

## Climate Change Vulnerability Index Report

*Pyrrhocoma hirta* var. *sonchifolia* (Sticky goldenweed)

Date: 26 February 2020

Assessor: Walter Fertig, WA Natural Heritage Program

Geographic Area: Washington

Heritage Rank: G4G5T3/S2

Index Result: Moderately Vulnerable

Confidence: Very High

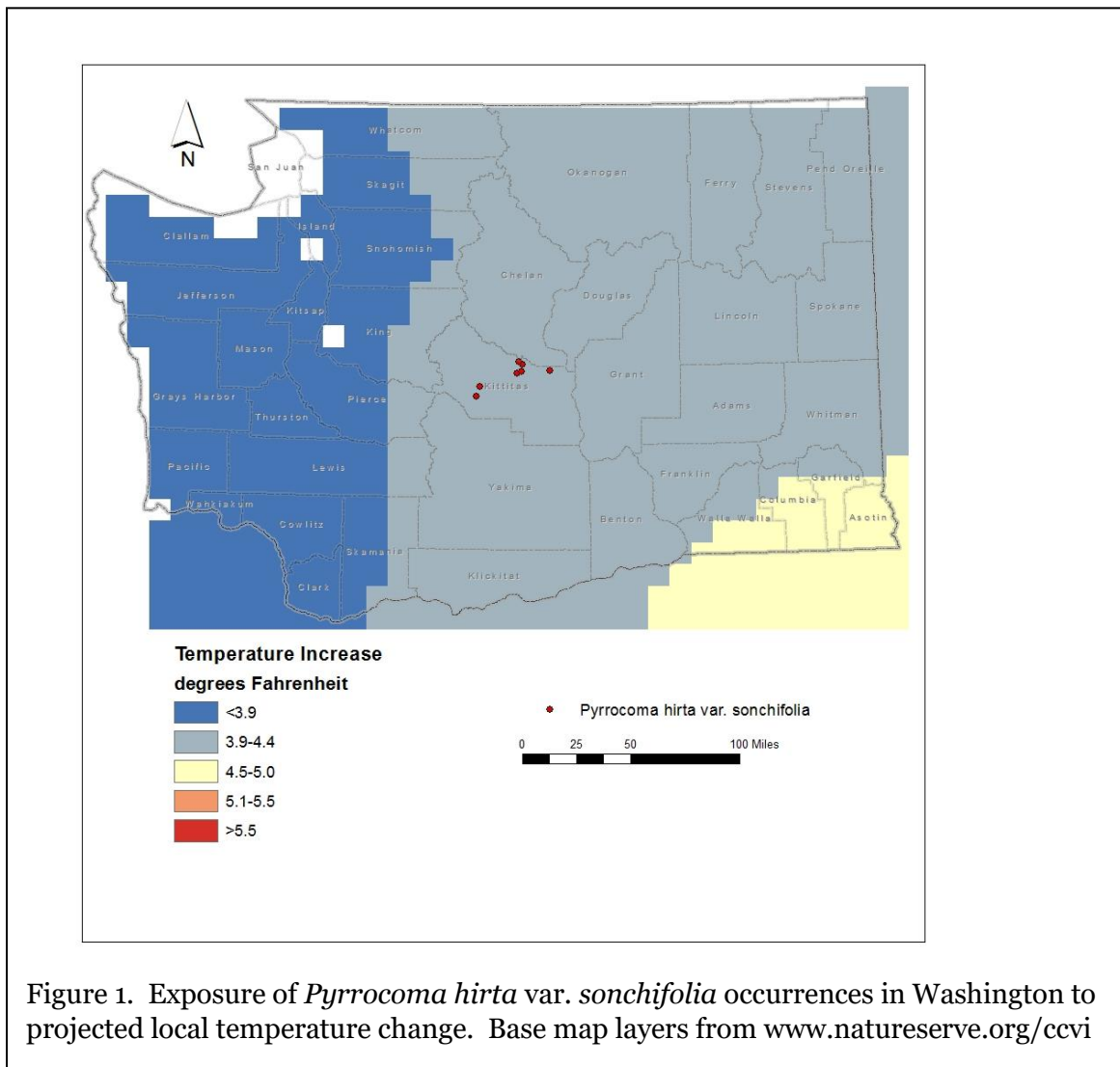
### Climate Change Vulnerability Index Scores

