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Huckleberry Monitoring in the Gifford Pinchot National Forest

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Introduction

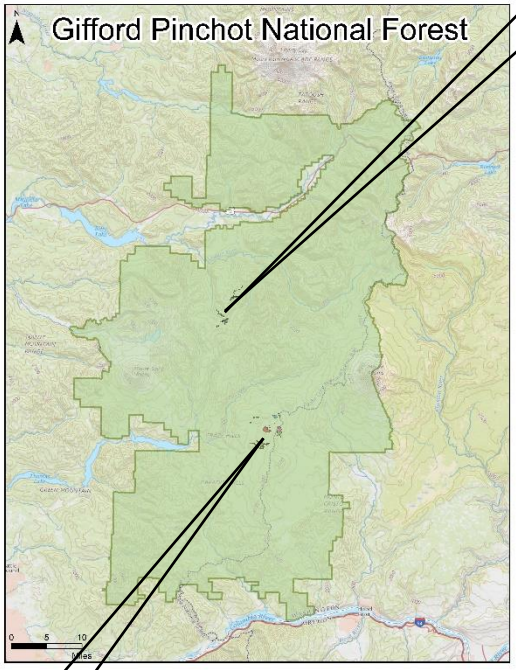
This report outlines our initial findings for the huckleberry surveys of 2017 in the Gifford Pinchot National Forest. The objectives of this project are to: (1) survey units within the Pole Patch and Sawtooth huckleberry treatment areas in order to evaluate the effectiveness of different silvicultural treatments in enhancing production and growth of big huckleberry (*Vaccinium membranaceum*) and (2) engage community members, stakeholders, and volunteers in monitoring activities. Our goal is to aid ecologically similar areas throughout the Pacific Northwest in being able to adopt effective and proven huckleberry restoration strategies. The overarching monitoring question we aim to answer is: To what extent did vegetation management, including thinning and burning, impact huckleberry plant abundance, fruit production, plant height, and ecosystem characteristics within the plot and unit?

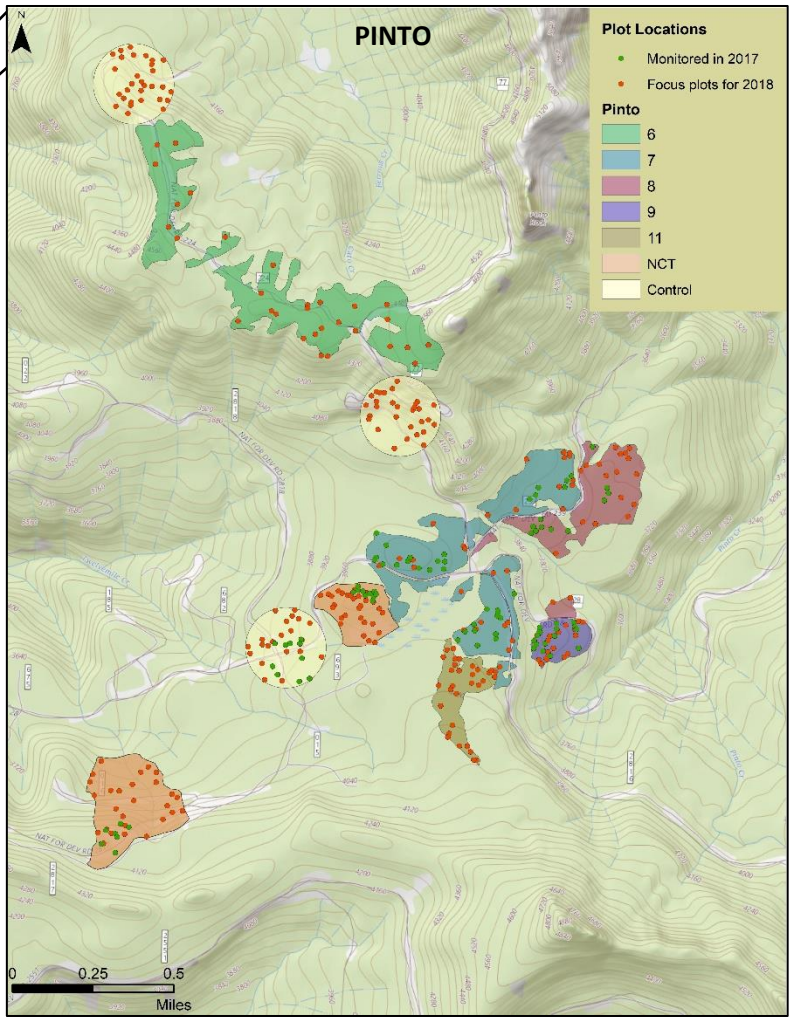
This work has been carried out in partnership with Pinchot Partners under grants from the Weyerhaeuser Family Foundation and the Rural Advisory Council. Jeff Gerwing (Portland State University), Jessica Hudec (U.S. Forest Service), and other staff members of the Gifford Pinchot National Forest assisted us in planning and refining this work. Volunteer citizen scientists have been instrumental in helping us collect data in the field, with community members offering over 423 volunteer hours in service of the project. This report is a preliminary report for the project. A publishable report will be completed at the conclusion of year two (December 2018).

