## Henry M. Jackson Jackson Hydroelectric Project

(FERC Project No. 2157)

## **Study Plan 9: Wetland Surveys**

## **Technical Report**

Prepared by:

Bernice Tannenbaum, Environmental Consultant and Karen Bedrossian, Sr. Environmental Coordinator Public Utility District No. 1 of Snohomish County



October 2008

#### **Table of Contents**

Acronyms	ii
ive Summary	iii
STUDY OBJECTIVES AND DESCRIPTION	1
BACKGROUND INFORMATION	1
METHODS	4
RESULTS	6
Wetlands Surveyed in the Spada Lake and Williamson Creek Tracts	16
1.1 Lake-fringe Wetlands	16
1.2 Depressional Wetlands	23
Wetlands Surveyed in the Lost Lake Tract	34
Wetlands Surveyed in the Lake Chaplain Tract	39
Wetlands Surveyed on the Sultan River and vicinity	43
DISCUSSION AND CONCLUSIONS	49
REFERENCES	50
1	Acronyms

### List of Figures

Figure 1-1	Project Area for RSP 9 – Wetland Survey	2
Figure 4-1	Wetlands Rated for RSP 9 – Spada Lake & Williamson Creek Tracts	7
Figure 4-2	Wetlands Rated for RSP 9 – Lake Chaplain & Lost Lake Tracts	8
Figure 4-3	Wetlands Rated for RSP 9 – Lower Sultan River	9

#### List of Tables

Table 4-1	Wetlands Evaluated in This Study10
Table 4-2	Wetland Functional Rating Summary12
Table 4-3	Indicators of Lake Fringe Wetlands on Spada Lake that Affect Wetland Functions
Table 4-4	Indicators of Depressional and Riverine Wetlands on the Spada Lake and Williamson Creek Tracts that Affect Wetland Functions
Table 4-5	Indicators of Depressional Wetlands on the Lost Lake Tract that Affect Wetland Functions

Table 4-6	Indicators of Depressional Wetlands on the Lake Chaplain Tract that Affect Wetland Functions
Table 4-7	Indicators of Depressional Wetlands on the Sultan River and Vicinity that Affect Wetland Functions

#### **List of Appendices**

- Appendix A. Maps of Surveyed Wetlands
- Appendix B. Photographs of Surveyed Wetlands
- Appendix C. Response to Stakeholder Comments on Draft Report

#### List of Acronyms

Ecology	Washington Department of Ecology
FERC	Federal Energy Regulatory Commission
GIS	Geographic Information System
GPS	Global Positioning System
HEP	Habitat Evaluation Procedure
PUD	Public Utility District
RSP	Revised Study Plan
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
WDFW	Washington Department of Fish and Wildlife
WHMP	Wildlife Habitat Management Plan

## EXECUTIVE SUMMARY

The Public Utility District No. 1 of Snohomish County (District), as licensee of the Henry M. Jackson Hydroelectric Project (FERC No. 2157), is engaged in the Integrated Licensing Process prescribed by the Federal Energy Regulatory Commission to relicense the Project; the current license expires in May 2011. Wetland evaluations, mapping and Geographic Information System (GIS) database updates for wetlands within the Jackson Hydroelectric Project area have been conducted since 2004 and as part of the relicensing process. These activities are conducted as specified in Revised Study Plan 9: Wetland Surveys (Snohomish County PUD and City of Everett, 2006). The objective for the study is to continue to develop an understanding of the functions and values, current level of protection and opportunities for enhancement of wetlands within the Project area.

Wetlands are mapped using Global Positioning System equipment and aerial photo interpretation. Data are entered into the vegetation cover GIS data layer maintained by the District. The Washington State Wetlands Rating System for Western Washington (Hruby 2004) is used to classify and evaluate the functional values of each rated wetland. Three groups of functions are recognized: improving water quality, hydrologic functions such as storm water abatement, and wildlife habitat. Wetlands are scored in terms of the potential for performing a particular function, and the wetland's opportunity to perform that function.

Twenty-one wetlands were evaluated, ranging in size from 0.6 to 41.6 acres. The rating system facilitated standardized characterization of the wetlands and evaluation of their functional values, but actual rating scores may not reflect the apparent value of these remote, sometimes pristine wetlands. Although many of the wetlands have the potential to function well, they did not receive a high score in this system because they do not have the opportunity to improve water quality, or protect humans and their property from flooding and erosion. In terms of providing wildlife habitat, the wetlands are functioning well and remediation was not indicated.

The lake-fringe wetlands at Spada Lake developed in response to the fluctuating water levels, occupying the shoreline in places where water levels permit growth. Impacts of continued Project operation within the reservoir fluctuation zone will be negligible, because no change in operation is proposed. Impacts on lake-fringe wetlands vary annually based on rainfall and reservoir fluctuations.

Other, mostly depressional, wetlands that were evaluated in the Project area did not result from construction or operation of the Jackson Project. Project-related impacts to these wetlands are primarily related to importation of invasive weed species on vehicles.

## **1.0 STUDY OBJECTIVES AND DESCRIPTION**

Public Utility District No. 1 of Snohomish County (District), as licensee of the Henry M. Jackson Hydroelectric Project, FERC No. 2157 (Project), conducted wetland evaluations, mapping and GIS database updates for wetlands within the Project area (Figure 1-1). The objective of these evaluations is to develop an understanding of the functions and values, current level of protection and potential opportunities for enhancement of Project area wetlands. This evaluation process is being conducted as detailed in Revised Study Plan 9: Wetland Surveys (Snohomish County PUD and City of Everett 2006). Evaluations were conducted on lands within the Project boundary and Wildlife Habitat Management Plan (WHMP) tracts. The survey also included wetlands identified in Revised Study Plan 18 adjacent to the lower Sultan River that could be affected by changes of the instream flow regime.

Ongoing Project operation includes activities that may cause disturbance to soils, hydrology, and native plant communities. These activities include reservoir fluctuations, control of stream flow conditions, road maintenance, ground-disturbing forest management activities such as commercial thinning and harvest, and project-related recreation with potential for ground disturbance at sites such as day use areas, trailheads and unimproved trails. Each of these activities has the potential to affect the functions or values of wetlands through disturbance from increased recreational use, and the introduction of noxious and invasive non-native plants.

## 2.0 BACKGROUND INFORMATION

Construction of the Spada Lake reservoir (joint use for power production and municipal water supply) during Stage I and Stage II of the Jackson Project in 1965 and 1984 respectively, inundated about 1,900 acres of habitat in the Sultan River basin. To offset this loss, and in response to the FERC Order Approving Aquatic Resources Mitigation Plan and Requiring Revised Terrestrial Resource Mitigation Plan for Project No. 2157, issued on August 22, 1984 (28 FERC 62,249), the District worked with the City of Everett (co-licensee of the original Project [City]), U.S. Fish and Wildlife Service (USFWS), Washington Department of Wildlife (now Washington Department of Fish and Wildlife [WDFW]), U.S. Forest Service (USFS), and the Tulalip Tribes to develop the WHMP (Snohomish County PUD and City of Everett 1988). As requested by these agencies and the Tribes, the WHMP' goals were designed to:

- 1. Mitigate for the loss of terrestrial habitat by creating or enhancing habitat similar to that which was lost;
- 2. Provide mitigation lands in the vicinity of the lost habitat whenever possible;



- 3. Emphasize the following types of habitat in the management plan: (a) oldgrowth coniferous forest, (b) mature riparian forest, (c) wetlands and (d) young riparian forest; and
- 4. Compensate for the average annual habitat units lost to the Project, as estimated by the Habitat Evaluation Procedure (HEP) study conducted by the WDW in 1982.