<b>Section A</b>	<b>Severity</b>	<b>Scope (% of range)</b>
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	28.5
	-0.074 to -0.096	43
	-0.051 to -0.073	28.5
	-0.028 to -0.050	0
	>-0.028	0
<b>Section B</b>		<b>Effect on Vulnerability</b>
1. Sea level rise		Neutral
2a. Distribution relative to natural barriers		Somewhat Increase
2b. Distribution relative to anthropogenic barriers		Neutral
3. Impacts from climate change mitigation		Neutral
<b>Section C</b>		
1. Dispersal and movements		Neutral
2ai Change in historical thermal niche		Somewhat Increase
2aii. Change in physiological thermal niche		Somewhat Increase
2bi. Changes in historical hydrological niche		Neutral
2bii. Changes in physiological hydrological niche		Somewhat Increase
2c. Dependence on specific disturbance regime		Somewhat Increase
2d. Dependence on ice or snow-covered habitats		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		Neutral
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
<b>Section D</b>	
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 seven of the known occurrences of *Pyrrcoma hirta* var. *sonchifolia* in Washington (100%) occur in an area with a projected temperature increase of 3.9-4.4° F (Figure 1).



A2. Hamon AET:PET Moisture Metric: Two of the seven Washington occurrence of *Pyrrcoma hirta* var. *sonchifolia* (28.5%) are found in an area with a projected decrease in available moisture (as measured by the ratio of actual to potential evapotranspiration) in the range of -0.051 to -0.073 (Figure 2). Three other populations (43%) are found in areas with a projected decrease in moisture of -0.074 to -0.096 and two (28.5%) are found in areas with a projected decrease of -0.097 to -0.119.

