LAKERIDGE TREE STUDY

21-165-S

Lakeridge Park, Seattle, WA

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1. INTRODUCTION

Atlas Technical Consultants (Atlas) was contracted by Seattle Public Utilities (SPU) to inventory trees and provide tree retention and removal analysis in support of a proposal to install two micropile slope stabilization structures on the Lakeridge Park property. Coniferous and deciduous trees surrounding the site may be impacted by the development.

The project area is divided into two sites within Lakeridge Park. The first site is on the west side of Taylor Creek (2,141 square feet), and the second site is on the east side of the creek (823 square feet). Both sites are off the main trail, on opposite sides of a pedestrian bridge. The terrain features a dense forest on a slope that is a geological hazard, an environmentally critical area (ECA) in the city of Seattle. Any proposal that requires removal of large trees on private property within the city of Seattle must be reviewed by the Department of Construction and Inspections for consistency with municipal code governing tree removal and environmentally critical areas.

This report was developed concurrently with engineering, landscape architecture, and construction work plans to be submitted for permit approval. This report is divided into two general sections: a summary of the basic findings of the tree inventory and data analysis such as inventory data, and impact analysis related to the proposed slope stabilization project and the City of Seattle code requirements. These sections are followed by a list of applicable tree protection measures (Best Management Practices (BMPs)) that can be used to protect adjacent trees and landscape.

2. PROJECT LOCATION

The proposed project is in the Rainier View neighborhood of the City of Seattle, on King County tax parcel 0123049002 (unaddressed) (subject parcel), and adjacent to unincorporated King County (Figure 1). This parcel is owned and managed by the Seattle Department of Parks and Recreation (SPR). All work would occur within the City of Seattle Lakeridge Park, riparian areas of Taylor Creek and Dead Horse Canyon. The Project is in the Lake Washington/Cedar/Sammamish Water Resource Inventory Area (WRIA) 8 and Township 23N, Range 4E, Section 1. Surrounding land uses include urban residential, parkland, and open space.

3. PROJECT DESCRIPTION

Lakeridge Slope Stabilization Project will install two micropile slope stabilization structures: one 10-feet-long on the east side of Taylor Creek and one approximately 140-feet-long on the west side of the Creek. Micropiles are small diameter, bored, cast in place composite piles in which the applied load is transferred to the surrounding ground by skin friction. Each micropile structure would consist of a row of drilled and grouted 6-inch diameter micropiles extending from a few feet below the ground surface to depths of 15 to 30 feet below ground surface. The west structure would install 68 micropiles on 2-foot centers. The east structure would install 45 micropiles on 1.5-foot centers. A 2-foot-wide concrete beam would structurally connect the tops of the micropiles, a few feet below the ground surface. Narrow-width tracked and wheeled vehicles, and hand labor, would be used to conduct the work. Vehicles and laborers would use existing pedestrian trails to access both work sites. All equipment required for construction of the

micropiles is available in widths less than 3.5 feet; the approximate width between railings on the pedestrian bridge across Taylor Creek and less than the average width of the trail.

4. GENERAL SITE CONDITIONS

Lakeridge Park is in Seattle's Rainier View neighborhood, and in Zone NR3, a residential zone which generally allows detached single-family houses, attached and detached accessory dwellings.

4.1 Existing Vegetation

The park is characterized by mixed forest, with an estimated tree canopy coverage of 89.4 percent, (City of Seattle Tree Canopy Assessment of 2021). Native conifer and deciduous trees dominate the park. Deciduous trees include big leaf maple (*Acer macrophyllum)* and red alder (*Alnus rubra*). Conifers, interspersed with deciduous trees, consist of small and large diameter western hemlocks (*Tsuga heterophylla*), western red cedars (*Thuja plicata*), and Douglas firs (*Pseudotsuga menziesii*). Sword ferns (*Polystichum minitum*) dominate the understory; other native shrubs include beaked hazelnut (*Cornus cornuta*), salmonberry (*Rubus spectabilis*) and osoberry (*Oemlaria cerasiformis*).

4.2 Environmentally Critical Areas (ECAs)

A review of the City of Seattle's Department of Construction & Inspections GIS Interactive online mapping application (Seattle Department of Construction & Inspections 2024) identifies the project area as Steep Slope, Steep Slope Buffer, Wetland Buffer, Riparian Management, and Wildlife Habitats ECAs.

4.3 Jurisdiction

All trees inventoried are within the subject parcel, owned and managed by Seattle Parks and Recreation; there are no trees within the Seattle Department of Transportation right of way. The project will require a Seattle Parks & Recreation Revocable Use Permit for non-park use of a park property.

Figure 1 – Project Vicinity

5. TREE INVENTORY METHODS

Two Atlas ISA-Certified Arborists visited the project site on January 24, 2024, to inventory trees rooted in the project area. The size of subject trees was measured using guidelines outlined in Guide for Plant Appraisal, 9th Edition (CLTA, 2000) (Guide). Trunk diameters were measured 4.5 feet above the ground surface (diameter at breast height[1] (DBH)) using a graduated metal loggers diameter tape. Low branching, leaning, multi-stemmed trees, or trees on slopes were measured using Modifications to Tree Size Measurements Section of the Guide. Multi-stemmed trees were given a one-stem equivalent diameter in the attached inventory log using the total cross sectional trunk area for all stems contributing to the canopy (Director's Rule 16-2008). The cross sectional derived equivalent DSH was used to determine the "Tier" status under Seattle Municipal Code (SMC) for multi-stemmed trees.

Average branch radius was measured to the approximate average branch length using the logger's tape. Height was visually estimated to the nearest five feet. A condition rating was assigned to each tree using a one to six scale, one being excellent and six being dead. The health factor combined an assessment of tree vigor and the soundness of the above-ground structure. Tree risk was not the primary target of assessment, but a basic, ISA Level 1 Risk Assessment screening of all trees in the inventory was performed.

The regulatory status of trees was determined by classifying the size of the tree with the relevant Tier status based on the SMC. Chapter 25.11.130- defines a "Tier 1" tree as a heritage tree, which is identified in the Seattle Tree Inventory interactive map (Seattle Tree Inventory Map) and was reviewed for Section 5. A "Tier 2" tree is any tree that is 24-inches diameter at standard height (DSH) or greater, tree groves, each tree comprising a tree grove, and specific tree species less than 24-inches DSH as provided by the Director's Rule. A "Tier 3 tree" is any tree that is 12-inches DSH or greater but less than 24 inches. "Tier 4 tree" is any tree that is 6-inches or greater DSH but less than 12-inches DSH (Director's Rule 7-2023).

6. TREE INVENTORY RESULTS

A total of 40 trees were inventoried (Table 1), 29 in the west site and 11 in the east site. The most common tree species were big leaf maple (n=19) and western red cedar (n=11). Red alder (n=5) and western hemlock (n= 5) were also rooted within the project area. The representative species are of mature size, with some smaller conifers.

There are no Tier 1 trees in Lakeridge Park. A total of 9 trees were categorized as Tier 2, and 10 trees were characterized as Tier 3. Nine trees were Tier 4, and the remaining 12 trees were not assigned a tier because their diameters were less than 6-inches. Fourteen trees were found to be in good condition. Twenty trees were in fair condition, and four trees were in poor condition. The poor trees observed at the western site are a red alder (NT-3) and big leaf maple (NT-9). The red alder has wounds and decay on the trunk, and the maple has low live crown ratio, a significant lean over the trail, and one smaller dead stem. At the east site, a western hemlock (#1637) and

[1] DBH is used interchangeably with Diameter at Standard Height (DSH).

big leaf maple (#1643) were in poor condition. The western hemlock exhibited rot at the base, dying branches, and was leaning towards the creek. The big leaf maple had a broken top 45 feet from ground level. A large western hemlock (NT-1) at the western site was classified as dying, with a substantial trunk wound revealing rotting sapwood, and conks on the trunk. One red alder snag (#3354) at the western site was determined to be dead.

West Site

The west site contains 14 big leaf maples, 7 western red cedars, 4 western hemlocks, and 3 red alders. Among these, the largest diameter tree was a big leaf maple (NT-14) with two stems and a combined diameter of 53.3 inches. It was 75 feet tall and with a crown radius of 20 feet. The smallest diameter tree was a 1.8-inch western red cedar (NT-12). It was 10 feet tall, with a radius of 3 feet.

East Site

The east site has 4 big leaf maples, 4 western red cedars, 2 red alders, and 1 western hemlock. The largest diameter tree was a big leaf maple (1643) with two stems and combined diameter of 81.7 inches. The tree was 70 feet tall, with a crown radius of 20 feet. The smallest diameter tree was young western red cedar (NT-21) with a 3.4-inch diameter, height of 15 feet, and 6-foot crown radius.

Table 1 Summary of Subject Trees

Botanical Name	Common Name	Count of Trees	Total DSH (in)	Average DSH (in)
Acer macrophyllum	Western Hemlock	19	420.2	22.1
Tsuga heterophylla	Bigleaf Maple	5	99.2	19.8
Alnus rubra	Red Alder	5	60.8	12.2
Thuja plicata	Western Red Cedar	11	58.6	5.3
	Total	**40**	**638.8**	**16.0**

7. SITE PHOTOGRAPHS

Figure 2 – Western hemlock (NT-1) with rotting sapwood and conks on trunk (January 24, 2024)

Figure 3 Western hemlock (3341) growing on nursery log with thinning foliate (January 24, 2024).

Figure 4 Bigleaf maple (1504) leaning towards Taylor Creek with minor trunk wounds (Photo January 24, 2024).

Figure 5 Mature bigleaf maple (1593) within 20 feet of the work limits (Photo January 24, 2024).

Figure 6 These trees had fallen since the previous tree inventory (January 24, 2024).

8. IMPACT ANALYSIS

West Site

Seven trees are in direct conflict with project construction or will experience greater than 35-percent CRZ damage, which will result in tree mortality. Two of these trees will not be physically removed, a western hemlock (3341) and a bigleaf maple (1593) and may retained onsite as they senesce and become habitat features for wildlife.

East Site

One big leaf maple (1639) will require removal due to root damage exceeding 35-percent.

Table 2 Trees that require removal due to direct conflict with the project.

Tree Tag	Common Name	DSH (inches)	Tier Category	Sheet Reference Number	Tree Replacement (Ratio 3:1 & 2:1)
NT-16	Western red cedar	7.9	Tier 4	105	3
3338	Red alder	15.1	Tier 3	105	3
1639	Bigleaf maple	18.9	Tier 3	104	3
3337	Western red cedar	9.0	Tier 4	105	3
NT-12	Western red cedar	1.8	Tier 3	105	3
3341	Western hemlock	13.1	Tier 3	105	3
3352	Western red cedar	7.2	Tier 4	105	2
1593	Bigleaf maple	33.5	Tier 2	105	3
				Total	23

9. MITIGATION PLAN

9.1 Existing Ecological Functions

The existing ecological functions of the trees and vegetation onsite include storm water retention function and habitat function for aquatic and terrestrial species, such as birds and small mammals. Trees also contribute to structural diversity by providing large woody material and shade to Taylor Creek which benefit fish species. Tree roots stabilize slopes and reduce erosion by holding soils in place.

9.2 Impacts on the Existing Ecological Functions

Tree removals disrupt ecological functions, increasing the risk of soil erosion and displacing wildlife. Branch pruning may be needed for construction access, but it has negligible impacts to the existing ecological functions provided by trees. The timing of tree removals and branch pruning may impact habitat function of trees used by birds for nesting and small mammals for foraging and denning.

9.3 Mitigation Recommendations

To compensate for the loss of trees, the applicant will replace (plant) trees in accordance with Executive Order 03-05, Section 1 (d). replacement criteria. If the recommended TPF relocations are not possible, the total tree replacement mitigation is 23 trees. If the recommended relocation of tree protection fencing is implemented, the total tree replacement would be 9 trees. In addition to tree replacement and to restore ecological functions, the following plant replacement palette and density are proposed. Plant density was calculated using the Forest Steward Field Guide (2020).

For medium desired plant density, 214 native shrubs with 4-foot spacing and 381 ground cover with 3-foot spacing will be planted in the area where tree removal will occur to compensate for the impact associated with this project (Table 4). A total of 23 replacement trees are included in the planting plan. A conceptual planting plan is shown in Appendix II. Specific planting plan will be developed in collaboration with Seattle Parks and Recreation.

Table 3 List and number of replacement trees and plants to be installed in West and East sites.

Type	Common Name	Scientific Name	West	East	Total
Trees	Douglas fir	*Pseudotsuga menziesii*	7	-	7
	Western red cedar	*Thuja plicata*	5	3	8
	Western hemlock	*Tsuga heterophylla*	6	2	8
Shrubs	Vine maple	*Acer circinatum*	28	20	48
	Osoberry	*Oemleria cerasiformis*	35	10	45
	Snowberry	*Symphoricarpos albus*	42	10	52
	Salmonberry	*Rubus spectabilis*	25	10	35
	Red elderberry	*Sambucus racemosa*	25	9	34
Ground covers	Sword fern	*Polystichum munitum*	140	53	193
	Oregon grape	*Mahonia aquifolium*	135	53	188

Soil Amendments

To compensate for impacts to soil on the project site, the applicant will add 3-inches of compost and incorporate into the top 18-inches of topsoil.

10. MITIGATION SEQUENCING

The sequencing process is a three-step iterative process completed during the design process that follows these steps respectively: (1) avoid impacts wherever possible, (2) reduce the magnitude of proposed damage, and (3) compensate for any unavoidable permanent or temporary loss of the natural resource. This principle is applied to the protection and preservation of the tree canopy and required for impacts to steep slopes under SMC 25.09.065 (A). The

following section discusses how the SPU, and the design team followed the principles of Mitigation Sequencing outlined in the SMC.

10.1 Avoidance

- SPU or its designee shall establish a tree protection zone. The tree protection zone will be clearly marked with fencing.
- Construction personnel shall be trained regarding the purpose of the tree protection zone as a no access area.
- During construction, SPU or its designee will avoid impacting trees surrounding the project that would not be affected by the construction activity.
- All construction activities, including ingress and egress, shall keep away from the tree protection area.

10.2 Minimization

The applicant's contractor will use standard industry methods to reduce and minimize impacts to branches and trunks of protected trees. Any pruning needed for equipment clearance will be conducted per industry standards with sharp, clean tools.

10.3 Rectifying

Refer to section 10.5.

10.4 Reducing

Refer to section 12.

10.5 Compensation

To compensate for the impacts, the applicant will comply with the City of Seattle Mayor's Executive Order 03-05, Section 1 (d). replacement criteria. Healthy trees will be replaced with a minimum 3:1 ratio. For dead, hazard or invasive tree species removed, the tree replacement ratio is 2:1. In accordance with SMC 25.11.090, tree replacement will be monitored with an 80-percent survival rate requirement for newly planted trees during a five-year time frame. The restoration phases outlined in the Forest Steward Field Guide (Green Seattle Partnership 2020) will be followed for planting vegetation and trees (Appendix III). In Phase 2, appropriate species of native plants will be planted consistent with the site conditions and ecosystem. A planting plan including number, location and spacing is included in Appendix II.

11. MAINTENANCE AND MONITORING PLAN

The maintenance and monitoring plan follows the guidelines in the Forest Steward Guide and SMC.

1. Maintenance and monitoring plans shall include:

a. Criteria for determining the success of mitigation and for evaluating the effectiveness of mitigation to ensure protection of the ecological functions of the environmentally critical areas;

b. Contingency actions to be taken if the mitigation fails to meet the established success criteria in subsection 25.09.065.D.1.a; contingency actions shall include additional monitoring if the mitigation fails;

c. Performance bonds for wetlands, wetland buffers, fish and wildlife habitat conservation areas, and flood-prone areas not to exceed a term of five years are required to ensure compliance with the conditions for mitigation if the cost of the mitigation is greater than $5,000, except for public agencies. The bond shall be in an amount of at least 150 percent of the cost to retain a qualified environmental professional in the appropriate field to assess the mitigation and submit a report to the City at least twice yearly, prior to and near the end of each growing season and shall also provide a bond in an amount sufficient to implement additional restoration measures if the mitigation does not meet the success criteria identified in subsection 25.09.065.D.1.a at the end of five growing seasons; and

d. Any additional information that the Director requires to help ensure the success of the mitigation.

2. Mitigation that includes planting trees and vegetation shall include:

a. Tree and vegetation species, planting location, and soil amendment criteria meeting the standards in subsection 25.09.065.C.2;

The selected trees and vegetation are from the Native Plant List in the Forest Steward Field guide (2020).

b. Not less than five years of maintenance that ensures 80 percent survival of new trees and vegetation planted at the end of five years;

c. Annual inspections of the plants;

d. Replacement of failed plants;

e. Removal of exotic invasive species that have become established; and

f. Photographic documentation of planting success retained for the five-year period.

E. Additional requirements for steep slope erosion hazard areas. The Director shall require mitigation of all impacts to the natural erosion capacity of the disturbed steep slope erosion hazard area, unless such mitigation would result in adverse impacts to slope stability, in the following order of preference:

1. Removing ivy on site in the remaining steep slope erosion hazard areas and their buffers.

2. Removing other invasive vegetation and planting native trees and vegetation in the remaining steep slope erosion hazard areas and their buffers.

3. Removing ivy from adjacent parcels.

4. Removing other invasive vegetation and planting native trees and vegetation on site in areas outside the steep slope erosion hazard areas and their buffers.

12. CITY OF SEATTLE CODE ANALYSIS

The proposal to remove trees to install piles is regulated by SMC 25.09 with relevant sections shown below in bold with the consistency analysis following.

12.1 MC 25.09.065 Mitigation Standards

25.09.065 (B.) 2. Priority mitigation measures. Lower priority measures shall be applied only if higher priority measures are infeasible or inapplicable.

3. Priority for the location of ecological mitigation in relation to compensation required under subsection 25.09.065.B.1.e shall be in the following order and the lower priority restoration location shall be allowed only if the higher priority location is infeasible or the applicant demonstrates that there will be a greater ecological benefit if a lower priority site is used:

a. At the site;
b. Within the same creek watershed;
c. Within Seattle city limits;
d. Within the same Watershed Resource Inventory Area.

A planting plan will be implemented to replace trees and vegetation which will provide important site stabilization and understory habitat function.

25.09.065 (B.) 5. As part of any application for approval of development that requires mitigation, the applicant shall submit a mitigation plan that meets the standards of subsection 25.09.065.C and a maintenance and monitoring plan that meets the standards of subsection 25.09.065.D unless the applicant demonstrates based on best available science that no impact to the ecological functions of the environmentally critical area or areas will occur as the result of the development or its use, construction, or management. The mitigation plan and the maintenance and monitoring plan must be approved by the Director.

See section 12 and the Conceptual Landscape Planting Plan in Appendix II.

12.2 SMC 25.09.070 Standards for tree and vegetation and impervious surface management

25.09.070 (A.) The following activities in landslide-prone critical areas, steep slope erosion hazard areas and their buffers, fish and wildlife habitat conservation areas, wetlands, and

wetland buffers shall comply with the provisions of this Chapter 25.09 including this Section 25.09.070:

1. Planting, disturbing, or removing trees or vegetation;

2. Adding, altering, or removing impervious surface; or

3. Other land disturbing activity.

This report complies with the above code by including tree removal within an ECA.

25.09.070 (C.) If the activities in subsection 25.09.070.A are authorized in compliance with the provisions of this Chapter 25.09 by a permit or the Director's approval that does not require a permit, the following apply, except as provided in subsection 25.09.070.D:

1. A tree and vegetation and/or impervious surface plan is required for all authorized activities in subsection25.09.070.A. The plan shall identify:

a. The location and size of the area where the authorized activities will occur;

See the Engineering and Landscape Architectural Submittal in Appendix II.

b. The type and area of the existing ground coverage, including the size, species, and location of existing trees and vegetation in the proposed work areas; and

See Appendix I for inventory of trees.

c. The type and area of final proposed ground coverage, including the species and location of trees and vegetation.

See Section 10.0 of this report and the Conceptual Landscape Planting plan in Appendix II.

2. Any area cleared of trees and vegetation or disturbed and not to be used for development shall be planted with native trees and vegetation. Landscaped areas not meeting the requirements of this Section 25.09.070 are considered development; and

3. Mitigation pursuant to subsection 25.09.065.C is required.

G. A tree and vegetation maintenance and monitoring plan approved by the Director that complies with subsection 25.09.065.D is required for trees and vegetation planted pursuant to this Section 25.09.070.

See maintenance and monitoring plan above.

12.3 Construction BMPs

The following BMPs will be implemented during pre-construction, construction, and post-construction phases. These BMPs are a starting point and should be modified, as needed, as design is completed, and reviewed prior initiation of project construction.

A. Establish high-visibility construction fencing (HVCF) prior to land disturbing activity at the critical root zone (CRZ) as detailed in the plans and determined by the arborist.

1. Fencing shall be established at the edge of the critical root zone of protected trees or at the location indicated on the construction drawings if work is within the CRZ.

2. No construction access or equipment storage shall be allowed in the tree protection area.

3. The fencing shall stay in place for the duration of the project.

B. Affix tree protection signage to protective fencing at regular intervals, near sensitive trees or high-traffic areas and will not be attached directly to the tree.

1. Tree protection signage will reference the applicable City Seattle code including permit number. An example of the tree protection signage is in Appendix IV.

2. Signs should be 8.5 by 11 inches with text at least two-inches tall that say, “Tree Protection Area: Do not enter this area without approval of the Resident Engineer. Do not park or store materials within the protection area.”

C. For construction activity that is unavoidable in the critical root zones of subject trees, remedial actions shall include but not be limited to the following:

1. Mechanized equipment used for development will be staged outside of the CRZ of retained trees.

2. Remove soil by hand or with an air-spade within the CRZ of retained trees.

3. In general, demolition and excavation within the drip line of subject trees shall proceed with extreme care, either using hand tools, or with other low-impact equipment that will not cause damage to the tree, roots, or soil.

4. Excavated soil shall be stockpiled outside of the critical root zones of trees.

5. When encountered, exposed roots 2 inches and larger in diameter shall be worked around in a manner that does not break the outer layer of the root surface (bark). Exposed roots shall be covered in Wood Chips or mulch and shall always be maintained above permanent wilt point. Roots 2 inch and larger in diameter that conflict with the project shall only be cut back to the minimum necessary. Work shall be performed and scheduled to close excavations as quickly as possible over exposed roots.

6. Roots larger than 2 inches in diameter shall be cut using a sharp saw. Large roots shall not be cut with hydraulically driven equipment (e.g., excavator buckets) as they typically “rip” or “tear” roots beyond protection limits and damage the root zone beyond the necessary amount.

7. Tree branches that interfere with the construction may be tied back or pruned to clear only to the point necessary to complete the work. Other branches shall only be removed when specifically indicated by the Owner's Representative. Tying back or trimming of all branches and the cutting of roots shall be in accordance with accepted arboricultural practices (ANSI 28 A300, part 8) and be performed under supervision of the arborist.

D. During the dry season (June 15 through October 15), ensure the critical root zones of newly exposed (due to construction) trees along the boundary of construction work receive at least one inch of water once every two weeks. This should be done during construction and during any portion of the dry season directly following construction. Trees that receive excessive root impacts from excavation shall be evaluated by an Arborist.

E. When the construction period is over, all tree protection BMPs will be removed.

14. REFERENCES

Green Seattle Partnership. 2020. Forest steward field guide.

