistflower's optimal habitat is along the edges or canopy gaps, however, severe herbivory from white-tailed deer and other ungulates has pushed the species into sub-optimal habitat amongst shrub thickets for protection.
 - **Reproduction/pollinators:**
 - "Flowers begin opening in April, peak in May, and are occasionally seen as late as July. The capsules begin developing soon after the flowers are fertilized and remain attached to the stalks during the summer as they mature and dehisce, releasing the seeds. [...] Seeds disperse by gravity, although other mechanisms, such as water flowing over the soil, may also occur."
 - Pollinators include: leafcutter and other native bees
- **Taxonomy (Source: 2023 Species Status Assessment)**
 - FWS Category: Flowering dicot plants

- **Relevant Pesticide Use Sites in FWS Documents (Source: 2023 Critical Habitat Designation)**
 - Specific pesticide use sites were not discussed in available FWS documents.
- **Relevant Recovery Criteria and Actions (Source: 2023 Recovery Outline)**
 - FWS’ “recovery strategy addresses the principal threats of severe herbivory, juniper and shrub competition, and low levels of resilience, redundancy, and genetic and ecological representation. In addition, the strategy includes public outreach [...] and scientific investigations on the species’ fire ecology and its associations with specific geological substrates.” The following recovery actions will be implemented under an approved recovery plan:
 1. “Protect existing populations on public and private conservation land from severe herbivory by white-tailed deer and other introduced ungulates.”
 2. Promote vegetation management practices (prescribed burns, fencing, deer herd and/or wood plant management, etc.) to benefit the bracted twistflower.
 3. Search for additional populations, promote conservation of those newly identified populations, and reintroduce populations on viable conservation land.
 4. “Prevent the demographic collapse of small populations.”
 5. “Prevent the genetic collapse of small populations.”
 6. “Promote conservation and awareness of bracted twistflower on private lands.”
 7. “Additional research to support conservation efforts.”

3. Description of the species range (Source: 2023 Species Status Assessment)

- The current range stretches along the eastern and southern edge of the Edwards Plateau, also known as the Balcones Escarpment zone. This range spans about 143 miles across five Texas counties (Bexar, Hays, Medina, Travis, Uvalde).
- **Figure A1-1** depicts the current FWS species range (last updated July 12, 2022).
- The species range is approximately 2,500,000 acres.

