Segelsen Ridge Huckleberry Enhancement Response Monitoring Report

2011

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Darrington Ranger District
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Submitted by:

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SEGELSEN RIDGE HUCKLEBERRY ENHANCEMENT MONITORING REPORT 2011

1.0 PROJECT SCOPE

A goal of the USFS and the Tulalip tribe is to increase big-leaf huckleberry (*Vaccinium membrenacium*, VAME) fruit production in huckleberry fields of Segelsen ridge. These fields have been producing substantial huckleberry fruit since the mature forest was harvested in the area in the 1980's but fruit production is now declining at the same time conifer species have become established in the fields and have begun to overgrow the huckleberry plants. Based on the hypothesis that VAME fruit production will increase if conifer species competing for light and soil resources are removed, the USFS and Tulalip tribe set a goal to reduce forest overstory cover by approximately 70% in one-half of the huckleberry release area and to monitor the project in such a way as to determine if forest removal had the desired effect. This led to our development of a study plan to contrast VAME fruit production in areas where forest overstory is removed versus areas where forest overstory is not removed:

2.0 PROJECT IMPLEMENTATION AND MONITORING

The USFS and Tulalip Tribe chose an area to conduct VAME release work along Segelsen ridge northwest of the town of Darrington, Washington. This area is comprised of early successional vegetation regrowing after forest harvesting in 1982 (Fig 1).

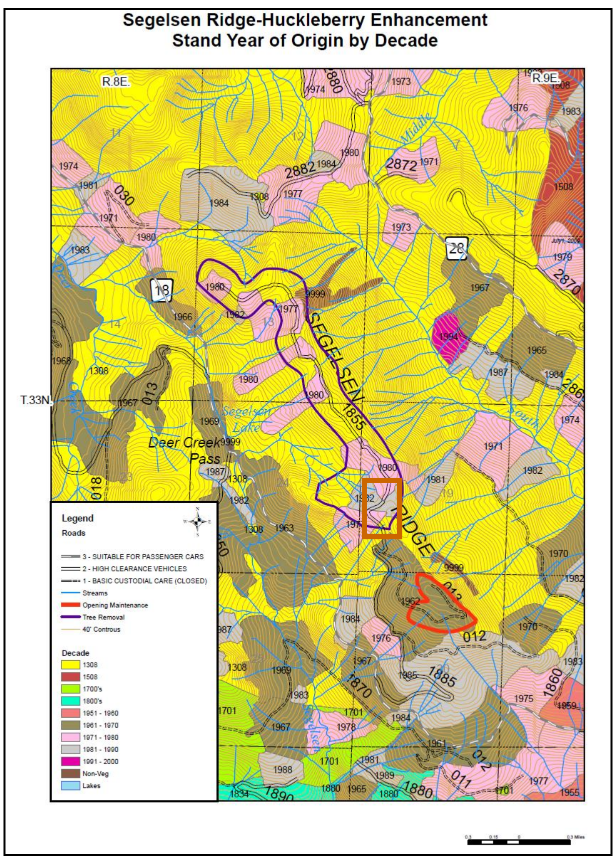

Figure 1 Stand origin map of Segelsen ridge. The VAME release area is outlined by a brown box. The basemap was provided by the USFS.

The size of the study area accommodated six experimental units measuring 100 ft parallel to road 1855 by 200ft perpendicular to the road (Fig 2). Dividing the release area into six units allows us to contrast three overstory removal units with three untreated units.

