

Searching for the Rare Pueblo Valley Peppergrass in Southeastern Oregon

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Looking south at the Pueblo Valley between the Trout Creek Mountains (left) and the Pueblo Mountains (right). Photo by Marilyn McEvoy.

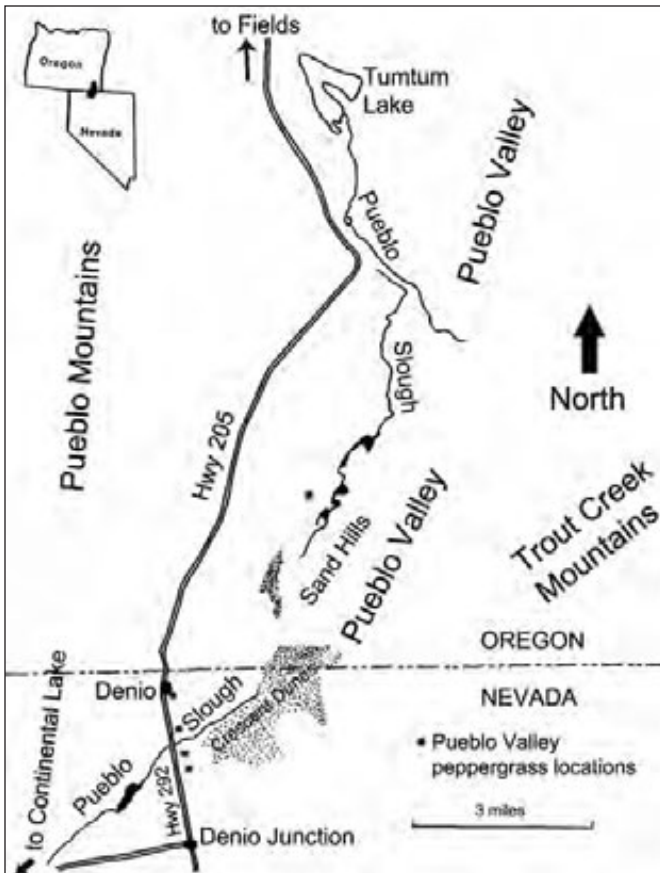
Oregon is home to many members of the mustard family (Brassicaceae), native and non-native species of Crucifers, annual and perennial, common and rare. During the summer of 2009, while employed at the Burns District, Bureau of Land Management (BLM) in Harney County, I had the privilege of collecting seeds from some of Oregon's most sensitive native mustard species. These seeds were needed for ongoing research in Switzerland, a project dedicated to finding biological control agents for use on non-native mustards classified as noxious in the Pacific Northwest. This article is the result of my independent research, prompted by my concern for one of these sensitive native species and its continued survival in Oregon.

Most of Oregon's non-native mustard species are common annuals we all know: yellow alyssum (*Alyssum alyssoides*), shepherd's purse (*Capsella bursa-pastoris*), field mustard (*Brassica rapa*), and tumble mustard (*Sisymbrium altissimum*). Others are perennials that are so invasive that the Oregon Department of Agriculture classifies them as noxious weeds: perennial pepperweed (*Lepidium latifolium*), and hoary cress/white top (*Lepidium draba*). Biological control agents for these species must be tested to make sure that they will not damage rare native species, several of which grow in Oregon. Some of these rare species are Federally listed as Species of Concern and by the state of Oregon as Threatened.

Many of Oregon's rarest mustards are found only in the

southeastern corner of the state, in remote, hard to find locations. Hairy wild cabbage (*Caulanthus pilosus*) is known to occur only in the Mickey Basin Hot Springs area near the Alvord Desert, while Cusick's draba (*Draba cusickii*) is restricted to Steens Mountain near Kiger Gorge overlook and Rooster Comb Ridge. Thickstem wild cabbage (*Caulanthus crassicaulis*) grows near the Nevada-Oregon border at the northern edge of the Sheldon National Wildlife Refuge in Harney County, at Oregon End Table and Long Draw. Malheur prince's plume (*Stanleya confertiflora*), and Davis pepperweed (*Lepidium davisii*) can be found in Harney and Malheur counties. Davis pepperweed, Oregon's most endangered Brassicaceae, grows only on desert playas that are alternately inundated with water and cracked by blistering sun. Pueblo Valley peppergrass (*Lepidium montanum* var. *nevadense*) is known only from a small dune area near Denio at the Nevada-Oregon border.

