Magnuson Park Wetland Delineation Report

Prepared for:

City of Seattle
Department of Parks & Recreation

Prepared by:

Sheldon & Associates, Inc

August 16, 2005

Wetland Delineation Report for Magnuson Park
Seattle, Washington

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1.0 INTRODUCTION

A wetland delineation has been conducted on a portion of Magnuson Park in Seattle, Washington. The City of Seattle Department of Parks and Recreation prepared a Master Plan for the future development of Magnuson Park in 2001 (Seattle Parks and Recreation 2001). Part of the Master Plan involves creating athletic fields and associated infrastructure such as parking lots and stormwater treatment facilities, and preserving and enhancing wetland and upland habitats. The purpose of this wetland delineation report is to present the findings of the wetland delineation conducted in spring of 2005 within a portion of Magnuson Park. This information will be used to inform the final design and configuration of proposed actions within Magnuson Park.

Wetlands were identified using the *Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987) and the *Washington State Wetlands Identification and Delineation Manual* (Washington Department of Ecology 1997). Methods used to identify wetlands include the Routine Determination, a modified Comprehensive Determination, and a statistical approach method. A total of approximately 29.84 acres of wetlands were identified within the area examined in Magnuson Park. There are 25 wetlands identified using the Comprehensive Determination Method; these 25 include within them 10 wetlands delineated using the Routine Determination Method. Also, three ditches were delineated using the Routine Method, and a small amount of acreage was identified as wetland using the Statistical Approach method as described later in this document.

The majority of the wetlands identified would be Category 3 using the Western Washington Rating System of Ecology (2004) which is used by both the City of Seattle, Ecology, and the Corps of Engineers to rate wetlands for regulatory purposes.

1.1 Project Location

Magnuson Park is located in the City of Seattle, King County, Washington (Figure 1). It is located in the northeast corner of Seattle on a peninsula surrounded by Lake Washington (Figure 2). The Park lies in Section 2, Range 4 East, and Township 25 North. Magnuson Park is bordered on the west by Sandpoint Way NE, along the south roughly by NE 65th Street (a portion of the Park lies south of NE 65th if it was extended to the lake shore), on the east side by Lake Washington, and to the north by the National Oceanic and Atmospheric Administration (NOAA) facilities.

The portion of Magnuson Park that was examined for wetlands, herein referred to as the Project Area, is based on the 2001 Master Plan descriptions for future development. The Project Area includes the majority of the ‘interior’ portion of Magnuson Park, east of the historic officers housing, north of 65th Street, south of the Jr. League playground and Sports Meadow, and east to the Lake Washington shoreline. Other areas within the Park have been identified as wetland through various regulatory processes and for a variety of permitting actions by Seattle Department of Parks and Recreation. Because of the size of Magnuson Park, and the lack of a single complete Master Plan that addresses the whole Park as one entity, there have been several permit applications for actions in the Park that involve aquatic resources. These projects have been separate and complete actions with distinct funding sources, they are not mutually dependent, and they have been initiated over a span of many years therefore they have not been assimilated or analyzed as a “single and complete” project by regulatory agencies.

For the current Master Plan, the vegetated portion of the Project Area that was examined for wetlands covers approximately 95 acres. This area was divided into thirteen polygons to facilitate collecting and collating data. The polygons were designated A through H and J through N (there was no I). They were delimited based on readily identifiable physical features such as roads and paths, existing land uses, distinct changes in plant community types, and/or topography. Figure 3 illustrates these 13 polygon areas, as well as the general direction of surface water flow in ditches and sheet flow based on topographic gradients across the Project Area. Table 1 describes the size and location of each of the 13 polygon areas.

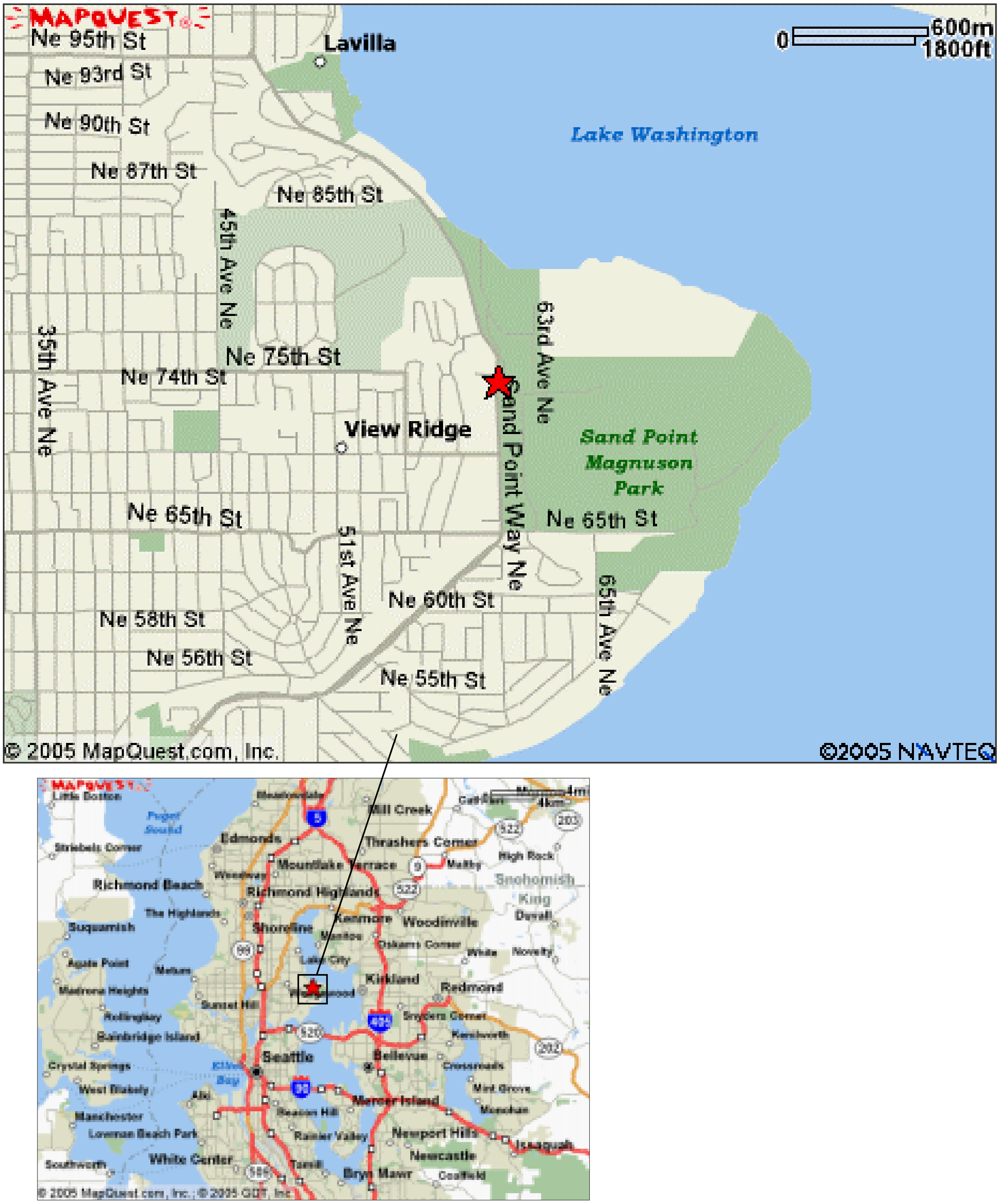

Figure 1. Vicinity Map of Magnuson Park in Seattle, Washington.

Overview aerial photo of Magnuson Park

Figure 2. Aerial Photograph of Magnuson Park Project Area.

Aerial photo showing 13 polygon areas but not transect/plot locations.

Figure 3. Polygon Areas and Generalized Flow Patterns Within Magnuson Park Project Area.

Table 1. Polygon Areas Within the Magnuson Park Project Area

Polygon Area	Area (ft^2)	Area (acre)	Location
A	71,167	1.63	Toe of slope, NW of the intersection of Sportsfield Drive and NE 65th Street; west of Sportsfield Drive
B	294,966	6.77	Area NE of the intersection of Sportsfield Drive and NE 65th Street; S of grass playfields, W of Commissary
C	45,882	1.05	Triangular area between playfields and Commissary
D	64,451	1.48	Forested area N of playfields, S of Jr. League playground
E	773,509	17.76	E of grass playfields, S of Sports Meadow, west of parking lot for tennis courts
F	35,575	0.82	SE of Sports Meadow, W of restrooms, NE of tennis parking
G	38,386	0.88	Triangular area north of parking lot for tennis court
H	120,663	2.77	Lawn area surrounding tennis courts
J	163,112	3.74	NE of bunkers, SW of Kite Hill woodland and parking lot
K	729,732	16.75	E of drive to tennis parking, NW of Beach Drive, S of bunkers
L	358,495	8.23	N of boat launch, east of Beach Drive to waters' edge
M	855,386	19.64	NE of Commissary, south of tennis parking, west of drive to tennis parking lot
N	592,332	13.60	Grass playfields E of Sportsfield Drive, SW of Jr. League playground
Total	**4,143,656**	**95.13**	

2.0 METHODS

2.1 Review of Existing Information

Several existing documents were reviewed to gain specific background information on the Magnuson Park site. These included: historic and current aerial photographs and maps of the site; the *Sand Point Peninsula History* (Seattle Parks and Recreation 2003); *Sand Point Magnuson Park Master Plan EIS* (Seattle Parks and Recreation 2001); the *Sand Point Magnuson Park Vegetation Management Plan* (Sheldon & Associates 2001); and *Seattle Urban Nature Project* (2000) habitat maps. Given the urban setting of Magnuson Park, other standard sources of wetland information typically used, such as the U.S.G.S. topographic maps, soil survey for King County, and the National Wetland Inventory maps were not relevant (in 2005 the City contracted with U.S. Fish and Wildlife Service to re-assess wetlands within the City limits: the results of the delineation work in this report has been made available to the staff of U.S.F.W.S at the request of City of Seattle Department of Planning and Development staff).

The lands within Magnuson Park have gone through tremendous change over the last 85+ years. In addition to the lowering of Lake Washington by 10 feet with the construction of the Hiram Chittenden Locks in 1916, the entire peninsula was completely graded and filled to create a Naval Air Station in the 1930's. There is photo-documentation of a large peat-based wetland on the site (Mud Lake) being filled, as well as the removal of the original Sand Point Head, a small bluff in the vicinity of the current Kite Hill. The Naval Air Station operated as a military airport for approximately 40 years until it was decommissioned in the 1970's. The lands reverted to the City of Seattle and the University of Washington. The vegetation in the 'natural areas' of the Park has recovered since the removal of the airstrip, meaning that the majority of the communities within the interior portions of the site are approximately 30-35 years old (see Figure A-1 in Appendix A for an aerial photograph of the Naval Air Station in 1958).

Decommissioning of the Naval Air Station resulted in the deconstruction of nearly all the landing strips, taxiways, and internal road system of the airport. Deconstruction methods varied, they included demolishing the concrete and asphalt landing strips and leaving the rubble in place, complete removal of the asphalt/concrete in some locations, piling rubble and covering it with earth to create Kite Hill, and leaving portions of the runways/road system intact for current use (e.g., the parking lot for the tennis courts). Throughout the recovering portions of the site there are still remnant air-station infrastructure present (e.g., underground concrete vaults and electrical lines that served the runways, runway lighting concrete pads, and buried conduit and drainage systems). Earthwork to create the runways and then to deconstruct them after decommissioning has left the soils on this site severely impacted. As will be noted below, soil data pits had to be excavated across the site by use of a motorized soil auger because of the severe compaction.

Final stages of demolition of the runways included excavation of shallow ditches across the site to attempt to facilitate drainage of surface waters towards the lake (due to the extremely flat conditions resulting from the construction of the airport). In the mid-1970's, when the City first acquired the site, the Sports Meadow fields were constructed north of the Project Area. The fields were designed and constructed with a buried stormwater collection system to drain the fields of precipitation, and direct the collected water into two created ditches located west and east of the Sports Meadow (see Figure 3).

The highly disturbed nature of the site necessitated a collaborative effort with agency staff at the U.S. Army Corps of Engineers (COE), Washington Department of Ecology (Ecology), and City of Seattle in developing the wetland delineation methods. Sheldon & Associates (S&A) collaborated with these agencies through a combination of site visits and written correspondence (Sheldon & Associates 2005) to reach a consensus on the methods that would be used to delineate wetlands, which are described below.

2.2 Wetland Delineation Methods

Our original approach to identifying wetlands in the Project Area was presented to the regulatory agencies in a letter dated January 14, 2005 (Sheldon & Associates 2005). We proposed to delineate topographically discrete wetlands using the *Routine Determination* method (Environmental Laboratory 1987) and to create a surveyed grid of data plots and use a statistical approach to estimate the acreage of remaining wetland area (outside of delineated wetlands). We proposed delineating and surveying the topographically distinct wetlands to be certain that these areas were not overlooked by using a statistical approach, and to assure the various citizen groups involved with the Park that the named and/or clearly topographically distinct areas were included and assessed.

As agreed to with the regulatory agencies, we conducted roughly two weeks of field identification on the site before asking agency staff to conduct a field check of our results. S&A staff delineated and flagged most of the topographically discrete wetlands and had collected representative plot data for the agency field check on March 14, 2005. During the field check the agency staff determined that we should modify the wetland identification method. They requested that we use the information generated from the surveyed grid of data plots coupled with best professional judgment to approximate the boundaries of wetlands using a modified *Comprehensive Determination* method (Environmental Laboratory 1987), rather than rely so heavily on a statistical approach for estimating wetland acreage.

Thus, in our initial results we had identified topographically discrete wetlands that were delineated using the Routine Determination method. However, each of these initially delineated wetlands is located within a larger estimated wetland that was identified using the modified Comprehensive Determination method. Therefore, in the Results Section of this report we describe, rate, and classify the identified Estimated wetlands, we do not describe, classify, or rate the delineated wetlands as distinct wetlands. Each delineated wetland is included as a component within a larger estimated wetland mosaic. We have mapped the locations of the delineated wetlands on Figure 7 to reflect the original field work, but thereafter in the text and figures those wetlands are absorbed into the classification, rating, and functional assessments of the estimated wetlands found on the site.

The majority of the vegetated portion of the Project Area is characterized by flat to hummocky ground with little topographic relief across the entire site. Shallow ditches are present, as are tire ruts and hummocks caused by vegetation growing patterns. In some areas where no airfields were historically present, the soil profiles are less compacted and they approach what might be considered ‘normal’ conditions because they have not been graded since the 1930’s. For much of the Project Area the soil conditions are affected by the past filling, grading, paving, and deconstruction activities associated with the airfields. The flat hummocky topography and compacted soils strongly influences hydrologic patterns on the site. Compaction results in long-term inundation on the site, though not always long-term saturation into the soil. Hydroperiods are driven by precipitation that sits on the surface in shallow depressions or moves as sheet flow; it is not driven by typical shallow groundwater moving laterally or ‘rising’ from below. It was not unusual during field work to find shallow water standing on the surface and bone-dry soils inches below the surface due to severe soil compaction.

Vegetation across the site is highly variable, with broad expanses of non-native grasses, dense thickets of invasive species (e.g. Himalayan blackberry and English hawthorn), stands of native trees and shrubs (e.g. willows, hardhack, and black cottonwood), and clumps of herbaceous plants randomly intermingled. Soil conditions seem to have little influence on plant species presence/absence except in those areas with clearly long-term inundation. Soil characteristics are strongly hydric in most settings, while the vegetation patterns are often a complex mosaic of wet-tolerant to upland species in close proximity.

As noted, the discrete depressional areas with characteristic wetland vegetation, hydric soil, and physical evidence of long-term ponding (e.g., bare ground, algae mats, cracked surface soils, etc.) were delineated and surveyed, as described below in Section 2.2.1, using the Routine Determination method. These areas are scattered throughout the site and include named wetlands (e.g., Frog Pond), ditches, closed depressions with relatively long-term inundation, and sedge stands (e.g., at the base of Kite Hill).

