# WETLAND AND STREAM MITIGATION GUIDELINES

***City of Woodinville***
***Planning & Community Development***
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The following information is provided to help applicants prepare and submit mitigation plans that expedite environmental review. Every mitigation project must be based on an approved plan, just as all other construction must be based on an approved plan. Requirements and guidelines for mitigation plans are authorized under City of Woodinville Zoning Code Title 21.24.120 and 21.24.120.130

**Section One** outlines plan requirements; maps, site plans, and other drawings.

**Section Two** outlines Compensation Plan report requirements; project description, installation/construction details, maintenance and monitoring plans. This is a written report that describes in detail the existing conditions, proposed actions, change in function anticipated, goals/objectives, quantified performance standards linked to goals/objectives, a monitoring program tied to the performance standards, and an adaptive management plan. The key elements of the Compensation Plan that should appear on plan sheets Notes are identified.

**Section Three** contains Design Requirements (Part I); specific and additional guidelines for designing mitigations and their performance standards (Part II), and creating planting specifications (Part III).

Sections One and Two, and Part I of Section Three, contain **required minimum** elements for compensatory mitigation plans for wetlands, streams, or buffers within Woodinville City limits.

**SPECIAL REQUIREMENTS –** Each mitigation project may have unique circumstances that require special instructions beyond this outline's scope. The applicant must obtain from the Planning Director, in writing, either instructions or waiver of this provision.

**IMPORTANT**

Most mitigations are secured by a financial guarantee. For more details, see "Performance Guarantees", Paragraph 11, page 12.
**Wherever this document uses restrictive language – "must", "require", etc., the required actions must be performed or the assignment of funds will become liable for forfeiture.** Please review this document carefully, and retain a copy for your

records until your assignment of funds is released. Should you sell your property before your assignment of funds is released, you will still be obligated to perform the work. The City of Woodinville therefore strongly recommends that you review Paragraph 11, PERFORMANCE GUARANTEES before selling your property, which explains transfer of this obligation to the purchaser. We want to help you avoid being obligated to perform work on property you do not own!

## SECTION ONE: PLAN SHEET REQUIREMENTS

There are nine Paragraphs in this Section describing graphic components of the mitigation plan sheets. The information specific to each Paragraph must appear on a plan sheet, it may be appropriate to provide several 'layers' on a single sheet, as long as the information is legible and useful in that format. As many plan sheets should be used as will make the resulting plan set legible.

1.0 VICINITY MAP
- 1.1 Site location.
- 1.2 North arrow.
- 1.3 Driving directions from the nearest highway.
- 1.4 Street names/numbers.
- 1.5 In less developed areas, distance to nearest landmarks or nearest abutting address.

2.0 MITIGATION SITE PLAN

*Scale described in Paragraph 2.1 are maximums and apply to ALL plans in Section One, unless otherwise noted. Plans may be provided at smaller scale (e.g., 1:10) if the design detail warrants it.*

- 2.1 Scale must be shown at:
  - 2.1.1 1 inch : 20 feet if site is less than two acres; or
  - 2.1.2 1 inch : 40 feet if site is more than two acres; and
  - 2.1.3 1 inch : 5 feet for cross sections and typical sections.
- 2.2 North arrow.
- 2.3 Property lines, dimensions, bearings, and owner's address and telephone number. Proof of legal ownership must be provided with the submittal package.
- 2.4 Date map prepared, date of all revisions to plans based on input from the Environmental Specialist, address and telephone number of preparer.
- 2.5 Plan approval block for Environmental Specialist signature approval, developer and preparer.

**See the descriptions in the Compensation Text components in Section TWO, below for additional information on expected Plan Sheets to accompany the Compensatory Mitigation Plan**.

3.0 GRADING PLAN

3.1 If appropriate the USGS topographic map 1:24,000 scale, or at the least one of the following performed by a State of Washington licensed land surveyor:

3.1.1 1' contours (projects where grading or modifying hydroperiod is involved);

3.1.2 2' contours (some minor residential projects);

3.2 Cross-sections in representative areas showing existing and proposed grades in 1' contours throughout each proposed habitat type in the entire mitigation area including buffer. Where no grading is proposed, cross-sections of existing contours should be provided.

3.3 The surveyed minor projects based on the judgment of the Environmental Specialist, may submit tape-and-compass estimates of the:

3.3.1 Wetland edge;

3.3.2 Top of bank and center line of type 1, 2 or 3 streams.

3.4 Existing trees more than 18" in diameter at breast height with species identied.

3.5 To expedite plan review, the following surveyed lines are strongly recommended:

3.5.1 Existing/proposed streets or other right-of-ways on or abutting the site with proper labels;

3.5.2 Existing/proposed easements on or abutting the site with proper labels;

3.5.3 Existing structures with proper labels/symbols;

3.5.4 Existing site improvements (e.g., driveways, culverts, etc.) with proper labels/symbols.

4.0 HYDROLOGIC REGIME (See Appendix A for more information)

Show both in plan view and in cross-section:

4.1 For <u>existing</u> conditions: elevations of all inlet and outlets, water surface elevation or depth below surface of winter saturation levels, and;

4.1.1 Streams and their buffers: Center-line, OHWM, top-of-bank, stream type using Woodinville ratings, culverts, habitat features or blockages.

4.2 For <u>proposed</u> conditions: elevations of all inlet and outlets, water surface elevation or depth below surface of winter saturation levels, and;

4.2.1 Streams and their buffers: Center-line, OHWM, top-of-bank, stream type using Woodinville ratings, culverts, habitat features or blockages.

4.3 Water control structures and special features to be shown in both plan detail and cross-section. These typically include, but are not limited to culverts, inlet/outlet structures, level-spreaders, weirs, leaky berms, etc.

5.0 HABITAT FEATURES - Including, but not limited to the following:

5.1 Large woody debris, brush piles, rock piles.

5.2 Snags.
5.3 Bird or bat nest boxes, etc.

6.0 EROSION CONTROL

6.1 Limits of clearing, limits of vegetation to be saved, identification of vegetation to be salvaged.
6.2 Temporary erosion control structures; silt fences (locations and details), temporary sediment ponds utilizing methods from Ecology's 2005 Storm Water Design Manual.
6.3 Permanent erosion control structures; LID (low impact design features), bio-swales, terraces, check dams, rain gardens, dispersion trenches, etc.
6.4 Schedule and sequencing for removal of temporary erosion control structures.

7.0 PLANTING PLANS

7.1 Keyed to and same scale as Site Grading Plan.
7.2 Legible, readily understandable plant key.
7.3 Planting schedule Tables that include each species of trees, shrubs, herbaceous plants, plugs, and seeds. Schedule shall include, by species, plant material type (e.g., balled and burlapped, bare-root, potted, live-stakes); plant material size (e.g., 1-5 gallon, plug, 3' live-stake, etc.); spacing (e.g., 3 feet on-center, pounds/acre for seed, etc.); and quantity of each species for each proposed vegetation community type.
7.4 Clearly show location of acreage of each vegetation community type within the project area (e.g., "created emergent wetland, 3800 sq. ft.; restored scrub-shrub, 4000 sq. ft.; enhanced deciduous forest upland buffer, 5000 sq. ft.", etc).
7.5 Plant selection and replacement per appropriate portion of Section Three of this document (see Appendix C, Habitat Worksheet).