I looked forward to the challenge, my last assignment of the season. The idea of collecting seeds for Oregon's "war against weeds," gave me a goal towards a worthy cause. It felt more like a treasure hunt than work, even though I knew it wasn't going to be easy finding any of the target species. From preliminary seed collections in 2007, I had excellent GIS maps and aerial photographs for locations of all but one of the species. The exception was Pueblo Valley peppergrass, so I knew this species



The Pueblo Valley straddles the Oregon-Nevada line south of the Alvord Desert and is bounded by the Pueblo Mountains on the west and Trout Creek Mountains on the east. Map prepared by Cindy Roché.

would be particularly difficult to locate. Odds of success, I knew, were low; it was early August in the high desert, and it would be hard to accurately identify any one of them so late in the season. I was also concerned there might not be any seed left to collect.

The Search Begins

Over the course of a month I was able to relocate and collect seeds from all but Pueblo Valley peppergrass. A former field technician had searched for this species along the Pueblo Slough Road in 2007 without finding it. The first time I searched the area I was on my way to Oregon End Table to collect seeds of thickstem wild cabbage; my initial reconnaissance for the rare peppergrass in the Pueblo Valley was not productive. I almost gave up on it, but with perseverance and determination I eventually found it.

Pueblo Valley is a narrow basin that straddles the Oregon-Nevada border at the little town of Denio. The area is an expanse of sagebrush, sand dunes, bright green alfalfa fields, and

a few modest ranch homes. Pueblo Slough parallels Highway 205 for several miles, and Pueblo Slough Road runs across the valley floor heading east from the highway. Unfortunately, no road signs are posted on the numerous dirt roads that crisscross each other, veering off in different directions across the sagebrush. Some of the roads, if you can call them that, narrowed down from dirt tracks to nothing in the thick sagebrush, or ended at fenced, irrigated hay fields. It became quite confusing, and I gave up after a couple hours of retracing my own tire tracks, going around in circles.

Disappointed and a little discouraged, I continued on my way to Oregon End Table and the wild cabbage, but I was glad I had stopped. Obviously, Pueblo Valley peppergrass wasn't going to jump out at me (there were no inflorescences to catch my attention this time of year). I knew I needed a better strategy for finding this species, other than just driving around, hoping for the best. Ironically, I wasn't aware that my route through Sheldon National Wildlife Refuge, via Highway 140, would take me by most of Nevada's well-documented Pueblo Valley peppergrass sites a few miles south of the Oregon state line (Morefield 2001).

Sleuthing the Cold Case Files

All of the information I had to date came from the field data acquired in 2007, the *Burns BLM District 2004 Special Status Plant Identification Book*, and what I could find online, but unfortunately I didn't search for Nevada's data. The next morning, I rechecked the Agency's Special Status Species botany files for *Lepidium montanum* var. *nevadense*. The BLM State Office classifies Pueblo Valley peppergrass as a "sensitive" species in Oregon, so a folder should have been in the cabinet with the other rare plant files. I didn't see one. Thinking I might find some misfiled information, I removed the bulging *Lepidium davisii* folder from the drawer to look through it, and noticed that another file, labeled *Lepidium montanum* var. *nevadense*, had slid underneath it.

The folder was so flat on the bottom of the drawer it looked



The interdune area dominated by greasewood (*Sarcobatus vermiculatus*), big and black sagebrush (*Artemisia tridentata*, *A. nova*), shortspine horsebrush (*Tetradymia spinosa*), rabbitbrush (*Ericameria*), and winter fat (*Krascheninnikovia lanata*) is typical habitat for Pueblo Valley peppergrass. Photo by Marilyn McEvoy.



Maturing silicles (seedpods) of Pueblo Valley peppergrass. Photo by Marilyn McEvoy.

empty. Inside there was only a single sheet of faded notebook paper with four lines of cursive hand writing at the top, dated May 1987, and signed by Arnold Tiehm, the botanist who had collected a specimen and deposited it in the Burns BLM Herbarium. Scrawled out were detailed instructions to the site where he had found Pueblo Valley peppergrass in Oregon, 23 years ago! These instructions said to go north an exact number of miles on Highway 205 from the Oregon-Nevada border at Denio, then proceed east 1.5 miles along a fence line. I was flabbergasted, and wondered how long this note had gone unnoticed, and if it could actually lead me to Pueblo Valley peppergrass after so many years? I couldn't imagine how much the area had changed since then, but I knew there was a good chance that "progress" could have eliminated the population.

