Blue Ridge goldenrod
(*Solidago spithamaea*)
5-Year Status Review:
Summary and Evaluation

Photo by Dr. Christopher Ulrey.

U.S. Fish and Wildlife Service
Southeast Region
Asheville Ecological Services Field Office
Asheville, North Carolina
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STATUS REVIEW

Blue Ridge goldenrod (*Solidago spithamaea*)

GENERAL INFORMATION

Current Classification: Threatened

Lead Field Office: Asheville Ecological Services Field Office

Review Author(s): Dr. Natali Ramirez-Bullon and Gary Peeples, Asheville Ecological Services Field Office, (828) 216-4970

Reviewers:

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Cooperating Field Office(s): Cookeville Ecological Services Field Office, Cookeville, Tennessee, Geoff Call, (931) 261-8277.

Date of original listing: April 29, 1985 (50 FR 12306; March 28, 1985)

Methodology used to complete the review:

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 the Blue Ridge goldenrod *(Solidago spithamaea*) to inform this status review.

We announced initiation of this review in the Federal Register on May 11, 2023 (88 FR 30324) with a 60-day comment period and received no comment. The primary sources of information used in this analysis were the 1985 final listing rule (50 FR 12306), the 1987 recovery plan, past five-year reviews, peer-reviewed reports, agency reports, unpublished survey data and reports, and personal communication with recognized experts.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, Asheville Ecological Services Field Office (ASFO), Asheville, North Carolina. All literature and documents used for this review are on file at the ASFO. All recommendations resulting from this review are the result of thoroughly reviewing the best available information on the Blue Ridge goldenrod.

FR Notice citation announcing the species is under active review:

May 11, 2023 (88 FR 30324)

Species' Recovery Priority Number at start of 5-year review (48 FR 43098):

8. Blue Ridge goldenrod is a species with moderate degree of threats and a high recovery potential. At the end of this review, we recommend a new Recovery Priority Number.

Review History:

Two previous 5-year reviews recommending no change in status were signed on March 29, 2012, and May 20, 2019 (Service 2012, 2019).

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) (61 FR 4722)

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

Final Recovery Plan for the Blue Ridge goldenrod (*Solidago spithamaea*), October 28, 1987.

Recovery plans are not regulatory documents and 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).

Criterion 1: *The three populations at Roan Mountain, Grandfather Mountain, and Hanging Rock are protected.*

Criterion 2: *Any necessary management actions have been undertaken for these populations by landowners or cooperating agencies and it has been documented that this management is successfully ensuring the continued survival of these populations.*

Criterion 3: *Through 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).*

Criterion 4: *All five populations and their habitat are protected from present and foreseeable human-related and natural threats that may interfere with the survival of any of the populations.*

The Service believes these criteria are appropriate and relevant; however, no criteria have currently been met.

Biology and Habitat Summary

Blue Ridge goldenrod occurs at vertical to near vertical cliffs and high-elevation rock outcrops (4,500 to 6,000 feet above sea level, Figure 1) which makes surveys challenging. As of 2023, there are three extant populations of this species: Roan Mountain, Grandfather Mountain, and Hanging Rock. We reviewed the North Carolina Natural Heritage Program and the Tennessee Natural Heritage Program databases. North Carolina Natural Heritage Program records were the most updated and included counts of number of clumps at each population or element of occurrence. For the purpose of this review, we consider each Elemental Occurrence as a population and sub-Elemental Occurrences as sub-populations.

