

## Expert-based Model Guidance and Documentation

### Project Information

- Species: Spreading avens (*Geum radiatum*)
- Lead modeler: Melissa Ruiz, Stantec ([Melissa.ruiz@stantec.com](mailto:Melissa.ruiz@stantec.com)) 919-865-7529
- Date started: July 2018
- Date completed: March 2020

### Species Information

#### **NCDOT NRTR Habitat Description**

USFWS Optimal Survey Window: June –September

Spreading avens occurs in areas exposed to full sun on high elevation cliffs, outcrops, and bases of steep talus slopes. This perennial herb also occurs in thin, gravelly soils of grassy balds near summit outcrops. The species prefers a northwest aspect, but can be found on west-southwest through north northeast aspects. Forests surrounding known occurrences are generally dominated by either red spruce-Fraser fir, northern hardwoods with scattered spruce, or high-elevation red oaks. Spreading avens typically occurs in shallow, acidic soil (such as the Burton series) in cracks and crevices of igneous, metamorphic, or meta-sedimentary rocks. Soils may be well drained but almost continuously wet, with soils at some known occurrences subject to drying out in summer due to exposure to sun and shallow depths. Known populations occur at elevations ranging from 4,296 to 6,268 feet above mean sea level. Blue Ridge goldenrod, Heller’s blazing star, and Roan Mountain bluet are a few of its common associate species.

#### **Additional Information**

According to the recovery plan there are 11 populations in North Carolina and Tennessee. However of the 11, the populations in Buncombe, Transylvania, and Yancey no longer exist and no other current occurrences are documented within these three counties. Haywood County is not listed in the recovery plan and there is a current occurrence located within its borders. The NHP database contains 41 occurrences.

### County Information

- NHP listed counties: Ashe, Avery, Buncombe, Burke (historic), Haywood, Mitchell, Transylvania, Watauga, and Yancey
- FWS listed counties: Ashe, Avery, Buncombe, Haywood, Mitchell, Watauga, and Yancey
- There are no occurrences in Buncombe, Burke, Transylvania, and Yancey.

## 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. Spreading avens is known to occur in a specific range of elevations.
- “Habitat” versus “Non-habitat” designations:
  - Areas with elevation above 4,200 feet above sea level were identified as habitat. The NCDOT habitat description states known populations occur at elevations ranging from 4,296 to 6,268 feet above mean sea level. However, element occurrence, EO-5 is located at approximately 6,585 feet above mean sea level on Mount Craig within Mount Mitchell State Park. It was determined no upper limit on elevation should be set for habitat within North Carolina.

### **Layer 2**

- Layer name: County\_Boundary
- Layer description:
  - Select Ashe, Avery, Buncombe, Haywood, Mitchell, Watauga, and Yancey Counties from County Boundary shapefile
- Layer selection justification:
  - Species listed in Ashe, Avery, Buncombe, Haywood, Mitchell, Watauga, and Yancey Counties
- “Habitat” versus “Non-habitat” designations:
  - Potential habitat Ashe, Avery, Buncombe, Haywood, Mitchell, Watauga, and Yancey 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 file included in Appendix 1
  - Layer 1 DEM – selected all areas above 4,200 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.

