

Expert-based Model Guidance and Documentation

Project Information

- Species: Blue Ridge goldenrod (*Solidago spithamea*)
- Lead modeler: Melissa Ruiz, Stantec (Melissa.ruiz@stantec.com) 919-865-7529
- Date started: March 2018
- Date completed: March 2020

Species Information

NCDOT NRTR Habitat Description

USFWS Optimal Survey Window: July –September

Blue Ridge goldenrod, endemic to the Appalachian Mountains of North Carolina and Tennessee, occurs in the High Elevation Rocky Summit natural community generally at or above elevations of 4,600 feet above mean sea level along cliffs, ledges, balds, and dry rock crevices of granite outcrops of the higher mountain peaks. This early pioneer herb usually grows in full sun on generally acidic soils of shallow humus or clay loams that are intermittently saturated. The encroachment of woody vegetation such as ericaceous shrubs can eliminate the goldenrod through competition and shading. Roan Mountain bluet, Heller’s blazing star, and spreading avens are a few of its common associate species.

Additional Information

There are 3 recorded populations of the species in North Carolina (21 element occurrences (EOs)). They are considered to be a southern representative of a large group of colder climate alpine goldenrod populations. It occurs on rock outcrops, cliff and balds, and ledges without tree canopy in the Blue Ridge Mountains at elevations higher than 4600’ according to the recovery plan. However, EOs have been documented at elevations slightly lower than 4600’.

Habitat descriptions per literature review and expert elicitation guided the model process in determining the best model layers and attributes in these layers to represent the species habitat requirements.

County Information

- NHP listed counties: Ashe, Avery, Buncombe, Mitchell, and Watauga
- FWS listed counties: Ashe, Avery, Buncombe, Mitchell, and Watauga
- There are no occurrences in Ashe and Buncombe

Environmental Data Information

All spatial data are in NAD 1983 StatePlane North Carolina FIPS 3200 (US feet). Table of all environmental data layers available via DOT ATLAS project server.

Layer 1

- Layer name: DEM
- Layer description:
 - NC Floodplain Mapping Program 20-foot DEM acquired August 2018
- Layer selection justification:
 - The data includes a grid of elevation values for the entire state although data is clipped to county boundary plus a buffer. Blue Ridge goldenrod is known to occur in a specific range of elevations.
- “Habitat” versus “Non-habitat” designations:
 - Areas with elevation greater than 4,400 feet above sea level were identified as habitat.

Layer 2

- Layer name: County_Boundary
- Layer description:
 - Select Ashe, Avery, Buncombe, Mitchell, and Watauga Counties from County Boundary shapefile
- Layer selection justification:
 - Species listed in Ashe, Avery, Buncombe, Mitchell, and Watauga Counties
- “Habitat” versus “Non-habitat” designations:
 - Potential habitat Ashe, Avery, Buncombe, Mitchell, and Watauga Counties.

Model Information

- Model domain
 - This model identifies all year-round potential suitable habitat for the species.
- Model output
 - Figure 1 – Model prediction.
 - Model output is binary, and includes the USFWS species range, excluding historic counties. The species model range is split between “High” and “Low” potential habitat. “High potential habitat” represents GIS based layer areas deemed suitable habitat, and “Low potential habitat” representing areas identified as areas deemed low quality or non-habitat.
 - Shapefile covering listed counties.
- ArcGIS Model Builder
 - version ArcMap 10.4.1
 - Model builder toolbox attached as deliverable

- Layer 1 DEM – selected all areas above 4,400 feet above sea level, clipped to select counties
- AGOL Review
 - A model prediction file was shared with select reviewers on ArGIS Online (AGOL). Points were placed within the USFWS potential habitat as well as the model potential habitat in order to solicit feedback. Reviewers could place additional comments for consideration by modeler.
 - AGOL review was completed in May 2019 on a draft version of this model (See Appendix 2)
- Independent Data Review
 - Describe data sources – Natural Heritage Program element occurrences
 - Describe methods – Current aerial imagery was used to determine if EO sites have been developed. Elevation data was used to confirm the elevations included in EO records.