Due to the historic disturbances to the soils, the current mosaic of vegetation growth patterns, and the standing surface water conditions caused by compaction, a modified Comprehensive Determination method was used to estimate wetland boundaries in the entire Project Area. The areas of estimated wetland were mapped based on clusters of data plots determined to be wetland and on visual characteristics (i.e., vegetation and inundation), as described below in the Comprehensive Determination method in Section 2.2.2.

The Project Area was divided into 13 polygons. Most polygons were sampled by a surveyed grid of data plots, and each data plot was determined to be wetland or upland. Within each polygon all areas within the polygon that were not identified as either a delineated wetland or an estimated wetland, were analyzed for how many wetland plots were present. From the plot data, a percent presence of wetland was then calculated for the remaining portions of the polygon, as described below in the *Statistical Approach Method* in Section 2.2.3. For the calculation of percent acreage of wetland in each polygon outside an estimated or delineated wetland, the number of data plots determined to be wetland is divided by the total number of data plots sampled within the remaining area to come up an estimated percent acreage/polygon. This percentage of wetland data plots was multiplied by the acreage of the remaining area in each polygon to determine how much additional wetland area was present. This method was used, in addition to the acreages identified through the Comprehensive Method, to assure that a conservative (i.e., a maximum) estimate of wetland acreage was utilized for the Project analysis.

2.2.1 Routine Determination Method

For discrete wetlands within Polygons E, F, L, and M, the Routine Determination method described in the *Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987) and the *Washington State Wetlands Identification and Delineation Manual* (Washington Department of Ecology 1997) was used originally to determine wetland edges. The Routine Determination method relies on the presence of three parameters (vegetation, soils, and hydrology) to determine if wetland conditions exist.

Hydrophytic vegetation consists of those plant species that readily grow in water, or soil or other substrate that at least periodically lacks oxygen in the root zone due to saturation or inundation. The hydrophytic vegetation criterion is met when more than 50 percent of the dominant species are hydrophytic, based on the wetland plant species indicator status from the Region 9 section of the *National List of Plant Species Occurring in Wetlands* (Reed 1988). The plant list separates vascular plants into five basic groups by their wetland indicator status, which is based on that species estimated frequency of occurrence in a wetland. Plant species were identified using plant identification guides by Hitchcock and Cronquist (1973), Cooke (1997), and Pojar and MacKinnon (1994).

A hydric soil is one that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part. Prolonged anaerobic conditions result in a chemically reducing environment wherein some soil components such as iron and manganese become reduced. Reduction of these minerals results in field indicators in the soil such as mottling and gleying (Kollmorgen 1994). Mottles are spots or blotches of contrasting color occurring within the soil matrix. Gleyed soils are predominantly blue gray in color.

Indicators of wetland hydrology include visual observation of inundation or saturation, watermarks, drift lines, sediment deposits, and drainage patterns. Guidelines for duration of inundation and/or soil saturation are based on the number of consecutive days with temperatures above biologic zero (40^{o} F), which corresponds to the growing season. Inundation or saturation to the surface for at least 12.5 percent of the growing season is the general guideline used to clearly establish wetland hydrology, although areas with shorter periods of surface saturation may also qualify as wetlands. Based on the typical growing season for the Puget Sound area (about 195 days), the project area should have about 24 days of continuous hydrology during the growing season of an average rainfall year to definitively establish wetland hydrology.

These discrete wetland areas were delineated, flagged with sequentially numbered flagging, and surveyed by Seattle Parks and Recreation Department survey crews. Discrete wetlands were identified for those wetlands with names (e.g., Frog Pond), those with distinct topographic edges (e.g., excavated drainage ditches), or those with obvious evidence of long-term inundation (e.g., algae mats, cracked soil surfaces, and/or areas of standing water without vegetation at the time of the field work). These wetlands were delineated at the beginning of the field work when it was assumed that the statistical approach methodology would be used on the majority of the Project Area. We wanted to be certain that all topographically discrete wetlands were identified and assessed so that they would not be 'overlooked' by using a statistical approach. With the change in methodology agreed to with the regulatory agency staff, the delineated wetlands ended up being incorporated into the larger estimated wetlands identified using the modified Comprehensive Method described below.

In addition, two wetlands located mostly north of the current Project Area were delineated and confirmed by the COE in 2003 during the Phase I Sports Fields development in the Park (Sheldon & Associates 2003). Portions of these two wetlands lie within Polygons E and F. They are engineered and constructed ditches (built in 1972) used to convey surface water from the sub-drainage system of the Sports Meadows. The COE took regulatory authority over these features in 2003, and a portion of them fall within the current Project Area.

2.2.2 Comprehensive Determination Method

The Project Area (except for Polygons J, L, and N) was assessed for wetlands based on a modified version of the Comprehensive Determination method as described in the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987).

Within each polygon, a baseline was located parallel to the long axis of the area along a readily identifiable landmark such as a paved road or permanent trail (Figure 4). Transects were established at roughly perpendicular angles to each baseline using cardinal directions (north/south and east/west lines) and were spaced 75-200 feet apart depending on the polygon size and shape. The beginning of each transect along a baseline was identified by spray-painting a mark on paved roads or walkways. Transects were surveyed in by City survey crews. Figure 4 illustrates the location of the baselines and transects within each polygon. Table 2 describes the baseline lengths, number of transects per polygon, and distance between transects per polygon.

The transects in different polygon areas were spaced at varying distances. In polygon areas that are proposed to be significantly altered for non-habitat uses, transects were placed at closer intervals to assure a finer resolution of wetland/upland locations. In portions of the Project Area that are proposed to remain habitat in future conditions, the transect spacing was at greater intervals.

In Polygons J and L, data plots were positioned in representative plant communities instead of using transects. For J this was because of the large wetland complex that encompasses most of the western 'half' of the Polygon; for L this was because the area was clearly all upland and plots were intended to represent small variations in topography and/or vegetation characteristics. In Polygon N, a single transect was established because it was clear the area was upland (it's the outfield of baseball fields) and data was collected to simply confirm this assumption and to minimize damage to active sports fields.

For all other Polygons, the data plots along each surveyed transect were located with hand-held tape measures and spaced at either 50 or 100 feet, based on the type of plant community present and level of information needed. Data plots were generally spaced at 50-foot intervals along transects. In areas of forested canopy with greater than 30 percent aerial cover by trees, data plots were spaced at 100 feet. Data plots were also spaced at 100-foot intervals along transects in Areas H and K where no fields development is proposed. Table 3 identifies the number of data plots sampled along each transect within each polygon. A total of 473 data plots were sampled in all 13 Polygons.

When a data plot landed within a delineated wetland area that was previously identified using the Routine Determination method, no data was collected (data was collected for the delineated wetlands at the time they were delineated). When intersecting transects created over-lapping data plots, data was only gathered for one of the plots. Generally, the first data plot along a transect was located 50 feet from the edge of pavement as measured from the baseline. However, along approximately 10 percent of the transects, the first data plot was located at either 10 or 25 feet from the edge of pavement in order to collect representative data of roadside shoulders. Each data plot was uniquely numbered and pin flags were used to locate the plots.

At each data plot, the three parameters were assessed to determine if wetland conditions exist (Environmental Laboratory 1987). This involved digging a soil pit at each data plot by either using an auger mounted to a machine or a shovel. Hydric soil was examined in each soil pit excavated at least 16 inches deep and 6 inches wide. Hydrologic indicators were assessed at each data plot by examining the depth of standing water in the soil pit or other signs of hydrology. Pits were allowed to stand open for at least 15 minutes before hydrology data was collected, to assure that clayey soil profiles had sufficient time to equilibrate with groundwater conditions. Care was taken to note if the soils below the surface were dry at the time of excavation and whether moisture/water in the hole was caused by surface waters flowing into the open excavation rather than by groundwater moving into the excavation laterally or from upwelling.

Vegetation was assessed at each data plot. The size of vegetation data plots was determined by the dominant strata layer: a 30-foot radius plot for trees, a 10-foot radius for saplings/shrubs/vines, and herbaceous species within a 3.3-foot square. Results were plotted on an electronic base map, and 'clusters' of wetland plots were assimilated to identify estimated wetland areas (Environmental Laboratory 1987) as described in Section 3 of this report. S&A used the data plot base maps to ground truth each estimated wetland within each polygon area. As recommended by COE staff, the ground-truthing relied on vegetation patterns and signs of hydrology to extrapolate the estimated wetland boundary in areas between data plots.

Map of transects and plots but without aerial photo in background

Figure 4. Transect and Data Plot Locations in Magnuson Park Project Area.

Table 2. Transect locations for wetland delineation in Magnuson Park Project Area.

Polygon	Baseline Length (ft.)	No. of Transects	Distance Between Transects (ft.)
A	550	4	125
B	870	7	160
C	450	4	125
D	225	2	75
E	1,200	12	175
G	175	3	100
H	510	2	175
K	1,200	6	200
M	1,475	13	175
N	1,175	1	NA
	Total	**54**	

Table 3. Number of data plots sampled along transects in Magnuson Park Project Area.

Transect No.	Polygon Area										Total
	A	**B**	**C**	**D**	**E**	**G**	**H**	**K**	**M**	**N**	
1	4	8	5	7	5	3	3	7	14	3	
2	3	8	2	3	18	2	2	8	18		
3	2	9	2		20	1		7	19		
4	1	9	2		17			6	21		
5		1			13			6	6		
6		16			9			3	3		
7		12			4				4		
8					18				5		
9					17				29		
10					20				15		
11					11				13		
12					8				12		
13									9		
Total	**10**	**63**	**11**	**10**	**160**	**6**	**5**	**37**	**168**	**3**	**473**

Procedures in the Comprehensive Determination method that were modified for this study include:

1. Spacing of transects along a baseline was not selected using a random number generator (step 7). Instead a regular spacing of transects along a baseline was selected that produced a random sampling pattern.
2. The number of data plots along a transect was not selected based on the transect length (step 8). Instead a spacing of either 50 or 100 feet was used regardless of transect length.
3. Determining the wetland boundary between data plots that are different (wetland versus upland) along a transect generally requires collecting additional data points between plots until the boundary is determined (step 18). Based on conversations with regulatory staff, concurrence was reached that it would be sound in this highly disturbed setting to use the results of the data plots and best professional judgment to determine the wetland boundary fine tuning the line between plots based on vegetation and evidence of hydrology.

2.2.3 Statistical Approach Method

The remaining area within each polygon that was not included within a delineated wetland or an estimated wetland was assessed for wetlands using a statistical approach. The rationale for this approach was to assure that we conservatively estimated the acreage of wetlands within the Project Area. Concurrence was reached that estimating the extent of wetland using the Comprehensive Method would 'capture' most of the wetlands in the Project Area. However, in an effort to make sure that small non-discrete area of wetland was included in the acreage estimate, it was proposed and agreed that a statistical approach would be used in all portions of polygons that were not included within an estimated or delineated wetland. For each polygon, the acreages of delineated and estimated wetland were subtracted from the total polygon area (based on size take-offs from the electronic base maps) to identify the acreage of remaining area. If there were no wetland plots in the remaining area of the polygon, no additional wetland acreage was identified for that polygon. If the polygon had one or more wetland plots (not located within a delineated or estimated wetland boundary), the number of wetland plots was divided by the total plots within the remaining area to determine what percent of the plots in the remaining area were wetland. That percent figure was then multiplied by the acreage of the remaining area to establish statistically what percent of the remaining polygon area should be 'tallied' as wetland. This wetland acreage estimate is labeled as the Statistical acreage for each polygon where it occurred (see Section 3.3).

2.2.4 Fieldwork Timing and Precipitation

S&A biologists conducted the fieldwork for this wetland study over a 7-week period between March 7 and April 26, 2005. This corresponds to 19 days of fieldwork (roughly 535 man-hours) performed mainly during the month of March. Due to a prolonged drought in the winter of 2004/05, precipitation records were reviewed to compare conditions in the spring of 2005 relative to a 'normal' precipitation year. Daily precipitation records from the National Weather Service meteorological station at Sand Point (NWS 2005) were tabulated for the period between February 21 and April 30, 2005 and are presented in Table B-1 in Appendix B. This spans a two-week period prior to any fieldwork and the entire duration of sampling.

Monthly precipitation totals from the Sand Point meteorological station were also reviewed for a 20-year period between 1985 and 2005. This data was reviewed for the relevant portion of the water year, October to April. Table 4 compares the 20-year average of monthly precipitation totals with conditions before and during the delineations. The data indicates that monthly precipitation totals during the five months prior to the delineations (October 2004 to February 2005) ranged from 38% to 90% of the 20-year average for the same months. Monthly precipitation totals for the two-month period during the delineations (March to April 2005) were 99% and 108% (respectively) of the 20-year average. The cumulative precipitation for the period from October 2004 to April 2005 was 80% of the 20-year average.

The soil conditions at Magnuson Park are not typical to the Puget Sound lowlands; lowering the lake level, filling and grading, runway construction and deconstruction have all resulted in a soil profile that is extremely compacted. Rainfall tends to collect on the surface, sheet flow across the site, and move through the excavated ditches on the site. Wetland hydroperiods are driven by precipitation, surface runoff from their small surrounding catchments, and evapotranspiration. The wetland hydroperiods are not driven by groundwater moving laterally or up/down on a seasonal basis. Thus, the slightly below normal rainfall for the 04/05 water year (October-April) would not be expected to strongly affect the hydroperiod of the wetlands on this site. The average to above average rainfall in the spring would have allowed surface waters to collect in the shallow depressions in a normal fashion. Wetland edges were determined by the correlation between wetland vegetation and hydrologic indicators, more so than hydric soils. So a small variation in annual precipitation would not be expected to influence the wetland 'edge' in the Project Area.

Table 4. **Precipitation records from Sand Point meteorological station adjacent to Magnuson Park.**

	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Total
20 Year Average (inches)	3.24	5.47	5.14	4.95	3.12	3.67	2.93	28.52
October 2004-April 2005 (inches)	2.81	3.16	4.37	4.44	1.20	3.63	3.16	22.77
Difference (inches)	-0.43	-2.31	-0.77	-0.51	-1.92	-0.04	+0.23	-5.75
Percent of 20-Year Average	87%	58%	85%	90%	38%	99%	108%	

2.3 Wetland Classification

Three methods of wetland classification were used to describe the wetlands. The hydrogeomorphic (HGM) system classifies wetlands based on their landscape position and water regime (Brinson 1993). The U.S. Fish and Wildlife Service adopted a classification system devised by Cowardin et al. (1979) based on physical wetland attributes (vegetation, soils, water regime). The City of Seattle uses a two-tiered classification system that recognizes wetlands of exceptional value and degraded wetlands (Seattle 2005).

2.4 Wetland Ratings

Wetlands in the Project Area were rated using the Washington Department of Ecology *Washington State Wetland Rating System for Western Washington* (Hruby 2004). This rating method evaluates various physical and biological characteristics that result in a four-tiered system based on HGM class and wetland functions. Although the City of Seattle uses a two-tiered wetland classification system in their environmentally critical area code, they defer to Ecology's rating system to determine wetland ratings for regulatory purposes (R. Knable, personal communication 2005). For the purposes of this report, all Category IV wetlands rated by the Ecology system (Hruby 2004) were assigned a "degraded" classification, and all Category I through III wetlands were assigned an "exceptional" value classification based on communication from R. Knable, the City of Seattle Wetland Planner (August, 2005).

2.5 Functional Assessment Method

The *Methods for Assessing Wetland Functions, Volume I: Riverine and Depressional Wetlands in the Lowlands of Western Washington* (WFAM) by the Washington State Department of Ecology (Hruby et. al.

1999) was used for assessing wetland functions in the Project Area. The WFAM method is based on the hydrogeomorphic (HGM) classification system (Brinson 1993), and provides guidance on arriving at technical assumptions on which assessments of performance of functions are based. The HGM classes of wetlands form the basis of the WFAM. For WFAM, wetlands are divided into assessment units (AUs), based on differences in water regime. AU boundaries occur where the volume, flow, or velocity of the water changes rapidly, whether created by natural or artificial features. A wetland may also be uniform in its water regime, and would therefore be comprised of only one AU.