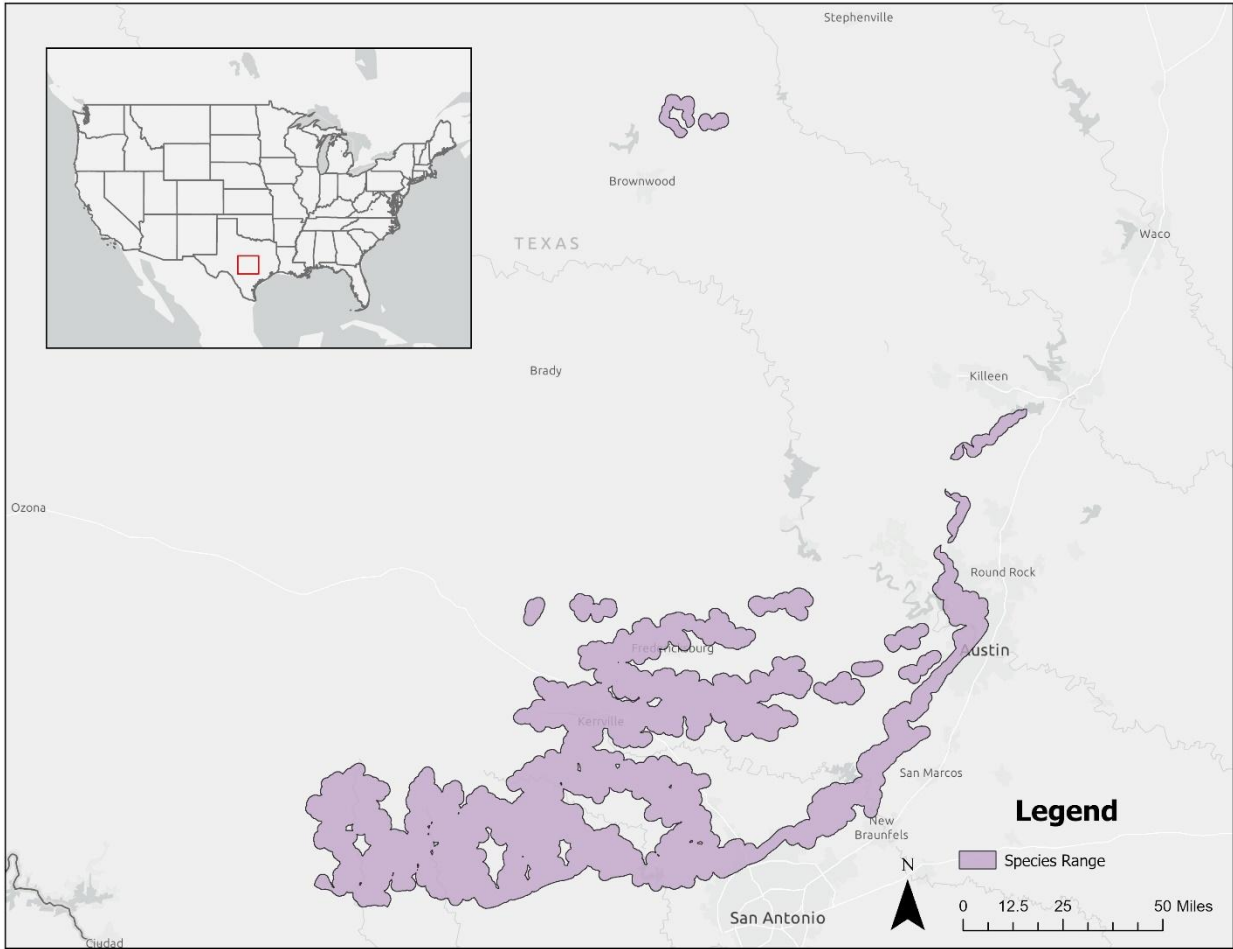


Figure A1-1. FWS Range of the bracted twistflower.

4. Designated Critical Habitat (Source: 2023 Five Year Review)

- Bracted twistflower’s critical habitat was developed in 2023. The area is approximately 1,596 acres.
- **Figures A1-2, A1-3, A1-4, and A1-5** depict the current critical habitat.

