Occurrence and habitat status evaluation for Golden Chinquapin (*Chrysolepis chrysophylla* (Dougl. ex Hook.) Hjelmqvist) on the Olympic National Forest

Report prepared for the Interagency Special Status Species Program
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Introduction

Golden chinquapin (*Chrysolepis chrysophylla* (Dougl. ex Hook.) Hjelmqvist), also called giant chinquapin, is an evergreen member of the oak and beech family (Fagacaea). Its narrow, lanceolate leaves are dark green on the upper surface, with a pale golden lower surface. The mature fruits of this monoecious species are 0.4- to 0.6-inch nuts contained within spiny golden-brown burs. The species also reproduces vegetatively from stumps or basal burls (McMurray 1989). Golden chinquapin displays both shrub and tree forms. The shrub form is found throughout the species' range, especially on drier or high elevation sites. The tree form occurs in the relatively moister portion of the range. The species is shade intolerant (Kruckeberg 1980) to moderately shade-tolerant (McKee 1990), and is associated with mixed coniferous forest types. It apparently requires some mesic conditions for establishment from seed (Keeler-Wolf 1988, cited by McMurray 1989) but once established it can thrive in more xeric conditions. It is most successful on droughty, relatively infertile sites (McKee 1990). In the southern portion of its range, golden chinquapin is often considered to be a competitor with more desirable conifer species, particularly in early successional stages after disturbance by fire or timber harvest (McMurray 1989).

The natural range of golden chinquapin extends from about 39 degrees latitude in northwestern California to about 45 degrees latitude in western Oregon, with small populations along the Columbia River Gorge and scattered disjunct populations in Washington State (figure 1). Within this range, it occurs from sea level to 6000 feet in elevation (McKee 1990). The species is rare in Washington State – several small occurrences in Mason County comprise the northernmost known population of the species (Kruckeberg 1980, McKee 1990). One of the largest Mason County occurrences is on the Olympic National Forest. There is also a disjunct population on the Gifford Pinchot National Forest, in Skamania County (McKee 1990, Ruchty 2008), about 125 miles southeast of the Mason County population. Kruckeberg (1980) speculates that the Mason County population may have originated from a chance dispersal of seed by birds, or may be a relic of a generally more northern historical distribution of the species.

Because of its rarity in the state, golden chinquapin is listed on the Forest Service Region 6 Regional Forester's Sensitive Species List (USDI 2008) as a Sensitive species in Washington State. Its NatureServe conservation status is as follows: Global status G5 (secure); National status N5 (secure); Washington State status S2 (imperiled) (NatureServe 2009). The primary threats to the species in the northern reaches of its range are competition from overtopping conifers (McKee 1980), timber harvest, conversion of forest land to other uses, and natural

disasters (Washington State DNR 2003). Golden chinquapin is of additional interest because it is the only known host plant for the golden hairstreak butterfly, *Habrodais grunus*. The butterfly is also listed as sensitive in Washington State on the Regional Forester's Sensitive Species List (USDI 2008). In fiscal year 2009 the Regional Interagency Special Status Species Program funded the Olympic National Forest to revisit the golden chinquapin sites on the Olympic National Forest to assess the current condition of that subpopulation and its habitat.

Background

In 1990, several golden chinquapins were discovered in an uncut unit (unit 3) of the Hornet Heights timber sale. This unexpected discovery prompted a field review in which a population of 180 to 200 golden chinquapin was located within the unit (Lesher 1990). The chinquapins were scattered in patches across several acres between 2100 and 2500 feet above sea level, on a steep south- to southwest-facing slope dominated by large Douglas-fir. Stand age at the time was estimated at 180 years (Grover 1990). The twelve largest golden chinquapin encountered measured between 8 and 20 inches in diameter at breast height (dbh, measured at 4.5 feet above the ground) and were up to 70 feet in height. Most reproduction appeared to be vegetative, with fruit observed on only two of the larger trees. Subsequent systematic transit surveys later that season located additional individuals and small patches outside of the unit and on adjacent private and state-owned forest land. The great majority of the golden chinquapin observed throughout the broader survey area were small individuals (less than 1 inch dbh) and small multi-stemmed shrubs. Most of these originated as vegetative offshoots – very little evidence of sexual reproduction was found (Grover 1990; Lesher 1990). The chinquapin population in the Hornet Heights unit was the densest group encountered, and had the largest specimens – at that time, at least two of the trees were larger than the record big tree for golden chinquapin in the Washington State Big Tree Program (Grover 1990).

