Interim Core Map Documentation for the Golden Sedge

Version 1
Review Completed: June 2025
Core Map Developer: Compliance Services International (CSI)

Review Notes

CSI developed 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 developed by CSI and evaluated if: (1) the map and documentation are consistent with EPA's process; (2) areas added to or excluded from the interim core map are consistent with the species biology and/or recovery needs; (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. EPA did not alter the developer's map and made minor edits to the documentation.

The core map developed in this document for the golden sedge is considered interim. This core map incorporates information developed by the U.S. Fish and Wildlife Service (FWS) and made available to the public. EPA reviewed the core map; 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.

Species Summary

The golden sedge (*Carex lutea*; Entity ID 1189) is an endangered monocotyledonous plant. FWS has designated a critical habitat for the golden sedge. This species is found in very wet, saturated, and periodically shallowly inundated soils. The largest populations are found in wet to saturated ecotones of savannas and hardwood forests in coastal areas of the Southeast U.S . At a few sites, the plants are most abundant in wet to saturated soils adjacent to drainage ditches, and in the saturated to shallowly inundated ditches themselves (FWS 2014). Additional information is provided in **Appendix 1**.

Description of Core Map

The core map for the golden sedge is based on both federally designated critical habitat and a supplemental refinement of areas within the species range using relatively more precise known location data, then excluding areas of contiguous cultivated land > 25 acres (EPA 2024). For areas outside of the critical habitat, the outer extent of the core map is the FWS range (708,360 acres), but unique refinements are made for each of two locations in which the species occurs, based on spatial datasets created to match textual descriptions of population information in the most recent FWS 5-Year Review (FWS 2022). These are summarized in more detail in **Appendix 2**.

This interim core map spans 120,192 acres. A summary of acreage by National Landcover Database (NLCD) land use type is provided in

NLCD_Land_Cover_Class	Acres
Woody Wetlands	69,597

Evergreen Forest	36,131
Open Water	4,332
Herbaceous	3,422
Developed, Open Space	2,750
Emergent Herbaceous Wetlands	1,838
Shrub/Scrub	1,052
Developed, Low Intensity	624
Deciduous Forest	179
Hay/Pasture	130
Developed, Medium Intensity	65
Cultivated Crops	51
Mixed Forest	11
Barren Land	7
Developed, High Intensity	3

Table 1. Based on EPA's "best professional judgment classification" system, CSI has graded this core map as "limited" because it comprises unaltered boundaries of two easily identifiable and well-defined areas, from trusted datasets from the U.S. Geological Survey (PAD-US) and the Florida Department of Revenue. Additionally, designated critical habitat boundaries were used for areas in North Carolina, modified only to exclude a lone population that is no longer extant. Biological information was not used for this map. More information about this classification system and its definitions can be found in the core map process document (EPA 2024).

When FWS reviews this interim core map, it may be possible to improve confidence in this core map by revising population location information this analysis and may be further refined by including any other known areas that are observed from reliable and precise observational datasets. Additional refinement may include the application of a filter to remove land cover types and habitats that are inconsistent with the FWS habitat descriptions for this species.

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

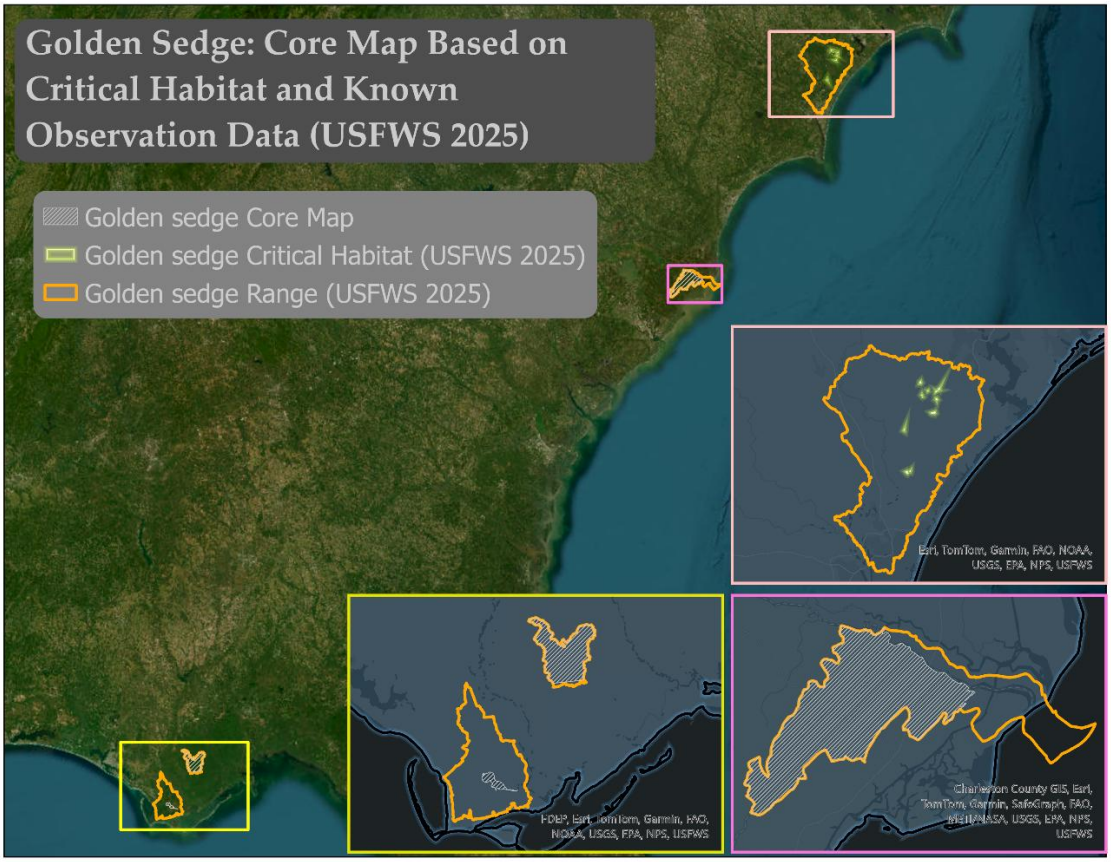

Figure 1. Core map, critical habitat, and range of the golden sedge (120,192 acres).

NLCD_Land_Cover_Class	Acres
Woody Wetlands	69,597
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Barren Land	7
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Table 1. Acres by National Land cover Database (NLCD) class within the core map of the golden sedge. Total core map area (based on NLCD pixel count): 120,192 acres[1].

[1] This acreage is slightly different from the core map acreage (120,201) due to the pixelation of NLCD land cover. The core map is not developed from raster data.

Evaluation of Known Location Information

There are four datasets with spatially delineated known location information:

- Descriptions of locations provided by FWS
- iNaturalist
- Global Biodiversity Information Facility (GBIF)
- NatureServe (Explorer Pro, public version)

Compliance Services International (CSI) evaluated these four datasets before developing the core map. The descriptions of locations provided by FWS were generally easily identifiable and comprise a full catalogue of the known observational areas with extant populations. In general, these are areas of critical habitat or have since been identified as well-defined areas that could be found in spatial datasets such as (PAD-US and FDOR).

There were 56 research grade observations found in iNaturalist[2]. These locations were consistent with other datasets, including the GBIF database (which had just 16 observations with coordinates). These observation totals are somewhat surprising, as research-grade observations from iNaturalist are often a subset of the GBIF database. **Appendices 1 and 2** include more information on the available known location information.

