

Climate Change Vulnerability Index Report

Sericocarpus oregonensis ssp. *oregonensis* (Oregon white-topped aster)

Date: 9 March 2020

Assessor: Walter Fertig, WA Natural Heritage Program

Geographic Area: Washington

Heritage Rank: G5TNR/S1

Index Result: Moderately Vulnerable

Confidence: Very High

Climate Change Vulnerability Index Scores

Section A	Severity	Scope (% of range)
1. Temperature Severity	>6.0° F (3.3°C) warmer	0
	5.6-6.0° F (3.2-3.3°C) warmer	0
	5.0-5.5° F (2.8-3.1°C) warmer	0
	4.5-5.0° F (2.5-2.7°C) warmer	0
	3.9-4.4° F (2.2-2.4°C) warmer	100
	<3.9° F (2.2°C) warmer	0
2. Hamon AET:PET moisture	< -0.119	0
	-0.097 to -0.119	0
	-0.074 to -0.096	100
	-0.051 to -0.073	0
	-0.028 to -0.050	0
	>-0.028	0
Section B		Effect on Vulnerability
1. Sea level rise		Neutral
2a. Distribution relative to natural barriers		Neutral
2b. Distribution relative to anthropogenic barriers		Somewhat Increase
3. Impacts from climate change mitigation		Neutral
Section C		
1. Dispersal and movements		Neutral
2ai Change in historical thermal niche		Somewhat Increase
2aii. Change in physiological thermal niche		Neutral
2bi. Changes in historical hydrological niche		Neutral
2bii. Changes in physiological hydrological niche		Neutral
2c. Dependence on specific disturbance regime		Increase
2d. Dependence on ice or snow-covered habitats		Neutral
3. Restricted to uncommon landscape/geological features		Neutral
4a. Dependence on others species to generate required habitat		Neutral
4b. Dietary versatility		Not Applicable
4c. Pollinator versatility		Neutral
4d. Dependence on other species for propagule dispersal		Neutral
4e. Sensitivity to pathogens or natural enemies		Unknown
4f. Sensitivity to competition from native or non-native species		Somewhat Increase
4g. Forms part of an interspecific interaction not covered above		Neutral
5a. Measured genetic diversity		Unknown
5b. Genetic bottlenecks		Unknown
5c. Reproductive system		Neutral

6. Phenological response to changing seasonal and precipitation dynamics	Neutral
Section D	
D1. Documented response to recent climate change	Neutral
D2. Modeled future (2050) change in population or range size	Unknown
D3. Overlap of modeled future (2050) range with current range	Unknown
D4. Occurrence of protected areas in modeled future (2050) distribution	Unknown

Section A: Exposure to Local Climate Change

A1. Temperature: Both occurrences of *Sericocarpus oregonensis* ssp. *oregonensis* in Washington (100%) occur in areas with a projected temperature increase of 3.9-4.4° F (Figure 1).