8.0 MONITOIRNG PLAN

8.1 Contact address and telephone of person or organization under contract to carry out construction supervision and subsequent implementation of the monitoring plan over the five year monitoring period.
8.2 Permanent photo-points, at least 4 per project or ¼ acre.
8.3 Permanent vegetation transects (line or belt) at least one per plant community.
8.4 Permanent wells, staff gages, or other monitoring structures (when applicable).
8.5 Estimates of percent plant cover, plant survival and percent cover of noxious weeds (ten percent or less).
8.6 Wildlife observation and use.
8.7 Water regime quality and hydrology – is there adequate water for successful plant establishment and necessary flows in the wetland and its watershed?

8.8 Soil characteristics i.e. soil color, ph, redoximorphic potential, organic content, time and duration of saturation.
8.9 Overall qualitative assessment of project success for the mitigation: Are the performance criteria being met?

9.0 MAINTENANCE SITE PLAN
9.1 Clearly marked access points for ongoing maintenance activities.
9.2 Layout of temporary irrigation system.
9.3 Calendar and schedule of a maintenance plan per MAINTENANCE, in Section Two, Paragraph 12 of this document.
9.4 Contact address and telephone of person or organization under signed contract to carry out the maintenance plan over the monitoring period.

10.0 IRRIGATION PLAN
10.1 A temporary above ground or drip irrigation system will be required. If this method is not feasible or water is not available to the site, other methods such as watering trucks must be utilized.
10.2 The system shall be operational for the dry summer months from June 1 to September 30.
10.3 Irrigation shall be provided for the first two years of the monitoring period.
10.3.1. The irrigation system shall provide adequate water to assure the survival of the plant species (1 gallon of water per plant per week is a general rule.)

## SECTION TWO: REPORT REQUIREMENTS

The written Compensation Plan shall follow the content outline provided below.

EXECUTIVE SUMMARY: To include but not limited to: Site name, location, client, project-staff, field survey date, determination (stream, wetland type), fish usage, stream buffer condition, proposed project and impacts and proposed measures.

1.0 INTRODUCTION
Project Location: street address, S/T/R, vicinity map.
Responsible Parties: applicant, owner, author(s) of the compensation plan.
Project Description: Overview of proposed actions general overview of project, acreages of impacts, acreages of compensation area, ratings of wetlands, and replacement ratios utilized. Provide the summary of goals for the compensation action and identify time-frame of monitoring.
Wetland Delineation Overview: If it has been provided in a previous report, then provide a summary of the wetland delineation conducted for the site. Document confirmation of the delineated edge by City of Woodinville, Dept.

of Ecology, and/or Corps of Engineers staff as appropriate.

## 2.0 PROJECT IMPACTS

Describe the proposed actions, the acreages of impacts (direct, indirect, and operational as appropriate). Provide accompanying graphics that clearly indicate the extent, location and acreages of impacts of delineated and surveyed wetland edges.

## 3.0 ECOLOGICAL ASSESSMENT OF EXISTING SITE

### 3.1 Existing Habitats Overview

A descriptive overview of upland and wetland habitats on the site; their overall condition, degree or extent of disturbance; and relevant historic conditions, linkages to off-site habitats.

### 3.2 Uplands

Describe major vegetation community types by canopy dominance, sub-canopy, herbaceous layers (as appropriate); identify extent and condition of invasives within each community; and identify slopes, land-uses, infrastructure or historic alterations.

### 3.3 Wetlands

Describe each wetland including Cowardin type, Rating, HGM (per wetland), dominant vegetation species, disturbance, presence/absence of invasives, sources of hydrology and annual hydroperiod parameters, soils, and habitat features. Using a peer reviewed and accepted functional assessment method (i.e., Ecology's Washington Functional Assessment Method[1], or WSDOT's Linear Functional Assessment Method[2]) conduct a functional assessment of existing wetland conditions.

## 4.0 MITIGATING MEASURES

Describe what actions have been taken to avoid, minimize and rectify adverse impacts to wetland and significant upland habitats in the project area.

### 4.1 Impact Avoidance and Minimization

Best Management Practices: describe what BMPs are proposed to minimize or rectify adverse impacts to water quantity, water quality and wildlife habitat.

### 4.2 Unavoidable Impacts

Describe in detail what impacts are unavoidable, what the acreages of impacts are from direct fill/grading, from direct changes in hydroperiod (include wetlands that are proposed to be 'preserved', but which may experience a change in hydroperiod from project actions), or changes in expected habitat benefits caused by the proposed projects (e.g., impacts to species which are intolerant of humans or domestic pets).

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[1] Source: http://www.ecy.wa.gov/programs/sea/wfap/
[2] Source: http://www.wsdot.wa.gov/environment/biology/docs/bpjtool.pdf

## 5.0 COMPENSATION PLAN

### 5.1 Overview of Proposed Compensation

For each Section (5.1-5.4, below) provide a detailed description of proposed conditions for soils, hydroperiod, vegetation communities, and habitat features. Plan sheets may contain one or more of these elements (e.g., grading and vegetation communities overview), however the text report must also address each of these design elements and correlate text descriptions to Plan Sheet illustrations.

For soils provide plan sheets that illustrate existing and proposed topography (e.g. grading plans), slopes, areas of excavation or fill, over-excavation and depth of backfill, soil harvesting, stockpile locations, and site construction staging areas. Text should address all aspects of design including, but not limited to, proposed grading, over-excavation, soil amendment(s), mulching, soil harvesting, soil import, cubic yards of excavation and/or import, etc.

For hydroperiod provide plan sheets that illustrate existing and proposed topography (e.g. grading plans) with anticipated sources and elevations of water to the site, inlets/outlets and their elevations, weirs and their elevations, slopes, elevation of OHW, elevation of assumed groundwater (targeted below surface elevation), and contributing area (i.e., catchment or basin) for each distinct wetland or Cowardin community type. Plan sheets may be combined with grading sheets, however they must be clearly legible and information readily apparent. Text should address all aspects of design including, but not limited to, all proposed sources of water to the habitats (include data on existing groundwater and precipitation records for projects that propose to create wetland), design elevations of inlets/outlets, winter water surface elevations or depth of saturation, durations of inundation or saturation for wetland habitats, annual hydroperiod, receiving bodies of discharge water, etc.

For vegetation communities provide a description of each proposed vegetation community type including Cowardin class, HGM class, acreage, species composition, successional/seral planting schedule (if appropriate), type of plant material proposed to be used (e.g., live stakes, b&b, seeds, etc.), spacing, planting patterns, etc. Correlate each proposed vegetation community to soils, grades, and designed hydroperiod. Provide planting schedule tables and plan sheets as necessary to support the text descriptions and as required in Section ONE.

