Conservation Assessment
for
Gasquet Manzanita
(*Arctostaphylos hispidula*)

Within the State of Oregon

Photo by Clint Emerson

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Disclaimer

This Conservation Assessment was prepared to compile existing published and unpublished information for the rare vascular plant Gasquet manzanita (*Arctostaphylos hispidula*) as well as include observational field data gathered during the 2008 field season. This Assessment does not represent a management decision by the U.S. Forest Service (Region 6) or Oregon/Washington BLM. Although the best scientific information available was used and subject experts were consulted in preparation of this document, it is expected that new information will arise. In the spirit of continuous learning and adaptive management, new information that will assist in conserving *Arctostaphylos hispidula* should be forwarded to the interagency Special Status/Sensitive Species Conservation Planning Coordinator in Portland, Oregon via http://www.fs.fed.us/r6/sfpnw/issssp/contactus/.

Executive Summary

Arctostaphylos hispidula Howell (Gasquet manzanita, Howell's manzanita) is a vascular plant member of the Ericaceae (Heath) family. The species worldwide ranges from Curry County, Oregon south through Humboldt County, California with disjunct populations in northern Sonoma County, California. The plant mostly grows in open rocky conditions where ultramafic serpentine soils have dictated vegetative assemblages. It also is found in non-serpentine situations on coastal mountain balds dominated by postfire brushfields.

It is considered a Sensitive species by the USDA Forest Service, Region 6 and USDI Bureau of Land Management (BLM), Oregon State office. The US Fish and Wildlife Service list it as a Species of Concern. The majority of known sites in Oregon, totaling thirty five, occur on the Gold Beach and Powers Ranger Districts of the Rogue River-Siskiyou National Forest. Nine sites occur on Coos Bay BLM managed lands and four sites occur on private lands, however two of the sites are very questionable and need to be checked in the future. Three previously recorded sites, one on Medford BLM land and two on private land, were determined to be errors in identification or are no longer extant.

Primary threats to the species include timber management, fire exclusion and competitive succession, mining, and infrastructure development and maintenance (ex. telecommunication towers etc.). Very little information is known about the plants life history elements such as pollinators, seed dispersal mechanisms, seed bank dynamics, or gene flow between populations. Based on our field assessments of a majority of all known sites in Oregon, the species appears to be stable to slightly declining, primarily due to fire exclusion.

A large portion of its already limited range in Oregon was burned by the Biscuit Fire of 2002. Nearly all sites within the fire perimeter were revisited. None of the sites visited had been extirpated by the fire, and little recruitment of new individuals was noticed. In addition, several other known sites outside of the Biscuit fire were reexamined in order to ascertain the health and vigor of each population. This included an attempt to relocate several populations that appeared to be fairly far to the east of the plants normal coastal

distribution. The goal was to reassess whether or not these sites were correct identifications of this often difficult to identify genus. None of the sites visited in the eastern Siskiyou Mountains were determined to be *A. hispidula*, however two outlier sites are yet to be reexamined but seem likely to be mis-identifications.

Very little information exists about the dispersal biology of *A. hispidula*. The species is not thought to produce a burl from which re-sprouting shoots form following disturbance such as fire. Dispersal by seed is theorized as the main mode the species reproduces by. Our field assessments sought to make reproductive observations for *A. hispidula* within sites burned over by the Biscuit fire in 2002.

Based on our assessment it was determined that the lack of disturbance across the landscape, mainly in the form of fire, has resulted in small fragmented populations. Several management considerations are offered in order to assist in the long term conservation of the species. In particular introducing fire through prescribed burning practices has the potential to remove competing vegetation and spur germination of seed banks. Cutting, piling and burning competing vegetation is an efficient way to accomplish this while minimizing hazards created from underburning within thick shrubby vegetation on steep south facing slopes.

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I. Introduction

Arctostaphylos hispidula (Gasquet, Howell's Manzanita) is a rare shrub species with a limited distribution within Oregon. The species is more stable and secure in California, though it is limited to only the most northern coastal counties with a disjunct set of populations a few hundred miles to the south. Though the species is not thought to be globally rare, there is concern about the lack of information pertaining to its distribution and reproductive biology in Oregon. It is a very difficult species to discern from other common manzanitas and therefore may be over reported because of misidentifications.

A. Goal

One goal of this Conservation Assessment is to summarize historic and current knowledge regarding the biology, ecology and threats to *A. hispidula* in order to determine if active management may be necessary to maintain or promote the species. This document will serve as a guiding tool, providing management considerations that will help present and future line officers make informed decisions when managing land within and adjacent to *A. hispidula* sites and habitat.

A second goal is to share a succinct set of field characteristics that can be used to positively identify this plant accurately. Several populations that have been reported appear to be other common species of manzanita, creating confusion with regard to the distribution of *A. hispidula*.

Lastly we share information gained from field assessments geared at determining the main mode of reproduction for *A. hispidula,* because of concerns that large scale fire could potentially extirpate several populations of the species within a relatively short time. Some concern already existed about the effects of the 500,000+ acre Biscuit fire that occurred in 2002. Determining the reproductive mode helps to identify and develop management approaches that could enhance the species (i.e. prescribed burning, active propagation/planting etc).

The goals and management considerations of this Assessment are specific to BLM and Forest Service lands in Oregon.

B. Scope

The geographic scope of this assessment is the Coast and Siskiyou Mountains of Curry, Josephine and Douglas Counties in extreme southwestern Oregon. Two known sites previously reported from Josephine County and one in Douglas County, Oregon were revisited in preparation of this Conservation Assessment, and were determined to not be accurate *A. hispidula* populations. The range of the species extends south into Del Norte and Humboldt County, California with disjunct populations in Sonoma County, California. The California portion of the range is not included in this assessment. The California Natural Diversity Database (CNDDB) does not rank *A. hispidula* as a priority for conservation because of its somewhat abundant distribution in the state.

Available data on known sites comes from Federal lands administered by the Forest Service (Rogue River-Siskiyou National Forest (RRSNF) and Six Rivers NF) and USDI Bureau of Land Management (Coos Bay and Medford Districts). Data for sites on private lands comes from the Oregon Natural Heritage Information Center (ORNHIC).The CNDDB provided limited data on sites in California.

The scope of the assessment is limited to the rare plant *A. hispidula* and does not include any other species. All information summarized is dynamic; therefore adaptive management over time is likely to add new information to this assessment.

C. Management Status

The information presented here is compiled to help manage the species in accordance with Forest Service Region 6 Sensitive Species (SS) policy and Oregon/Washington Bureau of Land Management Special Status Species (SSS) policy. Additional information for Region 6 SS and Oregon BLM SSS is available on the Interagency Special Status Species website (www.fs.fed.us/r6/sfspnw/ISSSSP).

For lands administered by the Oregon/Washington Bureau of Land Management (OR/WA BLM), SSS policy (6840 manual) details the need to manage for species conservation.

For Region 6 of the Forest Service, SS policy requires the agency to maintain viable populations of all native and desired non-native wildlife, fish, and plant species in habitats distributed throughout their geographic range on National Forest System lands (USDA Forest Service, 2002). Management "must not result in a loss of species viability or create significant trends toward federal listing" (FSM 2670.32) for any identified SS.

The status of *A. hispidula* in Oregon is designated by the Oregon Natural Heritage Information Center (ORNHIC). They have placed the species on List 2, which "contains taxa that are threatened with extirpation or presumed to be extirpated from the state of Oregon. These are often peripheral or disjunct populations of species that are of concern when considering species diversity and distribution within Oregon's borders. They can be very significant when protecting the genetic diversity of a taxon. ORNHIC regards extreme rarity as a significant threat and has included species which are very rare in Oregon on this list" (Oregon Natural Heritage Information Center 2007). In California, the status is defined by the California Native Plant Society (California Native Plant Society 2006) and the California Natural Diversity Database (California Department of Fish and Game 2006), which ranked the species on the CNPS List 4.2, the "watch list". Nature Serve ranks the species as G3 "vulnerable, at moderate risk of extinction or elimination" with a Heritage Rank of S2 "imperiled in Oregon". The US Fish and Wildlife Service lists *A. hispidula* as a "Species of Concern".

Table 1. Rarity of *Arctostaphylos hispidula* in Oregon.

Oregon Distribution	Global Rank	State Rank	ODA State Status	Federal Status	ORNHIC Rank
Curry, Douglas? & Josephine?; Klamath/Siskiyou and Coast Ranges	G3	S2	None	Species of Concern	List 2

II. Classification and Description

A. Nomenclature and Taxonomy

Scientific Name: *Arctostaphylos hispidula* Howell
Common Name: Gasquet, Howell's or Hairy Manzanita
Family: Ericaceae
Species Code: ARHI5
Type Locality: Near Gasquet, Del Norte County, California, Thomas Jefferson Howell in April 1886 (Adams 1940). On bottom lands along Smith River at Gasquet [sic], Del Norte County, California (Howell 1901, Abrams 1951)

The genus *Arctostaphylos* consists of about 60 accepted species with the majority of them occurring on the west coast and primarily in California (USDA NRCS, 2008). The genus forms a very diverse and difficult to differentiate complex of species. A high level of hybridization amongst species further complicates the taxonomy of this genus (Bouldin, 1991; Wells, 1988; Chambers, 2003).

The species was described by several botanists under five different names between 1887 and 1940 adding more to the confusion about what the actual distribution and morphological characteristics were that defined the taxon. It was first described as *Arctostaphylos stanfodiana* by C.C. Parry in 1887 from near Calistoga, California. Thomas J. Howell described *A. hispidula* in 1901 from a plant he collected in 1886 from near Gasquet, California along the Smith River. Heller described it as *Uva-ursi hispidula* in 1913. The species was described as *Arctostaphylos viscosissima* by Morton E. Peck from a collection he made in 1932 on Bald Mountain within the Euchre Creek watershed. J. E. Adams described a new combination as *A. stanfordiana ssp. hispidula* in his monograph of *Arctostaphylos* in 1940. Finally in 2000 Philip V. Wells re-acknowledged Howell's original description of the species as *A. hispidula* in his monograph of manzanita's in California.

Morphologically *A. hispidula* has been theorized to have originated in the Sonoma County region of California as a hybrid of *A. stanfordiana* and *Arctostaphylos viscida* (Wells, 1988). Phylogenetic research has shown a different lineage for *A. hispidula*. Though *A. stanfordiana* was found to be a close relative, the study put *A. viscida* into an entirely separate clade (Boykin, Vasey, Patterson, Parker, 2005).

Synonyms include the following: *Arctostaphylos viscosissima* M.E. Peck, *A. hispidula* T. J. Howell var. *viscosissima* M. E. Peck; *A. viscosissima* Peck, *A. pungens* Kunth ssp. *hispidula* (T. J. Howell) J. B. Roof; *A. stanfordiana* Parry ssp. *hispidula* (T. J. Howell) Adams (Munz and Keck 1968), *A. stanfordiana* Parry var. *hispidula* (T. J. Howell) Adams (Peck 1941), and *Uva-ursi hispidula* Heller.

B. Species Description

The following technical description by Wells is from the Jepson Manual (Hickman 1993):

Shrub 1–2 m; burl 0
Stems spreading or erect; twigs finely glandular-bristly
Leaves erect; petiole 3–6 mm; blade 1.5–3 cm, 0.5–1.5 cm wide, ± elliptic to oblanceolate, base generally wedge-shaped, margin entire or teeth few, surfaces ± alike, dark green, dull or ± shiny, generally finely glandular-bristly, papillate, scabrous
Inflorescence: branches 3–6, crowded; flowers well spaced; bracts 2–4 mm, scale-like, awl-like; lowest bract 8–10 mm, leaf-like, linear-lanceolate; pedicel 3–5 mm, glabrous; immature axes 1–2 cm, slender, ascending to erect
Flower: ovary glabrous
Fruit 5–7 mm wide, subspheric, glabrous, whitish tan, becoming ± glaucous
Ecology: UNCOMMON. Rocky serpentine soils or sandstone, open sites, forest
Elevation: 300–600 m.
Bioregional distribution: Klamath Ranges, Outer North Coast Ranges
Distribution outside California: sw Oregon
Synonyms: *A. stanfordiana subsp. h.* (Howell) J.E. Adams

Non-technical description based on field observations by the author:

Shrub .5 to 2.5 meters in height; many branched plants with somewhat erect leaves tending toward an army green color; leaves are small and lance-elliptic shaped with a sandpaper feel, especially on the more mature leaves; nascent inflorescences are gracile and often glandular hispid and very sticky to the touch; flowers and fruits are somewhat smaller than other associated manzanita species; bark color tends to be a more chocolate color rather than the more red tinted color of the other associated manzanitas, plants mostly found on barren serpentine shallow soils but sometimes occurring to a lesser extent in fire created shrub fields with deeper soils.

C. Regional Differences

Some botanists have reported observing basal burls within some of the larger populations of *A. hispidula* on the Six Rivers National Forest in Del Norte County (Bouldin, 1991). These reports may have represented sightings of *Arctostaphylos glandulosa* intermixed with *A. hispidula* populations. Basal burls were not observed at any of the sites in Curry County on the Rogue River-Siskiyou National Forest. In general basal burls have not been observed in *A. hispidula*.

D. Similar Species

Within the range of this assessment there are five other species of *Arctostaphylos* found. They are, in order of observed dominance: *Arctostaphylos columbiana*, *Arctostaphylos nevadensis*, *Arctostaphylos canescens*, *Arctostaphylos patula* and *Arctostaphylos glandulosa*.

The most morphologically similar species in the field are *A. patula* and *A. glandulosa*. It has been speculated that *A. patula* may hybridize with *A. hispidula* in some instances (Wells, 1988). The following table presents a comparison of characteristics that define each species of *Arctostaphylos* within the range of *A. hispidula* in Oregon.

Table 2. Comparison of *Arctostaphylos* species found within the range of *A. hispidula* in Oregon. (Table created by the author, C. Emerson, using various information sources: Jepson, 1994; Wells,1988; Flora of North America online at efloras, 2008; and the authors field observations).

