BELLEVUE CRITICAL AREAS UPDATE WETLAND INVENTORY

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1.0 INTRODUCTION

Wetlands are defined as critical areas in Washington Administrative Code (WAC) 365-190-080. The code states that wetland of Washington State "are fragile ecosystems which serve a number of functions. Wetlands assist in the reduction of erosion, siltation, flooding, ground and surface water pollution, and provide wildlife, plant, and fisheries habitats. Wetlands destruction or impairment may result in increased public and private costs of property losses." There are five general types of wetlands in Bellevue that occur in all major basins and are dispersed throughout the landscape. Bellevue has also created new wetlands through mitigation required for permitted development activities. These newly created wetlands are protected as Native Growth Protection Areas (NGPAs) and also contribute to the aquatic ecosystem in the City. This report first discusses the methodology for this wetlands inventory. Then, wetlands within a landscape setting are discussed, followed by a detailed discussion of wetland characteristics and functions and values by major drainage basin. Figures and photos referenced throughout the text are provided at the end of the report, followed by appendices.

2.0 METHODOLOGY

Two levels of investigation were conducted to compile this wetland inventory; a review of existing information and an on-site investigation. A review of existing literature, maps, and other materials was conducted to identify and characterize wetlands in the City of Bellevue. Two days of field reconnaissance were used to supplement the paper review to field-verify wetland functions, values, and conditions. The goal of the inventory was to characterize predominant wetland types within Bellevue, not to inventory each wetland within the City. Major sources of information are described below.

2.1 NWI Map

Using the National Wetlands Inventory (NWI) Map (USFWS, 1988), wetland areas were targeted for surveying during the field investigations and for GIS analysis of the wetland. The NWI provided a map of wetlands categorized by Cowardin (1979) classification including: Palustrine Forested (PFO), Palustrine Scrub-shrub (PSS), Palustrine Open Water (POW) and Lacustrine wetlands as well as the subclasses of these classes (Figure WT-1).

The NWI map was used because it was available in a digital format, unlike the Bellevue Sensitive Areas Notebook, and could easily be overlaid onto aerial photography. This NWI aerial map was then used for both field observations and GIS analysis. Additionally, City staff indicated that the Bellevue Sensitive Areas Notebook (see below) contained some incorrect or outdated information; this was confirmed through field observations and review of the Notebook. While both the Bellevue Sensitive Areas Notebook and the NWI map are outdated, the NWI map was used for this study because it was the best inventory tool available. This is further discussed under the Limitations of Wetlands Inventory Section on page 7.

2.2 Bellevue Sensitive Areas Notebook

The City of Bellevue's Sensitive Areas Notebook (City of Bellevue, 1987) was also reviewed. The Notebook provides a detailed description of wetlands within the City. The Bellevue Sensitive Areas Notebook did not contain a single, comprehensive map of wetlands in the City; however, it did contain individual maps of inventoried wetlands with information on Cowardin (1979) classes within the wetlands, Bellevue wetland classification, dominant vegetation, and bird species observed in each wetland. A list of all vegetation species identified during production of the Bellevue Sensitive Areas Notebook is provided in Appendix WT-1. According to City staff and based on review of the Notebook, some information is incorrect or outdated. As a result, this information was used in a qualitative fashion, but not to characterize the specific, type, or extent of each wetland in the City. Instead, as described above, we utilized the NWI map that was available electronically, and field observations to identify the location and extent of wetlands in the City. This is further discussed under the Limitations of Wetlands Inventory Section on page 7.

2.3 Aerial Photographs

The 2000 aerial photograph provided by the City of Bellevue was used to identify potential wetland areas that were shown on the NWI map and/or the Bellevue Sensitive Areas Notebook. The photograph provided information on the extent of different wetland classes, including open water, scrub-shrub, forested, and emergent classes. In addition, the photograph could be used to document wetland losses between 1988, the date of the NWI, and 2000.

2.4 Bellevue GIS Map Layers

Bellevue GIS map layers and attribute data were used to conduct both field investigations and GIS analysis. The Native Growth Protection Area Map layer and associated attribute data was used to assess the creation, enhancement, and/or restoration of wetlands within Bellevue by major drainage basin. The attribute data for NGPAs was limited to type of project (i.e., wetland or steep slope), name, date of creation, and location. Therefore we were unable to assess the quality or condition of the wetlands. NGPAs that were labeled in the GIS data as "wetland" or "wetland-riparian" were used in the analysis of this wetlands inventory. Other NGPAs may exist as protection of steep slopes or upland restoration, but were not included for this wetlands inventory.

2.5 Soils Map

Bellevue provided a GIS map layer that identifies mapped soil units based on the Soil Conservation Service (now the Natural Resources Conservation Service) Survey (1952) and the King County Soil Survey (1973) (Figure WT-1). Using GIS, the NWI map was overlaid on the soils map to determine the types of soils mapped for wetland areas in Bellevue.

2.6 Stream Typing Report

The City of Bellevue Stream Typing Report (Watershed Company, 2001) was reviewed to determine the presence of federal or stated-listed threatened or endangered fish species in streams that passed through wetlands in Bellevue. For wetlands that were identified in riparian corridors, the Stream Typing Report also provided information on use of these wetland habitats by fish species to assist in the functional assessment of the wetlands.

2.7 Park Plans and Environmental Impact Statements

- The following park plans and Environmental Impact Statements (EISs) prepared for park plans were reviewed for relevant information:

- *Draft Environmental Impact Statement for Lake Hills Greenbelt Park* (City of Bellevue Parks and Recreation Department, 1985).
- *Lake Hills Greenbelt Park Management Plan* (City of Bellevue Parks and Recreation Department, 1988).
- *Draft Environmental Impact Statement for Mercer Slough Open Space Master Plan* (City of Bellevue, 1988).
- *Final Environmental Impact Statement for Mercer Slough Open Space Master Plan* (City of Bellevue, 1990).
- *Kelsey Creek Community Park Renovation Plan*, Prepared for City of Bellevue Parks and Recreation Department (Jones & Jones, 1993).

- These plans and EISs provided background information on wetlands, lakes, streams, and wildlife habitat in the Mercer Slough, Lake Hills Greenbelt, and Kelsey Creek Community Parks. They also provided information on restoration and management activities within these parks.

2.8 PRISM Maps

- The Department of Urban Design and Planning at the University of Washington has prepared a Puget Sound Regional Synthesis Model (PRISM) analysis for the City of Bellevue. The University analyzed high resolution aerial multi-spectral imagery to map vegetative cover. The PRISM analysis identified land cover types in the City such as coniferous vegetation, deciduous vegetation, lawn, and impervious area. The City will be exploring options for incorporating these findings into its future critical area mapping efforts.

2.9 On-site Investigation

Biologists conducted site investigations on February 28 and 30, 2002 of wetlands that are identified on the NWI map and are located on public land. No field reconnaissance of wetlands on private land was conducted. Fifteen wetlands were visited during this field investigation representing a broad range of he types of wetlands present in the City. A State of Washington Wetland Rating Form, a Functional Assessment Form, and a Wildlife Habitat Assessment Form were completed for each wetland type observed in the field. Examples of the State Wetland Rating and Functional Assessment Forms are provided in Appendix WT-3. An example of the Functional Assessment Forms for each wetland type is provided respectively in Appendix WT-2 and Appendix WT-3. An example of the Wildlife Habitat Assessment Form is provided in Appendix WL-2 of the Wildlife Habitat Inventory, Section B.

Methods defined in the *Washington State Wetlands Identification and Delineation Manual* (Washington State Department of Ecology, 1997), a manual consistent with the *Corps of Engineers Wetlands Delineation Manual* ("1987 Manual") (Environmental Laboratory, 1987) were used to characterize the wetlands within Bellevue. The methodology outlined in the manual is based on three essential characteristics of wetlands: (1) hydrophytic vegetation; (2) hydric soils; and (3) wetland hydrology. Field indicators of these three characteristics must all be present to make a positive wetland determination, unless problem areas or atypical situations are encountered. Atypical situations are wetland area where soils, hydrology, or vegetation has been significantly altered through human or natural means (i.e., excavation in wetland, vegetation has been cleared, substantial diversion of original water source away from wetland, etc.). Problem areas are conditions that make application of one or more indicators (soil, vegetation, or hydrology) difficult, at least at certain times of year (i.e., wetlands on slopes, seasonally-wet wetlands, soils that appear hydric, but are upland soils).

Vegetation communities of the wetlands were classified according to the Cowardin (1979) classification system. Cowardin (1979) classes are those defined in the *Classification of Wetlands and Deepwater Habitats of the United States by* U.S. Fish and Wildlife Service; they categorize wetlands by hydrologic (palustrine, lacustrine, riverine, estuarine, and marine) and vegetative classes (forested, scrub-shrub, emergent, aquatic bed, open water).

2.9.1 Assessment of Wetland Functions

Wetland functions were evaluated using a system developed by the U.S. Army Corps of Engineers (Reppert et. al, 1979), and modified for the Pacific Northwest by Cooke (1996). Wetland functions assessed included: (1) flood and storm water control; (2) base flow and ground water support; (3) erosion and shoreline protection; (4) water quality improvement; (5) natural biological support, (6) overall habitat functions; (7) specific habitat functions; and (8) cultural and socioeconomic characteristics. More details regarding how functions are performed by wetlands is described in the Best Available Science - Wetlands paper.

A functional assessment was completed for each wetland group identified during the site investigation and the individual functions currently provided by these types of wetlands. A rating of "LOW," "MODERATE," or "HIGH" was assigned for the individual functional categories for each wetland group. For the purposes of the functional assessment, each function

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was assigned a maximum total of points based on the number of criteria used in the evaluation. The ratings of "LOW", "MODERATE", or "HIGH" correspond to the low, middle and higher third of the point scale for each respective function. For example, the highest possible number of points for the water quality improvement function is 12. Therefore for this function a score of four to six is LOW, a score of seven to nine is MODERATE, and a score of 10 to 12 is HIGH (See Functional Assessment Form in Appendix WT-3).

2.9.1.1 Flood and Stormwater Control

Flood and stormwater control refers to a wetland's ability to reduce or modify potentially damaging effects of storm and flood flows. The wetland stores stormwater and slows its movement and then slowly releases it to adjacent water bodies or groundwater. This function of wetlands has the effect of lowering flood flow velocities and peak flows during storm events within a watershed. This function is evaluated according to size and category of wetland; type of outlet, amount of forested cover; and position in the drainage.

2.9.1.2 Baseflow and Groundwater Support

Baseflow and groundwater support is defined as "...the role which a specific wetland area plays in maintaining the stability and environmental integrity of the entire system to which it is physically and functionally related" (Reppert et. al, 1979). Water is stored within wetlands depending on wetland characteristics and then released over time into streams and groundwater. Therefore, wetlands provide baseflow to streams, particularly during the dry season, and open water habitats and also recharge aquifers. This function is evaluated according to size and location of the wetland; proximity to other palustrine, riverine, or lacustrine systems; hydroperiod; and presence of flow-sensitive fish.

2.9.1.3 Erosion and Shoreline Protection

Erosion and shoreline protection refers to a wetland's ability to mitigate the effects of waves and storm damage, and thus increase shoreline stability and limit erosion. Wetlands are often along the edge of other waterbodies, such as streams and lakes, and contain vegetation that slows stormwater and wave activated flows; effectively reducing erosion and protecting shorelines. This function is evaluated according to such features as type, structure, and density of vegetation; width of the vegetated area and buffering capacity; and amount of development in the sub-catchment (see Glossary).

2.9.1.4 Water Quality Improvement

Water quality improvement refers to a wetland's ability to purify water through a variety of physical, biological, and chemical processes. Sediment- and pollutant-laden water that passes through wetlands is slowed by vegetation allowing sediments and attached pollutants to settle out. Chemicals, such as nitrogen and phosphorous, are converted to forms useful for biological production, through biological and chemical processes. This function is evaluated according to such characteristics as size and type of wetland; nature and density of vegetation; hydroperiod; and proximity to pollution sources.

2.9.1.5 Natural Biological Support

Natural biological support refers to a wetland's ability to provide nutrients, energy for the food chain and for a diversity of species. Wetlands provide both vegetation that is foraged by animals and also export nutrients within decayed biomass for organisms that feed on detrital matter. Wetlands provide the base units of energy and food within the food chain, although some wetlands, such as bogs and fens, act as sinks for biomass material. This function is evaluated according to such parameters as type, diversity, and amount of vegetation; proximity to other habitats; prevalence of invasive species; amount of organic accumulation and export; type, diversity, size, and amount of habitat features, width of buffer; and connectivity to other habitats.

2.9.1.6 Specific and Overall Habitat Function

Overall habitat function refers to the ability of a wetland to provide diverse habitats for fish and wildlife species. Many fish and wildlife species are dependent on wetland habitats for all or part of their life cycle. Wetlands and their surrounding uplands can consist of a diversity of plant communities that are both species rich and structurally diverse; therefore providing food, cover, nesting, and perching habitat for a wide variety of fish and wildlife. This function is evaluated according to characteristics of size, amount of habitat diversity, and the presence or absence of a wildlife refuge or protected area.

Specific habitat function indicates the wetland's capacity to provide habitat for invertebrates, amphibians, fish, mammals, and birds. These animals have varying habitat requirements. Depending on the physical, biological, hydrologic, and vegetative characteristics of a wetland and its surroundings it may provide better habitat for one type of animal over another and one type of species of animal than another. This function is evaluated by parameters that include presence of surface water, connectivity to other aquatic features, diversity of vegetative communities, and proximity to other habitats.

2.9.1.7 Cultural and Socioeconomic Characteristics

Cultural and socioeconomic characteristics, based on the value of the wetland to humans, are evaluated by assessing parameters including opportunities for education or recreation, public access, aesthetic value, presence of commercially valuable natural resources, historical or archaeological value, and proximity to other types of open space. Because we are discussing wetlands within an urban setting, there are other benefits of wetlands that are beneficial to the public, even though a wetland area may not be publicly accessible. These additional benefits include reduction of flood damage, water purification, erosion control, increased market values of property due to presence of natural habitat near homes and businesses, and backyard wildlife habitat and green space for passive recreational and aesthetic pleasure.

3.0 LIMITATIONS OF THE WETLANDS INVENTORY

This wetland inventory is not an exhaustive tally of all wetlands within Bellevue. Rather it is an assessment of the major types of wetlands based on the 1988 NWI Map (USFWS), and their relative functions within each major drainage basin.

As discussed in the Methods Section, a comparison of the NWI map to the Bellevue Sensitive Areas Notebook (City of Bellevue, 1987) revealed that they did not match in all cases. There were several NWI wetlands that were not recorded in the Sensitive Areas Notebook and the reverse is true as well. The data presented in this section is based on the NWI map from 1988, which may only partially represent the number and extent of wetlands in some areas. The largest discrepancy between the NWI map and the Bellevue Sensitive Areas Notebook was in the Small Lake Washington Tributaries Basin. The NWI map showed only four wetlands within the Small Lake Washington Tributaries Basin; however, the Bellevue Sensitive Areas Notebook (1987) indicates that six more wetlands may be present within this basin. However, while the NWI map may be outdated and missing some of the wetlands that currently exist within Bellevue, it was the best available tool for analyzing the number, percent area, functional contribution, geomorphic setting, and types of wetlands within each major drainage basin. There are likely to be more wetlands in the city of Bellevue than those shown on Figure WT-1.

During field investigations and based on an overlay of the NWI map on aerial photographs of Bellevue (Bellevue, 2000), it was discovered that five of the wetlands identified on the NWI map no longer existed. Two wetlands in Small Lake Washington Tributaries Basin and three in Kelsey Creek/Mercer Slough Basin have been lost; these wetlands have been filled through residential or commercial development. These lost wetlands are depicted on modified NWI map in Figure WT-1. Based on the 1988 NWI maps, these five wetlands were relatively small (0.5 to 4 acres) and did not appear to have been hydrologically connected to streams. The loss of wetlands is not uncommon in urban areas and the amount of loss since pre-settlement times is greater than that shown through comparison of the NWI map to the 2000 air photo. However, wetlands have also been restored, enhanced, and created in Bellevue through compensatory mitigation requirements for impacts to existing wetlands according to the City's Native Growth Protection Areas data.

4.0 WETLAND TYPES

The city of Bellevue contains a variety of wetlands, the majority of which are associated with riparian corridors or drainages. Most of the wetlands that have been preserved in Bellevue are located within publicly-owned park land. In characterizing wetlands in Bellevue, we used a hybrid classification (or typing). We used both the Cowardin (1979) wetland classes, which are based on vegetative communities, (i.e. forested, scrub-shrub, emergent, and open-water) and the hydrogeomorphic (HGM) classification developed by Brinson (1993) and modified by Department of Ecology (Hruby et. al., 1999), which defines the hydrologic functioning of wetlands in a geographic or watershed setting. These classifications are described below. We modified some of the names of these classifications so that terms would be more recognizable to the lay person and also so that they would fit the landscape setting specific to Bellevue, however, classifications of wetlands are based on their respective classification methodologies.

Five wetland types have been identified in Bellevue:

- Large Wetland Complexes (Outflow Depression),
- Small Riparian Wetlands (Riverine),
- Seep Wetlands (Slope),
- Lacustrine,
- Hydrologically-Isolated Wetlands (Closed Depression), and
- Native Growth Protection Areas (NGPAs).

Each of these is defined below, with the exception of Native Growth Protection Areas; information on the characteristics of vegetation classes and condition of NGPAs was not available or assessed for this inventory. However, NGPAs are depicted on Figure WT-1 and their position in the landscape is described below. For simplicity, the first name before the hyphen is used throughout the rest of the document to refer to the wetland type. For example, Large Wetland Complexes - Outflow Depression is referred to as "Large Wetland Complexes."

In the following section, Wetland Characterization: Functions, Constraints, and Opportunities, wetlands are characterized by major drainage basins. The characterization include a discussion of wetland functions, geomorphic location, and constraints and opportunities for protection.

4.1 Cowardin Classes

Lacustrine, palustrine, and riverine systems as defined by Cowardin (1979) are freshwater wetland systems present in Bellevue. Lacustrine systems are wetlands associated with deep water bodies or lakes greater than 20 acres in size. Riverine wetlands are those located along the edges of streams, predominately fed by overflow from the stream. Palustrine systems are freshwater systems that are not lacustrine or riverine systems, usually fed by groundwater, precipitation, and surface runoff.

Palustrine and riverine systems include vegetative subclasses: Forested (PFO), Scrub-Shrub (PSS), Emergent (PEM), and Open Water (POW) (this subclass does not apply to riverine systems). A subclass is assigned to a wetland based on the dominant uppermost vegetative layer (trees, shrubs, herbaceous, aquatic plants in open water) (Cowardin, 1979). Wetlands may also contain more than one vegetative subclass, and are typically referred to as wetland complexes (e.g., forested/scrub-shrub, or open water/emergent/scrub-shrub). A forested subclass is defined as a plant community that contains trees greater or equal to 20 feet in height, have a canopy areal cover of at least 30 percent, and trees are the dominant influence in the community (Washington State Department of Ecology, 1993). Scrub-shrub subclasses are dominated by shrubs and sapling trees that are less than 20 feet in height. The emergent subclass is dominated by herbaceous vegetation, such as sedges, rushes, grasses, and other non-woody plants.

There are two main types of open water wetlands in Bellevue: lacustrine and palustrine. According to Cowardin (1979), lacustrine systems include "wetlands and deepwater habitats that have the following characteristics: 1) situated in a topographic depression or a dammed river channel; 2) lacking trees, shrubs, persistent emergents, emergent mosses or lichens with greater than 30 percent areal coverage; and 3) their total area exceeds 20 acres."

Open water systems less than 20 acres are too small to meet the criteria of a lacustrine classification, thus are considered palustrine open water (POW). Cowardin assigns two subclasses to these open water wetlands: unconsolidated bed (PUB) and aquatic bed (PAB). Cowardin (1979) defines unconsolidated bed wetlands as those with at least 25 percent cover of particles smaller than stones and vegetative cover of less than 30 percent. Aquatic bed wetlands are defined as wetlands or deepwater habitats that are dominated by plants that grow principally on or below the surface of the water for most of the growing season, and for most years. Larsen Lake, 10 acres in size, is an example of an Open Water wetland in Bellevue that contains both Unconsolidated Bed and Aquatic Bed.

4.2 Hydrogeomorphic Classes

There are four main hydrogeomorphic (HGM) classifications of wetlands as defined by Brinson (1993) and Washington Department of Ecology (Hruby et al., 1999):

- Depression, which is split into Outflow and Closed subclasses,
- Slope,
- Riverine, and
- Lacustrine Fringe.

Table 1 gives a summary of the wetland types that were identified in Bellevue with their HGM characteristics including geomorphic setting, water source, and hydrodynamics and their associated Cowardin (1979) vegetative classes.

