



King County

Department of Permitting and Environmental Review

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Critical Areas: Restoration & Enhancement in King County

Understanding the process & technical assistance in preparing a plan

For alternate formats, call 206-296-6600.

This document is intended to assist property owners in the restoration or enhancement of critical areas and their buffers. It includes instructions on the process and procedural steps (Section I) as well as technical assistance in designing a restoration plan (Section II).

These guidelines are **only** for minor projects, typically on single-family home lots. If the project involves grading, water control structures, critical fish or wildlife areas, slopes greater than 40 percent, covers more than 2,500 square feet, involves removal of more than 100 cubic yards of fill, involves wetland creation, or has other complex components, restoration or enhancement is typically guided by the Department of Permitting and Environmental Review (Permitting) publication, *Critical Area Mitigation Guidelines*.

SECTION I: UNDERSTANDING THE PROCESS

This section explains the process that you will be required to follow to either obtain a valid building, clearing or grading permit or to resolve a code enforcement case.

Frequently Asked Questions

Why am I required to prepare a restoration or enhancement plan?

The county may require this for several reasons. Common situations include:

- As part of a permit application, you are proposing to do buffer averaging under King County Code (KCC) 21A.24.325. To qualify for this, you must increase the functions of the remaining buffer;
- You are proposing to reduce a buffer from the standard width through the alteration exception process;
- You are applying for a restoration permit to enhance a wetland, stream or associated buffer;
- Your proposal involves some stream or wetland buffer impact due to a driveway crossing; or
- A code violation, such as clearing, grading or filling within a wetland, stream or associated buffer has been identified on your parcel.

Restoration and enhancement projects are a mechanism to restore critical areas that are proposed to be, or have been, lost in order to fulfill the requirements of KCC 21A.21. This portion of the KCC calls for protection of the natural environment and the public health and safety.

What are the steps in this process?

- A. Work with the King County senior ecologist to determine what steps are necessary and to get ideas for the restoration or enhancement plan.
- B. Complete restoration or enhancement plan (see Section II of this document for instructions). The completed plan will consist of a report and illustrations showing the planting plan and associated details.
- C. Complete Bond Quantity Worksheet. This worksheet establishes the bond amount discussed in Item F. in this section of this document.

- D. Submit completed plan and Bond Quantity Worksheet to the King County staff person with whom you are working.
- E. County staff will review the plan and respond. The county may require modifications to the plan or documentation of the plan to ensure that it is in compliance with KCC
- F. Make changes or corrections as request by the county; resubmit plan.
- G. Post bond. After King County approves the mitigation or restoration plan, the county will usually require a bond or financial guarantee. The purpose of this bond is to provide funds for the county to complete the project should the owner fail to do so. For this reason, the cost of the bond is not calculated based on what it will cost you to install the project but is instead based on what it would cost the county. More information on financial guarantees is provided in Permitting Customer Information Bulletin #40, *Financial Guarantees*, available online via the Permitting Web site at www.kingcounty.gov/permits, at the Permitting Service Center, or by calling 206-296-6600. The King County ecologist who is working with you will initiate the paperwork for a financial guarantee after he or she has approved your mitigation or restoration plan. You will then receive notification from the county on how to post the bond.
- H. Record Critical Areas Notice on Title. You will be required to file a Notice on Title with the King County Office of Records and Elections prior to permit approval to record the presence of critical areas and their buffers on your property. The Notice on Title provides a public record of the critical areas and associated development restrictions and is a requirement of the Zoning Code (KCC 21A.24.170). County staff will provide forms and specific instructions for recording the Notice on Title after the extent of critical areas and their buffers are established.
- I. Arrange for the site inspection. After installation of the mitigation plan, an on-site inspection will be conducted by King County staff.
- J. Conduct monitoring. Monitoring of the mitigation area will be required for a period of three to five years per KCC 21A.24.130A. Monitoring reports shall be provided to the department according to a schedule set forth in the approved mitigation plan.
- K. Complete contingency. Where monitoring reveals a significant deviation from performance standards, you will need to implement an approved contingency plan submitted per KCC 21A.24.034C. The contingency plan constitutes new mitigation and is subject to all mitigation and financial guarantee requirements including, but not limited to, monitoring for a period of up to five years.

Who will do the work?

After King County has approved your plan, it will be your responsibility to either do the work yourself or contract it out. Your permit will specify a deadline for installation. In the case of a building permit, your certificate of final occupancy may be contingent on installation of the restoration project.

Who will do the monitoring?

As described in Item J above, monitoring will be required. This can be conducted by a knowledgeable landowner following the instructions provided in this document or by a consultant. King County staff will review annual report submittals and conduct a final site visit to verify conditions and insure that performance standards are met. Be aware that your bond will not be returned if the performance standards have not been met by the end of the monitoring period, so it is to your benefit to accurately monitor the site and perform corrective actions as needed.

I have never done this sort of thing before. What are some resources for me to use?

The following list of resources may be helpful as you prepare your restoration or enhancement project:

Permitting staff. The Permitting staff person assigned to your project can assist you with general suggestions of a location for the mitigation, plant species to use, and other general concepts. Be aware, however, that you will be billed hourly for staff time.

Consultant. Some landowners choose to hire a consultant to prepare the mitigation plan. For a list of Permitting Preferred Consultants, visit the Permitting Web site at www.kingcounty.gov/permits/. You can also refer to the Yellow Pages under "Wetlands Consultants" or "Environmental & Ecological Services." When interviewing potential consultants, be sure to ask about their experience with other similar projects, and get a clear understanding of what you can expect for your money.

Nurseries. A list of plan nurseries is provided in Appendix A. Staff at these nurseries is a wealth of information on the plants: what to plant where, how it will look, how to care for it, etc.

Books. Useful references about native plants and wetlands include:

Cooke, Sarah Speare. 1997. *A Field Guide to the Common Wetland Plants of Western Washington & Northwestern Oregon*. Seattle Audubon Society.

Guard, Jennifer. 1995. *Wetland Plants of Oregon and Washington*. Redmond, WA. Lone Pine Publishing. Excellent photos for field identification of aquatic and wetland plants.

Pojar, Jim and Andy Mackinnon. 1994. *Plants of the Pacific Northwest Coast*. Redmond, WA. Lone Pine Publishing. Extensive information and photographs of native plants.

Internet. The Internet is an excellent resource for information on native plants, wetlands, and restoration. Because Web sites change so frequently, specific sites are not listed here. However, the King County Web site <http://dnr.metrokc.gov/wlr/cposa/shrp/> offers links to other useful sites.

I am supposed to install Critical Area signs. Where do I get these?

Critical Area signs are available for purchase at the Permitting Services Center. Price depends on current supply cost. Please inquire at the cashier station.

What if I sell my property?

As permit applicant and bondholder of your critical area mitigation project, it is very important you understand the full responsibilities related to the permit and bond. Under the approved permit and mitigation bond, the bondholder is held responsible for maintenance, monitoring and success of the mitigation project throughout the bond monitoring period (three to five years) even if the property is sold. Under the sale of the property, arrangements should be made for access to the mitigation area for maintenance, monitoring and inspections unless transfer of the bond obligation occurs.

If the new property owner is to assume the responsibility for the restoration/enhancement plan, then the new property owner shall post a replacement bond for the remaining duration of the monitoring period. Once the replacement bond is in place, your existing bond can be released and the responsibility of the success of the mitigation project will shift to the new property owner. As original property owner and permittee, it is your responsibility to provide adequate documentation and education to the new owner as to the monitoring responsibilities associated to the permitted mitigation project.