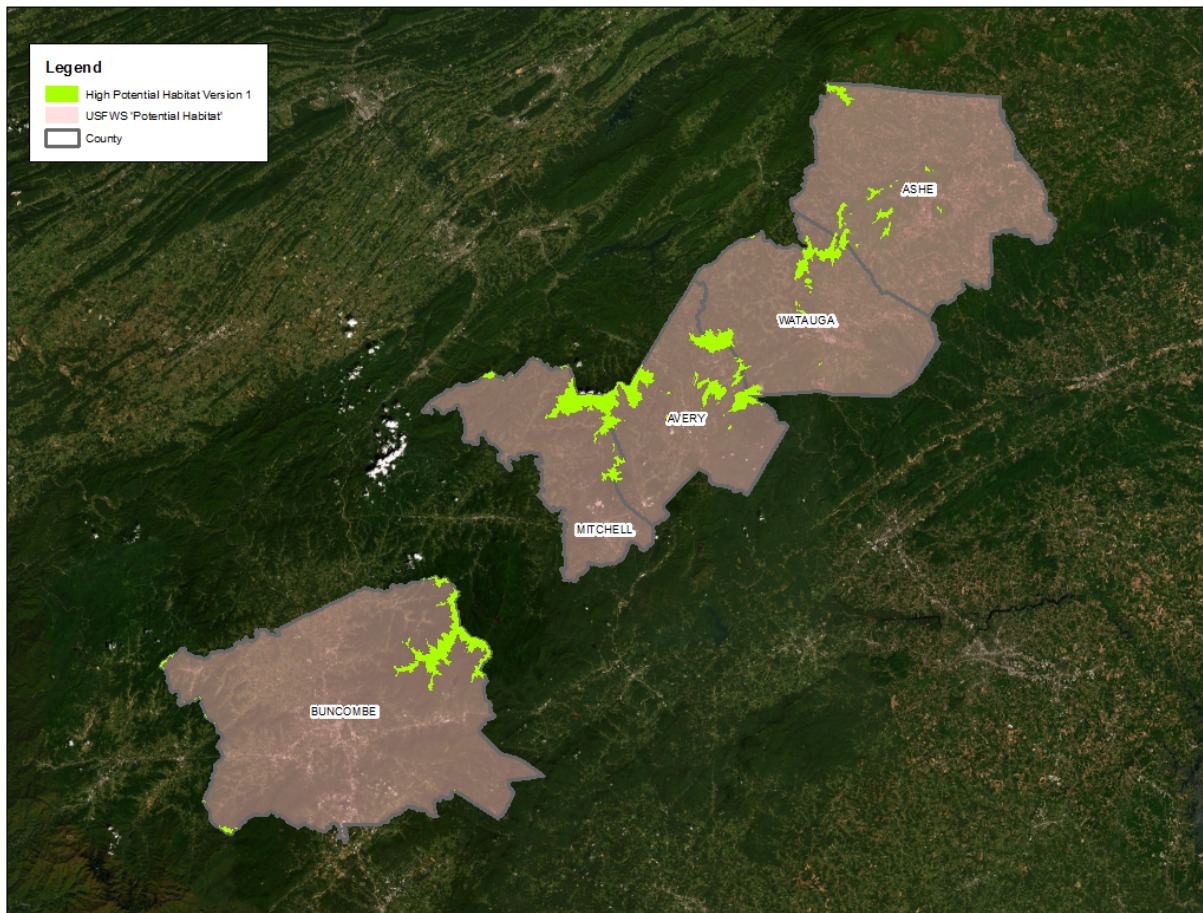


Figure 1. Range Map and High Potential Habitat Version 1

Previous Model Versions (Draft)

There are no previous versions to this model. A draft was produced in 2018 and no changes were made after its review in 2019.

