Lomatium pastorale Inventory

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Umatilla and Wallowa-Whitman National Forests

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Introduction

Lomatium pastorale is a recently described species (Darrach and Wagner 2011), narrowly endemic to the Blue Mountains of northeastern Oregon, occupying a very small range of just a few square miles about 10-15 miles north-northwest of La Grande, Oregon (Figure 1). Darrach and Wagner had earlier noted the presence of populations clustered in two vicinities. Most occurrences are on the Umatilla National Forest; the Wallowa-Whitman National Forest had one confirmed location and two other putative locations. All known sites are on NFS lands. Occupied habitat is restricted to vernally-wet, shallow Columbia River Basalt Group derived lithosols on gently to moderately sloping surfaces of varying aspect. Some local portions of the populations are quite dense – most notably in areas that are subject to persistent disturbance of the top several centimeters of the soil profile. Natural disturbances include well-documented fossorial rodent (northern pocket gophers) activity, big game ungulate use, freeze-thaw cycles, sheet erosion, and, possibly, fire. Documented human-induced disturbances that appear to have positively affected populations include domestic sheep usage, and one site that has been used for quarrying and piling road metal. In the absence of a persistent disturbance regime successional processes result in declines in *L. pastorale* populations presumably largely as a function of increased competitive selection pressures. The species exhibits ruderal characteristics and strong evidence indicates it requires periodic disturbance to maintain its population viability (Darrach and Wagner 2011). Threats to the species include interruptions in the disturbance regime to which the species is adapted; destruction of habitat, such as new road construction, quarrying and piling activities and *early* season grazing. The small range of the species also leaves it vulnerable to destruction via natural stochastic events and intentional or accidental anthropogenic impacts such as aggressive weed infestations. An additional threat noted during this study is the ongoing impacts of off-road vehicle activity – predominantly ATV's and some full-size 4 wheel drive usage as well. These illegal incursions are resulting in soil rutting and compaction.

Until recently, very little has been known about *Lomatium pastorale*, and we lacked important specific knowledge of the abundance, distribution and conservation status of the few known occurrences. A few forays were made at two or three sites back in the 1980's and early 1990's. Since then, the Forest Service has devoted little attention to this plant owing largely to botany staff turnovers through the years and a perceived, but never adequately investigated, uncertain taxonomic status. None of the occurrences had been mapped and described according to the national Forest Service protocol nor entered into the NRM TES-IS national database. For the purposes of this project we collected population data at all known sites with the exception of one uncharacterized site just south of Big Saddle along the FS 3100000 road (Fig. 2). We entered all field data into NRM TESP-IS.

