Rubus bartonianus Status Review for Wallowa-Whitman NF And Baker Resource Area, Vale District BLM

October 2010

Photo by Roger Ferriel

Introduction

Rubus bartonianus (Bartonberry) is endemic to Hells Canyon of the Snake River and its tributaries. Bartonberry is named in honor of Lenora Barton, a rancher who owned a considerable amount of land in Hells Canyon in the early to mid part of the last century. Mrs. Barton first found the Bartonberry at Battle Creek around 1931. She sent some "fragments" to Morton Peck at Willamette University. Peck visited northeastern Oregon in the summer of 1933, including Hells Canyon and the Bartonberry at Battle Creek. Peck tentatively called the plant *R. deliciousus*, due to its resemblance to that Rocky Mountain species. On further examination, Peck determined the Hells Canyon shrub to be distinct from *R. deliciousus* and subsequently named it after Mrs. Barton (Peck, 1934).

In Oregon, Bartonberry has been reported from the Snake River in Hells Canyon between Copper Creek on BLM land about five miles north of Copperfield to Christmas Creek, which is approximately 11 air miles southeast of the confluence of the Snake and Salmon Rivers. The total historic range of Bartonberry in Oregon extends over 48 air miles. In Idaho, it occurs more or less continuously between Kinney Creek on the Payette NF to opposite the mouth of Battle Creek in the Hells Canyon NRA, a distance of about 11.5 river miles (Moseley and Mancuso 1992). Downstream from this, it is known from three widely disjunct locations in Idaho (Moseley and Mancuso 1992). Hitchcock, et al. (1977) describes Bartonberry as growing on protected canyon sides, forming thickets along streams. Elevations for Bartonberry range from about 1100 feet near the Snake River to around 4600 feet for the uppermost populations. Bartonberry has been propagated in Riggins by Mrs. Barton's son, Ace Barton (Rosentreter, pers. comm.).

To date, little is known about the current status of known Bartonberry sites or its ecology. In this study, we revisited known Bartonberry sites to determine the extent and current status of the population in Oregon. We were also interested in gaining an understanding of threats to the plant, such as competition from other plant species, and its response to fire.

Study Area

The study area included 59.5 river miles of the Snake River in Hells Canyon between Copper Creek, near Copperfield to Christmas Creek on the Oregon side of the canyon. Hells Canyon is the deepest canyon in North America, measured from the tallest peak in the Seven Devils to the Snake River the gorge measures 8000 vertical feet. Adjacent ridges are on average 5,500 vertical feet above the river. As you travel through the canyon by boat, you have the overwhelming sense of cataclysmic forces at work. Impossibly steep canyons lift from under the surface of the river to many thousand feet above. Waterfalls cascade off the lips of sheer cliffs. The area has been visited by lava flows, plate tectonics, great uplifts, faults and massive flooding and landslides. Vegetation changes with changes in soil type and moisture retention as well as aspect and elevation. The complex mosaic of side canyons offers shady protected microsites, frequently with abundant water from seeps. Columbia basalt overlies complex and ancient geology below, which is exposed as the Snake River has worked its way deeper into the earth (see Vallier, 1998). Bartonberry is found on the oldest geology, originating over 200 million years ago along two continental plates at the subduction zone. This diverse mixture of metasedamentary and metavolcanic rock was heated under great pressure and folded into a chaotic complex of rock types. Depth to bedrock is less than 2 feet and rock outcrops abound (Sasich 2006).

Methods

We used the focused (intuitive controlled) survey method (USDAFS 2005), starting with documented sites (ORNHIC, NRIS, GEOBOB) and expanding to suitable adjacent habitat. Due to the challenges of the steep, sometimes unstable terrain, we accessed most sites by boat. Bartonberry sites were GPSed and mapped. We were able to backpack to the upper portions of the documented populations.

A search of regional herbaria was also completed to see where *Rubus bartonianus* had been collected in the past. The following herbaria were contacted or their databases were accessed on-line to obtain the *R. bartonianus* herbarium records that are in Appendix 3: The Consortium of Pacific Northwest Herbaria; The Marion Ownbey Herbarium at Washington State University at Pullman, WA; The Stillinger Herbarium at University of Idaho, Moscow, ID; The University of Montana Herbarium at University of Montana, Missoula, MT; The H. M. Tucker Herbarium at Albertson College of Idaho, Caldwell, ID; The C. V. Starr Herbarium at the New York Botanical Garden, New York, NY; The Rocky Mountain Herbarium at the University of Wyoming, Laramie, WY; and the Wallowa Whitman National Forest Herbarium, Baker City, OR.