Following the Clues

That afternoon I drove to the Oregon-Nevada border on Highway 205, reversed my direction, keeping track of the miles ticking off on the odometer. I stopped near a ranch house on the east side of the road, and could see there were several fences running east-west, just north of the house. I didn't see any gates for access, or a dirt road running along either fence; I just about gave up, thinking the area had

changed too much since Tiehm had written his directions. It was possible, however, that my measurements were in error, so I decided to drive the route again, using the tripmeter instead of the odometer.

The second time I drove north on Highway 205, the mileage took me a little further, beyond the ranch house and fences where I had stopped previously. Without a doubt, there was an east-west fence exactly where Tiehm's note said it would be. As I pulled off the highway I could see a seldom-used road (really two tire tracks) running along the fence through the sagebrush. A wire gate equipped with a cheater bar made it easy for me to enter the field, and after checking my map to make sure this was BLM land, I closed the gate, reset the tripmeter, and drove up the fenceline, per Tiehm's directions.

At the half-mile mark, the road veered north through an open gate onto a well-traveled dirt road, and because it appeared that the track ended in the sagebrush on the other side of the gate, I thought north was the only way I could go. I quickly saw signs of heavy grazing: sagebrush trampled and stripped, bare dirt and cow pies. It didn't look likely that I would find a rare plant here. I also didn't have a good feeling about turning north at the gate, away from the fence; Tiehm's note hadn't mentioned any turns or gates. But,



Flowers of Pueblo Valley peppergrass are white with the four petals typical of the mustard family. Photo by Marilyn McEvoy.



Pueblo Valley peppergrass, growing in a typical association with greasewood and saltgrass, prefers the edge of a mound and the east or north side of the bush. Here it competes with dense cheatgrass (*Bromus tectorum*). Photo by Marilyn McEvoy.

I followed the road until the truck's trip odometer read 1.5 miles anyway, and stopped. I walked through the degraded sand dunes and a few scrawny greasewood bushes (*Sarcobatus vermiculatus*), searching for over half an hour before giving in to the realization that any plants here would have been grazed down earlier in the season. There was nothing that stood out, or remotely resembled what I was looking for, except the dry clasping pepperweed (*Lepidium perfoliatum*) that formed thick mats along the roadside. I saw no identifiable forbs, only desiccated stems protruding from the sand, chomped down or broken off.

I drove on up the road, but it kept veering northward, and soon the environment no longer looked suitable for Pueblo Valley peppergrass; sand dunes and greasewood gave way to a sea of big sagebrush (*Artemisia tridentata*) that had been ravaged by cattle. Feeling a little disheartened, I turned around and headed back, stopping at the gate where I had initially turned north. For some reason, I instinctively looked left (for oncoming traffic?), and noticed the original two track I'd been following east along the fence did continue past the sagebrush. I just hadn't seen it earlier from that angle! It looked like no one had traveled this section of tracks in years, and for the first time I noticed there were no signs of grazing on this side of the fence. Feeling a renewed sense of hope, I made a sharp turn left instead of right, and drove through the sagebrush, continuing along the two-track for a little over a mile. After passing through a narrow area created by a high dune and the fence, the road opened up into a more typical desert saltbush-dune habitat. Tiehm found the peppergrass growing with *Artemisia* in interdune areas on the valley floor.

Success

Within a few minutes I found the Pueblo Valley peppergrass! I knew it instantly, even though it was desiccated and leaf-less. I was elated when I saw there were still a few seeds left in the opened

Pods. Single plants were scattered throughout the sand dunes, but mostly I found them in small patches of two to four plants growing along the inside edges of the dunes, mostly on the east and north sides of the greasewood. The dune ridges formed gravelly, sandy bowls, or hard flat areas of caliche (hardened deposits of calcium carbonate) that appeared wind-blown or washed, where saltgrass clung to life, and obsidian flakes lay exposed. Finding the rare peppergrass became predictable, and I soon counted 44 specimens. A few plants still had a couple of green leaves left on their lower stems, but the big find was four, first-year, basal rosettes that were still green. I took photos, collected a few seeds from each plant, and recorded GPS coordinates (noting the elevation as 4,170 feet).

I had no doubt that the plants I found were Pueblo Valley peppergrass: I had Arnold Tiehm's detailed instructions to the site and his specimen in hand for comparison. I also had Reed Clark Rollins (1993) description from *Cruciferae of Continental North America:*

Systematics of the Mustard Family from the Arctic to Panama. Finding the rosettes was exciting, but to collect a voucher specimen I needed an inflorescence for positive identification, and it was the wrong time of year for that. Unfortunately, I missed that opportunity the following year as well.