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APPENDIX I
TREE INVENTORY SPREADSHEET

Lakeridge Slope Stabilization Project
Tree Retention and Removal Plan

Inventory issued: 03/11/2024
Field Investigation: 01/24/2024

	TAG NO.	SPECIES NAME	# STEMS	DBH 1 (IN)	DBH 2 (IN)	DBH 3 (IN)	CMBND DBH* (IN)	HEIGHT (FT)	CANOPY RADIUS (FT)	CNDTN	CRZ RADIUS (FT)	Tier per SMC	CZR Impact	REMOVE OR RETAIN	NOTES
1	1504	Acer macrophyllum, (Bigleaf Maple)	1	35.2			35.2	90	20	FAIR	20	Tier 2	16%		Wound on trunk, some decay, scafold branch faliure common, 10' from root loss, lean away from trail and project
2	1514	Acer macrophyllum, (Bigleaf Maple)	1	23.5			23.5	65	18	FAIR	18	Tier 3	15%		Lean away, retain as group with 1515
3	1515	Acer macrophyllum, (Bigleaf Maple)	1	28.2			28.2	75	20	FAIR	20	Tier 2	27%		Lean towards creek, odd root formation, likely little impact, faliure towards stream
4	1593	Acer macrophyllum, (Bigleaf Maple)	1	33.5			33.5	80	30	FAIR	30	Tier 2	**35%**	REMOVE	large, remove on paper. May be hazard for construction; RETAIN IN FIELD; remove on paper
5	1637	Tsuga heterophylla, (Western Hemlock)	1	33.1			33.1	90	18	POOR	18	Tier 2	13%		Lean towards creek, rot at base, dying branches
6	1638	Acer macrophyllum, (Bigleaf Maple)	1	34.5			34.5	80	22	FAIR	22	Tier 2	9%		Large maple, lean towards creek
7	1639	Acer macrophyllum, (Bigleaf Maple)	1	18.9			18.9	80	12	FAIR	12	Tier 3	**DIRECT**	**REMOVE**	Direct conflict
8	1643	Acer macrophyllum, (Bigleaf Maple)	2	62.3	19.4		65.3	70	20	POOR	20	Tier 2			Broken top at 45'
9	1644	Alnus rubra, (Red Alder)	1	8.1			8.1	45	8	FAIR	8	Tier 4	19%		
10	3337	Thuja plicata, (Western Red Cedar)	1	9.0			9.0	25	12	GOOD	12	Tier 4	**DIRECT**	**REMOVE**	Good health, young cedar, protect if possible, may recover from injury
11	3338	Alnus rubra, (Red Alder)	1	15.1			15.1	65	12	FAIR	12	Tier 3	**DIRECT**	**REMOVE**	Lean towards creek, direct conflict
12	3341	Tsuga heterophylla, (Western Hemlock)	1	13.1			13.1	45	18	FAIR	18	Tier 3	**53%**	REMOVE	Nursery log, decent tree, thinning foliage *Use BMPS to mitigate impact and prune, may need to clean cut roots along project edge
13	3342	Acer macrophyllum, (Bigleaf Maple)	1	27.5			27.5	75	25	FAIR	25	Tier 2	37%		Healthy crown; protect using BMPs and retain in field even though exceeds threshold
14	3352	Thuja plicata, (Western Red Cedar)	1	7.2			7.2	40	10	GOOD	10	Tier 4	**DIRECT**	**REMOVE**	Slight lean towards project
15	3354	Alnus rubra, (Red Alder)	1	9.4			9.4	10		DEAD	n/a	Tier 4	30%		Snag, dead
16	3470	Alnus rubra, (Red Alder)	1	19.2			19.2	80	15	FAIR	15	Tier 3			Low LCR, seperated by trail
17	3471	Acer macrophyllum, (Bigleaf Maple)	1	16.5			16.5	75	18	FAIR	18	Tier 3			Low LCR, lean towards bridge. Seperated by trail from project. Use BMPS
18	NT-1	Tsuga heterophylla, (Western Hemlock)	1	44			44.0	110	12	V. POOR	12	Tier 2			Rotting sapwood, conks on trunk, leaning away from trail and project, 15' from the trunk, minor impact
19	NT-10	Acer macrophyllum, (Bigleaf Maple)	1	14.2			14.2	55	18	FAIR	18	Tier 3	6%		Canpy weighted towards piles, unbalanced but full
20	NT-11	Acer macrophyllum, (Bigleaf Maple)	2	5.2	14.5		15.4	55	18	FAIR	18	Tier 3	23%		Canopy full, balanced, leaning towards project
21	NT-12	Thuja plicata, (Western Red Cedar)	1	1.8			1.8	10	3	GOOD	3	no tier	**DIRECT**	**REMOVE**	Young healthy
22	NT-13	Acer macrophyllum, (Bigleaf Maple)	1	5.9			5.9	25	5	FAIR	5	no tier	28%		45 degree lean south arching over construction enterance, hung on 3341
23	NT-14	Acer macrophyllum, (Bigleaf Maple)	2	31.2	22.1		38.2	75	20	FAIR	20	Tier 2	34%		Large tree, along trail, protect with BMPS, protect with mulch
24	NT-15	Tsuga heterophylla, (Western Hemlock)	1	5.1			5.1	20	5	GOOD	5	no tier			Small hemlock, between maples, good condition
25	NT-16	Thuja plicata, (Western Red Cedar)	1	7.9			7.9	35	10	GOOD	10	Tier 4	**DIRECT**	**REMOVE**	Good health, potentially in the way
26	NT-17	Thuja plicata, (Western Red Cedar)	1	5.5			5.5	25	7	GOOD	7	no tier			Small, good shape, low impact
27	NT-18	Thuja plicata, (Western Red Cedar)	1	5.5			5.5	25	8	GOOD	8	no tier			Small, good, low impact
28	NT-19	Thuja plicata, (Western Red Cedar)	1	3.8			3.8	20	8	GOOD	8	no tier			Right side of trail, good condition
29	NT-2	Acer macrophyllum, (Bigleaf Maple)	1	10.5			10.5	45	12	FAIR	12	Tier 4			Wound on trunk, dead old small stem, far from work, no impact
30	NT-20	Thuja plicata, (Western Red Cedar)	1	5.6			5.6	18	8	GOOD	8	no tier			
31	NT-21	Thuja plicata, (Western Red Cedar)	1	3.4			3.4	15	6	GOOD	6	no tier			Young healthy
32	NT-22	Thuja plicata, (Western Red Cedar)	1	5.1			5.1	25	8	GOOD	8	no tier			
33	NT-23	Thuja plicata, (Western Red Cedar)	1	3.8			3.8	20	8	GOOD	8	no tier	4%		
34	NT-3	Alnus rubra, (Red Alder)	1	9.0			9.0	45	5	POOR	5	Tier 4			Wounds on trunk with decay, growing in trail, may be impacted from acess
35	NT-4	Acer macrophyllum, (Bigleaf Maple)	1	11.8			11.8	55	10	GOOD	10	Tier 4			Good, low LCR, potential impacted

DBH=Trunk diameter at 4.5 feet above grade
CRZ=Critical Root Zone

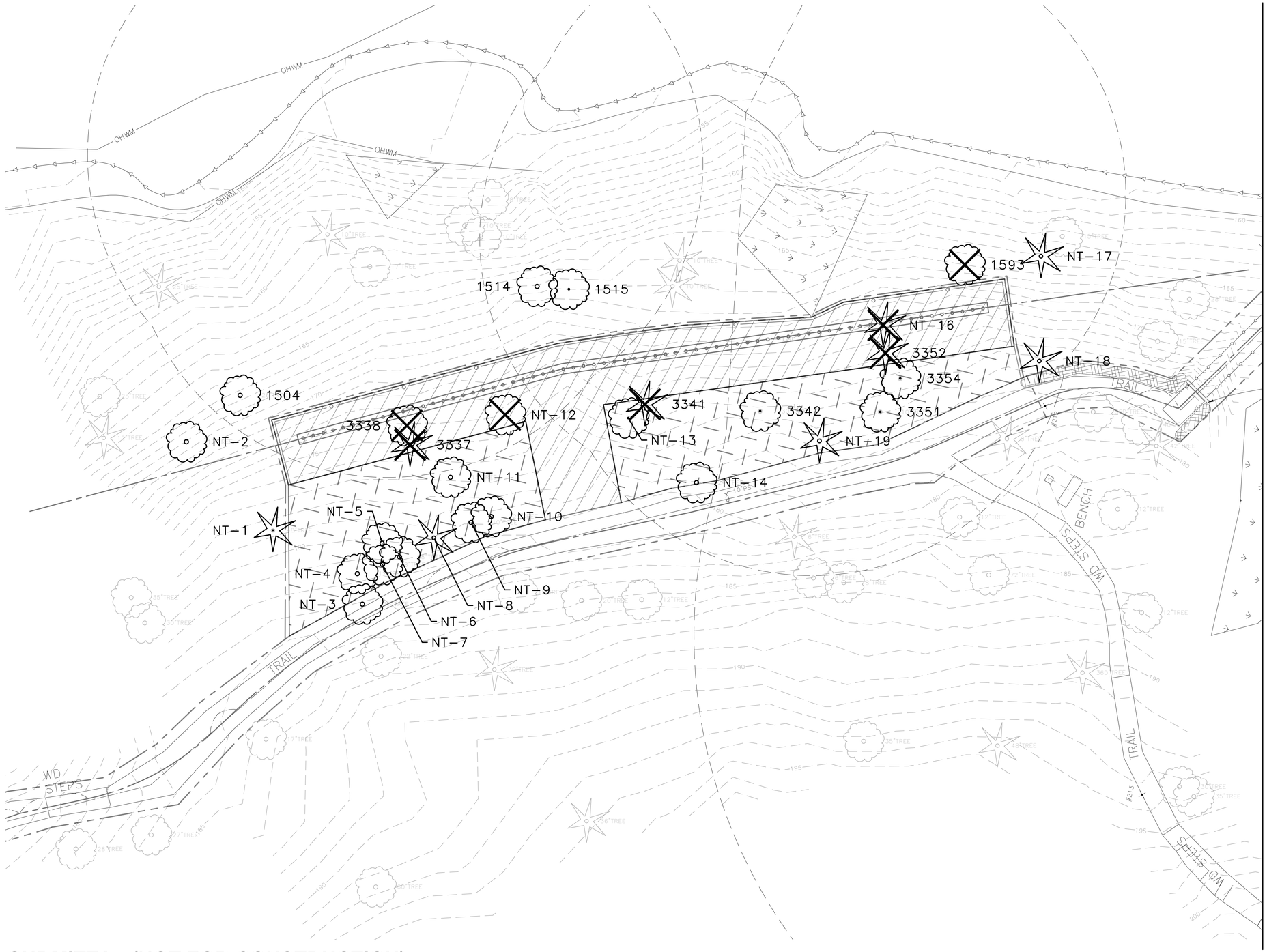
Lakeridge Slope Stabilization Project
Tree Retention and Removal Plan

Inventory issued: 03/11/2024
Field Investigation: 01/24/2024

	TAG NO.	SPECIES NAME	# STEMS	DBH 1 (IN)	DBH 2 (IN)	DBH 3 (IN)	CMBND DBH* (IN)	HEIGHT (FT)	CANOPY RADIUS (FT)	CNDTN	CRZ RADIUS (FT)	Tier per SMC	CZR Impact	REMOVE OR RETAIN	NOTES
36	NT-5	Acer macrophyllum, (Bigleaf Maple)	2	7.3	4		8.3	35	4	FAIR	4	Tier 4			Decent in grove
37	NT-6	Acer macrophyllum, (Bigleaf Maple)	1	15.2			15.2	55	10	FAIR	10	Tier 3			Low LCR, no conflict with pile system
38	NT-7	Acer macrophyllum, (Bigleaf Maple)	1	5.2			5.2	20	7	FAIR	7	no tier			Big arch, leans over pile area, may need to be trimmed for aerial clearance
39	NT-8	Tsuga heterophylla, (Western Hemlock)	1	3.9			3.9	10	8	GOOD	8	no tier			Young, good condition
40	NT-9	Acer macrophyllum, (Bigleaf Maple)	2	11.2	5.3		12.4	55	8	POOR	8	Tier 3			Low LCR, small crown, smaller stem dead, leans over trail

DBH=Trunk diameter at 4.5 feet above grade
CRZ=Critical Root Zone

APPENDIX II
TREE REMOVAL AND RETENTION PLAN SET



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SCALE IN FEET

LEGEND:

- DECIDUOUS TREE TO BE PROTECTED
- EVERGREEN TREE TO BE PROTECTED
- TREE TO BE REMOVED
- DECIDUOUS TREE
- EVERGREEN TREE

SDCI 3020770

60% SUBMITTAL (NOT FOR CONSTRUCTION)

TREE REMOVAL PLAN (1 OF 2)

VAULT SERIAL #	DATE	MARK	NATURE REVISIONS	MADE	CHK'D	REV'D
37627						

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DES.	CONST.
SDOT	PROJ. MGR.
RECEIVED	
REVISED AS BUILT	

Seattle Public Utilities

ORDINANCE NO. PW NO.

SCALE: 1"=10'

LAKERIDGE SLOPE STABILIZATION PROJECT

JOB PC C314059 CO
VPI # 790-833
CD104
SHEET 10 OF 23

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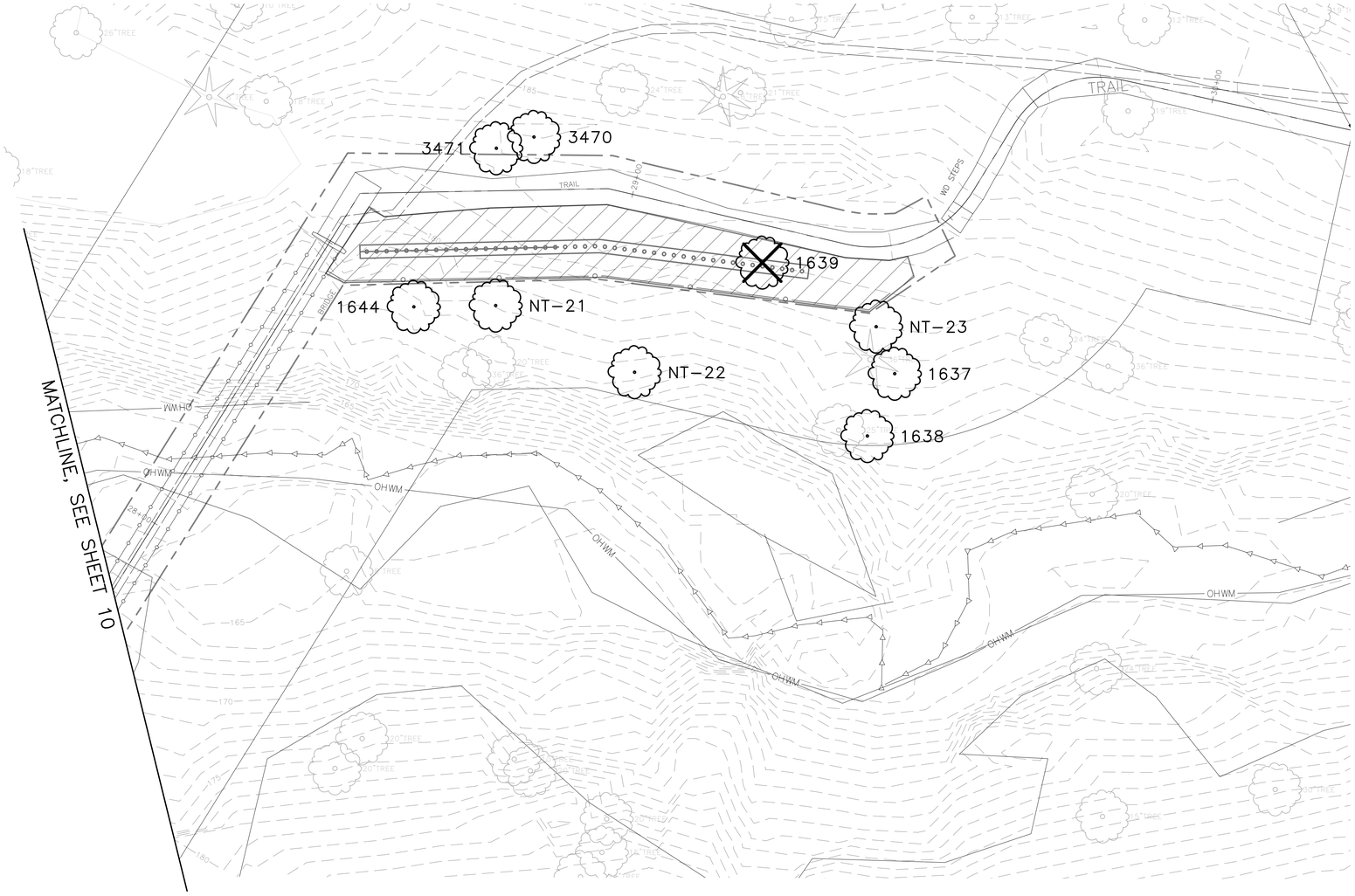

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SCALE IN FEET

LEGEND:

- DECIDUOUS TREE TO BE PROTECTED
- EVERGREEN TREE TO BE PROTECTED
- TREE TO BE REMOVED
- DECIDUOUS TREE
- EVERGREEN TREE

VAULT SERIAL #	DATE	MARK	NATURE REVISIONS	MADE	CHK'D	REV'D
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TREE REMOVAL PLAN (2 OF 2)

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ORDINANCE NO. PW NO.

SCALE: 1"=10'

LAKERIDGE SLOPE STABILIZATION PROJECT

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CD105		
SHEET	11	OF 23

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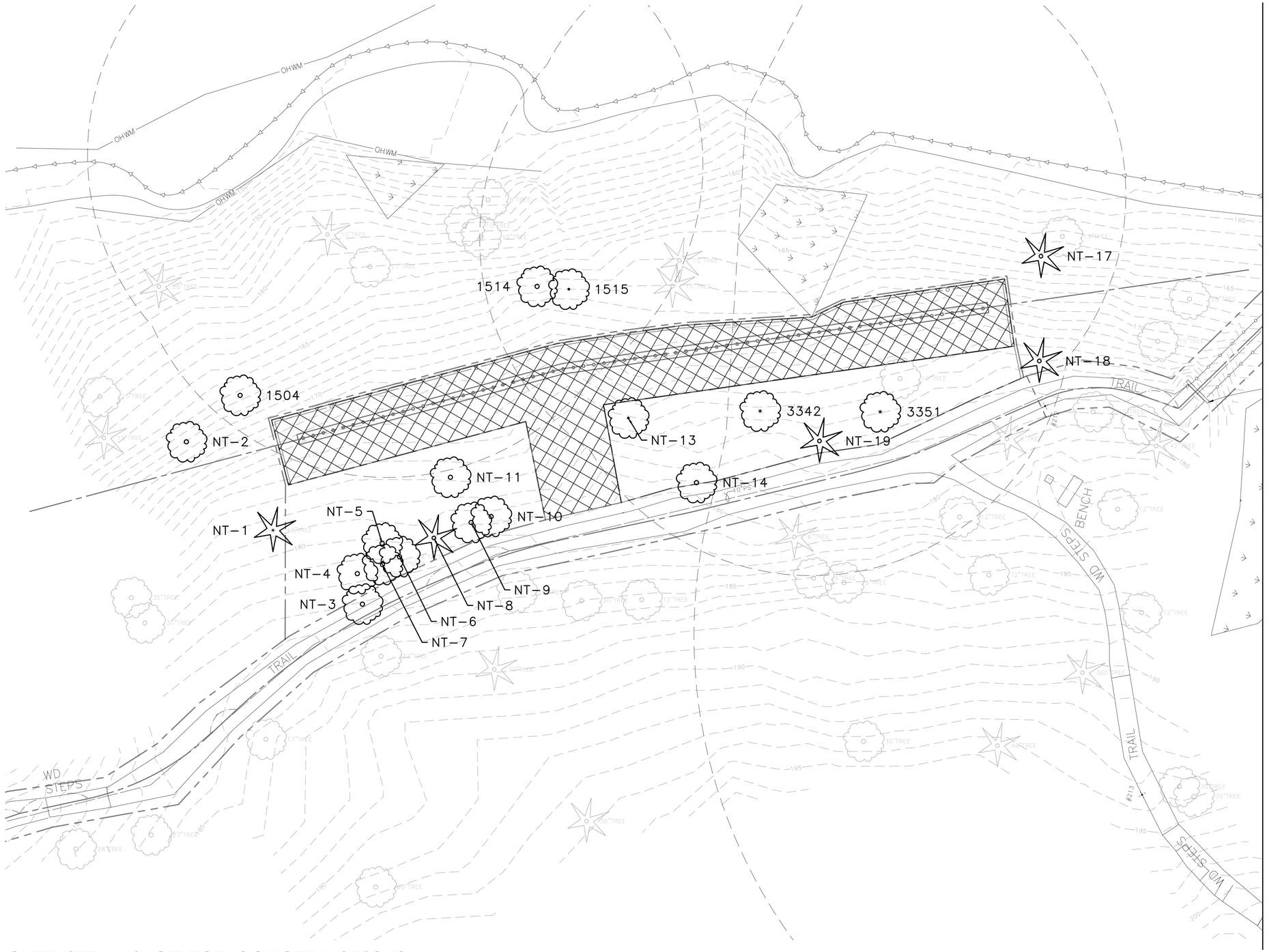

MATCHLINE, SEE SHEET 13

10 5 0 10 20
SCALE IN FEET

LEGEND:

SOIL AMENDMENT AREA

NOTES:

1. THE APPLICANT WILL ADD 3-INCHES OF COMPOST AND INCORPORATE INTO THE TOP 18-INCHES OF TOPSOIL.

SDCI 3020770

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SOIL RESTORATION PLAN (1 OF 2)

REVD	CHK'D	MADE	NATURE	MARK	DATE	REVISIONS

VAULT SERIAL # 37627

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ORDINANCE NO. PW NO.

