

Interim Core Map Documentation for Mountain Sweet Pitcher-Plant

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

Species Summary

The mountain sweet pitcher-plant (*Sarracenia rubra ssp. jonesii*; Entity ID 995) is a dicotyledonous endangered plant found in North Carolina and South Carolina. The U.S. Fish and Wildlife Service (FWS) has not assigned designated critical habitat for the mountain sweet pitcher-plant. This species inhabits mountain bogs and stream shores, usually in sites that occur in level depressions associated with floodplains. 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, but 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 mountain sweet pitcher-plant is biological information type, based on the species range refined to only include habitat used by this species. The species' ECOS page (FWS 2025) includes textual descriptions of habitats where the species is known to occur. Known location information from the iNaturalist and Global Biodiversity Information Facility (GBIF) databases, and NatureServe, provided corroboration for the core map extent, but were not otherwise used in core map development.

The core map for the mountain sweet pitcher-plant is based on biological information. Habitat within these areas was represented using different state-level datasets for North Carolina and South Carolina. In North

Carolina, habitat was represented using a species-specific model developed by the North Carolina Department of Transportation (NCDOT) in 2020. In South Carolina, habitat areas were represented using the National Wetlands Inventory (NWI) water bodies with attributes matching descriptions of species habitat. Statewide habitat layers were combined, then had areas of contiguous cultivated areas > 25 acres removed from the core map.

The core map developed in this document for the mountain sweet pitcher-plant spans 7,808 acres (Figure 1). A summary of acreage by National Landcover Database (NLCD 2021) land use type is provided in Table 1.

Based on EPA’s “best professional judgment classification” system, CSI has graded this core map as “moderate” (4) because assumptions were made when connecting species life history and/or biological needs (*i.e.* habitat preferences) to a Geographical Information System (GIS) dataset, in this case the NWI dataset (FWS 2023). These assumptions involved associating the species’ habitat—bogs and stream shores—with corresponding NWI classifications, in this case, select palustrine and riverine wetlands listed in **Appendix 2**. The NCDOT dataset was developed independently of this core mapping effort; however, its underlying data sources and subsequent vetting by FWS render it suitable for use in this analysis. More information about the best professional judgment classification system and its definitions can be found in the core map process document (EPA 2024).

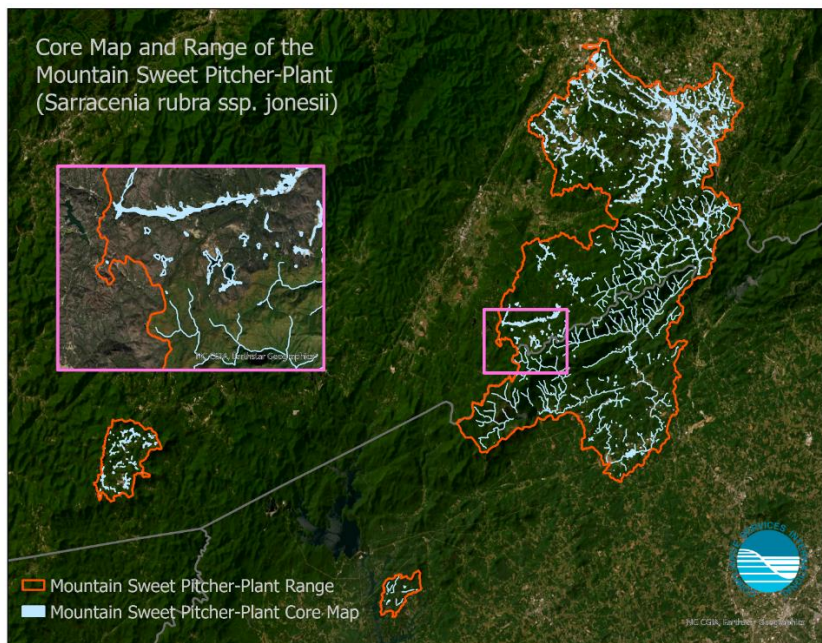


Figure 1. Interim core map for the mountain sweet pitcher-plant (*Sarracenia rubra ssp. jonesii*; Entity ID 995). The core map spans 7,808 acres, while the range is 194,179 acres.

Table 1. Acres by National Land cover Database (NLCD 2021) class within the core map of the mountain sweet pitcher-plant. Total core map area (based on NLCD pixel count): 7,846 acres¹.

NLCD_Land_Cover_Class	Acres
Developed, Open Space	1,717
Hay/Pasture	1,569
Deciduous Forest	1,096
Mixed Forest	1,031
Woody Wetlands	688
Developed, Low Intensity	421
Cultivated Crops	352
Open Water	273
Developed, Medium Intensity	263
Evergreen Forest	177
Developed, High Intensity	83
Herbaceous	83
Emergent Herbaceous Wetlands	54
Shrub/Scrub	34
Barren Land	5

Evaluation of Known Location Information

There were three evaluated datasets with known location information:

- Occurrence locations in iNaturalist;
- Occurrence locations in GBIF; and
- Occurrence locations in NatureServe.

