Conservation Assessment
for
Helminthoglypta hertleini,
Oregon Shoulderband

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USDA Forest Service Region 6 and
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Interagency Special Status and Sensitive Species Program

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Preface

Summary of 2015 updates:

In 2015, the framework of the original document was reformatted to more closely conform to the standards for the Forest Service and BLM for Conservation Assessment development in Oregon and Washington. Additions to this version of the Assessment include NatureServe ranks, photographs of the species, and Oregon/Washington distribution maps based on the record database that was compiled/updated in 2015. Distribution, habitat, life history, taxonomic information, and other sections in the Assessment have been updated to reflect new data and information that has become available since earlier versions of this document were produced. A textual summary of records that have been gathered between 2005 and 2015 is provided, including number and location of new records, any noteworthy range extensions, and any new documentations on FS/BLM land units. A complete assessment of the species' occurrence on Forest Service and BLM lands in Oregon and Washington is also provided, including relative abundance on each unit.

Executive Summary

Species: *Helminthoglypta hertleini* Hanna & Smith 1937 (Oregon Shoulderband)

Taxonomic Group: Land snails (Phylum Mollusca: Class Gastropoda: Order Pulmonata)

Management Status:
H. hertleini is listed as a Sensitive Species in Oregon by the BLM and Region 6 of the Forest Service. The NatureServe Status for this species is as follows:

Global Status: G1 (2002)
National Status (United States): N1
State/Province Statuses: Oregon (S1), California (S1)
(NatureServe 2015).

Range: This species is endemic to northern California and southwest Oregon. The type locality is along Route 66 east of Ashland, Oregon on BLM Medford District land. In Oregon, the range includes Jackson, Josephine, and Douglas Counties, with verified locations in Roseburg and, Medford BLM Districts, and Umpqua and Rogue River-Siskiyou National Forests. In California, it has been reported in the Klamath River Basin in Siskiyou County, from the vicinity of Happy Camp east to the Shasta and Little Shasta River Drainages in the Klamath National Forest. The range extends south into Trinity County, with the westernmost edge of the range on the eastern slopes of the Trinity Mountains in the Weaverville Ranger District and additional sites to the east in Shasta County, within the Shasta-Trinity National Forest..

Habitat: The species is associated with rocks and woody debris in rocky areas within forest habitats, often adjacent to areas with substantial grass or seasonal herbaceous vegetation. Seasonal deep refugia include talus deposits and outcrops, which contain stable interstitial spaces large enough for snails to enter. These seasonal refugia also provide protection from fire and predation during inactive periods. Within rocky habitat, the species is also associated with subsurface water, herbaceous vegetation and deciduous leaf litter, generally within 30 m (98 ft.) of stable talus deposits or rocky inclusions. Vegetation types where the species has been located include dry conifer and mixed conifer/hardwood forest communities as well as oak communities. Forest canopy cover moderates the extremes in environmental conditions and may provide additional moisture to the site in the form of condensation drip. Woody debris and deciduous leaf litter is often used as daily refugia during foraging and dispersal in the moist seasons.

Threats: Habitat alteration and fragmentation leading to isolated populations is considered to be the major threat to the species. The species is vulnerable to activities which increase temperature, decrease moisture, or decrease food supplies available in populated sites. Habitat changes that likely impact this species include quarry development, road construction, mining, fire, herbicide use, recreation development, and timber harvest. In general, land snails cannot tolerate extremely dry (xeric) conditions, have restricted ranges, and are slow to disperse. Maintaining environmental conditions in these habitats is especially critical to survival of local populations.

Management Considerations: Within species habitat areas, maintain undisturbed talus and adjacent forested areas with vegetative cover sufficient to maintain suitable environmental

conditions. These include cool moist temperatures during fall and spring, stable refuge sites for summer and winter aestivation, and a food supply including seasonal herbaceous vegetation, leaf and needle litter, and fungi. Due to the rarity of known populations, protect sites from wildfire and prescribed fire to the extent feasible, without degrading the current habitat condition such that the local population or critical habitat features are lost.

Data Gaps and Information Needs: Information is needed to determine the range of the species, the location of other populations, the stability of the known populations, and the effects of fire and land management activities on population stability.

I. Introduction

A. Goal

The goal of this Conservation Assessment is to summarize existing information regarding the biology, ecology, known threats, and management considerations for *Helminthoglypta hertleini* (Oregon Shoulderband), in order to assist managers in the formulation of options for management activities. This species is of concern due to its highly restricted distribution, limited mobility, narrow habitat requirements, and sensitivity to anthropogenic disturbance. Federal management for this species follows Region 6 Sensitive Species (SS) and/or OR/WA BLM Special Status Species (SSS) policies.

For OR/WA BLM administered lands, SSS policy details the need to manage for species conservation. For Region 6 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. Management "must not result in a loss of species viability or create significant trends toward federal listing" (FSM 2670.32) for any identified SS.

B. Scope

The geographic scope of this assessment includes consideration of the known and suspected range of the species, in the planning area of the Forest Service Region 6 and/or Oregon and Washington BLM. An emphasis of species-considerations is provided for federal lands; however, species-knowledge compiled from federal lands outside the planning area and non-federal lands is included as it is relevant to the overall conservation of the species. This assessment summarizes existing knowledge of a relatively little known invertebrate. A great deal of new information has been generated regarding this species in the last decade, and is incorporated here, but information updates may be necessary to keep this assessment current with time. Also, threats named here summarize known or suspected existing threats, which also may change with time. Management considerations typically apply to site-specific locations; however some larger scale issues such as population connectivity and range-wide concerns are listed. Uncertainty and inference are acknowledged where appropriate.

C. Management Status
H. hertleini is listed as a Sensitive Species in Oregon by the BLM and Region 6 of the Forest Service. The NatureServe Status for this species is as follows:

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II. Classification and Description

A. Systematic/Taxonomic History and Synonymy
Family: Helminthoglyptidae
Species: *Helminthoglypta hertleini* Hanna & Smith 1937 (Oregon Shoulderband)

Helminthoglypta was first described by Ancey in 1887, with *Helix tudiculata* Binney (1843) as the type species. The family Helminthoglyptidae was proposed by Pilsbry (1939), which he divided into four subfamilies. One of them is the Helminthoglyptinae, which is confined to the Pacific States and includes the genera *Helminthoglypta*, *Monadenia*, and *Micrarionta*. Most subsequent authors have followed Pilsbry's classification. However, Burch and Pearce (1990) used an older name, Xanthonychidae, for the family, and van der Laan (1980) used Helicidae. Others have used Helicoidea as the superfamily (e.g., Smith et al. 1990). See Roth (1996) for a recent phylogenetic analysis and new system of classification for the Helminthoglyptidae.