Character	*A. hispidula*	*A. patula*	*A. glandulosa*	*A. columbiana*	*A. canescens*	*A. nevadensis*
Habit and height	Erect to spreading shrub; .5-2.5 meters; no burl evident	Shrub forming circular clones; decumbent w/lower branches rooting; 1-2 m; no burl	Shrub 1-2.5 m; burl large, generally wide and flat topped	Shrub, tree like, 2-10 m, no burl	Shrub, .3-2 m, no burl	Shrub, < .6 m, mat to mound like, no burl
Leaf shape	Elliptic to oblanceolate; base generally wedge shaped	Widely ovate to round; base round; tip often rounded	Elliptic to ovate, base wedge-shaped to rounded, sometimes lobed	Generally ovate to elliptic, base wedge-shaped to ± rounded	round-ovate, ovate, or elliptic, base rounded to wedge-shaped, tip acute to abruptly soft-pointed	Obovate or oblanceolate, base ± wedge-shaped, tip ± obtuse
Leaf size	1.5-3 cm long; .5-1.5 cm wide	2.5-6 cm long; 1.5-4 cm wide	2-4.5 cm long; 1-2.5 cm wide	4-6 cm long; 2-3 cm wide	2-5 cm long, 1-3 cm wide	1-3 cm long, 1-1.5 cm wide
Petiole length	3-6 mm	7-15 mm	5-10 mm	4-10 mm	3-10 mm	3-7 mm
Leaf texture and vestige	Glandular-hispid when young; scabrous when mature	Glabrous and smooth	Glandular-puberulent to -bristly, scabrous, becoming glabrous and smooth in age	Finely tomentose, ± sparsely glandular-bristly, papillate, becoming glabrous	Canescent, becoming strigose	± puberulent, becoming glabrous, smooth
Leaf color	Army green to darker green	Bright green	Bright green to strongly glaucous	Dark green, dull	Glaucous	Bright green, shiny

Character	*A. hispidula*	*A. patula*	*A. glandulosa*	*A. columbiana*	*A. canescens*	*A. nevadensis*
Inflorescence branches	3-6 branches; crowded	4-8 branches; open	3-6 branches; crowded	3-8 branches; +/- open	Raceme or 1-3 branched	Raceme, sometimes weakly 1-branched
Inflorescence bracts	2-4 mm; scale like lowest bract leaf like 8-10 mm	4-6 mm; scale like, +/- deltate; lowest bract 1-2 cm, leaf like	5-10 mm, leaf like throughout; upper bracts 3-5 mm lower bracts 8-15 mm	10–18 mm, leaf-like, oblong-lanceolate, acuminate	Bracts 6–20 mm, leaf-like, wide-lanceolate;	Bracts 2–3 mm, scale-like, linear or linear-lanceolate, lowest bract generally 5–10 mm, leaf-like
Pedicels	3-5 mm; glabrous	2-7 mm; glabrous	3-10 mm, finely tomentose to shorth glandular	2-4 mm, finely glandular-bristly	5-9 mm, recurved in fruit, tomentose	3-5 mm, glabrous
Flower	Ovary glabrous	Ovary glabrous	Ovary hairs like pedicel	Ovary densely white-hairy, sparsely glandular or not	Ovary densely white-tomentose, sometimes glandular	Ovary glabrous
Fruit size	5-7 mm wide	7-10 mm wide	6-10 mm wide	8-11 mm wide	5-10 mm wide	6-8 mm wide
Fruit shape and texture	Subspheric, glabrous	Subspheric, glabrous	Subspheric; hairy to smooth or finely glandular-bristly, sticky	Sparsely hairy	hairy	Spheric, glabrous
Fruit color	whitish tan, becoming ± glaucous	Dark chestnut brown	Tan to chestnut brown	Tan to chestnut brown	Reddish brown	Reddish brown
Bark color and texture	Chocolate brown to more rarely orange brown; mostly smooth	Orange brown and smooth	Brown to orange brown; smooth	Orange brown, often shredding	Orange brown	Orange brown
Ecology	Rocky serpentine and fire created shrub fields	Forest openings, rocky areas, rarely on serpentine	Rocky ridges and slopes, seldom on serpentine	Rocky slopes, coniferous forest	Ridges, slopes, chaparral forest	Rocky soils, coniferous forest
Elevation	0-4,000 feet	3,000-10,000 ft.	0-6,500 feet	200-2,400 feet	500-4,500 feet	2,500-9,500 ft.

A. columbiana, *A. canescens* and *A. nevadensis* are readily identifiable in the field and easily discerned from *A. hispidula*. *A. columbiana* is the most common *Arctostaphylos* species in the study area and can be found at almost every site of *A. hispidula*, or at least

in the general vicinity. *A. columbiana* and *A. canescens* are somewhat similar species both with dense ,whitish forms of vestige on their leaves and inflorescences giving them a distinct whitish to glaucous hue from a distance. The two can be differentiated by the type of vestige (*A. columbiana* being more bristly to glandular bristly while *A. canescens* is more tomentose or white downy), the size of the leaves/plants, and the shape of the immature inflorescence. *A. nevadensis* is a low growing often decumbent species but can be confused for *A. hispidula* when individuals grow more upright. However the texture (*A. nevadensis* being very smooth and not at all scabrose) and the shape of the leaves often make separation of the two species possible.

Figure 1. Photo showing *A. hispidula* on left and *A. columbiana* on the right. This photo highlights the size difference and color of fruits as well as the overall thickness difference of the pedicels.

A. patula and *A. glandulosa* can be more difficult to differentiate from *A. hispidula* plants. These two species seem to be the culprits of the misidentified sites that were reevaluated during this assessment. *A. glandulosa* and *A. hispidula* share many of the same morphological characteristics, especially the ones easily discernible in the field, such as being glandular pubescent on nascent inflorescences and leaves. They share a similar ecological niche and *A. glandulosa* can be found on serpentine at times. However, an obvious character to look for with *A. glandulosa* is the presence of a basal burl from which the species re-sprouts after disturbances such as fire. Sometimes this character is not easily observed and some digging may need to occur to be certain. The

other main characteristic to look for is the presence of leaf-like bracts throughout the entire inflorescence. *A. patula* appears most similar to *A. hispidula* in the field, and is the main species that is mistaken for it. The main difference between the two species can be seen in the morphology of the inflorescence. *A. patula* tends to have the flowers and bracts of the inflorescence somewhat crowded with a thicker pedicel (>1 mm) with dense overlapping bracts hiding the buds. *A. hispidula* has the bracts and flowers more evenly spaced on slender long axes (<1 mm) that are almost threadlike. The buds are exposed and not hidden by overlapping bracts. Other more subtle character differences are leaf color (*A. hispidula* being less shiny and darker army green) and size (width to be precise), fruit color (*A. patula* has very dark chestnut brown fruits as opposed to the paler *A. hispidula*), and leaf shape (*A. patula* tends to have a more rounded base but this is highly variable).

Figure 2. Clockwise from upper left: *A. hispidula*, *A. patula* and *A. glandulosa*.

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Due to these various similar characteristics, sometimes it seems impossible to be absolutely sure what species one is looking at. Many times botanists in the area have reported what they thought were intermediary hybrid species between *A. hispidula* and *A.*

patula. Some of these sites were observed during our field assessments and our observations support these claims.

Figure 3. *A. hispidula* (behind) growing with *A. columbiana* (foreground).

III. Biology and Ecology

A. Life History and Reproductive Biology

Life History

Arctostaphylos hispdula is a perennial shrub that reproduces most often by seed dispersal (Bouldin, 1992; Wells, 1988). The species forms perfect bisexual flowers with both male and female parts present. It is not thought to produce basal burls from which it can re-sprout after fire. Some reports have claimed basal burls were observed on *A. hispidula* but our field assessments were not able to verify these claims. Current knowledge is that this plant likely forms long term seed banks where it occurs and that the seeds are germinated predominantly by fire disturbance (Wells, 1988; Chambers, 2003; Kruckeberg, 1977; Keeley, 1991,2000).

Reproductive Biology

Specific reproductive information for *A. hispidula* is lacking but considerable information exists for the genus as a whole. Information relating to the obligate seeding species in the genus is particularly important. *A. hispidula* appears by most accounts to be an obligate seeder with its only reproductive method being the dispersal and subsequent germination of fertile seed. Bouldin (1992) reported observing a few plants re-sprouting from low hanging branches that had come in contact or been partially buried by soil. This was not observed during our field assessments.

Arctostaphylos species are mostly long lived shrubs in the absence of high intensity fire, with some stands living for over a hundred years (Keeley and Zedler, 1978). *A. hispidula* plants appear to become more reproductive the older they get (Keeley and Keeley, 1977). Our field observations support this, as larger more mature plants seemed to have many more flowers and fruits. Many species of *Arctostaphylos* reach maturity around 15-25 years of age (Horton, 1951), though precise data for *A. hispidula* is lacking.

Because the species is an obligate seeder, it likely produces more viable seed than re-sprouting species such as *A. glandulosa* (Keeley and Keeley, 1977). In order to maximize viable seed stores, obligate seeding species usually expend more energy to produce higher levels of nectar, therefore attracting more pollinators. Though it is not known for certain that *A. hispidula* is a self pollinator, it has been shown that other obligate seeding species of *Arctostaphylos* are. It seems likely that *A. hispidula* would evolve as self-compatible in order to ensure species persistence after a large scale high intensity fire (Fulton, 1979). During these fire events many individuals could be lost, therefore limiting cross-pollination opportunities (Keeley and Keeley, 1977).

Common insects observed visiting *Arctostaphylos* species are bumblebees (*Bombus spp.)*, honeybees (*Apis spp.*), solitary bees and syrphid flies (Keeley and Keeley, 1977). During our field assessments bumblebees and honeybees were observed visiting flowers of *A. hispidula*. Being an obligate seeding species, *A. hispidula* tends to produce a large amount of flowers and rely heavily on pollination from insects to establish a large seedbank in the surrounding soils. There are not any studies available detailing the specifics of pollination biology for *A. hispidula*. Our field assessments did not focus on this topic and limited data were gathered during fieldwork relating to pollination.

Most of our reproductive biology observations focused on the regeneration of *A. hispidula* following the Biscuit fire of 2002. In particular we were interested in identifying seedling reproduction patterns in sites that had been burned over. Besides areas burned by the fire, we also were interested in numbers of seedlings or immature plants at other non-burned sites. In general, reports and personal communications about *A. hispidula* seem to lack much, if any, information about younger immature plants or seedlings being observed at known sites.

Most studies have shown *Arctostaphylos* species (*A. glandulosa*, *A. glauca*, *A. canescens* etc.) to have refractory seeds requiring high temperatures and the presence of charred wood to cause a chemical reaction that promotes or allows germination of seeds to occur (Keeley, 1991). *Arctostaphylos* species also tend to require a cold stratification to break dormancy. In general, the germination of *Arctostaphylos* species in nursery settings has proven difficult, with percent germination usually very low.

Autochory is the main mode of seed dispersal in the *Arctostaphylos* genus but zoochory has been observed as well. *Arctostaphylos* seeds have been collected from coyote scat in chapparal ecosytems of Southern California and were germinated in a lab setting (Silverstein, 2005). It would make sense that birds would disperse the seeds, feeding on the rather large, showy, berry-like fruits of the shrubs, but little documentation has shown this to be true. It may be that the mealy and grainy texture of the fruits does not appeal to many bird species. Most evidence shows that much of *A. hispidula* dispersal likely occurs within close proximity to reproductive mother plants. The largest mono-cultural site known in Oregon lends to this theory, as several thousand plants occupy a roughly 20 acre area, with little to no other plant species present in the area. The fruits appear to harden and shrink on the plants and eventually fall to the ground within feet of the mother plants.

Obligate refractory seeding species such as *A. hispidula* have been observed to create extensive seed banks that are long lived, as the seeds lay dormant, waiting for the right conditions to stimulate germination. The most common ecological trigger to seed germination is the occurrence of a wild fire that burns throughout an existing population, resulting in the complete loss of mature reproductive plants and a reliance on newly germinated seedlings to survive and re-colonize the previously established niche. This method of reproduction relies heavily on the seed bank for viability of the species. If there are not enough germinants after the necessary disturbance, then it is likely the niche could be colonized by other competitive species.

The other issue with relying on fire for germination of seed is that when it does not occur within a certain amount of time, it is likely that adult plants will eventually desiccate and die off. When this happens, and seeds are not triggered by the presence of charred wood, then it seems likely that the habitat could be invaded by competitive species. This issue was one of our main concerns when considering conservation of this rare manzanita species.

B. **Range, Distribution and Abundance**

Arctostaphylos hispidula is known to occur from the Coast Mountains and Klamath/Siskiyou Mountains of northern California to the Coast Mountains and Klamath/Siskiyou Mountains of southwest Oregon. There are a handful of disjunct populations occurring on sandstone substrate in northern Sonoma County California.

The following counties in Oregon and California have documented sites according to the Oregon Natural Heritage Information Center and the California Native Plant Society data sets:

Oregon: Curry, Josephine, Douglas (two of the three sites in Josephine county were found to be other species of *Arctostaphylos* while the third site just east of Grants Pass needs verification still*;* one of two sites in Douglas county were found to be erroneous or no longer extant. The other site in Douglas County was inaccessible and still needs verification.)

California: Del Norte, Humboldt, Siskiyou, Sonoma

Within Oregon there are currently 48 known extant sites of *A. hispidula,* all found in the furthest southwest corner of the state. A majority of these known sites (35) are located on Rogue River-Siskiyou National Forest lands, specifically on the Gold Beach Ranger District. Within the total of 35 populations there were 3,482 individual plants estimated to be present. An additional nine known sites occur on Coos Bay BLM land and four sites on private lands (USDI Bureau of Land Management- Brian, 2005).