SCALE: 1"=10'

LAKERIDGE SLOPE STABILIZATION PROJECT

JOB PC C314059 CO
VPI # 790-833
CD106
SHEET 12 OF 23

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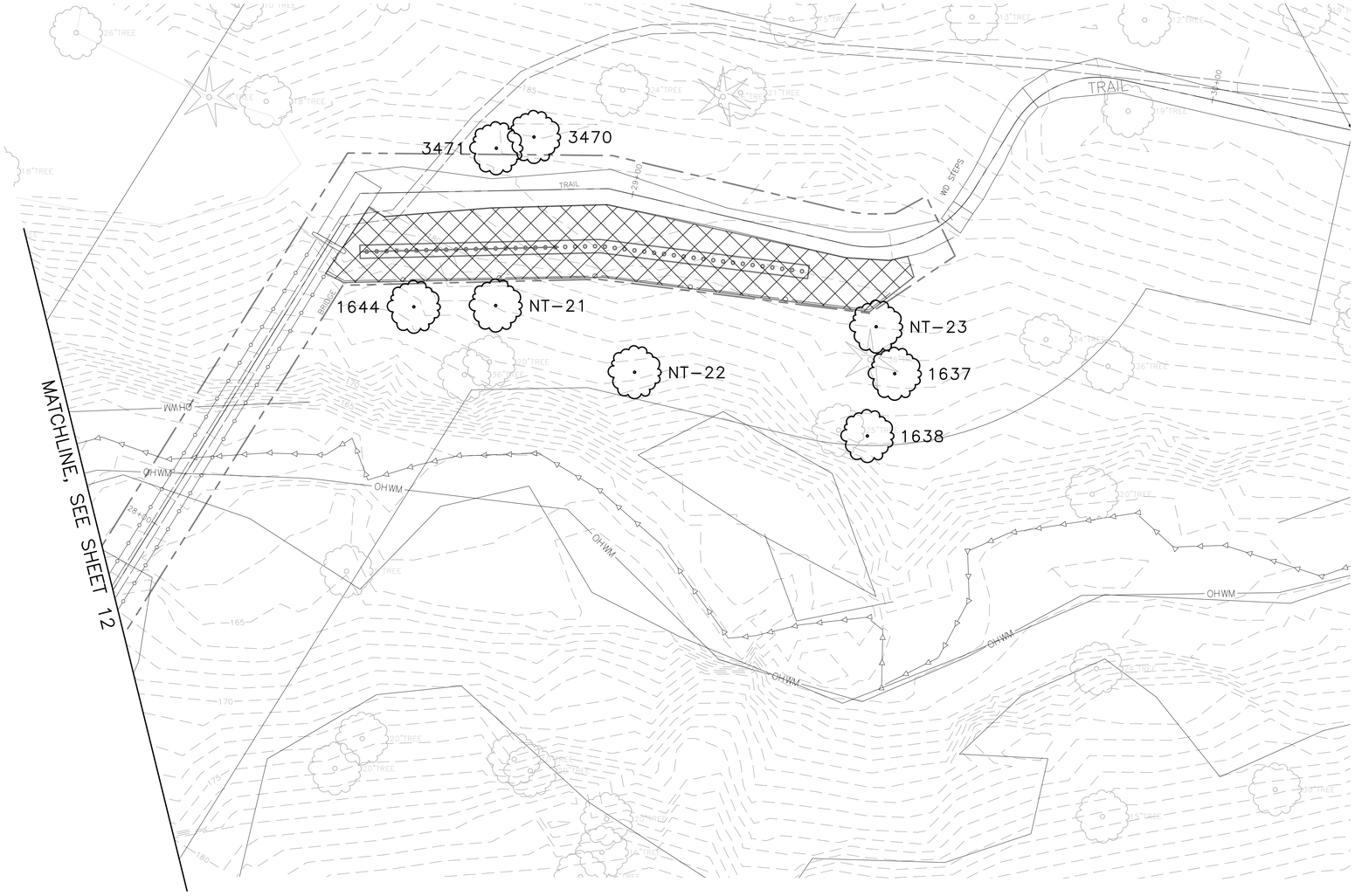

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SCALE IN FEET

LEGEND:

SOIL AMENDMENT AREA

NOTES:

1. THE APPLICANT WILL ADD 3–INCHES OF COMPOST AND INCORPORATE INTO THE TOP 18–INCHES OF TOPSOIL.

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SOIL RESTORATION PLAN (2 OF 2)

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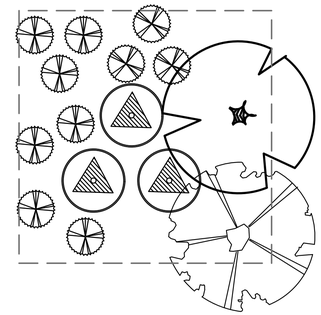
SCALE: 1"=10'

LAKERIDGE SLOPE STABILIZATION PROJECT

JOB	PC	C314059
	CO	
VPI #	790–833	
CD107		
SHEET	13	OF 23

LEGEND:

	TREES	QTY	SPACING	SIZE
	DOUGLAS FIR/PSEUDOTSUGA MENZIESII	7	TBD	2 GAL.
	WESTERN RED CEDAR/THUJA PLICATA	8	TBD	2 GAL.
	WESTERN HEMLOCK/TSUGA HETEROPHYLLA	8	TBD	2 GAL.
	SHRUBS			
	VINE MAPLE/ACER CIRCINATUM	48	4' O.C.	1 GAL
	OSOBERRY/OEMLERIA CERASIFORMIS	45	4' O.C.	1 GAL
	SNOWBERRY/SYMPHORICARPOS ALBUS	52	4' O.C.	1 GAL
	SALMONBERRY/RUBUS SPECTABILIS	35	4' O.C.	1 GAL
	RED ELDERBERRY/SAMBUCUS RACEMOSA	34	4' O.C.	1 GAL
	GROUNDCOVER			
	SWORD FERN/POLYSTICHUM MUNITUM	193	3' O.C.	4" POT
	OREGON GRAPE/MAHONIA AQUIFOLIUM	188	3' O.C.	4" POT



TYPICAL 10'x10' PLANTING AREA
(NOT TO SCALE)

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CONCEPTUAL PLANTING PLAN (1 OF 2)

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SCALE: 1"=10'

LAKERIDGE SLOPE STABILIZATION PROJECT

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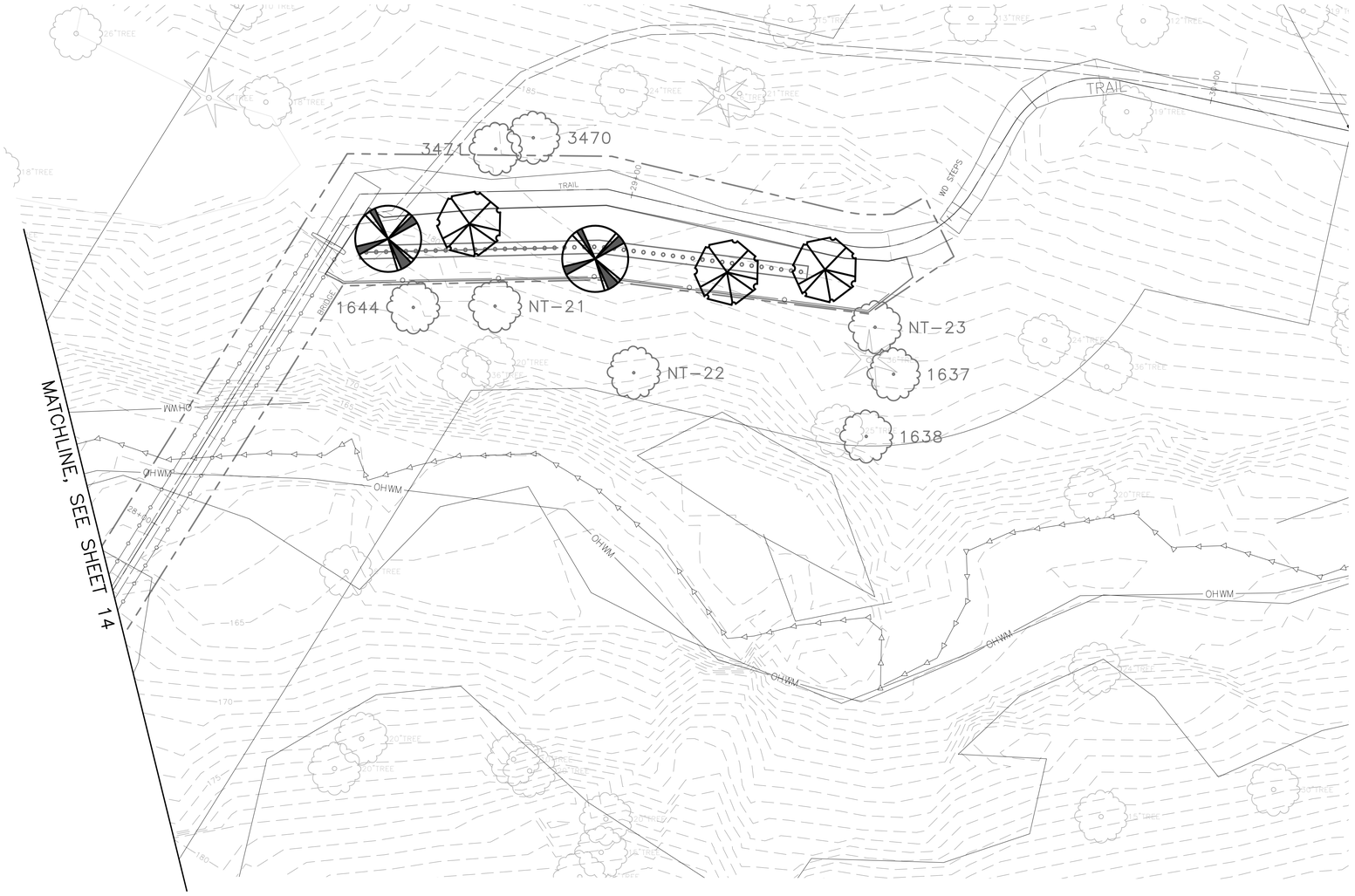

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SCALE IN FEET

LEGEND:

	TREES	QTY	SPACING	SIZE
	DOUGLAS FIR/PSEUDOTSUGA MENZIESII	7	TBD	2 GAL.
	WESTERN RED CEDAR/THUJA PLICATA	8	TBD	2 GAL.
	WESTERN HEMLOCK/TSUGA HETEROPHYLLA	8	TBD	2 GAL.
	SHRUBS			
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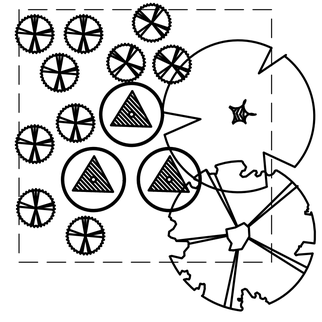

TYPICAL 10'x10' PLANTING AREA
(NOT TO SCALE)

SDCI 3020770

VAULT SERIAL #	DATE	MARK	NATURE REVISIONS	MADE	CHK'D	REV'D
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SCALE: 1"=10'

CONCEPTUAL PLANTING PLAN (2 OF 2)

LAKERIDGE SLOPE STABILIZATION PROJECT

JOB		
	PC	C314059
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VPI #	790-833	
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SHEET	15	OF 23

APPENDIX III
FOREST STEWARD GUIDE

FOREST STEWARD FIELD GUIDE

GREEN SEATTLE PARTNERSHIP

FORT&RRA

Thank you to all the partners who have contributed to the information in this guide.

Design by André Mora with illustrations by Joel Kimmel.
Printed in Seattle, Washington

For more information, contact info@greenseattle.org or visit greenseattle.org.

Table of Contents

DEAR FOREST STEWARD

Welcome to the Green Seattle Partnership (GSP)!

The GSP Forest Steward Program provides you the opportunity to be part of one of the largest, most unique community-based urban forest restoration efforts in the country. We have an ambitious goal to restore all 2,751 acres of Seattle's forested parklands by the year 2025 — and with your volunteer efforts, we can achieve it.

This endeavor benefits both the environment and local communities. To date, the work of many dedicated Forest Steward volunteers has been substantial. GSP and Seattle Parks and Recreation (SPR) staff stand by to assist in making your experience personally satisfying — and your efforts highly successful.

While the thought of tackling invasive plants in your neighborhood park may seem daunting, remember that you have the unyielding and full support of the GSP program. As Forest Stewards, you will stand shoulder to shoulder with GSP and SPR staff, professional crews, other volunteers, and partner organizations to get the work done. You also play the vital role of engaging your community — inviting new people into the urban forest and providing them opportunities to volunteer in their neighborhood park.

This Forest Steward Field Guide contains basic, yet essential information you will need to start and implement site restoration plans, and track your progress. As a Forest Steward, you will have opportunities to expand your forest restoration knowledge and skills by attending specialized training sessions. In addition, Forest Stewards at each park are eligible to receive tools, materials, plants, and crew assistance for your restoration projects through GSP.

Thank you for taking the lead to restore, maintain, and steward our urban forests. Your commitment makes Seattle an even better place to live. We look forward to many great years of cooperation and success!

Sincerely,
The Green Seattle Partnership

Field Guide Purpose

This Field Guide is a quick reference for Forest Steward volunteers on how to get started and proceed with community-based forest restoration at their neighborhood parks.

It does not have all of the answers to invasive plant management, community engagement, or species selection.

The best available science drives GSP work and is reflected within our current program policies. As urban forest restoration is a relatively young practice, GSP has had to build many of its own Best Management Practices (BMPs) to effectively complete field work and maintain a consistent quality of work across all GSP sites.

On a broad scale, learning and innovation occurs at restoration sites every day, the results of which are captured in formal documents like this Forest Steward Field Guide. BMPs are updated as new methods are tested and deemed successful. Remember: Your feedback is essential to our continuous learning process.

Regulations

Many of the habitats where GSP works, including wetlands, are ecologically important and sensitive. As such, SPR has a responsibility to comply with a variety of state and local regulations. The State Environmental Policy Act (SEPA) was used as the basis to assess potential environmental impacts of our restoration program and to issue project requirements that are embedded in the BMPs.

The City of Seattle has determined that if city staff, its contractors, and GSP volunteers comply with the BMPs, as referenced in this Field Guide, then the program is in compliance with the regulations set forth in the city's Critical Areas Ordinances (CAO). Individual restoration efforts are assessed for compliance through the aforementioned regulatory framework, but also could be subject to additional state and federal regulations.

Full Best Management Practices documents can be found at
GREENSEATTLE.ORG/INFORMATION-FOR/FOREST-STEWARD-RESOURCES/

Why the Green Seattle Partnership?

Our vision: Seattle is a livable city with healthy urban forests supported by an aware and engaged community.

The Green Seattle Partnership (GSP) is a unique public/private venture dedicated to promoting a livable city by re-establishing and maintaining healthy urban forests. It was founded in 2004 through a Memorandum of Understanding between the City of Seattle and Forterra (FORTERRA.ORG), a Seattle-based nonprofit that secures land to ensure a sustainable future for the Pacific Northwest. GSP is now managed by the Natural Resources Unit of Seattle Parks and Recreation (SPR), with additional support provided by Seattle's Office of Sustainability and Environment, Seattle Public Utilities, Forterra, other partner organizations, neighborhood groups, and individual volunteers.

Seattle's landscape has a history of logging and urbanization that has left our natural areas in less than ideal conditions. Many of these areas have a canopy of short-lived deciduous trees, like red alder and bigleaf maple, and an understory that often is battling aggressive invasive plants. These conditions do not support the regeneration of a diverse native forest. Without intervention, we are at risk of losing the quality forests our city needs.

These forests provide a host of benefits to Seattle: cleaner air, cleaner water, reduced stormwater impacts, reduced erosion, improved wildlife habitat, and mitigated climate change impacts. Additionally, healthy forests are attractive assets in Seattle's neighborhoods and provide access to nature all across the city. GSP strives to provide education and engagement opportunities for all Seattleites, empowers residents to make a positive change in their community, and encourages the next generation of Forest Stewards.

GSP is committed to creating healthy forested parklands, supported by long-term community stewardship and the establishment of resources within the city.

Our Goals

1 Restore and maintain the forested parklands and designated natural areas of Seattle.

2 Expand and galvanize an informed, involved, and active community around forest restoration and stewardship.

In order for GSP to achieve these goals, we utilize volunteers, professional crews, community partners, and staff to advance our progress in restoring Seattle's forested parklands.

Being a Forest Steward

Forest Stewards are dedicated and trained volunteers who serve as the backbone of GSP. They build a community of stewardship around the city's public forested parks to safeguard their future.

Forest Stewards commit to stewarding a specific park in collaboration with SPR and their community.

FOREST STEWARD RESPONSIBILITIES AND DUTIES

- Attend the GSP Forest Steward orientation.
- Serve as key contact at a park for the GSP.
- Coordinate volunteer forest restoration events and activities in your park; at least four volunteer events per year (of any size), where appropriate.
- Manage event postings and material requests, sign-in sheets, and work logs on the CEDAR online data portal. (See "What is CEDAR?" on page 10.)
- Participate in a biennial site-planning visit with GSP and SPR staff to agree on an identified plan for volunteer work.
- Attend at least one Green Seattle training event per year for ongoing personal development.
- Follow Best Management Practices for volunteers working on SPR property.
- Maintain a positive working relationship with staff, volunteers, donors, and community members.
- Stay in compliance with SPR background check requirement.
- Follow the SPR Volunteer Code of Conduct (SEATTLE.GOV/DOCUMENTS/DEPARTMENTS/PARKSANDRECREATION/VOLUNTEER/VOLUNTEERBEHAVIOREXPECTATIONS.PDF)

Seattle Parks and Recreation Volunteer Code of Conduct

1. As a volunteer, you represent SPR. You must treat the public, park users, other volunteers, and SPR staff with respect.

2. Threatening or harassing behavior will result in removal from the volunteer event and could result in expulsion from the park.

3. Individuals must not be under the influence of alcohol or controlled substances while participating in volunteer activities.

4. Safety is of utmost importance at all times. Take safety seriously and consider the use of safe work practices for yourself and others as a personal responsibility.

5. Recognize parks as public places. All users have rights to the parks. Volunteer events are open to the public unless SPR staff has approved a closure or exclusive event.

What is CEDAR?

To simplify and streamline the documentation process for more than 1,000 volunteer events a year, volunteers use CEDAR (CEntralized DAta Repository), an online request and reporting website. Forest Stewards will receive a username and password, and be trained on CEDAR at their Forest Steward orientation.

For more information about CEDAR, visit: GREENSEATTLE.ORG/INFORMATION-FOR/FOREST-STEWARD-RESOURCES/CEDAR-HOW-TO

The Role of a Forest Steward

This section is intended to clarify the role of a Forest Steward. It will help you get your feet firmly planted before you start digging in.

STEPS TO FOLLOW

1. Orient yourself

Attend GSP's annual Forest Steward orientation.

2. Pick a site

To be set up for success, your restoration site should be:

- Accessible (to volunteers and for materials/support)
- Appropriate (for restoration activities performed by volunteers)
- Safe (not too steep or located along busy streets)
- Sturdy (sometimes wetlands or other sensitive areas are not the best choice for volunteers)

3. Schedule a site visit

GSP staff will help Forest Stewards establish a site plan that identifies specific goals for ecological restoration. Some parks already have a Vegetation Management Plan (VMP) established, in which case staff will help you interpret that plan. Staff will clarify what work volunteers can perform and identify areas that must be left for professional crews, such as slopes and areas in need of herbicides. Site visits will cover the following:

- The history of any prior forest restoration work at your site.
- How to set a timeline for volunteer events.
- The best area to focus volunteer work in your first year.
- What SPR-approved Best Management Practices (BMPs) to use to work efficiently and effectively.
- Which plant species exist at your site.
- A draft list of tools needed for your work.

For more information on Forest Steward resources, visit GREENSEATTLE.ORG/INFORMATION-FOR/FOREST-STEWARD-RESOURCES, **or go to** GREENSEATTLE.ORG **and search:** FOREST STEWARD RESOURCES

4. Get familiar with your site

Explore your site to understand its ecological conditions, including sun exposure, water features, wet conditions, and signs of wildlife. Familiarize yourself with the site's plant species and soil type (Appendix A). Visit the online GSP Reference Map to view streams, delineated wetlands, slope conditions, Target Ecosystem, and Target Forest Type expectations for the zone you will be working in.

5. Recruit volunteers and prepare for your event

On the CEDAR portal, post your event, set up online registration, and request tools and materials. Conduct outreach for your event using GSP printed materials, social media, networking sites, neighborhood blogs, and word of mouth. Print volunteer sign-in sheets and make sure you have the tools, materials, and snacks you need to run a successful event.

6. Host events

Pick up any coffee or snacks before your event, and plan to arrive early to set up. Make sure your volunteers all sign in and have work gloves. Use the Event Welcome and Safety Talk speaking points on pages 18–20. Thank all volunteers and celebrate the work accomplished. Clean and put away tools, and have volunteers brush their boots and shoes.

7. Follow up

For each event you host, be sure to submit a work log and volunteer sign-in sheet as soon as possible. If you are working independently, please record and submit hours regularly. Timely submission of work logs and volunteer sign-in sheets is important for tracking and reporting monthly progress, and demonstrating this progress is key to attracting the financial, political, and volunteer support necessary to sustain the program into the future. CEDAR will automatically send a thank you email, but you also could send personalized emails to volunteers to thank them and invite them to your next event.

8. Repeat

Continue with volunteer events, reporting, and individual work. The work will change throughout the seasons and over time as your site progresses through the phases of restoration. You will gain experience, expertise, and confidence with each volunteer event. Attend GSP workshops and training opportunities. Read up on the latest BMPs, and utilize GSP staff to help you grow in your Forest Steward role. Stay connected to the GSP and Forest Steward community through social media, the Forest Steward Happenings monthly email, and the GSP monthly e-newsletter.

COMMUNITY ENGAGEMENT

Forest Stewards often are the face of the GSP's restoration efforts. You will interact with volunteers, SPR staff, park users, and the broader community. Community engagement tools are available to you as a Forest Steward:

To access the GSP Reference Map, visit GREENSEATTLE.ORG/INFORMATION-FOR/FOREST-STEWARD-RESOURCES/GSP-RESTORATION-MAP
or go to GREENSEATTLE.ORG **and search:** REFERENCE MAP

GREEN SEATTLE EVENT CALENDAR All of your volunteer events will be publicized on a citywide website and the City of Seattle's volunteer calendar, by virtue of using the CEDAR portal.

FUTURE HEALTHY FOREST SIGNS These temporary iconic green corrugated plastic signs let park users know a little bit about what is going on at the park and invite readers to participate in a volunteer event or contact you about your restoration project.

KIOSK SIGNS Some parks have kiosks that are available to you to publicize information about your restoration project or invite community members to an event.

GSP SOCIAL MEDIA If you have a special event or an event you want to highlight on the GSP social media streams, send them to: INFO@GREENSEATTLE.ORG.

YOUTH ENGAGEMENT

GSP has a specific goal to engage youth in forest restoration efforts and train the next generation of Forest Stewards. You can help us reach that goal in a number of ways:

- Make your events family- and kid-friendly.
- Connect with teachers and administrators at schools nearby your park.
- Advertise your events as a way for middle and high school students to earn community service hours that many Seattle schools require.
- Connect youth working at your site with GSP youth leadership opportunities, including summer job opportunities.

Planning Youth Events

- A supervisor-to-youth ratio of 1:5 to 1:7 is recommended. Supervisors can be other Forest Stewards, teachers, or parent chaperones.
- Prepare age-appropriate tasks for youth volunteers. Plan multiple tasks for a volunteer event so that you can be flexible if something isn't working out well.
- Provide appropriate-sized tools and equipment for youth volunteers, which can be requested through CEDAR.
- Be prepared to provide snacks, or arrange in advance for volunteers to bring their own snacks.
- Youth (under 14 years old) attending a regular volunteer event on their own need to be signed in by a parent or guardian or bring a signed youth waiver form with them.
- Students attending a volunteer event with their school or with an organized group may have their own youth waiver forms. In this case, the teacher or group leader

For more information on the latest GSP outreach materials, visit GREENSEATTLE.ORG/INFORMATION-FOR/OUTREACH-COMMUNICATION-RESOURCES/OUTREACH **or go to** GREENSEATTLE.ORG **and search:** PRINTED OUTREACH MATERIALS

is considered the guardian and the youth can sign-in like normal. Make sure all teachers, leaders, and chaperones also sign in.

Event Logistics

- Give older kids a chance to help lead younger kids.
- Be mindful of event length. One-hour volunteer events are typical for elementary school students.
- Celebrate work accomplished and lessons learned. Ask youth volunteers to identify one thing that they accomplished or learned during their work time.

Fun and Games

PAIRS PLANTING Have students work in teams of two for planting. Have them identify their plant species with ID cards (if available) and make a mulch donut.

FRIENDLY COMPETITION Have students compete to remove the largest blackberry root ball, create the largest compost pile, or pull the longest strand of ivy.

SCAVENGER HUNT Select three to five leaves, berries, bugs or other items from your park and encourage the youth to find them throughout the event.

BIRD OR NATURE WALK Take a break from the work and walk through the park with the youth, pointing out interesting features like nurse logs, snags, bird nests, animals, special plants, and human impacts.

MATH SKILLS Engage youth in reporting by having them measure newly mulched areas, tally up plantings and ivy rings, or estimate the size of weeded areas.

GSP INTRODUCTION FOR YOUTH AND STUDENTS

Here is an example of a script that can help you engage and inspire the youth and students who have arrived to volunteer at your GSP work site.

Today, you are joining the Green Seattle Partnership to work at _____ Park.

Who here has a favorite park in Seattle?
(Expect answers related to soccer fields, spray parks, playgrounds, etc.) This park is a little bit different. Instead of soccer fields and jungle gyms, this park is meant to be a forest.

Who knows why healthy forests are important for a city?
ANSWERS: They absorb and filter rain water in a totally natural way. — They absorb pollution in the air and provide fresh clean oxygen. — "Take a deep breath in! Thank you, trees!" — They provide a living space for wildlife, like birds, and a place for people to connect with nature and the outdoors.

Does anyone know how much forested land is part of a Seattle park?

For additional activities and educational lessons for youth, visit the Washington Native Plant Society resource page at WNPS.ORG/EDUCATION/RESOURCES/INDEX.HTML

ANSWER: 3.9 square miles. "About the same size as 2,500 soccer fields!"

To improve the health of all of that forested land, we need the help of everyone in the city, "including young people just like you!"

The Green Seattle Partnership brings together people like you and me to extend the life of our forests so that you can enjoy them for many years to come, maybe with your own children and grandchildren.

BUSINESS ENGAGEMENT

Local businesses can help build your volunteer base, promote a healthier and cleaner forest, coordinate group volunteer efforts, and provide donations for your restoration events:

- Invite local businesses or business associations to volunteer at your restoration site.
- Ask local businesses if you can advertise your neighborhood event at their location.
- Partner with local businesses to provide in-kind donations for your volunteer events, such as coffee, donuts, or healthy snacks.
- Review a guide for engaging your local business community and utilize GSP's outreach flyer by visiting GREENSEATTLE.ORG and searching: Business Engagement.

RACE AND SOCIAL JUSTICE INITIATIVE

The City of Seattle's Race and Social Justice Initiative aims to ensure racial equity in city programs and services to make tangible differences in people's lives. GSP is a program of the City of Seattle, and is working to increase participation of people of color in our forest restoration efforts.