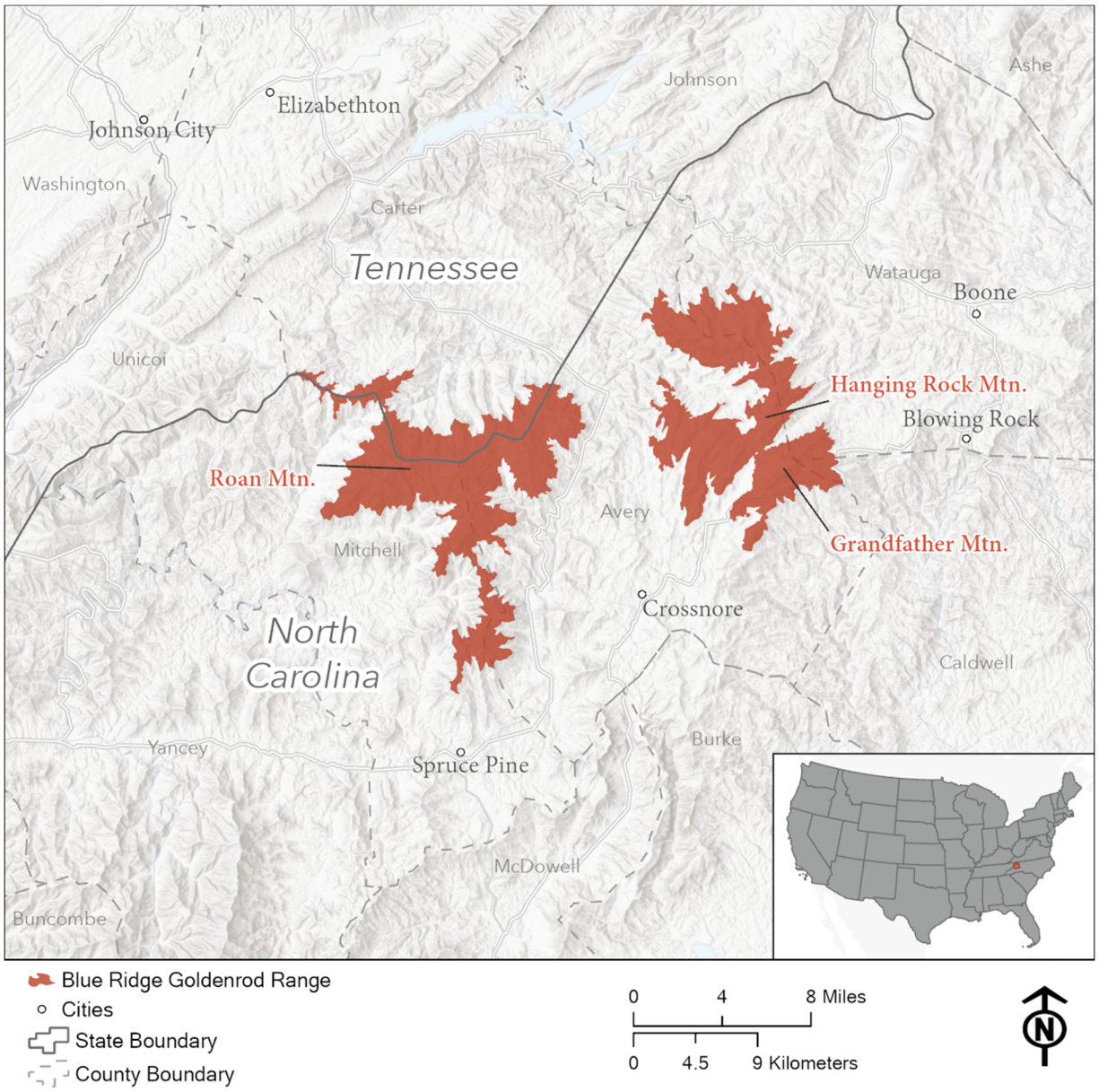

Figure 1: Blue Ridge goldenrod (*Solidago spithamaea*) current range.