For habitat features provide a description of type of feature (e.g., rock piles, brush piles, snags, LWD, etc.), source of material, location to be placed, dimensions, quantity per acre (for large projects), assumed targeted guilds, and if necessary, a design detail. For site specific

placement, locations shall be shown on the Plan Sheets required in Section ONE.

5.2 Wetland Enhancement
Soils, Hydroperiod, Vegetation Communities, and Habitat Features.

5.3 Wetland Creation
Soils, Hydroperiod, Vegetation Communities, and Habitat Features.

5.4 Upland Forest
Soils, Hydroperiod, Vegetation Communities, and Habitat Features.

5.5 Replacement Ratios: Per Woodinville Code
Identify the acreages of wetland type to be impacted, by Cowardin/HGM and rating. Identify the acreages of wetland habitat to be created, enhanced, rehabilitated, re-established, or preserved as compensation AND the compensation ratios associated with each of those actions correlated to wetland ratings. Present in a Table a summary of the acreages of proposed compensation, the replacement ratios per compensation type (e.g., creation, re-establishment, preservation, etc.), and the total acreages of compensation provided. Summarize in a Table the acreages of impacts proposed correlated to proposed compensation acreages to illustrate if adequate compensation acreage is proposed.

5.6 Functions of Proposed Wetland Communities
Using a peer reviewed and accepted functional assessment method (i.e., Ecology's Washington Functional Assessment Method[3], or WSDOT's Linear Functional Assessment Method[4]) conduct a functional assessment of proposed wetland conditions. Assess functions for assumed conditions of proposed habitats at *no more than 10 years* post-installation. Thus habitats planted with trees shall be assessed as shrub/sapling communities, not as forests in proposed conditions. Use targeted performance standards for aerial coverage, diversity, plant richness, and buffer conditions for year 10.

## 6.0 GOALS, OBJECTIVES, AND PERFORMANCE STANDARDS

6.1 Goals and Objectives
Identify clearly stated goals for the proposed actions. For each goal, identify one or more objectives which are the actions that are proposed to achieve the goal. An example of Goals and Objectives follows.

Goal #2: Enhance the functions of wetlands and uplands to remain in the project area.

- Objective 2.1: Passively increase the duration and depth of inundation of existing wetlands through back-watering or

[3] Source: http://www.ecy.wa.gov/programs/sea/wfap/
[4] Source: http://www.wsdot.wa.gov/environment/biology/docs/bpjtool.pdf

increased volume of input to shift the hydroperiod to support a community of more wet-tolerant native plant species.

- Objective 2.2: Actively change the hydroperiod of existing wetlands through shallow to moderate grading to create areas of deeper inundation for longer duration to improve native vegetation conditions.
- Objective 2.3: Improve native species richness, diversity, and physical complexity by seeding and installing native species in all habitat types to be enhanced. Installation methods include seeding, plugs, live stakes, bare-root or potted emergents, shrubs, or trees. Select species based on the appropriate successional stage of the community (e.g., under-plant existing shrub/sapling zones with later seral stage coniferous species).
- Objective 2.4: Remove and control non-native plants (invasives and non-invasive species) through physical removal and active management, changes in hydroperiod to create inappropriate growth conditions, and/or over-planting of native species.
- Objective 2.5: Create physical complexity on the forest floor for habitat improvements through placement of LWD, brush piles, and rock piles in all habitat types.

6.2 Performance Standards

Provide quantifiable performance standards directly linked to each objective of each goal. Performance standards are the tools used to determine if the goals are being met or if the physical/biological parameters are in place for goals to be met over time. The performance standards have to be differentiated in such a manner that the City's Environmental Specialist can evaluate if the project is achieving its stated goals. Performance standards must establish the physical indicator to be measured and they must directly be linked to a timeframe for establishment. Measurable indicators include vegetation, water or evidence of water, physical structures or conditions, and/or project infrastructure.

6.3 Adaptive Management Actions/Contingency Plan

For each Performance Standard identify the Adaptive Management Action that will be taken if the Performance Standard is not reached within the identified time-frame. Identify, where appropriate, the standard that will trigger the adaptive response. It is not appropriate to state that an adaptive management response will be 'to collect further data to analyze future actions' unless agreed to by the City's Environmental Specialist.

If there is a significant problem with achieving the performance standards the applicant shall work with the Community Development Department to develop a contingency plan. Contingency plans can include, but are not

limited to: regarding, additional plant installation, erosion control, modifications to hydrology, plant substitutions of type, size quantity and location. Such contingency plans shall be submitted to the Community Development Department by December 31st of any given year when deficiencies are discovered.

## 7.0 MAINTENANCE PLAN

Identify the following maintenance actions that will be provided, their frequency, how it will be documented in the annual monitoring report, and the adaptive management actions to address issues.

- Temporary irrigation
- Mulching: sheet goods, arborist mulch, wood chip, compost
- Weeding of herbaceous plants: note weed whips should be specifically not allowed as a maintenance tool in the Maintenance Section of the Plan Notes
- Grubbing of rooted invasives
- Mowing of invasives or non-targeted grasses and herbs
- Removal of debris and trash
- Removal of temporary construction elements such as silt fence, straw bales, barrier fencing
- No staking wires, staples, cords or plastic ties shall be used on any installed woody material
- Sediment control
- Replacement of plant material as necessary to conform with Performance Standards

## 8.0 MONITORING PLAN

Annual monitoring reports will be prepared and submitted to the Community Development Department annually for 5 years by September 1st of each monitoring year. Year 1 monitoring will occur the first year *after* the completion of construction. The first five years are critical for maintenance, control of invasives, and establishing appropriate hydrology and vegetation communities. The following outlines the monitoring frequency and reporting schedule that shall be used.

### *Hydrology*

For wetland systems - To document the hydroperiod, data will be collected from staff gauges and piezometers installed during construction. Hydrology data will be collected on a monthly basis from December through May for every year of monitoring activity. Precipitation data will be obtained from the nearest documented calibrated gage. On-site hydrology data will be correlated to precipitation data on a water-year basis and provided in the annual monitoring report.

*Vegetation*

Vegetation data will be collected for a variety of matrices depending upon the plant material or seeds installed. Given the highly variable survival rate for live stakes, vigor and percent aerial cover will be used as Performance Standards rather than a strict percent survival. It is a commercial landscaping standard to use 100% survival of installed rooted plant material as a 'performance standard'. Although this standard may be appropriate for 'commercial parking lot' landscape installation, it is not reasonable for acres of plants installed in a wide range of habitat and soil conditions. That standard will be maintained at 100% survival performance standard for those plants that are bid with that provision. For all other rooted plant materials (i.e. container and bare-root), use a performance standard of 80% survival after 5 years.

Beyond survival, plant establishment (as measured by percent aerial cover) should also be used as a metric for monitoring. Define the aerial coverage Performance Standards to occur over a time frame. Correlate them to conditions of the soils, hydrology, plant health, herbivory, mulch, etc as necessary. It is appropriate to use ranges of aerial coverage for Performance Standards at targeted years (e.g., 3, 5, 7, and 10) for trees and shrubs. Include a metric for plant species richness and diversity (the number of species and the relative percent presence of species, respectively). Include qualitative assessments of plant vigor, recolonization, grazing or herbivory effects, etc. to also assess vegetation community health.

