Interim Core Map Documentation for the Hairy Rattleweed

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

Species Summary

The hairy rattleweed (*Baptisia arachnifera*, Entity ID 643) is an endangered terrestrial plant (dicot). The U.S. Fish and Wildlife Service (FWS) has not designated a critical habitat for the hairy rattleweed. The known occurrences of hairy rattleweed are concentrated in Southeastern Georgia in Wayne and Brantley Counties. This species is typically found in mesic pine lowland forest or pine flatwoods and grow in sandy soils underlain by an organic hardpan. Soils are typically acidic (pH 4.2 to 5.1) and low in fertility. Elevations of sites with known populations range from 17 to 26 m (55 to 85 ft). Additional information on the species is provided in **Appendix 1**.

Description of Core Map

The core map for the hairy rattleweed is biological information type based on known locations identified by FWS.

Figure 1 depicts the resulting interim core map for the hairy rattleweed. The size of his core map is approximately 13,000 acres.

The core map developed for the hairy rattleweed is considered interim. This core map will be used to develop pesticide use limitation areas (PULAs) that include the hairy rattleweed. This core map incorporates information developed by the U.S Fish and Wildlife Service (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 species expert feedback from FWS. This interim core map has an "average" (3) best professional judgment classification to describe major uncertainties/limitations. The map is based on known locations described by FWS, and EPA removed some additional areas based on biological needs of the species. This core map does not replace or revise any range or designated critical habitat developed by FWS for this species.