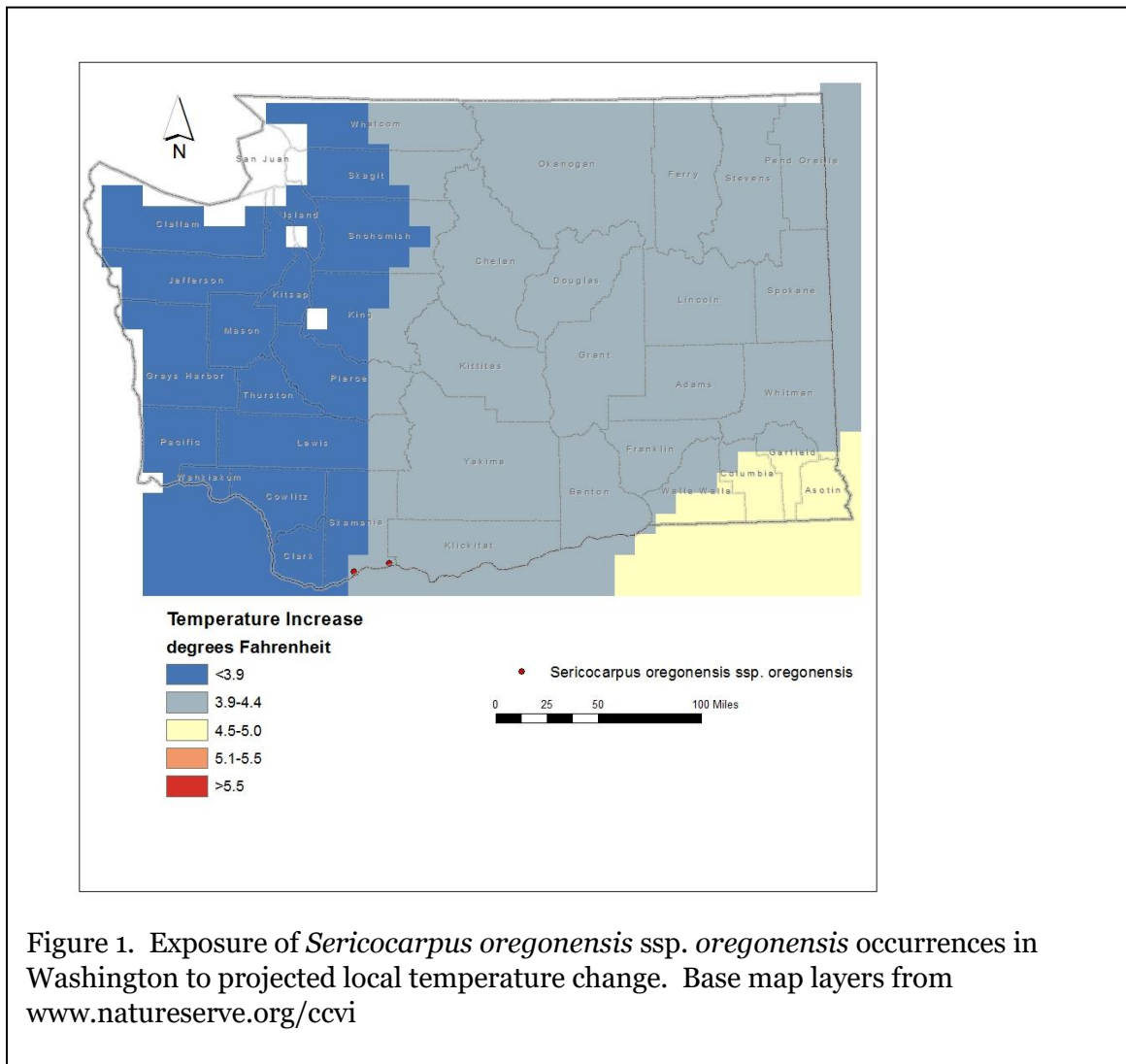


Figure 1. Exposure of *Sericocarpus oregonensis* ssp. *oregonensis* occurrences in Washington to projected local temperature change. Base map layers from www.natureserve.org/ccvi

A2. Hamon AET:PET Moisture Metric: Both occurrences of *Sericocarpus oregonensis* ssp. *oregonensis* (100%) in Washington are found in areas with a projected decrease in available moisture (as measured by the ratio of actual to potential evapotranspiration) in the range of -0.074 to -0.096 (Figure 2).

