

Blue Ridge Goldenrod
(*Solidago spithamea*)

5-Year Review:
Summary and Evaluation
Addendum 1

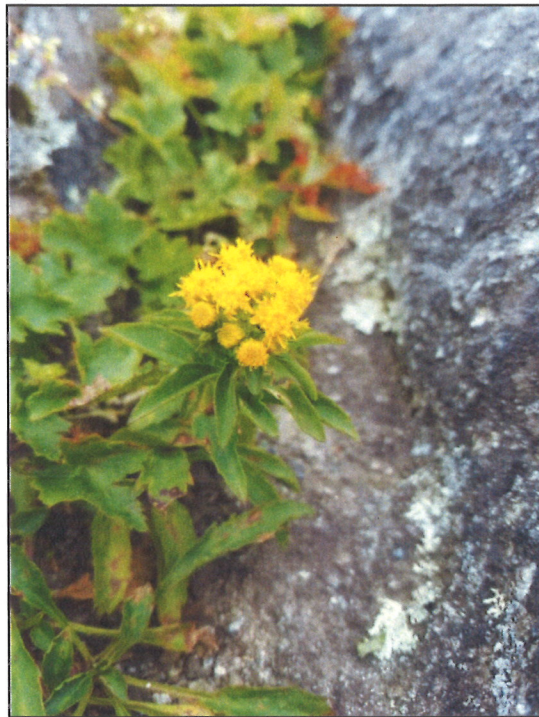


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US Fish and Wildlife Service
Southeast Region
Asheville Ecological Services Field Office
Asheville, North Carolina

5-YEAR REVIEW OF BLUE RIDGE GOLDENROD
(*Solidago spithamaea*)

Addendum 1. Summary of new information obtained since the 2012 5-year review.

The *Federal Register* notice announcing the initiation of this 5-year review was published on August 6, 2018 (83 FR 38320). No comments were received during the 60-day public comment period following this notice. However, the US Fish and Wildlife Service (Service) did receive additional information about the species, from biologists familiar with the species, in response to requests for specific information.

Updated information is presented below. Internal review was conducted by four members of Service's Southeast Region. Additionally, the Service conducted independent peer review on new information (Appendix A). The Service sought review from six knowledgeable experts on this species and its habitats. Comments have been addressed and incorporated into this addendum as appropriate and necessary.

I. GENERAL INFORMATION

B. Reviewers

Lead Field Office: Asheville Ecological Services Field Office, Rebekah Reid, (828) 258-3939.

C. Background

- 1. Federal Register Notice citation announcing initiation of this review:** 83 FR 38320; August 6, 2018.
- 2. Species Status:** Stable. The known range of *Solidago spithamaea* (Hanging Rock, Roan Mountain, and Grandfather Mountain) has remained the same since the species was listed in 1985 (Service 1985). As stated in the 2012 5-year review, the Hanging Rock population may consist of fewer than 10 clumps, the Roan Mountain population consists of several hundred clumps, and the Grandfather Mountain population consists of several hundred to 1,000 clumps (Service 2012). It should be noted, at the time of the 2012 population estimate, the species had not been monitored since 2001 and determining consistency of monitoring methods among observers was not possible (Service 2012). A recent range-wide survey, conducted in 2016 and 2017, noted 24 clumps at Hanging Rock, 420 clumps at Roan Mountain, and 1,814 clumps at Grandfather Mountain (Thompson 2018b). Inconsistent and infrequent monitoring prior to 2016 increases uncertainties associated with the species' status and trends; however, current population estimates are consistent with estimates derived from 2001 monitoring which indicates stability from 2001 to 2016.

5. **Review History:** The Service finalized a 5-year review for *Solidago spithamaea* in 2012. The review recommended the species remain classified as threatened due to known threats and lack of increasing population sizes (Service 2012).

II. REVIEW ANALYSIS

B. Recovery Criteria

3. **List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information.**

Criterion 3. Through the introduction and/or discovery of new populations, two additional self-sustaining populations exist within the species' historical range (it is believed that at least two additional populations are required to ensure that the species will not become extinct in the foreseeable future).