The genus *Helminthoglypta* is a large genus in which Pilsbry (1939) recognized 46 species and 43 additional subspecies. This complex has since been divided into four subgenera that were redefined by Roth and Hochberg (1992). Members of this genus primarily inhabit California, with just two species ranging north into Oregon (Burke 2013) and seven species whose distributions include or are limited to Baja California (Smith 1990). The extensive speciation in this group seems to reflect the low mobility of these snails combined with the complex topography and generally dry climate of California.

An investigation of the phylogenetic relationships between *Helminthoglypta* species in Oregon and California using mitochondrial DNA revealed that specimens from Siskiyou and Shasta counties initially identified as *H. cypreophila* or *H. hertlei* form a relatively homogeneous clade that is the sister-group of presumptively typical *H. cypreophila* from Stanislaus County. The sequence divergence between these sister-groups is at a level (19.8-20.0%) elsewhere associated with separate species. The Siskiyou-Shasta clade includes a near-topotype (sample 41) of *H. hertleini*; the name *Helminthoglypta hertleini* applies to this clade. The range of *H. hertleini,* which was thought previously to be limited to the area north from the confluence of the Shasta and Klamath rivers, is now seen to extend southward at least to the vicinity of Shasta and Lewiston lakes (Lindberg 2002, Roth 2002).

B. Species Description
As noted above, this taxon belongs to a genus in the land snail family Helminthoglyptidae. This family is composed of just one genus in the Pacific Northwest, *Helminthoglypta*. Members of

this genus can be distinguished from other snails in southern Oregon by the large body whorl with round periphery and with a single dark band well above the periphery (Burke 2013). There are just two species in this genus in Oregon, *H. hertleini* and *H. mailliardi*. *Helminthoglypta hertleini* can be distinguished from *H. mailliardi* by the fairly low conic spire (as opposed to high conic); umbilicus contained about 9 or more times in the shell width and one-half or less covered by the columellar lip (as opposed to 14 times in the shell width and more than half covered by the reflected columellar lip); and other more subtle features (see key in Burke 2013).

Burke (2013) describes the species as follows:

> The shell of this medium-sized snail is thin and rather fragile. The 5 to 5.5 whorls increase in size regularly and fairly rapidly. The shell measures 18 to 23 mm wide and its height is about 70% or more of its width. The narrow umbilicus is contained 9 or more times in the shell width. The body whorl is capacious, the spire fairly low and conic. The color is golden-brown with a narrow, darker brown or reddish band well above the periphery; the band may be bordered by an indistinct area that is a lighter shade of the shell color. The aperture is roundly lunate; the lip is generally simple but thickened a little inside. The outer and basal lip margins are barely flared, but the columellar is reflected to cover about half of the umbilicus. Sculpturing is merely growth-wrinkles, although on some shells weak malleations may be seen.

The original description of this species by Hanna & Smith (1937) reported the shell morphology for this species as follows: “Shell thin and delicate, pale golden brown, with a very narrow band of a darker shade, bounded below by an equally narrow band of a lighter shade; whorls five, regularly increasing in size; surface marked with fairly coarse growth ridges, and very irregularly scattered papillae; nuclear whorl with faint growth lines and a finely roughened surface; aperture not expanded; peristome simple and scarcely reflected (except in the umbilical region) and slightly thickened interiorly; umbilicus narrow, half covered by the reflected basal wall. Max. diameter 18.5 mm; min. diameter 15.3 mm; altitude 12.5 mm; diameter umbilicus about 2 mm” Note that further collecting from the type locality by Pilsbry indicates that the species diameter is up to 22.6 mm.

Pilsbry (1939) placed this species in the subgenus *Helminthoglypta sensu stricto* and further defines it as a member of the *H. tudiculata* series. This series is described as follows: "Globose or globose-depressed, with sculpture of growth wrinkles below the suture, generally malleate in the peripheral region or throughout; not granulose, but sometimes with some granulation behind the lip; last whorl wide." *H. hertleini* was described by Pilsbry (1939) as follows: “Helices of moderate or large size, the shell globose or depressed with conic or low spire and open or covered umbilicus; periphery rounded at all stages of growth. Embryonic shell 1 ½ to 1 ¾ whorls; after the smooth tip and a few radial ripples it has sculpture of close, microscopic, waved, radial wrinkles, over which there are papillae in forwardly descending trends (often indistinct or practically absent). Adult sculpture of simple growth lines or with spiral engraved lines, malleation, papillae or granulation also. A dark band revolves above the periphery (sometimes absent). Peristome narrow, expanded outwardly, usually reflected at base, dilated at columellar insertion.” In comparing this species to other members of the *H. cypreophila* group, Pilsbry (1939) noted that *H. hertleini* has lost the reflected peristome, and most of the surface markings; the bands are much less prominent and the shells are thin and delicate, somewhat like *tularensis* (Hemphill). Pilsbry also reported that "the umbilicus is far wider than in *H. napaea*,

which also lacks papillae, and it seems to be an independent northern derivative of the *cypreophila* stock."

Refer to Hanna & Smith (1937), Pilsbry (1939), and Burke (2013) for species descriptions and illustrations. See Appendix for photographs of this species. Soft body anatomy is not required for field identification.

III. Biology and Ecology

A. Life History

Little is known regarding the reproductive biology, oviposition behavior, number/appearance of eggs, development, generation time, or potential longevity of this species. Like most terrestrial gastropods, *Helminthoglypta* are hermaphroditic, having both male and female organs. Although not confirmed specifically for this genus, self-fertilization has been demonstrated in some species of gastropods, but cross-fertilization is the norm. Bayne (1973) discussed the complexities of the Pulmonate reproductive system, and studied mechanisms by which allosperms (sperm from another) exert dominance over autosperms (sperm from oneself) during fertilization. Thus, ". . . self-fertilization is normally avoided, but remains a possible alternative to cross-fertilization." The advantage is in normally avoiding potentially deleterious inbreeding, yet retaining the option to reproduce if a mate is not available.

Other *Helminthoglypta* species are reported to live several years and may reproduce multiple times. Some inferences for the reproductive biology of this species can be drawn from a study of a coastal species (*Helminthoglypta arrosa*) by van der Laan (1971, 1980). Within 24 hours after the first soaking rain in October, the adult snails of this species would emerge from aestivation and begin mating, both at night and on overcast and rainy days. Although the coastal species was active at temperatures as low as 4°C, they only mated at ambient temperatures of 10 to 15°C. Their eggs were deposited in shallow holes in the soil below the leaf litter; the eggs averaged 2.2 mm in diameter and the mean number of eggs per egg mass was 75.6 (range 45-171). The young snails hatched in March and April (Laan 1971, 1980).

