Mason Gulch
Activities and Monitoring Report 2019/2020

Prepared by City of

Tacoma Passive Open

Space Program

Permit # LU16-0272

Contents

1. 0 Introduction

The Mason Gulch Landscape Management Plan (City of Tacoma, ESA, Robinson Noble Inc., 2016) (hereafter referred to as "LMP") was permitted in 2017, and provides goals, objectives, and performance standards for slope stability, forest health, public safety and other elements (Table 1). Detailed planting and restoration plans (hereafter referred to as "Work Plan(s)") for all five management units were created based on specifications from Appendix B of the LMP.

The purpose of this report is to provide an overview of the activities performed at Mason Gulch during 2019/2020, including those from the Work Plan. Relevant performance standards outlined in the Mason Gulch LMP will be addressed, and monitoring results from 2019/2020 will be summarized and used to make recommendations concerning future activities. The 2019/2020 activity and monitoring year began on October 1st, 2019 and ended September 30th, 2020.

1. 1 Mason Gulch Background Information

Mason Gulch is a 36-acre open space area located near Commencement Bay in Tacoma, Washington (Figure 1). The gulch lies adjacent to private residences to the north and south; N. Stevens Street and N. Mason Avenue to the west; and the City's North End Wastewater Treatment Plant to the east. Some portions of the upper gulch are located on private land.

Mason Gulch is divided into five landscape management units (MUs). Management Unit (MU) 1 is horseshoe shaped and located near the rim of the gulch (Figure 2). The remaining MUs, from 2 to 5, are located consecutively downslope from the top rim of the gulch to the inner valley. Restoration activities occurred in some capacity in all MUs during 2019/2020, however most efforts were focused on MUs 1 and 2 (Figure 5).

Elevation along the rim of the gulch is at approximately 310 feet (ft) above sea level (Figure 3). At the bottom of the gulch, in the northeast region of the site, elevation is approximately 30 ft above sea level. Steep slopes exist near the rim of the gulch and grades decrease approximately halfway down the gulch. Steep slopes can measure 200% or more, however those slopes are limited in length. Slope inclinations in the range of 60% to 70% are more prevalent. Surficial landslides and tree failures have been noted in recent history.

The upland portions of Mason Gulch historically contained what is known as North Pacific Maritime Mesic-Wet Douglas-fir-Western Hemlock Forest (WDFW 2018) prior to being logged. This ecological system develops through succession, and climax species, such as Douglas-fir (*Pseudotsuga menziesii*), Western hemlock (*Tsuga heterophylla*) and Western red cedar (*Thuja plicata*), replace earlier successional species such as red alder (*Alnus rubra*) and big leaf maple (*Acer macrophyllum*). The lack of seed bank and the presence of invasive species have prevented natural successional processes. Many of the big leaf maple (*A. macrophyllum*) trees located at the top of the gulch were previously coppiced resulting in multi-stemmed, damaged and diseased trees along the western rim.

There are 14 intermittent streams emerging from seeps, and one permanent stream (Mason Creek) that

exist in the lower reaches of the gulch (Figure 4). Mason Creek ultimately empties into Commencement Bay, with some of the water being diverted for use by the wastewater treatment plant. There are four wetland complexes present (A-D, Figure 4) totaling 9.4 acres.

1. 2 Management Unit Descriptions

1. 2. 1 Management Unit 1

This management unit is located near the crest of the steep slopes in the western portion of Mason Gulch and is 1.7 acres in size (Figure 2). Prior to restoration, this strip of hillside was dominated by invasive species, including Japanese knotweed (*Fallopia japonica*), Scotch broom (*Cytisus scoparius*), and Himalayan blackberry (*Rubus armeniacus*), in addition to other weed species that prevented native vegetation from becoming established. Restoration included weed eradication and replanting with species adapted to dry, exposed, steeply-sloping, sandy soils.

The GeoEngineers Baseline Assessment of Mason Gulch (2014) reported the steep upper portions of Mason Gulch to be "unstable" as identified from the Ecology Coastal Zone Atlas map, yet the most recent version of the Washington State Department of Geology Pierce County Landslide Inventory (07/2017) did not indicate this area as being at high risk for landslides. Regardless, Mason Gulch is considered a landslide hazard area based on the City of Tacoma's Critical Areas Ordinance. Recent observations indicate that areas of MU1 may be unstable; these include soil creep and a cracked and tilted concrete foundation located on the flat, upper bench of the gulch.

1. 2. 2 Management Unit 2

Located directly interior to MU1, MU2 is made up of a narrow strip of land that spans 3.8 acres across the western and part of the southern regions of the gulch (Figure 2). This area is dominated by big leaf maples (*A. macrophyllum*), many of which were previously coppiced, resulting in poor health and a dense, multi-stem growth response. Sword fern (*Polystichum minutum*) makes up a significant portion of the understory. Invasive sweet cherry trees (*Prunus avium*) and cherry laurel are also (*Prunus laurocerasus*) common in MU2, along with Himalayan blackberry (*R. armeniacus*). Slopes in this area are steep (40-80%) with some slopes being close to 200% (Figure 6).

1. 2. 3 Management Units 3, 4 and 5

Management Units 3, 4 and 5 all have mature, healthy vegetation dominated by deciduous trees, and conifers interspersed throughout these MUs. Management Unit 3 has steep, sandy slopes; MU 4 is a transition zone between MU3 and the wet interior valley of MU5 (Figure 2). Wet, silty soils overlying clay in MU4 have resulted in shallow-rooted trees, many of which have senesced and toppled due to the combination of age and soils. Management Unit 5 is dominated by wetlands and streams and has more dense, native shrub cover compared with MUs 3 and 4. Management Units 3, 4 and 5 are 21.3, 3.7 and 9.6 acres, respectively.

2. 0 Management Unit Activities

2. 1 Management Considerations

The following management considerations were taken into account when developing the LMP (Table 1).

1. **Achieving a Sustainable Target Ecosystem:** This element should be applied throughout all of Mason Gulch in order to ensure long-term success and habitat improvement.

2. **Improving Slope Stability:** This element is the main priority within the steeply sloping areas (over 40% slope) of the gulch and will be considered the top priority in areas where slopes occur below and/or above roadway and utility infrastructure.

3. **Improving Wildlife Habitat:** Mason Gulch is already home to a variety of birds, small mammals and even larger mammals including deer. One of the benefits of improving the diversity and density of vegetation (as a part of other management goals) in Mason Gulch is the secondary benefit of improving habitat for existing and potentially new species.

4. **Maximizing Stormwater Benefits**: Stormwater benefits include managing both the amount of precipitation that reaches the soil surface and runs off, and the quality of stormwater runoff that reaches the creeks in Mason Gulch.

5. **Working to Protect Public Infrastructure and Public Safety:** Public safety includes controlling access onto steep hazardous slopes and reducing the likelihood of slope failure below and/or above existing roadways and utilities.

6. **Developing a Program for Stewardship and Public Involvement:** Neighbors and other community members with an interest in Tacoma's green spaces can be highly effective in monitoring and improving places like Mason Gulch.

7. **Scenic View Management from Public Areas:** View enhancement will be a secondary management consideration after the other management elements (public safety, stormwater, slope stability, etc.) have been fully addressed to the extent of this LMP.

2. 2 Restoration Overview

Restoration began on Mason Gulch in July of 2016, with herbicide treatment to Japanese knotweed (*F. japonica*) in the northern area of MU1. Four treatments were required to eliminate the knotweed prior to planting. Management Unit 1 was divided into two sections, with the northern section undergoing restoration in 2016/2017, and the southern section in 2018/2019 (Figure 5). This included invasive species removal, installation of erosion control blanket and wattles, and planting native species (Table 2). Restoration work was performed by Washington Conservation Corps (WCC) crews and supervised by Passive Open Space Program staff.

Plant survival in MU1 was found to be poor shortly after planting for the 2016/2017 season, therefore it was decided to replant the area at a greater density during 2017/2018. The combination of dry summer conditions, animal browsing and nutrient poor soils may have contributed to poor plant survival. Since monitoring often causes damage to erosion control materials, it was decided to forego formal monitoring efforts to help keep the erosion control materials as intact as possible prior to replanting. Only qualitative monitoring was performed in 2017/2018.

The northwest section of MU1 was replanted in 2017/2018 at three times the plant density of the previous season, and additional management strategies were employed to improve survival.

Management Unit 2 is divided into a grid of approximately 300, 25 ft x 25 ft squares (Figures 6 & 7). Restoration began on the top row of squares in 2019/2020, with work occurring in every other square with < 80% slope. Big leaf maple (*A. macrophyllum*) trees, most of which were previously coppiced and multi-stemmed, were reduced to one stem to increase the amount of sunlight reaching the forest floor. Native conifer trees were densely planted in the restoration squares.

Smaller patches of invasive species were treated and/or removed in MUs 3, 4 and 5 and some infill planting took place.

3. 0 Methods

3. 1 Invasive Vegetation Removal

Initial invasive weed treatment took place in MU1 North (N) during 2016/2017 and in MU1 South (S) during 2018/2019. Monocultures of Himalayan blackberry (*R. armeniacus*) and other noxious weeds were brushcut to the ground and the re-growth was sprayed with an herbicide approved for aquatic use (1.0% Triclopyr with a 1.0% surfactant). While most weeds required only one treatment, Japanese knotweed (*F. japonica*) was treated four times. Post-treatment, the cut vegetation was covered with erosion control blanket in areas where slopes were between 40%-80%, which included the majority of the MU1 restoration area (Table 1- Section 4.1.1b). This methodology provided a BMP by leaving the roots *insitu* to lessen soil disturbance and help maintain slope integrity until newly planted vegetation becomes established.

Invasive species were managed via spot treatment from 2017 to 2020 in MU1N and from 2019/2020 in MU1S; invasive cover was minimal in the MU1 restoration area at the beginning of 2019/2020. Smaller areas of invasive species removal and/or treatment took place in MUs 3, 4 and 5, and included Himalayan blackberry (*R. armeniacus*), bamboo and yellow archangel (*Lamium galeobdolon*) (Figure 5). Volunteers removed Himalayan blackberry (*R. armeniacus*) and English ivy (*H. helix*) using hand tools in MUs 4 and 5 from 2017 - 2020 (Table 1- Section 4.1.1b, Figure 5).

3. 2 Removal of Big Leaf Maple Stems

Per the LMP, all but one of the healthiest stems was removed from previously coppiced big leaf maple trees in Row 1 squares, designated as "1" squares (Figures 6 & 7). Wood from the removed stems was cut into logs ~ 3 ft long and stacked largest to smallest from the bottom to the top, with each stack running perpendicular to the one below it. This methodology creates wildlife habitat while the logs decompose and adds nutrients back to the soil.

3. 3 Erosion Control BMP Installation

Erosion control blanket made of 100% coir with photodegradable netting was installed across the entire MU1N restoration area in 2016/2017. Twelve-inch diameter coir logs wrapped in coir netting were installed with wooden stakes at maximum intervals of 10 feet. Prior to replanting in 2017/2018, BMPs were re-secured or repaired as needed (Table 1 - Section 4.1.2b). Similar erosion control materials were used in MU1S, however the erosion control blanket used had biodegradable netting.

3. 4 Vegetation Installation

Vegetation was planted in each MU in accordance with the LMP (Table 1 – Sections

4.1.1a & 4.1.2a, Tables 2A, 2B & 2C). Planting for MU1 and MU2 occurred during the time periods outlined in Table 3, after the installation of erosion control materials.

3. 4. 1 MU1N Vegetation Installation

Native plants were installed in the northern half of MU1 by WCC crews during December of 2017 and January of 2018 (Table 2A, Figure 5). The planting palette was made up of at least 63% evergreen species, dominated by shrubs. Prior to Y0 monitoring of MU1N during the spring of 2018, it was clear that plant survival was already poor and the entire area would need to be replanted. Thus, in-depth monitoring was not performed and survival was only estimated.

Native plants were installed by WCC crews during December of 2018 and January of 2019 at over three times the density as the previous planting season (Tables 2A & 3). Sixty six percent of all plants installed were evergreen, and all installed trees were conifers. Browsing appeared to have played a significant role in plant mortality during the previous season, therefore Plantskydd®, a product with an odor that deters browsing by deer, rabbits and other small mammals, was sprayed on plants and allowed to dry before installation. Plantskydd® is environmentally safe and has been listed by the Organic Materials Review Institute as suitable for use in the production of organic food and is USDA approved for organic gardening.

3. 4. 2 MU1N Soil Amendments

It is thought that nutrient poor soils contributed, in part, to low plant survival during 2017/2018, as well as dry conditions during the summer. Therefore, during 2018/2019, three different combinations of soil amendments were added to different sections of MU1N (Table 4) to address these conditions. These

amendments included SoilMoist® packets, SoilMoist® packets with added fertilizer, and/or topsoil. SoilMoist® is an environmentally safe product that absorbs water, releasing it when the surrounding environment begins to dry up. Also, two Plant Success Tablets®, which contain mycorrhizal fungi that colonize roots to aid in nutrient and water uptake, were added to every planting hole.

