

# Schuster Slope Activities and Monitoring Report 2020/2021

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**Prepared by City of Tacoma**

**Passive Open Space Program**

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## 1.0 Introduction

The Schuster Slope Landscape Management Plan (hereafter referred to as the “LMP”) was permitted in 2015, and provides goals, objectives and performance standards for slope stability, forest health, public safety and other elements (Table 1). The Schuster Slope Management Area – Unit 1 Work Plan (City of Tacoma et al. 2016) (hereafter referred to as “MU1 Work Plan”) was created to provide a detailed planting and restoration plan for the first of ten management units (MUs) based on recommendations from the LMP. This plan was reviewed by GeoEngineers (2015). The work plan for Management Unit 2 (MU2 Work Plan), modeled after the MU1 Work Plan, was developed by City of Tacoma Open Space staff and reviewed by Robinson Noble, Inc. (2016).

The purpose of this report is to provide an overview of the activities performed on Schuster Slope during 2020/2021 from the MU1 and MU2 Work Plans. The 2020/2021 reporting year began October 1<sup>st</sup>, 2020 and ended September 30<sup>th</sup>, 2021. In addition, relevant performance standards outlined in the Schuster Slope LMP will be addressed and monitoring results will be summarized and used to make recommendations concerning future activities.

### 1.1 Schuster Slope Background Information

Schuster Slope is a steeply sloped, urban forest adjacent to the west shore of Commencement Bay in Tacoma, WA (Figure 1). Approximately 55% of the area is comprised of slopes greater than 60% that frequently experience soil creep and surficial sloughing, with occasional debris flows. The dominant trees on Schuster Slope are early successional species dominated by bigleaf maple. Under naturally occurring forest succession processes, shade tolerant conifers and other longer lived woody species would have established, however, both the presence of invasive species and the lack of local parent material have precluded this opportunity. Restoration efforts are focused on moving Schuster Slope toward a healthy North Pacific Maritime Mesic Wet Douglas-Fir-Western Hemlock Forest ecosystem for improved stormwater benefit, slope stability and diversity for climate change resilience.

Schuster Slope is made up of 10 management units (Figure 1), totaling 31.2 acres. The LMP indicates Schuster Slope is divided into nine management units, however these were redistributed by the City of Tacoma to create more homogeneous units to better accommodate future work. Management Unit 1 remains unchanged from the LMP. Management Unit 2 has been altered from the LMP. Where it once spanned the slope from top to bottom adjacent to Management Unit 1 (MU1), it is now stretched across the top of the slope directly above MUs 3-6 (Figure 1).

Restoration began in 2015 when invasive vines were cut around trees (survival rings) in all areas of the site safe to access. Management Unit 1 is located at the southern end of the slope and is made up of six treatment plots (TPs), together totaling 2.8 acres in size (Figure 2). Slope stabilization efforts, including the installation of erosion control best management practices (BMPs) and planting native vegetation, occurred on most of MU1 in 2015/2016, and was completed in 2016/2017. Some additional infill planting occurred on MU1 during 2018/2019. Infill planting typically occurs when plants have poor survival due to dry conditions, animal browsing, pests or some other disturbance. Habitat restoration area monitoring began in the summer of 2017 for MU1 TPs 1 through 5, and part of TP6. Monitoring will take place for a total of

five consecutive growing seasons (through 2021) to determine vegetation survivability and cover as they pertain to the LMP permit requirements for the City of Tacoma. Monitoring for the remainder of TP6 began in the summer of 2018 and will continue through 2022.

Management Unit 2 is located north of MU1, and makes up approximately the upper one-third of the slope, with MUs 3-6 comprising the lower two-thirds of the slope (Figure 1). Management Unit 2 is 2.8 acres in size and made up of four TPs (Figure 3). Restoration began on Management Unit 2 (MU2) during 2016/2017, however the majority of efforts occurred during 2017/2018. Infill planting also took place in MU2 during 2018/2019. Monitoring began in MU2 during the summer of 2019 and will continue for five consecutive growing seasons.

Monitoring outcomes will be used to assess if standards related to slope stability, forest health, public safety, and other objectives are being met, as described in Section 4 of the LMP (See Table 1). Qualitative observations concerning human induced actions will also be considered.

## 1.2 Management Unit 1 Description

In the Baseline Conditions Assessment Report for Schuster Slope (GeoEngineers, 2014), the majority of MU1 was considered to have high landslide susceptibility as evidenced by active soil creep, limited groundcover vegetation and loose surficial soils. Slopes within the project area typically range from 60% to over 100%.

Vegetation within MU1 includes a mature deciduous canopy throughout most of the unit, and prior to restoration, heavy Himalayan blackberry (*Rubus armeniacus*) monocultures were found in the understory in some locations, and sparse understory vegetation in others. Heavy cover of English ivy (*Hedera helix*) and old-man's beard (*Clematis vitalba*) were also noted in some locations before restoration efforts took place. The top section of the slope, where there is a less steeply sloped bench adjacent to Stadium Way, can be characterized by young tree stands without overstory forest canopy; prior to restoration invasive monocultures were present as well. Some of the invasive monocultures extended down the slope over steep terrain, and still exist in areas with greater than 80% slope.

### 1.2.1 Management Unit 1 Treatment Plot Descriptions and Pre-Restoration Conditions

Management Unit 1 is divided into six TPs (Figure 2) based upon differences in soil composition, sunlight, slope and vegetation. Treatment plots located at the top of the slope (TPs 3 & 4) are generally separated from those at the bottom of the slope (TPs 5 & 6) by a "no touch" area, where slopes are 80% or greater (red hatched area in Figure 2). Treatment Plot 1 was located in this no touch region, however this area was covered with erosion control materials and planted from the top of TP2 to the bottom of TP3 during 2017/2018 per the LMP.

Treatment Plot 1 was a 10 foot (ft) x 16 ft experimental plot of land with slopes greater than 80%. Treatment Plot 2 was located below TP1 and generally has steep slopes (60%-100%). Treatment Plot 2

receives full sun, and had 100% invasive species cover made up of Himalayan blackberry (*R. armeniacus*) and Scotch broom (*Cytisus scoparius*) prior to restoration. All of TP1 became encompassed by TP2 when the TP2 restoration area was expanded upslope during 2017/2018. Treatment Plots 3 and 4 are located at the top of the slope. These areas experience full sun, and had approximately 80% invasive species cover dominated by Himalayan blackberry (*R. armeniacus*) before restoration. Treatment Plots 2-4 all have similarly sandy soils.

Treatment Plot 5 is located below TP3, and above the retaining wall adjacent to Schuster Parkway. Despite having a full canopy of bigleaf maple (*Acer macrophyllum*) trees, there was approximately 60% invasive cover dominated by Himalayan blackberry (*R. armeniacus*) that existed in patches throughout the site. Soils in this area are sandy with some gravel and cobble. Treatment Plot 6 is the largest TP in MU1, and consists of very steep slopes, sandy soils with significant amounts of gravel and cobble, a full canopy of bigleaf maples (*A. macrophyllum*), and little to no native understory vegetation prior to restoration. Approximately 30% of the area was covered with invasive vines. A small wetland is present at the toe of the slope in TP6.

### 1.3 Management Unit 2 Description

Management Unit 2, located at the top of the slope, is divided into four TPs (Figure 3). In general, MU2 is dominated by bigleaf maple (*A. macrophyllum*) trees, many of which were previously coppiced. Monocultures of Himalayan blackberry (*R. armeniacus*) and English ivy (*H. helix*) dominated the understory before restoration. Slopes are typically between 40%-80%. Soils tend to be made up mostly of sandy silt with some gravel.

#### 1.3.1 Management Unit 2 Treatment Plot Descriptions and Pre-Restoration Conditions

Prior to restoration, TP1 had an extensive monoculture of Himalayan blackberry (*R. armeniacus*) as well as English ivy (*H. helix*) in the understory. This area, being the largest of the TPs in MU2, has slopes ranging from less than 40% to greater than 80%. The soil has been compacted and degraded as a result of past construction activities. A social trail spans nearly the entire length of TP1 on the lower ledge above the no touch area, and homeless encampments have been commonplace in this area.

Treatment Plot 2 is a narrow stretch of land commonly used as an informal walking trail. Encampment debris has been abundant in this area. Himalayan blackberry (*R. armeniacus*) dominated the north portion of the plot. Slopes in this treatment plot are predominately greater than 80%.

Treatment Plots 3 and 4 had large areas of invasive Himalayan blackberry (*R. armeniacus*) and English ivy (*H. helix*) prior to restoration. Portions of these plots are characterized by coppiced bigleaf maple (*A. macrophyllum*) trees growing in especially tight clusters in TP3. Significant portions of both areas have slopes greater than 80%. Soils in TP4 have more silt compared with the other TPs in MU2. A band of concrete road construction debris (~ 800 ft<sup>2</sup>) runs through TP3. Treatment Plot 4 includes two relic staircases from the decommissioned Bayside Trail, which invite transient activity on the site. For the time being, the staircases will remain to provide restoration access for work crews.



## 2.0 Management Unit Activities

### 2.1 Management Considerations

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

- a. **Slope Stability and Geologic Hazard Mitigation:** This element is the main priority within the project area and will be considered critical in areas where slopes exceed 40%.
- b. **Forest Health:** This element should be applied throughout the project area in order to ensure the long-term success and habitat improvement of the project area.
- c. **Public Safety and Infrastructure Protection:** This element should be applied within public areas and adjacent to infrastructure where there is public interaction.
- d. **Views from Adjacent Areas:** This element may be considered in areas where view management has been identified in this management plan or by a private project proponent.
- e. **Voluntary Stewardship:** This element should be considered in areas that have the appropriate site conditions to provide for community volunteerism and restoration.

### 2.2 Restoration Overview

Restoration began on Schuster Slope in 2015, and survival rings (ivy and clematis) were cut around trees in areas that were safely accessible to crews. Intensive restoration activities began in 2016, on the first of ten management units (Figure 1). Management Unit 1 is approximately 124,303 ft<sup>2</sup> (2.8 acres), however only 89,470 ft<sup>2</sup>, or slightly over 2 acres, were involved in the MU1 Work Plan due to the band of severely steep slopes (>80%) cross-cutting the area (Figure 2). Management Unit 1 was divided into six TPs. Treatment Plot 6 makes up approximately 51% of MU1, however only 60% of TP6 was planted in 2015/2016 due to time constraints, with the remainder of the area being planted during 2016/2017. An additional 5,600 ft<sup>2</sup> of the slope, located between TP2 and TP3, was restored in 2017/2018 as part of an experimental plot outlined in the LMP. Management Unit 2 (Figure 3) is 123,692 ft<sup>2</sup> (2.8 acres) and made up of four treatment plots, the majority of which were planted in 2017/2018. Restoration work was performed by Washington Conservation Corps (WCC) crews, and supervised by Passive Open Space Program staff.

### 2.3 Invasive Vegetation Removal (Pre-Planting)

Monocultures of invasive species and other noxious weeds were sprayed with 0.75% Triclopyr with a 1.0% surfactant. Those weeds found in the wetland or wetland buffer areas were sprayed with an aquatic formulation of 2.0% glyphosphate with a 1.0% surfactant. Once the weeds senesced, they were brush-cut to the ground, and covered with erosion control blanket in areas where slopes were between 40%-80%. This methodology is a Best Management Practice (BMP). Leaving the roots *in situ* lessens soil disturbance and helps maintain slope integrity until newly planted vegetation becomes established.

Weeds on slopes between 0%-80%, not sprayed with herbicide, were also brush-cut to the ground and/or covered with erosion control blanket (when slopes were >40%) (Table 1 – Sections 4.2.1.1 and 4.2.2.2).

## 2.4 Erosion Control BMP Installation

All areas of MU1 TP6 planted during 2016/2017 had erosion control material installed the previous season (2015/2016) (Table 2A). The rest of MU1 was previously covered using BMPs in 2015/2016, aside from the TP2 expansion area which was covered later. Most erosion control materials for MU2 were installed during 2017/2018, with smaller areas having been covered during 2016/2017 (Table 2B). Erosion control blanket in these areas was made of 100% coir or 70% straw/30% coir, and 9" diameter straw wattles wrapped in photo-degradable netting were installed with wooden stakes (Table 1 – Section 4.2.1.2).

## 2.5 Vegetation Installation

Vegetation was planted in each treatment plot in accordance with the LMP, and MU1 and MU2 Work Plans (Table 1 – Sections 4.2.1.1 and 4.2.2.1, Table 3). Planting for MU1 and MU2 occurred during the time periods outlined in Table 4A, after the installation of erosion control materials. Also, in accordance with the MU1 Work Plan, TP2 was planted as a 20 ft lateral band beginning from the bottom of the MU during 2015/2016. As this vegetation matured, the next 20 ft lateral band was planted upslope during 2016/2017 and another in 2017/2018. Vegetation was installed in MU2 during 2017/2018 (Table 3, Table 4B), and monitoring began in 2018/2019.

## 2.6 MU1 Treatment Plot 6-Experimental Sub-Treatment Plots

Soils in TP6 are rocky and nutrient poor. Due to the low expected survivorship of newly planted vegetation in TP6, fabric was added to the planting holes to help retain soil, and thus nutrients, as well as provide stability for the establishing plants in this area known for soil creep. Three different types of fabric (straw, burlap or coir) were added to the planting holes, each of which was considered an experimental treatment. For this reason, TP6 was divided into 12 sub-treatment plots, with each sub-TP receiving one type of fabric or serving as a control (no fabric). The monitored sub-TP planted in 2016/2017 was TP6-1C, while TP6-1D, 2E, and 3F were planted in 2017/2018 (Table 4A & B, Figure 2). No differences were seen in plant survivorship or cover during the 2017/2018 or 2018/2019 monitoring periods, therefore the treatments received in each of the plots have not been taken into consideration in data analysis since the 2018/2019 monitoring season.

## 2.7 Restoration Activities Outside the LMP

During the fall of 2019, 20 madrones (*Arbutus menziesii*) were planted along the flat ledge of MUs 8 and 9 (Figure 1). This area is flat and not included in the LMP. Staff noted browse damage shortly after planting, therefore the trees were caged to prevent further damage. These trees were grown from seeds collected at a variety of locations throughout their native range. Washington State University (WSU) researchers are tracking the health of plantings at common garden sites to determine if ecotypes may be successful at different latitudes. The City is partnering with WSU on this study at Schuster Slope by planting and monitoring trees provided by WSU. Additionally, evergreen trees were planted on the flat bench of MU9 during November 2019.

## 3.0 Methods

### 3.1 Monitoring Requirements from the Landscape Management Plan

According to the Schuster Slope LMP Specifications (2015), “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 4.2 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 restoration site will include 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 will be monitored using randomly selected but permanent sample plots located along the established permanent transect (2 sample plots per 50 foot transect). Sample plots will consist of a 9 foot radius circle from a stationary point along the transect.
- Photographs will be 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 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.”

### 3.2 Monitoring Personnel

The development and implementation of monitoring methodologies, data collection, and data analyses were performed by City of Tacoma Passive Open Space staff with the assistance of WCC crew members during monitoring.

### 3.3 Monitoring Locations

#### 3.3.1 Transect and Quadrat Selection

In MU1 and 2, the total number of possible transect lengths was selected based upon the acreage of the treatment plot to equal one 50 ft transect per quarter acre. The maximum length of the TP 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 TP along the y-axis. This was done by using the same methodology used to identify transect location along the x-axis. The total width of the TP was determined and divided by 18 ft (diameter of the quadrat). The first possible location of the transect center along the y-axis was located 9 ft from the top of the slope, with each subsequent potential transect center location being placed 18 ft downslope. A random number generator was used to determine where each transect would be placed along the y-axis.

Two 9 ft radius quadrat locations were identified along the transect by selecting a quadrat center point between 9 ft and 41 ft using a random number generator. This process was repeated until two non-overlapping quadrats were identified. Quadrats for MU1 were selected using the same method, however the y-axis was divided into 9 ft widths, instead of 18 ft widths, due to the smaller size of the quadrats (4.5 ft radius vs. 9 ft radius) (see Schuster Slope Monitoring Report (2016/2017 for explanation).

### 3.3.2 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. Measurements were made from permanent landmarks with either a wheel measure or a tape measure. 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. Also, white, spray-painted marks were made on the sidewalk below MU1 TPs 2 and 6; above MU1 TPs 3 and 4, and all MU2 TPs; and on the retaining wall below TP5. These marks were placed in line with each transect end point for ease in future location. Black sharpie was used to write labels on each of the marks. GPS coordinates had been attempted during monitoring year 1 (Y1) using a Trimble R1GNSS receiver with an antenna to boost the signal, however accuracy error was still up to 30 ft due to the interference of the steep slope and trees.

The rebar marking the monitoring locations has been removed in some treatment plots without permission, making it difficult to locate previous monitoring locations in MU1 TPs 3 and 6 and in MU2 TPs 1, 2, 3 and 4. The monitoring locations were estimated, and in some cases, the rebar in these plots replaced to the best of the monitoring crew's ability. Although photos of the monitoring locations had been taken the previous year, changes in vegetation such as plant mortality, growth of grasses and infill planting, made comparisons challenging.

### 3.3.3 Total Number of Transects and Quadrats in each Treatment Plot

The number of transects within each TP was based upon the LMP requirements of one 50 ft transect per quarter acre. One 50 ft transect was established for MU1 TPs 2, 3, 4, and 5, and MU2 TP2. Three transects were identified for MU1 TP6, MU2 TPs 3 and 4, and four transects for MU2 TP1. Two 9 ft radius quadrats were established along each of the transects for MU2 (Figure 3). The quadrats for MU1 had a 4.5 ft radius (Figure 2).

## 3.4 Data Collection

Data collected in the quadrats and transects (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.

Data collected during 2016/2017, 2019/2020 and 2020/2021 was recorded with an iPad, using a GIS Survey123 program that was linked to the City of Tacoma Environmental Services ESRI cloud. Data collected in all other monitoring years was recorded in writing and entered manually to the database.

### 3.4.1 Estimation of Cover in Transects

To collect data within a transect, 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 within 3 ft 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 11A-11F & 12A-12K). The percent exposed soil and percent invasive species covers were estimated visually using a Daubenmire scale (Table 6).