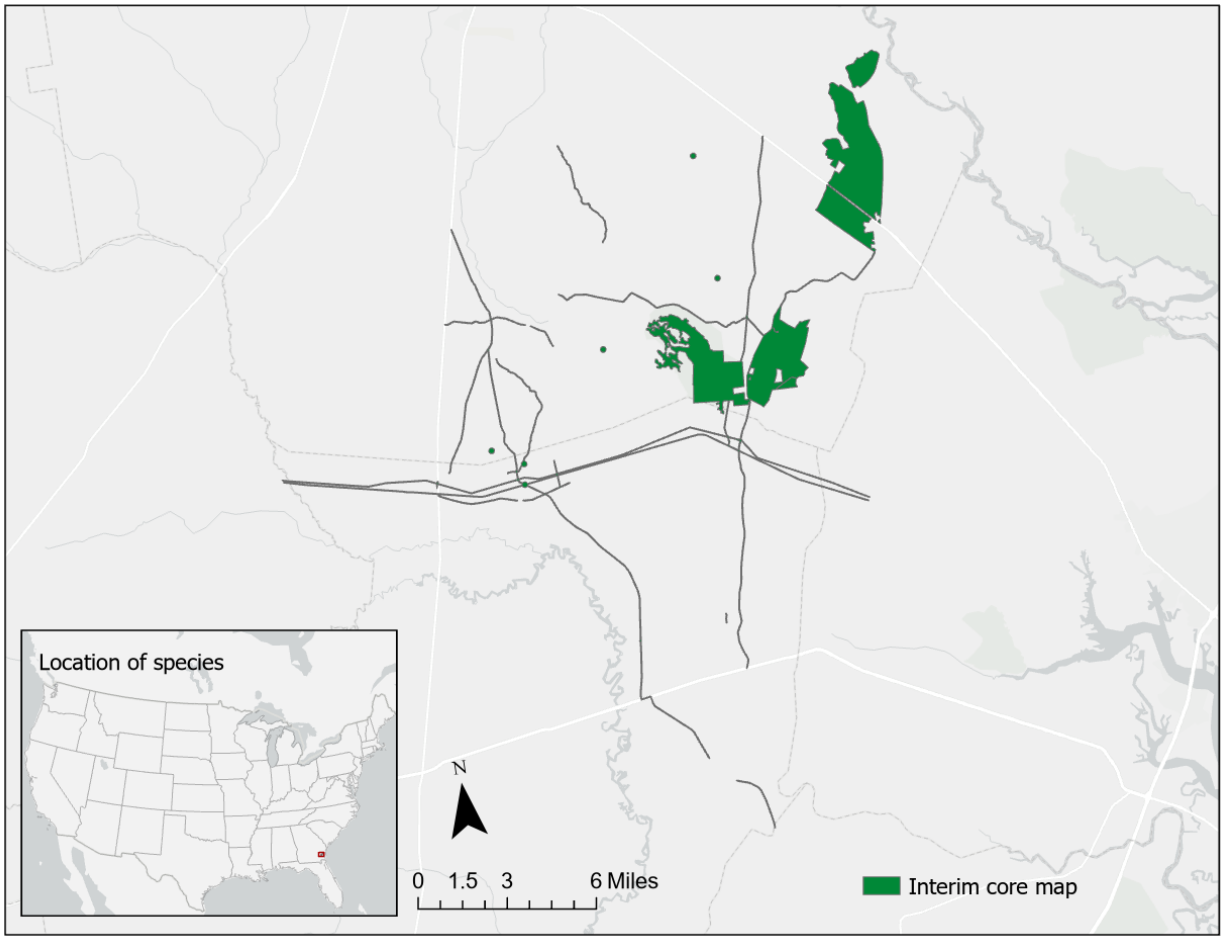

Figure 1. Interim core map for the hairy rattleweed.

Example pesticide use sites/types	NLCD Landcover (Value)	% of core map represented by landcover	% of core map represented by example pesticide use
Forestry	Deciduous Forest (41)	0	34
Forestry	Evergreen Forest (42)	34	
Forestry	Mixed Forest (43)	0	
Agriculture	Pasture/Hay (81)	0	0
Agriculture	Cultivated Crops (82)	0	
Mosquito adulticide, residential	Open space, developed (21)	5	7
Mosquito adulticide, residential	Developed, Low intensity (22)	2	
Mosquito adulticide, residential	Developed, Medium intensity (23)	0	
Mosquito adulticide, residential	Developed, High intensity (24)	0	
Invasive species control	Woody Wetlands (90)	45	58
Invasive species control	Emergent Herbaceous Wetlands (95)	2	
Invasive species control	Open water (11)	0	
Invasive species control	Grassland/herbaceous (71)	7	
Invasive species control	Scrub/shrub (52)	4	
Invasive species control	Barren land (rock/sand/clay; 31)	0	
Total Acres	**Interim Core Map Acres**	**~ 13,000**	

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

Evaluation of Known Location Information

There are four datasets with known location information:

- Descriptions of locations provided by FWS;
- Occurrence locations in iNaturalist;
- Occurrence locations in NatureServe; and
- Occurrence locations in the Global Biodiversity Information Facility (GBIF).

EPA evaluated these sets of data before selecting the type of and developing the core map.

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

Approach Used to Create Core Map

The core map was developed using the "Process EPA Uses to Develop Core Maps for Draft Pesticide Use Limitation Areas for Species Listed by the U.S. Fish & Wildlife Service (FWS) and their Designated Critical Habitats"[2] (referred to as "the process"). EPA developed the core map using the 4 steps described in the process document:

1. Compile available information for a species;
2. Identify core map type;
3. Develop the core map for the species; and
4. Document the core map.

For step 1, EPA compiled available information for the hairy rattleweed from FWS, as well as observation information available from various publicly available sources (including iNaturalist, NatureServe, and GBIF). The information compiled for the hairy rattleweed is included in **Appendix 1**. Influential information that impacted the development of the core map included:

- Occurrences and known locations of the hairy rattleweed.

For step 2, EPA used the compiled information to identify the core map type including species range and known location information. In the 2019 5-Year review, FWS identified 36 known populations of the hairy rattleweed. Of these populations, 29 were considered extant, for six the status was unknown, and one was considered a historical population that was no longer extant. Therefore, EPA based the core map on the known locations identified by FWS for populations of extant or unknown status. The entire range of the species was not used as the core map because the range contains areas where the species does not occur.