Results and Discussion

2009

Transportation	**Days**	**People**	**Person Days**
Tri County CWMA Boat	2	4 people/ day	8
Hells Canyon Adventures Jet Boat	2	4 people/ day	8
Hiking	6	2-3 people	16
MIMA survey crew, incidental sightings	na	na	na

2010

Transportation	**Days**	**People**	**Person Days**
Winding Rivers Rafting Company (April)	4	6 people/ day	24
Hiking	3	2 people/ day	6

Acres Surveyed

Year	**BLM**	**USFS**
2009	**64**	**280**
2010	**91**	**288**
Total Acres Surveyed		**723**

Abundance and Distribution

In 2009, ten previously documented Bartonberry sites were revisited. Bartonberry was not relocated at two sites - the historic site (Christmas Creek last visited in 1927) and BLM's Copper Creek. Populations were confirmed for five sites: Lynch Creek, Lower Squaw Creek, Upper and Lower 32 Mile Creek, and Steamboat Creek. Populations were found to extend over larger areas for three sites: Upper Squaw Creek, Hells Canyon Dam Launch Area and trail, and

Battle Creek. Four new locations were found at Wild Sheep and Bull Creeks, Cache Creek, South of Davis Creek, and between McCarty and Somers Creeks.

In 2010, an additional three days were spent searching for the historic BLM site at Copper Creek. No plants were detected. See Appendix 1 for details. Four sites were visited during the April raft trip, three are new, and one was a revisit as there was a historic record for McCarty Creek. The population of Bartonberry in Oregon currently occupies two disjunct portions of Hells Canyon (**SEE MAP**). The southern portion of the population occupies the area between Lynch Creek and Cache Creek, about 15 river miles. The smaller northern portion is found from just north of Pleasant Valley Creek to just south of Somers Creek, about 2.25 river miles. The Idaho side of the population corresponds, more or less, with the Oregon population, with the exception of the Steep Creek population, which lies between the southern and northern populations.

During the April 2010 raft trip, the mouth of Camp Creek was surveyed and no Bartonberry was detected, however the survey was done looking down into the creek and vegetation was dense. It was noted that Camp Creek needs another visit. The herbarium search also yielded a historic record from McCarty Creek that was not in ORBIC or NRIS databases. The 2009 and 2010 searches failed to detect Bartonberry at Copper Creek or Christmas Creek sites and it appears Bartonberry has been extirpated from these sites. This is a reduction of 14.5 river miles of Bartonberry's global extent.

A total of 56 *Rubus bartonianus* herbarium records were found. Twenty-one collections are duplicates by the same collector, same collection date, and same collection location. Thus, thirty-five unique collections of *Rubus bartonianus* were found. The herbarium search also revealed four previously undocumented *Rubus bartonianus* locations in Oregon at Somers, McCarty, Davis, and Camp Creeks.

Observations Regarding Life History

Bartonberry is generally found on soils derived from basalt parent material where there is at least seasonally abundant water available and shading for part of the day. Its elevational range is between 1100 and 4600 feet, with the southern population ranging from 1700 to 4600 feet and the northern population at 1100 to 1400 feet. Observations in September 2010 indicate the shrub is deciduous and loses most of its leaves by late September. Plants commonly associated with Bartonberry are netleaf hackberry (*Celtis reticulata*), elderberry (*Sambucus cerulea*), mockorange (*Philadelphus lewisii*), rocky mountain maple (*Acer glabrum*), Gooding's gooseberry (*Ribes velutinum* var. *gooddingii*), western white clematis (*Clematis ligusticifolia*), ninebark (*Physocarpus malvaceus*), western poison ivy (*Toxicodendron radicata*), smooth sumac (*Rhus glabra*), choke cherry (*Prunus virginiana*), serviceberry (*Amelanchier alnifolia*), dogwood (*Cornus sericea*) and bluebunch wheatgrass (*Pseudoroegneria spicata*).