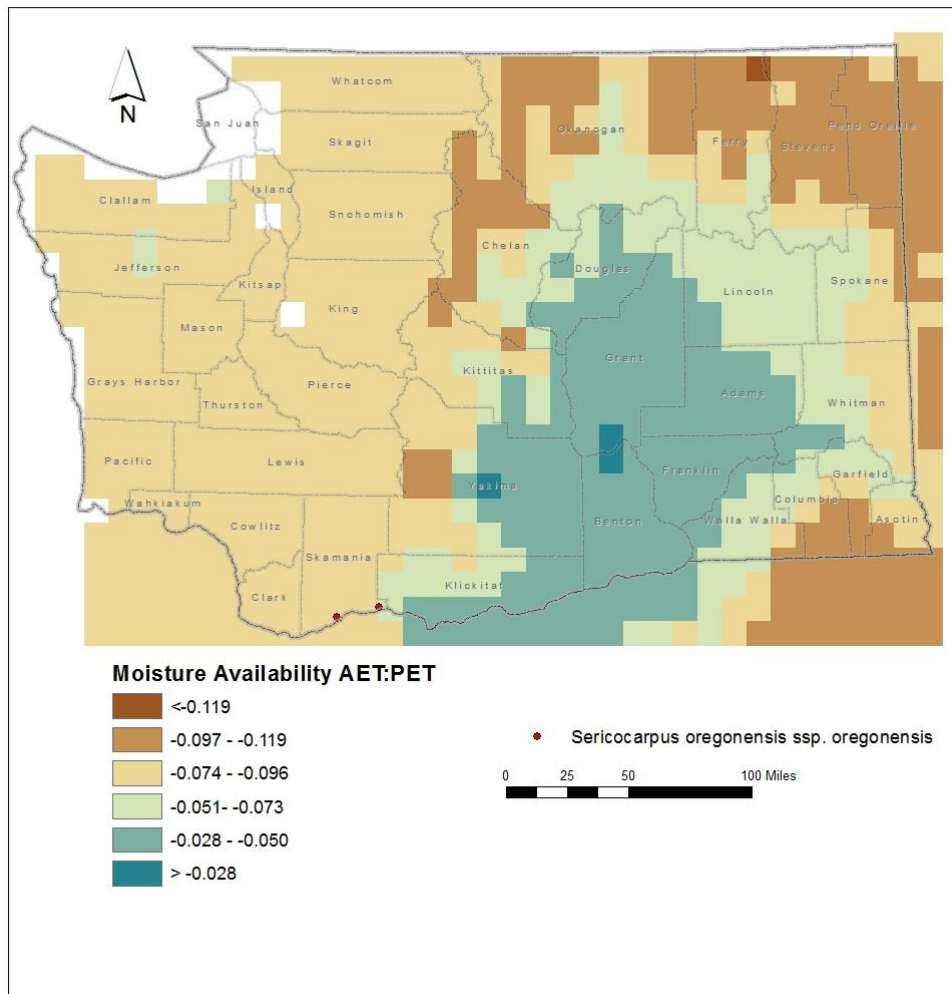


Figure 2. Exposure of *Sericocarpus oregonensis* ssp. *oregonensis* occurrences in Washington to projected moisture availability (based on ratio of actual to predicted evapotranspiration). Base map layers from www.natureserve.org/ccvi

Section B. Indirect Exposure to Climate Change

B1. Exposure to sea level rise: Neutral.

Washington occurrences of *Sericocarpus oregonensis* ssp. *oregonensis* are found at 320-1150 feet (100-350 m) and would not be inundated by projected sea level rise.

B2a. Natural barriers: Neutral.

In Washington, *Sericocarpus oregonensis* ssp. *oregonensis* is found in mesic to well-drained open woodlands and dry, rocky conifer forests (Camp and Gamon 2011, Fertig & Kleinknecht 2020). In Oregon, this species is often associated with Douglas-fir or Ponderosa pine in wooded grasslands on thin soils over basalt (Consortium of Pacific Northwest Herbaria records). This habitat probably corresponds with the Northern Rocky Mountain Ponderosa Pine Woodland and Savanna ecological system (Rocchio and Crawford 2015), but might also fit the substrate-restricted Northern Rocky Mountain Foothill Conifer Wooded Steppe system. The single extant occurrence occupies a few areas of suitable habitat and is isolated from another historical population by 17.5 miles (28 km). These sites are embedded within a matrix of unsuitable natural habitat and areas of human development. Of the two, anthropogenic barriers may be more significant in restricting dispersal today, while natural barriers may have been significant historically (see below).

B2b. Anthropogenic barriers: Somewhat Increase.

The range of *Sericocarpus oregonensis* ssp. *oregonensis* may be naturally fragmented in Washington, but this has been greatly exacerbated by human impacts within its range.

B3. Predicted impacts of land use changes from climate change mitigation: Neutral.

Section C: Sensitive and Adaptive Capacity

C1. Dispersal and movements: Neutral.

Sericocarpus oregonensis ssp. *oregonensis* reproduces by one-seeded dry achenes that have a tuft of hairs (pappus of capillary bristles) for dissemination by wind. Most fruits land close to their parent, but some have the potential to travel over 1 km.