We summarized the most recent information in Table 1, where we assumed that the last survey available represents the current status of the populations. We found a decline in the total number of clumps (n= 1,355, Table 2) compared to the last five-year review (n=2,258, Table 2). There was a significant decline in one of the sub-populations at the Grandfather Mountain population in Avery County between year 2016 and 2017 (Table 1). That first sub-population experienced a decline of 95.2% in 2017 but it recovered to 45.3% of its original abundance by year 2023. Possible explanations for that decline are that 38% of those clumps had signs of trampling, as well as observed encroachment of 21%, and herbivory at 25% in 2016 (Thompson unpublished notes). The combination of those factors and the abnormally dry spring recorded for Avery County in year 2017 (U.S. Drought Monitor 2023) could have led to the reduced number of clumps observed. North Carolina Natural Heritage Program also ranks each population and sub-population for viability. For example, a rank of A indicates excellent estimated viability, and a rank BC means good or fair estimated viability. North Carolina Natural Heritage Program ranked Roan Mountain and Grandfather Mountain with A for viability. The Hanging Rock population was ranked with a B rank meaning good viability increasing their past rank. A total of five sub-populations have decreased their viability ranks, and three sub-populations have increased their viability ranks since the last five-year review (Table 1).

Table 1: Blue Ridge goldenrod number of clumps at each sub-population (Roan Mountain (n=6), Grandfather Mountain (n=10), and Hanging Rock (n=0)). The last column represents our estimate of current population size based on most recent information. ns indicates no survey was conducted.

Population	**County**	**2017 Rank**	**2023 Rank**	**2016**	**2017**	**2018**	**2020**	**2023**	**Most recent data**
Roan Mountain	Mitchell	A	A	236	169	ns	Ns	ns	169
Roan Mountain	Mitchell	B	B	52	120	ns	Ns	ns	120
Roan Mountain	Carter-TN	AB	AB	33	35	ns	Ns	ns	35
Roan Mountain	Mitchell	BC	BC	39	40	ns	30	ns	30
Roan Mountain	Mitchell	AB	B	8	35	ns	Ns	ns	35
Roan Mountain	Mitchell	D	C	ns	18	ns	Ns	ns	18
Grandfather Mountain	Avery	A	A	1081	87	ns	Ns	435	435
Grandfather Mountain	Avery	B	C	ns	ns	8	Ns	2	2
Grandfather Mountain	Avery	A	A	157	ns	ns	Ns	126	126
Grandfather Mountain	Avery	B	C	24	ns	ns	Ns	3	3

Population	County	2017 Rank	2023 Rank	2016	2017	2018	2020	2023	Most recent data
Grandfather Mountain	Avery	E	C	19	ns	10	Ns	ns	10
Grandfather Mountain	Avery	C	D	2	ns	ns	Ns	7	7
Grandfather Mountain	Avery	B	B	ns	21	ns	Ns	ns	21
Grandfather Mountain	Avery	BD	A	ns	160	ns	Ns	ns	160
Grandfather Mountain	Avery	BC	C	ns	119	ns	Ns	16	16
Grandfather Mountain	Avery	BC	BC	107	ns	ns	Ns	41	41
Hanging Rock	Avery Watagua	BD	B	ns	24	ns	Ns	ns	24

Table 2: Comparison in the number of clumps of Blue Ridge goldenrod (*Solidago spithamaea*) reported in the 2019 five-year review and the current estimates per population.

Population	2019 number of sub-populations	2019 number of clumps	2023 number of sub-populations	2023 number of clumps
Roan Mountain	6	420	6	407
Grandfather Mountain	10	1814	10	821
Hanging Rock	0	24	0	24
Total		2,258		1,355

We are not aware of any additional new biology or habitat information since the most recent species review that impacts the status of the species and all the information provided in the last 5-year review remains valid (Service 2019).

Threats (Five-Factor Analysis) Summary

The status of a species is determined from an assessment of factors specified in section 4 (a)(1) of the Act, including: Factor A: the present or threatened destruction, modification, or curtailment of its habitat or range; Factor B: overutilization for commercial, recreational, scientific, or educational purposes; Factor C: disease or predation; Factor D: the inadequacy of existing regulatory mechanisms; Factor E: other natural or manmade factors affecting its continued existence. A summary of this assessment is detailed below.

