

**Climate Change Vulnerability Assessment**  
**Washington Natural Heritage Program**  
**June 27, 2014**

**Species** Lupinus oregonus  
**English Name** Kincaid's lupine  
**Taxonomic Group** Vascular Plants  
**Geographic Area** Washington  
**Range Rel.** Entire range  
**Cave/Ground Water Obligate** No  
**GRank** G2  
**SRank** S1

**Index Result:**  
 Presumed Stable  
**Confidence:**  
 Very High  
**Assessor:**  
 John Gamon

**Climate Change Vulnerability Index Values:**

Temperature Scope	A >5.5F	0
	A 5.1F	0
	A 4.5F	0
	A 3.9F	0
	A <3.9F	100
Hamon AET:PET Moisture Metric Scope	< -0.119	0
	-0.119	0
	-0.096	100
	-0.073	0
	-0.05	0
	>-0.028	0
Sea level rise	B1	N
Natural barriers	B2a	N
Anthropogenic barriers	B2b	SI
Climate Change mitigation	B3	U
Dispersal/Movement	C1	SI
Historical thermal niche	C2ai	Inc
Physiological thermal niche	C2aii	N
Historical hydrological niche	C2bi	SD
Physiol. hydrological niche	C2bii	N
Disturbance dependence	C2c	N
Ice/snow dependence	C2d	N
Physical habitat restrictions	C3	N
Other spp create habitat	C4a	N
Dietary Versatility	C4b	N/A
Pollinator Versatility	C4c	N
Other spp for dispersal	C4d	N
Other spp interaction	C4e	U
Genetic variation	C5a	SI
Genetic bottleneck	C5b	N/A
Phenological response	C6	U
Documented response	D1	U
Modeled change	D2	U
Modeled overlap	D3	U
Modeled protected Areas	D4	U

Affect on Vulnerability:
GI = Greatly Increase
Inc = Increase
SI = Somewhat Increase
N = Neutral
SD = Somewhat Decrease
Dec = Decrease
U = Unknown

**Index Scores:**

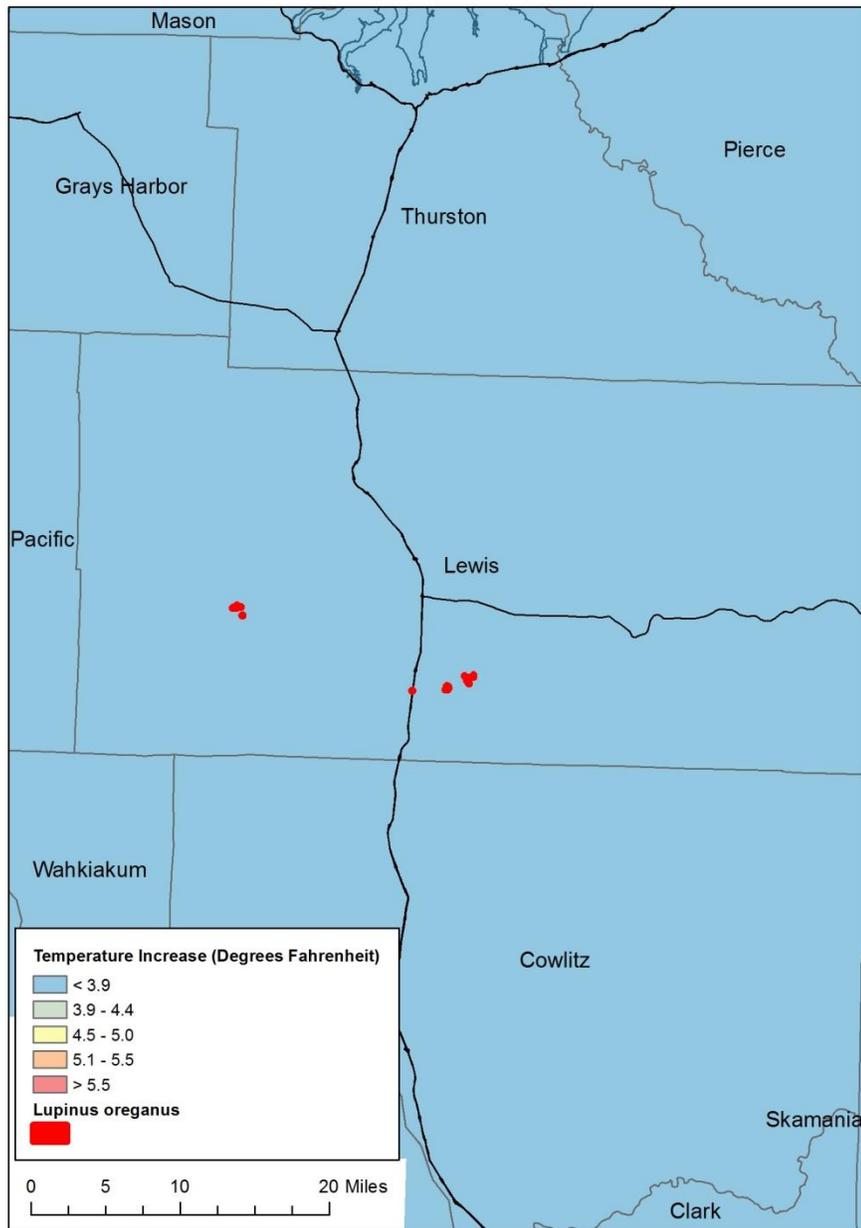
**Extremely Vulnerable:**  
 Abundance and/or range extent within geographical area assessed extremely likely to substantially decrease or disappear by 2050.