As part of the WHMP development process, a HEP analysis was used to provide guidance on the adequacy of the draft plan and identify additional needs for the plan to make it acceptable to the wildlife agencies and the Tribes. Evaluation species were selected to represent habitat types in the Project area. The HEP indicated that the draft WHMP (which did not include 1,745 acres of terrestrial habitat in the Spada Lake Tract that was obtained in the 1991 land exchange and added to the WHMP) would provide full mitigation, over 140 percent for wetlands. Changes in the plan for the Lost Lake and Lake Chaplain tracts following the HEP analysis provided more mixed forest and wetlands, and the addition of land (a minimum of 700 acres was required, 1,745 acres were provided) in the Spada Lake Tract, significantly increased the mitigation for wetlands (see Section 6 of the WHMP for additional details).

The HEP analysis formed part of the basis for the negotiated agreement on the content of the WHMP. Since mitigation was not set to begin until the late 1980s, and as a proactive approach to meeting the requirements of the next license period (beginning in 2011), the WHMP was designed to account for impacts of Project construction and ongoing Project operation, and to provide mitigation benefits through 2060.

The WHMP was accepted by the wildlife agencies in 1988 and by FERC in 1989 (Order Approving with Modification Revised Wildlife Habitat Management Plan issued May 19, 1989). Since the Spada Lake Tract was acquired after the WHMP was formulated and accepted, a Spada Lake Tract Supplemental Plan (a detailed plan for the 1,745 acres of lands surrounding Spada Lake that were acquired in 1991), was created, and approved by the FERC in 1997 (Order Approving Wildlife Habitat Management Plan Supplement for the Spada Lake Tract Issued April 18, 1997). The 1997 supplemental plan was updated and approved by FERC in 2007. The goals of the plan include preserving water quality and wetlands.

The co-licensees (District and City) continue to consult with the wildlife agencies and Tribes regarding implementation of the WHMP and advise them of any proposed changes and improvements. Since its inception, the WHMP (including the Spada Supplement) has been subject to continual review and adaptive management, documented in Annual Reports and periodic meetings with resource agencies and Tribes.

The WHMP guides management of five tracts of land totaling approximately 7,070 acres (4,861 acres of land and 2,207 acres of reservoir and lake) (Figure 1-1). The District owns approximately 4,345 of these acres and the City of Everett owns approximately 2,688 acres. The remaining WHMP lands are secured through easements. The WHMP addresses all terrestrial vegetation types present within the Project area, including

wetlands. Mitigation measures in the WHMP are designed to protect wetland habitats. The WHMP goals for managing wetlands include the protection of wetland, lake, and stream habitat and requirements for buffer zones around these features. The Lost Lake Tract was purchased to protect the lake, bog/wetlands and uplands from development. Wetland buffer zones are implemented to protect the quality of wetlands and provide edge habitat. Wetland buffers required by the WHMP vary from 200 to 500 feet.

Progress reports are provided to the resource agencies and Tribes annually and to the FERC at 5-year intervals. All of the annual reports are available on the District's relicensing web site (<u>http://www.snopud.com/WaterResources/relicensing.ashx?p=2334</u>).

In addition to the requirements of the WHMP and Spada Supplement, the District began surveying wetlands on Project lands in 2004 and proposed to continue their survey and mapping effort during the relicensing process. No formal stakeholder comments were received on the Proposed Study Plan or Revised Study Plan 9, which uses the Washington State Wetland Rating System for Western Washington (Hruby 2004).

## 3.0 METHODS

The wetlands study area consists of the entire Project area (including the Project Boundary and Project lands addressed by the WHMP) and land adjacent to the lower Sultan River that could be affected by changes to the instream flow regime (Figure 1-1). Wetlands were identified for this study from several sources:

- Jackson Project GIS data base vegetation cover type layer for lands managed under the WHMP, developed by the District
- Results of Study Plan 18 (Stillwater Sciences & Meridian Environmental 2008)
- Aerial photo interpretation of color orthophotos from DNR/Snohomish county flights in 2003 and 2007
- Field reconnaissance

Some wetlands were mapped using GPS equipment with sub-meter accuracy (Trimble GeoXH) and others were mapped through photo interpretation. Wetland polygons were entered into the vegetation cover GIS data layer maintained by the District.

The District used the Washington State Wetlands Rating System for Western Washington methods (Hruby 2004) to classify and evaluate the functional quality and values of each wetland. The rating system categorizes wetlands by their location and physical features and rates their functions in terms of water quality, floodwater abatement, and wildlife habitat. This system was developed for use by agencies and local jurisdictions in Washington.

The wetlands were evaluated by District biologists who are experienced in rating wetlands using this system and were trained by Ecology in its use. Ratings were

completed for all wetlands that are located immediately adjacent to Project facilities, have a hydrologic connection to Project reservoirs, or are within the floodplain of the Sultan River below Culmback Dam (and have the potential to be influenced by the operation of the project depending on their location relative to the river and their connectivity to the river). Wetlands at these locations could be affected by potential changes in Project operations, reservoir levels, or instream flow requirements. Other wetlands exist adjacent to the study area, but would not be affected by operations of the Jackson Project; thus, were not evaluated in this study.

A series of standard field form questionnaires (Hruby, 2004) are used to identify functional and value attributes for different types of wetlands which produces an index score used to place a wetland into one of the four rating categories. The first step of the rating system is to define the boundary of the wetland and identify it by its hydrogeomorphic category; 1) depressional or flat wetland, 2) riverine or freshwater tidal fringe wetland, 3) lake-fringe wetland, or 4) slope wetland. The second step of the rating system is to evaluate and score the wetland for its water quality functions, hydrologic functions, and habitat functions. The scoring system is based on a series of questions related to observable indicators that are correlated to how the wetland performs each function. One set of indicators reflects the potential that a wetland has to perform a particular function. Scores for potential functioning may range from 0 to 9, depending on the indicator(s) in question. Another set of indicators reflects the opportunity that a wetland has to perform the same function. For hydrologic and water quality functions, possible opportunity scores are either 2 (there is an opportunity for the wetland to perform the function) or 1 (there is no opportunity for the wetland to perform the function). Opportunity scores are used as multipliers for potential scores for these functions. Thus, a wetland with both potential and opportunity to perform a function would have a total score twice as large as a wetland with the same potential but no opportunity. Habitat functions consist of the sum of potential and opportunity scores. The total score, out of 100 possible points for depressional or riverine wetlands, and 72 points for riverine wetlands (Table 4-2), determines category of the wetland.

Four categories of wetlands are identified using this rating system:

- Category I wetlands are those that 1) represent a unique or rare wetland type; 2) are more sensitive to disturbance than most wetlands; 3) are relatively undisturbed and contain ecological attributes that are impossible to replace within human lifetime; or 4) provide a high level of functions.
- Category II wetlands are difficult, though not impossible, to replace and provide high levels of some functions.
- Category III wetlands are 1) wetlands with a moderate level of functions; or 2) interdunal wetlands between 0.1 and 1 acre in size. These wetlands have generally been disturbed in some way, and are often less diverse or more isolated from other natural resources in the landscape than Category II wetlands.

• Category IV wetlands have the lowest level of functions and are often heavily disturbed. These are wetlands that can often be replaced, and in some cases be improved.

Wetland complexes were evaluated as sub-units based on changes in the water regime, using the standards described in the wetland rating system for linear wetlands contiguous with a stream or river (Hruby 2004). Wetlands suited to subdivision include those affected by a weir or dam, a series of rapids, or the effect of a tributary stream that increases the flow significantly. A wetland evaluation report was prepared for each wetland or sub-unit; each report includes a completed wetland rating form, field observation notes, maps and photos of the wetland, and the field surveyors' interpretation of the function and values of the wetland. The biologists noted all observed wetland plant species on the data forms. These forms are available upon request.