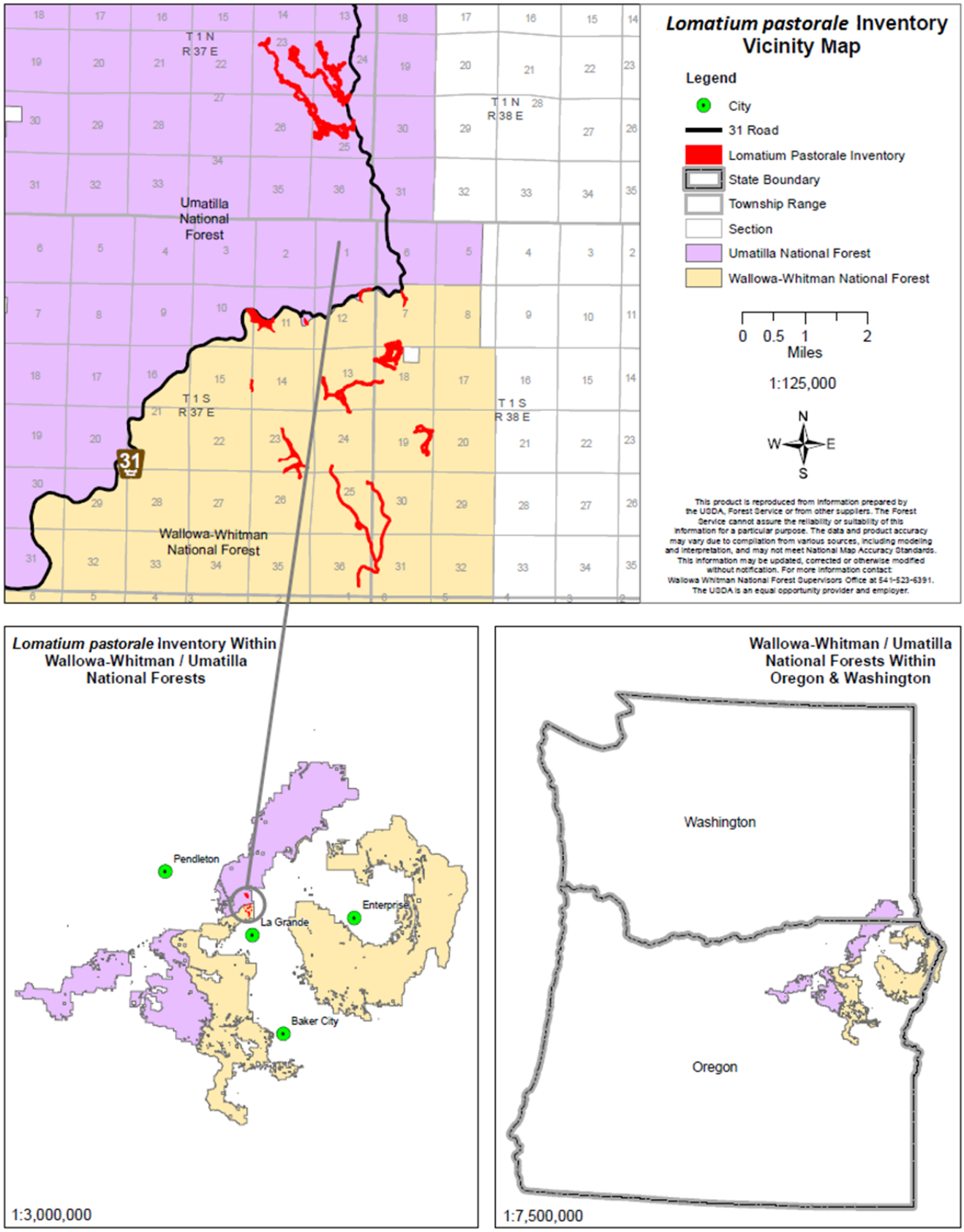

Figure 1. Project Vicinity Map

Methods:

The study/survey area is located on both the Umatilla and Wallowa-Whitman National Forests north and south of the northernmost divide separating the two forests. *L. pastorale* is a relatively easy plant to survey as it is readily identifiable and distinguishable from its congeners. Effective timeframes for surveying in a typical year begin in mid-May and conclude by July 1st. Late in July the plants fully die back to the root crown, enter dormancy and are largely not recognizable on the ground. The species has unique characters including a prostrate habit when in bloom with the typical yellow corolla common in the genus, relatively broad and notably shiny green leaflets and, when mature, spreading narrowly elliptical fruits with a short, but noticeable pedicel. The aspect ratio of mature *L. pastorale* fruits ranges from 2.0 to 3.5. In contrast *L. leptocarpum* – the species most likely to be confused with *L. pastorale* – has a more upright habit when at anthesis, much narrower leaves with a dull patina, and very narrow semi-erect elongate fruits that are very nearly fully sessile. Aspect ratios for mature *L. leptocarpum* fruits range from 3.5 – 13.3.

