

Blue Ridge Goldenrod
(Solidago spithamea)

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



(U.S. Fish and Wildlife Service photo)

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

5-YEAR REVIEW

Blue Ridge Goldenrod (*Solidago spithamaea*)

I. GENERAL INFORMATION.

A. Methodology Used to Complete the Review: Public notice of this 5-year review was given in the *Federal Register* on July 29, 2008 (73 FR 43947), and a 60-day comment period was opened. We did not receive any additional information about *Solidago spithamaea* (Blue Ridge goldenrod) in response to the *Federal Register* notice. Pertinent status data were obtained from the recovery plan, published papers, unpublished reports, and experts on this species. Once all known and pertinent data were collected for this species, the status information was compiled and the review was completed by the species' recovery lead biologist in the U.S. Fish and Wildlife Service's (USFWS) Ecological Services Field Office (ESFO) in Asheville, North Carolina.

The USFWS did receive additional information about the species directly from peer reviewers--biologists who are familiar with the species. The information received was evaluated and incorporated as appropriate (see Appendix A).

B. Reviewers.

Lead Region - Southeast Regional Office, USFWS, Atlanta, Georgia: Kelly Bibb, 404/679-7132.

Lead Field Office – Asheville ESFO, Asheville, North Carolina: Mara Alexander, 828/258-3939, Ext. 238.

Cooperating Field Office – Cookeville ESFO, Cookeville, Tennessee: Geoff Call, 931/528-6481, Ext. 213.

C. Background.

1. **Federal Register Notice citation announcing initiation of this review:** July 29, 2008:73 FR 43947.
2. **Species' status:** Uncertain (2011 Recovery Data Call); monitoring has not occurred since 2001.
3. **Recovery achieved:** 1 (1 to 25 percent of recovery objectives achieved).

4. Listing history:

Original Listing:

FR notice: 50 FR 12306.

Date listed: March 28, 1985.

Entity listed: species.

Classification: threatened.

5. Review history.

Final recovery plan – October 1987.

Recovery Data Call – 2011, 2010, 2009, 2008, 2007, 2006, 2005, 2004, 2003, 2002, 2001, 2000, 1999, and 1998.

The USFWS conducted a 5-year review for *Solidago spithamaea* in 1991 (56 FR 56882). In that review, the status of many species was simultaneously evaluated with no in-depth assessment of the five factors or threats as they pertain to the individual species. The notice stated that the USFWS was seeking any new or additional information reflecting the necessity of a change in the status of the species under review. The notice indicated that if significant data were available warranting a change in a species' classification, the USFWS would propose a rule to modify the species' status. No new information or additional data was received for *S. spithamaea*. Therefore, no change in the plant's listing classification was found to be appropriate.

6. **Species' Recovery Priority Number at start of review (48 FR 43098):** 8. This number indicates a moderate degree of threat and a high recovery potential.

7. Recovery plan.

Name of plan: Recovery Plan for the Blue Ridge Goldenrod (*Solidago spithamaea* Curtis).

Date issued: October 28, 1987.

II. REVIEW ANALYSIS.

- A. **Application of the 1996 Distinct Population Segment Policy:** The Endangered Species Act defines species as including any subspecies of fish or wildlife or plant, and any DPS of any vertebrate wildlife. Therefore, the DPS policy applies to only vertebrate species of fish and wildlife. Because *S. spithamaea* is a plant, the DPS policy is not applicable and is not addressed further in this review.

B. Recovery Criteria.

- 1. Does the species have a final approved recovery plan containing objective, measurable criteria? Yes.**
- 2. Adequacy of recovery criteria.**
 - a. Do the recovery criteria reflect the best available and most up-to-date information on the biology of the species and its habitat? Yes.**
 - b. Are all of the five listing factors that are relevant to the species addressed in the recovery criteria (and is there no new information to consider regarding existing or new threats)?** Yes. The existing recovery criteria could not be met without addressing the three listing factors still identified as significantly affecting the status of the species in the listing rule (habitat loss, the inadequacy of existing regulatory mechanisms, and other natural or manmade factors). There are no new threats affecting the species beyond those mentioned in the listing rule and the recovery plan. Accelerated global climate change is expected to exacerbate those threats already identified; this is discussed later in the “Five-factor analysis” section.
- 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.**