### 3.4.2 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 the temporary rebar in the center of the quadrat, and a 9 ft radius circle (quadrat) was marked using pin flags. Data observations were made regarding native plant numbers, percent aerial cover, and other physical factors associated with the quadrat (Tables 7A-7H & 8A-8D).

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.

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).

### 3.4.3 Drone Footage

We tested using drones to collect data during 2019/2020, in an attempt to reduce damage to the slope from monitoring. High resolution drone footage was captured as close as six feet above the ground in

areas of the slope that were part of routine monitoring. Unfortunately, a significant number of plants were unable to be identified, even when the footage was magnified. Thus, drone footage will not be used to assess detailed restoration impacts to the slope at this time. As drone methodologies rapidly advance, this might become an option in the future.

## 4.0 Results/Discussion

### 4.1 General Observations

#### 4.1.1 Management Unit 1

Few changes occurred in the MU1 landscape between 2019/2020 and 2020/2021 monitoring years. Slopes in MU1 generally ranged from 40%-80%, with most areas having dry, sandy soils (Tables 7A-7H). Treatment Plot 6 soil also has significant amounts of gravel and cobble.

During February, 2020, two landslides occurred, starting at the top of TP3, and ending in TP2 (Figure 2). The width of each landslide was ~15 ft. Ecology blocks and fencing prevented most of the material from reaching the street and sidewalk. Water from light rail construction activities, in addition to regular winter precipitation run-off, was all being diverted to drain directly into TP3 from Stadium Way. This is the most likely cause of the landslides, and Sound Transit has taken responsibility for restoring this area during fall/winter 2021 with the City approving the restoration plan. In the meantime, plastic sheeting has been placed over the eroded area. The contractor responsible for the landslide will hire a qualified non-City crew to perform the physical work. The landslide overlapped with part of the monitoring transect in TP3 and one of the quadrats in TP2.

As a result of the landslide, there an increase in exposed soil in T1-Q1 (Table 7A) during 2019/2020. The plastic sheeting covering the landslide area was partially burned during 2020/2021 and not replaced by the contractor, resulting in an expansion of the exposed soil. Significant landscape changes were not seen in all other TP's in MU1 (Tables 7B-7E).

#### 4.1.2 Management Unit 2

Treatment plots in MU2 (Tables 8A-8D) had sandy-silt soils, and monitoring locations were generally less steep in MU2 relative to MU1, ranging from 17%-80%. Treatment Plot 1 had large pieces of concrete debris and soil compaction from construction, while TP2 had soil compaction related to construction and restoration activities. A band of road construction debris runs through TP3, however the monitoring locations did not overlap with that band. In general, soils had higher concentrations of silt moving across the site from TP1 to TP4.

In general, exposed soil did not change much in MU2 from 2019/2020 to 2020/2021 (Tables 8A- 8D). Some increases in exposed soil were seen in TP3-T2Q1 and Q2 and T3Q1+Q2 (Table 8C). The reason for this increase appears to be from degradation of erosion control blanket. Treatment Plot 4-T2Q1 and Q2 showed a small decrease in exposed soil, however this was due to dumped yard waste and not restoration

plant growth (Table 8D).

## 4.2 Plant Survival

### 4.2.1 Management Unit 1 Plant Survival

Quadrats were used to estimate survival for vegetation planted in MU1 TPs 2, 3, 4, 5, and 6-1C. Baseline monitoring was not performed for these plots, therefore survival was calculated based upon the estimated number of plants installed per quadrat in Y0 which was extrapolated from the total number of plants installed in each TP, which was known. Infill planting has taken place in all MU1 treatment plots since Y1, making it challenging to calculate percent survival accurately. Thus, survival was calculated based on the number of plants present regardless of year planted. This author suggests that plant cover is a better estimator of plant health and survival for the Schuster Slope restoration. Monitoring did not occur for MU1 TPs 6-1D, 6-2E and 6-3F (Tables 9F-9G) during 2020/2021 as all plot markers had been removed prior to 2019 without permission and most of the vegetation had died, making plot identification nearly impossible. However, qualitatively, these plots appeared very similar to TP6-1C.

The number of plants recorded for each table (9A-9H) represents the sum for two quadrats. Most of the plant species in MU1 TPs 2-6 had low survival. Plants that performed better included snowberry (*Symphoricarpos albus*) and tall Oregon grape (*Mahonia aquifolium*), and shore pine (*Pinus contorta*) to a lesser extent. These results are similar to those observed during previous monitoring years.

Since monitoring began in 2017 at Schuster Slope, the following species that were part of the prescribed plant palette (Table 3) have shown moderate to poor survival in MU1: vine maple (*Acer circinatum*), bald hip rose (*Rosa gymnocarpa*), Kinnikinnick (*Arctostaphylos uva-ursi*), sword fern (*Polystichum munitum*) and Pacific wax myrtle (*Morella californica*). Survival has been slightly better for Nootka rose (*Rosa nutkana*), osoberry (*Oemleria cerasiformis*) and oceanspray (*Holodiscus discolor*) in this area. These plants should have performed well given the amount of sunlight, however the nutrient poor soils and dry summer conditions seemed to contribute to poor survival as watering was not allowed previously per the LMP due to slope steepness. New plants species that have been added to the planting palette for MU2, such as red flowering currant (*Ribes sanguineum*) and thimbleberry (*Rubus parviflorus*), may be considered for infill in MU1 if they perform well, in addition to climate adapted species.

Percent plant survival in MU1 ranged from 11% (TP5, Table 9D) to 1200% (TP4, Table 9C). Higher survival can mostly be attributed to the persistence or increase in the number of tall Oregon grape (*M. aquifolium*) (Tables 9B & 9C). Plants are counted if all or part of their stem is within the quadrat. A trail running through the monitoring quadrats may have contributed to low survival in TP5; this trail is frequented by people experiencing homelessness. Lower survival in TP2 quadrats (40%, Table 9A) was due in part to the landslide that occurred in 2020 and the fire that occurred in 2021. Dry, shifting, gravelly soils in TP6 along with a nearly full tree canopy make plant survival difficult in this area (Table 9E).

### 4.2.2 Management Unit 2 Plant Survival

Year 2 survival could not be calculated accurately for plants in MU2 due to infill planting, however, some



trends were apparent (Tables 10A-10K). Snowberry (*S. albus*) appeared to have the best survival amongst all plants in all monitored transects, with tall Oregon grape (*M. aquifolium*), shore pine (*P. contorta*) and oceanspray (*H. discolor*) doing well in a couple transects.

Year 0 to Y3 survival for all plants in MU2 ranged from 9% (TP4-T2, Table 10J) to 58% (TP1-T1, Table 10A). There were plots where markers had been removed making qualitative monitoring the only option; the tables for these plots include X's or O's instead of numbers to indicate species presence or absence within the area near the plot. As a result of the Covid-19 pandemic, homeless encampments could not be moved per Washington State Department of Health regulations, and resulted in increased activity in MU2 that may have contributed to poor plant success. Additionally, WCC crews were not able to work near encampments, therefore needed maintenance could not be performed. Low survival in TP4-T2 was due primarily to illegal dumping of yard waste (Table 12J). The City has attempted to address this twice with adjacent property owners through targeted outreach.

### 4.3 Percent Cover and Plant Community Composition

Plants that typically reach 15 ft or more in height are considered trees in this report, while shrubs are typically multi-stemmed with mature heights of 3 ft-15 ft. Low growing, spreading plants with mature heights < 3 ft are considered groundcovers for this report. Tree canopy cover is a separate category and not included in the native plant cover category; only trees > 5" DBH are considered part of the tree canopy. Tree canopy cover generally did not decrease in any of the plots, rather the unexpected differences were most likely due to estimations from different monitoring teams when the actual value was close to the category breaks (e.g. canopy cover that was near 50% might have been categorized as either 25%-50% or 50%-75%). Volunteer and established plants are taken into account in plant cover. Although low Oregon grape (*Mahonia nervosa*) and snowberry (*S. albus*) are considered groundcovers in the planting palette created by the consultants for the LMP (Table 3), they are considered shrubs in this report.

Some TPs in Tables 11A-11F and 12A-12K showed cover greater than 100%. This occurred because more than one plant can have foliage that occupied space within 3 ft of the center transect line both horizontally and vertically. It is important to note that cover measurements are especially useful for making comparisons of plant growth from year to year. The Estimated (Est.) Total Native Vegetation is an estimate of native plant cover for the entire transect area using a Daubenmire scale (Table 6). This estimate, examined with Total (measured) Native Vegetation can provide a better picture of the structure of plant composition. For example, a transect with a high Total Native Vegetation cover and a low Est. Total Native Vegetation cover could indicate the vegetation present had more complex canopy layering (Tables 11A & 11C).

#### 4.3.1 Management Unit 1 Plant Cover

The average Total Native Vegetation cover increase was 17% across all MU1 transects (Tables 11A-11E), however, the most significant gain (75%) was seen in TP3 (Table 11B), even with the landslide area taking up 24% of this transect. Transects 2 and 4 also had significant gains in cover at 21% and 31%, respectively (Tables 11A and 11C). Transects 2 and 4 also had an increase in the Total Estimated Native Vegetation cover with TP2 increasing from 25%-50% to 50%-75% cover, and TP4 increasing from 5%-25% to 50%-



75% cover. Treatment Plot 5 had an 8% increase in plant cover. In all monitored transects, the gains or losses in vegetation cover were comparable between evergreen and deciduous vegetation, with the exception of TP3 which saw no change in evergreen vegetation cover but a 75% increase in deciduous vegetation (Table 11B).

Deciduous plants with significant cover included Nootka rose (*R. nutkana*) in TPs 2 and 3, oceanspray (*H. discolor*) in TPs 2, 3, 5 and 6-1C and snowberry (*S. albus*) in TPs 3, 4, 5 and 6-1C (Tables 11A-11E). Those evergreen plants with significant cover were tall Oregon grape (*M. aquifolium*) in TPs 2, 3 and 4, grand fir (*Abies grandis*) in TPs 2 and 5, Austrian pine (*Pinus nigra*) in TP3, shore pine (*Pinus contorta*) in TP4, and sword fern (*P. munitum*) in TP6-1C. A few Austrian pine were mixed in with the shipment of shore pine and accidentally planted in Y0.

In areas that are generally less impacted by transient activity, such as TPs 2, 3 and 4, Total Native Vegetation cover was 50%-75% and these areas appear to have a more complex multi-layered plant canopy (Tables 11A – 11C). Tree canopy cover varied between these areas. Treatment Plots 3 and 4 had tree canopy cover of 5%-25% and 0%-5%, respectively, and had few trees at the beginning of restoration. Planted evergreen trees have shown steady growth in these areas, with many trees showing increases in height and girth, growing from a stem size of <2" DBH to a 2"-5" stem. In the next couple years these trees, which include mostly shore pine (*P. contorta*), should reach a height where they are contributing to the overall tree canopy. In general, evergreen trees are large enough to provide significant tree canopy cover when they have a stem >5" DBH and are at least 5 ft tall, and for deciduous trees, when the bottom of the crown is typically taller than 5 ft. The tree canopy in TP3 is rooted primarily in the adjacent TP2 and is significant at 75%-95% (Table 11B).

Estimated Native Vegetation cover for TPs 5 and 6-1C is 5% -25%. Treatment Plot 5 has significant transient activity that has made plant establishment difficult. There are areas of TP5 with more tree canopy cover, but there are also areas with less cover (5%-25%), as seen in the monitoring transect. The majority of trees in this area are bigleaf maples (*A. macrophyllum*) that are diseased and in decline. Fortunately, grand fir (*A. grandis*) appears to be growing well in this area. Tree survival is minimal in TP6 and there were not trees in the monitored plots (TP6-1C) (Table 11E). As mentioned previously, this area has a significant tree canopy, albeit of bigleaf maple trees in decline, leaving few native tree species that can establish under the canopy. Tree establishment is further hampered by nutrient poor, dry, shifting, gravelly soils. Different planting hole treatments have been tried in the past without success. The only advantage in this area is that invasive plants are unable to grow well either, with cover typically being <5% (Table 11E).

Invasive species cover decreased in TP2, but still remains too high at 25%-50%. The foothold that invasive species got when maintenance was unable to be done during the first wave of Covid-19 (2019/2020) resulted in significant increases in invasive species. During 2020/2021, invasive species decline was seen in all other MU1 TPs with the exception of TP6-1C which saw no change at 0%-5% cover, and TP5, which saw an increase from 50%-75% to 75%-95% cover. Most native plants were draped in a combination of old man's beard (*C. vitalba*) and cleaver (*Gallium aparine*) in TP5, which were common invasive species

found throughout MU1 in addition to Himalayan blackberry (*R. armeniacus*).

Although there is a correlation between plant survival and cover, cover provides a much better picture of vegetation changes at the site. A comparison between total native vegetation cover and estimated total native vegetation cover showed the former to be significantly higher than the latter in all transects, indicating a more complex canopy is developing. No infill planting occurred in the past year, therefore all increased cover is due to growth.

#### 4.3.2 Management Unit 2 Plant Cover

Plant cover increased by only 1% on average across MU2 (Tables 12A-12H). The change in Total Native Vegetation cover ranged from -22% in TP1-T3 (Table 12C) to +17% in TP1-T4 (Table 12D). Half of all quantitatively monitored transects had a decrease in the overall vegetation cover for MU2 (-2% for both TP3-T2 and TP4-T2). It is unclear why cover decreased in TP3-T2 given the increase seen in the previous monitoring year along with low invasive species cover (0%-5%) and no social trails (Table 12G). However, there was a record-breaking heat wave during the summer of 2021 which may have impacted plant growth and survival. Loss in cover in TP4-T2 appeared mostly due to illegal dumping of yard waste in the area. Increased cover was modest in TP1-T1 (+11%) and TP4-T2 (+8%) (Tables 12A & 12J). Increased cover in TP1-T3 was mostly due to snowberry (*S. albus*). Similar to MU1, the greatest cover occurred primarily due to deciduous snowberry (*S. albus*), along with evergreen sword fern (*P. munitum*) and shore pine (*P. contorta*). No infill planting took place in 2020/2021 due to the presence of nearby encampments.

Similar to MU1, all quantitatively monitored transects in MU2, had greater Total Native Vegetation cover relative to the Estimated Total Native Vegetation cover, indicating a multi-layered plant canopy is developing. For most transects, estimated cover was 5%-25%, being slightly lower (0%-5%) in TP4-T2 where there was significant illegal dumping, and greater (75%-95%) in TP3-T2 where there was previously established beaked hazelnut (*Corylus cornuta*) (Tables 12J & 12G). The tree canopy layer across MU2 is made up of mostly bigleaf maple trees (*A. macrophyllum*) that are in decline and/or have been previously coppiced. There are also some ornamental maple trees throughout MU2.

Like MU1, invasive species in MU2 were dominated by cleaver (*G. aparine*), old man's beard (*C. vitalba*) and Himalayan blackberry (*R. armeniacus*); English ivy (*H. helix*) was highly prevalent in MU2 as well. Invasive species cover was greater in MU2 with cover being greater than 25% for all monitored transects with the exception of TP3-T2 (0%-5%) where there was significant native vegetation cover prior to restoration (Tables 12A-12J).

#### 4.3.3 Plant Cover Summary

Across Schuster Slope, 23 different species of trees and plants have been installed, however only a handful of these species have performed well (Tables 9A-9H and 10A-10K). Of the 12 different deciduous shrubs installed, snowberry (*S. albus*) is the only shrub to thrive in this area, with oceanspray (*H. discolor*) and Nootka rose (*R. nutkana*) doing well in a few areas. Deciduous shrubs outperform evergreen shrubs, although tall Oregon grape (*M. aquifolium*) has done well in certain areas. The one deciduous tree species, cascara (*Frangula purshiana*) has not performed especially well, and only two of the four native evergreen

tree species have had success and include shore pine (*P. contorta*) and grand fir (*A. grandis*). Species such as swordfern (*P. munitum*) and beaked hazelnut (*C. cornuta*) that were already established continue to thrive, however installed swordfern do not grow as well.

Invasive species cover was generally more in MU2 compared with MU1. As mentioned previously, crews were unable to perform maintenance due to the high presence of encampments. Additionally, vegetation in MU2 is at Y3 compared with that in MU1 primarily being at Y5. This seems to indicate invasive species are less likely to be successful as native vegetation becomes established on Schuster Slope. Management Unit 1 has also had more time for invasive weed control as well, however no maintenance has been performed in close to two years in either MU1 or MU2.

#### 4.4 Human Activities and Safety

Fewer encampments were found in MUs 1 and 2 after restoration began, however with the onset of the Covid-19 pandemic in early 2020, the number and size of encampments increased substantially, possibly reaching or surpassing pre-restoration numbers. Encampments only became more prevalent in 2020/2021. The Environmental Services Department (ESD) was able to hire a homeless outreach staff member in the summer of 2021 that was able to touch base with campers and find services for many, thus moving some campers off-site. The City is still not allowed to move campers per Washington Department of Health guidance, however, ESD has submitted an Encampment Removal Request to the City manager's office requesting to move people off-site as it is dangerous for campers to be on the steep, unstable slopes.

Many encampments occurred under the sidewalk "bump-outs" at the top of MU2 as these provide cover from rain. These areas were fenced off resulting in fewer encampments, but not eliminating them completely, as campers sometimes cut the fence and/or the lock on the gate. At any given time, there are typically encampments in MU1 TP5 (Figure 2), and MU2 TP1 and the bottom of TP4 (Figure 3). There is quite a bit of transient activity across MU1 TPs 2 and 3, and MU2 TP4 is used to access another common encampment area located below MU2. Encampment clean-up costs for Schuster Slope during 2020/2021 totaled \$34,503.88, costing almost three times more than the previous year. Management Unit 2 TP1-T2 had an encampment physically present across most of the monitoring area that destroyed the nearly 100% vegetation cover that existed there. Although other plots did not have camps directly in them, these areas were likely impacted by transient activity.

Trash and debris were found in all TPs, which most likely had some negative impacts on the vegetation. Graffiti is a constant issue at the top of MU1 TP3 and MU2 TP3 along the wall dividing Schuster Slope from Stadium Way. Areas known for encampments often have a lot of garbage as well as used hypodermic needles. Garbage was especially prolific this year given the increased number of campers.