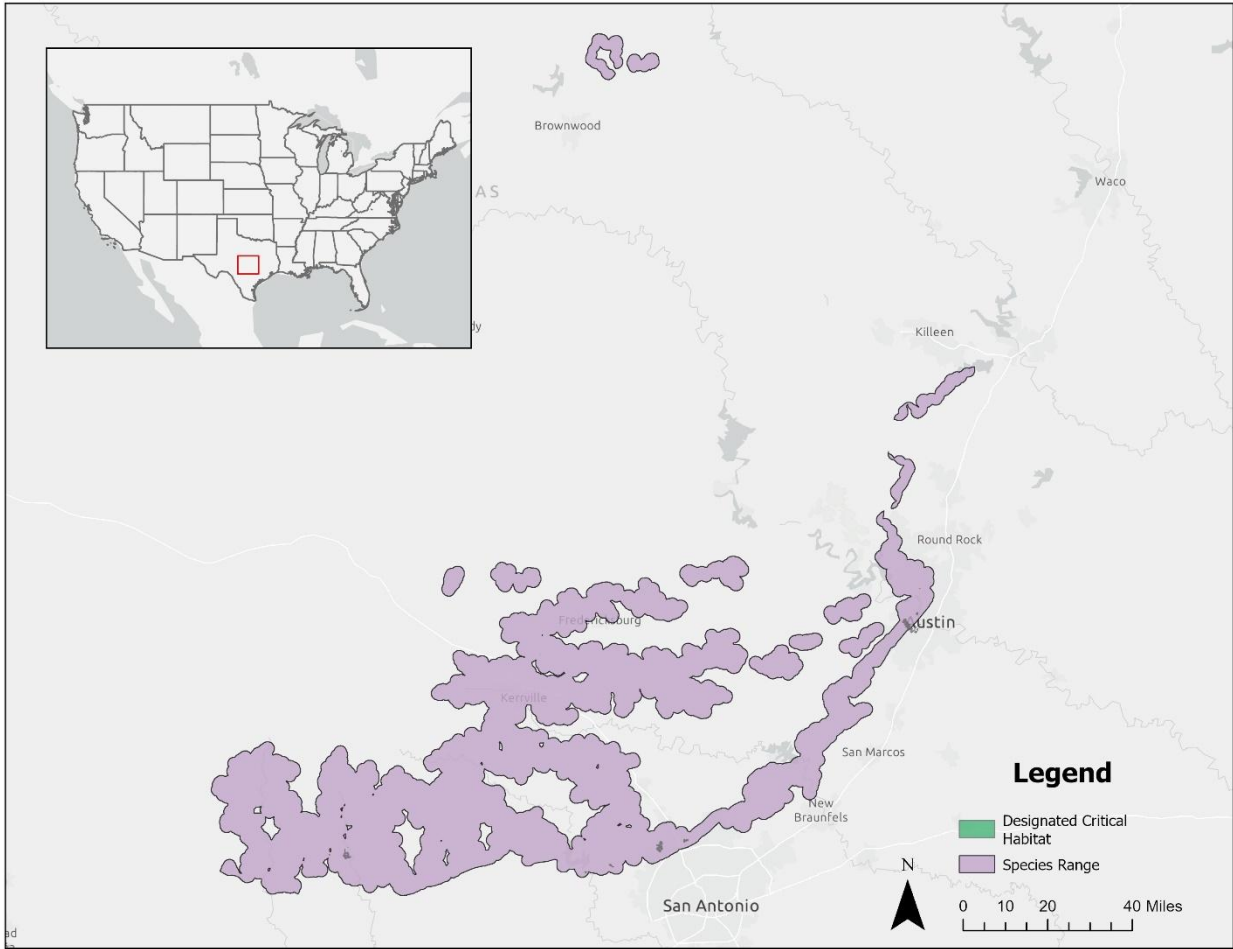


Figure A1-2. FWS' designated critical habitat of the bracted twistflower. Range also included for reference.

