The Current Status of Serpentine Catchfly (*Silene hookeri ssp. serpentinicola*) in Oregon

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Executive Summary

Serpentine catchfly (*Silene hookeri ssp. serpentincola*) is a vascular plant species within the Caryophyllaceae (Pink) family. It is a serpentine endemic species found along the harsh, dry, shrub dominated ridges and slopes above the North Fork Smith River. Three historical botanical sighting reports that maintain the plant occurs in Oregon are in need of reassessment. Region 6 of the Forest Service lists serpentine catchfly as a "Strategic" species because of the lack of information surrounding the historic sites. The Oregon Biodiversity Information Center (ORBIC) lists this species as G2/S1? ORBIC List 3. List 3 and "Strategic" species are considered to have such little information known about them that they require further investigation in order to determine their proper listing. The Region 6 Interagency Special Status and Sensitive Species Program (ISSSSP) has an interest in helping ORBIC assess the state ranking for this species in order to determine whether it would be best managed as "Sensitive".

Serpentine catchfly populations are mostly found within the North Fork Smith River serpentine bands of Del Norte County, California. A few populations have been found within the Middle Fork Smith River further south. Habitat for this species ranges from Jeffrey pine savanna to recently burned serpentine areas to roadside serpentine rock outcrops. Based on our many observations of serpentine catchfly occurring along road cuts and within recently burned areas in California, it seems the species may have a propensity for disturbance.

The purpose of this project is two-fold:

1) Attempt to relocate and document three historic sites (Veva Stansell, 1992; Dave Imper, 1983; T.J. Howell, 1884) in the state of Oregon. The Imper and Howell populations have not been reassessed since originally being documented. An attempt was made in 2009 to locate the Stansell population but it was not found.
2) Inventory new potential habitat to determine the extent of the species within the state of Oregon.

Intensive surveys of two of the historically reported populations were unsuccessful at relocating the species at the reported sites. The Howell collection from 1884 had little information about its location making it difficult to determine where to start surveying. The suspected site (near Waldo, Oregon) is significantly east of what is considered the current range of the species. It was impossible to determine whether or not the Howell collection maintains an extant population within the state of Oregon.

Roughly 250 acres of suitable habitat were inventoried in Oregon with the goal of locating new populations of serpentine catchfly in the state. One new population was located in Curry County along the Oregon/California border. It is occupying an area that burned sometime within the past one to two decades. In addition several other rare, Sensitive or Endangered vascular plant species (*Arabis macdonaldiana, Arctostaphylos hispidula, Horkelia sericata* and *Rosa gymnocarpa* var. *serpentina*) were documented while conducting inventories for serpentine catchfly.

Introduction

Serpentine catchfly (*Silene hookeri* Nutt. *ssp. serpentinicola* (T.W. Nelson & J.P. Nelson) K.L. Chambers & S.C. Meyers) is a globally rare rhizomatous perennial found on serpentine soils[1] in extreme northwestern California. The goal of this inventory is determine whether or not serpentine catchfly maintains extant populations in Oregon. Prior to this study only two oral reports and a voucher specimen from T.J. Howell in 1884 form the basis for determining whether or not this species is included in the Oregon flora. There is a need to reassess the historic populations and inventory high potential habitat in Oregon.

Background

There are an estimated 700 species of the genus *Silene* worldwide, a majority of them are found in the northern hemisphere (FNA efloras, 2012). There are 70 species known from North America (FNA efloras, 2012), with 26 of them found in Oregon (OFP Atlas, 2012).

For many years the few known sites of serpentine catchfly were incorrectly identified as *Silene californica* (currently *Silene laciniata var. californica*), an overall larger plant with flower petals lobed 4-6 times as opposed to 2-4 times as in serpentine catchfly. In addition the two species differ in habitat. *S. l. var. californica* mostly occurs in mixed conifer woodlands and only occasionally on serpentine derived soils.