Solidago spithamea shall be considered for delisting when the following criteria are met:

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

The population at Grandfather Mountain occurs on property that, until 2009, was owned by Grandfather Mountain, Inc., a private corporation with a long history of working with the USFWS and other conservation partners toward the conservation of the rare species and habitats found there. The first measures of formal protection occurred in 1979, when this landowner placed portions of its land on a voluntary Registry of Natural Heritage Areas maintained by the North Carolina Natural Heritage Program (NCNHP) (The Nature Conservancy 1996). The landowner signed a Cooperative Agreement with the USFWS and the North Carolina Department of Agriculture in 1983; in 1991, this owner granted the North Carolina Chapter of The Nature Conservancy a perpetual conservation easement on more than 1,000 acres of the property. In 2009, the State of North Carolina announced the purchase of 2,456 acres formerly owned by Grandfather Mountain, Inc., for inclusion in the North Carolina State Park system. Some portions of the *S. spithamea* population were retained by Grandfather Mountain, Inc., which has converted to a nonprofit organization--the Grandfather Mountain Stewardship Foundation--and is devoted to education, outreach and environmental stewardship

(Jesse Pope, Grandfather Mountain Stewardship Foundation, 2009, personal communication).

The population at Roan Mountain occurs on land managed by the U.S. Forest Service (USFS), Pisgah and Cherokee National Forests. This population receives protection under provisions of the Endangered Species Act that require federal agencies to assist in recovery efforts for federally listed species and to consult with the USFWS before undertaking actions which may affect the continued existence of such species. The USFWS has a long history of working with the USFS toward the conservation of Roan Mountain and the rare species that occur there (including six federally listed plants and animals).

The Grandfather Mountain and Roan Mountain populations are protected from overt forms of habitat destruction, such as land-use conversion and large-scale commercial or residential development. However, both areas are open to the public and managed (at least in part) for recreational uses, which is an acknowledged threat to *S. spithamaea*. Additional comments on this threat and efforts to manage it are provided below.

The population at Hanging Rock is in private ownership and remains unprotected.

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.

Grandfather Mountain, Inc., has a long history of implementing appropriate management actions on behalf of the rare species that occur on its properties. The numerous rock cliffs and outcrops which support *S. spithamaea* and numerous other rare and endemic plant species have long been closed to climbing and rappelling. Another site was formally closed to the public (and specifically to hang gliding activities) in the early 1990s, due in large part to concerns over impacts to rare species (including *S. spithamaea*). However, portions of the Grandfather Mountain *S. spithamaea* population occur in areas that receive considerable visitation by the public for recreational purposes. Documentation that management actions are effectively controlling impacts to *S. spithamaea* is currently lacking.

The USFS closed two Roan Mountain sites containing this species (protecting five of the six *S. spithamaea* subpopulations supported there) to the public in the early 1990s, primarily in response to concerns that public access was or could result in impacts to the rare species found there. The one Roan Mountain subpopulation that is not closed to the public is in Tennessee, is not visible from a trail, and does not appear to be impacted by recreational visitors (Gary Kauffman, USFS, 2012, personal communication).

The population at Hanging Rock is not protected and is not receiving any form of management.

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).

One additional population has been tentatively identified at The Peak in Ashe County, North Carolina. No other new populations have been discovered or introduced.

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.

To date, there are three extant populations of the species and a fourth population awaits further confirmation. Threats related to trampling are being managed at the two largest populations of the species (Grandfather Mountain and Roan Mountain); however, some impacts continue to occur at both populations as a result of recreational visitors who disregard signs and established barricades. Vegetation succession and habitat desiccation (both of which may be exacerbated by accelerated global climate change) remain as threats to all populations.

C. Updated Information and Current 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 rugged high-elevation (4,500 to 6,000 feet above sea level) rock outcrops and vertical to near-vertical cliffs occupied by this species present numerous survey challenges. Within these habitats, a single *S. spithamaea* population (or subpopulation) may span several hundred feet in elevation, with only a fraction of the plants accessible without ropes or, at the very least, a precarious scramble over rock that is slick, steep, and (at times) complexly fractured. As a result, it can be difficult to distinguish varying levels of survey effort from actual trends in the plant population (or subpopulation). While conducting this review, we have undertaken great effort to verify the spatial extent of all estimates used in inferring trends and to restrict inferences to those observations which we are reasonably confident can be meaningfully compared. We have noted limitations in available data where appropriate.

