Lomatium greenmanii Inventory and Monitoring

Final Report

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Wallowa-Whitman National Forest
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Introduction

Lomatium greenmanii (Greenman's desert parsley) is endemic to subalpine meadows and rocky outcrops in the Wallowa Mountains of northeast Oregon. There exist three disjunct populations range wide: Mount Howard, Ruby Peak and Redmont Peak. All three occur on the Wallowa-Whitman National Forest, Eagle Cap Ranger District. The population at Redmont Peak consists of one small patch. On Ruby Peak, several small patches are dispersed along the north ridge of the peak. The largest population, consisting of numerous large and small patches, is found on the summit of Mount Howard. Mount Howard is easily accessible by a recreational tram facility (Wallowa Lake Tramway) that transports over 30,000 visitors per year to the summit. In addition to the tram facilities, numerous trails have been developed within habitat occupied by the species. Due to its extreme rarity and accessibility to humans, *L. greenmanii* is vulnerable to threats from recreational activities, including trampling from hikers and operations of the Wallowa Lake Tramway. The lack of distribution knowledge and population trend monitoring, especially on Mt. Howard with regard to visitor impacts, are identified information gaps in the *Interagency Special Status and Sensitive Species Programs High Priority Species Implementation Guide*.

In 2007, a Candidate Conservation Agreement (CCA) was signed between the Wallowa-Whitman National Forest and the U.S. Fish and Wildlife service. The primary purpose of this CCA is to ensure the long-term conservation of *Lomatium greenmanii* through implementation of conservation actions and minimization of threats through an adaptive management process. These actions include the continued inventory or suitable habitat and the monitoring of known populations, especially at Mt. Howard, at least every two years.

In 2005, Joanna Schultz and Jeff Matthews developed a predictive model for *L. greenmanii*. This model uses geology, precipitation, slope, aspect, and elevation data from known *L. greenmanii* locations to identify and rank areas with the highest probability of occurrence. This model was used in 2007 and 2011 to survey habitat in the western portion of Wallowa Mountains (ISSSSP funded). No new populations were located in 2007. In 2011, one small new patch was detected within the vicinity of known population on Ruby Peak. This model identifies additional high potential habitat in the vicinity of Redmont Peak, Wing Ridge, and Brown Mountain. Brown Mountain has never been inventoried for *Lomatium greenmanii* or for any other rare plants.

In 2010, permanent monitoring transects were established at the Mt. Howard, Redmont Peak and Ruby Peak sites to assess the population trend of *Lomatium greenmanii* (Mancuso 2010). This monitoring protocol replaced previous efforts that were not consistent from site to site and

subsequently abandoned. The goal of this new monitoring program is to provide population, habitat, and threat trend information relevant to the rangewide conservation of Greenman's desert-parsley. It is meant to support the management objective to maintain Greenman's desert-parsley population abundance and extent at points similar to 2010 baseline monitoring values. Nested frequency data were collected along transects for *Lomatium greenmanii*, as well as for all vascular plants observable at the time. In 2011, these transects were again read at the Redmont Peak and Ruby peak sites, with the results reported to the ISSSSP. This report recommended modifying the monitoring design to read only the 3 smallest nest sizes for *Lomatium greenmanii* and to repeat the plant community frequency measurements at only 5 or 6-year intervals, rather than each visit. With this project, we read the monitoring plots on Redmont and Ruby Peaks, and inventoried for the presence of *Lomatium greenmanii* in suitable habitat on Brown Mountain.

Methods:

The study area is located in the Wallowa-Whitman National Forest, Eagle Cap Wilderness. One monitoring plot is on Redmont Peak near the eastern boundary of the wilderness; the other sits on the north ridge of Ruby Peak in the central-north of the wilderness (Figure 1 below).

Monitoring: We collected monitoring data per the protocol developed by Michael Mancuso, as modified. The sampling objective is to be 90% certain of detecting a 20% change in Greenman's desert-parsley frequency. At each site frequency data were collected at 1 meter intervals along a 50 meter transect for five plot sizes nested within a 0.5 meter x 0.5 meter microplot frame: 10 cm^2, 100 cm^2, 500 cm^2, 1000 cm^2, and 2000 cm^2. We collected frequency data for both vegetative and reproductive plants and for the presence of all vascular plant species, plus other attributes including ground cover, ground disturbance, and animal pellet presence. Ground cover "classes" included bare soil, litter, biological crust (moss/lichen), gravel (<8 cm [3 in] diameter), rock (>8 cm [3 in] diameter), and wood. The Redmont Peak plot was read July 25, 2013 and the Ruby Peak plot was read August 8, 2013. Frequency data was analyzed via chi-square analysis; however, we analyzed only the frequency of *Lomatium greenmanii* and no other species or habitat features.