Bartonberry appears to be, at least in part, a fire evader, growing in rock talus and out of cliff crevices in rock faces where competition in minimal and where rock acts as a fire refugium. However, it can also be found growing along streams under a fairly dense canopy of other shrub species. Bartonberry has been observed to be a vigorous root-sprouter after fire, as observed on the north tributary of Battle Creek. Moseley (1989) also observed that in Idaho "*A large proportion of the (bartonberry) individuals on the Payette NF were burned in the 1988 Eagle Bar Fire. I observed in May 1989, that most of the plants burned were resprouting from the base and had new shoots up to two feet long.*" In addition, the seven occurrences that were within the perimeter of the 2007 Battle Creek Fire were found to be extant with the exception of one of the

locations within the Upper Squaw Creek population. This site consisting of one plant was not relocated.

Both the pollinators and the seed dispersers of Bartonberry are not known. We did observe fecal splats, probably from birds, that appeared to be primarily berries, on rocks near the plants. At Steamboat Creek, we saw what appeared to be skippers taking nectar from the Bartonberry flowers. We also saw insects that looked like a cross between flies and bees visiting the flowers. The Bartonberry plants along the Hells Canyon Dam Trail heading north were infested with blister beetles, an insect that is common on many plant species in our area (Liah Speigel, pers. comm.) Blister beetles are not pollinators, they eat plant tissue. Bartonberry plants were also lightly infested with orange rust on the undersides of leaves. Outwardly, this rust looked very similar to rust found on Ribes. It did not seem to be adversely affecting the Bartonberry.

Threats to Bartonberry

Past disturbances in Bartonberry habitats include fire, livestock grazing, landslides, road construction and maintenance, and dam construction. Present and future threats include global climate change, noxious weeds, invasive nonnative plants, livestock grazing, noxious weed control, and landslides. There are two active grazing allotments within the range of the southern Bartonberry population. Saddle Creek allotment extends from north of Hells Canyon Dam Visitors Center to the upper portion of the Battle Creek site. Light grazing was observed during the 2009 visit to the lower portion of Battle Creek, which is not in this allotment. The Snake Allotment runs from McGraw Creek to north of Thirty-two Point Creek. This allotment includes the bench area located 3000 feet above the river, which is the uppermost elevational extent of Bartonberry. One hundred to one hundred-fifty cow-calf pairs are run from April to July in this allotment. In 2009, one location within the upper Squaw Creek population (EO# PDROS1K0x0.7) was not relocated. This site consisted of a single plant in 1993. Cattle use was light, with the exception of the area immediately adjacent to the trail, which was where the location of Bartonberry had been described. The area had also burned in the 2007 Battle Creek Fire Complex. Whether the plants were mis-mapped or extirpated due to a combination of fire and grazing is not known. Bartonberry that grows in rock crevices and talus slides is most likely not accessible to cattle. It is possible that cattle and wild ungulates browse Bartonberry along with other shrubs in accessible drainages after grasses have cured. Sheep may have had greater browsing impacts historically, but sheep grazing was curtailed in HCNRA in 1994, due to the potential for transmission of pasteurella pneumonia to wild big horn sheep.

Considering all noxious weeds that might affect Bartonberry, Himalayan blackberry (*Rubus armeniacus*) is the greatest concern. It is able to occupy the same habitats as Bartonberry and appears to be the better competitor. Himalayan blackberry is a fast growing sprawling shrub that does not lose its leaves in the winter in Hells Canyon (Leigh Dawson per comm.). Recently it has been noted that the Himalayan blackberry is moving upslope into depressions and rock crevices in Hells Canyon. Its root crown has the ability to resprout readily after fire. Caplan & Yeakley (2010) found that Himalayan blackberry (*Rubus armeniacus*) stores more water during summers than the native *Rubus* (*R. spectabilis* and *R. parviflorus*), possibly helping it achieve higher growth and reproductive rates, in all but the most shaded areas, while native *Rubus* species faced significant water limitations in the summer. Himalayan blackberry canes can grow to 10 m and individual canes produce over 700 fruits per year (Pojar and MacKinnon, 1994). Post-fire spread of Himalayan blackberry in Hells Canyon is a concern. For example, Pittsburg

Creek burned in the 2005 Tryon Fire, where a 1996 Area Ecology Plot WW4621 had 50% cover of Himalayan blackberry and the 2006 cover of Himalayan Blackberry was 80%. At least eight of the twelve current Oregon Bartonberry sites have Himalayan blackberry in the vicinity.