GSP has set a goal to have volunteer hours completed by people of color be proportionate to Seattle's race/ethnicity demographics as a whole. To measure our progress toward this goal, GSP asks for voluntary anonymous demographic information of volunteers when they register online, which includes race/ethnicity. Forest Stewards may get questions about the demographic survey. View them as your opportunity to explain the racial equity goal for the program.

In addition to collecting demographic data at GSP volunteer events, GSP is working on other ways to meet the goals of Race and Social Justice Initiative:

- Build individual and programmatic knowledge of institutional racism by hosting at least one annual Forest Steward training that focuses on the topic.
- Build paid opportunities for minorities and underrepresented groups into GSP programming.
- GSP's Public Engagement Committee is tasked with applying an equity lens to all of our efforts and materials.

THE 10 ESSENTIALS OF A VOLUNTEER EVENT

1. Volunteers!
2. Restoration materials: plants, mulch, etc.
3. Tools and work gloves
4. Garbage bags for trash and, if needed, as makeshift rain ponchos
5. Signs for posting at park entrance and sign-in table
6. Sign-in materials: volunteer sign-in sheet, extra youth waiver forms, clipboards, pens, etc.
7. Program and site information: your site plan, GSP brochures, dates for subsequent events, etc.
8. Work plan: clear goal of restoration work for the day
9. Safety resources: first-aid kit, cell phone, nearby hospital or clinic information
10. Water, coffee, and snacks

VOLUNTEER EVENTS

Each group receiving GSP support should commit to holding at least four events per year, if appropriate. Volunteers can help with all four phases of restoration — from the initial removal of invasive plants to watering and maintaining plants.

Volunteer events vary in size, from a small group of neighbors to a larger corporate outing. Forest Stewards should post all volunteer events to the CEDAR online portal at least three weeks in advance. This is to ensure that there are no conflicting events in the park, and to allow GSP staff to better direct interested volunteers to your event and provide enough time to coordinate the necessary resources.

In addition to posting volunteer events on CEDAR, Forest Stewards are encouraged to do additional outreach to recruit enough volunteers for a successful event. GSP has created outreach materials that are available to Forest Stewards such as door hangers, kiosk posters, business cards, and GSP brochures.

Volunteers events are a great way to get work done in the forest, but they also serve as important opportunities to get people outside and connected to Seattle's parks. Forest Stewards can provide a fun and rewarding experience for residents by being organized, friendly, prepared, and appreciative. To set up a successful volunteer event, prepare to have enough work and enough event leads for volunteers to get the instruction they need to do meaningful work. Suggested work group sizes are 10 to 15 for adults and five to seven for youth and student groups. Each group should have a knowledgeable leader, who can be another

Forest Steward or an experienced volunteer.

GSP staff and professional crews are available to help lead larger events, as long as enough advance notice is provided. Please contact GSP staff to request volunteer-event support. If you cannot accommodate an interested volunteer group, please ask GSP staff for assistance or direct the requester to another scheduled GSP event.

BE PREPARED

1 At least three weeks in advance of your volunteer event, identify what work volunteers will be doing — and where. Considerations include:

ACCESS TO AMENITIES Is the work site close to parking and restrooms? Will the restrooms be open for your event?

SAFETY Is the site too steep for volunteers? Are there other site hazards that could impact negatively the volunteer experience, such as overhead dead trees, active bees nests, high traffic areas (bikes/runners)?

SKILL/EXPERIENCE LEVEL Is this work appropriate for the skill level that volunteers will have?

SUCCESS Is the work plan something that could be accomplished in a single event and provide a feeling of success?

SEASONALLY APPROPRIATE WORK Is the work appropriate for the season? For example, is it the most opportune time to work in wet areas, install new native plants, work in brushy areas where birds nest? Consult the GSP Seasonal calendar on pages 26–27 to get an idea of what activities are appropriate for the time of year.

EVENT LEADERS Are there enough knowledgeable leaders to support a larger volunteer event?

2 Create a list of tools and materials for your event to ensure that you have the right resources to accommodate your volunteers and get the work done. Request any materials, sani-cans, or extra tools through the CEDAR online portal at least three weeks in advance. Learn more about creating a tool list in Appendix D.

3 Conduct outreach to recruit volunteers and encourage online registration for the event.

HOSTING YOUR EVENT

As a volunteer event leader, the Forest Steward's main jobs during the volunteer event are to explain to the volunteers how the work impacts the forest, teach volunteers how to do the work, monitor work quality, and ensure that volunteers are working safely and enjoying their time. It will be tempting to dig in and do the work yourself, but a better investment of

Access the CEDAR how-to guide at GREENSEATTLE.ORG/INFORMATION-FOR/FOREST-STEWARD-RESOURCES/CEDAR-HOW-TO/

your time is to make sure all volunteers are doing quality work. Follow these steps to ensure you cover all important points.

1. Prepare for volunteers

- Be onsite and ready 15 to 30 minutes before volunteers are scheduled to arrive.
- Make sure adequate signage is posted at the park entrance so volunteers can locate your site easily.
- Set out and count tools.
- Set out the sign-in sheet.
- Make sure any co-Stewards or lead volunteers know the agenda and work plan for the day.

2. Event welcome

Feel free to customize or adapt these talking points as you get more comfortable leading volunteer events.

Introduce yourself and other Forest Stewards and/or GSP staff present.

Thank everyone for donating their time.

Explain why it is so important that people are participating

— Healthy forests in our urban areas provide many benefits including improved water and air quality, reduction in stormwater runoff, habitat, and improved public health.

— Forest restoration work parties help bring together communities, promote healthy living, and make the park look better.

— Seattle has 2,751 acres of forested parklands.

— "These forests need our help!" Many are dominated by relatively short-lived trees, such as red alder and bigleaf maple. The forest floor is being taken over by weeds like English ivy and Himalayan blackberry. These conditions are preventing the native forest from regenerating and creating a forest that is sustainable and long-lived.

Explain the Green Seattle Partnership

"The Green Seattle Partnership is a citywide effort that includes the City of Seattle, Forest Stewards like myself, many nonprofit partners, and residents like you working together to restore all 2,751 acres of Seattle's forested parklands." (Consider providing a longer explanation or related activity at a break/lunch.)

Acknowledge tribal history

"We are on the ancestral homelands of the Duwamish and Muckleshoot Tribes, along with other Salish Tribes that have lived here for thousands of years. It's our honor to work with them in healing their ancestral lands."

Introduce your project

— Give an introduction to your specific park.
— Touch on the history of the restoration and your long-term work plan.
— If your group is appropriately sized, have volunteers introduce themselves.

Explain today's activities

— Today we are going to be:
— Our schedule is going to be:
— Bathrooms are located:
— Water and snacks are located:

3. Safety talk

Set the tone for safety

- *"While we are working today, our main goals are to be safe, have fun, and get some good work done — in that order."*

General safety reminders

- *"If you haven't already signed in, please do so now."* (Pass around a clipboard, if needed.)
- Let volunteers know that you have a first-aid kit and tell them where it can be found.
- Tell volunteers that they can always call 911 for emergencies. If other issues arise, ask them to find you. Also share that you have copies of incident and accident forms with you on site and share where they can be found.

Tool safety

- Introduce what tools you are using, addressing all aspects of CUSS (Carry, Use, Safety, Storage) for each tool.
- Remind volunteers to keep track of tools and to return them to an identified area before switching to a new tool.
- Remind everyone that they should be wearing work gloves, which you are providing.

Activity and environmental concerns

- Warn against heavy lifting.
- Explain that no work is to be conducted on steep slopes, or even moderate slopes (show areas that are appropriate or inappropriate).
- If your event is close to a road, inform volunteers that they must be wearing safety vests and no one should be working in the road.
- Welcome water breaks and rest in the shade.
- Be aware of ground nesting bees, and recommend that if volunteers get stung, they should run far and fast to escape other stinging bees; ask volunteers to identify (to the group or event lead) if they have a bee sting allergy.
- Remind volunteers to not pick up items from the work site that could be personal belongings (tents, clothes, etc.).Remind volunteers to never pick up needles or syringes; notify the event lead so that the area can be flagged off and reported to SPR.
- Always wear gloves!
- Identify known areas of noxious weed infestations that should be avoided, or if you are working in those areas, explain the need to clean boots, clothes, and tools before leaving the area. Show the location of boot brushes and explain how and why to use them.

4. Demonstrate Best Management Practices

Demonstrate how you want volunteers to perform restoration work, including:

- Identification of invasive plants
- Proper invasive plant removal techniques
- Compost pile building

- Proper planting techniques

After you demonstrate, ask if anyone has questions.

5. Final pre-work reminders

- Identify event leads one more time.
- "If you have any questions while we are working today please feel free to ask us. We will be walking around to be available to help you."
- "If you have any general forest- or park-related questions, let us know and we will do our best to answer them."
- Break up into work groups (as the last step or before the safety talk, depending on your group size).

6. Other considerations during the event

- Check in with volunteers to make sure they feel comfortable with the tools and the day's tasks.
- Redirect volunteers to a different task if they request a change or you observe that one may be necessary.
- Remember that you are there to facilitate the event, not do all the work yourself.
- Keep your volunteers busy and make them feel useful.
- Thank everyone sincerely and often.

7. Event Wrap-up

- Wrap up your event a few minutes early so that you can have volunteers help with clean up, gather them together, and formally conclude by the posted time.
- Have volunteers return tools for counting and cleaning.
- Have volunteers brush tools and their personal footwear. (See sidebar on page 21.)
- Thank volunteers for their time and efforts.
- Ask volunteers for something they learned or enjoyed at the event.
- Tell volunteers what their impacts were today (example: 200 square feet of ivy removed, 5 yards of mulch spread).
- Share other opportunities for volunteers to stay involved (provide the date and time of the next event or reference the Green Seattle website to help out at parks all across Seattle).
- Take a group photo that you can send out with the follow-up "thank you" email.
- Tell the group how they can stay involved with your project and other Green Seattle events.

REPORTING

Reporting citywide forest restoration progress is absolutely essential for gaining political will and financial support, and for adapting practices to ensure an ongoing successful program.

Event Hours and Work

After each event, go to your online CEDAR portal dashboard to:

1. Finalize sign-in sheet
Confirm volunteer attendance, add

any volunteers on the sheet that did not pre-register via CEDAR, and then submit sign-in sheets.

2. Enter event work log
Calculate quantifiable work from the event and submit on CEDAR after each event. Be equipped to take notes during the event. The key metrics to be recorded are:

— Number of volunteers
— Number of volunteer hours
— Invasive species removed (check list)
— Number of ivy survival rings
— Area (in square feet) of first-time invasive plant removal
— Area (in square feet) of weeding
— Plants installed (by category and stock type, not species)
— Area (in square feet) of mulch spread
— Plants watered

Individual Volunteer Time and Work

Your work and time contributed to park restoration outside of volunteer events can be captured in an individual work log on CEDAR. Please record your hours that contribute indirectly to the work on the ground such as: attending site visits, conducting outreach, or whatever you do to keep things running smooth at the park. The individual work log can only be used for reporting work for yourself, not for your volunteers' work or time. You can submit an individual work log after every trip to the park, or lump work and hours together at an interval that works best for you, such as weekly, monthly, or even annually.

Accidents

If you or any volunteers sustain an injury while working in the park, complete an accident report form and ensure that the injured volunteer is signed in on the sign-in sheet. If you

Tool and Boot Brushing

The seeds of troublesome weeds are traveling to different restoration sites on tools, boots, and clothing. To avoid making infestations worse or spreading them to new parks, please have your volunteers use the boot and tool brushes provided by GSP. To reduce the potential for moving weeds, soil, and seeds on boots or clothing:

- **Clean soil from tools while still on site using a stiff brush or gloves in a designated decontamination area. Plan time into your event schedule to accomplish this with volunteers.**
- **Remove plants and mud from boots before entering the site, using a stiff brush.**
- **Before leaving site, remove plants and mud from boots with a stiff brush, and consider spraying down with water if available.**
- **Limit access to designated noxious weed areas during volunteer events.**

do not have a copy of the accident report form with you in the park, take down the contact information of the injured volunteer and procure details after the event. You can find the accident report form at GREENSEATTLE.ORG/WP-CONTENT/UPLOADS/2015/05/E-12ACCIDENT-REPORT-INVOLVING-PARK-USERS.PDF. Submit the completed form to your GSP staff contact.

Incidents

If you encounter an item, person, or situation in the park that you think should be reported — for example, an altercation with a park user, the discovery of something suspicious or dangerous, or vandalism — fill out an incident report form. This is not in lieu of a police report, but it does document the occurrence for SPR staff and can be used to analyze patterns or trends. You can find the incident report form at GREENSEATTLE.ORG/WP-CONTENT/UPLOADS/2018/05/E-09-INCIDENT-REPORT.PDF. Submit the completed form to your GSP staff contact.

For more information about reporting incidents and accidents, visit:
GREENSEATTLE.ORG/INFORMATION-FOR/FOREST-STEWARD-RESOURCES/REPORTING-INCIDENTS-AND-ACCIDENTS/

Ecological Restoration

Ecological restoration is the practice of renewing and restoring degraded, damaged, or destroyed ecosystems and habitats in the environment through human intervention and action. The history of logging, the presence of invasive plants, and urban pressures have guided GSP in the development of a four-phase approach to ecological restoration. This approach captures the key actions for restoring urban natural areas in the Puget Sound area. Additionally, this breakdown of phases aids our ability to monitor progress and develop site-specific management strategies.

PHASE 1 focuses on removing invasive plants for the first time.

PHASE 2 focuses on the planting of native trees, shrubs, and groundcovers.

PHASE 3 focuses on native plant establishment. Sites are weeded, mulched, and watered as needed. Some sites may stay in Phase 3 for several years to manage invasive plant regrowth and wait for new plantings to grow.

PHASE 4 focuses on long-term stewardship and maintenance, which includes monitoring for new populations of invasive plants, social use impacts, and other ecosystem health indicators.

While most forest areas will need all four phases of restoration, some with low levels of invasive plants may only need a quick Phase 1 sweep to prepare the site for Phase 2. If a healthy native plant community already exists, the site may graduate quickly to Phase 3 or Phase 4.

Considering Climate Change

GSP is well-positioned to help Seattle Parks and Recreation move forward a variety of climate change resistance and resilience actions. Current invasive species management efforts will continue to help build diversity, as will more recent efforts to use ecological thinning to accelerate restoration of long-lived conifer species. In addition, GSP is beginning to source native tree materials from more southern regions to support species through climate transitions. Visit GREENSEATTLE.ORG, search "climate" for more information.

GSP REFERENCE MAP

Each park that GSP identifies for ecological restoration is broken down into management units. These units, called zones, are various sizes but generally share site characteristics. Available online (see bottom of page 23), the GSP Reference Map presents important spatial data to support project planning, broken down by

park and zone. Core data includes park boundaries, GSP zone boundaries, information on the estimated phase of restoration, and more. Using aerial images or other base maps available as part of the GSP Reference Map can help you explore past and current site conditions and consider the logistics of restoration implementation.

The seven Target Ecosystems

1. Conifer Broadleaf Evergreen Mixed Forest
2. Dry-Mesic Conifer and Conifer Deciduous Forest
3. Mesic-Moist Conifer and Conifer Mixed Forest
4. Oak Woodland
5. Riparian Forest and Shrubland
6. Scrub Shrub Wetland
7. Bog and Fen

REFERENCE ECOSYSTEMS

An important principle of ecological restoration is the identification of a reference ecosystem to serve as a guide for planning projects and a benchmark for evaluating success. A reference ecosystem can be an actual site or a conceptual site that is representative of what you want your site to look like in the final phase of restoration. There are seven different reference ecosystems, called Target Ecosystems, which we have identified for forested parklands in Seattle.

Nested within each Target Ecosystem are numerous Target Forest Types, which are common native plant associations that provide a more specific planting palette. These associations are named by dominant and diagnostic plant species. For example, within Conifer Broadleaf Evergreen Mixed Forest, three different Target Forest Types represent different plant palettes and site characteristics. GSP staff have assigned a Target Ecosystem and a Target Forest Type to each zone that falls in the GSP work plan. These assignments are based on site characteristics and some field verification. You can investigate the assigned Target Ecosystem and Target Forest Type by looking up your restoration zone on the GSP Reference Map.

GETTING TO PHASE 4

Once work on the ground begins, GSP records what restoration work has occurred and calculates progress. Progress happens as zones move through the four phases of restoration and as zones transform into the identified Target Ecosystem. Zones are moved into Phase 4 after GSP staff perform a verification process that ensures the full zone is on a trajectory toward Target Ecosystem goals.

To access the GSP Reference Map, visit GREENSEATTLE.ORG/INFORMATION-FOR/FOREST-STEWARD-RESOURCES/GSP-RESTORATION-MAP
or go to GREENSEATTLE.ORG **and search:** GSP REFERENCE MAP

For explanations of Target Ecosystems and Target Forest Types, visit GREENSEATTLE.ORG/INFORMATION-FOR/FOREST-STEWARD-RESOURCES/RESTORATION-RESOURCES/REFERENCE-ECOSYSTEMS
or go to GREENSEATTLE.ORG **and search:** REFERENCE ECOSYSTEMS

Tracking Progress

Work Logs (CEDAR): What restoration work is happening on the ground? Your restoration project story is told through the logging of information on what work has been done in the park — and where. A work log quantifies how much volunteer and/or crew time has been contributed in a given area, and the work completed. Work logs are submitted electronically through the CEDAR online data portal.

GSP Inventory: How much land currently is in restoration? Each year, SPR coordinates a rapid ecological assessment of active restoration sites to capture current conditions and support work planning. GSP prioritizes about 350 acres of inventory each year. GSP inventory protocols include collecting data on plant composition, as well as regenerating trees and overstory trees.

Restoration Phase Mapping: What phase of restoration is this zone/site in? To represent restoration progress, areas that have seen substantial restoration activities in the previous year are directly observed and mapped. Restoration phase mapping often happens concurrently with inventory data collection. The restoration phase information then is updated annually on the online GSP Reference Map.

Forest Monitoring: How is this natural area progressing over time? While the GSP Inventory provides a rapid assessment of current conditions, the Forest Monitoring program uses permanent plots across the city's forested parklands to provide a long-term view of forest change. Parklands are visited before and after initial restoration, and on a five-year cycle thereafter. The Forest Monitoring program has been collecting data since 2010.

The Long View: How should I plan annually? Forest restoration is so much more than just a large-scale weeding effort. Forest Stewards take time to plan out the entire restoration cycle, identifying and accounting for any site-specific considerations before work on the ground begins. We even have an annual planning booklet written specifically for Forest Stewards, which can be found at GREENSEATTLE.ORG/WP-CONTENT/UPLOADS/2016/03/ANNUALPLANWORKBOOKFINAL-3_20_2014.PDF.

For more information on GSP inventory, visit GREENSEATTLE.ORG/FOREST-INVENTORY-RESULTS**, or go to** GREENSEATTLE.ORG **and search:** INVENTORY

Seasonal Considerations

Although enjoying a generally mild climate year-round, Seattle's four distinct seasons dictate appropriate and efficient timing for urban forest restoration activities. This guide outlines basic forest restoration considerations and recommendations for each of the four seasons.

WINTER

Invasive plant removal is easiest in damp soils.

If invasive plant removal results in large amount of bare soils, cover with mulch or organic debris.

Native plant installation should be wrapped up by March.

Live stake plant propagation and installation.

Watch for early bird nesting and avoid working in areas of high avian nesting activity.

SPRING

Invasive plant removal is easiest in damp soils.

Maintenance weeding in planted areas.

Avoid removing brushy invasive plants form April to July to respect nesting birds.

Wetland species can be planted in wet areas after flooding has receded (April to June).

Plan for fall planting by identifying planting location and organizing a species list.

Submit herbicide requests for applicable invasive species for summer treatment.

SUMMER

Remove invasive plants.

Break down dried-up compost piles.

Water plants if available and/or appropriate (May to September).

Professional crews conduct herbicide treatment.

Restoration pruning occurs (mid-July to September).

FALL

Remove invasive plants.

If invasive plant removal results in large amount of bare soils, cover with mulch or organic debris.

Plants that will be installed in saturated or seasonally wet sites should be planted in September to October or March to April, outside of the wet season as much as possible.

Install native plants once rain is regularly falling (October to March).

Site-Specific Considerations

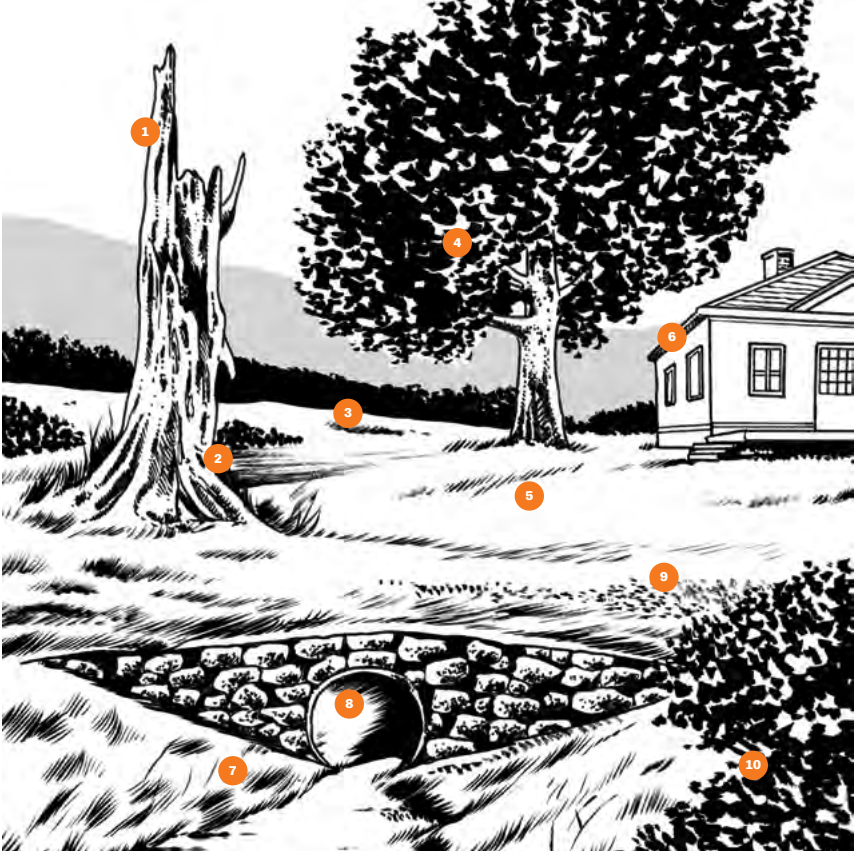
In addition to seasonal climate, there are additional site-specific considerations to factor into restoration planning in order to accommodate wildlife, people/volunteers, safety, and wetlands.

BIRD HABITAT

Once the forests are restored, they will provide superior habitat to invaded ecosystems. While sites are in the process of restoration, it is important to plan activities with the needs of birds and other wildlife in mind. Here are some suggestions for improving bird habitat while also being respectful of the current habitat:

- Spend time getting to know your site during nesting season. Come before a volunteer event to look and listen for bird nesting activities. Become familiar with the birds that are nesting in your restoration areas. Use the nesting diagram for ideas of where to look for nesting activity at your park.
- Avoid clearing work or large events in high value nesting areas from April 15 to July 31.
- Avoid leaving sites barren for extended periods. Limit clearing work to areas where you can ensure replanting and establishment.
- Minimize long periods of disruption to riparian areas and wetlands and their buffers as much as possible, as these areas are widely used by wildlife.
- Leave snags and other habitat structures on site. Do not cut down invasive trees.
- Consider continuity between restoration sites to allow for safe travel between populations.
- Spend time with a SPR bird expert to get familiar with local species. Some great places to access and people to contact are Seward Park Audubon Center, Seattle Audubon, and SPR Naturalists. Attend their events!

For more information on bird habitat considerations:
GREENSEATTLE.ORG/WP-CONTENT/UPLOADS/2015/08/SEATTLE_AUDUBON_NBP_REPORT_FINAL_MAY_2015.PDF



SEATTLE BIRD NESTS

Look for... 1. Woodpecker nests in snags. **2.** Pacific wren nests in log and stump crevices. **3.** Spotted towhee nests on open ground under shrubs. **4.** Songbird nests in healthy tree branches; chickadee and brown creeper nests in the crevices of trees. **5.** Spotted towhees and Pacific wren nests in compost piles. **6.** Robin, house finch, and barn swallow nests under eaves. **7.** Kingfisher nests in streambanks. **8.** Barn swallow nests in culverts. **9.** Killdeer nests in open gravel. **10.** Hummingbird and warbler nests in shrub branches.