For step 3, EPA used the best available data sources to generate the core map. Data sources are discussed in the process document. For this core map, EPA used descriptions of known locations of the hairy rattleweed populations from appendix B of the 2019 5-Year review within the species range along with appropriate buffers to identify locations for inclusion into the core map. **Appendix 2** provides more details on the GIS analysis and specific data used to generate the core map.

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

Appendix 1. Information Compiled for the Hairy Rattleweed During Step 1

1. **Recent FWS documents/links and other data sources**
    - Five Year Review (2019) (https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/2779.pdf)
    - Five Year Review (2011) (https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/1890.pdf)
    - Recovery Plan (1984) (https://ecos.fws.gov/docs/recovery_plan/hairy%20rattleweed%20rp.pdf)

2. **Background information**
    - **Status:** Federally listed as endangered in 1978.
    - **Resiliency, redundancy, and representation (the 3Rs)**
        - No SSA is available for this species
    - **Habitat**
        - The hairy rattleweed occurs predominantly on sandy roadsides, powerline ROWs, old fields, open pine flatwoods, and plantations. (5-Year Review, 2019)
        - This species naturally occurred in pine-saw palmetto flatwoods where frequent fire (approximately 1-3 year return interval) maintained open conditions. (5-Year Review, 2019)
        - The hairy rattleweed is now restricted to open conditions found within the powerline rights-of-way, roadsides, open fields, and young pine plantations (5-Year Review, 2019)
        - The hairy rattleweed occurs in sandy soils of open pine flatwoods. Two separate but contiguous regions support different plant associations on the flatwood terraces. The most extensive regions occupy a slightly lower elevation with soils characterized by an organic hardpan 18-24 inches below the surface. Moisture level in these soils ranges from near saturation in early spring to dry by late summer and fall. The tree overstory is almost exclusively pines (Pinus lliottii and P. serotina). Undergrowth consists of a distinctive shrub zone composed mostly of saw palmetto (Serenoa repens), gallberry (Ilex glabra), poor-grub (Lyonia ferruginea), blueberries (Vaccinium), gopherberries (Gaylussacia sp.), wicky (Kalmia hirsuta), and wax myrtle (Myrica cerifera). (Recovery Plan, 1984)
        - The hairy rattleweed occurs on level to gently sloping land (FWS 1984, Humphrey 1987, ESIS 1996). Soils are sandy groundwater spodosols (suborder: aquods) and are underlain by an organic hardpan (5-Year Review, 2011)
        - Soils are acidic (pH 4.2 to 5.1) and low in fertility. (5-Year Review, 2011)
        - Elevations of the sites of known populations range from 17 to 26 m (55 to 85 ft) (5-Year Review, 2011)
    - **Pollinator/reproduction**
        - Herbaria data indicate that flowering begins as early as June (Duncan, June 1, 1949) and extends well into August (Palmer, August 8, 1954). Late June - early July appears to be the flowering peak. (Recovery Plan, 1984)
        - In fall and winter, plants will easily break off in the wind and may disperse some distance in a tumbleweed fashion with many seeds still on the plant (Humphrey