The public NatureServe Explorer Pro occurrences corroborated range information for the species but did not significantly improve upon the known location data that could be gleaned from descriptions of known location areas in FWS documentation. Therefore, NatureServe data were used mainly as validation on other sources and did not factor into the spatial delineation of the core map extent.

Finally, textual descriptions by FWS of known areas of extant occupancy were spatially delineated by CSI. Details on this process are provided in **Appendix 2**.

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 FWS and their designated critical habitats[2] (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: Designated Critical Habitat, Range, and Biological Information. From EPA, summaries of each core map type are provided below (EPA 2024).
    - Designates Critical Habitat: habitat core maps are appropriate in cases where the critical habitat includes all or nearly all the species' current habitat or areas that are targeted by FWS for conservation of a species.

[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-).

- Range: Range core maps are most appropriate for narrow (small) range endemic species (a species that is native and restricted to a certain place) with maps that FWS has refined. A refined range map from FWS will typically follow landscape features rather than political boundaries (such as county or state boundaries) and will generally have a more limited total area; ranges with an area of 10,000 acres or less are likely refined. Ranges with larger areas may still be refined when FWS generated the range using species locations or landscape features such as habitats or watersheds, for example the Miami tiger beetle or the bull trout. The larger refined ranges, often include many (more than 10) disconnected polygons with boundaries that do not have straight lines or right angles.
- Biological Information: Core maps based on biological information should reflect the spatial/mappable data that best represent the biological requirements of a species, and this may include one or more datasets. These biological requirements will vary by species, but examples include habitat type, soil requirements, foraging range, migratory area, or bloom periods. This type of core map should reflect the best available information but may have greater uncertainty in representing areas that are most important to species conservation.

3. Develop the core map for the species
4. Document the core map

For step 1, CSI compiled available information for the golden sedge from USFWS, as well as observation information available from various publicly available sources (including iNaturalist, GBIF, and NatureServe). The information compiled for the golden sedge is included in **Appendix 1**.

For step 2, CSI used the compiled information including the species range, critical habitat, known locations, and habitat location information to determine the core map type. CSI compared the known location data to the range and critical habitat and found that known locations were usable as a supplement to critical habitat for the core map development process. CSI selected the core map type of critical habitat, supplemented by refinements to other range areas based on identifiable known location information. CSI did not use habitat information to derive this core map, although this could be considered for further refinement (further explained in the following section discussion approaches and data that were considered but not used).

For step 3, CSI used the best available data sources to generate the core map. Data sources are discussed in the process document. For this interim core map, CSI identified known location areas that were refined from species range. That extent was established using textual descriptions of population information from FWS documentation. **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

CSI considered applying habitat or land cover-based refinement to develop the interim core map. CSI determined that in this case further refinements based on habitat may risk increasing uncertainty in the accuracy of spatial areas depicted. This is because at small scales, these types of national land cover data sources (NLCD, LANDIRE, etc.) integrate multiple datasets including satellite imagery, field data, and ecological models; therefore, local validation is limited in certain areas, leading to potential inaccuracies when applied at small scales. This is a frequent problem for most national level land cover datasets. A species-specific model for the golden sedge, developed by the North Carolina Department

of Transportation (NCDOT), provided a useful validation of the core map areas in North Carolina; however, these data were not used to develop the core map because it did not improve upon the quality of the original dataset—critical habitat boundaries—used in that region for this purpose.

Appendix 1. Information compiled for Golden Sedge

1. **Recent FWS documents**
   - 5 Year Review (2022) https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/3896.pdf
   - Recovery Plan (2014) https://ecos.fws.gov/docs/recovery_plan/20140507%20Carex%20lutea%20Recovery%20Plan%20Final.pdf
   - Critical Habitat (2011) https://www.govinfo.gov/content/pkg/FR-2011-03-01/pdf/2011-4036.pdf#page=1
2. **Background information**
   - Status: Federally listed as endangered in 2002.
   - Resiliency, redundancy, and representation (the 3Rs)
     - The 3 Rs were not specifically described in the species recovery plan or most recent FWS for this species and there is no species status assessment.
   - Habitat, Life History, and Ecology
     - Habitat: "*Carex lutea* is found in very wet to saturated to periodically shallowly inundated soils. The largest populations are found in the wet to saturated ecotones of savannas and hardwood forests. At a few sites, the plants are most abundant in wet to saturated soils adjacent to drainage ditches, and in the saturated to shallowly inundated ditches themselves." (FWS 2014)
     - "*Carex lutea* occurs on fine sandy loam (Grifton, a Typic Ochraqualf) and on loamy fine sands (Foreston, an Aquic Paleudult; Stallings, an Aeric Paleaquult; and Woodington, a Typic Paleaquult). Taggart and Long (2012) collected 96 soil samples (48 topsoil and 48 subsoil) at three *Carex lutea* sites. Mean pH values within sites were very strongly (4.7) to moderately acid (5.7) for topsoils. Mean pH values for subsoils were moderately (5.8) to slightly (6.5) acid" (FWS 2014)
     - Pollinators: "The reproductive biology of *Carex lutea* is unknown; however, because ample mature seed production has been observed, we can confidently surmise that *Carex lutea* reproduces both sexually, involving gravity and wind dispersed pollen, as well as vegetatively." (FWS 2014)
   - Taxonomy
     - Wetland plant – "From analysis of a mature specimen collected on May 22, 1991, it was determined that the taxon belonged to the genus *Carex*, section Ceratocystis (=Extensae), a circumboreal section not previously known from North Carolina. Sedges of the section Ceratocystis occur in temperate regions in North America, Europe, Asia, and Australia. In North America, they are primarily in the northern temperate region. *Carex lutea* is the southern-most species in the section in North America." (FWS 2014)
   - Relevant Potential Pesticide Use Sites
     - "Population NC 18 changed from a rank of excellent (A) to poor (C) indicating the population has declined, due to fire suppression and herbicide damage." This population occurs in a utility right-of-way and was sprayed with herbicide. No plants were observed after the spraying (FWS 2022).
   - Relevant Recovery Criteria and Actions (FWS 2022)
     - According to the recovery plan, *Carex lutea* will be considered for removal from the List of Endangered and Threatened Species (delisting) when:

- "There are 15 protected sites in the wild that are distributed across the range of the species"
- "On each of the 15 *Carex lutea* sites, for at least 5 years, any non-native plant species that have the potential to displace *Carex lutea* are maintained at or below 10 percent of total number of species and at or below 10 percent cover (volume)."
- "All 15 *Carex lutea* sites demonstrate stable or increasing population trends for ten consecutive years."
- "Habitat management plans are actively being implemented for all protected sites and are showing evidence that actions are proving effective for this plant."
- "A prescribed fire regime is being conducted at all sites to mimic historical frequency and timing (which will be determined through recovery actions in this plan)."
- "With regards to the recovery criteria outlined in the Recovery Plan, we currently know of 12 populations, 11 of which are extant and one extirpated. Nine of the 12 known populations are in conservation ownership and protected. All 11 extant sites are likely dominated by at least 90% native vegetation. Monitoring has been inconsistent, so the stability of most populations is unknown. Eight populations are managed with prescribed fire. At this time the recovery criteria have not been met."