Survey areas

Figure 1 shows the area of study. We focused on two main project areas, Pole Patch and Sawtooth, both located in the Gifford Pinchot National Forest. Although the ecological conditions in these two areas are slightly different and huckleberry growth responses can be expected to vary in ways that are unrelated to treatment type, these areas do share many ecological characteristics and are in close enough proximity to allow us to consider their results together. We explore the results both separately and together.

Three units within Pole Patch (Pinto 7, Pinto 8, and Pinto 9) and seven units within Sawtooth (Sawtooth 3, Sawtooth 5, Sawtooth 8, Sawtooth 9, Sawtooth 10A, Sawtooth 11A, and Sawtooth 12) had undergone treatment to promote the growth of huckleberries. These were the focus of our survey efforts in 2017, with the exception of Sawtooth 12, which has not yet been surveyed. Most of the units we surveyed were treated (thinned) between 2010 and 2014. Units in the Veta project area (a second project area in Pole Patch) and units 6 and 11 in the Pinto project area had not yet been treated. These were not visited in 2017 but will likely be surveyed in 2018 to collect baseline data for future monitoring efforts. In addition to surveying plots in these project areas, we also monitored management units treated under a non-commercial thinning prescription (referred to as NCT) that was intended to promote huckleberry growth (with spacing between 16 x 16 and 18 x 18). We also surveyed control plots, which were located in comparable forest areas next to huckleberry treatment areas. In total, we visited 147 plots in 2017. Our goal is to visit 200 plots in 2018.





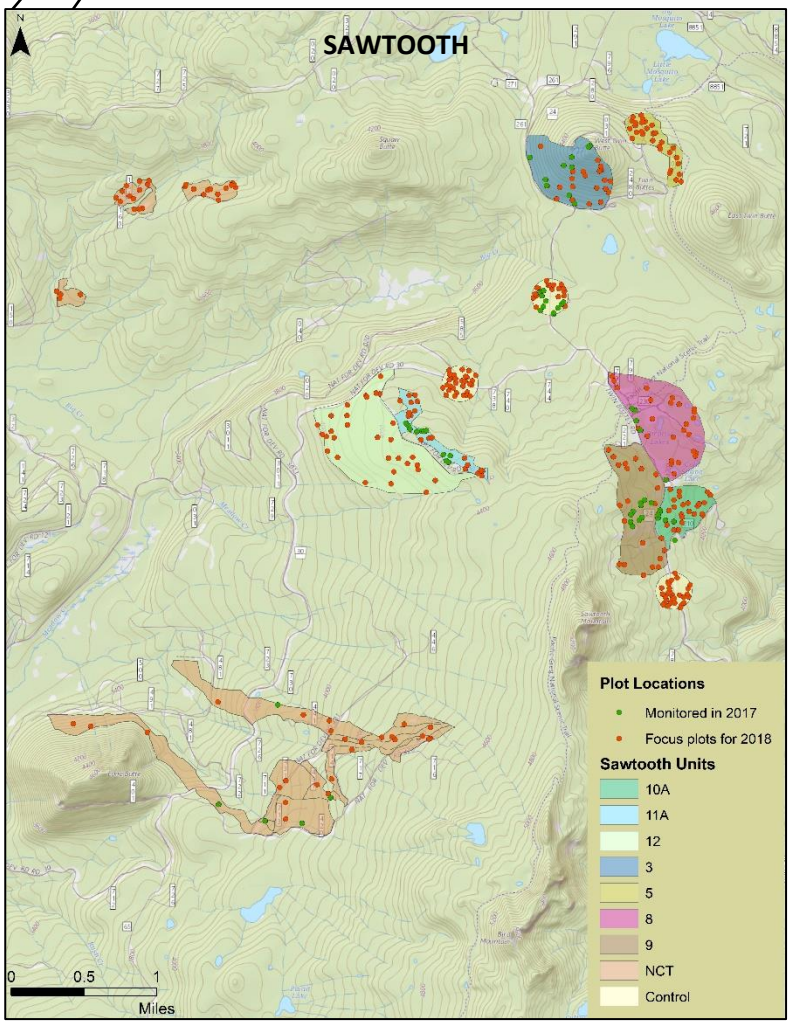


Figure 1: Maps of plots monitored in 2017 and the focus plots for monitoring in 2018 in Pinto (above) and Sawtooth (left).