After installation, permanent photopoints and a sufficient number of permanent sampling plots to accurately represent the different habitats/planting areas shall be established. Emergents shall be monitored in 1 meter plots, shrubs shall be monitored in 5 meter plots, and trees shall be monitored in 10 meter plots. Vegetation monitoring shall occur in Years 1, 2, 3, 4, and 5. For emergents, percent aerial cover by species shall be measured, and species composition of the whole wetland shall be noted. For plants that were installed as live-stakes, percent survival shall be estimated for Years 1 and 2. For plants that were installed as rooted plants, surviving installed plants shall be counted (by species) to determine percent survival for Years 1 and 2. For all trees and shrubs, during monitoring Year 5, 5 percent aerial cover shall be measured for: installed species; desirable volunteer native species; and non-native invasive species. For all monitoring years, photographs shall be taken from the photopoints, and the general condition of the plantings shall be noted for all emergents, trees, and shrubs. To the extent possible, herbaceous species and estimated cover shall be noted in tree/shrub plots. Observations of the plants should include: size; new growth; presence of disease, harmful insects and yellowed leaves; browsing effects; etc. Dead/dying plants shall be noted as well as the probable cause for

the loss. If deemed necessary to satisfy the Performance Standards, adaptive management responses as outlined shall be undertaken.

*Non Native Invasive Species*

Non-native invasives should be actively controlled by directed maintenance activities. A performance standard of 100% removal of discretely rooted plants (e.g., Himalayan blackberry (*Rubus armeniacus*), Scot's broom (*Cytisus scoparius*), etc.) shall be used. For rhizomatous colonizing invasives (e.g., Japanese knotweed and its hybrids (*Polygonum cuspidatum, P. bohemicum, P. sachalinense*); and reed canary-grass (*Phalaris arundinacea*)) a performance standard of 100% over-topping with canopy species within 3-5 years, a reduction of vigor or density, documentation of multi-year maintenance actions shall be used to document achievement of performance standards. Monitoring plots of invasive species should focus on existing and former patches of the invasives, and include the entire patch within the project area. Plots shall be monitored to watch for re-sprouting and/or recolonization of managed species. In Years 1, 2, and 3, invasive monitoring shall occur a minimum of two times per year to ensure that rapid maintenance actions can be undertaken to remove/control invasives before they become re-established. In subsequent Years, as long as the Performance Standards are met, invasive monitoring may be reduced to a minimum of one time per year. If invasive presence exceeds the Performance Standards, adaptive management responses to be undertaken should be identified.

*Wildlife Use and Condition of Habitat Structures*

Locations of all habitat structures shall be surveyed and included in the As-Builts. Monitoring wildlife use and conditions of the habitat structures will occur once per year for Years 1, 2, 3, 4, 5 and shall coincide with the annual vegetation monitoring. Specific monitoring will occur for some of the more easily observed fauna (e.g. birds, amphibians, and macroinvertebrates. Indicators of wildlife use and presence, such as trails in and out of the habitat structures, scat, droppings, grazing, etc., shall be monitored. The dimensions and conditions of habitat structures will be noted and documented with photographs. If deemed necessary to satisfy the Performance Standards, actions to maintain the habitat structures (e.g. adding brush or rocks to existing piles, installing additional LWD, etc.) shall be undertaken.

*Special One-Time Monitoring Events to Occur at Completion of Construction*

Several performance standards are expected to require a single monitoring event:

*Site Grading*: After completion of grading and preparation of the As-Builts, this parameter will be monitored by examining the As-Builts to determine whether final site grading reflects the approved designs. If not, grades and elevations will be modified as necessary to achieve appropriate water movement and control erosion. All construction modifications will be documented with change-order approvals from the design ecologist and environmental specialist.

*Removal of Infrastructure*: If the project objectives include removal and proper disposal of infrastructure, then at the end of the demolition stage of construction, removal of impervious materials will be documented in the As-Builts. Photographs will be included in either the Baseline Report or the Year 1 Monitoring Report. If it is not possible to complete the removal process during a single period, materials can be removed in stages. The percent of material removed will be documented in the annual monitoring reports.

9.0 REFERENCES

Provide full citations for all references used in the Compensation Plan text. Material or information accessed on the web should be provided with the web link URL.

10.0 ATTACHMENTS

Photographs: dated photographs from each permanent monitoring photo-point. Include a map that indicates the photo-point locations, as necessary. Include Year 1 photos in all subsequent years' annual reports.

Half-sized Plan Sheets of Proposed Plans

Provide engineering and planting drawings in at least half-size scale for ease of review and legibility.

Functional Assessment Forms

Provide all functional assessment forms for existing and proposed conditions.

Contracts

Copies of signed monitoring and maintenance contracts for the length of the monitoring period.

11.0 PERFORMANCE GUARANTEES

11.1 If the applicant seeks a development permit that is contingent on the performance of a mitigation project, an assignment of funds for 150% of the cost of the mitigation must be submitted to the Permit Center prior to issuance of the development permit. The assignment of funds will be held

until the mitigation has been completed and approved by the City of Woodinville's Environmental Specialist. Once the mitigation has been approved, the assignment of funds will convert to a maintenance monitoring assignment of funds (See section 12 Maintenance.)

11.2 Once the mitigation plan is approved, an assignment of funds will be required based on all elements of the mitigation plan for a five year period. The total cost, plus contingency fees, will be in the amount of 150% of the cost of the mitigation project that the applicant is required to provide (See appendix E for Restoration cost worksheet.)

11.3 An approved assignment of funds shall include required start date for mitigation construction.

11.4 Should the property be sold before the assignment of funds is released, you can transfer your obligation. If the purchaser posts an equivalent assignment of funds, and acknowledges responsibility for all details of the approved Mitigation Plan, the City of Woodinville will release your assignment of funds and end your obligation.

## SECTION THREE: DESIGN GUIDELINES

This section is divided into three parts: I: Design Requirements; II: Design Guidelines; and III: Planting Specifications. Standards must meet the criteria in the Wetland Mitigation Guidance document from Ecology, Corps of Engineers and EPA (2004) or be more stringent. If this document is updated, design and planting specifications shall be required to meet the updated specifications.

The following examples are typical for the Puget Lowlands however some communities have been excluded, (e.g. bogs) due to an understanding that they are not replicable. Unusual situations will require unusual designs, and will be evaluated and conditioned by the Environmental Specialist on a case-by-case basis. This document is meant to be guidance and set minimum standards.

### Part I: Design Requirements

Every mitigation plan must be guided by the following parameters:

1.0 VEGETATION

1.1 All plants specified must be native and of genetic origin to the Puget lowlands of Western Washington.

1.2 Shade-dependent species (as defined by the "Habitat Worksheet", Appendix C) are to be specified where shade exists at time of planting. This includes designing for sequential installation of later seral stages a minimum of three years after initial early seral stage species installation.

1.3 Plant selection and placement should be guided by moisture, light, and other habitat needs – see the appropriate portion of Part II of this Section for more details.