B. Activity Pattern and Movement

The species is normally crepuscular (active during dawn and dusk) during the spring and fall seasons when humidity is higher. Condensation in frost and dew may provide an important source of water for this species in otherwise dry habitats. During the wet seasons, individuals may be found away from rock refugia, foraging for green vegetation and fruit, feces, old leaves, leaf mold, and fungi. Each day when the humidity drops, individuals typically retreat under cover objects such as woody debris or loose rock. Daily refugia used during moist seasons can also simply be loose soil or accumulations of litter. The arrangement and abundance of such surface features play a role in determining dispersal rates and patterns of the species.

Less than half of each year is spent actively growing, reproducing and dispersing. During the summer and winter, snails become dormant and may be found deep within stable accumulations of rocks, usually in association with a moisture source such as a seep or riparian drainage, which serve as refuge sites from desiccation, and protection from predators while they are immobile. These deep rock refugia also provide the important, environmentally stable sites needed to

survive wildfire events and cold winter conditions. The distribution of suitable stable rock refugia sites across the landscape may determine or at least help to explain the distribution of the species.

Like most terrestrial mollusks, these snails are probably relatively sedentary and have poor dispersal abilities, as evidenced by the species' scattered distribution throughout its range.

C. Food Habits

While the specific food requirements of this species are not known, *Helminthoglyptas* in general are known to forage on a variety of green, herbaceous vegetation, subsurface roots, fungi, and organic debris, typically found in talus slopes. Small invertebrates that may serve as food sources also inhabit the talus environment. Forest litter and coarse woody debris in the semi-dry areas in which these species occur is considered necessary to provide food (shelter and substrate for fungi) and temporary cover when foraging.

D. Range, Distribution, and Abundance

This species is endemic to northern California and southwest Oregon. In Oregon, the range includes Jackson, Josephine, and Douglas Counties. The type locality is along Route 66 east of Ashland, Oregon on BLM Medford District land. In California, this species has been reported in Siskiyou County, in the Klamath River Basin from the vicinity of Happy Camp east to the Shasta and Little Shasta River Drainages in the Klamath National Forest. The range extends south into Trinity County, with the westernmost edge of the range on the eastern slopes of the Trinity Mountains in the Weaverville Ranger District of Trinity National Forest. Additional sites occur to the east in Shasta County, within the Shasta National Forest.

Distribution on FS/BLM lands: In Oregon, this species is documented on Rogue River Siskiyou and Umpqua National Forests, and on Medford, and Roseburg District BLM lands (ISSSP 2011; GeoBOB 2014; NRIS 2014; Young 2015). It is Suspected on Coos Bay District BLM land (ISSSP 2011).

Further details regarding FS/BLM distribution: Most sites for this species are on Medford and Roseburg District BLM lands, and on Umpqua National Forest. Three recent records have confirmed the presence of this species on Rogue River-Siskiyou National Forest.

Summary of Recent Data: Since the Conservation Assessment was last updated in 2005, three records of this species from the Star Ranger District of Rogue River-Siskiyou National Forest in southern Oregon have been reported (Young 2015). Since this species is known from northern California, these southern Oregon records do not represent an extension of the known range, but do serve to document the species on a new Administrative Unit (RRS). In addition, 33 new records have been reported on the Tiller Ranger District of Umpqua National Forest, where the species was previously known from 24 records (NRIS 2014); and 52 new records have been reported from Douglas County, Oregon, almost entirely on Roseburg District land, primarily in the South River Resource Area (GeoBOB 2014). Most of these are in the immediate vicinity of known sites and do not represent significant range extensions for this species (NRIS 2014, GeoBOB 2014).

Species Abundance:

Population density at known sites has not been determined, however, only a few individuals have

been found at most sites. Known sites are widely scattered across the species' range. The distribution of stable rock refugia in conjunction with moisture sources across the landscape may determine or at least help to explain the distribution of the species in areas with short fire-return intervals.

E. Population Trends

Population trends of this species are not known. Frest & Johannes (1999) report that the presumed type locality population is still extant, although small. Most other sites, e.g., on Umpqua and Rogue River-Siskiyou National Forests, and on Medford and Roseburg BLM land, are relatively recent and population information is not available.

F. Habitat

The species is associated with rocks and woody debris in moist, rocky areas within forest habitats, often adjacent to areas with substantial grass or seasonal herbaceous vegetation. Seasonal deep refugia include talus deposits and outcrops, which contain stable interstitial spaces large enough for snails to enter. Often subsurface water is present near such refugia. Temperature is lower and humidity is higher under talus than in the surrounding environment. These seasonal refugia also provide protection from fire and predation during inactive periods.

Within rocky habitat, the species is also associated with herbaceous vegetation and deciduous leaf litter, generally within 30 m. (98 ft.) of stable talus deposits or rocky inclusions. Vegetation types where the species has been located include dry conifer and mixed conifer/hardwood forest communities as well as oak communities. Vegetation within the surrounding forest not only moderates the temperature and moisture conditions within the rock habitats, but provides food, loose soil and litter conditions necessary for egg laying and may provide additional moisture to the site in the form of condensation drip. Woody debris and deciduous leaf litter is often used as daily refugia during foraging and dispersal in the moist seasons.

No strong riparian association has been identified, although Roth (1993) and Frest & Johannes (1999) list this species as a riparian associate in part. Many sites are located in areas which have at least seasonal surface water, typically in the form of small springs and seeps, which may only be apparent during the dry season due to the increase in herbaceous vegetation in the vicinity. Several sites in Roseburg BLM have been located in rock quarries and riparian areas adjacent to them.

Mollusks which inhabit talus slopes also utilize the surrounding forest areas during moist, cool conditions, ranging out from the refugia to forage in litter of the adjacent forest floor. Vegetation within the surrounding forest not only moderates the temperature and moisture conditions within the rock habitats, but provides food, loose soil, and litter conditions necessary for egg laying. Generally, the lower one third of a talus slope contains the largest and most suitable habitat elements. Because of the long-term stability in these areas and larger interstitial spaces between the rocks, microsite conditions are more favorable and provide dependable refugia sites. Shading over these refugia sites helps to moderate environmental extremes.

Species of *Vespericola, Monadenia, Trilobopsis, and Haplotrema* commonly occur in the same areas as *Helminthoglypta.* The species occurs with *Monadenia chaceana* at some sites.

G. Ecological Considerations

Terrestrial gastropods make a significant contribution to the biomass and energy in boreal forests, where they comprise at least 2.5% of the animal biomass and 6% of the animal energy (highly conservative estimates based only on active gastropods on the forest floor) (reviewed in Foltz Jordan & Black 2012).