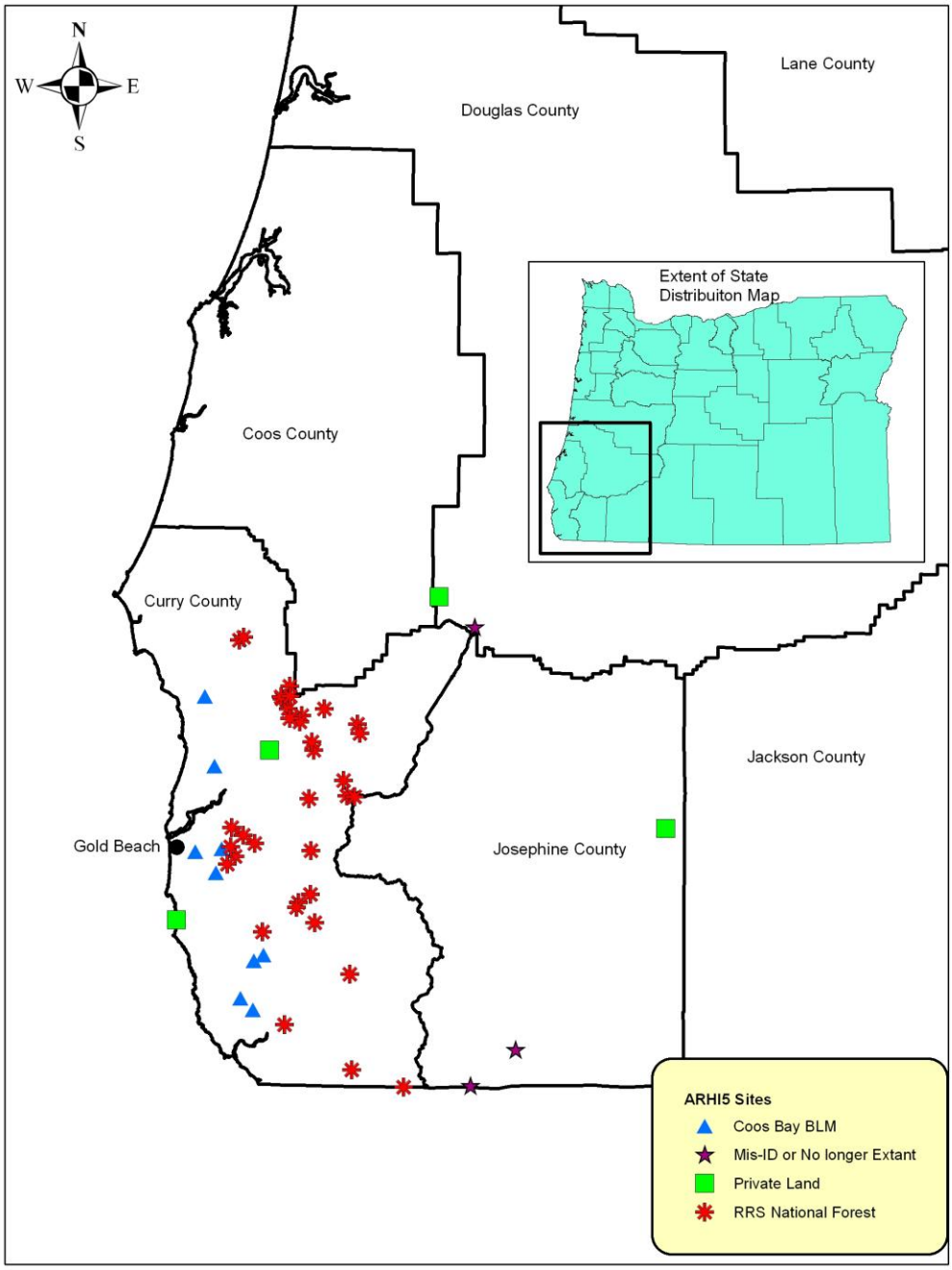
Many of the historic sites found on the Gold Beach Ranger District represent sub-populations of what are likely larger meta-populations. Using criteria established by The Nature Conservancy, several of the historic known sites were combined into element occurrences with multiple sub-populations. It is likely that more plants would be found if the areas between the sub-populations were surveyed. The end result is that there are significantly less element occurrences, but each occurrence contains significantly more individuals. Sites on BLM and private lands did not undergo this element occurrence revision because spatial data accuracy was unknown and most populations were already somewhat spread out.

One issue that must be considered with regard to the known distribution of this species in Oregon is that very few new populations have been found within the past fifteen years. Several sites were located in the early 1980's to mid-1990's corresponding with extensive project compliance surveys during that era.

One of the main questions in our field assessments was to verify whether the species ranges east of the coastal side of the Siskiyou Mountains in Oregon as is suggested by several sites in Josephine and Douglas counties. Based on our revisits to some of these more eastern sites it appears that *A. hispidula* does not range outside of the coastal influenced area of the Siskiyou Mountains. Our data are somewhat inconclusive though, because not every site in Douglas or Josephine County was revisited due to time constraints and difficulty interpreting the old data sheets. We have a moderate confidence level that the species is restricted to the western slopes of the Siskiyou and Coast Mountains in southwest Oregon. The three historic sites that we revisited east of this area appeared to be the more common *Arctostaphylos patula,* which is a dominant species in the Cascade Mountains. These historic *A. hispidula* sites are considered invalid and therefore are not included in our overall population counts listed above. Two

more sites, one just east of Grants Pass from a 1915 Cusick collection and one in Douglas County from an Estella Morgan collection in 1993 still need to be verified to validate our theory.

Figure 4. Known distribution of *Arctostaphylos hispidula* in Oregon.



Within Oregon the pattern of distribution for the species is sporadic and patchy appearing to follow fairly distinctive habitat parameters. In general, but with a few exceptions, the occurrence of ultramafic geology and serpentine soils seem to establish the distribution

pattern for *A. hispidula* in southwest Oregon. Abundance of *A. hispidula* within its habitat is highly variable with some sites forming monocultures with hundreds of plants. Most known historic sites were recorded as having relatively few plants. Many of the historic locations report only one or two plants being present at a site. The accuracy of the data is not known and the effort to locate the entire extent of each population may have limited the plant numbers at some sites. This would be a plausible explanation especially when one considers the terrain and density of associated vegetation growing with *A. hispidula*. It is very difficult to get an exact plant count for an entire known site in many cases.

Some areas, such as the ultramafic bands in and around the Signal Butte area on the Gold Beach Ranger District, are likely to have thousands of plants occurring within them. The current data from the area are likely to grossly underestimate the numbers of plants because of minimal inventory, the density of vegetation, and difficulty in identifying *A. hispidula*.

Considering range, distribution, and abundance, *A. hispidula* can be classified as a rare species based on a fairly narrow geographic range, an affinity for unique habitat/substrate (serpentine) and small to moderate sized populations (Kaye et. al., 1997), with the exception of a few populations recently discovered during our field assessments.

C. Population Trends and Demography

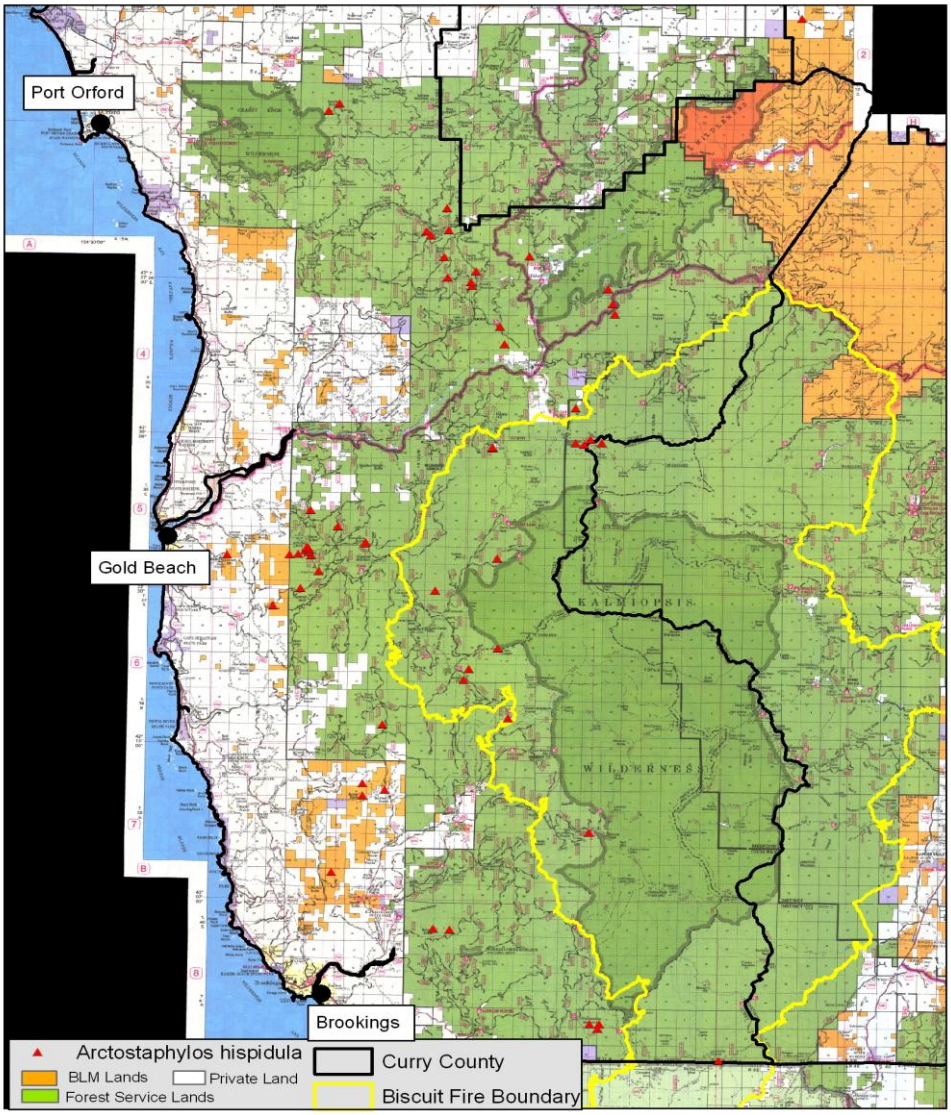
This topic was of the utmost importance to our 2008 field assessments because of the unknown affects that the Biscuit fire of 2002 had on populations of this species. Based on our field observation of twenty known historic sites, seven of which were within the perimeter of the Biscuit fire, we were able to ascertain a non-statistical qualitative outlook of the demographic situation for *A. hispidula*. At each historic known site we visited we gathered data on the following:

1. Total or estimated plant count.
2. Estimated and/or measured the density, height and rate of growth of competing manzanita and other brush species, as well as tree species that could shade out *A. hispidula* sites.
3. Estimated the best way to monitor long term tends in population dynamics and habitat quality.
4. Summarized conservation actions that may be beneficial at each site to maintain viability of *A. hispidula*.
5. Sites within the Biscuit Fire boundary were searched for newly established juvenile plants. We looked for re-sprouting of any adult manzanita species paying close attention to *A. hispidula* plants. We made estimates of competing vegetation on juvenile *A. hispidula* cohorts and determined if active management through cutting and removal of competition was a viable possibility.

Several points were made clear through our field work and data collection. The first is that there were no historic sites that clearly had juvenile *A. hispidula* regenerating. Either

A. hispidula has very little success or is very slow at regenerating, or juvenile manzanita species are mostly impossible to differentiate from each other. Some occurrences, like the Mineral Hill site that burned over during the Biscuit Fire, had what were thought to be juvenile *A. hispidula* plants, but it was impossible to tell without a doubt that the juveniles were not *A. patula*. Our final assumption at this site was that because the observed juvenile plants were so close to the remaining adult *A. hispidula* plants, it seemed likely the immature plants were in fact *A. hispidula*. However, only one or two of these juveniles were documented at that site. In general it seems that *A. hispidula* is limited in its germination and does not compete well in post fire conditions, unless the site is difficult for other shrub species to colonize. In addition no *A. hispidula* adult plants were observed re-sprouting from their base within any of the burned over historic sites. This was not unexpected considering the species is known to be an obligate seeder. More interesting was that it appeared very few of the adult plants reported prior to the Biscuit fire had been consumed by fire and there was not a single site where the population had been completely extirpated.

Figure 5. Map of *A. hispidula* Range with Biscuit Fire Boundary



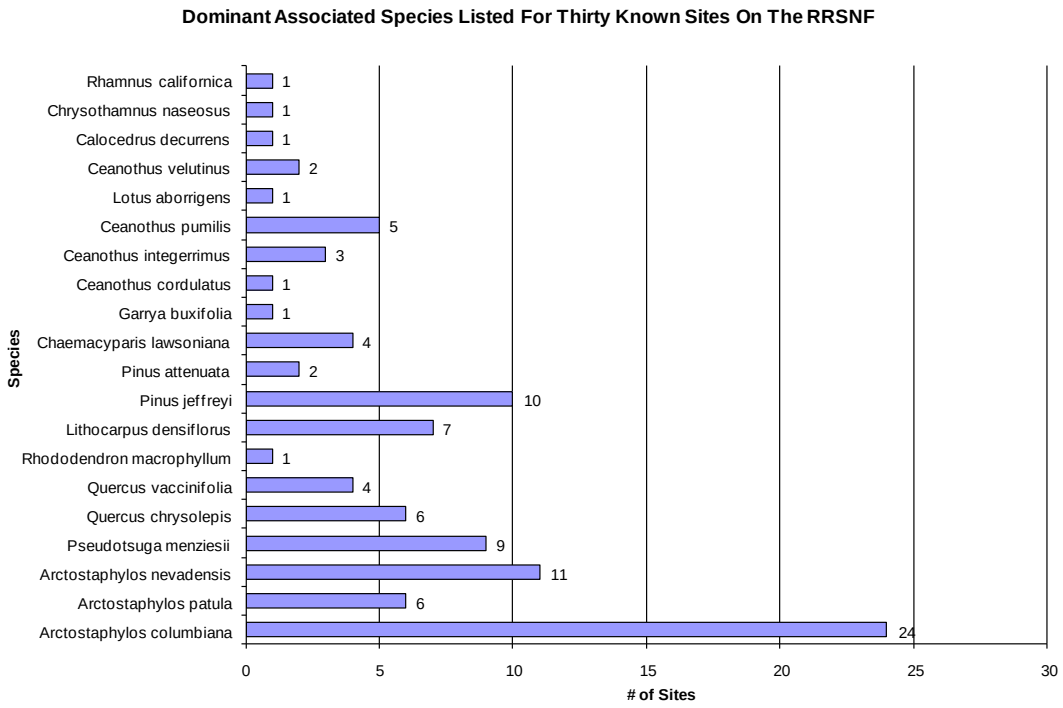
Another interesting observation was that many of the historic known sites had very low plant counts for each report. Our observations on plant counts showed a similar pattern. At most sites it seems there are generally only a handful of somewhat scattered plants intermixed with several other shrub species, especially *Artctostaphylos columbiana*. We did, however, locate one new population that appears to be the largest solid stand of *A. hispidula* in Oregon. The 3313 Road site covers about two solid acres and consists of an estimated one thousand *A. hispidula* plants. Morphologically these plants are the most consistent fit with the described species and no hybridization was thought to be occurring. Ironically though, there were very few juveniles observed within this stand. At this site we felt we observed *A. hispidula* at its most vigorous ecologic stage. We realized that based on this site a baseline goal for population and ecological restoration and enhancement for other sites could be established.

