Interim Core Map Documentation for Alabama Canebrake Pitcher-Plant

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

Species Summary

Alabama Canebrake Pitcher-Plant (*Sarracenia rubra ssp. alabamensis*; Entity ID 994) is a dicotyledonous endangered plant found primarily in the Southern United States. The United States Fish and Wildlife Service (FWS) has not assigned designated critical habitat for Alabama Canebrake Pitcher-Plant. This species inhabits wetland habitats, specifically sandhill seeps, swamps, and bogs along the fall-line of central Alabama. Additional habitat information is provided in **Appendix 1**.

EPA Review Notes

The developers created this core map using U.S. Environmental Protection Agency (EPA)'s 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 EPA'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 EPA'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 Alabama Canebrake Pitcher-Plant is biological information type, based on counties and ecoregions with extant populations of the species. The most recent 5-Year Review (FWS 2023a) includes textual descriptions of counties where the species is known to occur. Known location information from the iNaturalist and Global Biodiversity Information Facility (GBIF) databases provided validation of these general locations but were not otherwise used in core map development. Data from NatureServe were considered for use in core map development, as they offered a meaningful expansion into areas not captured by the range; however, these data ultimately did not factor into the analysis as these areas are outside of the known county, ecoregion, and subbasin area outlined in FWS documentation.

The core map for the Alabama Canebrake Pitcher-Plant is based on biological information, which was used to refine an extent based on counties and ecoregions with extant populations of the species. Habitat within

these areas were additionally clipped to the species range to develop the core map.

The core map developed in this document for the Alabama Canebrake Pitcher-Plant spans 644 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" 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 National Wetland Inventory (NWI) dataset (FWS 2023b). These assumptions involved associating the species' habitat—sandhill seeps, swamps, and bogs —with corresponding NWI classifications, in this case, palustrine emergent and moss/lichen wetlands. More information about this classification system and its definitions can be found in the core map process document (EPA 2024).

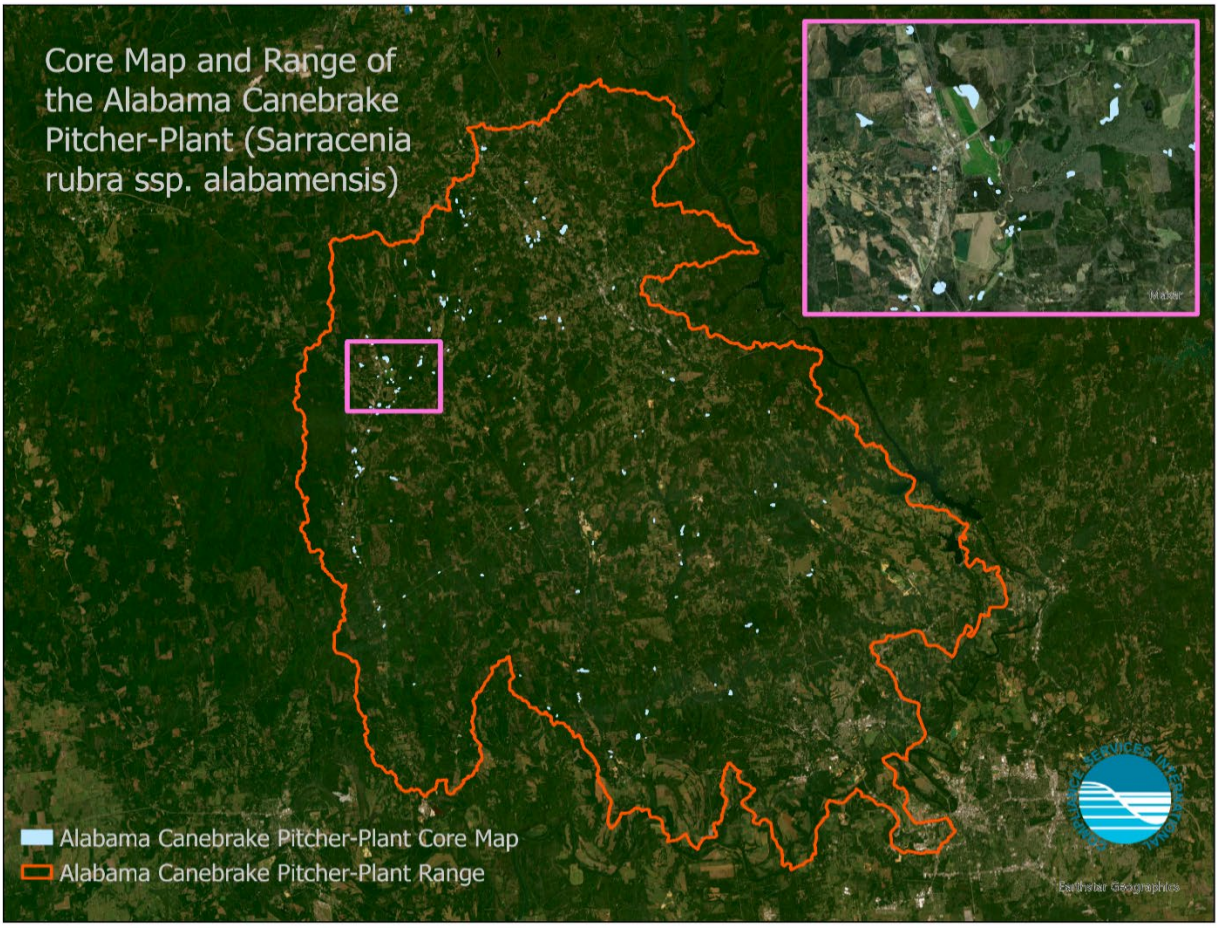

Figure 1. Interim core map for the Alabama Canebrake Pitcher-Plant (Sarracenia rubra ssp. alabamensis; Entity ID 994). The core map spans 644 acres, while the range is 733,778 acres.