Decomposition and nutrient cycling: As primary consumers of plant, animal, and fungal matter, gastropods aid in forest decomposition processes and contribute to nutrient cycling, soil formation, and soil productivity (reviewed in Foltz Jordan & Black 2012). For example, the slug *Ariolimax columbianus* speeds up nutrient cycling by ingesting large amounts of living and senescing plants, and subsequently excreting the partially digested plant tissue. Snails and slugs further contribute to the breakdown of forest floor litter by aiding in the dispersal of some fungi, and by physically and chemically altering plant material in ways that appear to promote fungal and bacterial growth. According to earlier versions of this assessment, *Helminthoglypta* probably has a digestive efficiency rate in the high forties for assimilation of food materials, a low rate which results in the viable spores and fragments of fungal hyphae to be excreted with the feces. Thus, they may represent an important dispersal mechanism for fungal species throughout the seasons when this mollusk is active.

Food and calcium for wildlife: Terrestrial gastropods are an important food source to a vast number of species, including salamanders, frogs, toads, turtles, snakes, lizards, birds, shrews, voles, moles, rats, mice, chipmunks, and squirrels (reviewed in Foltz Jordan & Black 2012). Invertebrate predators of terrestrial mollusks include sciomyzid fly larvae, firefly larvae, parasitic wasp larvae, carabid and staphylinid beetles, ants, spiders, and harvestmen. Terrestrial snails can also serve as important food sources to other gastropods such as predatory snails, and slugs that become cannibalistic when no other food is available (Burke 2014 *pers. comm.*). Additionally, the reproductive cycles of some nematodes and trematodes (flatworms) are dependent on snails and slugs as intermediate hosts for their parasitic eggs and larvae (reviewed in Foltz Jordan & Black 2012). Since snail shells are very high in calcium, terrestrial snails have an important role in storing, releasing, and cycling calcium in the ecosystems they inhabit (reviewed in Foltz Jordan & Black 2012). Snail shells are the primary calcium source for the eggs of some bird species, and declines in mollusk abundance in forest ecosystems have been significantly linked to eggshell defects, reduced reproductive success, and population declines in the song bird, *Parus major* (reviewed in Foltz Jordan & Black 2012). Empty snail shells are used as shelters and egg laying sites by insects and other arthropods, and broken down shells return calcium to the soil (reviewed in Foltz Jordan & Black 2012).

Plant pollination and seed dispersal: Although pollination by snails (malacophily) is a rare and obscure phenomenon, at least one study clearly demonstrates the significant role of a snail (*Lamellaxis gracile*) in the pollination of a flowering plant (Convolvulaceae: *Volvulopsis nummularium),* especially on rainy days when the activity of bees is completely lacking (reviewed in Foltz Jordan & Black 2012). Since some slugs consume fruit and excrete seeds, these animals can play a significant role in seed dispersal (albeit over short distances) and also appear to increase seed germination rates of some flowering plants (reviewed in Foltz Jordan & Black 2012).

Indicators of environmental health: Due to limited mobility, small home ranges, defined habitat

preferences, and acute sensitivity to environmental conditions, snails and slugs are excellent and unique indicators of ecosystem health (reviewed in Foltz Jordan & Black 2012). Since terrestrial gastropods cannot easily escape areas that are subjected to disturbance, changes in gastropod abundance and diversity reflect the immediate impact of natural or experimental disturbance in their habitat. As such, gastropods provide managers with a valuable tool for site-specific assessment of environmental and community change (reviewed in Foltz Jordan & Black 2012).

IV. Conservation

A. Threats to Species

Primary threats to this species are the loss and fragmentation of habitat due to roads, mining, quarry development, fire and fire management, timber harvest, and recreation (Frest & Johannes 1999). This species is very vulnerable to any activities which increase temperature, decrease moisture, or decrease food supplies available in populated sites. The degree of connectivity for dispersal within and between occupied areas depends on the density and arrangement of shaded down wood and other cover objects which provide daily refugia during the wet season. Maintenance of suitable rock-on-rock refugia in areas with short fire return intervals may be critical to allow the species to survive wild fires. Habitat alteration by either human or natural means (including fire, herbicide use, recreation development, quarry development, road construction, and timber harvest), alteration of the hydrologic patterns which provide moisture, and disturbance during aestivation may constitute major threats to this species. Further details on key threats are provided below:

Quarry development, mining, and road construction: Road building, talus mining, and other mining operations are documented threats to this species in the Shasta corridor of Siskiyou County, California, and in Jackson County, Oregon. Frest & Johannes (1999) note that there is an active quarry below the Oregon type locality; this area originally included a spring, but road building and quarrying has destroyed this. Several sites in Roseburg BLM have been located in rock quarries and riparian areas adjacent to them. Additional sites were found on roadsides where large material from those quarries was used for the construction of culvert crossings, riprap for slope stabilizing, and other road-related uses. It is not known whether populations at these roadside locations are natural or were colonized by individuals transported there with quarry material. Road cuts which require removal of rock outcrops and talus may result in loss of some natural sites, or transport of individuals from those sites to new remote locations which may not be suitable.

Construction of new roads and maintenance of existing roads is a threat across the species' range. Roadways eliminate and degrade snail habitat, cause direct mortality in snails, and hinder snails' ability to disperse (reviewed in Foltz Jordan & Black 2012). Mollusk populations are not only extirpated in the roadway proper, but impacts can extend into adjacent habitat as well, due to site preparation, road construction, vehicle use, and maintenance activities. Where roads and railroads cross rivers and streams, there is the risk of petrochemicals, herbicides and silt entering the waterways. For a complete review of ecological impacts of roadways on snails including environmental contaminants, traffic and desiccation-related mortality, roads as distribution barriers, and road-related changes in the direction and intensity of gene flow, see Foltz Jordan & Black (2012).

High intensity fire - Although natural and anthropogenic fire have played major roles in shaping forest ecosystems in the Pacific Northwest, the impacts of fire management on invertebrate communities are often highly variable. Fire has the potential to negatively influence gastropods in several ways: directly, by fire-related mortality, and indirectly, by altering microclimate conditions, and by reducing, eliminating, or otherwise altering resources, including vegetation, fungi, leaf-litter, duff, woody debris, and other habitat elements pertaining to shelter or food (*reviewed in* Foltz Jordan & Black 2012). The degree of fire-related impact and the potential for animals to rebound post-impact are related to a number of factors, namely, the degree of exposure to lethal temperature, the stress experienced in the post-fire environment, the suitability of post-treatment vegetation as habitat, and the ability to rebuild numbers in the site (from survivors and/or colonizers). Direct mortality due to fire exposure can be avoided by animals either in space (i.e., by escaping/retreating into shelter from fire) or in time (i.e., by being in a physiologically least susceptible stage at the time of burn). In general, less decline has been recorded for species below ground or within or beneath unburned wood, and greater decline for species in the herb (fuel) layer or near the soil surface, particularly for individuals with low mobility. Mobility is important in both fire avoidance (e.g., the ability to escape approaching flames and reach suitable unburned habitat) and in post-fire recolonization (e.g., the ability to reach burned sites from unburned sites) (*reviewed in* Foltz Jordan & Black 2012).