C2ai. Historical thermal niche: Somewhat Increase.

Figure 3 depicts the distribution of *Sericocarpus oregonensis* ssp. *oregonensis* in Washington relative to mean seasonal temperature variation for the period from 1951-2006 (“historical thermal niche”). Both of the known occurrences (100%) are found in areas that have experienced slightly lower than average (47.1-57°F/26.3-31.8°C) temperature variation during the past 50 years and are considered at somewhat increased vulnerability to climate change.

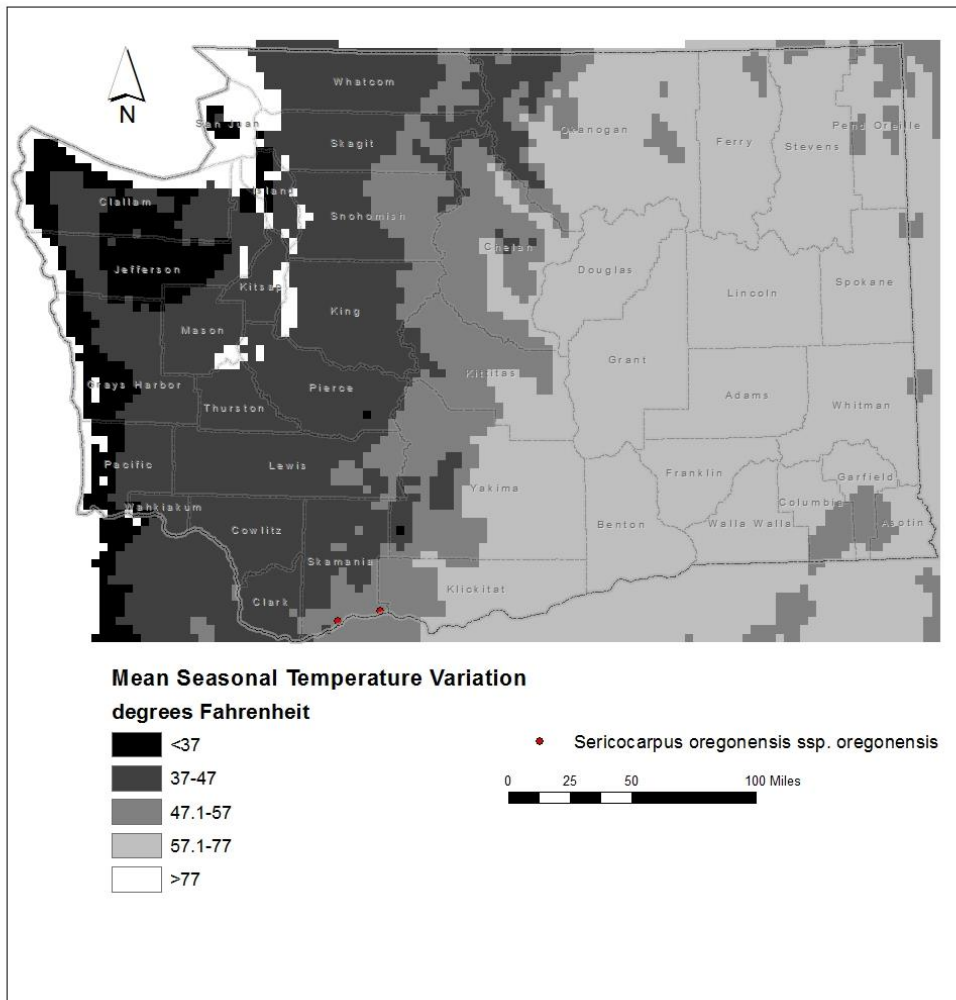


Figure 3. Historical thermal niche (exposure to past temperature variations) of *Sericocarpus oregonensis ssp. oregonensis* occurrences in Washington. Base map layers from www.natureserve.org/ccvi

C2aii. Physiological thermal niche: Neutral.

The dry Ponderosa pine-Douglas-fir forest habitat of *Sericocarpus oregonensis ssp. oregonensis* is not associated with cold air drainage during the growing season and would have neutral vulnerability to temperature changes due to global warming.