3. Range

- Historical Range
  - The golden sedge is endemic to the outer coastal plains of North Carolina (FWS 2014). To date, a map of historical areas has not been created.
- Current Range

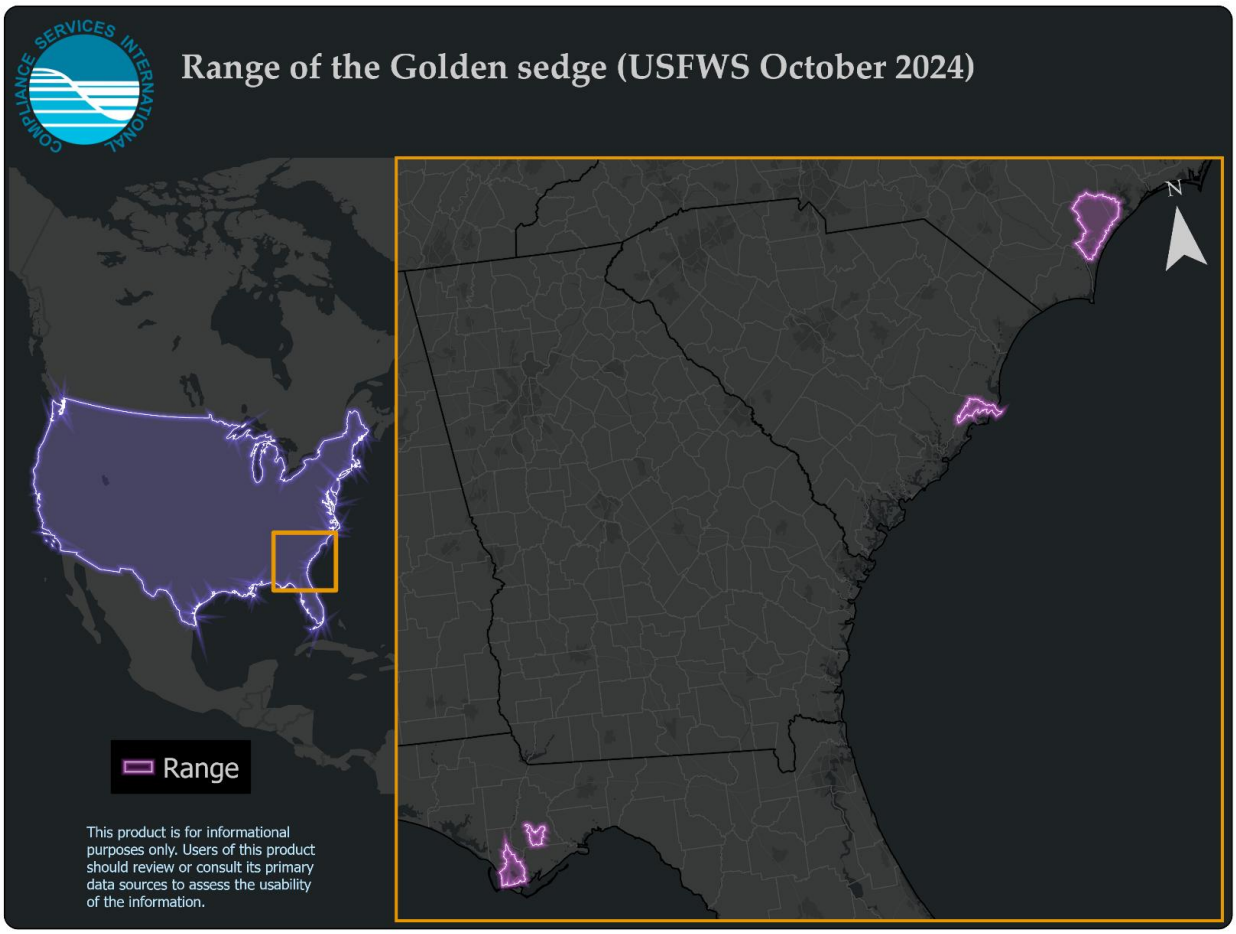

Figure 2. Current range of the golden sedge (Carex lutea) (FWS 2024).

4. Description of Critical Habitat (FWS 2011)

- Critical habitat designated in 2011**:** https://www.govinfo.gov/content/pkg/FR-2011-03-01/pdf/2011-4036.pdf#page=1
- 2011 Final Rule: Approximately 202 acres (82 hectares) in eight units located in Onslow and Pender Counties, North Carolina fall within the boundaries of the critical habitat designation.
- Primary Constituent Elements for the species: "Features essential to the conservation of *Carex lutea* is Pine Savanna (Very Wet Clay Variant) natural plant community or ecotones that contain:
    - Moist to completely saturated loamy fine sands, fine sands, fine sandy loams, and loamy sands soils with a pH between 5.5 and 7.2;
    - Open to relatively open canopy that allows full to partial sunlight to penetrate to the herbaceous layer between savannas and hardwood forests; and
- Areas of bare soil immediately adjacent (within 12 inches (30 centimeters)) to mature *Carex lutea* plants where seeds may fall and germinate or existing may expand in size.

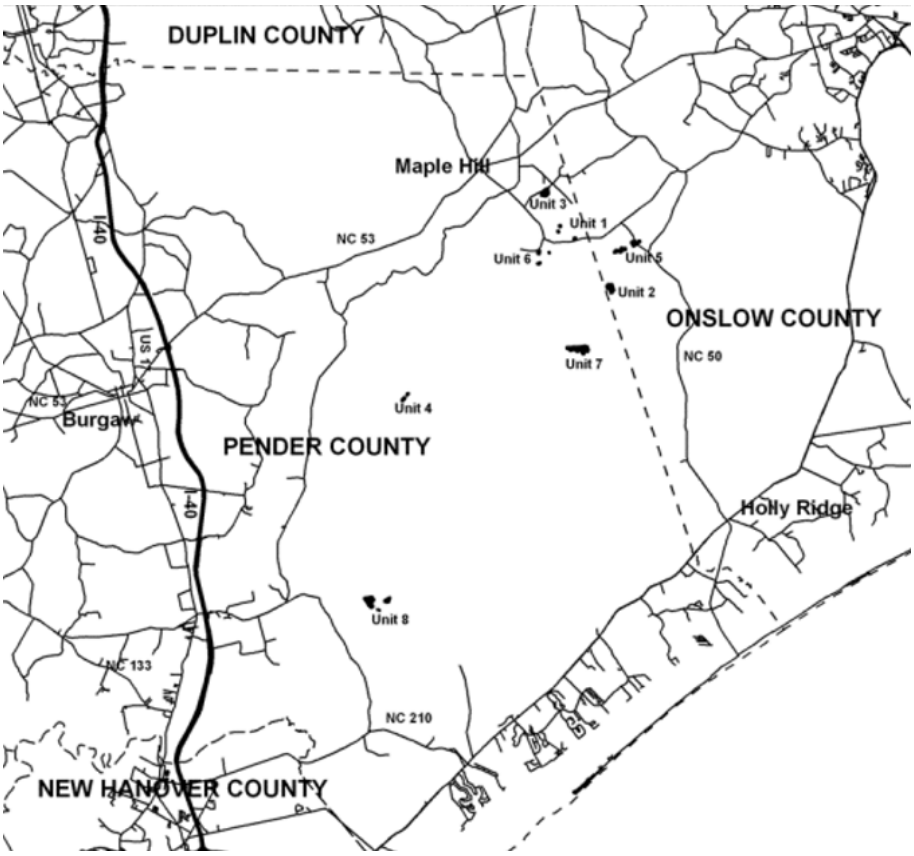

*Figure 3. Eight units of critical habitat for the golden sedge (*Carex lutea*) in Pender and Onslow Counties, North Carolina. Reproduced from Figure A1 of the Final Rule document (FWS 2011).*

