

**Short's Goldenrod
(*Solidago shortii*)**

**5-Year Status Review:
Summary and Evaluation**



**U.S. Fish and Wildlife Service
Southeast Region
Kentucky Ecological Services Field Office
Frankfort, Kentucky**

June 2023

5-YEAR STATUS REVIEW

Short's Goldenrod (*Solidago shortii*)

GENERAL INFORMATION

Current Classification: Endangered

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Date of original listing: October 7, 1985 (50 FR 36085; September 5, 1985)

In accordance with section 4(c)(2) of the Endangered Species Act of 1973, as amended (Act), the purpose of a status review is to assess each threatened species or endangered species to determine whether its status has changed and if it should be classified differently or removed from the Lists of Threatened and Endangered Wildlife and Plants ([50 CFR 424.11](#)). The U.S. Fish and Wildlife Service (Service) evaluated the biology, habitat, and threats of Short's goldenrod to inform this status review.

We announced initiation of this review in the Federal Register on May 13, 2022 (87 FR 29634) with a 60-day comment period and received no public comments. The primary sources of information used in this analysis were the 1985 final listing rule (87 FR 29634), the 1988 recovery plan, peer-reviewed reports, agency reports, unpublished survey data and reports, and personal communication with recognized experts. This review was completed by the U.S. Fish and Wildlife Service, Kentucky Ecological Services Field Office (KFO), Frankfort, Kentucky. All literature and documents used for this review are on file at the KFO. All recommendations resulting from this review are the result of thoroughly reviewing the best available information on the Short's goldenrod.

FR Notice citation announcing the species is under active review: May 13, 2022 (87 FR 29634)

Species' Recovery Priority Number at start of 5-year review ([48 FR 43098](#)): 8. This number indicates that Short's goldenrod is a species with a moderate degree of threat and a high recovery potential.

Review History:

Five-Year Review: A five-year review was completed on October 25, 2007 (Service 2007). In this comprehensive review, the Service evaluated recovery progress, summarized the species' biology and status, and described the species' current threats. The review recommended no change in status for the species.

Five-Year Review: An additional five-year review for Short's goldenrod was completed in 2017 (Service 2017). This review summarized new survey records and provided new biological and threats information gathered since completion of the previous five-year review. The review recommended no change in status for the species.

REVIEW ANALYSIS

Listed Entity

Taxonomy and nomenclature

We are not aware of any changes to the taxonomy of this entity, and it is still considered valid by the Service.

Distinct Population Segment (DPS)

The Act defines species as including any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate wildlife. This definition limits listing of a DPS to only vertebrate species. Because the species under review is a not a vertebrate, the DPS policy does not apply.

Recovery Criteria

Recovery Plan or Outline:

Short's Goldenrod Recovery Plan, May 25, 1988 (Service 1988)

Recovery plans are not regulatory documents and are intended to provide guidance to the Service, States, and other partners on methods of minimizing threats to listed species and on criteria that may be used to determine when recovery is achieved. If the recovery criteria defined in the plan are still valid, meeting recovery criteria can indicate that the species no longer requires protections under the Act. However, when recommending whether a listed species should be delisted, the Service must apply the factors in section 4(a) of the Act ([84 FR 45020](#)). Below are the downlisting and delisting criteria identified in the 1988 recovery plan (Service 1988).

Downlisting Criteria. Short's goldenrod will be considered for downlisting when the first three recovery criteria listed below have been met (criteria 1, 2, and 3).

1. *Adequate protection is obtained for the nine high priority occurrences¹ and the habitat in which they occur.*

This criterion has not been met. Adequate protection has been achieved for five of nine occurrences identified as “high priority” in the recovery plan (Note: Per the recovery plan, adequate protection would ensure that occurrences are not negatively affected by human activities). Occurrences 1, 2, and 4 are located within Blue Licks State Nature Preserve (SNP), a 53-acre preserve in Robertson County, Kentucky, that is part of the larger Blue Licks Battlefield State Resort Park managed and operated by the Kentucky Department of Parks (Note: occurrences 1 and 4 have been combined by the Office of Kentucky Nature Preserves (OKNP) due to their proximity). Portions of occurrences 7 and 8 (7a and 8a) have been protected through conservation agreements between OKNP, the Kentucky Transportation Cabinet, and The Nature Conservancy. Adequate protection has also been achieved for two other Kentucky occurrences (5 and 12a) identified as “lower-priority” in the recovery plan, another occurrence discovered in 1999 (now within Short's Goldenrod SNP), and another occurrence discovered in 2001 along the Blue River in Harrison County, Indiana (now part of Greenbrier Knob Nature Preserve in Harrison-Crawford State Forest). In total, adequate protection has been achieved for six occurrences, and partial protection has been achieved for two occurrences.