Finding More and More

In June 2010 I drove back to the site and photographed a few blooming plants. I was so intent on reaching my destination that I didn't pay much attention to my surroundings while driving in. However, on my way back to the highway I drove slowly, enjoying the landscape, and soon saw intermittent flashes of white: more Pueblo Valley peppergrass in bloom, scattered throughout the sagebrush. It was growing on both sides of the dirt track, and the other side of the fence where I had searched fruitlessly the year before after taking the wrong turn. Now that I could see its white flowers, it was obvious the population wasn't confined to the small area where I had found it the previous year. I stopped to scan the area and wondered about the total size of the population, and how many more plants might be out there hidden from my limited view. As I continued my drive through BLM land, I saw one more plant in the middle of the two-track, obvious to me now, that I had missed on the way in.

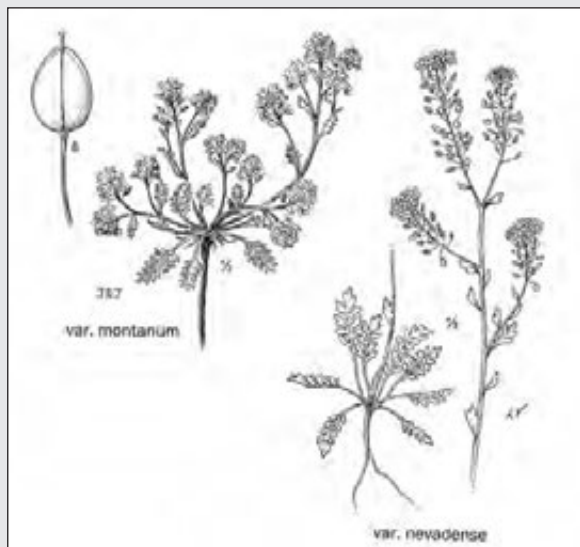
In 2010 and 2011 I returned to this small population of Pueblo Valley peppergrass, scattered along a desert dirt road, to explore the area and photograph the flowers and fruits. During my first visit in 2009 I only saw desiccated plants in the final seed dispersal stage, and I was anxious to see this little mustard in full bloom. When I returned in 2010 my time was limited to photographing a few plants along the roadside. In 2011, I followed the scattered Pueblo Valley peppergrass flowers across the dunes until I came to a small spring area and a plethora of this rare mustard growing in large patches throughout the wetlands.

Taxonomy

Pueblo Valley peppergrass is also called Nevada peppergrass or Denio pepperwort. Its other common names, mountain peppergrass, Western peppergrass, mountain pepperweed, or mountain pepperwort, are shared with *Lepidium montanum*. Numerous varieties have been described (Rollins 1993), but recent floras (*Flora of North America*, *The Jepson Manual*) do not recognize them (Al-Shehbaz and Gaskin 2010, Al-Shehbaz 2012). Two varieties are recognized in Oregon: var. *montanum* in Malheur County and var. *nevadense* in Harney County (Oregon Plant Atlas, <http://www.oregonflora.org/atlas.php>). The best key to distinguish the varieties is by Noel Holmgren in the Intermountain Flora (Holmgren *et al.* 2005).

Mountain peppergrass grows as a biennial to short-lived perennial, with one to many stems clustered on a crown that is attached directly to a taproot or from a short-branched, somewhat woody caudex. Plants range from a few inches to about 1.5 ft. tall with stems ending in a short dense raceme of white flowers. Leaves are pinnate or pinnatifid, forming a basal rosette in first year plants, and becoming progressively smaller up the stem in flowering plants. The inflorescences elongate with maturity, producing seeds in silicles (round pods). Plants may be glabrous or pubescent (Rollins 1993, Holmgren *et al.* 2005, Al-Shehbaz 2012).

The two varieties are distinguished based on number of stems and hairiness (Holmgren *et al.* 2005). The typical variety, var. *montanum* is perennial with more stems from a woodier crown, and the upper stems and inflorescence branches sparsely to densely pubescent with scale-like or club-shaped hairs (sometimes nearly glabrous). Pueblo Valley peppergrass (var. *nevadense*) is a biennial with a single stem that is completely glabrous.



Illustrations by Jeanne Janish and Laura Vogel of the two varieties of *Lepidium montanum* that grow in Oregon. Reproduced with permission of the publisher from: Noel H. Holmgren *et al.*, Subclass Dilleniidae. Intermountain Flora: Vascular Plants of the Intermountain West, U.S.A. Vol. 2B, The New York Botanical Garden Press, Bronx.