Table 1. HGM and Cowardin Classifications of Bellevue Wetland Types

Wetland Type	HGM Class	Geomorphic Setting	Water Source	Hydrodynamics	Cowardin Classes
Large Wetland Complexes	Depression - Outflow	Topographic depression lower than surrounding land that allows accumulation of surface waters. Occur in headwaters to streams, alluvial terraces above existing floodplains, and floodplains of major rivers that have become isolated from frequent flood events. Have surface water outflow to streams.	Dominant water sources are intermittent or permanent stream(s), groundwater, overland surface flow from adjacent uplands.	Water flow is from surrounding uplands and streams toward center of depression or stream at low point in depression. Water levels within wetland may fluctuate with seasonal differences in precipitation	Two or more classes in wetland including PFO, PSS, PEM and/or POW
Hydrologically-Isolated Wetlands	Depression -Closed	Topographic depression lower than surrounding land that allows accumulation of surface waters. No surface water outflow to channels, streams, or rivers, may have inlets. Found in depressions on top of clay lenses on glacial outwash, alluvial terraces above existing floodplains, depressions in glacial till.	Dominant water sources are precipitation, groundwater, overland surface flow from adjacent uplands.	Water flow is from surrounding uplands toward center of depression. Water levels within wetland may fluctuate with seasonal differences in precipitation	One or two classes including: PFO, PSS, PEM, or POW (including PUB and PAB)
Small Riparian Wetlands	Riverine	Occur in floodplains and riparian corridors in association with stream or river channel.	Dominant water sources are over bank flow and subsurface hydraulics connections between stream and wetland. Additional water sources are precipitation, tributary inflow, and overland and interflow from surrounding uplands.	When overbank flooding of the stream occurs, unidirectional surface flows dominate the hydrodynamics. Surface water is lost through the return of floodwaters t the channel after flooding. May have temporary standing water in shallow localized depressions or in impounded areas.	One or two classes including: PFO, PSS, and/or PEM
Seep Wetlands	Slope	Occur on sloping land (may range from hillsides to nearly flat slopes) where there is discharge of ground water to the land surface. Surface water cannot accumulate because the wetland lacks closed contours; no obvious surface water inflows; may grade into riverine wetlands at stream headwaters.	Dominant water sources are ground water, precipitation, groundwater, interflow from surrounding uplands.	Water flow is unidirectional downslope. If channels develop, they serve to convey water away from the wetland.	One or two classes including: PFO, PSS, and/or PEM
Lacustrine	Lacustrine Fringe	Adjacent to lakes, where the water elevation of the lake maintains the water table and water surface level within the wetland.	Lake is dominant water source; additional sources include precipitation and ground water discharge.	Water movement is bi-directional, controlled by water-level fluctuations in the adjoining lake.	Lacustrine (L) including LUB and/or LAB

(Source: Brinson, 1993; Hruby et al., 1999; Gwin et al., 1999)

5.0 LANDSCAPE SETTING

The pre-settlement landscape of Bellevue consisted of a matrix of mature forest, streams, and wetlands. Two large watersheds, one flowing to Lake Washington and the other to Lake Sammamish defined the vegetative and biological characteristics of the area. Smaller drainage basins within these two large watersheds were delineated by interconnected, complex, riparian and wetland systems that drained into larger streams and other wetlands, and eventually into one of the lakes. Wetlands that were not hydrologically connected to streams by surface water were also present within the depressions and topographic benches throughout the landscape. Wetlands were, and continue to be, an important biological and hydrologic element in this landscape. Wetlands continue to exist throughout Bellevue's drainage basins. They are an integral part of the riparian system, that feed, receive, and moderate water flows in streams. They also provide unique, important fish and wildlife habitat, and nutrients to adjacent water bodies and habitats. In pre-settlement times, wetlands were linked by forests and/or streams and provided rearing, nesting, breeding, water sources, and foraging for the predominant number of wildlife species that inhabited Bellevue.

The natural environment within Bellevue was changed by tree harvesting and the conversion of upland forest and wetland habitats to agricultural uses and urban development. Virtually all of the forests in Bellevue including some forested wetlands, have been harvested at least once. Timber harvest, and agricultural and urban development have resulted in a loss or modification of wetlands, particularly of smaller wetlands that were hydrologically-isolated from streams. Larger or perennially inundated wetlands remain on the landscape because they are difficult to build on or were recognized for their importance to the major stream systems in Bellevue. As impervious surface areas increased within drainage basins, the hydrologic conditions within the basins and within wetlands changed, resulting in negative effects to flora and fauna. Because less water is absorbed by pervious soils and plants, the importance of the stormwater control and water quality improvement functions of wetlands has increased, but at a cost to the original plant and animal communities within wetlands.

The landscape matrix of Bellevue now consists of urban habitat, predominantly single family residential lots. Bellevue can be divided hydrogeomorphically into five watershed basins: Small Lake Washington Tributaries, Kelsey Creek/ Mercer Slough, Small Lake Sammamish Tributaries, Lewis Creek, and Coal Creek. Streams systems still exist in each of the five major basins, and form valuable links between wetlands and native upland forest habitats present on steep slopes and on private and public land (see Wildlife Inventory, Section B). However, stream riparian habitat is degraded in terms of water quality, base flow, channel morphology, vegetation cover, and woody debris (see Stream Inventory, Section C). Large riparian wetlands remain in the Kelsey Creek/Mercer Slough drainage basin on Kelsey Creek, Mercer Slough and Richards Creek and at Phantom Lake in the Small Lake Sammamish Tributaries Basin. Some small hydrologically-isolated wetlands also occur in depressions within the landscape or in areas that have been cut off by development from what were once larger wetlands, although many of these have been lost to agricultural and urban development.

5.1 Summary of Wetlands by Basin

Wetlands play an important role within the five basins. Table 2 indicates total number, total area, and percent area of wetlands within each basin. The table also shows the percentage of:

- naturally-occurring wetlands (according to the 1988 NWI map),
- wetland loss (comparing to the NWI map to the 2000 photo), and
- Native Growth Protection Area Wetlands (NGPA) (based on Bellevue 2000 GIS data) occurring within each basin.

Figure WT-1 depicts both NWI naturally-occurring and NGPA wetlands in Bellevue.

The largest number (48) and most diverse wetlands are found in the Kelsey Creek/Mercer Slough Basin (Table 2). This basin is the largest (10,947 acres) and most complex hydrologically, and contains the largest percent wetland area (4.5 %). The Coal Creek basin is second in the total number of wetlands (18) followed closely by Lewis Creek Basin (17), but most of these wetlands are NGPA wetlands. The percent area of wetlands in both Coal and Lewis Creek basins is smaller than in the Small Lake Sammamish Tributaries Basin, where only 12 wetlands (including NGPA wetlands) were mapped. Only five wetlands were depicted on the 1988 NWI map (one seep wetland was added by Adolfson) within the Small Lake Washington Tributaries Basin, however, as discussed in the Limitations of Analysis Section, this may under-represent the actual number and percent area of wetlands within this basin. There are likely more wetlands in Bellevue than those depicted on the 1988 NWI map (Figure WT-1). The Bellevue Sensitive Areas Notebook reports six additional wetlands near Yarrow Creek in the Small Lake Washington Tributaries Basin. These six wetlands were not identified on the NWI map and were not observed during field observations due to lack of access to private property.

While the areal extent of wetlands within all basins is quite small, 0.2 percent to 4.5 percent, they have a significant effect on the hydrologic and biological functions within each basin. For example, basins with as little as five percent area of wetlands, can reduce flooding by 50 percent more than basins without wetlands (Mitsch and Gosselink, 1993).

Table 2. Number, Percent Area of Wetlands, and Percent Impervious Surface by Basin

Basin Name And Total Area (acres)[a]	Category	Number of Wetlands	Acres of Wetland in Basin by category	Percent Area of Wetland in Basin (%)	Percent Impervious Surface in Basin (%)[c]
Kelsey Creek/Mercer Slough Basin	Total number of wetlands in Basin	49	498	4.55%	30-45%
	Remaining Naturally Occurring Wetlands	38	481	4.39%	
10,947[a]	Native Growth Protection Areas[b]	8	13	0.12%	
	Wetland Loss based on comparison to 1988 NWI Map	3	4	0.04%	
Small Lake Washington Tributaries Basin	Total number of wetlands in Basin	6	13	0.28%	29-52%
	Remaining Naturally Occurring Wetlands	4	8	0.17%	
4,591[a]	Native Growth Protection Areas	0	0	0.00%	
	Wetland Loss based on comparison to 1988 NWI Map	2	5	0.10%	
Coal Creek Basin	Total number of wetlands in Basin	18	30	0.65%	24.7%
	Remaining Naturally Occurring Wetlands	4	3	0.06%	
4,544[a]	Native Growth Protection Areas	14	27	0.59%	
	Wetland Loss based on comparison to 1988 NWI Map	0	0	0.00%	
Lewis Creek Basin	Total number of wetlands in Basin	17	15	1.10%	28.2%
	Remaining Naturally Occurring Wetlands	4	10	0.73%	
1,403[a]	Native Growth Protection Areas	13	5	0.37%	
	Wetland Loss based on comparison to 1988 NWI Map	0	0	0.0%	
Small Lake Sammamish Tributaries Basin	Total number of wetlands in Basin	12	93	2.25%	30-42%
	Naturally Occurring Wetlands	8	92	2.21%	
4,157[a]	Native Growth Protection Areas	4	2	0.04%	
	Wetland Loss based on comparison to 1988 NWI Map	0	0	0.00%	

[a] This data is based on NWI data (USFWS, 1988) and may not fully represent the total area and number and wetlands within the basins.
[b] NGPA data is based on 2001 Bellevue GIS data.
[c] Total impervious surface based on City of Bellevue calculations see Section C: Streams, for more information.

6.0 WETLAND CHARACTERIZATION: FUNCTIONS, CONSTRAINTS, AND ENHANCEMENT/RESTORATION OPPORTUNITIES BY BASIN

6.1 Kelsey Creek Basin/Mercer Slough

The Mercer Slough/Kelsey Creek Basin is the largest basin and contains the largest and most diverse wetlands within Bellevue (Table 3). The NWI data and Adolfson field observations indicate that all five types of wetlands found in Bellevue are represented in this basin: Large Wetland Complexes, Small Riparian Wetlands, Hydrologically-Isolated, and Seep Wetlands. These wetlands are spread throughout the basin. NGPA wetlands are located exclusively in the top third of the basin. This is likely due to the location of wetland disturbance and opportunities for mitigation in this portion of the basin.

Wetlands within this basin range in size from 0.23 acre to 193 acres (Mercer Slough Wetland). Wetland sizes for the Large Wetland Complexes may be slightly exaggerated because roads have fragmented them and reduced their size or formed hydrologically-separate wetlands that are no longer part of the complex. For example, the Lake Hills Connector cuts through the Kelsey Creek Park and Richards Creek wetlands, however, these were assumed to be hydrologically connected and are shown as one large wetland complex on the NWI map.

Table 3. NWI and NGPA Wetland Types, Size and Geomorphic Setting in the Mercer Slough/Kelsey Creek Basin [a]

Wetland Count	NWI Wetland Map Identifier[b]	Assigned Bellevue Wetland Name	Wetland Type Name	Size (Acres)	Name of Associated Stream	Location in Basin (Top 1/3, Middle 1/3, Bottom1/3)
1	7	7-A through C Kelsey Creek North, South, and Mid	Complex	17.59	Kelsey Creek	Top
2	13	2-A Sammamish High School	Complex	19.94	Kelsey Creek	Top
3	14	3-A through H Kelsey Creek Park; 6-J Kelsey Creek Park	Complex	84.08	Richards Creek	Middle
4	15	Not in Bellevue Sensitive Areas Notebook	Complex	0.84	Kelsey Creek	Top
5	19	Not in Bellevue Sensitive Areas Notebook	Complex	1.70	Richards Creek	Middle
6	20	3-A Beaver Pond	Complex	5.18	Richards Creek	Middle
7	21	Not in Bellevue Sensitive Areas Notebook	Complex	0.90	Kelsey Creek	Top
8	22	2-C Larsen/Phantom Lk Greenbelt	Complex	13.04	Kelsey Creek	Top
9	26	Not in Bellevue Sensitive Areas Notebook	Complex	15.59	Sunset Creek	Middle
10	43	10-E Valley Creek South	Complex	0.47	Valley Creek	Top
11	23	1-C Mercer Slough	Complex	193.68	Mercer Slough	Bottom
12	25	Not in Bellevue Sensitive Areas Notebook	Complex	10.35	Mercer Slough	Bottom
13	31	4-A S. End of Mercer Slough	Complex	42.71	Mercer Slough	Bottom
14	12	2-B Larsen Lake	Complex - Headwater	27.86	Kelsey Creek	Top
15	5	6-B Lake Bellevue	Complex - Headwater	12.02	Sturtevant Creek	Top
16	8	Not in Bellevue Sensitive Areas Notebook	Isolated	0.52	None	Middle
17	9	Not in Bellevue Sensitive Areas Notebook	Isolated	0.38	None	Middle
18	27	5-A Robinswood Park	Isolated	1.35	None	Top
19	40	10-G Duckling Pond	Isolated	0.51	None	Top
20	46	9-C Overpass Wetland	Isolated	0.28	None	Top
21	48	9-F Prairie Market	Isolated	0.23	None	Middle
22	4	Not in Bellevue Sensitive Areas Notebook	Isolated	0.54	None	Top
23	34	4-C Newport United Church	Isolated	0.27	None	Middle
24	35	Not in Bellevue Sensitive Areas Notebook	No longer exists	3.28	None	Top
25	36	Not in Bellevue Sensitive Areas Notebook	No longer exists	0.42	None	Top
26	24	Not in Bellevue Sensitive Areas Notebook	No longer exists	0.54	Mercer Slough	Bottom
27	45	Not in Bellevue Sensitive Areas Notebook	Small Riparian	0.31	None	Top
28	6	Not in Bellevue Sensitive Areas Notebook	Small Riparian	2.03	West Fork Kelsey Creek	Middle
29	11	Not in Bellevue Sensitive Areas Notebook	Small Riparian	0.47	Kelsey Creek	Middle
30	16	Not in Bellevue Sensitive Areas Notebook	Small Riparian	0.36	Kelsey Creek	Middle
31	18	Not in Bellevue Sensitive Areas Notebook	Small Riparian	0.32	Kelsey Creek	Middle

Table 3. Continued

Wetland Count	NWI Wetland Map Identifier[b]	Assigned Bellevue Wetland Name	Wetland Type Name	Size (Acres)	Name of Associated Stream	Location in Basin (Top 1/3, Middle 1/3, Bottom1/3)
32	28	Not in Bellevue Sensitive Areas Notebook	Small Riparian	3.46	Sunset Creek	Middle
33	29	3-I N. of I-90	Small Riparian	2.12	Trib 0263A to Sunset Creek	Top
34	41	Not in Bellevue Sensitive Areas Notebook	Small Riparian	0.71	None	Top
35	42	10-E Valley Creek South	Small Riparian	0.58	Valley Creek	Top
36	47	Not in Bellevue Sensitive Areas Notebook	Small Riparian	1.67	Valley Creek	Middle
37	49	9-A Vernels Wetland	Small Riparian	4.25	West Fork Kelsey Creek	Top of W. Fork
38	50	9-B Safeway Wetland	Small Riparian	4.44	West Fork Kelsey Creek	Middle
39	10	6-A City Hall Wetland	Small Riparian	1.34	Sturtevant Creek	Middle
40	17	1-A Wilburton	Small Riparian	8.84	Sturtevant Creek	Bottom
41	Not on NWI map	Location SE 8th Street to the west of SE 148th Avenue	Seep wetland	0.30	Drains to Kelsey Creek	Middle
42	NGPA	Aaron Estates	Not classified	2.157	None*	Top
43	NGPA	Bellacere	Not classified	5.363	None	Top
44	NGPA	Blueberry Court	Not classified	2.673	None	Top
45	NGPA	Burditt	Not classified	0.497	None	Top
46	NGPA	Lyman Ridge	Not classified	0.231	None	Top
47	NGPA	Hayes	Not classified	0.987	None	Top
48	NGPA	Covington Park	Not classified	0.065	None	Top
49	NGPA	No name provided	Not classified	0.643	None	Top

[a] This data is based on NWI data (USFWS, 1988) and may not fully represent the total area and number and wetlands within the basin.
[b] See Figure WT-1 for location of wetland types including NGPAs.
* Appears from GIS layers that there is no direct association with streams.

6.1.1 Large Wetland Complexes

6.1.1.1 Location and Geomorphic Setting

Bellevue has preserved a number of large wetland complexes within this basin associated with Kelsey Creek (including Mercer Slough) and Richards Creek and their major tributaries, particularly within public park properties. Large wetland complexes exist within Mercer Slough Nature Park, Kelsey Creek Park, and Lake Hills Greenbelt Park. The Mercer Slough Wetland Complex, north of I-90, is the largest (193 acres) and contains PFO, PSS, PEM, PAB, and LAB (Lacustrine Aquatic Bed) classes. The Environmental Protection Agency designated Mercer Slough wetland as a wetland of national importance. This wetland is also designated as a shoreline of state-wide significance according to the Washington Administrative Code and the State Shoreline Management Act. The wetland in Kelsey Creek Park is smaller (84 acres) than Mercer Slough, but contains similar wetland vegetative classes. Somewhat smaller wetland complexes are also present along:

- Valley Creek at NE 24th Street between 140th Street and SR 520.
- Along Kelsey Creek between Lake Hills Greenbelt Park and Phantom Lake.

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Lake Bellevue is considered a large wetland complex because of its size. It contains open water (POW), scrub-shrub (PSS) and emergent classes (PEM); however, the emergent and scrub-shrub areas are highly disturbed and very small due to the development around the lake.

Larsen Lake, 10 acres, and Lake Bellevue, 8.5 acres, are too small to meet the criteria of lacustrine wetland systems. These ponds are classified as palustrine unconsolidated bed (PUB) and/or aquatic bed (PAB) wetlands. Lake Bellevue is highly developed and has very little submerged and floating aquatic vegetation and therefore is a palustrine unconsolidated bed wetland. Larsen Lake contains both aquatic bed and unconsolidated bed classes.

6.1.1.2 Vegetation

Vegetation descriptions of wetlands in this document use common plant names. A list of the common plant names with their taxonomic names is provided in Appendix WT-4.

Wetland complexes typically contain a mosaic of forested, scrub-shrub, emergent and open water classes of vegetation (Photo WT-1). The tree canopy of these wetlands is typically dominated by red alder, black cottonwood, willows, and a few western red cedar. The occasional Oregon ash is also present in Mercer Slough Nature Park. Douglas spiraea, red-osier dogwood, crabapple, and willow species including golden, Scoulers, sitka, and Pacific willow, dominate the scrub-shrub communities within these wetlands. The herbaceous layer varies, depending on water levels and sunlight availability. This layer is typically dominated by reed canarygrass, soft rush, various sedges and rushes, creeping buttercup, common cat-tail, and/or water parsley. The aquatic bed subclass within the open water class, is typically dominated by spatterdock and white pond-lily.

6.1.1.3 Hydrology

The hydrologic characteristics of large wetland complexes was described in the Wetland Types Section. Wetland hydrology in Large Wetland Complexes in the Kelsey Creek/Mercer Slough Basin is influenced by high groundwater table, precipitation, overland runoff from adjacent areas. In addition, in the area adjacent to the associated stream, hydrology is influenced by periodic overbank flooding. Lake Washington also influences the hydrology of Mercer Slough wetland, south of I-90; this is discussed under the Lacustrine Section below.

Lake Bellevue and Larsen Lake are headwater wetlands for Sturtevant and Kelsey Creeks, respectively. According to the *Catalog of Washington Streams* (Williams, 1975), Larsen Lake and Phantom Lake were not historically connected via a surface channel, however, these two water bodies are now connected. This connection altered and possibly increased the discharge of Larsen Lake to Kelsey Creek. These depressional headwater wetlands are more influenced by groundwater than other wetland complexes located lower in the basin and provide a major source of water for their associated streams.

6.1.1.4 Soils

Two soil units have been mapped within the Kelsey Creek/Mercer Slough wetlands (SCS, 1952; Snyder et al., 1973): Seattle muck (Sk) is located along Mercer Slough and around the Larsen

Lake area of Kelsey Creek where it flows north and south from the lake (Figure WT-2). A small area of this soil is also found in the south portion of Kelsey Creek Park along Richards Creek. The Seattle series is comprised of very poorly drained organic soils that derived primarily from sedges. Areas of Bellingham silt loam (Bh) are located within the south portion of Kelsey Creek Park. This soil is comprised of poorly drained soils that formed in alluvium, under grass and sedges. These soils are identified as hydric on the Hydric Soils List of the State of Washington (SCS, 1991).

