Preparing a SPEA Restoration and Enhancement Plan

A **Streamside Protection and Enhancement Area** (SPEA) Restoration and Enhancement Plan is required as part of a Streamside Protection and Enhancement Development Permit Application and shall be prepared in accordance with the development permit guidelines (Section 4.0 of Schedule II of the Burnaby Zoning Bylaw). The SPEA Restoration and Enhancement Plan must articulate how the riparian area will be improved through the proposed development by following the Streamside Protection and Enhancement Development Permit Guidelines in Schedule II of the Burnaby Zoning Bylaw. This plan must be registered on title as part of a SPEA Covenant and development permit.

All SPEA) Restoration and Enhancement Plans are to be prepared by a **Qualified Environmental Professional** (QEP) with expertise in ecological systems, species selection and growing conditions applicable for the site. A QEP may use their expert knowledge and access various sources of information to produce this plan.

All SPEA Restoration and Enhancement Plans should include, but not be limited to, the following sections:

1.0 Invasive Species

Identify and map the locations and areas of Invasive Species on and adjacent to the development site. Propose a plan to control the invasive species following the best management practices outlined by the Invasive Species Council of Metro Vancouver.

1.0 Native Planting Specifications

All planted species should meet the standards of the BC Landscape Association and guaranteed nursery stock. They should be well-rooted in the container but not root bound. Plants should be healthy and free of disease or insect damage. All plants should be checked upon delivery, and those that do not meet the most recent Landscape Standards should be returned to the nursery.

Planting should be completed at high densities, especially in sites with invasive plant infestations, to help prevent the re-establishment of invasive species and reduce risk of erosion. Triangular spacing should be used, placing plants in staggered rows to form an equilateral triangle. This method increases the number of plants that can be fit into an area and provides a more natural growth pattern.

Plant survivability is related to the size of the plant, and the site conditions (soil moisture and nutrient availability) during the growing season. The following minimum stock requirements for plants should be used for all restoration plans. Some sites may require higher or lower densities depending on site conditions. For sites where a high percentage of native species already exist, lower density may be acceptable. For sites where there are aggressive invasive plant species (e.g. knotweed, dense Himalayan blackberry, or reed canary grass), taller trees (>1.5 m) or tall shrubs can be planted at higher densities than recommended.

Table 1. Shows the recommended specifications for plants chosen or SPEA restoration projects

Plant Type	Minimum Size	Minimum Height	Recommended Spacing
Ferns	#1 pot	>0.3 m	1 m
Shrubs	#1 pot	>0.5 m	1 m
Trees	#5 pot	>1.2 m	5 m
Tree Bylaw Replacement Deciduous Trees	5-6cm in Diameter		
Tree Bylaw Replacement Conifers		2m	

2.0 Plant Selection

A Restoration and Enhancement Plan can also informed by the Planting List provided in Appendix 1.

a) A minimum of 50% of trees and shrubs planted should be fruit-bearing species
b) Coniferous trees should comprise not less than 10% nor more than 25% of the tree stock planted.

3.0 Planting Required Replacement Trees in the SPEA

The Burnaby Tree Bylaw is applied to the removal and replacement of trees. Any replacement trees identified by the Tree Bylaw can be planted in the SPEA restoration area. Replacement trees are generally larger in size, note the larger size requirements in Table 1. Replacement trees need to be identified in a planting plan drawing, and a security will be collected by the Building Department to ensure their installation.

4.0 Planting Plan Drawing

Include a drawing of the planting plan describing the locations, numbers and species selection. This plan is to be compatible with black and white printing as required by the Land Titles Office, therefore the use of shapes, numbers or icons to distinguish between species is preferred. This drawing should highlight any Tree Bylaw replacement trees proposed to be planted in the SPEA.

5.0 Creating Habitat for Wildlife

Some sites may require restoration measures to create habitat for a target species. These may include installation of large woody debris, wildlife trees, nest boxes or bat roosts. The restoration plan should clearly specify what habitat enhancements are required (if any). Often, large woody debris can be sourced from tree removals from within the development site or mossy rocks and herbs can be salvaged from the development site to help 'seed' the restored area with native groundcover species.

