Climate Change Vulnerability Index Report

Ribes cereum var. *colubrinum* (Snake wax currant)

Date: 1 November 2021

Assessor: Walter Fertig, WA Natural Heritage Program

Geographic Area: Washington Heritage Rank: G5T3/S1

Index Result: Highly Vulnerable Confidence: Very High

Climate Change Vulnerability Index Scores

Section A: Local Climate	**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	100
	3.9-4.4° F (2.2-2.4°C) warmer	0
	<3.9° F (2.2°C) warmer	0
2. Hamon AET:PET moisture	< -0.119	0
	-0.097 to -0.119	14.3
	-0.074 to -0.096	85.7
	-0.051 to -0.073	0
	-0.028 to -0.050	0
	>-0.028	0
Section B: Indirect Exposure to Climate Change		**Effect on Vulnerability**
1. Sea level rise		Neutral
2a. Distribution relative to natural barriers		Somewhat Increase
2b. Distribution relative to anthropogenic barriers		Somewhat Increase
3. Impacts from climate change mitigation		Neutral
Section C: Sensitivity and Adaptive Capacity		
1. Dispersal and movements		Neutral/Somewhat Increase
2ai Change in historical thermal niche		Neutral
2aii. Change in physiological thermal niche		Somewhat Increase
2bi. Changes in historical hydrological niche		Somewhat Increase
2bii. Changes in physiological hydrological niche		Increase
2c. Dependence on specific disturbance regime		Somewhat Increase
2d. Dependence on ice or snow-covered habitats		Neutral/Somewhat Increase
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		Unknown
4d. Dependence on other species for propagule dispersal		Neutral
4e. Sensitivity to pathogens or natural enemies		Neutral
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: Documented or Modeled Response	
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: All 7 of the extant and historical occurrences of *Ribes cereum* var. *colubrinum* in Washington (100%) occur in areas with a projected temperature increase of 4.5-5.0° F (Figure 1).

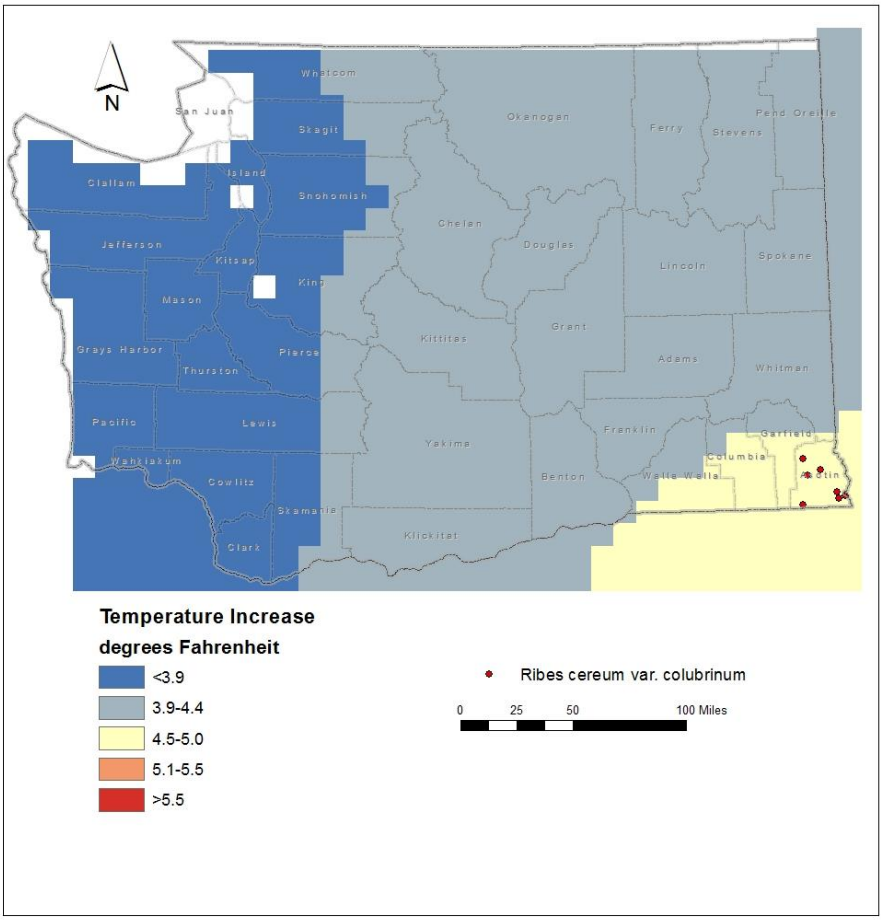

Figure 1. Exposure of *Ribes cereum* var. *colubrinum* occurrences in Washington to projected local temperature change. Base map layers from www.natureserve.org/ccvi