2.0 SOILS

2.1 Soils that are excavated more than one foot, or compacted, are to be deconsolidated (i.e., ripped, not tilled) to a minimum depth of 12".

2.2 All plans must specify that excavated or disturbed soils be amended. Typical amendment on compacted subsoil is 12" of compost spread over entire area.

3.0 HYDROLOGY

3.1 Hydrologic calculations for both existing and proposed wetlands or streams must be included with all mitigation designs. City standards require all hydrologic calculations to be conducted by a licensed civil engineer. See Appendix A, "Wetland Hydrology Management Guidelines" for estimating calculating hydrologic budgets.

3.3 See the appropriate portion of Part II of this Section for more details.

4.0 STRUCTURES

4.1 Mitigations may require a permanent fence at least 4' high. This will be determined by the Planning Director based upon the sensitivity of the critical area. A split-rail or round post-and-rail fence is sufficient for this purpose. Other fence types may be proposed.

4.2 Critical Area signs shall be mounted on posts set into the ground at 100' intervals or 1 per lot for smaller lots.

## Part II: Design Guidelines

Every mitigation plan must establish goals, objectives, and performance standards. Every plan should be specific to mitigation goals and to demonstrated hydrology[5]. The following are standard goals, objectives, and performance standards that mitigation plans must follow.

**Comment [DS1]:** Debra: this seems very very redundant to me (always has since Anna wrote it years ago). Not sure it is necessary when we've now provided a more detailed outline of what's expected in the text report and the plan sheets. Take a look and see what you think. DS

Like all boilerplates, there will be times when exceptions must be made. The City of Woodinville requires that all exceptions be based on careful, documented, well-referenced research. Performance standards are those aspects of a wetland or buffer mitigation that will be verified by City of Woodinville inspection. Mitigations that do not meet performance standards will be notified that they are in violation and will have 60 days to correct all violations or be liable to assignment of funds forfeiture.

Vegetation standards are typically based on both cover and survival. Non-native and other invasives – Himalayan blackberry, Japanese knotweed, evergreen blackberry,

reed canary grass, Scots broom, English ivy, morning glory, etc. – may only comprise up to 10% cover in any given stratum.

Desirable native volunteers like alder and cottonwood may count for up to 20% of cover in any stratum, but species diversity is important. Where desirable native volunteers cover more than 20% of any stratum, a contingency mitigation plan must be created and implemented that restores the mitigation site to the designed level of diversity. Applicants are strongly encouraged to design mitigation plans that propose achievable goals and that carefully prepare and maintain the mitigation to ensure those goals are met.

*The following are examples of typical goals, objectives, and performance standards for the creation or restoration of Cowardin communities. These typical standards shall be used as minimums for species richness, diversity, aerial coverage, presence of invasives, and hydroperiod, where appropriate. Where design parameters are for different HGM or Cowardin types than illustrated in these examples, standards shall be held to consistent ranges.*

1.0 GOAL: CREATE/RESTORE A PALUSTRINE EMERGENT (PEM) WETLAND

- 1.1 Vegetation performance standards (FAC, FACW, or OBL species),
  - 1.1.1 Emergent Cover: 20-30% by year one, 40-50% by year three, 60-80% by year five;
  - 1.1.2 A minimum of 3-5 species by year one (assumes seeding 5-7 species of plants including appropriate native volunteers); 3-4 species by year three and 3 species by year five assuming that appropriate native volunteers can be included.
- 1.2 Hydrology performance standards:

  At an absolute minimum, saturation within 12 inches of the ground's surface for 12.5% of the growing season (approximately 30 consecutive days) between February 1 and June 1 of years of normal precipitation. For more diverse emergent marsh habitats, hydroperiod should have a performance standard of a minimum of 12-18 inches of inundation for 12.5% of the growing season (approximately 30 consecutive days) between February 1 and June 1 of years of normal precipitation.

2.0 GOAL: CREATE/RESTORE A PALUSTRINE SCRUB-SHRUB (PSS) WETLAND

Typical performance goal for these wetter areas is a dense thicket of shrubs, such as willows, twinberry, red-osier dogwood, etc.

- 2.1 Vegetation performance standards (FAC, FACW, or OBL species),
  - 2.1.1 Shrub or sapling tree aerial cover by year three 30-40%, 50-60% by year five AND
  - 2.1.2 For species richness, there shall be a minimum of 3-5 species by end of Year 5 assuming an initial planting of at least 5-7 species. Appropriate native volunteers may be included in the richness

determination; no single species shall constitute more than 40% cover.

2.2 Hydrology performance standards:
Saturation within 12 inches of the ground's surface for 12.5% of the growing season (approximately 30 consecutive days) between February 1 and June 1 of years of normal precipitation

3.0 GOAL: CREATION OF A PALUSTRINE FORESTED (PFO) WETLAND
The performance goal for these wet areas is the creation of installed sapling stage trees and shrubs to establish forested wetlands over time with shrub, sub-canopy, and sapling tree layers by year five.

3.1 Vegetation performance standards (FACU-, FAC, FACW, or OBL species),

3.1.1 Shrub/ sapling tree aerial cover by year three 30-40%, 50-60% by year five AND

3.1.2 Hydrology performance standards:
Saturation between within 12" of the soil surface for for 12.5% of the growing season (approximately 30 consecutive days) between February 1 and June 1 of years of normal precipitation.

## Part III: Planting Specifications

Planting types and densities should be specific to demonstrated hydrology and site conditions. The following densities should enable mitigations to meet their performance standards. Quantities are average, based on container-grown material – divisions, slips, cuttings, and bare-root materials require higher planting densities to compensate for lower survival rates. Rough equation to correlate is: 1'-3' = 1 gal.; 2'-4' = 2 gal.; 3'-6' = 5 gal. Planting densities only give figures for total plants per area – plants should be placed in random, naturalized clusters. The following minimum acceptable densities per plant community are:

Comment [DS2]:

1.0 EMERGENT (PEM) WETLANDS (FAC, FACW, OR OBL SPECIES) ARE TO BE PLANTED TO:

1.1 Emergents 1.5 feet O.C. (this assumes 10" plug or 4" pot); OR

1.2 Emergents 1.5 feet O.C., if supplemented by overseeding of native emergents or graminoids as appropriate.

2.0 SHRUB (PSS) WETLANDS (FAC, FACW, OR OBL SPECIES) ARE TO BE PLANTED TO:

2.1 Shrubs 4 - 6 feet O.C., depending on species type; (this assumes 2 gal. size),

2.2 Plus herbs and groundcovers 6' O.C.(10" plug or 4" pot),

2.3 Plus overseeding with native emergents, graminoids, or sterile ryegrass as appropriate.

3.0 FORESTED (PFO) WETLANDS (FACU- TO FACW SPECIES) ARE PLANTED TO

3.1 EITHER:

3.1.1 Trees 6 feet O.C; (this assumes 1-3 gal. size) – such trees are to be at least 50% conifers,

3.1.2 **Plus** shrubs 4 feet O.C. (this assumes 1-2 gal. size),

3.1.3 **Plus** herbs and groundcovers 6' O.C., (10" plug or 4" pot);

3.1.4 **Plus** overseeding with native emergents, graminoids, or sterile ryegrass, as appropriate.