Dark, poorly drained, peat soils with similar hydric characteristics to Seattle Muck, exist in the Mercer Slough and Lake Hills Greenbelt Parks (Figure WT-2). Peat has been removed from these sites (Bellevue, 1988 and Bellevue, 1990), but some peat soils remain in the wetlands. According to the Bellevue Sensitive Areas Notebook (Bellevue, 1987), the Bellefield Office Park was built on the peat soils of a former bog, and these soils still remain along the channel and in isolated areas within the vicinity of the office park.

6.1.1.5 Functions and Values

Large wetland complexes in the Kelsey Creek/Mercer Slough Basin merit a moderate to high ranking for flood/stormwater control (Appendix WT-3). Stormwater is slowed as it passes through woody and herbaceous vegetation within these wetlands, which have the capacity to store significant amounts of water. Water is released slowly to streams and or lakes after flooding has subsided. This dampens stormwater flow velocities and peak flows during storms. Because of their position in the basin, wetlands located in the upper o1ne-third of the drainage basin have greater ability to control stormwater within the entire basin than those in the middle of the basin. In turn, wetlands in the middle of the basin provide better stormwater control than those in the bottom third of the basin. Therefore, headwater wetlands, such as the Larsen Lake wetland, rank the highest for stormwater control. Although, Lake Bellevue is a headwater wetland, it has very little shrub or forested vegetation round the lake and therefore would not provide as much stormwater control as the Larsen Lake wetland. Wetlands that contain large, forested, or dense shrub communities provide the best control, because floodwaters are more constrained by larger woody debris than herbaceous cover.

Wetland complexes merit a high ranking for water quality improvement. The dense cover of woody vegetation within the large wetland complexes in this basin slows and filters the stormwater as it passes through the wetlands, resulting in removal of sediment and pollutants. Water discharged to streams and lakes from the wetland is cleaner than water that flowed into the wetland. In highly urbanized areas this function is particularly important to the health of streams and lakes. Since the Large Wetland Complexes discharge to streams and lakes in this basin, this function is very important for the downstream water bodies.

These wetlands merit a high ranking for base flow support. The large size of these wetland complexes allows storage of significant volumes of water, which is later released to streams and lakes, thus providing base flow support during low flow periods. The wetlands moderate the overland flows into the streams, resulting in more consistent year-round flows into streams and lakes. Consistent perennial flow within streams is extremely important to salmonid species, which are sensitive to low flows in the summer and erratic hydroperiods. Since these Large

Wetland Complexes are adjacent to streams and lakes that contain salmonids, including the threatened chinook, this function is particularly important in this basin. Wetlands located in the upper third of the basin rank the highest for base flow support, followed by those located in the middle third of the basin, and then those in the bottom third. The provision of consistent baseflows within the upper portion of the basin will also provide consistent flows downstream.

These wetlands merit a high ranking for erosion control. Dense cover of trees and shrubs within wetlands along the ordinary high water mark of streams and lakeshores prevents erosion from occurring. Along streams, wetland complexes can slow flood flows, preventing further erosion downstream. The farther wetlands extend from the shorelines and stream edges, the greater erosion control will be provided. This function is particularly important in urban areas where development is present along streams and lake shorelines. In urban areas, bulkheads and dikes often replace natural vegetation in controlling erosion, but this is not the case in the majority of the Mercer Slough wetland.

These wetlands also merit a high ranking for natural biological support, and for overall and specific habitat functions. Wetland complexes by definition contain multiple wetland communities and provide a variety of habitats and habitat elements for fish and wildlife. Both the structural and species diversity in wetland complexes is greater than single community wetlands; typically correlating to higher diversity and abundance of wildlife (Kauffman, et al *in* Johnson and O'Neil, 2001). The open water and riverine classes provide habitat for invertebrate, amphibians, fish and waterfowl. Birds and mammals use the emergent, scrub-shrub, and forested habitat for foraging, nesting, and refuge. The Wildlife Habitat Inventory (Section B) discusses the wildlife habitat structure and habitat elements in wetlands in more detail.

These wetlands also merit a high ranking for cultural and socioeconomic value. These large wetlands are mostly contained within public parks in Bellevue and are easily accessible to the public. Many passive and active recreational opportunities exist within the parks and their wetlands. Bellevue is unique in the region for providing a linked trail from Mercer Slough along Lake Washington to Phantom Lake and the western shores of Lake Sammamish providing public access to its large wetland complexes. The large open water bodies provide opportunities for fishing, boating, and birding.

6.1.2 Small Riparian Wetlands

6.1.2.1 Location and Geomorphic Setting

Small Riparian Wetlands in the Kelsey Creek/Mercer Slough Basin mainly consist of scrub-shrub, forested, or forested/scrub-shrub wetlands that are associated with streams, drainage swales or tributaries to larger streams (Figure WT-1). Many of these wetlands are located in the top or middle third of the drainage basin. These wetlands are typically midslope wetlands that formed along shallow riparian ravines (Photo WT-3). The Small Riparian Wetlands in this basin range from 0.3 to 4.4 acres. They occur along the upper reaches of Kelsey Creek, the West tributary of Kelsey Creek, Sunset Creek, Sturtevant Creek, and Valley Creek

6.1.2.2 Vegetation

These wetlands contain one or two of the Cowardin vegetative subclasses including PFO, PSS, and PEM. The tree canopy in the forested wetlands is typically open and dominated by red alder and the occasional black cottonwood. Willow and/or red-osier dogwood, often interspersed with Himalayan blackberry, dominate the underlying scrub-shrub communities. The herbaceous layer within the forested wetlands is dominated by reed canarygrass, slough sedge, creeping buttercup, and/or English ivy. Non-native pasture grasses including reed canarygrass, bentgrasses and/or bluegrasses dominate the PEM wetlands.

6.1.2.3 Hydrology

These riparian, flow-through wetlands are associated with minor streams or stormwater drainage swales. A major source of water for these wetlands is periodic stream overbank flooding. Secondary sources include precipitation, and stormwater runoff from adjacent areas. An additional and possibly substantial source of water for these wetlands is stormwater that is discharged from the City's stormwater drainage system to these wetlands. For example, a portion of the wetland associated with Valley Creek has been excavated to create a stormwater detention pond to alleviate downstream flooding.

6.1.2.4 Soils

Everett gravelly sandy loam (EvC), Bellingham silt loam (Bh), and Norma sandy loam (No) units have been mapped in the vicinity of these wetlands in this basin (SCS, 1973) (Figure WT-2). Bellingham silt loam and Norma sandy loam are listed as hydric on Hydric Soils List of the State of Washington (SCS, 1991). Everett soil series are listed as non-hydric, but may contain hydric inclusions.

6.1.2.5 Functions and Values

Small Riparian Wetlands in Bellevue merit a moderate ranking for flood/stormwater control (Appendix WT-3). These wetlands typically have 30 percent forest cover and a culverted or semi-constrained outlet, which would serve to slow stormwater flows, but they do not tend to store water for longer than the flood period, except where constrictions in the stream system occur. The wetlands are small and have minimal storage capacity and therefore can only provide limited flood control.

These wetlands merit a low to moderate ranking for base flow support. These wetlands are typically located in the middle third of drainage basins and have seasonal or perennial flow. Therefore, they have the capability to provide moderate baseflow volumes for downstream waters. However, these wetlands are small and generally store small quantities (less than 25 percent) of overland flow. This limits the base flow support function of these wetlands.

These wetlands merit a moderate ranking for water quality improvement. Dense vegetation within these wetlands, particularly those with forested or scrub-shrub communities, can filter out pollutants and sediment in water flowing through them. However, small size limits the water quality in forest of these wetlands; these wetlands are small, water flows relatively quickly through them, and they only retain small amounts (less than 25 percent) of overland flow.

These wetlands merit a moderate ranking for erosion control. Those riparian wetlands that are forested or have dense woody vegetation along the ordinary high water mark of streams, such as those along Coal Creek, prevent erosion along stream banks.

Due to their small size and lack of diversity, these wetlands merit a low ranking for natural biological support and overall and specific habitat functions. While forested/scrub-shrub wetlands have relatively diverse structural conditions, plant species diversity was observed to be low. Those Small Riparian Wetlands that contain only a single emergent class have very little structural and species diversity. Additionally, Small Riparian Wetlands in Bellevue tend to be surrounded by residential or commercial development and are more prone to disturbance than the Large Wetland Complexes. Those Small Riparian Wetlands that are linked to upland forested areas or and open spaces have more wildlife species diversity (see Wildlife Inventory, Section B). Since the structural and plant species diversity in these wetlands is low, they do not provide a high level of biological support or habitat for wildlife. However, these wetlands are located along streams and can provide shade, nutrients, biomass and insects for stream habitats, which are important for fish and other aquatic organisms. Generally, wildlife use in this type of wetland is limited. Those wetlands that are forested/scrub-shrub would be used by a greater diversity and abundance of birds than the emergent wetlands. Mammals that are adapted to relatively small human-modified habitats may use these wetlands. Some of these wetlands may have limited habitat for fish, amphibians, reptiles, and some types of invertebrates.

The wetlands also merit a moderate ranking for cultural and socioeconomic value. Although these small wetlands typically occur on private property, they provide benefits to private property owners and the larger public. The benefits to the private homeowners include reduction of flood damage, water quality purification, erosion control, increased market values of property, and backyard wildlife habitat and green space. However, they are not accessible to the public and only provide limited educational opportunity and no recreational value to the community.

6.1.3 Seep Wetlands

6.1.3.1 Location and Geomorphic Setting

Seep wetlands are midslope wetlands where groundwater intersects with the soil surface, creating wetland conditions. One approximately 2-acre seep wetland was identified to the east of Kelsey Creek on SE 8th Street to the west of SE 148th Avenue during field investigations conducted by Adolfson for a permit review in 1999 (Figure WT-1). Seep wetlands may exist in similar geomorphic settings within this basin.

6.1.3.2 Vegetation

These mid-slope wetlands may contain forested, scrub-shrub, and/or emergent classes. The PEM wetland on SE 8th Street was highly disturbed and most of the trees and shrubs had been cleared, however, it contained some western red cedar and red alder. Reed canarygrass, skunk cabbage, bluegrass and bent grass dominated the groundcover of this seep wetland.

6.1.3.3 Hydrology

Groundwater is the main source of wetland hydrology for these wetlands. Precipitation provides a secondary source of water for these wetlands during the rainy season. The identified wetland within this basin discharged to undefined drainage channel that flowed downslope to Kelsey Creek.

6.1.3.4 Soils

Soils units mapped within the vicinity of the single identified Seep Wetland are Seattle Muck, and are described under the Large Wetland Complex Section.

6.1.3.5 Functions and Values

Seep wetlands merit a low rating for flood and stormwater control (Appendix WT-3). Based on field observations, these small wetlands typically contained 30 percent forested cover and were located in the middle of the drainage basin, which would slow overland flow and provide some control of flows downstream. However, these wetlands are hydrologically unique in that they discharge groundwater and store little or no surface water, which significantly limits their floodwater storage capability.

Seep wetlands merit a moderate rating for base flow support (Appendix WT-3). Based on field observations, these wetlands typically contained 30 percent forested cover and were located in the middle of the drainage basin. These wetlands are small, but their seasonal or semi-permanent saturation and location in the middle third of the drainage basin enables them to provide limited base flow support for downstream waters.

Seep wetlands merit a low to moderate rating for water quality improvement. These wetlands could provide water quality improvement in two ways: provision of clean groundwater to downstream waters, and, because they are mid-slope wetlands, filtering of overland flow through vegetation and poorly drained soils. However, these wetlands are small and therefore can only provide limited water quality improvement.

Due to their size and lack of diversity, these wetlands merit a low ranking for natural biological support, and overall and specific habitat functions. While these forested wetlands have relatively diverse structural conditions, their size is small and species diversity is low and therefore provide limited biological support. They would provide a limited source of water for animals within a forested habitat. Seep wetlands that were observed in Bellevue are surrounded by residential or commercial development and have very limited connections to open space or wildlife corridors (Figure WT-1). These wetlands would primarily be used by a select number of bird, mammal, and reptile. Amphibians may use seep wetlands for a water source, but are not able to breed in these wetlands due to the lack of open water.

These wetlands also merit a low ranking for cultural and socioeconomic value, because they provide some water purification and erosion control and aesthetic pleasure. They also offer limited educational and recreational opportunities for the community because of their position in the landscape, their small size, and limited public access.

6.1.4 Lacustrine Wetlands

A Lacustrine Aquatic Bed wetland may exist within the Kelsey Creek/Mercer Slough basin along Lake Washington. However, the NWI map shows a Palustrine Emergent class along the shoreline. This may be because of the significant changes to the Lake Washington levels that occurred in the early 1900's. Due to construction of the Locks, Lake Washington water levels dropped by approximately eight feet, significantly reducing the influence of the lake on the Mercer Slough wetland. This resulted in a significant change to the plant communities and fauna within that portion of the wetland. A new Lacustrine Aquatic Bed wetland class may have formed along the mouth of Mercer Slough, but the original lacustrine deep-water portion of the wetland has now converted to palustrine scrub-shrub/emergent classes. Additionally, Lake Washington water levels have been controlled since 1916 due to the construction of the Chittendon Locks and lake levels vary less than they had previously. Therefore, lake flooding in the southwest portion of Mercer Slough has less influence on the wetland hydrology than it did prior to the early 1900's.

A Lacustrine Aquatic Bed Wetlands contain submerged vegetation such as small or common bladderwort, milfoil, or aquatic vegetation that are rooted in the substrate but their leaves float on the lake surface, such as spatterdock and white pond-lily.

6.1.4.1 Soils

Seattle muck (Sk) soil units have been mapped along the mouth of Mercer Slough (Figure WT-2) and were described above.

6.1.4.2 Functions and Values

Since the Lacustrine wetland class (if it exists) in the Mercer Slough wetland is part of the Larger Wetland Complex the functions and values discussion for this wetland class is provided under that section. Since this portion of the wetland is by definition located along the lake shoreline, it provides important erosion control along the shoreline.

6.1.5 Hydrologically Isolated Wetlands

6.1.5.1 Location and Geomorphic Setting

Depressional wetlands that do not have a surface connection to other streams, lakes, or wetlands are considered hydrologically-isolated (Figure WT-1). Hydrologically-isolated wetlands in this basin are typically small, ranging from 0.2 to 1.2 acres in size. Adolfson was unable to observe a hydrologically-isolated wetland during field work in support of this project due to lack of access to private property. The Bellevue Sensitive Areas Notebook (Bellevue, 1987) however, describes several of these wetlands. For purposes of this discussion, we used the description of the GS #6-L Pool Wetland from the Bellevue Sensitive Areas Notebook (Bellevue, 1987) as a typical isolated wetland.

6.1.5.2 Vegetation

According to the Sensitive Areas Notebook, wetland #6-L contains palustrine open water, forested and scrub-shrub community. The tree canopy is dominated by red alder, black cottonwood, and the occasional western red cedar and western hemlock. Spiraea, willow, salmonberry, and red-osier dogwood dominate the shrub community. The herbaceous community contains skunk cabbage, water parsley, common cattail, and yellow iris.

6.1.5.3 Hydrology

Dominant water sources in depressional wetlands are precipitation, ground water, and overland surface flow. Water movement in these wetlands is typically from the surrounding uplands towards the center of the depression. Water levels within the wetland typically fluctuate with seasonal differences in precipitation and ground water levels.

6.1.5.4 Soils

Soils within the Kelsey Creek/Mercer Slough Basin are described under the Large Wetland Complexes Section.

6.1.5.5 Functions and Values

Isolated wetlands merit a low ranking for flood and stormwater control, base flow support and water quality improvement (Appendix WT-3). Although some of these wetlands may contain forested habitats, their small size limits their capacity to slow and retain floodwaters. Since these wetlands do not have a surface connection to streams, they do not provide base flow support to streams at the surface, but may recharge groundwater during the dry season. However, since they are small wetlands, groundwater recharge is limited. These wetlands may contain woody and/or herbaceous vegetation that slows the flow of the stormwater and allows pollutants and sediment to settle out. This may result in cleaner water discharge into the groundwater below. The small size of these wetlands limits its water quality improvement function.

Due to their size and lack of diversity, these wetlands merit a low ranking for natural biological support and overall and specific habitat functions. While these wetlands may contain multiple vegetative classes, these small wetlands would generally be isolated from connection to other habitats, providing very limited biological support. Although the wetlands are isolated and small, they may provide refuge and forage for birds and mammals within areas that may have no other habitats. Where these small wetlands are surrounded by forest habitat, they would be important habitat for amphibian breeding and foraging. The Wildlife Inventory (Section B) contains more information on remaining upland forested habitat.

These wetlands also merit a low to moderate ranking for cultural and socioeconomic value, because they provide some water purification and erosion control, backyard wildlife areas, and aesthetic pleasure. However, they offer limited educational and recreational opportunities for the greater community because of their small size and limited public access.

6.1.6 Constraints

The Kelsey Creek/Mercer Slough Basin contains the largest and most diverse wetland habitat area in Bellevue. The Large Wetland Complexes are connected to major streams, and upland forest habitat and/or open space providing large tracts of wildlife habitat (see Section B, Wildlife Inventory for more information). However, these wetlands and associated habitats are fragmented by roads, and urban development, and are surrounded by high or medium-density urban development. For example, the Lake Hills Connector cuts through the Large Wetland Complex associated with Kelsey and Richards Creeks. The southern end of Mercer Slough is impacted by I-90.

Many of the Hydrologically-Isolated wetlands and Small Riparian Wetlands within this basin are isolated from upland forest habitat or open space. Since the NWI map was created in 1988, it appears that three isolated wetlands in this basin were lost to urban development; however, several wetlands have been restored, enhanced, or created within this basin.

Impervious surfaces cover approximately 30 to 45 percent of the area within this basin. Large amounts of impervious surface increases surface water runoff, causing frequent, rapid, and high water level fluctuations within wetlands and streams. Since stormwater runoff flows into the depressional wetlands (Large Wetland Complexes and Hydrologically-Isolated wetlands) they are highly affected by increased quantities and peak flows of stormwater. The Large Wetland Complexes have a greater ability to absorb and moderate rapid, high storm flows than isolated depression wetlands. Small riparian wetlands can be damaged by increased and larger storm flows along small, constrained streams. Seep wetlands sometimes occur on unstable slopes, and rapid, high overland storm flows may cause slumping or landslides. While wetlands can provide stormwater control and water quality improvement, the flora and fauna of wetlands is significantly affected by frequent and high water level fluctuations. These rapidly fluctuating conditions favor invasive non-native species, such as reed canarygrass. Wetlands have a limit to the amount of sediment and pollutants they can store and biofiltrate and can easily be overwhelmed by direct stormwater discharge.

Wetlands in the proximity of urban development are vulnerable to invasive non-native species. Adjacent development provides seed sources of non-natives and disturbance in wetlands and their surrounding upland habitats fosters invasive plant establishment. These species can supplant natives, decreasing populations of wildlife adapted to live in native habitats (see Section B, Wildlife Inventory, for additional discussion).

Wetland complexes are large and their interiors are buffered from invasion of non-native plants; however, non-native species are encroaching on the edges of these wetlands. Invasive species that were often observed within the wetland complexes include Himalayan blackberry, Japanese knotweed, and non-native pasture grasses, such as reed canarygrass, bentgrasses, bluegrasses, and velvetgrass. Reed canarygrass is prevalent in these wetland areas because it was historically planted for pasture in wetland areas throughout western Washington. Based on field observations and air photo (Bellevue, 2000) interpretation and spot field observations it is estimated that invasive species comprise less than 10 percent of the aerial cover of these large wetland complexes.

The wetland in Kelsey Creek Community Park contains the largest patches of invasive species. The greatest concentration of invasive species was observed along two narrow tributaries that contain a narrow corridor of native vegetation flanked by overgrown non-native invasive shrub and herbaceous species (Photo WT-2). The larger wetland area in this park also contains large patches of reed canarygrass interspersed within the shrub and forest communities. The Mercer Slough wetland also contains large patches of reed canarygrass, particularly near Lake Washington and south of Interstate 90.

Invasive non-native species were observed to be prevalent within Small Riparian Wetlands. Based on field observations, these wetlands typically have very narrow (less than 25 feet) or non-existent upland buffers, thus allowing for easy disturbance and consequent invasion of non-native species. Wetlands observed during the field investigation contained between 10 and 35 percent invasive species. Himalayan blackberry, and English ivy, and reed canarygrass are three common non-native species found along edges of these wetlands. An example of non-native (English ivy) invasion of these small wetlands is provided in Photo WT-4. Other invasive species observed in these wetlands include reed canarygrass and Japanese knotweed.

The seep wetland at SE 8th Street wetland is disturbed and contains a large patch of non-native reed canarygrass covering approximately 50 percent of the wetland. Himalayan blackberry is also present along the edges of the wetland. The extent of non-native invasion of seep wetlands reflects the amount of disturbance within their buffers. Therefore, seep wetlands in disturbed settings will contain a higher percentage of invasives compared to those in less disturbed settings.