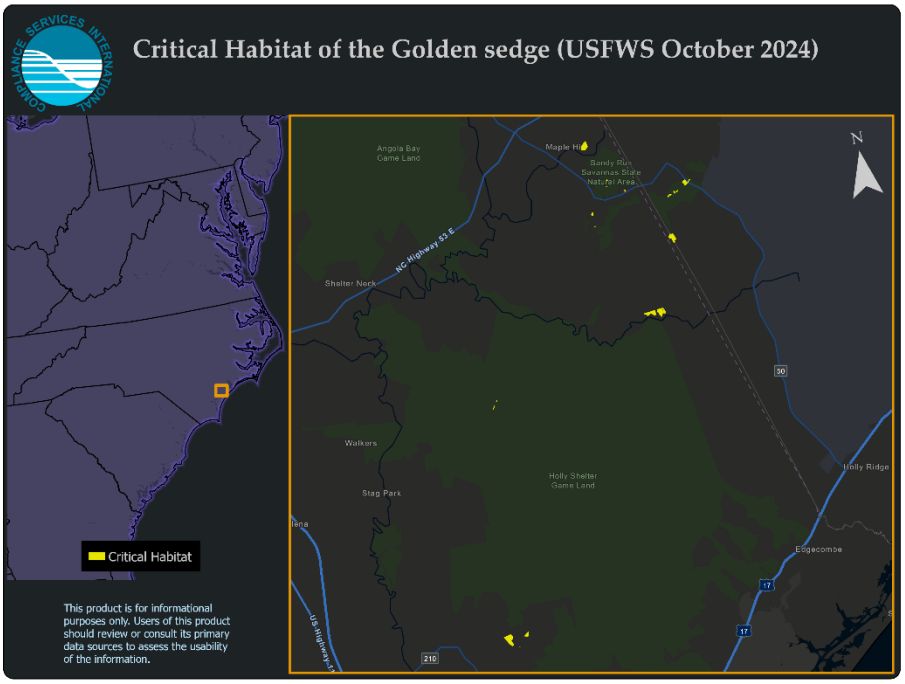

Figure 4. Critical habitat for the golden sedge (FWS 2024).

5. Known Locations (FWS 2022)

“With the addition of three populations in Florida and one in South Carolina, there are now a total of 11 extant populations in NC, SC and FL. Four populations are ranked with excellent viability (two in FL and two in NC), three with good estimated viability (one in FL and two in NC), three with fair estimated viability (all in NC) and one as extant (but not further rated; in SC). One population in NC has not been found recently and is likely extirpated. Since the 2015 five-year review, one NC population was lowered from excellent to fair because of its decline due to fire suppression and impacts from herbicide damage. Only one NC population had an improved rank since the last status review. Ranks for the remaining five populations in NC remained the same, indicating those populations are probably stable “(See Appendix B of the 2022, FWS below).

Principal Element Occurrence	Site Name	Conservation/ Ownership	Seed Banked	Native: Invasive 90: 10	Stable or Increasing	Management Plan Implemented	Regular Fire Management	Heritage Rank
FL 1	Apalachicola National Forest	Yes, US Forest Service	No	Most likely	Unknown	Yes	Yes	A
FL 2	Apalachicola National Forest	Yes, US Forest Service	No	Most likely	Unknown	Yes	Yes	A
FL 3	Apalachicola River Wildlife and Environmental Area, Lake Wimico Tract	Yes, FL Fish and Wildlife Conservation Commission	No	Most likely	Uknown	Yes	Yes	B
NC 5	Watkins Savanna	Partially, NC Division of Parks and Recreation / Private	Yes	Most likely	Monitored but unknown	No	Yes, partial	B
NC 7	Haws Run Mitigation Site	Yes, NCDPR	Yes	Most likely	Monitored but unknown	Yes	Yes	B
NC 10	Maple Hill School Road	No, Private	No	Unlikely	Possibly destroyed	No	No	F
NC 11	Southwest Ridge Savanna/ Ashes Creek	Yes, NC Wildlife Resources Commission	No	Most likely	Impacted by fire plow, monitored by Taggart (2015)	Unknown	Unknown	C
NC 15	Sandy Run Swamp and Savannas	Yes, NC Division of Parks and Recreation	Yes	Most likely	Monitored by unknown, impacted by road widening	Yes	Yes	C
NC 18	The Neck Savanna	Partially, NC Division of Parks and Recreation / Private	No	Most likely	Declining from fire suppression and herbicide damage	No	No	C
NC 21	Shaken Creek Savanna	Yes, The Nature Conservancy	Yes	Most likely	Monitored but unknown	Yes	Yes	A
NC 24	Shaken Creek Savanna	Yes, The Nature Conservancy	Yes	Most likely	Monitored but unknown	Yes	Yes	A
SC 1	Francis Mariona National Forest	Yes, US Forest Service	No	Most likely	Unknown	Yes	Yes	E

*Table 2. Summary of progress toward the recovery of golden sedge (*Carex lutea*). Principal Elemental Occurrence is identified as a population for the purposes of this review. Heritage ranks defined for each elemental occurrence by species experts (e.g. A: excellent estimated viability, B: good estimated viability, C: fair estimated viability, D: poor estimated viability, E: extant (but viability not estimated), F: failed to find). Reproduced from Appendix B of the most recent FWS (FWS 2022).*

- iNaturalist: https://www.inaturalist.org/observations?subview=map&taxon_id=160004
    - 56 research grade observations with coordinates, all dated since May 2011.
    - These locations generally align well with the FWS documentation of known populations in NC and SC, with somewhat less agreement in FL.
- GBIF: https://https://www.gbif.org/species/2726286
    - GBIF includes 128 records, 16 of which had usable coordinate data based on lat/long precision (3+ decimal places) and relative recency (2010-present). These are all attributed to human observation.
- NatureServe Explorer Pro: https://explorer.natureserve.org/pro/Map?taxonUniqueId=ELEMENT_GLOBAL.2.147501
    - Available public occurrence information from NatureServe Explorer Pro aligns with the information from iNaturalist in all three states of species presence (NC, SC, and FL)

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

The core map for this species is based on critical habitat, modified to exclude a single population in North Carolina that is deemed likely extirpated (NC-10), and to include principal element occurrences enumerated by FWS in its most recent 5 Year Review (FWS 2022).

1. **References and Software**
   - North Carolina Department of Transportation (NCDOT) ATLAS Project: https://xfer.services.ncdot.gov/gisdot/AtlasData/AtlasSpeciesModels/ATLASPlantMachineLearningModels/
   - PAD-US: https://catalog.data.gov/dataset/protected-areas-database-of-the-united-states-pad-us-3-0-ver-2-0-march-2023
   - Software used: ArcGIS Pro version 3.2
   - EPA Modified Cultivated Layer: https://cdn.arcgis.com/home/item.html?id=159e70ce4c284f5b972c687037f8a668
   - FWS Species Range & Critical Habitat: https://ecos.fws.gov/ecp/species/6025

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

2.1. Range

The range for this species was last updated on 8-16-2022. A shapefile including species range for all listed species was downloaded from the FWS ECOS website on January 24, 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 1189 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 rate of 0.000247105.
3. This shapefile was added to an ArcGIS Pro map and compared against the available known locations described in the FWS 5YR and the available occurrence information from the GBIF database. The current range and NatureServe public Element Occurrences (EOs) capture the locations identified in the FWS and include the occurrence information from iNaturalist to within the published uncertainty of each observation.