Survey protocol

Our survey protocol is outlined in Appendix A. In short, we aimed to investigate how the abundance of huckleberry plants, fruit production, and plant height were related to treatment variables such as treatment prescription, canopy cover, and soil disturbance. We also looked at the growth of other *Vaccinium* species, overall biodiversity, and fruit ripeness. At all survey sites, we monitored huckleberry and ecological characteristics in 100m^2 plots and captured fine-scale observations of huckleberry growth in 2m^2 subplots.

Results

Tables 1-3 show the percent ground coverage of huckleberry in all plots.

Table 1: Pinto

Huckleberry % Cover	Plots (n)
0%	11
1-5%	27
5-15%	15
15-30%	7
30%+	17

Table 2: Sawtooth

Huckleberry % Cover	Plots (n)
0%	1
1-5%	12
5-15%	8
15-30%	4
30%+	24

Table 3: Pinto & Sawtooth

Huckleberry % Cover	Plots (n)
0%	12
1-5%	39
5-15%	23
15-30%	11
30%+	41

The figures and tables below highlight observations at the *unit level*. Figures 2 and 3 (and associated tables 4 and 5) show the canopy cover and percent huckleberry cover measured at each unit in the Pinto project area.

Table 4

Units	Canopy Cover	Range in Canopy Cover	Plots (n)
	---Percent---		
Pinto Control	69.20	48 – 88	10
Pinto NCT 556	33.90	5 – 65	10
Pinto 8	31.73	6 – 68	11
Pinto 9	27.00	0 – 90	16
Pinto 7	24.30	0 – 61	33
Pinto NCT 543	22.86	0 – 48	7

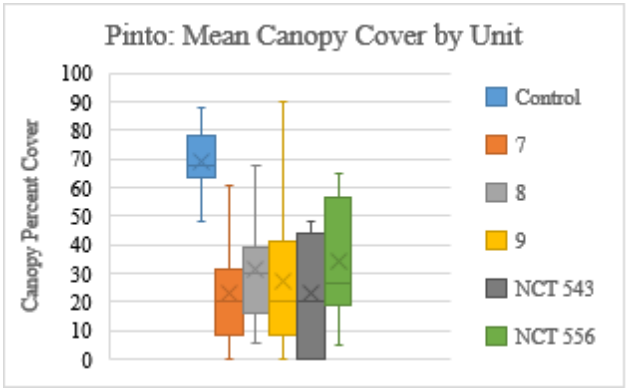


Figure 2

Table 5

Units	Average Huckleberry Cover	Range in Huckleberry Cover	Plots (n)
	--- Percent ---		
Pinto NCT 543	34.14	0 - 60	7
Pinto NCT 556	21.00	0 - 75	10
Pinto 8	19.45	0 - 60	11
Pinto 7	16.18	0 - 50	33
Pinto Control	7.40	0 - 10	10
Pinto 9	4.94	0 - 15	16

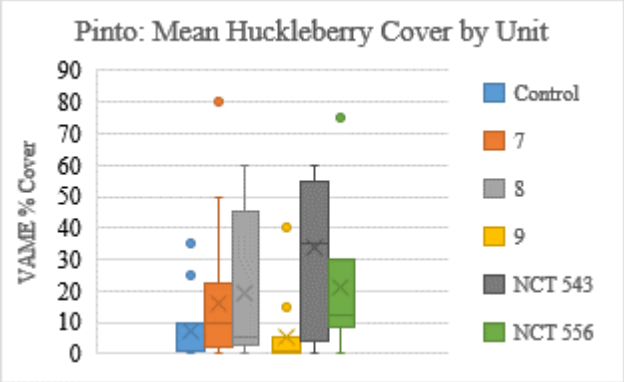


Figure 3

Figures 4 and 5 below show the average height of huckleberry and amount of fruit production inthe various Pinto units.