Invasive species within open water and lacustrine wetlands might include toxic blue-green algae, Eurasian milfoil, and purple loosestrife along the fringes. According to the *Characterization and Source Control of Urban Stormwater Quality Report* (Bellevue and Ecology, 1995), blue-green algal blooms have historically occurred in Larsen Lake. The algal blooms are now being controlled through aeration and reduction of nutrient input to this wetland, and is no longer a problem (Bellevue and Ecology, 1995). No purple loosestrife or Eurasian milfoil was observed during the field observations in open water wetlands.

Invasive non-native species within Hydrologically-Isolated Wetlands are similar to those species in other wetland types throughout the City of Bellevue. Because these wetlands are small, have a large edge to area ratio, and are mostly surrounded by urban development, they are prone to invasion by a number of non-native species. Examples of common invasive non-natives that may be found in these wetlands include, but are not limited to, English ivy, Himalayan blackberry, reed canarygrass, and Japanese knotweed.

6.1.7 Opportunities for Protection

The City's continued protection and management of the Mercer Slough wetland complex should provide increasing benefits to the wetland and riparian habitat in this area. Many of the restoration opportunities in the wetland complexes on public parkland have already been implemented. Long term management of invasive species in the Mercer Slough wetland area has and will continue to, improve habitat conditions within this wetland area. City guidelines for the protection of the great blue heron colony within this wetland could also be developed (see Section B, Wildlife Inventory for further discussion).

The upper portion of Kelsey Creek in this basin offers the largest amount of area for wetland enhancement/restoration in the city because there is still open space available. Agricultural areas located along the Kelsey Creek riparian corridor between Lake Hills Greenbelt Park and Phantom Lake offer opportunities for wetland creation and/or enhancement. Kelsey Creek is channelized within this area. The stream could be meandered through a created wetland that which would provide off-channel habitat for fish. A native scrub-shrub/forested wetland could be created to provide additional wildlife habitat.

The wetland along Richards Creek riparian area in this basin is disturbed by the Lake Hills Connector, but enhancement opportunities still exist. Along the Richards Creek wetlands non-native invasive plants such as blackberry and English ivy could be removed and these areas replanted with native species. Commercial and residential land owners in this basin could be discouraged or possibly prohibited from planting these invasive plants in their parking strips or lawns.

Enhancement or expansion of wetlands along Sunset Creek to the south of Richards Creek could also be implemented. These wetlands are more disturbed by urban development than those to the north and tend to have a higher percentage of non-native invasive species than the larger wetland complexes.

6.2 Small Lake Washington Tributaries Basin

The Small Lake Washington Tributaries Basin includes the Yarrow Creek, Meydenbauer Creek, and the Lakehurst Area storm drainage basins as defined in the *Stream Typing Report* (The Watershed Company, 2001). This basin contains by far the smallest number of wetlands and wetland area of all basins, due mainly to the low number of streams and the high-density commercial and residential development within this basin (Table 4). Six wetlands were identified in this basin based on the NWI map and field observations. Two of the NWI wetland, which are Hydrologically-Isolated Wetlands in the Meydenbauer subbasin, appear to have been filled based on field observations. The Bellevue Sensitive Areas Notebook (Bellevue, 1987) indicated two additional wetlands may be present near Yarrow Creek within this basin. Wetlands within this basin range in size from 0.88 acre to 4.2 acres and all are located in the top third of the their drainage subbasins.

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Table 4. NWI and NGPA Wetland Types, Size and Geomorphic Setting in the Small Lake Washington Tributaries Basin [a]

Wetland Count	Wetland Map Identifier [b]	Bellevue Wetland Name	Wetland Type Name	Size (Acres)	Name of Associated Stream	Location in Basin (Top 1/3, Middle 1/3, Bottom1/3)
1	38	Not in Bellevue Sensitive Areas Notebook	Isolated	0.88	None*	Top
2	2	Not in Bellevue Sensitive Areas Notebook	Isolated, No longer exists	4.05	None	Top
3	3	Not in Bellevue Sensitive Areas Notebook	Isolated, No longer exists	0.53	None	Top
4	44	10-B Hourglass Pond, 10-C Pasture Wetland	Complex	4.15	Yarrow Creek	Top
5	Not on NWI Map	Location NE 39th Street, east of NE 116th Avenue	Seep wetland	Approx. 2.0	Drains to Yarrow Creek	Top
6	Not on NWI Map	New Castle Beach Park	Complex	Approx. 1.0	Drains to Lake Washington	Bottom

[a] This data is based on NWI data (USFWS, 1988) and may not fully represent the total area and number and wetlands within the basin.
[b] See Figure WT-1 for location of wetland on 1988 NWI map.
* Appears from GIS layers that there is no direct association with streams.

6.2.1 Large Wetland Complexes

Two Large Wetland Complexes were identified in the Small Lake Washington Tributaries Basin:

- A forested/scrub-shrub/emergent wetland complex located in New Castle Beach Park that has a frontage on Lake Washington; and
- A scrub-shrub/emergent/open water wetland complex at NE 116th Avenue and NE 39th Street along the upper reaches of Yarrow Creek, which enters Lake Washington at Yarrow Bay in Kirkland.

While these complexes are not as large as those in the Kelsey Creek/Mercer Slough Basin, they provide important benefits and functions for Yarrow Creek, Lake Washington, and the surrounding habitats.

Hydrologic characteristics of these wetlands are similar to those described for the Large Wetland Complexes in the Kelsey Creek/Mercer Slough Basin although on a smaller scale. Ground water, precipitation, overland flow and periodic river flooding are the primary sources of water for the wetland. The forested wetland in New Castle Beach Park may be influenced by subsurface flows from Lake Washington.

Two soils units were mapped within the vicinity of the Yarrow Creek Wetland Complex (Figure WT-2):

- Alderwood gravelly sandy loam (AgC), which were described in the Kelsey Creek/Mercer Slough Basin section above;

- Norma sandy loam (No) (SCS, 1973) soils are dark-colored mucky sandy loam soils and are hydric according to the Hydric Soils List of the State of Washington (SCS, 1991).

Bellingham silt loam series (Br) and Alderwood gravelly sandy loam (AgC) soils were mapped in the vicinity of New Castle Beach Park. Bellingham silt loam is listed as hydric on Hydric Soils List of the State of Washington (SCS, 1991).

The Large Wetland Complexes at Yarrow Creek and New Castle Beach Park have similar functions and values to those described above for complexes in the Kelsey Creek/Mercer Slough Basin Section. However, the size of these wetlands is much smaller and therefore they have a more limited ability to provide stormwater control, baseflow support, water quality improvement, erosion control, and area of wildlife habitat. Because the Yarrow Creek complex is located at the top of the subbasin, it provides a greater level of baseflow support and stormwater control within the basin than the New Castle Beach Park complex, located at the bottom of its respective subbasin. These wetlands are two of the few wetlands in the Small Lake Washington Tributaries Basin and therefore, a high human and ecological value is placed on the functions of these wetlands.

6.2.2 Seep Wetlands

One seep wetland was surveyed on the slopes to the east of Yarrow Creek on NE 39th Street, east of NE 116th Avenue. Additional potential seep wetlands were observed during windshield surveys on adjacent properties along this slope. This groundwater-fed wetland is located on the slopes above Yarrow Creek. These wetlands drain by surface flow downslope to Yarrow Creek. Hydrologic conditions within this wetland are similar to those described for the seep wetland in the Kelsey Creek/Mercer Slough Basin.

This seep wetland contains forested and scrub-shrub classes. The forest canopy is dominated by red alder with an understory of red alder saplings, willow, and red-osier dogwood. The occasional western red cedar was also observed in this wetland. Patches of slough sedge, creeping buttercup and bluegrasses dominated the emergent layer.

Alderwood gravelly sandy loam (AgC, AgD) soils were mapped in the vicinity of this wetland (Figure WT-2). Alderwood soils were described in the Kelsey Creek/Mercer Slough Basin section.

Functions and values for the seep wetland in the Small Lake Washington Basin are similar to those described under the Kelsey Creek/Mercer Slough Basin Section. Since this is one of few wetlands of this type in this basin, a high value is placed on its functions.

6.2.3 Hydrologically-Isolated Wetlands

A Hydrologically-Isolated wetland was shown on the NWI map at the top of the Lakehurst Area subbasin is Palustrine Unconsolidated Bed wetland that is surrounded by residential development. This PUB contains a relatively small percentage of vegetation and is likely to contain common cattail, duck weed, and associated species such as soft rush or other sedges and rushes at its margins. Hydrologic characteristics of Hydrologically-Isolated Wetlands were described in the Kelsey Creek/Mercer Slough Basin Section. Soils units mapped within this area include Alderwood series soils (SCS, 1973) (Figure WT-2). Alderwood soils were described in the Kelsey Creek/Mercer Slough Basin Section above.

This wetland is small (0.88 acre) and would provide similar functions and values to H-I wetland described under Kelsey Creek/Mercer Slough Basin above. Because the wetland is surrounded by residential development and is a low depression in the landscape, it would may function more like a stormwater detention and treatment pond, which is important in an urban environment, but would be limiting to the flora and fauna in the wetland.

6.2.4 Constraints

The small remaining wetlands within the Small Lake Sammamish Tributaries Basin are affected by urban development, (altered hydrologic cycle due to large areas of impervious surfaces, and encroachment of non-native invasives), similar to wetlands in the Kelsey Creek/Mercer Slough Basin. Since this basin contains the highest levels of impervious surfaces and the wetlands are small, they are more vulnerable to the effects of urbanization. Two of the five mapped wetlands appear to be lost to urban development in the highly urbanized Meydenbauer Creek subbasin.

Reed canarygrass and Himalayan blackberry were the predominant non-native invasive species within the Large Wetland Complex. Approximately 40 percent of the emergent class within the wetland consisted of reed canarygrass. Cattails are invasive, but are native and are typical in open water environments throughout the Puget Sound Lowlands.

The seep wetland on NE 39th Street is buffered by upland coniferous/deciduous forest and contains approximately five percent invasives, mainly consisting of Himalayan blackberry and reed canarygrass. The extent of non-native invasion of seep wetlands depends in large part on the amount of disturbance within their upland surroundings.

Examples of common invasive non-natives that may occur in the Hydrologically-Isolated Wetlands in this basin include, but are not limited to, English ivy, Himalayan blackberry, reed canarygrass, and Japanese knotweed. These species may occur at the margins of open water wetlands.

6.2.5 Opportunities for Protection

Enhancement or restoration opportunities in wetlands are limited in the Small Lake Washington Tributaries Basin due to high-density urban development; however, some opportunities may exist. Enhancement of the forested/scrub-shrub wetland through removal of non-natives and replacement with native shrubs could be implemented in Newcastle Beach Park. Other opportunities for enhancement or wetland creation within this basin may be available along the Lake Washington shoreline. There may be some wetland creation or enhancement opportunities on private property in upland areas or along streams that flow into Lake Washington, particularly those in the south portion of the basin.

6.3 Coal Creek Basin

The Coal Creek Basin is the third largest basin and contains 18 wetlands: four naturally-occurring wetlands that were identified on the NWI map layer, and 14 NGPA wetlands (Table 5). These wetlands are depicted on Figure WT-1.

This basin, likely due to its steep contours, contains Small Riparian and Hydrologically-Isolated Wetlands, and may contain some Seep Wetlands (although these were not observed). These wetlands occur mostly in the top two-thirds of the basin. NGPA wetlands are located exclusively in the top third of the basin. This is likely due to the location of past wetland disturbance and related opportunities for mitigation. Wetlands within this basin range in size from 0.02 acre to 5 acres (the naturally occurring wetlands ranged from 0.3 to 1.3 acre).

Table 5. NWI and NGPA Wetland Types, Size and Geomorphic Setting in the Coal Creek Basin [a]

Wetland Count	Wetland Map Identifier [b]	Bellevue Wetland Name	Wetland Type Name	Size (Acres)	Name of Associated Stream	Location in Basin (Top 1/3, Middle 1/3, Bottom 1/3)
1	37	Not in Bellevue Sensitive Areas Notebook	Isolated	0.31	None*	Middle
2	39	Not in Bellevue Sensitive Areas Notebook	Isolated	0.36	None	Middle
3	59	Not in Bellevue Sensitive Areas Notebook	Isolated	0.70	None	Top
4	60	Not in Bellevue Sensitive Areas Notebook	Small Riparian	1.34	Trib 0276A-3 of Coal Creek	Top
5	NGPA	Avonlea	Not classified	1.104	Coal Creek Tributaries	Top
6	NGPA	Cougar Ridge West	Not classified	0.685	Coal Creek Tributaries	Top
7	NGPA	Cougar Ridge West	Not classified	2.120	Coal Creek Tributaries	Top
8	NGPA	Cougar Ridge West	Not classified	4.016	Coal Creek Tributaries	Top
9	NGPA	Cougar Ridge West	Not classified	2.127	Coal Creek Tributaries	Top
10	NGPA	Lakemont Woods Div. 1	Not classified	0.743	Coal Creek Tributaries	Top
11	NGPA	Lakemont Woods Div. 2	Not classified	1.568	Coal Creek Tributaries	Top
12	NGPA	Lakemont Ridge	Not classified	2.265	Coal Creek Tributaries	Top
13	NGPA	Lakemont Ridge	Not classified	2.569	Coal Creek Tributaries	Top
14	NGPA	Lakemont Ridge	Not classified	1.634	Coal Creek Tributaries	Top
15	NGPA	The West Summit	Not classified	0.086	Coal Creek Tributaries	Top
16	NGPA	The West Summit	Not classified	2.355	Coal Creek Tributaries	Top
17	NGPA	The Oaks	Not classified	5.027	Coal Creek Tributaries	Top
18	NGPA	Cougar Mtn Meadow	Not classified	0.631	Coal Creek Tributaries	Top

[a] This data is based on NWI data (USFWS, 1988) and may not fully represent the total area and number and wetlands within the basin.
[b] See Figure WT-1 for location of wetlands.
* Appears from GIS layers that there is no direct association with streams.

6.3.1 Small Riparian Wetlands

Many of the smaller wetlands in Bellevue are forested/scrub-shrub wetlands that are associated with drainage swales or with tributaries of larger stream (Figure WT-1). Forested/scrub-shrub wetlands were observed at locations where overflow occurs in the narrow floodplain of Coal Creek near the Bellevue city limits. The tree canopy in these wetlands is typically dominated by red alder, black cottonwood, and the occasional western red cedar. Willow and/or red-osier dogwood, often interspersed with Himalayan blackberry, dominate the underlying scrub-shrub communities within the forested wetlands.

The hydrologic characteristics of these riparian, flow-through wetlands were described in the Kelsey Creek/Mercer Slough Basin Section. Soil units mapped in this area consists mainly of Alderwood gravelly sandy loam (AgC) soils (SCS, 1973) (Figure WT-2), which were described in the Kelsey Creek/Mercer Slough Basin Section above.

Functions and values of these Small Riparian Wetlands are similar to those described under the Kelsey Creek/Mercer Slough Basin Section. The stormwater control, erosion control, and water quality improvement functions of Small Riparian Wetlands within this basin are perhaps the most important, because erosion has occurred along the steep ravine banks of Coal Creek resulting in mass loading of sediment (see Section C, Streams Inventory, for more information). However, these functions are limited by the small wetland size.

6.3.2 Hydrologically-Isolated Wetlands

The Hydrologically-Isolated depressional wetlands at the top of the Coal Creek Basin exist in the top third of the basin. Most of these wetlands are NGPA wetlands and data on the characteristics of these wetlands was not provided to Adolfson for this report. The naturally-occurring wetlands in this area were mapped as palustrine unconsolidated bed (PUB) and PEM wetlands. These open water wetlands contain relatively small percentages of vegetation such as common cattail, duck weed, and associated species such as soft rush or other sedges and rushes at its margins. Upland shrub and/or forest habitat may surround these wetlands, since urban development is not as dense in this basin compared to the Small Lake Washington Tributaries Basin (see Section B, Wildlife Inventory, for more information). PEM wetlands in this basin are likely to be dominated by reed canarygrass, soft rush, and/or slough sedge or other sedges and rushes.

Hydrologic characteristics of Hydrologically-Isolated Wetlands was described in the Kelsey Creek/Mercer Slough Basin Section. Soils units in this area are described under the Small Riparian Section for Coal Creek Basin.

Hydrologically-Isolated Wetlands in this basin are similar in size to those in other basins and would provide similar functions and values to the isolated wetlands described in the Kelsey Creek/Mercer Slough Basin Section. This basin is has medium-density residential development and 25% impervious surface, which is a lower percentage than all other basins, indicating that more upland forest habitat is present. In some areas, forested upland habitat is connected to wetlands. Wetlands that are connected to other habitats provide a greater level of wildlife habitat diversity. Due to steep slopes in the basin, overland flow is rapid, thus the stormwater control and erosion control functions of these wetlands and their surrounding forest habitat are important.

6.3.3 Constraints

The small wetlands within the Coal Creek Basin are affected by urban development, altered hydrologic cycle due to large areas of impervious surfaces, and encroachment of non-native invasives, similar to wetlands in other basins. While this basin has the smallest percentage of impervious surface, the level of development in the basin has likely altered the flora, fauna, and hydrologic characteristics of its wetlands.

Wetlands in this basin are vulnerable to non-native species invasion, because they are small and are some are created NGPA wetlands. Areas where soils are disturbed, such as those within NGPA wetlands, are more prone to non-native species invasion than undisturbed areas. Himalayan blackberry was the predominant non-native invasive species observed within the Small Riparian Wetlands along Coal Creek. The upper reaches of Coal Creek (within Bellevue City limits) contain mostly native forest habitat, and invasive species encroachment is relatively minimal. Examples of common invasive non-natives that may be found in the Hydrologically-Isolated Wetlands and NGPA wetlands include, but are not limited to, English ivy, Himalayan blackberry, reed canarygrass, and Japanese knotweed.

6.3.4 Opportunities for Protection

Wetlands within the Coal Creek Basin are mostly small palustrine scrub/shrub and/or forested wetlands that lie within the floodplain of Coal Creek, or small Hydrologically-Isolated Wetlands and NGPA wetlands. The wetlands provide important flood and stormwater control, erosion control, and water quality improvement functions. Small Riparian Wetlands may also provide fish habitat depending on their configuration and size. Continued protection of these wetlands will provide beneficial functions to the biological and human environments within the basin. Additionally, there may be opportunities along Coal Creek to create flood plain wetlands in areas where erosion is occurring or in areas where off-channel fish habitat is delisted. There may also be opportunities to create additional NGPA wetlands on private properties, these would be most beneficial in the upper portions of the basin. Invasive plants could be removed from existing naturally-occurring wetlands and replaced with native vegetation. Since NGPA wetlands are particularly prone to invasion by non-native species or failure, long-term monitoring and maintenance (five years or more) of these areas could be required. Monitoring and maintenance would better ensure success of wetland creation or enhancement in these areas and control invasion of non-native species.

6.4 Lewis Creek Basin

The Lewis Creek Basin is the smallest basin containing 17 wetlands including four naturally-occurring wetlands identified on the NWI map and 13 NGPA wetlands (Table 6). This basin, similar to Coal Creek Basin, contains Small Riparian Wetlands, Hydrologically-Isolated, and possibly some Seep Wetlands (although these were not observed). These wetlands occur mostly in the top two-thirds of the basin. The NGPA wetlands are located exclusively in the top third of the basin. Wetlands within this basin range in size from 0.08 acre to 5.3 acres (the naturally occurring wetlands ranged from 0.3 to 5.3 acre). Wetlands in this basin are mostly on private property, and were difficult to observe in the field.