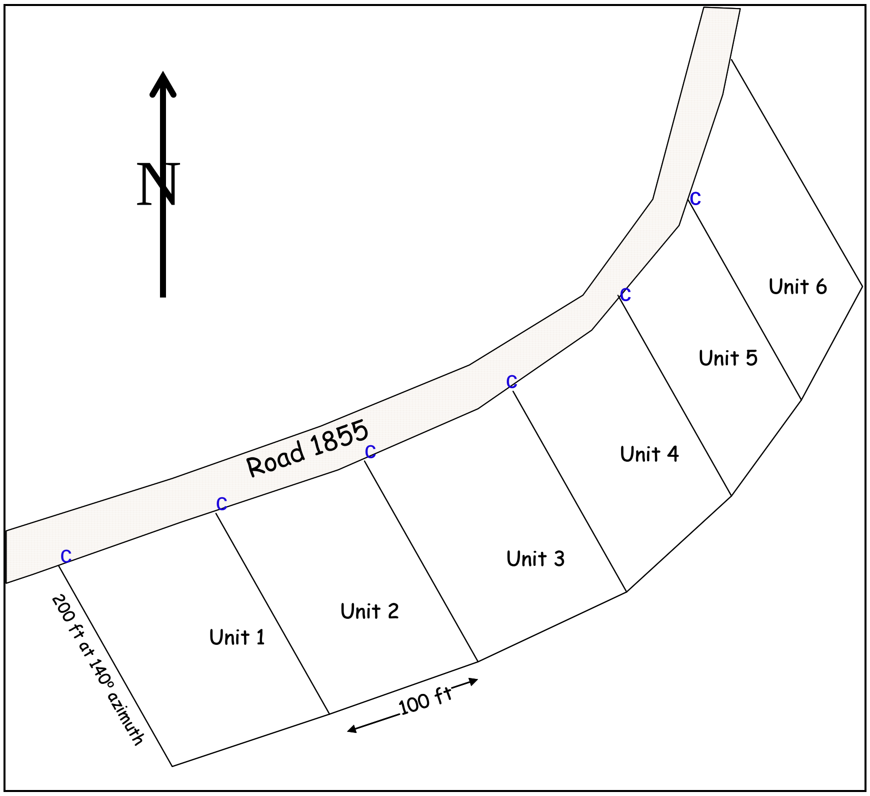

Fig 2 The VAME release area showing the six units relative to road 1855

Three 50-foot transects were established within each unit; with each transect oriented at 50º azimuth. Three temporary 1m^2 sampling quadrats were placed on the north (road) side of each transect; 1m from the transect line to avoid trampling effects (Fig 3).

A nearby mature forest was also included in this study as a late-successional reference area (Fig 4). The mature forest is located at an elevation similar to the huckleberry rejuvenation area, but it differs in both slope and aspect. The mature forest area informs us as to what huckleberry fruit production is under long-term tree competition conditions.

Three transects with nine quadrats were also established in the mature forest though the orientation of the transects in the mature forest differs from the treatment area due to differences in aspect (Fig 5). There are no replicate units in the mature forest.