A2. Hamon AET:PET Moisture Metric: Six of the 7 occurrences (85.7%) of *Ribes cereum* var. *colubrinum* 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). One other population (14.3%) is from an area with projected decrease of -0.097 to -0.119

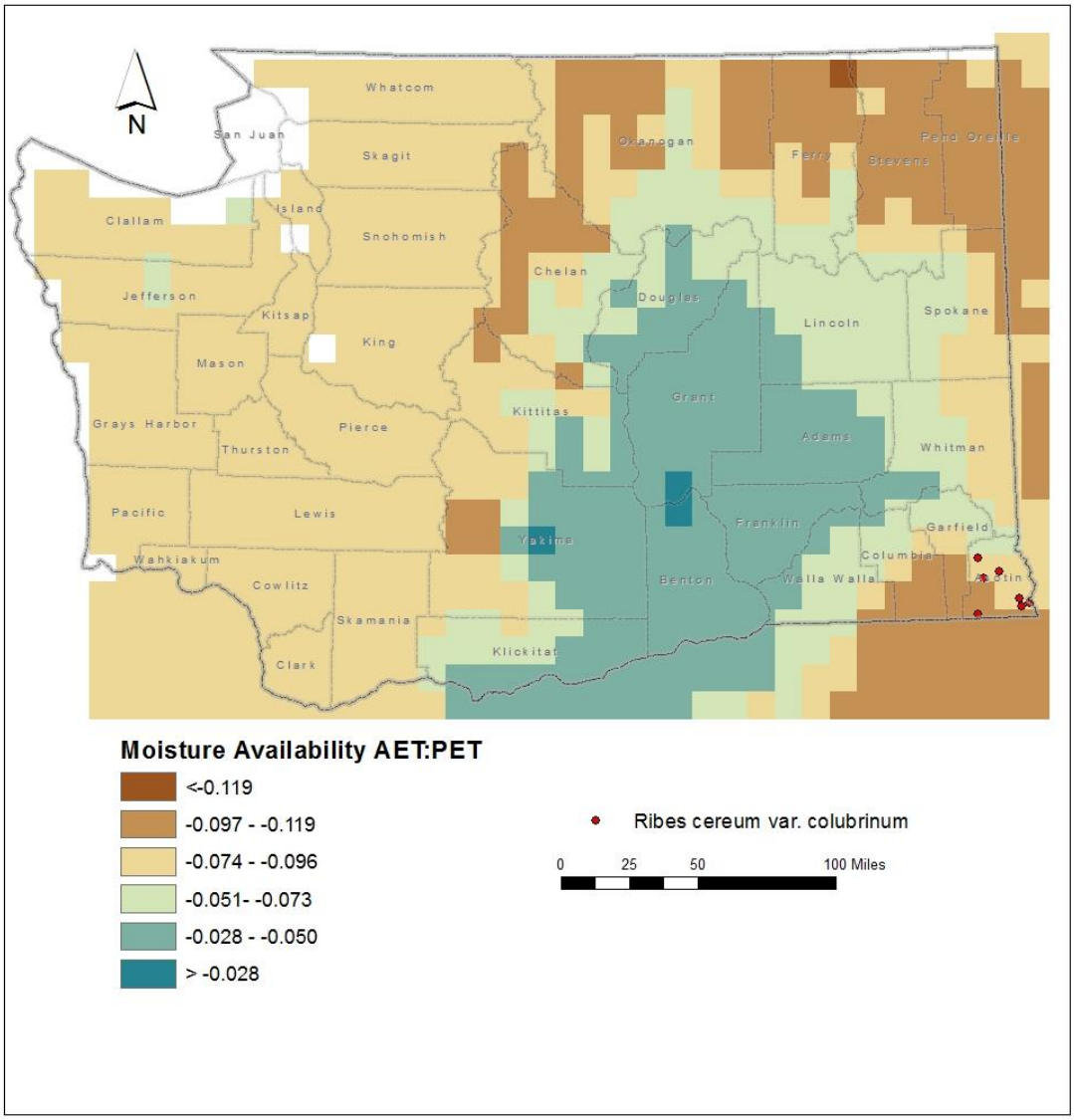

Figure 2. Exposure of *Ribes cereum* var. *colubrinum* occurrences in Washington to projected moisture availability (based on ratio of actual to predicted evapotranspiration). Base map layers from www.natureserve.org/ccvi

Section B. Indirect Exposure to Climate Change

B1. Exposure to sea level rise: Neutral.
Washington occurrences of *Ribes cereum* var. *colubrinum* are found at 1000-3300 feet (300-1000 m) and would not be inundated by projected sea level rise.

B2a. Natural barriers: Somewhat Increase.
Ribes cereum var. *colubrinum* occurs in dry, rocky canyon slopes or terraces along streams within tall shrub communities (Camp and Gamon 2011; Washington Natural Heritage Program 2021). This habitat is part of the Columbia Basin Foothill & Canyon Dry Grassland and Rocky Mountain Subalpine-Montane Mesic Meadow ecological systems (Rocchio and Crawford 2015). Populations may be separated from each other by 3-13 miles (4.5-21 km). Drier ridges with conifer forest or Palouse grassland habitats may provide an effective barrier to dispersal between drainage basins.

B2b. Anthropogenic barriers: Somewhat Increase.