The southern Bartonberry population is entirely within the 2007 Battle Creek Complex Fire. The northern population is within the 2005 Tryon Fire that also burned previously in the 1996 Salt Creek Fire. Bartonberry is a root sprouter and can grow in cliffs and slides where fuel is too low to carry fire. The unanswered question is how well Bartonberry can compete with Himalayan blackberry and other fire adapted plants that are able to occupy similar habitat.

Landslides and mass wasting are part of Hells Canyon geomorphology. Bartonberry is found in land type associations where the active geomorphic process is land movement induced by either water or gravity (Salich 2006). Both McGraw Creek and the BLM's Copper Creek show evidence of recent landslides that have changed the substrate and removed vegetation where these creeks flow into the Snake. It is possible that the documented Bartonberry population at BLM's Copper Creek was removed by a landslide in the late 1990s.

Future Research and Monitoring Opportunities

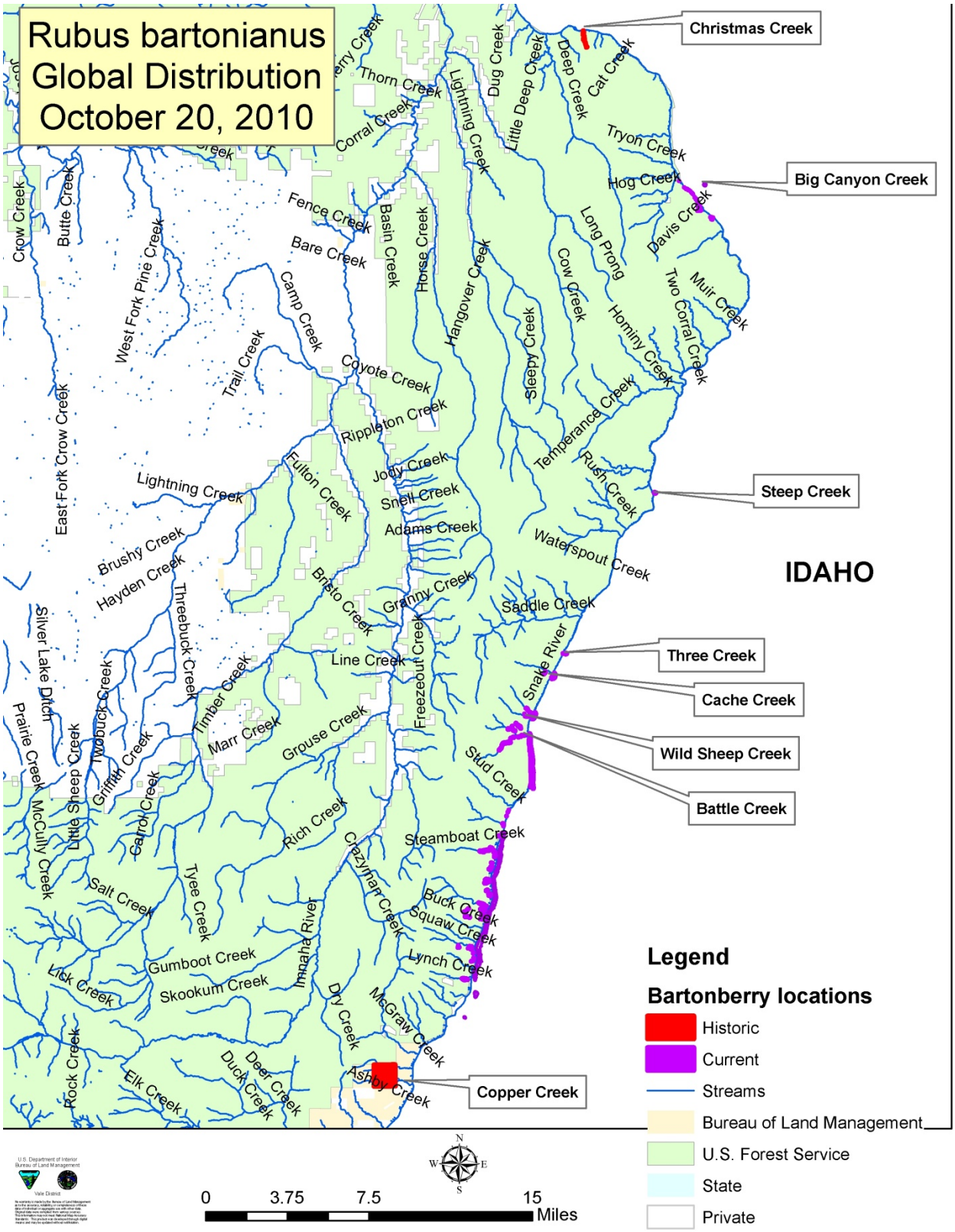
- Monitoring to determine if cattle grazing are affecting drainages inhabited by Bartonberry. Ungulate browsing needs to be monitored in draws with Bartonberry, this includes areas such as lower Battle Creek, which is not an active allotment, but receives cattle use.
- The distribution of Himalayan blackberry has not been mapped in Hells Canyon. Monitoring plots could be established to determine the rate of spread of Himalayan blackberry in drainages in Hells Canyon with and without fire. It may also be possible to use low-level aerial photography to determine the extent of Himalayan blackberry.
- Where Bartonberry and Himalayan blackberry co-exist, herbicide use should be monitored, ideally with both control (no treatment) and treatment plots.
- To date, landslides have not been mapped, or are not available in corporate GIS layers.
- Determine Bartonberry pollinators and seed dispersers.
- Can Bartonberry be propagated and successfully reintroduced to historic sites?
- How genetically similar are the north and south populations of Bartonberry?
- How much habitat was lost after the construction of Hells Canyon Dam?
- Determine impacts of insects and disease to Bartonberry.
- Further surveys adjacent to known sites. For example, Camp Creek needs further surveys.