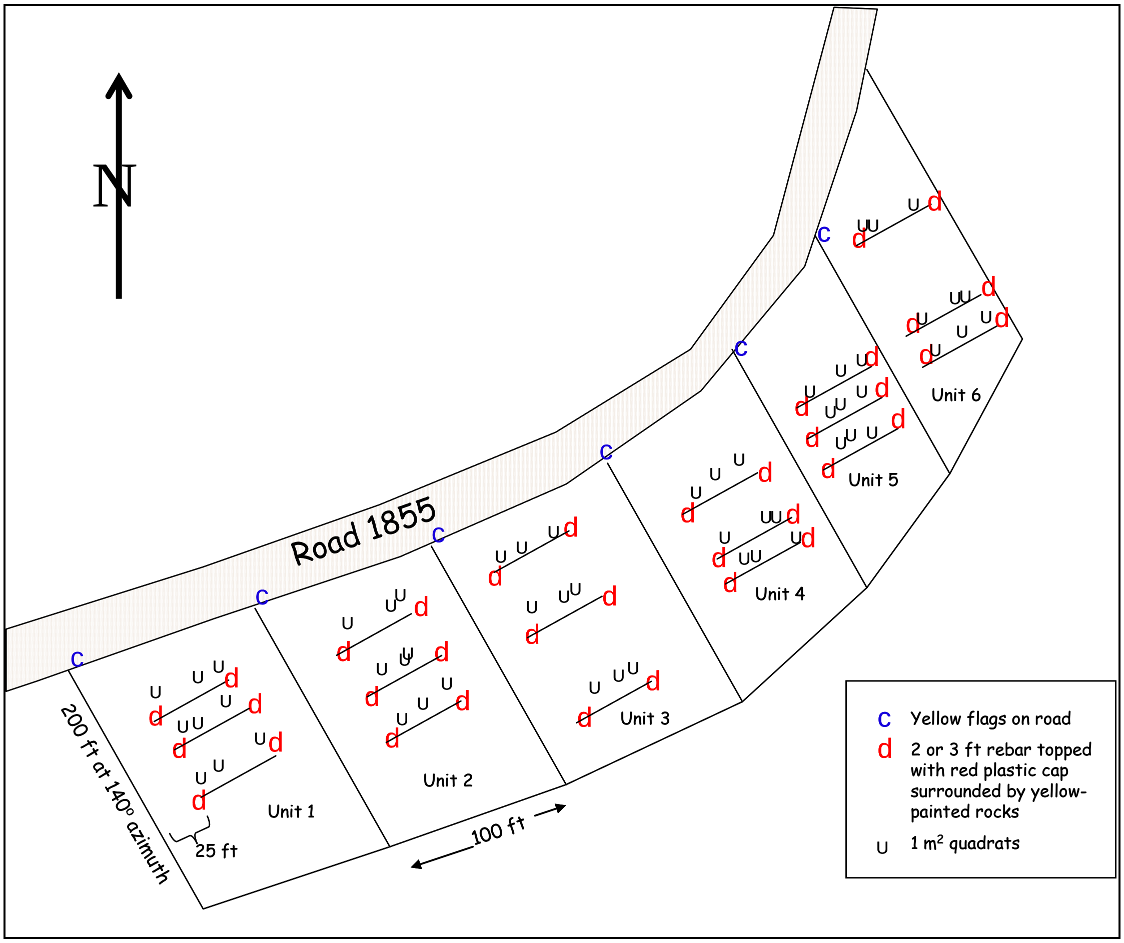

Fig 3 Map of the huckleberry release area with units outlined and the approximate locations of transects, headpins, tailpins and quadrats indicated.

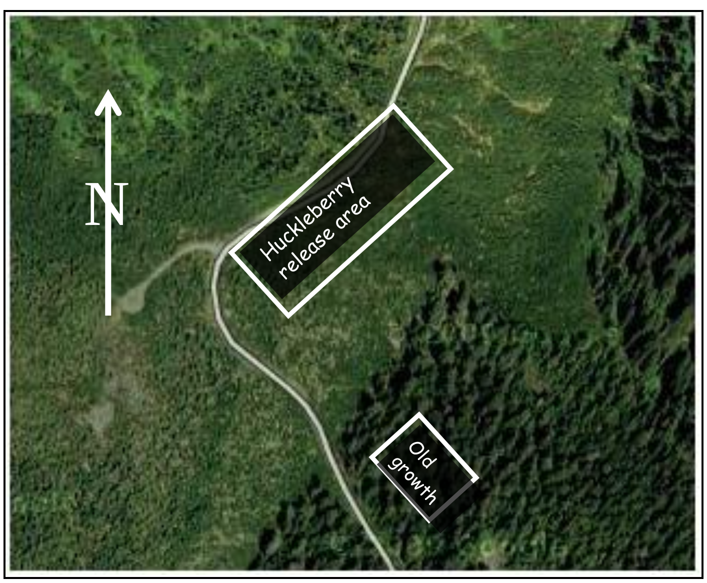

Fig. 4 Aerial photo of part of Segelsen ridge with the huckleberry release area and the mature forest comparative areas outlined in white. The base photo was provided by the USDA NAIP program.