Table 6. NWI and NGPA Wetland Types, Size and Geomorphic Setting in the Lewis Creek Basin [a]

Wetland Count	Wetland Map Identifier [b]	Bellevue Wetland Name	Wetland Type Name	Size (Acres)	Storm Drainage Basin	Location in Basin (Top 1/3, Middle 1/3, Bottom 1/3)
1	55	6-C Goff Creek	Isolated	0.28	None*	Middle
2	56	Not in Bellevue Sensitive Areas Notebook	Small Riparian	4.24	Lewis and Tributary 0162K	Middle
3	57	Not in Bellevue Sensitive Areas Notebook	Small Riparian	0.41	Lewis Creek	Middle
4	58	Not in Bellevue Sensitive Areas Notebook	Small Riparian	5.30	Lewis Creek	Top
5	NGPA	Whispering Crest	Native Growth Protection Area	0.197	Lewis Creek Tributaries	Top
6	NGPA	Lakemont Div. 4	Native Growth Protection Area	0.084	Lewis Creek Tributaries	Top
7	NGPA	Lakemont Div. 6	Native Growth Protection Area	0.543	Lewis Creek Tributaries	Top
8	NGPA	Lakemont Woods Div. 1	Native Growth Protection Area	0.099	Lewis Creek Tributaries	Top
9	NGPA	Lakemont Woods Div. 2	Native Growth Protection Area	0.305	Lewis Creek Tributaries	Top
10	NGPA	Coug. Meadow E./Vuemont 3	Native Growth Protection Area	1.248	Lewis Creek Tributaries	Top
11	NGPA	Vuemont Meadows	Native Growth Protection Area	0.035	Lewis Creek Tributaries	Top
12	NGPA	Vuemont Meadows	Native Growth Protection Area	0.188	Lewis Creek Tributaries	Top
13	NGPA	Vuemont South Div. 1	Native Growth Protection Area	1.275	Lewis Creek Tributaries	Top
14	NGPA	Vuemont South Div. 1	Native Growth Protection Area	0.075	Lewis Creek Tributaries	Top
15	NGPA	Vuemont South Div. 1	Native Growth Protection Area	0.082	Lewis Creek Tributaries	Top
16	NGPA	Vuemont South Div. 1	Native Growth Protection Area	0.904	Lewis Creek Tributaries	Top
17	NGPA	Vuemont South Div. 1	Native Growth Protection Area	0.217	Lewis Creek Tributaries	Top

[a] This data is based on NWI data (USFWS, 1988) and may not fully represent the total area and number and wetlands within the basin.
[b] See Figure WT-1 for location of wetlands.
* Appears from GIS layers that there is no direct association with streams.

6.4.1 Small Riparian Wetlands

Forested and forested/scrub-shrub Small Riparian Wetlands occur along Lewis Creek and tributaries to Lewis Creek (Figure WT-1). The tree canopy in these wetlands is typically dominated by red alder, black cottonwood, and the occasional western red cedar. Willow and/or red-osier dogwood, often interspersed with Himalayan blackberry, typically dominate the underlying scrub-shrub communities within the forested wetlands. Reed canarygrass, slough sedge, and creeping buttercup may be present within the herbaceous layer of these wetlands.

The hydrologic characteristics of these riparian, flow-through wetlands were described in the Kelsey Creek/Mercer Slough Basin Section. Soil units mapped in this area include Alderwood gravelly sandy loam (AgC) soils in the southern portion of the basin and Bellingham silt loam (BeC) soils in the northern and eastern portions of this basin (SCS, 1973) (Figure WT-2). Alderwood soils were described in the Kelsey Creek/Mercer Slough Basin Section above. Bellingham silt loam soils are considered hydric according to Hydric Soils of the State of Washington (SCS, 1991).

Functions and values of these Small Riparian Wetlands are similar to those described under the Kelsey Creek/Mercer Slough Basin Section. The stormwater control, erosion control, and water quality improvement functions of Small Riparian Wetlands within this basin are the most important, because erosion can occur along the steep ravine banks of Lewis Creek particularly in high gradient reaches (see Section C, Streams Inventory, for more information). However, the functions of these wetlands are limited by their small size.

6.4.2 Hydrologically-Isolated Wetlands

The Hydrologically-Isolated depressional wetlands and NGPA wetlands occur mostly in the top third of the Lewis Creek basin. Most of these wetlands are NGPA wetlands, and data on the characteristics of these wetlands was not provided to Adolfson for this inventory. The naturally-occurring wetlands in this area were mapped as palustrine unconsolidated bed (PUB) wetlands on the NWI map (Figure WT-1). The characteristics of these open water wetlands are similar to those previously described under the Small Lake Washington Tributaries Basin. Shrub and/or forest habitat may surround these wetlands, since urban development is not as dense in this basin compared to the Small Lake Washington Tributaries Basin.

Hydrologic characteristics of Hydrologically-Isolated Wetlands was described in the Kelsey Creek/Mercer Slough Basin Section. Soils units in the area of the Hydrologically-Isolated Wetlands were mapped as Alderwood gravelly sandy loam (AgC) and Bellingham silt loam (BeC) soils (SCS, 1973) (Figure WT-2). These soils are described under the Small Riparian Section for Lewis Creek Basin.

Hydrologically-Isolated Wetlands in this basin are similar in size to those in other basins and would provide similar functions and values to the isolated wetlands described in the Kelsey Creek/Mercer Slough Basin Section. This basin has medium-density residential development and contains relatively low percentage (28%) of impervious surface than other basins (except Coal Creek Basin), indicating that more upland habitat would be connected to wetlands. Wetlands that are connected to other habitats provide a greater level of wildlife habitat diversity. Due to steep slopes within the basin along riparian corridors, overland flow is rapid, thus the stormwater control and erosion control functions of these wetlands and their surrounding forest habitat are important.

6.4.3 Constraints

The small wetlands within the Lewis Creek Basin are affected by urban development, similar to wetlands in other basins. Constraints within the Lewis Creek Basin are very similar to those within the Coal Creek Basin, because of the similar characteristics of these basins and their wetlands.

Based on field observations, these Small Riparian Wetlands typically have very narrow (less than 25 feet) or non-existent upland buffers, allowing for easy disturbance and consequent invasion of non-native species. Wetlands observed during the field investigation contained between 10 and 35 percent invasive species. Invasive species observed in these wetlands include reed canarygrass, Japanese knotweed, Himalayan blackberry, and English ivy. English ivy was invading a wetland observed at 164th Avenue SE at SE 49th Street (Photo WT-4).

6.4.4 Opportunities for Protection

Opportunities for protection of wetlands within the Lewis Creek Basin are similar to opportunities within the Coal Creek Basin because they are geomorphically similar and have similar wetland characteristics. The main opportunities within the Lewis Creek Basin include:

- Protection of existing naturally-occurring wetlands;
- Long-term monitoring and maintenance of NGPA wetlands to control invasive non-native species and ensure these are successful wetland creations or enhancements; and
- Creation of new NGPA wetlands on private and/or public properties within the basin.

6.5 Small Lake Sammamish Tributaries Basin

The Small Lake Sammamish Tributaries Basin contains 12 wetlands, including 8 naturally-occurring wetlands and four NGPA wetlands (Table 7). The NWI data and Adolfson field observations indicate that four types of wetlands occur within this basin: Large Wetland Complexes, Small Riparian Wetlands, and Hydrologically-Isolated Wetlands. Due to the presence of slopes formed by glacial outwash, Seep Wetlands may also be present. Wetlands occur in the top two-thirds of the basin. The NGPA wetlands are located exclusively in the top third of the basin. Wetlands within this basin are mostly less than an acre in size, with the notable exception of the 88 acre Phantom Lake Wetland Complex.

6.5.1 Large Wetland Complexes

A 88-acre wetland complex associated with Phantom Lake is located in the middle of the Small Lake Sammamish Tributaries Basin. This wetland contains forested, scrub-shrub, emergent, and lacustrine aquatic bed classes. Phantom Lake is 55 acres in size and meets the criteria of a Cowardin (1979) lacustrine system. An aquatic bed community is present along the northwestern and southeastern portions of the shoreline, near the parks located in these areas.

Table 7. NWI and NGPA Wetland Types, Size and Geomorphic Setting in the Small Lake Sammamish Tributaries Basin [a]

Wetland Count	Wetland Map Identifier [b]	Bellevue Wetland Name	Wetland Type Name	Size (Acres)	Name of Associated Stream	Location in Basin (Top 1/3, Middle 1/3, Bottom 1/3)
1	53	2-E Phantom Lake	Complex - Headwater	88.46	Phantom Creek	Top
2	30	5-C Cooper Vision	Isolated	0.63	None*	Top
3	32	Not in Bellevue Sensitive Areas Notebook	Isolated	0.59	None	Top
4	33	5-B 161st Ave. SW Interchange	Isolated	0.36	None	Top
5	54	Not in Bellevue Sensitive Areas Notebook	Isolated	0.30	None	Top
6	51	Not in Bellevue Sensitive Areas Notebook	Seep or Isolated	0.27	None	Middle
7	1	Not in Bellevue Sensitive Areas Notebook	Small Riparian	0.84	Ardmore Creek	Top
8	52	Not in Bellevue Sensitive Areas Notebook	Small Riparian	0.29	Stream 90_12	Bottom
9	NGPA	Whispering Crest	Native Growth Protection Area	0.308	None	Top
10	NGPA	Johnson	Native Growth Protection Area	0.835	None	Top
11	NGPA	Wiens	Native Growth Protection Area	0.129	None	Top
12	NGPA	Ashbrook	Native Growth Protection Area	0.325	None	Top

[a] This data is based on NWI data (USFWS, 1988) and may not fully represent the total area and number and wetlands within the basin.
[b] See Figure WT-1 for location of wetlands.
* Appears from GIS layers that there is no direct association with streams.

Vegetation within the forested/scrub-shrub classes of the Phantom Lake wetland complex is dominated by red alder and black cottonwood with an understory of willow and red-osier dogwood, or salmonberry scrub-shrub areas. The LAB community is dominated by spatterdock and common cattail.

Wetland hydrologic characteristics of Large Wetland Complexes in the Small Lake Sammamish Tributaries Basin are the same as those described for the Kelsey Creek/Mercer Slough Basin. Phantom Lake is the headwater wetland for Phantom Creek that flows to Lake Sammamish. Phantom Lake also receives flows from Kelsey Creek to its north. Wetlands along the Phantom Lake shoreline at the mouth of Kelsey Creek and origin of Phantom Creek are also influenced by periodic stream flooding.

Soils units mapped in the vicinity of Phantom Lake are Seattle muck (Sk) (SCS, 1973) and were described under the Kelsey Creek/Mercer Slough Basin Section.

Functions and values of this large headwater wetland are similar to the functions and values described for similar habitats under the Kelsey Creek/Mercer Slough Basin Section. The Phantom Lake Wetland Complex is the largest wetland in the basin and provides the highest level of stormwater control, water quality improvement, baseflow, erosion control, wildlife habitat, and socioeconomic values among wetlands within the basin. Residential development occupies about two-thirds of the lake's shoreline, somewhat reducing the erosion control, stormwater control, water quality improvement and wildlife habitat functions of the wetland.

6.5.2 Small Riparian Wetlands

Open water palustrine unconsolidated bed riparian wetlands occur along the upper reaches of Stream 90_12 (south of Sunich Creek 0151) in the center of the basin and Ardmore Creek at the north end of the basin. These wetlands contain relatively small percentages of vegetation such as common cattail, duck weed, and associated species such as soft rush or other sedges and rushes at its margins. Shrub and/or forest habitat may surround these wetlands, however the basins contain impervious surface areas (30-42%) on par with the Kelsey Creek/Mercer Slough Basin and upland habitat is fragmented.

The hydrologic characteristics of these riparian, flow-through wetlands were described in the Kelsey Creek/Mercer Slough Basin Section. Although these wetlands are riverine wetlands they are classified as open water wetlands on the NWI map and therefore may retain stormwater for longer periods than the typical riverine wetland as defined by Brinson (1993).

The Alderwood gravelly sandy loam (AgC and AgD) soil unit was mapped in the vicinity of these wetlands (SCS, 1973) (Figure WT-2). Alderwood soils were described in the Kelsey Creek/Mercer Slough Basin Section above. They are not listed as hydric on the Hydric Soils List of the State of Washington (SCS, 1991).

Functions and values of these Small Riparian Wetlands are similar to those described under the Kelsey Creek/Mercer Slough Basin Section, however, they may also function somewhat like small open water depressions. The stormwater control, erosion control, and water quality improvement functions of the Small Riparian Wetlands within this basin are the most important, because erosion can occur along the steep ravine banks of these small streams (see Section C, Stream Inventory, for more information). However, functions are limited due to small wetland size.

6.5.3 Hydrologically-Isolated Wetlands

The Hydrologically-Isolated Wetlands and NGPA wetlands mostly occur in the top two-thirds of the Small Lake Sammamish Tributaries Basin or within the top third of the Ardmore and Wilkins Creek subbasins. Data on wetland characteristics of the NGPA wetlands was not provided to Adolfson for this inventory. The naturally-occurring wetlands in this area were mapped as palustrine unconsolidated bed (PUB) and palustrine emergent (PEM) wetlands. Vegetation in the PUB wetlands is similar to that discussed for other basins. PEM wetlands likely contain reed canarygrass, slough sedge, soft rush with other associated sedges, grasses, and rushes. Shrub and/or forest habitat may surround these isolated wetlands, however the basin contains high to medium- density residential development and upland habitat is fragmented.

Hydrologic characteristics of Hydrologically-Isolated Wetlands were described in the Kelsey Creek/Mercer Slough Basin Section. Alderwood gravelly sandy loam (AgC) soils were mapped in the vicinity of these wetlands in the Small Lake Sammamish Tributaries Basin (SCS, 1973)

(Figure WT-2). Alderwood soils were described in the Kelsey Creek/Mercer Slough Basin Section of this report.

Hydrologically-Isolated Wetlands in this basin are similar in size to those in other basins and would provide similar functions and values to the isolated wetlands described in the Kelsey Creek/Mercer Slough Basin Section. Due to steep slopes above Lake Sammamish within the basin, overland flow is rapid, thus the stormwater control and erosion control functions of these wetlands and their surrounding forest habitat are important. This basin has high to medium-density residential development and contains a high percentage of impervious surface (30-42%). Most of the upland habitats surrounding the Hydrologically-Isolated Wetlands in this basin are fragmented (see Section B, Wildlife Inventory), limiting the wildlife habitat diversity of these wetlands.

6.5.4 Opportunities for Protection

Although most of the West Lake Sammamish shoreline is privately owned, there may opportunities to restore or create wetland habitat along the shoreline. There are many riparian ravines that flow into Lake Sammamish, including Lewis Creek and its tributaries. The wetlands associated with riparian corridors provide important stormwater and erosion control and water quality improvement and wildlife functions. Protection of these wetlands would maintain these important functions. These wetlands have high percentages of invasive non-native species that could be removed and the wetlands enhanced with native species.

Several NGPA wetlands have been created in this basin already. There may be additional opportunities along these corridors, particularly on topographic benches where erosion has occurred, to create scrub-shrub/forested wetlands that would provide additional benefits for the basin. Continued protection of wetland habitat and surrounding upland habitat within the parks along the northern and eastern shorelines of Phantom Lake will provide continued benefits to the largest and most diverse wetland in the basin.

7.0 WASHINGTON WETLAND CLASSIFICATIONS AND APPLICABILITY TO BELLEVUE'S WETLANDS

Wetlands are often classified for the purposes of establishing regulations for their protection and for the mitigation of wetland impacts. According to Washington Administrative Code 365-190-080, counties and cities that do not now rate wetlands should "consider a wetlands rating system to reflect the relative function, value, and uniqueness of wetlands," including consideration of the 1) Washington State four tier wetlands rating system, 2) wetland degree of sensitivity to disturbance, 3) wetland rarity, and 4) ability to compensate for destruction or degradation of the wetland. Local jurisdictions may choose to establish their own wetland rating system that does not use the four-tier wetlands rating system, but a rationale for this must be provided to the State. Ecology's Wetlands Rating System (1993) specifies four categories of wetlands: Category I, II, III, and IV; these are discussed below.

7.1 Category I

According to Ecology's rating system, Category I wetlands meet one or more of the following criteria:

1) Documented presence of a federal or state-listed endangered or threatened species;
2) Washington Natural Heritage program high quality native wetland;
3) Regionally significant waterfowl and shorebird concentration area;
4) Mature forest consisting of either at least 80 year old evergreen trees or at least 50 year old deciduous trees and less than 25 percent non-native cover;
5) Estuarine wetlands, bogs and fens, or eelgrass and kelp beds; or
6) Documented wetland of local significance.

According to Ecology (Suggs, personal communication, 2002), a wetland would be classified as a Category I wetland if there is a documented presence of an endangered or threatened fish in a stream within a wetland. However, if the stream with the endangered or threatened species only went through a portion of the wetland, a dual rating (e.g. Category I and II) may be an appropriate assignment for the wetland. Dual rating of wetlands is further discussed below.

Only four of the wetlands in Bellevue that were investigated for this inventory met the criteria for Washington State Category I wetlands: the Valley Creek, Mercer Slough, Kelsey Creek/Richards Creek and Larsen Lake wetland complexes. Federally-threatened chinook salmon has been documented in streams and flooded portions of wetlands in Mercer Slough, and in Kelsey Creek within Lake Hills Greenbelt Park and immediately downstream of Larsen Lake (Watershed Company, 2001). According to the 2001 Culvert Assessment for Fish Passage and Salmonid Distribution Map (Bellevue, 2001), Valley Creek contains chinook and therefore the wetland complex at NE 24th Street and 140th Avenue NE would meet the criteria for a Category I wetland.

7.2 Category II and III

Category II and III wetlands must meet criteria that are between Category I and Category IV wetlands (see below). In order to determine if a wetland is either a Category II or III wetland, the Wetland Rating System Data Form must be completed. A typical Data Form is provided in Appendix WT-2. To complete the Data Form, wetlands are assigned a score for each habitat feature, which includes size, number of wetland classes, plant species diversity, structural diversity, special habitat features, connections to streams and other habitats, and condition of buffers. If the wetland scores more than 22 points it is classified as a Category II wetland, otherwise it is classified as a Category III wetland. Larger wetlands that have more structure are vegetatively diverse, have undisturbed buffers, and are connected to other streams and habitats typically score the highest and meet the criteria for Category II wetlands.

Many of Bellevue's wetlands meet the criteria Category II or III wetlands, due to their association with streams. Their category depends on their size, habitat conditions, and number of wetland classes. A clear example of a Category II wetland in Bellevue is the Phantom Lake wetland. This wetland is approximately 85 acres in size, contains four Cowardin classes, has structural and plant species diversity, and is connected to other habitats and streams. Rating of the smaller wetlands that are identified as Small Riparian Wetlands as either Category II or III wetlands is more ambiguous. Classification of the Small Riparian Wetlands depends on their particular characteristics and requires individual analysis. For example, the pasture wetland that was observed along Yarrow Creek on NE 116th Avenue at NE 37th Street would meet the criteria for a Category III wetland. In contrast, a forested/scrub-shrub/open water wetland associated with Valley Creek, which was observed on NE 24th Street between 140th Avenue NE and SR 520, scored 23 points and therefore meets the criteria for a Category II wetland.

7.3 Category IV

Category IV wetlands meet one of the following characteristics:

1) Less than one acre, hydrologically isolated, <u>and</u> comprised of one vegetated class that is dominated by one species from Table 3 or Table 4 that are provided in the Wetland Rating System Manual (Ecology, 1993) (see Appendix WT-5); or
2) Less than two acres, hydrologically isolated, with one vegetated class and more than 90 percent aerial cover of any species in Table 3 (Ecology, 1993); or
3) Wetland excavated from upland and a pond smaller than one acre without a surface water connection to streams, lakes, rivers, or other wetland, and has less than 0.1 acre of vegetation.

The NWI map was overlaid onto the Bellevue stream map; this revealed that several small hydrologically isolated wetlands exist within Bellevue, although none have been field verified. Most of these wetlands are under one acre in size (Table 1). If it is assumed that these wetlands are highly disturbed and are vegetated by plant species listed in Table 3 or 4 of the Ecology Wetland Rating System Manual (1993), then these wetlands would be classified as Category IV wetlands. There could, however, be a small hydrologically isolated wetlands that contain a forested class, and would therefore exceed criteria of a Category IV wetland. Such a wetland would be classified as a Category III wetland after completing the Wetland Rating System Data Form. Table 1 lists all the isolated wetlands in Bellevue as Category IV wetlands. This was based on the assumption that most of these would be degraded and contain limited herbaceous species coverage.

7.4 Dual Rating of Wetlands

According to the Washington Wetland Rating System (Ecology, 1993), a wetland can have a dual rating. To establish a dual rating, a clearly defined boundary must exist between wetland conditions qualifying for one classification and the other classification. For example, a portion of a wetland may be determined to be a bog, but its surrounding area may be a palustrine emergent wetland. The bog area could be classified as a Category I wetland, and the remaining area could be classified as a Category II wetland, but only if the characteristics and boundary between these two areas can be clearly defined. In another example, if a documented endangered or threatened species is found within a portion of the wetland, the portion of the wetland that provides habitat for the endangered or threatened species would be classified as Category I, while the other portion of the wetland would be classified under a different category, if a clearly defined boundary between these areas could be identified. In many cases, a boundary between one class of wetland and another cannot be clearly defined, making it impossible to establish dual ratings, thus the higher rating applies to the entire wetland.

Some of the large wetland complexes in Bellevue might be candidates for dual rating. For example, the northern portion of the wetland complex surrounding Larsen Lake may be a Category I wetland, due to the presence of the federally-threatened chinook salmon, but the southern portion of this wetland might be categorized as Category II. A clearly defined boundary between areas that do or do not provide chinook habitat would need to be determined in order to dual rate the wetland.