**Highly Vulnerable:** Abundance and/or range extent within geographical area assessed likely to decrease significantly by 2050.

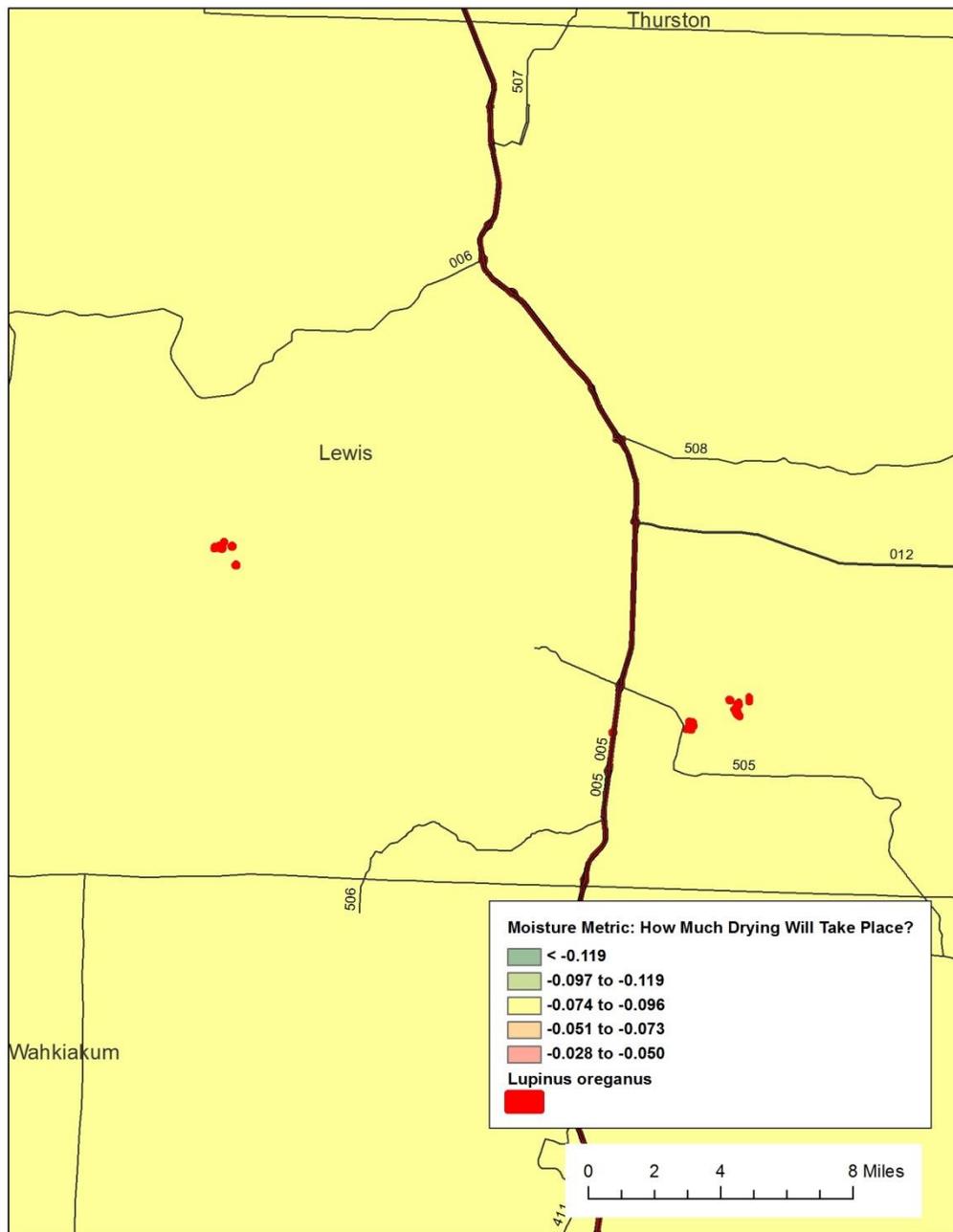
**Moderately Vulnerable:**  
 Abundance and/or range extent within geographical area assessed likely to decrease by 2050.