D. Habitat

In southwest Oregon *A. hispidula* can be found in several habitat types. Sites such as those found on Mt. Emily and the most northern known site on Mount Butler are more typical of the Coast Mountains. Plants occur in a matrix of openings, balds, and rock outcrops on coastal mountain tops within a dominant mesic conifer forest of Douglas fir (*Pseudotsuga menziesii*) and western hemlock (*Tsuga heterophylla*). The openings are early to mid seral areas likely to have been created by historic fires and are dominated by an assemblage of shrub species often with Columbia manzanita (*Arctostaphylos columbiana)* being the most abundant species. Most of the time *A. hispidula* is found on edges and in areas where other shrub species are not quite as dominant. These sites are within relatively close vicinity to the ocean (1-30 miles) and are somewhat unusual because of the apparent lack of ultramafic geology and serpentine soils.

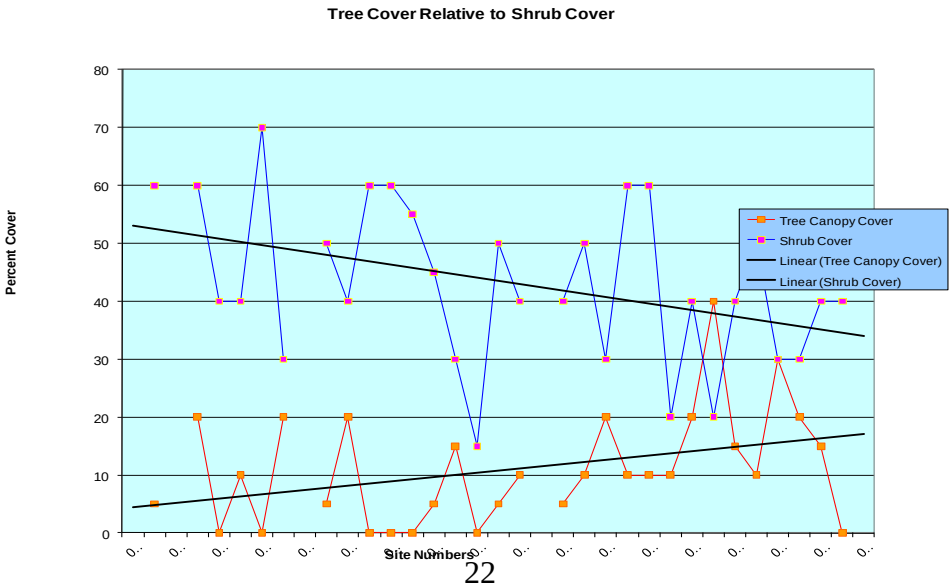
Sparse forest and scrub areas shaped by moderately deep ultramafic serpentine soils characterize the most common and dominant habitat type for *A. hispidula*. It is within this habitat that the species appears to reach maximum fecundity. Dominant associated tree species are Jeffrey pine (*Pinus jeffreyi*), western white pine (*Pinus monticola*) and Port Orford cedar (*Chaemacyparis lawsoniana*). Dominant associated shrub species are hairy manzanita (*Arctostaphylos columbiana*), huckleberry oak (*Quercus vaccinifolia*), coffeeberry (*Rhamnus californica*), Siskiyou mat (*Ceanothus pumilis*), pinemat manzanita (*Arctostaphylos nevadensis*) and canyon live oak (*Quercus chrysolepis*). Dominant forbs include bolander's hawkweed (*Hieracium bolanderi*), Del Norte iris (*Iris inomminata*), California fescue (*Festuca californica*) and naked buckwheat (*Eriogonum nudum*).

Figure 6. Occurrence frequency of dominant associated species at 30 ARHI5 sites on the RRSNF.



Within this habitat *A. hispidula* thrives on sites with limited to no competition created by areas where rock and gravel soils are very shallow, limiting colonization by other species. Though it is rarely the case where competition is absent we observed the greatest abundance and healthiest populations under these conditions. The 3313 Road site mentioned above is the quintessential example of this habitat. It is a large rock outcrop with wide and flat boulders that have trapped loose gravel and soil on the top of them. Over time the soil and gravel have become deep enough to allow *A. hispidula* to germinate and form roots. Nearly no other plant species besides a few small herbaceous species are able to colonize this area.

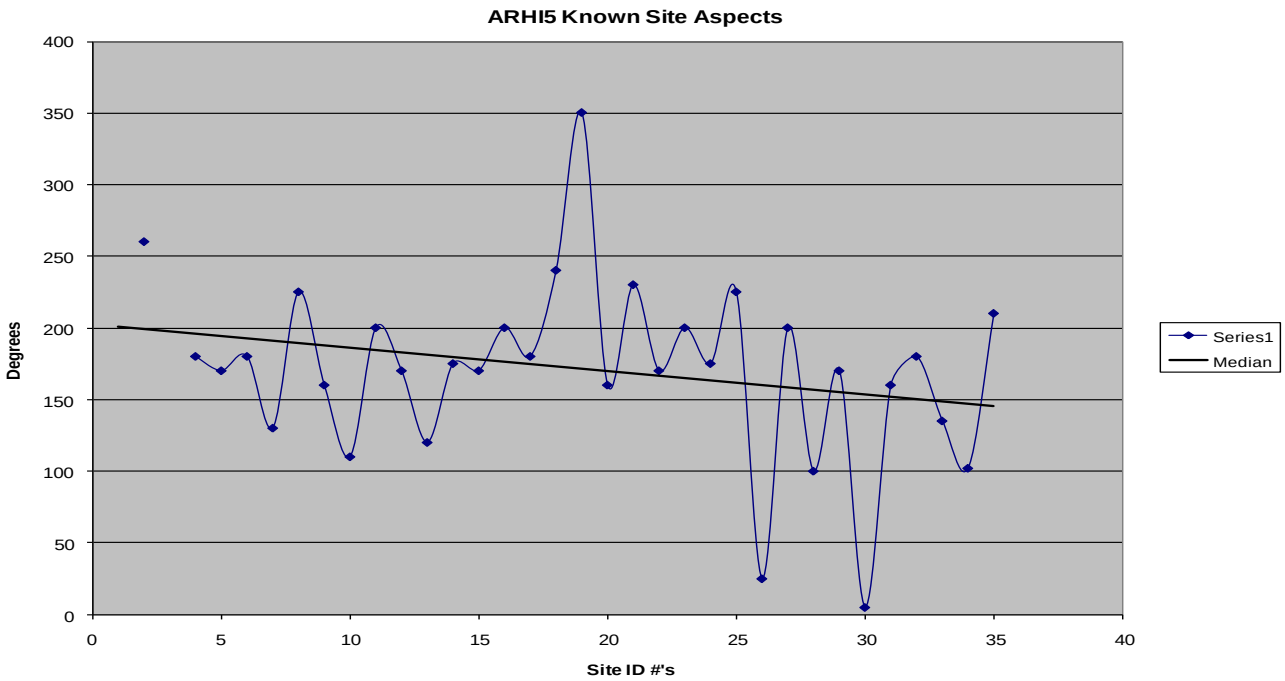
Figure 7. Graph showing tree cover relative to shrub cover on RRSNF sites.



A. hispidula appears to capitalize on other disturbance created conditions in addition to those created by fire, because a handful of sites were found on road edges or within old clear-cuts.

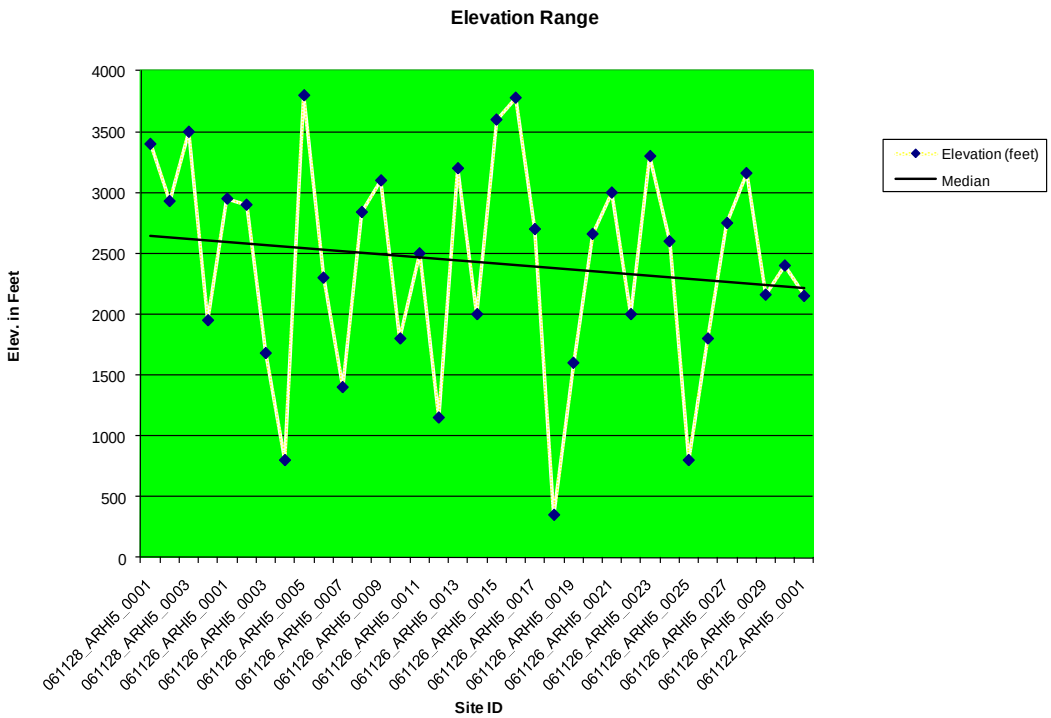
Besides soil, geology, and disturbance patterns, another factor that appears to influence *A. hispidula* habitat is slope aspect, which affects temperature and moisture holding capacity at each site. Nearly all known sites of *A. hispidula* occur at an aspect between 160°and 240° with a mean aspect of 172° for all populations on the RRSNF. Habitat for the species generally occurs on xeric southwest facing slopes but can occur on benches and flats with good sun exposure. There were a few outlying sites found on more northern slopes but they all have nearly flat topography.

Figure 8. Graph showing median aspect of ARHI5 sites on the RRSNF.



Neither slope pitch nor elevation range seem to have much influence on the presence or absence of *A. hispidula*. Sites were found in flat areas as well as on steep slopes, though it seems even the flat areas tend to have rapidly draining gravel laden soils, found on benches and small slope breaks. From our observations it does not appear it can grow in alluvial or clay soils in valley bottoms or in riparian areas. This is fairly typical of all the manzanita species. Elevations ranged from sea level to 3,800 feet above sea level. The average elevation for all sites is 2,400 feet above sea level.

Figure 9. Graph showing elevational range of known sites on forest service lands.



The two most common plant associations *A. hispidula* is found within are the Port Orford Cedar/Huckleberry Oak/Common Beargrass association within the Port Orford Cedar series, and the Jeffrey Pine/Huckleberry Oak-Pinemat Manzanita-Box-Leaved Silk-Tassel association within the Jeffrey Pine Series (USDA Forest Service, 2007). The next most common plant association it is found in is the Tanoak-Western White pine/Huckleberry Oak/Common Beargrass associaton within the Tanoak series. The non-ultramafic more coastal sites are difficult to classify but seem to fit best within the Douglas-Fir-Golden Chinquapin/Dwarf Oregon Grape plant association within the Douglas-Fir series (USDA Forest Service, 2007). As is the case with most plant association classifications, there is not an absolute match with any of the above listed associations at hardly any of the known sites for *A. hispidula*. There are aspects of each site that vary slightly from each association but generally the sites fall within these associations.

The extent and distribution of these plant associations in relation to high quality habitat for *A. hispidula* is relative. Within the range of the species there is an immense amount of potential habitat to occupy, yet from what we know the species is relatively rare, occurring only very sporadically within it. This is probably due to dispersal and germination limitations. Competition from other species is also another key limiting factor. Though *A. hispidula* can occur within more than one type of habitat, it seems unlikely that it would ever colonize a completely new habitat such as riparian areas or coniferous forest.

E. Ecological Considerations

Fire is the dominant ecosystem process that affects the distribution and abundance of *A. hispidula*. As with nearly all the other obligate seeding manzanita species, *A. hispidula* needs fire to catalyze seed germination. The role of fire also acts to clear out other competition and to restart succession, usually creating a condition *A. hispidula* favors.

The Biscuit Fire of 2002 burned over 500,000 acres, a large portion of it falling within the somewhat narrow range of *A. hispidula*. All Oregon historic known sites within the fire perimeter were examined to evaluate effects on each population. The results were not as was initially expected, because very few seedlings of *A. hispidula* were found. It may take longer to tell whether or not the Biscuit Fire will have an obvious positive effect on this species. It is likely that new habitat has been created by the fire and that eventually it may be colonized by *A. hispidula*.

Figure 10. Photo of *A. hispidula* from the Fry Place site. The effects of the Biscuit fire can be seen on trees in the background. The fire did not burn all the understory shrubs but crept around and smoldered burning slowly.