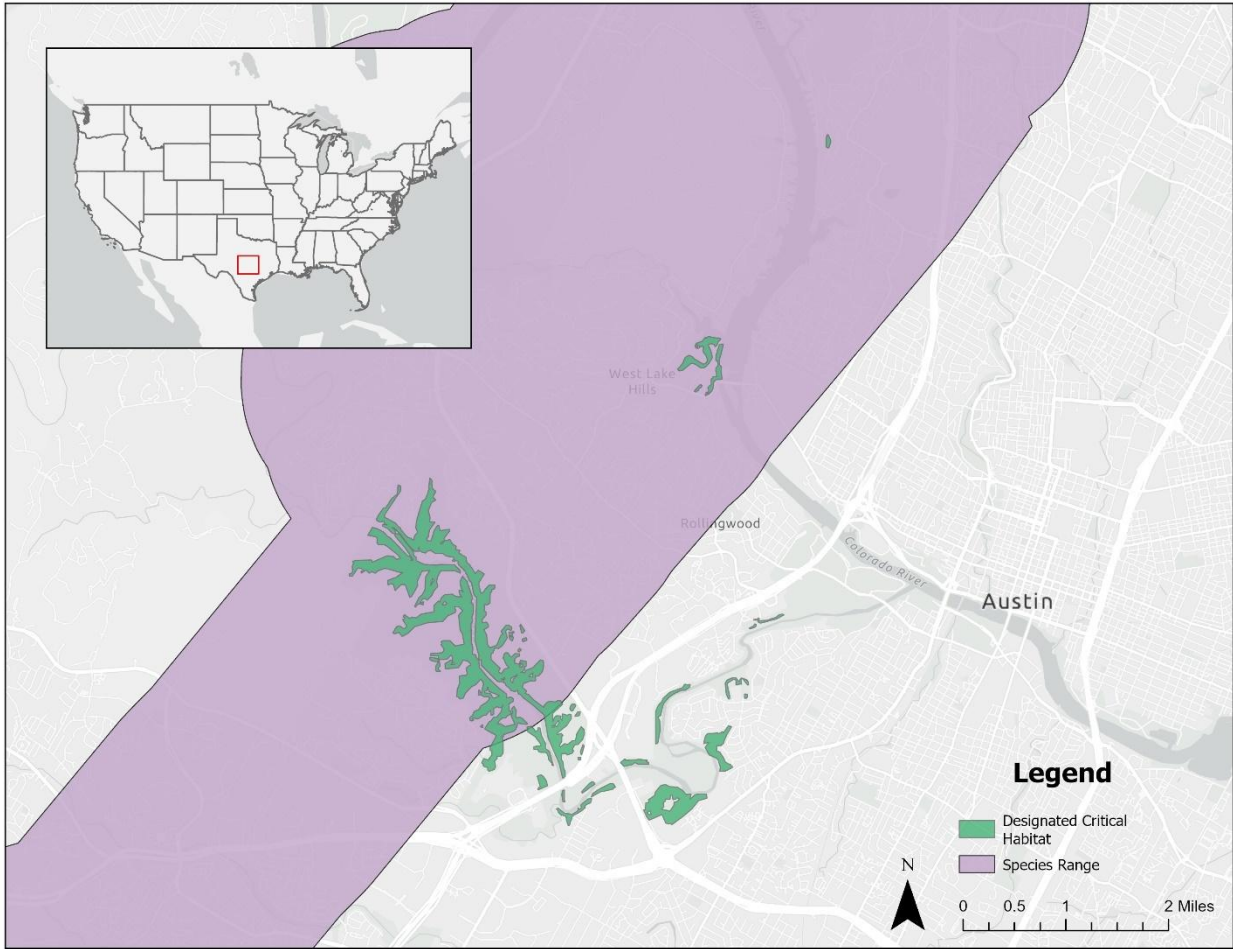


Figure A1-3. FWS' designated critical habitat of the bracted twistflower in the northeastern representation area. Range also included for reference.