We conducted the inventory using the intuitive controlled survey method within high and moderate potential habitat below the summit of Brown Mountain, which sits near the head of the West Fork Lostine River, immediately west of Minam Lake in the Eagle Cap Wilderness. The inventory was conducted in July 17-18, 2013. In addition, the lower and middle slopes of Brown Mountain contain habitat for several sensitive plants (*Carex vernacula*, *Carex micropoda*, *Carex nardina*, *Carex pelocarpa*), which would be examined on the route up and down the peak (Figure 2). And not to be passed up, a complex of wet meadows that contains habitat for *Carex media*, *Carex atrosquama*, *Carex media*, and rare *Botrychium* species rests in the vicinity of the logical campsite just north of Minam Lake. Approximately 150-200 acres of habitat would be examined.

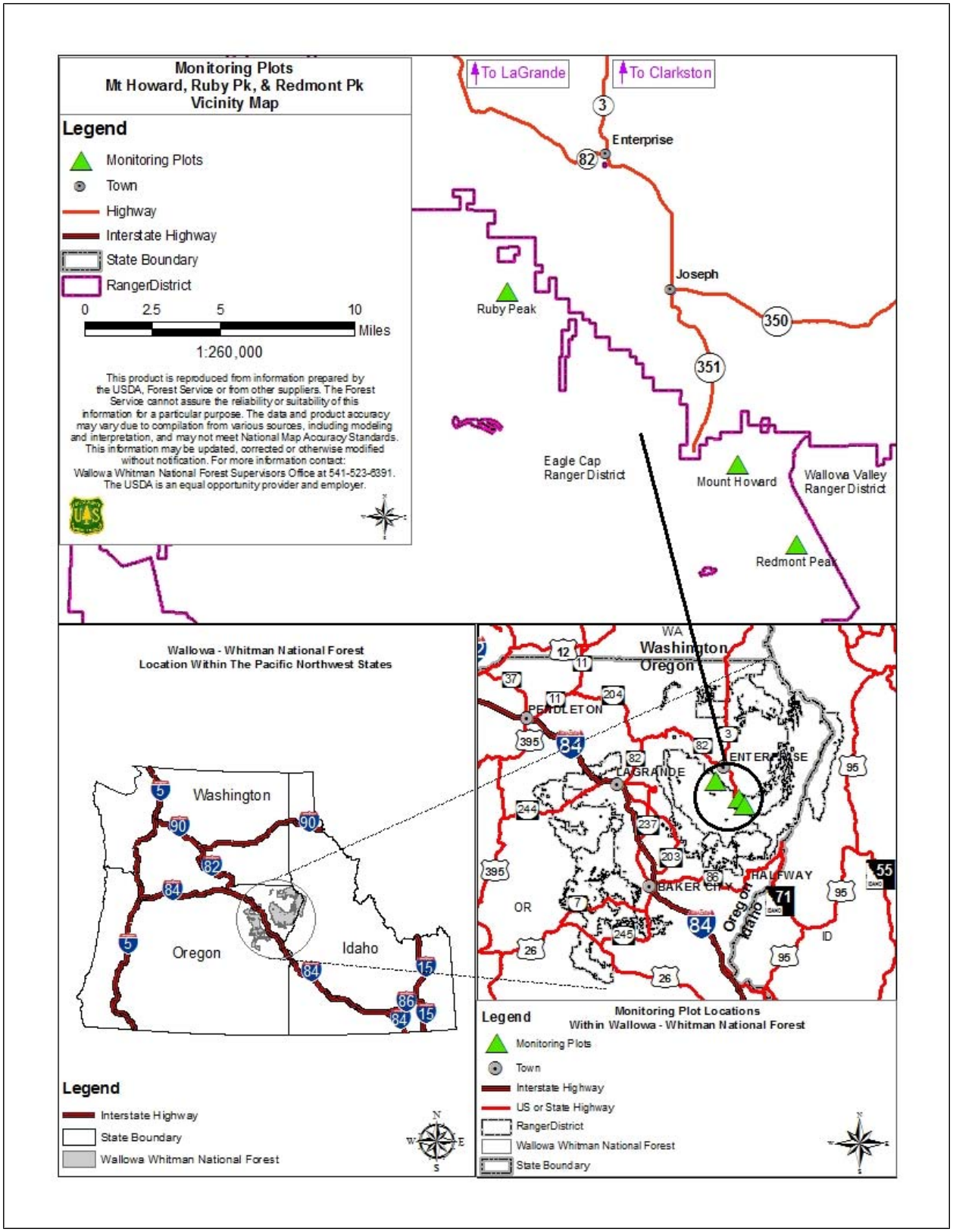

Figure 1. Project Area Map (from Mancuso 2010)

Results

Inventory: Figure 2 displays the area inventoried for the presence of *Lomatium greenmanii* on Brown Mountain. Although good suitable habitat was examined closely, *Lomatium greenmanii* was not detected.