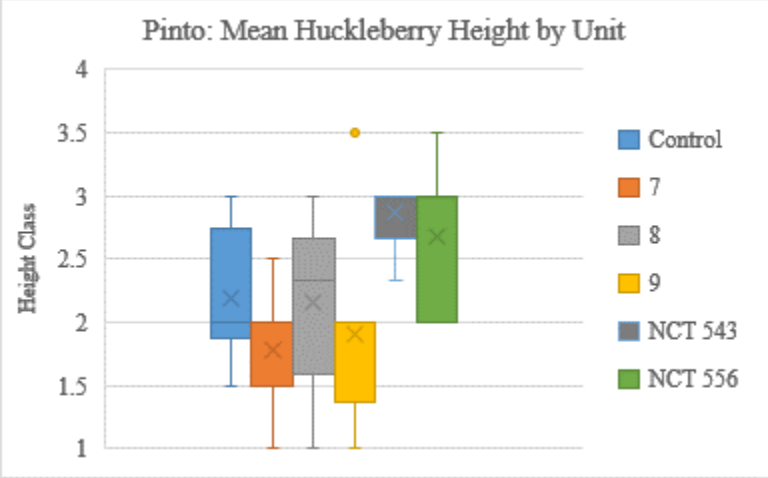


Figure 4

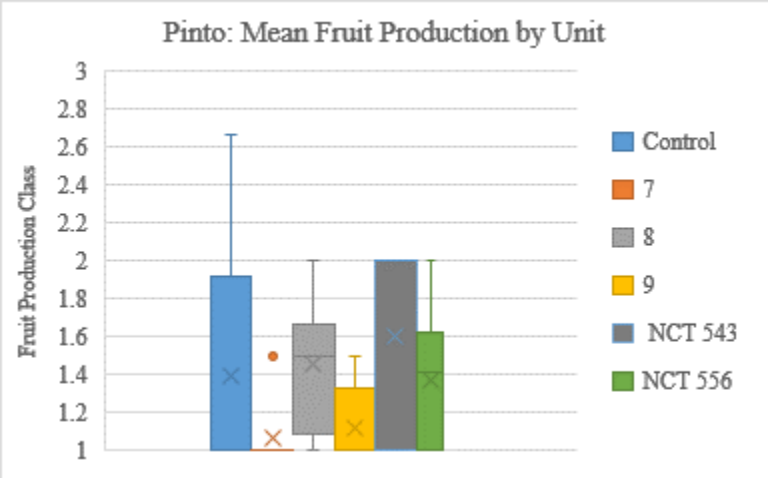


Figure 5

Figures 6, 7, 8, and 9 and tables 6 and 7 outline the initial unit-level findings for the Sawtooth project area.

Table 6

Units	Mean Canopy Cover	Range in Canopy Cover	Plots (n)
	---Percent---		
Sawtooth 3	45.30	20 – 74	10
Sawtooth NCT	40.40	5 – 81	5
Control	32.65	28 – 56	11
Sawtooth 11A	29.18	0 – 74	11
Sawtooth 10A	27.14	0 – 44	7
Sawtooth 8	14.80	2 – 32	5
Sawtooth 9	13.09	0 – 40	11

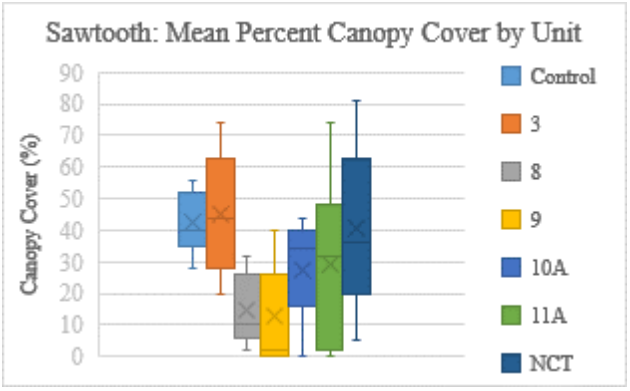


Figure 6

Table 7

Units	Mean Huckleberry Cover	Range in Huckleberry Cover	Plots (n)
	--- Percent ---		
Sawtooth 9	60.91	35 – 85	11
Sawtooth NCT	32.60	3 – 60	5
Sawtooth 3	30.10	1 – 60	10
Sawtooth 10A	25.00	0 – 35	7
Control	21.55	1 – 75	11
Sawtooth 8	18.80	2 – 60	5
Sawtooth 11A	10.09	1 – 35	11