List of Delivered Model Products

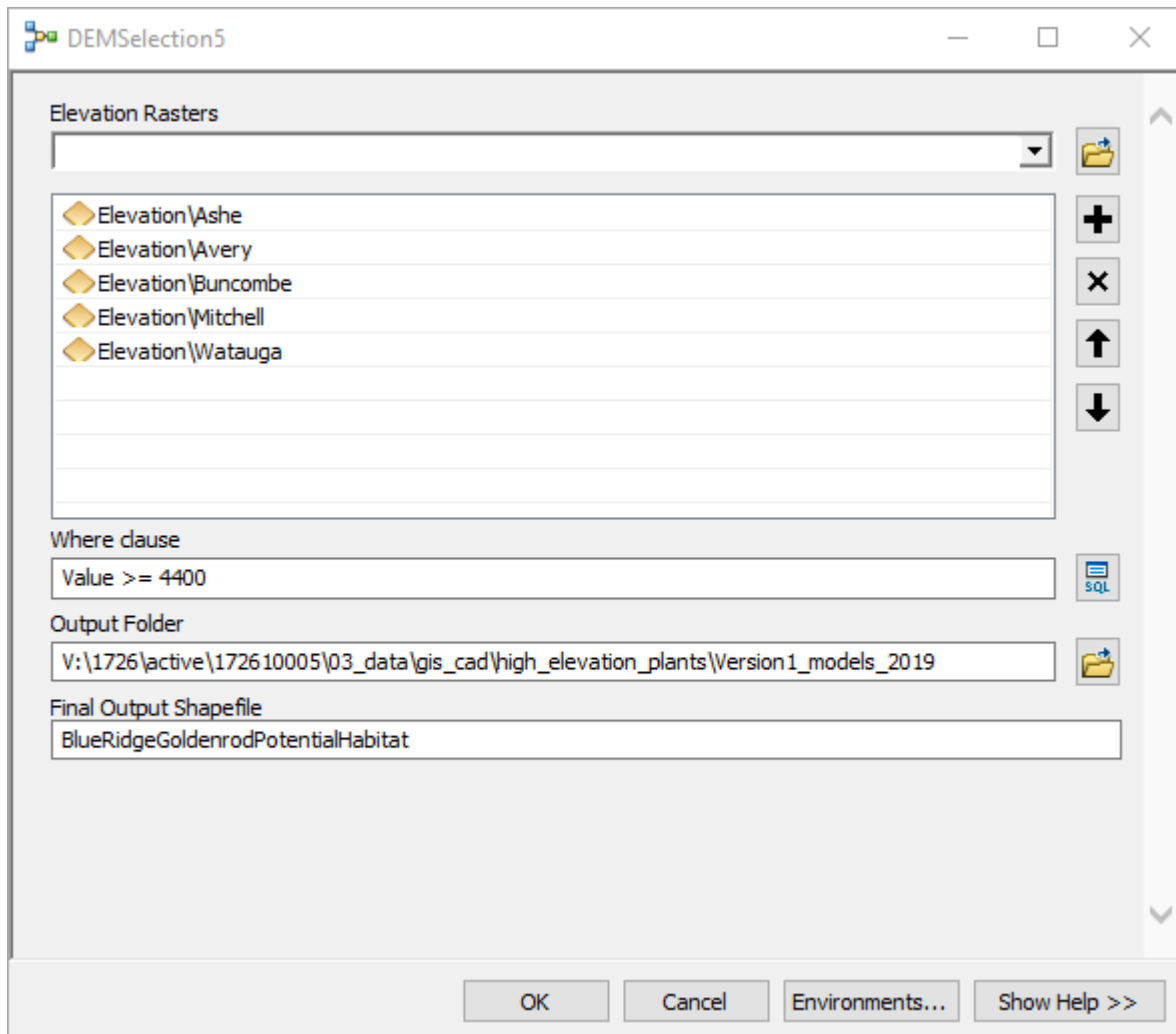
- *This summary document*
- *Version 1 Model builder toolbox and model screenshot (Appendix 1)*
- *Reviewer documentation (Appendix 2) – summary of comments and general model recommendations*
- *Version 1 Model prediction file(s) (shapefile)*
- *Desktop AGOL reviewer comments (shapefile)*