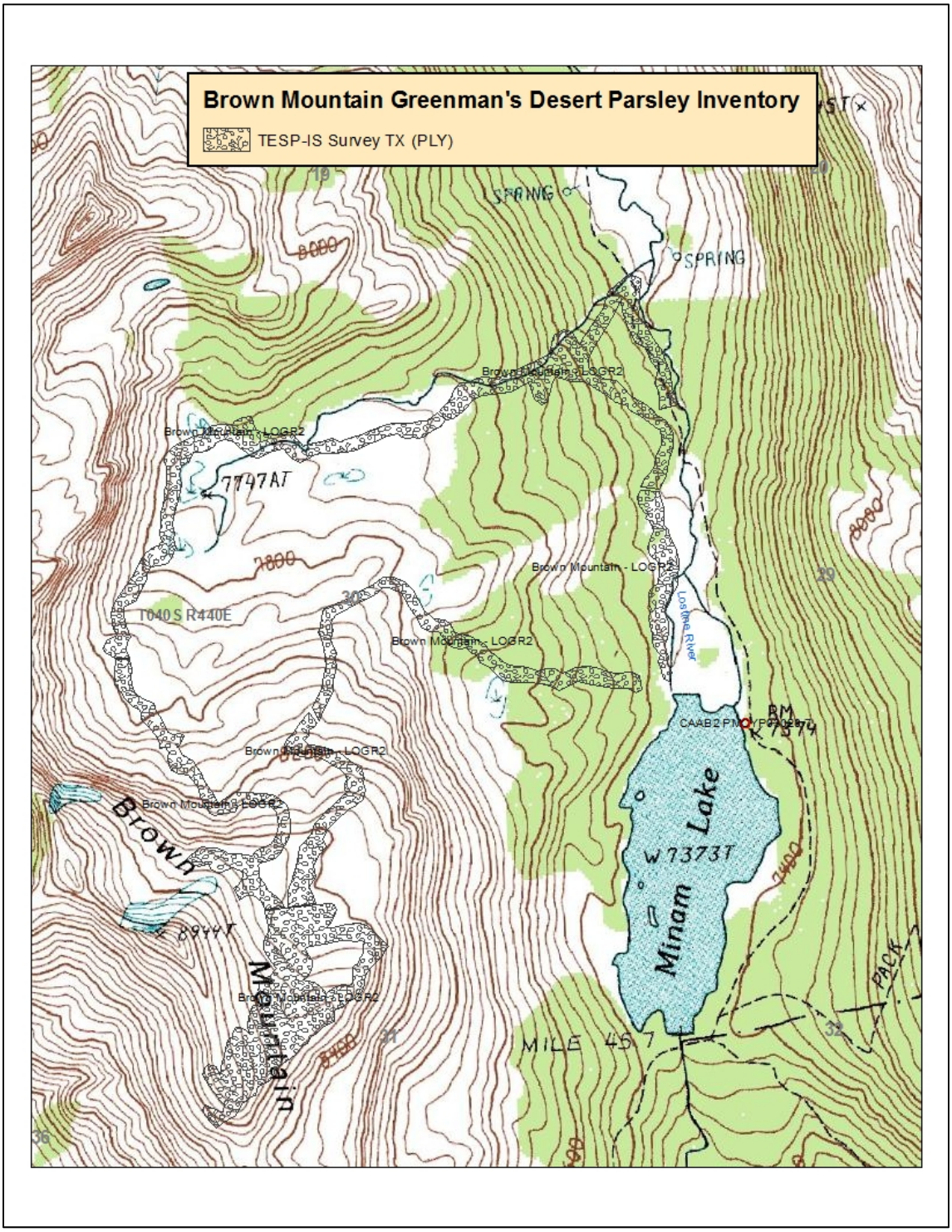

Figure 2. Map of Survey Area on Brown Mountain

Monitoring:

Table 1 and figure 3 below display the *Lomatium greenmanii* frequency results obtained in 2010, 2011, and 2013.

Table 1. Frequency values using the 100 cm^2 plot size.

Monitoring Site	2010	2011	2013
Ruby Peak	60%	46%	58%
Redmont Peak	62%	44%	48%

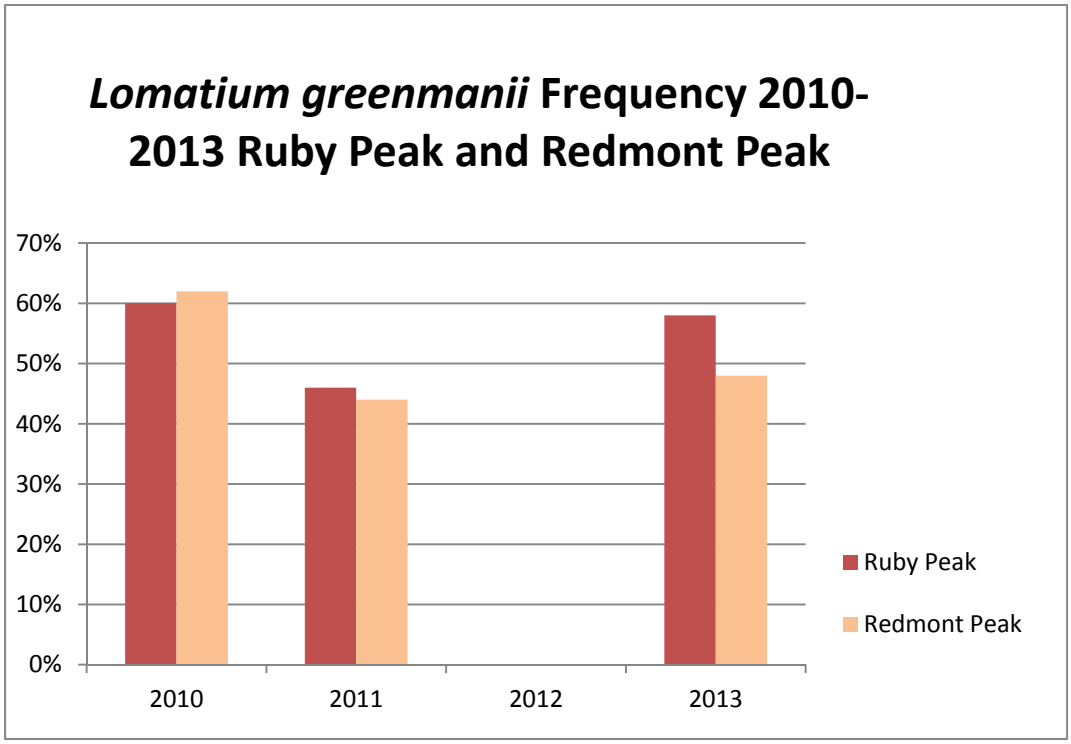

Figure 3. *Lomatium greenmanii* frequency at Ruby and Redmont Peaks.

Results are reported and charted using the 100 cm2 plot size because this rendered frequency values between 20 and 40 percent, as recommended by Elzinga, et al. (1999).

Discussion

Mancuso, 2010, nicely summarizes the monitoring efforts for *Lomatium greenmanii* prior to 2010:

"Prior to 2010, three separate monitoring studies were conducted in response to concerns over visitor disturbance impacts to Greenman's desert-parsley and its habitat at Mt. Howard. Methods and objectives varied, but each study included a component that attempted to correlate different levels of human trampling intensity with measures of Greenman's desert-parsley abundance. The first monitoring program for Greenman's desert-parsley was established at Mt.