Since *H. hertleini* lives for the most part on vegetation and in litter, has limited mobility and poor active dispersal aptitudes, and is sensitive to desiccation, this species is considered highly vulnerable to fire itself and to subsequent habitat destruction. Burke (2013) notes that fires, especially controlled burns, can kill thousands of snails, sometimes in a single burn. Slash disposal burns may be particularly devastating to gastropods since the accumulated woody debris provides excellent habitat and can have especially high snail densities. Moreover, prescribed burns are usually done during wet periods when the snails are active on or near the surface of the ground and most vulnerable to fire. In contrast, natural wildfires typically occur in dry weather, and it appears that at least some of the snails survive, possibly because they are aestivating underground at the time of the burn (Burke 2013).

Timber Management- Logging and clearing of relatively intact forest and grazing of logged areas has occurred across the species' range (Frest & Johannes 1999). Although not an old-growth dependent species, *H. hertleini* depends on numerous forest attributes that are frequently associated with intact forests, including shadiness and humidity, a stable microclimate, adequate calcium content, diverse vegetation, a sufficient amount of litter and coarse woody debris, and habitat continuity (*reviewed in* Foltz Jordan & Black 2012). These habitat dependencies, coupled with limited mobility with which to escape unfavorable conditions, suggest that silviculture activities and associated microhabitat changes would negatively impact this species at logged locations. Foltz Jordan & Black (2012) identify numerous ways in which tree harvest can significantly impact terrestrial gastropods, including increases in microclimate extremes; changes in forest vegetation and litter; reductions in coarse woody debris; soil compaction and other changes in microhabitat structure; population fragmentation; and changes in genetic population structure.

B. Conservation Status

1. Overview

Helminthoglypta hertleini is considered vulnerable to extinction or extirpation in Oregon due to limited distribution, low number of occurrences, low detection rate in suitable habitat, and its small range. The vast majority of recent detections are from a small area of southwestern Oregon, where population trends are not known, and habitat has been impacted by roads, rock quarry development, and other activities (Frest & Johannes 1999).

Due to limited mobility and narrow habitat preferences, this species, like many other terrestrial snails and slugs, cannot easily escape unfavorable habitat changes, and is thus highly impacted by environmental disturbance (*reviewed in* Foltz Jordan & Black 2012). These life history factors suggest that populations are especially vulnerable to habitat change or other changes in the environment.

2. Status History

According to the FEMAT report completed in 1993, Table IV-22, the options considered in the species assessments were less effective in providing for mollusks than for any other species group. High degrees of endemism, rareness, and habitat specialization account, in part, for the low ratings. Under the selected management option (Option 9), there would be a 32% probability that this species would be well-distributed across Federal lands, a 27% probability that the species would remain viable but with gaps in distribution, a 30% probability that populations would be restricted to refugia, and a 12% probability that it would be extirpated. This assessment did not reflect the potential benefits of riparian reserve protections, which were not part of the options analyzed at that time.

Helminthoglypta hertleini was considered to be a rare species under Survey and Manage, based on the low number of occurrences, its low detection rate in suitable habitat, and its small range. This species was removed from the Survey and Manage Standards and Guidelines in 2003, due to an apparent lack of association with late-successional and old-growth forests, but remained on the Oregon Natural Heritage Program List 1; with Global ranking G1, State ranking S1 (Critically imperiled globally and within the state because of extreme rarity or because it is somehow especially vulnerable to extinction or extirpation) In 2004, both Region 6 of the Forest Service and OR and CA BLM classified this species as Sensitive. Region 5 of the Forest Service did not classify this species as a sensitive species.

3. Major Habitat and Viability Considerations

Maintaining deep refugia areas with appropriate microclimate conditions during the summer and winter within and around occupied habitat is considered critical. Typically these seasonal deep refugia are provided by large scale rock talus piles, which provide access to underground moisture and retain cool, humid conditions deep within their interstitial species. Retaining large woody debris, herbaceous vegetation, leaf litter, uncompacted soil, and canopy cover may assist in maintaining summer shade, food, and daily surface refugia sites used during dispersal in spring and fall.

The survival of mollusk species in semi-xeric (dry) conditions is especially dependent upon the presence of adequate refuge sites during the hot summer and cold winter months. The range of

environmental conditions that this species can tolerate is not known, however they must be protected from freezing during the winter and from desiccation in the summer. An increase in temperature or decrease in moisture during the hot summer months is much more likely to adversely affect xeric species than those that live in a mesic (moist) environment, as they are often already living at the extremes of their tolerance limits.

The number of population sites required to maintain species viability is unknown, however, it can be assumed that the likelihood of species viability increases with the number of populations, increasing opportunities for interaction between populations. Landscape management which maintains a distribution of populations and suitable habitat of sufficient quality, distribution, and abundance to allow the species populations to stabilize on federal lands is thought to be necessary for species persistence. The historic distribution pattern for this species is thought to be related to the coincident occurrence of rock outcrops, talus, and other rock refugia with the availability of surface water, which has not changed much over time. While the current geographic distribution of these features is probably not very different from the historic pattern, fire suppression in areas with short fire return intervals may have reduced the habitat quality in some areas and plantations of conifer forest have replaced many of the original open herbaceous habitats. Quarry development and road construction through rock talus areas may also have resulted in loss of some populations, however the use of quarry material in road construction may have resulted in the colonization of new sites and increased the distribution of the species. Small gaps in distribution may continue to limit population interaction somewhat, but without causing isolation or extinction of local populations, loss of genetic or ecological diversity, or loss of ecological function.

4. Distribution Relative to Land Allocations:

Approximately 3% of known sites for this species are located in withdrawn or reserved land allocations on federal lands. Another 7% of sites are on private lands. The majority of known sites, however, are located on federal lands managed for timber production and other extractable resources. It is unknown how many occurrences are located within riparian reserves, but no strong riparian association has been identified.

C. Known Management Approaches and Considerations

1. Management Goals for the Taxon

Management for this species follows Forest Service Region 6 Sensitive Species (SS) policy, and/or Oregon and Washington BLM Special Status Species (SSS) policy. For Oregon and Washington Bureau of Land Management administered lands, SSS policy details the need to manage for species conservation. For Region 6 of the Forest Service, Sensitive Species 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. Management should also not create significant trends towards federal listing for any identified Sensitive species.