Table 1. Acres by National Land cover Database (NLCD 2021) class within the core map of the Alabama Canebrake Pitcher-Plant. Total core map area (based on NLCD pixel count): 641 acres[1].

[1] This acreage is slightly different from the core map acreage (644) due to the pixelation of NLCD land cover. The core map is not developed exclusively from raster data.

NLCD_Land_Cover_Class	Acres
Woody Wetlands	408
Hay/Pasture	132
Emergent Herbaceous Wetlands	40
Mixed Forest	22
Open Water	18
Deciduous Forest	8
Developed, Open Space	5
Evergreen Forest	5
Herbaceous	2
Shrub/Scrub	1
Developed, Low Intensity	-
Developed, Medium Intensity	-
Barren Land	-

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 four usable research-grade observations found in iNaturalist[2]. The GBIF dataset comprised 19 georeferenced observations, six of which were considered usable based on the criteria described below. Both datasets were useful to identify extant population sites for the Alabama Canebrake Pitcher-Plant, but not comprehensive enough to be used in core map development. These datasets were largely redundant because the GBIF observations comprised all the iNaturalist observations.

As of 2023, the FWS is aware of eight extant populations of the Alabama Canebrake Pitcher-Plant in two counties in central Alabama: Autauga and Chilton (Table 2). These locations are known to FWS, but not available as public information because of species poaching concerns. Had these locations been made available for use in core map development, these may have formed the basis of the core map extent.

[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-).

Table 2. Summary of Alabama Canebrake Pitcher-Plant population statuses. Copied from Table 1 of the most recent 5-Year Review (FWS 2023a).

County	Pop.[1]	Subbasin	Status	Size[2]	Survey year[2]	Protected
Autauga	A1	Upper Alabama	Extant (Natural & Transplant)	4106	2019	Partial (Preserve)
Autauga	A2	Upper Alabama	Extant	481	2019	No
Autauga	A3	Upper Alabama	Extant (Natural & Transplant)	859	2019	No
Autauga	A4	Upper Alabama	Extirpated	0	(2016)[3]	No
Autauga	A5	Upper Alabama	Extant	6	2021	No
Chilton	C1	Lower Coosa	Extirpated	0	(2018)	Yes (Easement)
Chilton	C2	Lower Coosa	Extant	74	2019	Yes (Easement)
Chilton	C3	Lower Coosa	Extant	7	2019	No
Chilton	C4	Upper Alabama	Extirpated	0		No
Chilton	C5	Upper Alabama	Extant	9	2019	No
Chilton	C6	Lower Coosa	Extant (Transplant)4	19	2019	No
Elmore	E1	Upper Alabama	Extirpated	0	(1995)	No

[1] All known populations occur within the Fill Line Hills ecoregion. [2] Most recent population sizes and year of survey (Murphy and Boyd 1999, Byrd 2016, 2018, Yawn 2018, Yawn et al. 2023). [3] Years in parentheses indicate last year plants were observed, if known. [4] Parent plants were transplanted in 1985 prior to deconstruction of the original population.

Instead of known location information, FWS does provide specific counties, subbasins (Hydrologic Unit Code (HUC)-8), and ecoregions that were available for use in refining core map extent. However, the subbasins were observed to entirely contain the range and so did not provide a meaningful refinement.

Approach Used to Create Core Map

The core map was developed using EPA's process for developing core maps for species listed by the"+[/F\WS 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 Alabama Canebrake Pitcher-Plant from FWS, as well as observation information available from various publicly available sources including iNaturalist, GBIF, and NatureServe. The information compiled for Alabama Canebrake 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 Recovery Plan:

- "This carnivorous plant occurs in sandhill seeps, swamps, and bogs along the fall-line of central Alabama. Encroachment of competing woody vegetation, resulting from changes in fire cycles and altered hydrology, limit its distribution and abundance.

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 FWS (counties and ecoregions) were useful refinements for core map development, identifying areas of potential occupancy within a vast range.

Review of the available data also suggested that landcover types could be used to identify relevant habitat to include the core map for this species. To represent the species' habitat, the NWI dataset was used to identify habitat classes associated with the species habitat description above; using the "ATTRIBUTE" field. These land cover types had contiguous cultivated areas less than 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. Alabama Canebrake Pitcher-Plant does not have critical habitat. The range core map type was not selected because the species range is not refined in most geographic areas and not considered endemic.

Counties and ecoregions known to be inhabited by the Alabama Canebrake Pitcher-Plant were identified in FWS documentation; these areas represent the outer boundary ("extent") considered for habitat refinements used for core map development. The NWI database was clipped to this extent and queried to create a layer representing potential habitat for the Alabama Canebrake Pitcher-Plant. **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, 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. The current range of the species encompasses all of the occurrences based on visual inspection. Locations described by FWS were selected as the basis of the core map and further refined with biological data. If additional observational data is acquired that improves upon the extent used here—based on extant counties and ecoregions—then this could serve as a suitable alternative for core map use.

EPA Cultivated Areas > 25 Acres

As mentioned above, based on the species' habitat requirements and other biological factors, it would have been appropriate to exclude cultivated areas > 25 acres from the core map. However, this would not have removed any acreage from the core map area and so was not needed. If the core map area were to change in the future, this refinement would be considered reasonable and appropriate.