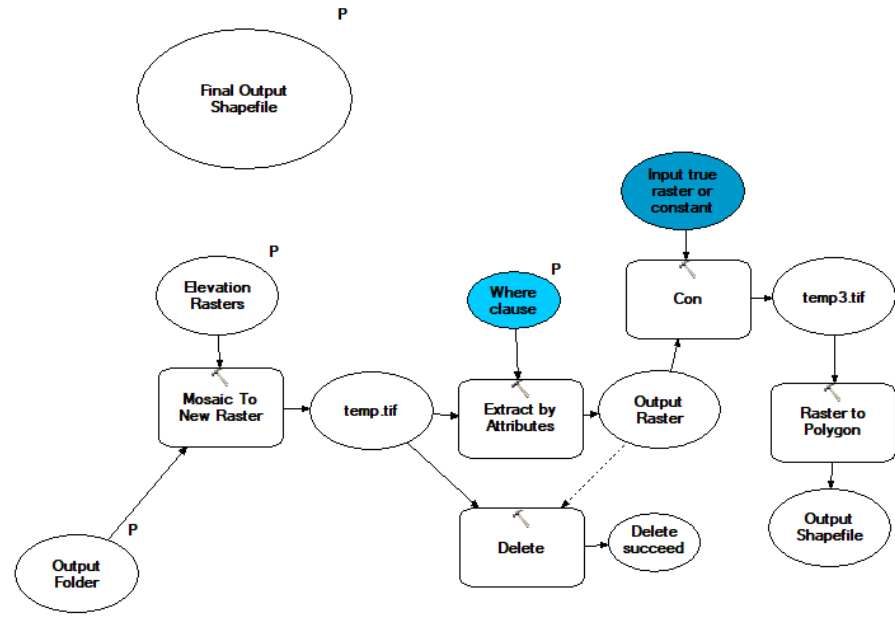
References

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

North Carolina Natural Heritage Program. 2018. Biotics Database. Division of Land and Water Stewardship. Department of Natural and Cultural Resources, Raleigh, North Carolina.

Appendix 1: Model Screenshots





Appendix 2: Reviewer Documentation

Project Information

- Species: Blue Ridge goldenrod (*Solidago spithamaea*)
- Lead modeler: Melissa Ruiz, Stantec (melissa.ruiz@stantec.com) 919-865-7529
- Reviewer names: 1. Rebekah Reid (USFWS-West)
 - 2. Matt Smith (CZR, Inc.)
 - 3. Jame Amaro (NCNHP)
 - Rebekah Reid is a listing and recovery biologist with the US Fish and Wildlife Service. She is the species lead for 15 plant species in present in North Carolina.
 - Matt Smith is a biologist at CZR, Inc. with more than 20 years of professional experience. He has been conducting field surveys and habitat assessments for federally listed plant species including: American chaffseed, Cooley’s meadowrue, dwarf-flowered heartleaf, golden sedge, harperella, Michaux’s sumac, pondberry, rough-leaved loosestrife, Schweinitz’s sunflower, seabeach amaranth, sensitive joint-vetch, smooth coneflower, Virginia spiraea. This experience has resulted in the documentation of new occurrences for dwarf-flowered heartleaf, Michaux’ sumac, rough-leaved loosestrife, Schweintiz’s sunflower, and sensitive joint-vetch. He has also completed field surveys documenting occurrences of federally protected animal species including piping plover, red-cockaded woodpecker, red knot rufa, wood stork, Appalachian elktoe, dwarf wedgemussel, yellow lance, and James spiny mussel.
 - Jame Amoroso is a conservation information specialist for the North Carolina Natural Heritage Program. She has been with NCNHP since 1994, starting as Program Botanist. Past and current work has included publishing the NCNHP Rare Plant List and maintaining conservation data for federally protected species. Jame received her Master of Science degree in Botany from the University of Florida with the thesis, *A Floristic Study of Cedar Key Scrub State Reserve, Levy County, Florida*.