6.0 Soil Restoration

Healthy soils form the foundation of successful ecological restoration. Once non-native vegetation has been removed, soils should be assessed for structure, nutrient availability, and hydrological function. Restoration may include targeted amendments such as organic nutrient additions, decompaction of compacted soils, and strategic regrading to re-establish natural drainage patterns. These measures support the survival of native plant communities by enhancing root penetration, restoring soil moisture regimes, and creating conditions that promote long-term ecosystem resilience.

(a) A minimum of 30 cm of native topsoil is required for planting success. Soil amendments may be required if soils have been disturbed, compacted, or stripped.

(b) A minimum of 5 cm of wood mulch is recommended to increase moisture retention in soil and suppress invasive regrowth

(c) All imported materials must be clean and free of invasives plant species.

7.0 Slope Stabilization

Slopes adjacent to watercourses can fail due to natural processes or disturbances associated with development, such as clearing and altered drainage. Where slope failures have occurred, restoration interventions can accelerate vegetation recovery and reduce further erosion. Slopes at risk of instability can be reinforced through bioengineering techniques, including the use of live staking, brush layering, and wattle fencing, which help regrade the slope, slow runoff, and establish vegetation. These techniques promote long-term stability while preserving ecological function and improving overall habitat quality.

8.0 Survivability, Monitoring and Maintenance Requirements

The restoration area must be monitored and maintained annually to assess the survivability of plants and invasive plant species coverage. It is recommended that this assessment be conducted in late summer/early fall to highlight the impacts of drought stress.

(a) Maintenance activities must be completed yearly to control invasive plant regrowth and replace any dead plants as required.

(b) Tree survivability must be 100% through the monitoring and maintenance period. All dead trees must notice within each monitoring cycle must be replaced during that cycle and reported on in the annual report.

(c) Shrub survivability must exceed 80%. If shrub mortality exceeds 20%, replanting is required.

(d) Invasive plant species must not make up more than 5% of the site.

At a minimum, maintenance activities shall consist of watering until establishment or installing irrigation, the removal of invasive plants, and the replacement of dead stock.

9.0 Timing of Works

(a) Fall planting (September – November) is recommended for all planting stock. Spring planting (March-April) is possible if a summer irrigation plan is in place. The likelihood of survival is greatest with fall planting due to cooler temperatures and rainfall.

(b) Planting should take place following the end of the last drought period

(c) Planting should occur after invasive plant species have been removed and after soil has been deposited

10.0 Watering and irrigation requirements

(a) All plantings should be watered (if necessary) until root systems are well established. Irrigation or regular watering by truck may be required for some sites.

(b) Appropriate seasonal timing, species selection, and moisture retention may be considered sufficient to ensure survivorship based on QEP recommendations.