C2bi. Historical hydrological niche: Neutral.

Both of the populations of *Sericocarpus oregonensis* ssp. *oregonensis* in Washington (100%) are found in areas that have experienced average or greater than average (>20 inches/508 mm) precipitation variation in the past 50 years (Figure 4). According to Young et al. (2016), these occurrences are at neutral vulnerability to climate change.

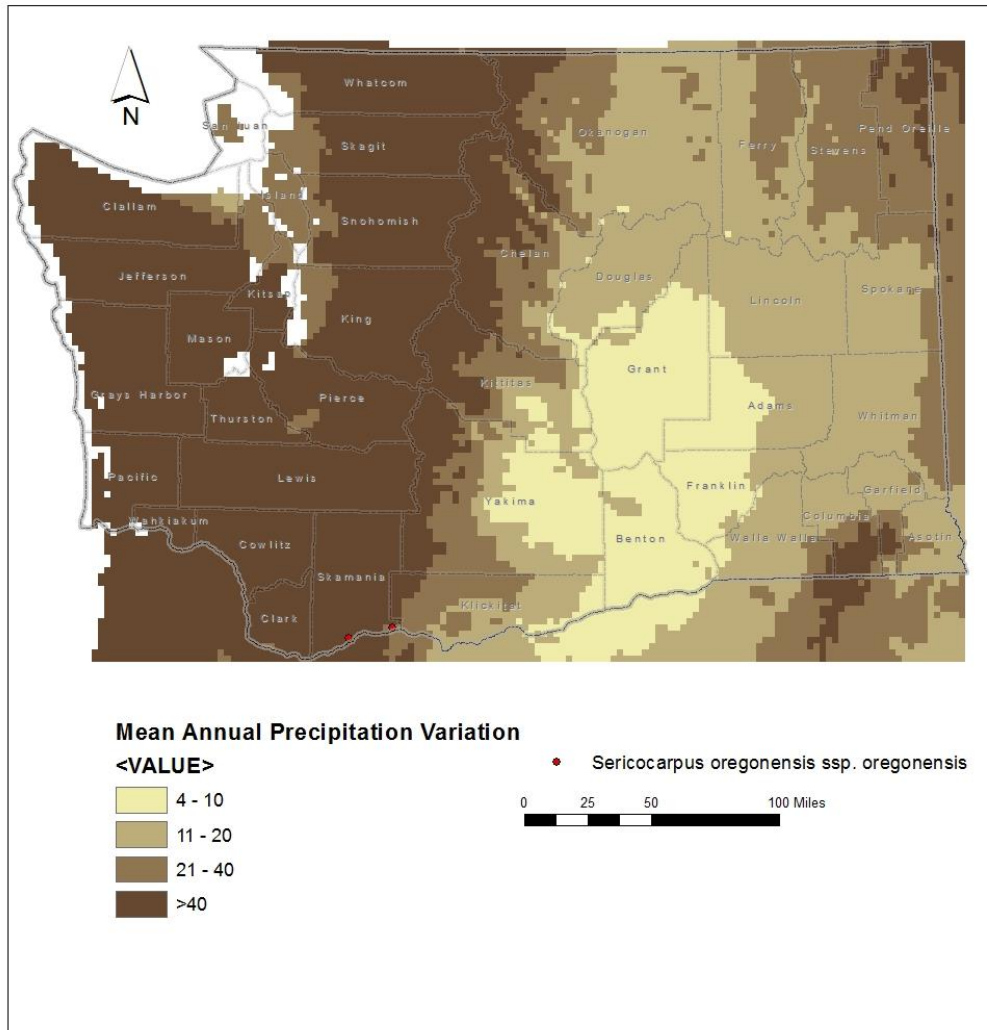


Figure 4. Historical hydrological niche (exposure to past variations in precipitation) of *Sericocarpus oregonensis* ssp. *oregonensis* occurrences in Washington. Base map layers from www.natureserve.org/cvi

C2bii. Physiological hydrological niche: Neutral.