The WFAM method relies on indicators of functions to assess potential performance, rather than direct measurements. A total of 15 categories of functions are assessed using the Washington State method. Indicators are physical characteristics of the wetland or its surrounding area that are correlated to a specific function. For example, the presence of steep banks in the wetland is used as an indicator of the potential suitability of the wetland habitat for aquatic mammals. After collecting detailed data on indicators, mechanistic models are applied to the data to arrive at an indexed score for each function. This step is based on the assumption that the relationship between indicators and the actual performance level for a function can be reflected by a simple mathematical expression. Different mathematical models were developed in WFAM for each HGM class of wetland and for each function assessed.

In the Project Area we conducted a functional assessment on each estimated wetland. In addition, one delineated wetland and three ditches that do not lie within an estimated wetland were assessed for functions. The results of the functional assessment are provided in Section 3.6.

3.0 RESULTS

Results of the wetland delineation within the Project Area of Magnuson Park are discussed below. There is approximately 29.84 acres of wetland on the site. There are 25 estimated wetlands based on using the modified Comprehensive Determination method, the estimated wetlands include the 10 wetlands delineated using the Routine Determination method. There are also 3 ditches that were delineated and a small percentage of area identified as wetland using the Statistical Approach method.

Figure 5 shows the results of the data plot sampling, the estimated wetlands and the delineated wetlands within the Project Area. The table on Figure 5 identifies the acreages for the estimated and delineated wetlands only, it does not include the acreages estimated using the Statistical approach (see Table 5, pg. 20) Note that all the delineated wetland acreages are incorporated into acreages of the estimated wetlands with the exception of the four segments of ditch, and wetland 1-F which was identified in 2003 for the Sports Meadow project.

Figure 6 shows the extent of the wetlands more clearly (without the transect data plots indicated) and Figure 7 shows the results mapped over an aerial photograph of the Project Area. Table 5 summarizes the acreages of estimated wetland areas (which include most delineated wetlands), the ditch segments, and delineated wetland 1-F, as well as the acreages calculated using the statistical approach. Table 5 illustrates that approximately 29.84 acres of wetland have been identified in the Project Area.

Representative photographs of both wetland and upland habitat in the Project Area are provided in Appendix A. A list of plant species found on the site is provided in Table B-2 in Appendix B. Appendix C contains the functional assessment data forms for the wetlands in the Project Area. There are nearly 500 field data sheets that were compiled for both wetland and upland areas in the Project Area. The data sheets are available upon request, hard copies have been provided to the Army Corps of Engineers, Department of Ecology, City of Seattle wetland regulatory staff.

3.1 Delineated Wetlands

As noted previously in this report, topographically discrete wetlands were delineated at the initiation of field work for this project using the Routine Method, because it was assumed that the vast majority of the Project Area would be analyzed for wetland using a statistical approach. After initial field work was conducted it was agreed by the authors and the staff of the regulatory agencies that a more accurate assessment of conditions could be provided if a modified Comprehensive Method was used to estimate wetland boundaries. At the completion of the field work it was found that 9 of the 10 wetlands initially delineated were wholly contained within the boundaries of estimated wetlands. One delineated wetland (1-F) and 3 ditches were found not to be located within the area of an estimated wetland; those wetlands are discussed in more detail in this section.

The locations of all the wetlands that were delineated are shown in Figures 5 and 6 for informational purposes. For descriptions of the classification, rating, and functional assessments the 9 delineated wetlands contained within estimated wetlands see Section 3.2, below. Table 6 summarizes the size, hydrogeomorphic classification, and USFWS classification of the four delineated wetland and ditches.

3.1.1 Wetland 1-F

Wetland 1-F is a created drainage swale that conveys surface water from surrounding uplands and the engineered sub-drainage system of the Sports Meadow located to the northwest. This swale was delineated and confirmed by the COE in 2003 during the Phase I development of Magnuson Park (Sheldon & Associates 2003). The swale is shallow, with a broad fully-vegetated bottom. It is lined with emergent vegetation and has scrub/shrub vegetation on the banks. The hydrogeomorphic classification is riverine flow-through, and the USFWS classification is palustrine scrub/shrub broad-leaved deciduous.

Hydrology

There are two sources of water to this swale. It was designed and constructed in the mid-1970’s to convey the run-off from the sub-surface drainage system installed to keep the Sports Meadow athletic fields drained. The sub-surface drains of the Sports Meadow continue to drain into this swale. In addition, the swale collects water from the surrounding uplands that drain into it directly by sheet flow. There are signs of standing water, sediment deposits, debris lines, and algal mats. Flow through the swale is controlled by the elevation of culvert inlets under pathways. Water head south, and is dissipated as sheet flow south of the old roadway that defines the southern edge of Polygon E.

Figure 5. Wetlands Areas In Magnuson Park Project Area Based On Data Plot Results.

Figure 6. Delineated and Estimated Wetlands in Magnuson Park Project Area.

Figure 7. Wetlands With Aerial Photograph In Magnuson Park Project Area.

Table 5. Summary of Wetlands in the Magnuson Park Project Area.

Polygon Area	Wetland Name	Delineated Wetland Area (acre)[a]	Estimated Wetland Area (acre)	Wetland Area Based on Statistical Approach (acre)[b]	Total Wetland Area
A	A1		0.49		0.49
B				0.14	0.14
	B1		1.63		1.63
	B2		0.33		0.33
	B3		0.48		0.48
	B4		0.27		0.27
C	C1		0.34		0.34
D	D1		0.06		0.06
E				0.65	0.65
	E1	1-E = 0.13 2-E = 0.10	8.55		8.55
	E2		0.62		0.62
	E3	3-E = 0.20 4-E = 0.09	0.72		0.72
	E4		0.01		0.01
F	1-F	0.16			0.16
G	G1		0.08		0.08
H	H1		0.05		0.05
J	J1		1.29		1.29
K	K1 K2 K3		3.16 2.78 0.73		3.16 2.78 0.73
L	Ditch 1 Ditch 3A/3B Ditch 4A	0.08 0.02 0.04			0.08 0.02 0.04
M				0.57	0.57
	M1		0.33		0.33
	M2		0.43		0.43
	M3		1.40		1.40
	M4	1-M = 0.07 2-M = 0.19 3-M = 0.12	1.90		1.90
	M5	4-M = 0.24 5-M = 0.13	1.39		1.39
	M6		0.96		0.96
	M7		0.08		0.08
	M8		0.02		0.02
	Ditch 4B	0.08			0.08
TOTAL					**29.84**

[a] Except for 1-F and the ditch segments, all delineated wetlands are within an estimated wetland. The acreage of the estimated wetland therefore includes the areas of each delineated wetland.
[b] Area estimated within polygon from data plots not located within either a delineated or estimated wetland.

Table 6. Delineated wetlands and ditches in Magnuson Park Project Area.

Polygon Area	Wetland Name	Area (ft^2)	Area (acre)	HGM Class[a]	USFWS Class[b]	Description
F	1-F	7,113	0.16	Riverine flow through	PSS	Drainage swale
L	Ditch 1	3,317	0.08	Riverine flow through	R4UB	Mainstem drains to Lake Washington
L	Ditch 3A/3B	1,040	0.02	Riverine flow through	R4UB	Tributary to Ditch 1
L/M	Ditch 4A/4B	5,346	0.12	Riverine flow through	R4UB	Tributary to Ditch 1
	Total	**16,816**	**0.39**			

a = HGM classification based on Brinson (1993).
b = USFWS classification based on Cowardin et al. (1979), where R4UB = riverine intermittent unconsolidated bottom.

Vegetation
The herbaceous species in the swale consists of colonial bentgrass, tall fescue, soft rush, and reed canarygrass. The banks of the swale contain black cottonwood, Sitka willow, hardhack, and red-osier dogwood.

3.1.2 Ditches 1, 3A, 3B, 4A, and 4B

Ditches 1, 3A, 3B, 4A, and 4B are excavated ditches that convey surface flows to Lake Washington from Areas K, L, and M. These ditches are vegetated and meet the three-parameter criteria as wetlands. They are covered with emergent vegetation on the ditch bottoms and scrub/shrub vegetation on the banks. The hydrogeomorphic classification of these ditches is riverine flow-through and the USFWS classification is riverine intermittent unconsolidated bottom. A description of the hydrology, soils, and vegetation in these ditches is provided below.

Hydrology
The source of water to these wetlands is from two sources. Ditch 1 is directly linked to Lake Washington, thus water elevations in the ditch are driven by the lake elevations. High summer water levels cause surface water to be present in the lower reaches of Ditch 1. Ditches 3A, 3B, 4A, and 4B collect sheet flow and surface runoff from the surrounding uplands, and direct it into Ditch 1. The ditches have seasonal standing and slow-moving water, sediment deposits, and debris lines. Water levels in the ditches are controlled by culverts under the boat ramp road (Ditch 3B) and Beach Drive (Ditch 4B), and the water level in Lake Washington (Ditch 1 and 3A).

Soils
A total of 5 soil pits were examined during the delineation of these ditches. The wetland soil pits (SP-11, SP-17, SP-18, and SP-19) consisted of an A horizon of 10YR 4/2 silty organic muck and a B horizon of 2.5Y 5/1 sandy clay with mottles. The upland soil pit (SP-10) had a profile consisting of an A horizon of 10YR 2/2 sandy silt and a B horizon of 10YR 4/3 gravelly sand. The wetland and upland soil pits have different soil colors and textures due to saturated conditions.

Vegetation
The banks of Ditch 1 are covered with black cottonwood, Pacific willow, paper birch, Sitka willow, hardhack, slough sedge, iris, and reed canarygrass. Vegetation along Ditches 3A and 3B consists of black cottonwood, Sitka willow, Himalayan blackberry, soft rush, and tall fescue. Ditches 4A and 4B are bordered by black cottonwood, Sitka willow, cattail, soft rush, birdsfoot trefoil, and reed canarygrass.

3.2 Estimated Wetland Areas

A grid network of transects and data plots were used in polygon areas A-E, G, H, K, and M to collect wetland data and estimate the boundaries of 25 wetland areas. At each of the 473 data plots, a determination was made whether it was upland or wetland. Figure 6 illustrates the 25 estimated wetland areas by polygon. Note that delineated wetlands that occur within estimated wetlands are also depicted on this Figure. Table 7 describes the size and classification of the 25 estimated wetland areas. A qualitative description of estimated wetlands in each polygon area is provided below.

3.2.1 Wetland A1

A1 is located in a field at the toe of a slope near the intersection of Sportsfield Drive and NE 65th Street. This estimated wetland area covers 0.49 acres and is located along the toe of slope. The hydrogeomorphic classification of estimated wetland A1 is depressional closed and the USFWS classification is palustrine emergent. A description of the hydrology, soils, and vegetation in this wetland is provided below.

Hydrology
This area receives hydrology from groundwater seeps from the slope to the west, stormwater runoff that is conveyed in a drainage ditch, and precipitation in the immediate area. Portions of this wetland appear to be underlain by a layer of sand from past filling, although it does not drain well.

Soils
A total of 10 soil pits were examined during the delineation of Polygon A. The wetland soil pits consisted of an A horizon of 10YR 2/2 sandy silt and a B horizon of 2.5Y 4/1 sand with mottles. The upland soil pits had a profile consisting of an A horizon of 10YR 3/2 sandy loam and a B horizon of 10YR 4/2 sandy loam but no mottling.

Vegetation
This area is covered with scattered saplings, Himalayan blackberry thickets, and grasses. The Himalayan blackberry thicket dominates the wetland area although these plants may be rooted in upland. Dominant grasses include redtop, tall fescue, and orchardgrass.

3.2.2 Wetlands B1, B2, B3, and B4

Polygon B consists of a field located northeast of the intersection of Sportsfield Drive and NE 65th Street. Four estimated wetland areas (B1 through B4) covering a total of 2.70 acres are located in this field. These four wetlands are generally similar, so they are described as a group below. Where distinctions occur, they are noted. The hydrogeomorphic classification of estimated wetlands is depressional closed and the USFWS classification is palustrine emergent. A description of the hydrology, soils, and vegetation in these wetlands is provided below.

Hydrology
The primary source of water to these wetlands is surface runoff from precipitation in the immediate area that perches over compacted soils. Signs of seasonal inundation include standing water, bare ground with no vegetation present, and sediment deposits.

Table 7. Estimated Wetland Areas in Magnuson Park Project Area.

Polygon Area	Wetland Name	Area (ft2)	Area (acre)	HGM Classification[a]	USFWS Classification[b]	Seattle Classification[c]
A	A1	21,356	0.49	Depressional closed	PEM	Exceptional Value
B	B1	70,838	1.63	Depressional closed	PEM	Exceptional Value
	B2	14,200	0.33	Depressional closed	PEM	Exceptional Value
	B3	20,952	0.48	Depressional closed	PEM	Exceptional Value
	B4	11,710	0.27	Depressional closed	PEM	Exceptional Value
	Sub-Total	117,700	2.70			
C	C1	14,972	0.34	Depressional closed	PEM	Degraded
D	D1	2,649	0.06	Depressional closed	PEM	Exceptional Value
E	E1	372,235	8.55	Depressional closed	PFO/PSS/PEM	Exceptional Value
	E2	26,937	0.62	Depressional open	PSS/PEM	Exceptional Value
	E3	31,466	0.72	Depressional open	PSS/PEM	Exceptional Value
	E4	455	0.01	Depressional closed	PEM	Degraded
	Sub-Total	431,093	9.90			
G	G1	3,523	0.08	Depressional closed	PEM	Degraded
H	H1	2,331	0.05	Depressional closed	PEM	Degraded
J	J1	56,128	1.29	Depressional open	PSS/PEM	Exceptional Value
K	K1	137,813	3.16	Depressional open	PSS/PEM	Exceptional Value
	K2	121,031	2.78	Depressional closed	PFO/PSS	Exceptional Value
	K3	31,985	0.73	Depressional closed	PEM	Exceptional Value
	Sub-Total	290,829	6.68			
M	M1	14,336	0.33	Depressional closed	PFO/PEM	Exceptional Value
	M2	18,770	0.43	Depressional closed	PSS/PEM	Exceptional Value
	M3	60,978	1.40	Depressional open	PSS/PEM	Exceptional Value
	M4	82,595	1.90	Depressional closed	PFO/PSS/PEM	Exceptional Value
	M5	60,510	1.39	Depressional closed	PSS/PEM	Exceptional Value
	M6	41,939	0.96	Depressional closed	PFO/PSS/PEM	Exceptional Value
	M7	3,651	0.08	Depressional closed	PFO	Exceptional Value
	M8	874	0.02	Depressional closed	PEM	Exceptional Value
	Sub-Total	283,653	6.51			
TOTAL			**25.79**			

a = HGM classification based on Brinson (1993).
b = USFWS classification based on Cowardin et al. (1979), where PFO = palustrine forested, PSS = palustrine scrub/shrub, and PEM = palustrine emergent.
c = Seattle classification based on City of Seattle Municipal Code (Seattle 2005) and each wetland receives minimum of 50-foot buffer.

Soils

A total of 63 soil pits were examined during the delineation of Polygon B. A typical profile in a wetland soil pit consisted of an A horizon of 10YR 3/3 sandy silt, a B horizon of 2.5Y 5/1 gravelly clay with mottles, and a C horizon of 2.5Y 4/2 sandy clay with mottles. The upland soil pits consisted of an A horizon of 10YR 4/3 sandy clay and a B horizon of 20YR 3/2 gravelly clay with mottles. Although the upland soil pits met the hydric soil criteria the hydrology criteria was not met.

Vegetation

The largest wetland area (B1) consists of an emergent area dominated by native and non-native grasses that is located between Sportsfield Drive and a parking lot. The other three wetland areas consist of small depressions with emergent vegetation and saturated soils. Other portions of this field with higher elevations are covered with upland grasses and Himalayan blackberry. Dominant wetland plants include colonial bentgrass, redtop, common velvetgrass, quackgrass, and slough sedge.