Contact the King County Financial Guarantee Management Unit (call 206-296-6600 or e-mail fgmu.ddes@kingcounty.gov) who will assist you in the process of establishing the replacement bond and preparing the associated paperwork for transfer. Contact the Critical Areas Section at 206-296-6600 to notify

them of the completed transfer to ensure that the monitoring, maintenance, inspections and bond release approvals are tracked under the new owner.

SECTION II: TECHNICAL ASSISTANCE IN CREATING A PLAN

This section provides information on how to prepare and document a simple restoration plan, including how to determine the impacts, number and types of plants to use, how to prepare a basic planting plan, and how to monitor and maintain the project. It is divided into two parts; the first describes what must be included in a report, and the second describes how to develop the actual planting plan. The planting plan is part of the report, however, so these two steps are not strictly linear.

Step 1: Report Preparation

Unless the Permitting staff person with whom you are working specifically indicates that no report is needed, the first step in the process is to prepare a report describing the proposed project. The purpose of the report is to document the site conditions, anticipated conditions, rationale for what is proposed, and details about how it will be accomplished. You may wish to hire a consultant to complete this. The following sections must be included:

- A. General Information/Background.** This must include the location of the parcel, site location map, and a brief description of the proposed project.
- B. Summary of Existing Conditions.** This section must provide an overall description of the site and a more detailed description of the resource(s) that will be impacted, including Coward in classification (Permitting will identify this for you), acreage, vegetation, etc. Often this can be extracted from an existing critical area report.
- C. Impact Analysis.** Describe the reason for the proposed impact. Summarize the square-footage of the impact, separated by habitat type. Permitting staff will assist you with determining the habitat types. A table is a useful way to portray this. See the example in Table 1 below.

Table 1. Example of Impact Study

HABITAT TYPE	AREA OF IMPACT (SQ. FT.)
Forested wetland	700
Forested buffer	1,005

- D. Proposed Mitigation.** Briefly summarize the mitigation concept. For example, "Revegetate XX square feet that was cleared without permits with native tree and shrub species." This initial concept must be discussed with the Permitting staff person reviewing your permit prior to report preparation. This will avoid unnecessary work.
- E. Mitigation Goals.** This section lists the goals of the project. As you develop goals, keep in mind that the success or failure of the project will be determined based on whether or not these goals are met. Simple, achievable goal statements are most useful. Keep in mind that if the goals are not met, you may lose your bond or be required to perform contingency measures at your expense. See Table 2 for examples of goals that may be appropriate for your site.
- F. Performance Standards.** Performance standards are the very specific criteria by which one can measure whether or not the goals have been met. It is critical to have very specific performance standards so that it is clear when the project is successful, or when a contingency action should be undertaken. A specific performance standard must be developed for each goal. Each performance standard must have a specific monitoring component that is designed to evaluate whether the particular performance standard has been met. In addition, each performance standard should have a list of specific contingency actions (i.e., actions that could be undertaken to correct the problem). Table 3 in this document offers a list of performance standards from which you may select. Permitting staff will assist you with identifying appropriate performance standards for your site.

Table 2. Examples of Goals with Associated Performance Standards, Monitoring and Contingency Actions

GOAL	PERFORMANCE STANDARD¹	MONITORING ACTION²	POSSIBLE CONTINGENCY ACTIONS³
Stabilize soils in disturbed area	1	Point-intercept sampling	<ul style="list-style-type: none"> • Install additional plants • Seed with groundcover • Mulch
Replant disturbed area with native species	2, 6, 7	Examination and counting of all planted specimens for survival and vigor	<ul style="list-style-type: none"> • Replace missing or dead plants • Install plants more suited to site conditions • Remove invasive species
Enhance XX square feet of buffer/wetland	2, 3, 6, 7	Delineation/mapping of restoration area	<ul style="list-style-type: none"> • Install additional plants • Amend soils • Irrigate • Fence from deer
Hydrology will be adequate to support a predominance of wetland plants	4	Point-intercept or line-intercept sampling of vegetation	<ul style="list-style-type: none"> • Install additional plants • Modify inlet/outlet* if appropriate • Regrade* if appropriate <p>* Note: These actions may require a permit from King County.</p>
Replace the area of buffer that will be lost at a XX:XX ratio	2, 5, 6, 7	Delineation/mapping of restoration area	
Provide a dense visual barrier between residence and wetland	6, 7	Line-intercept sampling of vegetation	<ul style="list-style-type: none"> • Install additional plants • Amend soils • Irrigate • Fence from deer

¹ See Table 3. Examples of Performance Standards for description of each number.

² See Appendix C, Monitoring Protocol, for details on monitoring methods and data forms

³ If contingency actions become necessary, approval by Permitting staff is required. (Note that monitoring period may exceed three years.)

Table 3. Examples of Performance Standards

NUMBER⁴	PERFORMANCE STANDARDS
1	Percent of bare ground will not exceed 15% at any time after completion of planting during the three-year period.
2	80% of planted specimens will be surviving at the end of three years
3	After installation of the project, the restored area will measure at least XX square feet in size.
4	By the end of Year 3, greater than 50% of the cover at the site will be offered by species that are listed as facultative, facultative wet, or obligate according to the most current version of the <i>National List of Plant Species that Occur in Wetlands: Northwest (Region 9)</i> (Reed, 1988).
5	After installation of the project, the restored area will measure at least XX square feet in size.
6	Tree and shrub cover will be greater than 10% after one year, greater than 20% after two years, and greater than 35% after three years. Non-invasive native volunteer species can be included in the overall percent cover.
7	Non-native invasive plants will not make up more than 10% cover in any growing season.

G. Planting Plan. Include the planting plan. Preparation of the planting plan is described under Step 2 of this section of this document.

H. Approach. This section describes how the mitigation plan will be accomplished. Subsections may include the following:

Site Preparation. Describe any work that will be necessary before installing plants. As applicable, describe minor grading, removal of invasive species, amending the soil with compost, etc. (Note: If the plan requires extensive grading, use the Critical Area Mitigation Guidelines. These basic restoration guidelines are for small, simple restoration projects.)

Plant Procurement. This section of the report indicates where the plants will be obtained. Plants that are proposed must be available commercially from local sources. Appendix A provides a list of nurseries that specialize in native plants.

Planting. This section provides instruction on planting, including methods, timing, and any unique instructions. Items to consider and include in this section include:

- Method for removing existing weedy (non-native, invasive) species to prepare for planting;
- Methods for protecting existing native vegetation during planting; and
- Mulching within the dripline of new trees and shrubs with weed-free compost or other mulch.

Inspection and Maintenance. This section describes any post-planting inspections and maintenance actions (such as irrigation or weeding) that will occur to ensure the success of the project.

Monitoring. This section will include a specific monitoring plan. A method of monitoring for compliance of each performance standard will be required by King County (see Appendix C), as well as a schedule for reporting. Use Table 2 to determine which monitoring items will be required for your project.

⁴ Numbers in this column are referred to in the second column of Table 2.

Contingency Plan. A contingency plan involves carefully identifying the likely causes of failure of the mitigation project and identifying corrective actions that will be taken. Although it is not possible to forecast all of the possible situations that could occur, many projects fail for obvious reasons, such as too little water, infestation by non-native, invasive species (such as Himalayan blackberry or reed canary grass), overgrazing by deer, or inadequate soils. Refer to the examples provided in Table 2.