#### 4.5 Performance Measures/Goals

(See Table 1).

##### 4.5.1 Slope Stability and Geologic Hazard Mitigation/Forest Health

According to the LMP, goals are to have 80% planted shrub and groundcover species survival in monitoring Year 3 (Y3) and 60% survival in monitoring Year 5 (Y5), and a long-term goal of 2/3rds of the tree cover consisting of evergreen conifer trees, with less than 10% aerial cover of invasive species.

Management Unit 1 TPs 2 through 6-1C are in Y5 monitoring, and TPs 6-1D, 2E and 3F are in Y4 monitoring, while MU2 TPs are all in Y3 monitoring. Having 100% soil binding root mass is a long-term goal that will not be achieved until installed vegetation becomes mature. As of the 2020/2021 monitoring period, erosion control blanket was almost entirely degraded, and straw wattles were generally 5%-25% intact across the restoration areas.

#### *4.5.1a Management Unit 1 Metrics*

According to the LMP, Y5 plant (shrubs and groundcovers) survival shall be 60%, and 80% at Y3. Treatment Plots 2-5 and 6-1C were at Y5 during the 2020/2021 monitoring season, while all other monitored plots in TP6 were at Y4. Unfortunately, only qualitative observations could be made for Y4 TP6 monitoring plots, however results closely mimicked TP6-1C. Survival ranged from 11% to 900%, with an average of 200% for TPs 2 through 6-1C (Table 13), with survival being calculated from Y0 to Y5. Mortality and infill planting make survival estimates challenging and are not always a good representation of plant success.

Another requirement of the LMP is to have at least three native shrubs and two native groundcovers in the restoration area, with at least one from each cover type being evergreen. This requirement was met for shrubs in all TPs with the exception of TPs 5 and 6-1C, where no evergreen shrubs have survived. Treatment Plots 2, 3 and 6-1C had more than 3 native shrubs present (Table 13). In general, groundcovers have had poor survival at Schuster Slope, therefore the focus has been to install more shrubs in compensation.

Tree density per the LMP shall be at 436 trees per acre. During the 2020/2021 monitoring, tree density was greater than this, averaging 667 trees per acre. Only TP5 and TP6-1C had a tree density below the desired threshold at 290 and 0 trees per acre, respectively (Table 13).

The LMP requires that 2/3<sup>rd</sup>s tree cover for planted trees be evergreen versus deciduous. During Y5, this percentage is exceeded in all TPs, with the exception of TP6-1C. However, the average across all treatment plots is 76% (Table 13). Mature shrubs and groundcovers are required to have 100% aerial cover across the site, however this will take many years to accomplish as most vegetation was planted within the past 5 years. Cover is currently estimated at 50%-75% in TPs 2, 3 and 4, and 5%-25% in TPs 5 and 6-1C (Table 13).

Per the LMP, invasive species cover is to be less than 10%. Cover was more in some of the transects, with TP2 having a cover of 25%-50%, TP4 a cover of 5%-25%, and TP5 with 75%-95% cover. As mentioned previously, TP6-1C had low invasive cover (0%-5%) as it is difficult for any plants to grow in this area.

#### *4.5.1b Management Unit 2 Metrics*

According to the LMP, Y3 overall plant survival shall be 80%. Survival was calculated from Y0 to Y3 and ranged from 4% to 58% (TP4-T2 & TP1-T1 respectively), with an average survival of 34% (Table 14). The LMP requirement is to have at least three native shrubs and two native groundcovers in the restoration

area, with at least one of each type being evergreen. This requirement was met by shrubs in TP1-T1 and T3, and TP4-T1; other TPs had more than three species of shrubs, including TP1-T4 and TP3-T2 (6 and 5 shrubs respectively), but none were evergreen (Table 14). The requirement was met for groundcovers only in TP4-T2. As was previously mentioned for MU1, it has been our experience that groundcovers have poor performance at Schuster Slope, therefore shrubs are overplanted. Also of note is that installed deciduous plants outperform installed evergreen plants at Schuster Slope. Under drought conditions, it is thought that deciduous plants might have an advantage over evergreen plants through early leaf drop.

During 2020/2021 monitoring, the tree density averaged 266 trees per acre in MU2. Tree densities were well above the benchmark of 436 trees/acre for TP1-T1, and only 1 tree/acre below the benchmark for TP1-T3 and TP4-T2, while all other treatment plots were below the benchmark and will require infill planting over the next season (Table 14).

Metrics from the LMP include 67% tree cover to be evergreen for trees less than 2" DBH. Currently, this percent cover is 100% in all quantitatively monitored plots, with the exception of TP3-T2 and T4-T1 (Table 14). No planted vegetation was found in TP1-T2 or TP4-T3 as a result of mortality from encampments or heavy foot traffic leading to encampments. Aerial cover for mature shrubs and groundcovers needs to reach 100%. Year 3 Cover was 5%-25% in TP1-T1, TP1-T3 and TP4-T1, 50%-75% in TP1-T4, 75%-95% in TP3-T2, and 0%-5% in TP4-T2 (Table 14).

An additional goal of the LMP is to have less than 10% invasive species cover. Unfortunately, there was an increase in invasive cover over the past year, in part because regular maintenance could not be performed. There was a range in cover from 0%-5% on the low end for TP3-T2, up to 75%-95% for monitoring locations TP1-T1 and T2. Invasive cover for TP1-T4 and TP4-T2 was 50%-75%, and 25%-50% for TP4-T1 (Table 14). Cleaver (*G. aparine*) and old man's beard (*C. vitalba*) contributed heavily to invasive species cover in addition to more prolific species, such as Himalayan blackberry (*R. armeniacus*).

#### 4.5.1 Public Safety

Public safety performance measures were met during 2020/2021. Passive Open Space Program staff surveyed the areas adjacent to public areas along Schuster Parkway and Stadium Way. Areas were assessed for hazard trees and to ensure open views from the sidewalk up to 10 horizontal feet. Three high risk hazard trees were identified along Schuster Parkway and all have been removed. No trimming for surveillance was required.

#### 4.5.2 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 on Schuster Slope, however the final developed plan cannot be utilized until all

other performance measures are met for a given area.

#### 4.5.3 Volunteer Stewardship

No areas of MU1 or MU2 are considered appropriate for volunteers since areas with < 25% slope are located next to steep drop-offs. As work progresses to other areas of Schuster Slope, other volunteer stewardship opportunities will be considered.

### 4.6 Adaptive Management/Recommendations

Plant survival rates and cover will be used to adapt the number and species planted in the future, in an attempt to ensure greater plant success.

Based on the monitoring data, the following adaptive management strategies are recommended:

- Invasive species will continue to be monitored and prioritized for removal by WCC crews, especially in areas previously occupied by homeless encampments,
- Replacement plantings in MUs 1 and 2 will be overplanted based on survival numbers to achieve a target plant survival rate of 80% by monitoring Y3 and 60% by monitoring Y5. Although MU1 TPs 2- through 6-1C have reached Y5, these areas will continue to be monitored and planted until goals for cover are achieved,
- The original planting palette will continue to be used for trees, with the possible addition of more species of native evergreen trees, such as Western white pine (*Pinus monticola*) and climate adapted species, such as incense cedar (*Calocedrus decurrens*) and seaside juniper (*Juniperus maritima*),
- Most of the original planting palette will continue to be used for shrubs and groundcovers, however new species will be added to the palette for infill planting to achieve target numbers, such as planting mock orange (*Philadelphus lewisii*) in dry, gravelly areas and the climate adapted evergreen shrub buckbrush (*Ceanothus cuneatus*),
- Watering MUs 1 and 2 during periods of high temperature and/or low precipitation is advised, and has been approved by a geotechnical engineer (GeoDesign 2019), however logistics may prevent this from happening,
- Animal browsing will be monitored, and trees will be caged if significant damage begins to occur,
- For new monitoring areas, it is recommended that monitoring plots be limited to transects, doubling the number of transects, while eliminating quadrats. This not only increases spatial coverage of the site, but also causes less damage to the slope compared with temporarily staking a quadrat in the field that can cross multiple contours. Transects are typically limited to one contour and do not require additional temporary staking. Also, it is much easier for staff to see the entire transect from one location, as opposed to quadrats, which can require staff to move up and down contours to visualize the quadrat as a whole. This would result in less damage to the slope and better data quality.

## 5.0 References

1. Baseline Conditions Assessment Report for Schuster Slope. 2014. GeoEngineers, Tacoma, WA.
2. Schuster Slope Landscape Management Plan. 2015. City of Tacoma Environmental Services, GeoEngineers, Landau Associates, and Metro Parks Tacoma, Tacoma, WA.
3. Schuster Slope Management Area – Unit 1 Tacoma, Washington. 2015. GeoEngineers, Tacoma, WA.
4. Schuster Slope Monitoring Report 2016/2017, City of Tacoma Environmental Services, Tacoma, WA.
5. Schuster Slope Management Unit 2 Work Plan. 2016. City of Tacoma, Tacoma, WA.

**Table 1. Summary of Schuster Slope Goals, Objectives, Standards and Progress from the Landscape Management Plan**

Management Consideration	Goal	Objective	Standard(s)	Timeline	Progress 2020-2021
4. 2. 1 Slope stability and geologic hazard mitigation					
4. 2. 1. 1 Surface water and erosion control	A self-sustaining native plant community to provide rainwater interception, erosion control, and overall stormwater benefit.	To create an evergreen dominated, multi-layer canopy structure of large trees, small trees, shrubs and groundcover.	<ul style="list-style-type: none"> <li>• 100% soil-binding tree root zone shall be maintained for healthy mature trees (calculated as 1 ft-radius of lateral root extent per 1" dbh).</li> <li>• 2/3<sup>rd</sup>s tree cover will consist of evergreen conifers.</li> <li>• A minimum tree density of 436 trees per acre will be maintained.</li> <li>• Monitoring for a minimum of 5 years will be required to ensure establishment and survivability of plantings.</li> </ul>	Site preparation and installation of select planting areas are anticipated to be completed within one year. Monitoring and maintenance will be conducted over a 5 year period to allow for plant establishment and adaptive management.	It will take many years for trees to reach 100% soil binding root mass. 95% of all tree cover for trees < 2 inches DBH in Management Unit (MU) 1 and 100% of trees in MU2 were conifers. Tree density in MU1 averaged 667 trees/acre and 266 trees/acre in MU2 across restoration areas, including mature deciduous trees. Year 5 (Y5) monitoring of MU1-TPs 2, 3, 4, 5, & 6-1C took place, along with Y4 general observations of MU1-TPs 6-1D, 6-2E, & 6-3F, and Y3 monitoring of MU2-TPs 1, 2, 3, & 4.



Management Consideration	Goal	Objective	Standard(s)	Timeline	Progress 2020-2021
4.2.1.2 Steep slope stabilization	Improve slope stability throughout project area.	Implement soil stabilization and erosion control measures where applicable to allow the establishment of vegetation and provide public safety and infrastructure protection.	<ul style="list-style-type: none"> <li>• Erosion control measures will be implemented in accordance with the most current version of the City erosion control best management practices (BMP's) as provided by the City's Stormwater Management Manual on slopes 40% and greater where applicable.</li> <li>• Slopes 67% or greater over a distance of 10 ft in vertical height or greater shall be evaluated by a geotechnical consultant or an engineering geologist experienced in slope stability to evaluate for the appropriateness of working on that slope and implementing a landscape management program.</li> </ul>	Erosion control BMP's should be implemented prior to land disturbing activities including planting. Implementing soil stabilization and erosion control measures on slopes 67% or greater requiring engineering solutions, specifically areas where public safety and infrastructure protection are a concern. May require considerable time to allow for slope assessment, design, permitting, and installation activities.	Erosion control blanket and wattles were previously installed in all of MU1 (2015-2017) and MU2 (2016/2018) in areas with slopes from 40%-80%, where concrete debris was not present. Temporary sheet plastic was secured with sandbags in the MU1 TPs 2 & 3 landslide area. Plans have been developed to re-restore and re-stabilize this area that will be implemented during 2021/2022 by a contractor working for Sound Transit.

Management Consideration	Goal	Objective	Standard(s)	Timeline	Progress 2020-2021
4.2.2 Forest health					
4.2.2.1 Native vegetation	Create a multi-layered canopy of vegetation and improve habitat.	In addition to the tree requirements contained in the Surface Water and Erosion Control Goal, planting areas will contain mature shrub and groundcover layers.	<ul style="list-style-type: none"> <li>• Mature shrub and groundcover shall be maintained at 100% aerial cover once established.</li> <li>• Shrub layer shall consist of at least 3 native species, and a minimum of one species shall be evergreen; groundcover layer will consist of at least 2 native species, and a minimum of one species shall be evergreen.</li> <li>• Each planted shrub and groundcover layer will meet 80% survival by Monitoring Year 3 (Y3) and 60% survival by Monitoring Year 5 (Y5).</li> </ul>	Site preparation and installation of select planting areas are anticipated to be completed within one year. Monitoring and maintenance will be conducted over a five year period to allow for plant establishment and adaptive management.	Most plants in MU1 were installed in the past 3-5 years, and plants in MU2 were mostly installed 3 years ago. Plants have not had time to reach full aerial cover potential. Native shrub species requirements were met in 3 of 5 transects in MU1, although transects did have at least 3 shrub species present (Table 13). This shrub requirement was met in 3 of 6 transects in MU2 (Table 14). No plots in MU1 or MU2 met minimum groundcover species requirements. Y5 survival requirements were met in 2 of 5 TPs in MU1 and Y3 survival requirements were not met for any plots in MU2. Infill planting did not take place due to encampments, but will occur in 2021/2022. Plant cover appears to capture progress better than survival.

Management Consideration	Goal	Objective	Standard(s)	Timeline	Progress 2020-2021
4.2.2.2 Invasive vegetation	Provide for a native plant dominated, healthy target ecosystem.	Less than 10% of the aerial cover of vegetation will consist of invasive species.	<ul style="list-style-type: none"> <li>Remove invasive vegetation from the project area and monitor and maintain to prevent resurgence for a minimum period of 5 years.</li> <li>Replant area where invasive vegetation was removed with new native vegetation which conforms to the target ecosystem forest type.</li> </ul>	Planting area is anticipated to be completed within one year. Monitoring and maintenance will be conducted over a 5-year period to control invasive species and allow for native plant establishment.	Routine invasive species sweeps were not able to be done for MU1 and MU2 due to the heavy presence of encampments. In general, invasive species cover was greater than 10% for MU1, with the exception of TP3 and TP6-1C. Similar observations were made in MU2, with the exception of TP3-T2 where invasive cover was less than 5%. There will be a strong emphasis on invasive species control during 2021/2022.

Management Consideration	Goal	Objective	Standard(s)	Timeline	Progress 2020-2021
4.2.3 Public safety					
	Enhance public safety using vegetation management.	Vegetation will be maintained for natural surveillance within public areas. Maintain public safety through tree management.	<ul style="list-style-type: none"> <li>• In an area measuring 10 horizontal ft adjacent to all public areas, vegetation should be actively maintained to provide open views in a zone between 3 to 8 ft above the ground surface. This includes planting low shrubs and groundcovers and limbing up trees to 8 ft.</li> <li>• In areas where homeless encampments or transient activity use is high, all trails should be closed and selected species of plants should be planted that are vigorous and have thorns or other such protections that will deter public access.</li> <li>• Conduct tree assessments annually along all public areas.</li> <li>• Remove hazardous trees and branches where they can impact public areas and infrastructure.</li> </ul>	The initial vegetation management is anticipated to be completed within one year for active management areas. Vegetation maintenance and tree assessments should be conducted annually as long as the public safety and infrastructure applies.	Vegetation assessments were performed along Stadium Way and Schuster Parkway and no work was needed. Hazard tree assessments were performed along Stadium Way and Schuster Parkway, and several potentially hazardous trees were removed along Schuster Parkway. Most thorny vegetation planted to deter transient activity was trampled before it became large enough to deter activity, and no infill planting was possible due to encampments.

Management Consideration	Goal	Objective	Standard(s)	Timeline	Progress 2020-2021
4.2.4 Views from adjacent areas					
4.2.4.1 Public view management	Provide public views while maintaining mature mixed conifer forested conditions.	Establish native vegetation prior to vegetation pruning or removal for public views.	<ul style="list-style-type: none"> <li>• Trees shall be pruned to current industry standards according to the most current versions of ANSI Z133.1 for safety of pruning operations, the ANSI A300 Standard Practices, and the Tree Pruning Guidelines of the International Society of Arboriculture.</li> <li>• Tree removal and/or pruning to maintain views shall not be conducted until the management unit has met all other applicable goals, objectives, and standards.</li> <li>• No more than 25% 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.</li> <li>• If mitigation planting is required in order to satisfy goals, objectives, and standards of the management plan, pruning for view enhancement may not be conducted until the planting has become established (3 years following planting).</li> </ul>	Site preparation and installation of select planting areas are anticipated to be completed within one year. Monitoring and maintenance will be conducted over a 5 year period to allow for plant establishment. Pruning actions are only permitted during the allowable time frame.	Chapter 9.20 TMC (Trees and Shrubs – View Blockage) Administrative Guidance put in place. Any requests must first adhere to the LMP requirements.

Management Consideration	Goal	Objective	Standard(s)	Timeline	Progress 2020-2021
4.2.4.2 Private view management	Provide a process for a private vegetation modification request on City property to enhance a private view.	Provide a transparent process where project proponents may apply for and receive approval to conduct landscape management activities on the Schuster Slope that are in conformance with the techniques and goals in this management plan.	<ul style="list-style-type: none"> <li>• All management actions approved for private view management shall be conducted in accordance and compliance with this management plan.</li> <li>• Tree removal and/or pruning to maintain views shall not be conducted until the management unit has met all other applicable goals, objectives, and standards.</li> <li>• No more than 25% 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.</li> <li>• If mitigation planting is required in order to satisfy goals, objectives, and standards of the management plan, pruning for view enhancement may not be conducted until the planting has become established (3 years following planting).</li> </ul>	Site preparation and installation of select planting areas are anticipated to be completed within one year. Monitoring and maintenance will be conducted over a 5 year period to allow for plant establishment. Pruning actions are only permitted during the allowable time frame.	A draft guideline has been created.