Compliance Services International evaluated these datasets before developing the core map. Overall, there were 194 usable research-grade observations found in iNaturalist². The GBIF dataset comprised one georeferenced observation, which was not considered usable based on the criteria described below. The iNaturalist dataset was useful to identify the general distribution of the mountain sweet pitcher-plant within its range, but not precise enough to be used as a meaningful refinement of range in core map development.

As of 2023, FWS is aware of twelve extant populations of the mountain sweet pitcher-plant in two states, North Carolina and South Carolina. These locations are known to FWS, but have not been made available as public information, likely because of species poaching concerns. Had these locations been made available for use in core map development, these may have informed the core map.

¹ This acreage is slightly different from the core map acreage (7,808) 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->).

Approach Used to Create Core Map

The core map was developed using EPA's process for developing core maps for species listed by 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 mountain sweet pitcher-plant from FWS, as well as observation information available from various publicly available sources including iNaturalist, GBIF, and NatureServe. The information compiled for the mountain sweet pitcher-plant is included in **Appendix 1**. Influential information that impacted the development of the core map includes a description of the species habitat from the species' ECOS page:

- 'The habitat of mountain sweet pitcher plant consists of mountain bogs and streambanks, usually on soils of the Toxaway silt loam or Hatboro loam series. These soils are deep, poorly drained combinations of loam, sand, and silt, with a high organic matter content and medium to highly acidic pH. Most sites occur in level depressions associated with floodplains; however, a few occur in "cataract bog" or "waterslide" situations, where sphagnum and other typical bog species line the sides of waterfalls on granite rock faces. The hydrology of the sites can be described as intermittently exposed to intermittently flooded (Schafale and Weakley 1985, U.S. Department of Agriculture 1980)' (FWS 2025).

For step 2, CSI used the compiled information including the species range, known locations, and habitat location information to determine the core map type. Compliance Services International compared the known location data to the range and found that known locations from iNaturalist and NatureServe were not usable as meaningful refinements of species range; this is largely due to the recent reduction in species range, as of January 23, 2025.

Review of the available data also suggested that relevant habitat could be mapped and used to inform the core map. To represent the species' habitat, in South Carolina the NWI dataset was used to identify habitat classes associated with the species habitat description above; using the "ATTRIBUTE" field. In North Carolina, habitat was represented by areas of "High" potential habitat according to a species-specific model developed by the NCDOT. The state-level habitat areas were merged and then had contiguous cultivated areas > 25 acres (EPA 2025) removed to develop the core map.

For step 3, CSI used the best-available data sources to generate the core map. Data sources are discussed in 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 biological information. Designated critical habitat was quickly eliminated as a core map type because the mountain sweet pitcher-plant does not have critical habitat. The range core map type was strongly considered because it was recently refined to an area roughly 10% of its previous size; also, the resulting layer appears to be based in part on watershed (HUC-12) boundaries, which could be appropriate for a wetland-dependent species. Ultimately, range was not chosen because it still contained a

significant amount of area that is not consistent with descriptions of the mountain sweet pitcher-plant habitat. Rather, range was used to establish the outer boundary of the core map shape, and habitats within the range were identified for the core map. **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

Known Observation Datasets

Datasets such as iNaturalist 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. The current range of the species is relatively refined; use of iNaturalist observations buffered by their uncertainty, or NatureServe EOs at a public resolution of 343 mi² hexagons, would not meaningfully limit the extent of the core map. However, known observation data from FWS could be useful to further inform the core map if it were to be made public or otherwise available.

Appendix 1. Information compiled for the Mountain Sweet Pitcher-Plant

1. Recent FWS documents

- 5-Year Review (2013) https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/2037.pdf.
- 5-Year Review (2021) https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/996.pdf.
- Recovery Plan (1990) https://ecos.fws.gov/docs/recovery_plan/Mountain_sweet_pitcher_plant_RP.pdf.
- ECOS Profile Page (2025) <https://ecos.fws.gov/ecp/species/4283>.