Appendix 1. Information compiled for Alabama Canebrake Pitcher-Plant

1. **Recent FWS documents**
   - 5-Year Review (FWS 2012) https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/1895.pdf.
   - 5-Year Review (FWS 2023a) https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/4765.pdf.
   - 5-Year Review Addendum (FWS 2018) https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/2567.pdf.
   - Recovery Plan (FWS 1992) https://ecos.fws.gov/docs/recovery_plan/921008.pdf.
   - Recovery Plan Amendment (FWS 2019) https://ecos.fws.gov/docs/recovery_plan/Alabama%20Canebrake%20Pitcher%20Plant%20Recovery%20Plan%20Amendment_3.pdf.
2. **Background information**

1. Status: Federally listed as endangered in 1989.
2. Resiliency, redundancy, and representation (the 3Rs) were not evaluated for this species.
3. Habitat, Life History, and Ecology
   - Habitat: 'This pitcher plant occurs on acidic, highly saturated, deep peaty sands or clays of upper Cretaceous origin (Case and Case 1974, McDaniel and Troup 1982). Common associates include cinnamon fern (*Osmunda cinnamomea*) ;pipeworts (*Eriocaulon* sp.); orchids (*Calopogon*, *Cleistes*, *Poaonia*); yelloweyed grasses (Xyris sp.); beak rushes (*Rynchospora* sp.); sundews (*Drosera* sp.); and butterworts (*Pinguicula* sp.). Woody associates may include cane (*Arundinaria tecta*); bamboo-vine (*Smilax laurifolia*); sweet bay (*Magnolia virginiana*); alder (*Alnus* sp.); red maple (*Acer rubrum*); poison sumac (*Rhus vernix*); and wax myrtle (*Myrica* sp.). Colony sites are wet much of the year and are often characterized as wet bogs or wet flatwoods. Within this general habitat type, colony health seems to be a function of unaltered hydrology and maintenance of an early successional stage in which competing woody vegetation is limited. Naturally occurring fires and hydrological conditions controlled the pioneering of woody species on these sites. Case and Case (1974) believe *Sarracenia rubra* ssp. *alabamensis* to be more shade tolerant than most other pitcher plants, but note that its most vigorous growth was attained in full sunlight' (FWS 1992).
   - 'Seedling recruitment was reported to be absent from the majority of populations (Brewer and Chesser 2009), further inhibiting recovery efforts, as well as long-term viability and evolutionary potential. Because the species can reproduce vegetatively, seedling recruitment may not be paramount at sites experiencing light to moderate levels of fire exclusion; however, vegetative reproduction may not compensate for mortality or the lack of sexual reproduction at some sites' (FWS 2012).
   - Pollinators: Small bees (*Bombus* spp.) are listed as potential pollinators for this species (FWS 2018).
4. Taxonomy
   - 'The first collections of this species were made during the early 1900's by Pollard and Maxon (McDaniel 1986; McDaniel and Troup 1982) and later by Harper (1918, 1922). However, Case and Case (1974) were the first to formally recognize these plants as representing a distinct taxon. There has been much disagreement regarding the proper taxonomic disposition of this taxon and the *Sarracenia rubra* complex in general. The

subspecies "*alabamensis*" was not recognized by Bell (1949); McDaniel (1966, 1971) considered it a regional variant; Schnell (1977, 1978, 1979) called it a subspecies; while Case and Case (1974, 1976) and McDaniel (1986) considered it a full species. According to Case and Case (1976) and McDaniel (1986), the taxonomic confusion within the *Sarracenia rubra* complex in general stems from the presence of alleged "intermediates" which are actually ecologically induced variants or introgressed hybrids. Hybridization has been well documented in *Sarracenia* species (Bell 1952, Bell and Case 1956, McDaniel 1971). Authors agree that leaf shape is the most significant diagnostic character in *Sarracenia* and that the distinctiveness of *Sarracenia rubra* ssp. *alabamensis* is best displayed in its large summer pitchers which are distinctively shaped, puberulent, yellow-green in color and inconspicuously veined and aerolate in the upper portion. Moreover, members of the *Sarracenia rubra* complex maintain their morphological distinctiveness when grown under standardized conditions (Case and Case 1976, Schnell 1977). Nomenclature in this plan follows the most recently published determination (FWS 1992).

5. Relevant Potential Pesticide Use Sites
    - 'As noted in previous 5-year reviews (Service 2012, 2018), incompatible road right-of-way maintenance, including herbicide application, contributed to the extirpation of one population (A4). Similar concerns exist for part of another population (C5) occurring within a railroad right-of-way; however, the railroad manager has installed a sign prohibiting herbicide application in the population, which may reduce potential for extirpation at this site because of this activity. The species requires active habitat management, such as prescribed fire or hand thinning to maintain open habitats and limit encroachment of woody, invasive, and competing species. Such management activities require cooperation from willing landowners, and the lack of these cooperative relationships has limited or prevented necessary habitat management of some local sites' (FWS 2023a).
6. Relevant Recovery Criteria and Actions (FWS 2019)
    - Downlisting Criteria:
        1. At least 10 geographically distinct populations of sufficient size within the Fall Line Hills ecoregion (Level IV) in Alabama exhibit stable or increasing population trends, as evidenced by natural recruitment and multiple generations over an appropriate time span. Populations are considered to be geographically distinct when they are separated by at least 1 mile (1.6 kilometer) from their nearest neighbors. (Addresses Factors A, B, E)
        2. These 10 populations are protected by a conservation mechanism that addresses the conservation needs of the Alabama Canebrake Pitcher-Plant. (Addresses Factors A, D)
        3. Protected populations are managed to promote open canopies, integrity of native plant communities, and Alabama Canebrake Pitcher-Plant growth. (Addresses Factors A, E)
    - Delisting Criteria:
        1. At least 10 additional geographically distinct populations of sufficient size (as described in Criterion 1) within the Fall Line Hills ecoregion in Alabama exhibit stable or increasing population trends, as evidenced by natural recruitment and multiple generations over an appropriate time span (Addresses Factors A, B, D, E).
        2. The Upper Alabama and Lower Coosa sub-basins within Fall Line Hills ecoregion each support at least three (3) viable populations protected by a conservation

mechanism (Addresses Factors A, E).