Management Consideration	Goal	Objective	Standard(s)	Timeline	Progress 2020-2021
4.2.5 Voluntary stewardship					
	Offer public “hands-on” opportunities to gain access to and restore the Schuster Slope project area.	Provide volunteer opportunities for the diverse Tacoma demographic while implementing strategies and tactics outlined in this plan.	<ul style="list-style-type: none"> <li>Recruit, train, deploy, and support volunteers in the specific areas where volunteers can safely and effectively work towards the goals and objectives of this plan.</li> </ul>	Ongoing.	Small areas of MUs 1 & 2 with < 25% slope are located next to steep drop-offs, therefore no areas of MU1 or MU2 are considered safe for volunteers.

**Table 2A. Erosion Control Best Management Practices (BMPs)  
Installed in Management Unit 1**

Treatment Plot	Area (ft <sup>2</sup> )	~ Treatment Plot Cover with Erosion Control Blanket (%)	Other BMP's
2	5,600	100	600 ft Straw wattles, Silt fence, Ecology blocks
3	16,307	60	Straw wattles, Silt fence
4	8,116	90	Straw wattles, Silt fence
5	14,442	90	Straw wattles, Silt fence
6	18,360	100	4,280 ft Straw wattles, Silt fence

**Table 2B. Erosion Control Best Management Practices (BMPs)  
Installed in Management Unit 2**

Treatment Plot	Area (ft <sup>2</sup> )	~ Treatment Plot Cover with Erosion Control Blanket (%)	Other BMP's
1	40,302	47	1,056 Straw wattles
2	12,992	30	None
3	34,889	10	485 ft Straw wattles
4	35,509	25	485 ft Straw wattles



**Table 3. Planting Palettes for Management Units 1 and 2**

<b>MU1 TP5 &amp; TP6</b> <b>Slope Face and Toe</b> <b>Dry to Moist Soils, Shade to Part Shade</b>						
Scientific Name	Common Name	Form	Mature Height	Stock Type and Spacing O.C.	Percent of Plantings	
<b>Tree Layer</b>						
<i>Abies grandis</i>	Grand fir	Evergreen Tree	100 ft	C, S 15 ft	50	
<i>Frangula purshiana</i>	Cascara	Deciduous Tree	30 ft	C, S 15 ft	10	
<i>Thuja plicata</i>	Western red cedar	Evergreen Tree	100 ft	C, S 15 ft	20	
<i>Tsuga heterophylla</i>	Western hemlock	Evergreen Tree	100 ft	C, S 15 ft	20	
<b>Shrub Layer</b>						
<i>Acer circinatum</i>	Vine maple	Deciduous Shrub	20 ft	C, S 6 ft	20	
<i>Corylus cornuta</i>	Beaked hazelnut	Deciduous Shrub	12 ft	C, S 6 ft	15	
<i>Holodiscus discolor</i>	Oceanspray	Deciduous Shrub	12 ft	C, S 6 ft	20	
<i>Morella californica</i>	Pacific Wax-Myrtle	Evergreen Shrub	15 ft	C, S 6 ft	20	
<i>Oemleria cerasiformis</i>	Osoberry	Deciduous Shrub	15 ft	C, S 6 ft	15	
<i>Symphoricarpos albus</i>	Snowberry	Deciduous Shrub	4 ft	C, S 4 ft	25	
<i>Vaccinium ovatum</i>	Evergreen huckleberry	Evergreen Shrub	12 ft	C, S 6 ft	10	
<b>Groundcover Layer</b>						
<i>Gaultheria shallon</i>	Salal	Evergreen Shrub	3 ft	C, S 4 ft	25	
<i>Mahonia nervosa</i>	Low Oregon grape	Evergreen Shrub	2 ft	C, S 4 ft	25	
<i>Polystichum munitum</i>	Sword fern	Evergreen Fern	3 ft	C, S 4 ft	25	
<b>MU1 TP2</b> <b>Slope Face and Toe</b> <b>Dry to Moist Soils, Sun</b>						
Scientific Name	Common Name	Form	Mature Height	Stock Type and Spacing O.C.	Percent of Plantings	
<b>Tree Layer</b>						
<i>Abies grandis</i>	Grand fir	Evergreen Tree	100 ft	C, S 15 ft	50	
<i>Frangula purshiana</i>	Cascara	Deciduous Tree	30 ft	C, S 15 ft	10	
<i>Pinus contorta</i>	Shore pine	Evergreen Tree	40 ft	C, S 15 ft	20	
<i>Pseudotsuga menziesii</i>	Douglas-fir	Evergreen Tree	100 ft	C, S 15 ft	20	
<b>Shrub Layer</b>						
<i>Acer circinatum</i>	Vine maple	Deciduous Shrub	20 ft	C, S 6 ft	15	
<i>Corylus cornuta</i>	Beaked hazelnut	Deciduous Shrub	12 ft	C, S 6 ft	15	
<i>Holodiscus discolor</i>	Oceanspray	Deciduous Shrub	12 ft	C, S 6 ft	15	
<i>Mahonia aquifolium</i>	Tall Oregon grape	Evergreen Shrub	8 ft	C, S 6 ft	20	
<i>Morella californica</i>	Pacific Wax-Myrtle	Evergreen Shrub	15 ft	C, S 6 ft	20	
<i>Rosa nutkana</i>	Nootka rose	Deciduous Shrub	10 ft	C, S 6 ft	15	
<i>*Rosa gymnocarpa</i>	Baldhip rose	Deciduous Shrub	4 ft	C, S 6 ft	N/A	
<i>Symphoricarpos albus</i>	Snowberry	Deciduous Shrub	4 ft	C, S 4 ft	25	
<b>Groundcover Layer</b>						
<i>Arcostaphylos uva-ursi</i>	Kinnikinnick	Evergreen Shrub	< 1 ft	C, S 4 ft	25	

<b>MU1 TP3 &amp; TP4;</b>						
<b>MU2 TP1, TP2, TP3, &amp; TP4</b>						
<b>Top of Slope; Dry to Moist Soils, Sun</b>						
<b>Scientific Name</b>	<b>Common Name</b>	<b>Form</b>	<b>Mature Height</b>	<b>Stock Type and Spacing O.C.</b>	<b>Percent of Plantings</b>	
<b>Tree Layer</b>						
<i>Frangula purshiana</i>	Cascara	Deciduous Tree	30 ft	C, S 15 ft	25	
<i>Pinus contorta</i>	Shore pine	Evergreen Tree	40 ft	C, S 15 ft	75	
<b>Shrub Layer</b>						
<i>Acer circinatum</i>	Vine maple	Deciduous Shrub	20 ft	C, S 6 ft	15	
<i>Corylus cornuta</i>	Beaked hazelnut	Deciduous Shrub	12 ft	C, S 6 ft	15	
<i>Holodiscus discolor</i>	Oceanspray	Deciduous Shrub	12 ft	C, S 6 ft	15	
<i>Mahonia aquifolium</i>	Tall Oregon grape	Evergreen Shrub	8 ft	C, S 6 ft	20	
<i>Morella californica</i>	Pacific Wax-Myrtle	Evergreen Shrub	15 ft	C, S 6 ft	20	
<i>Rosa nutkana</i>	Nootka rose	Deciduous Shrub	10 ft	C, S 6 ft	15	
<i>Ribes sanguineum*</i>	Red flowering currant	Deciduous Shrub	6 ft	C, S 6 ft	N/A	
<i>Rosa gymnocarpa*</i>	Bald hip rose	Deciduous Shrub	6 ft	C, S 6 ft	N/A	
<i>Rubus parviflorus*</i>	Thimbleberry	Deciduous Shrub	6 ft	C, S 6 ft	N/A	
<i>Symphoricarpos albus</i>	Snowberry	Deciduous Shrub	4 ft	C, S 4 ft	25	
<b>Groundcover Layer</b>						
<i>Arcostaphylos uva-ursi</i>	Kinnikinnick	Evergreen Shrub	< 1 ft	C, S 4 ft	25	

<b>MU2 TP1, TP3 &amp; TP4</b>						
<b>Top of Slope</b>						
<b>Dry to Moist Soils, Shade to Part Shade</b>						
<b>Scientific Name</b>	<b>Common Name</b>	<b>Form</b>	<b>Mature Height</b>	<b>Stock Type and Spacing O.C.</b>	<b>Percent of Plantings</b>	
<b>Shrub Layer</b>						
<i>Acer circinatum</i>	Vine maple	Deciduous Shrub	20 ft	C, S 6 ft	20	
<i>Corylus cornuta</i>	Beaked hazelnut	Deciduous Shrub	12 ft	C, S 6 ft	15	
<i>Holodiscus discolor</i>	Oceanspray	Deciduous Shrub	12 ft	C, S 6 ft	20	
<i>Morella californica</i>	Pacific Wax-Myrtle	Evergreen Shrub	15 ft	C, S 6 ft	20	
<i>Oemleria cerasiformis</i>	Osoberry	Deciduous Shrub	15 ft	C, S 6 ft	15	
<i>Vaccinium ovatum</i>	Evergreen huckleberry	Evergreen Shrub	12 ft	C, S 6 ft	10	
<i>Symphoricarpos albus</i>	Snowberry	Deciduous Shrub	4 ft	C, S 4 ft	25	
<i>Philadelphus lewisii</i> <sup>^</sup>	Mock Orange	Deciduous Shrub	9 ft	C, S 4 ft	N/A	
<b>Groundcover Layer</b>						
<i>Gaultheria shallon</i>	Salal	Evergreen Shrub	3 ft	C, S 4 ft	25	
<i>Mahonia nervosa</i>	Low Oregon grape	Evergreen Shrub	2 ft	C, S 4 ft	25	
<i>Polystichum munitum</i>	Sword fern	Evergreen Fern	3 ft	C, S 4 ft	25	

<b>MU1 TP6</b> <b>Wetland/Streams</b> <b>Moist to Wet Soils, Shade to Part Shade</b>							
Scientific Name	Common Name	Form		Mature Height	Stock Type and Spacing O.C.		Percent of Plantings
<b>Tree Layer</b>							
<i>Thuja plicata</i>	Western redcedar	Evergreen	Tree	100 ft	C, S	15 ft	40
<i>Picea sitchensis</i>	Sitka spruce	Evergreen	Tree	100 ft	C, S	15 ft	40
<i>Frangula purshiana</i>	Cascara	Deciduous	Tree	30 ft	C, S	15 ft	20
<b>Shrub Layer</b>							
<i>Cornus sericea</i> <i>v. stolonifera</i>	Red-osier dogwood	Deciduous	Shrub	10 ft	C, S, L	6 ft	25
<i>Oplopanax horridus</i>	Devil's Club	Deciduous	Shrub	9 ft	C, S	6 ft	0
<i>Physocarpus capitatus</i>	Pacific Ninebark	Deciduous	Shrub	12 ft	C, S	6 ft	25
<i>Rubus spectabilis</i>	Salmonberry	Deciduous	Shrub	12 ft	C, S	6 ft	50
<b>Groundcover Layer</b>							
<i>Athyrium filix-femina</i>	Lady fern	Deciduous	Herb	3 ft	S	3 ft	50
<i>Carex obnupta</i>	Slough sedge	Deciduous	Sedge	3 ft	S	3 ft	50
C = Containerized 1 gallon or larger ft = Feet L = Live Stake O.C. = On center spacing in feet (ft) S = Seedling * Plants that were added to the palette in 2017/2018 for adaptive management purposes ^Plants that were added to the palette in 2018/2019 for adaptive management purposes							

**Table 4A. Planting and Monitoring Schedule for Management  
Unit 1**

Treatment Plot	Planting Month and Year (Y0)	Baseline (Y0) Monitoring Month and Year	Monitoring Year 1 (Y1) Month and Year	Monitoring Year 2 (Y2) Month and Year	Monitoring Year 3 (Y3) Month and Year	Monitoring Year 4 (Y4) Month and Year	Monitoring Year 5 (Y5) Month and Year
1	01/2016	none	07/2017	Incorporated into TP2	Incorporated into TP2	Incorporated into TP2	Incorporated into TP2
2	12/2015	none	07/2017	08/2018	08/2019	09/2020	09/2021
2 Landslide Area	TBD/2022	TBD/2022	TBD/2023	TBD/2024	TBD/2025	TBD/2026	TBD/2027
3	01/2016	none	07/2017	08/2018	08/2019	09/2020	09/2021
3 Landslide Area	TBD/2022	TBD/2022	TBD/2023	TBD/2024	TBD/2025	TBD/2026	TBD/2027
4	01/2016	none	07/2017	08/2018	08/2019	09/2020	09/2021
5	02/2016	none	07/2017	08/2018	08/2019	09/2020	09/2021
6-1C	03/2016	none	07/2017	08/2018	08/2019	09/2020	09/2021
6-1D	03/2017	09/2017	09/2018	08/2019	08/2019 Qualitative only	09/2020 Qualitative only	09/2021 Qualitative only
6-2E	03/2017	09/2017	09/2018	08/2019	08/2019 Qualitative only	09/2020 Qualitative only	09/2021 Qualitative only
6-3F	03/2017	09/2017	09/2018	08/2019	08/2019 Qualitative only	09/2020 Qualitative only	09/2021 Qualitative only

**Table 4B. Planting and Monitoring Schedule for Management  
Unit 2**

Treatment Plot	Planting Month and Year (Y0)	Baseline (Y0) Monitoring Month and Year	Monitoring Year 1 (Y1) Month and Year	Monitoring Year 2 (Y2) Month and Year	Monitoring Year 3 (Y3) Month and Year
1	12/2016 & 12/2017	03/2018	08/2019	09/2020	09/2021
2	12/2017	03/2018	08 & 09/2019	09/2020	09/2021
3	01/2018	04/2018	08/2019	09/2020	09/2021
4	01/2018	04/2018	08 & 09/2019	08/2020	09/2021

**Table 5. Data Collection in Quadrats**

Variable	Measurement
Native plant name	Identified to species whenever possible
Number of each native plant	Individually counted
Estimated cover for each native plant species (Daubenmire scale)	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 cover for all invasive species (Daubenmire scale)	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 (Daubenmire scale)	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 cover (includes trees that are >2" diameter at breast height (DBH)) (Daubenmire scale)	0%-5%, 5%-25%, 25%-50%, 50%-75%, 75%-95%, 95%-100%
Evidence of erosion	Stable, erosion, slump, slide
Erosion control material (still intact) (Daubenmire scale)	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 cover)	Feet and Inches
Dominant invasive species present (up to 5) and unusual invasive species	Identified to species whenever possible
Estimated foliar cover of all invasive species (Daubenmire scale)	0%-5%, 5%-25%, 25%-50%, 50%-75%, 75%-95%, 95%-100%
Overstory canopy cover (includes trees that are >2" diameter at breast height (DBH)) (Daubenmire scale)	0%-5%, 5%-25%, 25%-50%, 50%-75%, 75%-95%, 95%-100%
Tree basal stem cover (Daubenmire scale)	0%-5%, 5%-25%, 25%-50%, 50%-75%, 75%-95%, 95%-100%
Shrub plus groundcover foliar cover (Daubenmire scale)	0%-5%, 5%-25%, 25%-50%, 50%-75%, 75%-95%, 95%-100%
Grass cover (Daubenmire scale)	0%-5%, 5%-25%, 25%-50%, 50%-75%, 75%-95%, 95%-100%
Estimated exposed soil (Daubenmire scale)	0%-5%, 5%-25%, 25%-50%, 50%-75%, 75%-95%, 95%-100%
Erosion control material (still intact) (Daubenmire scale)	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 Treatment Plot 2**

Transect/ Quadrat	T1Q1					T2Q1				
Monitoring Year	Y1 2016/2017	Y2 2017/2018	Y3 2018/2019	Y4 2019/2020	Y5 2020/2021	Y1 2016/2017	Y2 2017/2018	Y3 2018/2019	Y4 2019/2020	Y5 2020/2021
Restoration Status	Partially Cleared and Planted					Partially Cleared and Planted				
Slope (%)	80					80				
Soil Texture	Sand					Sand				
Slope Stability	Stable	Erosion	Erosion	Stable & Landslide	Landslide	Stable	Erosion	Erosion	Stable	Erosion
Exposed Soil (%)	0-20	5-25	5-25	0-5 & 95-100	75-95	0-20	5-25	5-25	No data	5-25
Erosion Control Blanket (% intact)	>50	0-5	0-5	0-5	0-5	>50	0-5	0-5	0-5	0-5
Erosion Control Blanket Material	Biodegradable Coir					Biodegradable Coir				

**Table 7B. Landscape Observations for Management Unit 1 Treatment Plot 3**

Transect/ Quadrat	T1Q1					T2Q1				
Monitoring Year	Y1 2016/2017	Y2 2017/2018	Y3 2018/2019	Y4 2019/2020	Y5 2020/2021	Y1 2016/2017	Y2 2017/2018	Y3 2018/2019	Y4 2019/2020	Y5 2020/2021
Restoration Status	Partially Cleared and Planted					Partially Cleared and Planted				
Slope (%)	9					64				
Soil Texture	Sand					Sand				
Slope Stability	Stable	Stable	Stable	Stable	Stable	Erosion	Erosion	Erosion	No data	Erosion
Exposed Soil (%)	0-20	5-25	0-5	0-5	0-5	0-20	25-50	25-50	No data	5-25
Erosion Control Blanket (% intact)	0-50	0-5	0-5	0-5	0-5	0-50	0-5	0-5	No data	0-5
Erosion Control Blanket Material	Straw Coir					Biodegradable Coir				



**Table 7C. Landscape Observations for Management Unit 1 Treatment Plot 4**

Transect/ Quadrat	T1Q1					T2Q1				
	Y1 2016/2017	Y2 2017/2018	Y3 2018/2019	Y4 2019/2020	Y5 2020/2021	Y1 2016/2017	Y2 2017/2018	Y3 2018/2019	Y4 2019/2020	Y5 2020/2021
Restoration Status	Partially Cleared and Planted					Partially Cleared and Planted				
Slope (%)	69					69				
Soil Texture	Sand					Sand				
Slope Stability	Erosion	Erosion	Erosion	Erosion	Erosion	Stable	Erosion	Erosion	Erosion	Erosion
Exposed Soil (%)	0-20	50-75	75-95	5-25	5-25	0-20	5-25	5-25	0-5	5-25
Erosion Control Blanket (% intact)	>50	0-5	0-5	0-5	0-5	>50	0-5	0-5	0-5	0-5
Erosion Control Blanket Material	Straw Coir					Straw Coir				