2.2. PAD-US

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

In the case of the golden sedge, where known occurrences include well-defined areas such as national forests and other environmental areas, the PAD-US dataset was useful in extracting areas meant to conservatively capture extant populations of the species. These were used to supplement critical habitat spatial data, where appropriate.

2.3. Florida Department of Revenue (FDOR): Statewide Parcels

The Florida Department of Revenue's Property Tax Oversight (PTO) program collects parcel level GIS data every April from each of the state's county property appraisers' offices. This land parcel dataset was used to identify and extract one Principal Element Occurrence: Apalachicola River Wildlife and Environmental Area, Lake Wimico Tract (FL-3 in Table 2). This polygon was slightly modified as described below, and contributed to the core map shape.

Principal Element Occurrence	Site Name	Conservation/ Ownership	Seed Banked	Native: Invasive 90: 10	Stable or Increasing	Management Plan Implemented	Regular Fire Management	Heritage Rank
FL 1	Apalachicola National Forest	Yes, US Forest Service	No	Most likely	Unknown	Yes	Yes	A
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Table 2. List of element occurrences from Florida's Department of Revenue

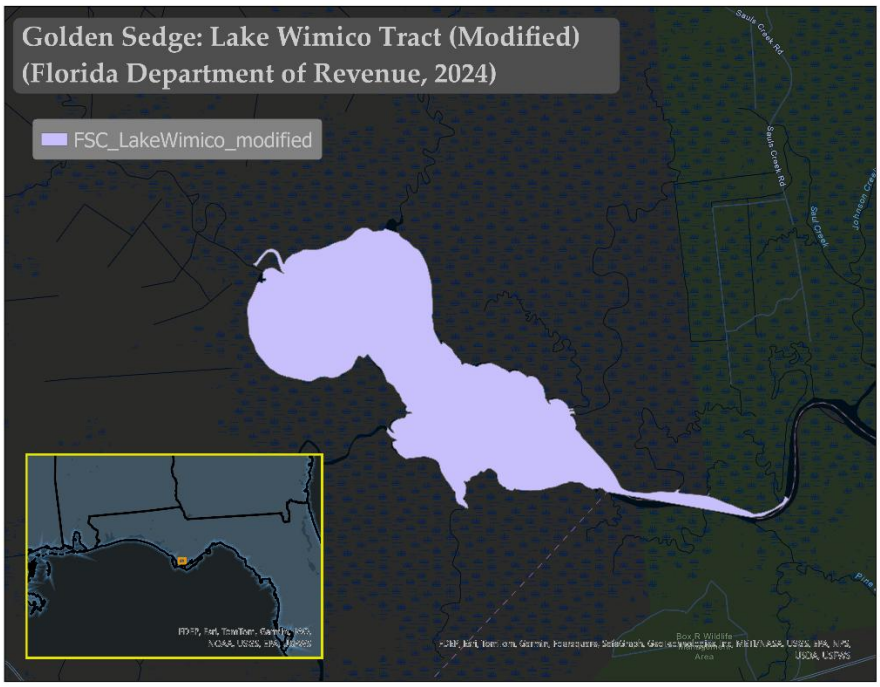

Figure 5. Lake Wimico Tract shape used for the core map (Florida Department of Revenue, 2024).

2.4. NCDOT ATLAS

Regions of suitable habitat were used to validate the core map of the golden sedge. NCDOT completed a project ("ATLAS") in 2019 that categorized land within the range as low, moderate, or high suitability for species habitat for the golden sedge. This model leveraged machine learning to arrive at its classifications. Ultimately, regions of "low" suitability were excluded from the core map, while "ModerateHigh" suitability were included. Categories of low/high for this species are defined as follows ("moderate" was not defined):

- 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.

The thresholds for this species in the underlying continuous variable model are: Low-Moderate (0.12) and Moderate-High (0.32).

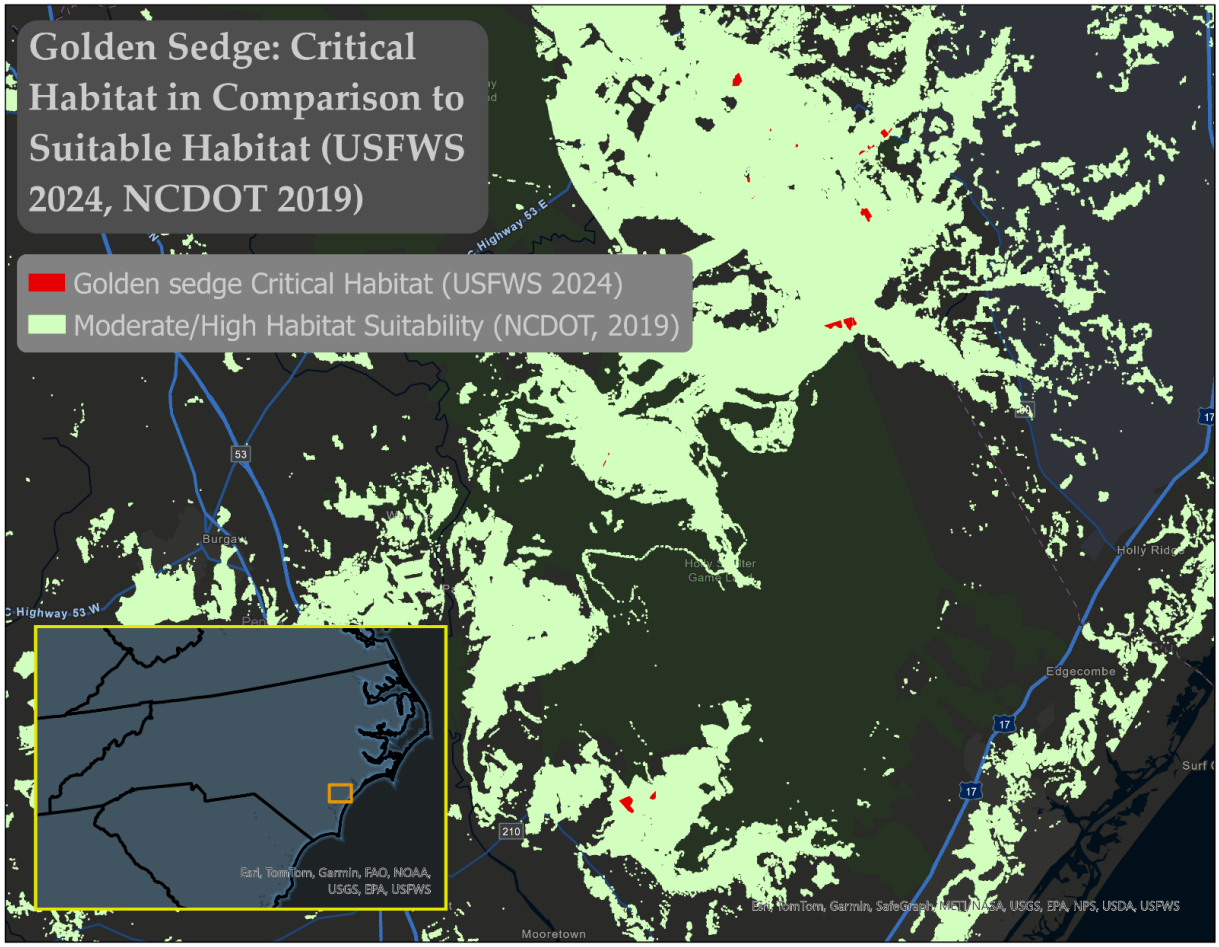

Figure 6. Golden sedge critical habitat within and/or near areas of moderate or high habitat suitability (green) for the golden sedge (NCDOT 2019; FWS 2024).