Thus, serpentine catchfly was first described 9 years ago as *Silene serpentinicola* by Thomas and Jane Nelson (Nelson and Nelson, 2004) as a recent addition to the flora of North America. In 2011 *S. serpentinicola* underwent a taxonomic revision and was placed as a subspecies of *Silene hookeri,* citing updated interpretations of cytological studies conducted by Arthur Kruckeberg in the early 1960's, as well as gross morphological similarities (Chambers and Meyers, 2011). Continued morphologic comparisons of *S. hookeri* specimens with *S. h. ssp. serpentinicola* specimens, found in the Smith River drainage of northern California, have revealed consistent and distinct morphological differences between the two. Filament color, stamen exertion and carpophore morphology represent differing characteristics in specimens that were compared (Michael Mesler, pers. com. December 2012). Of

Figure 1. A short tongued bombyliid fly that may act as a pollen thief on members of the *Silene hookeri* complex, such as *S. h. ssp. serpentinicola* (Mesler, pers. com., 2012). Photo: Kailey Albertson

[1] Serpentine soils are rich in heavy metals particularly iron, chromium, nickel and cobalt. Serpentine soils are derived from ultramafic rocks, particularly serpentinite, a rock formed by the hydration and metamorphic transformation of ultramafic rock from the Earth's mantle. Serpentine soils are characterized by a low calcium to magnesium ratio and a lack of essential nutrients such as nitrogen, potassium and phosphorous

particular interest is that *S. h. ssp. serpentinicola* has a distinct shaped short and broad carpophore that lacks "nectar windows"[2] (Michael Mesler, pers. com. December 2012). The lack of "nectar windows" may be the reason it is pollinated by hummingbirds, as opposed to long tongued bombyliidae flies like other species of the *S. hookeri* complex (Michael Mesler, pers. com. December 2012). Further studies are being conducted by Mesler et al. and may result in a future publication about the taxonomic status of *S. h. ssp. serpentinicola,* as well as other subspecies within the *S. hookeri* complex.

Geographic Range

The known distribution of serpentine catchfly reveals it to be a very narrow endemic that is mostly confined to the north fork Smith River basin, with a few populations found in the middle fork and south fork Smith River drainages. The species is also edaphically limited, occurring only on serpentine soils in these specific areas. The adjacent map shows the currently known geographic range totaling about a 34 sq. mi. area.