7.5 Applicability of Ecology Rating of Bellevue Wetlands

Accurate classifications of all wetlands in Bellevue requires assessment on a case-by-case basis including field investigation and delineation. Bellevue's major wetland types were defined above and include: Complex, Small Riparian, Seep, Lacustrine, and Isolated. Since most of these wetlands were not investigated in the field, some of those wetlands that were labeled as Isolated or Small Riparian wetlands may be Seep wetlands. Large Wetland Complexes that contain chinook-bearing waters and provide habitat for fish such as those associated with Kelsey Creek and Mercer Slough would likely meet the criteria Category I wetlands. Other complexes and Small Riparian wetlands would likely meet the criteria for Category II or III wetlands depending on their habitat diversity and connection to upland habitat. It was assumed that all isolated wetlands would be classified as a Category IV wetland because they are not associated with streams. However, because isolated wetlands could be forested or have a diversity of species they may exceed the criteria for a Category IV wetland.

Three categories of wetland are specified in Chapter 20.50 of the Bellevue Land Use Code. Bellevue has three wetland categories, Type A, Type B, and Type C. Type A wetlands are those that are hydrologically related to Type A or B streams, as defined under the City's code. Type B are hydrologically isolated from streams and are greater than 7,200 square feet. Type C wetlands are those that are hydrologically isolated and are less than 7,200 square feet.

If Bellevue's Land Use Code wetland classifications are applied, all wetlands except Isolated wetlands would be Type A wetlands. Since none of the Isolated wetlands identified on the NWI map were greater than 7,200 square feet, all would fall into the Type C category.

The State Wetland Rating System provides additional specificity in classifying and protecting wetlands, particularly medium-sized wetlands connected to streams, than does the Bellevue rating system. The State system also categorizes wetlands based on the presence of endangered species, vegetative characteristics, functions, and sensitivity to disturbance, while the Bellevue system categorizes wetlands based on hydrologic connection to streams and size. The State Wetland Rating System gives a higher rating to wetlands that contain endangered or threatened species or rare wetland types, which is not addressed in the Bellevue rating system. The State system provides a better assessment of the quality of wetlands than the Bellevue rating system, which provides more information for prioritizing protection of one wetland over another.

8.0 INFORMATION GAPS

Bellevue has collected a substantial amount of information on its large wetland complexes within the City. However, this report identifies the following gaps in information regarding wetlands and is a recommended list of information that could be collected by Bellevue.

- Develop a GIS database and map of existing naturally-occurring wetlands within Bellevue to add to the NGPA data. This could be done through an update of both the NWI Map and the Bellevue Sensitive Areas Notebook. This would allow the City to better manage and protect existing wetland resources.
- Collect a consolidated list of information regarding existing restoration projects that have been implemented in Bellevue and document their success over time. This could be accomplished by requiring developers to collect the base information and then Bellevue could add this to it NGPA database. This database would be useful to understand what types of NGPA wetlands projects have worked, and those that have not been as successful and the reasons for problems.
- Identify site for wetland restoration opportunity within Bellevue, both on public and private land.
- Collect more information about wetland buffer conditions in Bellevue and assess their effectiveness at protecting wetlands from threats such as urban development and other disturbance. This could be completed through a focus study of representative wetland buffer conditions.
- Collect more information about the impacts of urban development upon wetlands in Bellevue. A study of water quality and wildlife impacts of a sample of a variety of wetlands could be conducted and compare to existing reference data collected by King County Studies (Azous and Horner, 2001).
- Collect data about smaller wetlands, particularly those along streams that might be reconnected to streams to provide or enhance fish habitat.
- Collect more information regarding the presence of invasive non-native plant species in wetlands, which would be useful for developing a non-native management plan.
- Collect more information about wildlife and fish use in wetlands, particularly in chinook-bearing riparian areas and smaller wetlands throughout Bellevue. This could be done in conjunction with stream and fish surveys.

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10.0 GLOSSARY

agricultural wetland: areas where wetland soils and hydrology remain, but hydrophytic vegetation have been removed to allow a crop to be grown.

anaerobic: a situation in which molecular oxygen is absent (or effectively so) from the environment.

atypical situation: areas in which one or more parameters (vegetation, soil, and/or hydrology) have been sufficiently altered by recent human activities or natural events to preclude the presence of wetland indicators of the parameter. Recent is intended to mean that period of time since legal jurisdiction of an applicable law began.

best management practices (BMP's): physical, structural, and/or managerial practices that, when used singly or in combination, prevent or reduce pollutant discharges.

buffer: a designated area along the perimeter of a stream or wetland which is regulated to control the negative effects of adjacent development from intruding into the aquatic resource.

concretion: a local concentration of chemical compounds (e.g. calcium carbonate, iron oxide) in the form of a grain or nodule of varying size, shape, hardness, and color. Concretions of significance in hydric soil are usually iron and/or manganese oxides occurring at or near the soil surface, which develop under conditions of prolonged soil saturation.

dominant species: a plant species that exerts a controlling influence on or defines the character of a community.

emergent: a plant that grows rooted in shallow water, the bulk of which emerges from the water and stands vertically. Usually applied to non-woody vegetation.

emergent wetland: in the USFWS classification system (Cowardin et al., 1979), a wetland characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens.

enhancement: an improvement in the functions and values of an existing wetland.

fill material: any material placed in an area to increase surface elevation.

forested wetland: in the USFWS classification system (Cowardin et al., 1979), a wetland characterized by woody vegetation that is six meters (20 feet) tall or taller.

404 permit: a permit issued by the U.S. Army Corps of Engineers under Section 404 of the federal Clean Water Act which allows an activity (filling) within a wetland. A 404 permit usually requires compensation or mitigation for the allowed use in a wetland.

gleyed: a soil condition resulting from prolonged soil saturation, which is manifested by the presence of bluish or greenish colors through the soil mass or in mottles (spots or streaks) among other colors. Gleying occurs under reducing soil conditions resulting from soil saturation, by which iron is reduced predominantly to the ferrous state.

ground water: that portion of the water below the ground surface that is under greater pressure than atmospheric pressure.

herbaceous: with the characteristics of an herb; a plant with no persistent woody stem above ground.

homogenous vegetation: a situation in which the same plant species association occurs throughout an area.

hydric soil: a soil that formed under conditions of saturation, flooding, or ponding long enough to develop anaerobic conditions in the upper part. Hydric soils that occur in areas having positive indicators of hydrophytic vegetation and wetland hydrology are wetland soils.

hydrology The science dealing with the properties, distribution, and circulation of water.

hydrophyte any plant growing in water or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content.

hydrophytic vegetation The sum total of plant life growing in water or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content. When hydrophytic vegetation comprises a community where indicators of hydric soils and wetland hydrology also occur, the area has wetland vegetation.

in-kind compensation compensation for lost wetland habitat with a replacement wetland of the same habitat type.

inundation a condition in which water from any source temporarily or permanently covers a land surface.

invasive plant species those species which become established easily in disturbed conditions, reproduce readily, and often establish monocultures. Most invasive plants are non-native species (i.e. were introduced to the northwest intentionally or unintentionally, by humans) Examples of common invasive species in the Pacific Northwest are: Scot's broom, Canada thistle, hedge bindweed, English ivy, reed canarygrass, purple loosestrife, and soft rush.

lacustrine in USFWS classification system (Cowardin et al., 1979), freshwater (less than 0.5 parts per thousand ocean-derived salts) area with all of the following characteristics: (1) situated in a topographic depression or a dammed river channel; (2) has less than 30% coverage of trees, shrubs, persistent emergents, mosses, or lichens; and (3) total area exceeds eight hectares (20 acres). For areas less than 20 acres, an area is considered lacustrine if it has an active wave-formed or bedrock shoreline or is deeper than 6.6 feet in the deepest part.

mitigation (as per WAC 197-11-766)

(1) Avoiding the impact altogether by not taking a certain action or parts of an action;
(2) Minimizing impacts by limiting the degree or magnitude of the action and its implementation, by using appropriate technology, or by taking affirmative steps to avoid or reduce impacts;
(3) Rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
(4) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action;
(5) Compensating for the impact by replacing, enhancing or providing substitute resources or environments: and/or
(6) Monitoring the impact and taking appropriate corrective measures.

mottles	spots or blotches of different color or shades of color interspersed within the dominant color in a soil layer, usually resulting from the presence of periodic reducing soil conditions.
100-year floodplain	the flood with a 100-year recurrence interval; those areas identified as Zones A, A1-30, AE, AH, AO, A99, V, V1-30, and VE on most current Federal Emergency Management Agency (FEMA) Flood Rate Insurance Maps, or areas identified as 100-year floodplain on applicable local Flood Management Program maps.
ordinary high-water mark	the line on the shore established by the fluctuations of water and indicated by physical characteristics such as: a clear, natural line impressed on the bank; changes in the character of soil or vegetation; shelving; or the presence of a line of litter or debris.
out-of-kind compensation	compensation for lost wetland habitat with a replacement wetland of a different habitat type.
palustrine	in USFWS classification system (Cowardin et al., 1979), freshwater (less than 0.5 parts per thousand ocean-derived salts) area dominated by trees, shrubs, persistent emergents, mosses, or lichens. They can be non-tidal or tidal. Palustrine also includes wetlands lacking this vegetation, but has the following characteristics: (1) area less than 20 acres; (2) no active wave-formed or bedrock shoreline; (3) water depth in the deepest part is less than 6.6 feet at low water.
persistent emergents	emergents which remain standing at least until the beginning of the next growing season.
reach	a length of channel with uniform characteristics.
restoration	to improve a disturbed or altered wetland by returning wetland parameters which may be missing. The restoration may return an original wetland habitat or may alter the wetland for some other desired outcome.
rhizosphere	the zone of soil in which interactions between living plant roots and microorganisms occur.
riverine	in USFWS classification system (Cowardin et al., 1979), freshwater (less than 0.5 parts per thousand ocean-derived salts) areas that are contained within a channel and which are not dominated by trees, shrubs, and persistent emergents, for example, rivers and streams.
saturated soil conditions	a condition in which all easily drained voids (pores between soil particles) in the root zone are temporarily or permanently filled with water to the soil surface at pressures greater than atmospheric.
scrub-shrub	in USFWS classification system (Cowardin et al., 1979), areas dominated by woody vegetation less than 6 meters (20 feet) tall. The species include tree shrubs, young trees, and tress or shrubs that are smaller stunted because of environmental conditions.
section 404 permit	see "404 Permit".
soil matrix	the portion of a given soil having the dominant color. In most cases, the matrix will be the portion of the soil having more than 50 percent of the same color.
sub-catchment	a subdivision of a drainage basin generally determined by topography.

synonymy different scientific names for the same species.

wetland transitional lands between terrestrial and aquatic systems, where the water table is usually at or near the surface or the land is covered by shallow water. Wetlands must have one or more of the following attributes: (1) at least periodically, the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is non-soil and is saturated with water or covered by shallow water at some time during the growing season of each year.

wetland boundary the point on the ground at which a shift from wetlands to nonwetlands or aquatic habitat occurs. These boundaries usually follow contours.

wetland hydrology the total of all wetness characteristics in areas that are inundated or have saturated soils for a sufficient duration to support hydrophytic vegetation.

wetland indicator status (WIS) categories of plant species based upon the estimated probabilities (expressed as a frequency of occurrence) of a species occurring in a wetland or non-wetland. Wetland indicator statuses include the following:

- Obligate (OBL): species that almost always occur wetlands under natural conditions (estimated probability >99%).
- Facultative wetland (FACW): species that usually occur in wetlands (estimated probability 67 to 99%), but are occasionally found in non-wetlands.
- Facultative (FAC): Species that are equally likely to occur in wetlands or non-wetlands (estimated probability 34 to 66%).
- Facultative upland (FACU): species that usually occur in non-wetlands (estimated probability 67 to 99%), but are occasionally found in wetlands.
- Upland (UPL): species that almost always occur in non-wetlands under normal conditions (estimated probability >99%).
- Not listed (NL): species that are not listed and are presumed to be upland species.
- No indicator status (NI): species that have not yet been evaluated.
- A (+) or (-) following the WIS signifies a greater or lesser likelihood of being found in wetland conditions.

•

FIGURES AND PHOTOS

Photo WT-1. Mercer Slough Wetland Complex, east of Bellevue Park-and-RideWestside (1-30-02).

Photo WT-2. Invasive Species in wetland complex in Kelsey Creek Community Park (1-28-01).

Photo WT-3. Single Community Riparian Wetland, 164th Avenue SE and SE 49th Street (2-12-02).

Photo WT-4. Invasive English Ivy of Single Community Riparian Wetland, 164th Avenue SE and SE 49th Street (2-12-02).

APPENDIX WT-1:
BELLEVUE SENSITIVE AREA NOTEBOOK PLANT LIST

City of Bellevue, Washington — Sensitive Areas Notebook

TABLE 8B – 1
WETLAND TOLERANT PLANTS OF THE BELLEVUE AREA

Scientific Name	Common Name
TREES	
Abies amibilas	Silver Fir
Acer macrophyllum	Big Leaf Maple
Alnus rubra	Red Alder
Betula spp.	Birch
Betula papryfera	Paper Birch
Fraxinus latifolia	Oregon Ash
Picea sitchensis	Sitka Spruce
Pinus contorta	Lodgepole Pine
Populus tremuloides	Quaking Aspen
Populus trichocarpa	Black Cottonwood
Thuja plicata	Western Red Cedar
Tsuga heterophylla	Hemlock
HERBS	
Alisma gramineum	Narrow Leaved Water Plantain
Alisma plantago-aquatica	Water Plantain
Aruncus sylvester	Goatsbeard
Brassenia schruberi	Watershield
Caltha biflora	Marsh Marigold
Cicuta douglasii	Water Hemlock
Conicum maculatum	Poison Hemlock
Drosera rotundifolia	Sundew
Elodea nuttallii	
Epilobium	Fireweed
Galium spp.	Bedstraw
Hackelia floribunda	Many-flowered Stickseed
Heracleum lanatum	Cow-parsnip
Iris pseudocarpus	Yellow Iris
Lobelia dortmanna	Water Lobelia
Ludwigia palustris	Water Purslane
Lysichitum americanum	Skunk Cabbage
Lythrum salicaria	Purple Loosestrife
Meyanthes trifoliata	Bog Bean
Mimulus guttatus	Monkey Flower
Myriaphyllum spp.	Water Milfoil
Nasturtium officianale	Water Cress
Nuphar polysepalum	Yellow Pond Lily
Nymphaea odorata	White Pond Lily
Oenanthe sarmetosa	Water Parsley
Parentucellia viscosa	Yellow Schrophularia
Polygonum hydropiper	Marsh Pepper
Potentilla pacifica	Pacific Silverweed
Potentilla paulustris	Potentilla

City of Bellevue, Washington Sensitive Areas Notebook

Scientific Name	Common Name
HERBS (Continued)	
Potomageton natans	Pond Weed
Prunella vulgaris	Self-heal
Ranunculus aquatilis	Water Crowfoot
Ranunculus orthorhynchus	Aquatic Buttercup
Ranunculus repans	Creeping Buttercup
Rumex spp.	Dock
Sagittaria latifolia	Wapato
Sium suave	Water Parsnip
Solanum dulcamara	Bittersweet Nightshade
Stachya cooleyse	Hedge Nettle
Tiarella trifoliata	Foamflower
Tolmies menziessii	Youth-on-age
Trientalis arctica	Bog Starflower
Triglochin maritimum	Arrow Grass
Typha latifolia	Cattail
Urtica dioia	Stinging Nettle
Utricularia minor	Bladderwort
Veronica americana	American Brooklime
Veronica scuttellata	Marsh Speedwell
Verstrum californicum	False Hellebore
Viola paulustris	Marsh Violet
Zannichellia paulustris	Horned Pondweed
SHRUBS	
Acer circinatum	Vine Maple
Betula glandulosa	Bog Birch
Cornus stolenifera	Red-osier Dogwood
Kalmia occidentali	Bog Laurel
Ledum groenlandicu	Labrador Tea
Menziesia ferrygin	False Azalea
Oemieria cerasifor	Indian Plum
Oplopanax horridus	Devil's Club
Physocarpus capita	Ninebark
Prunus spp.	Cherry
Pyrus fusca	Wild Crabapple
Rhamnus purshiana	Cascara
Rosa spp.	Rose
Rubus spectabilis	Salmonberry
Salix spp.	Willow
Sambusus racemosa	Red Elderberry
Sorbus sitchensis	Mountain Ash
Spirea douglassii	Hardhack
Symphoricarpus alb	Snowberry
Vaccinium spp.	Domestic Blueberry
Vaccinium oxycoccu	Cranberry
Vaccinium uliginos	Bog Blueberry

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City of Bellevue, Washington — Sensitive Areas Notebook

Scientific Name	Common Name
SEDGES/RUSHES/GRASSES/FERNS	
Alopecurus spp.	Foxtail Grass
Athyrium felix-femina	Lady Fern
Azolla spp.	
Blechnum spicant	Deer Fern
Carex spp.	Sedge
Carex aquatilis	Water Sedge
Carex obnupta	Slough Sedge
Dulichium arundinaceum	
Eleocharis spp.	
Eriophorum chamissonis	Cottongrass
Equisetum spp.	Horsetail
Fucus distichus	Rockweed
Glyceria spp.	Glyceria Grass
Gramines spp.	Grass
Juncus spp.	Rush
Juncus acuminatus	
Juncus bufonius	Toad Rush
Juncus effusus	
Juncus ensifolius	
Juncus oxymeris	
Juncus supiniformis	Spreading Rush
Juncus tennuis	
Lemna minor	Duckweed
Luzula spp.	Wood Rush
Lycopodium inundatum	Clubmoss
Marchantia spp.	Liverwort
Phalaris arundinacea	Reed Canary Grass
Ricciocarpus natans	Aquatic Liverwort
Scirpus spp.	Bulrush
Scirpus cyperinus	
Scirpus fluviatilis	River Bulrush
Scirpus maritimus	
Scirpus microcarpus	
Scirpus validus	
Sparganium emursum	
Sparganium eurycarpum	
Sparganium minimum	
Sphagnum spp.	Peat Moss
Ulva spp.	

8-B123

APPENDIX WT-2:
WASHINGTON STATE WETLAND RATING FORM

Wetlands Rating Field Data Form

Background Information:

Name of Rater: ______________ Affiliation: ______________ Date: ________

Name of wetland (if known): ______________________________

Government Jurisdiction of wetland: ______________________________

Location: 1/4 Section: _____ of 1/4 S: _____ Section: _____ Township: _____ Range: _____

Sources of Information: (Check all sources that apply)

Site visit: ___ USGS Topo Map: ___ NWI map: ___ Aerial Photo: ___ Soils survey: ___

Other: ___ Describe: ______________________________

When The Field Data form is complete enter Category here: [ ]

Q.1. High Quality Natural Wetland

Circle Answers

Answer this question if you have adequate information or experience to do so. If not find someone with the expertise to answer the questions. Then, if the answer to questions 1a, 1b and 1c are all NO, contact the Natural Heritage program of DNR.

1a. Human caused disturbances.

Is there significant evidence of human-caused changes to topography or hydrology of the wetland as indicated by any of the following conditions? Consider only changes that may have taken place in the last 5 decades. The impacts of changes done earlier have probably been stabilized and the wetland ecosystem will be close to reaching some new equilibrium that may represent a high quality wetland.

1a1. Upstream watershed > 12% impervious.	Yes: go to Q.2
1a2. Wetland is ditched and water flow is not obstructed.	Yes: go to Q.2
1a3. Wetland has been graded, filled, logged.	Yes: go to Q.2
1a4. Water in wetland is controlled by dikes, weirs, etc.	Yes: go to Q.2
1a5. Wetland is grazed.	Yes: go to Q.2
1a6. Other indicators of disturbance (list below)	Yes: go to Q.2
	No: go to 1b.