2. *Protected occurrences are determined to be self-sustaining and maintaining current population levels or above.*

This criterion has not been met. Based on OKNP survey data, only four high priority occurrences (1, 2, 7a, 8a) identified in the recovery plan are self-sustaining and maintaining current population levels. Four additional occurrences (5, 12a, one occurrence on Short's Goldenrod SNP, and one occurrence along the Blue River in Indiana) also appear to be self-sustaining and at least maintaining current population levels.

3. *Species biology and ecological requirements are sufficiently understood to determine and implement long-term management strategies.*

This criterion has not been met; however, various aspects of the biology, ecology, and conservation of this narrow endemic have been investigated by Baskin *et al.* (2000), Buchele *et al.* (1989, 1991a, 1991b, 1992a, 1992b), Smith *et al.* (2004), and Walck *et al.* (1997a, 1997b, 1997c, 1997d, 1997e, 1998, 1999a, 1999b, 1999c, 1999d, 1999e, 2001). Collectively, these investigations have (1) provided an overview of the historical and present geographical distribution of *S. shortii*, describing each of the extant occurrences

¹The Office of Kentucky Nature Preserves has combined some of the high priority Kentucky occurrences noted in the recovery plan and has renumbered several occurrences. See Table A-1 for a summary of changes.

and summarizing general vegetation and cultural changes at the sites between 1937 and 2003; (2) described and characterized the physical habitat of *S. shortii*; (3) proposed a model of the successional relationships for the species; and (4) investigated various aspects of its life history – seed production, seed bank, seed germination, drought resistance, and colonization ability. However, implementation of long-term management strategies at the nine protected occurrences has not been achieved.

Delisting Criteria. Short's goldenrod will be considered for downlisting when the first three recovery criteria listed above (1, 2, and 3) and the final criterion listed below (criterion 4) have been met.

4. *At least nine additional protected occurrences, equal in size and significance to the high priority occurrences mentioned above, are discovered in the vicinity of the Blue Licks population or at a currently unknown location.*

This criterion has not been met. Only two protected occurrences, equal in size and significance to the original high priority occurrences, have been discovered since completion of the recovery plan. These include one population on Short's Goldenrod SNP, Fleming County, Kentucky, and another occurrence along the Blue River in Harrison County, Indiana (Greenbrier Knob Nature Preserve).

Biology and Habitat Summary

Habitat

In Kentucky, Short's goldenrod occurs in dry, upland, mostly open habitats with full sun or partial shade (Service 1988). These habitats include limestone cedar glades, open eroded areas, cedar thickets, pastures, old fields, power line rights-of-way, rock ledges along highways, and edges of dry, open, oak-hickory forest (Evans 1987, Service 1988). Historically, the species was associated with bison traces (trails), and the species continues to occupy these habitats along remnant bison traces in Blue Licks Battlefield State Park (Service 1988). Open habitats for Short's goldenrod were likely maintained historically through periodic fire and trampling and grazing by herbivores (*i.e.*, bison, elk, and deer) (Service 1988). In Indiana, the species occupies relatively dry, limestone ledges along the Blue River in Harrison County. These habitats are scoured periodically during high water events.