**Not Vulnerable/Presumed Stable:** Available evidence does not suggest that abundance and/or range extent within the geographical area assessed will change (increase/decrease) substantially by 2050. Actual range boundaries may change.

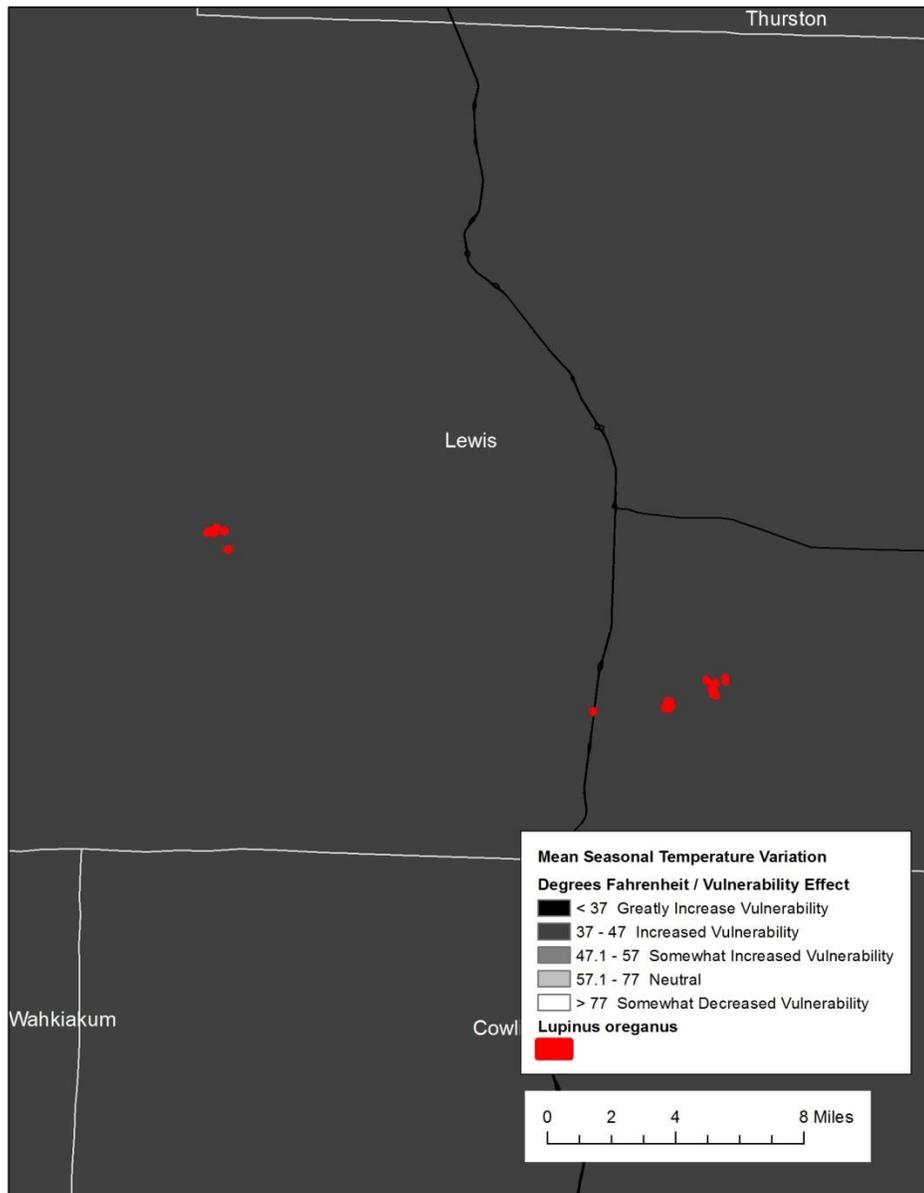
**Not Vulnerable/Increase Likely:** Available evidence suggests that abundance and/or range extent within geographical area assessed is likely to increase by 2050.