Management Recommendations

- Maintain current Global and State Rarity Rankings for both Oregon and Idaho (G2, S2) due to narrow endemism, lack of information on life history, genetics, and the unknown extent of the risk of Himalayan blackberry to Bartonberry. There are now 21 current occurrences of Bartonberry globally. Twelve currently extant occurrences of Bartonberry are in OR and nine occurrences of Bartonberry are in ID in approximately 829 acres.
- Complete a Conservation Assessment for Bartonberry
- Use Best Management Practices as stated in Wallowa-Whitman National Forest Invasive Plants Treatment FEIS.
- Prioritize Himalayan blackberry removal in sites with Bartonberry habitat. Herbicide application should be implemented using technicians trained in plant identification, and

provide days in the field with the area botanist, or forest botanist for plant identification and plant conservation concerns specific to Hells Canyon.

- Complete special status plant surveys in areas of proposed noxious weed control within potential Bartonberry habitat.
- Complete Bartonberry seed collections for long-term conservation storage. Currently there are no Bartonberry seed collections in conservation storage.
- Consider the reintroduction of Bartonberry to the Copper Creek site to maintain the species geographic distribution.


Rubus bartonianus
Global Distribution
October 20, 2010
Christmas Creek
Big Canyon Creek
Steep Creek
Three Creek
Cache Creek
Wild Sheep Creek
Battle Creek
Copper Creek
IDAHO
Legend
Bartonberry locations
Historic
Current
Streams
Bureau of Land Management
U.S. Forest Service
State
Private
0
3.75
7.5
15
Miles
Thorn Creek
Corral Creek
Lightning Creek
Dug Creek
Little Deep Creek
Deep Creek
Cat Creek
Tryon Creek
Hog Creek
Davis Creek
Muir Creek
Two Corral Creek
Hominy Creek
Long Prong
Cow Creek
Sleepy Creek
Hangover Creek
Horse Creek
Basin Creek
Fence Creek
Bare Creek
Camp Creek
Trail Creek
Coyote Creek
Rippleton Creek
Jody Creek
Snell Creek
Adams Creek
Fulton Creek
Temperance Creek
Rush Creek
Waterspout Creek
Saddle Creek
Granny Creek
Bristo Creek
Line Creek
Freezeout Creek
Snake River
Stud Creek
Steamboat Creek
Buck Creek
Squaw Creek
Lynch Creek
McGraw Creek
Ashby Creek
Dry Creek
Imnaha River
Crazyhan Creek
Rich Creek
Grouse Creek
Marr Creek
Timber Creek
Threebuck Creek
Hayden Creek
Brushy Creek
Lightning Creek
Crow Creek
Butte Creek
West Fork Pine Creek
East Fork Crow Creek
Silver Lake Ditch
Prairie Creek
Twobuck Creek
Little Sheep Creek
Griffith Creek
Carrol Creek
McCully Creek
Salt Creek
Tyee Creek
Gumboot Creek
Skookum Creek
Lick Creek
Rock Creek
Elk Creek
Duck Creek
Deer Creek