3. 4. 3 MU1S Vegetation Installation

Plants were installed in MU1S during December of 2019 and January of 2020 at three times the density outlined in the LMP, due to the high plant mortality seen is MU1N during 2017/2018 (Table 2B). No soil amendments were used.

3. 4. 4 Management Unit 2

Evergreen trees were installed at a density of 15 ft off center in all designated "1" squares located in Row 1 during 2019/2020. The groundcover was generally healthy and dense in the squares, therefore erosion control materials were not installed.

3. 4. 5 Management Units 3, 4 and 5

Conifer trees were planted By WCC crews in MUs 4 and 5 in two small areas where heavy invasive species removal took place. Trees included 120 Western red cedar (*Thuja plicata*) and 40 Douglas-fir (*P. menziesii*). In addition, 30 Western red cedar (*T. plicata*) trees were planted across MUs 3, 4, and 5 by volunteers (Table 1 – Sections 4.1.1a and 4.1.2a, Figure 5).

3. 5 Monitoring Requirements from the Landscape Management Plan

According to the Mason Gulch LMP Specifications (2016), "a monitoring plan will be implemented by the project proponent or project proponent's representative to document the progress and challenges of the plants and project area according to the objectives and performance standards for the management element(s) as defined in Section 5.2 of the Specifications (Appendix B of the LMP). Monitoring must be prepared by a Certified Horticulturalist, Restoration Ecologist, Professional Wetland Scientist, Certified Arborist, Landscape Architect or other qualified professional as approved by the City. Monitoring will also assist in identifying adaptive management needs. The planting area will be monitored for a minimum period of five growing seasons from the date of installation. The project will be specifically monitored for the survival of the planted material within the planting area, the aerial cover of noxious or invasive weed species, soil erosion, vandalism, disease, survivability, human activity, and slope failure".

Monitoring of the MU1N restoration area included the following:

- Establishment of at least one 50-foot monitoring transect per quarter acre of planting area to monitor survival of plantings, percent cover of plantings, composition of the plant community, and noxious/invasive weed species cover.
- Percent survivability was monitored using randomly selected but permanent sample plots located along the established permanent transect (2 sample plots per 50 foot transect). Sample plots

consisted of a 9-foot radius circle from a stationary point along transect.

- Photographs were collected from each transect end and each sample plot point to compare vegetation density and compositions from year to year.
- Observations of the project area were made for excessive erosion, slope instability, vandalism, disease, plant stress, human activity and debris, as well as general observations of the entire planting area and/or areas directly adjacent.

Monitoring of the MU1S restoration area was nearly identical to methods used in MU1N, however two 50 ft transects per quarter acre were established, and no quadrats.

Monitoring of the MU2 restoration area included the grid cell area method and was used to estimate the percent cover of trees and shrubs and included monitoring 25% of the total grid cells for each phase of the project.

3. 5. 1 Monitoring Personnel

The monitoring and data analysis were performed by City of Tacoma Passive Open Space staff, with the assistance of WCC crew members.

3. 5. 2 Baseline Monitoring

Baseline monitoring, also referred to as Year 0 (Y0) monitoring, took place post-planting to establish baseline conditions for comparison with future monitoring years, Year 1 (Y1) through Year 5 (Y5). At Y0, plants were recorded to determine initial cover of planted and invasive species, along with the number of plants installed for survival estimates (Table 3). Physical observations related to erosion and human activity were also recorded.

3. 6. Monitoring Locations

3. 6. 1 Transect and Quadrat Establishment

In MU1 the total number of transects was selected based upon the acreage of the treatment plot to equal one 50 ft transect per quarter acre. The maximum length of the northern half of MU1 was divided by 50 ft (transect length) to identify the total number of potential transect lengths. The length of the TP can be thought of as an “X” axis and the width of the slope (top of slope to bottom of slope) being thought of as a “Y” axis, with the entire grid sitting at an angle mimicking slope. A random number generator was used to identify the location of the first transect between 0 and 50 ft, and all subsequent possible transects were spaced 50 ft apart along the x-axis. These transects were numbered sequentially, and a random number generator was used to select transects for monitoring. This step was repeated until the appropriate number of transects was identified. If a transect was randomly selected more than once, the previous step was repeated until a new numbered transect appeared.

Each transect length along the x-axis needed to be randomly placed between the top and bottom of the MU along the y-axis. This was done by using the same methodology described above. The total width of the MU was determined and divided by 18 ft (diameter of the quadrat). The first possible location of the transect centerline along the y-axis was located 9 ft from the top of the slope, with each subsequent potential transect centerline location being placed 18 ft downslope. A random number generator was used to determine where each transect would be place along the y-axis.

Two 9 ft radius quadrat locations were established along the transect by selecting a quadrat center point at 10 ft and 40 ft.

For MU2, grid cells were measured from the bottom of MU1 and spaced 25 feet apart. Grids were marked with rebar, and every other grid, or "1" square along the top horizontal band (Row 1) underwent restoration (Figure Q).

3. 6. 2 Locating Transects and Quadrats in the Field

Prior to monitoring, all transects and quadrats were identified on a map in ArcGIS, and their distances from key landmarks were measured. These distances were used in the field to identify starting points for transects, and measurements were made from permanent landmarks. A four ft piece of metal rebar was pounded into the ground to mark the beginning and end of each transect. The top ~one ft of the rebar was spray-painted white or red in order to find the same locations in subsequent years. A tape measure was used to identify the center point for each quadrat along the transect where temporary rebar was installed during monitoring. Collecting GPS coordinates had been attempted at the top of Mason Gulch during 2016/2017 using a Trimble R1 GNSS receiver with an antennae to boost the signal, however accuracy error was still up to 30 ft due to the interference of the slope and trees. Despite these inaccuracies, GPS coordinates were still recorded, but monitoring locations were identified using physical markers in the field.

3. 6. 3 Transect and Quadrat Numbers

The number of transects within the northern half of MU1N was one 50 ft transect per quarter acre, therefore three permanent transect were established in this 0.85 acre area (Figure 5), each with 2 quadrats. Seven transects were established for the 0.84 acre MU1S area, and no quadrats. Monitoring personnel have noted that monitoring results in some damage to the slope, with quadrat monitoring creating more damage and having less accuracy than transect monitoring, therefore the number of transects was doubled in MU1S and quadrat monitoring was eliminated.

25% of the grid cells were randomly selected for monitoring for MU2. Grids were monitored by collecting the same data as that collected in the quadrats (Table 5).

3. 7 Data Collection

Data collected in the transects and quadrats (Tables 5 & 6) was used to monitor plant survival, composition of the plant community, invasive species cover, and visual changes in the plant community

over time. Also, data was collected that would identify excessive erosion, slope instability, vandalism, and other human activity.

3.7.1 Estimation of Cover in Transects

To collect data within a transect, a mark was made at 3 ft on a piece of rebar. The end of the rebar was held from the centerline of the transect outward. The centerline was identified by a tape measure that was laid on the ground between transect end points. Monitoring personnel walked the line, noting the beginning and end point (in feet and inches) along the tape measure for each native plant that touched the 3 ft rebar on either side of the centerline. Percent native plant cover was estimated by dividing the total length of the plant along the transect by the total length of the transect (Tables 9A-9J), using this modified belt transect methodology. Since more than one plant can occupy space both horizontally and vertically along a transect, it is possible for cover to be over 100%. The percent exposed soil and percent invasive species cover were estimated visually using a Daubenmire scale (Table 6).

3.7.2 Data Collection within Quadrats

To collect data within a quadrat, a rope was marked at 9 ft from the top of a loop. The loop was placed around temporary rebar in the center of the quadrat, and a 9 ft radius circle (quadrat) was marked temporarily using stake flags. Data observations were made regarding native plant numbers, percent aerial cover, and other physical factors associated with the quadrat (Tables 9A-9C).

Degree slope was measured on an iPhone 6S using the Clinometer Application with a slope finder created by Peter Breitling (2016), then converted to percent slope. The phone was laid directly on the ground near the center of the quadrat and slope was read. These measurements were compared with slope measurements in ArcGIS for accuracy.

Installed vegetation was monitored in the quadrats shortly after planting to identify baseline or Year 0 (Y0) data for comparison with future monitoring years one through five (Y1-Y5) (Table 3).

3. 7. 3 Data Collection within Squares

The corners of all restoration squares were marked by rebar. Data collected within the squares was the same information collected in the quadrats.

4. 0 Results/Discussion

4. 1 General Observations

4. 1. 1 Management Unit 1 North

The northern half of MU1 at Mason Gulch had been dominated by invasive weeds prior to restoration, therefore the entire area was treated for invasives prior to erosion control blanket installation. Due to

the uniform steepness of the slope and sloughing, sandy soils, a tightly woven 100% coir erosion control blanket was installed across the entire restoration area, along with 12" wattles made from coir logs wrapped in coir netting. Erosion control materials installed in 2017 were mostly degraded by 2019/2020, with most quadrats showing 5% to 25% remaining blanket in MU1N (Table 7A).

There was a general trend of decreased soil exposure in all MU1N quadrats where exposure was 0% - 5% for most quadrats (Table 7A). This was due in part to plant growth, but also due to the presence of exotic and invasive herbaceous species such as velvetgrass (*Holcus lanatus*) which resulted in a subsequent increase in litter depth in all quadrats. Common mullein (*Verbascum thapsus*) had overrun the northernmost part of the restoration area and required removal by hand prior to the 2018/2019 planting season. Most of this invasive species has been eliminated from this area in Y1, however Scotch broom (*Cystisus scoparius*) and evergreen bugloss (*Pentaglottis sempervirens*) took a foothold during 2019/2020, along with invasive herbaceous species. Litter depth increased in nearly all quadrats due to the increased presence of non-native herbaceous species.

There are no mature trees present in the MU1N restoration area. Some of the lower reaches of MU1 experience shade during the day due to the tree canopy from the adjacent MU2.

4. 1. 2 Management Unit 1 South

All monitored transects in MU1S were steep and measured close to 80% (Table 7B). Soils in MU1S had higher amounts of silt compared with MU1N, with soils becoming more sandy moving from south to north. There was generally no soil compaction in MU1S and visible soils were stable. This area was not entirely cleared and planted like MU1N. There were many patches of native species where erosion control blanket was not needed. Litter depth and coarse woody debris were negligible. Erosion control blanket remained largely intact since planting, however there were evident game trails through the area that resulted in increased degradation of blanket and wattles in T5 and T6.

4. 1. 3 Management Unit 2 Row 1 Squares

All monitored Row 1 (R1) squares had sandy loam soil, and three of the four monitored squares had steep slopes near 80% with the fourth square having a 28% slope (Table 11). Although some squares had areas of exposed soil, there was only mild erosion and light soil compaction in all squares mainly caused by the tree thinning work that took place. Erosion control blanket was not installed in the squares due to the tree density; it was thought that "keying in" the blanket in multiple spots would cause more erosion than having no blanket. Also, trees were dispersed across the squares, therefore there were no large bare areas. Litter depth was low in all squares at 0.5 to 1.0 inches in Square 1A (S1A) and less than 0.5 inches in all other monitored squares. All large coarse woody debris had been moved from the cut-tree squares to adjacent squares to make room to work. Canopy cover wasn't significantly reduced in S1A-S1C, however canopy in S1D went from 50%-75% to 25%-50%.

4. 2 Plant Survival

4. 2. 1 Management Unit 1 North Quadrats

Plant mortality was significant from Y0 to Y2 ranging from 22% to 26% survival in MU1N quadrats (Tables 9A – 9C). Snowberry (*Symphoricarpos albus*) and tall Oregon grape (*Mahonia aquifolium*) were the top performers in all MU1N transects. Incense cedar (*Calocedrus decurrens*) had good survival in T2 and T3, and sword fern (*Polystichum munitum*) in T2.

Plantskydd® sprayed on plants prior to installation did appear to help reduce browsing relative to the previous year, but was not used during 2019/2020. Browsing may have contributed to some mortality.

4. 2. 2. Management Unit 1 South Transects

Estimated survival was 82% to 129% in Transects 4-10 (Tables 9D to 9J). Nearly all transects showing greater than 100% survival had 100% survival of installed plants, along with plants that had grown into the transect from the surrounding area. For example, there was an especially prolific beaked hazelnut (*Corylus cornuta*) that spread into T4 and T5 from below the plot. Sword fern (*P. munitum*) also grew well in some areas, spreading into Transects 4, 7, 8 and 9, while oceanspray (*Holodiscus discolor*) grew into Transects 4, 5, 9 and 10. Snowberry (*S. albus*) had 80% to 100% survival in nearly all transects, and showed new growth in Transects 5 and 7.