The final listing rule described threats to the Blue Ridge goldenrod from trampling and habitat disturbance due to heavy recreational use of its habitat by hikers (Factor A; Service 1985) because this species occurs at mountain summits that are common hiking destinations. Recent information shows that these threats remain ongoing, occur throughout the species range, and we expect them to continue in the future.

We have no indication that overutilization for commercial, recreational, scientific, or educational purposes (Factor B) or disease and predation (Factor C) poses a significant threat for the species.

The inadequacy of existing regulatory mechanisms (Factor D) remains a threat to the species as acknowledged in the listing rule and recovery plan (Service 1985, 1987). North Carolina and Tennessee laws protecting rare plants have limited authorities. For example, neither state protects plants from habitat destruction from recreational use, which is the main threat to the species at this time.

The listing rule identified woody succession as a threat to this species (Factor E). This threat reduces survival by competition for light and space, therefore without management to reduce woody vegetation it can impact the species throughout its range. This threat remains ongoing, moderate, and occurring throughout the species range, and we expect this to continue in the future. Another threat reported is natural rockslides (Factor E, Thompson 2023) - it was observed that plants were damaged due to rock shedding. This threat is natural, weather-related, and has not been quantified yet. Additionally, climate change (Factor E) is likely to disrupt climatic conditions required for alpine relics such as Blue Ridge goldenrod. Temperatures in North Carolina have risen since the beginning of the 20th century and are expected to rise in the future (Frankson et al. 2022). Additionally, temperatures in Tennessee are also likely to increase into the future (Runkle et al 2022). These increased temperatures along with changes in precipitation (including snowfall) and severe weather events may negatively impact the species in the future. Wiser et al. (1998) used linear models to predict Blue Ridge goldenrod occurrence, it was suggested that this species has an intolerance of higher temperatures associated with increased potential solar radiation because of the lowest probability of occurrence at the highest annual potential solar radiation levels.

Synthesis

Blue Ridge goldenrod is perennial herb and an alpine relic plant endemic to a limited area of the Blue Ridge Mountains of North Carolina and eastern Tennessee. The species continues to occur at three populations that were known at the time of the species listing. However, the total number of clumps in those populations has declined by 40% since the last five-year review. All populations are in the vicinity of heavily-used recreation areas along trails and at summits which are impacted by direct trampling caused by visitor use. Through the years the rate of recreational visitors has increased in all sites. In addition, the threat of vegetation succession, natural rockslides, and climate change may negatively impact the species' continued existence. Because of ongoing threats and the current condition of the species, this species continues to meet the definition of a threatened species. We recommend changing the species' recovery number from 8 to 11 due to the change from high to low recovery potential observed. Blue Ridge goldenrod life cycle is poorly understood, difficult to study, and this species is declining in abundance.

RECOMMENDED FUTURE ACTIVITIES

The 2012 and 2019 five-year reviews included a list of recommendations to improve recovery of the species. Recommended future activities are as follows:

- Develop a taxonomic key distinguishing co-occurring seedlings and juvenile plants of Skunk goldenrod (*Solidago glomerata*) from Blue Ridge goldenrod (Recovery Task 1.2)
- Work with appropriate partners to evaluate protection alternatives at Hanging Rock population, including voluntary landowner agreements (Recovery Task 1.4).
- Develop interim research and management plans in conjunction with the USFS; North Carolina Division of Parks and Recreation; and Grandfather Mountain stewardship foundation (Recovery task 1.1).
- Implement monitoring at a representative number of subpopulations across all populations (Recovery tasks 2,2.1,2.3). We recommend that partners use clumps counts as defined by Thompson thesis draft (unpublished). Clumps are separated by 25 cm of distance.
- Compile quantitative data summarizing transplant survivorship across all previously attempted introductions or augmentations efforts involving this species and evaluate causes for success/failure (Recovery task 2.8). Furthermore, if future introductions are conducted analyze if occurrence models predict habitat suitable for reintroduction accurately as suggested by Wiser et al. (1998).
- Evaluate long-term storage requirements for this species, and work with appropriate partners to place representative genetic material in long-term storage (Recovery Task 3).
- Collaborate with partners to determine how climate change would impact the resiliency of Blue Ridge goldenrod populations (Recovery Task 1.3 and 1.4).
- Identify other co-occurring federally listed plants before monitoring to avoid trampling.
- Share Thompson notes and thesis draft with all land managers and property owners to ensure we use the same criteria when conducting future monitoring efforts.
- Meet with partners to discuss monitoring protocol. Aim to identify gaps of knowledge and misconceptions when counting clumps and identifying different life stages.