3. Creating the Core Map

3.1. Developing Extent

Critical Habitat

The core map for the golden sedge in North Carolina is defined by its critical habitat. Using a relatively recent set of descriptions of each unit of critical habitat, the decision was made to exclude the only unit that is considered extirpated (Principal Element Occurrence NC-10 in

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NC 18	The Neck Savanna	Partially, NC Division of Parks and Recreation / Private	No	Most likely	Declining from fire suppression and herbicide damage	No	No	C
NC 21	Shaken Creek Savanna	Yes, The Nature Conservancy	Yes	Most likely	Monitored but unknown	Yes	Yes	A
NC 24	Shaken Creek Savanna	Yes, The Nature Conservancy	Yes	Most likely	Monitored but unknown	Yes	Yes	A
SC 1	Francis Mariona National Forest	Yes, US Forest Service	No	Most likely	Unknown	Yes	Yes	E

Table 2). This component of the core map was developed according to the procedure below.

1. Set a definition query on a feature class of all USFWS species critical habitats (downloaded October 2024) for the Golden Sedge (Entity ID = 1189).
2. Export previous layer as a standalone feature class representing species critical habitat to a file geodatabase (“GS_CH”).
3. Manually create a new feature class layer consisting of one polygon encompassing all units of critical habitat except the extirpated unit (“GS_polygon4clip”).
4. Use the Pairwise Clip tool to clip the critical habitat layer by the layer in the previous step and save to the file geodatabase (“GS_CH_pcExtant”).

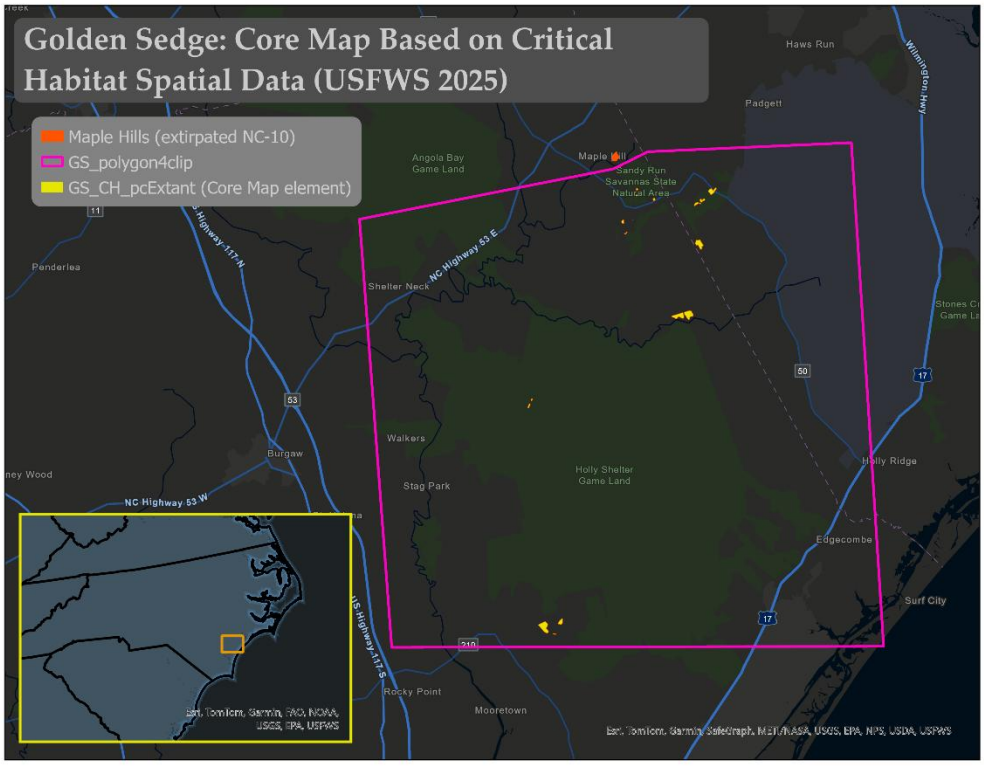

Figure 7. Golden sedge core map based on critical habitat (FWS 2025).

Francis Marion National Forest

A feature class for the Francis Marion National Forest was developed using the PAD-US dataset described above. The combined “Proclamation, Marine, Fee, Designation, Easement” layer was queried in SQL as follows: Loc_Nm LIKE '%Francis Marion National Forest%'. This query produced four spatially adjacent records. The Pairwise Dissolve tool was used to combine these four records into a single layer and saved to a file geodatabase as “Francis_Marion_National_Forest_pd”.

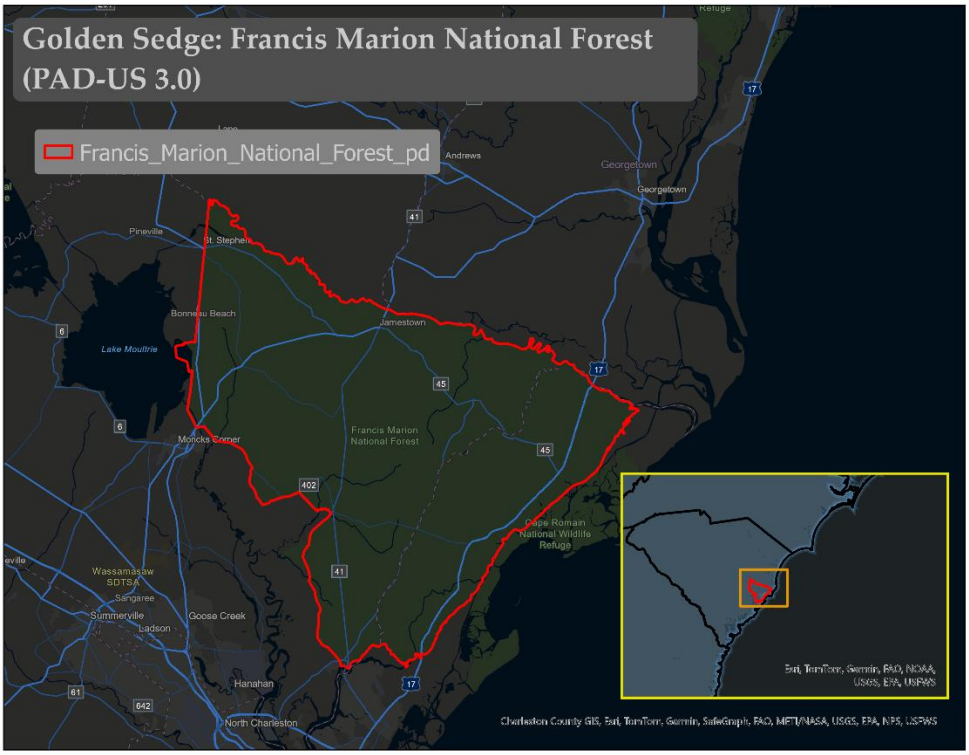

Figure 8. Francis Marion National Forest (PAD-US 3.0).

Apalachicola National Forest

A feature class for the Apalachicola National Forest was also developed using the PAD-US dataset. The combined “Proclamation, Marine, Fee, Designation, Easement” layer was queried in SQL as follows: Loc_Nm LIKE '%Apalachicola National Forest%'. This query produced a single record. This record was exported to a file geodatabase as “Apalachicola_National_Forest”.