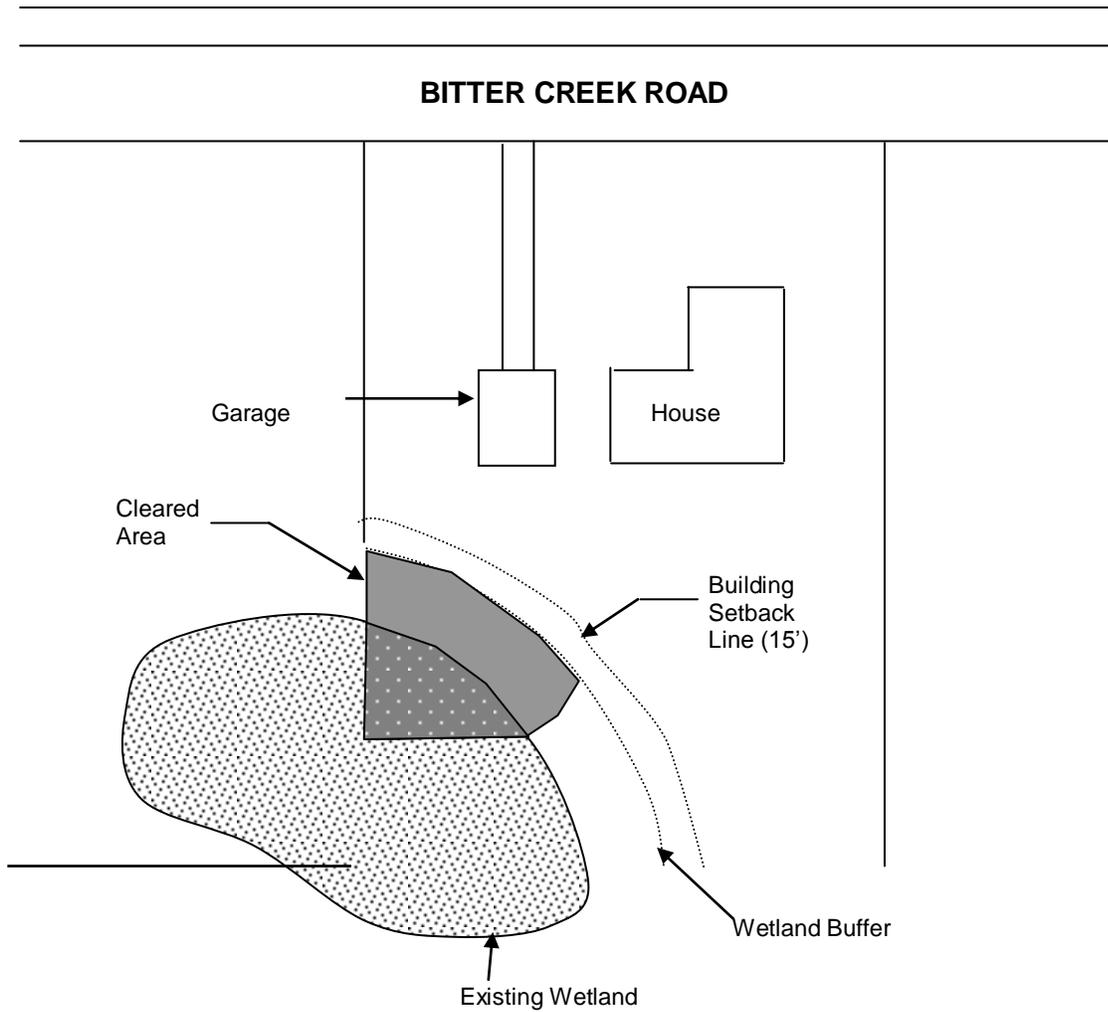
Step Two: Design

The following sections describe how to prepare the actual planting plan.

Site Plan. (See Figure 1 for an example.) Prepare a site plan using an assessor's map or other base map. Provide:

- a North arrow;
- map scale;
- nearest street names;
- location of existing or proposed improvements, if any, including house, barn, garage, driveway, septic system, well, fences, large trees, sidewalks, and any other structures or improvements;
- approximate location of the critical area(s);
- buffer, and
- mitigation area.

EXISTING CONDITIONS MAP



NORTH

SCALE: 1" = 100'

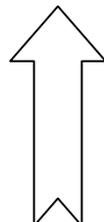


Figure 1

Planting Plan. (See Figure 2 for an example.) Draw on the site plan the location of the plants in natural, randomized clusters. Prepare a second site map with a larger scale for this purpose. The planting plan will consist of a map and a plant schedule showing the proposed location of each plant, the species, quantities, spacing, size and condition. The scale for the planting plan shall not be greater than 1" = 20".

Select appropriate native plants that will allow you to address the goals of the mitigation plan. Refer to detailed explanation under the Design section in this document. See Appendix B for guidance in selecting appropriate native plants for your area. To determine which plants to include, try to match the native plant community in other undisturbed similar areas nearby.

Calculate the number of plants required using the following formula:

Determine the total area to be restored or enhanced in square feet. Multiply the restoration/enhancement area by the following numbers to calculate the total number of plants required for the site (minimum figures):

Trees	0.012 per square foot (9-foot on center)
Shrubs	0.028 per square foot (6-foot on center)
Herbs/groundcover	0.25 per square foot (assumes 4" pot) 2-foot on center

Note: List the goals, construction notes and performance standards on the planting plan. If fencing or critical area signs will be required for your project, show these on the site plan.

Step Three: Site Preparation and Planting

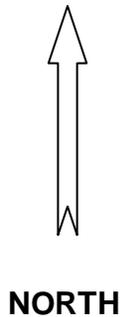
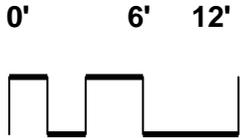
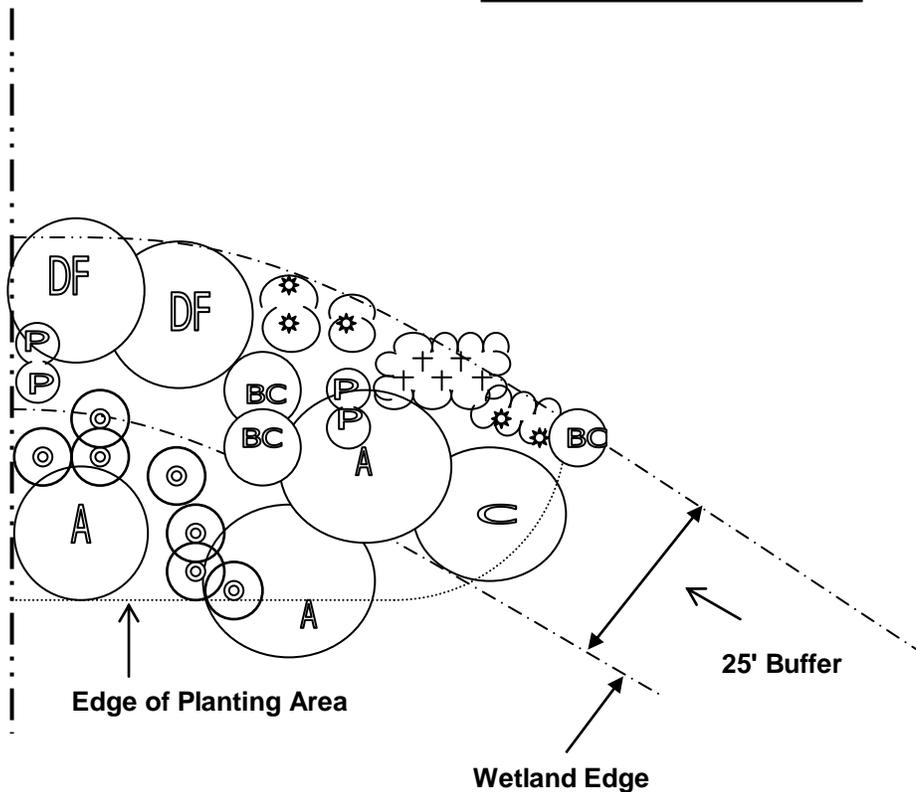
After the county has approved your project, you may install it per the description provided in the report. If you plan to do the work yourself, you will want to be educated on planting methods. The nursery where you purchase the plants will be able to provide this information. The best times to plant trees and shrubs are fall, winter (bare root), and early spring.