2. Identification of Species Habitat Areas

All known sites on federal lands administered by the Forest Service and/or BLM in Oregon and Washington are identified as areas where the information presented in this Conservation Assessment could be applied. A species habitat area is defined as the suitable habitat occupied

by a known population plus the surrounding habitat needed to support the species at the site.

This document addresses management at two spatial scales. At the local population scale, a species habitat area is designed to support a functional population of interacting individuals. The size of such areas is based on estimates of dispersal distances in similar-sized terrestrial mollusks and estimates of genetic neighborhood, or deme, size and the environmental tolerances of the species. Based on the small size and limited dispersal ability of this species, the amount of area required to sustain a population of interacting individuals may range in size, depending on amount of contiguous moist habitat and the environmental modification effect of the surrounding habitat.

In addition to managing this species within species habitat areas, attempts should be made to connect habitat areas to each other or to other reserves such as riparian reserves, either directly, by locating them adjacent to occupied habitat within reserves, or indirectly, by retaining suitable quantities of key habitat elements in harvest or project areas to provide a potential bridge or temporary "bank account" to accelerate future habitat development.

At the smallest scale, within each habitat area, habitat elements such as rock talus and woody debris should be protected from disturbance, to provide for the critical periods in the animals' life history (aestivation, hibernation, reproduction). In all cases where springs or seeps provide the only available moisture, the water source, its average flow rate and associated aquifer, should be identified and managed.

3. Management Within Species Habitat Areas

The objective of species habitat areas is to maintain habitat conditions such that species viability will be maintained at an appropriate scale, in accordance with agency policies.

In general within the Species Habitat areas, provide for the conditions necessary to maintain cool moist temperatures during fall and spring, refugia sites for summer and winter aestivation, and a food supply including herbaceous vegetation, leaf and needle litter, and fungi. This includes maintaining undisturbed talus with deep crevices and vegetative cover. Manage adjacent forested areas to provide shade, coarse woody debris, and uncompacted forest litter. Due to the rarity of known populations, protect sites from wildfire events, but manage with prescribed fire to maintain historic conditions. The following suggestions should be considered within species habitat areas:

- Maintain uncompacted soil in and near populated sites.

- Maintain undisturbed talus and rocky outcrops (most important in the lower third of the slope and where moisture sources provide shallow underground or surface water).

- Manage vegetative community and shading in the species habitat areas within the natural range of variation for the habitat type. Maintain or enhance the naturally occurring diversity of plant species. This will increase the range of hosts for a variety of species of fungi and make other food substrates available throughout the season. It will also provide assurance that specific plant species, if found to be critical in the life cycle of these mollusk species, are not inadvertently lost. As yet we know too little about the needs of

this species to identify an optimum mix of tree species, but it appears that mixed stands of conifer and hardwoods provide the best habitat. Maintaining a mix of conifer and hardwood species would provide a more diverse and complete set of conditions for multiple species and a more fully functioning ecosystem. A range of canopy closure across the habitat area, with some open areas and other areas of closed canopy and deep shade, will provide opportunities for animals to locate appropriate microhabitats. The degree of connectivity and dispersal within and between habitat areas depends on the density and arrangement of shaded down wood and other cover objects which provide daily refugia during the wet season.

- Maintain current volume of coarse woody debris as food sources (substrate for fungi) and refuge sites and manage for future sources of coarse woody debris in the habitat area, using the DecAID model or other appropriate method for estimating the natural amounts found in the habitat type.

- Maintain soil temperature and moisture regime of the refugia sites by retaining vegetation cover over these sites (cool and moist during the summer).

- To the extent practical, protect sites from high-intensity wildfire events which cause direct mortality and loss of habitat. Prescribed fire treatments could be used to maintain the herbaceous vegetation and to reduce fuel loading outside of species habitat areas, to protect those areas from catastrophic wildfire events (Burke 2014, *pers. comm.*). Design prescribed burning or other treatments to avoid significant impacts to the habitat conditions within the habitat area as outlined above. Prescribed fire is likely to have a less damaging effect if conducted while mollusks are dormant during the summer or winter and are insulated from surface heat (Burke 2014, *pers. comm.*). If burning is conducted during seasons when animals are active, ensure that a mosaic of unburned patches is retained. This may provide a measure of confidence that some individuals survive the treatment.

- Manage occupied rockslides and talus areas to prevent adverse effects from road construction, quarrying, and other major site disturbing activities that may cause temperature and/or humidity changes within the interspaces.

- Protect inhabited areas from introductions of non-native species. This includes restricting use of un-washed vehicles that could carry weed seeds or other exotics, and use of hay bales or other nonnative mulching materials and planting mixes used for erosion control. Exotic species of both plants and animals are entering habitats occupied by this species. If exotic species are found, measures to control them should be implemented if feasible. Measures to control exotic species should not be adverse to *Helminthoglypta hertleini* and other native species.

V. Research, Inventory, and Monitoring Opportunities

The objective of this section is to identify opportunities for additional information that could contribute to more effective species management.

A. Data Gaps and Information Needs
The following data gaps have been identified:

- The present distribution, reproductive rates, and dispersal rates of this species.
- Local and range-wide abundance and population trends.
- Impact of anthropogenic threats, including road construction and quarry development.
- Full range of habitat conditions favored or tolerated by the species.

Note that field research associated with any mollusk species often results in detections in different habitats than expected based on prior knowledge. Range extensions are also common. Surveys outside of known habitat conditions may be helpful in determining the full range of habitat conditions in which the organisms can survive.

B. Research Questions

- What are the food requirements of this species?
- What is the range of environmental conditions that this species can tolerate and how long can extremes be tolerated?
- What are the effects of fire and management activities on population demographics?
- What factors control the species' rate and distance of dispersal?
- What is the species' natural life span?
- What adaptations has the species made that allow it to be more xeric tolerant than other species?
- What is the actual range of the species?
- How far does an individual range away from its refuge site?
- What are the population densities of the known sites?
- What are the biological attributes required by this species?
    - Plant community associations, and specific plant species required/used
    - Optimal amount of large woody debris/rock
    - Optimal forest crown cover adjacent to habitat, to maintain desired conditions

C. Monitoring Opportunities
Since the long-term security of this species is questionable, monitoring existing populations is considered a critical conservation measure for this species. Monitoring known sites is recommended to track trends in populations (numbers, size and density), reproduction, and quantity/quality of habitats. Monitoring is also recommended to determine impacts on habitats and populations from management activities, natural disturbances, and vegetative succession. Monitoring strategies should be designed to assist in determining if the implementation of management recommendations is resulting in the protection of habitat for the species. In addition, monitoring should be designed to ensure that site disturbance or collection activities do not extirpate local populations.