- Recovery Actions (FWS 2023a):
    1. Continue the use of prescribed fire at protected sites and encourage and cooperate with landowners of unprotected sites to conduct prescribed fire as frequently as possible to maintain favorable habitat conditions.
    2. Where use of prescribed fire is not feasible, use fire surrogates such as hand clearing and mowing of competing vegetation to maintain favorable habitat conditions.
    3. Work with landowners and cooperators to secure adequate protection of privately-owned populations.
    4. Work with state, county, and local transportation departments to ensure proper protective measures are implemented for those areas where Alabama canebrake pitcher-plants occur within roadside rights-of-way.
    5. Continue to preserve genetic material from all populations through long-term seed storage and live plant collections ex situ (off-site).

3. Range

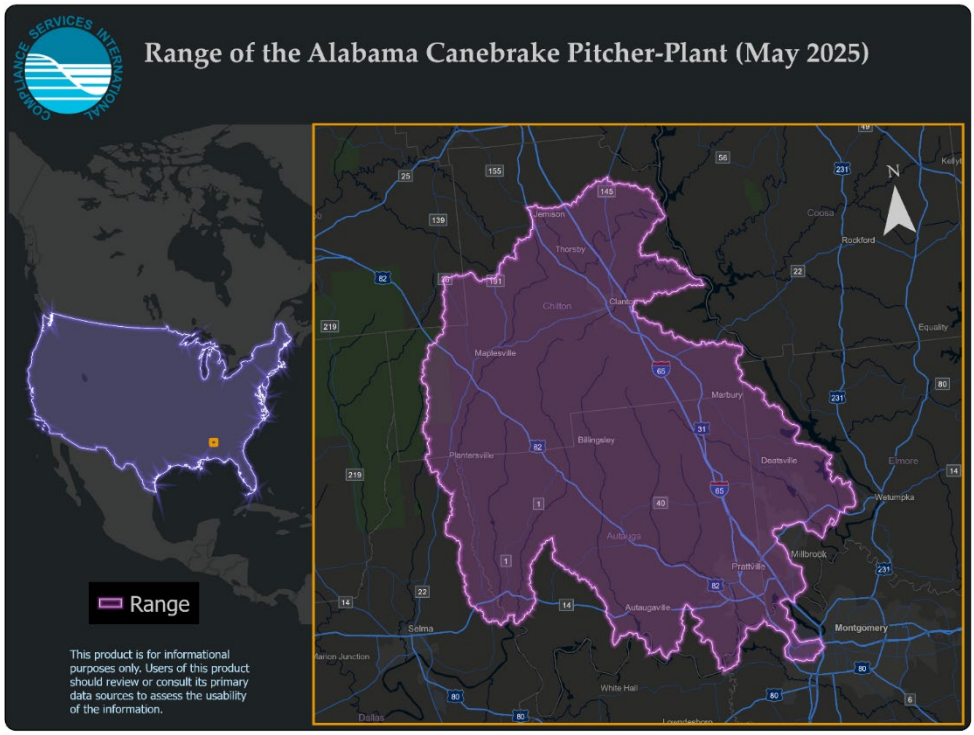

Figure 2. Range of the Alabama Canebrake Pitcher-Plant (FWS 2025).

- Historical Range
    - The Alabama Canebrake Pitcher-Plant is a carnivorous plant that is endemic to central Alabama, with all known populations, extant and extirpated, found in the Fall Line Hills ecoregion (FWS 2019). Species historically occurred in Autauga, Chilton, and Elmore Counties, Alabama. In Autauga County one population has since been extirpated (Byrd 2016) and the remaining five now represent three populations, with two populations continuing as distinct populations and three of the former populations now representing three sub-populations comprising

one population. No extant populations are known to occur in Elmore County (FWS 2018).

- Current Range (FWS 2023a)
  - 'The species is currently only found in Autauga and Chilton Counties and is considered extirpated in Elmore County, Alabama. Of Alabama canebrake pitcher-plant's 12 known populations, 8 are extant (including one small population consisting entirely of transplanted individuals and their progeny), and 4 are extirpated. While one population was discovered since the 2018 5-year review, another population has since been extirpated. In addition to few extant populations, small population size remains a threat with most (5 of 8) populations having less than 100 plants. Only 3 populations have 100 or more plants and only 1 population has over 1,000 plants. Two populations occur on conservation lands; however, one of these protected populations is also the largest known population (encompassing nearly threequarters of the species' entire known population in the wild). While overall population size has increased since the mid-1990s by over 48%, active recruitment of the species is generally low, with recent observations noting seedlings at only 3 populations, which represent only a small fraction of individuals within each of these populations. Discovery of additional populations and population augmentation have also contributed to recent population increases' (FWS 2023a).