## 4.0 RESULTS

Twenty-one wetlands were evaluated on the Spada Lake, Lost Lake and Lake Chaplain Tracts, and on the upper Sultan River and lower Sultan River (Figures 4-1 through 4-3 and Appendix A). The sizes and classifications of these wetlands are summarized in Table 4-1 and their functional ratings under the Hruby (2004) system are summarized in Table 4-2. Wetlands ranged in size from a small depressional wetland (Wetland 14 - 0.6 ac.) located slightly upstream from the shoreline of Spada Lake to the large wetland south of the Lake Chaplain water treatment plant (Wetland 5 - 41.6 ac.) and Marsh Creek wetland (Wetland 18 – over 93 ac.). Several wetlands are complexes that were subdivided into smaller sub-units based on changes in the water regime along their length. On Jackson Project lands, wetlands 4, 5, 9, 10, 12 and 20 fall into this situation because they consist of a complex of pools and beaver dams. They were divided into pool-dam units, and the largest (or most representative) units in the wetland complex were evaluated. The outlets of two wetlands on the lower Sultan River (Wetlands 17 and 19) are controlled by beaver dams also, but it was not necessary to subdivide these wetlands because only one beaver dam was present on each.

All of the beaver-dam complexes were rated as depressional with the exception of one unit of Wetland 12, in which riverine wetland characteristics were dominant (>90%). The bog surrounding Lost Lake (Wetland 2) and Wetland 3, also on the Lost Lake Tract, are examples of wetlands that formed in topographic depressions. Wetland 2 rated the highest score (Category I) because it is a pristine bog. Wetland ratings for the other, mostly depressional, wetlands varied between Category II and Category III. Typically these wetlands scored relatively higher as wildlife habitat than they did for the water quality preservation hydrologic functions they provide.







Wetland #	Field Visit Date	Management Tract	Mgt. Unit	Name/Location Wetland Size (acre		Wetland Class	Amphibian Survey Site***
1	8/11/04	Spada lake	9-105	South Shore Recreation Site Wetland	11.4	Lake-fringe	SL-2
2	6/28/04	Lost Lake	7-5A	Lost Lake Wetland (edge of lake)	25.6	Bog/Depressiona I	WS-1
3	7/8/04	Lost Lake	7-1	Lost Lake Tract SW corner	7.5	Depressional	
4	7/1/04	Spada lake	9-119	Sub-Unit A. South Shore Road Wetland Complex (between South Shore and Nighthawk Rec. Sites)	2.5*	Depressional	WS-4
4	7/1/04 7/24/07	Spada Lake	9-119	Sub-unit B. South Shore Road * Wetland Complex (between South Shore and Nighthawk Rec. Sites)		Depressional	
5	8/31/07	Lake Chaplain	5-14	Sub-unit A. Chaplain Marsh Wetland Complex	41.6*	Depressional	WC-2
5	8/31/07	Lake Chaplain	5-14	Sub-unit B. Chaplain Marsh Wetland Complex	*	Depressional	
5	8/31/07	Lake Chaplain	5-14	Sub-unit C. Chaplain Marsh Wetland Complex	*	Depressional	
6	7/30/04	Spada Lake	10-10/10- 11	Williamson Creek Wetland (east of road)	3.0	Depressional	WW-1
7**	8/4/05	Spada Lake	9-14	Williamson Creek Arm Wetland	3.0	Lake-fringe	WS-5
8	8/15/05	Spada Lake	9-73	North Fork Arm Wetland	8.5	Lake-fringe	SL-5
9	8/19/05 9/7/07	Spada lake	9-184	Sub-unit A. Upper South Shore Recreation Site Wetland Complex	1.9*	Depressional	WS-3

#### Table 4-1. Wetlands Evaluated in This Study

Wetland #	Field Visit Date	Management Tract	Mgt. Unit	Name/Location Wetland Size (acres)		Wetland Class	Amphibian Survev Site***
9	8/19/05 9/7/07	Spada Lake	9-184	Sub-unit B. Upper South Shore Recreation Site Wetland Complex	*	Depressional	
9	8/19/05 9/7/07	Spada Lake	9-184	Sub-unit C. Upper South Shore Recreation Site Wetland Complex	*	Depressional	
9	8/19/05 9/7/07	Spada Lake	9-184	Sub-unit D. Upper South Shore Recreation Site Wetland Complex	*	Depressional	
10	9/14/05 8/28/07	Spada Lake	9-85	North Shore Wetland	3.3	Depressional	WS-6
11	9/12/06	Spada Lake	9-95	North Fork, South Shore Wetland	3.3	Lake-fringe	SL-3
12	7/26/06 8/6/07	Lost Lake	7-5B	Sub-unit A. Lost Lake (west of ford)	3.6*	Depressional	
12	7/26/06 8/6/07	Lost Lake	7-5B	Sub-unit B. Lost Lake (west of ford)	*	Riverine	
14	8/28/07	Spada Lake	9-160	South Fork Wetland 1	0.6	Depressional	WS-1
15	8/29/07	Spada Lake	9-188	South Shore Wetland 1	1.5	Lake-fringe	
16	8/29/07	Spada Lake	9-182	South Shore Wetland 2	3.4	Lake-fringe	SL-1
17	6/16/08	Sultan River		Oxbow 7	6.6	Depressional	SR-5
18	6/10/08	Sultan River		Marsh Creek	94 (5.4 rated)	Depressional	WP-1
19	7/8/08	Sultan River	N/A	Oxbow 5	0.5	Depressional	
20	7/15/08	Spada Lake		South Fork Wetland Complex	3.2	Depressional	WS-2
21	7/17/08	Sultan River	N/A	6122 Road Wetland	1.0	Depressional	

Wetland #	Field Visit	Management	Mgt. Unit	Name/Location	Wetland	Wetland Class	Amphibian
1	Date	Tract			Size (acres)		Survey Site***

<sup>\*</sup>Acreage of all wetland units in each complex is listed for Sub-unit A of the complex.

\*\*Wetland 7 was first rated in August 2005 when water levels were at 1437ft MSL. When biologists rated Wetland 13 in September 2006 the water level was at 1408 ft MSL and the wetlands were connected, so they have been combined as one wetland.

\*\*\*Corresponding RSP 10 amphibian survey site. Source: Devine Tarbell & Associates, Inc. 2008. Amphibian Survey. Draft Final Technical Report. Submitted by Devine Tarbell & Associates, Inc., Bellingham, WA. Submitted to Snohomish Co. PUD No. 1, Everett, WA. 35 pp. + appendices.

# Table 4-2. Wetland Functional Rating Summary (See footnote for total possible scores for each function)

Wetland #	Name/Location	Wetland Class	Water Quality Score*	Hydrologic Score*	Habitat Score*	Total Score All Functions*	Wetland Category
1	South Shore Recreation Site Wetland	Lake-fringe	12	8	23	43	Ш
2	Lost Lake Wetland (edge of lake)	Bog/Depres- sional	11	10	31	52	I
3	Lost Lake Tract SW corner	Depressional	15	28	26	65	Π
4	Unit A. South Shore Road Wetland Complex (between South Shore and Nighthawk Rec. Sites)	Depressional	8	3	26	37	111
4	Unit B. South Shore Road Wetland Complex (between South Shore and Nighthawk Rec. Sites)	Depressional	10	13	29	55	11
5	Unit A. Chaplain Marsh Wetland Complex	Depressional	10	6	30	46	
5	Unit B. Chaplain Marsh Wetland Complex	Depressional	9	6	32	47	III
5	Unit C. Chaplain Marsh Wetland Complex	Depressional	12	16	25	53	Ι
6	Williamson Creek Wetland (east of road)	Depressional	11	5	31	47	Ш
7 and 13**	Williamson Creek Arm Wetland	Lake-fringe	12	8	24	44	
8	North Fork Arm Wetland	Lake-fringe	12	8	25	45	=