Monitoring recommendations include:

- Conduct surveys in spring and fall after the first heavy rainfall or frost.
- Record all environmental conditions where the species is found to better understand their habitats and management needs.

- Through surveys and studies, determine the extent of the species range, and the habitats and ecology of the species.
- Monitor sites for conditions and trends of populations.
- Monitor known population sites following land management activities to assess effectiveness of management recommendations applied.

VI. References

Ancey, 1887. Description of North American shells. The Cochologists' Exchange [The Nautilus] 2:64.

Binney, A. 1843. Descriptions of two undescribed species of North American helices. Boston Journal of Natural History, vol. 4, pp 360-361 and plate 20.

Burch, J.B. and T.A. Pearce. 1990. Terrestrial Gastropoda, pp. 201-309, in D.L. Dindal (ed.), Soil Biology Guide. J. Wiley, N.Y. 1359 pp.

Burke, Tom. 2014. Regional mollusk expert. Personal communication with Sarah Foltz Jordan, Xerces Society.

Burke, T. 2013. Land snails and slugs of the Pacific Northwest. Oregon State University Press, Corvallis, Oregon. 344 pp.

Foltz Jordan, S. and S. H. Black. 2012. Effects of forest land management on terrestrial mollusks: A literature review. Prepared for Interagency Special Status and Sensitive Species Program, USDA Forest Service, Region 6 and USDI Oregon/Washington Bureau of Land Management. 87 pp. Available online at: http://www.xerces.org/wp-content/uploads/2012/04/forest-land-management-and-mollusks.pdf

GeoBOB 2014. GeoBOB Database: Fauna observations. GIS export provided to Sarah Foltz Jordan, Xerces Society, by Diane Stutzman, January 2014.

Hanna, G. Dallas & Smith, Allyn G. 1937. The Nautilus 51: 16.

Lindberg, D.R. and A. Cordero. 2002. Molecular phylogeny of some land snails of the clades *Monadenia* and *Helminthoglypta* in Southern Oregon and Northern California. Report to USDI Bureau of Land Management, Roseburg, Oregon.

NatureServe. 2015. *Helminthoglypta hertleini*. NatureServe Explorer: An online encyclopedia of life [web application]. Feb. 2009. Version 7.1. NatureServe, Arlington, Virginia. Available at: http://www.natureserve.org/explorer/ (Accessed 12 Feb 2015).

NRIS 2014. Forest Service NRIS Database: Wildlife observations. GIS export provided to Sarah Foltz Jordan, Xerces Society, by Diane Stutzman, January 2014.

Pilsbry, Henry A. 1939. Land Mollusca of North America (North of Mexico). Acad. Nat. Sci. Philadelphia, Monogr. 3, V.1(1): i-xvii, 1-573, i-ix.

Roth, Barry. 2002 Taxonomy and Classification of Helminthoglypta; Report provided under BLM Purchase Order HAB020406.

Roth, B. 1996. Homoplastic Loss of Dart Apparatus, Phylogeny of the Genera, and Phylogenetic Taxonomy of the Helminthoglyptidae (Gastropoda: Pulmonata). The Veliger 39(1): 18-42

Roth, B. and F.G. Hochberg. 1992. Two new species of *Helminthoglypta* (Gastropoda: Pulmonata) from southern California, with comments on the subgenus *Charodotes* Pilsry. The Veliger 35(4): 338-346.

Roth, B. 1993. Critical Review of Terrestrial Mollusks Associated with Late-Successional and Old-Growth Forests in the Range of the Northern Spotted Owl. B. Roth, San Francisco, CA. 42 p.

Smith, A. G. and Miller, W.B., Christensen, C.C., and B. Roth. 1990. Land Molluska of Baja California, Mexico. Proceeding, California Academy of Sciences 47(4): 95-158.

USDI BLM and USDA Forest Service. 2004a. Final Supplemental Impact Statement to Remove or Modify the Survey and Manage Mitigation Standards and Guidelines. Portland, Oregon, 2 vols.

USDI BLM and USDA Forest Service. 2004b. Record of Decision to Remove or Modify the Survey and Manage Mitigation Standards and Guidelines. Portland, Oregon

Van der Lann, Kenneth L. 1980. Terrestrial pulmonate reproduction: seasonal and annual variation and environmental factors in Helminthoglypta arroas (Binney((Pulmonata: Helicidae). The Veliger 23(1): 48-54.

Van der Lann, Kenneth L. 1971. The population ecology of the terrestrial snail, Hleminthoglypta arrosa (Binney) (Pulmonata: Helicidae). The Veliger 17(4): 354-359.