A putative population, in Ashe County at The Peak in Elk Knob State Park, was reported to the North Carolina Natural Heritage Program (NCNHP) in 1997 (NCNHP 2018). The original record (1997) noted that the “plant could be *S. cutleri* of northern Appalachians” and no herbarium record could be found despite contrary information indicating a voucher specimen was held at the University of North Carolina Chapel Hill Herbarium. The identification of *Solidago spithamaea* at The Peak remained unconfirmed during the 2012 5-year review. In 2016, members of North Carolina State Parks (NCSP), the National Park Service (NPS), and the US Forest Service (USFS) visited the site to resolve the unconfirmed identification. *Solidago spithamaea* was not observed at the site; however, other *Solidago* spp., including *Solidago glomerata*, were present (Kauffman 2018, USFS, personal communication). *Solidago glomerata* is a co-occurring species that is often mistaken for *Solidago spithamaea* when immature. It remains unknown whether the plant observed in 1997 was misidentified or extirpated from the site. Regardless, the Service does not recognize The Peak as having an extant population of *Solidago spithamaea*.

A population on NPS property in Buncombe County, originally reported to the NCNHP in 1990, has never been relocated despite multiple efforts, with the most recent effort in 2016 (Ulrey 2018, NPS, personal communication; NCNHP 2018; Thompson 2018b). Until presence can be confirmed, the Service does not recognize the site as having an extant population of *Solidago spithamaea*.

C. Updated Information and Current Species Status

1. Biology and Habitat

- a. **Abundance, population trends (e.g., increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, family size, birth rate, age at mortality, mortality rate, etc.), or demographic trends:** The listing rule and recovery plan recognize three extant populations of *Solidago spithamaea*; however, there is no estimation of population sizes in these documents (Service 1985; Service 1987). The

2012 5-year review attempted to estimate population sizes but noted inconsistency in monitoring methods and counting units among observers (Service 2012).

Thompson (2017), with North Carolina State University, recognized the inconsistency in monitoring methodologies and unreliability of historic data. She developed a monitoring protocol that could be used to establish a baseline population census and conducted range-wide monitoring of *Solidago spithamaea* in 2016 and 2017. Thompson (2018a, NCSU, personal communication) notes that her census may be incomplete due to inaccessibility as a result of rugged and vertical terrain; however, this effort represents the most thorough inventory of the species since listing.

The NCNHP has mapped the three known populations of *Solidago spithamaea* as two principle element occurrences (EO) and one stand-alone EO (NCNHP 2018). For this species, principle EOs represent an entire population and can contain multiple sub-EOs (a smaller geographically distinct area contained within a principle EO). A stand-alone EO contains one occurrence, representing a population, with no sub-EOs. Principle and stand-alone EOs can be thought of as proxies for populations in the absence of species-specific information on pollination and dispersal distances. Thompson (2018b) counted patches (or clumps) of plants at each extant population, including all accessible sub-EOs. Abundance data for each population is summarized below.

Population	Population #	# of Sub-EOs	# of Clumps
Hanging Rock	1	0	24
Roan Mountain	2	6	420
Grandfather Mountain	3	10	1,814
Total			2,258

Thompson identified several taxa of insects landing on *Solidago spithamaea* inflorescences, including sweatbees, *Bombus spp.*, and hoverflies (Thompson 2019, NCSU, personal communication).

- d. **Spatial distribution, trends in spatial distribution (e.g., increasingly fragmented, increased numbers of corridors, etc.), or historical range (e.g., corrections to the historical range, change in distribution of the species within its historical range, etc.):** An herbarium record documenting a site in Botetourt County, Virginia was discovered during the course of this review (NYBG 1977). Flower characteristics and leaf morphology are not consistent with published key traits for *Solidago spithamaea* (Weakley 2018, UNC, personal communication). As noted by Weakley, the specimen was misidentified and is likely a depauperate form of *Solidago bicolor*. The herbarium record is not documentation of a current or historical range expansion.