Life History

Various aspects of the biology, ecology, and conservation of Short's goldenrod have been investigated by Baskin *et al.* (2000), Buchele *et al.* (1988, 1989, 1991a, 1991b, 1992a, 1992b), Smith *et al.* (2004), and Walck *et al.* (1997a, 1997b, 1997c, 1997d, 1997e, 1998, 1999a, 1999b, 1999c, 1999d, 1999e, 2001). Short's goldenrod produces flowers from mid-August to early November, and the fruits mature several weeks after the flower withers. Specific pollinators have not been documented, but native sweat bees (Family Halictidae) and blister beetles (Family Meloidae) have been observed on the flowers. Seed dispersal is by wind, and bison may have played a role in seed dispersal prior to European settlement. Baskin *et al.* (2000) reported 250 to 1,700 seeds per flowering stem, and a high percentage of seeds were viable. Under greenhouse conditions, germination rates have been close to 100 percent, but germination rates in the wild

are unknown. Short's goldenrod seeds did not have any special dormancy-breaking or germination requirements that could not be fulfilled outside its present-day geographic range. The soil seed bank of Short's goldenrod was shown to be smaller and depleted at a faster rate than those of two other goldenrod species, tall goldenrod (*S. altissima*) and gray goldenrod (*S. nemoralis*), but these studies demonstrated that Short's goldenrod can form a persistent seed bank. Seed germination occurred over a broad range of environmental conditions, suggesting that this phase of the life cycle probably does not contribute to the narrow endemism of the species. Morphological traits of Short's goldenrod appear to enable it to tolerate drier habitats than tall goldenrod, but it was shown to compete poorly with tall goldenrod on wetter sites. Finally, it was shown that both high light and high nutrient levels are necessary to maintain high vigor of Short's goldenrod. In areas subject to invasion by woody plants or other goldenrod species, periodic disturbance may be required to prevent population extirpation.

Genetics

No information is available regarding the population genetics of Short's goldenrod.

Distribution

Short's goldenrod was first collected in 1840 at Rock Island, adjacent to the Falls of the Ohio in Jefferson County, Kentucky. This site was later inundated by dam construction on the Ohio River, and the occurrence was lost. The species was considered extinct until 1939, when Dr. E. Lucy Braun discovered numerous occurrences growing on rocky slopes and in pastures in the Blue Licks area of Nicholas, Robertson, and Fleming counties, Kentucky (Braun 1941).

When the recovery plan was completed in 1988, the species' range consisted of 13 Blue Licks occurrences, all of which were located on Blue Licks Battlefield State Resort Park or the surrounding area (Service 1988; Table 1). The number of extant occurrences has fluctuated over the last 35 years due to the combining of several occurrences, the discovery of three new occurrences, and two extirpations. Currently, the species is known from 20 extant occurrences, including 12 Blue Licks occurrences (two occurrences are now considered extirpated); 3 introduced occurrences near Claysville in Harrison County, Kentucky; 1 introduced occurrence along the Licking River in Robertson County, Kentucky; 3 introduced occurrences at Clay Wildlife Management Area in Fleming and Nicholas counties, Kentucky; and 1 occurrence along the Blue River, Greenbrier Knob Nature Preserve, in Harrison County, Indiana (Homoya and Abrell 2005). A 2014 effort to introduce the species (25 plants) along the Licking River in Kenton County, Kentucky, was unsuccessful and is no longer managed or tracked by OKNP (Littlefield 2023, pers. comm). A summary of extant and extirpated occurrences is provided in Appendix A (Table A-1).

For over 20 years, OKNP has monitored and managed populations of Short's goldenrod in the Blue Licks area. All Kentucky occurrences are re-visited and evaluated every five years, and several long-term, quantitative monitoring plots and transects have been established to monitor the response of Short's goldenrod occurrences to habitat management activities, such as invasive plant management, cedar thinning, and prescribed fire. In 2021, OKNP observed slight increases in the number of stems at Short's Goldenrod SNP and slight increases in both stems and flowers at Blue Licks SNP (OKNP 2021). The Indiana occurrence along the Blue River is visited and monitored annually by the Indiana Department of Natural Resources. The number of stems has

remained relatively stable since completion of the last five-year review, and the primary threat to this occurrence continues to be encroachment from invasive plants (Namestnik 2022, pers. comm.).

Table 1. Summary of Short’s goldenrod occurrences (1988 – present). A detailed summary of each occurrence can be found in Appendix A; additional information can be found in the 1988 recovery plan and the two previous 5-year reviews (Service 1988, 2007, 2017, respectively).