The population of golden chinquapin documented on National Forest Lands during these surveys is the only known population of this species on the Olympic National Forest. These trees, along with the additional specimens located on adjacent state-owned and private lands, comprise the northernmost verified native population of golden chinquapin (Kruckeberg 1980). The 2007 Washington Natural Heritage Program database contains several element occurrences for *Chrysolepis chrysophylla* in this vicinity (figure 2).

Methods

The objective of this effort was to revisit and assess the current condition of the chinquapin population discovered in 1990 by Forest Service personnel on the Olympic National Forest, and to document any changes in habitat. This report focuses on the subpopulation located within Hornet Heights unit 3, where the largest concentration of chinquapins was found in the 1990 surveys. The unit was never harvested, and the condition of these potentially sexually reproductive trees is of great importance to the long-term viability of the species on the Olympic National Forest.

The Hornet Heights location was visited in 2009 on two separate occasions in mid-September and early October. On the first visit, the crew failed to locate chinquapin on National Forest lands, although several healthy clumps were found in second growth douglas-fir forest on adjacent land managed by the Washington State Department of Natural Resources (DNR) (photo 1). For the second visit the crew was joined by Patricia Grover, former District Botanist for the Hood Canal Ranger District. On this occasion the crew was successful in relocating the Hornet Heights subpopulation. Data collected included GPS coordinates for individual chinquapins over two inches in diameter at breast height (dbh), estimates of tree height, and visual assessment of tree condition. Trees were observed for evidence of flowering or seed production, and the crew also looked for golden hairstreak butterflies.

Results

Nine chinquapins eight inches or greater in dbh were encountered, with heights ranging from 40 to 90 feet. Of these nine individuals, three (10, 12, and 20 inches dbh) were recently dead and down, apparently as a result of wind throw or snow load within the past two years. The 20-inch dbh down tree had a hollow bole resulting from heart rot (photo 2). At least two other large-diameter standing live trees exhibited heart rot: a 22-inch dbh tree that also had a broken top and several visible cavities in its crown; and a 26-inch dbh tree, the largest tree encountered (photo 3). Twelve smaller live trees between 2 and 4 inches dbh were also observed. There were no live trees between 4 and 10 inches dbh. Live crowns on all the small-diameter individuals were sparse; live crowns on the larger, taller trees began relatively high up on the bole, probably as a result of competition with the stand's large conifers. Both the large and small diameter classes of chinquapin were occupying or leaning toward relatively open spaces in the forest canopy. No evidence of flowering or seed production was observed. Nearly all the trees had vegetative sprouts at or near their bases. The primary root of one randomly selected vegetative sprout was traced back over four feet to the base of the next nearest chinquapin. A few individual small trees between 1 and 2 inches dbh were growing in small openings far enough away from other living chinquapins that they may have originated from seed. Golden hairstreak butterflies were not seen on either field visit.

The 1990 field review of this unit (Lesher 1990) identified over twelve large, live individuals of dbh eight inches or more, while the current review documented only nine, three of which were recently dead. There are many stumps and down trees of various species and decay classes in the stand, and it is likely that the difference of three large live trees can be accounted for by wind throw or snow load in the 19 years that elapsed between visits. All told, there has been a reduction of 50 percent (from twelve to six) in the number of live mature chinquapin trees in the Hornet Heights occurrence.

The plant association in which this group of chinquapin occurs is TSHE/RHMA/GASH (western hemlock/rhododendron-salal) (Henderson et al 1989). In the 1990 field review, Lesher reported ground cover as open, low shrub layer (GASH/BENE) as moderate, high shrub layer (RHMA/ACCI) as dense, and tree layer (PSME/TSHE/THPL) as having 50 to 60 percent canopy cover. In the ensuing 19 years species composition is unchanged; ground cover, low shrub, and high shrub layers have remained at the 1990 levels; and tree canopy cover has increased to 70 to

80 percent, with occasional small openings resulting from root rot and wind throw. Low shrub cover is higher in these openings than in the surrounding stand. The overall effect on the chinquapin is continued competition from the shrub layers, and increasing competition from a progressively denser overstory canopy.

There has been no active management on Forest Service land in or near this stand since the Hornet Heights timber sale. Hornet Heights units to the north and south of this unit were clearcut around 1990, but the unit containing the chinquapin was never cut. The spur road that leads to the area is unmaintained and overgrown, although there is evidence that high-clearance vehicles can access the ridge above the stand using this road. There are currently no plans for active forest management of any kind on Forest Service land in the area.