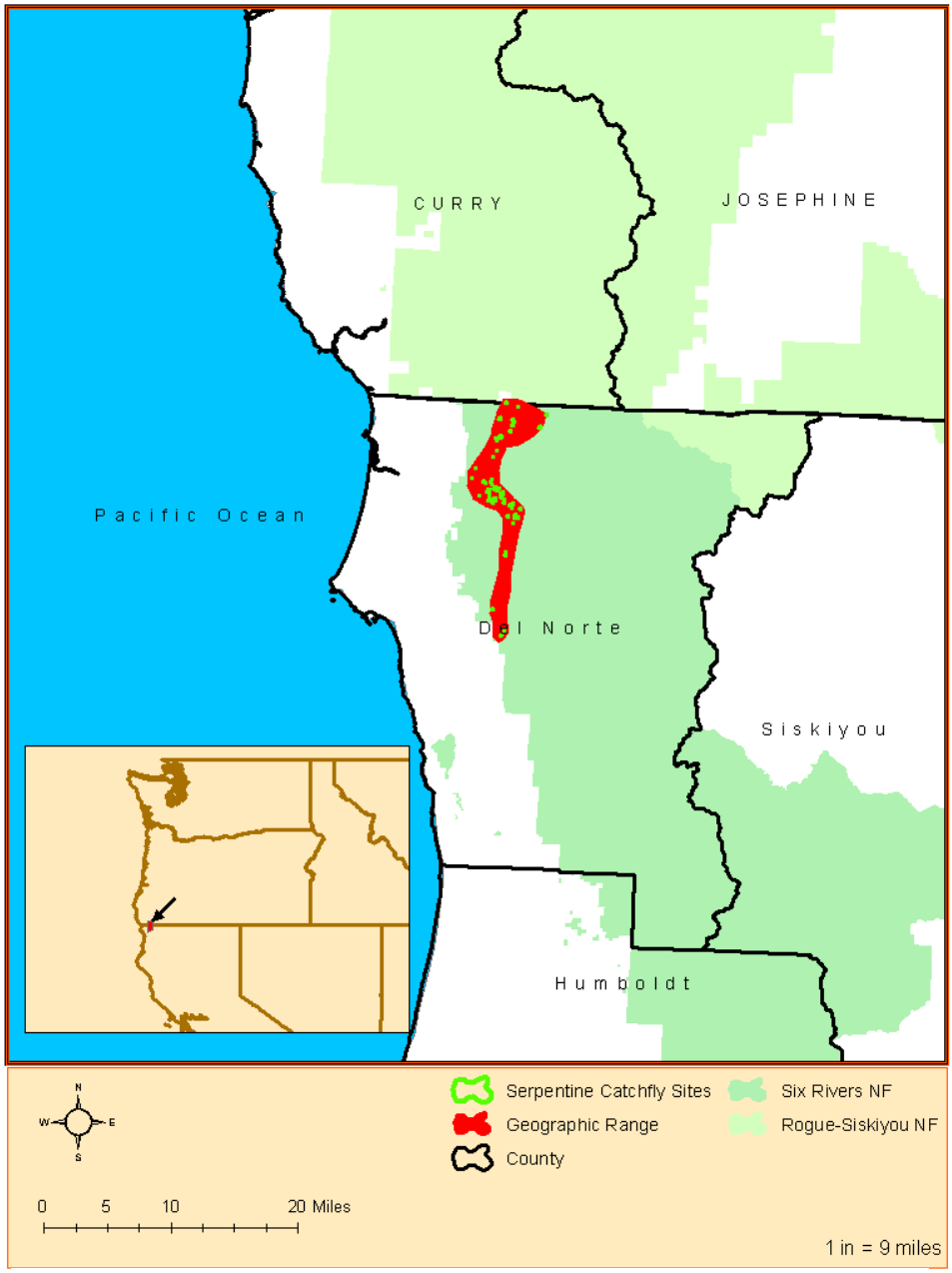

Figure 2. Worldwide distribution of *Silene hookeri ssp. serpentinicola*

Generally speaking this species exhibits a distribution that is somewhat typical for endemic plants (Kaye et. al, 1997). In this instance a geographically confined area of potential habitat is

[2] Distinct gaps between the bases of petals and anti-sepalous filaments (Mesler, pers. com., Dec. 2012).

extensively utilized by the species while long distance dispersal limitations, habitat affinity or other factors make the species very rare across the greater landscape.

Conservation Status

Serpentine catchfly is ranked as G2 by NatureServe (June, 2013). A G2 rank is given to species that are imperiled because of rarity or because other factors demonstrably make it very vulnerable to extinction (extirpation), typically with 6-20 occurrences worldwide (ORBIC, 2010). Based on criteria[3] established by NatureServe (October, 2004) for separating plant element occurrences there appear to be ~12 current meta-populations in the world, some of which are quite large comprising many sub-populations and occupying hundreds to possibly thousands of acres of habitat.

The Oregon Biodiversity Information Center (ORBIC) rank serpentine catchfly at the state level as S1? (ORBIC, 2010), and list Josephine as the only county where the species is thought to be present. A "?" behind the state ranking indicates a provisional determination that requires further documentation due to uncertainty (ORBIC, 2010). Often this is given to taxa that have older historical sites, but for which very few recent records exist. This is the case for serpentine catchfly. The sites reported in Oregon are all more than 20 years old. One very old report is from more than a century ago.

For purposes of prioritization of conservation efforts, ORBIC ranks species rarity and imperilment for the state. They include serpentine catchfly on their List 3 which contains taxa for which more information is needed before status can be determined, but which may be threatened or endangered in Oregon or throughout the range of the species (ORBIC, 2010). The List 3 status was part of the impetus for conducting this inventory in Oregon.

In Region 6 of the Forest Service serpentine catchfly is considered a "Strategic" species. Strategic species include taxa for which more information is needed before determining if they should be placed on the Sensitive list. The Region's Sensitive and Strategic species list criteria are based on global and state ranks. It is common to see ORBIC List 3 species start out on the agencies Strategic list and then move up if they become List 1 or 2 species once more information is gathered through reports such as this one.

Habitat

There is very little information specifically addressing habitat requirements for the serpentine catchfly. The Flora of North America describe habitat as grassy, gravelly, or rocky openings in chaparral, woodlands, and coniferous forest on serpentine (FNA efloras, 2012). The Jepson Manual 2nd edition gives this brief habitat description: serpentine soils, chaparral, conifer forest; 100-800 m. The original description for the species characterizes habitat as serpentine soils within the Smith River basin of northwestern Del Norte County,

[3] The NatureServe element occurrence (EO) data standard provides a default separation distance of 1 km (~0.62 miles) or greater for plant and animal elements that lack EO specs such as the serpentine catchfly.

Figure 3. Maritime Jeffrey pine savanna. Photo: Clint Emerson

extreme northwestern California (Nelson and Nelson, 2004). They mention that they were unable to find populations in extreme southwestern Oregon but that the same serpentine sequences in Del Norte County extend into Oregon.