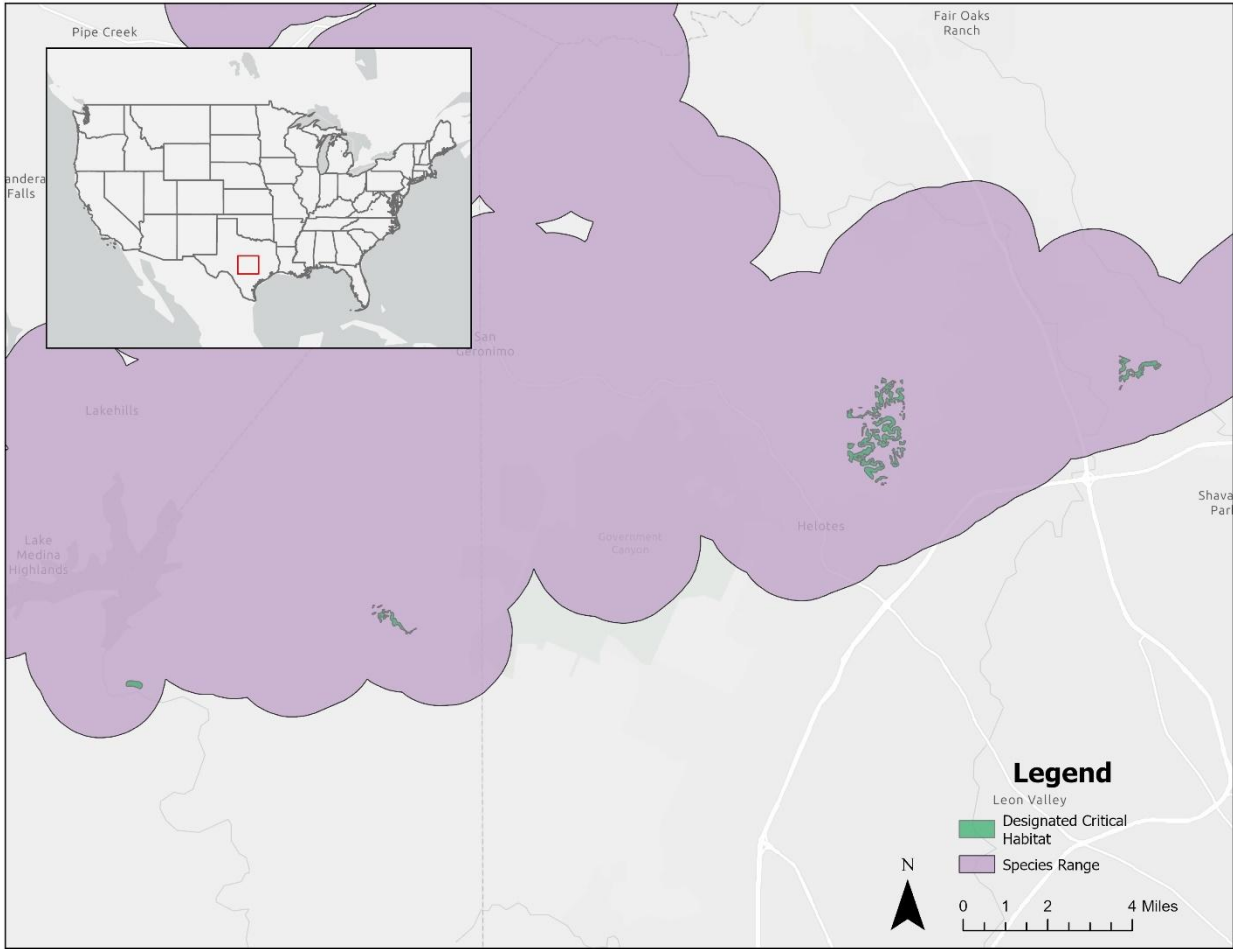


Figure A1-4. FWS’ designated critical habitat of the bracted twistflower in the central representation area. Range also included for reference.