Additional future activities, are recommended below:

- Quantify threats and protection priority of all sub-populations.
- Determine species habitat and niche requirements to inform climate change models.

REFERENCES

Frankson, R., K.E. Kunkel, L.E. Stevens, D.R. Easterling, W. Sweet, A. Wootten, H. Aldridge, R. Boyles, and S. Rayne, 2022: North Carolina State Climate Summary 2022. NOAA Technical Report NESDIS 150-NC. NOAA/NESDIS, Silver Spring, MD, 5 pp. https://statesummaries.ncics.org/chapter/nc/

North Carolina Natural Heritage Program. 2023. Element Occurrence records for *Solidago spithamaea*. Print date December 21, 2023.

Runkle, J., K.E. Kunkel, D.R. Easterlng, L.E. Stevens, B.C. Stewart, R. Frankson, L. Romolo, J. Neilsen-Gammon, T.A. Joyner, W. Tollefson, 2022: Tennessee State Climate Summary 2022. NOAA Technical Report NESDIS 150-TN. NOAA/NESDIS, Silver Spring, MD, 5 pp. https://statesummaries.ncics.org/chapter/tn/

Thompson, A. 2017. The Ecological Context of *Solidago spithamaea*. North Carolina State University, Raleigh, NC. Unpublished proposal.

Thompson, A. 2023. Personal communication. In person meeting between Andrea Thompson, North Carolina State University, Raleigh, NC and the U.S. Fish and Wildlife Service.

U.S. Fish and Wildlife Service (Service). 1985. Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for *Solidago spithamaea* (Blue Ridge Goldenrod). 50 FR 12306. 4 pp.

U.S. Fish and Wildlife Service (Service). 1987. Blue Ridge Goldenrod Recovery Plan. Atlanta, GA. 30 pp.

U.S. Fish and Wildlife Service (Service). 2012. Blue Ridge Goldenrod (*Solidago spithamaea*) 5-Year Review: Summary and Evaluation. Asheville, NC. 17 pp.

U.S. Fish and Wildlife Service (Service). 2019. Blue Ridge Goldenrod (*Solidago spithamaea*) 5-Year Review: Summary and Evaluation. Asheville, NC. 11 pp.

Wiser, S.K., R.K. Peet and P.S. White. 1998. Prediction of a rare-plant occurrence: a Southern Appalachian example. Ecological Applications 8(4): 909-920.

RESULTS / SIGNATURES

U.S. Fish and Wildlife Service
Status Review of Blue Ridge 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*

X No change needed

New Recovery Priority Number (48 FR 43098):

The species original Recovery Priority Number was 8, indicating a species with moderate degree of threats and a high recovery potential. Our new recovery number, 11, indicating a species with a moderate degree of threat and a low recovery potential. Although the degree of threat remains the same, this species biology is poorly understood and difficult to study due to it's occurrence in cliffs. This leads us to reclassify the degree of recovery potential from high to low.

FIELD OFFICE APPROVAL:

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

Approve JANET MIZZI Digitally signed by JANET MIZZI Date: 2024.09.09 14:27:05 -04'00'