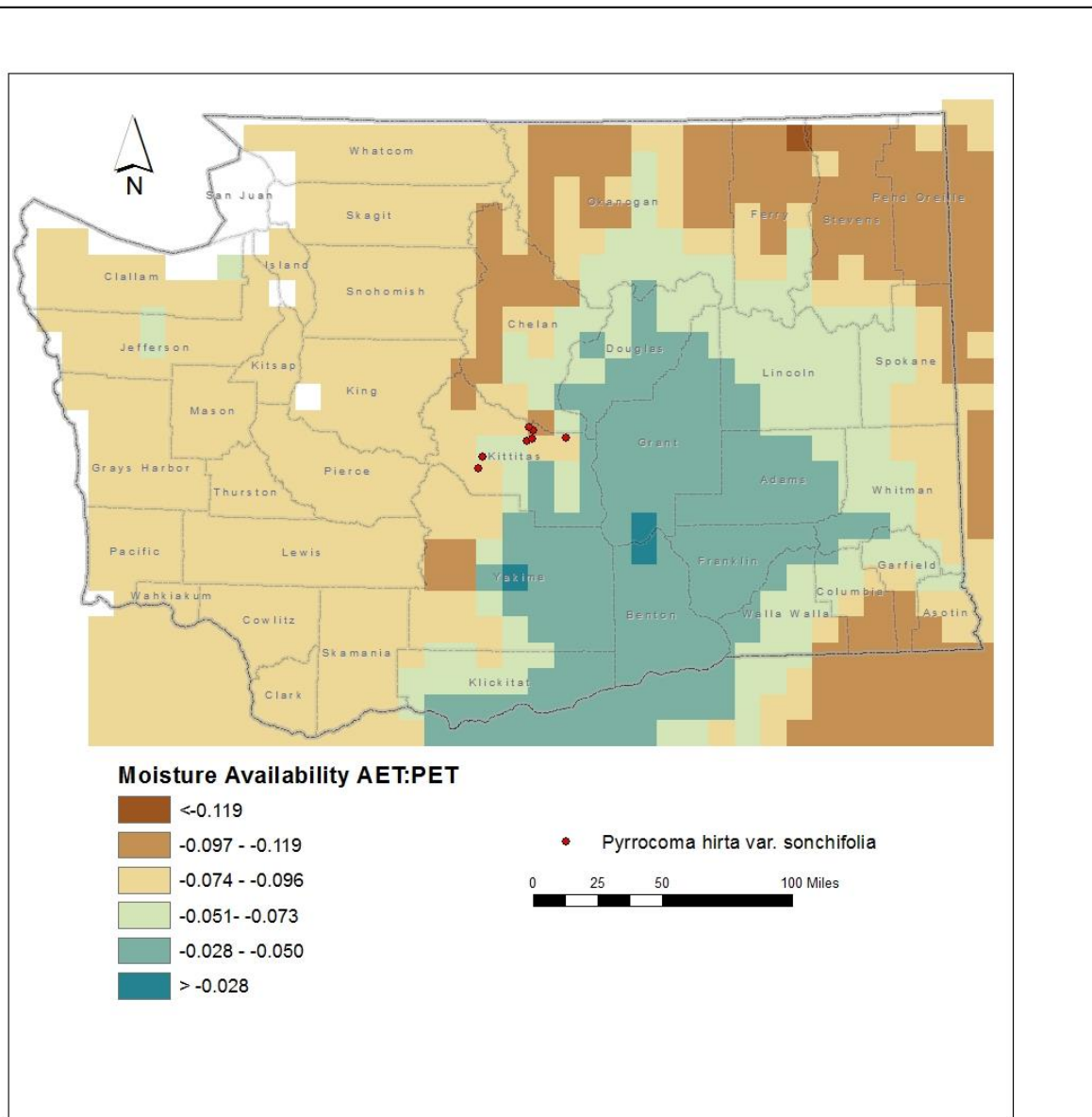


Figure 2. Exposure of *Pyrrcoma hirta* var. *sonchifolia* occurrences in Washington to projected moisture availability (based on ratio of actual to predicted evapotranspiration). Base map layers from [www.natureserve.org/ccvi](http://www.natureserve.org/ccvi)

## **Section B. Indirect Exposure to Climate Change**

B1. Exposure to sea level rise: Neutral.

Washington occurrences of *Pyrrocomma hirta* var. *sonchifolia* are found at 4040-5600 feet (1230-1710 m) and would not be inundated by projected sea level rise.

B2a. Natural barriers: Somewhat Increase.

In Washington, *Pyrrocomma hirta* var. *sonchifolia* is found in seasonally moist meadows (wet in the spring, but dry in summer and fall) on flats or shallow depressions of clay-rich soil over basalt bedrock within a matrix of conifer forests dominated by *Pinus ponderosa*, *P. monticola*, *P. contorta*, *Abies grandis* and *Pseudotsuga menziesii* (Camp and Gamon 2011, Fertig and Kleinknecht 2020). This habitat is a component of the Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland ecological system (Rocchio and Crawford 2015). Washington populations are separated by 3-28 km (2-17 miles) and often occupy small areas of suitable habitat, embedded within less-suitable forest systems that could create a barrier to dispersal.

B2b. Anthropogenic barriers: Neutral.

The range of *Pyrrocomma hirta* var. *sonchifolia* in Washington is embedded within a matrix of native and human-influenced lands. The species is probably more isolated by natural barriers than anthropogenic ones.

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

## **Section C: Sensitive and Adaptive Capacity**

C1. Dispersal and movements: Neutral.

*Pyrrocomma hirta* var. *sonchifolia* produces numerous 1-seeded achenes topped by a pappus of bristles to facilitate dispersal by wind. These propagules can probably travel at least 1 km.