Range Map to Potential Habitat Version 1

- USFWS Range 1,197,176 acres
- ATLAS Range 51,635 acres

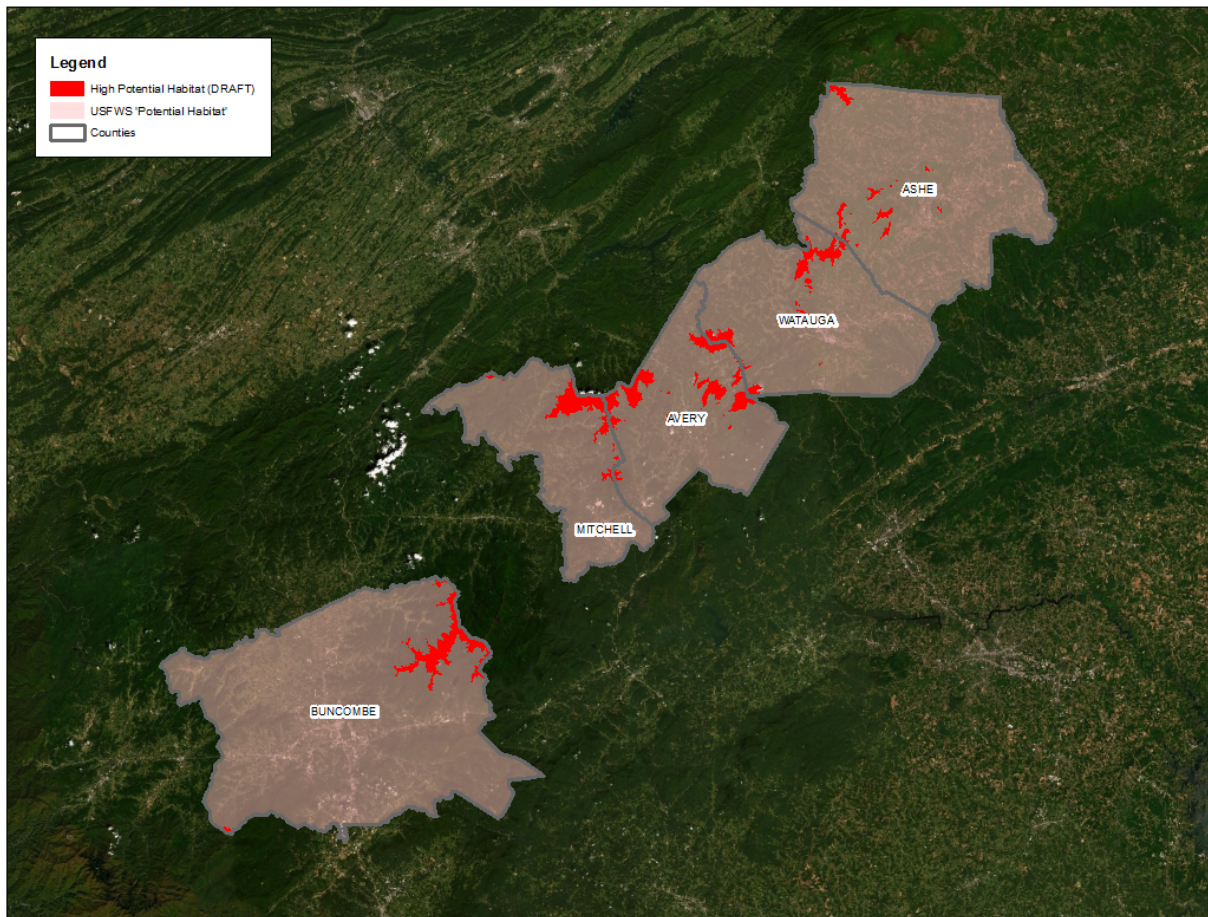


Figure 2. Range Map and Potential High Habitat Draft Version

Summary of Model Draft Version

- Environmental data layers used included DEM and county boundaries
- Selected all areas in DEM over 4,400 feet above mean sea level and clipped to select counties.
- There was no change between draft and version 1
- Response Rate
 - Reviewer Response Rate: 100%
 - 10 reviewer points placed by modeler
 - # Additional Comments (placed by reviewer): 17