The rocky canyon and streamside shrub habitat of *Ribes cereum* var. *colubrinum* in the foothills of the Blue Mountains in southeastern Washington is bisected by agricultural lands that may provide a barrier to dispersal.

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

Section C: Sensitive and Adaptive Capacity

C1. Dispersal and movements: Neutral/Somewhat Increase.
Ribes cereum var. *colubrinum* produces red to orange, many-seeded, fleshy berries that are eaten by a wide variety of bird and animal species. Potential dispersal distances vary depending on the home range and foraging habits of the species that feed on berries, but are likely to be 100-1000 meters or more.

C2ai. Historical thermal niche: Neutral.
Figure 3 depicts the distribution of *Ribes cereum* var. *colubrinum* in Washington relative to mean seasonal temperature variation for the period from 1951-2006 ("historical thermal niche"). Five of the 7 occurrences in the state (71.4%) are found in areas that have experienced average (57.1-77˚F/31.8-43.0˚C) temperature variation during the past 50 years and are considered at neutral vulnerability to climate change (Young et al. 2016). The other two occurrences (28.6%) are from areas that have had slightly lower than average (47.1-57˚F/26.3-31.8˚C) temperature variation over the same period and are at somewhat increased vulnerability to climate change.

C2aii. Physiological thermal niche: Somewhat Increase.
Most occurrences of *Ribes cereum* var. *colubrinum* in Washington are found in shaded, rocky draws or narrow canyons that have a cooler microclimate than surrounding areas.