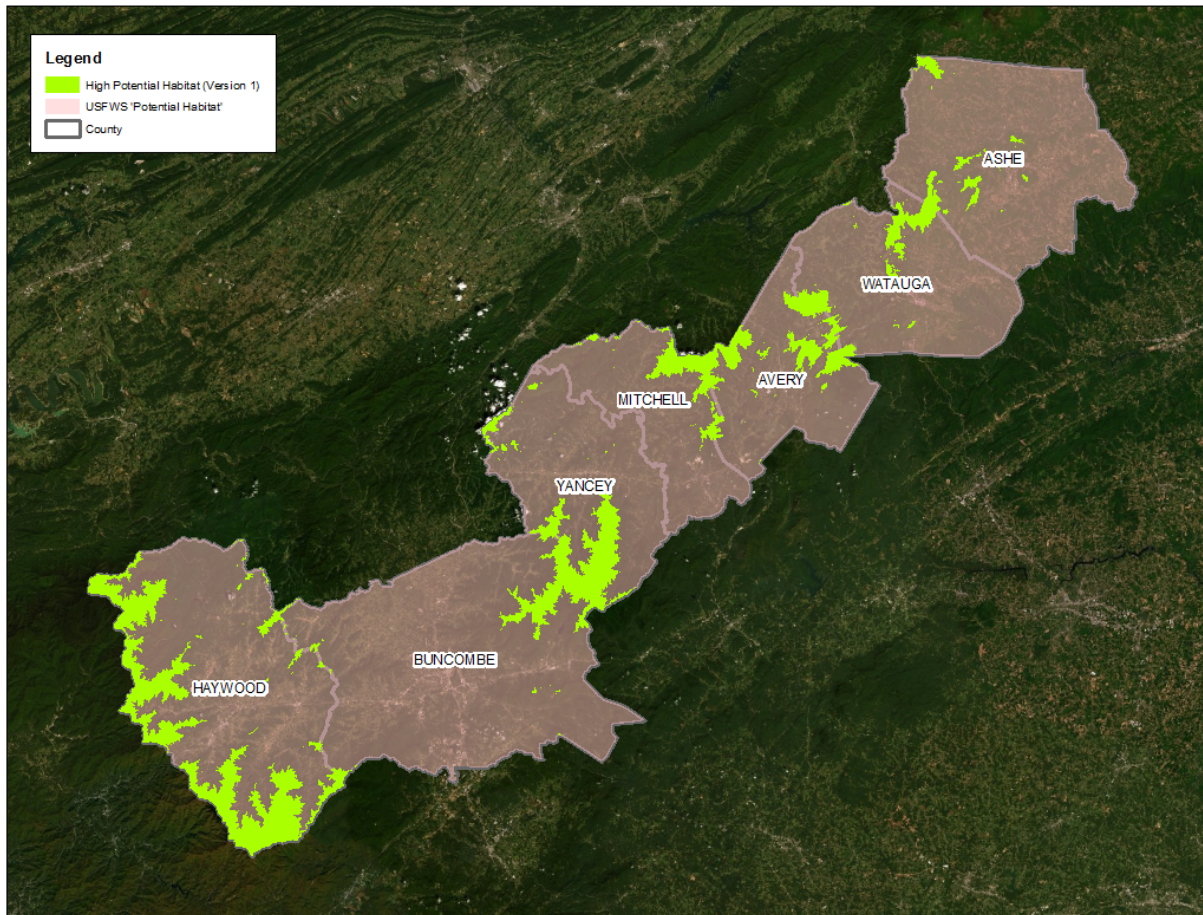


Figure 1. Range Map and High Potential Habitat Version 1

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

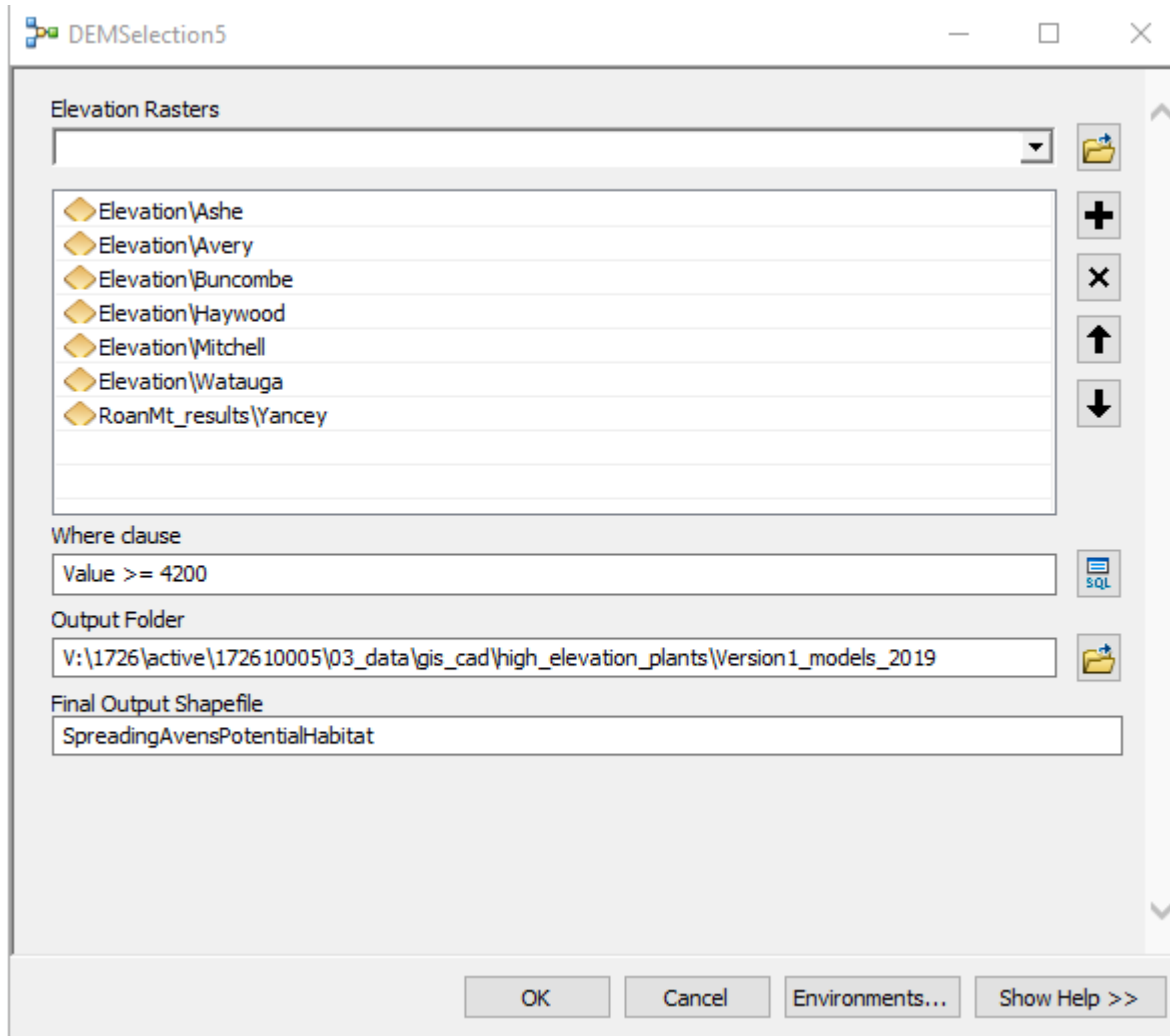
- *This summary document*
- *Version 1 Model builder toolbox and model screenshot (Appendix 1)*
- *Reviewer documentation (Appendix 2) – summary of comments and general model recommendations*
- *Version 1 Model prediction file(s) (shapefile)*
- *Desktop AGOL reviewer comments (shapefile)*