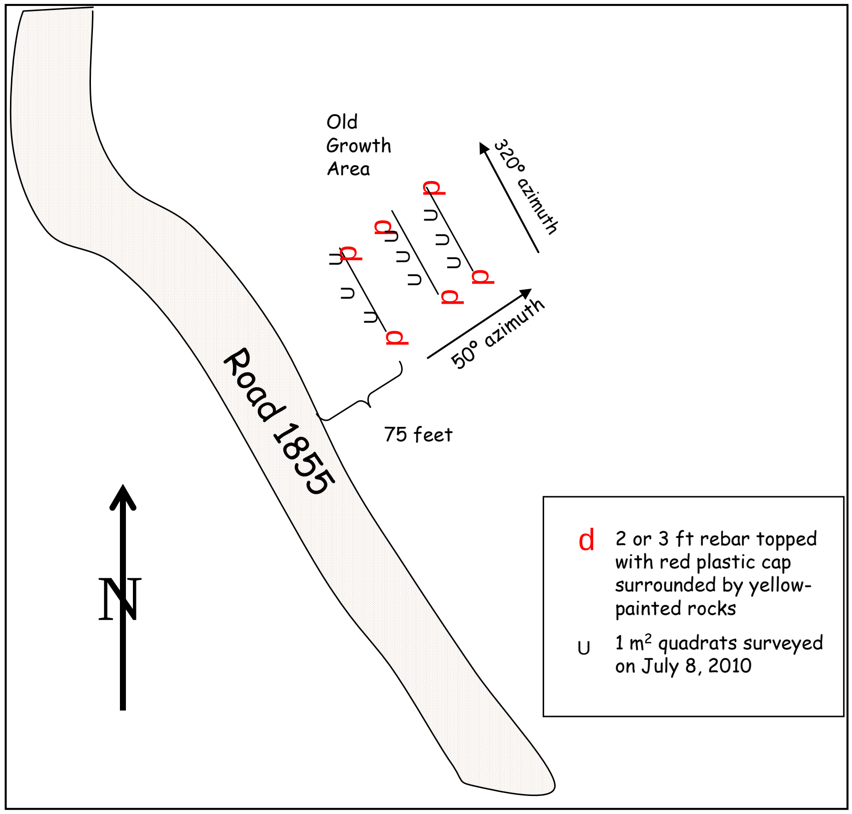

Fig 5 Segelsen ridge mature forest area where comparative transects are located.

On July 3, 2010, prior to thinning, the pre-thinning overstory canopy cover (estimated as the canopy cover of all non-VAME plants overtopping VAME in the quadrats) was measured in all the units. Pre-thinning overstory canopy covered ranged from approximately 30% in unit 2 to almost 90% in the mature forest area (Fig 6, reprinted from Riley 2010).

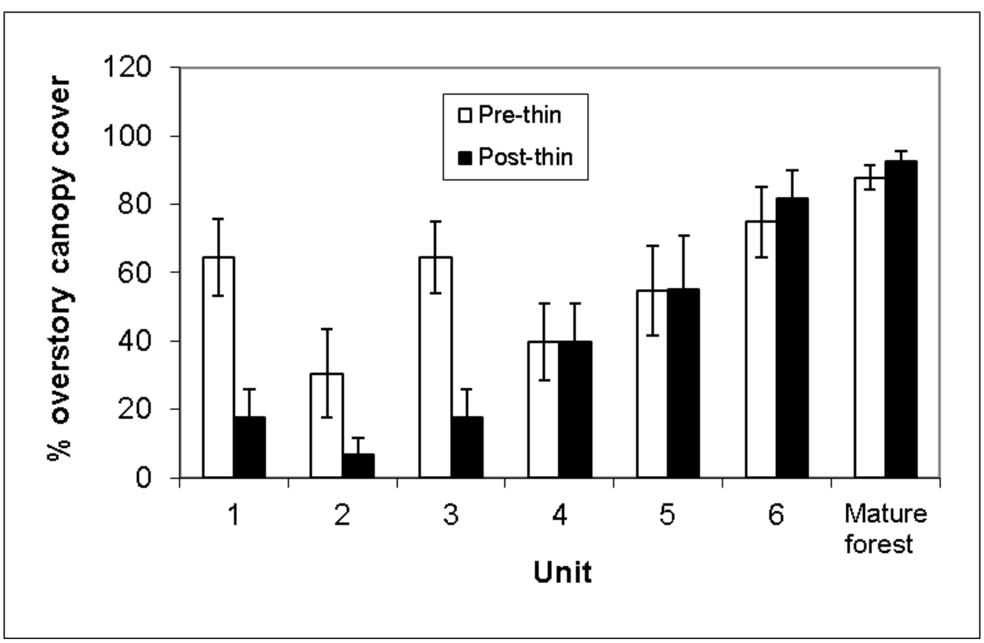

Fig 6. Percent forest canopy cover determined before and after the VAME release units were thinned. Data reprinted from Riley 2010

In consultation with the USFS, units 1, 2 and 4 were initially chosen to be thinned. In the end however, units 1, 2 and 3 were thinned, leaving units 4, 5 and 6 unthinned (Fig 7). This design allows a two-way analysis of variance (ANOVA) with 3 replicates of thinned units and three replicates of unthinned units, with time as the second factor. Since the original random assignation of treatment was not used, any underlying environmental gradient from west to east will be included in our ANOVA error estimate, perhaps reducing our ability to distinguish significant treatment response. We anticipate given the magnitude of the thinning treatment, this effect on the error estimate will be exceeded by treatment effects in the long run.