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Appendices

Appendix 1: BLM Report and Map

Appendix 2: Summary of Spatial Distribution of Bartonberry

Appendix 3: Herbarium Search Results [not included in pdf version]

Appendix 4: Photos

BLM Bartonberry Survey Results

The goal of these plant surveys was to relocate the *Rubus bartonianus* site found by Bob Meinke on April 12, 1977 (Oregon Biodiversity Information Center EO CODE # = PDROS1K0X0.5; GeoBOB FLSITE_CN = 200834134139655148227). No one is known to have revisited the site, since it was originally located. The site was not well documented, or GPSed. There was scant location information to go on. The legal location on the original field form gives the location as two entire sections. The comments on the field report simply state: *Copper Creek canyon and other shaded side tributaries to the Snake River.* Bob Meinke was also contacted via email to see if he could remember any more detailed location information for this site. Bob replied "I can still recall finding a small population of RUBA (*Rubus bartonianus*), but the location is fuzzy. What sticks in my mind is a nook nearer to the river with some shade and cliffs." Meinke's herbarium sheet (Wallowa Whitman National Forest Herbarium # 376 and Oregon State Herbarium # 118620) labels for this location were also reviewed. The herbarium sheet labels did not have any more detailed information. It seemed probable that based upon the limited information we had and the difficulty of cross-country travel in this steep rocky terrain that the site must be near the Snake River and the trail that follows the river on the Oregon side.

Jenifer and Roger Ferriel both spent a total of 5 days attempting without success to relocate Meinke's 1977 Bartonberry site. Surveys dates were April 14 and 16 2009 and April 13, 14 and May 12, 2010. The 2009 surveys were focused on riparian areas (Figure 1). The focus of the 2010 surveys were rock outcrops, areas of boulders and scree (Figure 1). A total of approximately 160 acres were searched over these five days. Travel was slow due to the steep rocky terrain. Survey polygons with negative observation information were input into GeoBOB.

It is possible that Meinke's bartonberry site has been extirpated. There have been large debris flows that came down both Copper Creek and McGraw Creek, during the late 1990's. The mouths of these two streams are now depauperate of most plant life and have accumulations of course rock fragments due to these debris flows (See Figures 2 and 3). It is also possible that Meinke's bartonberry site has been taken over by Himalayan blackberry and the bartonberry has been extirpated. Some survey areas along the river were observed to be heavily infested with Himalayan blackberry (Figure 4). Alternatively, there is a smaller possibility that we did not observe the site where Meinke found bartonberry in 1977. Time did not allow us to visit the entire two sections that Meinke gave as the location of his collection. Still we did use intuitive control survey methodology to concentrate our survey efforts in those areas that had the highest probability of being bartonberry habitat.

Recommendations

The bartonberry site at Copper Creek was its southernmost known occurrence. Thus, the loss of this bartonberry location reduces the global distribution for bartonberry. The loss of the Copper Creek bartonberry site reduces the global distribution of bartonberry by approximately 6 river miles (or 10% of the total 59.5 river miles occupied). The southernmost extant occurrence of bartonberry in Oregon is now located at Lynch Creek. The shrinkage of bartonberry's global distribution could promote a reduction in the viability of bartonberry. Thus, it would be prudent to consider reintroducing bartonberry at Copper and McGraw Creeks to maintain the historical global distribution of the species. Seed could be collected from extant bartonberry sites and seedlings could be grown out at a nursery from the collected seed. The nursery grown seedlings

could be planted out in the depositions of course fragments at the mouth of Copper and McGraw Creeks.