POLLINATOR HABITAT

Pollinators need safe places for nesting, laying eggs, and overwintering, ideally located within 300 feet of a food source. GSP forest restoration can provide quality habitat for native pollinators with careful consideration:

- Leave it messy! Dead wood, leaf debris, rocks, and compost piles are all structural and nutrient resources for a rich and diverse insect paradise. Dead wood includes standing dead trees, downed logs, stumps, root wads, log rounds, untreated lumber, and chunks of bark. Place large

For The Native Pollinator Habitat Restoration Guide, published by EarthCorps, visit GREENSEATTLE.ORG/THE-NATIVE-POLLINATOR-HABITAT-RESTORATION-GUIDE **or go to** GREENSEATTLE.ORG **and search:** POLLINATOR

wood in the shade and let fungus go to work on it. Holes, peeling bark, or bits of wood may be utilized as lodging or housing materials by butterflies, beetles, and bees.

- Compost or brush piles are great nest sites for bumble bees. If you need to flip a compost pile to pull out invasive weeds underneath it, first examine it for signs of active bee nesting and try not to disturb if bee activity is observed.

- Rocks provide safe and dark spaces for all kinds of invertebrates. Piles of rocks can provide overwinter refuge and cover for butterflies and bumble bees. If rocks are already on your site, it is more valuable to leave them and not disturb the critters already using them. If importing rocks to a site, consider making a few piles and placing them near plantings, as they can keep moisture in the ground during summer.

- Spots of bare, undisturbed ground allow ground-nesting bees to make a home. They need a few spots that are un-vegetated and un-mulched, even better if they are sunny and gently sloped. Well-draining soils that are sandy or loamy are preferred.

- Take care with soils. Excessive social trails, tillage, compaction, and digging can disrupt pollinator nest sites.

WETLANDS AND WET AREAS

Designated wetlands can be identified by searching the online GSP Reference Map (GREENSEATTLE.ORG/INFORMATION-FOR/FOREST-STEWARD-RESOURCES/GSP-RESTORATION-MAP). You also can use the wet area decision tree in Appendix F to see if site conditions are consistent with a wetland or wet area. If a site has wetland conditions, please adjust restoration planning and implementation appropriately:

- If there is a year-round wet area in the restoration site, limit volunteer involvement to small events of 10 or fewer people. If the wet area is seasonal, regular to large events are permitted when the site is dry.

- If possible, try to work at the driest time of year.

- If a Stewardship trail skirts or passes through a wet area, planks or duck boards should be used to minimize impacts to the soils.

- Adjust planting timing to install native plants in the shoulder season (often early fall or late spring) when soils are damp or wet, but not saturated or with standing water. Native plants installed in standing water could float out of their planting hole.

- Do not place compost piles in areas that become wet or saturated.

For Wetland and Wet Area Best Management Practices for Forest Stewards, visit GREENSEATTLE.ORG/WP-CONTENT/UPLOADS/2019/11/GSP-WETLAND-PROTOCOLS-FOR-FOREST-STEWARDS-JAN2018.PDF
or go to GREENSEATTLE.ORG **and search:** WETLANDS

Access and Safety Considerations

ACCESS PATHS

Stewardship access paths create access to restoration sites. Not all GSP restoration sites have official SPR trails to move volunteers and materials to and through sites. In those cases, access paths need to be carefully planned and laid out, taking into account disturbances that foot traffic will have on your restoration site.

- Access paths should travel through the center of restoration areas, not adjacent to them.
- These paths often are inviting for other parks users. In fact, many people consider them a permanent park feature. To discourage use, keep paths discrete and close access points by pulling brush across entrances when not in use.
- Stewardship access paths are for temporary access only. Once a site is in maintenance, trails should be replanted and naturalized.

CRIME PREVENTION THROUGH ENVIRONMENTAL DESIGN (CPTED)

CPTED is an approach to deter crime that was developed for the urban built environment. Based off the principle of designing spaces that reduce the opportunity and desirability for criminal acts, effectively applied CPTED principles can also make spaces feel more comfortable and safe to park users. With thoughtful planting, intentional pruning, and careful weed removal, these principles also can be applied to managed natural areas. See page 52 and 54 for CPTED considerations related to plant selection and placement, and pages 63–64 for CPTED considerations for restoration pruning in the plant establishment section.

Your restoration goal is to preserve the naturalistic character of the urban forest while also providing personal safety for all park users. CPTED guidelines are as follows:

TREES WITH HIGH CANOPY
High branching structure allows for clear sight lines, which are associated with a greater sense of safety and allow for visibility in and out of the park and to and from trails.

VIEW CORRIDORS Open sight lines provide the ability to see and be seen at many entry points and along trails.

VEGETATION WITH TRANSPARENCY
Plantings that are open and composed of plants with varied heights will allow for visibility through the vegetation and reduce opportunities for concealment.

WELL-MAINTAINED SETTINGS A more intentional level of care for trails, entrances, and critical locations not only helps manage vegetation, but also presents a sense of continuous community attention and oversight that can deter crime.

COMMUNITY STEWARDSHIP Involving and engaging the community in forest stewardship provides increased opportunities for surveillance and provides a more maintained setting.

For more information on the CPTED, visit
GREENSEATTLE.ORG/WP-CONTENT/UPLOADS/2019/02/
CPTED-IN-NATURAL-AREAS-FINAL-DRAFT-FEB-2018_WEB.PDF

Phase 1
Invasive Plant Management

Phase 1 focuses on removing invasive plants for the first time.

Invasive plants require thoughtful management strategies. Integrated Pest Management (IPM) should be used to help decide and develop your approach for reducing invasive plants at your site. IPM options consider weed biology, site conditions, and anticipated labor capacity.

In some cases, using volunteers to remove invasive plants will work great. Some plant species and populations, however, may require herbicide treatment that requires a professional crew to perform. Over several years, multiple methods of invasive plant removal often will be used. The City of Seattle is committed to using non-herbicide strategies whenever possible and strictly follows the citywide Pesticide Use Reduction Strategy and Policy.

MANUAL REMOVAL

Manual removal techniques can be very effective and may be applied to invasive shrubs, vines, and herbs. Here are some considerations for manual removal:

- Take into account habitat considerations when planning the size of clearing goals. In some cases, leave a portion of the invasive plants in place until the new native plants are established.
- Removal often causes soil disturbance; make plans for covering bare soils before starting.
- Place flagging around the perimeter of the work area to identify where volunteers should work (called

For more information on the City of Seattle's Integrated Pest Management policies related to invasive plants, visit SEATTLE.GOV/PARKS/ABOUT-US/POLICIES-AND-PLANS/INTEGRATED-PEST-MANAGEMENT

"clearing limits") to avoid impacting sensitive areas, especially during larger volunteer events.

- Hand pulling is most appropriate for small herbaceous plants and some vines, while hand tools can help with shrub and vine removal.
- Use tools of an appropriate size for the job to avoid stress on your hands and the tools. Stem-cutting tools include hand pruners for stems of less than 1 inch in diameter, loppers for stems of 1 to 2 inches in diameter, and handsaws for stems of more than 2 inches in diameter. Root-removal tools include hand tillers for herbaceous plants, and large picks, shovels, and Pullerbear™ (formerly called Weed Wrenches) for shrub roots, tree roots, and rhizomes (creeping rootstalks).
- Be sure to maintain a safe distance of at least 10 feet between volunteers when they are using tools.
- Demonstrate to volunteers the proper ergonomic use of tools.
- Avoid pulling non-target plants. Spend time helping volunteers with plant identification during your work event.
- Consider assigning one species for removal so that volunteers who are not as familiar with plant identification can become experts in identifying and controlling a specific plant species.

When deciding if an invasive plant infestation can reasonably be removed manually, weigh the full impacts of manual removal against other methods. These impacts include:

- Soil disturbance.
- The potential for scattered plant fragments to re-sprout.
- The risk for composted materials to re-sprout in new locations.
- Impacts from dragging and hauling vegetative material across a site.
- The potential for increasing sediments in nearby water.
- Impacts to wildlife.

CHEMICAL CONTROL

In some instances, herbicide use is our best tool to control a given plant species or population. Forest Stewards and volunteers never are allowed to do any herbicide application on SPR property. Instead, Forest Stewards can request professional crew support from SPR, which will review the request and coordinate any work that may come from it.

For more information on how to make herbicide requests, visit GREENSEATTLE.ORG/INFORMATION-FOR/FOREST-STEWARD-RESOURCES/REQUESTING-HERBICIDE-TREATMENT**, or go to** GREENSEATTLE.ORG **and search:** HERBICIDE REQUEST

EROSION CONTROL

For the health of the larger watershed and to prevent erosion, keep soils in their natural areas. The following should be considered before moving forward with invasive plant removal:

- Volunteers are restricted from working on steep slopes. GSP staff coordinates all slope work and only professional crews perform it.
- Utilize the "Steep Slope" layer on the GSP Reference Map (more information on pages 23-24) to determine areas that are too steep for volunteer work. If you are unsure if a slope is too steep, reach out to your Plant Ecologist.
- Wet slopes with seeps or perched wetlands present specific challenges, including an increased likelihood of soil erosion and the possibility of more deep-seated slope stability problems. GSP staff will help determine if wet slopes in areas that are not steep are appropriate for Forest Stewards or need professional crew attention.
- Bare soils are more susceptible to erosion. Sections of bare soils and minimal canopy cover must be covered within five days. Leaves, downed wood or twigs, blackberry canes (cut to 2 feet in length), forest duff, burlap, and wood chip mulch all can be used to cover soils.
- If sites are close to a lake, stream, or wetland (or even a drain structure), erosion barriers may be needed during invasive plant removal efforts. GSP staff can provide recommendations, materials, and crew support if needed.
- On-site wood debris can be used. Lay or stake it perpendicular to the slope to provide some additional stability.

COMPOSTING AND WEED DISPOSAL

Have a plan for the disposal of weed waste before any plants or plant materials are removed. In some situations, we prefer that you bag and dispose of invasive weeds. You can coordinate the pickup of bagged weeds with GSP staff in the following situations:

- If the plants are capable of re-sprouting from plant fragments (ex. knotweed).
- If the plant contains seed parts that spread easily (ex. stinky Bob).
- If the plant is toxic to people or pets (ex. poison hemlock).
- If the plant is on the Class A noxious weed list (ex. garlic mustard).
- In some cases, removing only the reproductive parts of the plant is necessary (ex. arum fruits and seeds).

For more information on invasive plant identification and removal and disposal methods, visit the King County Noxious Weeds website: KINGCOUNTY.GOV/SERVICES/ENVIRONMENT/ANIMALS-AND-PLANTS/NOXIOUS-WEEDS.ASPX**, or go to** KINGCOUNTY.GOV **and search:** NOXIOUS WEEDS

BUILDING AN ONSITE COMPOST PILE

Onsite composting is cost effective, helps to leave organic material and nutrients where they belong, and provides excellent habitat for wildlife. There are two basic forms of compost piles:

SQUARE Should not exceed 4 feet by 4 feet in area on the ground.

WINDROW Should not exceed 3 feet wide, but can be as long as necessary. Windrows can be strategically placed along informal boundaries or run parallel to gradual slope contours to provide simple erosion control.

Steps for building onsite compost piles are as follows:

Step 1
Find or create an area free of native plants and remove all invasive plants and roots. Clear the area thoroughly before you build your compost piles. Place compost piles out of sight from walking trails and roads as much as possible. Never build a compost pile against the trunk of a living tree.

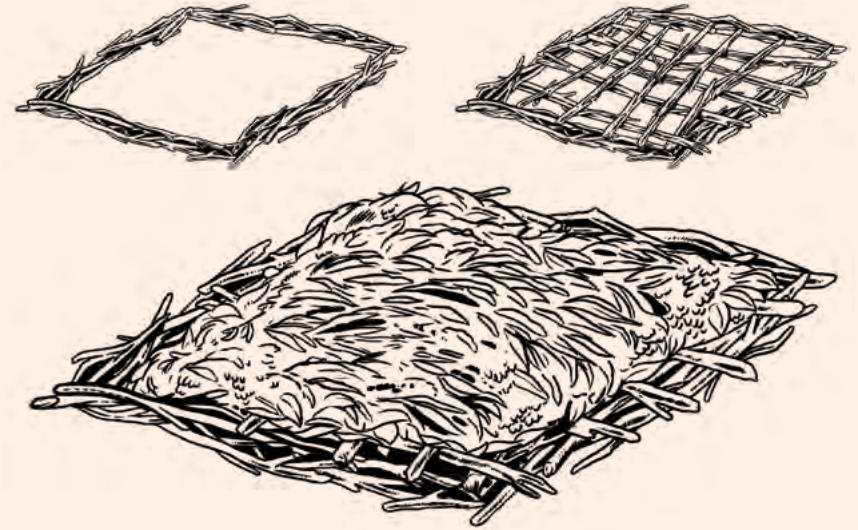
Step 2
Collect and lay out a frame of downed sticks and branches from your park that will define the edges of your compost pile. If you are using burlap, lay the burlap down first, then put the frame of branches on top of the burlap edges.

Step 3
Fill in the frame with dead branches and sticks found on site. Place them in both directions to form a grid. This helps prevent the composting weeds from having direct contact with the soil and allows for air to circulate under the pile.

Step 4
Put pulled weeds on top of the compost rack. For square compost piles, do not stack weed debris taller than 4 feet. For windrow compost piles, do not stack weed debris taller than 2 feet. Do not let weed debris spill over beyond the frame. Separate invasive woody material, such as laurel or holly branches, into a different pile from herbaceous weeds when creating piles. The herbaceous material breaks down faster and can be redistributed sooner. Only weed debris should go in compost piles. Resist the urge to clean up the forest floor of all sticks and leaves. Not only does this create more compost piles than necessary, but decaying logs and sticks are an important component of healthy forest ecosystems.

Step 5
Check piles throughout the year. Turn or maintain them as needed to ensure that weeds do not re-sprout.

Step 6
Pull compost piles apart when all the material has dried out. This can take



Square compost piles
Keep composting weeds from direct contact with the soil, and allow air circulation to dry out and kill the weeds.

Windrow compost piles
Can be placed strategically along informal boundaries.

as little as three months to more than a year depending on temperature, moisture, and weed species. Dried-out weed debris can be used like mulch across your site, spread across the ground or concentrated around new plants. Redistribute sticks and logs throughout the site. Do not deconstruct piles during bird nesting season if you observe bird activity as some ground-nesting species use compost piles for nesting, foraging, and refuge. Feel free to leave some compost piles so wildlife can continue to use them.

Methods for Removing Invasives

The species described on the following pages are some of the most common invasive plants a Forest Steward will encounter in the parks. For the methods of removal described, "small infestation" refers to an area from which you can effectively and reasonably remove all necessary plant material (usually all above and below ground plant parts) given your available time, ability, and resources.

INVASIVE TREES AND SHRUBS

Do not cut down or pull out an invasive tree unless you also remove all of its roots. If roots are left behind, they will send up suckers that will grow into many more trees, greatly multiplying the problem. Small, young plants may be hand pulled. Plants that are less than 1 inch in diameter may be taken out successfully with a Pullerbear™.

For any tree more than 1 inch in diameter, remove the lower branches to provide access to the ground around the tree. Then, submit a request through the online form for a professional crew to apply an herbicide treatment.

Do not leave freshly cut or pulled holly stems or branches in direct contact with the soil, as the cuttings can easily re-root. Make sure they are left to dry out on top of an onsite compost pile. Place invasive tree branches and stems on their own compost piles, separate from cut and pulled blackberry and ivy, as they decompose at different rates.

Woody Invasive Plants

Here is the complete list of target woody invasive tree and shrubs.

Botanical Name
Common Name

Acer platanoides
Norway Maple

Acer psuedoplatanus
Sycamore Maple

Aesculus hippocastanum
Horse Chestnut

Buddleia davidii
Butterfly bush

Clematis vitalba
Traveler's Joy

Cotoneaster spp.
Cotoneaster

Crataegus monogyna
English Hawthorne

Ilex aquifolium
English Holly

Populus alba
Silver Poplar

Populus nigra
Black Polar (Lombardy)

Prunus domestica
domestic cherry

Prunus spinosa
Sloe

Prunus avium
Wild Cherry

Prunus cerasifera
Thundercloud plum

Prunus laurocerasus
Cherry Laurel, English Laurel

Prunus lusitanica
Portuguese Laurel

Pyracantha spp.
Firethorn

Robinia pseudoacacia
Black Locust

Sorbus acuparia
Mountain Ash

Tamarix ramosissima
Saltcedar

Ulex europaeus
Gorse

Ulmus parvifolia
Chinese Elm

Ulmus procera
English Elm

Ulmus pumila
Siberian Elm

BITTERSWEET NIGHTSHADE *(Solanum dulcamara)*

Hand-pull the stem close to the ground and pull or dig up the roots, taking care not to break the slender roots. This method is most effective with young plants and small infestations. Manual control works best after rain or in loose soils. Recommended tools include shovels, spades, and hand tillers to loosen soil. When substantial manual removal is used in wet areas, take care to prevent soil erosion. Wear gloves when handling Bittersweet nightshade, as it can be toxic to people, pets, and livestock.

Fruiting plants and root balls should be collected and disposed of in the garbage. Composting root balls is not recommended. Stems can be left on site to dry out and decompose if they are in a dry area where they will not move into waterways or onto moist soil.

Bittersweet Nightshade

English Ivy

ENGLISH IVY *(Hedera helix)* CLEMATIS *(Clematis vitalba)*

Create “lifesavers” or “survival rings” to preserve existing trees and reduce the seed source. Start by cutting vines at shoulder height, then again at the base of the tree. Then, remove all ivy or clematis from the tree, from shoulder to base. Grub out the roots in a radius at least 5 feet away from the tree. Do not attempt to pull vines above shoulder height out of the tree. They will die and decompose on their own, and pulling them down from high branches can possibly damage the tree.

Remove dense ground patches of ivy and clematis by clipping edges of the swaths, then continue clipping,

Clematis

Garlic Mustard

IVY REMOVAL & DISPOSAL

"Lifesaver" Tree Ring

Ivy Log

Ivy Bundle

digging, and rolling the tangled mat up into an ivy/clematis log. The rolling method works better for ivy because it grows along the ground and the vines and roots are more flexible. Clematis can grow up trees, down trees, and back up trees again, which requires following all vines to make sure the plant isn't making contact with the ground. Take care to cut around or gently lift ivy/clematis mats over existing native plants. If the ivy or clematis vines grow into thick woody stems that are too large to dig out, Forest Stewards can request herbicide treatment through the online form. Ivy and clematis can be composted on site.

Quick Tips for Removing Ivy/Clematis

"LIFESAVER" TREE RING Cut ivy at shoulder height and again at base of tree. Do not attempt to pull vines out of tree. Roll ivy back away from tree in logs. Clear at least 5 feet back from each tree trunk.

IVY BUNDLE For small clumps of ivy, pull all vines out, wrap into a tight bundle, and dispose on compost pile or hang on a branch where it will not come into contact with the ground.

IVY LOG For large contiguous swaths of ivy, clip edges of 5- to 10-foot-wide sections, roll into a log, clip root connections at the end of the roll, and roll on top of the compost pile to decompose. Ivy logs fit nicely on windrow compost piles.

GARLIC MUSTARD
(Alliaria petiolate)

IMPORTANT: Garlic mustard is designated as a regulated noxious weed in King County. Please report to GSP staff all locations of garlic mustard that you identify, or report them online at KINGCOUNTY.GOV/WEEDS (Report a Weed) — even if you remove the weed.

Hand-pulling individual garlic mustard plants is effective if the entire root is removed. Flowering or seeding plants must be put in a bag and discarded in the garbage. Carefully and thoroughly clean off boots, clothes,

and tools before leaving the area to avoid carrying the tiny seeds to new sites. Larger populations of garlic mustard will have to be managed by professional crews, so please notify GSP staff to coordinate the removal.

HEDGE BINDWEED/ MORNING GLORY
(Calystegia sepium)

Hand pull at least three times per year (early growing season, mid-summer, and late summer) for at least three growing season cycles. If keeping up with all the bindweed takes more time than you have available, you may need to prioritize clearing all the bindweed from the native plants first, or at minimum, clipping all the bindweed away at their base as they are trying to establish. Covering bindweed with sheet mulch can help weaken the bindweed, slow re-growth, and make pulling more effective. Bindweed can be composted on site unless it is blooming. Shade is the best way to control bindweed. Plant conifers and other native plants for long-term bindweed suppression success.

For larger or more established infestations where manual removal is impractical, consult with GSP staff for options.

HERB ROBERT A.K.A. STINKY BOB
(Geranium robertianum)

Hand-pulling individual plants is effective if the entire root is removed. Try to remove plants before the seeds form to avoid further distribution of seeds. Flowering or seeding plants must be put in a bag and

Herb Robert

Hedge Bindweed

Himalayan Blackberry

Knotweed

discarded in the garbage. If Stinky Bob is growing in a monoculture, then sheet mulching can be an effective way to smother seeds and root fragments that are left behind. Carefully and thoroughly clean off boots, clothes, and tools before leaving the area to avoid carrying the tiny seeds to new sites.

HIMALAYAN BLACKBERRY
(Rubus armeniacus syn. *Rubus discolor)*

Blackberries have a large root mass in the first 6 to 18 inches of soil, and often have smaller roots that spread from the main root mass. All roots should be dug up as completely as possible. Blackberry canes and roots can be composted on site.

To keep compost piles tidy and volunteers safe from stickers, cut live canes into manageable pieces to stack on the compost piles before digging in to get the roots. With large volunteer groups, you can assign cane cutters and root diggers separately.

Before initiating blackberry removal during early and primary nesting season (February to the end of July), visit your site and watch for nesting activities. Phase removal over time, if possible, to minimize eliminating all habitat.

KNOTWEED
(Polygonum cuspidatum and other species)

Foliar herbicide application is the most effective way to eradicate knotweed. It must be performed by GSP staff or professional crews during dry periods from July to September. If knotweed is present, Forest Stewards can request herbicide treatment through the online form.

Volunteers are highly discouraged from removing knotweed patches as disturbance promotes growth and dispersal. Hand removal of knotweed is impractical and could actually exacerbate the problem.

Any fragments of the plant should be disposed of in the garbage. Do not compost this plant on site.

POISON HEMLOCK
(Conium maculatum)

IMPORTANT: Poison hemlock is designated as a regulated noxious weed in King County. Please report to GSP staff all locations of poison hemlock that you identify, or report them online at KINGCOUNTY.GOV/WEEDS (Report a Weed).

Removal of this plant is not appropriate for a volunteer event. Forest Stewards may request professional crew support to remove poison hemlock through the online form. If attempting to manually control poison hemlock, please note that all parts of this plant are toxic. You must wear gloves and long sleeves, and wash hands thoroughly after handling plants. Pull or dig up the entire plant, including the root. All parts of the plant should be disposed of in the garbage. Adding a layer of mulch to the area after it has been cleared will reduce germination of seeds still present in the soil.

POLICEMAN'S HELMET
(Impatiens granduliferа)
SPOTTED JEWELWEED
(Impatiens capensis)

IMPORTANT: Policeman's helmet is designated as a regulated noxious weed in King County. Please report to GSP staff all locations of policeman's helmet that you identify, or report them online at KINGCOUNTY.GOV/WEEDS (Report a Weed) — even if you remove the weed.

Manual removal is effective for small infestations. Pull or dig up plants in the spring or early summer when the soil is still moist and before the plant develops seed capsules. Make sure to remove entire root as the plants have a tendency to snap off near the ground and will re-grow if the root is not removed entirely.

Cut and bag all flower and seed heads, using sturdy plastic bags. Dispose as garbage, not in yard waste or compost bins. Stems can be left on site to be composted but only if they are first crushed and dried out thoroughly. Do not let plant fragments get into waterways. This plant is notorious for continuing to grow after it has been pulled. It is very important to crush the stems and leave them somewhere dry, or leave on a tarp to prevent them from forming new roots and producing new flowers.