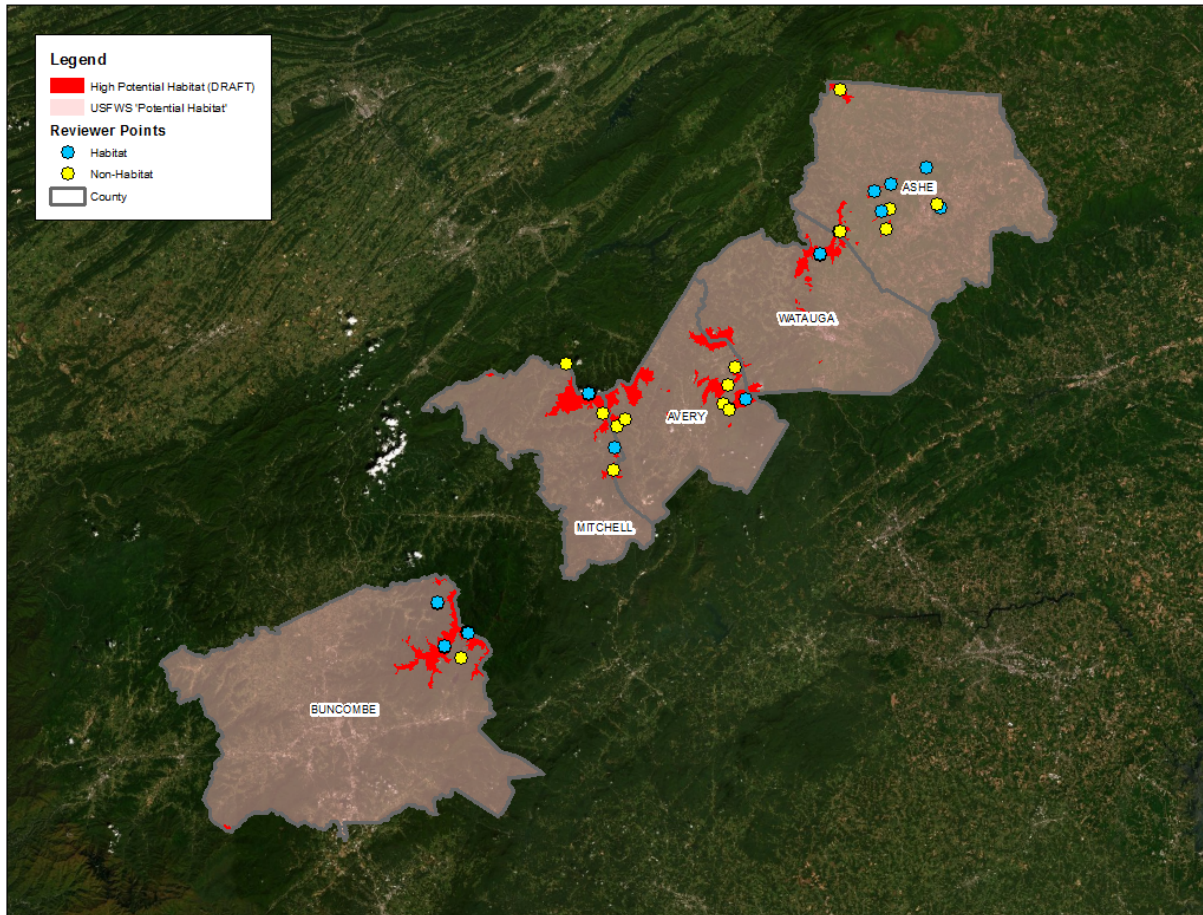


Figure 3. Reviewer Points High Potential Habitat (DRAFT)

Reviewer Responses

- Reviewers provided a complete and balanced review. Flags were concentrated on the habitat area as well as a zone at a slightly lower elevation. High elevation plants are not known to grow at lower elevations in the county therefore flags were not placed in those areas nor were comments expected.
- Reviewers for the most part agreed with the potential habitat. There were comments that dense forests and other wooded areas were included where they shouldn't be. A shapefile including all comments is a supplement attachment to this document.

Proposed Version 1 Model

No changes were made to address reviewer comments. While reviewers commented on the overprediction of forested areas, habitat could not be limited to open areas or areas with rock outcrops due to limitations in data content and scale. In addition, there were no true negative comments.

Model Accuracy

Model was not changed. Statistics on reviewer comments of the draft/version 1 are included below. Percent correctly classified is 55.3% due to the high number of false positives.

	Potential	Non-Habitat
Potential	True Positive 16	False Positive 21
Non-Habitat	False Negative 0	True Negative 10

Figure 4. Accuracy summary is the reviewer responses to Draft

Table 1. Accuracy statistics based on counts in the above summary table

Statistic	Draft
Percent Correctly Classified	55.30
Sensitivity	1.0
Specificity	0.3