Howard in 1988 (Kaye and Meinke 1993), but discontinued after the 1996 field season. A new program established monitoring plots at Mt. Howard and Ruby Peak in 1997 (Kagan 1999). Resampling of these plots was discontinued after the 2002 field season. In 2004, another monitoring effort was initiated, with baseline data collected at Mt. Howard and Ruby Peak (Schultz and Mathews 2004). A plot at Redmont Peak was added in 2005, but then this program was also discontinued.

"Inconsistency in the three previous monitoring effort methods precluded comparisons of the various datasets, including long-term conservation trend evaluation for Greenman's desert-parsley. A 2007 Conservation Agreement (U.S. Forest Service and U.S. Fish and Wildlife Service 2007) for Greenman's desert-parsley outlined a series of objectives, including the use of monitoring information to help maintain the species' long-term conservation. . . . The goal of this new monitoring program is to provide population, habitat, and threat trend information relevant to the rangewide conservation of Greenman's desert-parsley. It is meant to support the management objective to maintain Greenman's desert-parsley population abundance and extent at points similar to 2010 baseline monitoring values."

The Mancuso method is straightforward and easy to implement. Although its results cannot fairly be compared to the prior frequency method for gathering data, we can assess trend during the period from 1997-2002 at Ruby Peak from results gathered using the Kagan (1999) methodology (Figure 4, below), and then also analyze separately the period from 2010-2013 (Figure 3) using the Mancuso method.

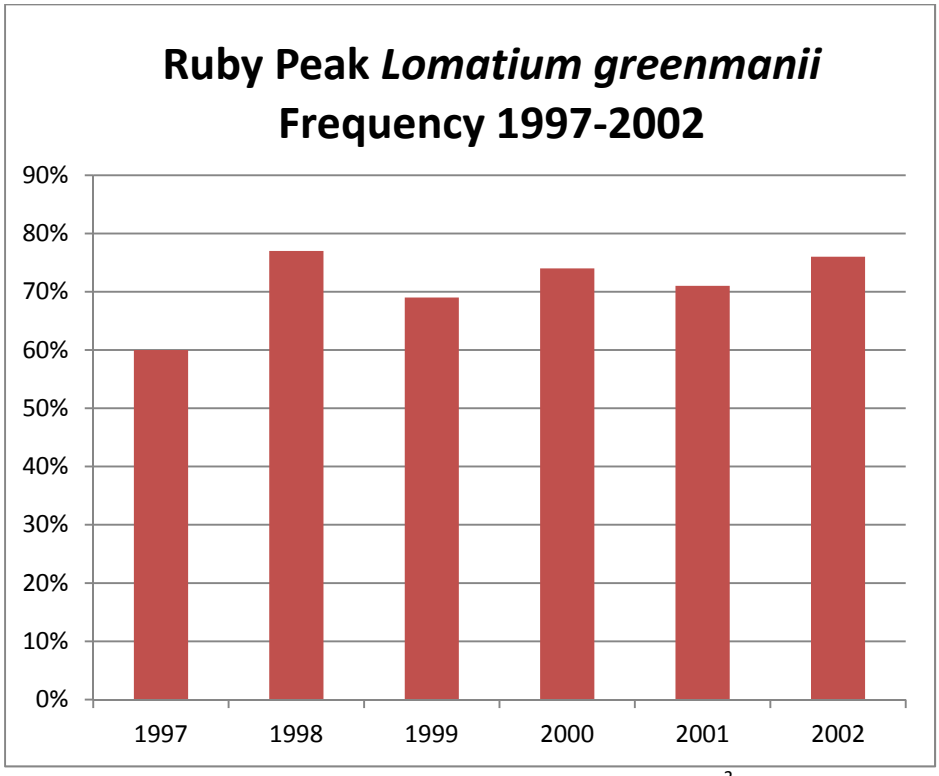

Figure 4. Frequency values at Ruby Peak, 1997-2002; 100 cm^2 plot.