General Location	Number of extant (and extirpated) occurrences			
	1988	2007	2017	2023
Falls of the Ohio, Jefferson Co., KY – occurrence 10	0 (1)	0 (1)	0 (1)	0 (1)
Blue Licks, Fleming, Nicholas, Robertson Co., KY – occurrences 1-9, 11-15	13 (0)	14 (0)	12 (2)	12 (2)
Claysville, Harrison Co., KY – occurrence 16-18	0	0	3 introduced	3 introduced
Licking River, Robertson Co., KY – occurrence 19	0	0	1 introduced	1 introduced
Clay Wildlife Management Area, Fleming and Nicholas Co., KY – occurrence 20, 21, 22	0	0	0	3 introduced
Blue River, Greenbrier Knob Nature Preserve, Harrison Co., IN occurrence - 001	0	1 (0)	1 (0)	1 (0)

Threats (Five-Factor Analysis) Summary

As specified in section 4 (a)(1) of the Act, a species’ status must be determined through consideration of the following five factors:

- A. present or threatened destruction, modification, or curtailment of its habitat or range;
- B. over-utilization of the species for commercial, recreational, scientific, or educational purposes;
- C. disease or predation;
- D. inadequacy of existing regulatory mechanisms; and
- E. other natural or manmade factors affecting its continued existence.

Habitat destruction and disturbance (Factor A) associated with agriculture (pasture maintenance, heavy grazing and trampling by livestock), development (land-clearing, grading, bulldozing of habitats), highway road maintenance (right-of-way clearing, spraying of herbicides), and utility line maintenance (spraying of herbicides) continues to represent an imminent threat of moderate to high magnitude for occurrences on non-protected lands. The species also continues to be threatened by competition from exotic plants, such as crown vetch (*Securigera varia*), Queen

Anne's lace (*Daucus carota*), sweet clover (*Meililotus alba*), tall fescue (*Schedonorus arundinaceus*), and musk thistle (*Carduus nutans*).

When the recovery plan was completed in 1988, the Service concluded that recreational activities (hiking) at Blue Licks Battlefield State Resort Park could pose a potential threat to the species (Factor B). These activities have continued for over 30 years since the species was listed, but we have no current evidence that these activities are harming occurrences on the park. The species' small range and low number of individual plants make it vulnerable to overcollection for scientific purposes (Medley 1980; Baskin and Baskin 1984); however, these activities are infrequent, and plants within Blue Licks Battlefield State Resort Park cannot be collected without a permit from the Kentucky Department of Parks and OKNP. These permits are only issued for valid scientific purposes, but plants occurring on private property are not afforded this protection. The Indiana occurrence is also potentially threatened by recreational use, but we have no evidence that these activities pose a significant threat at this time.

No diseases are known to be adversely affecting the species (Factor C); however, a fungus has been observed in recent years on the leaves of many occurrences. The effect of this fungus on the species is unknown. Over-grazing by cattle on private property has the potential to adversely affect the species by eliminating flower production, but this effect has not been observed directly.

Existing regulatory mechanisms (Factor D) have protected occurrences at Blue Licks Battlefield State Resort Park and preserves managed by OKNP, but these protections do not extend to occurrences located on private property. The Indiana occurrence occurs on state property (Harrison-Crawford State Forest) and is also protected from unauthorized disturbance.

The species has been reduced to a small number of occurrences with a limited number of individuals. Consequently, the species is vulnerable to natural or human-induced factors (fire suppression) that might directly destroy individuals and further reduce population size. Historically, open habitats supporting Short's goldenrod occurrences were likely maintained through periodic fire or other natural disturbances, such as grazing by bison. A lack of maintaining these habitats will result in declines in the species' reproductive success, resulting in reduced abundance and eventual extirpation if habitats become completely unsuitable. Natural (secondary) succession can eliminate potential habitat for Short's goldenrod through changes in vegetational composition and increased canopy cover. As old-field habitats and closed canopy woodlands develop, potential Short's goldenrod habitat is lost.