Surveys were conducted between May 23 and Jun 24th, 2016. Surveys were conducted using the random meander method (Nelson 1985). Mark Darrach, Susan Geer, Kayla Saager, Paula Brooks, and Joann Harris-Rode first visited the type locality for *Lomatium pastorale* May 23, 2016 to examine phenology and confirm identification. The type locality was fully inventoried to delineate population boundaries. Additional surveys were conducted in the area on both the Umatilla and Wallowa-Whitman National Forests north, west and south of the type locality in gently sloping, vernally wet, lithosol habitats between 5,000 and 6,000 feet (1500-1830 m) in elevation, assumed to be appropriate for the species. Habitat consists of meadows sparsely vegetated by native bunchgrasses (*Poa secunda, Danthonia spicata, Achnatherum lemmonii*), other geophytes (*Allium fibrillum, Fritillaria pudica, Lomatium ambiguum, L. leptocarpum, L. grayi, L. piperi, Tritelia grandiflora*) and a host of forbs (*Achillea millefolium, Balsamorhiza hookeri, Eriogonum heracleoides, Senecio integerrimus*) (Wagner 2013; Darrach and Wagner 2011).

Results

715 acres were inventoried (360 Wallowa-Whitman NF; 355 Umatilla NF); 4 previously undocumented, or poorly-constrained, occurrences were fully documented and entered into NRM. Table 1 summarizes select fields from NRM TESP-IS Element Occurrence (EO) data records for each occurrence. Figure 2 shows mapped survey areas and *Lomatium pastorale* element occurrences.

Table 1. *Lomatium pastorale* Element Occurrences

Wallowa-Whitman National Forest				
SITE ID	***EO DATE***	***PLANT COUNT***	***ELEV AVG***	***DISTURBANCE / THREATS / COMMENTS***
0616062543	07/01/2010	750	5170	The only known population of *Lomatium pastorale* with no apparent source of sufficient persistent disturbance; vegetation succession is clearly replacing the plants here and the population is likely to be extirpated over the long term.
0616062542	05/23/2016	Est 10000	5760	OHV activity at this site was observed and is of concern.
0616062545	05/25/2016	Est 8000	5186	Non-native species *Thinopyrum intermedium* and *Hypericum perforatum* present

Umatilla National Forest				
SITE ID	***EO DATE***	***PLANT COUNT***	***ELEV AVG***	***DISTURBANCE / THREATS / COMMENTS***
0614061066	05/23/2016	Est 5000	5600	Type locality, fossorial rodents are active at this site and the population is apparently healthy and thriving.
0614061064	07/06/2011	200	5180	Small satellite population to EO 1066
0614061071	06/24/2016	Est 10000	5600	OHV activity is a significant issue throughout much of this element occurrence.

Figure 2. Overview of study area. Red polygons are *Lomatium pastorale* occurrences labeled with the NRM TESP Site ID**;** light blue polygons represent surveyed areas.

Discussion

Survey efforts documenting *Lomatium pastorale* populations in 2016 have revealed and further support previous investigative efforts (Darrach and Wagner 2011; unpublished data 2011). Our results confirm the species is a rare, very narrow endemic with highly specific habitat requirements. *Lomatium pastorale* grows on shallow, poorly developed soils derived from Miocene age Columbia River basalt in open, vernally moist "meadows" between 5100 and 5800 feet (1550 m – 1750 m) in elevation. These sites typically are sparsely vegetated by xeric bunchgrasses (*Poa secunda, Danthonia unispicata*) with a flora consisting mainly of other geophytes and forbs exploiting the late spring, early summer moisture. Sites are exposed and typically situated on broad summits, ridges or other gently sloping topography of varying aspects. The micro-topography is usually concave with plants found in swales, ephemeral runoff channels and "depressions"; locations where snowmelt collects and soils remain saturated longer into the season.

Lomatium pastorale dominates the vegetation cover at EO's 0614061066, 0614061071, and 06160625, where sheep and cattle grazing in the late 19th and early 20th century left these sites relatively barren. Ensuing erosion resulted in the current shallow-soiled environment, with ample erosion pavement. The type locality for *L. pastorale* (EO 0614061066) is reported to have been a sheep bedding area during the early settlement period and the nearby spring, in continuing use as a livestock watering site, has likely lead to increased trampling from cattle in the EO (Wagner 2013). Though some 80 years have passed since the heaviest grazing ended at this site, grasses have not recovered to the density seen at other nearby meadows. The dominance of *L. pastorale* in this ruderal habitat suggests the species is adapted to disturbance and earlier successional transition states (Wagner 2013).