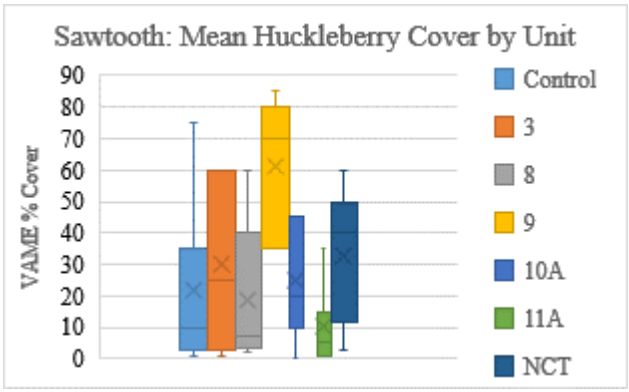


Figure 7

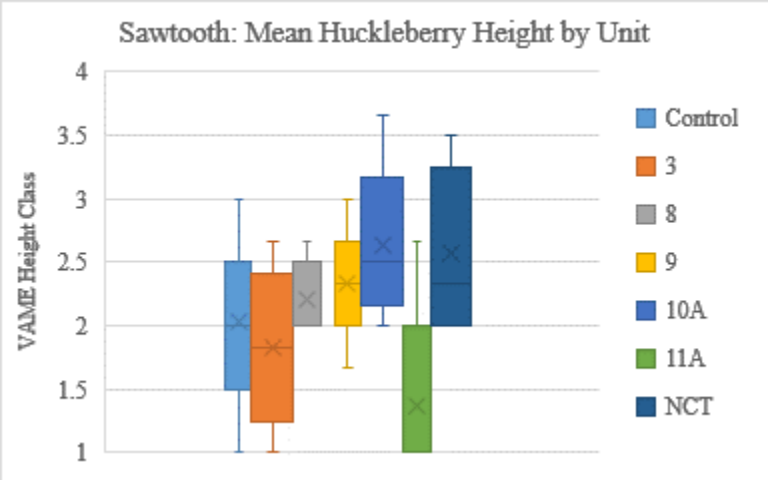


Figure 8

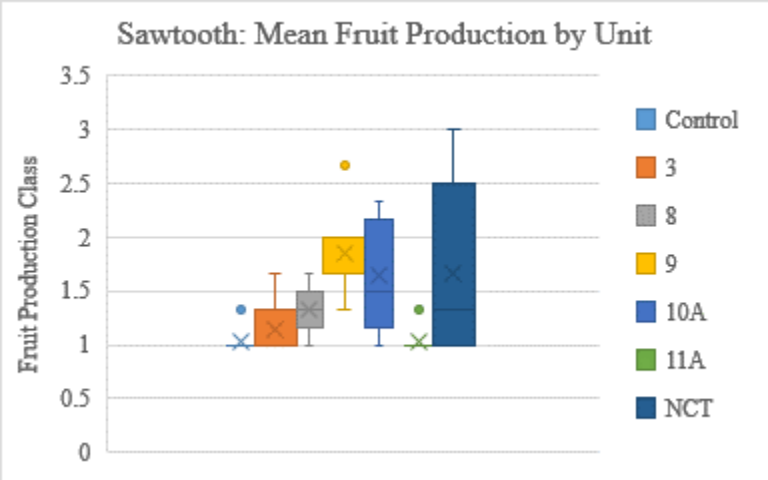


Figure 9

Figures 10, 11 and 12 below explore the *plot-level* relationships where there were notable correlations between treatment (canopy cover and soil disturbance) and huckleberry (percent cover, shrub height, and fruit production). This was done by combining results from all plots.

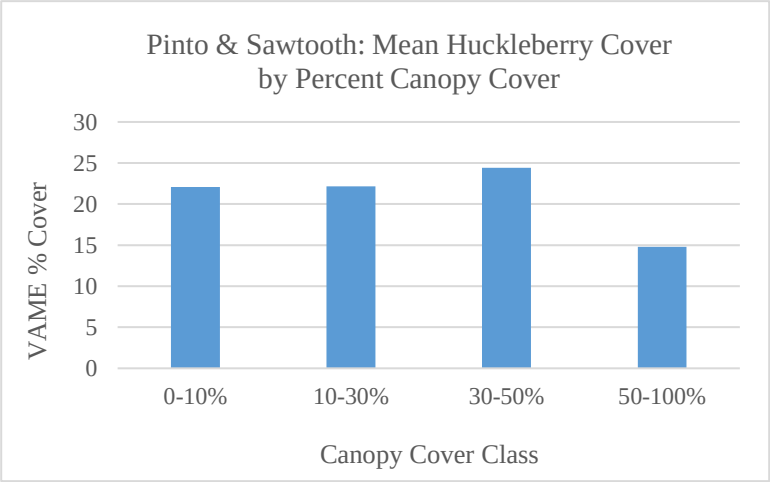
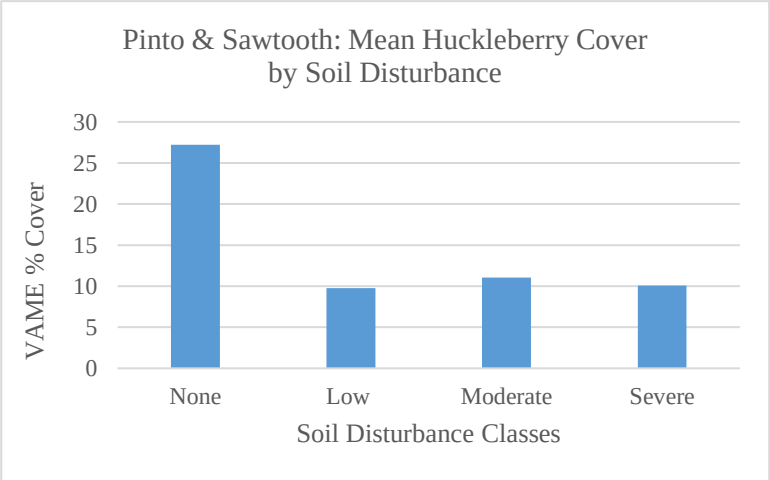