As stated in Section II.B.3, the Service does not recognize The Peak as having an extant population of *Solidago spithamaea*; therefore, the site does not represent a new county record.

2. Five Factor Analysis (threats, conservation measures, and regulatory mechanisms)

- a. **Present or threatened destruction, modification or curtailment of its habitat or range:** The listing rule cites trampling and habitat disturbance due to heavy recreational use as a primary threat to *Solidago spithamea* (Service 1985). Recreational impacts remain a threat to the species. Thompson (2018b) observed the number of trampled clumps at each population or sub-EO during her census. Trampling was observed as crushed stems, and/or bruised and torn leaves (Thompson 2019, NCSU, personal communication). It should be noted that only safely accessible clumps were evaluated; therefore, the total number of evaluated clumps can be less than the population or sub-EO census (Thompson 2018a, NCSU, personal communication).

The Hanging Rock population is a stand-alone EO containing approximately 24 clumps, and no clumps had signs of trampling (NCNHP 2018; Thompson 2018b). Hanging Rock is privately owned, and *Solidago spithamea* is located in a remote and rarely visited location on the property (Thompson 2018a, NCSU, personal communication).

The Roan Mountain population consists of six extant sub-EOs containing a total of approximately 420 clumps (NCNHP 2018; Thompson 2018b). As noted by Thompson, 14 of 168 clumps (8%) at one sub-EO had signs of trampling. While two of the trampled clumps are in an area open to recreational users, 12 clumps are in an official closure area. *Geum radiatum* is also monitored at this site each year within the closure area (Kauffman 2019, USFS, personal communication). Trampling at this location could be a result of recreational use and/or the yearly monitoring efforts. In four other sub-EOs, no clumps had signs of trampling, and one sub-EO was unassessed (Thompson 2018b).

The Grandfather Mountain population consists of 10 extant sub-EOs containing a total of approximately 1,814 clumps (NCNHP 2018; Thompson 2018b). Grandfather Mountain is the largest population, and one sub-EO contains approximately 52% of all known plants throughout the range. As noted by Thompson, four of the 10 sub-EOs had signs of trampling. Thompson divided Linville Peak, the largest of all sub-EOs, into two locations: the trailhead and the swinging bridge. Sixty-three of 87 clumps (72%) at the trailhead and 244 of 643 clumps (38%) at the swinging bridge had signs of trampling (Thompson 2018b). The trailhead is in an area easily accessible to visitors and adjacent to a parking lot. Although the swinging bridge is also easily accessible to the public, there are railings and seasonal natural resources staff to encourage visitors to stay on designated pathways and overlooks. Two other sub-EOs also had signs of trampling at rates of 11% in an area open to the public and 12% in an official closure area (Thompson 2018b). Thompson consulted with the Grandfather Mountain Stewardship Foundation regarding language to use on signs that would deter visitors from unknowingly impacting rare plants. Signs ask visitors to avoid rare plants by only stepping on bare rock. While data has not been collected to quantify effects the signs may be having on rare plants, recent observations suggest that the response may be positive (Thompson 2018a, NCSU, personal communication). Additionally, the Grandfather Mountain Stewardship Foundation is developing a Land Resource Management Plan that will guide resource

management practices and levels of resource protections while providing a recreational experience to visitors (Cavney 2018).

Two sub-EOs, one each at Roan Mountain and Grandfather Mountain, had signs of trampling despite closure orders (Thompson 2018b). Although closure orders aid in the protection of rare species, the data shows they do not guarantee protection of plants and habitat from recreational or other impacts, such as monitoring.

- c. **Disease or predation:** Thompson (2018b) observed the number of predated clumps at each population or sub-EO during her census. It should be noted that only safely accessible clumps were evaluated; therefore, the total number of evaluated clumps can be less than the population or sub-EO census (Thompson 2018a, NCSU, personal communication).