Wetland #	Name/Location	Wetland Class	Water Quality Score*	Hydrologic Score*	Habitat Score*	Total Score All Functions*	Wetland Category
9	Unit A. Upper South Shore Recreation Site Wetland Complex	Depressional	8	3	29	41	Ш
9	Unit B. Upper South Shore Recreation Site Wetland Complex	Depressional	10	8	29	47	Ш
9	Unit C. Upper South Shore Recreation Site Wetland Complex	Depressional	8	3	25	36	111
9	Unit D. Upper South Shore Recreation Site Wetland Complex	Depressional	12	3	26	41	Ш
10	North Shore Wetland	Depressional	8	3	27	38	III
11	North Fork, South Shore Wetland	Lake-fringe	10	8	19	37	Ш
12	Unit A. Lost Lake (west of ford)	Depressional	12	5	27	44	III
12	Unit B. Lost Lake (west of ford)	Riverine	16	22	29	67	Ш
14	South Fork Wetland 1	Depressional	8	5	20	33	III
15	South Shore Wetland 1	Lake-fringe	12	4	22	38	III
16	South Shore Wetland 2	Lake-fringe	12	12	23	47	III
17	Oxbow 7	Depressional	20	6	28	54	II
18	Marsh Creek Depre		12	14	30	56	II
19	Oxbow 5 Depre		20	6	29	55	II
20	South Fork Wetland Complex	Depressional	6	0	26	32	III
21	6122 Road Wetland	Depressional	8	12	27	47	

\* Total possible scores for depressional wetlands: Water Quality Functions 32, Hydrologic Functions 32, Habitat Functions 36; All functions 100.
 Total possible scores for lake-fringe wetlands: Water Quality Functions 24, Hydrologic Functions 12, Habitat Functions 36; All functions 72.
 Total possible scores for riverine wetlands: Water Quality Functions 32, Hydrologic Functions 32, Habitat Functions 36; All functions 72.
 Total possible scores for riverine wetlands: Water Quality Functions 32, Hydrologic Functions 32, Habitat Functions 36; All functions 100.
 \*\* Wetlands 7 and 13 were originally evaluated separately at high reservoir pool, but they are actually connected at lower reservoir levels.

## 4.1 WETLANDS SURVEYED IN THE SPADA LAKE AND WILLIAMSON CREEK TRACTS

Wetlands 1, 4, 6, 7, 8, 9, 10, 11, 14, 15, 16, and 21 (Tables 4-1 and 4-2, see maps in Appendix A) are located in the Spada Lake and Williamson Creek Tracts. Wetlands surveyed in these tracts included lake-fringe wetlands and depressional wetlands.

#### 4.1.1 Lake-fringe Wetlands

Six lake-fringe wetlands are present on the shoreline of Spada Lake in shallows on the South Fork, the South Shore and the east end of the reservoir, including the Williamson Creek arm of the reservoir. These wetlands are generally emergent and scrub/shrub types, including Wetlands 1, 7, 8, 11, 15, and 16. Indicators of their wetland functions that were used to rate them are summarized in Table 4-3. Dominant emergent species in the lake-fringe wetland include smallfruited bulrush (Scirpus microcarpus) and other grass species; where a scrub/shrub-shrub component is present the dominant species is Pacific willow (Salix lucida var. lasiandra). Reed canarygrass (Phalaris arundinacea) is present in most of these wetlands. Some other lake-fringe wetlands were too small to survey using the wetlands rating technique, but possess similar vegetation classes and species composition. The South Fork and portions of the southern shoreline and east end of the reservoir are gently sloped and tend to accumulate woody debris; these sites in particular support large stands of reed canarygrass. Two large wetlands (Wetlands 8 and 11) support emergent herbaceous species including sedges (Carex sp), horsetail (Equisetum sp), western yellow cress (Rorippa curvisiliqua), water pepper (Polyganum hydropiperoides), and reed canarygrass that extend well into the reservoir below the full pool water level. The lowest portions of these wetlands are exposed during low water periods of late summer and fall. At higher elevations the wetlands support willow (Salix sp) and black cottonwood (*Populus balsamifera var. trichocarpa*) in addition to grasses, rushes, and sedges.

Lake-fringe wetlands respond to the reservoir's water levels, and the lowest level at which vegetation will survive may vary each year as a function of the time and duration of high water levels. Lake-fringe wetlands at Spada Lake were rated as Category III. In general their water quality functions received low scores because they are in a remote location and do not have the opportunity to protect downstream water quality. Thus the multiplier for indicators of potential functions was only 1, rather than 2. Wetlands upstream from dams also lack the opportunity to perform downstream hydrologic functions, although the Spada Lake wetlands were given credit for reducing shoreline erosion and sedimentation in the reservoir. Habitat scores were higher than water quality or hydrology scores, but still were only moderate values. The lake-fringe wetlands are growing under an adverse water regime, in which high water occurs during the growing season and inundates the plants, thus plant species richness is less diverse, and habitat function scores are reduced. These wetlands may be isolated from other natural resources in the landscape (such as riparian corridors, other wetlands, or forested habitats). As a group, lake-fringe wetlands scored 32 to 45 points out of a possible 100 points for all three wetland functions.

Wetland #	Name/Location	Wetland Category	Water Quality Function	Hydrologic Function	Habitat Function			
1	South Shore Recreation Site Wetland	111	Width of vegetation is > 33 ft. Herbaceous plants >90% of the area No opportunity to improve water quality	<ul> <li>&gt;3/4 of fringe vegetation is shrubs or trees at least 33 ft. wide.</li> <li>Opportunity to reduce shoreline erosion</li> </ul>	<ul> <li>3 vegetation classes: AB, EM, SS<sup>1</sup></li> <li>Lake-fringe hydroperiod</li> <li>Moderate species richness<sup>2</sup></li> <li>High interspersion of habitats</li> <li>3 Special habitat features: CWD<sup>3</sup>, snags, amphibian habitat</li> <li>Good buffer condition. Good connections to other habitats</li> <li>1 WDFW Priority habitat</li> <li>1 other wetland within ½ mile</li> </ul>			
<sup>1</sup> Vegetation classes: AB = aquatic bed, EM= emergent, SS = scrub/shrub, FO = forested <sup>2</sup> Species richness: High >19 species, moderate 5 – 19 species, low < 5 species <sup>3</sup> CWD = coarse woody debris								

### Table 4-3. Indicators of Lake-fringe Wetlands on Spada Lake that Affect Wetland Functions

Wetland	Name/Location	Wetland Category	Water Quality Function	Hydrologic Function	Habitat Function
#		outogory			
8	North Fork Arm Wetland	111	Width of vegetation > 33 ft. Herbaceous plants >90% of the area No opportunity to improve water quality	<ul> <li>&gt;1/4 of fringe vegetation is shrubs or trees at least 33 ft. wide.</li> <li>Opportunity to reduce shoreline erosion</li> </ul>	<ul> <li>3 vegetation classes: EM, SS, FO<sup>1</sup></li> <li>Lake-fringe hydroperiod</li> <li>Moderate species richness<sup>2</sup></li> <li>High interspersion of habitats</li> <li>3 Special habitat features: CWD<sup>3</sup>, snags, steep banks</li> <li>Good buffer condition. Good connections to other habitats</li> <li>1 WDFW Priority habitat</li> </ul>
<sup>1</sup> Vegetati	ion classes: AB -	= aquatic be	ed EM= emergent SS = scrub	/shrub FO = forested	1 other wetland within ½ mile
$^{2}$ Species	richness: High >	- aquatic be	moderate $5 - 19$ species low	< 5 species	
$^{3}$ CWD =	= coarse woody de	ebris			

Wetland #	Name/Location	Wetland Category	Water Quality Function	Hydrologic Function	Habitat Function		
11	North Fork South Shore	111	Width of vegetation > 33 ft.	>1/4 of fringe vegetation is shrubs or trees at least 33 ft.	2 vegetation classes: EM, SS <sup>1</sup>		
	Wetland		Herbaceous plants >90% of the area	wide.	Lake-fringe hydroperiod		
			No opportunity to improve	Opportunity to reduce shoreline erosion	Moderate species richness <sup>2</sup>		
			water quality		Moderate interspersion of habitats		
					2 Special habitat features: CWD <sup>3</sup> , amphibian habitat		
					Good buffer condition. Good connections to other habitats		
					No WDFW Priority habitat		
					1 other wetland within ½ mile		
<sup>1</sup> Vegetati	<sup>1</sup> Vegetation classes: $AB = aquatic bed$ , $EM = emergent$ , $SS = scrub/shrub$ , $FO = forested$						
<sup>2</sup> Species	richness: High >	19 species,	moderate $5 - \overline{19}$ species, low	< 5 species			
$^{3}$ CWD =	coarse woody de	ebris					