**Table 7D. Landscape Observations for Management Unit 1 Treatment Plot 5**

Transect/ Quadrat	T1Q1					T2Q1				
	Y1 2016/2017	Y2 2017/2018	Y3 2018/2019	Y4 2019/2020	Y5 2020/2021	Y1 2016/2017	Y2 2017/2018	Y3 2018/2019	Y4 2019/2020	Y5 2020/2021
Restoration Status	Planted Only					Planted Only				
Slope (%)	80					29				
Soil Texture	Sand					Sand				
Slope Stability	Stable	Stable	Stable	Erosion	Erosion	Stable	Erosion	Erosion	Erosion	Erosion
Exposed Soil (%)	0-20	0-5	5-25	5-25	0-5	25-50	0-5	25-50	5-25	5-25
Erosion Control Blanket (% intact)	>50	0-5	0-5	0-5	0-5	1-50	0-5	5-25	0-5	0-5
Erosion Control Blanket Material	Biodegradable Coir					Biodegradable Coir				

**Table 7E. Landscape Observations for Management Unit 1 Treatment Plot 6-1C**

Transect/ Quadrat	T1Q1					T2Q1				
Monitoring Year	Y1 2016/2017	Y2 2017/2018	Y3 2018/2019	Y4 2019/2020	Y5 2020/2021	Y1 2016/2017	Y2 2017/2018	Y3 2018/2019	Y4 2019/2020	Y5 2020/2021
Restoration Status	Planted Only					Planted Only				
Slope (%)	80					80				
Soil Texture	Gravel					Gravel				
Slope Stability	Erosion	Erosion	Erosion	Slumping	Slumping	Erosion	Erosion	Erosion	Slumping	Slumping
Exposed Soil (%)	25-50	5-25	75-95	75-95	75-95	25-50	75-95	95-100	50-75	75-95
Erosion Control Blanket (% intact)	1-50	5-25	5-25	5-25	0-5	1-50	5-25	0-5	0-5	0-5
Erosion Control Blanket Material	Biodegradable Coir					Biodegradable Coir				

**Table 7F. Landscape Observations for Management Unit 1 Treatment Plot 6-1D**

Transect/Quadrat	T1Q1			T2Q1		
Monitoring Year	Y1 2016/2017	Y2 2017/2018	Y3-2018/2019 Y4-2019/2020 <b>Y5-2020/2021</b>	Y1 2016/2017	Y2 2017/2018	Y3-2018/2019 Y4-2019/2020 <b>Y5-2020/2021</b>
Restoration Status	Partially Cleared and Planted			Partially Cleared and Planted		
Slope (%)	80			80		
Soil Texture	Gravel			Gravel		
Slope Stability	Erosion	Erosion	No data	Erosion	Erosion	No data
Exposed Soil (%)	25-50	5-25	No data	25-50	75-95	No data
Erosion Control Blanket (% intact)	1-50	5-25	No data	1-50	5-25	No data
Erosion Control Blanket Material	Straw Coir			Biodegradable Coir		

**Table 7G. Landscape Observations for Management Unit 1 Treatment Plot 6-2E**

Transect/Quadrat	T1Q1			T2Q1		
Monitoring Year	Y1 2016/2017	Y2 2017/2018	Y3-2018/2019 Y4-2019/2020 <b>Y5-2020/2021</b>	Y1 2016/2017	Y2 2017/2018	Y3-2018/2019 Y4-2019/2020 <b>Y5-2020/2021</b>
Restoration Status	Partially Cleared and Planted			Partially Cleared and Planted		
Slope (%)	80			80		
Soil Texture	Gravel			Gravel		
Slope Stability	Erosion	Erosion	No data	Erosion	Erosion	No data
Exposed Soil (%)	25-50	50-75	No data	5-25	50-75	No data
Erosion Control Blanket (% intact)	50-100	25-50	No data	50-100	5-25	No data
Erosion Control Blanket Material	Straw Coir			Straw Coir		

**Table 7H. Landscape Observations for Management Unit 1 Treatment Plot 6-3F**

Transect/Quadrat	T1Q1			T2Q1		
Monitoring Year	Y1 2016/2017	Y2 2017/2018	Y3-2018/2019 Y4-2019/2020 <b>Y5-2020/2021</b>	Y1 2016/2017	Y2 2017/2018	Y3-2018/2019 Y4-2019/2020 <b>Y5-2020/2021</b>
Restoration Status	Partially Cleared and Planted			Partially Cleared and Planted		
Slope (%)	80			80		
Soil Texture	Gravel			Gravel		
Slope Stability	Stable	Erosion	No data	Stable	Stable	No data
Exposed Soil (%)	5-25	5-25	No data	5-25	5-25	No data
Erosion Control Blanket (% intact)	50-100	75-95	No data	50-100	50-75	No data
Erosion Control Blanket Material	Straw Coir			Straw Coir		

**Table 8A. Landscape Observations for Management Unit 2 Treatment Plot 1**

Transect/Quadrat	T1Q1				T1Q2			
Monitoring Year	Y0 2017/2018	Y1 2018/2019	Y2 2019/2020	Y3 2020/2021	Y0 2017/2018	Y1 2018/2019	Y2 2019/2020	Y3 2020/2021
Restoration Status	Partially Cleared and Planted				Partially Cleared and Planted			
Slope (%)	30				40			
Soil Texture	Silt				Silt			
Slope Stability	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Stable
Exposed Soil (%)	0-5	5-25	0-5	5-25	0-5	50-75	0-5	0-5
Erosion Control Blanket (% intact)	95-100	50-75	No data	0-5	95-100	25-50	0-5	0-5
Erosion Control Blanket Material	Biodegradable Coir				Biodegradable Coir			

Transect/Quadrat	T2Q1				T2Q2			
Monitoring Year	Y0 2017/2018	Y1 2018/2019	Y2 2019/2020	Y3* 2020/2021	Y0 2017/2018	Y1 2018/2019	Y2 2019/2020	Y3* 2020/2021
Restoration Status	Partially Cleared and Planted				Partially Cleared and Planted			
Slope (%)	17				22			
Soil Texture	Silt				Silt			
Slope Stability	Stable	Stable	Stable	No data	Stable	Stable	Stable	No data
Exposed Soil (%)	50-75	5-25	0-5	No data	5-25	0-5	0-5	No data
Erosion Control Blanket (% intact)	0-5	0-5	No data	No data	0-5	0-5	No data	No data
Erosion Control Blanket Material	Biodegradable Coir				Biodegradable Coir			

\*Monitoring not performed due to transect being taken over by an encampment.

Management Unit 2 Treatment Plot 1 continued

Transect/Quadrat	T3Q1				T3Q2			
Monitoring Year	Y0 2017/2018	Y1 2018/2019	Y2 2019/2020	Y3 2020/2021	Y0 2017/2018	Y1 2018/2019	Y2 2019/2020	Y3 2020/2021
Restoration Status	Partially Cleared and Planted				Partially Cleared and Planted			
Slope (%)	33				33			
Soil Texture	Silt				Silt			
Slope Stability	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Stable
Exposed Soil (%)	0-5	5-25	5-25	0-5	5-25	50-75	0-5	0-5
Erosion Control Blanket (% intact)	95-100	25-50	0-5	0-5	0-5	25-50	0-5	0-5
Erosion Control Blanket Material	Biodegradable Coir				Biodegradable Coir			

Transect/Quadrat	T4Q1				T4Q2			
Monitoring Year	Y0 2017/2018	Y1 2018/2019	Y2 2019/2020	Y3 2020/2021	Y0 2017/2018	Y1 2018/2019	Y2 2019/2020	Y3 2020/2021
Restoration Status	Partially Cleared and Planted				Partially Cleared and Planted			
Slope (%)	56				44			
Soil Texture	Silt				Silt			
Slope Stability	Erosion	Erosion	Slumping	Slumping	Erosion	Erosion	Slumping	Slumping
Exposed Soil (%)	0-5	50-75	25-50	No data	5-25	25-50	75-95	No data
Erosion Control Blanket (% intact)	95-100	25-50	No data	0-5	75-95	25-50	0-5	0-5
Erosion Control Blanket Material	Biodegradable Coir				Biodegradable Coir			



**Table 8B. Landscape Observations for Management Unit 2 Treatment Plot 2**

Transect/Quadrat	T1Q1		T1Q2		T1Q1+Q2
Monitoring Year	Y0 2017/2018	Y1-2018/2019 <b>Y3-2020/2021</b>	Y0 2017/2018	Y1-2018/2019 <b>Y3-2020/2021</b>	Y2 2019/2020
Restoration Status	Partially Cleared and Planted		Partially Cleared and Planted		
Slope (%)	67		67		
Soil Texture	Gravel		Gravel		
Slope Stability	Stable	No data	Stable	No data	Erosion
Bare Ground (%)	0-5	No data	0-5	No data	No data
Erosion Control Blanket (% intact)	95-100	No data	95-100	No data	5-25
Erosion Control Blanket Material	Biodegradable Coir		Biodegradable Coir		

**Table 8C. Landscape Observations for Management Unit 2 Treatment Plot 3**

Transect/Quadrat	T1Q1		T1Q2		T1Q1+Q2	
Monitoring Year	Y0 2017/2018	Y1 2018/2019	Y0 2017/2018	Y1 2018/2019	Y2 2019/2020	Y3 2020/2021
Restoration Status	Partially Cleared and Planted		Partially Cleared and Planted			
Slope (%)	61		67			
Soil Texture	Silt		Silt			
Slope Stability	Stable	No data	Stable	No data	Stable	Erosion
Exposed Soil (%)	0-5	No data	0-5	No data	0-5	0-5
Erosion Control Blanket (% intact)	75-95	No data	95-100	No data	5-25	0-5
Erosion Control Blanket Material	Biodegradable Coir		Biodegradable Coir			

Transect/Quadrat	T2Q1				T2Q2			
Monitoring Year	Y0 2017/2018	Y1 2018/2019	Y2 2019/2020	Y3 2020/2021	Y0 2017/2018	Y1 2018/2019	Y2 2019/2020	Y3 2020/2021
Restoration Status	Partially Cleared and Planted				Partially Cleared and Planted			
Slope (%)	64				64			
Soil Texture	Silt				Silt			
Slope Stability	Stable	Stable	Stable	Erosion	Stable	Stable	Erosion	Erosion
Exposed Soil (%)	0-5	0-5	0-5	25-50	75-95	50-75	5-25	50-75
Erosion Control Blanket (% intact)	95-100	75-95	50-75	25-50	25-50	0-5	0-5	0-5
Erosion Control Blanket Material	Biodegradable Coir				Biodegradable Coir			

Management Unit 2 Treatment Plot 3 continued

Transect/Quadrat	T3Q1		T3Q2		T3Q1+Q2	
	Y0 (2017/2018)	Y1 (2018/2019)	Y0 (2017/2018)	Y1 (2018/2019)	Y2 (2019/2020)	Y3 <b>2020/2021</b>
Restoration Status	Partially Cleared and Planted		Partially Cleared and Planted			
Slope (%)	2		80			
Soil Texture	Silt		Silt			
Slope Stability	Stable	No data	Stable	No data	Stable	Erosion
Exposed Soil (%)	75-95	No data	95-100	No data	0-5	25-50
Erosion Control Blanket (% intact)	0-5	No data	0-5	No data	No data	0-5
Erosion Control Blanket Material	Biodegradable Coir		Biodegradable Coir			

**Table 8D. Landscape Observations for Management Unit 2 Treatment Plot 4**

Transect/Quadrat	T1Q1				T1Q2			
	Y0 2017/2018	Y1 2018/2019	Y2 2019/2020	Y3 2020/2021	Y0 2017/2018	Y1 2018/2019	Y2 2019/2020	Y3 2020/2021
Restoration Status	Partially Cleared and Planted				Partially Cleared and Planted			
Slope (%)	40				56			
Soil Texture	Silt				Silt			
Slope Stability	Stable	Stable	Stable	Erosion	Stable	Stable	Stable	Erosion
Exposed Soil (%)	0-5	0-5	0-5	5-25	5-25	0-5	0-5	0-5
Erosion Control Blanket (% intact)	75-95	75-95	50-75	25-50	75-95	75-95	25-50	25-50
Erosion Control Blanket Material	Biodegradable Coir				Biodegradable Coir			

Management Unit 2 Treatment Plot 4 continued

Transect/Quadrat	T2Q1				T2Q2			
Monitoring Year	Y0 2017/2018	Y1 2018/2019	Y2 2019/2020	Y3 2020/2021	Y0 2017/2018	Y1 2018/2019	Y2 2019/2020	Y3 2020/2021
Restoration Status	Partially Cleared and Planted				Partially Cleared and Planted			
Slope (%)	80				63			
Soil Texture	Silt				Silt			
Slope Stability	Stable	Stable	Stable	Erosion	Stable	Stable	Stable	Erosion
Exposed Soil (%)	5-25	5-25	5-25	0-5	0-5	0-5	5-25	0-5
Erosion Control Blanket (% intact)	50-75	50-75	25-50	5-25	50-75	50-75	25-50	0-5
Erosion Control Blanket Material	Biodegradable Coir				Biodegradable Coir			

Transect/Quadrat	T3Q1		T3Q2		T3Q1+Q2	
Monitoring Year	Y0 2017/2018	Y1 2018/2019	Y0 2017/2018	Y1 2018/2019	Y2 2019/2020	Y3 2020/2021
Restoration Status	Partially Cleared and Planted		Partially Cleared and Planted			
Slope (%)	80		76			
Soil Texture	Silt		Silt			
Slope Stability	Stable	Stable	Stable	Stable	No data	Erosion
Exposed Soil (%)	5-25	25-50	5-25	50-75	No data	25-50
Erosion Control Blanket (% intact)	0-5	0-5	0-5	0-5	No data	0-5
Erosion Control Blanket Material	Biodegradable Coir		Biodegradable Coir			

**Table 9A. Plant Survival Rates Management Unit 1 Treatment Plot 2 Quadrats**

Evergreen/ Deciduous	Growth Habit	Species/Common Name	Y0 #* 2015/2016	Y1 # 2016/2017	Y2 # 2017/2018	Y3 # 2018/2019	Y4 #** 2019/2020	Y5 # 2020/2021	Survival Y0-Y5
Deciduous	Shrub	<i>Rosa gymnocarpa</i> / bald hip rose	No data	0	0	2	0	0	
Deciduous	Shrub	<i>Rosa nutkana</i> / Nootka rose	No data	6	1	0	1	0	
Deciduous	Tree	<i>Acer macrophyllum</i> /bigleaf maple	No data	0	0	1	0	0	
Evergreen	Shrub	<i>Mahonia aquifolium</i> / tall Oregon grape	No data	4	4	4	1	1	
Evergreen	Tree	<i>Abies grandis</i> / grand fir	No data	0	0	1	1	0	
Evergreen	Tree	<i>Pseudotsuga menziesii</i> /Douglas-fir	No data	0	0	1	1	1	
Total Shrub + Groundcover Plants			4	10	5	6	2	1	25%
Total All Native Plants			5	10	5	9	4	2	40%

\*The number of plants installed per monitoring location was estimated based upon the total number of plants installed per treatment plot, no baseline monitoring was performed.

\*\*Landslide wiped out plants in 1/4 to 1/2 of quadrats in Y4, and a fire burned the vegetation in Y5.

**Table 9B. Plant Survival Rates Management Unit 1 Treatment Plot 3 Quadrats**

Evergreen/ Deciduous	Growth Habit	Species/Common Name	Y0 #* 2015/2016	Y1 # 2016/2017	Y2 # 2017/2018	Y3 # 2018/2019	Y4 # 2019/2020	Y5 # 2020/2021	Survival Y0-Y5
Deciduous	Shrub	<i>Acer circinatum</i> / vine maple	No data	2	2	1	No data	1	
Deciduous	Shrub	<i>Holodiscus</i> <i>discolor</i> /oceanspray	No data	0	1	1	No data	2	
Deciduous	Shrub	<i>Symphoricarpos</i> <i>albus</i> /snowberry	No data	10	5	4	No data	2	
Deciduous	Tree	<i>Acer macrophyllum</i> /bigleaf maple	No data	0	0	1	No data	0	
Evergreen	Shrub	<i>Mahonia aquifolium</i> /tall Oregon grape	No data	0	0	4	No data	4	
Evergreen	Tree	<i>Pinus contorta</i> / shore pine	No data	2	1	2	No data	3	
Total Shrub + Groundcover Plants			9	12	8	11	No data	9	100%
Total All Native Plants			10	14	9	13	No data	12	120%

\*The number of plants installed per monitoring location was estimated based upon the total number of plants installed per treatment plot, no baseline monitoring was performed.

**Table 9C. Plant Survival Rates Management Unit 1 Treatment Plot 4 Quadrats**

Evergreen/ Deciduous	Growth Habit	Species/Common Name	Y0 #* 2015/2016	Y1 # 2016/2017	Y2 # 2017/2018	Y3 # 2018/2019	Y4 # 2019/2020	Y5 # 2020/2021	Survival Y0-Y5
Deciduous	Shrub	<i>Rosa nutkana</i> / Nootka rose	No data	0	0	0	0	1	
Deciduous	Shrub	<i>Symphoricarpos albus</i> /snowberry	No data	1	1	5	4	6	
Deciduous	Tree	<i>Prunus emarginata</i> / bitter cherry	No data	2	3	2	2	2	
Evergreen	Ground- cover	<i>Arctostaphylos uva- ursi</i> /Kinnikinnick	No data	0	0	1	0	0	
Evergreen	Shrub	<i>Mahonia aquifolium</i> /tall Oregon grape	No data	0	0	1	1	2	
Evergreen	Tree	<i>Pinus contorta</i> / shore pine	No data	0	0	0	0	1	
Total Shrub + Groundcover Plants			0	1	1	7	5	9	900%
Total All Native Plants			1	2	4	9	7	12	1200%

\*The number of plants installed per monitoring location was estimated based upon the total number of plants installed per treatment plot, no baseline monitoring was performed.