The recovery plan recognized three extant populations of *S. spithamaea* (USFWS 1987). As of 2009, there remain three confirmed extant populations

of this species. These populations correspond to the three previously named in the recovery plan (Grandfather Mountain, Roan Mountain, and Hanging Rock). The Grandfather Mountain population is the world's largest, with over 16 subpopulations; Roan Mountain is the next largest population, with 6 subpopulations. Hanging Rock contains a single location (and no subpopulations).

We undertook a review of the combined databases of the NCNHP and the Tennessee Natural Heritage Program (TNHP) to determine the available best estimates of population size for these populations (NCNHP 2009, TNHP 2009). According to these data, 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. It should be noted that there is currently not a way to determine the consistency among observers in denoting clumps. There are no standard criteria for delineating clumps of *S. spithamea*.

In 1997, a fourth population was tentatively identified by botanists familiar with the species; however, there is no voucher specimen for this occurrence, and the observers noted some doubt as to the species' identification (NCNHP 2011). This putative new population occurs on property owned by the State of North Carolina at The Peak in Ashe County, North Carolina. Available data suggests that the population is small, with only three flowering stems reported at a single location. No one has returned to this site to verify the species' occurrence there.

The recovery plan states that declines had been noted in at least one of the three known populations within the last 10 years but does not name the site. Information we have on file suggests that these observations pertain to the Roan Mountain population of *S. spithamea* (specifically the Roan High Bluff subpopulation). The USFS, in partnership with the USFWS, erected a formal closure order at this site in the early 1990s in response to impacts and declines in the rare species found there, including *S. spithamea*. All accounts by those familiar with the site conditions before the closure suggest that it has been largely successful and that numbers have rebounded to (or near) historical levels (David Danley, USFS, 2004, personal communication; Donaldson 1999a, 1999b, 2002b).

In 2005 and 2006, the USFS erected hidden trail counters at this site in response to observations that many visitors were violating the closure order by entering closed areas (USFS 2007). The purpose of this investigation was to determine the level of visitation to the observation platform and the percentage of visitors who climbed over established barricades (fences) and entered rare plant habitat. Trail counter data revealed some 2,300 visitors to the platform in 2005 and some 2,000 visitors the following year. In each year, an average of two persons per day violated the closure order. Although no

discernable impacts to rare plant species were observed, *S. spithamea* is not monitored at this location, thus making it difficult to know for sure whether plants were trampled or killed from these impacts. However, at this location *S. spithamea* occurs interspersed with *Geum radiatum*, another federally listed plant species that is receiving annual monitoring by the USFS. This monitoring has demonstrated that *G. radiatum*'s subpopulation has remained stable since 2005. Although *S. spithamea* and *G. radiatum* occur in subtly different microhabitats and are likely subject to different limiting factors due to differences in biology and life history (e.g., life span, pollination, seed set, dispersal, and seedling recruitment), it is unlikely that trampling pressure is disproportionately greater to *S. spithamea* compared to *G. radiatum*. Trampling probably has less of an impact to *S. spithamea* given its shorter stature, its tendency to occur in narrow crevices, and its denser fibrous root structure. The absence of obvious declines or sources of trampling-related impacts within the *G. radiatum* population suggests that such impacts are not currently affecting *S. spithamea*.¹ Regardless, the volume of visitation (and violation of the closure order) illustrates the potential magnitude of this threat and the need for continued monitoring and management to ensure that it does not reach a critical level within this or other *S. spithamea* populations.