Pueblo Valley peppergrass takes its name from a narrow strip of land approximately 24 miles long that varies from two to ten miles wide (State Water Resources Board of Oregon 1967). It sits between Pueblo Mountains on the west, and the Trout Creek Mountains on the east, stretching southwest from the Alvord Desert in the north past Crescent Dunes at the state line towards Continental Lake in Nevada. The Pueblo Valley-Continental Lake watershed comprises an area of about 280 square miles in Oregon and 1,500 square miles in Nevada; Pueblo Slough Valley (110,500 acres in Harney County) is one of four sub-basins (Sinclair 1963, State Water Resources Board of Oregon 1967). The series of creeks, springs and marshes in the Pueblo Slough corridor of southeastern Oregon creates an intermittent wetland area approximately eight miles long. It includes Tum Tum Lake, a 475-acre playa that is designated as a Research Natural Area. Pueblo Slough parallels Highway 205 along the western edge of Pueblo Valley, crossing the state line and extending southwest along Highway 140 to Continental Lake where, during periods of excessive flow, Continental Lake spills northeastward through a narrow gap between the Pueblo Mountains and Pine Forest Range into Pueblo Valley and eventually ending at Tum Tum Lake.

The Pueblo Valley is an expanse of sagebrush, sand dunes, playas, and bright green (irrigated) alfalfa fields. The interdune environment consists of stabilized high sand dunes varying in height from 10 to 20 feet. There are lower mounds between the high dunes and in the interface zone from the high dunes into the saltbush desert. These smaller, irregular mounds appear washed down and composed of ash and/or clay rather than sand. Like the dunes, they are heavily vegetated with greasewood, several sagebrush species including big and black sagebrush, and less abundantly with shortspine horsebrush, rabbitbrush, and winterfat. Cheatgrass, great basin wildrye (*Leymus cinereus*), and Indian ricegrass (*Achnatherum hymenoides*) grow in the sandier areas between the mounds. By August most of the small forbs are dry stems, and unrecognizable except for the clasping pepperweed along the roadside, and occasional flixweed (*Descurainia sophia*).

The Nevada Native Heritage Program indicates that the peppergrass is “dependent on sand dunes or deep sand” (NNHP 2010). The Northern Nevada Native Plant Society describes it as likely more common along the edges of dunes (NNNPS 1999). Herbarium labels describe the environment as sandy soil on the valley floor, saline flats near hot springs, and interdune areas on the valley floor; associated species are greasewood and big sagebrush.

In August 2009, I saw only a few stems protruding from the sand and plants scattered throughout the low mounds next to greasewood, mostly on the north and east sides of the taller bushes, but I did not explore the higher dunes. When I returned in May 2010, I found hundreds of Pueblo Valley peppergrass plants thriving along the edge of a pond in the middle of the desert. This robust population’s affiliation with water led me to speculate about other populations might be distributed within the Pueblo Slough watershed. When I returned in June 2010 to photograph Pueblo Valley peppergrass in flower, I counted more than 100 bright white spots scattered throughout the sagebrush, and knew the original population must be even larger than I had

Checking Herbarium Specimens

The Oregon Atlas Project shows four specimens of Pueblo Valley peppergrass, all in Harney County. Morton Peck's collection near The Narrows, in 1912, the earliest record, was identified to variety in 2009 by Richard Halse. The New York Botanical Garden (NYBG) Virtual Herbarium data base/online specimen catalog lists seven collections, including the collection by Tiehm in 1987 (www.NYBG.org). These specimens represent the documented geographic distribution of Pueblo Valley peppergrass, extending from Continental Lake in Nevada through the Pueblo Slough area in Oregon, with a disjunct site farther north at The Narrows.

Harney Co., OR: Narrows. Saline ground. M.E. Peck 5259, 3 Jul 1912. Det. Richard R. Halse. (WILLU3211)

Humboldt Co., NV: Denio, Oregon-Nevada state line. Desert valley. *Artemisia*. P. Train s.n., 21 Jun 1932. (NY76394).

Harney Co., OR: 3 mi. N. of Narrows. Low sandy ground. M.E. Peck #25287, 18 Jun 1948. Det. Richard R. Halse. (WILLU 26602).

Harney Co., OR: Malheur Wildlife Refuge. Ray C. Erickson s.n., 4 Aug 1950. Det. Richard R. Halse. (WILLU29707).