At the Hanging Rock population, 4% of clumps had herbivory (Thompson 2018b). At the Roan Mountain population, four sub-EOs had herbivory at a rate of 18% to 48%, one sub-EO had none, and one sub-EO was unassessed (Thompson 2018b). At the Grandfather Mountain population, seven sub-EOs had herbivory at a rate of 1% to 72% (Thompson 2018b), and three sub-EOs had none. Predation was primarily in the form of insect herbivory and impacts to plant health were negligible even at sub-EOs with high rates (Thompson 2018a, NCSU, personal communication).

- d. **Inadequacy of existing regulatory mechanism:** The 2012 5-year review indicated that *Solidago spithamaea* was listed as an endangered species in North Carolina according to the North Carolina Protected Plant Species List from December 1, 2010 (Service 2012). This was noted in error and the species is identified as threatened on that list (North Carolina Plant Conservation Board 2010). The 2010 North Carolina Protected Plant List is the most current list of protected plant species maintained by the state of North Carolina.

- e. **Other natural or manmade factors affecting its continued existence:** The listing rule cites encroachment of ericaceous shrubs as a threat to *Solidago spithamaea* (Service 1985). Woody encroachment remains a threat to the species. Thompson (2018b) observed the number of clumps impacted by woody encroachment at each population or sub-EO during her census. Encroachment was observed as an overhanging woody-stemmed species or proximal woody species casting a shadow over the plants, or woody-stemmed species physically encroaching on or enclosing the plant (Thompson 2019, NCSU, personal communication). It should be noted that only safely accessible clumps were evaluated; therefore, the total number of evaluated clumps can be less than the population or sub-EO census (Thompson 2018a, NCSU, personal communication).

At the Hanging Rock population, 33% of clumps had encroachment (Thompson 2018b). At the Roan Mountain population, five sub-EOs had encroachment at a rate of 11% to 53%, and one sub-EO was unassessed (Thompson 2018b). Although encroachment was noted at Roan Mountain, the USFS has actively managed encroaching woody and herbaceous vegetation in portions of three of the five sub-EOs (Kauffman 2019, USFS,

personal communication). At the Grandfather Mountain population, nine sub-EOs had encroachment at a rate of 4% to 47% (Thompson 2018b). Thompson noted, one sub-EO and the trailhead location had no encroachment. All three *Solidago spithamaea* populations had encroachment including 14 of 15 assessed sub-EOs of the Roan Mountain (despite active management) and Grandfather Mountain populations (Thompson 2018b).

D. Synthesis

Solidago spithamaea should remain classified as threatened. Previous surveys were incomplete; however, the population sizes appear to have remained stable since 2001. It is unclear if any perceived increase in population abundance is due to a true increase or the more comprehensive survey methods used by Thompson. Additionally, no new populations have been identified. The known threats to the species remain unchanged. Recreational impacts remain a threat at two known populations (Roan Mountain and Grandfather Mountain). Closure orders have been implemented at two sub-EOs; however, Thompson's data has shown this is not a consistently reliable method of protection against impacts. The elimination or decrease in severity of recreational impacts at several sub-EOs is a by-product of the remote and inaccessible character of these areas. This character should be maintained to ensure continued existence of the species. Impacts associated with monitoring *Geum radiatum* may also contribute to trampling. Woody encroachment remains a threat at all known populations. Without management, vegetative succession may negatively impact population stability. Although threats have been ameliorated at some sites, they have not been eliminated and Thompson's data highlights the need for continued management and monitoring to assess threats.