Considering the fact that so many *Arctostaphylos* species rely on disturbance such as fire, it seems reasonable that other disturbance mechanisms could create similar habitat. Roughly 8 known sites visited during our assessment were along roads and at least 4 sites were found in previously burned clear-cuts. Apparently, *A. hispidula* thrives as an edge species as evidenced by very few plants being found within the middle of dense stands of shrubs or in forests. Edge habitats have increased through time in the form of roads, harvest units, trails and other anthropogenic uses. Conversely the suppression of fire has likely decreased edge habitat. It is likely that the net result is that total edge habitats have increased since pre-historical times. It is unknown whether or not the loss or increase of this habitat has helped or been detrimental to *A. hispidula*. Through this assessment we are hoping to initiate the process for describing a coarse ecosystem management strategy that will take into account the need to maintain or create new habitat areas for *A. hispidula*.

Invasive plants were not found at any of the known sites examined during our field assessments. This was not surprising considering the harsh environment which this species inhabits. Very few invasive plant species are able to adapt to ultramafic serpentine soils. When found on or adjacent to these habitat areas, invasive plants usually occur sparsely and are unable to get a strong foothold.

Though the *Ericaceae* family has many genera and species that are known to have mycorrhizal relationships, *A. hispidula* has not been shown to be a mycorrhizal associated species.

IV. Conservation

A. Conservation Threats

Based on field observations, historic information and personal communication with botanists, conservation threats to *A. hispidula* are here prioritized within the state of Oregon. Threats in California are similar, although the species is considered much more stable within that portion of its range.

1. Fire Exclusion and Succession

The frequency of naturally ignited fires has decreased over time. This is due to anthropogenic management practices over the past 100 years that have had the goal of suppressing nearly all lightning fires. These practices have been quite successful at keeping fires small by putting them out quickly after discovering them.
In addition to naturally occurring lightning fires, human ignited fires have also been considerably decreased compared to pre-historic times. It is thought that Native Americans used fire as a tool to invigorate their hunting and gathering grounds on a regular basis. More emphasis has been put on prescribed burning over the past 20 years. Concerns about containing prescribed burns and costs to complete them have limited the amount of burning that has been implemented within the range of *A. hispidula*.

The result of less fire in the ecosystem has been higher intensity fires that burn hotter than the more frequent, low, creeping, fires that occurred historically. How this has affected habitat for *A. hispidula* is not entirely known. Considering the habitat and life history of the species, it is likely that there has been a negative effect to the species overall because hot fires may consume all fuels (i.e. mature *A. hispidula* plants) and potentially burn so hot that seed banks are consumed. (However, this was not observed in the Biscuit Fire). Frequent low intensity fire is necessary to germinate seeds and open up new habitat areas for the species.

Succession within the habitat *A. hispidula* occupies is a key issue for conservation of the species. Fire exclusion tends to throw the natural succession process out of balance. This usually results in dense shrub stands and increased competition from trees and other plants.

The fact that *A. hispidula* has refractory seeds and that the species relies on early seral conditions to establish led us to the hypothesis that fire exclusion is the number one conservation threat to the species.

2. Timber Harvest

Proposed timber harvest within or adjacent to known sites of *A. hispidula* has the potential to threaten the viability of those populations. Without pre-project consideration, sites could be damaged from trampling, uprooting and piling of slash that could kill individual plants or entire populations.

Timber harvest can have indirect effects such as changes to micro-climate conditions, soil moisture levels, hydrologic patterns such as snow accumulation changes, edge effects and wind-throw and the potential to introduce invasive plants that could out-compete *A. hispidula*. Reforestation practices can also create issues if trees are planted densely within known sites or adjacent to potential habitat. All these threats can be avoided through strategic planning and communication that includes a botanist.

When considered early in the planning process there is potential to enhance populations of *A. hispidula* through timber harvest activities. Positive effects from timber harvest could come in the form of decreasing competition from other forest species, setting back succession to an earlier stage and scarifying and stratifying seed beds through post harvest slash burning.

3. Infrastructure Maintenance

The most current threat to populations of *A. hispidula* are maintenance projects involving cell phone and radio towers at two of the coastal mountain sites. Historic known sites on Mt. Emily and Grizzly Mountain have been impacted over the past few years by work crews clearing vegetation and constructing buildings and new towers. Neither site has been completely extirpated but several individuals were lost at each site. The site at

Grizzly Mountain was cleared out for fire prevention purposes and two buildings were built over several *A. hispidula* plants (Rodenkirk, 2006). At Mt. Emily several *A. hispidula* plants were removed when widening the road that leads to the radio tower. The road widening took place in order to construct new buildings at the tower site.

Very few of the known sites of *A. hispidula* are within areas that are currently threatened by infrastructure development or maintenance. This type of activity does not pose a threat to the species across its entire range but has the potential to extirpate some geographically important sites such as on Mt. Emily.

4. Mining

Nickel mining within ultramafic geology has seen an increase over the past few years in the Siskiyou Mountains of Southern Oregon. Recently a new permit was drawn to core drill several acres within the Red Flat area on the Gold Beach Ranger District. The test drilling results in very little impact to the ground as the holes are only about 3 inches in diameter. However, vegetation must be cleared in order to reach the test holes. If sites are deemed feasible for mining, then a permit will likely be drawn to begin larger scale mining activities. There are known sites of *A. hispidula* within the Red Flats area but they were not affected by the initial test drilling.

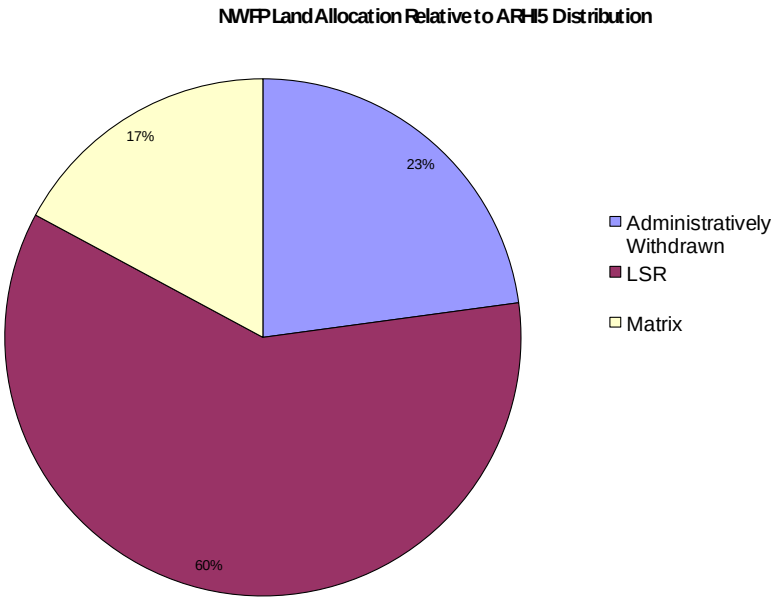
Based on the renewed interest in nickel mining in the Siskiyou Mountains this activity must be considered a conservation threat to this species because of its affinity to occur within ultramafic serpentine soils which are the same areas where nickel can be found.

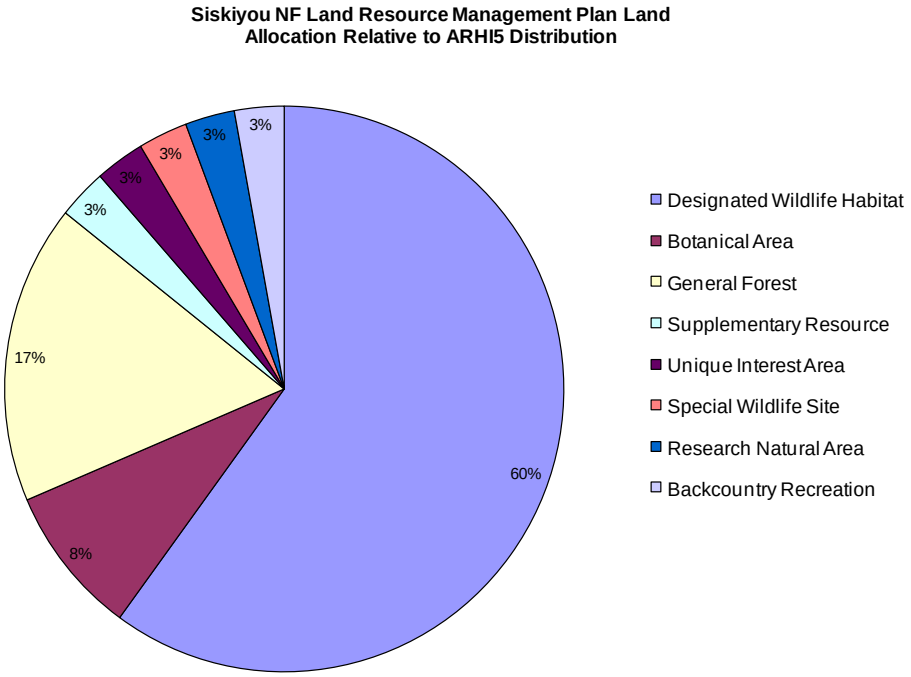
B. Conservation Status

Based on our revisits to several of the historic known sites we concluded through our assessment that the distribution and abundance of *Arctostaphylos hispidula* is stable to slightly declining. Some sites have seen a decline in individual numbers, probably due to fire exclusion allowing vegetative succession to advance to a stage unfavorable for *A. hispidula*. Most of the sites that were revisited had a similar acreage size and plant count as the original documentation showed. The most obvious change is the increased growth of competing shrub and tree species, though no sites were completely out-competed or extirpated at this point.

Of the thirty-five known sites of *A. hispidula* found on the Rogue River-Siskiyou National Forest, twenty-nine of them occur within protected land allocations such as Late Successional Reserve, Riparian Reserve, Wilderness or other Administratively Withdrawn land allocations. There are six known sites that occur within Matrix lands. On Coos Bay BLM lands three known sites are found in Late Successional Reserve and six sites are located within Matrix lands.

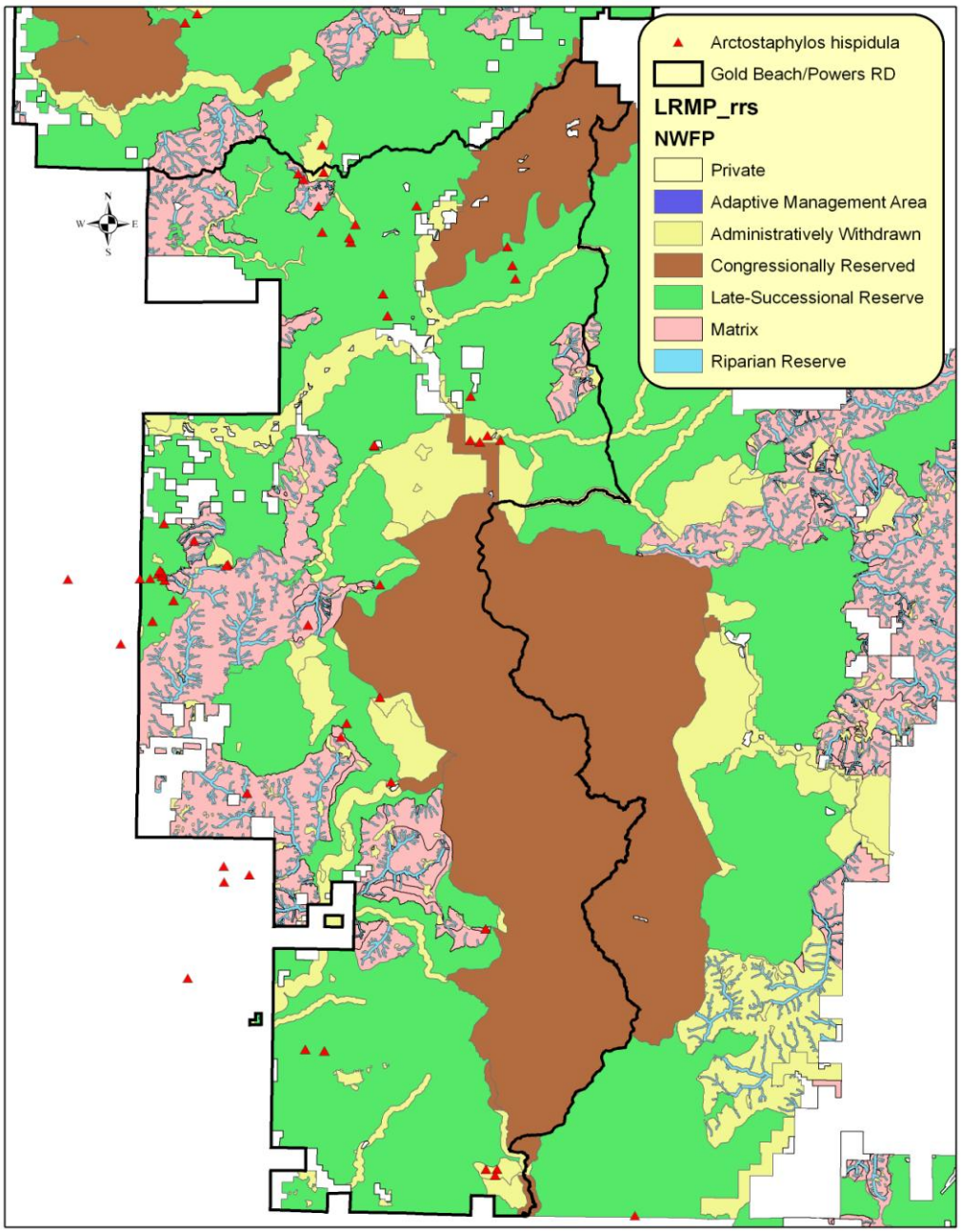
Figure 11. Distribution of ARHI5 Relative to NWFP and Siskiyou Land and Resource Management Plan land allocations on the Rogue River-Siskiyou National Forest.