Donaldson (assisted early on by Smith) conducted monitoring of this and several other federally listed plant species at numerous sites across their ranges from 1997 through 2001 (Donaldson 1999b, 1999b, 2002a, 2002b). He established permanent monitoring plots at Grandfather Mountain, Roan Mountain, and Hanging Rock. Donaldson visited The Peak in 2000 to qualitatively assess populations of *Geum radiatum* and *Houstonia montana* (also federally listed), but he does not mention *S. spithamea* as being present there (Donaldson 2002b). His data represent fixed sampling points within larger occurrences of *S. spithamea* and therefore cannot be used to estimate the total number of plants present at any given location (Donaldson 1999b and 2002a). He monitored the only known occurrence at Hanging Rock, 4 of 6 subpopulations at Roan Mountain, and 2 of 16 subpopulations at Grandfather Mountain. Donaldson did not adhere to a consistent schedule for monitoring his sampling points, and he occasionally expanded the size of his plots from one year to the next (including additional plants not previously monitored), thus making straightforward interpretation of his data difficult. However, overall, his data suggest that *S. spithamea* was stable within these monitored areas for the duration of his monitoring effort. Over 3 of the past 4 years, the small subpopulation has been monitored at Roan High Bluff West, with no large discernible change in the number of rosettes (G. Kauffman, 2012, personal communication).

¹The USFWS and USFS have discussed the need to monitor the Roan Mountain population of *S. spithamea*, and the USFS has committed to the implementation of some level of monitoring of this species' population in the near future.

Donaldson did not document seedling recruitment during the course of his monitoring but does comment on efforts to directly sow seeds at one subpopulation (Hang Glide Cliff, within the Grandfather Mountain population) (Donaldson 2002a). Approximately 1,000 to 1,200 seeds were sown at this site in 1999, but by 2001 Donaldson regarded this effort as a failure. Also in 1999, this subpopulation was augmented with 43 seedlings (reared under greenhouse conditions) from seeds collected elsewhere within the Grandfather Mountain population. By 2001, 37 of these were still surviving. This site was further augmented with greenhouse-reared plants in 2005 and again in 2006; however, updated information on transplant survivorship is currently lacking.

- b. Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.):** The USFWS is not aware of any genetic studies involving or pertaining to this species.
- c. Taxonomic classification or changes in nomenclature:** There are no taxonomic issues associated with this species.
- 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.):** The recovery plan described the current range to consist of three extant populations, two located in Avery County, North Carolina (Grandfather Mountain and Hanging Rock), and a third located on the border of Mitchell County, North Carolina, and Carter County, Tennessee (Roan Mountain). The recovery plan describes three additional sites documented by herbarium specimens that had not been relocated (despite surveys) as well as another three sites that were apparently known to the USFWS but not supported by herbarium specimens (these sites had also been subsequently searched without finding the species).

The tentative report of a new population at The Peak in Ashe County, North Carolina, would (if confirmed) represent a new county record for *S. spithamea*.

No corrections to the historical range are needed.

- e. Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem):** *S. spithamea* occupies high-elevation (over 4,500 feet above sea level) rocky summits and cliffs in the Southern Appalachians of western North Carolina and extreme eastern Tennessee. These rocky summits and cliffs usually appear as smaller-scale patchy habitats embedded within a larger forested landscape that consists of spruce-fir or northern hardwood forest or, occasionally, high-elevation red oak forest.

Wiser et al. (1998) explored the habitat requirements of four southern Appalachian endemic plant species (including *S. spithamaea*) by devising predictive models of occurrence using parametric and nonparametric regression. They constructed models at two scales (100 square meters [m²] and 1m²), noting significant predictors for each species at each scale. They failed to find significant predictors for *S. spithamaea* at the 1m² scale but did find several significant predictors at the 100m² scale. They found an inverse correlation between species' presence and solar radiation and a positive correlation between species' presence and soil iron availability. Interestingly, elevation was not a good predictor for any species, suggesting other factors are more important than elevation. The authors also noted the absence of *S. spithamaea* from peaks with seemingly suitable habitat (as suggested by their habitat models), and they theorize that this could indicate poor dispersal capabilities or prior extinction events. These authors emphasize the need to examine habitat at an appropriate spatial scale in high-elevation rock outcrop species like *S. spithamaea*, an occupant of rugged geologic formations that frequently exhibit considerable heterogeneity in elevation, aspect, solar radiation, and soil depth and chemistry within a few square meters. While these findings suggest that it will not usually be possible to predict this species' occurrence from site parameters that can be inferred remotely, these models have considerable utility in evaluating microhabitats for future introduction efforts. Such efforts are likely to play a critical role in the recovery of a species like *S. spithamaea*, whose global distribution is highly restricted.