C2ai. Historical thermal niche: Somewhat Increase.

Figure 3 depicts the distribution of *Pyrrocomma hirta* var. *sonchifolia* in Washington relative to mean seasonal temperature variation for the period from 1951-2006 (“historical thermal niche”). All seven 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 risk from climate change.

C2a.ii. Physiological thermal niche: Somewhat Increase.

The seasonally moist montane grassland habitat of *Pyrrocoma hirta* var. *sonchifolia* is associated with cold air drainage in the growing season and could be somewhat vulnerable to increased temperatures associated with climate change.

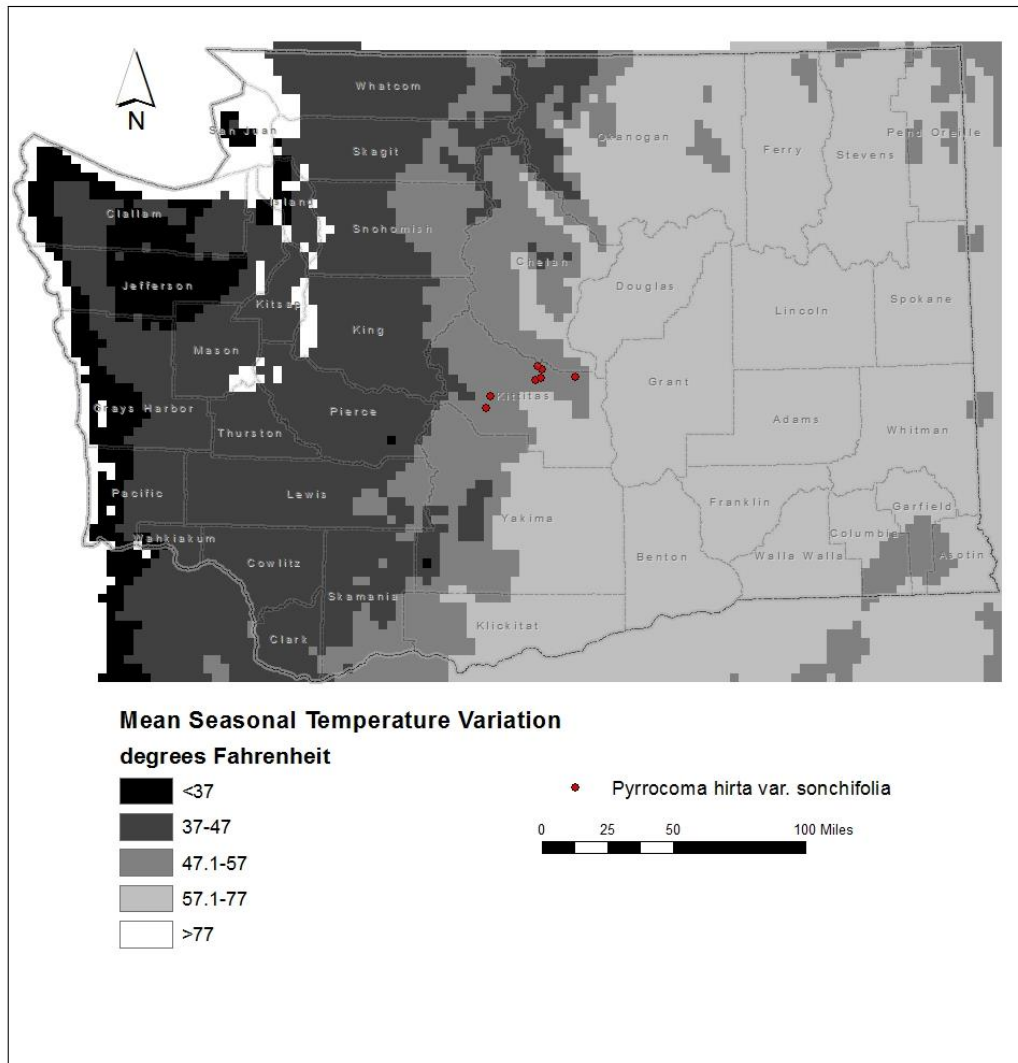


Figure 3. Historical thermal niche (exposure to past temperature variations) of *Pyrrocoma hirta* var. *sonchifolia* occurrences in Washington. Base map layers from [www.natureserve.org/ccvi](http://www.natureserve.org/ccvi)

C2bi. Historical hydrological niche: Neutral.

