

Interim Core Map Documentation for Short's Goldenrod

Version 1

Review Completed: April 2026

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

Species Summary

The Short's goldenrod (*Solidago shortii*, Entity ID 835) is an endangered terrestrial plant (dicot). The U.S. Fish and Wildlife Service (FWS) has not designated a critical habitat for the Short's goldenrod. This species prefers a variety of dry, mostly open habitats and grows in shallow rocky clay soils where fire and large herbivore trampling historically maintained habitat for this species. The Short's goldenrod appears to need some sort of regular disturbance for survival and is known to occur on pastures. This species relies on insect pollination with key pollinators being the Goldenrod soldier beetle and sweat bees. Currently, the Short's goldenrod is found in only two states: Indiana and Kentucky. Additional information on the species is provided in **Appendix 1**.

Description of Core Map

The core map for the Short's goldenrod is based on biological information. The outer extent of this core map is defined by intersecting Hydrologic Unit Code (HUC) 12 areas with buffered research grade known locations from iNaturalist. HUC 12 was used as the starting point because they conveniently capture existing occurrences and represent the smallest standard delineation level in the USGS Watershed Boundary dataset. The relevant habitat information (clay soil type and minimum bedrock depth) was used for further refinement.

Figure 1 depicts the resulting interim core map for the Short's goldenrod. The size of this core map is approximately 161,384 acres. Landcover categories within the core map area are included in **Table 1**. Landcover is predominantly pasture/hay and deciduous forest. Since this species occurs in areas "characterized by a sparse covering of grasses and forbs with scattered individuals or 'islands' of woody species" (Recovery Plan 1988), many of these areas potentially represent habitat.

The core map developed for the Short's goldenrod is considered interim. This core map will be used to develop pesticide use limitation areas (PULAs) that include the Short's goldenrod. 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 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 intersecting research grade known locations with HUC 12 areas. Due to the known locations being fuzzed, EPA used habitat information described by FWS to support the appropriateness of the intersected HUC 12 areas. This core map does not replace or revise any range or designated critical habitat developed by FWS for this species.

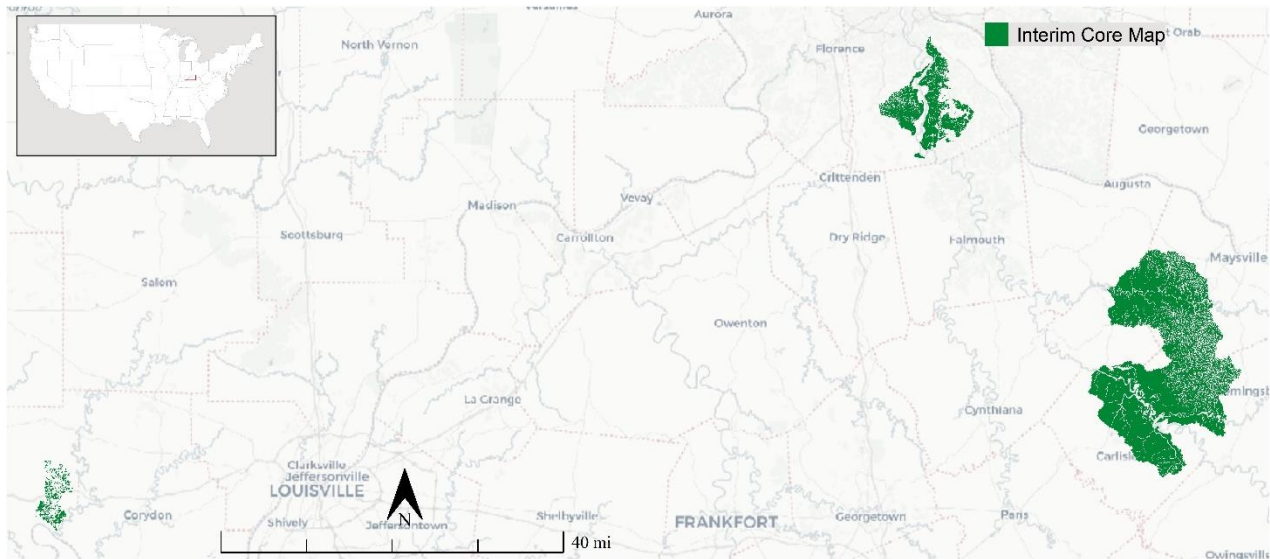


Figure 1. Interim core map for the Short's goldenrod.