3.2 OR: The Simple, Two-Step Process

3.3 Plant alders, cottonwood, willows (other seral species, e.g., big-leaf maple, Doug fir, as appropriate to site) at densities of 8' O.C. (assumes 2 gal. size), plus overseed with clover, low-growing non-invasive grasses, lupines, etc.,

3.3.1 After three years or greater than 85% survival, under-plant with:

3.3.1.1 Conifers (e.g., Sitka spruce, cedar, hemlock, yew, Doug fir in a wetter-to-drier continuum) 12' O.C. (this assumes 2-5 gal. size);

3.3.1.2 **Plus** shade-tolerant or dependent sub-canopy species (e.g., Indian plum, vine maple, etc.) 9' O.C. (assumes 1-2 gal.size);

3.3.1.3 **Plus** shade-tolerant and dependent herbs and groundcovers (e.g., waterleaf, trillium, *Smilacina*, etc.), 4' O.C. (10" plug or 4" pot), plus overseed with native herbs and grasses.

4.0 BUFFERS (UPL, FACU, OR FAC SPECIES)

4.1 Are to be planted as for Forested Wetlands, except:

4.1.1 See Site Placement in Habitat Worksheet, Appendix C. Best species for this area are those marked WB (wetter buffer) and DB (drier buffer).

***City of Woodinville***
***Planning & Community Development***
***17301 133rd Avenue NE***
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## Wetland Hydrology Management Guidelines

The Puget Sound Wetlands & Stormwater Management Research Program[1] (PSWSMRP) has developed guidelines for managing wetland hydro-periods post-development. These guidelines have, however, proven to be difficult to translate into engineering requirements for development proposals. In order to resolve these problems, the following technical guidelines have been developed.

These guidelines provide methods for determining pre-development wetland hydrology and designing surface water conveyance systems to maintain this hydrology post-development. Two methods have been developed; a simple method using the King County Runoff Time Series (KCRTS) hydrologic program, and a more accurate method using calibrated Hydrologic Simulation Program – Fortran (HSPF).

The Basic analysis is applied to wetlands that have low to moderate functions. A High Value analysis has been developed for wetlands that have high functions. Wetland functions may be determined by utilizing the "Wetland and Buffer Functions: Semi-Quantitative Assessment Methodology."[2] This method establishes three groups of wetland functions. Group 1 is roughly low functioning wetlands while Groups 2 and 3 are moderate and high functioning wetlands.

1. Basic Analysis (HSPF w/Regionalized Parameters, or KCRTS)
   This analysis does not model the wetland hydraulics, but instead matches the project's hydrologic contribution to the wetland. The basic analysis is performed with the full historical runoff files as statistics. The basic analysis should be combined with BMPs (e.g. dispersion, infiltration, energy dissipation, etc.) designed to closely match the transport characteristics of the existing site's hydrologic contributions to the wetlands, i.e. do flows from the existing site enter the wetland via concentrated surface flow as interflow, or combination of both?

a) determine the wetland contributing basin area, and soil and land cover types.
b) determine the pre-development probability of flow exceedence (flow durations) for different periods of the water year, as described below in Time Period of Interest.
c) determine the post-development probability of flow exceedence (flow durations) for the same time periods used in b. Different site development scenarios should be analyzed to determine the optimum developed site configuration.
d) determine the optimum developed site conditions which best match the pre-development frequency of exceedence as follows:
   i) modify the post-development contributing basin area (bypass increased volumes around wetland),
   ii) increased forest retention, and/or
   iii) infiltrate/disperse increased runoff volumes.

Time Period of Interest

Group 1 wetlands perform analysis seasonally with Spring and Summer being of primary concern to maintaining wetland functions. Spring is defined as February 1 through May 31, Summer is June 1 through August 31, Fall is September 1 through November 30, and Winter is December 1 through January 31. Seasons may be adjusted based on specific wetland characteristics, e.g., bogs may have a different critical season than lakes.

Group 2 wetlands not required to perform High Value Analysis: Time period shorter than seasonal during critical season(s). Perform partial-year duration analysis for each month during the wetlands critical season(s), and use seasonal time step for remainder of the year. The shorter time period will better match the existing time variable, hydrologic contributions from the site. The time period could be reduced further to a minimum of one week, which would essentially analyze flow durations on a storm-by-storm basis. An initial goal of matching the majority of partial-year flow durations should be used. Final determination as to the optimum site configuration will be agreed to through the engineering plan review process in conjunction with review by the City and/or private wetlands biologists.

The increased number of data points resulting from a shorter time period will likely require more judgment as to the optimum developed site configuration, as it is likely that different storm types will produce variable changes in runoff response under different land use assumptions (e.g., a thunderstorm may produce little to no runoff under existing conditions, but a fixed structure set to bypass the increased runoff from that storm may divert too much volume during a long duration winter storm). In other words, it is likely that a project will not be able to match to the same level the partial-year flow durations for all time periods, and therefore, judgment must be applied.

Proposals to modify the wetland hydraulics (storage or discharge) to control impacts should perform a calibrated HSPF analysis to measure fluctuations, as described in 2 below.

2. High Value Analysis (Calibrated HSPF) Group 3 wetlands. Use the PSWSMRP guidelines to analyze wetland water level fluctuations.
   a) Determine the water level fluctuation (WLF) for the wetland by gaging the wetland for one year. Use a combination of groundwater wells and crest-stage gages or continuous recording gages.
   b) Survey the topography of the wetland at a minimum of one foot contours.
   c) Perform a stage excursion analysis for 72-hour intervals.
   d) Limit stage excursions post-development using the PSWSMRP guidelines.

Note: Comparisons of existing and proposed conditions should be done based on calibrated simulations. Many of the errors in the analysis (e.g. reservoir hydraulics) will cancel, to a large extent if both conditions are simulated.

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References

[1] Homer, Richard R., S.S. Cooke, K.O. Richter, A. L. Azous, L.R. Reinelt, B.L. Taylor, K.A. Ludwa, and M. Valentine. 1966. Wetlands and Urbanization: Implications for the Future. Chapter 15. Puget Sound Wetlands & Stormwater Management Research Program.

[2] Cooke, Sarah Spear. May 1996. Wetland and Buffer Functions: Semi-Quantitative Assessment Methodology. Cooke Scientific Services. Seattle, WA.