Plant substitutions must be approved by the King County Permitting Senior Ecologist.

Step Four: Inspection

After the project has been installed, contact the senior ecologist whom you have been working with to request inspection of planting.

PLANTING PLAN



Goal

To restore disturbed portion of wetland and buffer with native vegetation

Performance Standards

- Percent bare ground will not exceed 15 percent at any time after completion of planting during the three-year period.
- Eighty percent of planted specimens will be surviving at the end of three years.
- Non-native invasive plants will not make up more than 10 percent cover in any growing season.

Plant Schedule				
Symbol	Plant Name	Qty	Size	Spacing
A	Oregon ash (<i>Fraxinus latifolia</i>)	3	2 gal	9' on center
C	western red cedar (<i>Thuja plicata</i>)	1	2 gal	9' on center
DF	Douglas fir (<i>Pseudotsuga menziesii</i>)	2	1 gal	9' on center
⊙	red-osier dogwood (<i>Cornus stolonifera</i>)	7	1 gal	4' on center
P	Indian plum (<i>Oemlaria cerasiformis</i>)	8	1 gal	4' on center
⊛	nootka rose (<i>Rosa nootkana</i>)	8	1 gal	4' on center
+	snowberry (<i>Symphoricarpos alba</i>)	8	1 gal	4' on center
BC	bitter cherry (<i>Prunus emarginata</i>)	3	2 gal	9' on center

Figure 2

Step Five: Maintenance

Each site will experience different conditions, and therefore, we cannot predict what, if any maintenance will be required. The following is a list of actions that may be required to insure the success of the project.

- Remove nonnative weeds (Himalayan blackberry, English ivy, Japanese knotweed, Scots broom, reed canary grass, morning glory purple loosestrife) by hand for three to five years after planting. Herbicides or pesticides should not be used in these areas unless you have permission from the senior ecologist. It is not necessary to remove native plants that have volunteered at the site. For more information on noxious weeds, see <http://dnr.metrokc.gov/wlr/lands/weeds/index.htm>.
- Irrigate the site. Plants that are just becoming established typically need an inch of water per week during the growing season. During the dry summer months, irrigation may be necessary. Typically, newly establishing plants will require one inch of water twice a week for the first year and one inch of water once a week for the second year. Deeper, less-frequent watering promotes establishment of deeper roots during the first year. During the second year, plants are gradually weaned from the irrigation by irrigating less.
- Provide fencing to limit deer intrusion while the plants are becoming established.

Step Six: Monitoring

Monitoring is required per the conditions of the approved permit. The purpose of this is to determine whether the site is meeting the performance standards. Typically, the monitoring period lasts for three to five years, as determined by the King County ecologist. The specific performance standards listed in the mitigation report must be met by the end of the monitoring period. When performance standards have been met, the financial guarantee (bond) can be released. Appendix C describes the methods for monitoring each performance standard. This section provides general information on reporting requirements.

Monitoring may be performed either by the applicant or a qualified consultant during the late summer or early fall season (between August 1-September 30, prior to leaf drop). If specific monitoring instructions were not provided in your original report, use Tables 2 and 3 and Appendix C to determine how to monitor the site. Otherwise, monitor in the manner described in the original report.

Under a three-year monitoring program, monitoring will occur annually. Under the five-year monitoring period, monitoring will occur, at a minimum, during years one, three, and five. If problems are identified during any monitoring year, you may wish to monitor during the subsequent year to be sure that problems have abated.

Monitoring reports will be prepared and submitted to King County Department of Permitting one year after installation. However, monitoring must be conducted at some point during the months of April through October. Sections to include in the report are described below. After you have prepared the report once, many of the sections will not change from year to year. However, county staff must receive a complete report each year.

1. Site plan and location maps.
2. Historic description. Describe the general background of the project and pertinent items from the mitigation report that was submitted at the application stage, including:
 - A. Date of installation project
 - B. Current year of monitoring
 - C. Goals of the mitigation plan
 - D. Performance standards
 - E. Monitoring methodology (See Appendix C to determine which methods are required for your site)
 - F. Photographic documentation (photopoints)
 - G. Results of specific monitoring
 - H. Contingency actions (if any)

APPENDIX A

Native Plant Sources for the Pacific Northwest

This list contains those nurseries known to Permitting staff that grow plants native to the Puget lowlands of Western Washington in quantities suitable for most mitigation sites. It was extracted from a longer list compiled by the Water and Land Resources Division (WLRD) of King County for your convenience, drawing in part on the Hortus West native plant directory and journal: Hortus West, P.O. Box 2870, Wilsonville, OR 97070. 800-704-7927. Fax: 503-570-0855. E-mail: editor@hortuswest.com. It is not an endorsement of these businesses. The full list is available from WLRD at 206-296-6519.

Nurseries that specialize in seeds are marked (SEEDS).

Abundant Life Seed Foundation (SEEDS)

P.O. Box 772
Port Townsend, WA 98368
360-385-5660

Barford's Hardy Ferns

23622 Bothell Way
Bothell, WA 98248
Phone: 425-438-0205
Fax: 206-483-0205

Botanica

P.O. Box 19544
Seattle, WA 98109
206-634-1370

Clark's Native Trees and Shrubs

1215 - 126th Avenue SE
Everett, WA 98208
206-337-3976

Cold Creek Nursery

18602 NE 165th Street
Woodinville, WA 98072
425-788-0201

Colvos Creek Farm

P.O. Box 1512
Vashon, WA 98070
206-441-1509

Inside Passage (SEEDS)

P.O. Box 639
Port Townsend, WA 98368
206-781-3575

Davenport Seed Corporation (SEEDS)

P.O. Box 187
Davenport, WA 99122-0187
800-828-8873

Emmery's Gardens

2829 - 164th Avenue SW
Lynnwood, WA 98037
Phone: 425-743-4555
Fax: 425-743-0609

Firetrail Nursery

3107 - 140th Street NW
Marysville, WA 98271
360-652-9021

Frosty Hollow Ecological Restoration (SEED)

P.O. Box 53
Langley, WA 98260
360-579-2332

Heathwood Cottage Nursery

18540 - 26th Avenue NE
Lake Forest Park, WA 98072
206-363-3189

IFA Nurseries, Inc.

463 Eadon Road
Toledo, WA 98591
425-864-2803

Sound Native Plants

P.O. Box 10155
Olympia, WA 98502
Phone: 360-352-4122
Fax: 360-943-7026

J & J Landscape Co.