All seven populations of *Pyrrocoma hirta* var. *sonchifolia* 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 areas are at neutral risk from climate change.

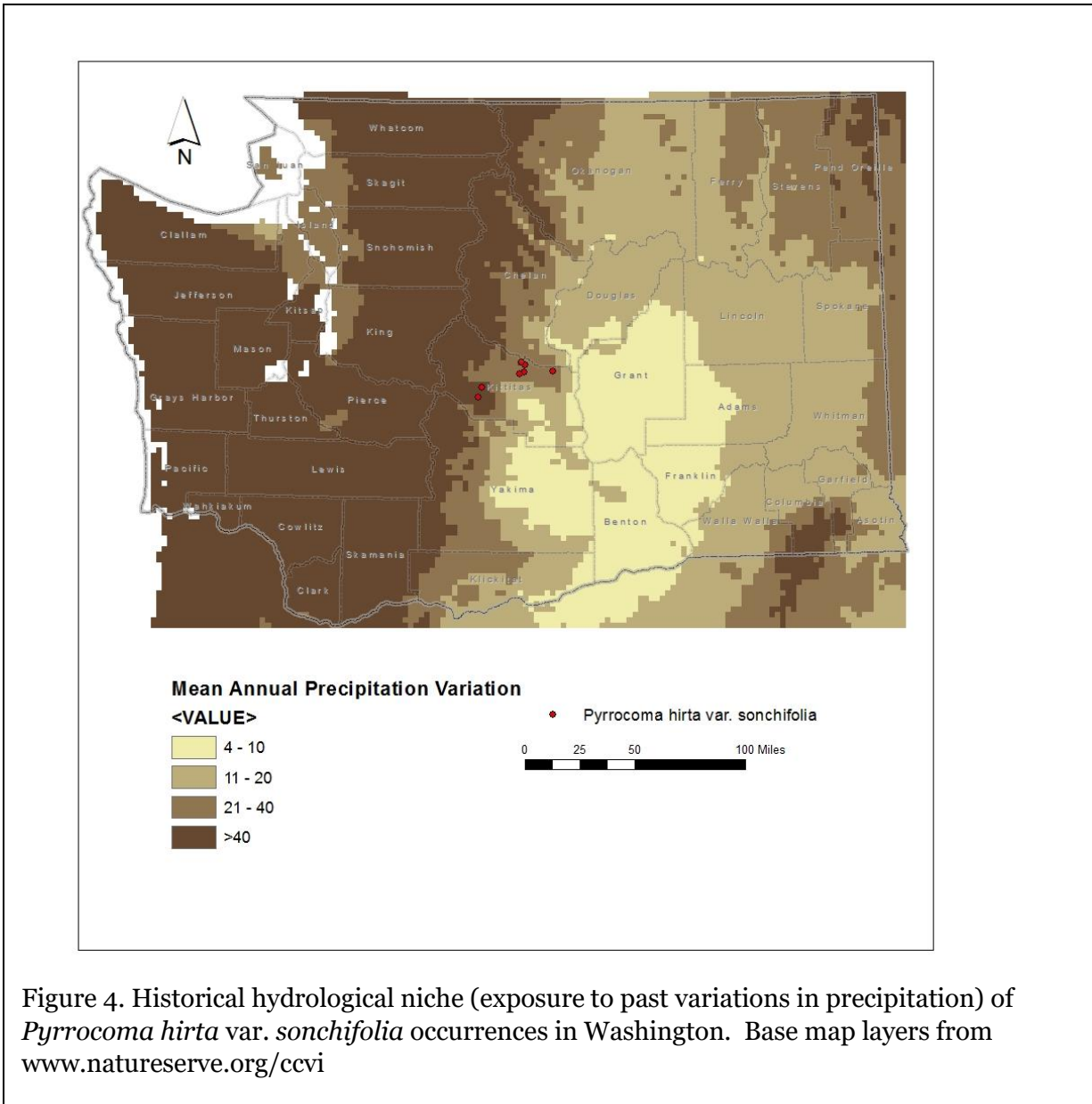


Figure 4. Historical hydrological niche (exposure to past variations in precipitation) of *Pyrrocoma hirta* var. *sonchifolia* occurrences in Washington. Base map layers from [www.natureserve.org/ccvi](http://www.natureserve.org/ccvi)

C2bii. Physiological hydrological niche: Somewhat Increase.

In Washington, *Pyrrocoma hirta* var. *sonchifolia* is found in slight depressions or other areas of high clay soil that are seasonally wet in spring, but become dry in summer. These vernal pool-like microsites within the Northern Rocky Mountains Lower Montane, Foothills and valley Grassland ecological system are dependent on winter and spring moisture and thus vulnerable

to changes in the amount and timing of precipitation from climate change (Rocchio and Ramm-Granberg 2017). Increased drought and temperatures in the growing season could lead to an increased risk of wildfire.

C2c. Dependence on a specific disturbance regime: Somewhat Increase.

*Pyrrocoma hirta* var. *sonchifolia* occurs on clay rich soils that support meadow communities within a matrix of mixed conifer forest. These openings could be created or maintained by periodic wildfire. These disturbances could become more frequent under projected climate change.

C2d. Dependence on ice or snow-cover habitats: Somewhat Increase.

The range of *Pyrrocoma hirta* var. *sonchifolia* on the east slope of the Cascades in Washington has low to moderate snowfall. Drifting or late-melting snow may be an important source of additional moisture for creating vernal pool-like conditions in the spring.

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

In Washington, *Pyrrocoma hirta* var. *sonchifolia* is strongly associated with shallow depressions in basalt with thin clay soil and standing water in spring. Basalt is widespread across central and eastern Washington, and not limiting.