3.2.3 Wetland C1

Polygon C is a triangular area surrounded by paved roads that has been highly disturbed. Estimated wetland C1 covers 0.34 acres and it is located along the northeast edge of Polygon C. The hydrogeomorphic classification of estimated wetland C1 is depressional closed and the USFWS classification is palustrine emergent. A description of the hydrology, soils, and vegetation in this wetland is provided below.

Hydrology
The source of water to this wetland is surface runoff from precipitation in the immediate area that perches over compacted soil. There are drainage ditches along the north and south borders of this area that collect some of this runoff.

Soils
A total of 11 soil pits were examined during the delineation of Polygon C. The typical wetland soil pit profile consisted of an A horizon of 10YR 4/2 sandy loam and a B horizon of 2.5Y 5/1 clayey sand with mottles. The upland soil pits have an A horizon of 10YR 3/2 silty sand and a B horizon of 10YR 4/3 sandy loam.

Vegetation
The emergent wetland is dominated by colonial bentgrass, redtop, common velvetgrass, and quackgrass. Other portions of Area C are covered with upland grasses, Himalayan blackberry, Scot's broom, and bare earth with wood chips.

3.2.4 Wetland D1

Polygon D is a roughly triangular-shaped area that is located south of the Jr. League playground. Estimated wetland D1 covers 0.06 acres and it is located in the northeastern corner. The hydrogeomorphic classification of estimated wetland D1 is depressional closed and the USFWS classification is palustrine emergent. A description of the hydrology, soils, and vegetation in this wetland is provided below.

Hydrology
This wetland receives stormwater runoff from the playground to the north. This runoff is conveyed in a culvert underneath a walking path and inundates a small swale.

Soils
A total of 10 soil pits were examined during the delineation of Polygon D. The wetland soil pit consisted of an A horizon of 5YR 3/2 silt loam, a B horizon of 10YR 4/1 gravelly sand with mottles, and a C horizon of 5Y 5/1 sandy clay with mottles. The typical upland soil pit consisted of an A horizon of 10YR 2/1 silt loam, a B horizon of 2.5Y 4/2 gravelly sandy clay, and a C horizon of 2.5Y 5/1 sandy clay with mottles.

Vegetation
Wetland D1 is characterized by redtop and tall fescue. The remaining portion of Polygon D is dominated by black cottonwood, madrone saplings, paper birch, red alder, and upland grasses.

3.2.5 Wetlands E1, E2, E3, and E4

Polygon E is the second largest area (17.76 acre) in the Project Area and is located between the playfields and parking lot for the tennis courts. Estimated wetland areas E1 through E4 cover a total of 9.90 acres interspersed in polygon E. The largest wetland area (E1) occupies the western half of the polygon and covers 8.55 acres. Delineated wetlands 1-E and 2-E were identified as cottonwood-lined depressions within the larger estimated wetland area E1. Estimated wetland area E2 is located in the northern tip of polygon E and consists of a drainage swale delineated in 2003 that extends off-site to the north (Sheldon & Associates 2003). Estimated wetland area E3 is located in the southeast corner of polygon E and covers 0.72 acres. Delineated wetlands 3-E and 4-E were identified within the larger estimated wetland area E3. Estimated wetland area E4 consists of a small depression lined by a black cottonwood tree. The hydrogeomorphic classification of estimated wetlands E1 and E4 is depressional closed, while estimated wetlands E2 and E3 are depressional closed systems. The USFWS classification of estimated wetland areas E1 through E4 consist of palustrine forested, scrub/shrub, and emergent classes. A description of the hydrology, soils, and vegetation in these wetlands is provided below.

Hydrology
The source of water to estimated wetlands E1 and E4 is surface runoff from precipitation in the immediate area that perches over compacted soil. Estimated wetland area E1 slopes to its southern tip where runoff is confined by roads. Signs of seasonal flooding are evident in estimated wetlands E1 and E4, including standing water, sediment deposits, watermarks on trunks, and algal mats.

Estimated wetlands E2 and E3 receive their hydrology from drainage swales flowing down from the north and surface runoff from precipitation in the immediate area. These drainage swales are part of an engineered sub-drainage system of the Sports Meadow located to the northwest. The drainage swale in estimated wetland E3 was delineated (Wetland 4E) and confirmed by the COE in 2003 during the Phase I development of Magnuson Park (Sheldon & Associates 2003). Delineated wetland 3E (Frog Pond) is a shallow depression that collects runoff that is perched over compacted soils.

Soils
A total of 160 soil pits were examined during the delineation of estimated wetland areas E1 through E4. Although the profiles in this many soil pits varies, the typical wetland soil pit consisted of an A horizon of 10YR 3/2 silt loam and a B horizon of 2.5Y 4/1 sandy clay with mottles. The typical upland soil pit consisted of an A horizon of 10YR 4/2 sandy loam and a B horizon of 2.5Y 5/1 silty clay with mottles.

Vegetation
Estimated wetland area E1 contains palustrine forested, scrub/shrub, and emergent plant communities in a mosaic pattern. The southern tip contains a forested wetland, the central area is dominated by emergent vegetation, and patches of scrub/shrub wetland occur throughout this area. Estimated wetland area E2 and E3 consist of palustrine scrub/shrub and emergent classes in concentric rings around standing water. Vegetation in estimated wetland areas E1 through E4 included black cottonwood, Sitka willow, hardhack, common hawthorn, colonial bentgrass, tall fescue, soft rush, Baltic rush, and reed canarygrass.

3.2.6 Wetland G1

Polygon G is a lawn area located between the tennis courts and a parking lot. One estimated wetland area (G1) covering 0.08 acres is located in the south central portion of this field. This emergent wetland has standing water perched over a compacted hardpan. The hydrogeomorphic classification of estimated wetland area G1 is depressional closed and the USFWS classification is palustrine emergent. A description of the hydrology, soils, and vegetation in this wetland is provided below.

Hydrology
The source of water to this wetland is surface runoff from precipitation in the immediate area that perches over compacted soils. Signs of seasonal inundation include standing water, bare ground with no vegetation present, and sediment deposits.

Soils
A total of 6 soil pits were examined during the delineation of estimated wetland area G1. The wetland soil pit consisted of an A horizon of 10YR 3/1 gravelly sand and a B horizon of 2.5Y 5/2 sandy clay with

mottles. The typical upland soil pit consisted of an A horizon of 10YR 4/2 gravelly loam and a B horizon of 2.5Y 5/2 sandy clay with mottles. Although the upland soil pits met the hydric soil criteria the hydrology criteria was not met.

Vegetation

This lawn area is dominated by colonial bentgrass, redtop, orchardgrass, tall fescue, lawn daisy, and Lombardy poplar.

3.2.7 Wetland H1

The lawn area surrounding the tennis courts is covered in upland grasses and Lombardy poplar. One estimated wetland area (H1) covering 0.05 acres is located along the northern edge where an emergent swale occurs. The hydrogeomorphic classification of estimated wetland area H1 is depressional closed and the USFWS classification is palustrine emergent. A description of the hydrology, soils, and vegetation in this wetland is provided below.

Hydrology

This wetland receives runoff from the tennis courts and a berm located to the north that collects in a swale and is perched over compacted soil. Signs of seasonal inundation include standing water and bare ground with no vegetation present.

Soils

A total of 5 soil pits were examined during the delineation of estimated wetland area H1. The wetland soil pit consisted of an A horizon of 10YR 4/2 sandy clay, a B horizon of gleyed (5B 5/1) sandy clay with mottles, and a C horizon of 2.5Y 5/2 sandy clay with mottles. The typical upland soil pit consisted of an A horizon of 10YR 4/2 sandy clay and a B horizon of 2.5Y 5/1 sandy clay with mottles.

Vegetation

Vegetation in the wetland included redtop, tall fescue, common velvetgrass, and common timothy.

3.2.8 Wetlands K1, K2, and K3

Polygon K is the third largest area (16.75 acre) in the Project Area and it is located between the tennis courts and boat launch. Three estimated wetland areas (K1 through K3) covering a total of 6.68 acres are located in this area. The largest wetland area (K1) covering 3.16 acres contains a palustrine emergent plant community in a broad swale that is connected to Ditch 1. Estimated wetland area K2 contains a mixture of palustrine scrub/shrub and forested vegetation with saturated soils perched over a compacted hardpan. Estimated wetland area K3 located in the southwestern corner is dominated by palustrine emergent vegetation. The hydrogeomorphic classification of estimated wetland K1 is depressional open, while estimated wetland areas K2 and K3 are depressional closed systems. A description of the hydrology, soils, and vegetation in these wetlands is provided below.

Hydrology

The source of water to estimated wetland area K1 includes runoff from estimated wetland M3 and precipitation that falls in the immediate area. Drainage from estimated wetland M3 passes through a culvert underneath a road to the tennis courts and flows through estimated wetland area K1 to Beach Drive where it flows into Ditch 1. Estimated wetland areas K2 and K3 receive their hydrology from surface runoff in the immediate area that perches over compacted soil. Signs of seasonal inundation include standing water, bare ground with no vegetation present, and sediment deposits.

Soils

A total of 37 soil pits were examined during the delineation of estimated wetland areas K1 through K3. The typical wetland soil pit consisted of an A horizon of 10YR 3/2 sandy clay and a B horizon of gleyed (5/N) sandy clay with mottles. The typical upland soil pit consisted of 10YR 4/2 sandy clay and a B horizon of 5Y 4/1 sandy clay with mottles.

Vegetation

Vegetation in estimated wetland K1 includes reed canarygrass, soft rush, slough sedge, red top, tall fescue, and hardhack. Estimated wetland K2 contains black cottonwood, English hawthorn, quacking aspen, Himalayan blackberry, redtop, and tall fescue. Estimated wetland K3 is dominated by soft rush, redtop, common velvetgrass, and black cottonwood saplings.

3.2.9 Wetlands M1, M2, M3, M4, M5, M6, M7, and M8

Area M is the largest polygon in the Project Area (19.64 acre) and it contains a complicated mixture of wetland and upland plant communities. Eight estimated wetland areas (M1 through M8) covering a total of 6.51 acres are interspersed throughout Area M. Estimated wetland areas M1, M2, and M6 consist of emergent swales and scattered black cottonwood trees. Estimated wetland area M3 surrounds a palustrine scrub/shrub and emergent plant community that receives runoff from estimated wetland area E3. Estimated wetland area M4 is located in the center of polygon M and contains a mixture of palustrine forested, scrub/shrub, and emergent plant communities. Delineated wetlands 1-M through 3-M were identified as cottonwood-lined depressions within the larger estimated wetland area M4. Estimated wetland area M5 is located along the east central portion of polygon M. Delineated wetlands 4-M and 5-M were identified as cottonwood-lined depressions within the larger estimated wetland area M5. Estimated wetland areas M7 and M8 consist of small depressions lined by black cottonwood trees. The hydrogeomorphic classification of most of these estimated wetlands (M1, M2, M4, M5, M6, M7, and M8) is depressional closed, while estimated wetland area M3 is a depressional open system. A description of the hydrology, soils, and vegetation in these wetlands is provided below.

Hydrology

The source of water to most of these estimated wetlands (M1, M2, M4, M5, M6, M7, and M8) is surface runoff from precipitation in the immediate area that perches over compacted soils. Signs of seasonal inundation in these wetlands include standing water, bare ground with no vegetation present, watermarks on tree trunks, and algal mats. Estimated wetland area M3 receives runoff from estimated wetland E3 and precipitation that falls in the immediate area. Drainage from estimated wetland E3 passes through a culvert underneath a road near Frog Pond and flows through estimated wetland M3 and eventually reaches estimated wetland K1.

Soils

A total of 168 soil pits were examined during the delineation of estimated wetland areas M1 through M8. Although the profiles in this many soil pits varies, the typical wetland soil pit consisted of an A horizon of 10YR 3/2 silty sand and a B horizon of 2.5Y 5/2 sandy clay with mottles. A typical upland soil pit consisted of an A horizon of 10YR 4/2 clayey sand and a B horizon of 2.5Y 4/2 sandy clay with mottles.

Vegetation

A variety of trees, saplings, shrubs, and herbaceous species were found in Polygon M. The wetlands contained black cottonwood, Sitka willow, English hawthorn, hardhack, colonial bentgrass, tall fescue, water foxtail, soft rush, Baltic rush, and aster. The upland areas were dominated by Himalayan blackberry, Scot's broom, English hawthorn, colonial bentgrass, sweet vernal grass, and common velvetgrass.

3.3 Results of Statistical Approach Method

The portions of each polygon in the Project Area that were not identified as estimated wetlands were assessed using the statistical approach method as described in Section 2.2.3. Table 8 summarizes the results of this analysis for each polygon. Only Polygons B, E, and M had wetland data plots outside of the estimated wetland areas. Polygon B had 3.4 % of plots not in the previously identified wetlands, accounting for 0.14 acres of wetland assumed using the statistical methods. Polygon E had 8.3 % of plots not in the previously identified wetlands, accounting for 0.65 acres of wetland assumed using the statistical methods. Polygon M had 4.4 % of plots not in the previously identified wetlands, accounting for 0.57 acres of wetland assumed using the statistical methods. The percentage of wetland data plots not accounted for in estimated wetlands results in a total of 1.36 acres of additional wetland. However, the vast majority of wetlands in the Project Area were identified through the modified Comprehensive Determination method.

Table 8. Percentage of Remaining Area Defined as Wetland Based on Statistical Approach.

Polygon Area	Total Polygon Area (acre)	Delineated and/or Estimated Wetland Area (acre)	Remaining Area (acre)	Percentage of Wetland Data Plots in Remaining Area	Wetland Area Based on Statistical Approach (acre)
A	1.63	0.49	1.14	0	
B	6.77	2.70	4.07	3.4%	0.14
C	1.05	0.34	0.71	0	
D	1.48	0.06	1.42	0	
E	17.76	9.90	7.86	8.3%	0.65
F	0.82	0.16	0.66	0	
G	0.88	0.08	0.80	0	
H	2.77	0.05	2.72	0	
J	3.74	1.29	2.45	0	
K	16.75	6.68	10.07	0	
L	8.23	0.14	8.09	0	
M	19.64	6.59	13.05	4.4%	0.57
N	13.60	0	13.60	0	
Total	**95.13**	**28.48**	**66.64**		**1.36**

3.4 Wetland Classification

Classification of the 25 estimated wetlands is presented in Table 7. According to the HGM classification system (Brinson 1993), the majority of wetlands in the Project Area are depressional closed types. Other HGM classes include depressional open and riverine flow through systems. Based on the USFWS classification system (Cowardin et al. 1979), the Project Area contains a mosaic of palustrine wetlands with forested, scrub/shrub, and emergent classes. The City of Seattle classification system (Seattle 2005) indicates that the majority of wetlands in the Project Area are of exceptional value with only four wetlands being classified as degraded. Most wetlands in the Project Area are rated as Category III using the Ecology system, which makes them Exceptional Value in the City system; those wetlands that are rated as Category IV are degraded per the City system (R. Knable, pers comm.). .

3.5 Wetland Ratings

The wetland ratings of one delineated wetland, three ditches, and 25 estimated wetlands were based on the Washington Department of Ecology system (Hruby 2004). Table 9 summarizes the wetland ratings within the Project Area. Using the Ecology rating system, the majority of wetlands in the Project Area are Category III, while only four wetlands were rated as Category IV.

Table 9. Ratings of Wetland Areas in Magnuson Park Project Area.

Polygon Area	Wetland Name	Ecology Category [a]
A	A1	III
B	B1	III
	B2	III
	B3	III
	B4	III
C	C1	IV
D	D1	III
E	E1	III
	E2	III
	E3	III
	E4	IV
F	1-F	III
G	G1	IV
H	H1	IV
J	J1	III
K	K1	III
	K2	III
	K3	III
L	Ditch 1	III
	Ditch 3A/3B	III
	Ditch 4A	III
M	M1	III
	M2	III
	M3	III
	M4	III
	M5	III
	M6	III
	M7	III
	M8	III
	Ditch 4B	III

a = Ecology classification based on Hruby (2004).