Wetland #	Name/Location	Wetland Category	Water Quality Function	Hydrologic Function	Habitat Function
7	Williamson Creek Arm North Wetland	111	Width of vegetation > 33 ft. Herbaceous plants >90% of the area No opportunity to improve water quality	<ul> <li>&gt;1/4 of fringe vegetation is shrubs or trees at least 33 ft. wide.</li> <li>Opportunity to reduce shoreline erosion</li> </ul>	<ul> <li>2 vegetation classes: EM, SS<sup>1</sup></li> <li>Lake-fringe hydroperiod</li> <li>Moderate species richness<sup>2</sup></li> <li>Moderate interspersion of habitats</li> <li>2 Special habitat features: CWD<sup>3</sup>, snags</li> <li>Good buffer condition. Good connections to other habitats</li> <li>1 WDFW Priority habitat</li> </ul>
					3 other wetlands within ½ mile
<sup>1</sup> Vegetation classes: AB = aquatic bed, EM= emergent, SS = scrub/shrub, FO = forested <sup>2</sup> Species richness: High >19 species, moderate 5 – 19 species, low < 5 species <sup>3</sup> CWD = coarse woody debris					

Wetland #	Name/Location	Wetland Category	Water Quality Function	Hydrologic Function	Habitat Function
16	South Shore Wetland 2	111	Width of vegetation > 33 ft.	>3/4 of fringe vegetation is shrubs or trees at least 33 ft.	2 vegetation classes: EM, SS <sup>1</sup>
			Herbaceous plants >90% of the area	wide.	Lake-fringe hydroperiod
			No opportunity to improve	Opportunity to reduce shoreline erosion	Moderate species richness <sup>2</sup>
			water quality		High interspersion of habitats
					4 Special habitat features: CWD <sup>3</sup> , snags, amphibian habitat, <25% invasive plants
					Good buffer condition. Good connections to other habitats
					1 WDFW Priority habitat
					1 other wetland within ½ mile
<sup>1</sup> Vegetati	on classes · AB =	= aquatic be	d EM = emergent SS = scrub	FO = forested	
$^{2}$ Species	richness: High >	19 species	moderate $5 - 19$ species low	< 5 species	
$^{3}$ CWD =	coarse woodv de	ebris	1) species, 10w		

Wetland	Name/Location	Wetland Category	Water Quality Function	Hydrologic Function	Habitat Function
#		catogoty			
15	South Shore Wetland 1	111	Width of vegetation > 33 ft.	Vegetation is at least 6 ft. wide.	1 vegetation class EM <sup>1</sup>
			Herbaceous plants >90% of the area	Opportunity to reduce shoreline erosion	Lake-fringe hydroperiod
			No opportunity to improve		Moderate species richness <sup>2</sup>
			water quality		Low interspersion of habitats
					4 Special habitat features: CWD <sup>3</sup> , snags, amphibian habitat, <25% invasive plants
					Good buffer condition. Good connections to other habitats
					1 WDFW Priority habitat
					3 other wetlands within 1/2 mile
<sup>1</sup> Vegetat	ion classes: AB =	= aquatic be	ed, EM= emergent, SS = scrub	b/shrub, FO = forested	1
<sup>2</sup> Species	richness: High >	19 species.	moderate $5 - 19$ species, low	< 5 species	
$^{3}$ CWD =	coarse woody de	ebris	<b>1</b> /	*	

#### 4.1.2 Depressional Wetlands

Six of the rated wetlands (Wetlands 4, 6, 9, 10, 14 and 20) in the Spada Lake Tract are depressional wetlands (Table 4-4), five of which were treated as wetland complexes because they include a series of ponds created by beaver dams. Because each dam is responsible for ponding and maintaining water levels, each dam/pond/wetland unit is considered a separate depressional wetland in the Washington Wetland Rating System (Hruby 2004). For this study, representative wetlands were selected for evaluation. Depressional wetlands contribute flow to Spada Lake but do not receive hydrologic input from the lake. Beaver ponds that are maintained are normally filled with water and do not offer much storage capacity. Therefore, water quality and hydrologic functions are generally low, and in this remote location the multipliers for these functions are generally 1 (i.e., no opportunity to perform the function). Habitat function scores were considerably higher than water quality or hydrologic function scores in these wetlands because they possess plant species diversity and vegetation structural diversity. Scrub/shrub zones include Pacific willow, salmonberry (Rubus spectabilis), elderberry (Sambucus racemosa), Indian plum (Oemleria cerasiformis), hemlock (Tsuga heterophylla) seedlings, and devil's club (Oplopanax horridus). The emergent zones include toad rush (Juncus bufonius), sedges, smallfruited bulrush, soft rush (Juncus effuses), lady fern (Athyrium filix-femina) and grasses. Where an aquatic bed community is present, Valisneria, algae and other aquatic plants are present.

Wetland 4 is a complex of beaver dams and pools adjacent to the South Shore Road on a tributary that flows toward Spada Lake. At the road, the wetland supports a number of noxious weeds, including thistles and tansy ragwort, but also a variety of native sedges and rushes are present, in addition to a scrub/shrub component. The Wetland 9 complex was also formed by beaver activity on a South Shore tributary of Spada Lake.

Wetland 20 is a complex fed by groundwater and several streams that flow down terraces on the reservoir shoreline on the South Fork Sultan River, and are controlled by numerous (>10) beaver dams. The southeast portion of the wetland complex receives groundwater from the south with no apparent surface flow, plus some seasonal inundation from the reservoir in early summer. Thus, this portion of the wetland has both depressional and lake-fringe characteristics. The remainder of this wetland complex is controlled by beaver dams, and therefore is classified as a series of depressional wetlands. The field survey did not identify a dividing line between this wetland and the beaver-dam depressional wetland, and the entire complex was evaluated as depressional.

# Table 4-4. Indicators of Depressional and Riverine Wetlands on the Spada Lake and Williamson Creek Tracts that Affect Wetland Functions

Wetland #	Name/Location	Wetland Category	Water Quality Function	Hydrologic Function	Habitat Function
4	South Shore Road Wetland Complex Unit A	111	Unconstricted <sup>1</sup> surface outlet (beaver dam) Persistent vegetation > 1/2 of area Seasonal ponding <1/4 total area No opportunity to improve water quality	Unconstricted <sup>1</sup> surface outlet (beaver dam) Marks of ponding <0.5 ft. Upstream basin is 10 to 100 times area of the wetland No opportunity to reduce flooding and erosion	<ul> <li>2 vegetation classes: EM, SS<sup>2</sup></li> <li>2 hydroperiods: PF, SO<sup>3</sup></li> <li>High species richness<sup>4</sup></li> <li>High interspersion of habitats</li> <li>Special habitat features: CWD<sup>5</sup>, snags, amphibian habitat, &lt;25% invasive plants</li> <li>Good buffer condition. Good connections to other habitats</li> <li>1 WDFW Priority habitat</li> <li>3 other wetlands within ½ mile</li> </ul>
<sup>1</sup> Beaver <sup>2</sup> Vegetat	dams are permeal ion classes: AB =	ble, and are = aquatic be	considered unconstricted or s ed, EM= emergent, SS = scrub	lightly constricted permanently b/shrub, FO = forested	flowing outlets.
<sup>3</sup> Hydroperiods: $PF =$ permanently flooded, $SF =$ seasonally flooded, $OF =$ occasionally flooded, $SO =$ saturated only, $PFS =$					
permaner	itly flowing strea	m 10 ·			
<sup>5</sup> CWD =	ricnness: High > = coarse woody de	ebris	moderate 5 – 19 species, low	< 5 species	