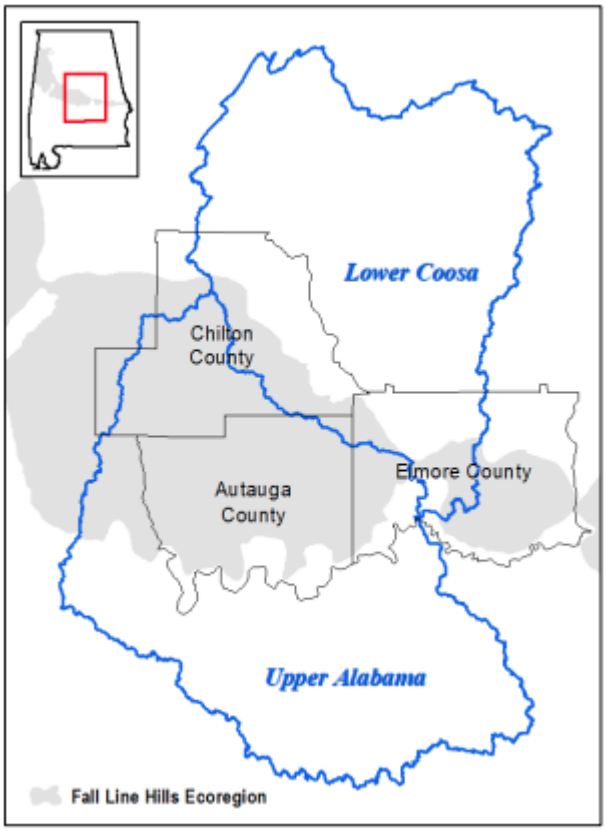

Figure 3. Counties, subbasins, and ecoregion with known Alabama canebrake pitcher-plant populations. Notes: The species is extirpated from Elmore County. Population locations are not presented in this map to reduce poaching threat to the species. Copied from Figure 1 of the most recent 5-Year Review (FWS 2023a).

4. Description of Critical Habitat

- Critical habitat has not been designated for this species.

5. Known Locations

- FWS
    - 'Of Alabama canebrake pitcher-plant's 12 known populations, 8 are extant (including one small population consisting entirely of transplanted individuals and their progeny), and 4 are extirpated. While one population was discovered since the 2018 5-year review, another population has since been extirpated. In addition to few extant populations, small population size remains a threat with most (5 of 8) populations having less than 100 plants. Only 3 populations have 100 or more plants and only 1 population has over 1,000 plants. Two populations occur on conservation lands; however, one of these protected populations is also the largest known population (encompassing nearly three-quarters of the species' entire known population in the wild)' (FWS 2023a).

- **Occurrences Included in Public Databases**
  GBIF, iNaturalist, and NatureServe were queried. Collectively, the occurrence data are consistent with the species range.

  GBIF: https://www.gbif.org/species/5572814
  - GBIF includes 229 occurrence records; 19 of which are georeferenced[3]. Six of these had 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."
  - All of the usable GBIF coordinates are originally sourced from iNaturalist, which had fewer records (4). It is not clear how the GBIF database would contain more records credited to the iNaturalist database than the iNaturalist database itself when both datasets were queried on the same day. Therefore, the GBIF dataset was not used for core map development.

- iNaturalist: https://www.inaturalist.org/observations?quality_grade=research&subview=map&taxon_id=62275
    - iNaturalist includes nine total observations, four of which are research-grade with usable coordinate data based on these criteria
    - Locations are consistent with GBIF, which is expected because all of the GBIF observations are credited to come from iNaturalist. There is one area southwest of the range that is in the GBIF database, but not iNaturalist.
    - Four of six iNaturalist records are outside of the counties known to FWS to have extant populations.
    - The iNaturalist data are neither comprehensive nor precise enough (falling outside of

[3] Figure 3 shows 1 georeferenced record, but the spatial data download on June 2, 2025 contains 19 usable GBIF records, 6 of which are usable according to the criteria developed.

those counties) to be used in core map development.

- NatureServe Explorer: https://explorer.natureserve.org/
    - Available public occurrence information from NatureServe Explorer aligns with the information from iNaturalist and GBIF and additionally includes more observations to the south and southeast of the range.
    - EOs were used to corroborate the decision to use a combination of range, ecoregion, and counties with extant populations to develop 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 based on counties with known extant populations and a modest refinement based on ecoregions. The core map identifies all areas within the extent (described below) matching the species habitat description from **Appendix 1**. Professional judgment was used to match "ATTRIBUTE" classes in the National Wetland Inventory (NWI) dataset as described below (FWS 2023b). NWI is regarded as a high quality national-level dataset that is appropriate to identify aquatic habitat for plant species such as the Alabama Canebrake Pitcher-Plant.

1. **References and Software**
    - Level III and IV Ecoregions (EPA 2023): https://www.epa.gov/eco-research/level-iii-and-iv-ecoregions-continental-united-states.
    - National Wetlands Inventory (FWS 2023b): https://www.fws.gov/program/national-wetlands-inventory.
    - Software used: ArcGIS Pro version 3.2.
    - FWS 5-Year Review (FWS 2023a): https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/964.pdf.
    - FWS Species Range (FWS 2025): https://ecos.fws.gov/ecp/species/1846.

2. **Datasets Used in Core Map Development**

2.1. Range

The range for this species was last updated by FWS on June 14, 2016. 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 #4269 ("North America Albers Equal Area Conic").

1. Using an ArcGIS Web Map the species was queried based on the ECOS listed "Entity ID" of 994 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 counties with known location information and ecoregions described in the FWS 5-year review (FWS 2023a). The range was used to refine the outer boundary ("extent") of the core map.