**Table 9D. Plant Survival Rates Management Unit 1 Treatment Plot 5 Quadrats**

Evergreen/ Deciduous	Growth Habit	Species/Common Name	Y0 #* 2015/2016	Y1 # 2016/2017	Y2 # 2017/2018	Y3 # 2018/2019	Y4 # 2019/2020	Y5 # 2020/2021	Survival Y0-Y5
Deciduous	Shrub	<i>Symphoricarpos albus/snowberry</i>	No data	1	1	2	2	1	
Evergreen	Ground- cover	<i>Polystichum munitum/sword fern</i>	No data	5	0	0	0	0	
Total Shrub + Groundcover Plants			9	6	1	2	2	1	11%
Total All Native Plants			9	6	1	2	2	1	11%

\*The number of plants installed per monitoring location was estimated based upon the total number of plants installed per treatment plot, no baseline monitoring was performed.



**Table 9E. Plant Survival Rates Management Unit 1 Treatment Plot 6-1C Quadrats**

Evergreen/ Deciduous	Growth Habit	Species/Common Name	Y0 #* 2015/2016	Y1 # 2016/2017	Y2 # 2017/2018	Y3 # 2018/2019	Y4 # 2019/2020	Y5 # 2020/2021	Survival Y0-Y5
Deciduous	Shrub	<i>Oemlaria cerasiformis</i> /Osoberry	No data	0	0	5	5	1	
Deciduous	Shrub	<i>Holodiscus discolor</i> /oceanspray	No data	0	0	2	1	0	
Deciduous	Shrub	<i>Symphoricarpos albus</i> /snowberry	No data	1	1	3	2	1	
Evergreen	Groundcover	<i>Polystichum munitum</i> / sword fern	No data	0	0	5	5	1	
Evergreen	Shrub	<i>Morella californica</i> / Pacific wax-myrtle	No data	1	0	0	0	0	
Evergreen	Shrub	<i>Vaccinium ovatum</i> / evergreen huckleberry	No data	0	0	1	0	0	
Evergreen	Tree	<i>Abies grandis</i> / Grand fir	No data	0	0	1	0	0	
Evergreen	Tree	<i>Thuja plicata</i> / Western redcedar	No data	1	0	0	0	0	
Total Shrub + Groundcover Plants			16	2	1	16	13	3	19%
Total All Native Plants			17	3	1	17	13	3	18%

\*The number of plants installed per monitoring location was estimated based upon the total number of plants installed per treatment plot, no baseline monitoring was performed.

**Table 9F. Plant Survival Rates Management Unit 1 Treatment Plot 6-1D Quadrats**

Evergreen/ Deciduous	Growth Habit	Species/Common Name	Y0 # 2016/2017	Y1 # 2017/2018	Y2-2018/2019 Y3-2019/2020 <b>Y4-2020/2021</b>
Deciduous	Shrub	<i>Acer circinatum</i> /vine maple	2	0	No data
Deciduous	Shrub	<i>Corylus cornuta</i> /beaked hazelnut	1	0	No data
Deciduous	Shrub	<i>Oemlaria cerasiformis</i> /Osoberry	1	0	No data
Deciduous	Shrub	<i>Holodiscus discolor</i> /oceanspray	3	0	No data
Deciduous	Shrub	<i>Symphoricarpos albus</i> /snowberry	2	2	No data
Deciduous	Tree	<i>Acer macrophyllum</i> /bigleaf maple	0	1	No data
Evergreen	Tree	<i>Thuja plicata</i> /Western redcedar	1	0	No data
Total Shrub + Groundcover Plants			8	2	No data
Total All Native Plants			9	3	No data

**Table 9G. Plant Survival Rates Management Unit 1 Treatment Plot 6-2E Quadrats**

Evergreen/ Deciduous	Growth Habit	Species/Common Name	Y0 # 2016/2017	Y1 # 2017/2018	Y2-2018/2019 Y3-2019/2020 <b>Y4-2020/2021</b>
Deciduous	Shrub	<i>Holodiscus discolor</i> /oceanspray	No data	0	No data
Deciduous	Shrub	<i>Symphoricarpos albus</i> /snowberry	No data	0	No data
Deciduous	Tree	<i>Acer macrophyllum</i> /bigleaf maple	No data	2	No data
Evergreen	Groundcover	<i>Polystichum munitum</i> /sword fern	No data	4	No data
Evergreen	Groundcover	<i>Gautheria shallon</i> /salal	No data	0	No data
Evergreen	Shrub	<i>Mahonia nervosa</i> /low Oregon grape	No data	0	No data
Total			10	6	No data

**Table 9H. Plant Survival Rates Management Unit 1 Treatment Plot 6-3F Quadrats**

Evergreen/ Deciduous	Growth Habit	Species/Common Name	Y0 # 2016/2017	Y1 # 2017/2018	Y2-2018/2019 Y3-2019/2020 <b>Y4-2020/2021</b>
Deciduous	Shrub	<i>Acer circinatum</i> /vine maple	1	0	No data
Deciduous	Shrub	<i>Corylus cornuta</i> /beaked hazelnut	1	0	No data
Deciduous	Shrub	<i>Holodiscus discolor</i> /oceanspray	7	1	No data
Deciduous	Shrub	<i>Symphoricarpos albus</i> /snowberry	2	0	No data
Evergreen	Groundcover	<i>Polystichum munitum</i> /sword fern	4	1	No data
Evergreen	Shrub	<i>Mahonia nervosa</i> /low Oregon grape	1	0	No data
Evergreen	Tree	<i>Abies grandis</i> /grand fir	1	1	No data
Total Shrub + Groundcover Plants			12	2	No data
Total All Native Plants			13	3	No data

**Table 10A. Plant Survival Management Unit 2 Treatment Plot 1 Transect 1 Quadrats**

Evergreen/ Deciduous	Growth Habit	Species/Common Name	Y0 # 2017/2018	Y1 # 2018/2019	Y2 # 2019/2020	Y3 # 2020/2021	Survival Y0 to Y3
Deciduous	Shrub	<i>Acer circinatum</i> /vine maple	3	0	0	0	
Deciduous	Shrub	<i>Corylus cornuta</i> /beaked hazelnut	2	0	0	0	
Deciduous	Shrub	<i>Oemlaria cerasiformis</i> /Osoberry	1	1	1	1	
Deciduous	Shrub	<i>Ribes sanguineum</i> / red flowering currant	0	0	2	1	
Deciduous	Shrub	<i>Rosa gymnocarpa</i> /baldhip rose	1	0	0	0	
Deciduous	Shrub	<i>Rosa nutkana</i> /Nootka rose	2	0	0	0	
Deciduous	Shrub	<i>Rubus parviflora</i> /thimbleberry	0	0	10	1	
Deciduous	Shrub	<i>Symphoricarpos albus</i> /snowberry	2	2	3	5	
Deciduous	Tree	<i>Acer macrophyllum</i> /bigleaf maple	1	2	1	2	
Deciduous	Tree	<i>Frangula purshiana</i> /Cascara	2	3	1	0	
Deciduous	Tree	<i>Prunus emarginata</i> /bitter cherry	2	1	1	1	
Evergreen	Groundcover	<i>Polystichum munitum</i> /sword fern	3	1	0	0	
Evergreen	Shrub	<i>Mahonia aquifolium</i> /tall Oregon grape	2	2	3	3	
Evergreen	Shrub	<i>Mahonia nervosa</i> /low Oregon grape	4	0	0	0	
Evergreen	Tree	<i>Pinus contorta</i> /shore pine	1	1	0	1	
Total Shrub + Groundcover Plants			20	5	19	11	55%
Total All Native Plants			26	13	22	15	58%

**Table 10B. Plant Survival Management Unit 2 Treatment Plot 1 Transect 2 Quadrats**

Evergreen/ Deciduous	Growth Habit	Species/Common Name	Y0 # 2017/2018	Y1 # 2018/2019	Y2 # 2019/2020	Y3 #* 2020/2021	Survival Y0 to Y3
Deciduous	Shrub	<i>Acer circinatum</i> /vine maple	1	0	0	No data	
Deciduous	Shrub	<i>Corylus cornuta</i> /beaked hazelnut	1	1	1	No data	
Deciduous	Shrub	<i>Oemlaria cerasiformis</i> /Osoberry	3	2	0	No data	
Deciduous	Shrub	<i>Rosa nutkana</i> /Nootka rose	1	0	0	No data	
Deciduous	Shrub	<i>Symphoricarpos albus</i> /snowberry	3	1	1	No data	
Deciduous	Tree	<i>Acer campestre</i> /hedge maple	1	1	1	No data	
Deciduous	Tree	<i>Acer macrophyllum</i> /bigleaf maple	1	1	0	No data	
Deciduous	Tree	<i>Prunus emarginata</i> /bitter cherry	2	1	3	No data	
Evergreen	Groundcover	<i>Polystichum munitum</i> /sword fern	0	4	6	No data	
Evergreen	Groundcover	<i>Rubus ursinus</i> /trailing blackberry	~ 6	6	1	No data	
Evergreen	Shrub	<i>Mahonia nervosa</i> /low Oregon grape	~ 90	~ 90	~ 90	No data	
Total Shrub + Groundcover Plants			106	104	99	No data	No data
Total All Native Plants			109	107	103	No data	No data

\* Nearly every plant was dead due to the presence of an encampment. Monitoring could not take place.

**Table 10C. Plant Survival Management Unit 2 Treatment Plot 1 Transect 3 Quadrats**

Evergreen/ Deciduous	Growth Habit	Species/Common Name	Y0 # 2017/2018	Y1 # 2018/2019	Y2 # 2019/2020	Y3 # 2020/2021	Survival Y0 to Y3
Deciduous	Shrub	<i>Acer circinatum</i> /vine maple	3	0	0	0	
Deciduous	Shrub	<i>Corylus cornuta</i> /beaked hazelnut	2	0	0	0	
Deciduous	Shrub	<i>Holodiscus discolor</i> /oceanspray	0	0	1	0	
Deciduous	Shrub	<i>Oemlaria cerasiformis</i> /Osoberry	1	0	0	0	
Deciduous	Shrub	<i>Rosa nutkana</i> /Nootka rose	0	0	0	1	
Deciduous	Shrub	<i>Rubus parviflorus</i> /thimbleberry	3	0	0	0	
Deciduous	Shrub	<i>Symphoricarpos albus</i> /snowberry	11	11	13	6	
Deciduous	Tree	<i>Acer macrophyllum</i> /bigleaf maple	1	1	0	1	
Deciduous	Tree	<i>Frangula purshiana</i> /cascara	1	0	0	0	
Evergreen	Groundcover	<i>Polystichum munitum</i> /sword fern	1	0	0	1	
Evergreen	Shrub	<i>Mahonia nervosa</i> /low Oregon grape	9	0	1	0	
Evergreen	Tree	<i>Pinus contorta</i> /shore pine	2	5	4	4	
Total Shrub + Groundcover Plants			30	11	15	7	23%
Total All Native Plants			34	17	19	12	35%

**Table 10D. Plant Survival Management Unit 2 Treatment Plot 1 Transect 4 Quadrats**

Evergreen/ Deciduous	Growth Habit	Species/Common Name	Y0 # 2017/2018	Y1 # 2018/2019	Y2 # 2019/2020	Y3 # 2020/2021	Survival Y0 to Y3
Deciduous	Shrub	<i>Acer circinatum</i> /vine maple	0	2	0	1	
Deciduous	Shrub	<i>Corylus cornuta</i> /beaked hazelnut	6	0	0	0	
Deciduous	Shrub	<i>Holodiscus discolor</i> /oceanspray	0	0	3	2	
Deciduous	Shrub	<i>Philadelphus lewisii</i> /mock orange	0	0	1	1	
Deciduous	Shrub	<i>Ribes sanguineum</i> /red flowering currant	0	0	0	1	
Deciduous	Shrub	<i>Rosa gymnocarpa</i> /baldhip rose	2	1	0	0	
Deciduous	Shrub	<i>Rosa nutkana</i> /Nootka rose	6	1	3	2	
Deciduous	Shrub	<i>Rubus parviflorus</i> /thimbleberry	0	0	1	1	
Deciduous	Shrub	<i>Symphoricarpos albus</i> /snowberry	7	5	4	6	
Deciduous	Tree	<i>Frangula purshiana</i> /cascara	1	0	0	0	
Evergreen	Groundcover	<i>Polystichum munitum</i> /sword fern	1	0	0	0	
Evergreen	Shrub	<i>Mahonia aquifolium</i> /tall Oregon grape	5	1	1	1	
Evergreen	Shrub	<i>Mahonia nervosa</i> /low Oregon grape	2	0	0	0	
Evergreen	Tree	<i>Pinus contorta</i> /shore pine	1	1	0	2	
Total Shrub + Groundcover Plants			29	10	13	15	52%
Total All Native Plants			31	11	13	17	55%

**Table 10E. Plant Survival Management Unit 2 Treatment Plot 2 Transect 1 Quadrats**

Evergreen/ Deciduous	Growth Habit	Species/Common Name	Y0 # 2017/2018	Y1 # 2018/2019	Y2 # 2019/2020	Y3 #* 2020/2021
Deciduous	Shrub	<i>Acer circinatum</i> /vine maple	2	0	0	No data
Deciduous	Shrub	<i>Corylus cornuta</i> /beaked hazelnut	6	0	X	No data
Deciduous	Shrub	<i>Holodiscus discolor</i> /oceanspray	5	X	X	No data
Deciduous	Shrub	<i>Lonicera involucrate</i> /twinberry	4	X	0	No data
Deciduous	Shrub	<i>Oemlaria cerasiformis</i> /Osoberry	0	X	0	No data
Deciduous	Shrub	<i>Ribes sanguineum</i> /red flowering currant	0	X	0	No data
Deciduous	Shrub	<i>Rosa gymnocarpa</i> /baldhip rose	3	X	0	No data
Deciduous	Shrub	<i>Rosa nutkana</i> /Nootka rose	3	0	0	No data
Deciduous	Shrub	<i>Symphoricarpos albus</i> /snowberry	4	X	X	No data
Evergreen	Groundcover	<i>Gaultheria shallon</i> /salal	1	0	0	No data
Evergreen	Groundcover	<i>Polystichum munitum</i> /sword fern	3	X	0	No data
Evergreen	Shrub	<i>Mahonia aquifolium</i> /tall Oregon grape	1	X	X	No data
Evergreen	Shrub	<i>Mahonia nervosa</i> /low Oregon grape	1	X	X	No data
Evergreen	Tree	<i>Pinus contorta</i> /shore pine	0	X	0	No data
Total			33	N/A	N/A	N/A

X = plant species present, but the number is unknown; 0 = plant absent.

N/A = Not applicable.

\* Could not get close enough to plot to monitor due to hostile encampment.



**Table 10F. Plant Survival Management Unit 2 Treatment Plot 3 Transect 1 Quadrats**

Evergreen/ Deciduous	Growth Habit	Species/Common Name	Y0 # 2017/2018	Y1 2018/2019	Y2 2019/2020	Y3* 2020/2021
Deciduous	Shrub	<i>Acer circinatum</i> /vine maple	0	X	X	0
Deciduous	Shrub	<i>Corylus cornuta</i> /beaked hazelnut	0			X
Deciduous	Shrub	<i>Holodiscus discolor</i> /oceanspray	0			X
Deciduous	Shrub	<i>Rosa nutkana</i> /Nootka rose	0			X
Deciduous	Shrub	<i>Symphoricarpos albus</i> /snowberry	0			X
Deciduous	Tree	<i>Frangula purshiana</i> /Cascara	3	0	0	0
Evergreen	Shrub	<i>Mahonia aquifolium</i> /tall Oregon grape	0			X
Evergreen	Tree	<i>Pinus contorta</i> /shore pine	2	X	X	X
Total			5	N/A	N/A	N/A

X = plant species present, but the number is unknown; 0 = plant absent.

N/A = Not applicable.

\*Although plot markers were gone, the monitoring crew was able to get closer to the plot in Y3 as there were no encampments nearby.

**Table 10G. Plant Survival Management Unit 2 Treatment Plot 3 Transect 2 Quadrats**

Evergreen/ Deciduous	Growth Habit	Species/Common Name	Y0 # 2017/2018	Y1 # 2018/2019	Y2 # 2019/2020	Y3 # 2020/2021	Survival Y0 to Y3
Deciduous	Shrub	<i>Acer circinatum</i> /vine maple	3	1	2	0	
Deciduous	Shrub	<i>Corylus cornuta</i> /beaked hazelnut	5	2	2	1	
Deciduous	Shrub	<i>Holodiscus discolor</i> /oceanspray	2	1	2	4	
Deciduous	Shrub	<i>Oemlaria cerasiformis</i> /Osoberry	4	1	2	2	
Deciduous	Shrub	<i>Rubus parviflorus</i> /thimbleberry	6	0	1	0	
Deciduous	Shrub	<i>Symphoricarpos albus</i> /snowberry	4	1	5	6	
Deciduous	Tree	<i>Acer sp.</i> /unknown maple species	0	1	1	1	
Evergreen	Groundcover	<i>Gaultheria shallon</i> /salal	9	0	0	0	
Evergreen	Groundcover	<i>Polystichum munitum</i> /sword fern	10	5	8	4	
Evergreen	Shrub	<i>Mahonia aquifolium</i> /tall Oregon grape	0	1	0	1	
Evergreen	Shrub	<i>Mahonia nervosa</i> /low Oregon grape	2	0	0	0	
Total Shrub + Groundcover Plants			45	12	21	18	40%
Total All Native Plants			45	13	22	19	42%

**Table 10H. Plant Survival Management Unit 2 Treatment Plot 3 Transect 3 Quadrats**

Evergreen/ Deciduous	Growth Habit	Species/Common Name	Y0 # 2017/2018	Y1 # 2018/2019	Y2 # 2019/2020	Y3 # 2020/2021
Deciduous	Shrub	<i>Acer circinatum</i> /vine maple	4	0	0	0
Deciduous	Shrub	<i>Holodiscus discolor</i> /oceanspray	2	X	0	X
Deciduous	Shrub	<i>Oemlaria cerasiformis</i> /Osoberry	1	0	0	0
Deciduous	Shrub	<i>Rubus parviflorus</i> /thimbleberry	2	0	0	0
Deciduous	Shrub	<i>Symphoricarpos albus</i> /snowberry	2	X	0	X
Deciduous	Tree	<i>Acer macrophyllum</i> /bigleaf maple	1	0	0	X
Deciduous	Tree	<i>Acer sp.</i> /unknown maple species	1	0	0	0
Evergreen	Groundcover	<i>Polystichum munitum</i> /sword fern	12	X	X	X
Evergreen	Shrub	<i>Mahonia nervosa</i> /low Oregon grape	5	X	0	0
Evergreen	Shrub	<i>Vaccinium ovatum</i> /evergreen huckleberry	3	0	0	0
Evergreen	Tree	<i>Pinus contorta</i> /shore pine	2	0	0	0
Total			35	N/A	N/A	N/A

X = plant species present, but the number is unknown; 0 = plant absent.