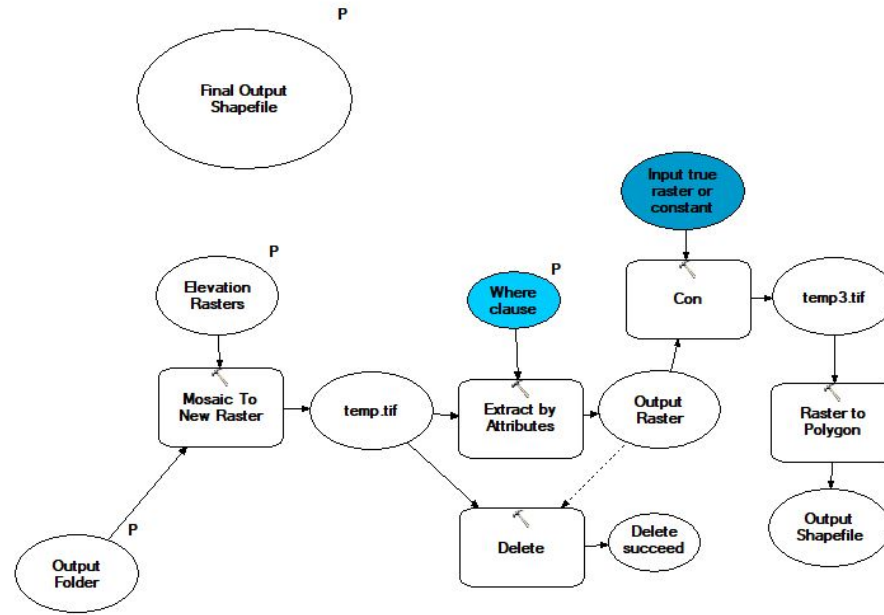
References cited

[USFWS] U.S. Fish and Wildlife Service. 1993. Spreading Ravens Recovery Plan. U.S. Fish and Wildlife Service, Atlanta, Georgia, 32pp.

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: Spreading avens (*Geum radiatum*)
- Lead modeler: Melissa Ruiz, Stantec ([Melissa.ruiz@stantec.com](mailto:Melissa.ruiz@stantec.com)) 919-865-7529
- Reviewer names: 1. Rebekah Reid (USFWS-West)
  - 2. Suzanne Mason (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.
    - Suzanne Mason (NCNHP) – Suzanne is a data manager for the North Carolina Natural Heritage Program. She has been with the NCNHP since 2005 and specializes in maintaining conservation data for federally protected species. Suzanne previously studied the genetic diversity of Schweinitz’s sunflower (*Helianthus schweinitzii*) for her Master of Science thesis.