Figure 10



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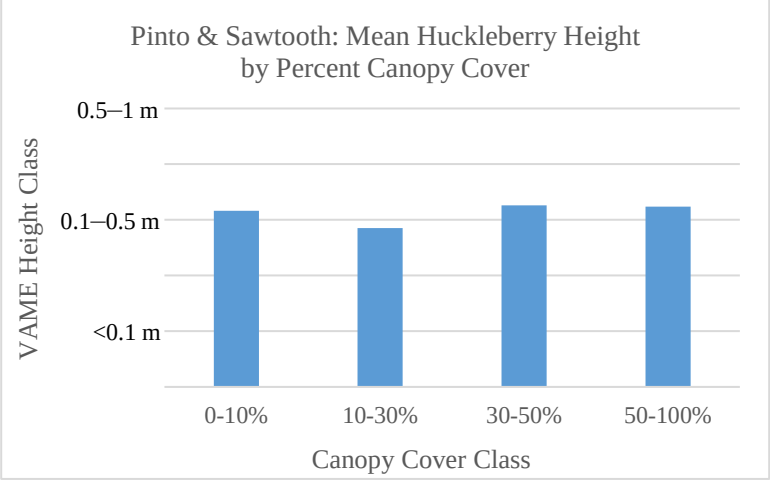

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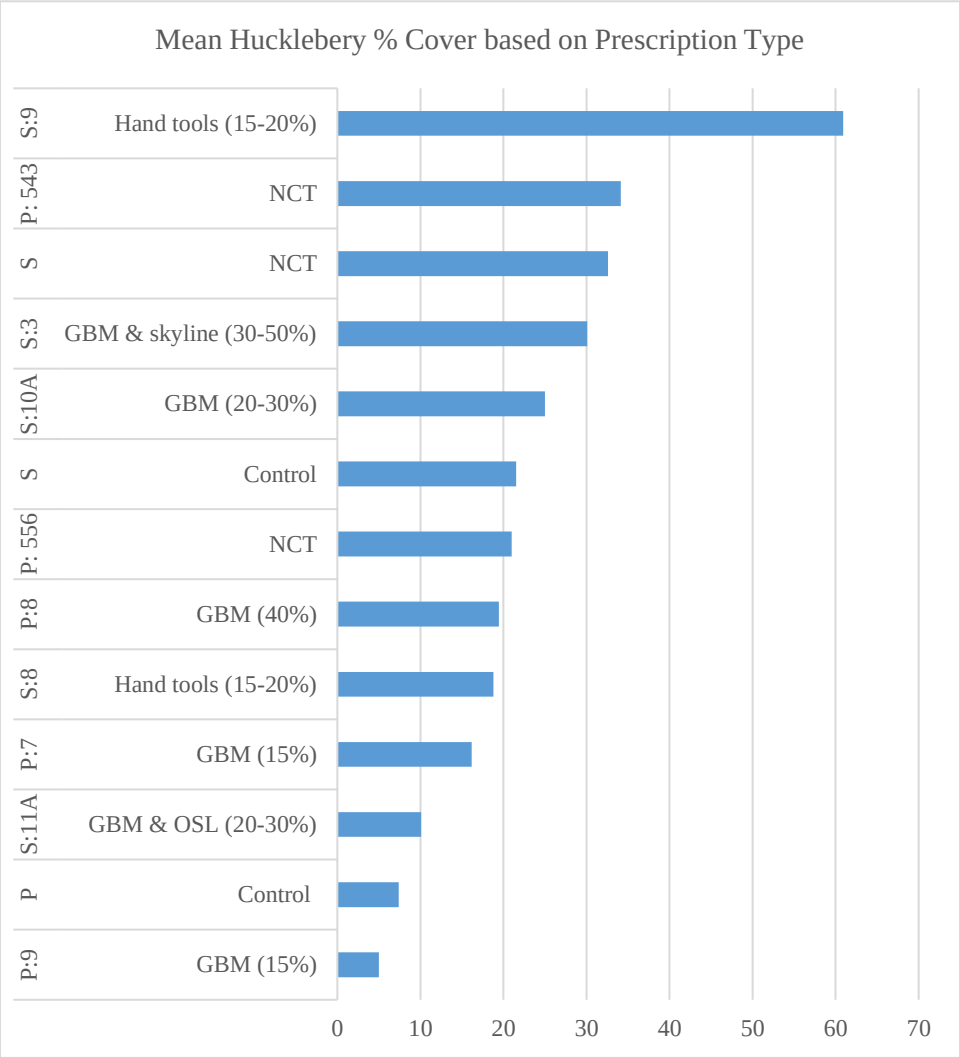

Figure 13: Huckleberry % Cover by plot averaged by unit prescription type. P = Pinto; S = Sawtooth. GBM = Ground-based machinery; OSL = Over-snow logging. (x-x%) = average residual canopy cover for each prescription.

Discussion

These results and observations are the initial findings from year one of a two-year study and are not intended to be conclusive or final.