N/A = Not applicable.

**Table 10I. Plant Survival Management Unit 2 Treatment Plot 4 Transect 1 Quadrats**

Evergreen/ Deciduous	Growth Habit	Species/Common Name	Y0 # 2017/2018	Y1 # 2018/2019	Y2 # 2019/2020	Y3 # 2020/2021	Survival Y0 to Y3
Deciduous	Shrub	<i>Acer circinatum</i> /vine maple	3	1	0	0	
Deciduous	Shrub	<i>Holodiscus discolor</i> /oceanspray	8	2	1	1	
Deciduous	Shrub	<i>Oemlaria cerasiformis</i> /Osoberry	2	0	0	0	
Deciduous	Shrub	<i>Symphoricarpos albus</i> /snowberry	10	5	5	3	
Deciduous	Tree	<i>Acer macrophyllum</i> /bigleaf maple	6	1	1	2	
Deciduous	Tree	<i>Crataegus douglasii</i> /black hawthorne	2	0	0	0	
Evergreen	Groundcover	<i>Arcostaphylos uvi-ursi</i> /Kinnikinnick	6	3	0	0	
Evergreen	Groundcover	<i>Gaultheria shallon</i> /salal	14	0	0	0	
Evergreen	Groundcover	<i>Polystichum munitum</i> /sword fern	10	5	8	0	
Evergreen	Shrub	<i>Mahonia aquifolium</i> /tall Oregon grape	6	3	4	3	
Evergreen	Tree	<i>Pinus contorta</i> /shore pine	2	0	0	0	
Total Shrub + Groundcover Plants			59	19	18	7	12%
Total All Native Plants			69	20	19	9	13%

**Table 10J. Plant Survival Management Unit 2 Treatment Plot 4 Transect 2 Quadrats**

Evergreen/ Deciduous	Growth Habit	Species/Common Name	Y0 # 2017/2018	Y1 # 2018/2019	Y2 # 2019/2020	Y3 # 2020/2021	Survival Y0 to Y3
Deciduous	Shrub	<i>Holodiscus discolor</i> /oceanspray	2	0	0	0	
Deciduous	Shrub	<i>Oemlaria cerasiformis</i> /Osoberry	3	1	0	0	
Deciduous	Shrub	Rosa sp./unknown rose species	0	1	0	0	
Deciduous	Shrub	<i>Rubus parviflorus</i> /thimbleberry	3	0	0	0	
Deciduous	Shrub	<i>Symphoricarpos albus</i> /snowberry	7	3	3	2	
Deciduous	Tree	<i>Acer macrophyllum</i> /bigleaf maple	3	1	1	1	
Deciduous	Tree	<i>Crataegus douglasii</i> /black hawthorne	1	0	0	0	
Evergreen	Groundcover	<i>Arctostaphylos uva-ursi</i> /Kinnikinnick	8	0	0	0	
Evergreen	Groundcover	<i>Gaultheria shallon</i> /salal	11	0	0	0	
Evergreen	Groundcover	<i>Polystichum munitum</i> /sword fern	13	0	0	0	
Evergreen	Shrub	Cyperaceae family/unknown	0	1	0	0	
Evergreen	Tree	<i>Pinus contorta</i> /shore pine	3	4	3	2	
Total Shrub + Groundcover Plants			46	6	3	2	4%
Total All Native Plants			53	11	7	5	9%

**Table 10K. Plant Survival Management Unit 2 Treatment Plot 4 Transect 3 Quadrats**

Evergreen/Deciduous	Growth Habit	Species/Common Name	Y0 # (2017/18)	Y1 # (2018/19)	Y2-2019/2020* Y3-2020/2021
Deciduous	Tree	<i>Acer macrophyllum</i> /bigleaf maple	1	0	No data
Deciduous	Tree	<i>Acer pseudoplatanus</i> /sycamore maple	0	1	No data
Deciduous	Tree	Unknown species	1	0	No data
Evergreen	Groundcover	<i>Arcostaphylos uva-ursi</i> /Kinnikinnick	6	0	No data
Evergreen	Groundcover	<i>Gaultheria shallon</i> /salal	5	0	No data
Evergreen	Groundcover	<i>Polystichum munitum</i> /sword fern	8	7	No data
Evergreen	Groundcover	<i>Rubus ursinus</i> /trailing blackberry	0	2	No data
Evergreen	Shrub	<i>Mahonia aquifolium</i> /tall Oregon grape	1	0	No data
Evergreen	Tree	<i>Pinus contorta</i> /shore pine	1	0	No data
Total Shrub + Groundcover Plants			20	9	No data
Total All Native Plants			23	10	No data

\*Plot destroyed by transient activity.

**Table 11A. Estimated Cover by Plant Type in Management Unit 1 Treatment Plot 2 Transect**

Monitoring Year	Y1 2016/2017	Y2 2017/2018	Y3 2018/2019	Y4 2019/2020	Y5 2020/2021	Species with Significant Cover 2020/2021
Deciduous Groundcover (%)	0	0	0	0	0	
Deciduous Shrub (%)	18	22	28	14	26	<i>Holodiscus discolor</i> /oceanspray <i>Rosa nutkana</i> /Nootka Rose
Deciduous Tree (%)	0	0	0	0	0	
Deciduous Total (%)	18	22	28	14	26	
Evergreen Groundcover (%)	0	4	0	0	0	
Evergreen Shrub (%)	14	22	40	55	58	<i>Mahonia aquifolium</i> /tall Oregon grape
Evergreen Tree (%)	13	6	30	12	20	<i>Abies grandis</i> /grand fir
Evergreen Total (%)	26	32	70	67	76	
Total Native Vegetation (%)	44	54	98	81	102	
Est. Total Native Vegetation (%)	No data	5-25	5-25	25-50	50-75	
Tree Canopy (%)	No data	50-75	25-50	25-50	75-95	
Exposed Soil (%)	25-50	50-75	5-25	5-25	5-25	
Invasive Species (%)	5-25	0-5	5-25	50-75	25-50	<i>Clematis vitalba</i> /old man's beard <i>Convulvulus arvensis</i> /poison hemlock <i>Cystisus scoparius</i> /Scotch broom <i>Gallium aparine</i> /cleaver <i>Rubus armeniacus</i> /Himalayan blackberry

**Table 11B. Estimated Cover by Plant Type in Management Unit 1 Treatment Plot 3 Transect**

Monitoring Year	Y1 2016/2017	Y2 2017/2018	Y3 2018/2019	Y4 2019/2020	Y5 2020/2021	Species with Significant Cover 2020/2021
Deciduous Groundcover (%)	0	0	0	0	0	
Deciduous Shrub (%)	38	71	104	42	112	<i>Holodiscus discolor</i> /oceanspray <i>Rosa nutkana</i> /Nootka rose <i>Symphoricarpos albus</i> /snowberry
Deciduous Tree (%)	3	0	6	2	7	
Deciduous Total (%)	41	71	110	44	119	
Evergreen Groundcover (%)	7	0	0	0	0	
Evergreen Shrub (%)	9	11	24	27	23	<i>Mahonia aquifolium</i> /tall Oregon grape
Evergreen Tree (%)	13	18	41	22	25	<i>Pinus nigra</i> /Austrian pine
Evergreen Total (%)	29	29	55	48	48	
Total Native Vegetation (%)	70	100	165	92	167	
Est. Total Native Vegetation (%)	No data	25-50	75-95	50-75	50-75	
Tree Canopy (%)	No data	5-25	5-25	5-25	5-25	
Exposed Soil (%)	25-50	5-25	25-50	0-5	0-5	
Invasive Species (%)	25-50	0-5	0-5	5-25	0-5	



**Table 11C. Estimated Cover by Plant Type in Management Unit 1 Treatment Plot 4 Transect**

Monitoring Year	Y1 2016/2017	Y2 2017/2018	Y3 2018/2019	Y4 2019/2020	Y5 2020/2021	Species with Significant Cover 2020/2021
Deciduous Groundcover (%)	24	0	0	0	0	
Deciduous Shrub (%)	0	23	50	54	80	<i>Symphoricarpos albus</i> /snowberry
Deciduous Tree (%)	14	18	21	19	8	
Deciduous Total (%)	38	41	71	73	88	
Evergreen Groundcover (%)	0	0	2	0	0	
Evergreen Shrub (%)	0	1	11	8	18	<i>Mahonia aquifolium</i> /tall Oregon grape
Evergreen Tree (%)	17	33	49	58	64	<i>Pinus contorta</i> /shore pine
Evergreen Total (%)	17	34	62	66	82	
Total Native Vegetation (%)	55	75	133	139	170	
Est. Total Native Vegetation (%)	No data	5-25	25-50	5-25	50-75	
Tree Canopy (%)	No data	5-25	5-25	5-25	0-5	
Exposed Soil (%)	0-5	5-25	50-75	0-5	5-25	
Invasive Species (%)	5-25	5-25	0-5	25-50	5-25	<i>Dipsacus fullonum</i> /common teasel <i>Clematis vitalba</i> /old man's beard <i>Gallium aparine</i> /cleaver <i>Rubus armeniacus</i> /Himalayan blackberry

**Table 11D. Estimated Cover by Plant Type in Management Unit 1 Treatment Plot 5 Transect**

Monitoring Year	Y1 2016/2017	Y2 2017/2018	Y3 2018/2019	Y4 2019/2020	Y5 2020/2021	Species with Significant Cover 2020/2021
Deciduous Groundcover (%)	0	0	0	0	0	
Deciduous Shrub (%)	25	31	35	47	52	<i>Holodiscus discolor</i> /oceanspray <i>Symphoricarpos albus</i> /snowberry <i>Acer circinatum</i> /vine maple
Deciduous Tree (%)	0	0	0	0	0	
Deciduous Total (%)	25	31	35	47	52	
Evergreen Groundcover (%)	0	0	0	0	0	
Evergreen Shrub (%)	0	0	0	0	0	
Evergreen Tree (%)	12	5	11	13	16	<i>Abies grandis</i> /grand fir
Evergreen Total (%)	12	5	11	13	16	
Total Native Vegetation (%)	37	36	46	60	68	
Est. Total Native Vegetation (%)	No data	0-5	5-25	5-25	5-25	
Tree Canopy (%)	No data	25-50	5-25	5-25	5-25	
Exposed Soil (%)	25-50	0-5	5-25	0-5	0-5	
Invasive Species (%)	5-25	0-5	5-25	50-75	75-95	<i>Clematis vitalba</i> /old man's beard <i>Cystisus scoparius</i> /Scotch broom <i>Daphne laureola</i> /spurge laurel <i>Gallium aparine</i> /cleaver <i>Rubus armeniacus</i> /Himalayan blackberry

**Table 11E. Estimated Cover by Plant Type in Management Unit 1 Treatment Plot 6-1C Transect**

Monitoring Year	Y1 2016/2017	Y2 2017/2018	Y3 2018/2019	Y4 2019/2020	Y5 2020/2021	Species with Significant Cover 2020/2021
Deciduous Groundcover (%)	0	0	0	0	0	
Deciduous Shrub (%)	17	2	53	43	32	<i>Holodiscus discolor/oceanspray</i> <i>Symphoricarpos albus/snowberry</i>
Deciduous Tree (%)	0	0	0	0	0	
Deciduous Total (%)	17	2	53	43	32	
Evergreen Groundcover (%)	0	0	42	35	26	<i>Polystichum munitum/sword fern</i>
Evergreen Shrub (%)	7	0	11	1	0	
Evergreen Tree (%)	1	0	3	1	0	
Evergreen Total (%)	8	0	56	38	26	
Total Native Vegetation (%)	25	2	109	81	58	
Est. Total Native Vegetation (%)	No data	0-5	5-25	5-25	5-25	
Tree Canopy (%)	No data	95-100	95-100	75-95	75-95	
Exposed Soil (%)	25-50	75-95	75-95	75-95	75-95	
Invasive Species (%)	5-25	0-5	5-25	0-5	0-5	

**Table 11F. Estimated Cover by Plant Type in Management Unit 1 Treatment Plot 6-1D Transect**

Monitoring Year	Y0 2016/2017	Y1 2017/2018	Y2 2018/2019	Y3 2019/2020	Y4 2020/2021
Deciduous Groundcover (%)	0	3	No data	No data	No data
Deciduous Shrub (%)	52	37	No data	No data	No data
Deciduous Tree (%)	0	0	No data	No data	No data
Deciduous Total (%)	52	40	No data	No data	No data
Evergreen Groundcover (%)	0	16	No data	No data	No data
Evergreen Shrub (%)	3	0	No data	No data	No data
Evergreen Tree (%)	7	0	No data	No data	No data
Evergreen Total (%)	17	16	No data	No data	No data
Total Native Vegetation (%)	68	56	No data	No data	No data
Est. Total Native Vegetation (%)	No data	0-5	0-5	No data	No data
Tree Canopy (%)	95-100	95-100	95-100	No data	No data
Exposed Soil (%)	5-25	50-75	50-75	No data	No data
Invasive Species (%)	0-5	0-5	0-5	No data	No data

**Table 11G. Estimated Cover by Plant Type in Management Unit 1 Treatment Plot 6-2E Transect**

Monitoring Year	Y0 2016/2017	Y1 2017/2018	Y2 2018/2019	Y3 2019/2020	Y4 2020/2021
Deciduous Groundcover (%)	0	0	No data	No data	No data
Deciduous Shrub (%)	18	7	No data	No data	No data
Deciduous Tree (%)	0	0	No data	No data	No data
Deciduous Total (%)	18	7	No data	No data	No data
Evergreen Groundcover (%)	21	9	No data	No data	No data
Evergreen Shrub (%)	3	0	No data	No data	No data
Evergreen Tree (%)	0	0	No data	No data	No data
Evergreen Total (%)	24	9	No data	No data	No data
Total Native Vegetation (%)	42	16	No data	No data	No data
Est. Total Native Vegetation (%)	No data	0-5	0-5	No data	No data
Tree Canopy (%)	No data	95-100	95-100	No data	No data
Exposed Soil (%)	75-95	75-95	75-95	No data	No data
Invasive Species (%)	0-5	0-5	0-5	No data	No data

**Table 11H. Estimated Cover by Plant Type in Management Unit 1 Treatment Plot 6-3F Transect**

Monitoring Year	Y0 2016/2017	Y1 2017/2018	Y2 2018/2019	Y3 2019/2020	Y4 2020/2021
Deciduous Groundcover (%)	0	0	No data	No data	No data
Deciduous Shrub (%)	56	46	No data	No data	No data
Deciduous Tree (%)	0	0	No data	No data	No data
Deciduous Total (%)	56	46	No data	No data	No data
Evergreen Groundcover (%)	16	11	No data	No data	No data
Evergreen Shrub (%)	14	0	No data	No data	No data
Evergreen Tree (%)	4	2	No data	No data	No data
Evergreen Total (%)	34	13	No data	No data	No data
Total Native Vegetation (%)	90	59	No data	No data	No data
Est. Total Native Vegetation (%)	No data	5-25	0-5	No data	No data
Tree Canopy (%)	No data	95-100	95-100	No data	No data
Exposed Soil (%)	75-95	50-75	50-75	No data	No data
Invasive Species (%)	0-5	0-5	0-5	No data	No data

**Table 12A. Estimated Cover by Plant Type for Management Unit 2 Treatment Plot 1 Transect 1**

Monitoring Year	Y0 2017/18	Y1 2018/2019	Y2 2019/2020	Y3 2020/2021	Species with Significant Cover (2020/2021)
Deciduous Groundcover (%)	0	0	0	0	
Deciduous Shrub (%)	11	14	22	26	<i>Symphoricarpos albus</i> /snowberry
Deciduous Tree (%)	3	11	5	10	
Deciduous Total (%)	14	25	27	36	
Evergreen Groundcover (%)	9	0	0	0	
Evergreen Shrub (%)	5	4	4	6	
Evergreen Tree (%)	5	7	10	10	<i>Pinus contorta</i> /shore pine
Evergreen Total (%)	19	11	14	16	
Total Native Vegetation (%)	33	36	41	52	
Est. Total Native Vegetation (%)	No data	5-25	5-25	5-25	
Tree Canopy (%)	No data	50-75	50-75	50-75	
Exposed Soil (%)	No data	50-75	5-25	0-5	
Invasive Species (%)	No data	5-25	50-75	75-95	<i>Clematis vitalba</i> /old man's beard <i>Gallium aparine</i> /cleaver <i>Lapsana communis</i> /nipplewort <i>Rubus armeniacus</i> /Himalayan blackberry

**Table 12B. Estimated Cover by Plant Type for Management Unit 2 Treatment Plot 1 Transect 2**

Monitoring Year	Y0 2017/18	Y1 2018/2019	Y2 2019/2020	Y3* 2020/2021
Deciduous Groundcover (%)	0	0	0	No data
Deciduous Shrub (%)	48	34	23	No data
Deciduous Tree (%)	1	0	0	No data
Deciduous Total (%)	49	34	23	No data
Evergreen Groundcover (%)	2	36	131	No data
Evergreen Shrub (%)	72	101	3	No data
Evergreen Tree (%)	0	0	0	No data
Evergreen Total (%)	74	101	134	No data
Total Native Vegetation (%)	123	135	157	No data
Est. Total Native Vegetation (%)	5-25	75-95	50-75	No data
Tree Canopy (%)	95-100	75-95	50-75	No data
Exposed Soil (%)	50-75	0-5	0-5	No data
Invasive Species (%)	0-5	0-5	0-5	No data

\* Plot destroyed by encampment.