2. Background information

- Status: Federally listed as endangered in 1988.
- Resiliency, redundancy, and representation (the 3Rs) were not evaluated for this species.
- Habitat, Life History, and Ecology
 - Habitat: 'The habitat of mountain sweet pitcher plant consists of mountain bogs and streamsides, usually on soils of the Toxaway silt loam or Hatboro loam series. These soils are deep, poorly drained combinations of loam, sand, and silt, with a high organic matter content and medium to highly acidic pH. Most sites occur in level depressions associated with floodplains; however, a few occur in "cataract bog" or "waterslide" situations, where sphagnum and other typical bog species line the sides of waterfalls on granite rock faces. The hydrology of the sites can be described as intermittently exposed to intermittently flooded (Schafale and Weakley 1985, U.S. Department of Agriculture 1980)' (FWS 2025).
 - Food Habits: 'Carnivorous plant. The evolutionary role of carnivory in such plants is not fully understood, but some evidence indicates that absorption of minerals from insect prey may allow carnivorous species to compete in nutrient-poor habitats (Folkerts 1977). Insects are attracted by nectar secreted from glands near the pitcher orifice, or by the plant's coloration, and fall or crawl into the pitchers. Just inside the mouth of the pitcher tube is a very smooth surface, offering no foothold to most insects; below this, the pitcher is lined with stiff downward-pointing hairs which assist descent and virtually prevent ascent. Those insects which cannot escape are eventually digested by enzymes in the fluid secreted inside the pitchers' (FWS 2025).
- Taxonomy
 - 'As noted in the recovery plan, the taxonomy within *Sarracenia rubra*, and *Sarracenia rubra* ssp. *jonesii* in particular, has received considerable attention in the literature. The USFWS listed this entity as a subspecies. Since the federal listing, most current floras (e.g., Weakley 2010) as well as the North Carolina Natural Heritage Program (NCNHP 2010) have adopted *Sarracenia jonesii* Wherry as the preferred treatment. The taxon is also listed as *S. jonesii* Wherry as a state endangered plant species under the North Carolina Plant Protection and Conservation Act (North Carolina Code Article 19B, § 106-202.12-202.22). However, the Integrated Taxonomic Information System (ITIS) regards *S. rubra* ssp. *jonesii* as the preferred nomenclatural treatment (ITIS 2010). The USFWS

supports the change to *S. jonesii*, but we have not yet made the change to the lists at 50 CFR 17.11 and 17.12. Furches (in litt. 2010) has initiated a study of hybridization within the genus *Sarracenia* and more specifically, intraspecific genetic variation with the *Sarracenia rubra* complex (consisting of five subspecies, including *S. rubra ssp. jonesii* as recognized by some authors). This study would be expected to have additional bearing upon the question of taxonomic distinctiveness for *S. rubra ssp. jonesii* (i.e., whether this taxon is more appropriately recognized as a full species, *S. jonesii*). The USFWS has assisted Furches in obtaining landowner collection permits, however preliminary results were not available at the time of this review' (FWS 2021).

- Relevant Potential Pesticide Use Sites
 - 'These threats, while known, are not necessarily easily managed. Mechanical removal of encroaching vegetation is labor-intensive, primarily because of the prolific re-sprouting that tends to occur in woody species and the inherently prolific nature of encroaching invasive exotic vegetation (e.g., Kiehl 2007). Various efforts have been undertaken to reduce the labor-intensive nature of this management approach, including the use of torches to kill the cambium (tissue) of cut stumps and even selective use of aquatic-approved herbicides. These techniques (particularly herbicides) have proven moderately effective, however increasingly those land managers who have faced the realities of this challenge are turning to selective use of grazers and/or browsers' (FWS 2021).
- Relevant Recovery Criteria and Actions (FWS 2021)
 - Delisting Criteria:

'The recovery plan contains two de-listing criteria, but no criteria for reclassifying the species from endangered to threatened status. The de-listing criteria are as follows:

1. *It has been documented that at least four populations within each drainage (Enoree, French Broad, and Saluda Rivers) are self-sustaining and that necessary management actions have been undertaken by the landowners or cooperating agencies to ensure their continued survival.*

Not met. None of the three drainages (Saluda, Keowee, and French Broad) contain even a single population that can be objectively assessed as self-sustaining, although some populations in the Saluda and French Broad drainages are receiving varied levels of management).

2. *All 12 of the above populations and their habitat are protected from present and foreseeable human-related and natural threats that may interfere with the survival of any of the populations.*

Not met. However, inasmuch as self-sustaining populations cannot be ensured unless the species has been protected from threats (both present and foreseeable), this criterion is not substantively different from the first and will not be discussed further here).'

3. Range

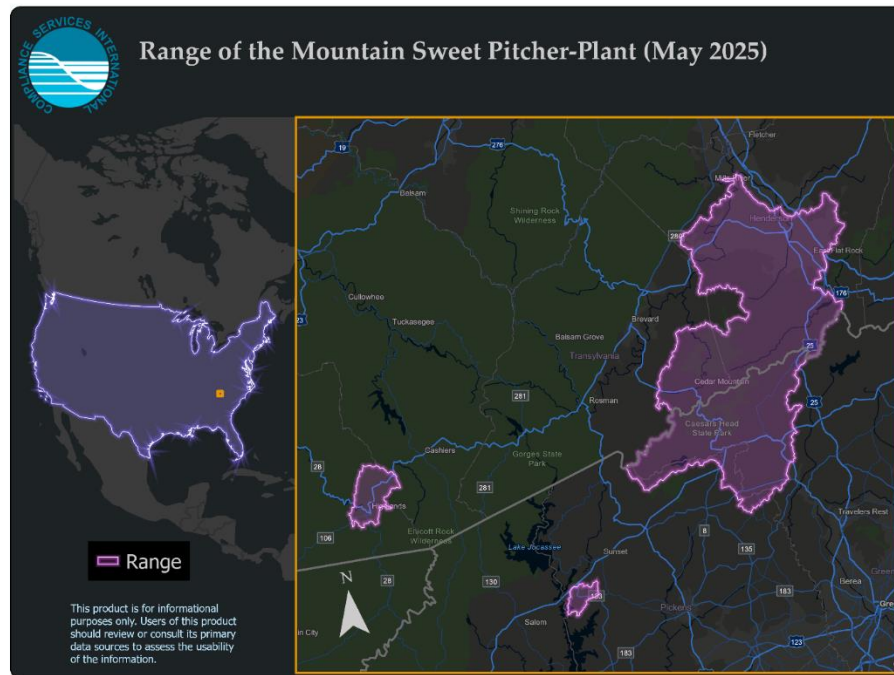


Figure 2. Range of the mountain sweet pitcher-plant (FWS 2025).