2. **Five-factor analysis.**

- a. **Present or threatened destruction, modification or curtailment of its habitat or range:** Although species-specific management agreements do not exist for any population of *S. spithamaea*, landowners at the Grandfather Mountain and Roan Mountain populations (and the possible population at The Peak) are cooperative and have expressed their willingness to work with the USFWS and its partners toward the management and recovery of this species. As noted above, a portion of the Grandfather Mountain population of this species has been acquired by the State of North Carolina for inclusion in the North Carolina State Park system. The remainder of this population occurs on land retained by Grandfather Mountain, Inc., which converted in 2009 to a nonprofit 501(3)(c) organization--the Grandfather Mountain Stewardship Foundation--and is devoted to education, outreach, and environmental stewardship. The USFWS has a long history of working with this landowner in the conservation of the rare species found there. The USFWS is actively working with staff from the North Carolina Division of Parks and Recreation to conserve populations of federally listed plant species on their other properties and plans to extend these efforts to populations of such species that occur within Grandfather Mountain State Park (including *S. spithamaea*).

The USFS manages the Roan Mountain population as part of the Pisgah and Cherokee National Forests. The USFWS works actively with the USFS to identify and address concerns relating to populations of federally listed plant species across Roan Mountain, which is a popular destination for recreational visitors. *Solidago spithamaea* receives protection under provisions of the Endangered Species Act that require federal agencies to assist in the recovery of federally listed species and avoid jeopardizing their continued existence through actions they authorize, fund, or carry out.

The principal source of habitat destruction affecting *S. spithamaea* is recreational use by people who venture out into the species' habitat in search of high-elevation views or adventurous rock climbing, boulder hopping, or other activities. Trampling compacts the plant's rhizome and can shear plants from the rocks in which they are anchored. In the process, fragile soils that have developed over geologic time frames can also be destroyed, making recolonization of these sites by *S. spithamaea* exceedingly difficult. Trampling has contributed to declines in at least one subpopulation of the species² and continues to threaten the long-term viability of several others.

A related concern stems from the construction of facilities intended to control or direct visitor use. These facilities must be sited and constructed appropriately in order to avoid impacts to *S. spithamaea*.

Unfortunately, the protection of sites through public ownership can (and usually does) lead to increased visitation by the public, thereby increasing the potential for impacts from trampling or the construction of recreation-related facilities. Fortunately, most of the subpopulations within the Grandfather Mountain and Roan Mountain populations are located in remote areas that are not frequented by most recreational visitors. However, some subpopulations occur within inches of established paths and popular destination points frequented by visitors who are largely unaware that their decision to venture off the trail can result in the destruction of rare species and globally imperiled habitats. Unfortunately, passive interpretation involving the use of signs (and even barricades) has proven only moderately successful. In most cases, these measures must be supplemented by active efforts at education, outreach, and enforcement.

Landowners at the Grandfather Mountain and Roan Mountain populations (and The Peak, if confirmed) should be encouraged to maintain the remote and inaccessible character of areas not currently subject to high visitation by discouraging the construction of trails that direct visitors to these locations. However, periodic monitoring of all sites is needed in order to ensure that visitor access is not posing a problem and that populations of *S. spithamaea* are not succumbing to this or other threats. Except for a single small

²This statement is in reference to the Roan High Bluff subpopulation.

subpopulation, qualitative monitoring is occurring at only a few subpopulations and is not sufficient for providing an early indication of impacts to *S. spithamaea*.