11.0 Fencing and Signage Requirements

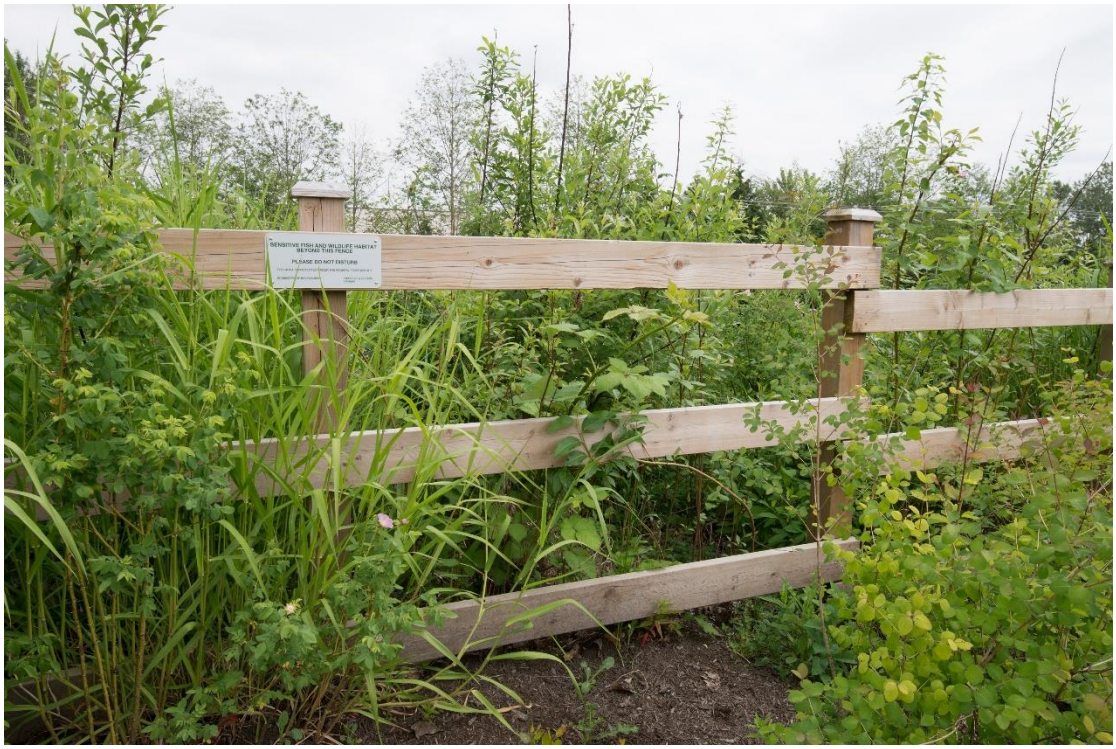

Figure 1. An example of a wood split rail fence with SPEA signage

Permanent fencing is required to protect the SPEA and to prevent encroachment. Below is a list of minimum fencing requirements expected:

(a) Fences must be a minimum of 4 feet tall (1.2 m), or as recommended by QEP.

(b) Fencing type can vary depending on the project site:

(c) Wood split rail fencing is appropriate for most sites.

(d) Chain link fencing can be used, with approval from the City, when trespassing or safety is a concern.

(e) Fencing should allow the wildlife movement and passage, where possible.

(f) Permanent signage should be installed on the fence at 20 m intervals identifying the area "Sensitive Habitat Area, Please Do Not Disturb."

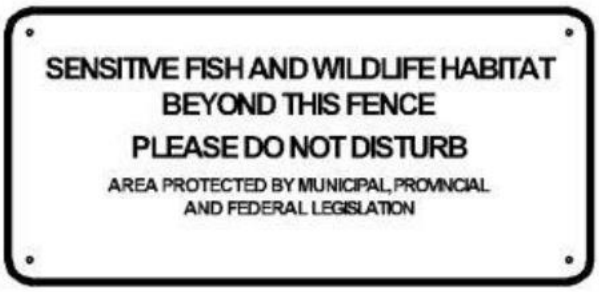

Figure 2. Sample text for SPEA fence signage

12.0 SPEA Security Cost Estimates and Refunds

Security is required for restoration plans. The restoration plan must include a cost estimate for security purposes. The cost estimate should include the following information, as applicable, itemized and grouped accordingly,

Security for the Restoration and Enhancement Plan under the Streamside Protection and Enhancement Development Permit The amount of security is to be based on a cost estimate prepared by a qualified environmental professional to implement the restoration and enhancement plan and the monitoring and maintenance plan. The cost estimate will be the sum of estimated costs for the following line items, as applicable:

12.1 Site preparation and plant installation

Site preparation

- invasive species removal
- grading
- temporary Erosion and Sediment Control (materials and labour)
- soil preparation/amendment (materials and labour)

Planting

- Materials: plants, growing medium, tree supports, beaver fencing, etc.
- Labour (installation, including supervision/direction by Registered Professional Biologist)

12.2 SPEA Fencing and Pathways (if applicable)

- Materials
- Labour

12.3 Monitoring and Maintenance

- Monitoring (labour)
- Maintenance (labour)
- Plant replacement (materials and labour)
- Annual reporting

The amount of security will be equivalent to estimated cost set forth in the cost estimate plus contingency (125%).