It is also recommended that bartonberry seed be collected for conservation and long-term storage at Berry Botanical Garden. This could provide source seed for possible future restoration plantings, to maintain bartonberry's distribution and abundance. There are currently no bartonberry seed collections in conservation storage.

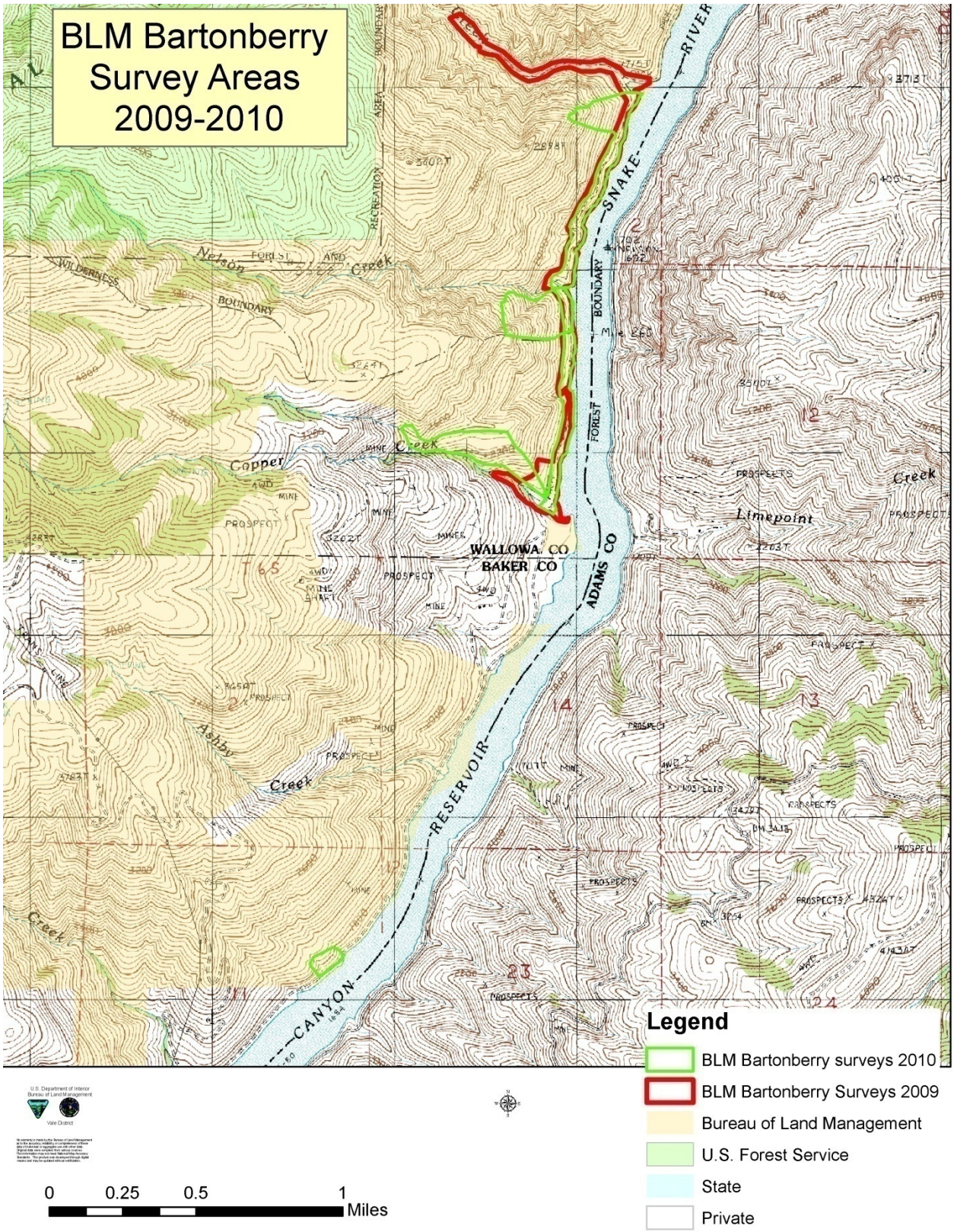

Figure 1: Bartonberry survey areas on BLM lands.

Figure 2: Mouth of Copper Creek on April 14, 2009 showing areas of debris with little vegetation from high flows in the late 1990's.