- b. Overutilization for commercial, recreational, scientific, or educational purposes:** This factor was not regarded as a significant threat to the species in the listing rule or recovery plan, and we have no additional information to suggest that it now poses a concern for the continued existence of *S. spithamaea*.
- c. Disease or predation:** This factor was not regarded as a significant threat to the species in the listing rule or recovery plan, and we have no additional information to suggest that it now poses a concern for the continued existence of *S. spithamaea*.
- d. Inadequacy of existing regulatory mechanisms:** This was acknowledged as a threat in the listing rule and recovery plan and remains a threat to the species. State laws protecting rare plant species have limited authorities, and neither North Carolina nor Tennessee's rare plant statutes protect the species from habitat destruction from recreational use. *Solidago spithamaea* is listed as endangered in the state of North Carolina (North Carolina Plant Conservation Board 2010) as well as in the state of Tennessee (Tennessee Department of Environment and Conservation 2008). In North Carolina, the protection of *S. spithamaea* is limited to the regulation of collection and trade (North Carolina Department of Agriculture 02 NCAC 48F.0301) (Buchanan and Finnegan 2010). *Solidago spithamaea* is protected under the Tennessee Rare Plant Protection Act of 1985 (T.C.A. 51-901), which forbids persons from knowingly uprooting, digging, taking, removing, damaging, destroying, possessing, or otherwise disturbing for any purpose, any endangered species from private or public lands without the written permission of the landowner.
- e. Other natural or manmade factors affecting its continued existence:** The listing rule identified woody succession as a threat to this species. As soils accumulate and other types of vegetation are able to populate areas where *S. spithamaea* had been growing, the taller successional species may outcompete *S. spithamaea*, which would negatively impact its ability to thrive.

Natural rock slides were also described as an additional threat to the species, but natural rock slides may also serve to open up additional areas of newly available habitat for an early-successional species like *S. spithamaea*. Thus, as with many factors, the frequency and severity of these disturbance events needs to be better understood for a meaningful evaluation of their effects on the continued existence of this species.

According to Wiser et al. (1998), it is possible that *S. spithamaea* has poor dispersal capabilities, which (when combined with other factors) may be detrimental to the species' continued existence.

Accelerated global climate change is likely to disrupt patterns of climate variability to which *S. spithamaea* has become adapted; thus, it is likely to exacerbate the threats already mentioned. However, the current scale of most global models of climate change offers little insight into the changes that will likely occur on the high peaks of the Southern Appalachians.

D. Synthesis.

Solidago spithamaea should remain classified as threatened because known threats to the species remain unchanged, more possible threats have been identified, and population sizes have not increased. The status of *S. spithamaea* has not changed appreciably since the 1987 recovery plan. The species continues to occur at three populations, with a fourth population reported and tentatively identified (but awaiting confirmation). Two of the confirmed populations occur on publicly owned land or on private land that is managed for conservation, and a third remains unprotected. The fourth population (if confirmed) occurs on land that is managed as a part of the North Carolina State Park system. All populations are threatened by uncontrolled visitor use (trampling), which has resulted in demonstrable declines to the species and its habitat. An associated threat is the construction of recreation-related facilities within the species' habitat. Although intended to manage visitor use, such facilities, if poorly sited, can be constructed within areas of occupied habitat. The potential threat of vegetation succession at many sites, combined with the possibility that *S. spithamaea* also suffers from intrinsically low rates of dispersal may negatively impact the species' continued existence. All these threats may be intensified with expected future changes in the Southern Appalachian climate.

The existing recovery criteria are objective and measurable and reflect the best available information on threats to the species and its habitat. Based on the information included in this review, *S. spithamaea* should remain classified as a threatened species.

III. RESULTS.

A. Recommended Classification:

 X No change is needed.

IV. RECOMMENDATIONS FOR FUTURE ACTIONS.

If completed, the existing set of recovery tasks identified for this species would help ensure its recovery. Recommended future actions are as follows:

- A. Confirm the taxonomic identity of the putative population of *S. spithamaea* reported at The Peak, in Ashe County, North Carolina (*Recovery Task 1.2*).
- B. Develop a taxonomic key distinguishing co-occurring immature *S. glomerata* from *S. spithamaea* (*Recovery Task 1.2*).
- C. Work with appropriate partners to evaluate protection alternatives at Hanging Rock, including the use of voluntary landowner agreements (*Recovery Task 1.4*).
- D. Develop interim research and management plans in conjunction with the USFS; North Carolina Division of Parks and Recreation; and Grandfather Mountain, Inc. (*Recovery Task 1.1*).
- E. Implement monitoring at a representative number of subpopulations across Grandfather Mountain and Roan Mountain (and The Peak, if confirmed) (*Recovery Tasks 2, 2.1, 2.3, and 2.6*).
- F. Compile quantitative data summarizing transplant survivorship across all previously attempted introduction or augmentation efforts involving this species, and evaluate causes for success/failure (*Recovery Task 2.8*).
- G. 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*).
- H. Collaborate with appropriate partners to begin stepping down global climate change models to a meaningful scale for purposes of projecting impacts to high-elevation Southern Appalachian rocky summit and cliff habitats, then devise and evaluate potential adaptation scenarios for *S. spithamaea* (*Recovery Tasks 1.3 and 1.4*).