Table 1. Percentage of Interim Core Map Represented by National Land Cover Database (NLCD)¹ Land Covers and Associated Example Pesticide Use Sites/Types.

Example pesticide use sites/types	NLCD Landcover (Value)	% of core map represented by landcover
Forestry	Deciduous Forest (41)	39
Forestry	Evergreen Forest (42)	1
Forestry	Mixed Forest (43)	9
Agriculture	Pasture/Hay (81)	41
Agriculture	Cultivated Crops (82)	2
Mosquito adulticide, residential	Open space, developed (21)	5
Mosquito adulticide, residential	Developed, Low intensity (22)	1
Mosquito adulticide, residential	Developed, Medium intensity (23)	<1
Mosquito adulticide, residential	Developed, High intensity (24)	0
Invasive species control	Woody Wetlands (90)	0
Invasive species control	Emergent Herbaceous Wetlands (95)	0
Invasive species control	Open water (11)	<1
Invasive species control	Grassland/herbaceous (71)	<1
Invasive species control	Scrub/shrub (52)	0
Invasive species control	Barren land (rock/sand/clay; 31)	0
Total Acres	Interim Core Map Acres	~ 161,384

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

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
- Occurrence locations in the Global Biodiversity Information Facility (GBIF)

EPA evaluated these sets of data before core map type selection and development. There are 12 occurrences in iNaturalist between 2010 and 2024 that were used to refine the HUC 12 areas. **Appendix 1** includes more information on the available known location information.

Approach Used to Create Core Map

The core map was developed using the “Process EPA Uses to Develop Core Maps for Draft Pesticide Use Limitation Areas for Species Listed by the U.S. Fish & Wildlife Service (FWS) and their Designated Critical Habitats”² (referred to as “the process”). 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
4. Document the core map

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

- Occurrences and known locations of the Short’s goldenrod
- HUC12 watersheds
- SSURGO data
- Species range

For step 2, EPA used the compiled information to identify the core map type including known location information, HUC 12 watersheds, soil data from SSURGO, and species range. The known locations are situated within or nearby the species range identified by FWS. EPA based the core map on the HUC12 watersheds that contain known locations identified in iNaturalist. EPA then used an approximation of suitable habitat based on hydraulic soil groups C, D, AD, CD, and BD (from SSURGO) as well as the minimum bedrock depth of less than 100cm to refine the intersected HUC 12’s. The entire range of the species was not used as the core map because the range is very large and 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 the HUC12 watersheds known locations

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

data from iNaturalist. **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

EPA explored using only the HUC 12s intersected with the buffered known locations as the core map type. However, the developers believe that refinements using soil characteristics added valuable refinement.

Appendix 1. Information Compiled for the Short's goldenrod

1. Recent FWS documents/links and other data sources

- Five Year Review (2022) (<https://www.govinfo.gov/content/pkg/FR-2022-05-13/pdf/2022-10342.pdf>)
- Recovery Plan (1988) (https://ecos.fws.gov/docs/recovery_plan/shortsgrodRP.pdf)

2. Background information

- **Status:** Federally listed as endangered in 1998
- **Resiliency, redundancy, and representation** (the 3Rs)
 - Resiliency: “Little is known about the reproductive status of *S. shortii*...there is no evidence that this species is expanding its range through wind dispersal...bison may have been a dispersal vector.” (Recovery Plan 1988)

“The primary reasons for the current endangered status of *Solidago shortii* appears to be habitat destruction or alteration, and possibly other natural or man-made factors such as fire suppression and the elimination of bison. Based on the few historic records, it appears that *S. shortii* may never have been a widespread or common plant. The limited known populations have been further reduced by human activities.” (Recovery Plan 1988)

Redundancy: “The primary reasons for the current endangered status of *Solidago shortii* appears to be habitat destruction or alteration, and possibly other natural or man-made factors such as fire suppression and the elimination of bison. Based on the few historic records, it appears that *S. shortii* may never have been a widespread or common plant. The limited known populations have been further reduced by human activities.” (Recovery Plan 1988)

Representation: “*Solidago shortii* does not appear to compete well and does best in areas with a low density or percent cover of other plants. It is not shade tolerant and apparently will not grow in low light situations such as closed canopy woods.” (Recovery Plan 1988)

“A substantial decline has occurred. This decline was probably the result of the numerous land-use changes that have occurred in the area” (Recovery Plan 1988).