Figure 3: Mouth of McGraw Creek on April 16, 2009. Note debris accumulations from high flows in the late 1990's.

Figure 4: Himalayan blackberry infestation on April 14, 2009 located along the Hells Canyon trail in between Copper and McGraw Creeks.

Appendix 2: Summary of Spatial Distribution of Bartonberry

Location Name	Status	Element Occurrence #	River mile marker location	Ownership	Current or Historical	State	Current Total Acres	Includes multiple polygons	Rubus discolor present	Site Visited	Subpop location within Metapop
Copper Creek	Existing	PDROS1K0X0*005*OR	260.5	BLM	H	OR	0	N	Y	YES	Southern
Little Dry Gulch	Existing	PDROS1K0X0*009*ID	256	FS	C	ID	3	N		NO	Southern
Dry Gulch	Existing	PDROS1K0X0*008*ID	255	FS	C	ID	21	N		NO	Southern
Kenny Creek to just below Hells Canyon Dam	Existing	PDROS1K0X0*001*ID	254.5-247	FS	C	ID	510	N		NO	Southern
Lynch Creek	Existing	PDROS1K0X0*010*OR	254.5	FS	C	OR	10	N	Y	YES	Southern
Doyle to Squaw Creek	Existing plus new locations	PDROS1K0X0*007*OR	253.5-252.5	FS	C	OR	10	Y		YES	Southern
Upper Squaw Creek	Existing plus new locations	PDROS1K0X0*008*OR	252.5	FS	C	OR	1	Y		YES	Southern
Upper Buck/ 32 Point Creeks	Existing plus new locations	PDROS1K0X0*006*OR	252-251	FS	C	OR	8	Y		YES	Southern
Buck Creek to 32 Point Creek	Existing plus new locations	PDROS1K0X0*011*OR	252-251	FS	C	OR	25	Y		YES	Southern
Below 32 Point Creek to Steamboat Creek	Existing plus new locations	PDROS1K0X0*012*OR	251-248	FS	C	OR	53	Y	Y	YES	Southern
Hells Canyon Dam - Short and Canyon Creeks and downstream	Existing plus new locations	PDROS1K0X0*004*OR	248.5-247	FS	C	OR	3	Y	Y	YES	Southern
Brush Creek to Battle Creek	Existing	PDROS1K0X0*007*ID	244.75-242	FS	C	ID	90	N		NO	Southern
Battle Creek	Existing	PDROS1K0X0*001*OR	242	FS	C	OR	33	Y	Y	YES	Southern
Wild Sheep Rapids	Existing	PDROS1K0X0*006*ID	241	FS	C	ID	19	N		NO	Southern
Wild Sheep and Bull Creeks	New		241	FS	C	OR	5	Y	N	N/A	Southern
Granite Rapids	Existing	PDROS1K0X0*003*ID	239.5	FS	C	ID	19	N		NO	Southern
Cache Creek	New		239.5	FS	C	OR	2	N	Y	YES	Southern
Three Creek	Existing	PDROS1K0X0*005*ID	238	FS	C	ID	4	N		NO	Southern
Steep Creek	Existing	PDROS1K0X0*004*ID	229	FS	C	ID	2	N		NO	Middle
South of Davis Creek	New		212.75	FS	C	OR	1	Y	Y	YES	Northern
McCarty Creek and downstream to above Somers	New		212-210.5	FS	C	OR	2	Y	Y	YES	Northern

Location Name	Status	Element Occurrence #	River mile marker location	Ownership	Current or Historical	State	Current Total Acres	Includes multiple polygons	Rubus discolor present	Site Visited	Subpop location within Metapop
Creek											
Upper Big Canyon Creek	Existing	PDROS1K0X0*002*ID	211	FS	C	ID	8	N		NO	Northern
Camp Creek	Historic?		210	FS	H	OR	0	N		YES	Northern
Christmas Creek	Historic	PDROS1K0X0*003*OR	201	FS	H	OR	0	N		YES	Northern
* Based on GIS analysis of mapped polygons							829*				

Appendix 4: Photos

Lynch Creek population - 2009

Steamboat Creek population – 2009

Steamboat Creek population, continued

Cache Creek population – 2010

McCarty Creek and downstream to above Somers population – 2010

McCarty Creek and downstream to above Somers population, continued