- Historical Range (FWS 1990)
 - 'Mountain sweet pitcher plant is endemic to a few mountain bogs and streams in southwestern North Carolina and northwestern South Carolina along the Blue Ridge Divide. Only 10 populations are currently known to exist--four are in the French Broad River drainage in Henderson and Transylvania Counties, North Carolina, five are in the Saluda River drainage in Greenville County, South Carolina, and one is in the Enoree River drainage in Greenville County, South Carolina. The species has also been reported from Buncombe County in North Carolina, but it is not currently known to survive there. Sixteen populations have been extirpated. Because of the extreme rarity of this species and its vulnerability to collectors, locations of extant populations are not specified in this plan.'
- Current Range (FWS 2021)
 - 'This narrow-ranging endemic has been extirpated from 16 populations, and now remains extant at 12 populations located in three North Carolina counties (Buncombe, Henderson and Transylvania) and two South Carolina counties (Greenville and Pickens). North Carolina populations are confined to the French Broad River drainage; South Carolina populations occur primarily in the Saluda River drainage (four populations) with one population (discovered since the recovery plan) located in the Seneca River drainage. Since the recovery plan, the species has become extirpated from the Enoree River drainage in South Carolina (within which the recovery plan identified a single population of the species). Of the 12 extant populations known, only three (two in Greenville County, South Carolina on lands owned by SCDNR; and one in Transylvania County, North Carolina recently placed under conservation easement) appear to have remained relatively stable over the past two decades. However, the North Carolina

population consists of fewer than a dozen clumps, and is unlikely to be self-sustaining.’

4. Description of Critical Habitat

- Critical habitat has not been designated for this species.

5. Known Locations

- FWS (2021)
 - Currently, there are 15 extant populations in four North Carolina counties (Buncombe, Henderson, Macon, and Transylvania) and two South Carolina counties (Greenville and Pickens) (NCNHP 2020, SCHTP 2019). The three populations added since the last 5- year review are in Henderson, Macon, and Transylvania Counties in North Carolina. The Macon County and Henderson County populations are introduced; the Transylvania County population is native. Aggregation of the last available size estimates for extant populations suggest the complete species’ range may contain 700-1,200 plants. The estimates of abundance presented here are informational only and should not be interpreted as an increase or decrease in overall abundance since only three of 15 populations have had two or more documented monitoring events since 2010 (year of data used for the previous 5-year review).

Table 2. Summary of the mountain sweet pitcher-plant populations by county over time. Copied from the most recent 5-Year Review (FWS 2021).

Year	Buncombe (NC)	Greenville (SC)	Henderson (NC)	Macon (NC)	Pickens (SC)	Transylvania (NC)	Total
1988 (Listing)	0	6	3	0	0	1	10
1990 (Recovery Plan)	0	6	3	0	0	1	10
2013 (5-year Review)	1 ^a	4	3	0	1	3	12
2020 (Current)	1	4	4 ^a	1 ^a	1	4 ^b	15

a- One population introduced

b- One native population found

Buncombe, Henderson and Transylvania= French Borad River watershed

Macon= Little Tennessee River watershed

- GBIF: <https://www.gbif.org/species/5572800>
 - GBIF includes 137 occurrence records; one of which is georeferenced. This was not a 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)
 - Must include date information.
 - No “preserved specimen” observations; only “human observation.”

- Since there were no usable coordinate data from the GBIF database, this dataset was not used for core map development.
- iNaturalist: https://www.inaturalist.org/observations?taxon_id=355633
 - iNaturalist includes 223 total observations, 194 of which are research-grade with usable coordinate data based on these criteria (Figure 3 and Figure 4):
 - 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 km³.
 - This resulted in the exclusion of six records.
 - The PPA value represents the positional uncertainty of the coordinate. This value was used as the buffer distance for iNaturalist points, to ensure that the actual position of the observation is captured. This is shown in Figure 4, but did not factor into core map development.
 - Ninety-six iNaturalist records are outside of the FWS species range; however, only one observation is beyond the range after considering its PPA uncertainty value and precision.
 - The iNaturalist data provides support for using the range as the outer boundary of the core map.