12.4 SPEA Security Refunds

Upon City acceptance of initial landscape installation, and annual Monitoring and Maintenance. Report, the following amounts will be refunded:

(a) 40% of the SPEA security upon inspection and approval of invasive species removal, plant and permanent fencing installation.

(b) 60% of the SPEA security will be held back and refunded in equal annual increments over the total monitoring period. (i.e. 40% in year 0, 1/5 of 60% at the end of years 1, 2, 3, 4, 5, etc.).

13.0 Monitoring and Maintenance Plan

A Monitoring and Maintenance Plan will be required as a condition for security release. These plans should address each of the following components:

13.1 Duration for Monitoring and Maintenance

The duration of monitoring and maintenance depends on the site and project and may range from 3 to 10 years.

(a) A minimum of 3 years is generally applied to smaller/simpler sites and projects including those in the R1 residential zoning district.

(b) A minimum of 5 years is generally applied to larger and more complex sites, including habitat compensation projects as previously authorized by DFO and for development in zoning districts excluding R1.

(c) A minimum of 10 years may be required in special cases to establish a higher standard or address specific challenges or opportunities.

13.2 Monitoring Methods and Performance Indicators

Specific goals should be stated for plant survival (e.g. 100% for trees, 80% for shrubs), and other indicators to measure success. Depending on the site, this may include:

(a) Vegetation monitoring plots.

(b) Photopoint monitoring from established repeatable locations.

(c) Percent cover measurement/estimation (bare soil, weeds, native plants).

Figure 3. Example of a photopoint monitoring site in Burnaby that shows the changes over a three-year monitoring period. Photo credit: Jacqueline Shaben

13.3 Description of Maintenance Activities

Typical maintenance consists of repair of any structures (e.g. tree stakes, beaver fencing, in-stream works), invasive species/weed removal, watering and replacement of any failed plantings.

13.4 Frequency of Monitoring and Maintenance Activities

Frequency should be appropriate for the site and conditions. Inspection, monitoring and maintenance should occur more frequently in the first 2 years to ensure good establishment of plantings, several times over the growing season. A schedule should be included in the plan.

13.5 Reporting

An annual report is required to be submitted to the attention of Environmental Planning via email to ecoplanning@burnaby.ca or uploaded via the City's online permitting portal, before the end of each fiscal year. The report should include documentation of results of monitoring, addressing the above components and including details regarding activities undertaken and level of effort, description of conditions/status/health of restored area, and include supporting photographs.

14.0 Additional Approvals

Projects may require additional senior government approvals (such as the Water Act, Contaminated Sites requirements, Canadian Environmental Assessment Act Approvals). It is the proponents' responsibility to comply with all provincial and federal legislation and to complete all relevant notifications.

15.0 Sign-off on the Restoration and Enhancement Plan

A QEP must certify the content of the Restoration and Enhancement Plan. The plan, once submitted, will be attached as a schedule in the combined Section 219 SROW and registered on title.

Appendix 1

Recommended Plants for Restoration and Enhancement Plans

The below tables are a list tree, shrub, and herbaceous species that are recommended for riparian restoration. Species highlighted in red denote a culturally significant vegetation identified by the Squamish Nation through the engagement process for the Burnaby 2050 Official Community Plan.