Other species showed more variable survival across transects. For example, across 6 transects, tall Oregon grape (*Mahonia aquifolium*) averaged 71% survival and survival ranged from 33% - 150%. Snowbrush (*Ceanothus velutinus*) survival averaged 23% and ranged from 0% - 66% across 5 transects. Nootka rose (*Rosa nutkana*) averaged 73% survival and ranged from 0% - 100% survival, evergreen huckleberry (*Vaccinium ovatum*) averaged 56% survival and ranged from 30% - 100% survival, and salal (*Gaultheria shallon*) had an average survival of 27% survival and ranged from 33% - 40% across 4 transects. Mock orange (*Philadelphus lewisii*) averaged 75% survival and ranged from 50% - 100% survival across 2 transects (Tables 9D – 9J).

4. 2. 3 Management Unit 2 Row 1 Squares

Only trees were installed in MU2 Row 1 squares during 2019/2020. Once the trees begin to establish, shrubs and groundcovers will be installed as needed.

Each of the squares had a slightly different aspect and soil moisture content. Two Western hemlock (*Tsuga heterophylla*) were planted in Row 1 Square 1 (R1S1) A, however neither survived. The site may have been too dry and the herbicide injection and senescence of nearby invasive cherry trees, may have added too much light to the square. One of the randomly selected monitoring squares (R1S1B) did not have trees installed, which was an oversight and will be corrected during the 2020/2021 planting season. The final two squares were planted with Western redcedar (R1S1C) and coast redwood (R1S1D) trees. Both squares showed 100% tree survival.

It is important to note that there was mortality of established plants within the squares. It was difficult for crews to protect existing vegetation while felling numerous big leaf maple stems in densely vegetated areas. Some squares had close to 20 stems that required felling, cutting and removal.

4. 3 Plant Cover

4. 3. 1 Management Unit 1 North

In Transects 1 and 2, plant cover declined from Y1 monitoring by 10% and 22% respectively (Tables 10A & 10B). Despite seeing an overall decline in cover in T1, snowberry *(S. albus*), tall Oregon grape (*M. aquifolium*), and incense cedar (*Calocedrus decurrens*) both had a 2% increase in cover from Y1. Also, despite a 22% loss of cover in T2, snowberry (*S. albus*) had a 6% increase in cover and sword fern a 3% increase in cover from Y1 to Y2. The large cover loss was primarily due to the 17% loss of snowbrush (*Ceanothus velutinus*). Transect 3 had an overall 1% increase in cover from Y1 to Y2. (Table 10C).

4. 3. 2 Management Unit 1 South

The majority of transects 4-9 in MU1S had an increase in vegetation cover, ranging from 2% to 23% (Tables 10D – 10J), despite some plant mortality in Transects 5 and 9 (Tables 9D – 9J). This demonstrates that the plants that are surviving are showing demonstrable growth. Transect 6 showed a significant loss in cover (29%) mostly due to a 16% loss of evergreen huckleberry (*V. ovatum*), a 7% loss of salal (*G. shallon*) and a 5% loss of swordfern (*P. munitum*) cover.

Despite a 40% increase in beaked hazelnut (*C. cornuta*) cover and a 5% increase in tall Oregon grape (*M. aquifolium*), there was an overall 9% loss of cover in T10 (Table 10J). This loss was the result of small cover losses of several species of plants including 1% losses of evergreen huckleberry (*V. ovatum*), Nootka rose (*R. nutkana*) and oceanspray (*H. discolor*), along with a 5% loss of both salal (*G. shallon*) and snowberry (*S. albus*) cover. There was significant loss of evergreen vegetation cover in T6 with a 16% loss evergreen huckleberry (*V. ovatum*), a 7% loss for salal (*G. shallon*) and a 6% loss of swordfern (*P. munitum*). It is unclear why plant mortality was greater in these areas as the plants that died should have been well suited for the conditions.

4. 3. 3 Management Unit 2 Squares

There were no changes of note in cover of established plants in Row 1 Squares, with the exception of an increase in swordfern (*P. munitum*) cover in R1S1B from 0%-5% cover to 5%-25% cover (Table 12B). This is noteworthy since there was significant mortality in squares R1S1A and R1S1B, with both squares losing over half the previously established plants. There was no significant growth of the installed conifer trees in R1S1B or R1S1D, and both installed Western hemlocks (*T. plicata*) did not survive in R1S1A (Tables 12A-12D).

4. 4 Performance Measures/Goals

See Table 1.

4. 4. 1 Slope Stability and Geologic Hazard Mitigation/Forest Health

Slope stability and vegetation performance measures pertaining to the LMP are not in effect until Year 3 (Y3), with additional measures to be met in Y5 (Table 1 – Section 4.1.2b).

4. 4. 2 Views from Adjacent Properties

An Administrative Guidance plan has been developed for public view management from adjacent properties (Chapter 9.20 TMC (Trees and Shrubs – View Blockage). A draft document has been created for private view management, however the final developed plan cannot be utilized until all other performance measures are met for a given area (Table 1 – Sections 4.1.7a and 4.1.7b).

4. 4. 3 Volunteer Stewardship

Areas that are safe for volunteers are located in the interior of the gulch, primarily in MUs 4 and 5. There were three volunteer work parties that took place between 10/01/2019 and 09/30/2020, with volunteers donating 79 hours of their time. Volunteers primarily removed invasive ivy, holly and installed 170 trees and plants (Table 1 – Sections 4.1.6). Volunteer events were extremely limited during 2020 due to Covid-19.

4. 5 Adaptive Management/Recommendations

Plant survival and cover data will be used to adapt the number and species used for infill planting in 2020/2021. Based on the 2019/2020 monitoring data, the following adaptive management strategies are recommended:

- Water plants in MU1 as needed. Crews were unable to work during the spring/summer of 2020 due to Covid-19, and therefore plant mortality was presumed higher as they were not able to be watered.
- Continue to add new plant species and climate adapted plants to diversify palette. Western white pine (*Pinus monticola*) and ponderosa pine (*Pinus ponderosa*) should perform well in some locations of MU2.
- Plantskydd® did appear to reduce browsing significantly during 2018/2019, but application is time intensive as multiple applications are required. It is recommended that trees species that experience significant browsing, such as Western redcedar (*T. plicata*) and madrone (*A. menziesii*) be caged.
- Invasive species will continue to be monitored and prioritized for removal by WCC crews,
- Volunteer efforts should continue to be focused in MUs 4 and 5.

5. 0 Planned Activities 2020/2021

In addition to monitoring and maintenance of installed plants in MU1 and Row 1 of MU2, work will continue in MU2. Crews will begin thinning big leaf maples (*A. macrophyllum*) in the second row from the top of MU2 in "1" squares (Figure 7) and install native evergreen trees. Volunteer efforts will continue in MU4 and MU5 removing invasive plants and installing native species. Crews will continue to sweep the entire site for noxious weeds and treat invasive species as needed.

6. 0 References

1. Mason Gulch Landscape Management Plan. 2016. City of Tacoma, ESA, Robinson Noble, Inc.
2. Washington Department of Fish and Wildlife. 2018. NatureServe Explorer. https://wdfw.wa.gov/conservation/research/ecofacts/n_pacific_maritime_mesic-wet_doug_fir_hemlock.html
3. Washington State Department of Geology Pierce County Landslide Inventory (07/2017)

Table 1. Mason Gulch Restoration Goals, Objectives and Standards

Goal	Objective	Standard	Progress
4.1.1a Create a multi-layered canopy of vegetation.	Planting palette will contain a mixed tree canopy, shrub layer and groundcover layer.	Mature tree canopy, overall 2/3 coniferous shall be maintained at 70% aerial coverage once established.	All trees planted in MU1N, MU1S and MU2 were conifer trees, with the exception of madrones which are evergreen. 170 conifer trees were planted in parts of MUs 3, 4, and 5 by WCC crews and volunteers in 2019/2020. All installed trees have been planted within the past 3 years, therefore it will take many years for the tree canopy to become established.
		Shrub layer shall consist of at least three native species, and a minimum of one species shall be a native evergreen; groundcover layer will consist of at least two native species, and a minimum of one species shall be a native evergreen.	MU1N and MU1S were planted with 5 different native shrubs including 3 evergreen species, and 1 groundcover, which was evergreen. Swordfern, a native evergreen groundcover, was already established in MU1 and MU2.
		Each planted shrub and groundcover layer will meet 80 percent survival by Monitoring Year 3 and 60 percent survival by Monitoring Year 5.	To be determined in Y3. MU1N is at Y2, MU1S at Y1, and MU2 Row 1 at Y1 during 2019/2020. Survival was technically 72% in MU1N based on the number of plants to be installed per the LMP, however many more plants were installed than recommended.
4.1.1b Provide for a native dominated, healthy target ecosystem.	Less than 20 percent of the aerial coverage of vegetation will consist of invasive species.	Remove invasive vegetation from the Project Area and monitor and maintain to prevent resurgence for a minimum period of five years.	Patches of English ivy, Himalayan blackberry, bamboo, and yellow archangel were treated in MUs 3, 4, & 5. Restoration areas were checked for invasive species and treated when possible, but Covid-19 limited the amount of work that could be completed.

Goal	Objective	Standard	Progress
		Replant area where invasive vegetation was removed with new native vegetation which conforms to the target ecosystem forest type.	Heavy invasive species removal took place in MU1N in 2017/2018 and during 2019/2020 in MU1S. Both areas were planted with native species following invasive removal. Areas not requiring retreatment with herbicide in MUs 3, 4 and 5 have been replanted.
4.1.2a A self-sustaining native plant community (Target Ecosystem) to provide rainwater interception, erosion control, and overall stormwater benefit.	To create an evergreen-dominated, mixed species, multi-layer canopy structure of large trees, small trees, shrubs, and groundcover.	A 100 percent soil-binding effective tree root zone shall be maintained for healthy mature trees; the effective root zone shall be calculated as 1-foot radius of lateral root extent for every inch of diameter at breast height (DBH) of the tree's trunk.	This will take many years to accomplish.
		Two-thirds of the tree species planted will consist of evergreen conifers per acre.	All planted trees were evergreen.
		A minimum tree density of 436 trees per acre will be maintained on the site (approximately 15'-0" on-center triangular spacing between trees).	Per the LMP, trees in MU1 are planted 50 ft apart, and trees in MU2 were planted 15 ft apart. Trees in other MU's shall be planted at the prescribed density upon commencement of restoration.

Goal	Objective	Standard	Progress
		Monitoring for a minimum of five years as areas are restored will be required to ensure establishment and survivability of the plantings.	Y2 monitoring occurred in MU1N, and Y1 monitoring in MU1S and MU2 Row 1.
4.1.2b Improve slope stability throughout Mason Gulch.	Implement soil stabilization and erosion control measures where applicable to allow the establishment of vegetation and provide public safety and infrastructure protection.	Erosion control measures will be implemented in accordance with the most current version of the City erosion control best management practices (BMPs) as provided in the City's Stormwater Management Manual on slopes 40 percent and greater and where applicable within all disturbed areas.	Slopes in MU1 & MU2, which typically range from 60%-80%, were covered with erosion control blanket in areas where native vegetation was not previously established. Coir wattles were also installed at the appropriate spacing based on percent slope in accordance with the City of Tacoma SWMM.
		Slopes 80 percent or greater over a distance of 10 feet in vertical height or greater should be evaluated by a geotechnical consultant or an engineering geologist experienced in slope stability to analyze the appropriateness of working on that slope and the appropriate treatments needed.	N/A for restoration work performed in 2019/2020.

Goal	Objective	Standard	Progress
4.1.5 Enhance public safety using vegetation management.	Vegetation along the top of the slope will be maintained areas as a natural barrier to slope access.	Plant a band or thickets of thorny plants wide enough to discourage access.	Nootka rose, baldhip rose and tall Oregon grape plants were installed at the top of the slope to deter transient activity.
	Maintain public safety through proactive tree management.	Conduct level 1 tree assessments annually along all publicly accessible areas.	Completed and no actions were required.
		Remove risk-prone trees and branches where they can impact public areas and infrastructure.	No tree removals or pruning were needed during 2019/2020.
4.1.6 Offer public "hands-on" opportunities to gain access to and restore Mason Gulch.	Provide volunteer opportunities for the diverse Tacoma demographic while implementing the strategies and tactics outlined in this plan.	Engage, train, deploy and support volunteers in specific areas where volunteers can safely and effectively work towards the goals and objectives of this LMP.	Volunteers worked in MUs 4 & 5 and had two work parties in 2019 and one work party in August of 2020. Volunteers installed 170 plants and removed significant areas of invasive species.

Goal	Objective	Standard	Progress
4.1.7a Provide public views while promoting mature mixed conifer forested conditions.	Establish native vegetation in conjunction with vegetation pruning for public views.	Trees shall be pruned by or under the direct supervision of an ISA (International Society of Arboriculture) Certified Arborist, to current industry standards according to the most current versions of the American National Standard Institute (ANSI) Z133.1for safety of pruning operations, the ANSI A300 Standard Practices, and the Tree Pruning Guidelines of the International Society of Arboriculture.	N/A.
		Tree pruning to maintain views shall not be conducted until the management area has met all other applicable goals, objectives, and standards. Tree removals may only be considered in the case of risk-prone trees and shall not be conducted until the management area has met all other applicable goals, objectives, and standards.	N/A.
		No more than 25 percent of any one tree's crown may be removed in any pruning event and for a minimum of one year following.	N/A.
		If mitigation planting is required in order to satisfy the goals, objectives and standards of this LMP, pruning for view enhancement may not be conducted until the planting has become established (3-5 years following planting) and 100% soil binding root mass is achieved.	N/A.