PURPLE LOOSESTRIFE
(Lythrum salicaria)
GARDEN LOOSESTRIFE
(Lysimachia vulgaris)

IMPORTANT: Purple and garden loosestrife is designated as a regulated noxious weed in King County. Please report to GSP staff

Poison Hemlock

Policeman's Helmet

Purple Loosestrife and Garden Loosestrife

Reed Canarygrass

all locations of purple and garden loosestrife that you identify, or report them online at KINGCOUNTY.GOV/WEEDS (Report a Weed) — even if you remove the weed.

Hand pulling of purple and garden loosestrife is only recommended for plants in sandy, mucky, moist, or loose soil. Removing hard, woody roots in compacted soils is impractical. If the plants are in flower or in seed, cut off and securely bag all flower heads. Pulling plants while they are in seed will disperse the small, lightweight seeds, which you want to avoid. Cut plants may continue to produce flowers later in the season. Regularly monitor them until frost, and cut and remove any subsequent flowers. Cutting will not control purple loosestrife, but is an adequate interim measure until more effective control methods can be implemented.

Care should be taken to minimize erosion when digging in saturated soils on shorelines. Brush off boots, clothing, and tools prior to leaving the infested area. All parts of the purple loosestrife plant, including flowers, seed heads, stems, leaves, and roots must be securely bagged and discarded in the garbage or taken to a transfer station. Do not compost or place in yard waste.

For larger or more established infestations where manual removal is impractical, consult with GSP staff for options. In most cases, controlling this species will require multiple methods over several years, potentially including herbicide treatment by professional crews.

REED CANARYGRASS
(Phalaris arundinacea)

Manual removal of reed canarygrass is impractical except for the smallest of patches (1 to 4 square feet). Hand dig when the ground is soft. Be sure to remove all roots and rhizomes because any left in the soil will re-sprout. Roots and rhizomes can be composted on site away from wet areas so long as they are not in contact with the soil. Monitor the site for regrowth.

For areas where reed canarygrass is dominant, one long-term control strategy is to shade it out. Shade won't eradicate the species, but it will control it and allow for a more structurally and genetically diverse site. Install sheet mulch with several layers of cardboard or burlap and 6 inches of wood chip mulch. Do not install sheet mulch in areas where standing water is 6 inches or more in depth at any point in the year. Leave sheet mulch in place for at least one growing season. Monitor the edges of the mulch site for shoots coming up from lateral growth of rhizomes. Efficacy can be increased by removing above-ground plant material at — or just after — flowering. Conduct this removal with hand tools, and time it prior to laying down the sheet mulch. Any removed above-ground plant material that hasn't gone to seed can be left on site.

After at least one growing season, the area should be planted with native species. Plant layout should be dense over the entire site, or in a clump-gap or row pattern. Fast-growing species adapted to wet areas — such as black cottonwood, red alder, and several types of willow — should be installed initially. Once they become established, a

second planting of shade tolerant species — such as Western red cedar; thicket-forming species like red-osier dogwood, snowberry, and Nootka rose; and fast growing conifers like Douglas and grand fir (placed along southerly and westerly edges) — should be planted.

SCOTCH BROOM
(Cytisus scoparius)

Hand-pull small plants and use Pullerbear™ to extract smaller plants when the soil is moist in spring. Note that disturbing the soil may cause germination of seeds in the soil. The area should be monitored to control any new seedlings.

Cutting can be effective on older Scotch broom plants that have a stem diameter of 2 inches or more. Cut plants in late summer to early fall as close to the ground as possible and monitor for new growth. Scotch broom can be composted on site.

SHINY GERANIUM
(Geranium lucidum)

IMPORTANT: Shiny geranium is designated as a regulated noxious weed in King County. Please report to GSP staff all locations of shiny geranium that you identify, or report them online at KINGCOUNTY.GOV/WEEDS (Report a Weed) — even if you remove the weed.

Shiny geranium is difficult to distinguish from other geranium species. It is distinguished by shiny, kidney-shaped leaves that have individual hairs and pink, five-petal flowers. Plants can be carefully hand-pulled or dug out before they


Scotch Broom


Shiny Geranium


Yellow Archangel


Yellow Flag Iris

go to seed, but take care to remove as much root and stem as possible to prevent plants from re-sprouting. Put all plant material in garbage bags to prevent spreading. Never compost shiny geranium plants. Deep mulch should be applied to the site to limit seed germination and regrowth. Work with GSP staff to determine if fencing off the site from foot and paw traffic is appropriate. Monitor the site closely.

YELLOW ARCHANGEL
(Lamiastrum galeobdolon)

Manual removal is generally not effective. Plants grow densely, sprout from root or stem fragments, grow easily among desirable vegetation, and are labor-intensive to hand-pull. For very small populations (less than 10 square feet), try continuous hand-pulling and revisit the site monthly. Sift through the soil to ensure removal of all root and stem fragments. This removal is easiest in fall through early spring. All plant debris should be disposed in the garbage.

Dense infestations may be controlled by sheet mulching. It is crucial to control any escaping plants, so regularly check for holes in the covering material. Stem fragments and roots can re-sprout if left in contact with wet ground. Forest Stewards can request herbicide treatment for yellow archangel through the online form.

YELLOW FLAG IRIS
(Iris pseudacorus)

Manual removal can be effective for small infestations, especially for very young plants not yet established. Manual removal of larger plants is difficult and may require sturdier tools or saws to remove the entire rhizome. Monitor the location after you have removed the plants — new leaves will show you where you missed any sections of rhizome. Precautions should be taken to protect your skin, as resins in the leaves and rhizomes can cause irritation. Dispose of all plant parts in the garbage.

For larger or more established infestations where manual removal is impractical, consult with GSP staff for options. In most cases, controlling this species will require multiple methods over several years, potentially including cutting and herbicide treatment by professional crews.

Improving Soil

In Seattle parks, we commonly use wood chip mulch (also called coarse arborist wood chips) to improve soil health at restoration sites. Wood chips help retain soil moisture, build soil nutrients and structure, block growth of weeds around desirable plants, prevent soil erosion, and moderate soil temperatures. Decaying wood chips mimic the decomposition that commonly happens in Pacific Northwest forests, improving soil bioactivity and plant growth. Mulching is particularly important for plantings that will not receive supplemental water.

DIFFERENT WAYS TO ADD WOOD CHIPS AT YOUR RESTORATION SITE

MULCH RING Apply wood chip mulch in the shape of a donut around new or existing plantings at a depth of 4 inches, about 12 inches wide, and with a 3-inch buffer of bare soil around the stem of the plant. Two 5-gallon buckets per plant is usually the right amount of mulch for newly installed plants. Do not create "mulch volcanoes." Mulch piled up around the stem of your plant, will trap moisture around the root collar, inviting decay and disease.

SHEET MULCH For areas that had been dominated by invasive plants, especially blackberry, sheet mulching can help suppress weed growth and prep soils for future planting. You may choose to place one or two layers of cardboard or burlap on the ground, working around any desirable native plants at the site. Make sure the two layers overlap so no openings exist for weeds to grow through. Follow up by applying 6 to 8 inches of wood chip mulch across the site. If you do not have access to cardboard or burlap, simply place a thick, 6–8 inch layer of mulch on top of the ground. This method helps suppress weed re-growth, but follow-up weed maintenance will be required. Sheet mulching should not be used in areas with a strong native seed bank since it will discourage regeneration of desired species.

Other considerations

- Do not use bark mulch, as this material contains a higher wax content than wood chip mulch and can reduce soil moisture.
- To minimize the spread of weeds or possible contamination by chemicals, acquire wood chips only from SPR, not outside sources.
- Burlap and cardboard for sheet mulching are not available from SPR. Forest Stewards are encouraged to reach out to local businesses to procure these materials. Please ensure these materials are

not made of plastic, and that they do not have any plastic attached.

- For restoration sites with wet areas, wood chip mulch should be used only in wetlands that dry out during the summer and early fall months, or where invasive regrowth pressure is high.

- When applying mulch near a stream bank, do not apply below the ordinary high water mark (OHWM). This is the elevation to which stream flows regularly rise. It can be estimated by locating exposed woody roots along the stream bank where soils have been scoured away or by identifying where herbaceous plants do not grow. Mulch placed below the OHWM has a high chance of washing away during rains.

A NOTE ON COMPOST

Compost generally is not used on GSP restoration sites due to cost but can be considered for sites that are extremely compacted and nutrient poor. Talk to a GSP plant ecologist for more information. Compost should be used only as a top dressing (1 to 2 inches on the soil surface with follow-up mulch to suppress weeds). It never should be used to prep planting holes.

HUGELKULTUR

Hugelkultur is a horticultural technique for building mounds, layered with logs, dead plant material, soil, compost, and wood chips. The mounds retain moisture, provide long- and short-term carbon and nutrients for plants, and can help diversify the topography of a site. Plants then can be installed on the top and sides of the mounds.

For more information on Hugelkultur, visit the King Conservation District's webpage at KCDCOMMUNITYAG.ORG/HUGELKULTUR, **and** GREENSEATTLE.ORG/AMENDING-SOIL-THROUGH-HUGELKULTUR

Phase 2
Planting

Phase 2 focuses on the planting of native trees, shrubs, and groundcovers.

TIMING: WHEN TO PLANT?

In the Puget Sound region, native plants installed in the fall have the highest survival rate in forest restoration projects. The cool, cloudy days and frequent precipitation provide ideal planting and transplanting conditions. Forest restoration projects often are not in close proximity to water for irrigation and the number of plants often makes watering impractical. The earlier plants go into the ground in the fall, the more time they have to recover from transplant shock, adapt to the site, and expand their root systems before the growing season.

EXCEPTIONS TO THE RULE

BAREROOT STOCK is an affordable option for plant material that often is not available until late winter, so fall planting is not an option. Plant bareroots as soon as possible, or pot up plants to install the following fall.

LIVE STAKES (cuttings that can grow into new plants) are harvested when the plant is dormant but before bud break, so installation time can span between late fall and early spring depending on the species. For more information on planting live stakes, see pages 60–61.

If your wet areas dry out during parts of the year, you will want to plant on either side of the wet season to avoid soil impacts (early fall/winter and late spring). Avoid planting when wet areas are inundated with water.

- If soil is saturated all year, prime planting time usually is between late spring and early fall. To ensure plant establishment, do not plant within the two months prior to site flooding as plants can float out of their holes. Avoid planting at a site if it is under water.

- If your site has standing open water at a depth of at least 10 centimeters at any time during December through May, avoid work during this

period as it may impact breeding and developing amphibian species.

SELECTION: WHAT TO PLANT?

Choosing the appropriate plant species is among the most critical responsibilities of Forest Stewards. Especially in the urban setting, Forest Stewards need to account for many considerations as they build a planting list. These considerations include: physical site characteristics; forest maturity; reference ecosystems; pollinator habitat; bird habitat; trail corridors; utility corridors; and crime prevention.

Changing climate conditions should be top of mind when selecting long-lived plant species. Please visit GREENSEATTLE.ORG search "climate" for the latest on plant sourcing and other information on GSP's climate adaptation and resilience strategies.

PHYSICAL SITE CHARACTERISTICS

SUNLIGHT Consider light conditions as they change dramatically through the year.

SOIL QUALITY Reference Appendix B to understand the type of soil present at your site.

ASPECT (DIRECTION THE SLOPE FACES) Certain species can handle more intense sun exposure, common to south and southeast facing slopes.

MOISTURE Get familiar with the moisture levels and wet areas across your site. Observe the site throughout all seasons to get a complete picture of where wet areas exist. Note the toe of slopes or other areas where soil moisture may be higher.

EXISTING VEGETATION AND SURVIVABILITY Identify native plants already thriving at your site. If creating a supplemental planting list, look at how previous plantings survived and select those that did well.

FOREST MATURITY

Some forest restoration projects are further along than others. For very young forests, you may need to consider succession planting to establish shade or enhance soil quality before "climax species" (late successional plantings) are installed.

For additional information on how GSP has defined referenced ecosystems, visit GREENSEATTLE.ORG/INFORMATION-FOR/FOREST-STEWARD-RESOURCES/RESTORATION-RESOURCES/REFERENCE-ECOSYSTEMS/

For detail on each target forest type and associated species, visit GREENSEATTLE.ORG/REFERENCE-ECOSYSTEMS-PLANT-COMMUNITIES; **or go to** GREENSEATTLE.ORG **and search:** REFERENCE ECOSYSTEMS

For additional resources, visit the Washington Native Plant Society Plant Directory at WNPS.ORG/NATIVE-PLANT-DIRECTORY **and the King County Native Plant Guide at** GREEN2.KINGCOUNTY.GOV/GONATIVE/PLAN.ASPX

REFERENCE ECOSYSTEMS

The plant species list associated to your target forest type is a great resource to consult before selecting your planting list. You can find the name of the reference ecosystem and target forest type for your site on the GSP Reference Map. Of course, getting out to natural areas around the Puget Sound area to look at what plants grow together — and under what conditions — will help you build a better understanding of how to build a future forest. Appendix G Native Plant List provides growing conditions for common native plants.

POLLINATOR HABITAT

Pollinators are drawn to the flower of a plant based on smell, color, size, shape, and the timing of blooms. Use the following guidelines when selecting plants to support pollinators:

SPECIES RICHNESS Plant at least 10 species of flowering plants that fit your moisture, light, and soil conditions. Groundcover, shrubs, and trees all flower. Flowers don't have to be showy to support native pollinators.

BLOOM TIMES Consider when the species you select will be blooming. When bloom times overlap, from February to October, the availability of nectar and pollen is continuous. Aim for at least three species that bloom in early-bloom season, three species in mid-bloom season, and three species in late-bloom season.

STRUCTURAL DIVERSITY A variety of plant forms (branching trees, thicket-forming shrubs, creeping groundcovers, etc.) will support a variety of insect and animal species. Strive to establish multiple vertical layers of plant heights. Where appropriate, include both annual and perennial species, as well as both woody and herbaceous plants. Even non-flowering plants, like sword fern, are helpful to pollinators because as hardy evergreens, they create structure. Flowers with a variety of different shapes (flat radials, cups, rounded domes, tubular trumpets, etc.) will appeal to different species of pollinators.

CLUMPING Plant species in clumps, preferably in a rounded shape. Pollinators are more inclined to locate a clump of flowers, rather than individual flowers that are separated.

STEM TYPES Plants with pithy or hollow stems (elderberry, for example) are helpful to cavity nesters, which burrow into the stems.

LARVAE Larval host plants are critical for moths and butterflies. They generally lay their eggs on or near specific plants that hatched larvae need for food. Grass species can act as larval host plants for some butterflies and provide overwintering or nest sites for bumble bees and other beneficial insects. If appropriate, include at least one native bunchgrass in your plant palette.

For more information on pollinator habitat, visit
GREENSEATTLE.ORG/THE-NATIVE-POLLINATOR-HABITAT-RESTORATION-GUIDE
or go to GREENSEATTLE.ORG **and search:** POLLINATORS

BIRD HABITAT

A variety of plant forms, from tall trees and brushy shrubs to groundcover, provide nesting habitat for a higher variety of bird species. Even if you don't see birds nesting at your site, they likely are utilizing it for shelter or foraging. Increased plant diversity also provides birds with food sources — directly through plants that produce nectar or berries, and indirectly through plants that attract different insects for birds to eat.

TRAIL CORRIDORS

For an official trail, the corridor includes the tread and the areas to the sides and above the tread. The standard trail tread width is 4 feet, while the trail corridor is 10 feet wide—3 feet on each side of the tread—and 8 feet tall. Consideration of the trail corridor in your planting plan will improve long-term success of your restoration site while also recognizing trail maintenance, which is coordinated through SPR.

Within 2 feet of a trail corridor, don't plant material that will grow significantly higher than 18 inches. Plant trees at least 10 feet away from the trail. Take time to explain these considerations to volunteers and walk the trails after volunteer events to check for plants that are too close. It is easier on the plants to relocate them before they get established. Trail corridor standards do not apply to social trails or stewardship trails.

To identify the type of trail found in your site, refer to the GSP Reference Map "Trails" layer. If you have questions about the SPR trail standards, or if you are interested in volunteering to do trails maintenance, contact TRAILS@SEATTLE.GOV.

UTILITY CORRIDORS

Aboveground and belowground utilities must be considered when placing plants, especially trees. Seattle City Light requires 10-foot clearances from overhead distribution lines and 16.5-foot clearances from overhead transmission lines. Trees are discouraged under or near transmission lines and towers. Do not plant trees within 30 feet of any power line.

For belowground utilities, refer to the GSP Reference Map "Sewage and Drainage Lines" layer. Belowground utilities and drainage lines may need to be accessed for maintenance or upgrades. Choose plants that can tolerate disturbance or harsh pruning along these areas. Do not plant trees or larger shrubs on or adjacent to these areas.

CRIME PREVENTION THROUGH ENVIRONMENTAL DESIGN (CPTED)

Selection of the right plants is imperative to make your site safe and comfortable for park users. Choose species with natural adaptations and growth habits, while also considering how users interact with the space. CPTED considerations include:

- Place low-growing species near trail edges, such as fringecup, sword ferns, and low Oregon grape.
- Place larger shrubs and trees with an ample setback from trails and from each other (at least 5 feet).

TRAIL CORRIDOR

Official trail tread in Seattle parks are 4-feet wide trail tread (**D**) with a corridor that is 8 feet high and 10 feet wide (**C**). This influences not only plant selection but trail maintenance over time. Groundcovers can be planted near trail edges (**E**), while shrubs should be planted at least 5 feet from the trail (**B**), and trees should be planted at least 10 feet from the trail (**A**). Existing mature trees that are within 10 feet (**F**) do not need to be removed.

- Keep densely growing and spreading plants away from trail and forest edges, specifically salmonberry, thimbleberry, native roses, snowberry, and red twig dogwood.

- Adjust the placement of evergreen trees and shrubs to accommodate different visibility needs within the site. Corners and entries need a broader view corridor. Trails are safer when they have a sense of open space and good views of what lies ahead.

SPACING: WHERE TO PLANT?

Just like with selecting what to plant, figuring out where to plant is a critical responsibility of Forest Stewards. Spacing refers to the amount of distance between installed plants, and it ultimately will determine how many plants you need to order. Spacing can be a difficult concept to grasp. Here are some concepts to consider:

DENSITY IS INSURANCE FOR POOR PLANT SURVIVAL It is extremely unlikely that you will have 100% plant survival, so overplanting is better than under planting. Given our citywide goals, we want to avoid planting the same site year after year.

SITE CONDITIONS DICTATE SPACING Areas with sandy soils or without water access should be planted at higher density, given the expected higher plant mortality rate. If your restoration site already has a healthy amount of mature and young conifer trees, you may consider selecting only a few for additional succession planning. If your restoration site already has a healthy and diverse shrub layer, you may not need to plant more and instead can focus on trees and groundcovers.

KNOW MATURE SIZE Some plants can be deceiving when they all start in the same 1-gallon pot. Plants vary greatly in size once they have matured. Familiarize yourself and your volunteers with plant species and think about how big they will grow together in five or 10 years. Although we talk about average spacing (as in the table on page 56), you should expect to plant more densely in big open gaps (with ample sunlight) and less densely around existing plants. It will never be even across the entire site.

The spacing table on page 56 is organized into plant type and desired plant density, indicating the square footage that each plant will occupy based on that spacing.

ORDERING

At least once a year, SPR will offer potted plants to active Forest Stewards for their restoration projects. Quantity will vary based on budget and availability. Forest Stewards should plan on putting together a plant order in late spring (often mid-May). These plants will be delivered to your site in late October or early November. Forest Stewards also may procure plants on their own from grants, donations, or plant salvages.

Some years SPR offers bareroot plants. These are ordered in January and picked up at the annual King Conservation District Bareroot Plant Sale in March. SPR also sometimes supplies seeds for planting.

SPACING

PLANT DENSITY ESTIMATES

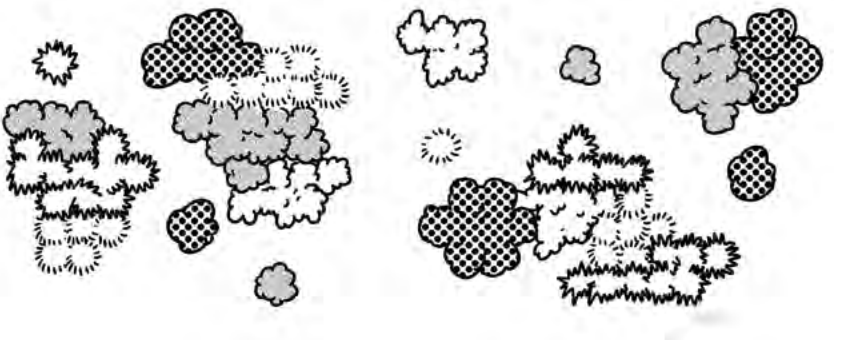
If you estimate the size of your restoration area, you can divide that size by the square footage to estimate the number of plants you would want in that area. After making these calculations, you need to factor in existing vegetation.

For example, if your site is 10,000 square feet and you are shooting for medium density:

TREES: 10,000 sq. ft.÷ 100 sq. ft. = 100 trees
SHRUBS: 10,000 sq. ft.÷ 16 sq. ft. = 625 shrubs
GROUNDCOVERS: 10,000 sq. ft.÷ 4 sq. ft. = 2,500 groundcovers

Plant and Stock Type	Desired Plant Density	Spacing Average (on center)	Divide Square Footage by
Trees	Dense Medium Sparse	6 ft. 8, 9, or 10 ft. 15 ft.	36 sq. ft. 64, 81, or 100 sq. ft. 225 sq. ft.
Shrubs	Dense Medium Sparse	3 ft. 4 ft. 5 ft.	9 sq. ft. 16 sq. ft. 25 sq. ft.
Live Stakes	Dense Medium Sparse	1 ft. 2 ft. 3 ft.	2 sq. ft. 4 sq. ft. 9 sq. ft.
Emergent Plugs	Dense Medium Sparse	6 in. 12 in. 18 in.	.25 sq. ft. 1 sq. ft. 2.25 sq. ft.
Herbaceous/ Ground Cover (4" pots in groups of 3)	Dense Medium	2 ft. 3 ft.	4 sq. ft. 9 sq. ft.
Herbaceous/ Ground Cover (1 gallon pot)	Dense Medium	2 ft. 3 ft.	4 sq. ft. 9 sq. ft.

PLANT STAGING



Clump-Gap Mosaic
Plants of each species are "clumped" and individuals of the different species are randomly placed in the gaps.

INSPECTING

Successful plantings start with good plant material. As soon as plants are delivered, you should inspect each one. Pull some plants from containers to examine the root ball for girdling or pot-bound roots. Use a clean, sharp pruner or hori-hori to sever girdling or overly matted roots. You also should watch for germinating weeds and signs of other pests or pathogens (spots on leaves, insect damage, etc.). If you observe unhealthy plants, please make a note of the species and communicate your findings to GSP staff. In some cases, GSP will decide not to plant them.

STAGING

Staging is the distribution of plants across a site in preparation for planting. Since first-time volunteers and new crew members may not be familiar with each plant species, we recommend that you place plants exactly where they will be planted prior to your planting event. It will take one person about one hour to stage 50 to 100 plants.

For smaller volunteer events, or events with more experienced volunteers, you can consider having the volunteers stage the plants. Consider focusing on a handful of species at a time. Provide a few basic rules to follow, such as no planting trees within 10 feet of a trail or other tree. You also should provide, information about the preferred site conditions for the species — for example, a Douglas fir does best in a sunny spot. If volunteers are staging plants, you should be prepared to answer their questions and monitor plant placement closely.

The following plant staging patterns are frequently used: clump-gap mosaic, forest thicket, and row planting. There also are special staging considerations for shade-tolerant conifers.

CLUMP-GAP MOSAIC

In this pattern, 5–10 plants of each species are "clumped," sometimes with several groups of 5–10 plants of other species. Between these clumps are gaps where individuals of the different species are randomly placed with wider spacing. The gaps lend a naturalistic aesthetic to the planting and supports pollinator habitat. This formation can improve plant establishment and makes maintenance easier.

FOREST THICKET

This planting pattern is high density, with no large gaps. As this pattern grows, it quickly will shade out bare ground and fill in completely. This style of planting is useful to address areas that were previously heavily infested by invasive weeds, as it maximizes site occupancy by native plants. If weeds are not well controlled at the time of planting, this type of density may make maintenance more challenging.