1987, ESIS 1996). Pollen dissemination agents are presumably insects. (5-Year Review, 2011)
    - The weevil *Apion rostrum* Say (Say's weevil) is possibly a major pollinator (5-Year Review, 2011)
- **Taxonomy**
    - Terrestrial Plant
- **Relevant Pesticide Use Sites**
    - Presently, most hairy rattleweed populations occur in slash pine plantations, within its range, it also frequently occurs along highway rights-of-way, logging roads and utility line rights-of-way (U.S. Fish and Wildlife Service 1984, Humphrey 1987, GDNR 2006). The species is known to occur on a few sites in longleaf pine-wiregrass shrub communities that exist in more-or-less natural conditions. (5-Year Review, 2011)
    - A small portion of the range of hairy rattleweed is in farmland (Humphrey 1987). Although the habitat best suited for the hairy rattleweed is poorly suited for most agriculture (U.S. Dept. of Agriculture 1965), the species occurs near the margins of some of this cultivated land which generally supports corn, tobacco and pastureland. (5-Year Review, 2011)
- **Recovery Criteria/Objectives (1984 recovery plan)**
    - There are at least eight self-sustaining populations secured and maintained within its historic or current range (eight would provide a reasonable degree of security against catastrophic loss and/or site alteration).
    - The number of individuals in the various populations has reached an optimum level of cover percentage and frequency occurrence, as established by management studies.
    - Its biology is sufficiently understood to allow perpetuation of the species should circumstances require immediate or drastic alteration of populations and/or sites.
    - Continuing protection and management after delisting are assured.
- **Recovery Actions (from 1984 recovery plan)**
    - Protect habitat and existing populations of the hairy rattleweed.
        - Encourage private landowners to protect existing stands.
        - Alert the Georgia Department of Transportation and county highway departments to locate and protect stands of the plant on road rights-of-way.
        - Alert Georgia Power Company, or any other public utility owning rights-of-way within the plants' range, to locate and protect existing stands.
        - Encourage State or Federal protection of one or more tracts of land that contain vigorous populations of the hairy rattleweed.
    - Monitor populations and their habitats.
        - Determine methods for monitoring populations.
        - Monitor habitat trends.
        - Periodically check sites for evidence of disturbance.
        - Gather data on population size and reproduction.
        - Determine minimum population size for self-sustaining populations.
    - Conduct searches for new stands of the hairy rattleweed.
        - Identify potential habitats using aerial photography.

        - Conduct ground investigations of potential habitats to determine presence or absence of the hairy rattleweed.
        - Train personnel to accurately identify the hairy rattleweed (also known locally as hairy wild-indigo).
    - Preserve existing germ plasm through cultivation and storage.
        - Propagate the hairy rattleweed, maintaining representative populations.
        - Continue to maintain fresh seeds and pollen in established germ plasm banks.
        - Establish stands at academic institutions, public botanical gardens, or in areas of state or federal jurisdiction.
    - Conduct autecological research.
        - Study in detail the life history of the hairy rattleweed.
            - Map vegetation at natural sites.
            - Establish permanent monitoring plots at one or more natural populations.
            - Assess changes in population size and distribution of age classes.
            - Determine the plant's reproductive and breeding systems.
            - Identify pollinators or vectors of dissemination.
            - Study germination and establishment processes.
        - Identify limiting factors.
            - Define edaphic requirements.
            - Define light relations.
            - Examine effects of competition by other vegetation on survival and reproduction.
            - Determine and study other types of biological competition; e.g., parasitism, predation, etc.
        - Determine effective management options.
            - Conduct experimental burning.
            - Conduct experimental reforestation.
            - Assess the effects of pesticides and herbicides on the plant.
            - Prepare management recommendations.
    - Develop public awareness and support.

3. **Description of Species Range**
    - **Figure A1-1** depicts the FWS range. The range was last updated on January 10, 2022. The total area of the range is approximately 243,000 acres.