19538 - 75th NE
Bothell, WA 98011

Judd Creek Wetland and Native Plant Nursery

20929 - 111th Avenue SE
Vashon, WA 98070
206-463-2812

MSK Nursery

20066 - 15th Avenue NW
Seattle, WA 98177
206-546-1281

Northfork Nursery

15751 Polson Road
Mt. Vernon, WA 98273-7142
360-445-4741

Pacific Natives & Ornamentals

P.O. Box 23
Bothell, WA 98041
Phone: 425-483-8108
Fax: 425-487-6198

Revegetate & Resource Plants

17836 Cedar Grove Road
Maple Valley, WA 98038
425-432-9018

Storm Lake Growers

21809 - 89th SE
Snohomish, WA 98290
360-794-4842

Sweet Briar

P.O. Box 25
Woodinville, WA 98072
425-821-2222

Thorsett Landscaping Nursery

13503 Southeast 226th Place
Kent, WA 98042
253-361-5838

Wabash Farms Native Plants

Ornamental and Reclamation
19390 SE 400th
Enumclaw, WA 98022
Phone: 360-825-7051
Fax: 360-825-1949

Weyerhaeuser-Western Revegetation Greenhouse

33405 - 8th Avenue South
Federal Way, WA 98003
800-732-4769

APPENDIX B

Habitat Worksheet

Project Name: _____

Project Number: _____

Location: _____

Contact Name: _____

LIGHT NEEDS*

SI=Shade Intolerant ST=Shade Tolerant
SD=Shade Dependent HA=Highly Adaptable

SITE PLACEMENT**

DB=Drier Buffer WB=Wetter Buffer
WE=Water's Edge SS=Saturated Soils SW=Shallow Water

Habitat requirements derived from: *Flora of the PNW* (Hitchcock & Cronquist); *Plants of the PNW Coast* (Pojar & MacKinnon); Wetland Plants of Western WA (Cooke); Guidelines for Bank Stabilization Projects and Surface Water Design Manual (King County); Proceedings of the Puget Sound Wetlands and Stormwater Management Research Study (9/26/96); and Permitting field observations.

TREES						
Scientific Name	Common Name	Indicator	Max	Light	Site**	Comments
		Status	Ht.	Needs*	Placement	
<i>Abies grandis</i> *	grand fir	FACU-	125	SI-ST	DB	Best conifer for soil binding roots
<i>Acer macrophyllum</i>	big leaf maple	FACU+ [FAC]	100	SI-ST	WB,DB	Seral/sprouter - shallow rooter
<i>Alnus rubra</i>	Red alder	FAC	80	SI-ST	WB,DB	Seral, sprouter & spreader
<i>Arbutus menziesii</i>	Pacific madrone	UPL	80	SI	DB	Likes drier, coastal: slow-grower
<i>Betula papyrifera</i>	paper birch	FACW	80	SI	WE, SS	Saturated soils
<i>Fraxinus latifolia</i>	Oregon ash	FACW	80	SI-ST	WE,SS	Requires flat, damp soils
<i>Picea sitchensis</i> *	Sitka spruce	FAC	230	SI	WE,SS	Wettest conifer
<i>Pinus contorta</i> *	Shore pine	FAC	60	HA	WE,WB,DB	Tolerates poor soil
<i>Pinus monticola</i> *	Western white pine	FACU- [FACW]	120	SI	WB,DB	NOT within 900' of <i>Ribes</i> spp.!
<i>Populus tremuloides</i>	quaking aspen	FAC+	75	SI	DB	Seral in montane
<i>Populus trichocarpa</i>	black cottonwood	FAC	200	HA	WE,SS,WB	Seral; sprouter
<i>Prunus emarginata</i>	bitter cherry	FACU	50	SI	DB	Tree form has heavily pubescent leaves.
<i>Pseudotsuga menziesii</i> *	Douglas fir	FACU	300	SI	WB,DB	Driest conifer-seral, fast grower
<i>Taxus brevifolia</i> *	Pacific yew	NI [FAC-]	80	ST-SD	WB	Very slow growing
<i>Thuja plicata</i> *	western red cedar	FAC	230	SD	SS,WE,WB	Basic to PNW & wetlands
<i>Tsuga heterophylla</i> *	western hemlock	FACU-	200	SD	DB	Dry conifer
All plant prices from Fourth Corner Nurseries, Sound Native Plants, Storm Lake Growers, and Wabash Natives (containers); and Abundant Life and Frosty Hollow (seeds).						

SHRUBS						
Scientific Name	Common Name	Indicator Status	Max Ht.	Light Needs*	Site Placement	Comments
<i>Acer circinatum</i>	vine maple	FAC-	25	SD	WB,DB	Needs canopy shade or lots of moisture.
<i>Amelanchier alnifolia</i>	serviceberry	FACU	20	SI	DB	Edge-loving
<i>Berberis aquifolium</i>	tall Oregon grape	UPL	7	SD	DB	Dry sites
<i>Berberis nervosa</i>	short Oregon grape	UPL	4	ST-SD	DB	Drier sites
<i>Cornus stolonifera</i>	red-osier dogwood	FACW+	20	ST	WE,SS,WB	Takes sun if has lots of moisture
<i>Corylus cornuta</i>	hazelnut	FACU	15	ST	DB	Good wildlife habitat
<i>Crataegus douglasii</i>	black hawthorn	FAC	20	SI	WB,DB	Typically on meadow hummocks
<i>Gaultheria shallon</i>	salal	FACU	7	ST-SD	DB	Basic forest groundcover
<i>Holodiscus discolor</i>	ocean spray	NI	10	SI-ST	DB	Drought-tolerant, edge-loving
<i>Lonicera involucrata</i>	black twinberry	FAC+	10	SI-ST	WE,SS,WB	Takes sun if has lots of moisture
<i>Myrica gale</i>	sweetgale	OBL	6	SI	WE,SS	Common in scrub-shrub wetlands
<i>Oemleria cerasiformis</i>	Indian plum	FACU	15	SD	WB,DB	Sub-canopy
<i>Oplopanax horridus</i>	Devil's club	FAC+	7	ST	WE,WB	Needs good drainage, forms thickets
<i>Philadelphus lewisii</i>	mock orange	NI	10	SI-ST	WB,DB	Likes streams, good drainage
<i>Physocarpus capitatus</i>	Pacific ninebark	FACW -	20	SI-ST	WB,DB	Needs good drainage
<i>Prunus virginiana</i>	choke cherry	FACU	20		DB	Native to the whole US
<i>Pyrus fusca</i>	western crabapple	FACW	35	SI-ST	WE,WB	Edges - most of value in streamside control
<i>Rhamnus purshiana</i>	casacara	FAC-	30	ST-SD	WB,DB	Found in most wetlands
<i>Ribes bracteosum</i>	stink currant	FAC	10	ST	WB,DB	Transition
<i>Ribes lacustre</i>	prickly currant	FAC+	7	ST	WB,DB	Can take drought
<i>Ribes sanguineum</i>	red-flowering currant	NI	7	SI	WB,DB	Doesn't form thickets!
<i>Rosa gymnocarpa</i>	Wood rose	FACU	7	ST	DB	Tough, hardy
<i>Rosa nutkana</i>	Nootka rose	FAC [OBL]	10	ST	SS,WB	Rapid volunteer on damp soil
<i>Rosa pisocarpa</i>	clustered rose	FAC [FACW]	7	ST	WE,SS,WB	Will hybridize with nootka rose
<i>Rubus leucodermis</i>	black raspberry	NI	10	ST	DB	Good buffer planting
<i>Rubus parviflorus</i>	thimbleberry	FAC-	10	SI	DB	Seral groundcover in clear-cuts, drought tolerant
<i>Rubus spectabilis</i>	salmonberry	FAC+	15	HA	WE,WB,DB	Takes sun if has lots of moisture
<i>Salix geyeriana</i>	Geyer willow	FACW+	15	SI	SW,WE	Likes inundation, sluggish water, wet meadows
<i>Salix hookeriana</i>	Hooker's willow	FACW -	20	SI	SW,WE,SS	Only found <5 mi. from coast
<i>Salix lasiandra</i>	Pacific willow	FACW+	50	HA	WE,SS,WB	Common, tolerant, prefers riparian
<i>Salix scouleriana</i>	Scouler willow	FAC	35	ST	SS,WB,DB	Upland & wetland
<i>Salix sitchensis</i>	Sitka willow	FACW	25	HA	WE,SS,WB	Common, tolerant
<i>Sambucus racemosa</i>	red elderberry	FACU	20	HA	WB,DB	Rapid grower, tolerates sun, seral on clear-cuts
<i>Sorbus sitchensis</i>	Cascade mountain	FACU	15	SI-ST	WB,DB	Montane, not to be mistaken for <i>S. aucuparia</i>
<i>Symphoricarpos albus</i>	snowberry	FACU	7	SI	WB,DB	Common, tolerant
<i>Vaccinium ovatum</i>	evergreen	UPL	5	SD	DB	Prefers mature shade
<i>Vaccinium parvifolium</i>	red huckleberry	NI [FACU]	13	SD	DB	Requires lots of organic matter