ROW PLANTING

In this pattern, plants are placed in irregular intervals along rows to support mowing, or irrigation lines and hoses. When possible, orient rows along contours of the slope to avoid unnatural looking lines. Plants are in clumps of five to 10, by species. The initial aesthetic of these plantings may appear formal, but with careful staging, the plants will grow into a more natural aesthetic. This method works well for sites dominated by reed canarygrass.

Shade-Tolerant Conifers

Plant shade-tolerant conifers in an appropriate microsite, within 2 feet adjacent to tree stumps, logs, or compost piles. These conifers are important priority plantings for forest restoration and, as such, are not subject to the usual spacing considerations, They can be planted within 4 feet of another shade-tolerant conifer and within 6 feet of any other plant species.

INSTALLATION

Proper installation is one of the most important things you can do to influence plant survival. When working with volunteers, take time to properly teach planting techniques, and spend time with them to ensure quality installation. It can be helpful to have volunteers work in pairs, to build in some redundancy and quality control.

Preparing the Hole

Planting too deep can cause the stem to rot and kill the plant, and planting too shallow can dry out the roots.

- Clear away all loose materials, such as leaves, mulch, rocks, and branches from the planting area. It is important to install the plant into mineral soil, not just layers of mulch or debris.
- Dig the hole wide enough to completely spread out the plant roots, without crowding or bending them. If you are planting a container plant, dig a hole that is cylindrical and twice the width of the container.
- Pile soil in a cleared area next to the hole. Remove plant roots and grass clumps from the soil that you will be using to backfill the hole.

INSTALLING PLANTS

Potted Plant
Loosen roots outward and place the root collar level with the ground.

Bareroot Plant
Atop a cone of soil, arrange the roots pointing outward from the plant.

- Dig deep enough so the plant, when set in the hole, will have the top of the root crown flush with the soil surface. Use a shovel as a level. Use the level of soil around the base of a container plant as a guide for how to plant in the ground. To avoid soil settling, avoid digging deeper than necessary.

- Roughen the sides of the hole if they appear slick or claylike, as it will help the new roots to penetrate the surrounding ground.

- Incorporate a as much as one gallon of woodchips or mulch with the local soil when planting conifer trees or other woody species (but not madrone). This will help improve soil, sparking microbial activity.

Preparing the Plant

There are slightly different preparation methods depending on whether the plant is in a container or bareroot.

FOR POTTED PLANTS

- Tip the pot on its side and gently press on the pot to loosen the plant.

- Loosen up the roots with your hands or a tool such as a hand tiller. It is OK to allow the potting soil to fall away to expose the roots.

- Pull loose roots outward.

- Cut or straighten any roots encircling the root ball or growing upward. These roots may affect the health of the plant.

- Place the plant so that the root collar is level with the ground. When you fill the hole in later, the soil should be at the same level as it was in the pot.

- Place the plant in the hole and arrange the roots so they point outward.

On a Slope
Place the root collar level with the lower edge of the slope.

Burlap
Remove all burlap before backfilling hole with soil.

FOR BAREROOT PLANTS AND PLUGS

- Keep roots moist until planting by storing them in moist sawdust or soil. In addition, you may soak them for one to two hours (but never longer than six hours) before planting.
- Prune away badly bruised, broken, kinked, or jagged roots.
- Make a small cone of soil in the bottom of the hole.
- Arrange the roots around the cone so they all point outward from the plant.
- Make sure the hole is deep enough for roots to extend downward without curving back up.

PLANTING ON SLOPES

Dig your plant hole deep enough so that the root collar will be level with the lower edge of the slope. Place the plant so it grows straight up, not perpendicular to the slope.

BACKFILLING THE HOLE

To backfill, use the native soil that was dug out of the hole, or from a nearby hole if more soil is needed.

- Ensure that only soil goes back into the hole. Limit large rocks, sticks, grass clumps, leaves, or mulch.
- Push soil around the roots, minimizing disturbance to the root arrangement.
- Push soil down firmly to remove any air pockets. Gently pull the plant by holding the base of its stem to make sure it is firmly planted.
- Form the surface soil into a small basin around the periphery of the planting hole to hold water, and adjust the soil so that water drains away from the immediate trunk area.

Mulching

Apply wood-chip mulch to the top of the soil in a circle at least as 12 inches wide and 3 inches deep, but not

MULCH RING

Do leave space.

Do not pile mulch onto the trunk.

touching the stem. This mulch ring will help retain soil moisture, suppress weeds, and provide nutrients as the mulch breaks down. Two 5-gallon buckets of mulch in a 4-inch-deep donut around each container plant is optimal.

Watering

If possible, water the plant immediately to settle the soil and eliminate air pockets. Add more soil if needed.

Adding Flagging

All installed plants should be flagged with the appropriate year's flagging tape make it easier to find for weeding, watering, and monitoring. GSP has been using different colored and patterned flagging since 2007. For plants with year-round stems or branches, loosely tie a small section of flagging to a side branch. Do not tie flagging around the trunk or main stem. For plants without branches or above-ground vegetation at planting, tie flagging to a stick and place it in the ground near the plant.

PLANTING LIVE STAKES (CUTTINGS)

Live stakes are sections of branches taken from certain plant species that, when installed correctly, can grow in to a new plant. Live stakes frequently are used in wetland and riparian restoration projects, but they can be successful in upland forests, too. Live stakes should be collected and installed when plants are dormant but before bud break, which could be from late fall to early spring depending on species.

How to collect live stakes

- Use a clean pruner or loppers to cut upright branches of the parent plant. The optimal size of the stake has a diameter of ½ inch to 1½ inches, and a length of 1½ feet to 3 feet. Lengths and diameters may vary depending on species.

You can view the Green Cities Plant Propagation Field Guide at GREENSEATTLE.ORG/WP-CONTENT/UPLOADS/2015/08/PLANTPROPAGATIONGUIDE_FINAL.PDF

- To prevent the stakes from respiring and drying out, remove any leaves and small branches after cutting.
- When collecting stakes, cut back to the next largest branch or to the ground to leave the parent plant looking neat and healthy.
- Make a flat cut on the top of the branch above a leaf node, with the leaf nodes or buds pointing up toward the flat top. A straight cut will expose less surface area of the stake to potential disease and insect infestation.
- Make a diagonal cut on the bottom. A diagonal cut makes it easier to drive the live stake into the ground. It also aids in telling which end is up.
- If live stakes cannot be installed immediately, store them in a bucket of water or wrap them in wet burlap to keep them from drying out.

How to install live stakes

- A planting bar tool is often used to create a pilot hole for the live stake. In soft soil, the cuttings can sometimes be directly pushed in.
- Place the cutting in the hole right-side-up, with the flat end sticking up and the diagonal cut driving down into the ground. Make sure that the buds point upward.
- A general rule is to plant live-stake cuttings 18 inches deep, or for short cutting, at least half their length. Deeper is fine, as long as a few buds are exposed at the top.
- Spacing of live stakes depends on the mature size of the plant and site conditions that could impact survival, such as moisture levels.

INSTALLING LIVE STAKES

Some species that can be propagated by live staking include:

Cornus sericea Red-oisier dogwood
Lonicera involucrata Twinberry
Physocarpus capitatus Pacific ninebark
Populus trichocarpa Black cottonwood
Rosa nutkana Nootka rose
Rubus spectabilis Salmonberry
***Salix* spp.** Willows
***Sambucus* spp.** Elderberries
Spirea douglasii Spirea

Cuttings
Live-stake cuttings should be pushed into the soil to at least half their length.

Installing Wetland Plants

Special considerations are made for the installation of plants destined for wetlands.

- Keep the plugs in their packaging until just before planting.
- When installing emergent bareroot plugs, the most common method for planting is to use a dibble tool to open up a planting hole in soft, saturated soil. If you don't have a dibble, use a narrow-bladed shovel or trowel. Make a slit in the soil, levering back and forth so that the plug will fit into the slit.
- Carefully install the plug, and then press the surrounding soil to remove large air pockets. Do not over-compact the soil.
- Match the soil surface of the plug to the surrounding soil surface.
- Plugs can "float" out of their hole if water levels rise before the roots have anchored into the soil. Therefore, plant at least two months before the date you anticipate the site will become submerged.
- Mulch is rarely used when planting emergent plugs because the soils are typically moist enough year-round to support these species.
- Flag installed plugs by tying the designated flagging for that year to a stick, and then place the stick into the ground near the installed plant.

For more information on planting live stakes, visit GREENSEATTLE.ORG/INFORMATION-FOR/FOREST-STEWARD-RESOURCES/TRAINING-VIDEOS/ **and watch the live staking 101 video**

Phase 3
Plant Establishment

Phase 3 focuses on native plant establishment. Sites are weeded, mulched, and watered as needed. Some sites may stay in Phase 3 for several years to manage invasive plant regrowth and wait for new plantings to grow.

Most plants require at least three years of establishment care to ensure plant survival. Although native plants are adapted to our dry summer climate, installed container and transplanted plants both experience transplant shock that affects root and shoot health. Volunteers can do a lot to ensure plantings survive and thrive in their first years, including: replenishing mulch rings, watering, removing invasive plants, and supplemental planting or plant replacement (if needed). Remember that not all plants are expected to survive, which is accounted for in your planting plan density. Establishment is going well if you have at least 80% survival.

Watering

We tend to not water our restoration sites, due to access or practicality. Connecting to an existing irrigation system or installing a temporary gravity-fed cistern may be a possibility, however, depending on your site location and conditions. Volunteers also may transport water from the nearest source with buckets or watering cans. Coordinate with GSP staff before planting to discuss irrigation options.

Ideally, you want to saturate each plant with two gallons of water every one to two weeks, from June through September, for the first two years after planting.

Pruning

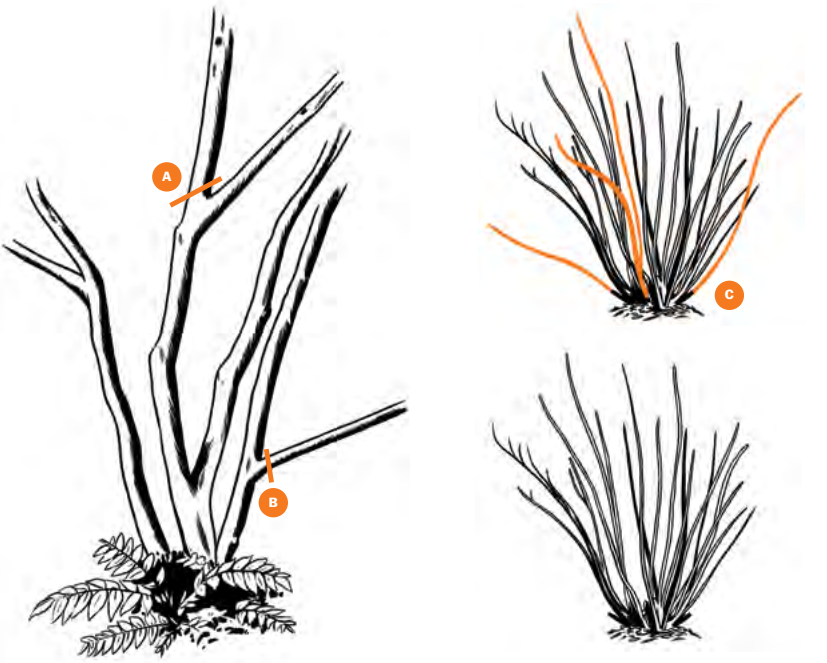
Restoration sites may need some tweaking as time progresses. Pruning can help tame plants installed in a less-than-ideal site, and can help make room for slower-growing conifers.

Removal and/or Relocation

Remove plants that are too large, cannot be fixed by pruning, or have growth habits that are incompatible with the trailside. Native plants, including seedlings of large plants that crop up, can be transplanted to a better location during the dormant (winter) season.

Restoration Pruning

Avoid shearing and heading cuts



REDUCTION & REMOVAL CUTS

along trail sides, as they promote dense hedges that are incompatible with CPTED principles. For more information on CPTED principles, turn to page 31–32. A light, late summer pruning (mid-July to September) results in a more subdued growth response, which is more desirable. Be sure to not prune more than one-quarter of living plant. Two types of pruning cuts are "reduction" and "removal":

- Reduction cuts shorten the length of a stem by cutting to a lateral branch large enough to serve as the new, shorter leader. Choose a lateral branch that is at least one-third the diameter of the main stem (See above, A).

- Removal cuts remove an entire branch at its point of attachment. These cuts are made at the branch collar on trees and larger shrubs (B), and down to the root crown for multi-stem shrubs and cane plants (C).

Releasing Conifers

Utilizing reduction or removal cuts, prune back native plants 5 feet from around smaller conifer trees to allow for greater light and airflow.

Tree Pruning

If medium to larger trees already are growing into to the trail, or will soon, prune lower branches to create overhead clearance. This is best done when branches are less than 2 inches in diameter. Place cuts at the branch collar and don't leave stubs. Cut branches all the way around the trunk — prune even those sides not growing into the trail. The remaining branch area after pruning should cover at least two-thirds of the total height of the tree.

Phase 4

Long-term Stewardship and Maintenance

Phase 4 focuses on long-term stewardship and maintenance, which includes monitoring for new populations of invasive plants, social use impacts, and other ecosystem health indicators.

After a restoration site has gone through invasive removal and planting, and the trees, shrubs, and groundcover are established, the zone may be a candidate for moving into the fourth and final phase of restoration: Long-term Stewardship and Maintenance. The decision to move a zone into Phase 4 is important because it helps the program shift attention and resources to the next restoration sites.

GSP staff use forest assessment data to evaluate a site's ecological health, along with a field visit to verify on-the-ground conditions. Using values specific to the identified Target Ecosystem, staff can measure how a GSP zone is progressing on seven criteria:

1. Native tree regeneration
2. Regenerating native tree diversity
3. Canopy cover
4. Shrub and groundcover density
5. Shrub and groundcover diversity
6. Invasive cover
7. Woody invasive regeneration

Be in touch with GSP staff if you'd like to nominate your park for Phase 4 verification. Remember, the entire zone must be ready to move into Phase 4 (not just your site), and there must not be any presence of Class A Noxious Weeds (weeds required for control annually, such as garlic mustard). Once your site is in Phase 4, your volunteer tasks and approach to hosting volunteer events may shift. In fact, Phase 4 stewardship and maintenance may occur just once a year and as little as once every five years, depending on your site conditions. We expect Forest Stewards of Phase 4 zones to:

- Sweep through sites looking for new or returning invasive plants. This can be accomplished by coordinating a small or medium volunteer event to search for specific plants that are a problem at the site. Alternatively, you can have volunteers spread out and walk through a site, looking for any and all invasive species. We often see ivy and holly/laurel in the

interior of a zone that is seeding in. Where parks property meets adjacent properties, be on the watch for garden-variety invasives finding their way into the park. This work requires a keen eye for identifying species. Be prepared to share photos or identification cards with volunteers, or plan the event for a small group of experienced volunteers.

- Bring flagging to mark problem areas or to mark specific invasive plants for future treatment. (SPR staff can provide the flagging.) Consider capturing the GPS coordinates (using a map app on a smart phone) and taking photos for easier follow-up and communication with GSP staff.

- Monitor the zone for social-use impacts that need to be addressed through restoration (for example, off-trail hiking).

- Monitor forest health issues, such as pockets of root rot or storm damage.

- Develop planting projects to address these impacts.

OTHER PARK ACTIVITIES

Forest Stewards often are the eyes and ears on the park and notice issues and opportunities that fall outside the purview of GSP forest restoration.

Litter Removal

If restoration work uncovers litter or other garbage, volunteers may collect it. If the garbage isn't a great volume, volunteers are encouraged to dispose of it in trashcans if they are on site. If there are no cans or the collected garbage is of considerable volume, then the garbage should be bagged up. Notify a GSP staff person to arrange for pickup. Place collected bags in a location where SPR staff can collect it easily, out of sight as much as possible so as to not encourage more dumping.

SPR Trails

The SPR Trails Program manages the installation and maintenance of official trails — gravel and soft surface — that navigate through natural areas and forests throughout Seattle's parks system. Forest Stewards and volunteers are welcome to keep the trails free of debris and vegetation. If you or your volunteers are interested in work to install or improve official SPR trails (not stewardship access paths), contact: TRAILS@SEATTLE.GOV.

Dealing with Dogs Off-Leash

While it is not your duty as a Forest Steward to regulate off-leash dog use in parks, you may consider some of these techniques to protect the restoration area.

- Use signs or fencing, when appropriate, to educate and designate areas where dogs are not allowed.

- Lay branches or rocks to designate protected areas and deter access from people and animals. Do so in a way that mimics downed wood and branches. Avoid lining the trail with material that may keep water on the trail tread.

- Consider leaving a temporary buffer of weeds (for example, 3

feet of blackberry) in front of your restoration site to keep dogs out while new plantings are getting established.

- If the problem persists, you can contact Animal Control at 206-386-7387 or file a complaint online at: SEATTLE.GOV/CUSTOMERSERVICE/REQUEST.HTM. Animal Control will ask for a description of the dog, the owner, and a license plate number (if available).

Unauthorized Camping in Seattle Parks

Leave camps and personal items in place. It is unlawful to remove personal belongings from a park. Do not approach camps, and be mindful of your own personal safety and that of your volunteers.

You may report unauthorized camping in a park by contacting the City of Seattle Customer Service Bureau: SEATTLE.GOV/CUSTOMER-SERVICE-BUREAU; 206-684-CITY (2489); or through the Find it, Fix it service request mobile app. Additionally, send an email to your plant ecologist with detailed information about what you reported. Please include a simple map and photo, and list any potential hazards or other relevant information. Follow up by contacting GSP staff with similar information so they can work with SPR to resolve any conflicts.

Needles and Syringes

Before starting your volunteer event, sweep your work site for needles, syringes, and other discarded sharp-pointed devices. If you find any, limit access to the area by flagging off the site. Place a pot over the needle or syringe, if possible. Forest stewards and volunteers are discouraged from removing any discarded needles and syringes that you find. Instead, report your findings to the SPR Maintenance Request Line at 206-684-7250, or on the Find it, Fix it mobile app. SPR staff will arrive to clean up the site as soon as possible.

If you or a volunteer is pricked by a needle during an event, transport yourself or your volunteer to the hospital, and bring the needle. File an accident report as soon as possible with SPR staff.

For up-to-date information on reporting unauthorized camping in Seattle parks, as well as for a list of resources related to homelessness, go to GREENSEATTLE.ORG **and search:** CAMPS.

Appendix A

THE DOS AND DONT'S OF GSP: A QUICK REFERENCE

- SPR must be notified before you begin forest restoration work in any city park.
- Volunteers are restricted from using power tools on City of Seattle properties, including all city parks.
- Volunteers are restricted from working on steep slopes. GSP staff will coordinate all slope work, using professional crews.
- Wet slopes with seeps or perched wetlands present specific challenges, including an increased likelihood of soil erosion and the possibility of more deep-seated stability problems. GSP staff will help determine if wet slopes in areas that are not steep are appropriate for volunteers or if they will need professional crew attention.
- Bare soils susceptible to erosion must be covered within five days.
- Volunteers should never clean-up unauthorized camps that they encounter within a park. They also should never move personal belongings from a campsite, or pick up discarded needles, syringes, or other sharp-pointed devices from a work site.

Appendix B

UNDERSTANDING SOIL

Soil quality is an important consideration in restoration plantings, especially in urban habitats where there can be significant disturbance. Before finalizing your planting plan, dig in and get familiar with the beneath-ground soils at your site.

Analyzing soil texture — the distribution of different sized particles — is key to understanding the capacity of a soil to hold and supply water and nutrients to a plant.

SANDS are the largest particles and make for well-aerated and well-drained soil that consequently has poor water- and nutrient-holding capacities.

CLAYS are the smallest particles and have slow drainage and poor aeration, but high water- and nutrient-holding capacities.

SILT PARTICLES fall between sands and clays in size, and also in their capacity to hold nutrients and moisture.

LOAM refers to a soil that has half as much clay as sand or silt, making for a well-structured soil with ideal pore space and surface area to hold water and nutrients.

Soil Texture Field Analysis

Select a soil sample from the rooting zone (between 4 and 8 inches deep). Place the soil in the palm of your hand, add water, and knead until the soil is like moist putty. When you squeeze it, see if the soil remains in a ball. If not, add more water or soil to get the correct consistency. If your soil still will not remain in a ball, it is sand.

If your soil is not sand, place your soil ball between your thumb and forefinger. Push the soil upward into a ribbon shape with uniform depth of about ⅛ of an inch. Let it break under its own weight. Does the soil form a ribbon? If yes, use the chart on page 71 to identify your soil. If your soil did not form a ribbon, it is loamy sand.

The results of your soil texture field analysis will help determine your best options for plant installation and management practices. Consider the following:

- Knowing your soil texture will change your approach to moisture management during dry summer months. Sandy soils drain quickly, so supplemental irrigation should be applied more frequently at decreased amounts. Irrigation may be unnecessary for clay or clay loam soils.

- Organic amendments such as mulch rings can improve the water-holding capacity of sandy soils by decreasing evaporation

Field Analysis	Forms a weak ribbon of less than 1 inch	Forms a ribbon 1–2 inches before breaking	Forms a ribbon 2 inches or longer before breaking
Feels gritty?	• Sandy • Loam	• Sandy • Clay • Loam	• Sandy • Clay
Feels equally gritty and smooth?	• Loam	• Clay • Loam	• Clay
Feels very smooth?	• Silt • Loam	• Silky • Clay • Loam	• Silky • Clay

and improving soil structure as the mulch decomposes.

- Soil amendments, however, can be expensive and logistically impossible to apply at many sites. Often, your best option is to select the right plant species for the existing soil conditions. For sandy soils with no natural seeps, select plants that establish roots quickly and can tolerate drought. Slow-draining soils heavy in clay are prime for plant species that can tolerate anaerobic conditions common in saturated soils.
- Clay soils can have adequate organic content, providing for a combination of good moisture-holding capacity and a structure that allows for drainage and aeration.
- At sites where plant establishment has proven to be difficult, you may consider sending a soil sample to a testing lab such as the Washington State University Extension or King Conservation District.

Appendix C

CALCULATING MULCH NEEDS

CALCULATING CUBIC YARDS

1 cubic yard = 27 cubic feet.

To convert cubic feet to cubic yards:

number of cubic feet
÷ 27 cubic feet
= number of cubic yards

EXAMPLE
You have an area of 1,000 square feet and you want to cover it with four inches (0.33 feet) of mulch. 1,000 square feet × 0.33 feet (depth of the mulch) = 330 cubic feet.

330 cubic feet
÷ 27 cubic feet
= 12.2 cubic yards

Each plant should receive two 5-gallon buckets of mulch to create the mulch ring after a plant is newly installed, which is about 1.25 cubic feet of mulch per plant. For 1 yard of mulch, you should be able to mulch 20 to 25 plants.

For reporting mulch rings on a work log, estimate 4 square feet per mulch ring. Example: 10 plants would be 40 square feet, or 50 plants would be 200 square feet.

MULCH DEPTH

Use this table to determine the total number of yards that you need, based on your area's square footage and desired depth.

Square Feet	Depth 3 in.	Depth 4 in.	Depth 5 in.	Depth 6 in.	Depth 7 in.	Depth 8 in.
100	1	1¼	1½	2	2¼	2½
150	1½	2	2½	2¾	3¼	3¾
200	2	2½	3	3¾	4½	5
250	2½	3	4	4¾	5½	6¼
300	2¾	3¾	4¾	5½	6½	7½
350	3¼	4½	5½	6½	7¾	8¾
400	3¾	5	6¼	7½	8¾	10
450	4¼	5¾	7	8½	9¾	11¼
500	4¾	6¼	7¾	9¼	10¾	12½
600	5¾	7½	9¼	11¾	13	15
700	6½	8¾	11	13	15¼	17¼
800	7½	10	12½	15	17½	20
900	8½	11¼	14	16¾	19½	22¼
1,000	9½	12½	15½	18½	21¾	24¾
2,000	18½	24¾	31	37	43¼	49½

Converting Square Feet into Acres

1 acre = 43,560 square feet (1 acre measures 208.71 feet × 208.71 feet)

EXAMPLE: You have a restoration area that is 7,850 square feet.