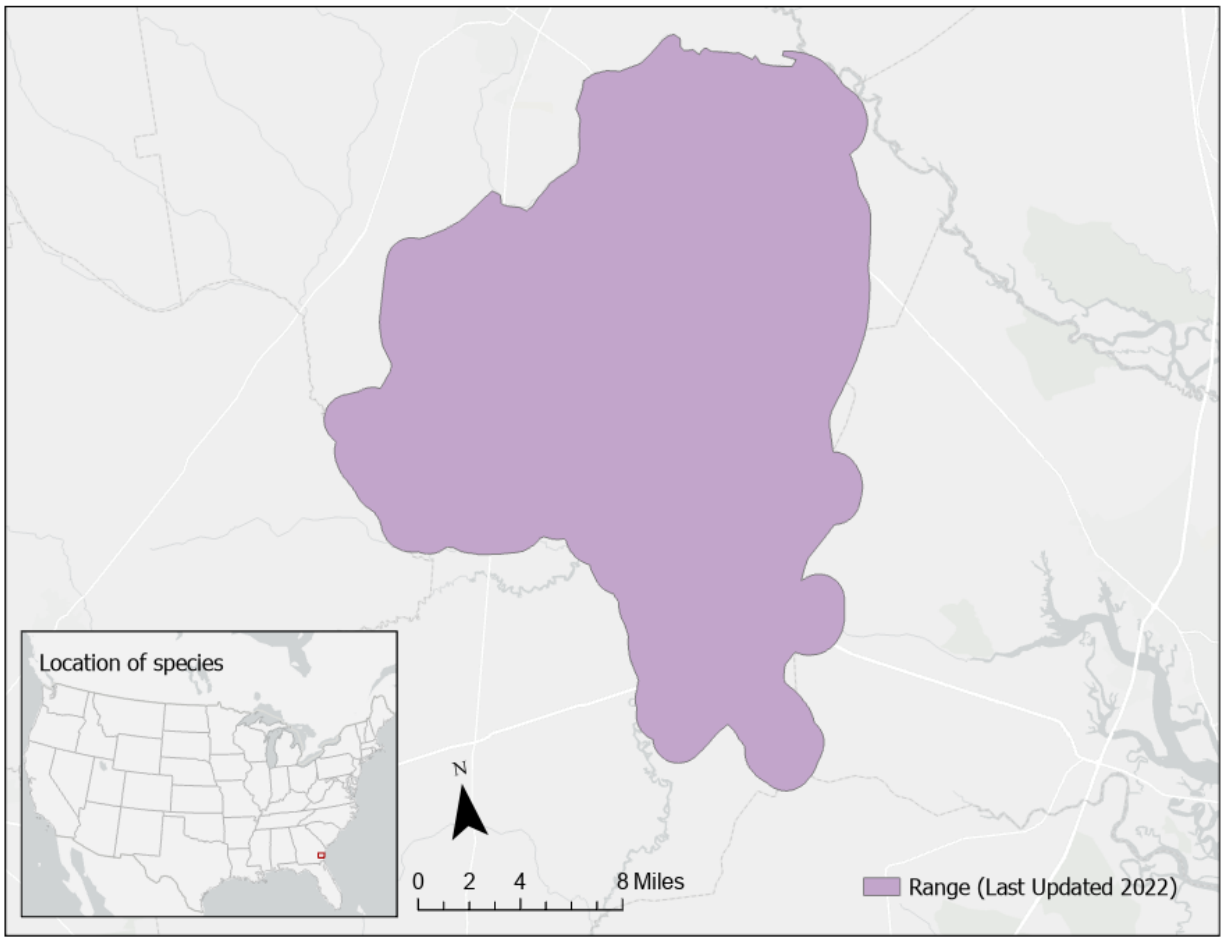

Figure A1-1. FWS range for the hairy rattleweed. Total area of range is around 243,000 acres.

4. **Critical Habitat**
    - FWS has not designated a critical habitat for this species (https://ecos.fws.gov/ecp/species/8029).
5. **Known locations**
    - Known Locations Described in FWS Recovery Documents
        - Appendix B of the 2019 5-year review describes 36 known populations of hairy rattleweed (reproduced below).
        - In the 2011 5-year review, extant populations of hairy rattleweed were estimated to occupy 3075 acres.