V. REFERENCES.

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- . 1999b. 1999 Final Report: Inventory and monitoring the federally-rare spreading avens (*Geum radiatum*), Roan Mountain bluet (*Houstonia montana*), and Blue Ridge goldenrod (*Solidago spithamaea*). December 27, 1999. 13 pp. plus appendices.
- . 2002a. 2001 Final Report: TNC North Carolina Northwest Mountains Preserves Rare Species Monitoring (*Geum radiatum*, *Houstonia montana*, *Liatris helleri*, *Lilium grayi*, *Solidago spithamaea*, and *Gymnoderma lineare*). January 2002. 26 pp.
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- Donaldson, J. 1997. Interim report: Inventory and monitoring spreading avens (*Geum radiatum*), Roan Mountain bluet (*Houstonia montana*), and Blue Ridge goldenrod (*Solidago spithamaea*). September 29, 1997. 6 pp.

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Massey, J.R., and P.D. Whitson. 1980. Endangered and Threatened Plant Survey of Twelve Species in the Eastern Part of Region IV. Contract 14-160004-78-108, Highlands Biological Station, Contractor. January 1980. 13 pp. plus appendices and attachments.

Smith, A. 1996. Preliminary report on 1996 field survey for *Geum radiatum*, *Solidago spithamaea*, and *Hedyotis purpurea* var. *montana*.

U.S. FISH AND WILDLIFE SERVICE

5-YEAR REVIEW of *Solidago spithamaea* (Blue Ridge goldenrod)

Current Classification: Threatened.


Recommendation resulting from the 5-Year Review:

X No change needed.

Review Conducted By: Carolyn Wells and Mara Alexander, Asheville Ecological Services Field Office.


FIELD OFFICE APPROVAL:

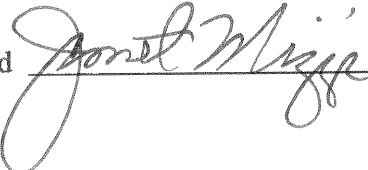
Lead Field Supervisor, U.S. Fish and Wildlife Service

Approved  Date: 2/21/12
Brian P. Cole, Field Supervisor

REGIONAL OFFICE APPROVAL:

The Regional Director or the Assistant Regional Director, if authority has been delegated to the Assistant Regional Director, must sign all 5-year reviews.

 Lead Regional Director, U.S. Fish and Wildlife Service

Approved  Date: 3/29/12

APPENDIX A

Summary of Peer Review for the 5-Year Review of the Blue Ridge Goldenrod (*Solidago spithamaea*)

- A. Peer Review Method:** A draft 5-year review was sent to each of the following biologists, as an attachment to an email, requesting their review and any other changes or additions that should be included in the document. All reviewers have extensive knowledge of this and similar species.
1. David Danley, Botanist for the Pisgah National Forest, U.S. Forest Service, Asheville, North Carolina.
 2. Gary Kauffman, North Carolina State Botanist, U.S. Forest Service, Asheville, North Carolina.
 3. Chris Ulrey, Plant Ecologist for the Blue Ridge Parkway, National Park Service, Asheville, North Carolina.
- B. Peer Review Charge:** Reviewers were charged with providing a review of the document, including any other appropriate comments and/or additions. Reviewers were not asked to comment on the legal status of the species.
- C. Summary of Peer Review Comments/Report:** Reviewers responded by email. All reviewers agreed that the species should remain classified as threatened and thought the information in the document provided to them was accurate.
- D. Response to Peer Review:** Recommendations from the reviewers were incorporated into the document as appropriate. These consisted primarily of additional information concerning the status of certain populations, threats to the species, and recommendations for future actions.