Based on observations made during this inventory it is apparent that this taxon can occur in at least three habitat types.

Several sub-populations were observed on Pine Flat Mountain (California) growing amongst a consistent cover of forb and graminoid species, in open un-shaded conditions. Jeffrey pine (*Pinus jeffreyi*) occur scattered across a flat to rolling plain of serpentine scabland, with islands of dense shrubs forming a mosaic across the landscape. This habitat is often referred to as maritime Jeffrey pine savanna and is an uncommon ecosystem within the landscape. In this habitat plants were found in small groups randomly scattered throughout grassy areas as well as along edges of dense shrub fields. Evidence of past fire is difficult to detect in these quickly growing forb and graminoid communities that have very little downed wood. It's probable that frequent fire plays a role in shaping these Jeffrey pine savanna habitats.

A commonly colonized habitat is recently (within 15 years) burned areas on shallow soiled serpentine. These areas are mostly denuded of vegetation due to high intensity fire. Remnant shrub species such as tanoak (*Lithocarpus densiflorus*), huckleberry oak (*Quercus vaccinifolia*) and myrtlewood (*Umbellularia californica*) were observed aggressively re-sprouting after recent fires in the area. This habitat is usually found on moderate to steep slopes that in the absence of fire would normally be dense impenetrable thickets. These field observations lead to questions about the role of natural disturbance, particularly wildfire, for the ecology

Figure 4. Young vegetative serpentine catchfly seedlings coming up in a recently burned area, as evidenced by the adjacent charred woody debris. Photo: Clint Emerson

and conservation of this taxon.

The final type of habitat observed could be characterized as rocky/gravelly serpentine soil on exposed road cuts. These areas are mostly lacking competing vegetation. The appearance of serpentine catchfly plants on these sites appear to differ slightly from sites within Jeffrey pine savanna habitat. Stems appear shorter and the plants have an overall more compact stature.

Figure 5. Roadcut habitat just east of the North Fork Smith River along the Low Divide Road in Del Norte County, California. Photo: Clint Emerson

Results of Field Inventory

Initial field work focused on determining the location of the three historically reported populations within the state. This was done by consulting the original botanists who reported the sites or with others who had valuable information.

Two of the sites were found by botanists still living and one site was reported at the end of the 19th century. Veva Stansell reported the species from the Packsaddle Mountain vicinity in Curry County in the early 1990's, but she did not collect a voucher specimen because there were not enough individual plants present. When consulted on this site she gave specific directions to an area where two abandoned mine shafts make it easy to relocate the exact spot. The location was thoroughly surveyed and it was determined that serpentine catchfly is no longer present at this site. The Jeffrey pine savanna habitat along a narrow saddle at the reported site is very similar in species composition and topography as the Pine Flat Mountain sites in California. So it seems likely the species occupied the area in the past and could again in the future.

David Imper reported a site of serpentine catchfly in the early 1980's (at the time he referred to it as *Silene hookeri ssp. pulverulenta*) from along the 4402 road (Wimer Road) just east of the bridge after passing over Whiskey Creek in a Jeffrey pine/fescue grassland. This area was thoroughly surveyed and the only Silene species found in the area is *Silene campanulata ssp. glandulosa*.

The third historic site in Oregon is from a voucher specimen taken by Thomas J. Howell in 1884. According to Kenton Chambers with the OSC herbarium it is not possible to get an exact location for this voucher specimen but it is likely near the historic mining town of Waldo, Oregon. With such little information it was impossible to know where to start surveying so there was not an attempt to relocate this specific site. However, considering the long term botanical interest in the town of Waldo and the surrounding area it seems probable that some botanist in the past 129 years would also have documented a site of serpentine

catchfly if it were present in the area. The current known distribution in California indicates that the species does not occur more than a few miles east of the North Fork Smith River so it would be a significant disjunct if it were to be found near Waldo. It is likely that the population Howell collected from is no longer extant, but there is no way to be certain either way. Previous confusion about Howell collections in the area have been noted so it may be that the site was actually in a different location, possibly not in Oregon.

Based on those findings attention was then placed on surveying high potential habitat areas in Oregon. Eight survey transects totaling roughly 250 acres were surveyed along the California/Oregon border. One known population in California on Six Rivers NF land along the northern margin of Pine Flat Mountain is growing only about 1000 feet from the Oregon border. After observing several sites in California, survey areas in Oregon were chosen keeping in mind many of the same ecologic variables and species composition assemblages. Many acres of suitable habitat exist along the southern boundary of Curry County but serpentine catchfly is mostly absent from these areas for unknown reasons. The reasons may have to do with fire suppression, natural geographic limitations and subtle differences in climate, soils and vegetation.