____
____
____
____

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1b Are there populations of non-native plants which are currently present, cover more than 10% of the wetland, and appear to be invading native populations? Briefly describe any non-native plant populations and Information source(s):____________	YES: go to Q.2 No: go to 1c.
1c. Is there evidence of human-caused disturbances which have visibly degraded water quality. Evidence of the degradation of water quality include: direct (untreated) runoff from roads or parking lots; presence, or historic evidence, of waste dumps; oily sheens; the smell of organic chemicals; or lifestock use. Briefly describe:____________	YES: go to Q.2 NO: Possible Cat. I contact DNR
Q.2. Irreplaceable Ecological Functions: Does the wetland: ⊖ have at least 1/4 acre of organic soils deeper than 16 inches and the wetland is relatively undisturbed; OR [If the answer is NO because the wetland is disturbed briefly describe: Indicators of disturbance may include: - Wetland has been graded, filled, logged; - Organic soils on the surface are dried-out for more than half of the year; - Wetland receives direct stormwater runoff from urban or agricultural areas.]; OR	(NO to all: go to Q.3) YES go to 2a
⊖ have a forested class greater than 1 acre; OR	YES: Go to 2b
⊖ have characteristics of an estuarine system; OR	YES: Go to 2c
⊖ have eel grass, floating or non-floating kelp beds?	YES: Go to 2d
2a. Bogs and Fens Are any of the three following conditions met for the area of organic soil?	
2a.1. Are Sphagnum mosses a common ground cover (>30%) and the cover of invasive species (see Table 3) is less than 10%?	
Is the area of sphagnum mosses and deep organic soils > 1/2 acre?	YES: Category I
Is the area of sphagnum mosses and deep organic soils 1/4-1/2 acre?	YES: Category II
	NO: Go to 2a.3
2a.2. Is there an area of organic soil which has an emergent class with at least one species from Table 2, and cover of invasive species is < 10% (see Table 3)?	
Is the area of herbaceous plants and deep organic soils > 1/2 acre?	YES: Category I
Is the area of herbaceous plants and deep organic soils 1/4-1/2 acre?	YES: Category II
	NO: Go to 2a.3

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2a.3. Is the vegetation a mixture of only herbaceous plants and Sphagnum mosses with no scrub/shrub or forested classes? Is the area of herbaceous plants, Sphagnum, and deep organic soils > 1/2 acre? Is the area of herbaceous plants, Sphagnum, and deep organic soils 1/4-1/2 acre?	YES: Category I YES: Category II NO: Go to Q.3.
Q.2b. Mature forested wetland. 2b.1. Does 50% of the cover of upper forest canopy consist of evergreen trees older than 80 years or deciduous trees older than 50 years? *Note:* The size of trees is often not a measure of age, and size cannot be used as a surrogate for age (see guidance).	YES: Category I NO: Go to 2b.2
2b.2. Does 50% of the cover of forest canopy consist of evergreen trees older than 50 years, AND is the structural diversity of the forest high as characterized by an additional layer of trees 20'-49' tall, shrubs 6' - 20', tall, and a herbaceous groundcover?	YES: Go to 2b.3 NO: Go to Q.3
2b.3. Does < 25% of the areal cover in the herbaceous/groundcover or the shrub layer consist of invasive/exotic plant species from the list on p. 19?	YES: Category I NO: Go to Q.3
Q.2c. Estuarine wetlands. 2c1. Is the wetland listed as National Wildlife Refuge, National Park, National Estuary Reserve, Natural Area Preserve, State Park, or Educational, Environmental or Scientific Reserves designated under WAC 332-30-151?	YES: Category I NO: Go to 2c.2
2c.2. Is the wetland > 5 acres; . . . . *Note:* If an area contains patches of salt tolerant vegetation that are 1) less than 600 feet apart and that are separated by mudflats that go dry on a Mean Low Tide, or 2) separated by tidal channels that are less than 100 feet wide; all the vegetated areas are to be considered together in calculating the wetland area.	YES: Category I
or is the wetland 1-5 acres;	YES: Go to 2c.3
or is the wetland < 1 acre?	YES: Go to 2c.4

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2c.3. Does the wetland meet at least 3 of the following 4 criteria: . . . . - minimum existing evidence of human related disturbance such as diking, ditching, filling, cultivation, grazing or the presence of non-native plant species (see guidance for definition); - surface water connection with tidal saltwater or tidal freshwater; - at least 75% of the wetland has a 100' buffer of ungrazed pasture, open water, shrub or forest; - has at least 3 of the following features: low marsh; high marsh; tidal channels; lagoon(s);woody debris; or contiguous freshwater wetland.	YES: Category I NO: Category II
2c.4. Does the wetland meet all of the four criteria under 2c3. (above)?. .	YES: Category II NO: Category III
Q.2d. Eel Grass and Kelp Beds. 2d.1. Are eel grass beds present?.	YES: Category I NO: go to 2d.2
2d.2. Are there floating or non-floating kelp bed(s) present with greater than 50% macro algal cover in the month of August or September?	YES: Category I NO: Category II
Q.3. Category IV wetlands. 3a. Is the wetland: less than 1 acre <u>and</u>, hydrologically isolated <u>and</u>, comprised of one vegetated class that is dominated (> 80% areal cover) by one species from Table 3 (page 19) or Table 4 (page 20)	YES: Category IV NO: go to 3b
3b. Is the wetland: less than two acres and, hydrologically isolated, with one vegetated class, and > 90% of areal cover is any combination of species from Table 3 (page 19)	YES: Category IV NO: go to 3c
3c. Is the wetland excavated from upland <u>and</u> a pond smaller than 1 acre without a surface water connection to streams, lakes, rivers, or other wetland, and has < 0.1 acre of vegetation.	YES: Category IV NO: go to Q.4

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<table>
<tr><td colspan="2">

Q.4. Significant habitat value.
Answer all questions and enter data requested.
4a. Total wetland area
Estimate area, select from choices in the near-right column, and score in the far column:

Enter acreage of wetland here:______acres, and source:___________

</td><td>

Circle scores that qualify
<u>acres</u> <u>points</u>
> 200 6
40- 200 5
10 - 40 4
5 - 10 3
1 - 5 2
0.1 - 1 1
< 0.1 0

</td></tr>
<tr><td colspan="2">

4b. Wetland classes: Circle the wetland classes below that qualify:
Open Water: if the area of open water is > 1/4 acre
Aquatic Beds: if the area of aquatic beds > 1/4 acre,

Emergent: if the area of emergent class is > 1/4 acre,

Scrub-Shrub: if the area of scrub-shrub class is > 1/4 acre,

Forested: if area of forested class is > 1/4 acre,

Add the number of wetland classes, above, that qualify, and then score according to the columns at right.
e.g. If there are 4 classes (aquatic beds, open water, emergent & scrub- shrub), you would circle 8 points in the far right column.

</td><td>

<u># of classes</u> <u>Points</u>
1 0
2 3
3 6
4 8
5 10

</td></tr>
<tr><td>

4c. Plant species diversity.
For each wetland class (at right) that qualifies in 4b above, count the number of different plant species you can find that cover more than 5% of the ground. You do not have to name them.

Score in column at far right:
e.g. If a wetland has an aquatic bed class with 3 species, an emergent class with 4 species and a scrub-shrub class with 2 species you would circle 2, 2, and 1 in the far column.
Note: Any plant species with a cover of > 5% qualifies for points within a class, even those that are not of that class.

</td><td colspan="2">

<u>Class</u> <u># species in class</u> <u>Points</u>
Aquatic Bed 1 0
2 1
3 2
> 3 3

Emergent 1 0
2-3 1
4-5 2
> 5 3

Scrub-Shrub 1 0
2 1
3-4 2
> 4 3

Forested 1 0
2 1
3-4 2
> 4 3

</td></tr>
</table>

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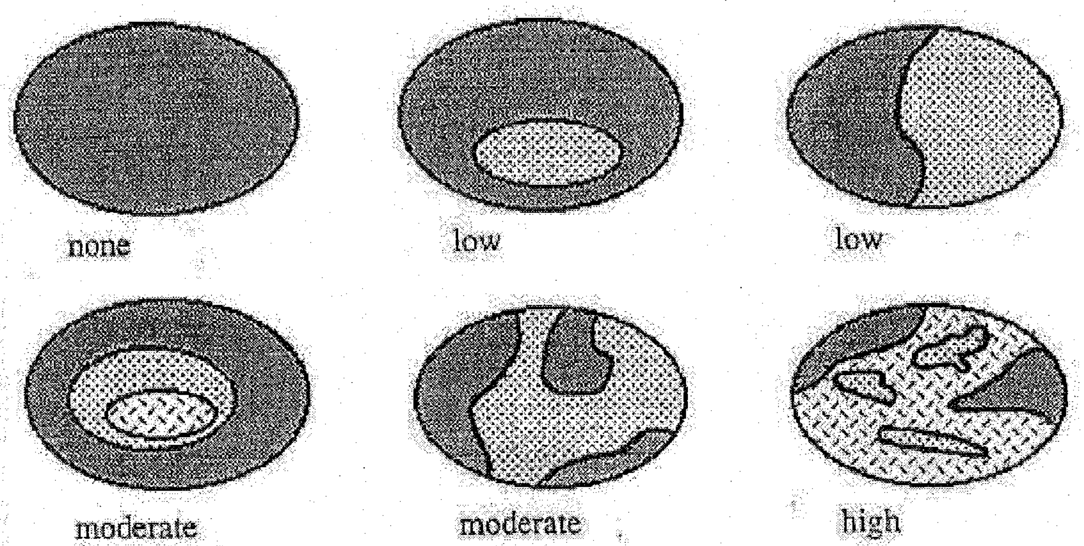
4d. Structural diversity. If the wetland has a forested class, add 1 point if each of the following classes is present within the forested class and is <u>larger than 1/4 acre</u>: -trees > 50' tall . . . . -trees 20'- 49' tall . . . . -shrubs. . . . . -herbaceous ground cover. . . . . Also add 1 point if there is any "open water" or "aquatic bed" class immediately next to the forested area (ie. there is no scrub/shrub or emergent vegetation between them).	 YES - 1 YES - 1 YES - 1 YES - 1 YES - 1
4e. Decide from the diagrams below whether interspersion between wetland classes is high, moderate, low or none? If you think the amount of interspersion falls in between the diagrams score accordingly (i.e. a moderately high amount of insterspersion would score a 4, while a moderately low amount would score a 2)	High - 5 Moderate - 3 Low - 1 None - 0



4f. Habitat features. Answer questions below, circle features that apply, and score to right:	
Is there evidence that the open or standing water was caused by beavers	YES = 2
Is a heron rookery located within 300'?	YES = 1
Are raptor nest/s located within 300'?	YES = 1
Are there at least 3 standing dead trees (snags) per acre greater than 10" in diameter at "breast height" (DBH)?.	YES = 1
Are there at least 3 downed logs per acre with a diameter > 6" for at least 10' in length?	YES = 1
Are there areas (vegetated or unvegetated) within the wetland that are ponded for at least 4 months out of the year, and the wetland has not qualified as having an open water class in Question 4b. ?	YES = 2

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4g. Connection to streams. (Score one answer only.) 4g.1. Does the wetland provide habitat for fish at any time of the year AND does it have a perennial surface water connection to a fish bearing stream.	YES = 6
4g.2 Does the wetland provide fish habitat seasonally AND does it have a seasonal surface water connection to a fish bearing stream.	YES = 4
4g.3 Does the wetland function to export organic matter through a surface water connection at all times of the year to a perennial stream.	YES = 4
4g.4 Does the wetland function to export organic matter through a surface water connection to a stream on a seasonal basis?	YES = 2
4h. Buffers. Score the existing buffers on a scale of 1-5 based on the following four descriptions. If the condition of the buffers do not exactly match the description, score either a point higher or lower depending on whether the buffers are less or more degraded.	
Forest, scrub, native grassland or open water buffers are present for more than 100'around 95% of the circumference.	Score = 5
Forest, scrub, native grassland, or open water buffers wider than 100' for more than 1/2 of the wetland circumference, or a forest, scrub, grasslands, or open water buffers for more than 50' around 95% of the circumference.	Score = 3
Forest, scrub, native grassland, or open water buffers wider than 100' for more than 1/4 of the wetland circumference, or a forest, scrub, native grassland, or open water buffers wider than 50' for more than 1/2 of the wetland circumference.	Score = 2
No roads, buildings or paved areas within 100' of the wetland for more than 95% of the wetland circumference.	Score = 2
No roads, buildings or paved areas within 25' of the wetland for more than 95% of the circumference, or No roads buildings or paved areas within 50' of the wetland for more than 1/2 of the wetland circumference.	Score = 1
Paved areas, industrial areas or residential construction (with less than 50' between houses) are less than 25 feet from the wetland for more than 95% of the circumference of the wetland.	Score = 0

4i. Connection to other habitat areas: Select the description which best matches the site being evaluated.	
-Is the wetland connected to, or part of, a riparian corridor at least 100' wide connecting two or more wetlands; or, is there an upland connection present >100' wide with good forest or shrub cover (>25% cover) connecting it with a Significant Habitat Area?	YES = 5
- Is the wetland connected to any other Habitat Area with either 1) a forested/shrub corridor < 100' wide, or 2) a a corridor that is > 100' wide, but has a low vegetative cover less than 6 feet in height?	YES = 3
-Is the wetland connected to, or a part of, a riparian corridor between 50 - 100' wide with scrub/shrub or forest cover connection to other wetlands?	YES = 3
- Is the wetland connected to any other Habitat Area with narrow corridor (<100') of low vegetation (< 6' in height)?	YES = 1
- Is the wetland and its buffer (if the buffer is less than 50' wide) completely isolated by development (urban, residential with a density greater than 2/acre, or industrial)?	YES = 0
Now add the scores circled (for Q.5a - Q.5i above) to get a total. **Is the Total greater than or equal to 22 points?**	**YES = Category II** **NO = Category III**

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APPENDIX WT-3: FUNCTIONAL ASSESSMENT

Functional Assessment for Wetland __

Criteria						
Function	**Group 1**	**1 pt**	**Group 2**	**2 pts**	**Group 3**	**3 pts**
Flood/ Storm Water Control		Size < 5 acres		Size 5 - 10 acres		Size > 10 acres
		Riverine or lakeshore wetland		Mid-sloped wetland		Depressions, headwaters, bogs, Flats
		< 10% forested cover		10 - 30% forested cover		> 30% forested cover
		Unconstrained outlet		Semi-constrained outlet		Culvert/bermed outlet
		Located in lower 1/3 of drainage		Located in middle 1/3 of Drainage		Located in upper 1/3 of drainage
Points (Max 15):						
Base Flow/ Ground Water Support		Size < 5 acres		Size 5 - 10 acres		Size > 10 acres
		Riverine or lakeshore wetland		Mid-sloped wetland		Depressions, headwaters, bogs, Flats
		Located in lower 1/3 of drainage		Located in middle 1/3 of Drainage		Located in upper 1/3 of drainage
		Temporarily flooded or saturated		Seasonally or semi-permanently flooded or saturated		Permanently flooded or saturated, or intermittently Exposed
		No flow-sensitive fish populat ions on-site or downstream		Small populations of flow-sensitive fish on-site or Downstream		Large populations of flow-sensitive fish contiguous with site in highly permeable strata
Points(Max 15):						
Erosion/ Shoreline Protection		Sparse grass/herbs or no veg Along OHWM		Sparse wood or veg along OHWM		Dense wood or veg along OHWM
		Wetland extends < 30 m from OHWM		Wetland extends 30 - 60 m from OHWM		Wetland extends > 200 m from OHWM
		Highly developed shoreline or Subcatchments		Moderately developed shoreline or subcatchment		Undeveloped shoreline or Subcatchment
Points (Max 9):						
Water Quality Improve - Ment		Rapid flow through site		Moderate flow through site		Slow flow through site
		< 50 % veg cover		50 - 80% cover		>80% veg cover
		Upstream in basin from wetland is undeveloped		≤ 50% of basin upstream from wetland is developed		> 50% of basin upstream from wetland is developed
	1	Holds < 25% overland runoff		Holds 35 - 50% overland runoff		Holds > 50% overland runoff
Points (Max 12):						
Natural Biological Support		Size < 5 acres		Size 5 - 10 acres		Size > 10 acres
		Ag land, low veg structure		Two level veg		High veg structure
		Seasonal surface water		Permanent surface water		Open water pools through Summer
		One habitat type PAB POW PEM PSS PFO EST		Two habitat types PAB POW PEM PSS PFO EST		≥ Three habitat types PAB POW PEM PSS PFO EST
		Low plant diversity (< 6 Species)		Moderate plant diversity (7 - 15 species)		High plant diversity (> 15 species)
		> 50% invasive species		10 to 50% invasive species		<10% invasive species
		Low primary productivity		Moderate primary productivity		High primary productivity
		Low organic accumulation		Moderate organic accumulation		High organic accumulation
		Low organic export		Moderate organic export		High organic export
		Few habitat features		Some habitat features		Many habitat features
		Buffers very disturbed		Buffers slightly disturbed		Buffers not disturbed
		Isolated from upland habitats		Partially connected to upland		Well connected to upland
Points (Max 36):						

Criteria						
Function	**Group 1**	**1 pt**	**Group 2**	**2 pts**	**Group 3**	**3 pts**
Overall Habitat Functions		Size < 5 acres		Size 5 - 10 acres		Size > 10 acres
		Low habitat diversity		Moderate habitat diversity		High habitat diversity
		Low sanctuary or refuge		Moderate sanctuary or refuge		High sanctuary or refuge
Points (Max 9):						
Specific Habitat Functions		Low invertebrate habitat		Moderate invertebrate habitat		High invertebrate habitat
		Low amphibian habitat		Moderate amphibian habitat		High amphibian habitat
		Low fish habitat		Moderate fish habitat		High fish habitat
		Low mammal habitat		Moderate mammal habitat		High mammal habitat
		Low bird habitat		Moderate bird habitat		High bird habitat
Points (Max 15):						
Cultural Socio-Economic		Low educational opportunities		Moderate educational Opportunities		High educational opportunities
		Low aesthetic value		Moderate aesthetic value		High aesthetic value
		Lacks commercial fisheries, agriculture, renewable resources		Moderate commercial fisheries, agriculture, renewable resources		High commercial fisheries, agriculture, renewable resources
		Lacks historical or archeological resources		Historical or archeological site		Important historical or archeological site
		Lacks passive and active recreational opportunities		Some passive and active recreational opportunities		Many passive and active recreational opportunities
		Privately owned		Privately owned, some public Access		Unrestricted public access
		Not near open space		Some connection to open space		Directly connected to open space
Points (Max 21):						

N/A = Not Applicable; N/I = No information available

APPENDIX WT-4:
COMMON & TAXONOMIC PLANT NAMES

SPECIES LIST FOR THE ____ PROJECT IDENTIFIED ON (date)

COMMON NAME	SCIENTIFIC NAME	WIS[1]
TREES		
big-leaf maple	Acer macrophyllum	FACU
bitter cherry	Prunus emarginata	FACU*
black cottonwood	Populus balsamifera	FAC
Cascara	Rhamnus purshiana	FAC-
Douglas fir	Pseudotsuga menziesii	FACU*
Engelman spruce	Picea engelmannii	FAC
Gary oak	Quercus garyana	NL
Greene's mountain ash	Sorbus scopulina	FACU
mountain ash	Sorbus aucuparia	NL
one-fruited hawthorn	Crataegus monogyna	ORN
Oregon ash	Fraxinus latifolia	FACW
Pacific crabapple	Malus fusca	FACW
Pacific madrona	Arbutus menzeisii	NL
paper birch	Betula papyrifera	FAC*
quaking aspen	Populus tremula	FAC
red alder	Alnus rubra	FAC
Sitka spruce	Picea sitchensis	FAC
western hemlock	Tsuga heterophylla	FACU-
western red cedar	Thuja plicata	FAC
western white pine	Pinus monticola	FACU
SHRUBS		
beaked hazelnut	*Corylus cornuta*	FACU
black hawthorn	*Crataegus douglassi*	FAC
black raspberry	*Rubus leucodermis*	NL
black twin-berry	*Lonicera involucrata*	FAC+*
bog willow	*Salix pedicellaris*	OBL
cherry laurel	*Prunus laurocerasus*	NL
clustered rose	*Rosa pisocarpa*	FAC
currant	*Ribes* spp.	FAC-FAC+
devil's club	*Oplopanax horridus*	FAC+
Douglas' spiraea	*Spiraea douglasii*	FACW
English holly	*Ilex aquifolium*	NL

COMMON NAME	SCIENTIFIC NAME	WIS[1]
SHRUBS		
English ivy	*Hedera helix*	NL
euonymus	*Euonymus* spp.	NL
evergreen blackberry	*Rubus laciniatus*	FACU
fool's huckleberry	*Menziesia ferruginea*	FACU+
grey-leaf willow	*Salix glauca*	FACW
heart-leaf willow	*Salix rigida*	OBL
Himalayan blackberry	*Rubus discolor*	FACU
honeysuckle	*Lonicera* spp.	FACU-FAC
Hooker's willow	*Salix hookeriana*	FACW-
huckleberry	*Vaccinium* spp.	NL-OBL
Indian plum	*Oemleria cerasiformis*	FACU
Labrador tea	*Ledum groenlandicum*	OBL
long-leaved Oregon grape	*Berberis nervosa*	NL
Nootka rose	*Rosa nutkana*	FAC
ocean spray	*Holodiscus discolor*	NL
one-seed hawthorn	*Crataegus monogyna*	FACU+*
pachistima	*Pachistima myrstinites*	NL
Pacific blackberry	*Rubus vitifolius*	NI
Pacific ninebark	*Physocarpus capitatus*	FACW-
Pacific willow	*Salix lasiandra*	FACW+
Pacific yew	*Taxus brevifolia*	FACU-
red elderberry	*Sambucus racemosa*	FACU
red huckleberry	*Vaccinium parvifolium*	NL
red-osier dogwood	*Cornus stolonifera*	FACW
salal	*Gaultheria shallon*	FACU*
salmonberry	*Rubus spectabilis*	FAC+
Scot's broom	*Cytisus scoparius*	NL
Scouler's willow	*Salix scouleriana*	FAC
Sitka willow	*Salix sitchensis*	FACW
small cranberry	*Vaccinium oxycoccus*	OBL
snowberry	*Symphoricarpos albus*	FACU
sticky currant	*Ribes viscosissimum*	FAC