Synthesis

Short's goldenrod is a rare, perennial plant that grows in shallow, clay soils and produces bright yellow flowers from mid-August to October. The species occupies cedar glades, cedar thickets, pastures, old fields, remnant bison traces, forest edges, and rocky streambanks in Kentucky and Indiana. The species' current range includes 20 occurrences, most of which (12) are in the vicinity of Blue Licks Battlefield State Resort Park in Fleming, Nicholas, and Robertson counties, Kentucky. The species' primary threat continues to be habitat destruction and range curtailment associated with agriculture, development, highway maintenance, and utility line maintenance. Existing regulatory mechanisms have helped to protect occurrences under state

ownership, but these protections do not extend to occurrences under private ownership. The species' fragmented distribution and small population size increases its vulnerability to stochastic events, and the species continues to be vulnerable to natural succession and competition from exotic plants. Because of its restricted distribution and continued vulnerability to these high magnitude and imminent threats, we believe that the species continues to meet the definition of an endangered species.

RECOMMENDED FUTURE ACTIVITIES

Recovery Activities

- Continue to pursue permanent protection (through registry agreements, easements, or land purchases) of occurrences under private ownership
- Expand the size of extant occurrences through habitat management and augmentation
- Establish viable occurrences in areas within the historical range that have suitable habitat, especially the Blue Licks area of Fleming, Nicholas, and Robertson counties, Kentucky, and the Falls of the Ohio area in Clark and Floyd counties, Indiana, and Jefferson County, Kentucky.
- Develop criteria for establishing experimental populations in Kentucky
- Acquire potentially suitable but currently unoccupied habitat for the species where the species can be introduced and managed
- Continue implementation of management actions for permanently protected occurrences; work with Indiana DNR and the Indiana ES Field Office to develop a management strategy for the Indiana occurrence
- Revise the recovery plan

Monitoring and Research Activities

- Continue searches for new occurrences in the Blue Licks area, especially near known buffalo traces
- Conduct searches for new occurrences in riparian outcrop habitats of central Kentucky and southern Indiana or in upland areas of the region with suitable habitat
- Continue to investigate the life history and ecological requirements of the species (*e.g.*, seedling establishment, seed, and pollen dispersal distances)
- Study the species' population genetics

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RESULTS / SIGNATURES

U.S. Fish and Wildlife Service Status Review of Short's Goldenrod

Status Recommendation:

On the basis of this review, we recommend the following status for this species. A 5-year review presents a recommendation of the species status. Any change to the status requires a separate rulemaking process that includes public review and comment, as defined in the Act.

- Downlist to Threatened
- Uplist to Endangered
- Delist:
 - The species is extinct*
 - The species does not meet the definition of an endangered or threatened species*
 - The listed entity does not meet the statutory definition of a species*
- No change needed

FIELD OFFICE APPROVAL:

Field Supervisor, Kentucky Ecological Services Field Office, Fish and Wildlife Service

Approve _____

* Since 2014, Field Supervisors in the Region have been delegated authority to approve 5-year reviews that do not recommend a status change.

COOPERATING REGIONAL OFFICE APPROVAL:

We emailed this 5-year review to the Bloomington, Minnesota Regional Office for their concurrence prior to finalizing the document. We will retain any comments that we received, as well as verification of concurrence from other regions, in the administrative record for this 5-year review.

APPENDIX A. SUPPORTING DOCUMENTATION

Table A-1. Summary of Short's Goldenrod Occurrences, Kentucky and Indiana.