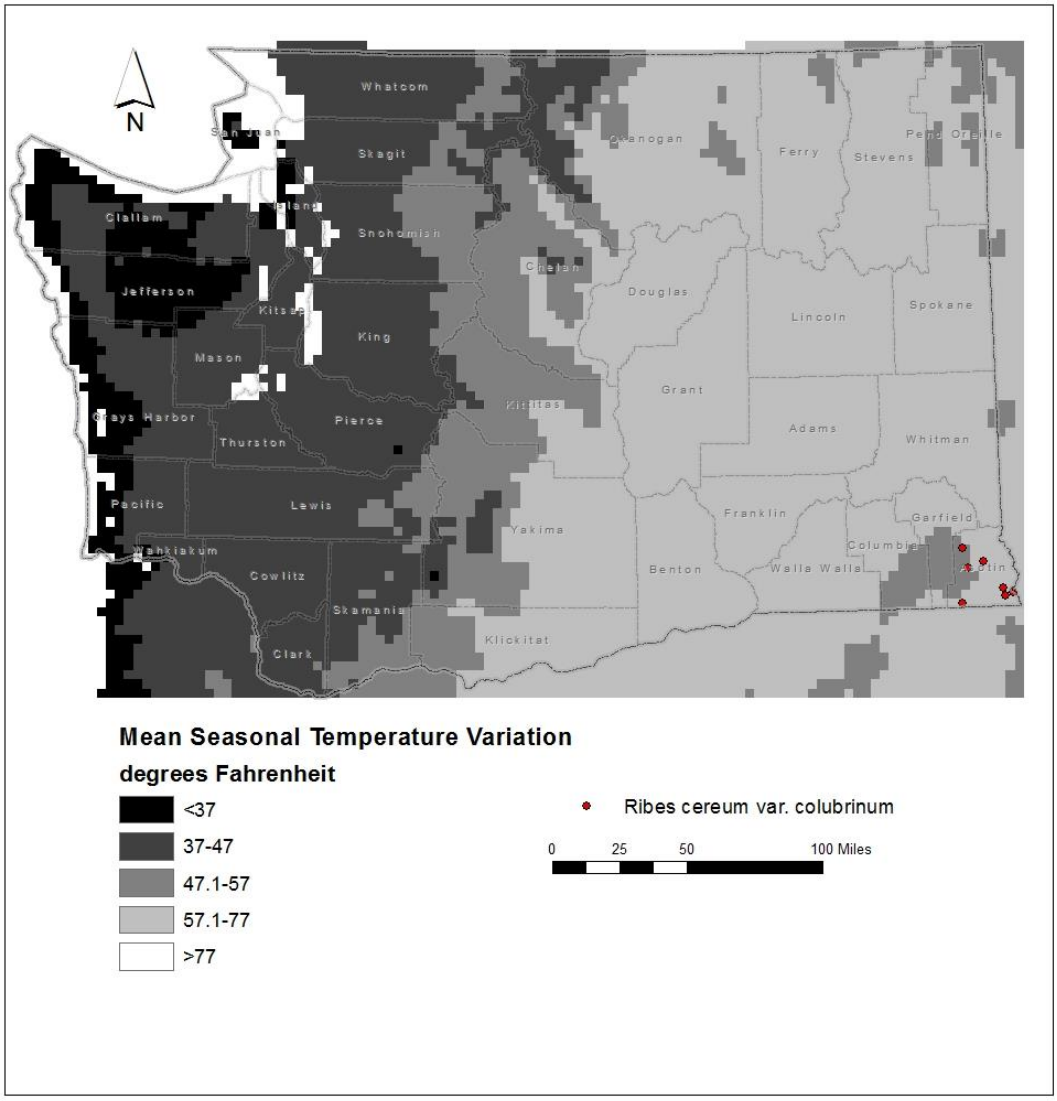

Figure 3. Historical thermal niche (exposure to past temperature variations) of *Ribes cereum* var. *colubrinum* occurrences in Washington. Base map layers from www.natureserve.org/ccvi

C2bi. Historical hydrological niche: Somewhat Increase.
All of the known populations of *Ribes cereum* var. *colubrinum* in Washington are found in areas that have experienced slightly lower than average precipitation variation in the past 50 years (11-20 inches/255-508 mm) (Figure 4). According to Young et al. (2016), these occurrences are at somewhat increased vulnerability from climate change.