Wetland #	Name/Location	Wetland Category	Water Quality Function	Hydrologic Function	Habitat Function
4	South Shore Road Wetland Complex Unit B Rated as Riverine	111	Depressions cover ¾ area of wetland Trees or shrubs >2/3 areas of the wetland No opportunity to improve water quality	Moderately high overbank storage Shrubs cover 1/3 of area. No opportunity to reduce flooding and erosion	<ul> <li>2 vegetation classes: EM, SS<sup>1</sup></li> <li>4 hydroperiods: PF, OF, SO, PFS<sup>2</sup></li> <li>High species richness<sup>3</sup></li> <li>High interspersion of habitats</li> <li>5 Special habitat features: CWD<sup>4</sup>, snags, undercut banks, amphibian habitat, &lt;25% invasive plants</li> <li>Good buffer condition. Good connections to other habitats</li> <li>1 WDFW Priority habitat</li> <li>3 other wetlands within ½ mile</li> </ul>
<sup>1</sup> Vegetation classes: AB = aquatic bed, EM= emergent, SS = scrub/shrub, FO = forested <sup>2</sup> Hydroperiods: PF = permanently flooded, SF = seasonally flooded, OF = occasionally flooded, SO = saturated only, PFS = permanently flowing stream, SFS = seasonally flowing stream <sup>3</sup> Species richness: High >19 species, moderate 5 – 19 species, low < 5 species <sup>4</sup> CWD = coarse woody debris					

Wetland #	Name/Location	Wetland Category	Water Quality Function	Hydrologic Function	Habitat Function
6	Williamson Creek Wetland (east of road)		Highly constricted surface outlet Persistent vegetation > 95% of area Seasonal ponding >1/2 total area No opportunity to improve water quality	Intermittently flowing, or highly constricted outlet Marks of ponding at least 6 in. from surface. Upstream basin is > 100 times area of the wetland No opportunity to reduce flooding and erosion	2 vegetation classes: EM, SS <sup>1</sup> 4 hydroperiods: SF, OF, PFS, SFS <sup>2</sup> High species richness <sup>3</sup> High interspersion of habitats 5 Special habitat features: CWD <sup>4</sup> , snags, steep banks, amphibian habitat, <25% invasive plants
					Good buffer condition. Good connections to other habitats 2 WDFW Priority habitats 3 other wetlands within ½ mile
<sup>1</sup> Vegetation classes: AB = aquatic bed, EM= emergent, SS = scrub/shrub, FO = forested <sup>2</sup> Hydroperiods: PF = permanently flooded, SF = seasonally flooded, OF = occasionally flooded, SO = saturated only, PFS = permanently flowing stream, SFS = seasonally flowing stream <sup>3</sup> Species richness: High >19 species, moderate 5 – 19 species, low < 5 species <sup>4</sup> CWD = coarse woody debris					

Wetland #	Name/Location	Wetland Category	Water Quality Function	Hydrologic Function	Habitat Function	
9	Upper South Shore Recreation Site Wetland Complex Unit A	111	Unconstricted surface outlet (beaver dam) <sup>1</sup> Persistent vegetation > 50% of area Seasonal ponding <1/4 total area No opportunity to improve water quality	Unconstricted surface outlet (beaver dam) <sup>1</sup> Marks of ponding <0.5 ft. Upstream basin I> 100 times area of the wetland No opportunity to reduce flooding and erosion	<ul> <li>3 vegetation classes: AB,EM, SS<sup>2</sup></li> <li>4 hydroperiods :PF, SF, SO, PFS<sup>3</sup></li> <li>High plant species richness<sup>4</sup></li> <li>High interspersion of habitats</li> <li>3 Special habitat features: CWD<sup>5</sup>, snags, &lt;25% invasive plants</li> <li>Good buffer condition, good connections to other habitats</li> <li>1 WDFW Priority habitat</li> <li>1 other wetland within ½ mile</li> </ul>	
<sup>1</sup> Beaver dams are permeable, and are considered unconstricted or slightly constricted permanently flowing outlets. <sup>2</sup> Vegetation classes: AB = aquatic bed, EM= emergent, SS = scrub/shrub, FO = forested <sup>3</sup> Hydroperiods: PF = permanently flooded, SF = seasonally flooded, OF = occasionally flooded, SO = saturated only, PFS = permanently flowing stream <sup>4</sup> Species richness: High >19 species, moderate 5 – 19 species, low < 5 species						

Wetland #	Name/Location	Wetland Category	Water Quality Function	Hydrologic Function	Habitat Function	
9	Upper South Shore Recreation Site Wetland Complex Unit B	111	Highly constricted surface outlet (culverts) Persistent vegetation > 50% of area Seasonal ponding >1/4 total area No opportunity to improve water quality	Highly constricted surface outlet (culverts) Marks of ponding at least 0.5 to 2 ft . Upstream basin I0 to 100 times area of the wetland No opportunity to reduce flooding and erosion	<ul> <li>2 vegetation classes: AB,EM, <sup>1</sup></li> <li>2 hydroperiods :PF, SF<sup>2</sup></li> <li>High plant species richness<sup>3</sup></li> <li>High interspersion of habitats</li> <li>4 Special habitat features: CWD<sup>4</sup>, snags, amphibian habitat, &lt;25% invasive plants</li> <li>Good buffer condition, good connections to other habitats</li> <li>1 WDFW Priority habitat</li> <li>3 other wetlands within ½ mile</li> </ul>	
<sup>1</sup> Vegetation classes: AB = aquatic bed, EM= emergent, SS = scrub/shrub, FO = forested <sup>2</sup> Hydroperiods: PF = permanently flooded, SF = seasonally flooded, OF = occasionally flooded, SO = saturated only, PFS = permanently flowing stream <sup>3</sup> Species richness: High >19 species, moderate 5 – 19 species, low < 5 species <sup>4</sup> CWD = coarse woody debris						

Wetland #	Name/Location	Wetland Category	Water Quality Function	Hydrologic Function	Habitat Function	
9	Upper South Shore Recreation Site Wetland Complex Unit C	111	Unconstricted surface outlet (beaver dam) <sup>1</sup> Persistent vegetation <1/10th of area Seasonal ponding >1/4 of	Unconstricted surface outlet (beaver dam) <sup>1</sup> Marks of ponding <0.5 ft. Upstream basin 10 to 100 times area of the wetland	3 vegetation classes: AB,EM, SS <sup>2</sup> 4 hydroperiods :PF, SF, SO, PFS <sup>3</sup> High plant species richness <sup>4</sup>	
			area No opportunity to improve water quality	No opportunity to reduce flooding and erosion	<ul> <li>High interspersion of habitats</li> <li>3 Special habitat features: CWD<sup>5</sup>, snags, &lt;25% invasive plants</li> <li>Good buffer condition, good connections to other habitats</li> <li>1 WDFW Priority habitats</li> <li>1 other wetland within ½ mile</li> </ul>	
<ul> <li><sup>1</sup>Beaver dams are permeable, and are considered unconstricted or slightly constricted permanently flowing outlets.</li> <li><sup>2</sup>Vegetation classes: AB = aquatic bed, EM= emergent, SS = scrub/shrub, FO = forested</li> <li><sup>3</sup>Hydroperiods: PF = permanently flooded, SF = seasonally flooded, OF = occasionally flooded, SO = saturated only, PFS = permanently flowing stream</li> <li><sup>4</sup>Species richness: High &gt;19 species, moderate 5 – 19 species, low &lt; 5 species</li> </ul>						