3.6 Wetland Functional Assessment

Results of the functional assessment of one delineated wetland, 3 ditches, and 25 estimated wetlands in the Project Area are discussed below. Most of the wetlands in the Project Area are depressional closed and depressional flow-through HGM classes, and a limited number are riverine flow-through. Appendix C contains the functional assessment forms completed for these wetlands. Table 10 summarizes the scores for the 15 functions that were assessed.

3.6.1 Water Quality Functions

The potential for removing sediment was only calculated for depressional open and riverine flow through wetlands. These scores, ranging from 3 to 6, are moderately low compared to the reference wetlands because the wetlands on site tend to have very shallow water depths and unconstricted outlets.

The potential for removing nutrients was calculated for depressional closed wetlands and these scores were either 5 or 10 depending on the wetland size and amount of woody vegetation. The potential for removing nutrients in depressional open and riverine flow through wetlands ranged from 1 to 6 compared to the reference wetlands. Ratings for removal of nutrients were based on the lack of outlets and the degree of vegetative cover.

The potential for removing heavy metals and toxic organics was calculated for depressional closed wetlands and these scores ranged from 3 to 7 depending on the presence and amount of herbaceous plant species that uptake toxicants. The scores for removing heavy metals and toxic organics in depressional open and riverine flow through wetlands ranged from 2 to 6; it was reduced in many wetlands in the Project Area due to the lack of floodwater retention.

3.6.2 Water Quantity Functions

The potential for reducing peak flows and downstream erosion was only calculated for depressional open and riverine flow through wetlands. In depressional open wetlands, the scores for reducing peak flows ranged from 2 to 4, while the scores for reducing downstream erosion ranged from 3 to 6. The riverine flow through wetlands had scores ranging from 2 to 8 for reducing peak flows and scores ranging from 3 to 8 for downstream erosion compared to the reference wetlands. The scores for reducing peak flows are relatively low because the wetlands are situated low in the watershed and they lack the ability to provide live storage for storm or flood waters. The scores for reducing downstream erosion are based on water storage and the extent of woody vegetation in the wetlands.

The potential for recharging groundwater ranged from 1 to 5 compared to the reference wetlands. These low ratings for groundwater recharge are because the compacted clay soils do not allow for infiltration, and water that does infiltrate is linked directly to the waters of Lake Washington, not to groundwater per se. The highest score (5) occurred in estimated wetland area A1, which is underlain with sand.

3.6.3 Habitat Suitability Functions

General habitat suitability scores ranged from 0 to 5 compared to the reference wetlands. These low ratings are due to lack of canopy closure, dominance of non-native species, lack of snag and large woody debris features, moderate degree of interspersion of vegetative classes, and shallow ponding depths.

Invertebrate suitability scores also ranged from 0 to 5 due to the lack of permanently flowing water, lack of large woody debris, and lack of different substrate types. The amphibian suitability rating ranged from 0 to 1 due to the lack of permanent open water, lack of egg-laying structures, and the lack of large woody debris. We know that Frog Pond (wetland 3-E) does provide amphibian breeding functions, however as a smaller

Table 10. Functional Assessment Rating for Wetlands in the Magnuson Park Project Area.

Wetland Function Category	Wetland Function	A1	B1	B2	B3	B4	C1	D1	E1	E2	E3	E4	1-F	G1	H1	J1	K1	K2	K3	M1	M2	M3	M4	M5	M6	M7	M8	Ditch 1	Ditch 3	Ditch 4
Water Quality Functions	Removing Sediment	-	-	-	-	-	-	-	-	3	3	-	3	-	-	3	3	-	-	-	-	4	-	-	-	-	-	5	6	5
	Removing Nutrients	5	5	5	5	5	5	5	10	4	4	3	1	5	5	4	4	10	10	10	10	4	10	10	10	10	5	5	6	5
	Removing Heavy Metals & Toxic Organics	3	3	3	3	3	3	3	6	5	5	3	2	3	3	5	5	5	7	6	6	6	5	7	7	6	4	3	6	5
Water Quantity Functions	Reducing Peak Flows	-	-	-	-	-	-	-	-	3	3	-	2	-	-	4	3	-	-	-	-	4	-	-	-	-	-	7	7	7
	Reducing Downstream Erosion	-	-	-	-	-	-	-	-	4	6	-	3	-	-	5	3	-	-	-	-	5	-	-	-	-	-	8	7	6
	Recharging Groundwater	5	1	1	1	1	1	1	1	1	2	3	1	1	1	1	1	1	2	1	1	2	2	2	3	4	2	1	1	1
Habitat Suitability Functions	General Habitat Suitability	3	2	1	1	0	1	2	5	3	4	1	3	1	1	3	4	5	3	4	2	3	5	4	4	4	2	5	4	2
	Suitability for Invertebrates	3	2	1	2	0	1	1	5	2	4	1	2	1	0	2	3	5	3	3	2	3	4	4	4	3	2	3	2	2
	Suitability for Amphibians	1	1	1	1	1	0	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1
	Suitability for Anadromous Fish	-	-	-	-	-	-	-	-	0	0	-	0	-	-	0	0	-	-	-	-	0	-	-	-	-	-	0	0	0
	Suitability for Resident Fish	-	-	-	-	-	-	-	-	1	1	-	1	-	-	1	1	-	-		-	1	-	-	-	-	-	1	1	0
	Suitability for Aquatic Birds	3	2	1	2	1	2	2	5	3	3	2	2	1	2	3	4	5	3	4	3	3	5	4	4	2	2	3	2	2
	Suitability for Aquatic Mammals	2	2	1	1	1	0	1	2	2	1	1	0	0	1	1	2	1	1	1	1	1	1	1	1	1	1	3	1	1
	Native Plant Richness	1	1	0	1	0	0	0	3	1	2	0	3	0	0	1	2	3	1	2	1	1	4	1	2	4	1	5	4	2
	Primary Production and Export	-	-	-	-	-	-	-	-	5	6	-	5	-	-	5	5	-	-	-	-	6	-	-	-	-	-	7	8	7

portion of a larger estimated wetland, it did not shift the functional assessment finding higher for the entire wetland.

The anadromous fish and resident fish suitability ratings were only calculated for depressional open and riverine flow through wetlands. These scores were all 0 are low compared to the reference wetlands due to lack of access for fish, lack of permanently flowing water, lack of spawning gravel, lack of large woody debris and shallow water depths.

The wetland associated birds suitability scores ranged from 1 to 5 compared to the reference wetlands. These low scores are likely due to the lack of snags, moderate interspersion of vegetation classes (edge habitat), and lack of invertebrates, amphibians (except wetland 3-E), and fish present in the wetlands. The wetland associated mammals suitability scores ranged from 0 to 3 due to lack of permanently flowing water, lack of woody vegetation for beaver, low likelihood of fish being present, and lack of stream banks for denning. It is known that beaver are active in Lake Washington, along the eastern shore of the Project Area, however the lake itself was not included in this functional assessment of wetland on the Project Area.

The native plant richness scores ranged from 0 to 5 compared to the reference wetlands. These low scores are due to dominance by non-native species, moderate interspersion of plant communities, and width of adjacent buffers.

The primary production and export function was only calculated for depressional open and riverine flow through wetlands. These scores ranging from 5 to 8 are moderate compared to the reference wetlands due to the presence of flowing water that links these wetlands to larger aquatic systems by surface flows that can transport organic matter.

3.7 Regulatory Implications

Several federal, state and local agencies regulate activities in or adjacent to wetland areas. Agencies that have regulatory authority for wetlands in the Project Area include the U.S. Army Corps of Engineers (COE) through Section 404 of the Clean Water Act, Washington State Department of Ecology (Ecology) through Section 401 of the Clean Water Act, and the City of Seattle through its Environmentally Critical Areas (ECA) regulations. Any proposal to eliminate or alter wetlands within the Project Area will require permits from all three regulatory agencies: COE, Ecology, and the City of Seattle. City of Seattle, ECA regulations will likely require a mitigation ratio of 2:1 (two acres of compensation for each acre of impact/alteration) for wetland creation/restoration. The City also requires a buffer width of 50-feet, however there are several provisions within the City code for buffer modification and/or exemptions. Using the recommendations from Ecology's Volume 2 BAS documents, buffers for Category III wetlands adjacent to high intensity land uses (e.g. ball fields) are recommended to have a buffer width of 80-150 feet; for Category IV wetlands the buffer is recommended to be 50 feet.

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APPENDIX A
PHOTOGRAPHS

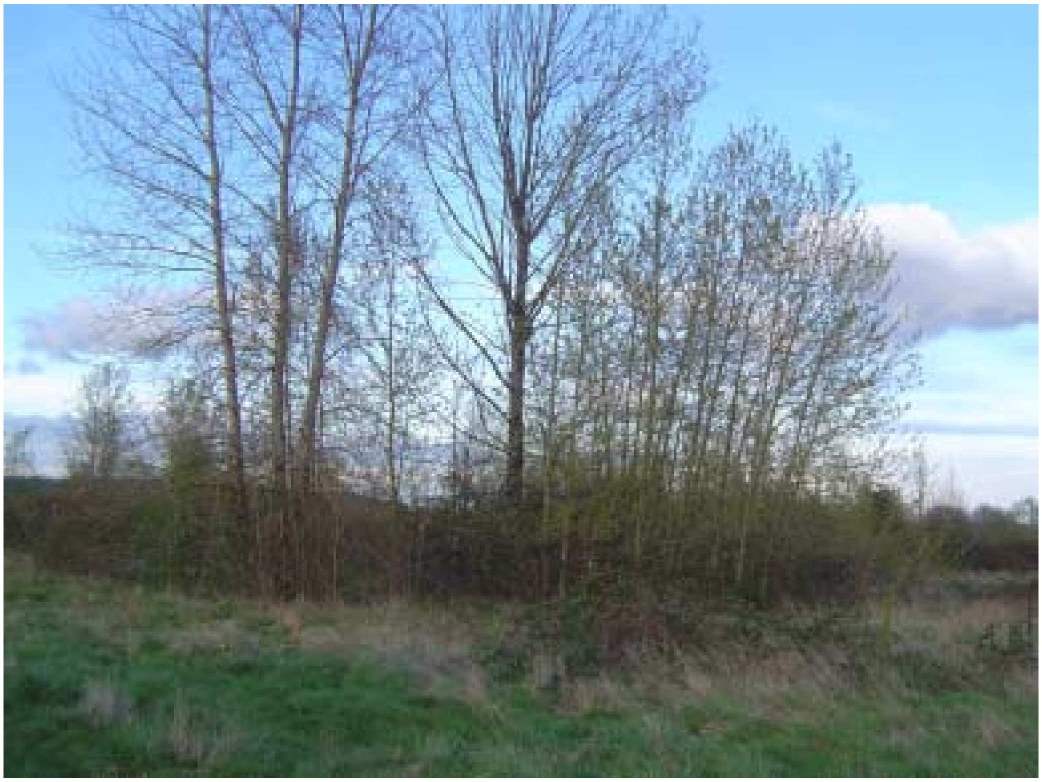

Photo 1—Wetland 1-E in Area E consists of cottonwood-lined depression.

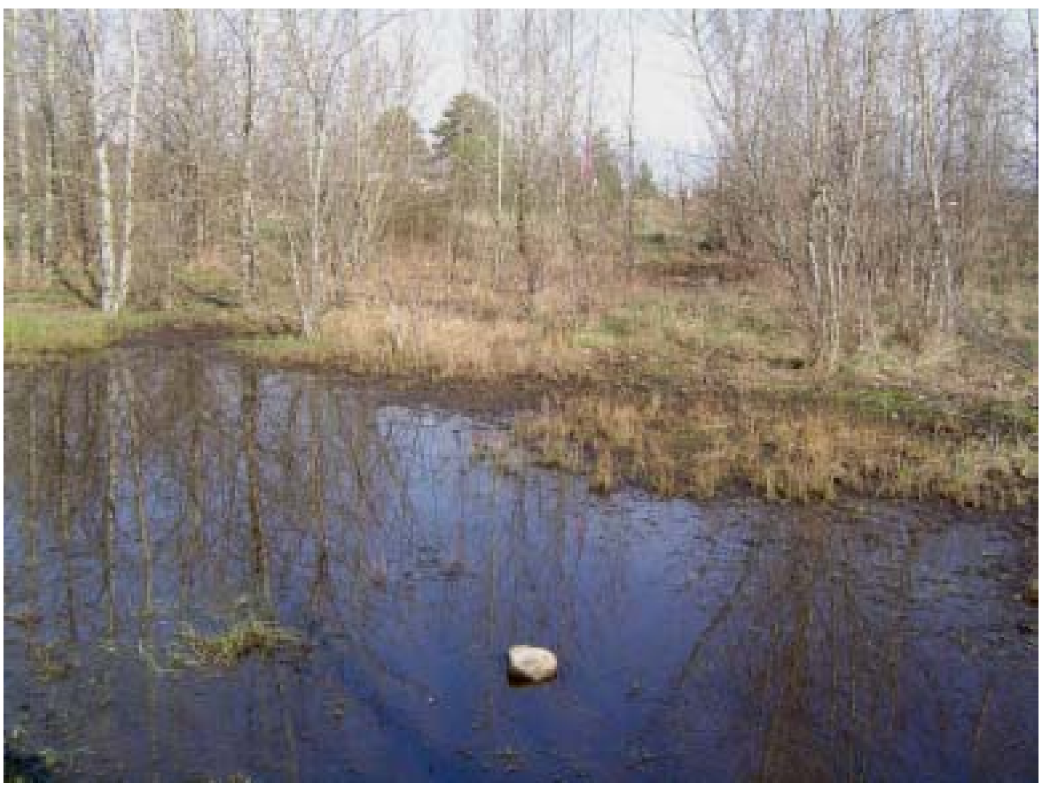

Photo 2—Wetland 2-E in Area E consists of cottonwood-lined depression.

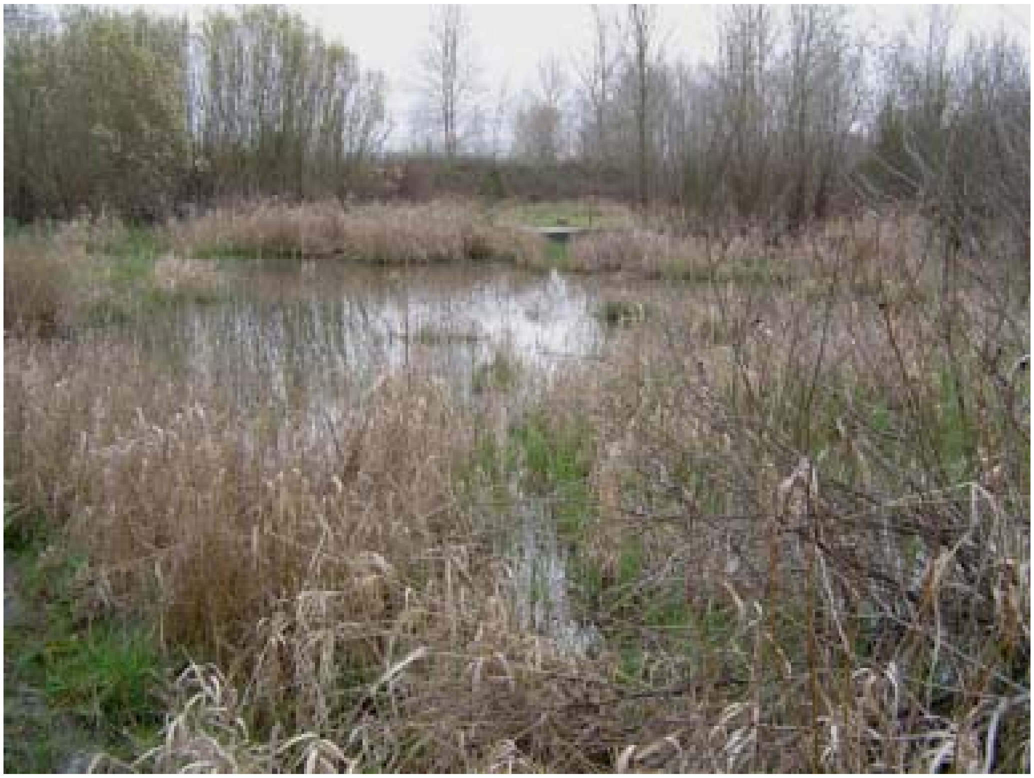

Photo 3—Wetland 3-E in Area E, as called Frog Pond.