Huckleberry cover and canopy cover

Canopy cover was divided into categories (0-10%, 10-30%, 30-50%, and 50-100%) in the analysis phase of the study to align with management protocols likely to be used in Forest Service projects. Overall, there was not a strong relationship between canopy cover and huckleberry percent cover. Although not statistically significant, the results show that huckleberry cover was lower when canopy cover was greater than 50%, and that the optimal canopy cover category for huckleberry was 30-50%.

When looking at the final results for each unit (averaging the plot data within each), the highest huckleberry cover percentages (>30% cover) were found in Sawtooth 9, Pinto NCT 543, Sawtooth NCT, and Sawtooth 3. Interestingly, all the plots in Sawtooth 9 that we monitored had at least a 35% huckleberry cover. Pinto 9 and Sawtooth 11A had the lowest huckleberry cover (>10% cover).

The NCT units in both Pinto and Sawtooth yielded some of highest amounts of huckleberry percent cover, fruit production, and plant height. But, some of the NCT units were exceedingly tough to navigate through due to fallen logs and short, small stumps cut at angles. So, either treatment would need to vary in order to support fruit gathering or more time from treatment would need to elapse before huckleberry picking would be practical for humans or other mammals.

Fruit production and plant height

Huckleberry plants can persist under a dense tree canopy, but fruit production can be hindered. In year one, though, we did not observe a strong relationship between canopy cover and fruit production.

Sawtooth 9 had the highest fruit production overall. Pinto NCT 543 had the highest fruit production and tallest huckleberry shrubs in the Pinto project area. Between Sawtooth and Pinto, Sawtooth had the most fruit production, but due to the fact that fruiting was low overall in 2017, neither site produced much fruit. The overwhelming majorty fell into the ‘low’ catergory of fruit production. The seasonal and annual variation in fruit production is part of the reason this study puts more emphasis on percent huckleberry cover, as it is less directly related to seasonal variations.

Tall huckleberry plants could potentially be an indicator of highly productive sites (Anzinger 2002). The average height of huckleberry plants was virtually the same Pinto as it was in Sawtooth. Fruit production and height had moderate to strong relationships throughout most of the plots in the project area. Similar results were found by Stark and Baker (1992) and Anzinger (2002).

Soil disturbance

Research suggests that soil disturbance can have an impact on the establishment of huckleberry plants in the treated units. The rhizomal network of the huckleberry plant can persist beneath the soil waiting for favorable conditions to arise so the plant can emerge (Martin 1979). However, too much scarification to

the soil and deep layers of tree debris can inhibit this new growth. On the other hand, topographic heterogeneity could possilby create conditions favorable to huckleberry regrowth. For this project, soil disturbance was measured on a ranked scale using these four categories (none, low, moderate, and severe). Each category had short explanations to help ensure consistency across surveyors.

Of the units that were treated and that had any instance of soil disturbance, all of them had a moderate to strong negative relationship between huckleberry percent cover and soil disturbance, indicating that soil disturbance had a negative impact on huckleberry cover. Overall, the treatment approaches in Sawtooth resulted in less soil disturbance than those in Pinto. For instance, of the 33 plots we surveyed in Pinto 7, all but two of them were in a slash pile, skid trail, or landing site (94% of the plots). Just over half of the plots (56%) in Pinto 9 were in a slash pile, skid trail or landing site. Pinto 8 had the highest huckleberry percent cover and the fewest occurrences of plots (36%) being in a slash pile, skid trail, or landing site.

Prescriptions and treatments

The relationship between the prescription and the resulting forest condition did not appear to correlate as much as we had expected. In addition to canopy cover being only loosely related to treatment prescription, the amount and severity of ground disturbance also varied widely among similar prescriptions.

Figure 13 shows the relationship between prescription and huckleberry cover. From what we can draw from the initial results of 2017, it would likely be beneficial to identify ways to ensure that treatment more closely matches the prescription and to investigate ways to decrease soil disturbance and impacts to the current huckleberry coverage while still meeting the goals of the treatment prescription.

Literature Cited

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Appendix A.

Survey protocol

Plot Establishment (see Figure 1 in report)

We established plot locations using the random point generator in ArcGIS. We designated 30 randomly selected points at each unit to use for survey. Our goal is to survey at least 10 plots within each treatment unit (or control area). We designated extra plots because some plots will not be reachable, others may encompass areas that are not suitable for survey (such as roads or camping areas), and there are time constraints that will limit the number of plots accessed.

Plots and Subplots

At each survey plot, a 100m^2 plot will be established using the randomly generated point as the center of the plot. Three 2m^2 square subplots will be established within the larger plot for finer scale observations of huckleberry phenology, with one at the center of the 100m^2 plot, one 1.4m north from the edge of the center plot, and one 1.4m south from the other edge of the center subplot (see Figure 1 below).