EO #	Site Name	County	First Observation	Last Observation	Status
1	Sansavilla WMA	Wayne	1982	2017	Extant
2	Browntown Rd.	Brantley | Wayne	1982	2018	Extant
3	Needmore Flatwoods	Brantley	1982	2019	Extant
4	Lower Long Branch	Wayne	1986	2007	Extant
5	Upper Long Branch	Wayne	1986	2006	Extant
6	Lower Crooked Rd.	Wayne	1986	1987-06	Unknown
7	Straight Rd.	Wayne | Brantley	1986	7/28/2006	Extant
8	Upper Crooked Rd.	Wayne	1986	1987-06	Unknown
9	Philadelphia Church Flatwoods	Wayne | Brantley	1986	2018	Extant
10	Hortense Hwy. 32 No. 1	Brantley	1987-?	6/13/2001	Extant
11	McKinnon/Oil Well Rd.	Wayne	1942	2017-08	Extant
12	Oil Well/Fendig Intersection	Wayne	1980	2009	Extant
13	32 Rd. No. 1	Wayne	1986	1987-06	Unknown
14	Penholoway Bay	Wayne	1986	2009	Extant
15	Hanger Rd.	Wayne	1986	2009	Extant
16	32 Rd. No. 2	Wayne	1986	2009	Extant
17	32 Rd. No. 3	Wayne	1986	2009	Extant
18	NE of Needmore	Wayne | Brantley	1987	1987-06	Unknown
19	Palmetto Island	Wayne	1987-06-Pre	1987-06	Unknown
20	Strickland Island	Wayne	1987	2009	Extant
21	Pendarvis	Wayne	1980-Pre	1980	Historical
22	Hortense Hwy. 32 No. 2	Brantley	1984-07-13-Pre	2009	Extant
23	Paul Lewis Property	Brantley	1991	8/1/2007	Extant
24	Hopkin's Property	Wayne	N/A	8/28/1994	Unknown
26	E of Honey Camp Branch	Wayne	8/28/1994	2009	Extant
27	At GA 32 Crossing of Mill Branch	Brantley	3/1/2000	3/1/2000	Extant
28	Hwy 110	Brantley	1986-?	7/28/2006	Extant
29	Wire Rd.	Wayne	2007-Sum	2007-Sum	Extant
30	Lewis Property	Brantley	7/7/2008	7/7/2008	Extant
31	Southern Power No. 1	Wayne	8/13/2014	8/13/2014	Extant
32	Mt Pleasant Road & Southern Power	Wayne	N/A	N/A	Extant
33	Southern Power No. 2	Brantley	N/A	N/A	Extant
34	N of Browntown Road	Brantley	N/A	N/A	Extant

Table A1-1. *Baptisia arachnifera* (hairy rattleweed) element occurrence data (reproduced from Appendix B of the 2019 5-Year Review).

- **Occurrences Included in Public Databases**
    - EPA queried iNaturalist, GBIF, and NatureServe. Collectively, the occurrence data are consistent with the FWS location data used to identify the core map.
    - iNaturalist (available here) had nine research grade observations for this species. Location data for these observations were in the vicinity of the locations used for the core map, however, the positional accuracy of the points do not allow EPA to determine if these occurrences fall within the area covered by the core map.
    - GBIF (available here) included 131 occurrences and human observations. Location data for these observations were in the vicinity of the locations used for the core map, however, the positional accuracy of the points do not allow EPA to determine if these occurrences fall within the area covered by the core map.
    - Occurrences in NatureServe (available here) are consistent with other occurrence data. Location data for these observations were in the vicinity of the locations used for the core map, however, the positional accuracy of the points do not allow EPA to determine if these occurrences fall within the area covered by the core map.

Appendix 2. GIS Data Review and Method to Develop Core Map (Step 3)

This core map was created based on biological information, including occupied locations and species habitat. EPA used the species range layer from the FWS (last updated in 2022) as the starting point (outer extent) for developing the core map. The core map was then refined to include only those locations where populations of the species were either known to be extant or locations where a population had been described as extant in the past, but whose status was unknown as described in Appendix B of the 2019 5-Year Review (reproduced in **Table A1-1** above). Populations along roadways, waterways or utility rights of way were accounted for by extending a 100 ft buffer from the named location. Populations in Sansavilla WMA were accounted for by including the area within the WMA. Populations whose named locations were only available as a set of coordinates or description relative to a named location were accounted for by extending a 500 ft buffer around the coordinates of the location.