As a result of our inventories one new population of serpentine catchfly was documented through a voucher specimen (Clint Emerson, Kailey Albertson, Catherine Dunn #1242) in Curry County, Oregon, 41° 59' 48.77" 123° 59" 59.62". The one acre population was discovered growing along the border extending to about 100 meters north of the state line into Oregon along the most northern edge of the broad and flat bench known as Pine Flat Mountain. The site occurs in a section of Oregon Department of Forestry land that is surrounded by lands managed by the Rogue River-Siskiyou National Forest (RRSNF) on the west, north and east sides, and confined by the California border to the south. The site lies roughly 600 meters west of adjacent lands managed by the Gold Beach Ranger District. The population consists of 100-150 flowering individuals with hundreds more vegetative individuals. The habitat is recently burned serpentine shrub-scrub with scattered Jeffrey pine and western white pine (*Pinus monticola)* in the overstory. The diverse shrub layer is dominated by tanoak, myrtlewood, huckleberry oak, whortleberry (*Vaccinium scoparium*), Gasquet manzanita *(Arctostaphylos hispidula)*, coffee berry (*Rhamnus californica*), pine mat manzanita (*Arctostaphylos nevadensis)*, pygmy Oregon grape *(Berberis pumila)* and mountain juniper *(Juniperus communis var. saxatalis)*. The forb layer is dominated by spreading phlox (*Phlox diffusa)*, yellow leaf iris (*Iris chrysophylla),* yellow inside-out flower *(Vancouveria chrysantha)*, Howell's biscuitroot (*Lomatium howellii)*, bigseed biscuitroot (*L. macrocarpum),* Pine violet *(Viola lobata),* small flowered death camas

Figure 6. Vouchering the only extant population of serpentine catchfly in Oregon. Photo: Catherine Dunn

(*Toxicoscordion micranthum*) and leafy fleabane (*Erigeron foliosus var. confinis*). This was one of the largest populations observed during the course of the inventory. The exact date of the fire that came through the area where the population occurs is unknown. Evidence of the fire is readily visible so it's probable that it occurred within the last 10 to 15 years. It also appeared that some sort of insect or disease has caused a large die off of western white pine in and adjacent to the site. The only anthropogenic threats in this area is likely to come from fire suppression and possibly mining. Soils at the site are classified as Mislatanah-Red Flat-Greggo Complex. Soils found in this complex are generally shallow and well drained and often occur on broad ridgetops and side slopes of mountains. The soils formed in colluvium and residuum and are derived from serpentinized peridotite or other serpentinized rock types. The mean annual precipitation in this area is roughly 110 inches per year, with the mean annual temperature at about 49° Fahrenheit (Curry County Soil Report, 1995).