Observations

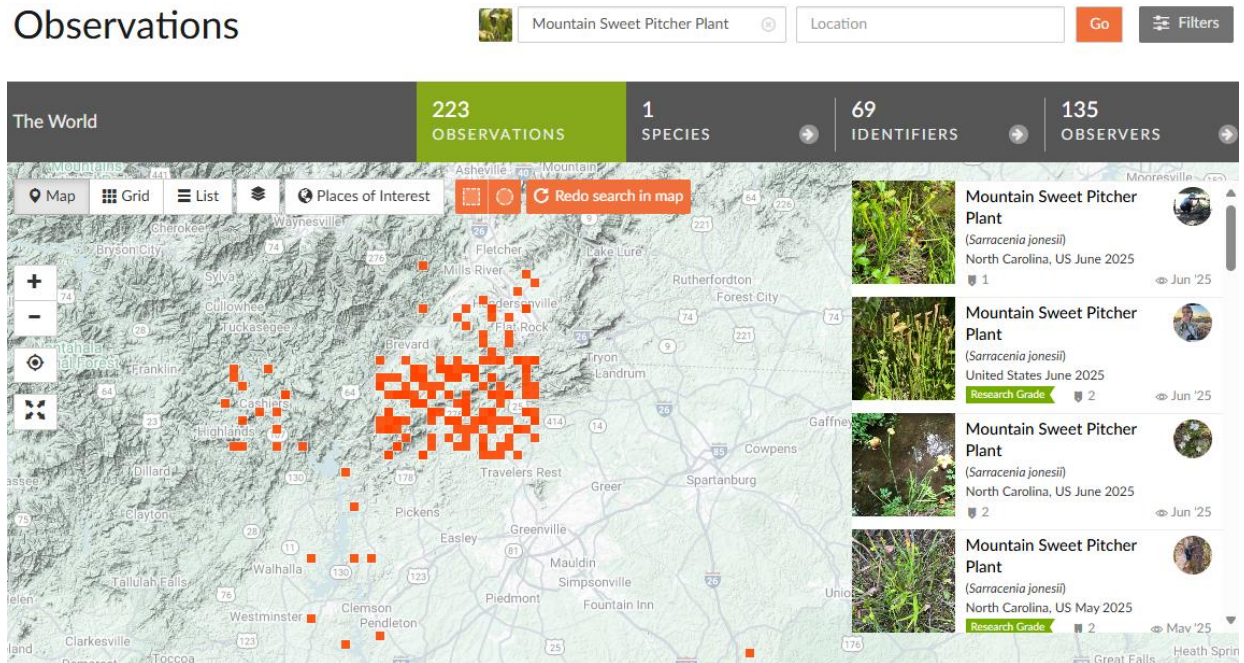


Figure 3. iNaturalist occurrences for the mountain sweet pitcher-plant (iNaturalist 2025).

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](#).