In his report summarizing prior monitoring efforts, Mancuso (2010) did not evaluate these data using the chi-square analysis, but interpreted the raw data to show a fairly stable trend in frequency. The results in the table above show apparently stable frequency values from year to year, with the possible exception of 1997-98. Chi-square analysis of these data reveal that, at a P-threshold of 0.1, there is a change in frequency between 1997 (60%) and 1998 (77%) but no statistically valid change from 1998 – 2002. At a P-threshold of 0.05, there is no change for the full span from 1997 to 1998.

For the years 2010 through 2013 at Ruby Peak, there is no statistically valid change in frequency between 2010 and 2011, 2011 to 2013 or 2010 to 2013.

Insofar as frequency is a good measure to track population trends over time[1], the Ruby Peak populations appear stable during both the 1997-2002 and 2010-2013 monitoring periods. Given the data gap of 8 years from 2002- 2010 and the difference between monitoring methods, there's no way to evaluate whether there were actual increases or decreases in frequency over the longer period or between the two monitoring periods. The mean frequency value for the years 1997-2002 is 71%, and for the years 2010 – 2013, 55%; however, we cannot conclude frequency dropped between the two periods. We may be contented with the fact that the frequency is stable during both periods that were measured at Ruby Peak

Redmont Peak

Frequency has been measured at Redmont Peak only 3 times over a four year period: 2010, 2011 and 2013. Chi-square analysis of the data show, at a P-threshold of 0.1, a valid change in frequency from 2010 (62%) and 2011 (44%). There is no change in frequency between 2011 and 2013 or from 2010 to 2013. At a P-threshold of 0.05, there is no statistically significant change in frequency over this period. Because of the brief period monitored, it's premature to draw any conclusions about the long term trend of frequency or population status at Redmont Peak.

Considerations: Because the transects are permanently located, McNemar's Test, rather than chi-square, could have been used to evaluate the data between two observations with much greater power to detect change (Elzinga, et al. 1999). However, to use McNemar's Test plots must be located precisely along the transect with each successive reading. Given the difficulty in laying out a 50 meter transect, even with the midpoint permanently marked, there is still lateral movement or sway in the tape measure used to establish the transect, such that small plots along the transect are not likely to be precisely located in the exact position each year.

The management objective is to maintain at least steady populations at each of the localities that support *Lomatium greenmanii*, Mt. Howard, Ruby Peak and Redmont Peak. Because both Ruby Peak and Redmont Peak are located in wilderness, off system trails, direct impacts from people are expected to contribute few, if any, lasting impacts. If we detected sustained downward trends over time, and could not determine a cause, we may be limited in our ability to intervene with management because of the wilderness designation. Because the plots are "more or less"

[1] Frequency is affected by both spatial distribution and density and not a true measure of population levels. See Elzinga et al. (1999) page 175.

permanent, I see no reason not to set the P-threshold at 0.05, and be 95 percent certain of a change in frequency.

Although all plot nests were recorded, the results are reported and charted above using the 100 cm2 plot size because this rendered frequency values between 20 and 40 percent, as recommended by Elzinga, et al. (1999). If, over time, a large shift in frequency either up or down is recorded, , then recent past data would be reanalyzed at the different nest size to continue to measure trend and change over time.

I evaluated the data at two different P-thresholds: $\alpha = 0.1$, as specified in the monitoring objective, but also at $\alpha = 0.05$. As a manager, I would rather analyze data at the 0.05 level, so we can have a higher probability of detecting change, or a lower probability of reporting a false change. It's very little additional work to perform chi-square analysis at a second P-threshold.

While the Mancuso monitoring design is not perfect (it does not sample from throughout the population and so cannot be used to draw conclusions about the entire population), transect placement is representative of the relatively small patches of *Lomatium greenmanii*; thus, inferences could fairly be drawn about the patch where the plant grows, assuming observers noted no other consequential changes in habitat (trampling, trailing, invasive plants, herbivory, etc.).

Mancuso (2010) is the fourth monitoring design since 1988. We need to continue monitoring with this design to be able to track frequency change over the long term. This is not possible by changing the monitoring design each decade. While it is helpful to understand, as a biological baseline, the year-to-year fluctuations in frequency over the short term, we are most interested in the long-term trend of the populations and species as a whole. We need to detect sustained changes over the long-term. The only way to do this is to use the same monitoring design over the long term.

References

Elzinga, C.L., D.W. Salzer, and J.W. Willoughby. 1998. Measuring and Monitoring Plant Populations, BLM Technical Reference 1730-1.

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