- **Habitat**
 - “*Solidago shortii* occurs in open glade-like areas along the remains of an old buffalo trace (a trail or road made by bison but historically called a “buffalo trace”) at Blue Licks Battlefield State Park and may have been associated with the bison that made these traces (Braun 1941, Evans 1987).”
 - Prefers full sun or partial shade
 - Prefers a variety of dry, mostly open habitats including limestone cedar glades, open eroded areas, edges of dry, open oak-hickory woods, cedar thickets, pastures, old fields, powerline rights-of-way, and rock ledges along highway rights-of-way (Recovery Plan 1988).

- “Cedar glades, open eroded areas, and woodland edges appear to be the natural habitats for *S. shortii* and support the largest and healthiest populations.” (Recovery Plan 1988)
 - Grows in shallow clay soils typically rocky (20-30% rock fragments) and dry, “with much of the limestone cobble and shale intermixed.” (Recovery Plan 1988)
 - Areas “characterized by a sparse covering of grasses and forbs with scattered individuals or “islands” of woody species.” (Recovery Plan 1988).
 - Fire and large herbivore trampling historically maintained habitat for this species
 - “*Solidago shortii* is also known to occur in pastures.” (Recovery Plan 1988, goes on to say that in the 1940’s, it was numerous in pastures) “Plants in pastures not recently grazed are much healthier and vigorous.” (Recovery Plan 1988)
 - “Sites range from relatively flat to steeply sloping and most have a west or south exposure, although some sites have an east exposure.” (Recovery Plan 1988)
 - Specifics on geology requirements from Recovery Plan: Ordovician bedrock, mainly of the Lexington Limestone Formation (though also the Kope and Clays Ferry Formations, as well as Tanglewood and Grier Formations).
 - Soil pH 5.6-8.4 (Recovery Plan 1988)
 - Grows in hot (average daily temperature 22 degrees C), humid summers with precipitation fairly well distributed throughout the year. Average yearly rainfall ~112 cm, 55% during growing season of April through September.
 - Can tolerate temperature extremes of -36 degrees C to 40 degrees C.
- **Pollinator/reproduction**
 - Flowering occurs from mid-August to early November with fruits maturing several weeks after flowers withered
 - Little is known about species dispersal rates and mechanisms, either by seed, pollinators, or some other method. (Five Year Review 2017)
 - Pollinators suspected to include sweat bees and maybe blister beetles. (Five Year Review 2017)
 - Wind plays a small role in seed dispersal. (Five Year Review 2017)
- **Taxonomy**
 - Terrestrial dicot plant – family *Asteraceae*, genus *Solidago*
- **Relevant Pesticide Use Sites**
 - The Recovery Plan (1988) says more explicitly about construction being a threat to this species, rather than pesticides. However, it notes that runoff is common and can be sudden and rapid.
- **Recovery Criteria/Objectives (1988 recovery plan)**
 - Primary recovery objective is to delist *Solidago shortii*
 - Achieve adequate protection for the nine high priority occurrences and the habitat they occur in
 - Protected occurrences are determined to be self-sustaining and maintaining current population levels or higher

- Species biology and ecological requirements are sufficiently understood to determine and implement long-term management strategies
- At least nine additional protected occurrences, equal in size and significance to the high priority occurrences, are discovered in the vicinity of the Blue Licks population or at a currently unknown location
- **Recovery Actions (from 2006 recovery plan)**
 - Conduct studies of life history and ecological requirements to determine appropriate management practices.
 - Protect existing occurrences and essential habitat
 - Conduct systematic searches for additional occurrences and populations and manage areas of occurrences that are considered high priority for the species survival.
 - Develop management plan and implement recommended management practices if determined beneficial
 - Monitor results of management practices and re-evaluate management needs as data on management results are obtained.

3. Description of Species Range

- Figure A1-1 depicts the FWS range. The range was last updated on 08/31/2018. Total acreage of range is around 924,371 acres.