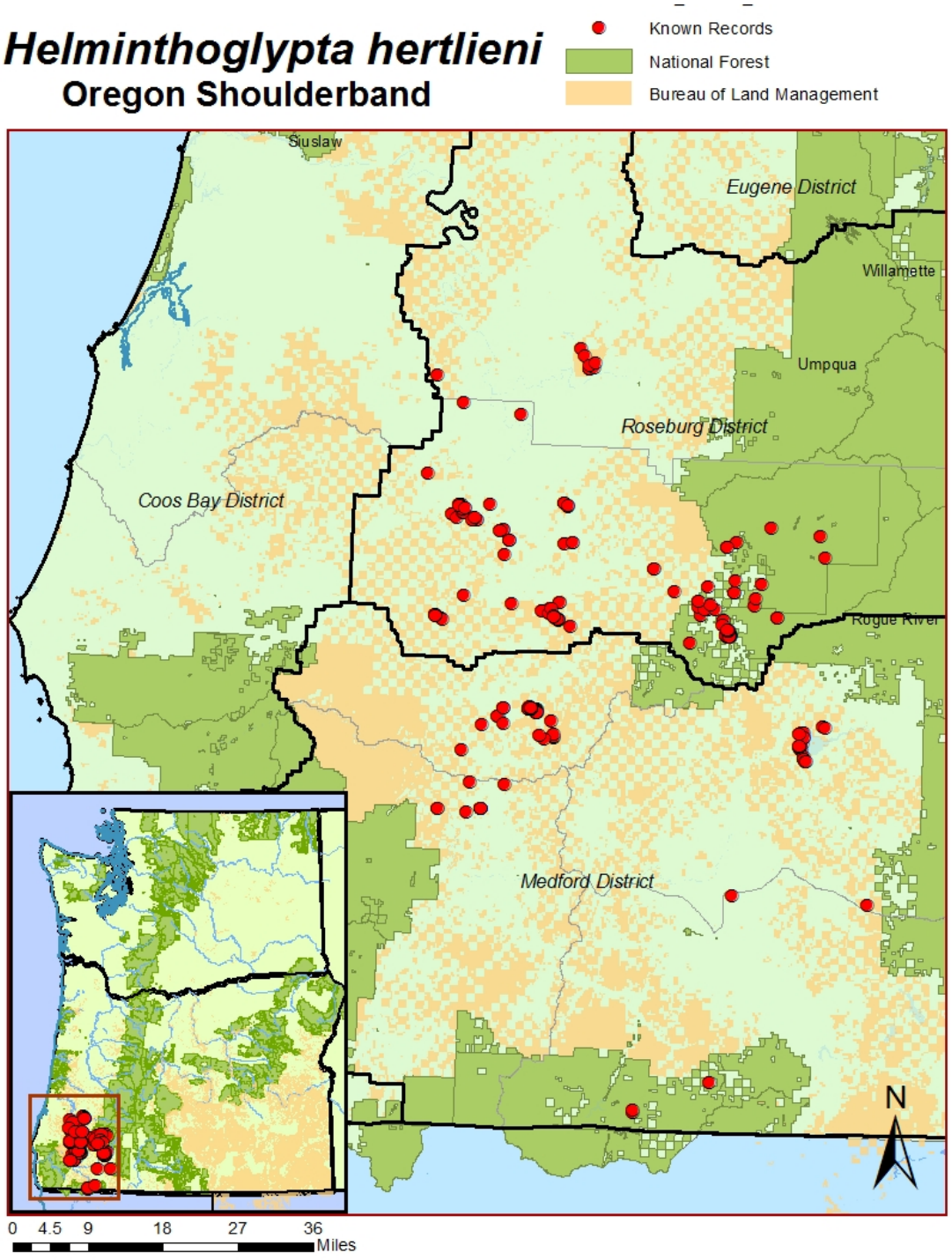
Young, T. 2015. Field Consultation Notes for *Monadenia chaceana* & *Helminthoglypta hertleini*. Rogue River-Siskiyou NF. Unpublished report. 5 pp.

VII. Photographs

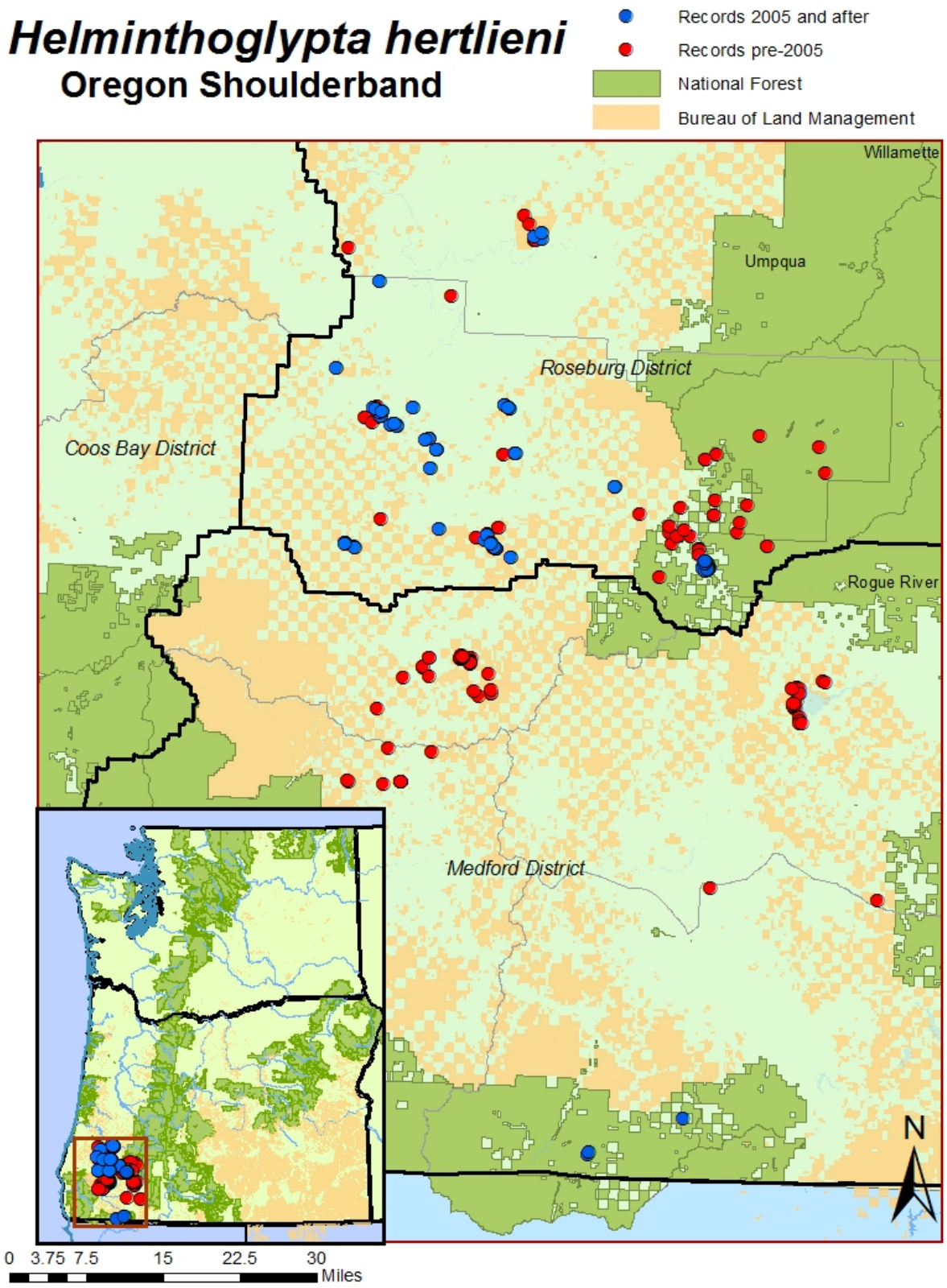
Helminthoglypta hertleini shell, dorsal view. Photo by Bradford Nelson, used with permission.

Helminthoglypta hertleini shell, ventral view. Photo by Bradford Nelson, used with permission.

VIII. Distribution Maps



Map showing known *Helminthoglypta hertleini* distribution relative to Forest Service and BLM lands in Oregon. Records from California are not shown.



Map showing known *Helminthoglypta hertleini* distribution relative to Forest Service and BLM lands in Oregon. Recent records (from January 2005 to present) are shown in blue. Older records (historic through 2004) are shown in red. Records from California are not shown.