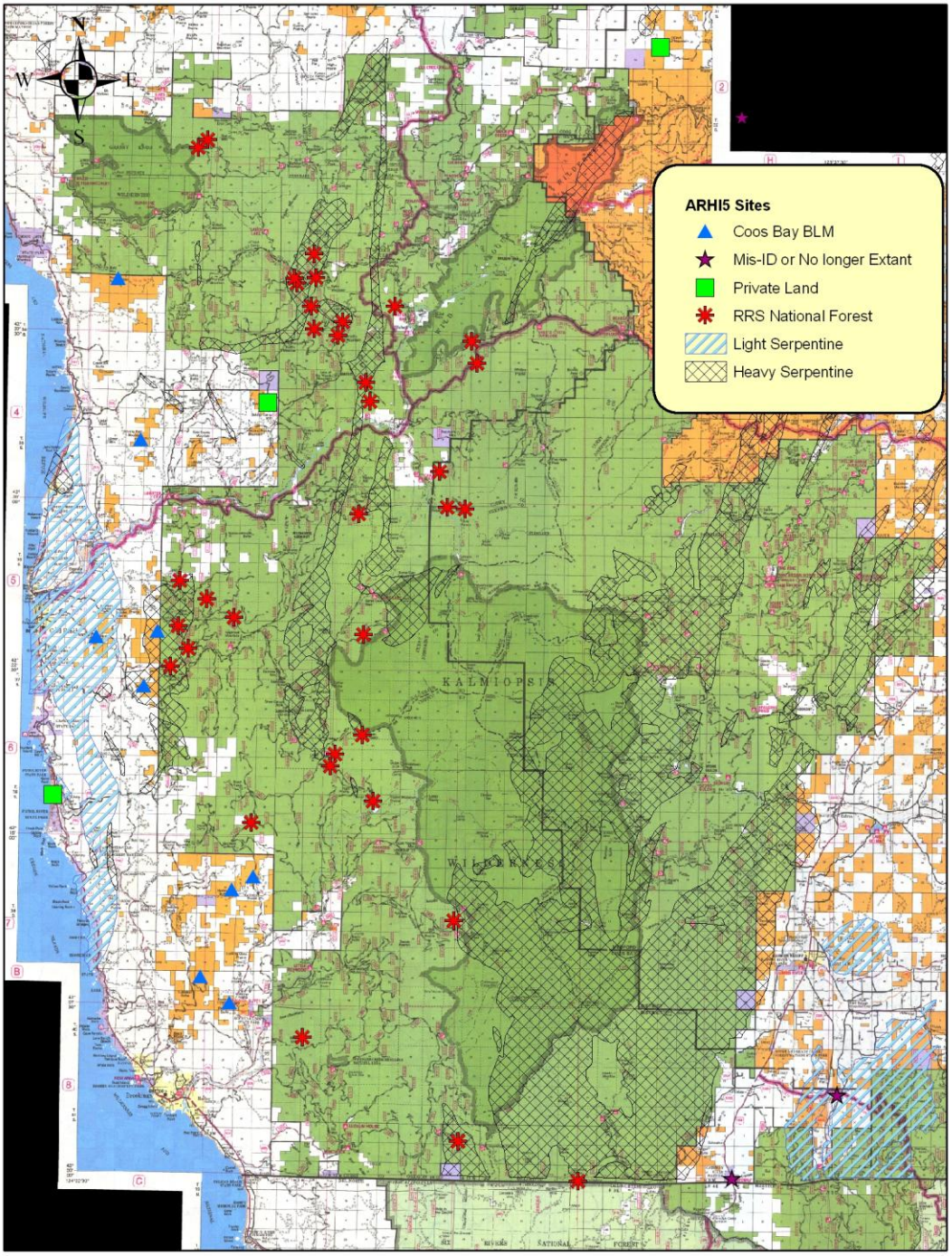
The fact that such a high percentage of populations occur within protected Forest Service lands seems favorable to the conservation of the species on the surface. However, the majority of the sites occur within Late Successional Reserve which is supposed to be managed for old growth and late successional forest and the species associated with these ecosystems. *A. hispidula* is an early to mid-seral species that requires somewhat frequent disturbance to catalyze seed germination and reduce competition. The management actions required for *A. hispidula* do not fit very well with the standards and guides for managing Late Successional Reserve lands. With this in mind, management actions for this species may need to be implemented within small areas of Late Successional Reserve, where they will not reduce late successional species habitat at a scale or rate that will be detrimental to them.

Figure 12. *A. hispidula* populations relative to NWFP Land Allocation on the RRS NF



Throughout its range within Oregon *A. hispidula* is spotty in its distribution mostly following patterns of serpentine soil distribution. However, the distribution of this geology is random and tends to occur in distinct bands in some areas but is completely absent from other areas. Here Figure 11 shows a rough estimate of the extent of serpentine soils within the range of the species. The map shows both heavily influenced and lightly influenced serpentine soils.

Figure 13. Map of ultramafic geology in relation to *A. hispidula* on the RRSNF (Serpentine layer from RRSNF Soils layer).



Within the different land allocations two habitat types have been identified that have the capacity to support populations of *A. hispidula*. Ultramafic serpentine shrub and scrub ecosystems are the ideal habitat, and this is where the largest populations were found. However, coastal balds and buttes with large shrub fields on their summit, and within five to ten miles of the ocean, also form habitat.

Considering these habitat types it is clear that geology and fire are the main historic influences on the distribution of *A. hispidula*. The geologic history within the range of the species is very old and complex and lends greatly to distribution of the species because of the pattern of formation of utramafic serpentine landscapes. Fire history also has had an important role in forming mosaic patterns of habitat opportunities for *A. hispidula*. Fire frequency and the pattern of burns have shaped the landscape in a way favorable for the colonization of habitat by the species, an example of this is the fact the species is almost always found on either south to southwest facing slopes or on or near the summit of mountains. Fire frequency and intensity is usually greater on south facing slopes and near ridges so these are areas where trees and other competing vegetation are often less dense as compared to north and northwest facing slopes. This pattern of fire behavior favors the colonization of *A. hispidula*.

Based on these habitat types, the life history and ecology of *A. hispidula* suggests that the species can tolerate significant environmental change, and, in fact, requires some level of stochasticity to populate new and existing habitat. The main concern is not stochasiticity in the environment but instead an environment that becomes static.

It is difficult to determine with any precision whether the habitat *A. hispidula* occupies is in decline. It is clear that ultramafic serpentine geology is not in decline, at least not by standards of our time scale. The vegetation assemblages that occupy this geology may be changing, resulting in more dense stands of shrubs and trees in general. Changes in frequency, intensity, and patterns of fire are the main issue with regard to habitat for *A. hispidula* declining across its range. It is likely that this habitat change has and is occurring, but at what rate is unknown.

There is moderate evidence that populations within Oregon are at risk of declining or becoming less viable due to increased vegetative competition from the lack of fire in the ecosystem, combined with other management activities, especially maintenance of administrative sites such as cell phone and radio towers. There is a sufficient amount of habitat within lands managed by the Rogue River-Siskiyou National Forest and Coos Bay BLM to ensure the long term viability of *A. hispidula* through proper conservation actions.

C. Known Management Approaches

To the best of our knowledge there have not been specific management approaches used to enhance habitat or conserve populations of *A. hispidula*. Prescribed burning and thinning are known management applications that can alter succession and result in less competing vegetation, increased light and can stimulate germination of certain refractory

seed species (Keeley, 1991, 2000). Based on this, it is thought that implementing these types of projects within *A. hispidula* habitat, or within known populations, could help the species. Because there is no existing data to tell whether or not this is true, it would be best to start on a small well-defined scale and conduct careful monitoring in order to test the efficacy of treatments.

D. Management Considerations

Management considerations are actions that can be utilized to address specific threats, or when projects are proposed around known sites. Based on field observations and literature research it can be concluded that active management of *A. hispidula* habitat could create positive conservation outcomes for the species. Management of *A. hispidula* can be considered at several scales. At the smallest scale an individual population may require a conservation measure such as a mitigation written into a timber sale NEPA document. A mid-scale management option may be including a portion of a planning area that is good habitat for *A. hispidula* into the proposed action and implementing actions such as thinning and burning. Large scale management considerations could include developing a project across a district or forest that seeks to implement burning, thinning and species augmentation within potential habitat and/or populations. Several opportunities, options and tools exist to implement projects that could enhance the viability of the species. The table in *Appendix A* lists the priority for restoration at each known site on the RRSNF and Coos Bay BLM lands. In general populations with smaller more vulnerable sites receive higher priority.

Conservation of Known Sites

At known sites, to address the main threats to this species, consider the following actions:

1. Fire exclusion and Succession

Prescribed under-burning is the most useful tool available for managing habitat of *A. hispidula*. The species can tolerate very little canopy closure; usually more than 30% is detrimental to establishing or existing plants. Most sites have no canopy cover at all. Prescribed fire is a necessary ecosystem-based approach to managing this species considering that it has refractory seeds that germinate after high enough soil temperatures are reached in conjunction with chemical reactions with charcoal (USDA Forest Service, 2008). Competition from other shrub species, *Arctostaphylos columbiana* in particular, can be minimized through fire treatments. Implementing fire treatment projects will require coordination with the fuels program responsible for management on the unit. Burn plans will need to be started early in the process in order to consider all variables at each site chosen for restoration. Seasonal restrictions on burning, mitigation measures to abate the spread of invasive plants and restrictions on mechanized equipment for spotted owls and marbled murrelets are all issues that will need to be considered. Through the NEPA process much of these issues will be worked out.

Delineating burn units will be dependent on existing vegetation, topography and existing size and abundance of *A. hispidula* populations. Protecting existing plants will be

challenging and considering most populations are small it is important to ensure the seed bank continues to be replenished from these mother plants.

Thinning competing vegetation from within and adjacent to known sites may be necessary to ensure goals and desired conditions are met. Cutting, piling and burning piles is a manageable and often less expensive approach to achieve some of the same goals that broadcast under-burning could achieve. Based on a prioritization of sites, projects could be implemented that carefully thin species such as *Arctostaphylos columbiana*, *Quercus vaccinifolia*, *Rhamnus californica* and other typically associated shrub species from within and near populations of *A. hispidula*. This would result in increased light and less competition for scarce resources in the serpentine soils. When thinning, avoid direct impacts to *A. hispidula* plants (tree falling, yarding, further fuels reduction work) and place any piles at least 25 feet from individual plants. Allow burning of piles or slash to creep as much as possible in order to treat the existing seed bank at each site.

There are opportunities to work with existing Timber Stand Improvement (TSI) programs to accomplish thinning work. When populations of *A. hispidula* occur within or near to sites scheduled for TSI, thinning prescriptions could be modified to incorporate *A. hispidula* habitat management into the project.

2. Timber Harvest

Around known sites timber harvest can be used to help open up the canopy to encourage more growth of *A. hispidula*. Care should be taken, however, to avoid trampling or uprooting known plants. Slash piles should be located at least 25' from plants.

Though timber sales, if planned properly, have the potential to help create suitable habitat, it is important that known sites are not inadvertently extirpated. Mitigations could be put in place that require logging machinery to remain at least 50 feet away from plants so that soils are not compacted and inadvertent uprooting is avoided. Excavation of soils adjacent to sites could lead to changes in drainage leaving sites in standing water. The species depends on quick draining soils so the effect of poor water drainage could be detrimental. Consider felling trees away from plants to avoid smashing individuals and to avoid skidding logs over plants that could potentially uproot stems.

When reforestation is proposed it should be done in a manner that doesn't threaten known sites or habitat by allowing dense canopies to establish. All reforestation proposals should be coordinated with a botanist when known populations or habitats are nearby.

3. Infrastructure Maintenance

At the two locations where ongoing vegetation maintenance activities are needed in order to maintain radio and cell phone towers and buildings, consider the development of a site management plan to determine how to manage for the infrastructure items while still maintaining *A. hispidula* at the site. A site management plan might allow for the loss of some *A. hispidula* plants, but would encourage the development and/or persistence of others, and would require analysis and management needs at the site specific scale.

Should other infrastructure facilities be proposed at other *A. hispidula* locations, try to avoid the loss of as many plants as possible, and consider the development of a long term site management plan as well.

4. Mining
Where mining is proposed in areas that may impact *A. hispidula* sites, develop mitigation to reduce or eliminate potential impacts. Consider avoiding direct removal of plants, and avoiding placement of access roads and structures on known sites. Consider placing tailings at least 50 feet downslope or 100 feet upslope from known sites.

Population Augmentation
When populations cannot be avoided during a project or when individuals have been lost to succession or for other reasons, there is opportunity to plant *A. hispidula* within suitable habitat areas. Population augmentation is a valuable tool used by plant conservation biologists to ensure that a species continues to be dispersed and breeds within a given population and habitat area.

Projects using population augmentation techniques require the collection of seed from the species, the germination of the seed, development of seedlings in a greenhouse/nursery setting, and the out-planting of plants into suitable habitat areas in the field. All aspects of the project vary depending on the species. Seed collection methods and timing vary greatly depending on the plant. For *A. hispidula* seed collection is easy, as fruits are simply picked from the shrubs. Timing is important so that mature seed is collected. Depending on the year, the best time for seed collection is usually in August or September. Breaking dormancy of the seeds in order to catalyze germination is the most difficult step with *A. hispidula*. The genus *Arctostaphylos* is known to be difficult to grow by the nursery industry. There are several options for development of seedlings, based on what size container is chosen. The longer the plants are grown in the nursery, the bigger the container and the more developed the root system becomes. Planting the containerized stock back into the field can be difficult especially considering the type of rocky soils *A. hispidula* prefers.

V. Research, Inventory, and Monitoring Opportunities

There are several aspects of *A. hispidula* biology and management where information and data are lacking or totally absent. The genus *Arctostaphylos* as a whole has considerable information about it relating to life history, population biology, fire response and other areas. However, there is nothing specifically written about *A. hispidula*. It is likely that much of the data for the species can be inferred from the information written about the genus, but specific species information would prove helpful for precise conservation measures to be implemented efficiently.

Specific information gaps and research questions include, in the following priority:

1) Reproductive Biology- Does the species ever re-sprout from the base? What are specific seed germination needs? What success can be achieved by augmentation planting?

2) Fire Response- What are specific responses to burning of its habitat? How are large mature plants affected? What is the level of seedling germination in response to fire?