Our field observations support Wagner's (2013) and other's observations that a *persistent* disturbance regime is critical for successful recruitment and subsequent establishment and survival of new cohorts. Data collected in 2011 as a field project at the *Lomatium pastorale* type locality (EO 0614061066 in Table 1 above), associated with a Foundations of Ecological Monitoring in a Management Context class presented by Dr. Bob Unnasch and Dr. David Maddox, strongly indicated that disturbance ecology plays an important role in allowing for successful establishment of seedlings.

Our inventories support this contention. The presence of abundant populations of northern pocket gophers (*Thomomys talpoides*) provide for a persistent and strong disturbance regime that bioturbates the top several centimeters of the soil profile where *Lomatium pastorale* is found. This in turn creates a seedbed in which the plants readily germinate and establish in the relative absence of strong competitive interactions with other plant species. In these sites it is clear that population structure includes the full spectrum of putative age classes from seedlings through to mature plants that are likely many decades old (Darrach and Wagner 2011). It is also apparent that this disturbance regime is potentially unstable, because we observed locales where *L. pastorale* lack a persistent source of disturbance (EO-0616062543 and peripheral areas of EO 0614061071). In these areas *L. pastorale* appears to have decreased in cover at the expense of more persistent species comprising later successional states. Northern pocket gophers and many

other fossorial mammals significantly rely upon the presence of winter snowpack to provide both cover from predation and thermoregulatory capacity (Vaughn et al. 2000). As the predicted effects of anthropogenically-mediated climate warming proceed, large reductions in snowpack are anticipated and attendant impacts to pocket gophers can be expected. The end result relative to *L. pastorale* is likely to be large population reductions of an already extremely rare species.

A second source of persistent disturbance, perhaps of less consequence than soil bioturbation by pocket gophers, is the drain patterns of melting snowpack on the gentle slopes where the plant grows. Snowpack in the area of EO's 0616062542 and 0614061071 is quite significant and would appear, in a normal water year, to be well in excess of 1-meter of standing snow at the height of winter. As the snow melts, the water ponds in some areas as the topography and remaining snowbanks impound it. This effect may last in some years for considerable periods thereby affecting the composition of the plant community. For example, this may inhibit the establishment of competing perennial bunchgrasses. These same areas also support an incompletely mapped population of the very rare species, midget quillwort (*Isoetes minima*). Snow melt channels are themselves sources of disturbance and are evidently habitable sites for dense populations of *L. pastorale*. A declining snowpack during a warming climate regime could result in the loss of suitable habitat for *L. pastorale*.

One additional risk factor to the species that was observed while conducting *L. pastorale* surveys is the presence of significant amounts of destructive off-road activities by both ATV and full-size 4-wheel vehicles at some of the populations. These impacts are particularly noteworthy in EO's 0616062542 and 0614061071 where both rutting of saturated soils and soil compaction were observed.

In addition to the physical damage to soils caused by off-road activity the threat of the introduction of invasive species brought in on these vehicles is of significant concern as well. While the presence of worrisome invasive plant species in the general area is rather low; *Hypericum perforatum* is the only species in the area that may pose a substantial threat. And the highly invasive and extremely competitive exotic annual grass species, North Africa grass (*Ventenata dubia*) was not detected the immediate area. The *Lomatium pastorale* sites would appear to be highly susceptible to invasions by this allelopathic and extremely competitive grass. If *V. dubia* were to establish in these populations, it would be very difficult to manage and, if not eradicated or substantially reduced in cover, may result in population extirpation over time.