Species Name	Common Name	Light Conditions	Moisture Requirements	Max Height (m)	Fruits/Nuts	Climate Adaptation
Evergreen/Coniferous Trees						
Abies grandis	Grand fir	Full Sun	Moist, Fresh, Dry	80.00	No	Marginal
Arbutus menziesii	Arbutus	Full Sun, Part Shade	Moist, Fresh, Dry	30.00	Fruit	Very Suitable
Picea stichensis	Sitka spruce	Full Sun	Wet, Moist, Fresh	70.00	No	Marginal
Pinus contorta var. contorta	Shore pine	Full Sun	Wet, Moist, Fresh, Dry	30.00	No	Very Suitable
Pinus ponderosa	Ponderosa pine	Full Sun	Fresh, Dry	40.00	No	Very Suitable
Pseudotsuga menziesii	Douglas-fir	Full Sun	Fresh, Dry	90.00	No	Suitable
Taxus brevifolia	Western Yew	Part Shade	Moist	15.00	Fruit	Suitable
Thuja plicata	Western redcedar	Part Shade	Wet, Moist	60.00	No	Marginal
Tsuga heterophylla	Western hemlock	Full Sun, Part Shade, Full Shade	Moist, Fresh	60.00	No	Marginal
Deciduous Trees						

Acer circinatum	Vine maple	Part Shade, Full Shade	Moist, Fresh, Dry	7.00	No	Marginal
Acer glabrum	Douglas maple	Full Sun, Part Shade	Moist, Fresh, Dry	10.00	No	Unknown
Acer macrophyllum	Bigleaf maple	Full Sun, Part Shade	Moist, Fresh, Dry	35.00	No	Marginal
Alnus rubra	Red alder	Full Sun, Part Shade	Wet, Moist, Fresh, Dry	25.00	No	Suitable
Betula papyrifera	Paper birch	Full Sun	Wet, Moist, Fresh	30.00	No	Marginal
Cornus nuttallii	Flowering Dogwood	Part Shade	Moist, Fresh	20.00	Fruit	Marginal
Crataegus douglasii	Black hawthorn	Full Sun	Moist, Wet	7.00	Fruit	Suitable
Malus fusca	Pacific Crab Apple	Full Sun	Wet	12.00	Fruit	Marginal
Populus balsamifera	Black cottonwood	Full Sun	Wet, Moist	50.00	No	Marginal
Populus tremuloides	Trembling Aspen/Poplar	Full Sun	Wet, Moist, Fresh	35.00	No	Marginal
Prunus emarginata	Bitter cherry	Part Shade	Wet, Moist, Fresh	15.00	Fruit	Suitable
Quercus garryana	Garry oak	Full Sun	Dry	25.00	Nut	Very Suitable

Shrubs

Species Name	Common Name	Light Conditions	Moisture Requirements	Max Height (m)	Fruits/Nuts
Amelanchier alnifolia	Saskatoon berry	Full Sun, Part Shade	Dry	0.66	Fruit
Arctostaphylos uva-ursi	Bearberry/kinnickinick	Full Sun	Dry	0.20	Fruit
Cornus sericea	Red-osier dogwood	Full Sun, Part Shade	Wet, Moist, Fresh	6.00	Fruit
Corylus cornuta	Beaked hazelnut	Full Sun, Part Shade	Moist, Fresh	3.00	Nuts
Gaultheria shallon	Salal	Part Shade, Full Shade	Moist, Fresh, Dry	3.00	Fruit
Holodiscus discolor	Oceanspray	Full Sun	Fresh, Dry	4.00	No
Lonicera ciliosa	Western honeysuckle	Full Sun, Part Shade	Moist, Fresh, Dry	6.00	Fruit
Lonicera involucrata	Black twinberry	Full Sun, Part Shade	Wet, Moist, Fresh	5.00	Fruit
Mahonia aquifolium	Tall Oregon grape	Full Sun	Fresh, Dry	2.50	Fruit
Mahonia nervosa	Dull Oregon grape	Part Shade	Fresh, Dry	0.60	Fruit
Oemleria cerasiformis	Osoberry	Full Sun, Part Shade	Moist, Fresh	5.00	Fruit
Oplapanax horridus	Devil's club	Part Shade, Full Shade	Wet, Moist	3.00	Fruit
Philadelphus lewisii	Mock orange	Full Sun	Fresh, Dry	3.00	No
Physocarpus capitatus	Pacific ninebark	Full Sun	Wet, Moist	4.00	No
Ribes bracteosum	Stink currant	Part Shade	Wet, Moist	3.00	Fruit
Ribes sanguineum	Red-flowering currant	Full Sun	Fresh, Dry	3.00	Fruit
Rosa gymnocarpa	Baldhip rose	Full Sun, Part Shade	Fresh, Dry	1.50	Fruit
Rosa nutkana	Nootka rose	Full Sun	Fresh, Dry	1.50	Fruit