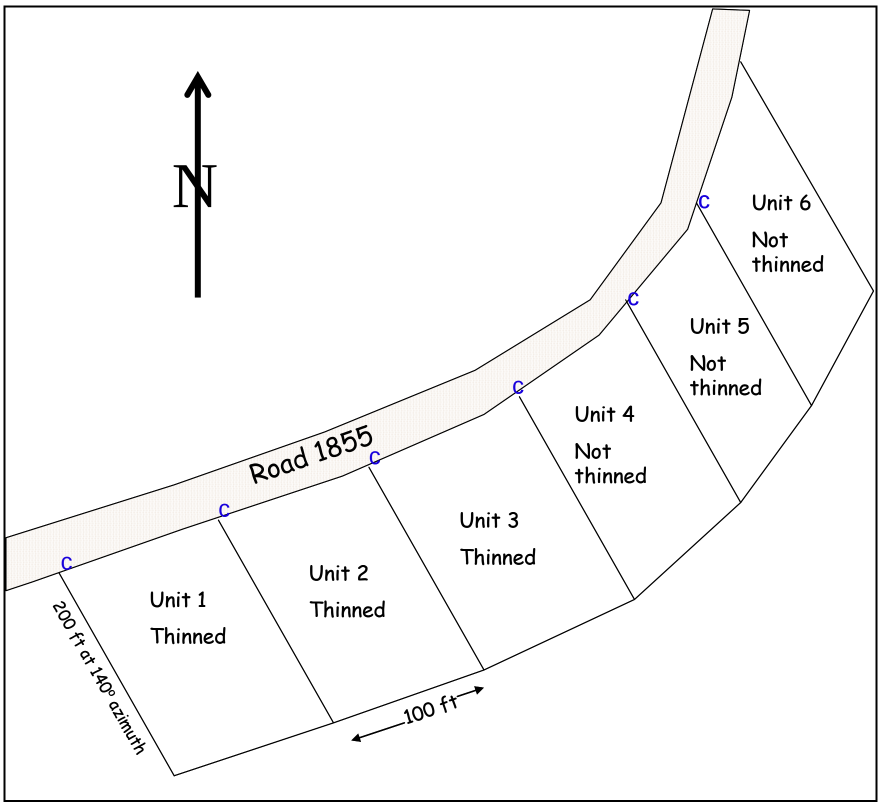

Fig 7. Final treatment plan of the Segelsen ridge huckleberry release area

On August 18, 2010, after some units were thinned and some slash removed, we returned to the same quadrats, remeasured overstory canopy cover and we estimated VAME height, VAME % canopy cover, and VAME fruiting production class using a scale as per D.L. Anzinger, 2002 (Table 1, Riley 2010). The post thin data indicated average overstory canopy cover was reduced in the thinned units to 22% to 28% of pre-thinning overstory canopy cover (Fig 6, reprinted from Riley 2010). Overstory canopy cover in the untreated units and the mature forest area were essentially unchanged.

On August 18, 2011, we returned, measured the VAME plants using the same transect and quadrat system, and did maintenance on the transect markers. The growing season in 2011 was substantially different from that of 2010, including snow accumulation and snowmelt rates. Segelsen Ridge was not snow-free until mid-August 2011, much later than it had been in 2010. VAME fruit production was consequently delayed (personal observation). Whereas VAME fruit were nearly ripe by August 18, 2010, VAME fruit were green and underdeveloped by August 18, 2011.

Fruit Production Class	Class Definition
0	**No huckleberry plants** in plot.
1	Huckleberry plants in plot, **no fruit**
2	**Low** (< 5 fruits/stem on all stems in plot.)
3	**Medium** (<5 fruits/stem on most stems in plot, between 5-10 fruits on others.)
4	**Medium-high** (< 10 fruits on most stems in plot, between 10-15 fruits on others.)
5	**High** (< 15 fruits on most stems in plot, between 15-20 fruits on others.)
6	**Extra high** (>20 fruits on most stems in plot.)

Table 1. Fruiting production scale used in D.L. Anzinger, 2002 and here.

Here we report the results of these two years of measurements, focusing on VAME fruiting since that is the variable of primary interest.

The VAME fruiting data for 2010 and 2011 were graphically assessed for conformity to a normal distribution. Further analysis indicated variances were homogenous ($F_{(a=4,\ 2d.f.)}$ = 24.25, P>0.05). A two-way ANOVA was done using time (years) and treatment (thinning) as factors with α=0.05. The data for the mature forest area was not included in the ANOVA.

The ANOVA indicated no significant difference between the study units (Fig 8). The thinning treatment has not made a significant difference in VAME fruiting ($F_{(1,8)}$ = 3.75, P = 0.08). There was no significant change of VAME fruiting within the thinned nor the unthinned units in the past year ($F_{(1,8)}$ = 0.279, P = 0.61). There was also no evidence of any differentiation between the thinned and unthinned units over time (interaction $F_{(1,8)}$ = 0.031, P = 0.87).