2.2. FWS 5-Year Review (2023a)

The most recent 5-Year Review includes the most up-to-date list of counties known to include extant populations of the Alabama Canebrake Pitcher-Plant that have been documented by FWS. These sites are catalogued in the document's Table 1, which additionally includes information about subbasins that are relevant to the Alabama Canebrake Pitcher-Plant. Figure 8 shows these counties and subbasins in relation to the Fall Line Hills ecoregion (Level IV, a subregion of the Southeastern Plains Level III Ecoregion), which is also specified as a constraint to the species extent. A layer of Ecoregions Level IV was downloaded from EPA's website and used to develop the core map extent as described in Section 3.

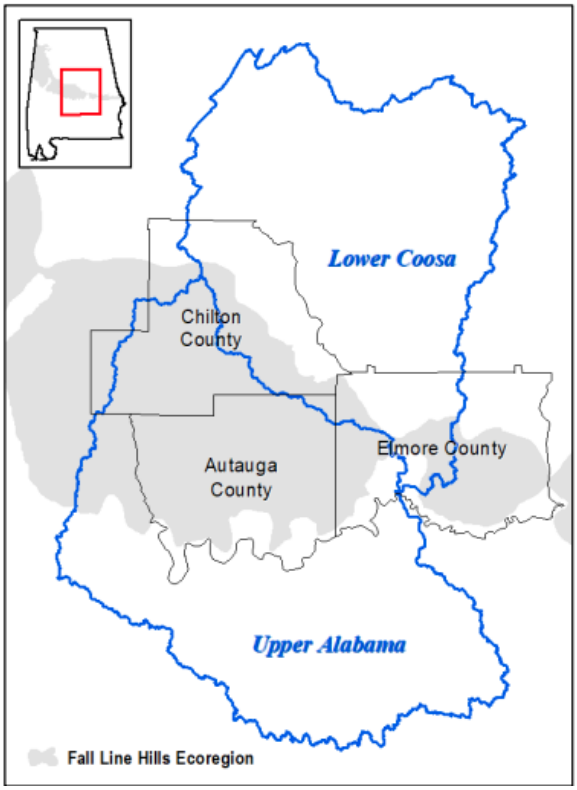

Figure 4. Counties, subbasins, and ecoregion level IV (Fall Line Hills) with known Alabama canebrake pitcher-plant populations. Notes: The species is extirpated from Elmore County. Population locations are not presented in this map to reduce poaching threat to the species. Copied from Figure 1 of the source document (FWS 2023a).

Limiting the extent to just these counties and the Fall Line Hills ecoregion removed some area (26.9%) from the species range.

2.3. Ecoregions

Textual descriptions of physiographic regions inhabited by the species are given in the 5-Year Review (FWS 2023a). Spatial data for these regions were downloaded by CSI on June 3, 2025 (see Figure 9 to see a map of all Level III Ecoregions of the United States). Only the Fall Line Hills ecoregion (Level IV, a subregion of the Southeastern Plains level III Ecoregion) is relevant to the Alabama Canebrake Pitcher-Plant. Because Level IV Ecoregions are more detailed and cannot be shown clearly at that scale, an additional figure (Figure 10) provides a focused view of the Southeastern Plains Level III Ecoregion, highlighting the Fall Line Hills (Level IV) subregion in relation to Figure 3.