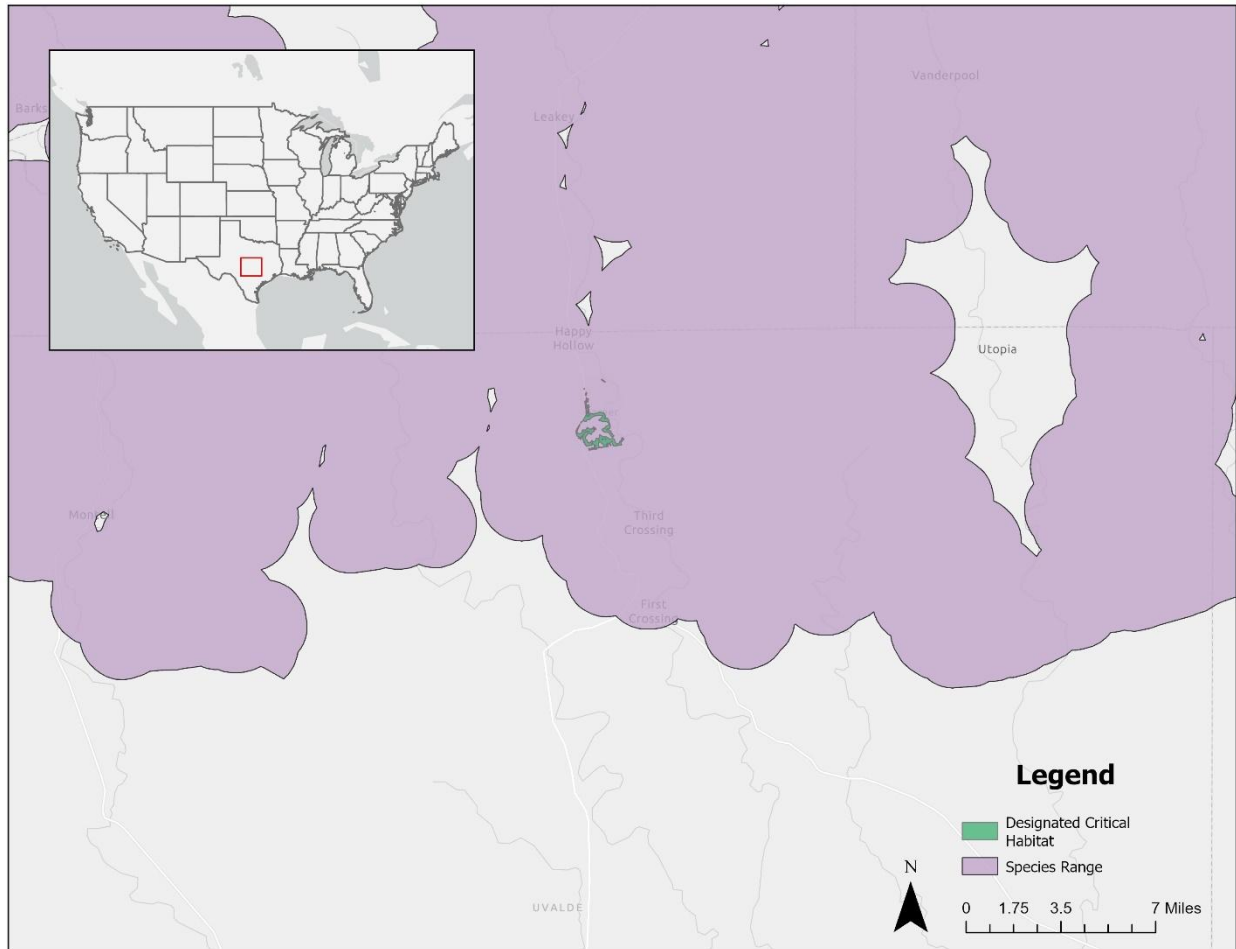


Figure A1-5. FWS’ designated critical habitat of the bracted twistflower in the western representation area. Range also included for reference.

5. Known Locations (Source: 2023 Species Status Assessment)

- Since 1989, bracted twistflower populations have been documented at 17 EOs. However, two have since been eradicated, while four others have been heavily destroyed by development.
- There are three representation areas of bracted twistflower: northeastern, central, and western.
- **Figure A1-6** depicts the three representation areas, the EO numbers, and extant and historic bracted twistflower populations from FWS’ Species Status Assessment.
- When considering the locations of the current extant populations (**Figure A1-6**), they are consistent with the interim core map (**Figures 1-1—1-4**).