3.0 DISCUSSION

The thinning treatment reduced tree canopy cover in the thinned units by approximately 70% (Fig 6, reprinted from Riley 2010). This substantial reduction in tree interception of light, and presumably a reduction in tree competition for below-ground resources as well, has not resulted in a significant change in VAME fruiting in the thinned area after one year.

We anticipate that eventually VAME fruiting in the thinned units will increase, VAME fruiting in the unthinned units will decrease, and VAME fruiting in the mature forest will remain unchanged. We discount the possibility that heavier snow cover and cooler summer temperature in 2011 than in 2010 significantly suppressed VAME fruit production in the thinned units. VAME fruiting in the unthinned units in 2011 was similar to VAME fruit production in 2010; suggesting weather did not influence the amount of fruiting in contrast to the timing of fruiting. More likely there has not been sufficient time for VAME plants to respond to the changes in the availability of light and soil resources in the thinned area. Other studies suggest significant VAME response to tree removal may take several years (e.g. Anzinger 2002).

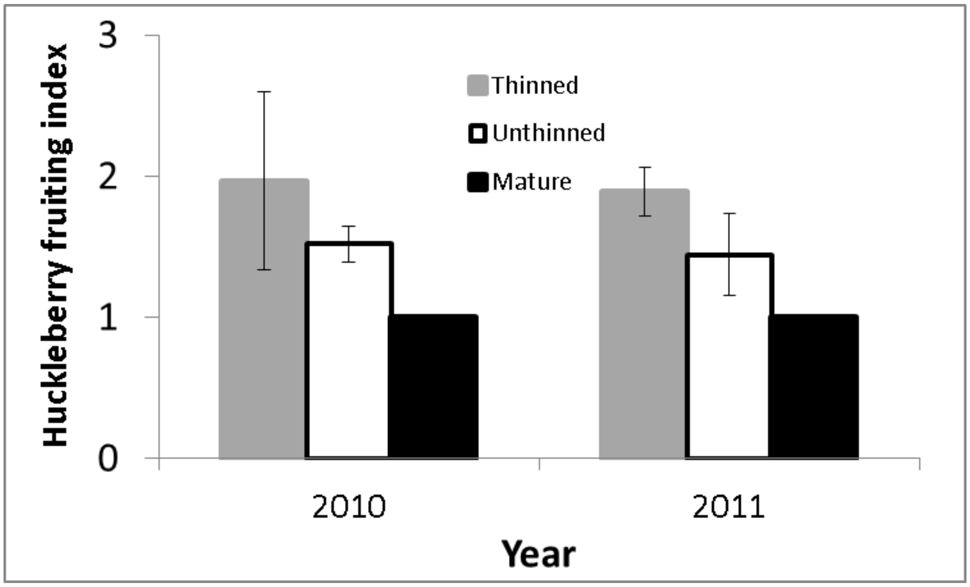

Fig. 8. Huckleberry fruiting index in the thinned, unthinned and mature forest areas in 2010 and 2011. Means + SE of three replicates per treatment in the thinned and unthinned areas are shown here. No SE data are shown for the mature forest area since there were no replicate units in the mature forest area. The mature forest data are included here only as a comparison. The fruiting index values follow Anzinger, 2002 with a 1 indicating VAME plants were present but were not fruiting on average while a 3 indicates VAME plants had fewer than 5 fruits per stem on most stems.

4.0 FUTURE MONITORING

It took two people six hours on-site to census all the quadrats in the treatment area and the mature forest. Contingent on travel time or changes in access to the site, possible future monitoring of these transects will be relatively straightforward.

5.0 ACKNOWLEDGEMENTS

Thanks to Phyllis Reed, our contact with the US Forest Service and Jason Gobin, our contact with the Tulalip Tribes Natural Resource Department for including us in this effort and for their efforts to implement the project. Thanks also to Dusty Casseria and Kendra Welling for excellent field help establishing and monitoring the transects.

6.0 LITERATURE CITED

Anzinger, Dawn. 2002. Big Huckleberry (*Vaccinium membranaceum* Dougl) Ecology and Forest Succession, Mt. Hood National Forest and Warm Springs Indian Reservation, Oregon. Masters thesis, Oregon State University

Riley, R.H. 2010. Segelsen Ridge Huckleberry Enhancement Response Monitoring Report. Submitted to USFS Darrington Ranger District, August 24, 2010.

7.0 CONTACT INFORMATION

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