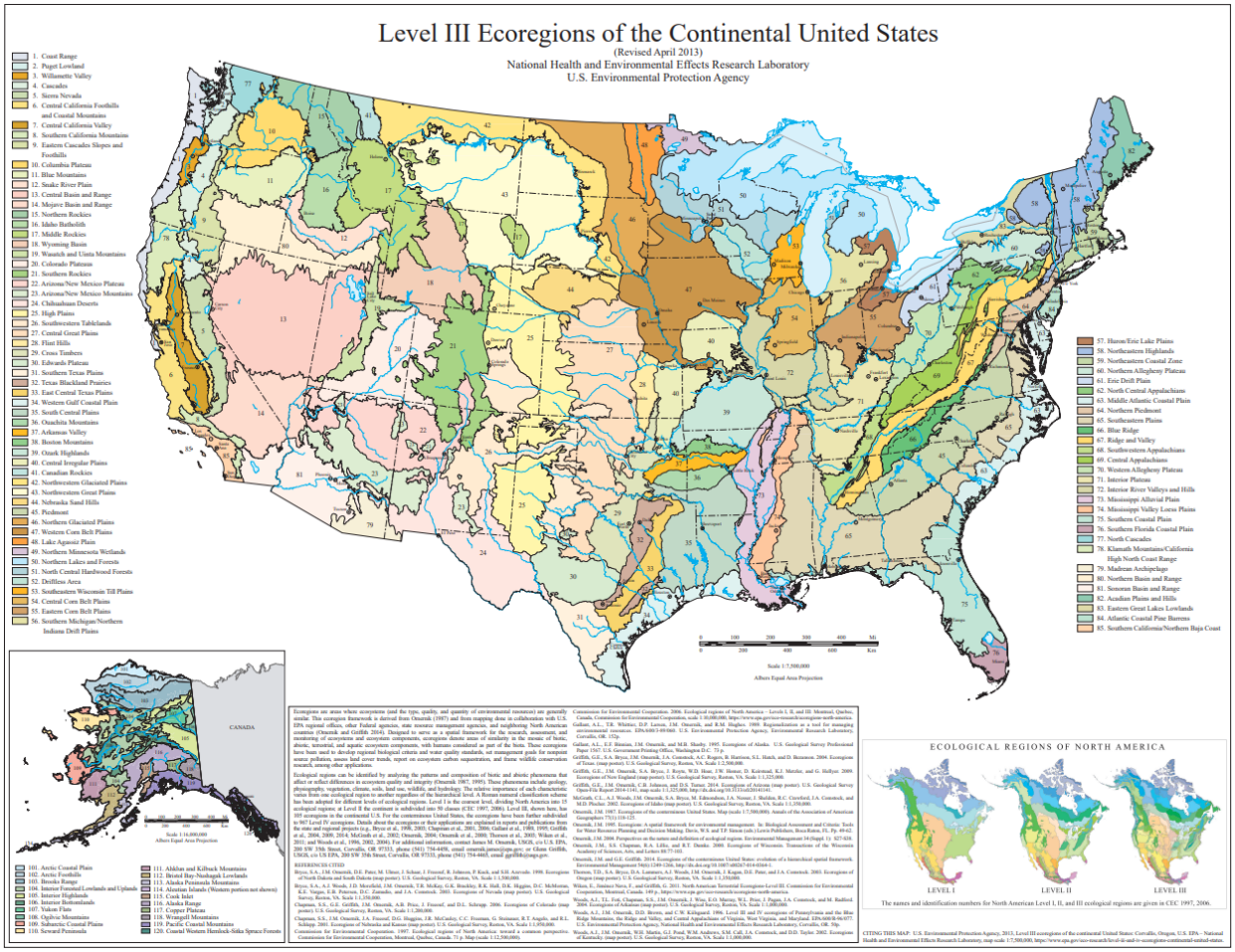

Figure 5. Level III Ecoregions of the United States (EPA 2023).

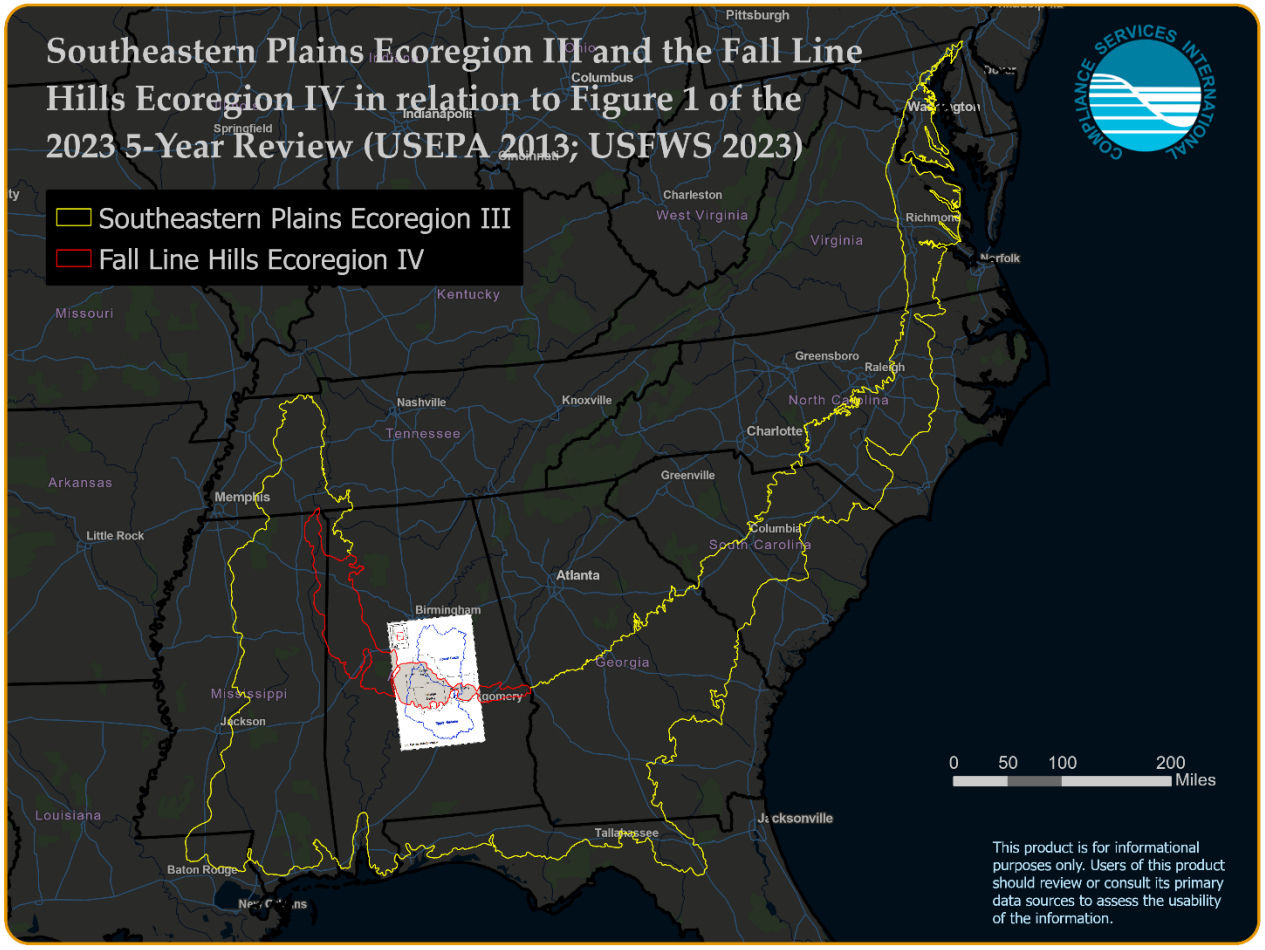

Figure 6. Southeastern Plains Ecoregion III and the Fall Line Hills Ecoregion IV in relation to Figure 1 of the 2023 5-Year Review (EPA 2013; FWS 2023).