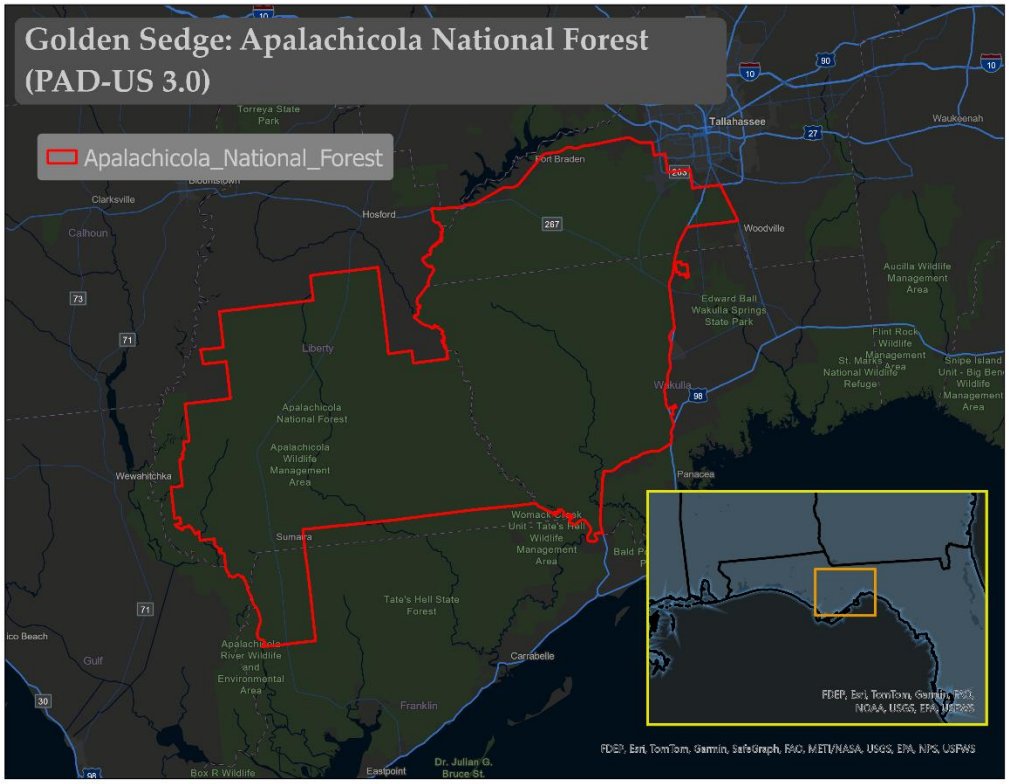

Figure 9. Apalachicola National Forest (PAD-US 3.0).

Lake Wimico Tract

The textual description of the Lake Wimico Tract identifies it as part of the "Apalachicola River Wildlife and Environmental Area." The PAD-US layer was queried for this area (Loc_Nm LIKE '%Apalachicola River Wildlife') and two resulting records were exported as a temporary layer. Neither record positively identified Lake Wimico itself, so a different source was sought for this information. The Florida Department of Revenue maintains a spatial land parcel dataset that includes this area; the FDOR dataset was first queried by location for parcels overlapping the Apalachicola River Wildlife and Environmental Area, then manually selected for the single shape intersecting the lake according to underlying basemap imagery and exported as a standalone layer ("Lake_Wimico", ESRI 2025).

This resulting shape included flowing waters adjacent to the lake. To remove these, the layer was exported as an identical separate layer ("Lake_Wimico_modified") and the manually trimmed during an edit session using the "Split" tool. Edits were saved, and this modified layer represents the core map of the species in this region.

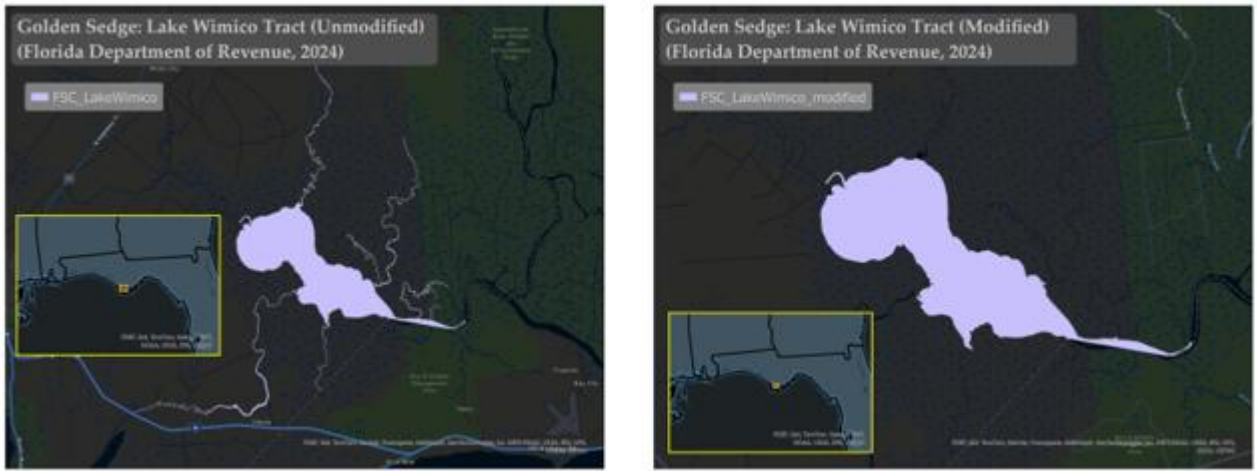

Figure 10. Lake Wimico Tract (Florida Department of Revenue, 2024).

Aggregation

The following four developed layers were combined using the Merge tool and saved to the geodatabase as a new layer ("Golden_sedge_Merge").

- GS_CH_pcExtant
- Francis_Marion_National_Forest_pd
- Apalachicola_National_Forest
- Lake_Wimico_modified

Next, the merged layer was dissolved into a single shape using the Pairwise Dissolve tool and saved as a new layer ("Golden_sedge_Merge_pd").

Clip To Range

The final step in determining extent was to clip the dissolved layer by the species range. This is to exclude areas that are already presumed not to include species presence. The Pairwise Clip tool was used to clip the dissolve layer by the range, saved as "Golden_sedge_Merge_pd_pc").

3.2. Cultivated Lands-based Refinement

The species is not considered to be "on-field." That is, it is unlikely the species would be found in agricultural fields and its natural habitat—very wet to saturated to periodically shallowly inundated soils—does not account for this land use type. To account for off-field species like the golden sedge, EPA developed and published its own cultivated layer for use in core map development as a potential refinement of extent (EPA 2025). CSI applied this refinement by using the Pairwise Erase tool on the species extent "Golden_sedge_Merge_pd" and exporting to a file geodatabase as a finalized core map layer ("Golden_sedge_CoreMap") (Figure 11). The core map layer spans 120,201 acres.