Wetland #	Name/Location	Wetland Category	Water Quality Function	Hydrologic Function	Habitat Function	
9	Upper South Shore Recreation Site Wetland Complex Unit D	111	Unconstricted surface outlet (beaver dam) <sup>1</sup> Persistent vegetation >95% of area Seasonal ponding >1/4 of area No opportunity to improve water quality	Unconstricted surface outlet (beaver dam) <sup>1</sup> Marks of ponding <0.5 ft. Upstream basin 10 to 100 times area of the wetland No opportunity to reduce flooding and erosion	<ul> <li>2 vegetation classes: AB,EM<sup>2</sup></li> <li>2 hydroperiods :PF, SF<sup>3</sup></li> <li>High plant species richness<sup>4</sup></li> <li>High interspersion of habitats</li> <li>4 Special habitat features: CWD<sup>5</sup>, steep banks, &lt;25% invasive plants</li> <li>Good buffer condition, good connections to other habitats</li> <li>1 WDFW Priority habitats</li> <li>3 other wetlands within ½ mile</li> </ul>	
<sup>1</sup> Beaver dams are permeable, and are considered unconstricted or slightly constricted permanently flowing outlets. <sup>2</sup> Vegetation classes: AB = aquatic bed, EM= emergent, SS = scrub/shrub, FO = forested <sup>3</sup> Hydroperiods: PF = permanently flooded, SF = seasonally flooded, OF = occasionally flooded, SO = saturated only, PFS = permanently flowing stream						
<sup>4</sup> Species <sup>5</sup> CWD =	richness: High > coarse woody de	19 species, ebris	moderate 5 – 19 species, low	< 5 species		

Wetland #	Name/Location	Wetland Category	Water Quality Function	Hydrologic Function	Habitat Function		
10	North Shore Wetland		Unconstricted <sup>1</sup> surface outlet (beaver dam)	Unconstricted <sup>1</sup> surface outlet (beaver dam)	3 vegetation classes: EM, SS, FO <sup>2</sup>		
			Persistent vegetation > 1/2 of area	Marks of ponding <0.5 ft.	3 hydroperiods: PF, SF, SFS <sup>3</sup>		
			Seasonal ponding <1/4 total	Upstream basin is >100 times area of the wetland	High species richness <sup>4</sup>		
			area	No opportunity to reduce	High interspersion of habitats		
			No opportunity to improve water quality	flooding and erosion	Special habitat features: CWD <sup>5</sup> , snags, amphibian habitat, <25% invasive plants		
					Good buffer condition. Good connections to other habitats		
					No WDFW Priority habitat		
					3 other wetlands within ½ mile		
<sup>1</sup> Beaver dams are permeable, and are considered unconstricted or slightly constricted permanently flowing outlets. <sup>2</sup> Vegetation classes: AB = aquatic bed, EM= emergent, SS = scrub/shrub, FO = forested <sup>3</sup> Hydroperiods: PE = permanently flooded, SE = seasonally flooded, OE = occasionally flooded, SO = saturated only, PES =							
permaner	permanently flowing stream						
<sup>7</sup> Species	richness: High >	19 species,	moderate $5 - 19$ species, low	< 5 species			
CWD =	= coarse woody d	ebris					
Wetland	Name/Location	Wetland Category	Water Quality Function	Hydrologic Function	Habitat Function		
---	-------------------------	---------------------	--	--	---	--	
π							
14	South Fork Wetland 1	111	Unconstricted' surface outlet (beaver dam)	Unconstricted' surface outlet (beaver dam)	2 vegetation classes: EM, SS <sup>2</sup>		
					2 hydroperiods: PF, PFS <sup>3</sup>		
			Persistent vegetation > 1/2 of	Marks of ponding <0.5 ft.	4		
			area		High species richness⁴		
			Concerned mending	Upstream basin is <10 times			
			area	area of the wettand	High interspersion of habitats		
				No opportunity to reduce	4 Special habitat features: CWD <sup>5</sup> ,		
			No opportunity to improve water quality	flooding and erosion	snags, amphibian habitat, <25% invasive plants		
					Good buffer condition. Good connections to other habitats		
					1 WDFW Priority habitat		
					No other wetlands within 1/2 mile		
<sup>1</sup> Beaver	dams are permeal	ble, and are	considered unconstricted or s	lightly constricted permanently	flowing outlets.		
<sup>2</sup> Vegetat	ion classes: AB =	= aquatic be	ed, EM= emergent, SS = scrul	o/shrub, FO = forested			
<sup>3</sup> Hydroperiods: $PF =$ permanently flooded, $SF =$ seasonally flooded, $OF =$ occasionally flooded, $SO =$ saturated only, $PFS =$							
permanently flowing stream							
<sup>4</sup> Species	richness: High >	19 species,	moderate 5 – 19 species, low	< 5 species			
<sup>5</sup> CWD =	coarse woody de	ebris					

Wetland #	Name/Location	Wetland Category	Water Quality Function	Hydrologic Function	Habitat Function	
20	South Fork Wetland Complex		Unconstricted <sup>1</sup> surface outlet (beaver dam) Persistent vegetation > 1/10th of area Seasonal ponding <1/4 total area No opportunity to improve water quality	Unconstricted <sup>1</sup> surface outlet (beaver dam) Marks of ponding <0.5 ft. Upstream basin is >100 times area of the wetland No opportunity to reduce flooding and erosion	<ul> <li>2 vegetation classes: EM, SS<sup>2</sup></li> <li>3 hydroperiods: PF, OF, PFS<sup>3</sup></li> <li>High species richness<sup>4</sup></li> <li>Moderate interspersion of habitats</li> <li>4 Special habitat features: CWD<sup>5</sup>, snags, steep banks, &lt;25% invasive plants</li> <li>Good buffer condition. Good connections to other habitats</li> <li>1 WDFW Priority habitat</li> <li>3 other wetlands within ½ mile</li> </ul>	
<sup>1</sup> Beaver dams are permeable, and are considered unconstricted or slightly constricted permanently flowing outlets. <sup>2</sup> Vegetation classes: AB = aquatic bed, EM= emergent, SS = scrub/shrub, FO = forested <sup>3</sup> Hydroperiods: PF = permanently flooded, SF = seasonally flooded, OF = occasionally flooded, SO = saturated only, PFS = permanently flowing stream <sup>4</sup> Species richness: High >19 species, moderate 5 – 19 species, low < 5 species						

#### 4.2 WETLANDS SURVEYED IN THE LOST LAKE TRACT

Wetlands 2, 3 and 12 are located in the Lost Lake Tract (Table 4-1, see maps in Appendix A). All of the wetlands in the Lost Lake Tract are categorized as depressional, although one sub-unit of Wetland 12 had riverine characteristics and was rated on the basis of these features (Tables 4-2 and 4-5). Remaining sub-units of Wetland 12, a complex created by a series of beaver dams; were rated as depressional. The Lost Lake Wetland (Wetland 2) received the highest rating, Category I, because it is a true bog. Bogs are rare in western Washington and impossible to recreate through compensatory mitigation. Wetland 2 was characterized as follows: "One of the most unique habitats in the Project area is the Lost Lake floating bog. The bog occupies the margin of the lake, extending substantially beyond the open water on the northern end. A large number of bog species are represented, including sundew, Labrador tea (Ledum groenlandicum), cranberry (Vaccinium oxycoccos), western bog laurel (Kalmia polifolia), white beak-rush (Rhynchospora alba), bog buckbean (Menyanthes trifoliata), scheuchzeria (Scheuchzeria *palustris*), and Chamisso's cotton grass (*Eriophorum chamissonis*). Several members of the sedge family are present, including several *Carex* species, both woolly and small-fruited bulrush (Scirpus cyperinus and S. microcarpus), and dulichium (Dulichium arundinaceum), which forms large stands in the shallows on the western shore." (Smayda 2007).

Wetland 3 is not a bog, but received functional scores high enough to warrant Category II status. Its primary functions are hydrologic, protecting the downstream channel, and habitat functions, reflecting a diverse plant community. This wetland was one of the few in this study that demonstrated significant storage capacity during wet periods: ponding at least 3 feet above the surface occurs at times in this wetland. The emergent community includes a large number of forb species, rushes (*Juncus spp*), bur-reed (*Sparganium sp*), lady fern, cattails (*Typha latifolia*) and sedges. Shrubs include salmonberry, spirea (*Spiraea douglasii*) and trailing blackberry (*Rubus ursinus*). The aquatic bed community includes floating-leaved pondweed (*Potamageton natans*) and yellow pond lily (*Nuphar lutem spp polysepalum*).