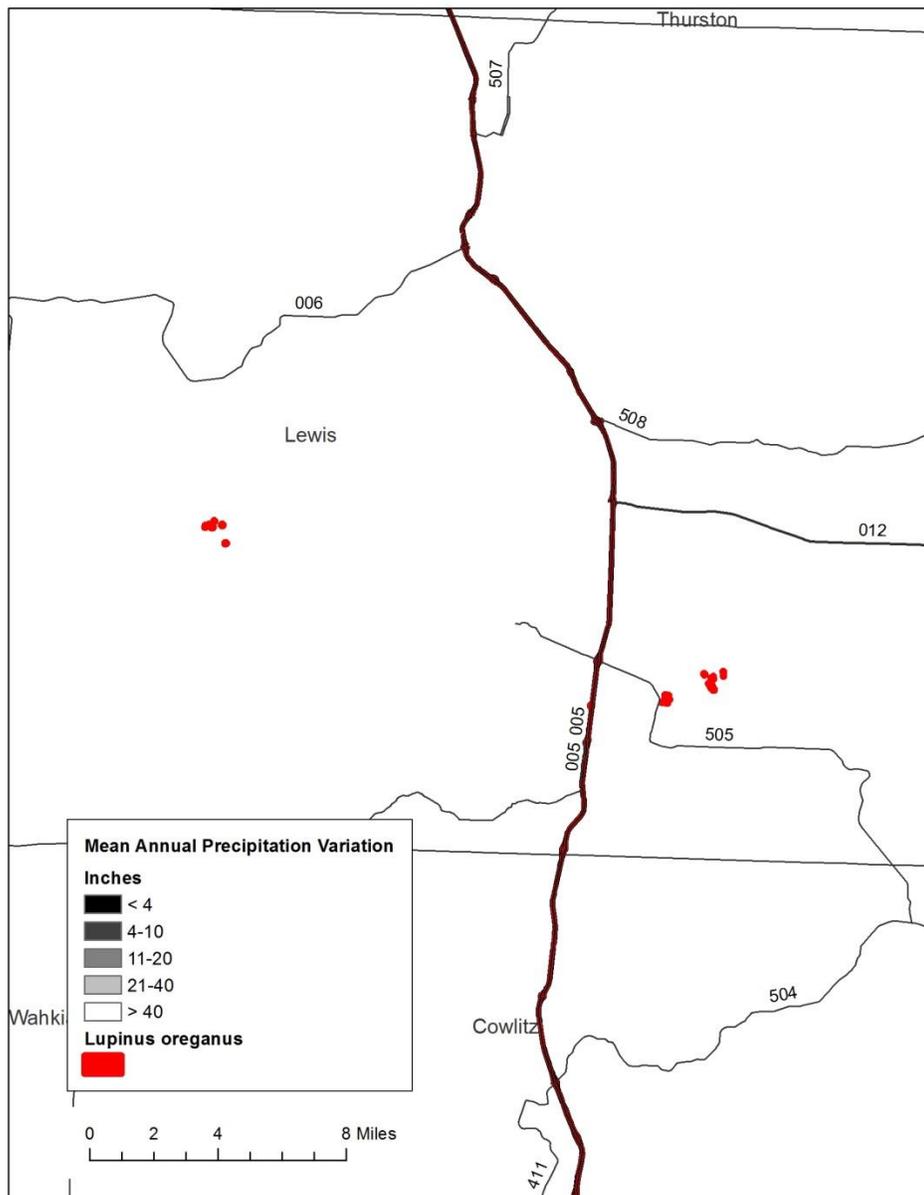
**Figure 1. Exposure of the known Washington occurrences of *Lupinus oregonus* to projected local climate change: temperature.** All occurrences are projected to experience a temperature increase of less than 3.9° F by the mid 2050s.



**Figure 2. Exposure of Washington occurrences of *Lupinus oregonus* to projected local climate change: predicted annual change in Hamon AET:PET moisture metric, 2040-2069.** Values represent percent change in the metric; negative values indicate net drying. Occurrences are projected to experience a net drying in the range of -0.074 to -0.096.



**Figure 3. Historical thermal niche (exposure to past variations in temperature) of the Washington occurrences of *Lupinus oregonus*.** This factor measures large-scale temperature variation that a species has experienced in recent historical times (i.e., the past 50 years), as approximated by mean seasonal temperature variation (difference between highest mean monthly maximum temperature and lowest mean monthly minimum temperature) for occupied cells within the assessment area. It is a proxy for species' temperature tolerance at a broad scale. Considering the mean seasonal temperature variation for occupied cells, the species has experienced **small (37 - 47° F/20.8 - 26.3° C)** temperature variation in the past 50 years. This range of variation is characterized as indicating an **Increased Vulnerability** to climate change.



**Figure 4. Historical hydrological niche (exposure to past variations in precipitation) of the Washington occurrences of *Lupinus oregonus*.** This factor measures large-scale precipitation variation that a species has experienced in recent historical times (i.e., the past 50 years), as approximated by mean annual precipitation variation across occupied cells within the assessment area. Considering the range of mean annual precipitation across occupied cells, the species has experienced **greater than average (> 40 inches/1,016 mm)** precipitation variation in the past 50 years. This range of precipitation variation is characterized as indicating a **Somewhat Decreased Vulnerability** to climate change.