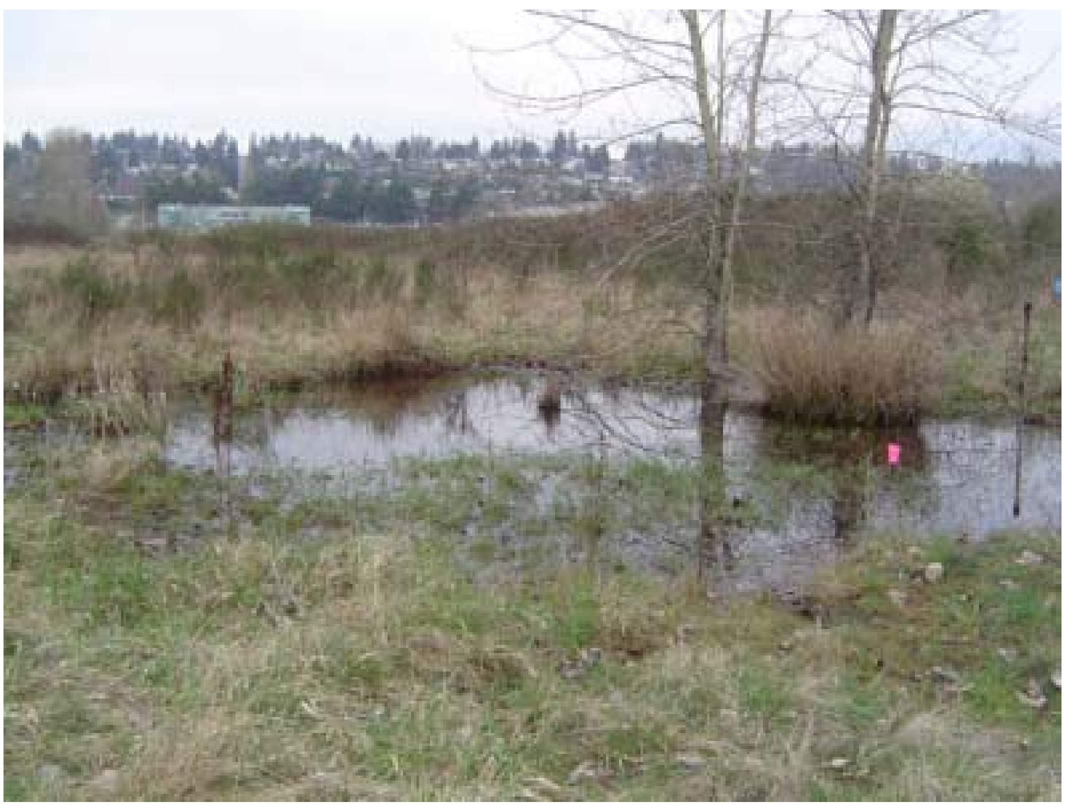

Photo 4—Wetland 1-M in Area M consists of cottonwood-lined depression.

Photo 5—Wetland 2-M in Area M consists of cottonwood-lined depression.

Photo 6—Wetland 3-M in Area M consists of cottonwood-lined depression.

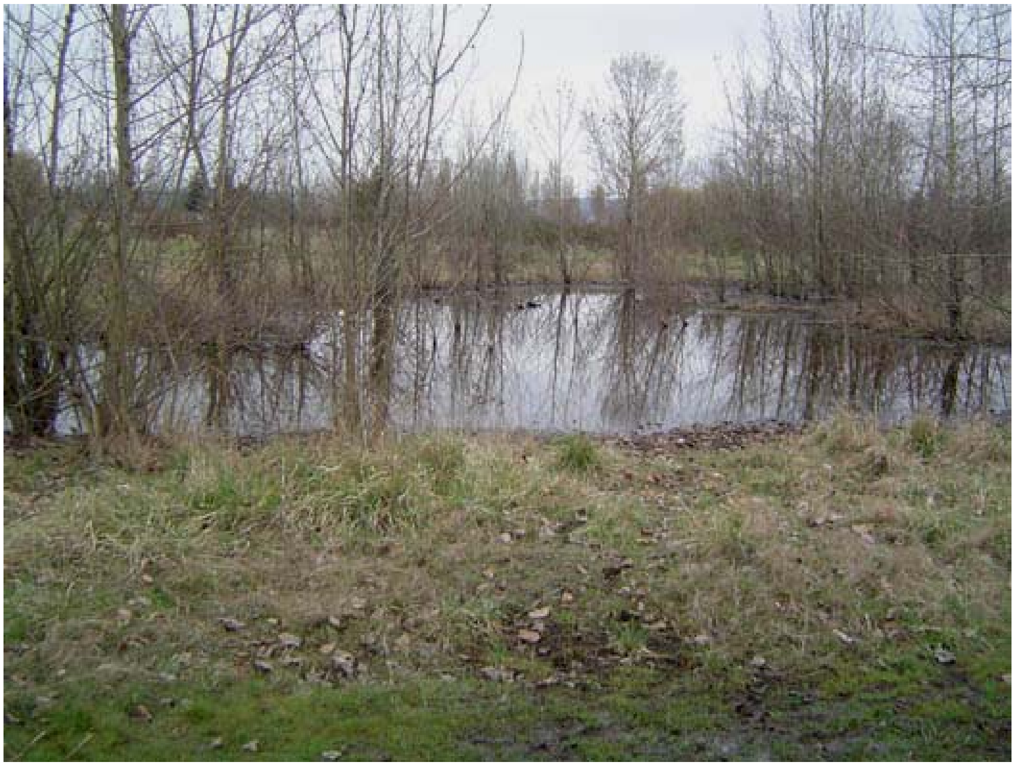

Photo 7—Wetland 4-M in Area M consists of cottonwood-lined depression.

Photo 8—Wetland 5-M in Area M consists of cottonwood-lined depression.

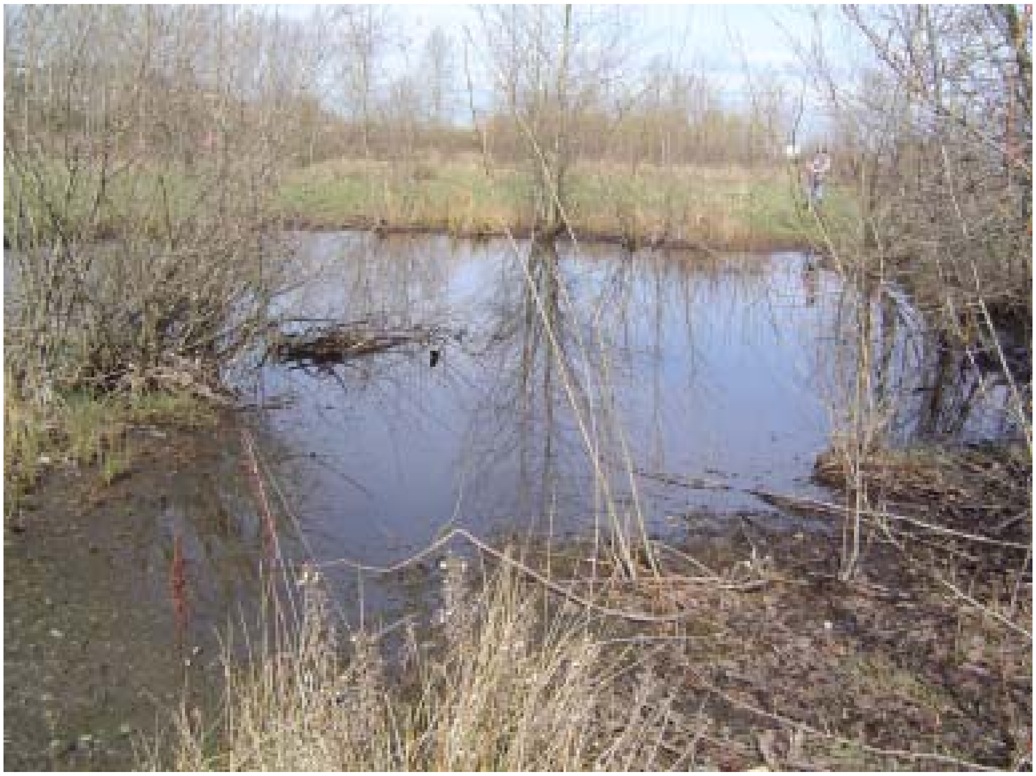

Photo 9—Wetland 6-M in Area M consists of cottonwood-lined depression.

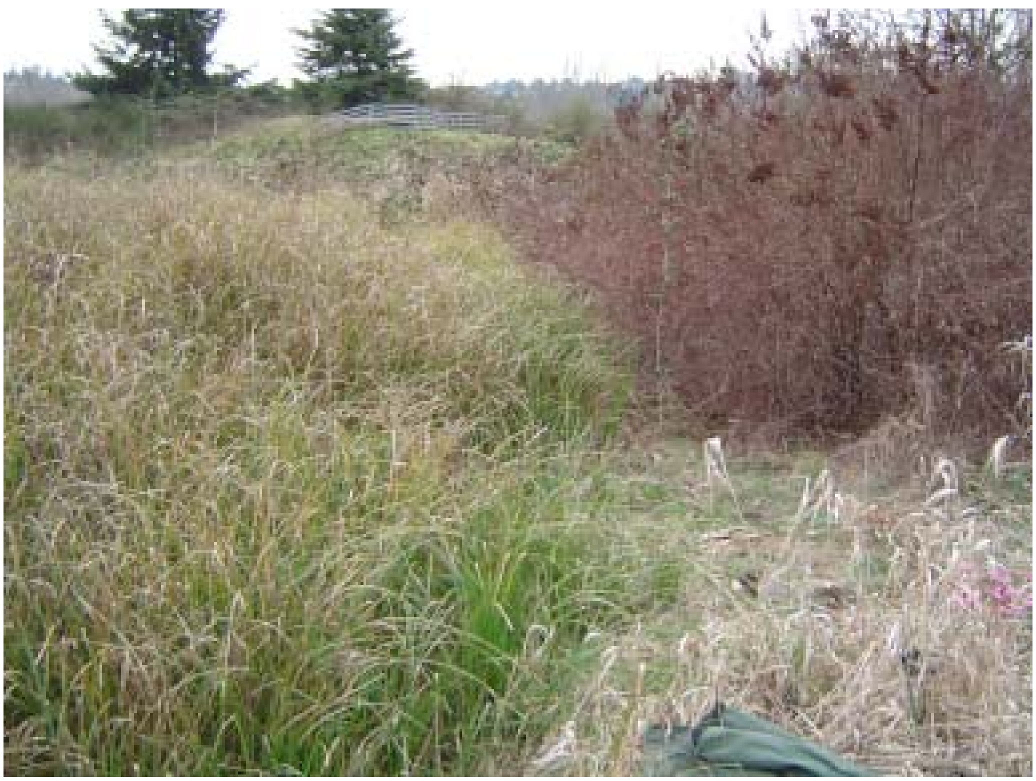

Photo 10—Wetland 1-J in Area J, also called sedge meadow.

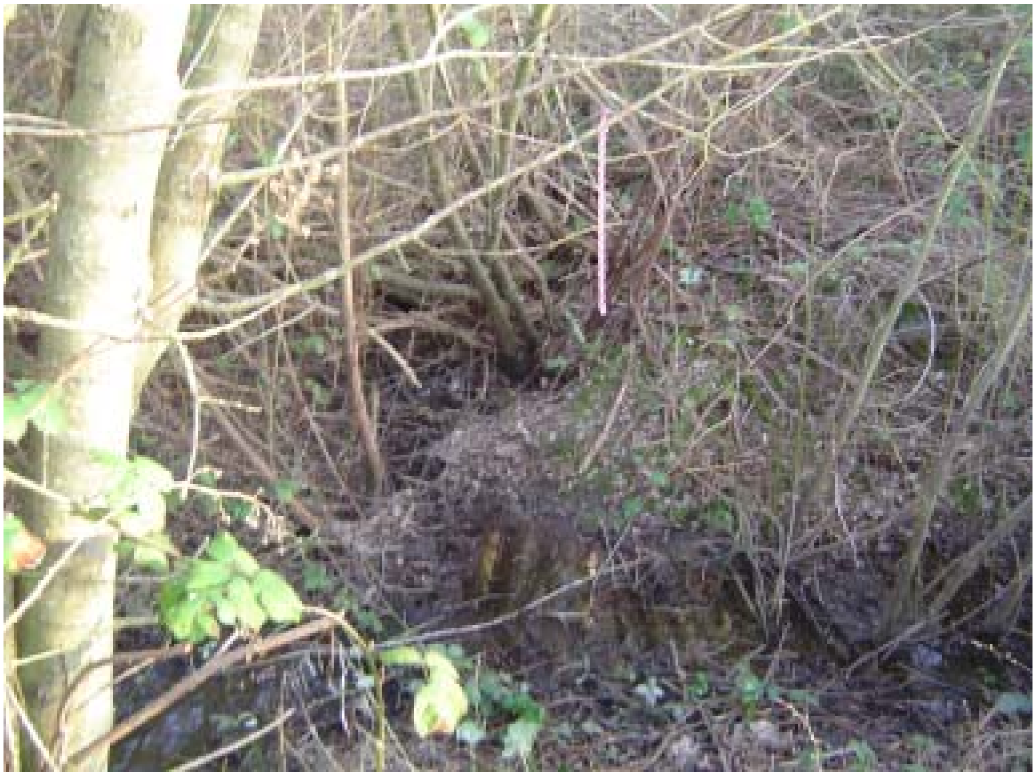

Photo 11—Ditch 1 in Area L consists of ditch lined by trees.

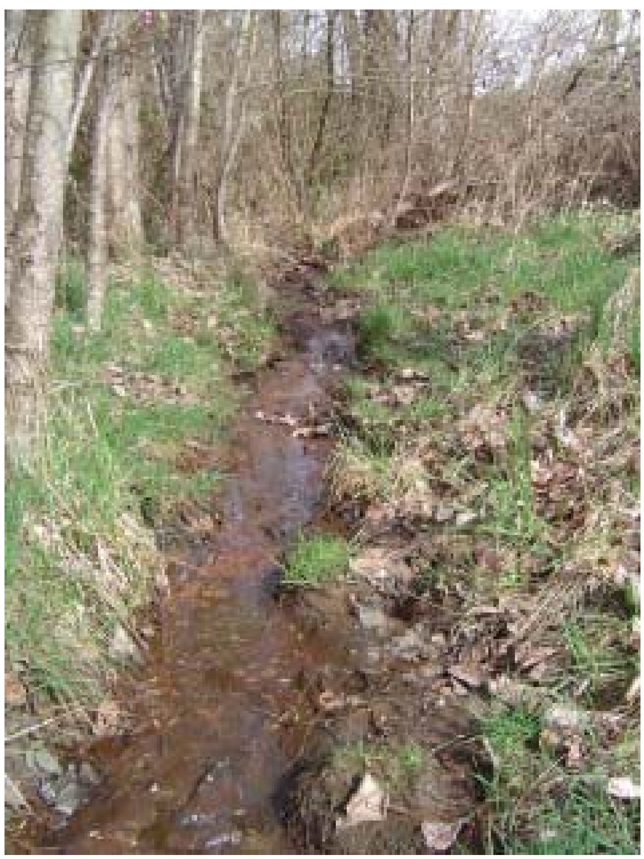

Photo 12—Ditch 3 in Area L consists of ditch lined by trees.