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

The meadow habitat and depressions occupied by *Pyrrocoma hirta* var. *sonchifolia* could be enhanced by wallowing animals, such as elk, but is probably maintained mostly by natural abiotic processes.

C4b. Dietary versatility: Not applicable for plants

C4c. Pollinator versatility: Neutral.

Like other members of the Asteraceae, *Pyrrocoma hirta* var. *sonchifolia* is adapted for pollination by numerous, unspecialized (generalist) species of insects and is unlikely to be pollinator limited.

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

Seed dispersal in *Pyrrocoma hirta* var. *sonchifolia* is entirely passive, with the small one-seeded fruits spreading by wind.

C4e. Sensitivity to pathogens or natural enemies: Neutral.

Impacts from pathogens are not known. This species does not appear to be a preferred forage species by livestock or native grazers.

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

*Pyrrocoma hirta* var. *sonchifolia* could be vulnerable to competition from other native or introduced plant species if its specialized vernal pool-like habitat became completely dried out due to climate change, or more susceptible to frequent 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 data are available on genetic variability for this species.

C5b. Genetic bottlenecks: Unknown.

C5c. Reproductive System: Neutral  
*Pyrrocoma hirta* var. *sonchifolia* is pollinated by a variety of insects and is likely an outcrosser.  
Genetic diversity is probably average.

C6. Phenological response to changing seasonal and precipitation dynamics: Neutral.  
Based on flowering dates from specimens in the Consortium of Pacific Northwest herbaria website, 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.  
No changes in the distribution of this species in Washington has been observed in recent years.

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.

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.

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.