### Range Map to Potential Habitat Version 1

- USFWS Range            1,557,530 acres
- ATLAS Range            194,901 acres



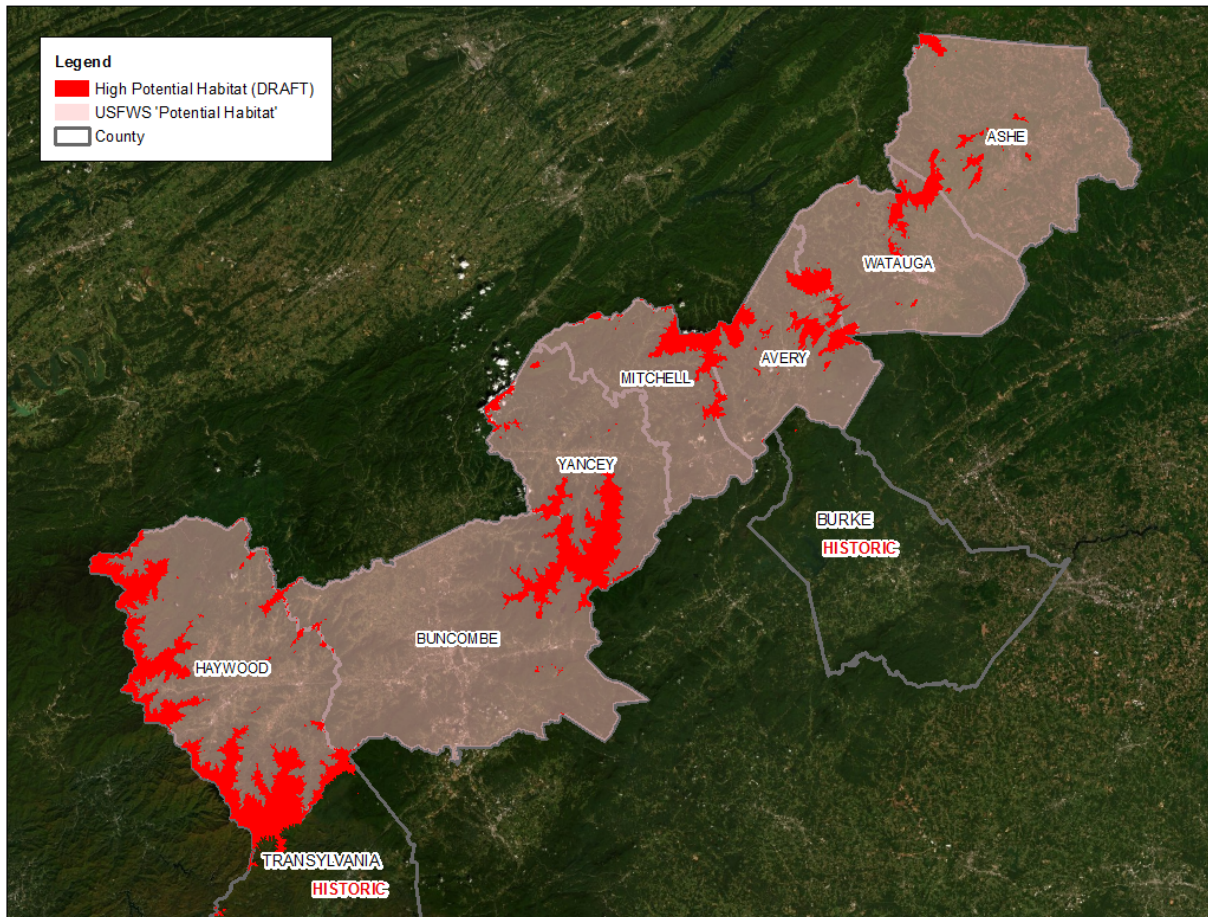


Figure 2. Range Map and Potential High Habitat Draft Version

Summary of Model Draft Version

- Environmental data layers used included DEM and county boundaries
- Selected all areas in DEM over 4,200 feet above mean sea level and clipped to select counties.
- The draft model included Burke and Transylvania which are considered historic counties. These two counties were excluded from the Version 1 model.
- Response Rate
  - Reviewer Response Rate: 94%
    - 9 reviewer points placed by modeler
  - # Additional Comments (placed by reviewer): 9