Rubus leucodermis	Blackcap raspberry	Full Sun	Moist, Dry	2.00	Fruit
Rubus parviflorus	Thimbleberry	Full Sun	Moist, Fresh, Dry	2.50	Fruit
Rubus spectabilis	Salmonberry	Part Shade	Wet, Moist, Fresh	4.00	Fruit
Rubus ursinus	Trailing blackberry	Full Sun, Part Shade	Moist, Fresh, Dry	0.50	Fruit
Salix Sp	Willow (Pacific, Scouler, Sitka)	Full Sun	Wet, Moist, Fresh	20.00	No
Sambucus cerulea	Blue elderberry	Full Sun	Wet, Moist, Fresh, Dry	5.00	Fruit
Sambucus racemosa	Red elderberry	Full Sun, Part Shade	Moist, Fresh	6.00	Fruit
Sorbus sitchensis	Sitka mountain ash	Full Sun	Moist, Fresh, Dry	4.00	Fruit
Spiraea douglasii	Hardhack	Full Sun	Wet, Moist, Fresh	2.50	No
Symphoricarpos albus	Snowberry	Full Sun, Part Shade	Moist, Fresh, Dry	3.00	Fruit
Vaccinium membranaceum	Black huckleberry	Full Sun, Part Shade	Moist, Fresh, Dry	1.50	Fruit
Vaccinium ovatum	Evergreen huckleberry	Part Shade	Moist	3.00	Fruit
Vaccinium parvifolium	Red huckleberry	Part Shade, Full Shade	Moist, Fresh	4.00	Fruit
Viburnum edule	Highbush cranberry	Full Sun	Moist, Fresh	3.50	Fruit
Ferns					
Adiantum aleuticum	Maidenhair fern	Part Shade	Moist	0.75	No
Athyrium filix-femina	Lady fern	Part Shade, Full Shade	Wet, Moist, Fresh	1.80	No
Blechnum spicant	Deer fern	Part Shade, Full Shade	Wet, Moist, Fresh	0.60	No
Dryopteris expansa	Spiny wood fern	Part Shade, Full Shade	Moist, Fresh	0.70	No

Gymnocarpium dryopteris	Oak fern	Part Shade	Moist, Fresh	0.25	No
Polypodium glycyrrhiza	Licorice fern	Part Shade	Moist, Fresh	0.60	No
Polystichum munitum	Sword fern	Full Sun, Part Shade, Full Shade	Moist, Fresh	1.50	No
Pteridium aquilimun	Bracken fern	Full Sun, Part Shade	Wet, Moist, Fresh	1.70	No
Perennials					
Achillea millefolium-	Yarrow	Full Sun	Dry	1.00	No
Achlys triphylla	Vanilla leaf	Part Shade	Moist, Fresh	0.30	No
Anaphalis margaritacea	Pearly Everlasting	Full Sun	Dry	0.90	No
Aruncus sylvestris	Goatsbeard	Part Shade, Full Shade	Moist, Fresh	2.00	No
Asarum caudatum	Wild Ginger	Part Shade, Full Shade	Moist, Fresh	0.10	No
Aster subspicatus	Douglas aster	Full Sun	Moist, Fresh, Dry	1.00	No
Camassia quamash	Common camas	Full Sun	Moist	0.70	No
Cornus canadensis	Bunchberry	Part Shade	Moist, Fresh	0.25	Fruit
Dicentra formosa	Pacific bleeding heart	Full Sun, Part Shade, Full Shade	Moist, Fresh	0.45	No
Epilobium angusstifolium	Fireweed	Full Sun	Fresh, Dry	3.00	No
Eriophyllum lanatum	Wooly sunflower	Full Sun	Dry	0.60	No
Fragaria vesca	Woodland strawberry	Full Sun, Part Shade	Fresh, Dry	0.12	Fruit
Gaillardia aristata	Blanket flower	Full Sun	Dry	0.70	No
Grindelia stricta	Coastal gumweed	Full Sun, Part Shade	Dry	0.80	No