Discussion

The population of chinquapin in this location appears to be in decline. This conclusion is drawn from the small size of the existing population; the decrease in the number of large, potentially seed-producing trees (from twelve in 1990 to six in 2009); the absence of a medium-diameter cohort to replace the lost larger trees; and increasing competition from conifers. The stand is susceptible to wind throw, and the large chinquapin that are exhibiting heart-rot are especially vulnerable. Golden chinquapin will be able to take advantage of small openings in the stand created by root rot or wind throw only if an existing chinquapin is in or near such an opening, or if the remaining large trees produce seed and seedlings are able to become established within the opening. The fact that the species reproduces vegetatively will allow the species to persist in a suppressed condition in the understory for some time, even if the number of mature individuals continues to decrease. Chinquapin is able to grow rapidly when released from competition (McMurray 1989). If some of these suppressed shoots survive a large disturbance such as fire or heavy wind throw, the resulting sharp decrease in competition might allow the survivors to reach maturity before the population again gives way to competing conifers. However, the lack of mature, seed-bearing trees would limit the potential spread of the species beyond the site, and would continue to do so until new individuals reached seed-bearing age.

Salstrom (1992) provides draft habitat management guidelines for chinquapin on the Olympic National Forest. Specific recommendations for the Hornet Heights stand include the potential for selective conifer removal; no timber harvest that might increase the susceptibility of wind throw for individual chinquapins; and no new road construction. Management direction has changed since the early 1990s, and timber harvest and road construction are no longer likely threats. Activities to consider in a conservation plan for this golden chinquapin occurrence fall into two categories: reducing competition to create better growing conditions for the current population; and directly increasing the population by planting chinquapin seedlings. Actions to reduce competition include patchy thinning of the conifer stand around individual chinquapins, and clearing competing understory vegetation in new and existing openings. Actions to directly increase the chinquapin population include collection of seed from this and other nearby chinquapin occurrences, and planting seedlings propagated from these collections back into natural or created openings the stand. Potential difficulties with these actions include protecting the existing large chinquapins from the possibility of increased wind throw vulnerability as a

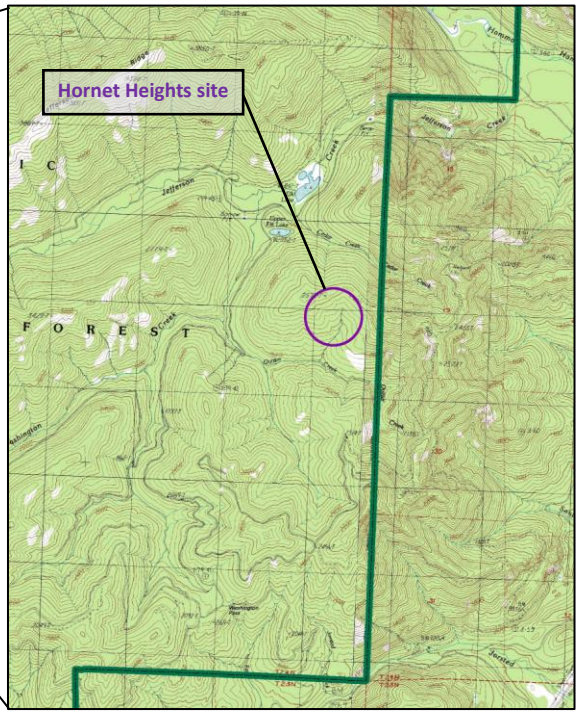
consequence of thinning nearby conifers (as in Salstrom 1992), and the reported difficulty in successfully propagating and transplanting this species (Hubbard 1974).

The Hornet Heights population should be visited on an annual basis to assess habitat conditions, mortality, recruitment, and seed production. Other nearby sites should also be monitored. Monitoring should include observing for presence of the chinquapin hairstreak butterfly, either larval or adult form. Comparisons with chinquapin patches on nearby sites with different management histories – for instance, recently clearcut sites and second-growth stands – may provide useful information about conserving the Hornet Heights population.

Figures and photos

Figure 1. Range of *Chrysolepis chrysophylla* (McKee 1990). Mason County disjunct population highlighted.