This species usually occurs in upland dry forest habitat (though the one extant occurrence in Washington is on the slopes above a small lake). These sites are not strongly tied to wetland features dependent on high amounts of spring/summer precipitation or winter snowfall, but may be vulnerable to drought and increased wildfire however (see below). Increased drought or fire could shift this community to shrub steppe or grassland habitats (Rocchio and Ramm-Granberg 2017).

C2c. Dependence on a specific disturbance regime: Increase.

The dry Ponderosa pine and Douglas-fir forest habitat of *Sericocarpus oregonensis* ssp. *oregonensis* in Washington is associated with frequent, low severity wildfire to maintain its open physiognomy and species composition (Rocchio and Crawford 2015). Under increased drought and reduced summer precipitation (and due to past fire suppression building up fuels) these sites may become more vulnerable to stand-replacing crown fires and become replaced by shrub or grassland-dominated ecological systems (Rocchio and Ramm-Granberg 2017).

C2d. Dependence on ice or snow-cover habitats: Neutral.

Snowpack in the range of *Sericocarpus oregonensis* ssp. *oregonensis* in Washington is moderate, but groundwater-recharge from slow-melting snow is not limiting in the dry forest habitats occupied by this species.

C3. Restricted to uncommon landscape/geological features: Neutral.

Washington occurrences of *Sericocarpus oregonensis* ssp. *oregonensis* are associated with Quaternary landslide deposits and the Quaternary Underwood Mountain basalt, which is fairly widespread in the Columbia River Gorge and southern Cascades.

C4a. Dependence on other species to generate required habitat: Neutral

The dry conifer forest habitat occupied by *Sericocarpus oregonensis* ssp. *oregonensis* is maintained by natural abiotic processes (such as fire and seasonal drought) rather than by interactions with other species.

C4b. Dietary versatility: Not applicable for plants

C4c. Pollinator versatility: Neutral.

Sericocarpus oregonensis ssp. *oregonensis* is pollinated by a variety of butterflies and other insects (Shepherd et al. 2006).

C4d. Dependence on other species for propagule dispersal: Neutral.

The dry, one-seeded fruits of *Sericocarpus oregonensis* ssp. *oregonensis* have a pappus of capillary bristles and are readily dispersed by the wind.

C4e. Sensitivity to pathogens or natural enemies: Unknown.

Impacts from pathogens and grazing animals are not known.

C4f. Sensitivity to competition from native or non-native species: Somewhat Increase.

Sericocarpus oregonensis ssp. *oregonensis* could be sensitive to competition from other plant species (especially non-native invasive annuals) if its dry forest habitat becomes converted to

shrub or grassland dominated systems due to increased drought or catastrophic wildfire (Rocchio and Ramm-Granberg 2017).

C4g. Forms part of an interspecific interaction not covered above: Neutral.
Does not require an interspecific interaction.

C5a. Measured genetic variation: Unknown.
No genetic data are available for Washington populations.

C5b. Genetic bottlenecks: Unknown.

C5c. Reproductive System: Neutral
Sericocarpus oregonensis ssp. *oregonensis* probably has average genetic diversity across its range due to its ability to outcross and disperse widely by wind. Washington populations are located at the northern edge of the species range and probably have less genetic diversity than occurrences from Oregon or California due to founder effects or genetic drift.

C6. Phenological response to changing seasonal and precipitation dynamics: Neutral
No changes have been detected in phenology in recent years.

Section D: Documented or Modeled Response to Climate Change

D1. Documented response to recent climate change: Neutral.
Significant changes in the distribution of *Sericocarpus oregonensis* ssp. *oregonensis* have not been documented.

D2. Modeled future (2050) change in population or range size: Unknown

D3. Overlap of modeled future (2050) range with current range: Unknown

D4. Occurrence of protected areas in modeled future (2050) distribution: Unknown

References

Camp, P. and J.G. Gamon, eds. 2011. Field Guide to the Rare Plants of Washington. University of Washington Press, Seattle. 392 pp.

Fertig, W. and J. Kleinknecht. 2020. Conservation status and protection needs of priority plant species in the Columbia Plateau and East Cascades ecoregions. Natural Heritage Report 2020-02. Washington natural Heritage Program, WA Department of Natural Resources, Olympia, WA. 173 pp.

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