Goal	Objective	Standard	Progress
4.1.7b Provide a process for a private vegetation modification request on City property to enhance a private view.	Provide a transparent process where private landowners may apply for and receive approval to conduct landscape management activities on City property in Mason Gulch that are in conformance with the techniques and goals in this LMP.	All management actions approved for private view management shall be conducted in accordance and compliance with this LMP and all applicable regulations.	N/A.
		Tree pruning to maintain views shall not be conducted until the management area has met all other applicable goals, objectives, and standards. Tree removals may only be considered in the case of risk-prone trees and shall not be conducted until the management area has met all other applicable goals, objectives, and standards.	N/A.
		No more than 25 percent of any one tree's crown may be removed in any pruning event and for a minimum of one year following. No tree topping will be allowed under any circumstance.	N/A.

Goal	Objective	Standard	Progress
		If mitigation planting is required in order to satisfy the goals, objectives and standards of this LMP, pruning for view enhancement may not be conducted until the planting has become established (3-5 years following planting) and 100% soil binding root mass is achieved.	N/A.

Table 2A. Planting Palette for Management Unit 1 North

Plant Type	Plant Common Name	Plant Species Name	Number Planted 2017/2018	Number Planted 2018/2019
Deciduous Shrub	Nootka rose	*Rosa nutkana*	130	522
Deciduous Shrub	Snowberry	*Symphoricarpos albus*	174	696
Evergreen Groundcover	Kinnikinnick	*Acrtostaphylos uva-ursi*	130	522
Evergreen Shrub	Pacific wax myrtle	*Morella californica*	174	696
Evergreen Shrub	Snowbrush	*Ceanothus velutinus*	174	696
Evergreen Shrub	Tall Oregon grape	*Mahonia aquifolium*	33	369
Evergreen Tree	Incense Cedar	*Calocedrus decurrens*	9	54
Total			824	3,555

Table 2B. Planting Palette for Management Unit 1 South

Plant Type	Plant Common Name	Plant Species Name	Number Planted 2018/2019
Deciduous Shrub	Baldhip rose	*Rosa gymnocarpa*	522
Deciduous Shrub	Snowberry	*Symphoricarpos albus*	696
Evergreen Groundcover	Kinnikinnick	*Acrtostaphylos uva-ursi*	522
Evergreen Shrub	Pacific wax myrtle	*Morella californica*	696
Evergreen Shrub	Snowbrush	*Ceanothus velutinus*	696
Evergreen Shrub	Tall Oregon grape	*Mahonia aquifolium*	369
Evergreen Tree	Incense Cedar	*Calocedrus decurrens*	54
Total			3,501

Table 2C. Evergreen Tree Planting Palette for Management Unit 2

Tree Common Name	Plant Species Name
Coast redwood	*Sequoia sempervirens*
Douglas fir	*Pseudotsuga menziesii*
Grand fir	*Abies grandis*
Pacific madrone	*Arbutus menziesii*
Ponderosa pine	*Pinus ponderosa*
Shore Pine	*Pinus contorta*
Sitka spruce	*Picea sitchensisi*
Western hemlock	*Tsuga heterophylla*
Western redcedar	*Thuja plicata*
Western white pine	*Pinus monticola*

Table 3. Planting and Monitoring Schedule

MU	Planting Month and Year (Y0)	Baseline Monitoring (Y0) Month and Year if different than Planting Month	Monitoring Year 1 (Y1) Month and Year	Monitoring Year 2 (Y2) Month and Year
1 (North Half)	12/2016-01/2017 & 12/2017	03/2017 & 03/2018	08/2019	08/2020
1 (South Half)	12/2019-01/2020	04/2020	08/2020	Anticipated 08/2021
2 Row 1 #1 Squares	12/2019-01/2020	04/2020	10/2020	Anticipated 08/2021
2 Row 2 #1 Squares	12/2020-01/2021	03/2021	Anticipated 08/2021	Anticipated 08/2022

Table 4. Management Unit North 1 Soil Amendments

Management Unit 1 (North Half)	Topsoil	Soil Moist®	Soil Moist plus Fertilizer®	Plant Success Tablets®
North	X	X		X
Middle	X			X
South			X	X

Table 5. Data Collection in Quadrats and Squares

Variable	Measurement
Native plant name	Identified to species whenever possible
Number of each native plant	Individually counted
Estimated coverage for each native plant species	0%-5%, 5%-25%, 25%-50%, 50%-75%, 75%-95%, 95%-100%
Dominant invasive species (up to 5) and unusual invasive species	Identified to species whenever possible
Estimated coverage for all invasive species	0%-5%, 5%-25%, 25%-50%, 50%-75%, 75%-95%, 95%-100%
Slope	Percent
Aspect	Downhill cardinal direction
Dominant soil texture	Clay, silt, sand, gravel
Soil moisture (typical of summer months)	Dry, damp, saturated, standing water
Soil compaction	None, moderate, light, heavy
Estimated exposed soil	0%-5%, 5%-25%, 25%-50%, 50%-75%, 75%-95%, 95%-100%
Litter depth	<0.5 inches, 0.5-1.0 inches, >1.0 inches
Course woody debris > 5” in diameter	0%-5%, 5%-10%, >10%
Overstory canopy coverage (includes trees that are >2” diameter at breast height (DBH))	0%-5%, 5%-25%, 25%-50%, 50%-75%, 75%-95%, 95%-100%
Evidence of erosion	Stable, erosion, slump, slide
Erosion control material (still intact)	0%-5%, 5%-25%, 25%-50%, 50%-75%, 75%-95%, 95%-100%
Type of erosion control material	None, coir, jute, straw coir, straw lined, straw wattles, etc.
General observations	Dumping, timber trespass, tree of concern, etc.
Phototags	Photos taken to incorporate entire quadrat

Table 6. Data Collection in Transects

Variable	Measurement
Native plant name	Identified to species whenever possible
Number of each native plant	Individually counted
Native plant species location and total length along transect (used to calculate coverage)	Feet and Inches
Dominant invasive species present (up to 5) and unusual invasive species	Identified to species whenever possible
Estimated foliar coverage of all invasive species	0%-5%, 5%-25%, 25%-50%, 50%-75%, 75%-95%, 95%-100%
Overstory canopy coverage (includes trees that are >2" diameter at breast height (DBH))	0%-5%, 5%-25%, 25%-50%, 50%-75%, 75%-95%, 95%-100%
Tree basal stem coverage	0%-5%, 5%-25%, 25%-50%, 50%-75%, 75%-95%, 95%-100%
Shrub plus groundcover foliar coverage	0%-5%, 5%-25%, 25%-50%, 50%-75%, 75%-95%, 95%-100%
Grass coverage	0%-5%, 5%-25%, 25%-50%, 50%-75%, 75%-95%, 95%-100%
Estimated exposed soil	0%-5%, 5%-25%, 25%-50%, 50%-75%, 75%-95%, 95%-100%
Erosion control material (still intact)	0%-5%, 5%-25%, 25%-50%, 50%-75%, 75%-95%, 95%-100%
Type of erosion control material	None, coir, jute, straw coir, straw lined, straw wattles, etc.
General observations	Encampment, trail, debris, etc.
Phototags	Photos taken from beginning and end point of each transect

Table 7A. Landscape Observations for Management Unit 1 North

Transect/Quadrat	T1Q1			T1Q2		
Monitoring Year	Y0 (2017/2018)	Y1 (2018/2019)	Y2 (2019/2020)	Y0 (2017/2018)	Y1 (2018/2019)	Y2 (2019/2020)
Restoration Status	Cleared and Planted			Cleared and Planted		
Slope (%)	31			78		
Soil Texture	Sand			Sand		
Slope Stability	Erosion	Erosion	Stable	Erosion	Erosion	Stable
Soil Compaction	None	None	Light	None	None	Light
Litter Depth (inch)	<0.5	<0.5	>1	<0.5	<0.5	>1
Course Woody Debris (%)	0-5	0-5	0-5	0-5	0-5	0-5
Canopy Cover (%)	5-25	0-5	0-5	0-5	0-5	0-5
Exposed Soil (%)	0-5	5-25	0-5	0-5	0-5	0-5
Erosion Control Blanket (% intact)	75-95	50-75	5-25	75-95	75-95	5-25
Erosion Control Blanket Material	100% coir			100% coir		

Transect/Quadrat	T2Q1			T2Q2		
Monitoring Year	Y0 (2017/2018)	Y1 (2018/2019)	Y2 (2019/2020)	Y0 (2017/2018)	Y1 (2018/2019)	Y2 (2019/2020)
Restoration Status	Cleared and Planted			Cleared and Planted		
Slope (%)	80			80		
Soil Texture	Sand			Sand		
Slope Stability	Erosion	Erosion	Stable	Erosion	Erosion	Stable
Soil Compaction	Light	Light	Light	Light	Light	Light
Litter Depth (inch)	<0.5	<0.5	>1	<0.5	<0.5	>1
Course Woody Debris (%)	0-5	0-5	0-5	0-5	0-5	0-5
Canopy Cover (%)	0-5	0-5	0-5	0-5	0-5	5-25
Exposed Soil (%)	0-5	0-5	0-5	0-5	5-25	0-5
Erosion Control Blanket (% intact)	75-95	75-95	5-25	75-95	50-75	5-25
Erosion Control Blanket Material	100% coir			100% coir		

Table 7A continued

Transect/Quadrat	T3Q1			T3Q2		
Monitoring Year	Y0 (2017/2018)	Y1 (2018/2019)	Y2 (2019/2020)	Y0 (2017/2018)	Y1 (2018/2019)	Y2 (2019/2020)
Restoration Status	Cleared and Planted			Cleared and Planted		
Slope (%)	80			80		
Soil Texture	Sand			Sand		
Slope Stability	Erosion	Erosion	Stable	Erosion	Erosion	Stable
Soil Compaction	None	None	None	None	None	Light
Litter Depth (inch)	<0.5	<0.5	>1	<0.5	<0.5	>1
Course Woody Debris (%)	0-5	0-5	0-5	0-5	0-5	0-5
Canopy Cover (%)	0-5	0-5	0-5	0-5	0-5	0-5
Exposed Soil (%)	0-5	5-25	0-5	50-75	25-50	0-5
Erosion Control Blanket (% intact)	75-95	25-50	5-25	25-50	25-50	0-5
Erosion Control Blanket Material	100% coir			100% coir		

Table 7B. Landscape Observations for Management Unit 1 South

Transect	T4		T5		T6		T7	
Monitoring Year	Y0 (2018/2019)	Y1 (2019/2020)	Y0 (2018/2019)	Y1 (2019/2020)	Y0 (2018/2019)	Y1 (2019/2020)	Y0 (2018/2019)	Y1 (2019/2020)
Restoration Status	Cleared and Planted		Cleared and Planted		Cleared and Planted		Cleared and Planted	
Slope (%)	80		80		80		74	
Soil Texture	Silt		Silt		Silt		Sandy Silt	
Slope Stability	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Stable
Soil Compaction	None	None	None	None	None	None	None	None
Litter Depth (inch)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Course Woody Debris (%)	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5
Canopy Cover (%)	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5
Exposed Soil (%)	5-25	0-5	5-25	0-5	5-25	5-25	5-25	0-5
Erosion Control Blanket (% intact)	75-95	75-95	75-95	50-75	75-95	50-75	75-95	75-95
Erosion Control Blanket Material	coir		coir		coir		coir	

Transect	T8		T9		T10	
	Y0 (2018/2019)	Y1 (2019/2020)	Y0 (2018/2019)	Y1 (2019/2020)	Y0 (2018/2019)	Y1 (2019/2020)
Restoration Status	Cleared and Planted		Cleared and Planted		Cleared and Planted	
Slope (%)	80		80		80	
Soil Texture	Sandy Silt		Sandy Silt		Sandy Silt	
Slope Stability	Stable	Stable	Stable	Stable	Stable	Stable
Soil Compaction	None	None	None	None	None	None
Litter Depth (inch)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Course Woody Debris (%)	0-5	0-5	0-5	0-5	0-5	0-5
Canopy Cover (%)	0-5	0-5	0-5	0-5	0-5	0-5
Exposed Soil (%)	5-25	5-25	5-25	0-5	5-25	0-5
Erosion Control Blanket (% intact)	75-95	75-95	75-95	75-95	75-95	75-95
Erosion Control Blanket Material	coir		coir		coir	

Table 8. Early Season (March 2017) Survival Rates of Plants Installed in Management Unit 1 North during 2016/2017