While *Lomatium pastorale* is a disturbance dependent species, vehicle damage is clearly concerning and needs to be addressed via management actions. Preliminary management actions have been discussed with Umatilla N.F. administrative, engineering and law enforcement staff. Road decommissioning and emplacement of cameras are under consideration. No actions have been taken to date and populations on the Wallowa-Whitman N.F. have not been addressed at this time.

Conclusions and Recommendations

The following recommendations should be considered with respect to further efforts and management of *L. pastorale* populations.

- Areas known to be occupied by *L. pastorale* immediately south of Big Saddle (figure 2) along the FS 31 road need to be mapped and characterized. Ample suitable habitat remains to be surveyed within the project area. A simple model could be constructed using elevation (> 3,000 ft); vegetation (non-forest or further refined to specific ecoclass types if these have been mapped in the project area); and slope, which would be determined following a slope analysis of known sites.

- Develop a long-term trend monitoring program, preferably one with both photo monitoring and point intercept data in two of the subpopulations; one on the Umatilla N.F. and one on the Wallowa-Whitman N.F.

- Develop site management plans that address the risk posed by OHV activity.

- Share the 2016 data with the Natural Heritage Programs so that an accurate ranking of *L. pastorale* can be conducted using the NatureServe Conservation Rank Calculator.

References

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Appendix A – Associated Species

Achillea millefolium	*Geum triflorum*	*Navarretia intertexta*
Achnatherum lemmonii	*Gilia capillaris*	*Olysynium douglasii* var. *inflatum*
Allium fibrillum	*Hesperochiron pumilus*	*Orogenia linearifolia*
Antennaria luzuloides	*Hydrophyllum capitatum*	*Paeonia brownii*
Balsamorhiza hookeri var. *hirsuta*	*Hypericum perforatum**	*Penstemon attenuatus*
Besseya rubra	*Isoetes minima*	*Perideridia gairdneri*
Bromus carinatus	*Juncus bufonium*	*Plagiobothrys scouleri* var. *penicellatus*
Bromus marginatus	*Juncus confusus*	*Poa bulbosa**
*Bromus tectorum**	*Juncus hemiendytus* var. *hemiendytus*	*Poa leibergii*
Camassia quamash	*Juncus parryi*	*Poa secunda*
Carex microptera	*Leptosiphon harknessii*	*Polygonum kelloggii*
Claytonia lanceolata	*Lewisia nevadensis*	*Polygonum majus*
Collinsia parviflora	*Lewisia triphylla*	*Primula conjugens*
Collomia linearis	*Lithophragma glabrum*	*Pseudoroegneria spicata*
Cryptantha torreyana	*Lithophragma parviflora*	*Pyrrocoma carthamoides*
Danthonia unispicata	*Lomatium ambiguum*	*Pyrrocoma hirta* var. *sonchifolia*
Delphinium nuttallianum	*Lomatium cous*	*Ranunculus orthorhynchus*
Deschampsia elongata	*Lomatium grayi*	*Ranunculus uncinatus*
Draba verna	*Lomatium leptocarpum*	*Rudbeckia occidentalis*
Drymocallis glandulosa	*Lomatium piperi*	*Sanguisorba annua*
Elymus elymoides	*Lupinus aridus* var. *aridus*	*Sanicula graveolens*
Epilobium brachycarpum	*Lupinus sulphureus*	*Saxifraga nidifica*
Epilobium palustre	*Madia glomerata*	*Sedum stenopetalum*
Eriogonum douglasii	*Mertensia longiflorus*	*Senecio hydrophiloides*
Eriogonum heracleoides	*Microseris nutans*	*Senecio integerrimus* var. *exaltatus*
Erythronium grandiflora	*Microsteris gracilis*	*Sicalcea oregana var. procera*
Floerkia proserpinacoides	*Monardella odoratissima*	*Thermopsis montana*
Fritillaria pudica	*Montia linearis*	*Triteliaea grandiflora* var. *grandiflora*
Gayophytum humile	*Navarretia divaricata*	*Vulpia bromoides**

(* Non-native species)