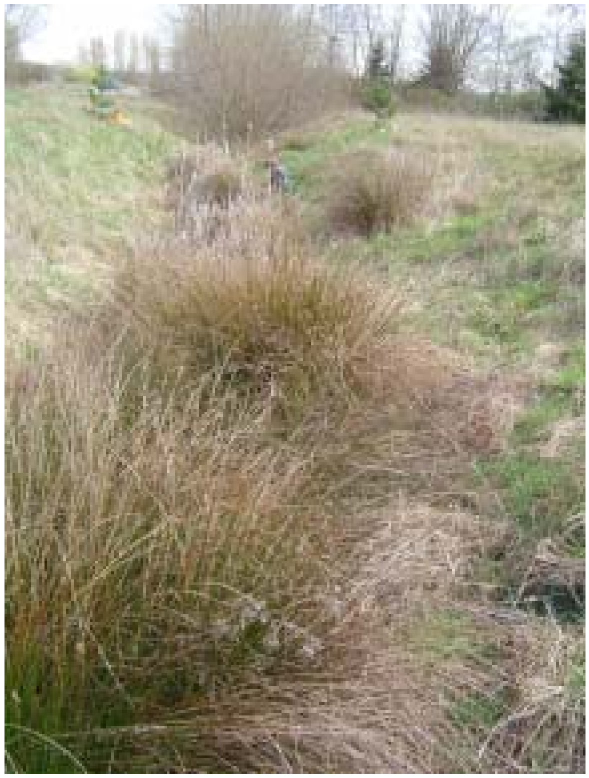

Photo 13—Ditch 4 in Area L consists of ditch lined with emergents.

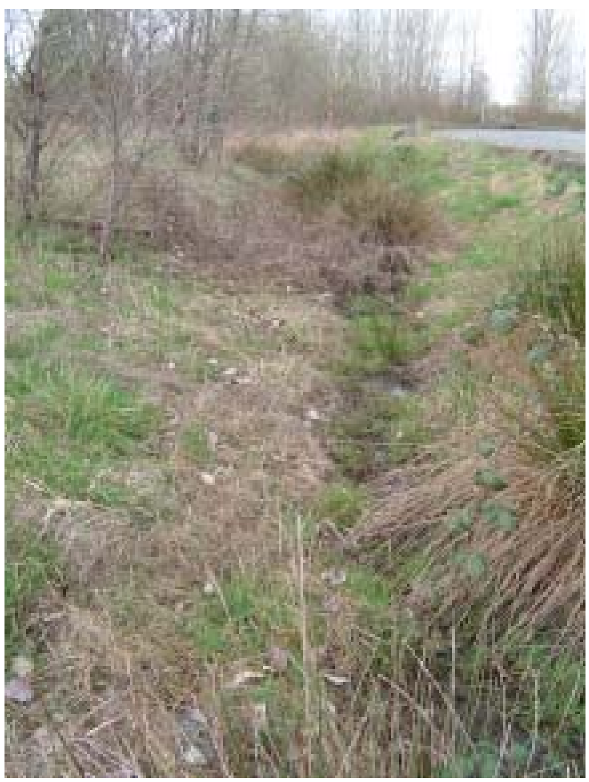

Photo 14—Ditch 4 in Area M consists of ditch lined by emergents.

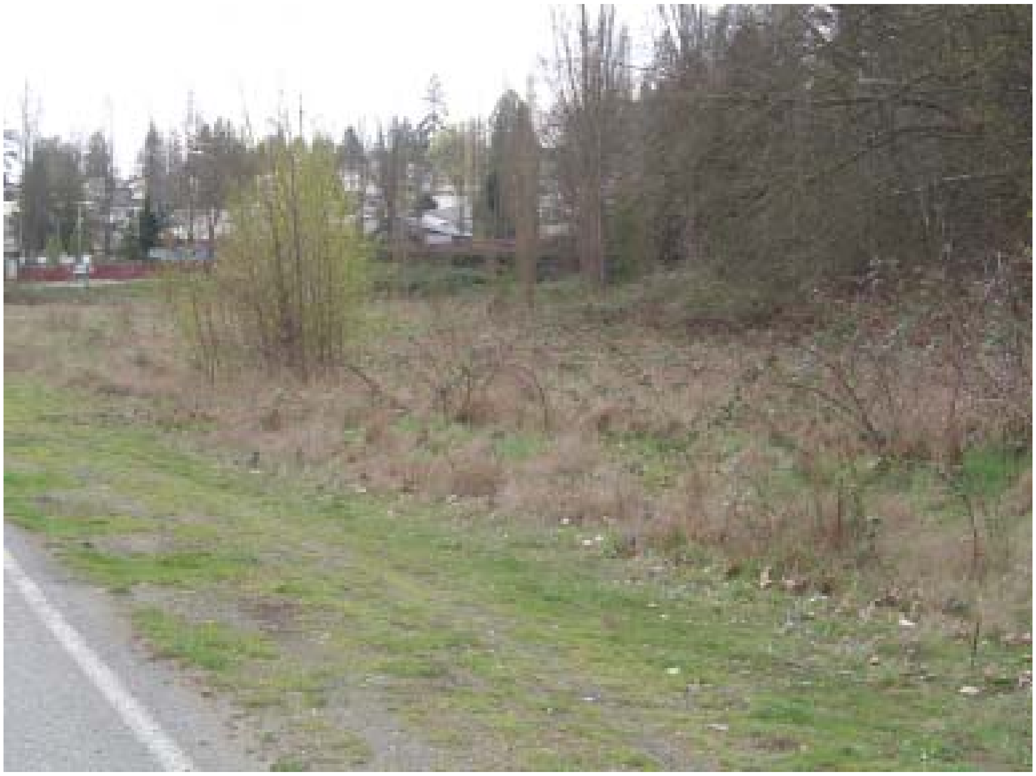

Photo 15—Area A near Sportsfield Drive.

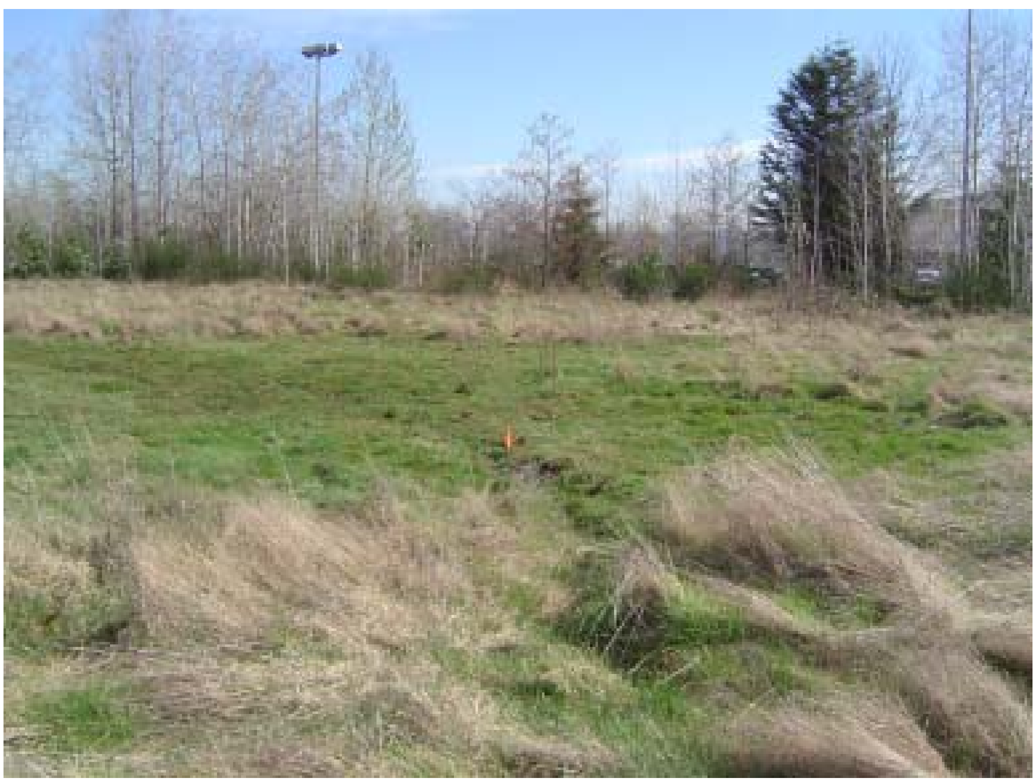

Photo 16—Area B showing emergent wetland in depression.

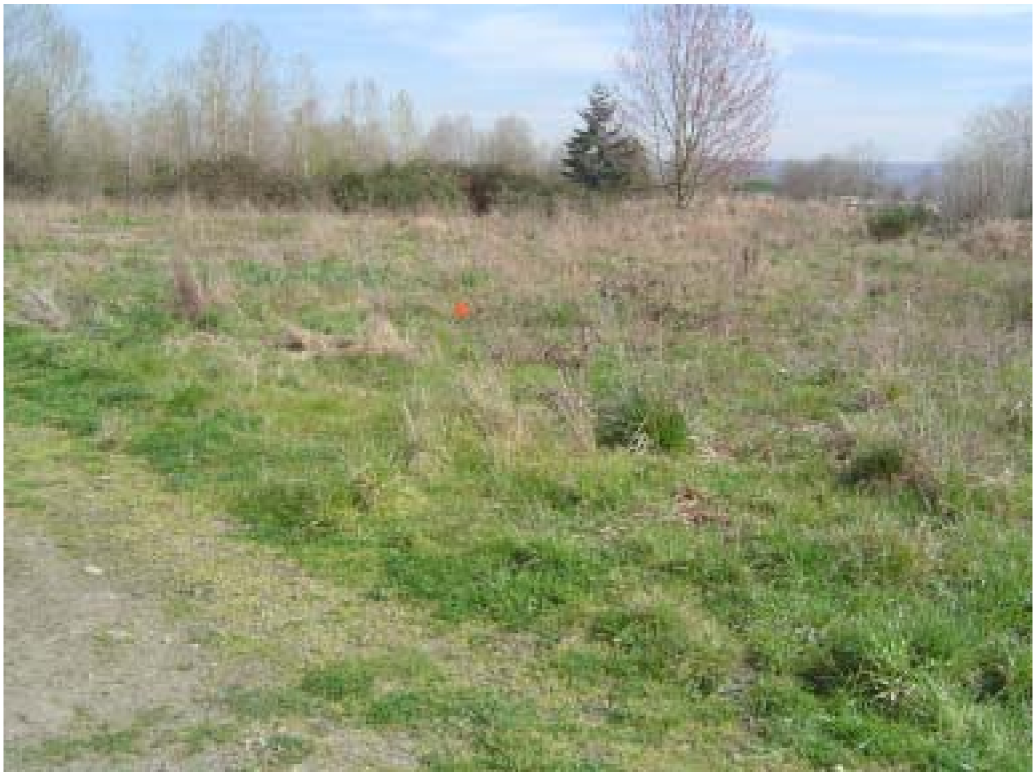

Photo 17—Area C disturbed upland area near baseball field.

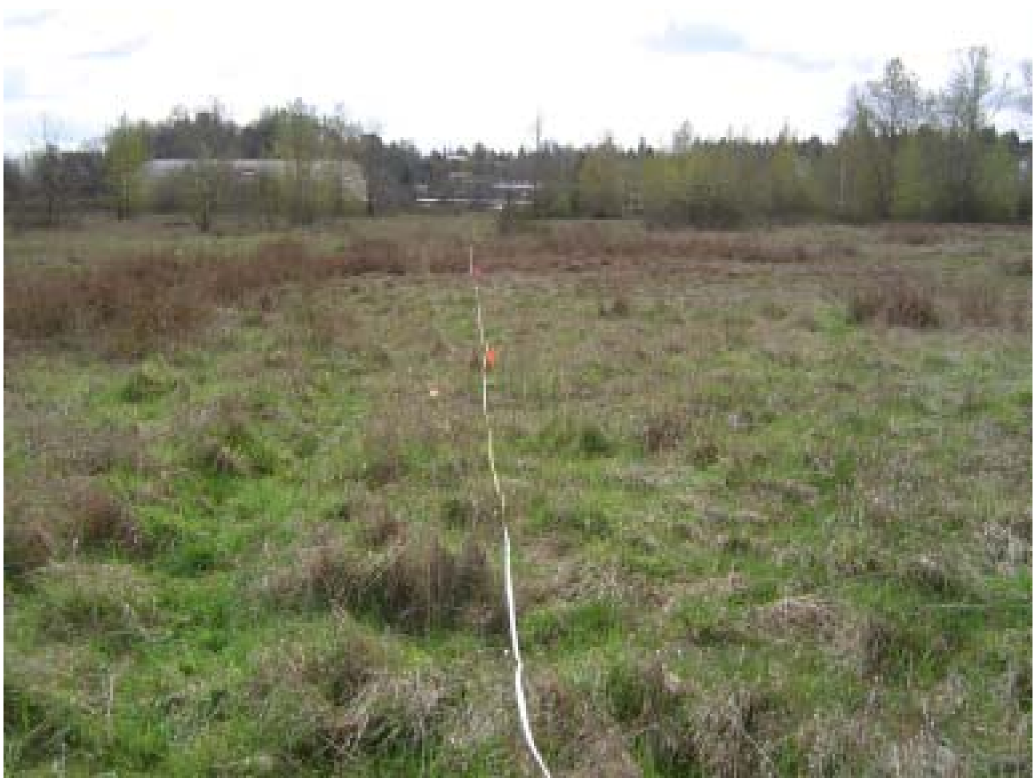

Photo 18—Area E looking along transect at emergent wetland in background.

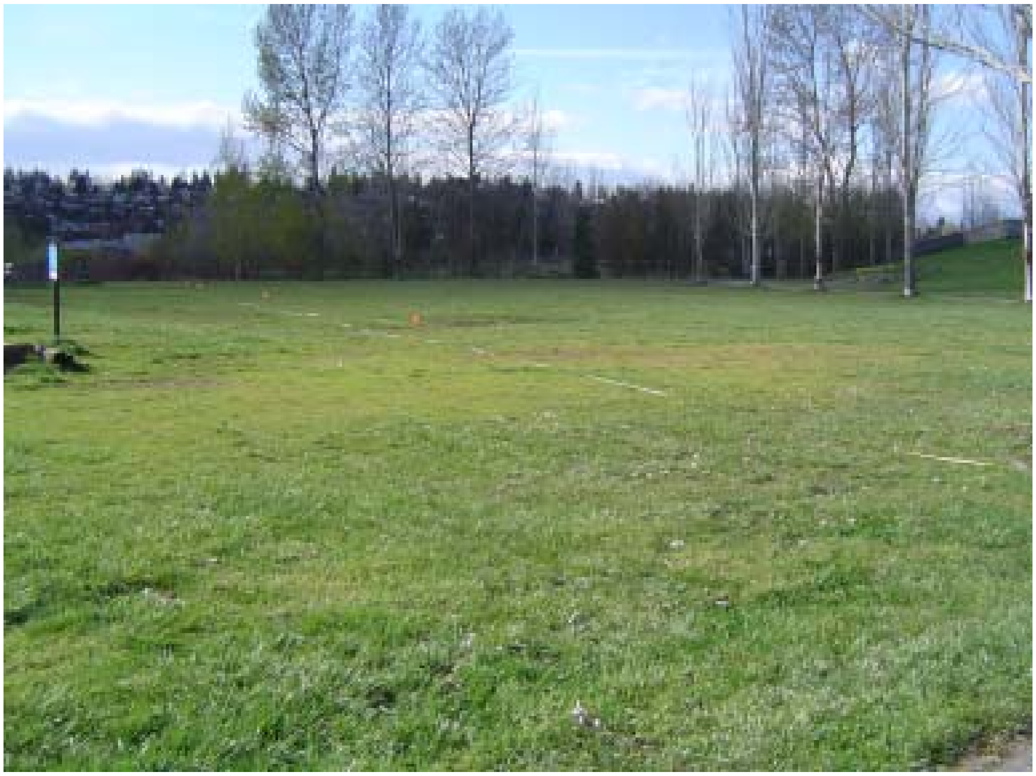

Photo 19—Area G near parking lot for tennis courts.