Sedges and Rushes						
Scientific Name	Common Name	Indicator	Max	Light	Site	Comments
		Status	Ht.	Needs*	Placement	
<i>Carex comosa</i>	Bristly sedge	OBL	2'	SI	SW,WE,SS	Rare in King County
<i>Carex lenticularis</i>	Shore sedge	FACW+	3'	SI	WE,SS	From shore to high mountains
<i>Carex lyngbyei</i>	Lyngby sedge	OBL	3'	SI	SW,WE,SS	Coastal only
<i>Carex obnupta</i>	Slough sedge	OBL	4.5'	ST	SW,WE,SS	Extremely common, coast to Cascade crest
<i>Carex rostrata (utriculata)</i>	Beaked sedge	OBL		SI-ST	SW,WE,SS	Common
<i>Carex stipata</i>	Sawbeak sedge	OBL	3'	SI-ST	SW,WE,SS	Lowland to mid-montane
<i>Eleocharis acicularis</i>	Spikerush	OBL	0.5'	SI	SW,WE	Rhizomatous, lowland to mid-montane
<i>Eleocharis palustris</i>	Common Spikerush	OBL	0.5'	SI	SW,WE	Rhizomatous, coastal to mid-montane
<i>Juncus acuminatus</i>	Tapered rush	OBL	2'	SI	SW,WE	Tolerant
<i>Juncus articulatus</i>	Jointed rush	OBL	2'	SI	SW,WE	Tolerant
<i>Juncus effusus</i> (var. <i>pacificus</i> ,	Soft rush	FACW	3'	SI-ST	SW,WE,SS	Weedy, common, hardy - often invasive
<i>Juncus ensifolius</i>	Dagger leaf rush	FACW	2'	SI	SW,WE,SS	Lowland to mid-montane, lovely flowers & foliage
<i>Juncus oxymeres</i>	Pointed rush	FACW+	3'	SI	SW,WE,SS	Lowland
<i>Scirpus acutus</i>	Hardstem bulrush	OBL	6'	SI	SW,WE	Tolerates up to 3' of water; common, hardy
<i>Scirpus maritimus</i>	Saltmarsh bulrush	OBL	4.5'	SI	SW,WE	Coastal only
<i>Scirpus microcarpus</i>	Small-fruited bulrush	OBL	4.5'	SI-ST	SW,WE,SS	Lowland to mid-montane, very common
Grasses						
Scientific Name	Common Name	Indicator	Max	Light	Site	Comments
		Status	Ht.	Needs*	Placement	
<i>Alopecurus aequalis</i>	Short-awn foxtail	OBL		SI-ST	SW,WE,SS	Often submerged
<i>Alopecurus geniculatus</i>	Water foxtail	OBL	1.5'	SI-ST	SW,WE,SS	Often submerged, tolerant
<i>Beckmannia syzigachne</i>	American	OBL	2'	SI	WE,SS	Good wildlife forage, lowland to mid-montane
<i>Calamagrostis canadensis</i>	Bluejoint reedgrass	FACW+			WE,SS,WB	Rhizomatous, coastal to mid-montane
<i>Cinna latifolia</i>	Wood reed	FACW	6'	ST	WE,SS,WB	Coastal to sub-alpine
<i>Deschampsia caespitosa</i>	Tufted hairgrass	FACW	2'	SI	WE,SS,WB	Common, keystone species in wet meadows
<i>Elymus glaucus</i>	Blue wildrye	FACU	2'	SI	DB	Very drought-tolerant, good wildlife forage
<i>Festuca idahoensis</i>	Idaho fescue	FACU*	2.5'	SI	DB	Drought-tolerant
<i>Festuca rubra</i> var. <i>rubra</i>	Red fescue	FAC+	2.5'	SI	SS,WB	Common, tolerant
<i>Glyceria borealis (occidentalis)</i>	Northern mannagrass	OBL	4'	ST	WE,SS	Tolerates up to 3' of water
<i>Glyceria elata</i>	Tall mannagrass	FACW+	4.5'	SD	WE,SS,WB	Prefers streamside
<i>Panicum occidentale</i>	Western panic-grass	FACW		SI	WE,SS,WB	Coastal to sub-alpine

Ferns						
Scientific Name	Common Name	Indicator	Max	Light	Site	Comments
		Status	Ht.	Needs*	Placement	
<i>Athyrium filix-femina</i>	lady fern	FAC	3	ST	SS,WB	Very common, tolerant
<i>Blechnum spicant</i>	deer fern	FAC+	2	SD	WB	Needs shade, moisture
<i>Dryopteris expansa</i>	shield fern	FACW	2	SD	WE,SS,WB	Likes muddy soil
<i>Polystichum munitum</i>	western sword fern	FACU	5	ST	DB	PNW basic; needs shade or moisture
<i>Pteridium aquilinum</i>	bracken	FACU	4	SI	DB	Seral on disturbed areas
Herbs and Groundcovers						
Scientific Name	Common Name	Indicator	Max	Light	Site	Comments
		Status	Ht.	Needs*	Placement	
<i>Achillea millefolium</i>	Yarrow	NI	1'	SI	DB	Self-seeds, robust, tolerant
<i>Anaphalis margaritacea</i>	Pearly everlasting	NI	1'	SI	DB	Robust, tolerant
<i>Arctostaphylos uva-ursi</i>	Kinnikinnick	FACU-	1'	SI	DB	Slow grower - likes dry stony soil
<i>Aruncus dioicus</i>	Goat's beard	FACU+	2'	ST	WB,DB	Streamside
<i>Caltha palustris</i>	Marsh marigold	OBL	9"	ST	SW,WE	Coastal
<i>Dicentra formosa</i>	Bleeding heart	FACU*	18"	ST-SD	WB,DB	Very common, tolerant
<i>Epilobium angustifolium</i>	Fireweed	NI	4'	SI	DB	Seral on clear-cuts, common, tolerant
<i>Fragaria chiloensis</i>	Coast strawberry	NI	6"	SI	DB	Rapid spreader, evergreen
<i>Geum macrophyllum</i>	Big-leaf avens	FACW-	3'	ST	WE,SS,WB	Common
<i>Heracleum lanatum</i>	Cow parsnip	FAC+	6'	ST	WE,SS,WB	Likes riparian, self-seeds
<i>Hydrophyllum tenuipes</i>	Pacific waterleaf	NI [FAC]	12"	ST-SD	WB,DB	Wet forest groundcover
<i>Linnaea borealis</i>	Twinflower	FACU-	6"	ST	DB	Usually in forests, but seral on clear-cuts
<i>Lupinus polyphyllus</i>	Big-leaf lupine	FAC+	3'	SI	DB	Seral, common, tolerant
<i>Lysichiton americanum</i>	Skunk cabbage	OBL	10"	SD	SW,WE	Totemic plant, like cedar
<i>Maianthemum dilatatum</i>	Wild lily of the valley	FAC	14"	ST	WB,DB	Rapid spreader
<i>Mimulus guttatus</i>	Yellow monkey flower	OBL	3'	SI	WE,SS,WB	Forms sheets near seeps
<i>Myosotis laxa</i>	Small forget-me-not	OBL	15"	ST	WE,SS	Uncommon, pretty
<i>Oenanthe samentosa</i>	Water parsley	OBL	3'	ST	SW,WE,SS	Common, hardy, good amphibian habitat
<i>Osmorhiza chiloensis</i>	Sweet cicely	NI	6"	ST-SD	DB	Very common in PNW forest
<i>Oxalis oregana</i>	Wood-sorrel	NI	9"	ST	WB,DB	Very rapid spreader, robust, highly tolerant
<i>Petasites frigidus</i>	Coltsfoot	FACW-	20"	ST	WE,SS,WB	Rhizomatous, good spreader
<i>Polygonum persicaria</i>	Lady's thumb	FACW	3'	SI-ST	SW	Many species in this genus, good amphibian habitat
<i>Potentilla fruticosa</i>	Bush potentilla	FAC-	3'	SI	DB	Montane, pretty
<i>Smilacina stellata</i>	Solomon's Star	FAC-	18"	ST	WB	Forms drifts near streams
<i>Stachys cooleyae</i>	Great betony	FACW	4'	SI-ST	WB	Common
<i>Tellima grandiflora</i>	Fringecup	NI	2'	ST	DB	Common, tolerant
<i>Tiarella trifoliata</i>	Foamflower	FAC-	2'	ST	DB	Common, tolerant
<i>Tolmiea menziesii</i>	Piggy-back plant	FAC	30"	SD	WB	Forms drifts near streams
<i>Viola glabella</i>	Stream violet	FACW+	7"	SI-ST	WB	Common, rapid spreader