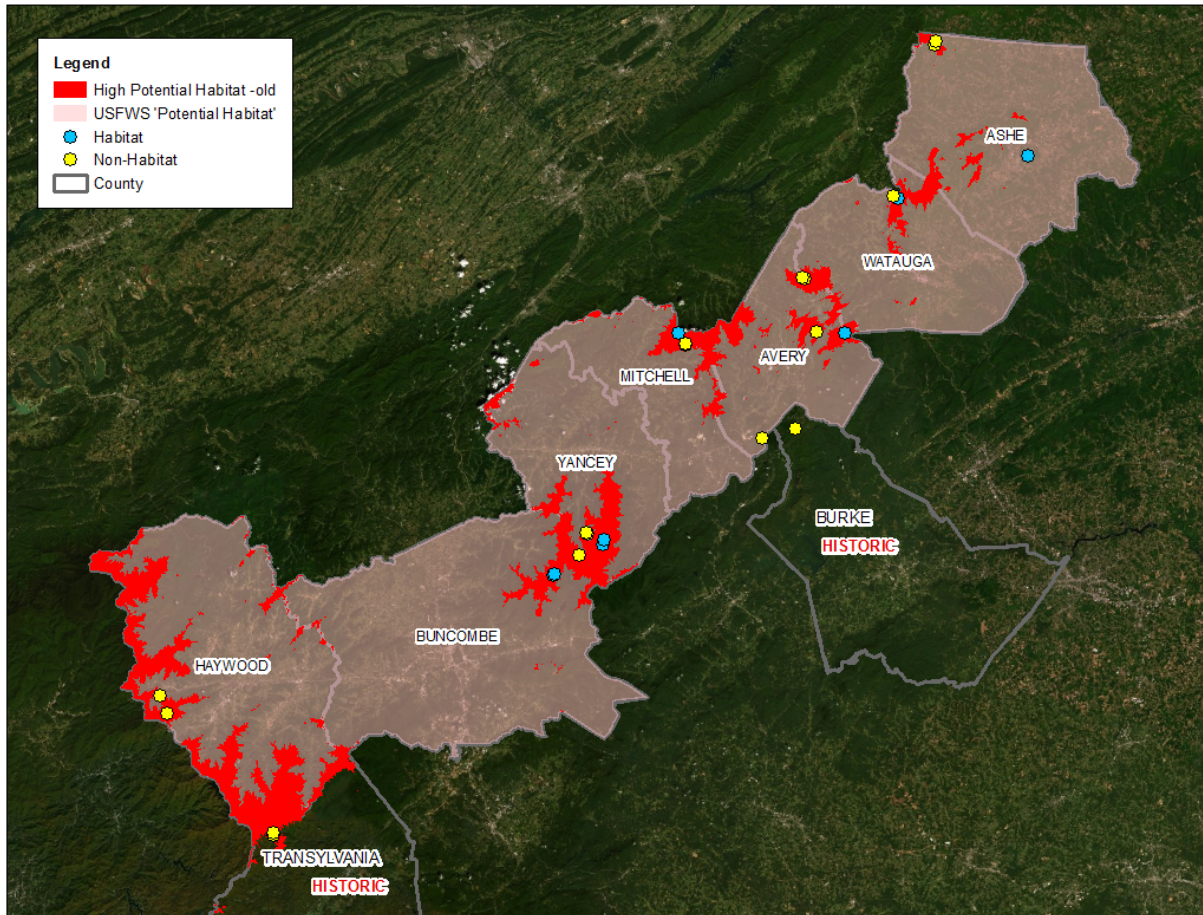


Figure 3. Reviewer Points High Potential Habitat (DRAFT)

### 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 it included valleys and flat areas without rocky cliffs and there were small patches of developed land. A shapefile including all comments is attached to this documentation.

### Proposed Version 1 Model

The only change was to exclude the historic counties. While reviewers commented on the overprediction of the model which included valleys and other flat areas found at elevations

over 4,200 feet, habitat could not be limited to cliffs due to limitations in data content and scale.

Model Accuracy

Model was not changed. Statistics on reviewer comments of the draft/version 1 are included below. Percent correctly classified is 57.7% due to the high number of false positives.

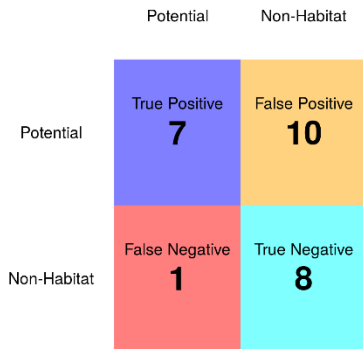


Figure 4. Accuracy summary is the reviewer responses to Draft

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

Statistic	Draft
<b>Percent Correctly Classified</b>	57.70
<b>Sensitivity</b>	0.9
<b>Specificity</b>	0.4