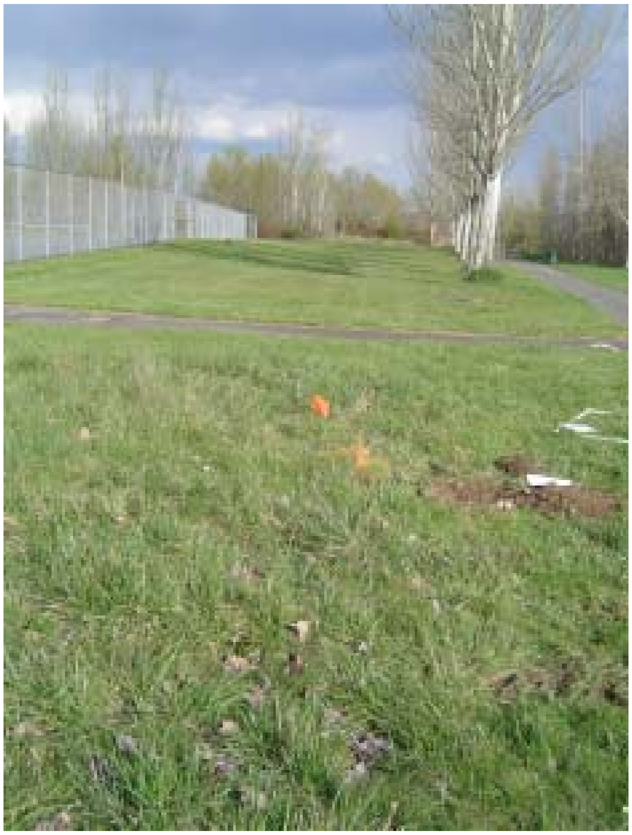

Photo 20—Area H lawn in front of tennis courts.

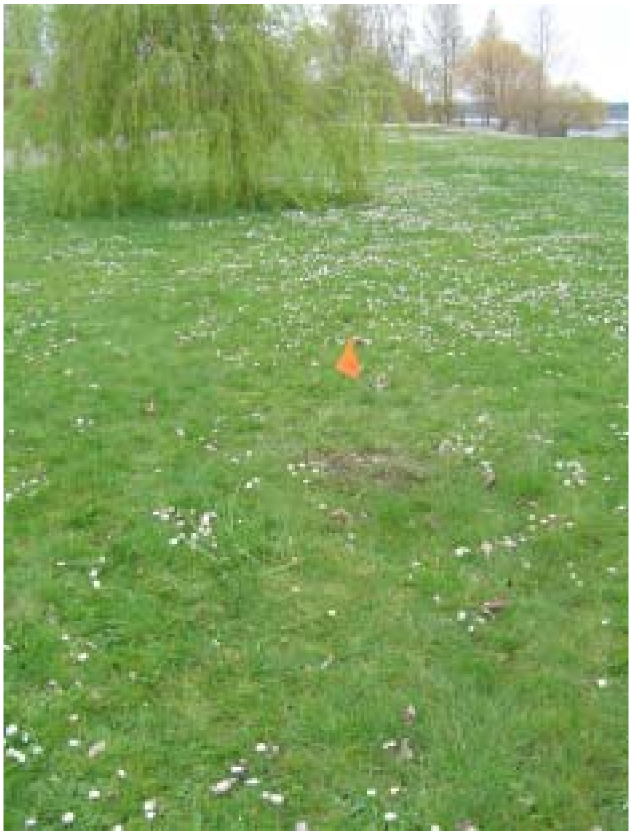

Photo 21—Area L lawn area near Lake Washington shoreline.

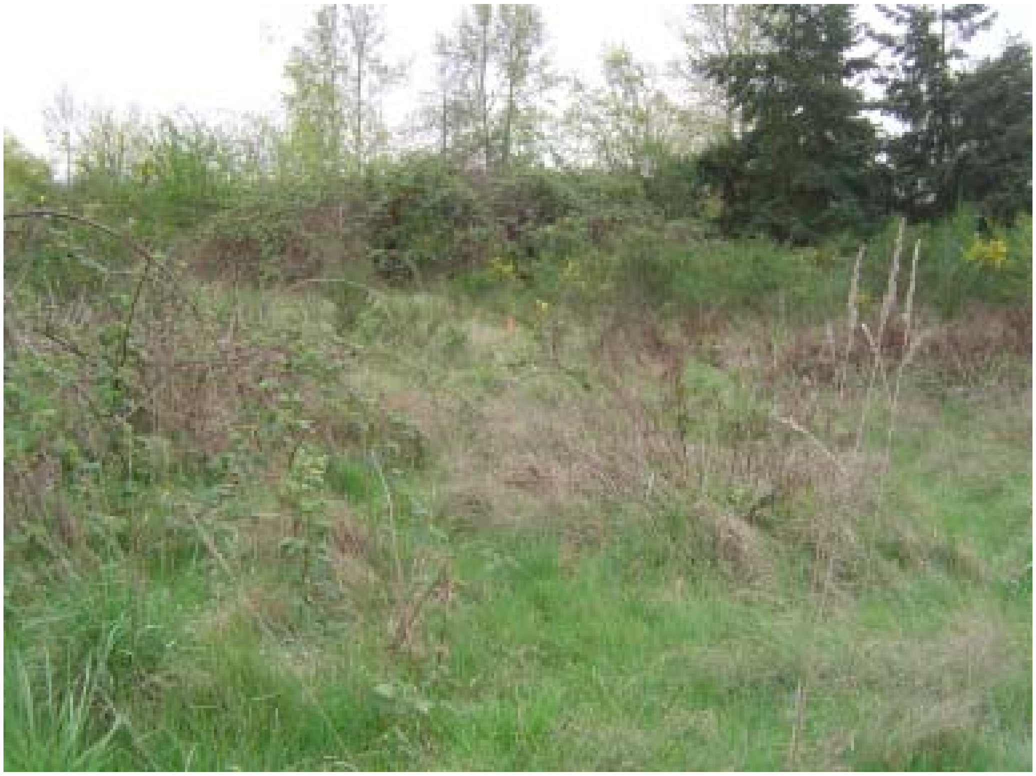

Photo 22—Area L upland area covered with invasive shrubs and grasses.

APPENDIX B
DATA TABLES

Table B-1. Precipitation records from Sand Point station for Magnuson Park wetland delineation.

Date	Daily Precipitation (inches)	Year to Date Precipitation (inches)	Site Activities
February 21, 2005	0	4.51	
February 22, 2005	0	4.51	
February 23, 2005	0	4.51	
February 24, 2005	0	4.51	
February 25, 2005	0	4.51	
February 26, 2005	0	4.51	
February 27, 2005	0	4.51	
February 28, 2005	0.14	4.65	
March 1, 2005	0.04	4.69	
March 2, 2005	0.04	4.73	
March 3, 2005	0	4.73	
March 4, 2005	0	4.73	
March 5, 2005	0	4.73	
March 6, 2005	0	4.73	
March 7, 2005	0	4.73	Delineate Wetlands C, F, G, I, L, and Ditch 1
March 8, 2005	0	4.73	Delineate Wetlands B, J, K, and Ditches 2-4
March 9, 2005	0	4.73	
March 10, 2005	0	4.73	Laid out transects and sample Area B transects
March 11, 2005	0	4.73	Laid out transects and sample Area B, C, and E transects
March 12, 2005	0	4.73	
March 13, 2005	0	4.73	
March 14, 2005	0	4.73	Laid out transects and sample Area E transects
March 15, 2005	0	4.73	Laid out transects and sample Area E transects
March 16, 2005	0.31	5.04	
March 17, 2005	0	5.04	Sample Area D and E transects
March 18, 2005	0	5.04	Laid out transects in Area A, E, G, and H
March 19, 2005	0.32	5.36	
March 20, 2005	0.15	5.51	
March 21, 2005	0.02	5.53	Sample Area D and E transects, and delineate Wetland A
March 22, 2005	0	5.53	Sample Area E transects
March 23, 2005	0	5.53	
March 24, 2005	0	5.53	Sample Area A, E, G, and H transects
March 25, 2005	0	5.53	
March 26, 2005	1.29	6.82	
March 27, 2005	0.67	7.49	
March 28, 2005	0.14	7.63	Laid out transects in Area K and M
March 29, 2005	0.35	7.98	
March 30, 2005	0	7.98	
March 31, 2005	0.3	8.28	Sample Area A, L, and M transects, and delineate Wetland H

Date	Daily Precipitation (inches)	Year to Date Precipitation (inches)	Site Activities
April 1, 2005	0.43	8.71	
April 2, 2005	0.05	8.76	
April 3, 2005	0.42	9.18	
April 4, 2005	0.03	9.21	
April 5, 2005	0.03	9.24	
April 6, 2005	0	9.24	
April 7, 2005	0.46	9.7	
April 8, 2005	0	9.7	
April 9, 2005	0	9.7	
April 10, 2005	0.25	9.95	
April 11, 2005	0.17	10.12	Sample Area M transects
April 12, 2005	0.02	10.14	Sample Area M transects
April 13, 2005	0	10.14	
April 14, 2005	0.03	10.17	
April 15, 2005	0.34	10.51	Laid out transects and sampled Area K transects
April 16, 2005	0.63	11.14	
April 17, 2005	0.01	11.15	
April 18, 2005	0	11.15	
April 19, 2005	0	11.15	Sample Area K and M transects
April 20, 2005	0	11.15	
April 21, 2005	0	11.15	Sample Area M transects
April 22, 2005	0	11.15	
April 23, 2005	0.05	11.2	
April 24, 2005	0	11.2	
April 25, 2005	0	11.2	
April 26, 2005	0	11.2	Sample Area M transects
April 27, 2005	0	11.2	
April 28, 2005	0.09	11.29	
April 29, 2005	0.12	11.44	
April 30, 2005	0.03	11.47	
Total Rain Amount	**6.96**	**11.47**	

Table B-2. List of plant species observed in Magnuson Park Project Area.

Stratum	Scientific Name	Common Name	Indicator[a]
Trees	*Acer macrophyllum*	Bigleaf maple	FACU
	Alnus rubra	Red alder	FAC
	Arbutus menziesii	Madrone	NI
	Betula pendula	European white birch	FACW
	Populus alba	White poplar	NI
	Populus balsamifera	Black cottonwood	FAC
	Populus nigra 'Italica'	Lombardy poplar	NI
	Populus tremuloides	Quaking aspen	FAC+
	Pseudotsuga menziesii	Douglas fir	FACU
	Sorbus aucuparia	Mountain ash	NI
	Thuja plicata	Western red cedar	FAC
Shrubs	*Cornus sericea*	Red-osier dogwood	FACW
	Crataegus monogyna	English hawthorn	FACU+
	Cytisus scoparius	Scotch broom	FACU
	Fraxinus latifolia	Oregon ash	FACW
	Ilex aquifolium	Holly	FACU
	Malus fusca	Western crabapple	FACW
	Malus sp.	Domestic apple	NI
	Oemleria cerasiformis	Indian plum	FACU
	Prunus sp.	Domestic cherry	NI
	Rhamnus purshiana	Cascara	FAC-
	Rosa eglanteria	Sweetbrier rose	FACW
	Rosa nutkana	Nootka rose	FAC
	Rubus spectabilis	Salmonberry	FAC+
	Salix alba var. vitellina	Golden willow	NI
	Salix hookeriana	Hooker willow	FACW-
	Salix lucida	Pacific willow	FACW+
	Salix scouleriana	Scouler willow	FAC
	Salix sitchensis	Sitka willow	FACW
	Spiraea douglasii	Hardhack	FACW
	Symphoricarpos albus	Snowberry	FACU
Vines	*Hedera helix*	English ivy	NI
	Rubus armeniacus	Himalayan blackberry	FACU
	Rubus laciniatus	Evergreen blackberry	FACU+
	Rubus ursinus	Trailing blackberry	FACU
Herbs	*Achillea millefolium*	Yarrow	FACU
	Aster subspicatus	Douglas aster	FACW
	Bellis perennis	Lawn daisy	NI
	Cardamine sp.	Bittercress	NI
	Cirsium arvense	Canada thistle	FACU+
	Cirsium vulgare	Bull thistle	FACU
	Daucus carota	Queen anne's lace	NI
	Epilobium ciliatum	Willow-herb	FACW-
	Equisetum arvense	Field horsetail	FAC

Stratum	Scientific Name	Common Name	Indicator[a]
	Equisetum telmateia	Giant horsetail	FACW
	Galium trifidum	Small bedstraw	FACW+
	Geranium dissectum	Cut leaf geranium	NI
	Geranium molle	Dovefoot geranium	NI
	Hypochaeris radicata	Cat's ear	FACU
	Lamium purpureum	Purple dead-nettle	NI
	Lotus corniculatus	Birdsfoot trefoil	FAC
	Lupinus polyphyllus	Lupine	FAC+
	Lythrum salicaria	Purple loosestrife	FACW+
	Myosotis sp.	Forget-me-not	NI
	Plantago lanceolata	Lance-leaf plantain	FAC
	Polystichum munitum	Sword fern	FACU
	Pteridium aquilinum	Bracken fern	FACU
	Ranunculus repens	Creeping buttercup	FACW
	Rumex acetosella	Sheep sorrel	FACU+
	Rumex crispus	Curly dock	FAC+
	Solanum dulcamara	Bittersweet nightshade	FAC+
	Stellaria sp.	Starwort	NI
	Taraxacum officinale	Dandelion	FACU
	Trifolium dubium	Hop clover	UPL
	Trifolium pratense	Red clover	FACU
	Typha latifolia	Cattail	OBL
	Verbascum thapsus	Common mullein	NI
	Vicia sativa	Common vetch	NI
Grasses, Sedges, and Rushes	*Agrostis capillaris*	Colonial bentgrass	FAC
	Agrostis gigantea	Redtop	FAC
	Alopecurus geniculatus	Water foxtail	OBL
	Alopecurus pratensis	Meadow foxtail	FACW
	Anthoxanthum odoratum	Sweet vernal grass	FACU
	Carex obnupta	Slough sedge	OBL
	Dactylis glomerata	Orchardgrass	FACU
	Elytrigia repens	Quackgrass	FAC-
	Festuca arundinacea	Tall fescue	FAC-
	Holcus lanatus	Common velvetgrass	FAC
	Juncus balticus	Baltic rush	FACW+
	Juncus effusus	Soft rush	FACW
	Lolium perenne	Perennial ryegrass	FACU
	Phalaris arundinacea	Reed canarygrass	FACW
	Phleum pratense	Common timothy	FAC-

[a] Wetland indicator status based on Reed (1988) where: obligate wetland (OBL), facultative wetland (FACW), facultative (FAC), facultative upland (FACU), upland (UPL), and not indicated (NI).

APPENDIX C

WETLAND DATA SHEETS
(Provided on CD only)

APPENDIX D

FUNCTION ASSESSMENT SHEETS

(Provided on CD only)

Appendix D

The *Methods for Assessing Wetland Functions, Volume I: Riverine and Depressional Wetlands in the Lowlands of Western Washington* (WFAM) by the Washington State Department of Ecology was used for assessing wetland functions in the Project Area. When using the WFAM method it is often necessary to use Best Professional Judgment (BPJ) and/or to base an evaluation of conditions on assumed parameters upon occasion. To assure that our assumptions are clear to all users, we've attempted to identify those used in the evaluations for this project, as described below.

- Land use within 1 km of the aquatic unit

The percent land use values were estimated for the overall Project Area instead of each wetland. These values were consistently applied to each wetland because of their relative proximity to each other. Therefore wetlands (AU's) located physically closer to Lake Washington or to the historic buildings on the site were assessed with the same assumed % land-uses regardless of where they were in the project area.

- pH of interstitial water and open/standing water

Field measurements of pH were not performed. A neutral pH of 7 was assumed for all wetlands because there was no evidence that acidic bog conditions were present.

- Aquatic unit is within 1.6km (1 mi) of a lake

All wetlands in the Project Area were assumed to be within 1 mile of Lake Washington, although measurements were not taken.