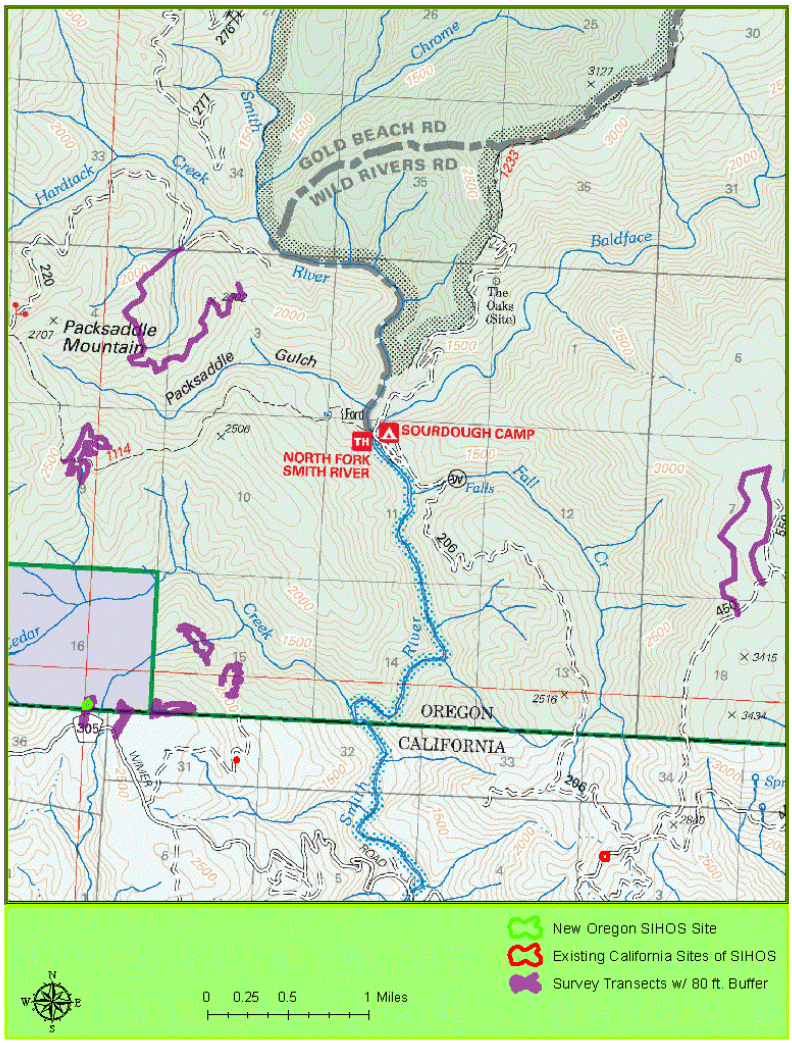

Figure 7. Map showing survey transects and the new population of serpentine catchfly found in Oregon during this inventory.

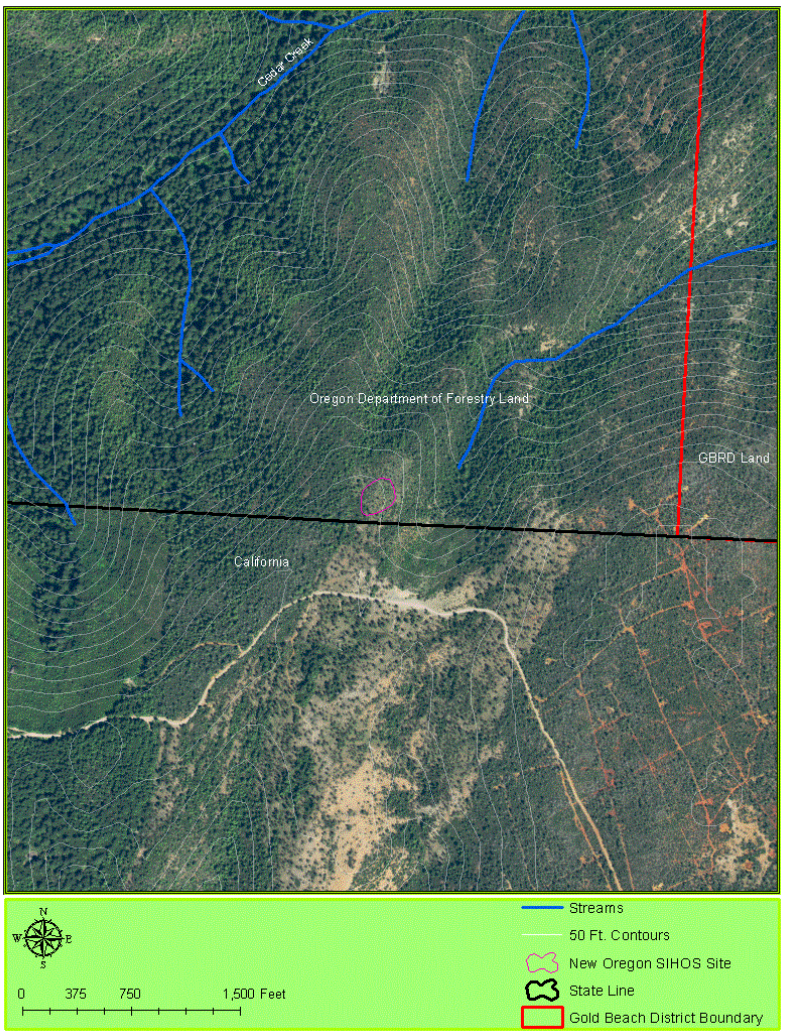

Figure 8. Specific location of the only vouchered and verified population of *Silene hookeri ssp. serpentinicola* in Oregon

Incidental Sites

In addition to discovering a new population of serpentine catchfly in Oregon, we also discovered several incidental rare plant species. In general the area around the North Fork Smith River in both Oregon and California is known by botanists far and wide to be rich in plant diversity. The table below outline's rare plant species encountered and their conservation status.