EO Number (OKNP)	Occurrence Number (Rec Plan)	Site Name - Location	EO Rank ²	EO Notes
1	1, 4 ¹	Blue Licks SNP (original tract), Nicholas & Robertson Co, KY	B	220 vegetative stems and 53 flowering stems observed along four, 10-m transects (001A) (Sep 2019); estimated 1,667 plants with 476 flowering stems (001A) and 200 plants with 30 flowering stems in adjacent field (001B) (Sep 2018).
2	2 ¹	Blue Licks SNP - Craig Site (Campground tract), Nicholas & Robertson Co, KY	C	1,424 vegetative stems and 452 flowering stems observed in 30 X 40m plot (Sep 2019); 864 plants and 57 flowering streams in comprehensive survey (Sep 2018).
3	10	Blue Licks - Allison Site, Nicholas Co, KY	D	100+ flowering plants observed on top of cliff/embankment behind workshop (Sep 2015).
4	7 ¹	Blue Licks - Indian Run, Robertson Co, KY	C	Estimated 250 vegetative plants and 5 flowering plants (004A), Estimated over 1,300 vegetative plants and over 800 flowering plants (004B) (Sep 2018).
5	N/A	Short's Goldenrod SNP, Fleming Co, KY	C	113 vegetative plants, 9 flowering stems (total 122 stems) (Oct 2021); 61 vegetative plants, 28 flowering stems (total 89 stems) (Sep 2020); 87 vegetative plants, 5 flowering stems (total 92 stems) (Oct 2019); 56 plants, 13 flowering plants (Sep 2018); occurrence discovered in 1998.
6	5	Blue Licks US 68 site (Smoot tract), Nicholas Co, KY	A	1,129 veg stems and 455 flowering stems within 10 X 50-m plot established in 2019 (Oct 2021); 925 veg stems and 282 flowering stems within 10X50m plot established in 2019, 35 of stems with fungus present (Sep 2020); 709 vegetative stems and 84 flowering stems within 10 x 50-m plot established in 2019, majority of stems with fungus present (Oct 2019); 2,373+ plants with over 1,200 flowering stems (Sep 2018).
7	12	Blue Licks US 68 (Roadcut), Nicholas Co, KY	C	Thousands of plants in bloom along bottom, middle, and top of road cut with a few patches on the road bank on the west side of road (007A and 007B) (Sep 2018).
8	11 ¹	(Abnee Tract), Nicholas Co, KY	C	1,347 stems, many will flower (Aug 2006).
9	8 ¹ , 9	Blue Licks Buffalo Trace, Fleming Co, KY	C	700 vegetative plants and 15 flowering stems (009B) (Sep 2018).

EO Number (OKNP)	Occurrence Number (Rec Plan)	Site Name - Location	EO Rank ¹	EO Notes
10	N/A	Falls of the Ohio Jefferson Co, KY	X	Occurrence now considered extirpated, last observed in 1848
11	13 ¹	Blue Licks Ellisville Site, Robertson Co, KY	F	Could not relocate in Sep 2015, likely extirpated; plants last observed in Aug 2006.
12	6 ¹	SR 165 / Rice Property, Robertson Co, KY	D	100 vegetative plants, 5 flowering stems along a 1 X 10-m strip (012B) (Sep 2018).
13	3 ¹	Blue Licks Hunter Site, Robertson Co, KY	C	154 vegetative stems, 43 flowering stems on edge of woods and hundreds more in adjacent mowed pasture (Sep 2018).
14	N/A	Kingsolver Site, Nicholas Co, KY	X	Plants last observed Sep 1994; occurrence discovered in 1989.
15	N/A	Short's Goldenrod SNP, Fleming Co, KY	CD	15 plants along US 68 (Aug 2006); occurrence discovered in 2003.
16	N/A	Claysville Site (Southern Conservation Corp.), Harrison Co, KY	NR	Introduced population; 500+ plants (Jun 2017), originally planted Apr 2006.
17	N/A	Claysville Site B (Southern Conservation Corp), Harrison County, KY	NR	Introduced population; 25 flowering plants, originally planted May 2014.
18	N/A	KYTC Site (Claysville Site C), Harrison Co, KY	NR	Introduced population (2014).
19	N/A	Licking River Site, Robertson Co, KY	NR	Introduced population (2014).
20	N/A	Clay WMA Fleming, Nicholas Co, KY	NR	Introduced population (Oct 2020); 10 plants.
21	N/A	Clay WMA Fleming, Nicholas Co, KY	NR	Introduced population (Oct 2020); 26 plants.

EO Number (OKNP)	Occurrence Number (Rec Plan)	Site Name - Location	EO Rank ¹	EO Notes
22	N/A	Clay WMA Fleming, Nicholas Co, KY	NR	Introduced population (Oct 2020); 102 plants in 3 patches (Clay WMA)

EO Number (INDNR)	Occurrence Number (Rec Plan)	Site Name - Location	EO Rank ¹	EO Notes
001	N/A	Blue River site, Greenbrier Knob Nature Preserve, Harrison Co, IN	B	183 clumps of plants within 286' X 10' area along Blue River (Aug 2022); 160 multi-stemmed clumps in river scour area along the Blue River (2021).

¹Occurrence identified in the recovery plan as "high priority"

²Element Occurrence (EO) Ranks: A, excellent estimated viability; B, good estimated viability; C, fair estimated viability; D, poor estimated viability; F, Failed to find; X, extirpated; NR, not rated – introduced occurrence.