Evergreen/Deciduous	Growth Habit	Common Name	Species	Survival Rate
Deciduous	Shrub	Bald hip rose	*Rosa gymnocarpa*	40%
Deciduous	Shrub	Snowberry	*Symphoricarpos albus*	50%
Evergreen	Groundcover	Kinnikinnick	*Acrtostaphylos uva-ursi*	25%
Evergreen	Shrub	Pacific wax myrtle	*Morella californica*	15%
Deciduous	Shrub	Snowbrush	*Ceanothus velutinus*	15%
Evergreen	Shrub	Tall Oregon grape	*Mahonia aquifolium*	35%
Evergreen	Tree	Incense cedar	*Calocedrus decurrens*	30%

Table 9A. Plant Survival Rates Management Unit 1 North Transect 1 Quadrats

Evergreen/ Deciduous	Growth Habit	Common Name	Species Name	Y0 # (2017/18)	Y1 # (2018/19)	Y1 Survival (%)	Y2 # (2019/20)	Y2 Survival from Y0 (%)
Deciduous	Shrub	Bald hip rose	*Rosa gymnocarpa*	2	2	100	0	0
Deciduous	Shrub	Nootka rose	*Rosa nutkana*	14	0	0	1	N/A
		Spirea	*Spirea douglasii*	X	X	X	2	N/A
Deciduous	Shrub	Snowberry	*Symphoricarpos albus*	9	9	100	4	44
Evergreen	Ground-cover	Kinnikinnick	*Arcostaphylos uvi-ursi*	8	2	25	0	0
Evergreen	Ground-cover	Sword fern	*Polystichum munitum*	2	2	100	0	0
Evergreen	Shrub	Pacific wax myrtle	*Morella californica*	12	3	25	2	17
Evergreen	Shrub	Snowbrush	*Ceanothus velutinus*	17	11	65	2	12
Evergreen	Shrub	Tall Oregon grape	*Mahonia aquifolium*	14	10	71	9	64
Evergreen	Tree	Incense cedar	*Calocedrus decurrens*	3	3	100	1	33
Total				81	42	52	21	26*

* Number of plants alive in Y2/number of plants alive in Y0.

X = none planted.

Table 9B. Plant Survival Rates Management Unit 1 North Transect 2 Quadrats

Evergreen/ Deciduous	Growth Habit	Common Name	Species Name	Y0 # (2017/18)	Y1 # (2018/19)	Y1 Survival (%)	Y2 # (2019/20)	Y2 Survival from Y0 (%)
Deciduous	Shrub	Nootka rose	*Rosa nutkana*	20	2	10	1	< 1
Deciduous	Shrub	Snowbery	*Symphoricarpos albus*	17	4	24	8	57
Evergreen	Ground-cover	Kinnikinnick	*Arcostaphylos uvi-ursi*	16	1	6	1	< 1
Evergreen	Ground-cover	Sword fern	*Polystichum munitum*	3	3	100	3	100
Evergreen	Shrub	Pacific wax myrtle	*Morella californica*	16	6	38	0	0
Evergreen	Shrub	Snowbrush	*Ceanothus velutinus*	29	20	69	5	17
Evergreen	Tree	Tall Oregon grape	*Mahonia aquifolium*	16	11	69	11	69
Evergreen	Tree	Incense cedar	*Calocedrus decurrens*	3	3	100	2	67
Total				120	50	42	29	24*

* Number of plants alive in Y2/number of plants alive in Y0.

Table 9C. Plant Survival Rates Management Unit 1 North Transect 3 Quadrats

Evergreen/ Deciduous	Growth Habit	Common Name	Species Name	Y0 # (2017/18)	Y1 # (2018/19)	Y1 Survival (%)	Y2 # (2019/20)	Y2 Survival from Y0 (%)
Deciduous	Shrub	Nootka rose	*Rosa nutkana*	13	0	0	0	0
Deciduous	Shrub	Snowberry	*Symphoricarpos albus*	24	12	50	10	42
Evergreen	Ground-cover	Kinnikinnick	*Arcostaphylos uvi-ursi*	10	1	10	0	0
Evergreen	Ground-cover	Sword fern	*Polystichum munitum*	0	0	0	0	0
Evergreen	Shrub	Pacific wax myrtle	*Morella californica*	31	1	3	0	0
Evergreen	Shrub	Snowbrush	*Ceanothus velutinus*	1	0	0	0	0
Evergreen	Tree	Tall Oregon grape	*Mahonia aquifolium*	15	10	67	10	67
Evergreen	Tree	Low Oregon grape	*Mahonia nervosa*	1	1	100	0	0
Evergreen	Tree	Incense cedar	*Calocedrus decurrens*	3	2	67	2	67
Total				98	27	28	22	22*

* Number of plants alive in Y2/number of plants alive in Y0.

Table 9D. Plant Survival Rates Management Unit 1 South Transect 4

Evergreen/ Deciduous	Growth Habit	Common Name	Species Name	Y0 # (2018/2019)	Y1 # (2019/2020)	Y1 Survival (%)
Deciduous	Shrub	Beaked hazelnut	*Corylus cornuta*	0	2	200
Deciduous	Shrub	Nootka rose	*Rosa nutkana*	1	0	0
Deciduous	Shrub	Oceanspray	*Holodiscus discolor*	3	3	100
Deciduous	Shrub	Mock orange	*Philadelphus lewisii*	2	1	50
Deciduous	Shrub	Snowberry	*Symphoricarpos albus*	13	13	100
Evergreen	Ground-cover	Sword fern	*Polystichum munitum*	5	5	100
Evergreen	Shrub	Snowbrush	*Ceanothus velutinus*	2	1	50
Evergreen	Shrub	Tall Oregon grape	*Mahonia aquifolium*	3	1	33
Total				29	26	90*

* Number of plants alive in Y1/number of plants alive in Y0.

Table 9E. Plant Survival Rates Management Unit 1 South Transect 5

Evergreen/ Deciduous	Growth Habit	Common Name	Species Name	Y0 # (2018/2019)	Y1 # (2019/2020)	Y1 Survival (%)
Deciduous	Shrub	Beaked hazelnut	*Corylus cornuta*	0	1	100
Deciduous	Shrub	Nootka rose	*Rosa nutkana*	6	6	100
Deciduous	Shrub	Oceanspray	*Holodiscus discolor*	2	5	250
Deciduous	Shrub	Snowberry	*Symphoricarpos albus*	0	1	100
Evergreen	Vine	Trailing blackberry	*Rubus ursinatus*	0	1	100
Evergreen	Ground-cover	Salal	*Gaultheria shallon*	5	2	40
Evergreen	Shrub	Evergreen huckleberry	*Vaccinium ovatum*	3	1	33
Evergreen	Shrub	Snowbrush	*Ceanothus velutinus*	1	0	0
Evergreen	Shrub	Tall Oregon grape	*Mahonia aquifolium*	12	7	58
Total				29	24	83*

* Number of plants alive in Y1/number of plants alive in Y0.

Table 9F. Plant Survival Rates Management Unit 1 South Transect 6

Evergreen/ Deciduous	Growth Habit	Common Name	Species Name	Y0 # (2018/2019)	Y1 # (2019/2020)	Y1 Survival (%)
Deciduous	Shrub	Nootka rose	*Rosa nutkana*	5	5	100
Evergreen	Ground-cover	Salal	*Gaultheria shallon*	6	2	33
Evergreen	Ground-cover	Sword fern	*Polystichum munitum*	7	6	86
Evergreen	Shrub	Evergreen huckleberry	*Vaccinium ovatum*	9	5	56
Total				22	18	82*

* Number of plants alive in Y1/number of plants alive in Y0.

Table 9G. Plant Survival Rates Management Unit 1 South Transect 7

Evergreen/ Deciduous	Growth Habit	Common Name	Species Name	Y0 # (2018/2019)	Y1 # (2019/2020)	Y1 Survival (%)
Deciduous	Shrub	Oceanspray	*Holodiscus discolor*	2	2	100
Deciduous	Shrub	Snowberry	*Symphoricarpos albus*	5	5	100
Evergreen	Ground-cover	Sword fern	*Polystichum munitum*	3	12	400
Evergreen	Shrub	Snowbrush	*Ceanothus velutinus*	3	2	67
Evergreen	Shrub	Tall Oregon grape	*Mahonia aquifolium*	8	8	100
Evergreen	Tree	Shore pine	*Pinus contorta*	0	1	100
Total				21	27	129*

* Number of plants alive in Y1/number of plants alive in Y0.

Table 9H. Plant Survival Rates Management Unit 1 South Transect 8

Evergreen/ Deciduous	Growth Habit	Common Name	Species Name	Y0 # (2018/2019)	Y1 # (2019/2020)	Y1 Survival (%)
Deciduous	Shrub	Oceanspray	*Holodiscus discolor*	2	1	50
Deciduous	Shrub	Nootka rose	*Rosa nutkana*	4	4	100
Deciduous	Shrub	Snowberry	*Symphoricarpos albus*	5	4	80
Evergreen	Ground-cover	Salal	*Gaultheria shallon*	1	0	0
Evergreen	Ground-cover	Sword fern	*Polystichum munitum*	6	15	250
Evergreen	Shrub	Evergreen huckleberry	*Vaccinium ovatum*	10	3	30
Evergreen	Shrub	Tall Oregon grape	*Mahonia aquifolium*	4	2	50
Evergreen	Tree	Shore pine	*Pinus contorta*	2	2	100
Total				34	31	91*

* Number of plants alive in Y1/number of plants alive in Y0.

Table 9I. Plant Survival Rates Management Unit 1 South Transect 9

Evergreen/ Deciduous	Growth Habit	Common Name	Species Name	Y0 # (2018/2019)	Y1 # (2019/2020)	Y1 Survival (%)
Deciduous	Shrub	Oceanspray	*Holodiscus discolor*	5	6	120
Deciduous	Shrub	Mock orange	*Philadelpus lewisii*	4	4	100
Deciduous	Shrub	Snowberry	*Symphoricarpos albus*	5	4	80
Evergreen	Ground-cover	Sword fern	*Polystichum munitum*	4	8	200
Evergreen	Shrub	Snowbrush	*Ceanothus velutinus*	1	0	0
Evergreen	Shrub	Tall Oregon grape	*Mahonia aquifolium*	9	4	44
Evergreen	Tree	Shore pine	*Pinus contorta*	3	3	100
Total				31	29	94*

* Number of plants alive in Y1/number of plants alive in Y0.

Table 9J. Plant Survival Rates Management Unit 1 South Transect 10

Evergreen/ Deciduous	Growth Habit	Common Name	Species Name	Y0 # (2018/2019)	Y1 # (2019/2020)	Y1 Survival (%)
Deciduous	Shrub	Beaked hazelnut	*Corylus cornuta*	0	1	100
Deciduous	Shrub	Oceanspray	*Holodiscus discolor*	4	5	125
Deciduous	Shrub	Nootka rose	*Rosa nutkana*	3	2	67
Deciduous	Shrub	Snowberry	*Symphoricarpos albus*	4	4	100
Evergreen	Ground-cover	Salal	*Gaultheria shallon*	3	1	33
Evergreen	Ground-cover	Sword fern	*Polystichum munitum*	5	4	80
Evergreen	Shrub	Evergreen huckleberry	*Vaccinium ovatum*	1	1	100
Evergreen	Shrub	Snowbrush	*Ceanothus velutinus*	3	0	0
Evergreen	Shrub	Tall Oregon grape	*Mahonia aquifolium*	4	6	150
Total				27	24	89*

* Number of plants alive in Y1/number of plants alive in Y0.

Table 10A. Estimated Cover by Plant Type in Management Unit 1 North Transect 1

Monitoring Year	Y0 Cover (%) (2017/2018)	Y1 Cover (%) (2018/19)	Y2 Cover (%) (2019/2020)	Change in Cover (%) Y0 to Y1	Change in Cover (%) Y0 to Y2	Change in Cover (%) Y1 to Y2	Species with Significant Cover (2019/20)
Deciduous Groundcover (%)	0	0	0	N/A	N/A	N/A	
Deciduous Shrub (%)	31	24	29	-7	-2	+5	SYMALB
Deciduous Tree (%)	0	0	0	N/A	N/A	N/A	
Deciduous Total (%)	31	24	29	-7	-2	+5	
Evergreen Groundcover (%)	7	4	0	-3	-7	-4	
Evergreen Shrub (%)	31	30	18	-1	-13	-12	MAHAQU
Evergreen Tree (%)	5	5	6	No Change	+1	+1	CALDEC
Evergreen Total (%)	43	38	24	-5	-19	-14	
Total Native Vegetation (%)	74	63	53	-11	-21	-10	
Est. Total Native Vegetation (%)	25-50	0-5	0-5	Decrease	Decrease	No Change	
Tree Canopy (%)	5-25	0-5	0-5	Decrease	Decrease	No Change	
Exposed Soil (%)	0-5	5-25	0-5	Increase	No Change	Decrease	
Invasive Species (%)	0-5	0-5	75-95	No Change	Increase	Increase	CYSTCO, RUBARM, PENSEM

N/A = not applicable, none planted. See Table 13 for plant code key.