2.4. National Wetlands Inventory

The NWI dataset was preliminarily vetted to determine its appropriateness in representing aquatic areas matching descriptions of the Alabama Canebrake Pitcher-Plant habitat. The species inhabits sandhill seeps, swamps, and bogs along the fall-line of central Alabama. CSI reviewed NWI attribute classes in relation to this description and determined that the species' potential habitat is best represented by palustrine emergent and moss/lichen wetlands. These possible site location types were selected in the NWI dataset using a SQL query: ATTRIBUTE LIKE '%PEM%' OR ATTRIBUTE LIKE '%PML%' (PEM code stands for: P = Palustrine, EM = Emergent; and PML code stands for P = Palustrine, ML = Moss-Lichen).

The NWI is publicly available as state-level downloads. The state-level NWI dataset for Alabama was downloaded and clipped to core map extent (described below), then queried for palustrine emergent and moss/lichen wetlands. These wetland polygons were dissolved into a single multipart shape that would ultimately represent the core map. Full details about the procedure used to develop the core map are provided in Section 3.

3. Creating the Core Map

3.1. Defining Extent

The core map for the Alabama Canebrake Pitcher-Plant was developed using counties and ecoregions known to include extant populations of the species. The layer of HUC-8 subbasins was used in the core map development procedure detailed below but found to present no refinement to the species range. The extent

used for core map development was created as follows:

1. Load a layer of US county boundaries into a GIS. Carefully inspect Figure 1 of the most recent 5-Year Review (FWS 2023a) to select corresponding counties with extant records: Autauga and Chilton. Export selected counties as a new layer, “ACPP_counties”.
2. Use the Pairwise Dissolve tool to dissolve the previous layer (“ACPP_counties”) into a feature class with a single shape, saved as “ACPP_counties_pd”.
3. Load a layer of US subbasin (HUC-8) boundaries into a GIS. Use the Select tool to select subbasins corresponding to the Lower Coosa and Upper Alabama regions, as shown in Figure 8. Export selected features as a standalone layer, “ACPP_subbasins”.
4. Use the Pairwise Dissolve tool to dissolve the previous layer “ACPP_subbasins” into a feature class with a single shape, saved as “ACPP_subbasins_pd”.
5. Load a layer of US ecoregion boundaries into a GIS. Carefully inspect Figure 1 of the most recent 5-Year Review (FWS 2023a) to select the lone relevant ecoregion for the Alabama Canebrake Pitcher-Plant: Fall Line Hills (Ecoregion Level IV). Export selected ecoregion as a new layer, “ACPP_ecoregions”.
6. Use the Pairwise Clip tool to clip the dissolved subbasins layer, “ACPP_subbasins_pd” by the selected ecoregion (“ACPP_ecoregions”) and save as a new layer, “ACPP_subbasins_pcEcoregions”.
7. Use the Pairwise Clip tool to clip the previous layer (“ACPP_subbasins_pcEcoregions”) by the dissolved counties layer (“ACPP_counties_pd”) and save as a new layer, “ACPP_subbasins_pcEcoregions_pcCounties”.
8. Use the Pairwise Clip tool to clip the previous layer (“ACPP_subbasins_pcEcoregions_pcCounties”) by the species range (“ACPP_range”) and save as a new layer, “ACPP_subbasins_pcEcoregions_pcCounties_pcRange”.
9. (Optional) Export the previous layer (“ACPP_subbasins_pcEcoregions_pcCounties_pcRange”) to a new feature class with a name that is easily recognizable as the core map extent (“ACPP_extent”).

3.2. Refinement based on Biological Information

The total extent of the Alabama Canebrake Pitcher-Plant core map—which comprises subbasins with extant populations clipped to select ecoregions, counties, and species range—includes a significant area and number of different land cover types that do not align with descriptions of Alabama Canebrake Pitcher-Plant habitat. To improve confidence in the core map, a refinement based on biological information was applied to the core map extent.

The best-available dataset for suitable species habitat was found to be the NWI dataset. This spatial layer was used as a refinement of the core map area as follows:

1. Download the state-level dataset of NWI wetlands in Alabama. Use the Pairwise Clip tool to clip all NWI wetlands in Alabama by the species extent (“ACPP_extent”) and save as a new layer, “NWI_ALwetlands_pcExtent”.
2. Use the Select by Attributes tool to select only palustrine emergent and moss/lichen wetlands from the NWI wetlands layer in Alabama, using the following SQL query: ATTRIBUTE LIKE '%PEM%' OR ATTRIBUTE LIKE '%PML%’. Export selected features to a new feature class, “NWI_ALwetlands_pcExtent_sel”. (PEM code stands for: P = Palustrine, EM = Emergent; and PML code stands for P = Palustrine, ML = Moss-Lichen).
3. Use the Pairwise Dissolve tool to dissolve features from the previous shape (“NWI_ALwetlands_pcExtent_sel”) into a layer with a single feature, saved as

"NWI_ALwetlands_pcExtent_sel_pd".

4. (Optional) Export features from the previous layer ("NWI_ALwetlands_pcExtent_sel_pd") into a new layer recognizable as the Alabama Canebrake Pitcher-Plant core map, "ACPP_CoreMap".

3.3. Cultivated Lands-based Refinement

The Alabama Canebrake Pitcher-Plant 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 ("NWI_ALwetlands_pcExtent_sel_pd") did not contain any cultivated areas according to NLCD (Table 1). Therefore, the step of removing cultivated areas > 25 acres was considered unnecessary and thus was not performed.

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