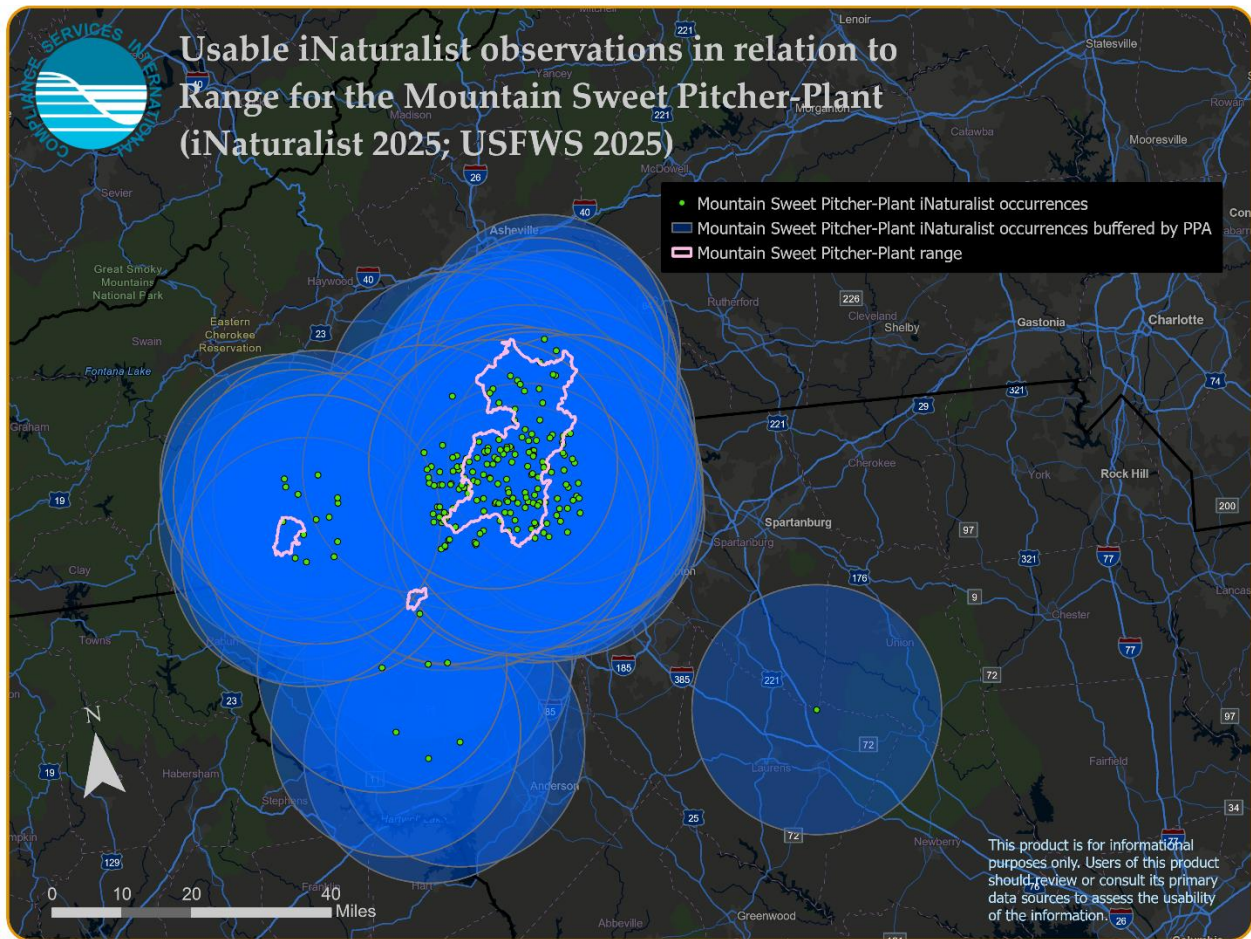


Figure 4. Usable iNaturalist observations, buffered by PPA, for the mountain sweet pitcher-plant in relation to species range (iNaturalist 2025; FWS 2025).

- NatureServe Explorer: <https://explorer.natureserve.org/>
 - Available public occurrence information from NatureServe Explorer aligns with the information from iNaturalist and additionally includes an observation to the north of the current range.
 - EOs were generally consistent with the range; however, these observations were not usable as a meaningful refinement of species range 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 biological information, which includes the habitat used by this species found within a spatial extent of species range. The core map identifies all areas within the extent matching the species' habitat description from **Appendix 1**. In North Carolina, potential habitat areas were represented using a species-specific model developed by the NCDOT. In South Carolina, professional judgment was used to match "ATTRIBUTE" classes in the National Wetland Inventory (NWI) dataset as described below (FWS 2023). NWI is regarded as a high quality national-level dataset that is appropriate to identify habitat for aquatic species such as the mountain sweet pitcher-plant.

1. References and Software

- National Wetlands Inventory (FWS 2023): <https://www.fws.gov/program/national-wetlands-inventory>.
- North Carolina Department of Transportation: "Mountain Sweet Pitcher Plant - Potential Habitat, March 2020." <https://xfer.services.ncdot.gov/gisdot/AtlasData/AtlasSpeciesModels/ATLASGISPlantAndAnimalModels/>.
- Software used: ArcGIS Pro version 3.2.
- FWS Species Range (FWS 2025): <https://ecos.fws.gov/ecp/species/4283>.
- EPA Modified Cultivated Layer: <https://cdn.arcgis.com/home/item.html?id=159e70ce4c284f5b972c687037f8a668>.

2. Datasets Used in Core Map Development

2.1. Range

The range for this species was last updated by FWS on January 23, 2025. A shapefile including species range for all listed species was downloaded from the FWS ECOS website on May 5, 2025. The shapefile was converted to a feature class 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 995 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 shapefile was added to an ArcGIS Pro map and compared against the known observation datasets and state-level habitat information (described below). The range was used to establish the outer boundary of the core map.

2.2. North Carolina Department of Transportation (NCDOT) Dataset

Regions of suitable habitat were used to refine the core map based on biological information. The NCDOT completed a project named "ATLAS" in 2021 that categorized land within the range as low or high suitability for species habitat for the mountain sweet pitcher-plant. Ultimately, regions of low suitability were excluded from the core map, while high suitability were included. Categories of "low" and "high" for this species are defined as follows:

- Low: Regions and sites where biologists would be very surprised to find this species and its habitat (occurrence here should be extremely rare).
- High: Biologists expect to frequently encounter areas that look like potential habitat based on visible environmental and vegetation community characteristics (Figure 5, NCDOT 2020).