Table 10B. Estimated Cover by Plant Type in Management Unit 1 North Transect 2

Monitoring Year	Y0 Cover (%) (2017/2018)	Y1 Cover (%) (2018/19)	Y2 Cover (%) (2019/2020)	Change in Cover (%) Y0 to Y1	Change in Cover (%) Y0 to Y2	Change in Cover (%) Y1 to Y2	Species with Significant Cover (2019/20)
Deciduous Groundcover (%)	0	7	0	+7	No Change	-7	
Deciduous Shrub (%)	11	11	12	No Change	+1	+1	SYMALB
Deciduous Tree (%)	0	0	0	N/A	N/A	N/A	
Deciduous Total (%)	11	11	12	No Change	+1	+1	PTEAQU (12%)
Evergreen Groundcover (%)	10	5	7	-5	-3	+2	POLMUN
Evergreen Shrub (%)	53	48	18	-5	-35	-30	MAHAQU
Evergreen Tree (%)	2	0	0	-2	-2	No Change	
Evergreen Total (%)	64	53	25	-11	-39	-28	
Total Native Vegetation (%)	75	71	49	-4	-26	-22	
Est. Total Native Vegetation (%)	25-50	5-25	Missing Data	Decrease	No Data	No Data	
Tree Canopy (%)	0-5	0-5	Missing Data	No Change	No Data	No Data	
Exposed Soil (%)	0-5	5-25	Missing Data	Increase	No Data	No Data	
Invasive Species (%)	0-5	0-5	Missing Data	No Change	No Data	No Data	

N/A = not applicable, none planted. See Table 13 for plant code key.

Table 10C. Estimated Cover by Plant Type in Management Unit 1 North Transect 3

Monitoring Year	Y0 Cover (%) (2017/2018)	Y1 Cover (%) (2018/19)	Y2 Cover (%) (2019/2020)	Change in Cover (%) Y0 to Y1	Change in Cover (%) Y0 to Y2	Change in Cover (%) Y1 to Y2	Species with Significant Cover (2019/20)
Deciduous Groundcover (%)	0	0	0	N/A	N/A	N/A	
Deciduous Shrub (%)	47	33	22	-14	-25	-11	SYMALB
Deciduous Tree (%)	0	0	0	N/A	N/A	N/A	
Deciduous Total (%)	47	33	27	-14	-20	-6	
Evergreen Groundcover (%)	7	0	0	-7	-7	NC	
Evergreen Shrub (%)	40	1	12	-39	-28	+11	MAHAQU
Evergreen Tree (%)	1	4	0	+3	-1	-4	
Evergreen Total (%)	48	5	12	-43	-36	+7	
Total Native Vegetation (%)	96	38	39	-58	-60	+1	
Est. Total Native Vegetation (%)	5-25	5-25	0-5	No Change	Decrease	Decrease	
Tree Canopy (%)	0-5	0-5	0-5	No Change	No Change	No Change	
Exposed Soil (%)	25-50	0-5	0-5	Decrease	Decrease	No Change	
Invasive Species (%)	5-25	0-5	50-75	Decrease	Increase	Increase	HOLLAN

N/A = not applicable, none planted. See Table 13 for plant code key.

Table 10D. Estimated Cover by Plant Type in Management Unit 1 South Transect 4

Monitoring Year	Y0 Cover (%) (2018/2019)	Y1 Cover (%) (2019/2020)	Change in Cover (%) Y0 to Y1	Species with Significant Cover (2019/20)
Deciduous Groundcover (%)	0	0	N/A	
Deciduous Shrub (%)	48	71	+23	CORCOR, SYMALB, HOLDIS
Deciduous Tree (%)	0	0	N/A	
Deciduous Total (%)	48	71	+23	
Evergreen Groundcover (%)	4	7	+3	POLMUN
Evergreen Shrub (%)	5	2	-3	
Evergreen Tree (%)	0	0	N/A	
Evergreen Total (%)	9	9	No Change	
Total Native Vegetation (%)	57	80	+63	
Est. Total Native Vegetation (%)	5-25	25-50	Increase	
Tree Canopy (%)	0-5	0-5	No Change	
Exposed Soil (%)	5-25	0-5	Decrease	
Invasive Species (%)	5-25	25-50	Increase	RUBARM, PENSEM, HOLLAN

N/A = not applicable, none planted. See Table 13 for plant code key.

Table 10E. Estimated Cover by Plant Type in Management Unit 1 South Transect 5

Monitoring Year	Y0 Cover (%) (2018/2019)	Y1 Cover (%) (2019/2020)	Change in Cover (%) Y0 to Y1	Species with Significant Cover (2019/20)
Deciduous Groundcover (%)	0	0	N/A	
Deciduous Shrub (%)	17	35	+18	ROSNUT, CORCOR, HOLDIS
Deciduous Tree (%)	0	0	N/A	
Deciduous Total (%)	17	35	+18	
Evergreen Groundcover (%)	9	4	-5	
Evergreen Shrub (%)	19	9	-10	MAHAQU
Evergreen Tree (%)	0	0	N/A	
Evergreen Total (%)	28	13	-15	
Total Native Vegetation (%)	45	48	+3	
Est. Total Native Vegetation (%)	5-25	5-25	No Change	
Tree Canopy (%)	5-25	0-5	Decrease	
Exposed Soil (%)	5-25	0-5	Decrease	
Invasive Species (%)	0-5	0-5	No Change	RUBARM, PENSEM, CONARV

N/A = not applicable, none planted. See Table 13 for plant code key.

Table 10F. Estimated Cover by Plant Type in Management Unit 1 South Transect 6

Monitoring Year	Y0 Cover (%) (2018/2019)	Y1 Cover (%) (2019/2020)	Change in Cover (%) Y0 to Y1	Species with Significant Cover (2019/20)
Deciduous Groundcover (%)	0	0	N/A	
Deciduous Shrub (%)	13	12	-1	ROSNUT
Deciduous Tree (%)	0	0	N/A	
Deciduous Total (%)	13	12	-1	
Evergreen Groundcover (%)	25	12	-13	GAUSHA
Evergreen Shrub (%)	29	13	-16	VACOVA
Evergreen Tree (%)	0	0	N/A	
Evergreen Total (%)	53	25	-28	
Total Native Vegetation (%)	66	37	-29	
Est. Total Native Vegetation (%)	5-25	0-5	Decrease	
Tree Canopy (%)	5-25	0-5	Decrease	
Exposed Soil (%)	5-25	5-25	No Change	
Invasive Species (%)	0-5	0-5	No Change	RUBARM, CLEVIT, CONARV, EPIANG

N/A = not applicable, none planted. See Table 13 for plant code key.

Table 10G. Estimated Cover by Plant Type in Management Unit 1 South Transect 7

Monitoring Year	Y0 Cover (%) (2018/2019)	Y1 Cover (%) (2019/2020)	Change in Cover (%) Y0 to Y1	Species with Significant Cover (2019/20)
Deciduous Groundcover (%)	0	0	N/A	
Deciduous Shrub (%)	19	22	+3	SYMALB
Deciduous Tree (%)	0	7	+7	
Deciduous Total (%)	19	22	+3	
Evergreen Groundcover (%)	6	19	+13	POLMUN
Evergreen Shrub (%)	13	7	-5	MAHAQU
Evergreen Tree (%)	0	3	-3	
Evergreen Total (%)	19	29	+10	
Total Native Vegetation (%)	38	53	+15	
Est. Total Native Vegetation (%)	5-25	5-25	No Change	
Tree Canopy (%)	0-5	0-5	No Change	
Exposed Soil (%)	5-25	0-5	Decrease	
Invasive Species (%)	5-25	5-25	No Change	RUBARM, PENSEM, CONARV

N/A = not applicable, none planted. See Table 13 for plant code key.

Table 10H. Estimated Cover by Plant Type in Management Unit 1 South Transect 8

Monitoring Year	Y0 Cover (%) (2018/2019)	Y1 Cover (%) (2019/2020)	Change in Cover (%) Y0 to Y1	Species with Significant Cover (2019/20)
Deciduous Groundcover (%)	0	0	N/A	
Deciduous Shrub (%)	23	17	-6	ROSNUT, SYMALB
Deciduous Tree (%)	0	0	N/A	
Deciduous Total (%)	23	17	-6	
Evergreen Groundcover (%)	8	27	+19	POLMUN
Evergreen Shrub (%)	21	8	-13	
Evergreen Tree (%)	4	6	+2	PINCON
Evergreen Total (%)	33	41	+8	
Total Native Vegetation (%)	56	58	+2	
Est. Total Native Vegetation (%)	5-25	5-25	No Change	
Tree Canopy (%)	0-5	0-5	No Change	
Exposed Soil (%)	5-25	5-25	No Change	
Invasive Species (%)	0-5	0-5	No Change	RUBARM, IMPGLA, PENSEM, EPIANG

N/A = not applicable, none planted. See Table 13 for plant code key.

Table 10I. Estimated Cover by Plant Type in Management Unit 1 South Transect 9

Monitoring Year	Y0 Cover (%) (2018/2019)	Y1 Cover (%) (2019/2020)	Change in Cover (%) Y0 to Y1	Species with Significant Cover (2019/20)
Deciduous Groundcover (%)	0	0	N/A	
Deciduous Shrub (%)	26	21	-5	HOLDIS, SYMALB, PHILEW
Deciduous Tree (%)	0	0	N/A	
Deciduous Total (%)	26	21	-5	
Evergreen Groundcover (%)	3	19	+16	POLMUN
Evergreen Shrub (%)	13	9	-16	MAHAQU
Evergreen Tree (%)	7	10	+3	
Evergreen Total (%)	23	42	+19	
Total Native Vegetation (%)	50	53	+3	
Est. Total Native Vegetation (%)	5-25	5-25	No Change	
Tree Canopy (%)	0-5	0-5	No Change	
Exposed Soil (%)	5-25	0-5	Decrease	
Invasive Species (%)	0-5	50-75	Increase	RUBARM, EPIANG, HOLLAN

N/A = not applicable, none planted. See Table 13 for plant code key.

Table 10J. Estimated Cover by Plant Type in Management Unit 1 South Transect 10

Monitoring Year	Y0 Cover (%) (2018/2019)	Y1 Cover (%) (2019/2020)	Change in Cover (%) Y0 to Y1	Species with Significant Cover (2019/20)
Deciduous Groundcover (%)	0	0	N/A	
Deciduous Shrub (%)	35	66	+31	CORCOR, SYMALB, HOLDIS, ROSNUT
Deciduous Tree (%)	0	0	N/A	
Deciduous Total (%)	35	66	+31	
Evergreen Groundcover (%)	19	14	-5	POLMUN
Evergreen Shrub (%)	8	11	+3	MAHAQU
Evergreen Tree (%)	0	0	N/A	
Evergreen Total (%)	27	25	-2	
Total Native Vegetation (%)	62	53	-9	
Est. Total Native Vegetation (%)	5-25	0-5	Decrease	
Tree Canopy (%)	25-50	25-50	No Change	
Exposed Soil (%)	5-25	0-5	Decrease	
Invasive Species (%)	0-5	5-25	Increase	RUBARM

N/A = not applicable, none planted. See Table 13 for plant code key.

Table 11. Landscape Observations for Management Unit 2 Squares

Square I.D.	R1S1A		R1S1B		R1S1C		R1S1D	
Monitoring Year	Y0 (2018/2019)	Y1 (2019/2020)	Y0 (2018/2019)	Y1 (2019/2020)	Y0 (2018/2019)	Y1 (2019/2020)	Y0 (2018/2019)	Y1 (2019/2020)
Restoration Status	Topped Trees Thinned and Planted		Topped Trees Thinned and Planted		Topped Trees Thinned and Planted		Topped Trees Thinned and Planted	
Slope (%)	80		80		28		80	
Soil Texture	Sandy Loam		Sandy Loam		Sandy Loam		Sandy Loam	
Slope Stability	Erosion	Erosion	Erosion	Erosion	Erosion	Erosion		
Soil Compaction	Light	Light	None	Light	Light	Light	None	Light
Litter Depth (inch)	0.5-1	0.5-1	0.5-1	< 0.5	0.5-1	< 0.5	0.5-1	< 0.5
Course Woody Debris (%)	5-10	0-5	5-10	0-5	0-5	0-5	0-5	0-5
Canopy Cover (%)	25-50	25-50	25-50	25-50	25-50	25-50	50-75	25-50
Exposed Soil (%)	5-25	5-25	25-50	5-25	5-25	25-50	50-75	50-75
Erosion Control Blanket (%)	None		None		5-25	0-5	None	
Type of Erosion Control Materials	Not Applicable		Not Applicable		Coir Blanket		Not Applicable	

Table 12A. Plant Survival and Cover for Management Unit 2 Square R1S1A

Evergreen/ Deciduous	Growth Habit	Common Name	Species	Y0 # (2017/2018)	Y1 # (2018/2019)	Survival (%) Y0-Y1	Y0 Cover (%) (2018/2019)	Y1 Cover (%) (2019/2020)	Change in Cover Y0-Y1
Deciduous	Shrub	beaked hazelnut	*Corylus cornuta*	2	1	50	5-25	5-25	No Change
Deciduous	Shrub	osoberry	*Oemlaria cerasiformis*	3	1	33	0-5	0-5	No Change
Deciduous	Tree	bigleaf maple	*Acer macrophyllum*	3	2	67	25-50	25-50	No Change
Evergreen	Ground-cover	sword fern	*Polystichum munitum*	2	1	50	0-5	0-5	No Change
Evergreen	Tree	Western hemlock	*Tsuga heterophylla*	2	0	0	0-5	0	Decrease
Invasives of Note (2019/2020)			ILEAQU, RUBARM				5-25	0-5	Decrease
Total				12	5	42			

See Table 13 for plant code key.