Heuchera cylindrica	Roundleaf alum root	Full Sun, Part Shade	Fresh	0.90	No
Maianthemum dilatatum	False lily-of-the-valley	Part Shade, Full Shade	Moist, Fresh	0.35	Fruit
Maianthemum stellata	Star flowered solomon's seal	Full Sun, Part Shade	Moist	0.60	Fruit
Penstemon serrulatus	Coast penstemon	Full Sun	Moist	0.70	No
Prosartes hookeri	Hooker's fairybells	Full Shade	Moist	1.00	Fruit
Sedum divergens	Spreading stonecrop	Full Sun	Dry	0.15	No
Sedum oreganum	Oregon stonecrop	Full Sun	Moist, Fresh, Dry	0.15	No
Sedum spathulifolium	Broad-leaved stonecrop	Full Sun	Moist, Fresh, Dry	0.22	No
Solidago canadensis	Goldenrod	Full Sun	Moist, Fresh, Dry	2.00	No
Tellima grandiflora	Fringecup	Part Shade	Moist, Fresh	0.80	No
Tiarella trifoliata	Three leaved foamflower	Part Shade	Moist	0.50	No
Tolmiea menziesii	Piggy back plant	Part Shade, Full Shade	Moist, Fresh	0.80	No
Urtica dioica	Stinging Nettle	Part Shade, Full Shade	Moist	0.3	No
Viola glabella	Stream violet	Full Shade	Moist	0.30	No
WET SITES - Sedges, rushes and others					
Carex obnupta	Slough sedge	Full Sun	Wet, Moist, Fresh	1.50	No
Equisetum hyemale	Scouring-rush	Full Sun, Part Shade	Wet	1.20	No
Juncus effusus	Common rush	Full Sun	Wet	1.20	No
Ledum groenlandicum	Labrador tea	Full Sun	Wet, Moist	1.50	No
Lysichiton americanus	Skunk cabbage	Part Shade	Wet, Moist	0.70	No

Myrica gale	Sweet gale	Full Sun	Wet, Moist	2.00	Fruit
Sagittaria latfolia	Wapato	Part Shade	Wet	0.90	No
Scirpus microcarpus	Small-flowered bulrush	Full Sun	Wet	1.50	No
Typha latifolia	Cattail	Full Sun	Wet	3.00	No

Appendix 2

Specific Soil Requirement for Trees

Species Name	Common Name	Soil Volume m3 (min per tree)
Abies grandis	Grand fir	25
Acer circinatum	Vine maple	10
Acer glabrum	Douglas maple	10
Acer macrophyllum	Bigleaf maple	55
Alnus rubra	Red alder	35
Arbutus menziesii	Arbutus	35
Betula papyrifera	Paper birch	10
Cornus nuttallii	Flowering Dogwood	20
Crataegus douglasii	Black hawthorn	10
Malus fusca	Pacific Crab Apple	10
Picea stichensis	Sitka spruce	35
Pinus contorta var. contorta	Shore pine	20

Pinus ponderosa	Ponderosa pine	20
Populus balsamifera	Black cottonwood	35
Populus tremuloides	Trembling Aspen/Poplar	10
Prunus emarginata	Bitter cherry	20
Pseudotsuga menziesii	Douglas-fir	55
Quercus garryana	Garry oak	55
Taxus brevifolia	Western Yew	10
Thuja plicata	Western redcedar	55
Tsuga heterophylla	Western hemlock	55