Figure 2. WA DNR Natural Heritage Element Occurrences of *Chrysolepis chrysophylla* on or near the Olympic National Forest



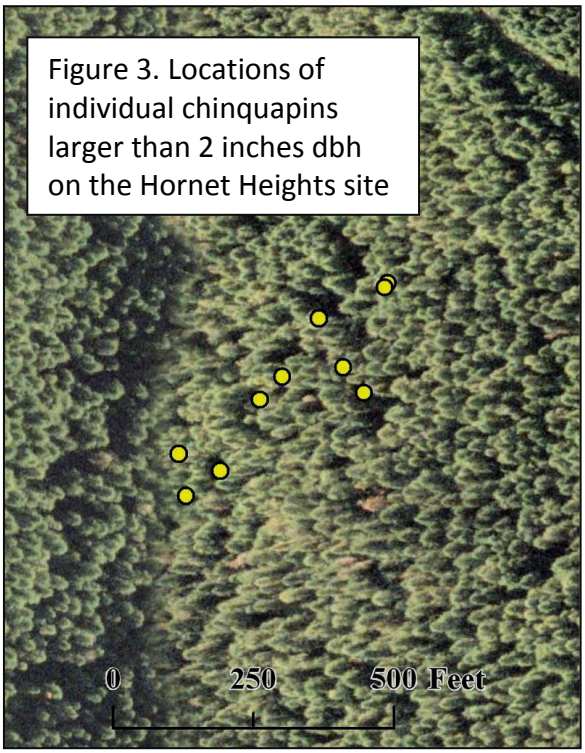


Figure 3. Locations of individual chinquapins larger than 2 inches dbh on the Hornet Heights site

Photo 1. Relatively open-grown golden chinquapin clump on State-owned forest land near Hornet Heights site. The largest stem in this clump is 8 inches dbh.

Photo 2. Dead and down 20-inch dbh golden chinquapin with advanced heart rot. Adjacent tree is a live chinquapin of similar size.

Photo 3.This 26-inch dbh specimen is the largest living golden chinquapin in the Hornet Heights occurrence. The tree has heart rot at the base.

References

Grover, P. 1990. Biological evaluation, Hornet Heights Timber Sale (unit 3) sensitive plant species. 7p. Report on file at Olympic National Forest Headquarters, Olympia, Washington.

Henderson, J.A.; D.H. Peter; R.D. Lesher; D.C. Shaw. 1989. Forested plant associations of the Olympic National Forest. USDA Forest Service, R6 Ecol. Technical Paper 001-0-88. Pacific Northwest Region. Portland, Oregon.

Hubbard, R.L. 1974. *Castanopsis* (D. Don) Spach, chinkapin. *In* Seeds of woody plants in the United States. p 276-277. C.S. Schopmeyer, Technical Coordinator. US Department of Agriculture, Agriculture Handbook 450. Washington DC.

Keeler-Wolf, T. 1988. The role of *Chrysolepis chrysophylla* (Fagaceae) in the *Pseudotsuga* hardwood forest of the Klamath Mountains of California. Madrono 35(4): 285-308.

Kruckeberg, A.R. 1980. Golden Chinquapin (*Chrysolepis chrysophylla*) in Washington State: a species at the northern limit of its range. Northwest Science 54(1): 9-15.

Lesher, R. 1990. Notes on Golden Chinquapin Field Review. 4p. Report on file at Olympic National Forest Headquarters, Olympia, Washington.

McKee, A. 1990. *Castanopsis chrysophylla. In* R. Burns and B. Honkala, Technical Coordinators. Silvics of North America: 1. Conifers; 2. Hardwoods. Agriculture Handbook 654. U.S. Department of Agriculture, Forest Service, Washington, DC. vol.2, 877 p. Available: http://www.na.fs.fed.us/spfo/pubs/silvics_manual/table_of_contents.htm (Accessed October 15, 2009)

McMurray, N.E. 1989. *Chrysolepis chrysophylla*. *In*: Fire Effects Information System, [Online]. NatureServe. 2009. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: October 15, 2009).

Salstrom, D. 1992. Draft habitat management guidelines for *Chrysolepis chrysophylla* (Dougl.) Hjelmqvist on the Olympic National Forest. Washington Natural Heritage Program. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/ (Accessed October 15, 2009).

USDI. 2008. State Director's Special Status Species List - Sensitive Vascular Plants. USDI Bureau Of Land Management - Oregon and Washington. June 2008.

Washington State Department of Natural Resources. 2003. *Chrysolepis chrysophylla* (Dougl.) Hjelmqvist. Washington DNR Natural Heritage Program. Available: http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html. (Accessed October 15, 2009).