Humboldt Co., NV: Pine Forest Range, 1.5 miles south of Nevada 8A on Alder Creek Ranch road. Alt. 4250 ft. *Sarcobatus* flats. N.H. Holmgren 1322 with J. L. Reveal, 08 Jul 1964. (NY90031).

Harney Co., OR: Pueblo Slough. T41S, R35E Section 2. G. Rosenberg, 18 Jun 1980. Det. Caryn Meinicke 21 Feb 2012. (BLM Burns herbarium).

Harney Co., OR: Pueblo Valley, 2.6 road miles north of the state line on highway from Denio to Fields and Burns, then 1.6 miles northeast along a fence line road. A. Tiehm 11057, 22 May 1987. (NY76105, ORE119205).

Humboldt Co., NV: Pueblo Valley, Crescent Dunes, 1 road mile south of Denio on Highway 140, east of the highway. Plants growing with *Artemisia* in interdune areas on the valley floor. A. Tiehm 11089, 24 May 1987. (NY185232).

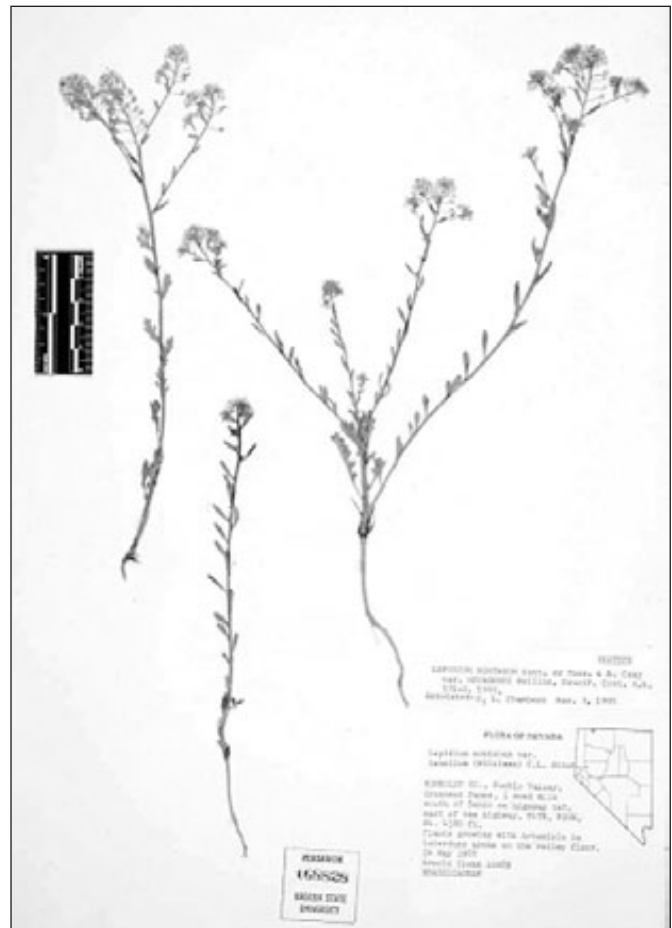
Humboldt Co., NV: Pueblo Valley, along State Route 140, 2.6 km (1.6 mi) south of the Oregon border (Denio), east of the highway. Mostly above the bottom flats of the slough. Among greasewood vegetation. N.H. Holmgren 13864 with P.K. Holmgren, 10 Jun 2000. (NY701805).

Humboldt Co., NV: Pueblo Valley, Crescent Dunes, along State Route 140, 1.8 km (1.1 mi) south of the Oregon border (Denio), east of the highway. Among scattered greasewood shrubs and saltgrass. N.H. Holmgren 13867 with Patricia K. Holmgren, 10 Jun 2000. (NY701806)

previously thought. With no time to explore, I took pictures of a few plants growing at road's edge, and left on my way to another assignment.

Later in June 2011, I stayed for the day, and meandered among the mounds of greasewood and a near continuous carpet of sprawling, fragrant evening primrose (*Oenothera caespitosa*). The profusion of blossoms filled the air with intoxicating scent; bees and other insects buzzed around, busy with so many flowers. Spring rains had been abundant, and flowering forbs now dotted the landscape, in striking contrast to the desiccation I saw in 2009. Sand-dune penstemon (*Penstemon acuminatus*), thread leaf phacelia (*Phacelia linearis*), and lupine stood out on the dunes, while dusty maiden (*Chaenactis douglasii*), basalt gilia (*Leptodactylon pungens*), slimpod milkvetch (*Astragalus filipes*), and wickerstem buckwheat (*Eriogonum vimineum*) added their subtle colors to the display. The real show stopper, however, was the oval-leaf cushion buckwheat (*Eriogonum ovalifolium*) with its brilliant yellow, round flower clusters that were almost as big as ping pong balls!