3) Competition/Succession- At what point does competing vegetation begin to be detrimental to the species? How and to what extent does reduced competition help the species?

4) Distribution- Continue to assess range and distribution patterns. Inventory high potential habitats. Revisit the questionable sites in Douglas and Josephine Counties.

5) Genetics/Hybridization- What level of hybridization is occurring? What species are hybridizing with *A. hispidula*?

6) Pollination Biology- What are the main pollinating species? What frequency and level of pollination is currently being achieved?

There are several options available to attain information that would help fill the gaps listed above. Cost, efficiency and length of time to collect the information have to be considered when outlining a strategy to fill the gaps in data. The most basic strategy that provides information for nearly all the above mentioned questions is to map potential habitat and conduct a strategic inventory. By completing this step, data will inherently be gathered that contributes to many aspects of *A. hispidula* management and will help prioritize areas where projects should be implemented. Modeling using software such as BioMapper could help determine and map potential habitat to be inventoried. Conducting nursery studies on seed germination, in conjunction with augmentation projects, has the potential to accomplish both in the field restoration and research data useful for understanding reproduction in the species. By implementing small scale burning projects and subsequently conducting vegetation monitoring, such as the "line intercept method", quantitative data can be gathered that will help understand the species response to fire. Similarly, implementing small scale thinning projects also provide an opportunity to monitor the species response to decreasing competing vegetation. Genetic and pollination biology issues are probably best dealt with through research conducted by the Pacific Northwest Research Station or by universities such as Oregon State or Humboldt State.

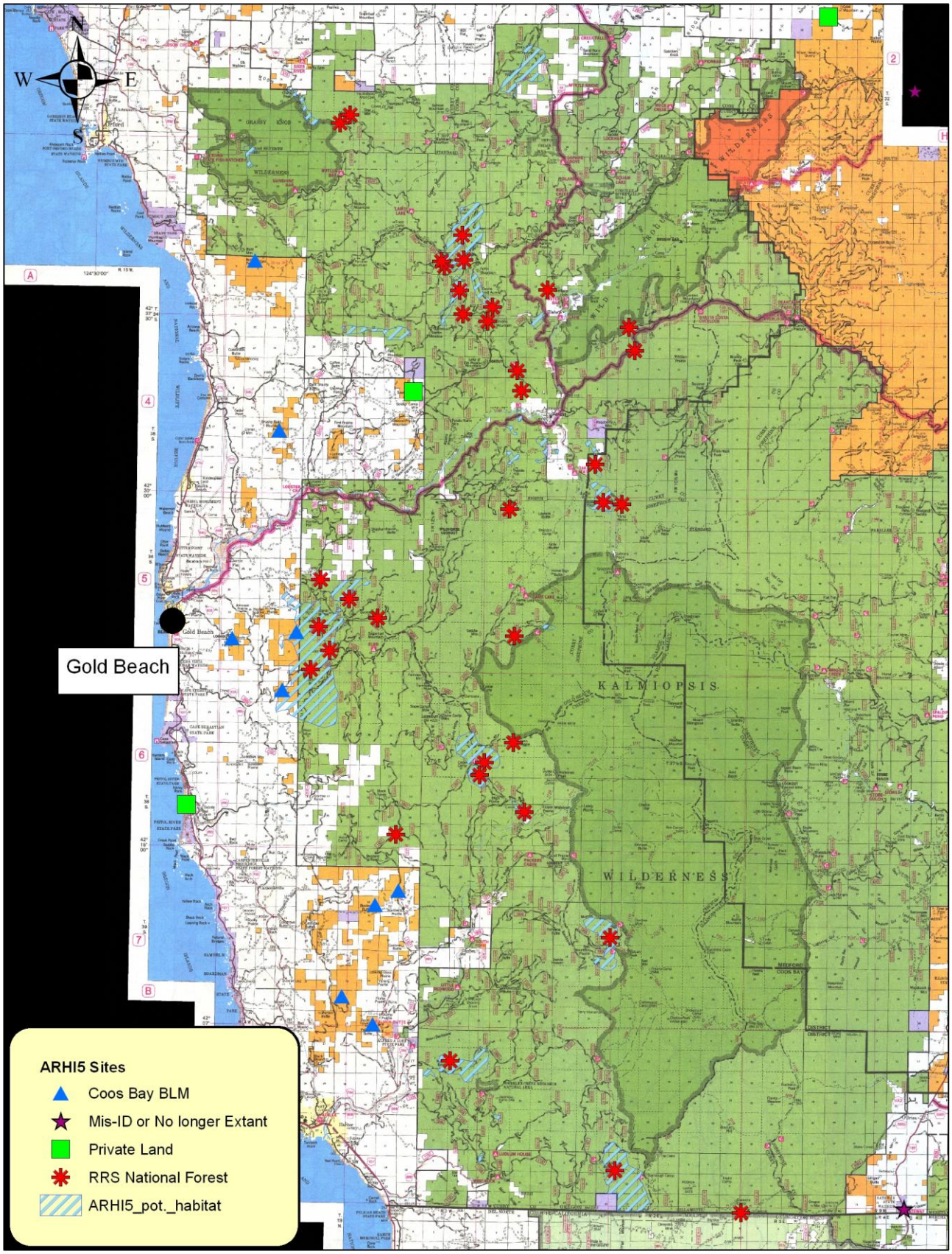
In addition to monitoring, researching and inventory in order to fill information gaps related to the species biology and management there also needs to be a strategy for detecting changes in viability at a population, Forest, and range scale with relation to threats to the species that were previously listed.

As already mentioned, the most important step is species inventory. Conducting a thorough inventory will help with understanding the current distribution and how critical each population is for conservation. Current inventory methods rely almost entirely on pre-project surveys and analysis to determine the range of the species. This limits the data and leaves an incomplete picture of distribution. A range wide inventory of habitat delineated using BioMapper is a potential option. Figure 13 below shows twenty-seven potential habitat areas totaling roughly 25,000 acres. The areas were delineated using digital aerial imagery focusing upon potential habitat. These potential habitat areas were determined considering adjacency to known sites, elevation, geologic factors, aspect and vegetation types. These delineated areas offer a good start with regard to future inventory of *A. hispidula* habitat if a modeling program such as BioMapper is not used to further refine potential habitat.

Photo-monitoring is an effective way to detect negative and positive changes to a given population. Several vegetation monitoring strategies exist but the most simple is making yearly observations at sites where projects are proposed or have occurred. Collecting data on such aspects as individual numbers, density, distribution of plants, phenology, canopy cover and vegetative cover will allow inferences about the population viability over time. Setting criteria, such as threshold levels for minimum individuals or minimum percentage of plants that are reproductive, will help determine whether or not restoration management activities should be triggered. Specific thresholds should be determined after some monitoring and assessment has been done in order to set baseline data.

Another important aspect to conservation is banking seed from the species. Seed should be collected when ripe, most likely late August into September. Seed can be stored at the Berry Botanic Garden in Portland, the J. Herbert Stone Nursery in Medford or sent to the Center for Plant Conservation to have on hand in case of emergency.

Figure 14. High potential habitat areas for future inventory work.



Definition of Terms Used (Glossary)

Disjunct Population

A population of a species that is geographically separated from the main range and populations of the species. Usually separated by geographic features such as mountain ranges.

Fragmentation

The loss, division or isolation of patches of similar habitat at a scale relevant for the species being addressed.

Hybridization

Refers to the act of two separate species breeding to form a species containing genes from the original parents.

Known Site (Occupied)

The location where an individual or population of the target species (taxonomic entity) was located, observed, or presumed to exist and represents individual detections, reproductive sites or local populations. This term also refers to sites located in the future (USDA, USDI 1994a).

Metapopulation

A group of interconnected subpopulations, which are spatially and/or temporally separated, resulting in lower levels of gene flow.

Monitoring

The collection of information used to determine if management actions are meeting objectives of standards and guidelines and if they comply with laws and management policy. Monitoring is used to determine if standards and guidelines are being followed (implementation monitoring), if they are achieving the desired results (effectiveness monitoring), and if underlying assumptions are sound (validation monitoring). Monitoring usually collects information on a sampling basis, provides standardized data, and occurs at multiple levels and scales.

Obligate Seeding Species

A plant species that reproduces only through dispersal of seed with no other known means of reproduction such as resprouting.

Persistence

The likelihood that a species will continue to exist, or occur, within a geographic area of interest over a defined period of time. Includes the concept that the species is a functioning member of the ecological community of the area.

Range

The limits of the geographic distribution of a species.

Refractory Seed

A plant seed that needs extreme heat from fire in order to break dormancy.

Serpentine Soils

Loosely refers to a broad group of minerals associated with the weathering of ultramafic rocks; soils associated with such rocks are generally called serpentine soils

Suitable habitat

Abiotic and biotic environmental conditions within which an organism is known to carry out all aspects of its life history.

Succession

The gradual process of change in an ecosystem brought about by the progressive replacement of one vegetative community by another in a definite order until a stable community i.e. climax community is established over a period of time.

Taxon

A category of organisms; a group to which organisms are assigned according to the principles of scientific classification including species, genus, family, order, class, and phylum

Ultramafic Soils

With high ferromagnesian content; describes a dark igneous rock, over 90% of whose content consists of ferromagnesian minerals, including olivine and pyroxenes.

Viability

Viable populations - a wildlife or plant population that contains an adequate number of reproductive individuals appropriately distributed on the planning area to ensure the long-term existence of the species (USDA, USDI 1994a).

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Appendix A: Table of Known Sites in Oregon

NRIS Site ID	Site Name	NWFP Land Allocation	Siskiyou NF LRMP	Month /Day	Year	Original Examiner	Plants	Slope	Aspect	Elev.	Habitat	Canopy Cover	Shrub Cover	Dominant Associated Species	Revisted For This Assessment?	Burned in Biscuit Fire?	Priority for Restoration Treatment*
061128_ARHI5_0001	Iron Mtn.	Admin. Withdrawn	Botanical Area		1956	W. Baker				3400	Serpentine forest dominated by Jeffrey Pine and Port Orford Cedar.			No data	Yes- not found	No	N/A
061128_ARHI5_0002	Mt. Butler	Admin. Withdrawn	Supplemental Resource	6/24	1993	D. Shea	500	5	260	2930	Non-serpentine rock outcrop on coastal influenced mountain top.	5	60	Pseudotsuga menziesii Quercus chrysolepis Arctostaphylos columbiana Rhododendron macrophyllum	Yes	No	Moderate
061128_ARHI5_0003	Iron Mtn. Trailhead	Admin. Withdrawn	Botanical Area	8/15	1991	J. Bouldin				3500	Serpentine forest dominated by Jeffrey Pine and Port Orford Cedar.			No data	Yes- not found	No	N/A
061128_ARHI5_0004	5201-396 Rd.	LSR	Designated Wildlife Habitat	8/9	1990	S. Latimer	3	40	180	1950	Non-serpentine; open shrub dominated meadow area above road cut.	20	60	Pseudotsuga menziesii Lithocarpus densiflorus Arctostaphylos columbiana Garrya buxifolia	Yes	No	Moderate
061126_ARHI5_0001	Mislatanah Creek	LSR	Designated Wildlife Habitat	6/16	1989	L. Wolf	3	60	170	2950	Serpentine forest dominated by Jeffrey Pine.	0	40	Arctostaphylos columbiana Pinus jeffreyi Pinus attenuata Lithocarpus densiflorus	Yes	Yes	Low

NRIS Site ID	Site Name	NWFP Land Allocation	Siskiyou NF LRMP	Month /Day	Year	Original Examiner	Plants	Slope	Aspect	Elev.	Habitat	Canopy Cover	Shrub Cover	Dominant Associated Species	Revisted For This Assessment?	Burned in Biscuit Fire?	Priority for Restoration Treatment*
061126_ARHI5_0002	Mt. Emily	LSR	Designated Wildlife Habitat	5/7	1992	M. Maret	125	30	180	2900	Dense shrub field and road edge on summit of Mt. Emily.	10	40	Arctostaphylos columbiana Arctostaphylos patula Lithocarpus densiflorus Arctostaphylos nevadensis	Yes	No	Moderate
061126_ARHI5_0003	Nancy Creek	LSR	Designated Wildlife Habitat	8/3	1988	V. Stansell	1	30	130	1680	Shrub dominated meadow on road edge. Minor serpentine influence.	0	70	Arctostaphylos columbiana Arctostaphylos patula Ceanothus cordulatus Ceanothus integerrimus	No	No	Low
061126_ARHI5_0004	Tincup Trailhead	LSR	Designated Wildlife Habitat	8/14	1991	L Levine	5	40	225	800	Serpentine dominated meadow within dense old growth Douglas fir forest.	20	30	Pinus jeffreyi Lithocarpus densiflorus Quercus chrysolepis Arctostaphylos columbiana	No	No	Moderate
061126_ARHI5_0005	Green Craggies	Admin. Withdrawn	Botanical Area	1/1	1978	V. Stansell		10	160	3800	Serpentine forest/scrub.			No data	No	Yes	Low
061126_ARHI5_0006	3313 Road	Admin. Withdrawn	Special Wildlife Site	7/16	2008	T. Delinks C. Emerson W. Rolle	100	20	110	2300	Serpentine rock outcrop.	5	50	Pinus jeffreyi Ceanothus pumilus Arctostaphylos nevadensis Chaemacyparis lawsoniana	Yes	No	Low
061126_ARHI5_0007	Fry Place	LSR	Designated Wildlife Habitat	8/7	1998	D. Pivorunas	2	0	200	1400	Mixed conifer forest with dense shrub understory. Mildly influenced by serpentine.	20	40	Pseudotsuga menziesii Arbutus menziesii Arctostaphylos columbiana Lithocarpus densiflorus	Yes	Yes	Moderate