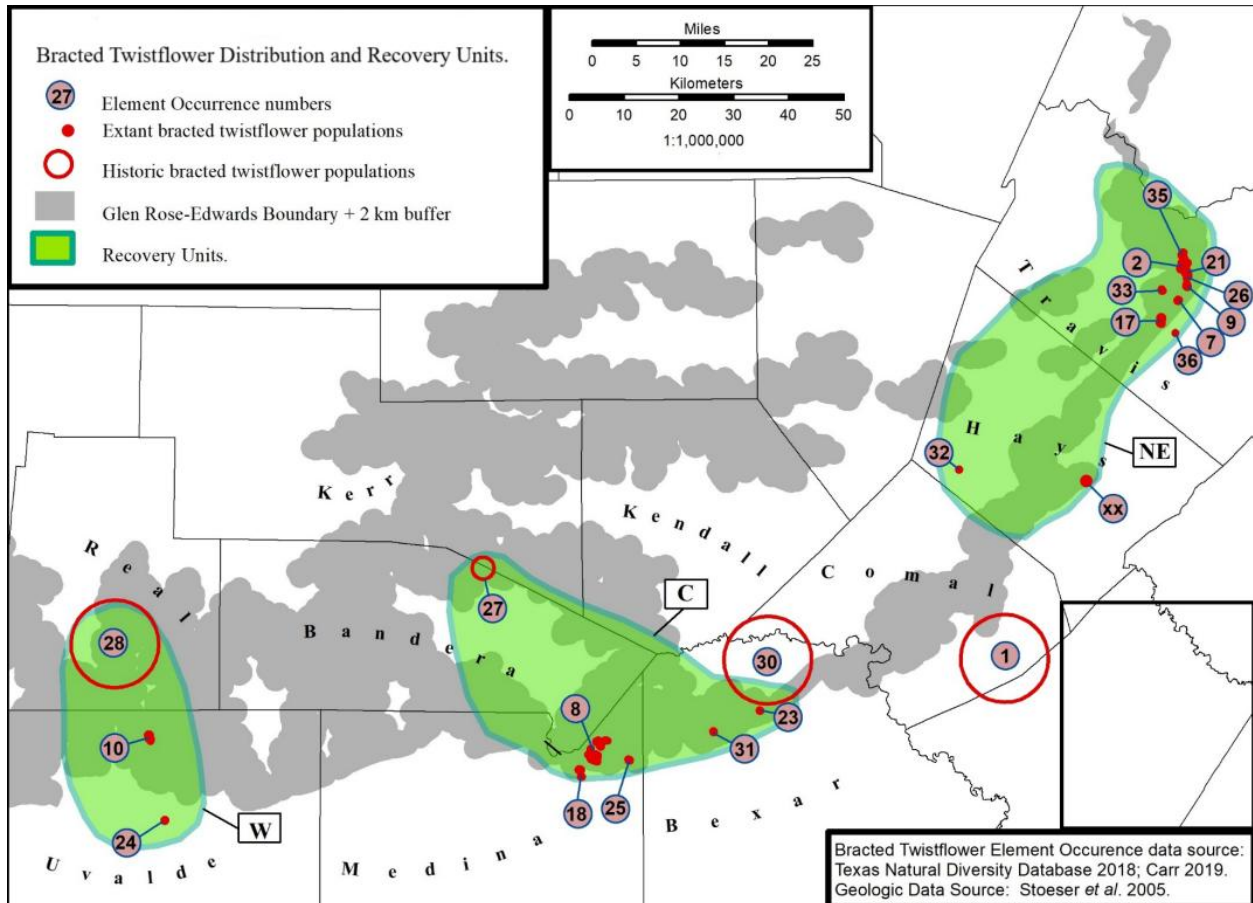


Figure A1-6. The three representation areas, the EO numbers, and extant and historic bracted twistflower populations. Reproduced from FWS Species Status Assessment (2023).

- **Occurrences included in Public Databases**
 - EPA queried iNaturalist, GBIF, and NatureServe on August 19, 2025. Collectively, the occurrence data are generally consistent with the areas identified in the interim core map.
 - iNaturalist (available [here](#)) had 67 research grade observations for this species (reported as, “Bracted Jewelflower”).
 - Between 2000 and 2025, GBIF (available [here](#)) had 58 human observations that were also reported to iNaturalist and NatureServe (43 and 15, respectively).
 - NatureServe’s (available [here](#)) known occurrences were generally consistent with the interim core map.

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

This core map was created based on biological information, including critical habitat and occupied locations. EPA used the critical habitat provided by FWS and the known location data provided by TPWD. These combined data were then refined to remove areas of medium to high intensity development and open water.

1. Dataset References and Software

- Texas Natural Diversity Database. 2025. Element Occurrence data export. Wildlife Diversity Program of Texas Parks & Wildlife Department. 7 August 2025.
- National Land Cover Dataset (NLCD). 2021. data service from ESRI Living Atlas <https://www.arcgis.com/home/item.html?id=3ccf118ed80748909eb85c6d262b426f>.
- FWS Designated Critical Habitat – Published on April 11, 2023.
- FWS Species Range – Last updated on July 12, 2022.
- Software used: ArcGIS Pro 3.4

2. Datasets Used in the Interim Core Map Development

- All datasets used in this interim core map development are described in EPA's [Process EPA Uses to Develop Core Maps for Pesticide Use Limitation Areas](#).
- The Texas Natural Diversity Database was requested through https://tpwd.texas.gov/huntwild/wild/wildlife_diversity/txndd/data.phtml.

3. Core Map Development

- EPA started with the species range described by FWS to ensure that the interim core map fell within the Balcones Escarpment zone.
- EPA then added in the critical habitat developed by FWS to establish a basis of known critical habitat.
- Next, EPA added in the known location data from the past 25 years (2000-2025), which was provided by TPWD. This data was generally consistent with other occurrence data sources, but provided a finer resolution of known locations from a verified source. Limiting the data to the past 25 years ensured that areas lost to development were not included.
- The NLCD data was then limited to the extent of the FWS critical habitat and TPWD's 25-year known location data, which was then converted to polygon format.
- The resulting polygon was then refined to remove areas of medium- and high-intensity development, as well as open water. These areas were removed because they are unsuitable habitat for the bracted twistflower.