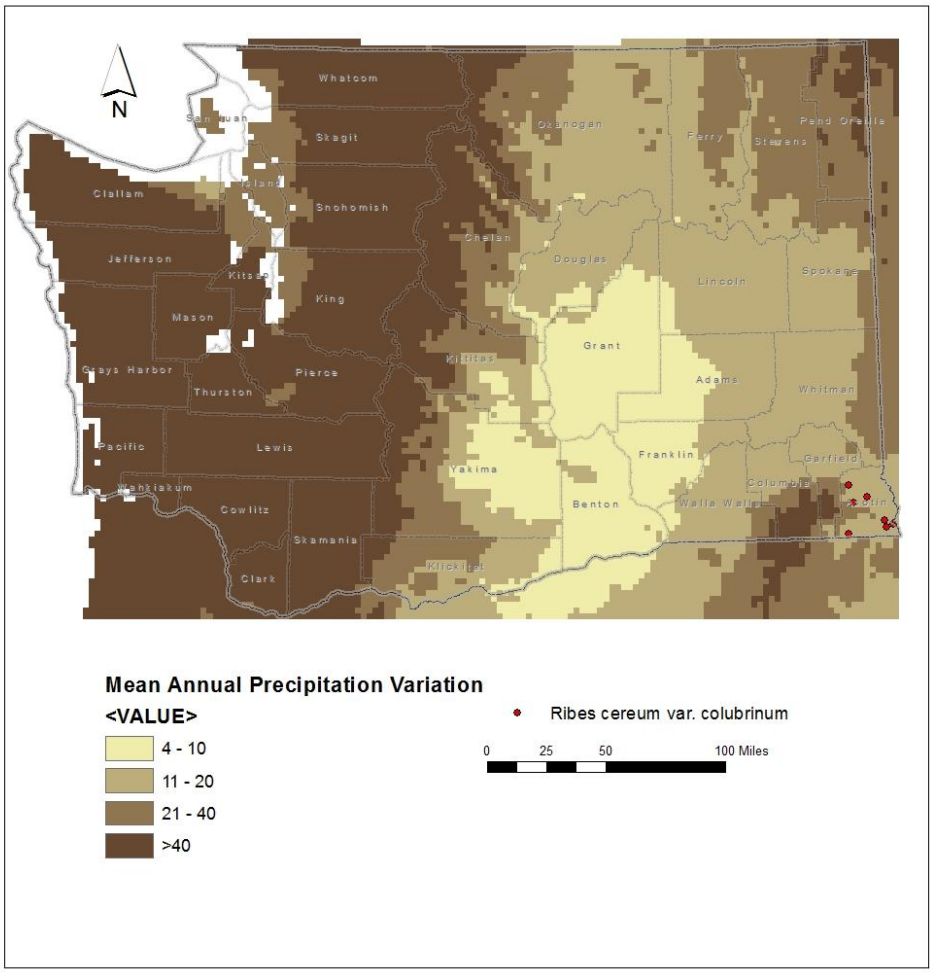

Figure 4. Historical hydrological niche (exposure to past variations in precipitation) of *Ribes cereum* var. *colubrinum* occurrences in Washington. Base map layers from www.natureserve.org/ccvi

C2bii. Physiological hydrological niche: Increase.
Populations of *Ribes cereum* var. *colubrinum* occur on stream terraces with a high water table. Water flows are dependent on recharge from melting snow at higher elevations or on seasonal precipitation. Projected climate change is likely to reduce the amount of snow and timing of melting and reduce or alter the timing of spring/summer rainfall, which in turn could make foothills stream areas more prone to drought (Rocchio and Ramm-Granberg 2017).

C2c. Dependence on a specific disturbance regime: Somewhat Increase.
Ribes cereum var. *colubrinum* occurs in rocky canyons and shaded stream terraces where natural disturbances are relatively low. Under projected climate change, these areas are likely to become warmer, drier, and more vulnerable to frequent wildfire, which could convert

streamside shrublands to open vegetation with more invasive weed species (Rocchio and Ramm-Granberg 2017). Studies in Colorado, however, suggest that *Ribes cereum* responds to low-intensity wildfire during the non-flowering season with increased growth (Young and Bailey 1975).

C2d. Dependence on ice or snow-cover habitats: Neutral/Somewhat Increase.
Most of the range of *Ribes cereum* var. *colubrinum* in Washington is in foothill areas that receive moderate amounts of winter snow. These areas may be influenced by adjacent highlands that receive more snow. Changes in the amount of snow and the timing of snowmelt could have deleterious effects on riparian vegetation in shady canyon sites dependent on recharge of subsurface flows (Rocchio and Ramm-Granberg 2017).