I climbed to the top of one the higher dunes, and saw a small sun-baked playa to the south. East of the playa, tucked between several dunes, was a fenced-in area that contained Russian olive trees (*Elaeagnus angustifolia*) and other bright green, water-loving vegetation. Curious, I traced my way through the dunes to this



Arthur Tiehm's 1987 collection of Pueblo Valley peppergrass. Scan courtesy of OSU Digital Collections. (oregondigital.org/cdm4/document.php?CISOROOT=/herbarium&CISOPTR=4285&CISOSHOW=3218&REC=2).

apparent oasis, and soon saw Pueblo Valley peppergrass growing everywhere in patches that became larger and more numerous the closer I got to the marsh area. Patches of alkali sacaton (*Sporobolus airoides*) hugged the edges of the dunes, and golden beeplant (*Cleome platycarpa*) grew throughout the salt grass that surrounded the marsh. Small willows (*Salix* sp.) and sedges (*Carex* sp.) grew with Pueblo Valley peppergrass next to a small pond fed by a well spring. The pond was full of cattails (*Typha* sp.) and rushes (*Juncus* sp.). I couldn't see the water, but a pair of cinnamon teals, red wing blackbirds, and a killdeer took flight as I approached their refuge. My walk took me back to the sun-baked playa, but it seemed uninviting compared to the wetland so I turned back to the dunes.

From the vantage point of a high dune I could see a few Pueblo Valley peppergrass plants scattered throughout the greasewood and sagebrush to the east, the population fading into the dunes towards the Trout Creek Mountains. The oasis area trailed off to the north becoming a sinuous snake of cattails and sedges meandering through the dunes. I scanned the Pueblo Valley peppergrass site back to its western edge towards the Pueblo Mountains and estimated the extent of the population area, from



Pueblo Valley peppergrass grows in the road across the dunes. Photo by Marilyn McEvoy.

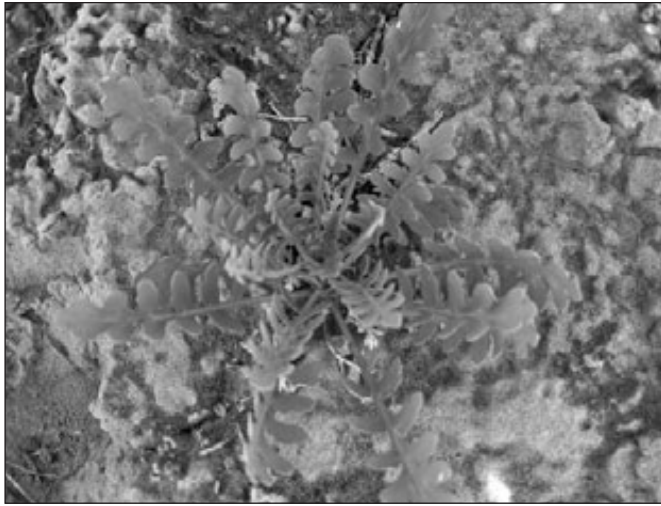
what I could see, to be about 320 acres containing around 2,000 plants, with rectangular dimensions of one mile by half mile at the population's edges. Behind me, a quarter mile away, was my vehicle, the fence line and road, and a sprinkling of Pueblo Valley peppergrass plants. Clearly, Tiehm's collection area in the dry dunes, where I had found 44 plants in 2009, lies at the most northern limit of a large population that stretches all the way to the pond and edge of the playa to the south. The healthiest and highest concentration of plants grew near the wetland and spread out into the dunes; it seemed to barely survive among the greasewood and sagebrush. My timing was perfect to observe what may be a peak population of this rare plant: two consecutive wet springs would be an absolute bonanza for a biennial.

Threats

In mid July 2011 I made my last trip to the Pueblo Valley peppergrass site arriving late in the afternoon to camp out in the desert under a full moon. I enjoyed a colorful sunset and an evening hike before settling down in my tent for the night. The next day's early morning light and cool temperature provided the perfect conditions to photograph the fruiting stage of Pueblo Valley peppergrass,



On the dunes Pueblo Valley peppergrass grows among basin wildrye (*Leymus cinereus*). Photo by Marilyn McEvoy.