Table 12B. Plant Survival and Cover Management Unit 2 Square R1S1B

Evergreen/ Deciduous	Growth Habit	Common Name	Species	Y0 # (2017/2018)	Y1 # (2018/2019)	Survival (%) Y0-Y1	Y0 Cover (%) (2018/2019)	Y1 Cover (%) (2019/2020)	Change in Cover Y0-Y1
Deciduous	Shrub	vine maple	*Acer circinatum*	0	2		0	0-5	Increase
Deciduous	Shrub	salmonberry	*Rubus spectabilis*	7	2	29	5-25	5-25	No Change
Deciduous	Tree	bigleaf maple	*Acer macrophyllum*	1	1	100	5-25	5-25	No Change
Evergreen	Ground-cover	sword fern	*Polystichum munitum*	10	3	30	0-5	5-25	Increase
Evergreen	Tree	Western red cedar	*Thuja plicata*	2	2	100	0-5	0-5	No Change
Invasives of Note (2019/2020)			RUBARM, ILEAQU, DIGPUR, PENSEM				0-5	5-25	Increase
Total				20	10	50			

See Table 13 for plant code key.

Table 12C. Plant Survival and Cover Management Unit 2 Square R1S1C

Evergreen/ Deciduous	Growth Habit	Common Name	Species	Y0 # (2017/2018)	Y1 # (2018/2019)	Survival (%) Y0-Y1	Y0 Cover (%) (2018/2019)	Y1 Cover (%) (2019/2020)	Change in Cover Y0-Y1
Deciduous	Tree	bigleaf maple	*Acer macrophyllum*	5	4	80	25-50	25-50	No Change
Evergreen	Ground-cover	sword fern	*Polystichum munitum*	24	24	100	25-50	25-50	No Change
Evergreen	Tree	tall Oregon grape	*Mahonia aquifolium*	1	2	100	0-5	0-5	No Change
Invasives of Note (2019/2020)			RUBARM, ILEAQU, HEDHEL, VINMIN				0-5	0-5	No Change
Total				30	30	100			

See Table 13 for plant code key.

Table 12D. Plant Survival and Cover Management Unit 2 Square R1S1D

Evergreen/ Deciduous	Growth Habit	Common Name	Species	Y0 # (2017/2018)	Y1 # (2018/2019)	Survival (%) Y0-Y1	Y0 Cover (%) (2018/2019)	Y1 Cover (%) (2019/2020)	Change in Cover Y0-Y1
Deciduous	Ground-cover	hairy honeysuckle	*Lonicera hispidula*	1	1	100	0-5	0-5	No Change
Deciduous	Tree	bitter cherry	*Prunus emarginata*	5	4	80	25-50	25-50	No Change
Evergreen	Ground-cover	sword fern	*Polystichum munitum*	24	24	100	25-50	25-50	No Change
Evergreen	Shrub	evergreen huckleberry	*Vaccinium ovata*	1	1	100	0-5	0-5	No Change
Evergreen	Tree	coastal redwood	*Sequoia sempervirens*	2	2	100	0-5	0-5	No Change
Invasives of Note (2019/2020)			RUBARM, HEDHEL, ILEAQU				5-25	0-5	Decrease
Total				33	32	97			

See Table 13 for plant code key.

Table 13. Plant Code Key

CODE	Plant Species Name	Plant Common Name	CODE	Plant Species Name	Plant Common Name
CALDEC	*Calocedrus decurrens*	Incense cedar	MAHAQU	*Mahonia aquifolium*	Tall Oregon grape
CEAVEL	*Ceanothus velutinus*	Snowbrush	MORCAL	*Morella californica*	Pacific wax myrtle
CLEVIT	Clematis vitalba	Clematis	PENSEM	*Pentaglottis sempervirens*	Evergreen bugloss
CONARV	*Convolvulus arvensis*	Field bindweed	PHILEW	*Philadelphus lewisii*	Mock orange
CORCOR	*Corylus cornuta*	Beaked hazelnut	PINCON	*Pinus contorta*	Shore pine
CYSSCO	*Cystisus scoparius*	Scotch broom	POLMUN	*Polystichum munitum*	Western sword fern
DIGPUR	*Digitalis purpurea*	Foxglove	PTEAQU	*Pteridium aquilinium*	Bracken fern
EPIANG	*Epilobium angustifolium*	Willowherb	ROSNUT	*Rosa nutkana*	Nootka rose
GAUSHA	*Gaultheria shallon*	Salal	RUBARM	*Rubus armeniacus*	Himalayan blackberry
HEDHEL	*Hedera helix*	English ivy	RUBURS	*Rubus ursinus*	Trailing blackberry
HOLDISC	*Holodiscus discolor*	Oceanspray	SYMALB	*Symphoricarpos albus*	Snowberry
HOLLAN	*Holcus lanatus*	Common velvetgrass	VACOVA	*Vaccinium ovatum*	Evergreen huckleberry
ILEAQU	*Ilex aquifolium*	English holly	VERTHA	*Verbascum thapsus*	Common mullein
IMPGLA	*Impatiens glandulifera*	Ornamental jewelweed	VINMIN	*Vinca minor*	Common periwinkle