C3. Restricted to uncommon landscape/geological features: Neutral.
Ribes cereum var. *colubrinum* is found almost entirely in canyons carved from Miocene-age Grande Ronde Basalt, a common geologic formation in the Blue Mountains and foothills. Some occurrences are also found on Quaternary alluvium derived from basalt (Washington Division of Geology and Earth Resources 2016).

C4a. Dependence on other species to generate required habitat: Neutral
The basalt canyon and shady stream terrace habitat occupied by *Ribes cereum* var. *colubrinum* is maintained largely by natural abiotic conditions.

C4b. Dietary versatility: Not applicable for plants

C4c. Pollinator versatility: Unknown.
Across its range in western North America, *Ribes cereum* is pollinated by a large number of bumblebee species (*Bombus*). The specific pollinators of var. *colubrinum* are not known.

C4d. Dependence on other species for propagule dispersal: Neutral.
The edible berries produced by *Ribes cereum* var. *colubrinum* are eaten and dispersed by a wide variety of bird and mammal species.

C4e. Sensitivity to pathogens or natural enemies: Neutral.
Impacts from pathogens are not known. This species may be browsed by ungulates, rabbits, or rodents, but is not threatened because of these uses.

C4f. Sensitivity to competition from native or non-native species: Somewhat Increase.
Predicted climate change is likely to make the canyon streamside thicket habitat of *Ribes cereum* var. *colubrinum* drier, warmer, and more vulnerable to wildfire in the future (Rocchio and Ramm-Granberg 2017), making these sites susceptible to increased competition from invasive weeds and other species adapted to drier conditions.

C4g. Forms part of an interspecific interaction not covered above: Neutral.
Ribes cereum is an alternate host for *Cronartium ribicola*, the invasive fungus that causes white pine blister rust in some species of pine (*Pinus*).

C5a. Measured genetic variation: Unknown.
The genetic diversity within and between populations of *Ribes cereum* var. *colubrinum* is not known.

C5b. Genetic bottlenecks: Unknown.
Not known.

C5c. Reproductive System: Neutral.
Ribes cereum var. *colubrinum* is presumed to be an obligate outcrosser and is not limited by pollinators or dispersal, so is presumed to have average genetic variation.

C6. Phenological response to changing seasonal and precipitation dynamics: Neutral.
Based on herbarium records in the Consortium of Pacific Northwest Herbaria website (pnwherbaria.org), *Ribes cereum* var. *colubrinum* has not changed its typical blooming time since the 1920s.

Section D: Documented or Modeled Response to Climate Change

D1. Documented response to recent climate change: Neutral.
No major changes have been detected in the distribution of *Ribes cereum* var. *colubrinum* in Washington since it was first discovered in the state in the 1920s.

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.

Rocchio, F.J. and R.C. Crawford. 2015. Ecological systems of Washington State. A guide to identification. Natural Heritage Report 2015-04. Washington Natural Heritage Program, WA Department of Natural Resources, Olympia, WA. 384 pp.

Rocchio F.J. and T. Ramm-Granberg. 2017. Ecological System Climate Change Vulnerability Assessment. Unpublished Report to the Washington Department of Fish and Wildlife. Washington Natural Heritage Program, Department of Natural Resources, Olympia, WA.

Washington Division of Geology and Earth Resources. 2016. Surface geology, 1:100,000 --GIS data, November 2016: Washington Division of Geology and Earth Resources Digital Data Series DS-18, version 3.1, previously released June 2010.
http://www.dnr.wa.gov/publications/ger_portal_surface_geology_100k.zip

Washington Natural Heritage Program. 2021-. *Ribes cereum* var. *colubrinum*. In: Field Guide to the Rare Plants of Washington. (https://fieldguide.mt.gov/wa/?species=ribes%20cereum%20var.%20colubrinum). Accessed 1 November 2021.

Young, B.E., E. Byers, G. Hammerson, A. Frances, L. Oliver, and A. Treher. 2016. Guidelines for using the NatureServe Climate Change Vulnerability Index. Release 3.02. NatureServe, Arlington, VA. 48 pp. + app.

Young, D.L. and J.A. Bailey. 1975. Effects of fire and mechanical treatment on *Cercocarpus montanus* and *Ribes cereum*. Journal of Range Management 28(6): 495-497.