As a biennial, Pueblo Valley peppergrass grows as a rosette the first year. Photo by Marilyn McEvoy.

but as the day became hot, I sought refuge in the marshy area next to the playa. My trained eye immediately picked out two perennial pepperweed plants in full bloom, growing at the edge of the cattails, only several feet away from a small patch of Pueblo Valley peppergrass. Perennial pepperweed is one of eastern Oregon's most aggressive noxious weeds, affecting thousands of acres of rangeland, and very difficult to control. It may be only a few years before this site is overrun by this aggressive weed species if measures aren't taken to control it. (ODA 2011)

I also found whitetop, another State (ODA) listed weed, growing in the center of the road near the peppergrass site. Large populations of whitetop have been documented in Pueblo Valley (ODA 2011), and this is another aggressive and rapidly spreading non-native species that prefers disturbed sites and overgrazed pastures.

When I originally researched Pueblo Valley peppergrass in 2009 it was with an eye for the assignment of finding plants, and collecting seeds from rare native mustards for a research project. However, each time I visited the site I became more concerned for its welfare and continued existence in Oregon. Pueblo Valley peppergrass's dependence on a fragile habitat makes it vulnerable to impacts of grazing, agriculture, and recreation. Now noxious weeds are threatening its survival as well. If this Pueblo Valley peppergrass population is the only site in Oregon then it's not only vulnerable, but precious as well. A full blown infestation of whitetop or perennial pepperweed could be the tipping point for its disappearance in Oregon.

A survey for Pueblo Valley peppergrass should be conducted to help determine its status in Oregon. For example, is there still a population at The Narrows where Peck collected it in 1912 and 1948? What happens to the Pueblo Slough population during a series of drought years? Question marks for rare native plant status do not help State and Federal agencies provide adequate protection. Perhaps the little mustard that fell through the cracks is worthy of protection, perhaps not. Are we willing to let it disappear without even noticing its passing? Providing answers for this seemingly insignificant native mustard will be challenging, but it will be a treasure hunt well worth the effort.

Status as a Rare Plant

While not a Federal candidate for listing as threatened or endangered, Pueblo Valley peppergrass is designated by the BLM in Oregon and Nevada as a sensitive species, either "State Director's Strategic Species" (Oregon), or "State Director's Sensitive Species" (Nevada)¹.

The Nature Conservancy's system, NatureServe/Heritage Network, ranks Pueblo Valley peppergrass as G5:T1? SNR with a "Rounded Global Status" of T1 a, "Critically Imperiled" designation based on "a very narrow range on borders of two states, [and is] rare in interdune areas on valley floor" (Morefield 2001). The NatureServe ranking system uses Global and State designations, and numerical indicators to describe a species status. "G" is a global rating and the number "5" indicates the species is "demonstrably, widespread, abundant and secure." T1 indicates a "Taxon" trinomial designation which is a "subspecies, variety or recognized race." A number "1" rank indicates the variety, in this case var. *nevadense*, may be "critically imperiled because of extreme rarity or because it is somehow especially vulnerable to extinction or extirpation, typically with 5 or fewer occurrences. The "?" accompanying both designations means that the "5" and "1" are an "Inexact Numeric Rank" indicating the "Taxa can be ranked, but for which the rank is not certain," that "the rank is probably correct, but that either documentation is lacking or there is still some uncertainty, [s]uch ranks are always provisional." The SNR part of the ranking indicates, "State Not Ranked," and indeed the State of Oregon does not list this variety as imperiled, threatened, or even as a candidate for listing in the near future (ODA 2008). In 2010 the Oregon Biodiversity Information Center (ORBIC) ranked Pueblo Valley peppergrass as a List 3 species, a "Review" classification, which "contain taxa for which more information is needed before status can be determined, but which may be threatened or endangered in Oregon, or throughout their range" (ORBIC 2010).

The Nevada Department of Conservation and Natural Resources Natural Heritage Program lists Pueblo Valley peppergrass as "Sensitive." Its ranking of "S1?" means the species could be "critically imperiled and especially vulnerable to extinction due to extreme rarity, imminent threats, or other factors," and "either documentation is lacking or there is still some uncertainty." The qualifying "?" indicates insufficient data for an exact ranking.

¹ This special listing provides taxa that are not already included as BLM Special Status Species under Federally listed, proposed, or candidate species, or State listed species with the same level of protection as is provided for candidate species in BLM Manual 6840.07C to ensure that actions authorized, funded or carried out do not contribute to the need for the species to become listed.

References

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Greasewood is a common associate of Pueblo Valley peppergrass. Photo by Marilyn McEvoy.