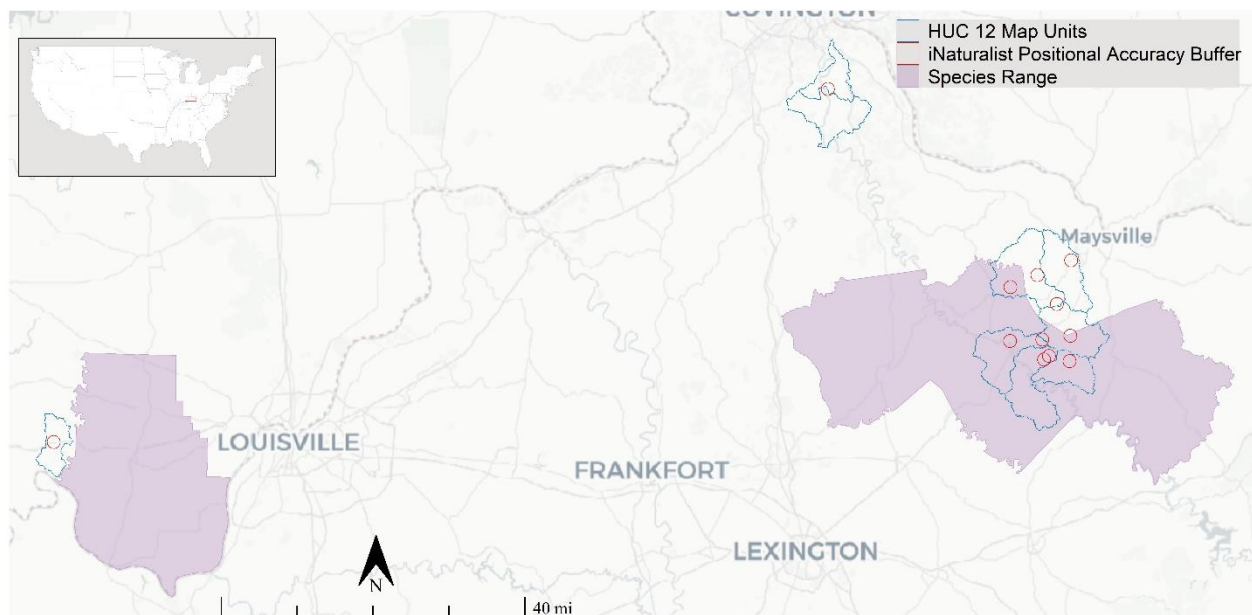


Figure A1-1. FWS range for the Short's goldenrod. The total acreage of the range is around 924,371 acres.

4. Critical Habitat

- FWS has not designated a critical habitat for this species (<https://ecos.fws.gov/ecp/species/5367>)

5. Known Locations

- **Occurrences Included in Public Databases**

EPA queried iNaturalist, GBIF, and NatureServe. The available occurrence data is consistent with the HUC 12 watersheds used to identify the core map.

iNaturalist (available [here](#)) had 12 research grade observations for this species, all of which appear to fall within the species range; however, the positional accuracy of the points are fuzzed.

GBIF (available [here](#)) and NatureServe (linked [here](#)) did not contain occurrence information that allowed EPA to refine the outer extent of this core map.

Collectively, the occurrence data are consistent with the three occupied watersheds included in the core map and do not support expanding the core map.

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

This core map was created based on biological information, including occupied location and HUC 12 watersheds. EPA used HUC 12 areas within Kentucky and Indiana as a starting point. These HUC12 sub-watersheds were refined to remove watersheds that did not contain any known from iNaturalist.

1. Dataset References and Software

- Species Range
 - <https://ecos.fws.gov/ecp/species/5367>
- HUC watersheds
 - HUC Hydraulic Unit Codes (HUC) 12 maps were gathered from living atlas (https://services.arcgis.com/P3ePLMYs2RVChkXj/arcgis/rest/services/Watershed_Boundary_Dataset_HUC_12s/FeatureServer).
- Known locations data
 - iNaturalist research grade – human observations between 2010 and 2024 (<https://www.inaturalist.org/>).
 - Positional accuracy of points is assumed to be the max value observed in the dataset (1,376 m).
- SSURGO data
 - R package ‘soilDB’ - a collection of functions for reading soil data from U.S. Department of Agriculture Natural Resources Conservation Service (USDA-NRCS) and National Cooperative Soil Survey (NCSS) databases. (<https://cran.r-project.org/web/packages/soilDB/index.html>)

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 first started with the iNaturalist known locations data whose spatial points are positionally obscured. EPA buffered these locations with 1,376 m which reflects the highest degree of obscuration observed in the data.
- EPA then intersected HUC-12 watersheds with the buffered known locations to arrive at the final set of HUC-12 areas that will be used.
- EPA then retained only the map units from the SSURGO dataset that satisfy all the following:
 - (1) Hydrological soil groups (column ‘hydgrpdc’) classified as C, D, AD, BD, or CD.
 - (2) Have a minimum bedrock depth (column ‘brockdpm’) with values less than 100 cm
- EPA then clipped this filtered soil data using the final HUC 12s – the result of which gives the interim core map (“shorts_goldenrod_coremap.shp”).