**Table 12C. Estimated Cover by Plant Type for Management Unit 2 Treatment Plot 1 Transect 3**

Monitoring Year	Y0 2017/18	Y1 2018/2019	Y2 2019/2020	Y3 2020/2021	Species with Significant Cover (2020/2021)
Deciduous Groundcover (%)	0	0	0	0	
Deciduous Shrub (%)	44	44	62	34	<i>Symphoricarpos albus/snowberry</i>
Deciduous Tree (%)	0	0	0	0	
Deciduous Total (%)	44	44	62	34	
Evergreen Groundcover (%)	2	0	0	4	
Evergreen Shrub (%)	3	0	0	4	
Evergreen Tree (%)	10	17	26	24	<i>Pinus contorta/shore pine</i>
Evergreen Total (%)	15	17	26	32	
Total Native Vegetation (%)	59	62	88	66	
Est. Total Native Vegetation (%)	5-25	5-25	5-25	5-25	
Tree Canopy (%)	5-25	0-5	0-5	5-25	
Exposed Soil (%)	5-25	50-75	5-25	0-5	
Invasive Species (%)	0-5	0-5	5-25	75-95	<i>Buddleia davidii/butterfly bush</i> <i>Gallium aparine/cleaver</i> <i>Holcus lanatus/velvetgrass</i> <i>Rubus armeniacus/Himalayan blackberry</i>

**Table 12D. Estimated Cover by Plant Type for Management Unit 2 Treatment Plot 1 Transect 4**

Monitoring Year	Y0 2017/18	Y1 2018/2019	Y2 2019/2020	Y3 2020/2021	Species with Significant Cover (2020/2021)
Deciduous Groundcover (%)	0	0	0	0	
Deciduous Shrub (%)	25	17	34	48	<i>Symphoricarpos albus</i> /snowberry
Deciduous Tree (%)	0	0	0	0	
Deciduous Total (%)	25	17	34	48	
Evergreen Groundcover (%)	0	0	0	0	
Evergreen Shrub (%)	1	1	0	0	
Evergreen Tree (%)	4	5	7	5	
Evergreen Total (%)	5	6	7	10	<i>Pinus contorta</i> /shore pine
Total Native Vegetation (%)	30	23	41	58	
Est. Total Native Vegetation (%)	5-25	5-25	0-5	5-25	
Tree Canopy (%)	0-5	0-5	0-5	0-5	
Exposed Soil (%)	5-25	50-75	50-75	5-25	
Invasive Species (%)	0-5	25-50	5-25	50-75	<i>Clematis vitalba</i> /old man's beard <i>Gallium aparine</i> /cleaver <i>Hedera helix</i> /English ivy <i>Rubus armeniacus</i> /Himalayan blackberry <i>Sonchus sp.</i> /sow thistle

**Table 12E. Estimated Cover by Plant Type for Management Unit 2 Treatment Plot 2 Transect 1**

Monitoring Year	Y0 2017/18	Y1 2018/2019	Y2 2019/2020	Y3 2020/2021
Deciduous Groundcover (%)	0	No Data	No Data	No Data
Deciduous Shrub (%)	18	No Data	No Data	No Data
Deciduous Tree (%)	0	No Data	No Data	No Data
Deciduous Total (%)	18	No Data	No Data	No Data
Evergreen Groundcover (%)	6	No Data	No Data	No Data
Evergreen Shrub (%)	13	No Data	No Data	No Data
Evergreen Tree (%)	3	No Data	No Data	No Data
Evergreen Total (%)	22	No Data	No Data	No Data
Total Native Vegetation (%)	40	No Data	No Data	No Data
Est. Total Native Vegetation (%)	0-5	0-5	No Data	No Data
Tree Canopy (%)	5-25	0-5	No Data	No Data
Exposed Soil (%)	0-5	0-5	No Data	No Data
Invasive Species (%)	5-25	5-25	25-50	No Data

**Table 12F. Estimated Cover by Plant Type for Management Unit 2 Treatment Plot 3 Transect 1**

Monitoring Year	Y0 2017/18	Y1 2018/2019	Y2 2019/2020	Y3 2020/2021
Deciduous Groundcover (%)	0	No Data	No Data	No Data
Deciduous Shrub (%)	0	No Data	No Data	No Data
Deciduous Tree (%)	2	No Data	No Data	No Data
Deciduous Total (%)	2	No Data	No Data	No Data
Evergreen Groundcover (%)	0	No Data	No Data	No Data
Evergreen Shrub (%)	0	No Data	No Data	No Data
Evergreen Tree (%)	8	No Data	No Data	No Data
Evergreen Total (%)	8	No Data	No Data	No Data
Total Native Vegetation (%)	10	No Data	No Data	No Data
Est. Total Native Vegetation (%)	0-5	0-5	No Data	No Data
Tree Canopy (%)	0-5	0-5	0-5	No Data
Exposed Soil (%)	0-5	0-5	0-5	No Data
Invasive Species (%)	5-25	5-25	25-50	No Data

**Table 12G. Estimated Cover by Plant Type for Management Unit 2 Treatment Plot 3 Transect 2**

Monitoring Year	Y0 2017/18	Y1 2018/2019	Y2 2019/2020	Y3 2020/2021	Species with Significant Cover (2020/2021)
Deciduous Groundcover (%)	0	0	0	0	
Deciduous Shrub (%)	107	118	127	130	<i>Corylus cornuta</i> /beaked hazelnut <i>Holodiscus discolor</i> /oceanspray <i>Symphoricarpos albus</i> /snowberry
Deciduous Tree (%)	1	0	0	0	
Deciduous Total (%)	108	118	127	130	
Evergreen Groundcover (%)	16	18	27	22	<i>Polystichum munitum</i> /sword fern
Evergreen Shrub (%)	13	0	0	0	
Evergreen Tree (%)	0	0	0	0	
Evergreen Total (%)	29	18	27	22	
Total Native Vegetation (%)	137	136	154	152	
Est. Total Native Vegetation (%)	50-75	75-95	50-75	75-95	
Tree Canopy (%)	50-75	50-75	25-50	50-75	
Exposed Soil (%)	50-75	0-5	5-25	50-75	
Invasive Species (%)	0-5	0-5	0-5	0-5	

**Table 12H. Estimated Cover by Plant Type for Management Unit 2 Treatment Plot 3 Transect 3**

Monitoring Year	Y0 2017/18	Y1 2018/2019	Y2 2019/2020	Y3 2020/2021
Deciduous Groundcover (%)	0	No Data	No Data	No Data
Deciduous Shrub (%)	22	No Data	No Data	No Data
Deciduous Tree (%)	0	No Data	No Data	No Data
Deciduous Total (%)	22	No Data	No Data	No Data
Evergreen Groundcover (%)	0	No Data	No Data	No Data
Evergreen Shrub (%)	16	No Data	No Data	No Data
Evergreen Tree (%)	4	No Data	No Data	No Data
Evergreen Total (%)	20	No Data	No Data	No Data
Total Native Vegetation (%)	42	No Data	No Data	No Data
Est. Total Native Vegetation (%)	No Data	0-5	No Data	No Data
Tree Canopy (%)	No Data	95-100	75-95	No Data
Exposed Soil (%)	No Data	5-25	0-5	No Data
Invasive Species (%)	No Data	0-5	0-5	No Data

**Table 12I. Estimated Cover by Plant Type for Management Unit 2 Treatment Plot 4 Transect 1**

Monitoring Year	Y0 2017/18	Y1 2018/2019	Y2 2019/2020	Y3 2020/2021	Species with Significant Cover (2020/2021)
Deciduous Groundcover (%)	0	0	0	0	
Deciduous Shrub (%)	41	13	26	30	<i>Symphoricarpos albus</i> /snowberry <i>Holodiscus discolor</i> /oceanspray
Deciduous Tree (%)	0	0	0	0	
Deciduous Total (%)	41	13	26	30	
Evergreen Groundcover (%)	31	20	19	29	<i>Polystichum munitum</i> /sword fern
Evergreen Shrub (%)	22	5	9	5	
Evergreen Tree (%)	2	2	3	0	
Evergreen Total (%)	55	27	30	34	
Total Native Vegetation (%)	96	40	56	64	
Est. Total Native Vegetation (%)	5-25	0-5	5-25	5-25	
Tree Canopy (%)	95-100	75-95	75-95	75-95	
Exposed Soil (%)	0-5	0-5	0-5	5-25	
Invasive Species (%)	0-5	0-5	25-50	25-50	<i>Gallium aparine</i> /cleaver <i>Hedera helix</i> /English ivy <i>Rubus armeniacus</i> /Himalayan blackberry

**Table 12J. Estimated Cover by Plant Type for Management Unit 2 Treatment Plot 4 Transect 2**

Monitoring Year	Y0 2017/18	Y1 2018/2019	Y2 2019/2020	Y3 2020/2021	Species with Significant Cover (2020/2021)
Deciduous Groundcover (%)	0	0	0	0	
Deciduous Shrub (%)	20	19	7	10	<i>Symphoricarpos albus</i> /snowberry
Deciduous Tree (%)	2	0	0	0	
Deciduous Total (%)	22	19	7	10	
Evergreen Groundcover (%)	28	5	3	0	
Evergreen Shrub (%)	10	0	0	0	
Evergreen Tree (%)	7	14	17	16	<i>Pinus contorta</i> /shore pine
Evergreen Total (%)	29	19	21	16	
Total Native Vegetation (%)	51	38	28	26	
Est. Total Native Vegetation (%)	0-5	0-5	0-5	0-5	
Tree Canopy (%)	50-75	50-75	50-75	75-95	
Exposed Soil (%)	5-25	0-5	5-25	0-5	
Invasive Species (%)	0-5	5-25	75-95	50-75	<i>Gallium aparine</i> /cleaver <i>Hedera helix</i> /English ivy <i>Lactuca serriola</i> /prickly lettuce <i>Rubus armeniacus</i> /Himalayan blackberry <i>Sonchus sp.</i> /sow thistle

**Table 12K. Estimated Cover by Plant Type for Management Unit 2 Treatment Plot 4 Transect 3**

Monitoring Year	Y0 2017/18	Y1 2018/2019	Y2 2019/2020	Y3 2020/2021
Deciduous Groundcover (%)	0	0	No Data	No Data
Deciduous Shrub (%)	3	0	No Data	No Data
Deciduous Tree (%)	0	0	No Data	No Data
Deciduous Total (%)	3	0	No Data	No Data
Evergreen Groundcover (%)	30	24	No Data	No Data
Evergreen Shrub (%)	2	0	No Data	No Data
Evergreen Tree (%)	0	0	No Data	No Data
Evergreen Total (%)	32	24	No Data	No Data
Total Native Vegetation (%)	35	24	No Data	No Data
Est. Total Native Vegetation (%)	0-5	0-5	No Data	No Data
Tree Canopy (%)	75-95	95-100	No Data	No Data
Exposed Soil (%)	5-25	50-75	No Data	No Data
Invasive Species (%)	5-25	5-25	No Data	No Data



**Table 13. Management Unit 1 Year 5 Metrics 2020/2021**

Treatment Plot		TP2	TP3	TP4	TP5	TP6-1C
	LMP Goal					
Invasive Species Cover (%)**	<10	25-50	0-5	5-25	75-95	0-5
Trees/Acre**	436	725	580	1,739	290	0
Evergreen Tree Cover/All Tree Cover (%) for Trees <2" DBH**	67	100	81	100	100	0
Native Shrubs**	3 species/ 1 evergreen	4/1	4/1	3/1	3/0	4/0
Native Groundcovers**	2 species/ 1 evergreen	0/0	0/0	1/1	0/0	1/1
Mature Shrub and Groundcover Aerial Cover (%)**	100	50-75	50-75	50-75	5-25	5-25
Survival (%)*	60 @ Y5	25	100	900^	11	19

\* Based on species in quadrats. \*\*Based on species in transect.

^ Calculated from Y1 as shrubs and groundcovers weren't planted in Y0 per the LMP.

**Table 14. Management Unit 2 Year 2 Metrics 2020/2021**

Treatment Plot		TP1				TP2
	LMP Goal	T1	T2	T3	T4	T1
Invasive Species Cover (%)**	<10	75-95	No data	75-95	50-75	No data
Trees/Acre**	436	580	No data	435	145	No data
Evergreen Tree Cover/All Tree Cover (%) for Trees <2" DBH**	67	100	No data	100	100	No data
Native Shrubs**	3 species/ 1 evergreen	3/1	No data	3/1	6/0	No data
Native Groundcovers**	2 species/ 1 evergreen	0/0	No data	0/0	0/0	No data
Mature Shrub and Groundcover Aerial Cover (%)**	100	5-25	No data	5-25	50-75	No data
Survival (%)*	80 @Y3	58	No data	35	52	No data

Management Unit 2 Year 2 Metrics 2020/2021 Continued

Treatment Plot		TP3			TP4		
Transect		T1	T2	T3	T1	T2	T3
	LMP Goal						
Invasive Species Cover (%)**	<10	No data	0-5	No data	25-50	50-75	No data
Trees/Acre**	436	No data	0	No data	0	435	No data
Evergreen Tree Cover/AllTree Cover (%) for Trees <2" DBH**	67	No data	0	No data	0	100	No data
Native Shrubs**	3 species/ 1 evergreen	No data	5/0	No data	3/1	1/0	No data
Native Groundcovers**	3 species/ 1 evergreen	No data	1/1	No data	0/0	2/2	No data
Mature Shrub and Groundcover Aerial Cover (%)**	100	No data	75-95	No data	5-25	0-5	No data
Survival (%)*	80% @ Y3	No data	40	No data	12	4	No data

\* Based on species in quadrats. \*\*Based on species in transect.

Figure 1. Schuster Slope Management Units



#5065ESGS Project: 2017P129 schusterSlopeManagementUnits 2017/10/26 11:31 am - Billford

**Legend**

- Management Units
- City Boundary

1:9,400



Map Date: 11/13/2017  
 Source: Science and Engineering  
 Division, Environmental Services Department  
 City of Tacoma  
 326 East D Street, Tacoma WA 98421  
 (253) 591-5588





Figure 2. Schuster Slope Management Unit 1 Monitoring Locations

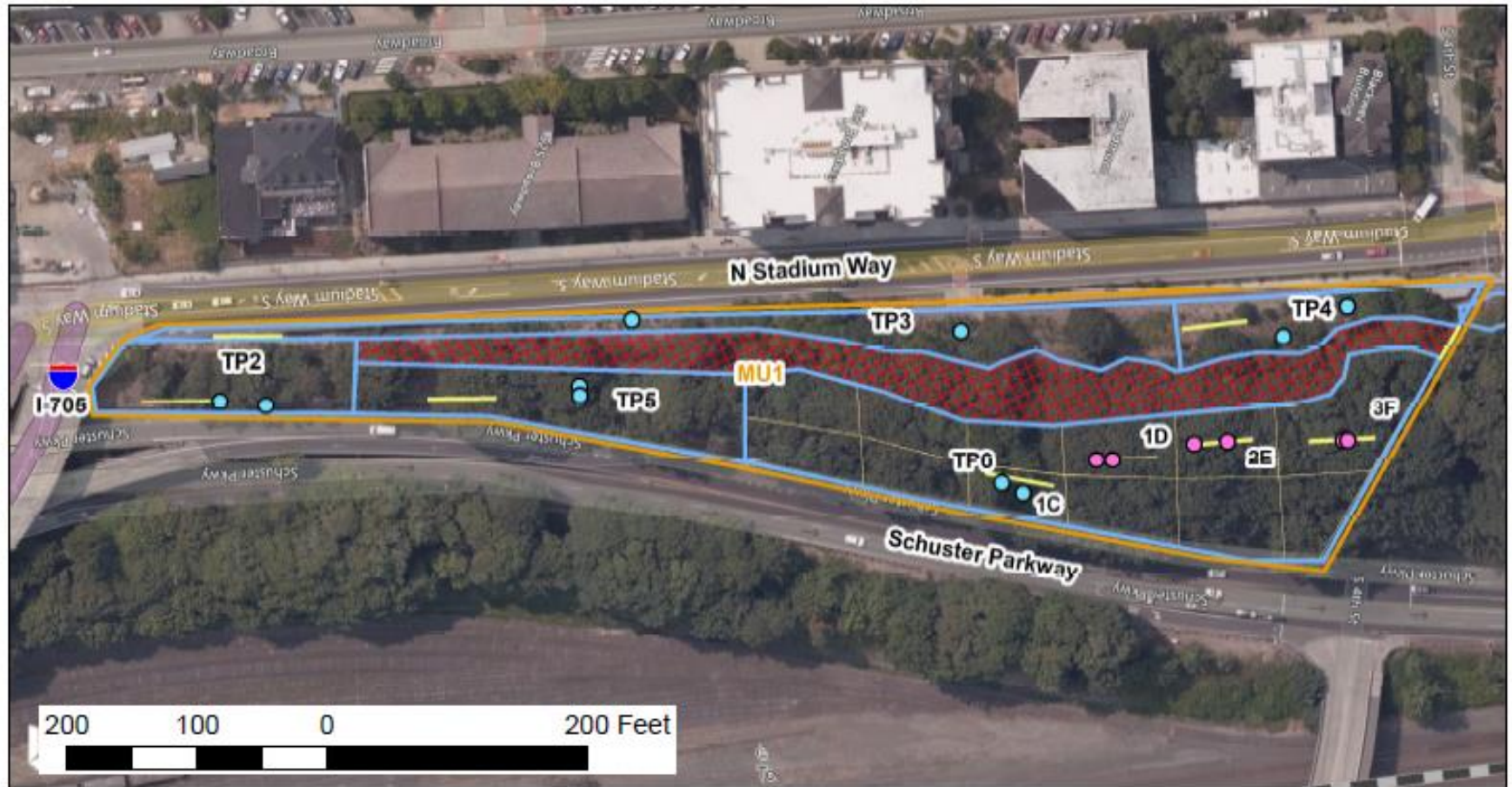


Figure 3. Schuster Slope Management Unit 2 Monitoring Locations