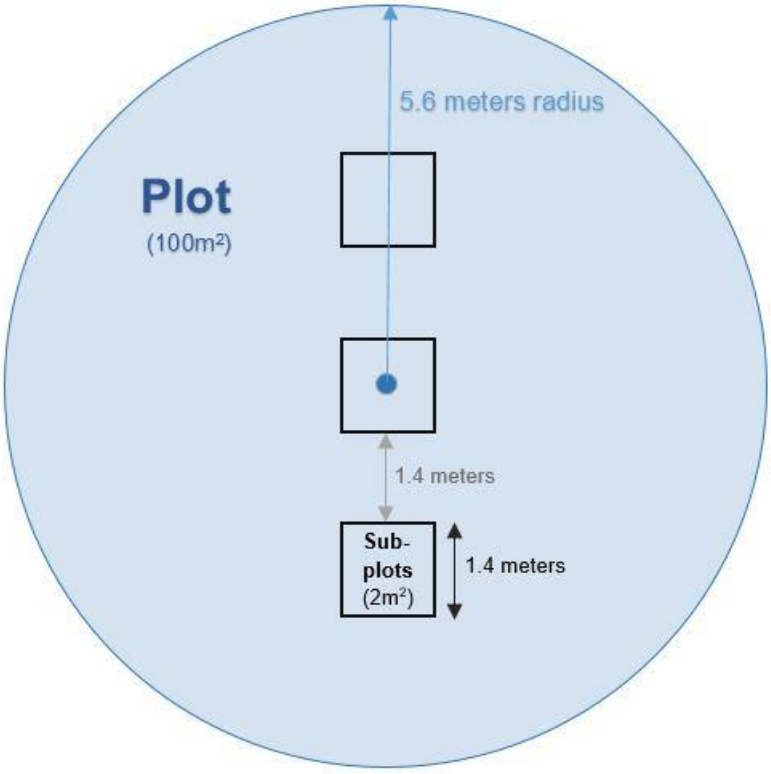

Figure 1. Survey plot and subplots.

Photopoints

One photopoint will be taken at a subset of the plots within each unit. Each photo will be taken from the center point and facing north. In 2018, we will be following up on previously established photopoints in the Pole Patch project area set by the Forest Service.

Data Collection – <u>Plot Level</u>
The following observations and measurements will be recorded at each 100m^2 plot:

- **Extrapolation of treatment**
    - Type of treatment/year treated, none, unsure, burned or unburned
- **Aspect**
    - N, NE, E, SE, S, SW, W, NW, flat
- **Approximate percent cover of huckleberry**
- **Spatial distribution of huckleberry**
    1 – Located mainly along forest edges
    2 – Scattered or clumped distribution
    3 – Fully distributed throughout the plot
- **Presence and percent distribution of other Vaccinium species**
- **Presence of invasives**
    - Y/N, make note if prominent species is known
- **Approximate percent cover of beargrass**
- **Soil disturbance**
    None – No observed soil disturbance
    Low – Topsoil is compacted but not churned
    Moderate – Topsoil is moderately churned or compacted
    Severe – Topsoil is severely churned or compacted
- **Biodiversity** of surrounding vegetation (general and quick observation, approximate classes)
    Class 1: 0–3 different understory shrubs/grass
    Class 2: 3–5 different understory shrubs/grasses
    Class 3: >5 understory shrubs/grasses
- **Percent canopy cover** (average of five readings: facing north for each reading, collect one at the plot center and one in each cardinal direction at the plot edge).
- **Stem density of trees / stems in the plot** (delineate live or dead)

Data Collection – <u>Subplot Level</u>
The following observations and measurements will be recorded at each 2m^2 plot (see tables 1, 2, and 3):

1. **Status of huckleberry production**
2. **Ripening status**
3. **Average plant height**

Sampling would ideally occur during the beginning and middle of huckleberry ripening (before humans and other animals have removed the berries). We will note if areas have been harvested by humans or other animals. Huckleberry fruit production and phenology will be assessed using 2m^2 subplots. Fruit production and phenology will be recorded using the classifications from the tables below. The classification is used for both ripe and green fruit, but an additional classification system will be used to identify most fruit within the plot as green, ripe, or fallen/taken. Plant height will be estimated as an average for the unit.

Table 1. Categories for assessing huckleberry fruit production (Anzinger 2002).

Fruit Production Class	Class Description (ripe or green)
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 2. Categories for assessing ripeness of fruit

Fruit Ripeness Class	Class Description
0	No ripe fruit
1	Up to half of the fruit is ripe
2	Most or all the fruit is ripe
3	Up to half the fruit fallen/taken
4	More than half the fruit fallen/taken

Table 3. Categories for assessing average heights of all huckleberry plants within a single plot

Height	Class Description
X-Small	Average height less than 0.1 m (4 in.)
Small	Between 0.1 m and 0.5 m (4 in. – 1.6 ft.)
Medium	Between 0.5 m and 1 m (1.6 – 3.2 ft.)
Large	Greater than 1 m (3.2 ft.)