Figure 7. Habitat at the Oregon site of serpentine catchfly. Photo: Clint Emerson

The most important discovery was a new population of Mcdonald's rockcress (*Arabis macdonaldiana*), a plant listed as Endangered by the US Fish and Wildlife service. The population was found growing within crevices of a large serpentine rock outcrop on a steep slope above Cedar Creek, a tributary to the North Fork Smith River. There is considerable taxonomic flux currently surrounding this species. See Summary Report to USFWS and BLM December 2012 by LindaVorobik for a detailed draft paper that is soon to be published. If the taxonomic changes are accepted then this particular population would likely be treated as *Arabis aculeolata var. delnortenis* var. nov. introduced in the Vorobik paper. It is unlikely this species will continue to be listed by the USFWS, although mining is threatening much of the habitat where the species occurs.

Species	USFWS Status	ORBIC Status	Forest Service Status
Arabis macdonaldiana McDonalds rockcress	Endangered	G2/S1 List 1	Endangered
Actostaphylos hispidula Gasquet manzanita	Species of Concern	G3/S2 List 2	Sensitive
Horkelia sericata silky horkelia	None	G3G4/S1? List 3	None yet
Rosa gymnocarpa var. serpentina serpentine rose	None	G5T2/SNR List 3	None yet

Gasquet manzanita (*Arctostaphylos hispidula*) was found along with serpentine catchfly at the new Oregon site. Silky horkelia (*Horkelia sericata*) was found while surveying an area of prime Jeffrey Pine savanna along a broad saddle just east of Packsaddle Mountain. The taxonomic status of silky horkelia has been confusing in the past, but is now treated as a separate species from the more common Howell's horkelia (*Horkelia howellii*). The two are easily distinguished by overall size and the fact that silky horkelia has stipules entire to

forked while Howell's horkelia has stipules pinnately divided. The final collection was of serpentine rose (*Rosa gymnocarpa var. serpentina*) from a dry harsh south facing slope above Cedar Creek. This is a recently described variety that, to date has very few collections within the state of Oregon. This is likely from under-collection due to taxonomic confusion therefore we intend to document many more sites over the coming years. Specimens for serpentine rose and silky horkelia are deposited at OSC. Collections were not made for Gasquet manzanita nor Mcdonald's rockcress.

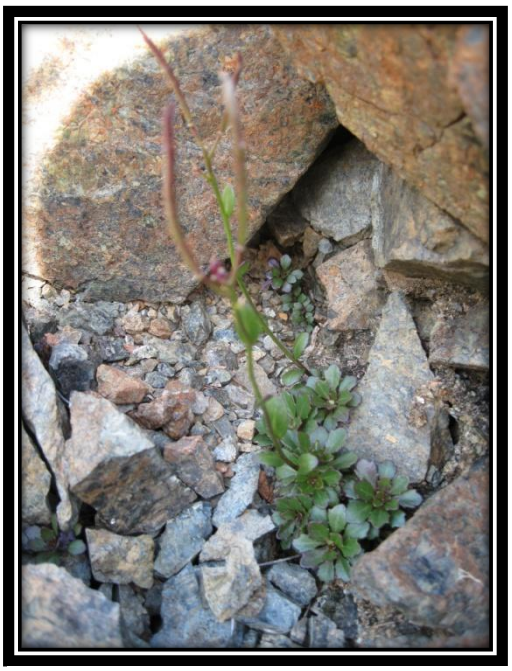

Figure 8. McDonald's rockcress (*Arabis macdonaldiana*). Maybe soon to be called Del Norte rockcress (*Arabis aculeolata var. delnortenis var. nov.*) Photo: Clint Emerson

Conclusion

The North Fork Smith River area is a very remote and rugged landscape that the Biscuit Fire of 2002 along with several other recent fires has helped to shape. The combination of dynamic disturbance, geology and topography create a unique landscape that is suited to the colonization of rare and endemic plant species. Based on our observation it seems likely that wild land fire plays a huge role in creating and maintaining habitat for serpentine catchfly. Though the Biscuit fire created and maintained thousands of acres of habitat in California the fire did not burn within the most suitable habitat areas located in Oregon. Much of the suitable habitat within Oregon was thoroughly surveyed during this project. There is potential to discover more populations within Oregon in areas of suitable habitat that were not examined during this inventory. This species would likely be a good candidate for species distribution modeling because of its high fidelity to its habitat. Inventory of the high likelihood habitat shown by the model could result in the discovery of more Oregon populations. With regard to the species biology it is recommended that the Forest Service pursue either let it burn policies or actively promote fire on certain portions of the landscape in this area in order to benefit serpentine catchfly. A pilot project could be tested in order to determine whether beneficial effects are possible through prescribed fire.