III. RESULTS

A. Recommended Classification: No change is needed.

IV. RECOMMENDATIONS FOR FUTURE ACTION

The 2012 5-year review included a list of recommendations to improve recovery of the species. These actions, A-H, remain applicable to species recovery. Accomplishments toward recommended actions are summarized below:

- A. In 2016, members of NCSP, the NPS, and the USFS visited the Peak to resolve the unconfirmed identification. *Solidago spithamaea* was not observed at the site. See Section II.B.3.
- B. Thompson, with NCSU, measured 35 characteristics on approximately 90 clumps, and has determined the three most distinct characteristics – midrib thickness, soil depth, and leaf color (Thompson 2018a, NCSU, personal communication). Her master’s thesis will include a more detailed description of distinguishing characteristics for *Solidago spithamaea* and immature *Solidago glomerata*. At the time of this review, Thompson’s thesis is in progress and a final draft for distribution was not complete.
- E. Thompson developed a monitoring protocol that could be used to establish a baseline population census. Range-wide monitoring of *Solidago spithamaea* was conducted in 2016 and 2017.

Additional future actions (I-K), in light of new information, are recommended below:

- I. *Solidago spithamaea* co-occurs with other federally listed species. Impacts from monitoring could inadvertently occur if field staff conducting monitoring are unaware of other species present or how to identify them. Pre-monitoring, tailgate meetings should occur prior to each monitoring event when species co-occur. Field staff should be briefed on species present, how to identify them, and strategies for avoidance.
- J. Work with Thompson to document the monitoring protocol and threats assessment used during the 2016 and 2017 field seasons. Share this information with land managers and property owners to ensure consistency during future monitoring events.
- K. Work with Thompson, or find an appropriate partner, to continue range-wide monitoring and threats assessment according to the protocol used in 2016 and 2017 so that consistent data can be meaningfully compared.

V. REFERENCES

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- . 1987. Blue Ridge Goldenrod Recovery Plan. Atlanta, GA. 30 pp.
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- Weakley, Alan. 2018. University of North Carolina Chapel Hill, Chapel Hill, NC. Personal communication, email.

US FISH AND WILDLIFE SERVICE
5-YEAR REVIEW OF BLUE RIDGE GOLDENROD

Current Classification: Threatened.

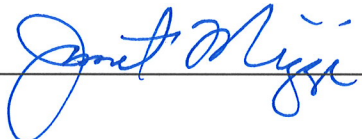
Recommendation resulting from the 5-Year Review:

- Downlist to Threatened
- Uplist to Endangered
- Delist
- No change needed

Review Conducted By: Rebekah Reid, Asheville Ecological Services Field Office

FIELD OFFICE APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service

Approve 

Date 5-20-19

APPENDIX A Peer Review

Summary of peer review for the 5-year review of Blue Ridge goldenrod (*Solidago spithamaea*).

- A. **Peer Review Method:** Peer review was coordinated by the Service's Raleigh Ecological Services Field Office in North Carolina. Six peer reviewers were selected by the Service for their knowledge of and expertise with Blue Ridge goldenrod. Individual responses were received from five of the six reviewers. Additionally, internal review was conducted by four members of Service's Southeast Region.
- B. **Peer Reviewers:** The peer review request included personnel from North Carolina State University (NCSU), the National Park Service-Blue Ridge Parkway (NPS), the US Forest Service in NC (USFS-NC) and TN (USFS-TN), the NC Natural Heritage Program (NCNHP), and the TN Natural Heritage Inventory Program (TNHP).
- C. **Peer Review Charge:** Reviewers were asked to conduct a scientific review of technical information presented. Reviewers were not asked to review the legal status determination.
- D. **Summary of Peer Review Comments:** The peer reviewer from the USFS-TN did not respond with comments. Peer reviewers from the NPS and TNHP reviewed the document but had no comments. Peer reviewers from NCSU, the USFS-NC, and the NCNHP provided comments. A brief summary of substantive comments is below:

The peer reviewer from NCSU provided additional information regarding pollinators, monitoring methods, and State status of the species in North Carolina.

The peer reviewer from USFS-NC provided clarification regarding management actions at Roan Mountain and questioned the role of monitoring co-occurring species in trampling impacts.

The peer reviewer from NCNHP provided updated element occurrence data.

- E. **Response to Peer Review:** All substantive comments received from reviewers were reviewed by the Service and incorporated into a revised version of this document, where appropriate.