1. Dataset References and Software
    - National Hydrography Dataset Plus High Resolution (available here)
    - U.S. Census Bureau TIGERweb/Transportation (available here)
    - GA Department of Natural Resources "WRD WMA Public" (available here)
    - U.S. Electric Power Transmission Lines (available here)
    - Coordinates for select locations not available from other sources:
        - Steinbrecher, R. A., Leege, L. M., & Saha, S. K. (2015). Soil and Leaf Nutrient Analysis of the Endangered Herb, Baptisia arachnifera, in Georgia, United States. International Journal of Plant and Soil Science, 7(5), 265.
        - Estep, T. J. (2011). Evaluating restoration potential of an endangered legume, Baptisia arachnifera: shade & litter effects on early life stages. (https://digitalcommons.georgiasouthern.edu/etd/760/)
    - Software used: ArcGIS Pro 3.3.0
    - FWS Species Range – last updated on 01/10/2022

2. Datasets Used in Core Map Development
    - All datasets used in core map development are described in EPA's process document.

3. Core Map Development
    - EPA started with the most recent FWS range map which was used as the outer extent of the core map.
    - Named locations were extracted from Appendix B of the 2019 5-Year Review
    - Local and Secondary road layers were extracted from the US Census Bureau Transportation layer (described above) and clipped to the species range area. Names of roads from **Table A1-1** were compared to available entries in the local and secondary road "Name" fields. Matches (along with certain rows with "null" entries that connected to segments of the named roads and appeared to be the road) were extracted into a new layer. In the case of "straight rd", an assignment was made to a road segment with a "null" name entry based on information derived from Estep et al. 2011. This approach was used for the following EO#s: 2, 7, 10, 11, 13, 16, 17, 22, 27, 28, 29, 32 and 34. A 100 ft buffer was added to each extracted road segment using the buffer tool to generate a polygon corresponding to each element occurrence entry.
    - Rivers and waterbodies were extracted from the National Hydrography Dataset Plus High Resolution. Names of rivers and waterbodies from **Table A1-1** were compared to the "Name

from Geographic Names Information System" field and matches were extracted into a separate layer. This approach was used for the following EO#s: 4, 5, 14, and 26. In the case of rivers/streams a 100 ft buffer was added to the flowline to create a polygon for each EO and in the case of EO 14 ("Penholoway Bay"), a polygon was already available and extracted without a buffer.

- For EO 1, Sansavilla WMA, polygons with "SANSAVILLA WMA" in the "Property Name" field were clipped to the range area, moved into a separate layer and the resulting polygons were used directly without a buffer.
- For cases where coordinates could be found using Google Maps, but which were not found through available GIS sources, lat/long coordinates were entered in a csv. The coordinate table was loaded into ArcGIS Pro using the Excel to Table tool. Coordinates were converted to points using the XY Table to Point tool, and a 500 ft buffer was added around each point to reflect uncertainty in the exact location of the population relative to the named location from **Table A1-1**. This approach was used for the following EO#s: 3, 6, 8, 9, 12, 18, 19, and 20.

- For EO#s that appeared to be located along electrical utility lines, the U.S. Electric Power Transmission Lines dataset was clipped to the species range area and a 100 ft buffer was added to all transmission lines within the region. This approach was used for the following EO#s: 31, and 33.
- Geographical locations for the remaining entries (EO#s 15, 23, 24, and 30) could not be located through publicly available sources and seem likely to represent either unpaved roads that are not shown on Google Maps, USGS maps, or GA DOT maps of the region, or private property.