COMMON NAME	SCIENTIFIC NAME	WIS[1]
SHRUBS		
swamp laurel	*Kalmia occidentalis*	FACW+
tall Oregon grape	*Berberis aquifolium*	NL
thimbleberry	*Rubus parviflorus*	FAC-
vine maple	*Acer circinatum*	FAC-
western snowberry	*Symphoricarpos occidentalis*	NI
white willow	*Salix alba*	FACW
wood rose	*Rosa gymnocarpa*	FACU
HERBS		
alsike clover	*Trifolium hybridum*	FAC
American brooklime	*Veronica americana*	OBL
American great bulrush	*Scirpus validus*	OBL
American three square	*Scirpus americanus*	OBL
American vetch	*Vicia americana*	NI
American waterlily	*Nymphaea odorata*	OBL
annual bluegrass	*Poa annua*	FAC
arrowhead	*Sagittaria latifolia*	OBL
aster	*Aster* spp.	NL-OBL
baltic rush	*Juncus balticus*	FACW+
baneberry	*Actea rubra*	NL
beaked sedge	*Carex rostrata*	OBL
beakrush	*Rhynchospora alba*	OBL
bedstraw	*Galium* spp.	UPL-FACW+
beggar-ticks	*Bidens* spp.	FAC-FACW+
big-head sedge	*Carex macrocephala*	FAC-
birdsfoot-trefoil	*Lotus corniculatus*	FAC
black medic	*Medicago lupulina*	FAC
blue skullcap	*Scutellaria lateriflora*	FACW
bluegrass	*Poa* spp.	NL-FACW
bluejoint reedgrass	*Calamagrostis canadensis*	FACW+
Bolander's spikerush	*Eleocharis bolanderi*	FACW+*
bracken fern	*Pteridium aquilinum*	FACU
brass buttons	*Cotula coronopifolia*	NL
bristle-stalked sedge	*Carex leptalea*	OBL

COMMON NAME	SCIENTIFIC NAME	WIS[1]
HERBS		
buckbean	*Menyanthes trifoliata*	OBL
bull thistle	*Cirsium vulgare*	FACU
bulrush	*Scirpus* spp.	OBL
bur-reed	*Sparganium* spp.	OBL
buttercup	*Ranunculus* spp.	NL-OBL
Canadian bluegrass	*Poa compressa*	FACU+
Canadian goldenrod	*Solidago canadensis*	FACU
Canadian thistle	*Cirsium arvense*	FACU+
catchweed bedstraw	*Galium aparine*	FACU
Chamisso's cotton-grass	*Eriophorum chamissonis*	OBL
chickweed	*Stellaria media*	FACU
cinquefoil	*Potentilla palustris*	OBL
clasping-leaved twisted-stalk	*Streptopus amplexifolius*	FAC-
climbing nightshade	*Solanum dulcamara*	FAC+
colonial bentgrass	*Agrostis tenuis*	FAC
coltsfoot	*Petasites* spp.	FAC-FACW
common cat-tail	*Typha latifolia*	OBL
common groundsel	*Senecio jacobaea*	FACU
common plantain	*Plantago major*	FACU+
common shepards' purse	*Capsella bursa-pastoris*	FACU
common speedwell	*Veronica officinalis*	NL
common spike-rush	*Eleocharis palustris*	OBL
common St. John's wort	*Hypericum perforatum*	NL
common tansy	*Tanacetum vulgare*	NI
common timothy	*Phleum pratense*	FAC-
common velvetgrass	*Holcus lanatus*	FAC
common vetch	*Vicia sativa*	NL
common yarrow	*Achillea millefolium*	FACU
Cooley's hedge-nettle	*Stachys cooleyae*	NL
cow parsnip	*Heracleum lanatum*	FAC+
creeping buttercup	*Ranunculus repens*	FACW
creeping velvetgrass	*Holcus mollis*	FACU*
cress	*Rorippa* spp.	FAC+-OBL

COMMON NAME	SCIENTIFIC NAME	WIS[1]
HERBS		
curly dock	*Rumex crispus*	FAC+
Cusick's sedge	*Carex cusickii*	OBL
daggerleaf rush	*Juncus ensifolius*	FACW
dandelion	*Taraxacum officinale*	FACU
dandelion hawksbeard	*Crepis runcinata*	FACU
deer fern	*Blechnum spicant*	FAC+
Dewey's sedge	*Carex deweyana*	FACU*
dock	*Rumex* spp.	FAC-.OBL
doorweed	*Polygonum aviculare*	FACW-
duckweed	*Lemna minor*	OBL
duckweed fern	*Azolla filiculoides*	OBL
dulichium	*Dulichium arundinaceum*	OBL
dune wildrye	*Elymus mollis*	NL
English ivy	*Hedera helix*	NL
English plantain	*Plantago lanceolata*	FAC
European beachgrass	*Ammophila arenaria*	FACU
false lily-of-the-valley	*Maianthemum dilatatum*	FAC
false-hellebore	*Veratrum viride*	FACW
feather false-Solomon's seal	*Smilacina racemosa*	FAC-
few-flower sedge	*Carex pauciflora*	OBL
field horsetail	*Equisetum arvense*	FAC
field mint	*Mentha arvenis*	FACW-
fireweed	*Epilobium angustifolium*	FACU+
flatsedge	*Cyperus* spp.	FAC-OBL
foamflower	*Tiarella trifoliata*	FAC-
forget-me-not	*Myosotis* spp.	FAC-FACW
fowl bluegrass	*Poa palustris*	FAC
foxglove	*Digitalis purpurea*	FACU*
foxtail timothy	*Crypsis alopecuroides*	OBL*
giant horsetail	*Equisetum telmateia*	FACW
GRASSES, RUSHES, AND SEDGES		
ground ivy	*Glecoma hederaceae*	FACU+
hairy cats-ear	*Hypochaeris radicata*	NL

COMMON NAME	SCIENTIFIC NAME	WIS[1]
GRASSES, RUSHES, AND SEDGES		
hairy woodrush	*Luzula comosa*	FAC*
hardstem bulrush	*Scirpus acutus*	OBL
hare's-foot	*Trifolium arrense*	NL
hooked buttercup	*Ranunculus uncinatus*	FAC-
horsetail	*Equisetum* spp.	FAC-OBL
inch-high rush	*Juncus uncialis*	FACW+
inflated sedge	*Carex vesicaria*	OBL
Italian ryegrass	*Lolium multiflorum*	NL
Japanese knotweed	*Polygonum cuspidatum*	FACU*
Kentucky bluegrass	*Poa pratensis*	FAC
ladies-tresses	*Spiranthes romanzoffiana*	OBL
lady fern	*Athyrium filix-femina*	FAC
lamb's quarter	*Chenopodium album*	FAC
lanceleaf spring-beauty	*Claytonia lanceolata*	FAC-
large-leaf avens	*Geum macrophyllum*	FACW-*
lesser bladderwort	*Utricularia minor*	OBL
lesser cat-tail	*Typha angustifolia*	OBL
licorice fern	*Polypodium glycyrrhiza*	NL
Lyngbye's sedge	*Carex lyngbyei*	OBL
mannagrass	*Glyceria* spp.	FACW+-OBL
marsh cudweed	*Gnaphalium uliginosum*	NL
marsh speedwell	*Veronica scutellata*	OBL
marshpepper smartweed	*Polygonum hydropiper*	OBL
meadow foxtail	*Alopecurus pratensis*	FACW
medic	*Medicago* spp.	NL-FAC
mint	*Mentha* spp.	FAC-OBL
monkey-flower	*Mimulus* spp.	FACU-OBL
montia	*Montia* spp.	FAC-OBL
mountain wood fern	*Dryopteris (dilatata)*	FACW
mustard	*Brassica campestris*	NL
narrow-leaf bur-reed	*Sparganium eurycarpum*	OBL
nodding trisetum	*Trisetum cernuum*	FACU
northern bugleweed	*Lycopus uniflorus*	OBL

COMMON NAME	SCIENTIFIC NAME	WIS[1]
GRASSES, RUSHES, AND SEDGES		
northern clustered sedge	*Carex arcta*	OBL
northern maiden hair fern	*Adiantum pedantum*	FAC
northern mannagrass	*Glyceria borealis*	OBL
northern starflower	*Trientalis arctica*	OBL
one-sided sedge	*Carex unilateralis*	FACW
orchard-grass	*Dactylis glomerata*	FACU
Oregon bentgrass	*Agrostis oregonensis*	FAC
ovoid spike-rush	*Eleocharis ovata*	OBL
oxeye-daisy	*Chrysanthemum leucanthemum*	NL
Pacific bedstraw	*Galium cymosum*	FACW
Pacific bleedingheart	*Dicentra formosa*	FACU*
Pacific silverweed	*Potentilla anserina*	OBL
pathfinder	*Adenocaulon bicolor*	NL
pearly everlasting	*Anaphalis margaritacea*	NL
perennial ryegrass	*Lolium perenne*	FACU
pig-a-back-plant	*Tolmiea menziesii*	FAC*
pineapple weed	*Matricaria matricarioides*	FACU
pointed rush	*Juncus oxymeris*	FACW+
pondweed	*Potamogeton* spp.	OBL
prickly sedge	*Carex stipata*	NL
Puget Sound gumweed	*Grindelia integrifolia*	FACW
purple loosestrife	*Lythrum salicaria*	FACW+
Pyrenean sedge	*Carex pyrenaica*	FAC
quackgrass	*Agropyron repens*	FAC-
red clover	*Trifolium pratense*	FACU
red dead-nettle	*Lamium purpureum*	NL
red fescue	Festuca rubra	FAC+
red sandspurry	*Spergularia rubra*	FAC-
redtop	*Agrostis alba*	FAC*
reed canarygrass	*Phalaris arundinacea*	FACW

COMMON NAME	SCIENTIFIC NAME	WIS[1]
GRASSES, RUSHES, AND SEDGES		
reed mannagrass	*Glyeria grandis*	NL
reedgrass	*Phragmites communis*	NL
Richardson's crane's bill	*Geranium richardsonii*	FACU+
ripgut	*Bromus rigidus*	NL
rosy twisted-stalk	*Streptopus roseus*	NI
rough hair- grass	*Agrostis scabra*	FAC
rush	*Juncus* spp.	FAC-OBL
salt rush	*Juncus lesueurii*	FACW
saltmeadow rush	*Juncus gerardii*	FACW+
scouring horsetail	*Equisetum hyemale*	FACW
seacoast bulrush	*Scirpus maritimus*	OBL
sedge	*Carex* spp.	FAC-OBL
sedge, water	*Carex aquatilis*	OBL
sheep sorrel	*Rumex acetosella*	FACU+
short-awn foxtail	*Alopecurus aequalis*	OBL
Siberian spring beauty	*Claytonia sibirica*	FAC
simplestem bur-reed	*Sparganium emersum*	OBL
Sitka sedge	*Carex sitchensis*	OBL
skunk cabbage	*Lysichitum americanum*	OBL
slender beak sedge	*Carex athrostachya*	FACW
slender rush	*Juncus tenuis*	FACW-
slough sedge	*Carex obnupta*	OBL
small bedstraw	*Galium trifidium*	FACW+
small flower forget-me-not	*Myosotis laxa*	OBL
small- fruited bulrush	*Scirpus microcarpus*	OBL
smartweed	*Polygonum* spp.	FACU-OBL
smooth brome	*Bromus inermis*	NL
smooth cats-ear	*Hypochaeris glabra*	NL
smooth saltmarsh cordgrass	*Spartina alterniflora*	OBL
smooth stem sedge	*Carex laeviculmis*	FACW
soft chess	*Bromus mollis*	NL
soft rush	*Juncus effusus*	FACW
Solomon-plume	*Senecio vulgaris*	FACU

COMMON NAME	SCIENTIFIC NAME	WIS[1]
GRASSES, RUSHES, AND SEDGES		
spatterdock	*Nuphar polysepalum*	OBL
speedwell	*Veronica* spp.	NL-OBL
sphagnum moss	*Sphagnum* spp.	NL
spike-rush	*Eleocharis* spp.	FACW-OBL
spikeweed	*Hemizonia pungens*	NL
spotted touch-me-not	*Impatiens capensis*	FACW
spreading bentgrass	*Agrostis stolonifera*	FAC+
spreading rush	*Juncus supiniformis*	OBL
starry Solomon's seal	*Smilacina stellata*	FAC-
stinging nettle	*Urtica dioica*	FAC+
strawberry	*Fragaria virginiana*	NL
sweet coltsfoot	*Petasites frigidus*	FACW-
sweet vernalgrass	*Anthoxanthum odoratum*	FACU
sweetgrass	*Hierchloe odorata*	FACW
switchgrass	*Panicum virgatum*	FACW
sword fern	*Polystichum munitum*	FACU
tall fescue	*Festuca arundinacea*	FAC-
tall mannagrass	*Glyceria elata*	FACW+
taper-tip rush	*Juncus acuminatus*	OBL
thistle	*Cirsium* spp.	FACU-OBL
toad rush	*Juncus bufonius*	FACW
true forget-me-not	*Myosotis scorpioidies*	FACW
tumicolous sedge	*Carex tumulicola*	NL
umbellate starwort	*Stellaria umbellata*	FACW*
vetch	*Vicia* spp.	NI-NL
violet	*Viola* spp.	FACU-OBL
water cress	*Rorippa nastursium-aquatica*	NL
water foxtail	*Alopecurus geniculatus*	OBL
water parsley	*Oenanthe sarmentosaa*	OBL
water parsnip	*Sium suave*	OBL
water plantain	*Alisma plantago-aquatica*	OBL
water smartweed	*Polygonum amphibium*	OBL

COMMON NAME	SCIENTIFIC NAME	WIS[1]
GRASSES, RUSHES, AND SEDGES		
water starwort	*Callitriche* spp.	OBL
water-purslane	*Ludwigia palustris*	OBL
Watson's willow-weed	*Epilobium watsonii*	FACW-
weak alakligrass	*Puccinellia pauciflora*	OBL
western meadow-rue	*Thalictrum occidentale*	FACU*
western St. John's wort	*Hypericum formosum*	FAC-
western starflower	*Trientalis latifolia*	FAC-
western touch-me-not	*Impatiens noli-tangere*	FACW
western twinflower	*Linnaea borealis*	FACU-
western water-hemlock	*Cicuta douglaslii*	OBL
wheatgrass	*Agropyron* spp.	FACU-FAC
white clover	*Trifolium repens*	FAC*
white trillium	*Trillium ovatum*	FACU*
woodrush	*Luzula* spp.	NL-FACW
wool grass	*Scirpus cyperinus*	OBL
woolly-fruit sedge	*Carex lasiocarpa*	OBL
yellow flag	*Iris pseudacorus*	OBL
yellow monkey-flower	*Mimulus guttatus*	OBL
yellow parentucellia	*Parentucellia viscosa*	FAC-

[1] WIS (Wetland Indicator Status)

OBL	(Obligate): species that almost always occur wetlands under natural conditions (est. probability >99%).
FACW	(Facultative wetland): species that usually occur in wetlands (est. probability 67 to 99%), but are occasionally found in non-wetlands.
FAC	(Facultative): Species that are equally likely to occur in wetlands or non-wetlands (est. probability 34 to 66%).
FACU	(Facultative upland): species that usually occur in non-wetlands (est. probability 67 to 99%), but are occasionally found in wetlands.
UPL	(Upland): species that almost always occur in non-wetlands under normal conditions (est. probability >99%).
NL	(Not listed): species that are not listed and are presumed to be upland species.
+	indicates a species that is more frequently found in wetlands
-	indicates a species that is less frequently found in wetlands
*	identifies a tentative assignment based upon either limited information or conflicting reviews

APPENDIX WT-5: TABLES 3 AND 4 OF THE WASHINGTON STATE WELTANDS RATING SYSTEM

Table 3 List of invasive/exotic plant species for question 2a.1 (peat wetlands), Question 2b.3, (mature forested wetlands), and Question 3.2 (Category IV wetlands)

Scientific Name	Common Name
Agropyron repens	Quackgrass
Alopecurus pratensis, A. aequalis	Meadow Foxtail
Arcticum minus	Burdock
Brumus tectorum, B. rigidus, B. brizaeformis, B. secalinus, B. japonicus, B. mollis, B. commutatus, B. inermis, B. erectus	Bromes
Cenchrus longispinus	Sandbur
Centaurea solstitialis, C. repens, C. cyanus, C. maculosa, C. diffusa	Knapweeds
Cirsium vulgare, C. arvense	Thistles
Cynosursus cristasus, C. echinatus	Dogtail
Cytisus scoparius	Scot's Broom
Dactylis glomerata	Orchardgrass
Dipsacus sylvestris	Teasel
Digitaria sanguinalis	Crabgrass
Echinochloa crusgalli	Barnyard Grass
Elaeagnus augustifolia	Russian Olive
Euphorbia peplus, E. esula	Spurge
Festuca arundinacea, F. pratensis	Fescue
Holcus lanatus, H. mollis	Velvet Grass
Hordeum jubatum	Foxtail Barley
Hypericum perforatum	St. John's Wort
Iris pseudocorus	Yellow Iris
Lolium perenne, L. multiflorum, L. temulentum	Ryegrass
Lotus corniculatus	Birdsfoot Trefoil
Lythrum salicaria	Purple Loosestrife
Matricaria matricarioides	Pineapple Weed
Medicago sativa	Alfalfa
Melilotus alba, M. officinalis	Sweet Clover
Phalris arundinacae	Reed Canarygrass
Phleum pratense	Timothy
Phragmites australis	Reed
Poa compressa, P. palustris, P. pratensis	Bluegrass
Polygonium aviculare, P. convolutus, P. cuspidatum, P. lapathifolium, P. persicaria	Knotweeds
Ranunculus repens	Creeping Buttercup
Rubus discolor, R. laciniatus, R. vestitus, R. macrophyllus	Non-native Blackberries
Salsola kali	Russian Thistle
Setaria viridis	Green Bristlegrass
Sisymbrium altissimum, S. loeselii, S. officinale	Tumblemustards
Tanacetum vulgare	Tansy
Trifolium dubium, T. pratense, T. repens, T. arvense T. subterraneum, T. hybridium	Clovers
Cultivated species:	Wheat, Corn, Barley, Rye, etc.

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Table 4. List of native species for rating Category IV wetlands

Scientific Name	Common Name
Juncus effusus	Soft Rush
Spirea douglasii	Hard Hack, Buck Brush
Typha latifolia	Cattail

Question 4. Significant habitat value:

4a. Total Wetland Acreage:
Use aerial photographs or NWI maps to measure and/or visually estimate acreage. Cite the source used. Unless you have considerable experience, visual estimation of acreage is unreliable. Use the guidance in Appendix 5 when the wetland is contiguous with large areas of open fresh water and/or streams.

Using areal measurements:
Areal measurements are those made as if the site were being viewed from the air. They are best made from recent air-photographs, if available, or derived from maps drawn from on the ground measurement. The latter method is time consuming and, unless the measurements are extensive, not as accurate. On the ground visual estimates can also be made. However, unless the rater has considerable experience these estimates are likely to be inaccurate.

The term "areal cover": means the % of the ground surface covered by vegetation. The % cover of plant species within a specific class is used to decide what classes are present in the wetland. Figure 3 gives a graphic example of a wetland with different classes and how the % cover might be distributed.

4b. Wetland Vegetation Classes:
Vegetation in wetlands is generally distinguished by its life form. Characteristics such as "herbaceous", "scrub-shrub", and "forest" are easy to distinguish and do not require extensive biological knowledge to determine.

To answer question 4b you will need to identify the classes of vegetation that are found in the wetland. This will involve walking through the wetland and developing a rough sketch of the distribution of plant life-forms on a map. From this it will then be possible to estimate the area covered by each vegetation class.

Deciding on Classes present in the wetland:
The following criteria are used in the rating system to determine whether or not wetland classes are present at all, and if wetland classes are present, whether there is enough area of a wetland class to score points. For example, the presence of a few trees scattered in a wetland is not enough for the wetland to qualify as having a forested wetland class or to score points.

First decide which classes of vegetation are present using the definitions listed below. Identify all areas that you would consider to be forested, scrub-shrub, emergent, open water, or aquatic bed and sketch them on a map of the site. Within these areas then estimate whether the plants that fall into that class cover at least 30% of the ground. Finally estimate whether the class covers at least 1/4 acre of the wetland (see Figure 3). A wetland class qualifies for points in the rating system only if it is larger than 1/4 acre. If the entire wetland is smaller than 1/4 acre, or if there are several vegetation classes present but none is greater than 1/4 acre SCORE a ZERO for this question.