APPENDIX C

Monitoring Instructions and Data Forms

INTRODUCTION

Monitoring is the mechanism by which the county is able to determine whether performance standards have been met. Most performance standards should be met by the final year of the monitoring period; however, some performance standards may need to be met within the first year. King County staff will visit the site at the end of the monitoring period to verify that conditions are as they have been reported, and that performance standards have been met so that your bond may be released. It is to your benefit to accurately report conditions during the monitoring events to insure that your bond will be released at the end of the monitoring period. You may request that Permitting staff visit your site at any point during the monitoring period to discuss problems; however, you will be billed hourly for staff time.

To begin monitoring, select the methods that are recommended for your performance standards. See Tables 2 and 3 to determine what methods to use. Instructions for each of these methods are described in this appendix.

PHOTOPOINTS

Purpose

Photopoints provide a visual record of the mitigation site over time. General photographs provide a representative view of the entire area and are helpful to document large-scale changes over time. Every monitoring effort should include photopoints.

Methods

1. Select one or more locations (depending on the size of the mitigation site) from which you can capture the majority of the site. Mark this spot in the field so that you can find the exact location from year to year. You may wish to drive a steel or wooden stake in the ground at this location.
2. Take a picture from each point that you have established. If your camera has the capability to imprint the date on the photograph, take advantage of this.
3. Identify the location of photopoints and the direction in which the photo was taken on your site plan.

LINE INTERCEPT METHOD

Purpose

The line intercept method is used to estimate the percent cover of trees and shrubs. If one of your performance standards relates to tree and/or shrub cover, this approach should be used during your monitoring.

Method

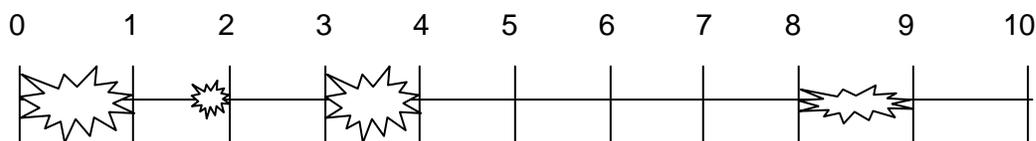
1. Establish permanent 50-foot transect lines. Transects may be permanently established and used for the entire three- or five-year monitoring period or randomly located during each monitoring event. Refer to the table below to determine how many transects are required. To establish transects, stretch a 50-foot tape measure⁵ between two points through an area planted with trees and shrubs. This same transect may be used to collect data for any of the methods.
2. Show the location of the transect on your site plan.

Determining Number of Transects

Size of Mitigation Area	Number of 50-Foot Transects Required
< 500 square feet	1
500-1,000	2
>1,000-2,500	3

3. Using **Data Form 1**, and beginning at the zero end of the tape, walk along the tape, noting and recording the length that each plant intercepts the transect line. See the following pictures as an example:

EXAMPLE



Plant 1 covers from 0-1 feet, Plant 2 covers approximately from 1.6 to 2 feet, Plant 3 covers from 3-4 feet, and Plant 4 covers from 8 to 9 feet. The total cover provided by these four plants is 3.4 feet out of 10 feet. This represents 34 percent cover. (3.4 feet of plants divided by 10 feet of the area evaluated).
 Note: Only measure the portion of the tree or shrub that actually intercepts the transect line. It is common for this percent cover calculation to be fairly low during Years 1 and 2, particularly if small plant material is used.

Data Sheet for Above Example

Species	Begin (Distance)	End (Distance)	Total Distance
Snowberry	0	1.0	1.0
Rose	1.6	2.0	0.4
Western Red Cedar	3.0	4.0	1.0
Big Leaf Maple	8.0	9.0	1.0
Total:			3.4

⁵ If you do not own a 50-foot tape measure, you can use a 50-foot length of plastic flagging, which is available in hardware stores. You may either use this in conjunction with a shorter tape measure, or you may mark off 1-foot increments on the plastic flagging using a permanent marker.

BELT TRANSECT

Purpose

This method may be used to determine plant density (e.g., number of plants per acre), or estimating survivorship and vigor of trees and shrubs within a sample area.

Method

1. Establish one or more transect lines. To do this, stretch a tape measure (100-foot tape is recommended) between two points through an area planted with trees and shrubs. The same transect may be used for other sampling elements, if desired. Using **Data Form 2**, and beginning at the zero end of the tape, walk along the tape, noting and recording any trees or shrubs that occur within 3 feet on either side of the tape. Observe the condition of each plant. This will assist you in detecting problems early. The type of observations you may make include:

- Browsed by deer
- Chlorotic (meaning leaves are yellow, which suggests stress)
- Vigorous
- Wilted
- Etc.

2. Use the following formula to calculate percent survivorship:

$(\text{Total number of living plants divided by total number of plants}) \times 100 = \text{percent survivorship}$

Use the other observations to determine if some corrective action is necessary.

POINT INTERCEPT

Purpose

This method can be used to measure the percent of bare ground.

Method

1. Establish one or more transect lines. To do this, stretch a tape measure (100-foot tape is recommended) between two points. The same transect may be used for other sampling elements, if desired. You may choose to establish permanent transects by marking each end so that you can measure the same area each year, or you may randomly select a transect during each monitoring period.

2. Use **Data Form 3**, and beginning at zero end of the tape, walks along the tape. At every 5 feet, stop and look directly below the tape at that point. Note whether bare ground or plants are present. Record this information.