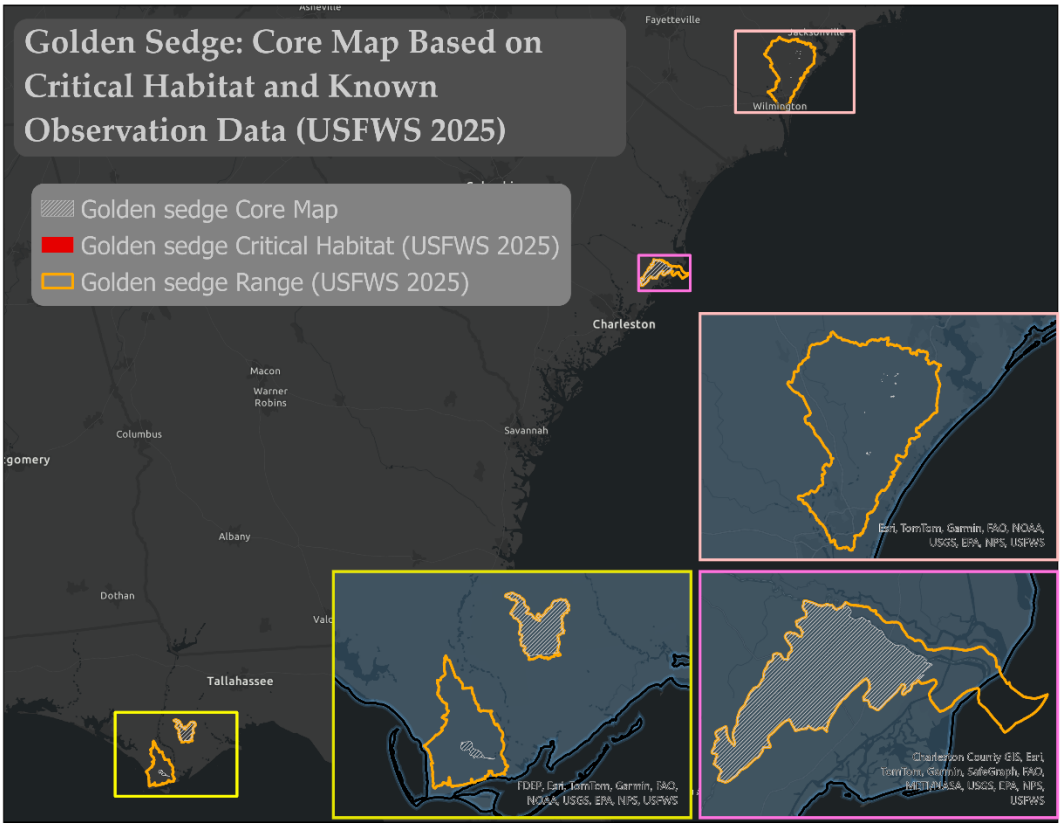

Figure 11. Core map, critical habitat, and range of the golden sedge. Core map area: 120,201 acres.

This layer was exported to a separate geodatabase ("Golden_sedge_CoreMap.gdb") and saved with the same layer name.

4. Datasets Considered but Not Used in Core Map Development

4.1. NLCD, LANDFIRE, and other landcover datasets

Typically, it would be reasonable to refine a core map for a species with a large and/or unrefined range based on descriptions of its habitat, which can be mapped to land cover datasets such as NLCD, LANDFIRE, and others. For the golden sedge, the core map locations were precise enough (based on designated critical habitat), that any additional refinement from those datasets risked decreasing, rather than increasing, confidence in the overall extent of the species. This is because at small scales, NLCD and LANDFIRE integrate multiple datasets including satellite imagery, field data, and ecological models; therefore, local validation is limited in some areas, leading to potential inaccuracies when applied at small scales. This is a frequent problem for most national level land cover datasets.

In CSI's opinion, the accuracy of delineating occupied areas, which consist mainly of nature preserves and military installations for this species, provides sufficient refinement for the core map and precludes need to further refine with land cover.

4.2. NCDOT ATLAS

The core map was examined and validated against the NCDOT species-specific habitat suitability model for the golden sedge in North Carolina. As expected, it was found that critical habitat was largely consistent with areas of moderate and high ("ModerateHigh") potential habitat for the golden sedge (Figure 6). The relative areas of low/moderate/high are individually represented in Figure 12, and corresponding acreages calculated. Areas of "high" potential habitat were found to represent 89% of extant critical habitat, while moderate and low areas were 9% and 2%, respectively.

Because low-probability areas within the extant critical habitat adopted for the core map comprised only 2%, it was decided that a refinement based on the species-specific model was not needed.

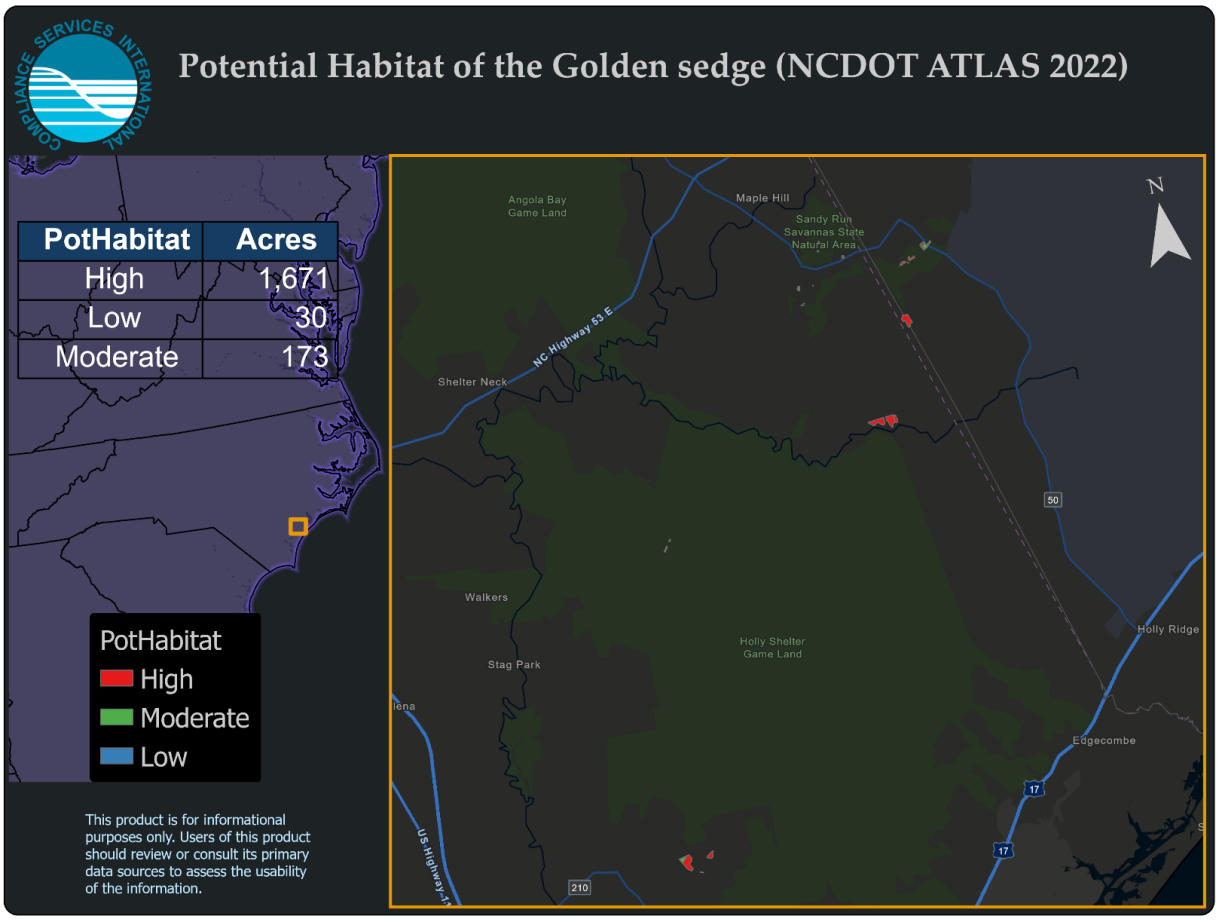

Figure 12. Potential habitat of the golden sedge, and associated acreages (NCDOT 2022).

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