NRIS Site ID	Site Name	NWFP Land Allocation	Siskiyou NF LRMP	Month /Day	Year	Original Examiner	Plants	Slope	Aspect	Elev.	Habitat	Canopy Cover	Shrub Cover	Dominant Associated Species	Revisted For This Assessment?	Burned in Biscuit Fire?	Priority for Restoration Treatment*
061126_ARHI5_0008	Frog Lake	LSR	Designated Wildlife Habitat	7/24	2008	C. Emerson	10	25	170	2840	Open rock outcrop at the top of a small knoll. Serpentine soils present.	0	60	Quercus vaccinifolia Juniperus communis Ceanothus pumilus Arctostaphylos nevadensis	Yes	No	Low
061126_ARHI5_0009	Mineral Hill	Matrix	General Forest	7/16	2008	C. Emerson W. Rolle T. Delinks	5	40	120	3100	Recently burned serpentine shrub/scrub. Dense brush throughout the entire area.	0	60	Arctostaphylos columbiana Arctostaphylos patula Arctostaphylos nevadensis Lithocarpus densiflorus	Yes	Yes	Moderate
061126_ARHI5_0010	Packsaddle Mtn. Trail	Admin. Withdrawn	Research Natural Area	5/1	1992	M. Yager	5	35	175	1800	Very harsh serpentine scrub forest.	0	55	Arctostaphylos columbiana Arctostaphylos nevadensis Ceanothus pumilus Pinus jeffreyi	No	No	Moerate
061126_ARHI5_0011	Cold Iron Camp	LSR	Designated Wildlife Habitat	1/10	1992	J. Bouldin	30	15	170	2500	Roadside shrub field within serpentine dominated Pinus jeffreyi forested landscape.	5	45	Arctostaphylos columbiana Ceanothus pumilus Quercus vaccinifolia Pinus jeffreyi	No	No	High
061126_ARHI5_0012	Silver Peak Trail	LSR	Designated Wildlife Habitat	12/3	1987	V. Stansell C. Webber	9	35	200	1150	Rock outcrop dominated by shrubs. Mild serpentine influence.	15	30	Pseudotsuga menziesii Pinus jeffreyi Arbutus menziesii Ceonothus cuneatus	Yes	Yes	Low
061126_ARHI5_0013	Red Mtn. Prairie	Matrix	Partial Retention Visual	5/18	1993	M. Maret	1	5	180	3200	Disturbed rocky roadbed. Slight serpentine influence.	0	15	Pseudotsuga menziesii Chaemacyparis lawsoniana Lotus aborrigens	Yes	Yes	Moderate

NRIS Site ID	Site Name	NWFP Land Allocation	Siskiyou NF LRMP	Month /Day	Year	Original Examiner	Plants	Slope	Aspect	Elev.	Habitat	Canopy Cover	Shrub Cover	Dominant Associated Species	Revisted For This Assessment?	Burned in Biscuit Fire?	Priority for Restoration Treatment*
061126_ARHI5_0014	N. Fork Lobster Creek	LSR	Designated Wildlife Habitat	1/1	1992	J. Bouldin	50	30	240	2000	Dense shrub dominated ridgeline. Moderate serpentine influence.	5	50	Arctostaphylos nevadensis Arctostaphylos columbiana Quercus vaccinifolia Quercus chrysolepis	No	No	High
061126_ARHI5_0015	Sourdough Camp	LSR	Designated Wildlife Habitat	7/15	2003	R. Jones	2	60	350	3600	Burned plantation dominated by low growing vegetation.	10	40	Arctostaphylos columbiana Arctostaphylos nevadensis Lithocarpus densiflorus Ceanothus velutinus	Yes	Yes	Low
061126_ARHI5_0016	Green Knob	LSR	Designated Wildlife Habitat	7/1	1978	H. Planeto, R. Hess		20	160	3780					No	No	Low
061126_ARHI5_0017	McCurdy Camp	Matrix	General Forest	9/1	1989	V. Stansell M. Farnsworth	20	20	230	2700	Serpentine forest that has been previously harvested. Plants occur along road edge and in old plantation.	5	40	Chaemacyparis lawsoniana Arctostaphylos nevadensis Arctostaphylos columbiana Quercus vaccinifolia	No	No	High
061126_ARHI5_0018	Foster Creek	LSR	Designated Wildlife Habitat	8/7	1989	H. Planeto	1	2	170	350	Open meadow area within mixed hardwood conifer forest. Non-serpentine.	10	50	Arctostaphylos columbiana	No	No	Low

NRIS Site ID	Site Name	NWFP Land Allocation	Siskiyou NF LRMP	Month /Day	Year	Original Examiner	Plants	Slope	Aspect	Elev.	Habitat	Canopy Cover	Shrub Cover	Dominant Associated Species	Revisted For This Assessment?	Burned in Biscuit Fire?	Priority for Restoration Treatment*
061126_ARHI5_0019	Morris Rodgers Creek	LSR	Designated Wildlife Habitat	3/21	1992	C. Dillingham	3	40	200	1600	Non-serpentine; open shrub dominated meadow above steep drainage.	20	30	Arctostaphylos columbiana	No	No	Moderate
061126_ARHI5_0020	23 Road	LSR	Designated Wildlife Habitat	8/16	1990	V. Stansell C. Perry	150	20	175	2660	Open shrub filled meadow within mixed hardwood conifer forest. Non-serpentine.	10	60	Arctostaphylos columbiana Arctostaphylos patula Quercus chrysolepis Rhus diversiloba	No	No	High
061126_ARHI5_0021	Signal Buttes	Matrix	General Forest	8/10	2007	C. Emerson C. Cole	600	25	225	3000	Serpentine forest dominated by Jeffrey Pine and Port Orford Cedar.	10	60	Pinus jeffreyi Chaemacyparis lawsoniana Arctostaphylos columbiana Arctostaphylos nevadensis	Yes	No	High
061126_ARHI5_0022	Agness Pass	LSR	General Forest	7/21	1977	V. Stansell	20	65	25	2000	Rock outcrop within a harvested area.	10	20	Pseudotsuga menziesii	No	No	Moderate
061126_ARHI5_0023	Devils Half Acre	LSR	Designated Wildlife Habitat	1/10	1992	J. Bouldin	16	45	200	3300	Roadside, open shrub dominated meadow. Moderately serpentine influenced.	20	40	Arctostaphylos columbiana Arctostaphylos patula Quercus chrysolepis Ceanothus integerrimus	Yes	No	High

NRIS Site ID	Site Name	NWFP Land Allocation	Siskiyou NF LRMP	Month /Day	Year	Original Examiner	Plants	Slope	Aspect	Elev.	Habitat	Canopy Cover	Shrub Cover	Dominant Associated Species	Revisted For This Assessment?	Burned in Biscuit Fire?	Priority for Restoration Treatment*
061126_ARHI5_0024	3310 Road	Matrix	General Forest	1/10	1993	J. Bouldin	11	10	100	2600	Roadside within an old clearcut.	40	20	Pseudotsuga menziesii Umbellularia californica Arctostaphylos columbiana Arctostaphylos patula	No	No	High
061126_ARHI5_0025	Illinois River Trail	Administratively Withdrawn	Backcountry Recreation	1/10	1992	J. Bouldin	300	35	170	800	Open meadow habitat dominated by shrubs with slight serpentine influence.	15	40	Calocedrus decurrens Ceanothus cuneatus Pinus jeffreyi Arctostaphylos columbiana	Yes	Yes	Low
061126_ARHI5_0026	Pine Point	LSR	Designated Wildlife Habitat	5/11	1977	V. Stansell	3	5	5	1800	Serpentine forest dominated by Jeffrey Pine and Port Orford Cedar.	10	50	Chaemacyparis lawsoniana Pinus jeffreyi Arctostaphylos columbiana Ceonothus pumilus	Yes	No	Moderate
061126_ARHI5_0027	140 Road	LSR	Designated Wildlife Habitat	1/10	1992	J. Bouldin	200	30	160	2750	Road cut and clear cut forest. Non-serpentine.	30	30	Pseudotsuga menziesii Arctostaphylos columbiana Ceanothus velutinus Ceanothus integerrimus	Yes	No	High
061126_ARHI5_0028	Quosatana Butte	Administratively Withdrawn	Unique Interest	1/10	1992	J. Bouldin	400	25	180	3160	Open shrub dominated rock outcropping with slight serpentine influence.	20	30	Arctostaphylos columbiana Pinus attenuata Pinus jeffreyi Arctostaphylos nevadensis	Yes	No	Moderate
061126_ARHI5_0029	4207.180 Road Jct.	Matrix	General Forest	11/6	2001	V. Stansell M. Mcdowell	1	10	135	2160	Roadside, above cutbank of road. Shrub was cut from brushing but has resprouted.	15	40	Pseudotsuga menziesii Lithocarpus densiflorus Arbutus menziesii Quercus chrysolepis	No	No	Moderate

NRIS Site ID	Site Name	NWFP Land Allocation	Siskiyou NF LRMP	Month /Day	Year	Original Examiner	Plants	Slope	Aspect	Elev.	Habitat	Canopy Cover	Shrub Cover	Dominant Associated Species	Revisted For This Assessment?	Burned in Biscuit Fire?	Priority for Restoration Treatment*
061126_ARHI5_0030	3336.050 Road	LSR	Designated Wildlife Habitat	10/7	1988	V. Stansell	1	10	102	2400	Open brush field along road edge. Serpentine influenced.	0	40	Arctostaphylos columbianaRhamnus californicaArctostaphylos nevadensisChrysothamnus nauseosus	Yes	No	Moderate
061122_ARHI5_0001	4402 Road	LSR	Designated Wildlife Habitat	5/16	1992	W. Rolle	5	30	210	2150					No	Yes	Low
ORNHIC Element Occurrence Number	**Site Name**	**NWFP Land Allocation**	**Ownership**	**Month /Day**	**Year**	**Original Examiner**	**Plants**	**Slope**	**Aspect**	**Elev.**	**Habitat**			**Dominant Associated Species**	**Revisited for this Assessment?**	**Burned in Biscuit Fire?**	**No Priority Has Been Set for BLM or Private Lands.**
EO# 5	Rocky Peak	Matrix	Coos Bay BLM	8/19	1987	V. Stansell	1			3000	Rocky ridge,sandstone			Quercus chrysolepis, Arctostaphylos columbiana, Xerophyllum tenax	No	No	N/A
EO #7	Bald Mt.	Matrix	Coos Bay BLM			Morton Peck-Holotype									No	No	N/A
EO #6	N. Fork Hunter Cr.ACEC	LSR	Coos Bay BLM	6/17	1992	B. Rittenhouse, E. Morgan	2	10	120	2675	Rocky outcrop in Jeffrey Pine forest			Arctostapylos columbiana, Pinus jeffreyi, Ceanothus pumilus, Arctostaphylos nevadensis	No	No	N/A
EO #27	Grizzly Mtn.	Matrix	Coos Bay BLM	2/24	1992	B Rittenhouse	3			2500	Coastal mountain top shrub community, serpentine influenced			Arctostaphylos columbiana, Quercus chrysolepis, Lithocarpus densiflorus	No	No	N/A

ORNHIC Element Occurrence Number	Site Name	NWFP Land Allocation	Ownership	Month /Day	Year	Original Examiner	Plants	Slope	Aspect	Elev.	Habitat	Canopy	Shrub	Dominant Associated Species	Revisited for this Assessment?	Burned in Biscuit Fire?	No Priority Has Been Set for BLM or Private Lands.
EO #26	Serpentine Ridge above Hunter Cr.	LSR	Coos Bay BLM	3/11	1992	B. Rittenhouse	1			2240	Shrub/pine habitat, serpentine influenced			Pseudotsuga menziesii, Lithocarpus densiflorus, Pinus monticola, Pinus attenuata	No	No	N/A
EO #25	39-13-35 Road	Matrix	Coos Bay BLM	10/9	1991	D. Phillips	75			2000	Ridgeline plant community			Arctostaphylos columbiana, Pseudotsuga menziesii	No	No	N/A
EO#1	Bosley Butte	Matrix	Coos Bay BLM	6/22	1992	Stansell, Rittenhous, Sundberg	30	20		3400	Serpentine on coastal bald.			Arctostaphylos columbiana, Quercus chrysolepis, Pinus attenuate	No	No	N/A
EO# 53	Ridge above Ransom Creek	LSR	Coos Bay BLM	4/13	1994	E. Morgan	75	10	180		Scabland/shrub habitat, serpentine influenced			Arctostaphylos Columbiana, Pseudotsuga menziesii, Pinus attenuata	No	No	N/A
EO# 20	Palmer Butte	Matrix	Coos Bay BLM			V. Stansell					Coastal mountain top shrub community				No	No	N/A
EO# 28	Sawtooth Rock	N/A	Private Land	2/24	1992	B .Rittenhouse	5	10	25	2850	Bare rocky serpentine outcrop			Sedum, Saxifraga, Allium	No	No	N/A
EO# 4	Mouth of Pistol River	N/A	Private Land- unable to relocate in 1992	5/4	1968	A. Callan				20	Open forest/dunes				No- needs to be revisited	No	N/A
EO# 2	Grants Pass	N/A	Private Land	6/19	1915	W. Cusick					Serpentin Hills east of Grants Pass				No- needs to be revisited in future	No	N/A
EO #43	Along road near Gold Mt.	N/A	Private Land	9/14	1993	E .Morgan	5	0		2500	Douglas fir/Canyon live oak forest on shallow soils			Pseudotsuga menziesii, Quercus chrysolepis, Arctostaphylos columbiana, Corylus cornuta	No- needs to be revisited in future	No	N/A

ORNHIC Element Occurrence Number	Site Name	NWFP Land Allocation	Ownership	Month /Day	Year	Original Examiner	Plants	Slope	Aspect	Elev.	Habitat	Canopy	Shrub	Dominant Associated Species	Revisited for this Assessment?	Burned in Biscuit Fire?	No Priority Has Been Set for BLM or Private Lands.
Totals/ Averages							367 9	24	166	2400		11	43				
Max										3800							
Min										20							

*Sites are prioritized based on number of plants, existing vegetation, estimated cover and potential for the site to be lost to succession. Sites with fewer plants and higher percentage of shrub and canopy cover are prioritized higher.

**Prioritization based on immediacy of threats. Many sites have not been visited recently, so they are listed as “unknown”.

Measurements presented in the table are as follows:
Slope=percent
Aspect=degrees
Elevation=feet
Canopy cover=percent
Shrub cover=percent