Figure 1. Mason Gulch Vicinity Map

ESA 2016; OSM 2016

Exhibit 1

Figure 2. Mason Gulch Landscape Management Units

Figure 3. Mason Gulch Elevation

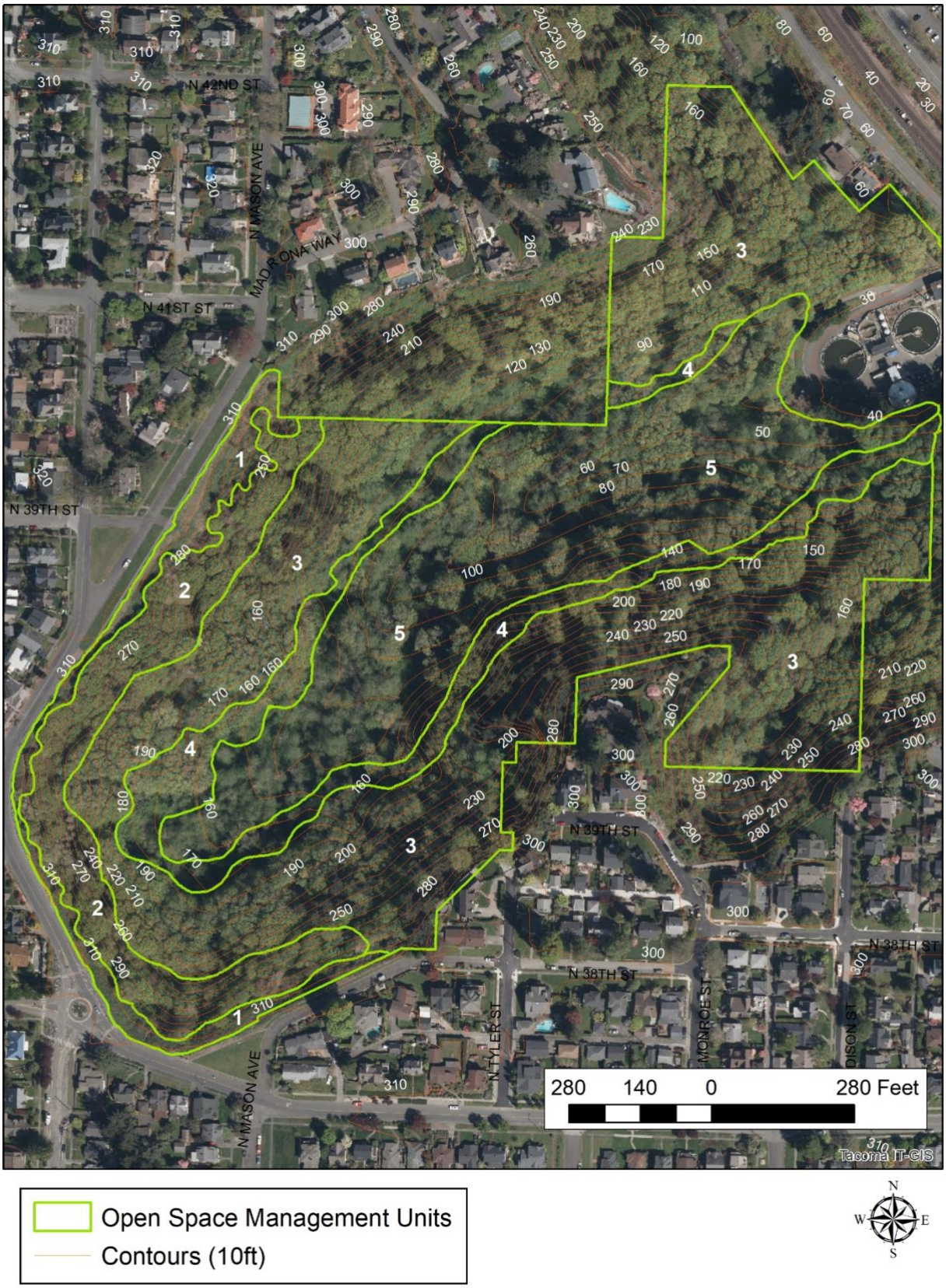


Figure 4. Mason Gulch Streams and Wetlands

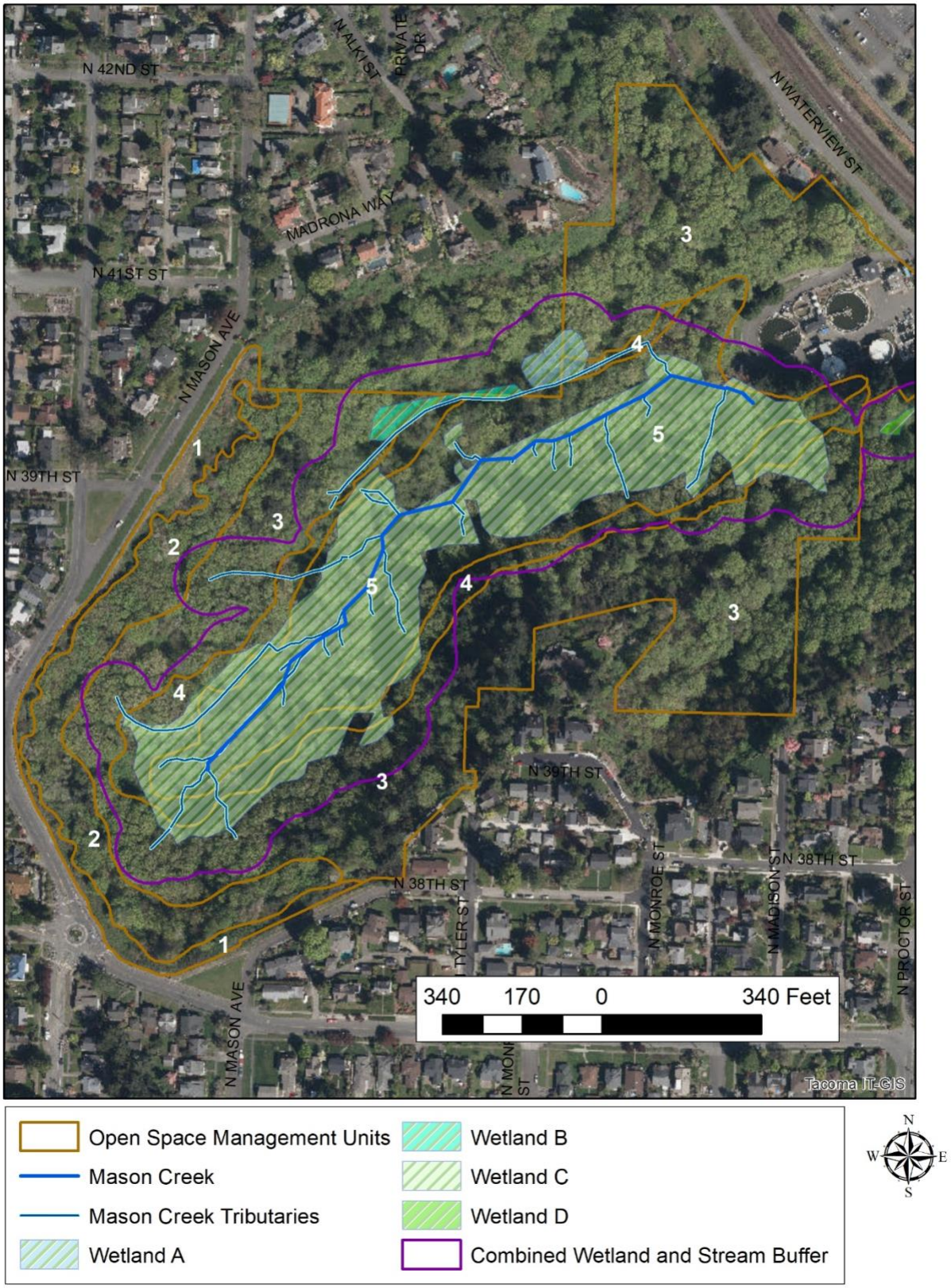


Figure 5. Mason Gulch Work Areas for 2019/2020

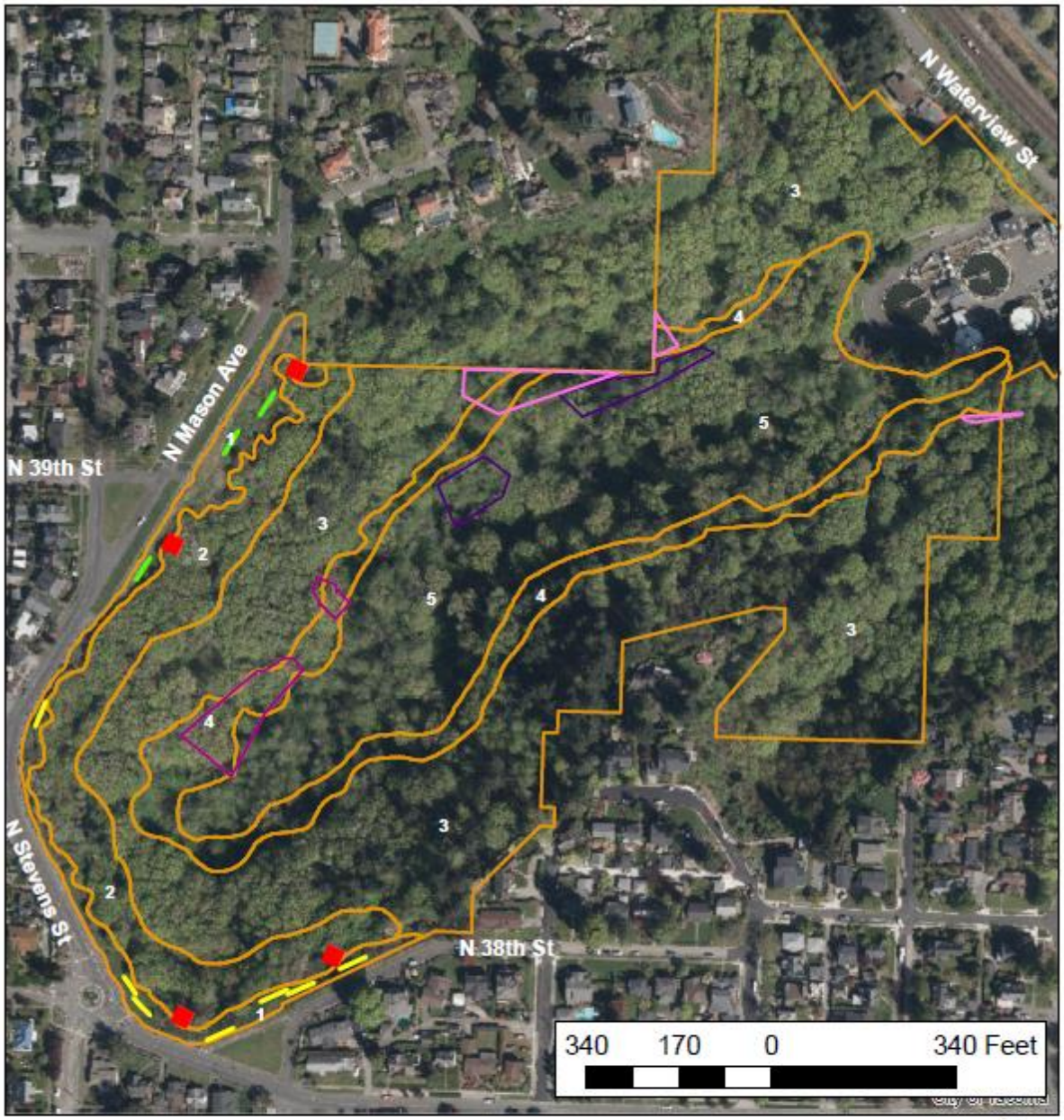
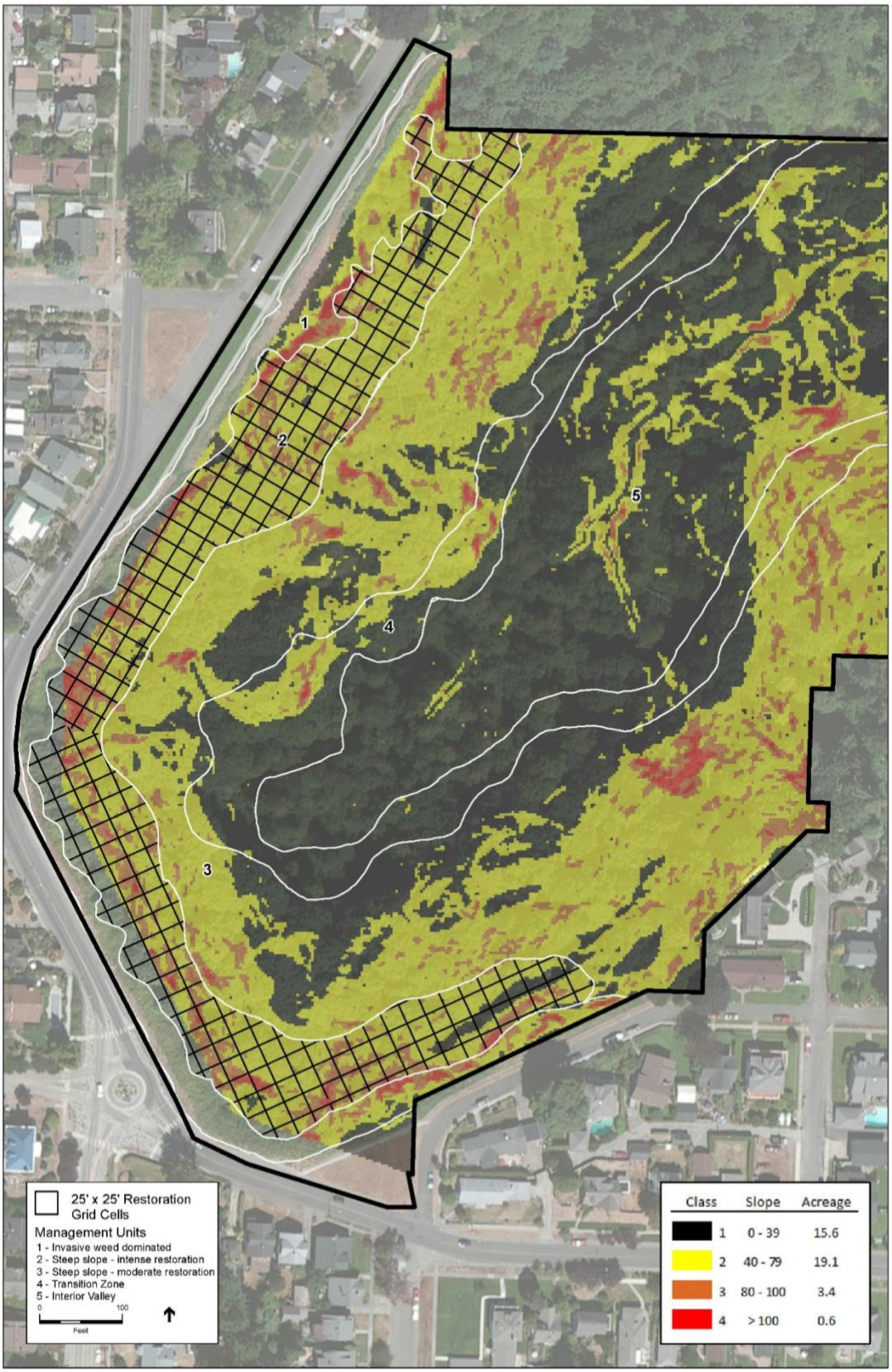


Figure 6. Restoration Grid Cells



SOURCE:
City of Tacoma 2016; NAIP 2013; ESA 2016

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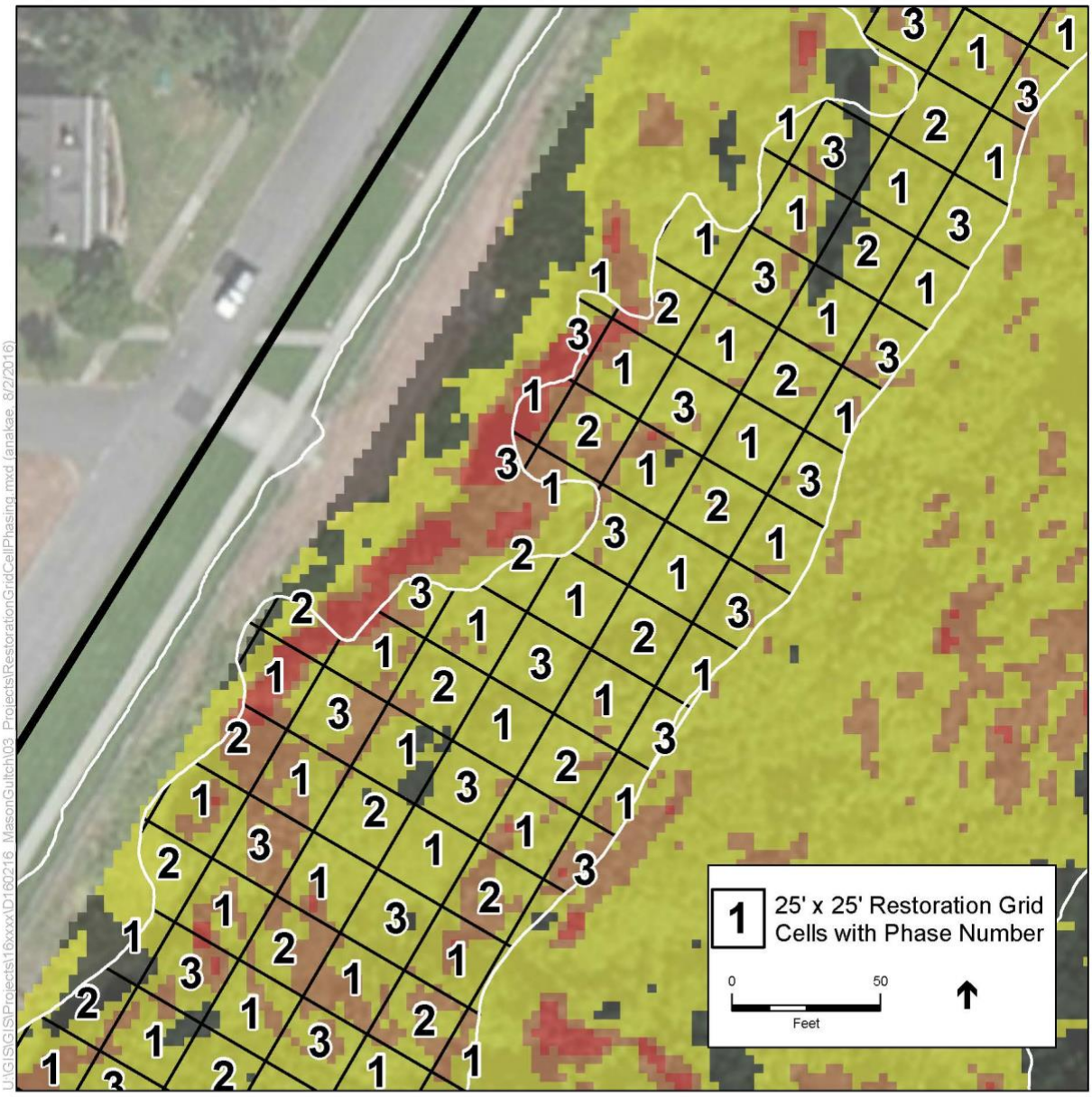
Figure 6
Restoration Grid Cells: Steep Slope - Intense Restoration

Figure 7. Restoration Grid Cell Phasing



SOURCE:
City of Tacoma 2016; NAIP 2013; ESA 2016

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Figure 7
Restoration Grid Cell Phasing