# Appendix B

***City of Woodinville***
***Planning & Community Development***
*17301 133rd Avenue NE*
*Woodinville, WA 98072*
*425-489-2757*

Name of Project _____

Location of impacted wetland County: City: State:
USGS quad: NWI quad:

Summary of project, including wetland functions impacted and mitigated:

_____
_____
_____
_____
_____

Acres of wetland impacted (Cowardin classification)

Aquatic bed_____ Emergent _____ Forested_____
Open water _____ Scrub Shrub _____

Other impacts to: Streams_____; Lakes_____; Estuaries_____; Coastal Waters _____

Acres of wetland mitigation (Cowardin classification)

| Restoration | | Creation | | Enhancement | |
|---|---|---|---|---|---|
| Open Water | _____ | Open Water | _____ | Open Water | _____ |
| Aquatic Bed | _____ | Aquatic Bed | _____ | Aquatic Bed | _____ |
| Emergent | _____ | Emergent | _____ | Emergent | _____ |
| Scrub Shrub | _____ | Scrub Shrub | _____ | Scrub Shrub | _____ |
| Forested | _____ | Forested | _____ | Forested | _____ |
| Total | _____ | | _____ | | _____ |

Is preservation being proposed as part of the plan?_____

If so, _____acres of wetland will be preserved
and _____acres of upland buffer and/or _____ acres of riparian corridor.

Buffers for mitigation site

Maximum width_____ft; Minimum width_____; TOTAL buffer area_____acres.

Water regime at mitigation site

Source of water? Ground Water _____, Rain Water_____, Surface Water____.
Owners of water rights?_____

| | Existing | Proposed |
|---|---|---|
| Average winter outflow (cfs) | _____ | _____ |
| Average spring outflow (cfs) | _____ | _____ |
| Average summer outflow(cfs) | _____ | _____ |
| Average fall outflow (cfs) | _____ | _____ |

Soil surface will be saturated at the surface or flooded for _____months/year.

Estimated time to reach Performance Standards _____yrs.

# Appendix C: Habitat Worksheet

***City of Woodinville***
***Planning & Community Development***
*17301 133rd Avenue NE*
*Woodinville, WA 98072*
*425-489-2757*

**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).

| **Trees** | | | | | | |
|---|---|---|---|---|---|---|
| Scientific Name | Common Name | Indicator Status | Max Ht. | Light Needs* | Site** Placement | Comments |
| *Abies grandis** | grand fir | FACU- | 125 | SI-ST | DB | Best conifer for soil binding roots |
| *Acer macrophyllum* | big leaf maple | FACU + (FAC) | 100 | SI-ST | WB, DB | Seral/sprouter – shallow rooter |
| *Alnus rubra* | red alder | FAC | 80 | SI-ST | WB, DB | Seral, sprouter & spreader |
| *Arbutus menziesii* | Pacific madrone | UPL | 80 | SI | DB | Likes drier, coastal: slow-grower |
| *Betula papyrifera* | paper birch | FACW | 80 | SI | WE, SS | Saturated soils |
| *Fraxinus latifolia* | Oregon ash | FACW | 80 | SI-ST | WE, SS | Requires flat, damp soils |
| *Picea sitchenis** | Sitka spruce | FAC | 230 | SI | WE, SS | Wettest conifer |
| *Pinus contorta** | Shore pine | FAC | 60 | HA | WE, WB, DB | Tolerates poor soil |
| *Pinus monticola** | Western white pine | FACU- (FACW) | 120 | SI | WB, DB | NOT with 900' of *Ribes* spp.! |
| *Populus tremuloides* | quaking aspen | FAC+ | 75 | SI | DB | Seral in montane |
| *Populus trichocarpa* | black cottonwood | FAC | 200 | HA | WE, SS, WB | Seral; sprouter |

| | | | | | | |
|---|---|---|---|---|---|---|
| *Prunus emarginata* | bitter cherry | FACU | 50 | SI | DB | Tree form has heavily pubescent leaves |
| *Pseudotsuga menziesii** | Douglas fir | FACU | 300 | SI | WB,DB | Driest confier-seral, fast grower |
| *Taxus brevifolia** | Pacific yew | NI (FAC-) | 80 | ST-SD | WB | Very slow growing |
| *Thuja plicata** | western red cedar | FAC | 230 | SD | SS, WE, WB | Basic to PNW & wetlands |
| *Tsuga heterophylla** | 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 |
| *Acer circinatum* | vine maple | FAC- | 25 | SD | WB, DB | Needs canopy shade or lots of moisture |
| *Amelanchier alnifolia* | Serviceberry | FACU | 20 | SI | DB | Edge-loving |
| *Berberis aquifolium* | tall Oregon grape | UPL | 7 | SD | DB | Dry sites |
| *Berberis nervosa* | short Oregon grape | UPL | 4 | ST-SD | DB | Drier sites |
| *Cornus stolonifera* | red-osier dogwood | FACW+ | 20 | ST | WE, SS, WB | Takes sun if has lots of moisture |
| *Corylus cornuta* | Hazelnut | FACU | 15 | ST | DB | Good wildlife habitat |
| *Crataegus douglasii* | black hawthorn | FAC | 20 | SI | WB, DB | Typically on meadow hummocks |
| *Gaultheria shallon* | salal | FACU | 7 | ST-SD | DB | Basic forest groundcover |
| *Holodiscus discolor* | ocean spray | NI | 10 | SI-ST | DB | Drought-tolerant, edge-loving |
| *Lonicera involucrata* | black twinberry | FAC+ | 10 | SI-ST | WE, SS, WB | Takes sun if has lots of moisture |
| *Myrica gale* | sweetgale | OBL | 6 | SI | WE, SS | Common in scrub-shrub wetlands |
| *Oemleria cerasiformis* | Indian plum | FACU | 15 | SD | WB, DB | Sub-canopy |
| *Oplopanax horridus* | Devil's club | FAC+ | 7 | ST | WE, WB | Needs good drainage, forms thickets |
| *Philadelphus lewisii* | mock orange | NI | 10 | SI-ST | WB, DB | Likes streams, good drainage |
| *Physocarpus capitatus* | Pacific ninebark | FACW- | 20 | SI-ST | WB, DB | Needs good drainage |
| *Prunus virginiana* | choke cherry | FACU | 20 | | DB | Native to the whole US |
| *Pyrus fusca* | western crabapple | FACW | 35 | SI-ST | WE, WB | Edges – most of value in streamside control |
| *Rhamnus purshiana* | cascara | FAC- | 30 | ST-SD | WB, DB | Found in most wetlands |
| *Ribes bracteosum* | stink currant | FAC | 10 | ST | WB, DB | Transition |
| *Ribes lacustre* | prickly currant | FAC+ | 7 | ST | WB, DB | Can take drought |
| *Ribes sanguineum* | red-flowering currant | NI | 7 | SI | WB, DB | Doesn't form thickets! |
| *Rosa gymnocarpa* | Wood rose | FACU | 7 | ST | DB | Tough, hardy |
| *Rosa nutkana* | Nootka rose | FAC (OBL) | 10 | ST | SS, WB | Rapid volunteer on damp soil |
| *Rosa pisocarpa* | clustered rose | FAC (FACW | 7 | ST | WE, SS, WB | Will hybridize with nootka rose |
| *Rubus leucodermis* | black raspberry | NI | 10 | ST | DB | Good buffer planting |
| *Rubus parviflorus* | thimbleberry | FAC- | 10 | SI | DB | Seral groundcover in clear-cuts, drought tolerant |
| *Rubus spectabilis* | salmonberry | FAC+ | 15 | HA | WE, WB, DB | Takes sun if has lots of moisture |
| *Salix geyeriana* | Geyer willow | FACW+ | 15 | SI | SW, WE | Likes inundation, sluggish water, wet meadows |