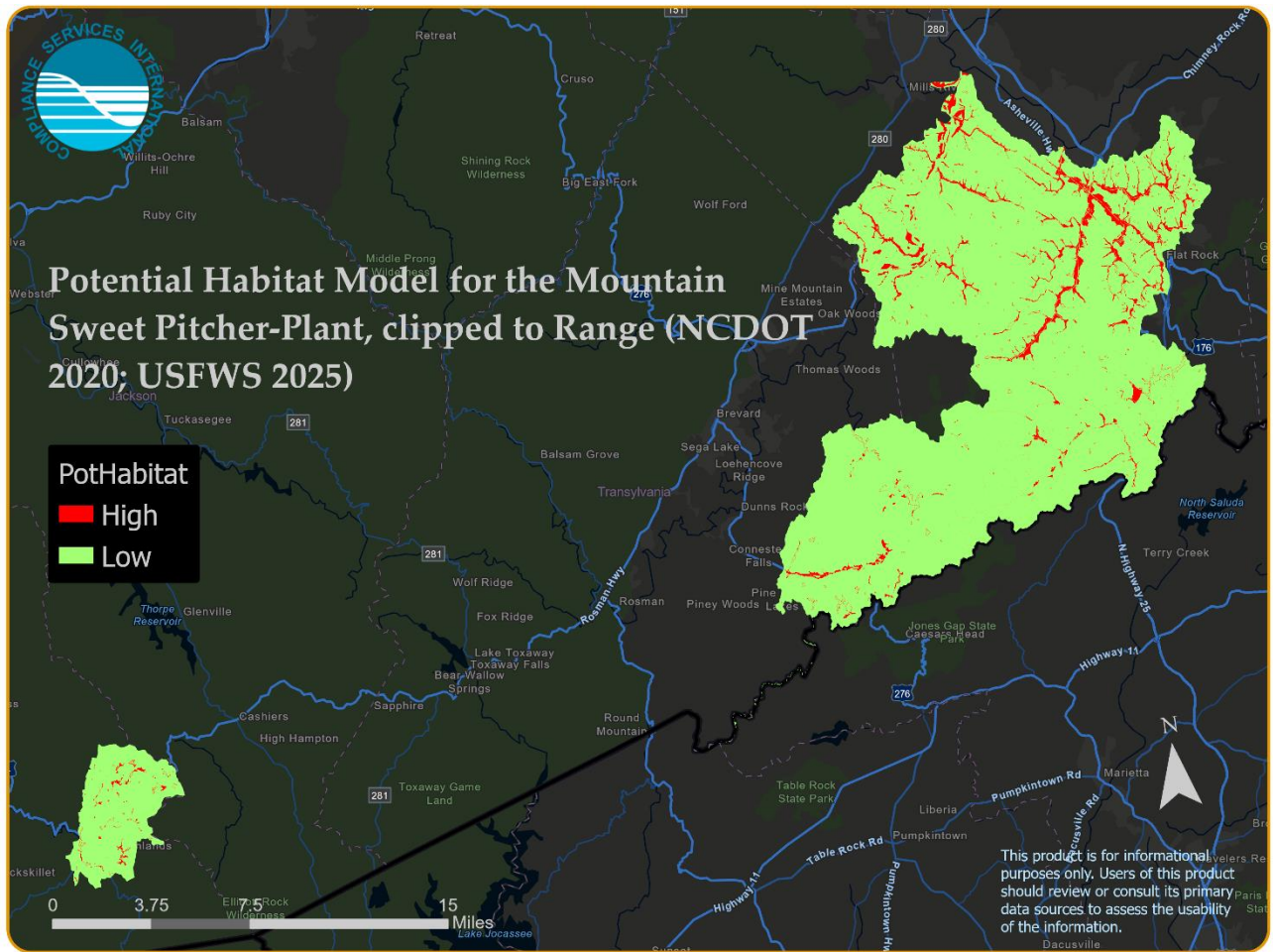


Figure 5. Areas of low and high habitat suitability for the mountain sweet pitcher-plant in North Carolina, clipped to range (NCDOT 2020; FWS 2025).

2.3. National Wetlands Inventory (NWI) Dataset

The NWI dataset was preliminarily vetted to determine its appropriateness in representing aquatic areas matching descriptions of the mountain sweet pitcher-plant habitat, for areas not already represented by the species-specific model developed by the NCDOT (South Carolina). The species inhabits mountain bogs and stream shores, usually in sites that occur in level depressions associated with floodplains. CSI reviewed NWI attribute classes in relation to this description and determined that the species' potential habitat is best represented by a combination of riverine and palustrine systems:

- Riverine (NWI code = R)
 - Subsystems: Lower Perennial (code = 2), Upper Perennial (3), Streambed (5)
 - Classes: Unconsolidated Bottom (UB), Aquatic Bed (AB), Streambed (SB)
- Palustrine (code = P)
 - Classes: Unconsolidated Bottom (UB), Moss-Lichen (ML), Emergent (EM)

These possible site location types were selected in the NWI South Carolina wetlands dataset using the following SQL query:

- ATTRIBUTE LIKE '%R2UB%' OR ATTRIBUTE LIKE '%R2AB%' OR ATTRIBUTE LIKE '%R2SB%' OR ATTRIBUTE LIKE '%R3UB%' OR ATTRIBUTE LIKE '%R3AB%' OR ATTRIBUTE LIKE '%R3SB%' OR ATTRIBUTE LIKE '%R5UB%' OR ATTRIBUTE LIKE '%R5AB%' OR ATTRIBUTE LIKE '%R5SB%' OR ATTRIBUTE LIKE '%PUB%' OR ATTRIBUTE LIKE '%PML%' OR ATTRIBUTE LIKE '%PEM%'.

The selected water body features were dissolved into a single shape to represent potential habitat of the mountain sweet pitcher-plant in South Carolina, then merged with the separately-developed dataset for North Carolina.