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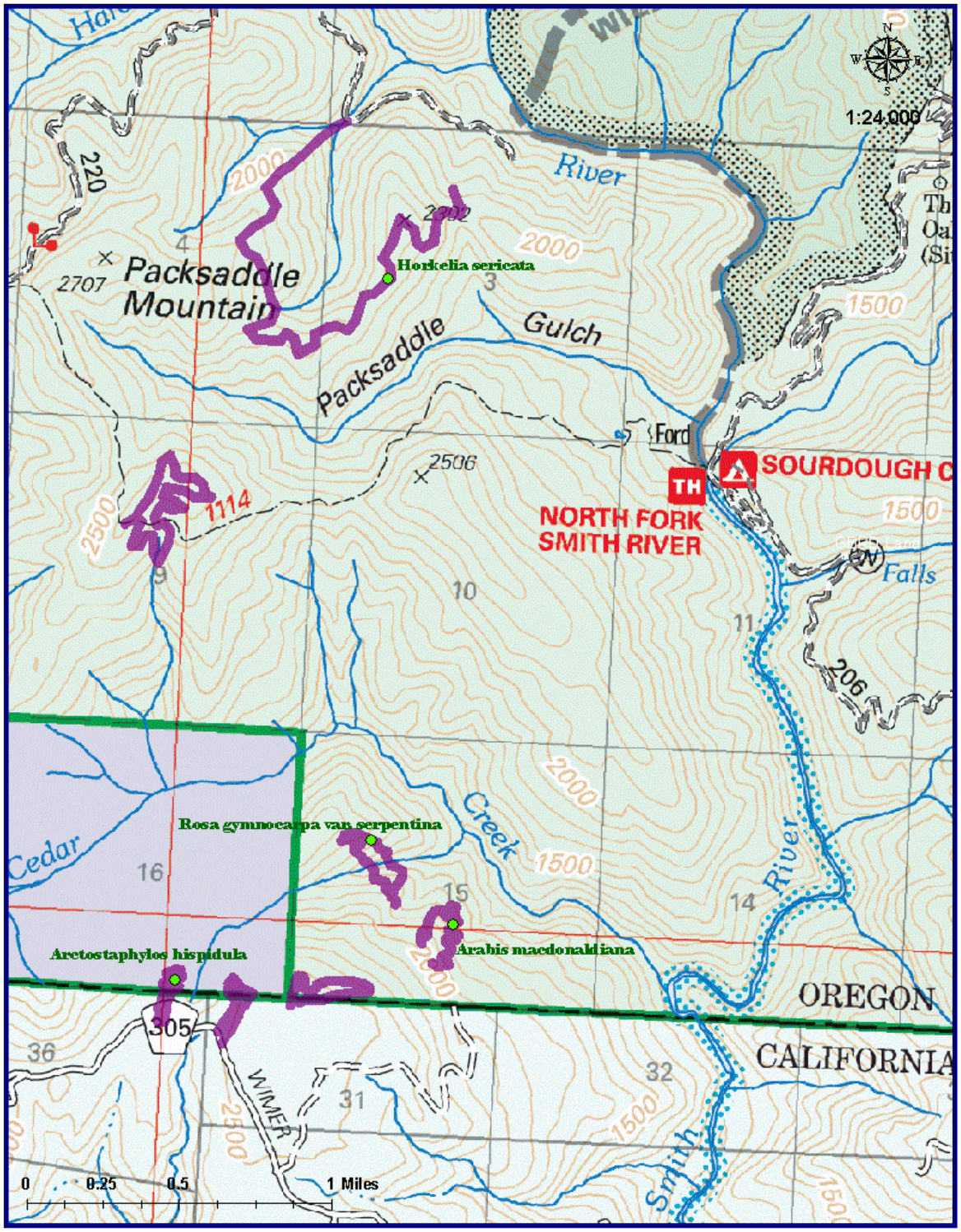

Figure 9. Incidental rare plant discoveries while conducting the serpentine catchfly inventory.

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