| | | | | | | |
|---|---|---|---|---|---|---|
| *Salix hookeriana* | Hooker's willow | FACW- | 20 | SI | SW, WE, SS | Only found < 5 mi. from coast |
| *Salix lasiandra* | Pacific willow | FACW+ | 50 | HA | WE, SS, WB | Common, tolerant, prefers riparian |
| *Salix scouleriana* | Scouler willow | FAC | 35 | ST | SS, WB, DB | Upland & wetland |
| *Salix sitchensis* | Sitka willow | FACW | 25 | HA | WE, SS, WB | Common, tolerant |
| *Sambucus racemosa* | red elderberry | FACU | 20 | HA | WB, DB | Rapid grower, tolerates sun, seral on clear-cuts |
| *Sorbus sitchensis* | Cascade mountain ash | FACU | 15 | SI-ST | WB, DB | Montane, not to be mistaken for *S. aucuparia* |
| *Symphoricarpos albus* | snowberry | FACU | 7 | SI | WB, DB | Common, tolerant |
| *Vaccinium ovatum* | evergreen huckleberry | UPL | 5 | SD | DB | Prefers mature shade |
| *Vaccinium parvifolium* | red huckleberry | NI (FACU) | 13 | SD | DB | Requires lots of organic matter |
| **Sedges and Rushes** | | | | | | |
| Scientific Name | Common Name | Indicator Status | Max Ht. | Light Needs* | Site** Placement | Comments |
| *Carex comosa* | Bristly sedge | OBL | 2' | SI | SW, WE, SS | Rare in King County |
| *Carex lenticularis* | Shore sedge | FACW+ | 3' | SI | WE, SS | From shore to high mountains |
| *Carex lyngbyei* | Lyngby sedge | OBL | 3' | SI | SW, WE, SS | Coastal only |
| *Carex obnupta* | Slough sedge | OBL | 4.5' | ST | SW, WE, SS | Extremely common, coast to Cascade crest |
| *Carex rostrata (utriculata)* | Beaked sedge | OBL | | SI-ST | SW, WE, SS | Common |
| *Carex stipata* | Sawbeak sedge | OBL | 3' | SI-ST | SW, WE, SS | Lowland to mid-montane |
| *Eleocharis acicularis* | Spikerush | OBL | 0.5' | SI | SW, WE | Rhizomatous, lowland to mid-montane |
| *Eleocharis palustris* | Common Spikerush | OBL | 0.5' | SI | SW, WE | Rhizomatous, coastal to mid-montane |
| *Juncus acuminatus* | Tapered rush | OBL | 2' | SI | SW, WE | Tolerant |
| *Juncus articulatus* | Jointed rush | OBL | 2' | SI | SW, WE | Tolerant |
| *Juncus effusus (var. pacificus)* | Soft rush | FACW | 3' | SI-ST | SW, WE, SS | Weedy, common, hardy – often invasive |
| *Juncus ensifolius* | Dagger leaf rush | FACW | 2' | SI | SW, WE, SS | Lowland to mid-montane, lovely flowers & foliage |
| *Juncus oxymeris* | Pointed rush | FACW+ | 3' | SI | SW, WE, SS | Lowland |
| *Scripus acutus* | Hardstem bulrush | OBL | 6' | SI | SW, WE | Tolerates up to 3' of water; common, hardy |
| *Scripus maritimus* | Saltmarsh bulrush | OBL | 4.5' | SI | SW, WE | Coastal only |
| *Scripus microcarpus* | Small-fruited bulrush | OBL | 4.5' | SI-ST | SW, WE, SS | Lowland to mid-montane, very common |
| **Grasses** | | | | | | |
| Scientific Name | Common Name | Indicator Status | Max Ht. | Light Needs* | Site** Placement | Comments |
| *Alopecurus aequalis* | Short-awn foxtail | OBL | | SI-ST | SW, WE, SS | Often submerged |
| *Alopecurus geniculatus* | Water foxtail | OBL | 1.5' | SI-ST | SW, WE, SS | Often submerged, tolerant |
| *Beckmannia syzigachne* | American sloughgrass | OBL | 2' | SI | WE, SS | Good wildlife forage, lowland to mid-montane |
| *Calamagrostis canadensis* | Bluejoint reedgrass | FACW+ | | | WE, SS, WB | Rhizomatous, coastal to mid-montane |
| *Cinna latifolia* | Wood reed | FACW | 6' | ST | WE, SS, WB | Coastal to sub-alpine |
| *Deschampsia caespitosa* | Tufted hairgrass | FACW | 2' | SI | WE, SS, WB | Common, keystone species in wet meadows |
| *Elymus glaucus* | Blue wildrye | FACU | 2' | SI | DB | Very drought-tolerant, good wildlife forage |
| *Festuca idahoenis* | Idaho fescue | FACU* | 2.5' | SI | DB | Drought-tolerant |
| *Festuca rubra var. rubra* | Red fescue | FAC+ | 2.5' | SI | SS, WB | Common tolerant |

| | | | | | | |
|---|---|---|---|---|---|---|
| *Glyceria borealis (occidentalis)* | Northern mannagrass | OBL | 4' | ST | WE, SS | Tolerates up to 3' of water |
| *Glyceria elata* | Tall mannagrass | FACW+ | 4.5' | SD | WE, SS, WB | Prefers streamside |
| *Panicum occidentale* | Western panic-grass | FACW | | SI | WE, SS, WB | Coastal to sub-alpine |

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

# Appendix D

***City of Woodinville***
***Planning & Community Development***
*17301 133rd Avenue NE*
*Woodinville, WA 98072*
*425-489-2757*

## RESULTS

Permit No.: _____ Project Name:_____

Inspector: _____Date:_____ Special Conditions: _____

I. Summarize how mitigation compares to standards of success.
   A. Vegetation:

   B. Hydrology:
   C. Other:

Corrective actions needed?

II. Summarize how well the buffer protects the mitigation.

Corrective actions needed?

III. Does mitigation function like a wetland or stream in any stage of seral progression? If so, how? If not, what overall corrective actions would make it do so?

IV. What other notes would you make that these forms do not include?

# Appendix E

City of Woodinville
Restoration Cost Worksheet

Name of Project _____

| Item | Unit Price | Quantity | Price |
|---|---|---|---|
| Mitigation Cost | | | |
| Clearing non-native vegetation | | | |
| Installation of habitat features (LWD, snags, bir boxes) | | | |
| Trees | | | |
| Shrubs | | | |
| Sedges & Rushes (if applicable) | | | |
| Grasses | | | |
| Ferns | | | |
| Herbs & Groundcovers | | | |
| Maintenance | | | |
| Monitoring & Reports | | | |
| Contingency Plan | | | |
| Structures (fencing, signage) | | | |
| SUBTOTAL | | | |
| 30% CONTINGENCY & MOBILIZATION | | | |
| GRAND TOTAL | | | |
| ASSIGNMENT OF FUNDS (150% OF TOTAL) | | | |

_____ _____

Applicant Signature Date Approved By Date