3. Use the following formula to calculate the percent of bare ground:

$(\text{Number of points with bare ground divided by total number of points evaluated}) \times 100 = \text{percent of bare ground}$

DATA FORM 3: Point Intercept

Name: _____

Transect Number: _____

Sampling Date: _____

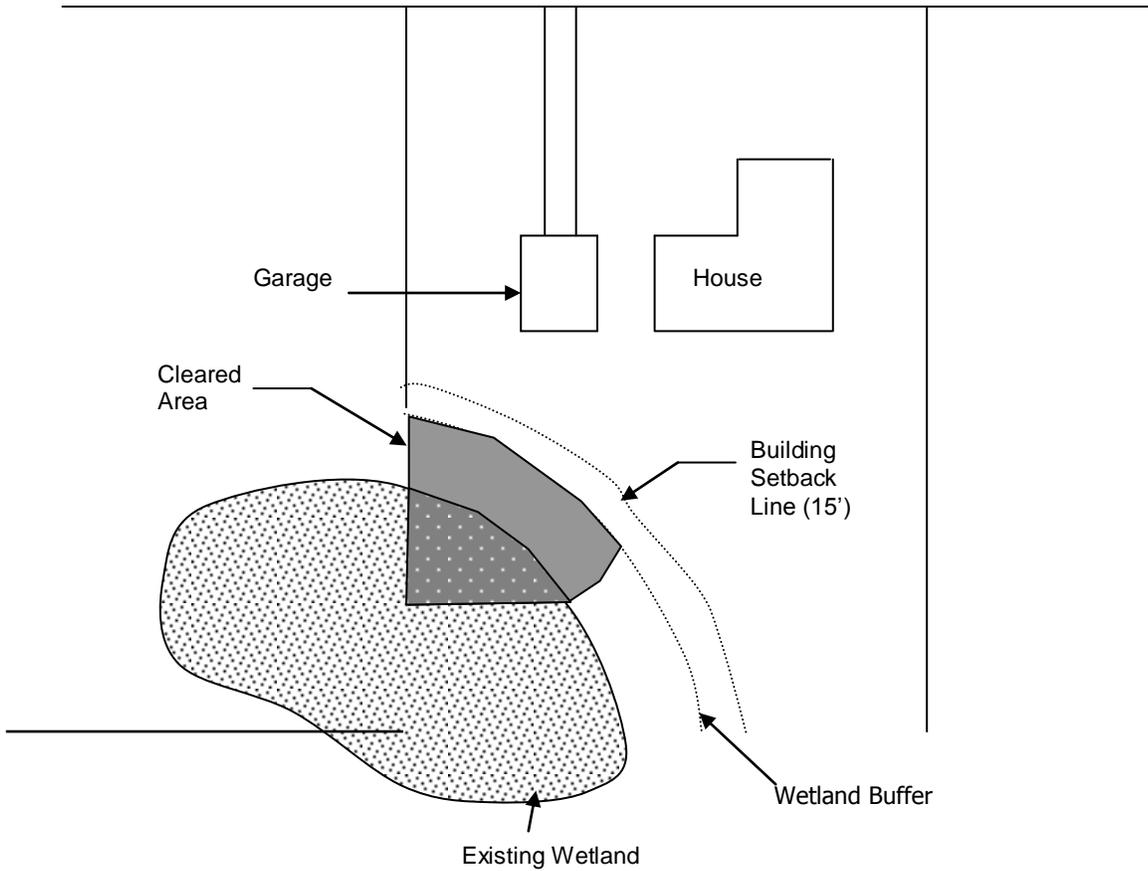
Transect Location: _____

Project Number: _____

Point	Vegetated	Bare Ground
0 feet		
5 feet		
10 feet		
15 feet		
20 feet		
25 feet		
30 feet		
35 feet		
40 feet		
45 feet		
50 feet		

**EXISTING CONDITIONS
MAP**

BITTER CREEK ROAD



NORTH

SCALE: 1" = 100'

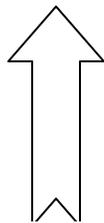
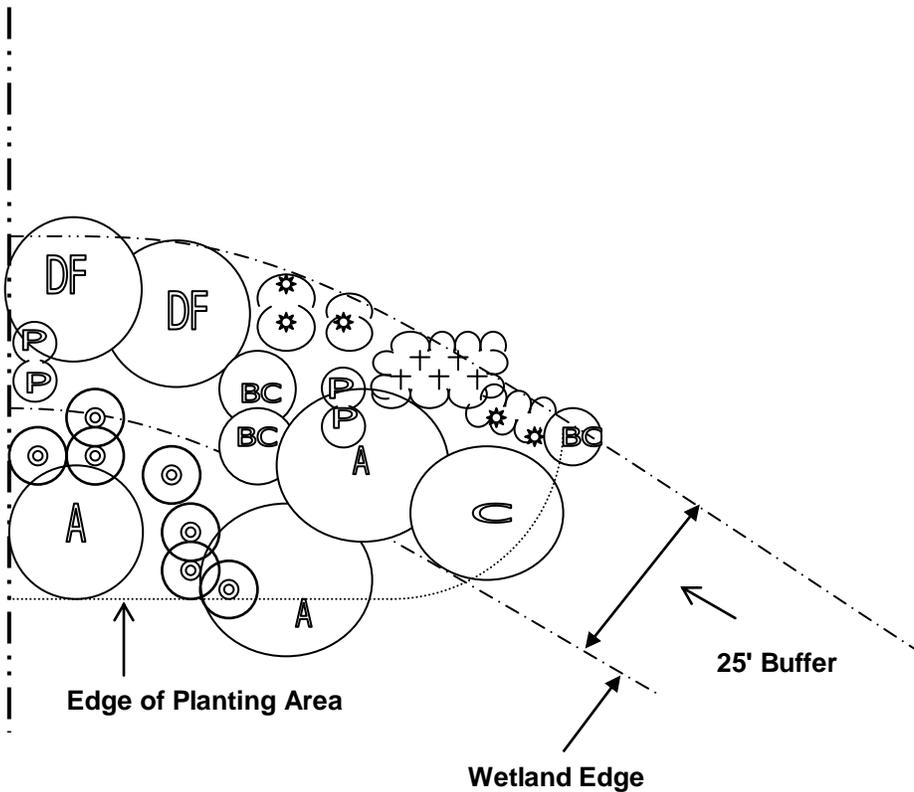


Figure 1

PLANTING PLAN



Goal

To restore disturbed portion of wetland and buffer with native vegetation

Performance Standards

- Percent bare ground will not exceed 15 percent at any time after completion of planting during the three-year period.
- Eighty percent of planted specimens will be surviving at the end of three years.
- Non-native invasive plants will not make up more than 10 percent cover in any growing season.

Plant Schedule				
Symbol	Plant Name	Qty	Size	Spacing
A	Oregon ash (<i>Fraxinus latifolia</i>)	3	2 gal	9' on center
C	western red cedar (<i>Thuja plicata</i>)	1	2 gal	9' on center
DF	Douglas fir (<i>Pseudotsuga menziesii</i>)	2	1 gal	9' on center
⊙	red-osier dogwood (<i>Cornus stolonifera</i>)	7	1 gal	4' on center
P	Indian plum (<i>Oemlaria cerasiformis</i>)	8	1 gal	4' on center
*	nootka rose (<i>Rosa nootkana</i>)	8	1 gal	4' on center
+	snowberry (<i>Symphoricarpos alba</i>)	8	1 gal	4' on center
BC	bitter cherry (<i>Prunus emarginata</i>)	3	2 gal	9' on center

Figure 2

Check out the Permitting Web site at www.kingcounty.gov/permits