2.4. EPA Cultivated Lands > 25 acres

EPA has developed and published its own cultivated layer for use in core map development as a potential refinement of habitat and/or extent (EPA 2025). For the mountain sweet pitcher-plant, habitat was refined by this layer using the Pairwise Erase tool to remove significant areas of agriculture (areas of contiguous agricultural land cover at least 25 acres) because the species habitat is not consistent with cultivated land and is therefore considered by CSI to be an “off-field” species. This removed 7.3% of area and is considered a reasonable refinement for core map development for off-field species.

3. Creating the Core Map

3.1. North Carolina

The core map for the mountain sweet pitcher-plant in North Carolina was developed using a specific-specific model produced by the NCDOT. The layer was clipped to the current species range, queried for high probability habitat areas, and dissolved into a single shape as follows:

1. Download the species habitat model shapefile for the mountain sweet pitcher-plant. Import this layer into a geodatabase, saved as “NCDOT”. Choose to output this layer and subsequent ones using the preferred projection of WKID #102008.
2. Use the Pairwise Clip tool to clip the previous layer (“NCDOT”) by the species range (“MSPP_range”) and save as a new layer, “NCDOT_pcRange”.
3. Use the Select by Attributes tool to select only features from the previous layer (“NCDOT_pcRange”) with a “High” potential habitat designation, using the following SQL query: PotHabitat = 'High'. Export selected features as a standalone layer, “NCDOT_pcRange_selHigh”.
4. Use the Pairwise Dissolve tool to dissolve the previous layer “NCDOT_pcRange_selHigh” into a feature class with a single shape, saved as “NCDOT_pcRange_selHigh_pd”.

3.2. South Carolina

In South Carolina, the core map for the mountain sweet pitcher-plant was developed from NWI data. Specifically, the state-level South Carolina dataset was clipped to species range and a state boundary layer, queried for habitat land cover types consistent with FWS descriptions of species habitat, and dissolved into a single shape as follows:

1. Download the state-level NWI layer of water bodies for South Carolina.
2. Use the Pairwise Clip tool to clip NWI water bodies in South Carolina by the species range (“MSPP_range”) and save as a new layer, “NWI_SC_pcRange”.
3. Import a layer of state boundaries of the United States. Use the Select tool to select the state of South Carolina (this is to facilitate the next step).

4. Use the Pairwise Clip tool to clip the previous layer (“NWI_SC_pcRange”) by the state boundary layer with South Carolina selected and save as a new layer, “NWI_SC_pcRange_pcSC”.
5. Use the Select by Attributes tool to select only features from the previous layer (“NWI_SC_pcRange_pcSC”) with “ATTRIBUTE” field values consistent with the species habitat description for the Mountain Sweet Pitcher-Plant according to the classes listed in **Appendix 2** Section 2.3, using the following SQL query. Save as a new layer, “NWI_SC_pcRange_pcSC_sel”.
 - ATTRIBUTE LIKE '%R2UB%' OR ATTRIBUTE LIKE '%R2AB%' OR ATTRIBUTE LIKE '%R2SB%' OR ATTRIBUTE LIKE '%R3UB%' OR ATTRIBUTE LIKE '%R3AB%' OR ATTRIBUTE LIKE '%R3SB%' OR ATTRIBUTE LIKE '%R5UB%' OR ATTRIBUTE LIKE '%R5AB%' OR ATTRIBUTE LIKE '%R5SB%' OR ATTRIBUTE LIKE '%PUB%' OR ATTRIBUTE LIKE '%PML%' OR ATTRIBUTE LIKE '%PEM%'.
6. Use the Pairwise Dissolve tool to dissolve the previous layer “NWI_SC_pcRange_pcSC_sel” into a feature class with a single shape, saved as “NWI_SC_pcRange_pcSC_sel_pd”.

3.3. Merging North Carolina and South Carolina Core Map Elements

The core map elements for North Carolina and South Carolina are mutually exclusive datasets that were merged to form the core map habitat as follows:

1. Use the Merge tool to merge the core map elements from North Carolina (“NCDOT_pcRange_selHigh_pd”) and South Carolina (“NWI_SC_pcRange_pcSC_sel_pd”) into a single layer representing species habitat in these two states. Save as a new layer, “MSPP_habitat”.
2. Use the Pairwise Dissolve tool to dissolve the previous layer (“MSPP_habitat”) into a feature class with a single shape, saved as “MSPP_habitat_pd”.

3.4. Cultivated Lands-based Refinement

The mountain sweet pitcher-plant is not expected to be found in agricultural areas, so a refinement to exclude areas of agriculture was applied. Here agricultural areas are represented by EPA’s modified cultivated layer, which includes areas spanning at least 25 acres. This was done as follows:

1. Use the Pairwise Erase tool to exclude cultivated areas > 25 acres from the previous layer (“MSPP_habitat_pd”) according to a layer developed by EPA (“CultivatedAreas_Over25acres”). Save as a new layer (“MSPP_habitat_pd_peCultivated25ac”).
2. (Optional) Export features from the previous layer (“MSPP_habitat_pd_peCultivated25ac”) into a new layer recognizable as the mountain sweet pitcher-plant core map, “MSPP_CoreMap”.

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