7,850 square feet
÷ 43,560 square feet
= 0.18 acres

Appendix D

TIPS FOR CREATING TOOL LISTS

When planning for your event, estimate about one or one-and-a-half hand tools per expected volunteer (not including buckets, wheelbarrows, tarps, etc.). Volunteers can share or trade tools as needed, so you do not need all of the different tools for each volunteer.

Most active Forest Stewards will be set up with an onsite tool storage box (JOBOX) containing a standard issue of tools for small to medium sized events. If Forest Stewards need tools in addition to what is in their jobox, they can request additional tools from SPR or, for a specific event, through the CEDAR work log online portal.

Please note that the preferred tool for a job varies among volunteers. The following suggestions are based on what tools are most readily available.

All Restoration Activities

- Gloves (make sure you have enough for each volunteer)
- Garbage bags

Invasive Plant Removal

- Hand tillers and/or mini-mattocks (for digging out small roots)
- Loppers (for all-purpose cutting)
- Hand pruners (for cutting smaller invasive plants)
- Folding hand saw (for cutting ivy vines from trees)
- Digging shovels (for digging out blackberry roots)
- Tarps (for carrying piles of invasive plants)
- Hard rake (for moving piles of invasive plants)
- Pullerbear™ (for removing Scotch Broom and small invasive trees)

Mulching

- Buckets (for moving mulch or gravel)
- Pitchfork
- Wheelbarrow
- Hard rake (for spreading mulch)

Planting

- Digging shovels
- Hand trowels (for smaller four-inch plants)
- Utility knife/industrial scissors (for cutting through burlap)

Other Available Tools and Materials

- Push broom (for sweeping paved surfaces)
- Leaf rake (for keeping trails free of debris)
- Litter picker-uppers
- Sani-cans (for larger events)
- Mulch
- Buckets for carrying tools

EXAMPLE

For a 20-volunteer event involving the removal of English ivy and some blackberries, you would need the following tools:

- 8 loppers
- 8 hand tillers
- 5 hand pruners
- 2 folding hand saws
- 3 shovels
- 2 tarps
- 25 sets of gloves
- 3 buckets (for carrying tools)
- 2 tarps

Tips for keeping track of your tools

- Count your tools before you start working.
- Keep tools in a central location at the work site when they are not in use.
- Collect and count tools when breaking for snacks or lunch.
- Assign one of your volunteers to sort and count tools at the end of the day before volunteers leave. If there are tools missing, have everyone go back and look together.
- Tie brightly colored flagging tape to small tools such as hand pruners and folding saws.
- Sweep through the site as people are working to look for abandoned tools.
- Make sure people don't forget to return their gloves neatly rolled together.

Caring for tools and joboxes

- Have volunteers clean off their own tools to make it easier for event leaders.
- Use tool brushes, grass, and/or puddles to clean tools.
- If tools dull or break, notify GSP staff to get a sharpener or replacement tool
- Don't over stuff joboxes with tools. They won't shut and could break. Notify GSP staff to have tools removed.
- Don't store treats or snacks in joboxes, as they invite mice.

Appendix E

ESTIMATING SQUARE FOOTAGE

Use your average stride as a measuring tool for estimating distance.

You can determine your average stride by counting how many strides it takes you to travel 100 feet. One stride is the equivalent of two steps, with each foot forward counting as one step. Take an average of two stride counts at 100 feet to determine your average.

EXAMPLE

Ann counts her strides for 100 feet two times. The first time, she counts 20.5 strides. The second time, she counts 19.5. Therefore, Ann's average number of strides for traveling 100 feet is 20, or 5 feet per stride.

100 feet
÷ 20 strides
= 5 feet per stride

So for every stride Ann takes, she can measure 5 feet.

Use your personal average stride calculation to measure the square-foot dimensions of your restoration area, which you will need to estimate for work log reporting.

Square footage area is calculated by multiplying length by width (Length × Width = Area).

For more information on estimating square footage, visit GREENSEATTLE.ORG/INFORMATION-FOR/FOREST-STEWARD-RESOURCES/TRAINING-VIDEOS/ **and watch the measuring restoration areas video**

Appendix F

WET AREA DECISION TREE

It's important to be able to answer the question: Does my site have a wetland or wet area? Answer the questions below, starting with question 1. If you get to a green box, move to the next question. If you land on an orange box, you have a wetland. A black box indicates that you have upland site. Throughout the Field Guide, there are special considerations and schedules specific to working in wet areas.

1 What season is it?

- **Dry** mid-June to mid-November
- **Wet** mid-November to mid-June

2 Is the soil surface glistening or is there standing water?

- Yes → **Wetland**
- No

3 What plants are present at your site?

Group 1

- skunk cabbage
- sedge species
- yellow flag iris
- watercress
- water parsely
- purple loosestrife

→ **Wetland**

Group 2

- black cottonwood
- red alder
- western red cedar
- salmonberry
- Oregon ash
- lady fern
- willow species
- red twig dogwood
- black twinberry
- hardhack
- reed canarygrass
- creeping buttercup
- large-leaved avens

→ **Neither** → **Upland**

4 Dig down 12 inches. Is the soil glistening or is there water?

- Yes → **Wetland**
- No → **Upland**

Appendix G NATIVE PLANT LIST

Species Code	Botanic Name	Common Name	Growth Form	Life History	Flowering Period	Average Soil Moisture Regime	Shade Tolerance
ABGR	*Abies grandis*	grand fir	tree	perennial	May–Jun	dry–moist	sun–shade
ACCI	*Acer circinatum*	vine maple	shrub	perennial	Mar–Jun	dry–moist	part shade-shade
ACMA	*Acer macrophullum*	bigleaf maple	tree	perennial	Mar–Jun	dry–moist	dry-moist
ACMI	*Achillea millefolium* var. *occidentalis*	yarrow	forb	perennial	July–Sep	dry–moist	sun–part shade
ACTI	*Achlys triphylla*	vanillaleaf	forb	perennial	Apr–July	dry–moist	part shade–shade
ADBI	*Adenocaulon bicolor*	pathfinder	forb	perennial	Jun–Oct	moist	moist shaded
ADAL	*Adiantum aleuticum*	Western maidenhair fern	fern	perennial		moist–wet	part shade–shade
ALCE	*Allium cernuum* var. *obtusum*	nodding onion	forb	perennial	July–Aug	dry–moist	sun
ALRU	*Alnus rubra*	red alder	tree	perennial	Mar–Apr	dry–wet	sun–part shade
AMAL	*Amelanchier alnifolia*	serviceberry, saskatoon	shrub	perennial	Apr–Jun	dry–moist	shade-tolerant/intolerant
ARME	*Arbutus menziesii*	arbutus, madrone, madrona	tree	perennial	Apr–May	dry	shade-tolerant/intolerant
ARDI	*Aruncus dioicus* var. *acuminatus*	goatsbeard	forb	perennial	May–July	moist	sun–part shade
ASCA	*Asarum caudatum*	wild ginger	forb	perennial	Apr-July	moist	part shade–shade
ASSU	*Aster subspicatus*	Douglas aster	forb	perennial	July-Oct	dry	Wet-moist
ATFI	*Athyrium filix-femina*	lady-fern	fern	perennial		moist–wet	sun–shade
BEAQ	*Berberis aquifolium*	tall Oregongrape	shrub	perennial	Mar–Jun	dry–moist	shade-tolerant/intolerant
BENE	*Berberis nervosa*	dull/Cascade Oregon-grape	shrub	perennial	Apr–Jun	dry–moist	shade-tolerant/intolerant
BLSP	*Blechnum spicant*	deerfern	fern	perennial		dry–wet	part shade–shade
CAQU	*Camassia quamash*	common camas	forb	perennial	Apr–Jun	dry–moist	shade-intolerant
CASC	*Campanula scouleri*	Scouler's bellflower	forb	perennial		dry–moist	sun–part shade
CADE	*Carex densa*	dense sedge	grass	perennial		moist–wet	

Species Code	Botanic Name	Common Name	Growth Form	Life History	Flowering Period	Average Soil Moisture Regime	Shade Tolerance
CADE	*Carex deweyana* var. *deweyana*	Dewey's sedge	grass	perennial		dry–wet	sun–shade
CAME	*Carex mertensii*	Merten's sedge	grass	perennial		moist–wet	
CAOB	*Carex obnupta*	slough sedge	grass	perennial		moist–wet	sun–part shade
CAPA	*Carex pachystachys*	thick-headed sedge	grass	perennial		moist–wet	
CIAL	*Circaea alpina ssp pacifica*	enchanter's nightshade	forb	perennial	May–Jun	dry–moist	sun–part shade
CONU	*Cornus nuttallii*	Pacific dogwood	tree	perennial	Apr–May	dry–moist	part shade
COSE	*Cornus sericea*	Red-osier dogwood	shrub	perennial	Jun–Aug	moist–wet	sun–shade
COUN	*Cornus unalaschkensis*	western bunchberry	forb	perennial	May–Jun	moist–wet	part shade–shade
COCO	*Corylus cornuta* var. *californica*	beaked hazelnut	shrub	perennial	Feb–Mar	dry–moist	sun–shade
CRDO	*Crataegus douglasii*	black hawthorn	tree	perennial	Apr–May	moist–wet	sun–part shade
DECE	*Deschampsia cespitosa*	tufted hairgrass	grass	perennial	Jun	dry–wet	sun–part shade
DIFO	*Dicentra formosa* ssp. *formosa*	Pacific bleedingheart	forb	perennial	Apr–May	dry–moist	part shade–shade
DREX	*Dryopteris expansa*	spreading woodfern	fern	perennial	NA	moist	sun–shade
ERSP	*Erigeron speciosus*	showy fleabane	forb	perennial		dry–moist	sun–part shade
EROR	*Erythronium oreganum* var. *oreganum*	Oregon fawnlily	forb	perennial	Apr–May	dry	shade–part shade
FEOC	*Festuca occidentalis*	western fescue	grass	perennial	Jun	dry–moist	part shade
FERO	*Festuca roemeri*	Roemer's fescue	grass	perennial	May–July	dry–moist	shade-tolerant/intolerant
FRVE	*Fragaria vesca* spp. *bracteata*	wood's strawberry	forb	perennial	Apr–Jun	dry–moist	shade-tolerant/intolerant
FRLA	*Fraxinus latifolia*	Oregon ash	tree	perennial	Apr–May	moist–wet	sun–part shade
GASH	*Gaultheria shallon*	salal	shrub	perennial	Apr–May	dry–moist	part shade–shade
GEMA	*Geum macrophyllum*	large-leaved avens	forb	perennial	May–Jun	moist–wet	sun–part shade
GLEL	*Glyeria elata*	tall managrass	grass	perennial	May–July	moist–wet	sun–full sun
GRIN	*Grindelia integrifolia*	entire-leaved gumweed	forb	perennial	Jun	moist	sun–full sun
HODI	*Holodiscus discolor*	oceanspray	shrub	perennial	May–Jun	dry–moist	sun–shade
HYTE	*Hydrophyllum tenuipes*	slender-stem waterleaf	forb	perennial	Apr-May	moist–wet	part shade–shade
IRTE	*Iris tenax*	Oregon iris	forb	perennial	May–Jun	moist–wet	sun–part shade

Species Code	Botanic Name	Common Name	Growth Form	Life History	Flowering Period	Average Soil Moisture Regime	Shade Tolerance
LOCI	*Lonicera ciliosa*	orange honeysuckle	vine	perennial	May–Jun	moist	part shade–shade
LOHI	*Lonicera hispidula*	hairy honeysuckle	vine	perennial	May–July	dry–moist	sun–part shade
LOIN	*Lonicera involucrata* var. *involucrata*	black twinberry	shrub	perennial	Apr–July	moist–wet	sun–shade
LYAM	*Lysichiton americanus*	skunkcabbage	forb	perennial	Mar–May	wet	part shade–shade
MADI	*Maianthemum dilatatum*	false lily-of-the-valley	forb	perennial	Apr–Jun	moist	sun–shade
MARA	*Maianthemum racemosum* ssp. *amplexicaule*	large false Solomon's seal	forb	perennial	May-Jun	moist	Part sun–Shade
MYCA	*Malus fusca*	Pacific crabapple	tree	perennial	May–Jun	moist–wet	sun–part shade
MYCA	*Myrica californica*	Pacific wax myrtle	shrub	perennial	May–Jun	dry–moist	sun–part shade
MYGA	*Myrica gale*	Sweet gale	shrub	perennial	NA	moist–wet	sun–part shade
OECE	*Oemleria cerasiformis*	Indian plum	shrub	perennial	Feb–Apr	dry–moist	part shade–shade
OXOR	*Oxalis oregona*	redwood sorrel	forb	perennial	Apr–Sep	dry–moist	part shade–shade
PEOV	*Penstemon ovatus*	broad-leaved penstemon	forb	perennial	Jun–Aug	dry–moist	sun–part shade
PEFR	*Petasites frigdus*	coltsfoot	Forb	perennial	Feb–Mar	moist–wet	sun–shade
PHLE	*Philadelphus lewisii*	mockorange	shrub	perennial	May–July	dry–moist	sun–part shade
PHCA	*Physocarpus capitatus*	Pacific ninebark	shrub	perennial	May–Jun	moist–wet	sun–shade
PISI	*Picea sitchensis*	Sitka spruce	tree	perennial	NA	moist–wet	sun–part shade
PICO	*Pinus contorta*	shore pine	tree	perennial	NA	dry–wet	sun–part shade
PIMO	*Pinus monticola*	Western white pine	tree	perennial	NA	dry–moist	sun–part shade
POGL	*Polypodium glycyrrhiza*	licorice fern	fern	perennial		moist–wet	
POMU	*Polystichum munitum*	western sword fern	fern	perennial	NA	dry–moist	part shade–shade
PREM	*Prunus emarginata* var. *mollis*	bitter cherry	tree	perennial	Apr–Jun	dry–moist	sun–part shade
PSME	*Pseudotsuga menziesii* ssp. *menziesii*	Douglas fir	tree	perennial	Mar–May	dry–moist	sun–part shade
PTAQ	*Pteridium aquilinum* var *pubescens*	bracken fern	fern	perennial		dry–moist	
QUGA	*Quercus garryana*	Garry oak, Oregon white oak	tree	perennial	Apr	dry	sun–part shade
RHPU	*Rhamnus purshiana*	cascara	tree	perennial	Apr–May	dry–wet	sun–shade
RHMA	*Rhododendron macrophyllum*	Pacific rhododendron	shrub	perennial	May–July	dry–moist	part shade–shade

Species Code	Botanic Name	Common Name	Growth Form	Life History	Flowering Period	Average Soil Moisture Regime	Shade Tolerance
RILA	*Ribes lacustre*	swamp currant	shrub	perennial	Apr–May	moist–wet	sun–shade
RISA	*Ribes sanguineum* var. *sanguineum*	red-flowering currant	shrub	perennial	Feb–Apr	dry–moist	sun–part shade
ROGY	*Rosa gymnocarpa*	baldhip rose	shrub	perennial	May–Jun	dry–wet	sun–shade
RONU	*Rosa nutkana*	nootka rose	shrub	perennial	May–Jun	moist–wet	sun–part shade
ROPI	*Rosa pisocarpa*	clustered wild rose	shrub	perennial	May–July	moist–wet	sun–shade
RUPA	*Rubus parviflorus*	thimbleberry	shrub	perennial	May–July	dry–moist	sun–shade
RUSP	*Rubus spectabilis*	salmonberry	shrub	perennial	Mar–Jun	moist–wet	sun–shade
RUUR	*Rubus ursinus*	trailing blackberry	shrub	perennial	Apr–Aug	dry–moist	sun–shade
SAHO	*Salix hookeriana*	Hooker's willow	tree	perennial		moist–wet	sun
SALU	*Salix lucida*	Pacific willow	shrub	perennial	Apr–May	moist–wet	sun–part shade
SASC	*Salix scouleriana*	Scouler's willow	tree	perennial	Apr–May	moist–wet	sun–part shade
SARA	*Sambucus racemosa* var *racemosa*	red elderberry	shrub	perennial	May–July	dry–moist	sun–shade
SCAC	*Scripus acutus*	hardstem bulrush	grass	perennial	Apr–May	wet	sun
SCMI	*Scripus microcarpus*	panicled bulrush	grass	perennial	May–Jun	wet	sun–part shade
SIKE	*Sidalcea kendrsonii*	checker mallow	forb	perennial	Jun–Aug	moist–wet	sun
SOCA	*Solidago canadensis*	Canada goldenrod	forb	perennial	Jun–Sep	dry–moist	sun–part shade
SPDO	*Spirea douglasii*	hardhack	shrub	perennial	May–July	moist–wet	sun–part shade
SYAL	*Symphoricarpos albus* var. *laevigatus*	common snowberry	shrub	perennial	May–Aug	dry–moist	sun–shade
TABR	*Taxus brevifolia*	Western yew	tree	perennial	NA	dry–moist	part shade–shade
TEGR	*Tellima grandiflora*	fringecup	forb	perennial	Apr–July	moist	part shade–shade
THPL	*Thuja plicata*	Western redcedar	tree	perennial	NA	moist–wet	part shade-shade
TITR	*Tiarella trifoliata* var *trifoliata*	threeleaf foamflower	forb	perennial	May–Aug	moist	part shade–shade
TOME	*Tolmiea menziesii*	youth-on-age	forb	perennial	May–Aug	dry–moist	part shade–shade
TROV	*Trillium ovatum* ssp. *ovatum*	western trillium	forb	perennial	Mar–May	dry–moist	part shade–shade
VAOV	*Vaccinium ovatum*	evergreen huckleberry	shrub	perennial	Apr–July	dry–moist	part shade–shade
VAPA	*Vaccinium parvifolium*	red huckleberry	shrub	perennial	Mar–May	dry–moist	part shade–shade

Appendix H

WOODY INVASIVE PLANT LIST

Botanic Name	Common Name	Growth Form
Acer campestre	Hedge Maple	tree
Acer platanoides	Norway Maple	tree
Acer psuedoplatanus	Sycamore Maple	tree
Aesculus hippocastanum	Horse Chestnut	tree
Buddleia davidii	Butterfly bush	shrub/tree
Clematis vitalba	Traveler's Joy	shrub
Cotoneaster spp.	Cotoneaster	shrub
Crataegus monogyna	English Hawthorne	tree
Cytisus scoparius	Scotch Broom	shrub
Ilex aquifolium	English Holly	shrub/tree
Laburnum anagyroides	Golden Chain Tree	tree
Ligustrum sinense	Chinese Privet	forb
Populus alba	Silver Poplar	forb
Populus nigra	Black Poplar, Lombardy Poplar	forb
Prunus domestica	Domestic Cherry	tree
Prunus spinosa	Sloe	tree
Prunus avium	Wild Cherry	tree
Prunus cerasifera	Thundercloud Plum	tree
Prunus laurocerasus	Cherry Laurel, English Laurel	shrub/tree
Prunus lusitanica	Portuguese Laurel	shrub/tree
Pyracantha spp.	Firethorn	shrub
Robinia pseudoacacia	Black Locust	tree

Botanic Name	Common Name	Growth Form
Sorbus acuparia	Mountain Ash	tree
Tamarix ramosissima	Saltcedar	tree
Ulex europaeus	Gorse	shrub
Ulmus parvifolio	Chinese Elm	tree
Ulmus procera	English Elm	tree
Ulmus pumila	Siberian Elm	tree

My Park's Plants

Record invasive and native plants present in your restoration site and any notes on quantity or percent cover.

Volunteer and Community Info

Use this space to collect the names and contact information of volunteers or community members you meet who might want to come back and volunteer at your site again. It is great to follow up with volunteers by thanking them and inviting them back.

Contact

IMPORTANT NUMBERS

APPENDIX IV
TREE PROTECTION SIGNAGE EXAMPLE

Seattle Department of
Construction & Inspections

700 5th Ave., Suite 2000
P.O. Box 34019
Seattle, WA 98124

TREE PROTECTION AREA

Tree protection fencing is a requirement of approved building permit #_____ to protect this tree's canopy, trunk, and roots.

The protective fence must be placed at the tree's drip line or as shown on the approved plans. **The fencing must remain in place throughout construction.**

No work, excavation, trenching, material storage, cleaning, or dumping is allowed behind this fence.

Do not remove or relocate this fence!

Failure to follow the required tree protection measures may result in a stop work order and civil penalties.

To report a suspected violation, contact SDCI code enforcement (206) 615-0808. Be prepared to provide the project number and/or the site address.

Attach here.

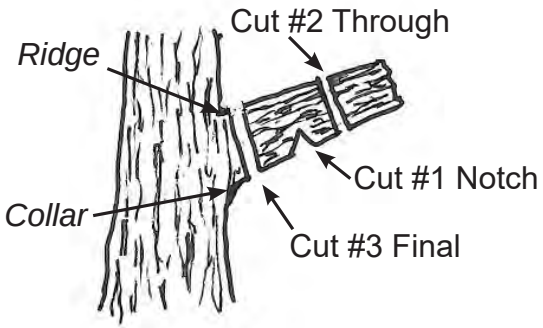
Attach here.

INSTRUCTIONS

- Install fence on posts securely set into the ground
- Fill in approved building permit number on the front side
- Plastic laminate this sign for weather resistance
- Affix the filled-in and laminated sign to the tree protection fencing using zip or twist ties, wire, or twine at the dashed attachment circles shown in the corners
- Place sign on fencing so it is visible to construction personnel and, to the greatest extent possible, from the street
- Keep the sign in readable condition for the entire duration of the project
- For information on these requirements contact the SDCI project planner at 684-8850

Link to this Tree Protection Area Sign

Proper Pruning Method



Three-Cut Method

Use the three-cut method when you need to prune or remove branches that are outside of the tree protection area.

- Cleanly cut using the "three-cut" method to avoid tearing / pealing remaining bark.
- Do not cut branches flush with the trunk or stem — leave branch bark ridge and collar.

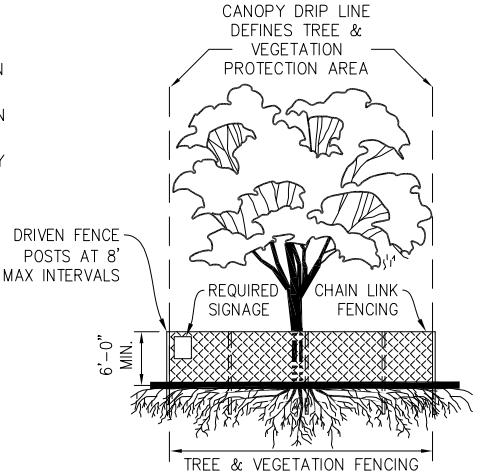
TREE & VEGETATION PROTECTION

TREE PROTECTION FENCING AND SIGN

1. CHAIN LINK FENCE REQUIRED (NO ORANGE CONSTRUCTION FENCE OR PLYWOOD)
2. MINIMUM 6' HIGH
3. FENCE SHALL BE SUPPORTED BY RIGID POSTS DRIVEN INTO THE GROUND AT 8' MAXIMUM INTERVALS
4. MUST BE INSTALLED PRIOR TO DEMOLITION OR GROUND DISTURBANCE
5. KEPT IN PLACE FOR THE DURATION OF CONSTRUCTION
6. NO DUMPING OF ANY MATERIALS IN THE PROTECTION AREA
7. NO SOIL DISTURBANCE OR ACTIVITY ALLOWED WITHIN FENCED AREA: MATERIAL STORAGE/STOCKPILING, PARKING, EXCAVATION, DUMPING, OR WASHING
8. MODIFICATIONS OF THESE REQUIREMENTS BY APPROVAL OF SDCI PLANNER ONLY
9. IF ROOTS GREATER THAN 2 INCH FOUND OUTSIDE OF FENCING, PROTECT BY HAND EXCAVATION AND, IF NECESSARY, CUT CLEANLY AND KEEP MOIST
10. USE 3 INCHES OR DEEPER WOOD CHIP MULCH OUTSIDE FENCED AREAS TO PROTECT FEEDER ROOTS

VEGETATION PROTECTION (DOES NOT APPLY TO TREES)

1. ORANGE MESH OR SIMILAR OPEN MATERIAL
2. PROTECT VEGETATION OUTSIDE CONSTRUCTION ZONE WITH FENCING AS SHOWN



From the City of Seattle Standard Construction Stormwater Control and post Construction Soil Mitigation Plan (CSC & Soil Plan).

Attach here.

Attach here.