# Table 4-5. Indicators of Depressional Wetlands on the Lost Lake Tract that Affect Wetland Functions

Wetland #	Name/Location	Wetland Category	Water Quality Function	Hydrologic Function	Habitat Function	
2	Lost Lake Bog	I (based on special characteristic	Highly constricted surface outlet (concrete ford)	Highly constricted surface outlet (concrete ford)	3 vegetation classes: EM, SS, FO <sup>1</sup>	
			Persistent vegetation > 95% of area	Marks of ponding at least 6 in.	2 hydroperiods: PF, SO <sup>2</sup>	
			Seasonal ponding <1/4 total	Upstream basin is <10 times area of the wetland	High species richness <sup>3</sup>	
			area	No opportunity to reduce	High interspersion of habitats	
			No opportunity to improve water quality	flooding and erosion	<ul> <li>5 Special habitat features: CWD<sup>4</sup>, snags, stable banks, amphibian habitat, &lt;25% invasive plants</li> <li>Good buffer condition. Good connections to other habitats</li> <li>1 WDFW Priority habitat</li> </ul>	
					3 other wetlands within ½ mile	
<sup>1</sup> Vegetation classes: $AB = aquatic bed$ , $EM = emergent$ , $SS = scrub/shrub$ , $FO = forested$ <sup>2</sup> Hydroperiods: $PF = permanently flooded$ , $SF = seasonally flooded$ , $OF = occasionally flooded$ , $SO = saturated only$ , $PFS = permanently flowing stream$						
$^{3}$ Species $^{4}$ CWD =	richness: High > - coarse woody de	19 species, mo ebris	derate 5 – 19 species, low <	5 species		

Wetland #	Name/Location	Wetland Category	Water Quality Function	Hydrologic Function	Habitat Function
3	Lost Lake Tract, SW corner	11	Intermittently flowing surface outlet Persistent vegetation > 95% of area Seasonal ponding >1/2 total area	Intermittently flowing surface outlet Marks of ponding at least 3 ft above the surface. Upstream basin less than 10 times area of the wetland	2 vegetation classes: EM, SS <sup>1</sup> 5 hydroperiods: PF, SF, OC, SO, PFS <sup>2</sup> High species richness <sup>3</sup> High interspersion of habitats
			No opportunity to improve water quality	Opportunity to reduce flooding and erosion	<ul> <li>4 Special habitat features: CWD<sup>4</sup>, snags, amphibian habitat, &lt;25% invasive plants</li> <li>Good buffer condition. Good connections to other habitats</li> <li>No WDFW Priority habitat</li> <li>3 other wetlands within ½ mile</li> </ul>
<sup>1</sup> Vegetation classes: AB = aquatic bed, EM= emergent, SS = scrub/shrub, FO = forested <sup>2</sup> Hydroperiods: PF = permanently flooded, SF = seasonally flooded, OF = occasionally flooded, SO = saturated only, PFS = permanently flowing stream <sup>3</sup> Species richness: High >19 species, moderate 5 – 19 species, low < 5 species <sup>4</sup> CWD = coarse woody debris					

Wetland #	Name/Location	Wetland Category	Water Quality Function	Hydrologic Function	Habitat Function	
12	Lost Lake Wetland (west of ford) Unit A		Unconstricted <sup>1</sup> surface outlet (beaver dam) Persistent vegetation > 95% of area Seasonal ponding >1/4 total area No opportunity to improve water quality	Unconstricted <sup>1</sup> surface outlet (beaver dam) Marks of ponding <0.5 ft. Upstream basin is <10 times area of the wetland No opportunity to reduce flooding and erosion	<ul> <li>2 vegetation classes: EM, SS<sup>2</sup></li> <li>4 hydroperiods: PF, SF, SO, PFS<sup>3</sup></li> <li>High species richness<sup>4</sup></li> <li>High interspersion of habitats</li> <li>4 Special habitat features: CWD<sup>5</sup>, snags, amphibian habitat, &lt;25% invasive plants</li> <li>Good buffer condition. Good connections to other habitats</li> <li>1 WDFW Priority habitat</li> <li>3 other wetlands within ½ mile</li> </ul>	
<sup>1</sup> Beaver dams are permeable, and are considered unconstricted or slightly constricted permanently flowing outlets. <sup>2</sup> Vegetation classes: AB = aquatic bed, EM= emergent, SS = scrub/shrub, FO = forested <sup>3</sup> Hydroperiods: PF = permanently flooded, SF = seasonally flooded, OF = occasionally flooded, SO = saturated only, PFS = permanently flowing stream, SFS = seasonally flowing stream <sup>4</sup> Species richness: High >19 species, moderate 5 – 19 species, low < 5 species						

Wetland #	Name/Location	Wetland Category	Water Quality Function	Hydrologic Function	Habitat Function	
12	Lost Lake Wetland (west of ford) Unit B Rated as Riverine	11	Depressions cover ¾ area of wetland Trees or shrubs >2/3 areas of the wetland No opportunity to improve water quality	Moderate overbank storage Shrubs cover >1/3 of area. Opportunity to reduce flooding and erosion	<ul> <li>2 vegetation classes: EM, SS<sup>1</sup></li> <li>4 hydroperiods: PF, SF, OF, PFS<sup>2</sup></li> <li>High species richness<sup>3</sup></li> <li>High interspersion of habitats</li> <li>5 Special habitat features: CWD<sup>4</sup>, snags, steep banks, amphibian habitat, &lt;25% invasive plants</li> <li>Good buffer condition. Good connections to other habitats</li> <li>1 WDFW Priority habitat</li> <li>3 other wetlands within ½ mile</li> </ul>	
<sup>1</sup> Vegetation classes: AB = aquatic bed, EM= emergent, SS = scrub/shrub, FO = forested <sup>2</sup> Hydroperiods: PF = permanently flooded, SF = seasonally flooded, OF = occasionally flooded, SO = saturated only, PFS = permanently flowing stream, SFS = seasonally flowing stream <sup>3</sup> Species richness: High >19 species, moderate 5 – 19 species, low < 5 species <sup>4</sup> CWD = coarse woody debris						

#### 4.3 WETLANDS SURVEYED IN THE LAKE CHAPLAIN TRACT

Wetlands on the Lake Chaplain Tract are not influenced by operation of the Project. They provide mitigation benefits as part of the WHMP. In the Lake Chaplain Tract, only Chaplain Marsh (Wetland 5) was rated in this study (Table 4-1, see maps in Appendix A). Chaplain Marsh was created by a series of beaver dams on Chaplain Creek, and comprises large areas of open water, and a complex array of emergent, aquatic bed, and scrub/shrub vegetation zones in most sub-units. Because its water level is controlled by beaver dams, it was rated as depressional. Indicators of wetland functions that were used in rating these wetlands are listed in Table 4-6. The two rated units that are bounded by beaver dams received very low water quality and hydrologic scores because the wetland is remote and because it has limited storage capacity. The lowest unit (Wetland 5, Unit C) is controlled by large culverts under the Diversion Dam Road, rather than beaver dams, producing a higher hydrologic function score.

Habitat scores were moderately high. Chaplain Marsh "has a very high number of grasses, sedges, and rushes, the majority of which are native species. Rice cut-grass (*Leersia oryzoides*) was present in large expanses along the south-central and south-western portions of the wetland; this species was not detected on any other survey sites." (Smayda 2007). Unit A has a large forested area (1/4-acre+ willow stand), aquatic bed vegetation (*Nuphar luteum spp polysepalum*), and scrub/shrub zones that include willows, spirea, red alder (*Alnus rubra*), Indian plum, and salmonberry. Downstream units also have diverse emergent, aquatic bed and scrub/shrub zones that are highly interspersed.

# Table 4-6. Indicators of Depressional Wetlands on the Lake Chaplain Tract that Affect Wetland Functions

Wetland #	Name/Location	Wetland Category	Water Quality Function	Hydrologic Function	Habitat Function		
5	Chaplain Marsh		Unconstricted <sup>1</sup> surface outlet (beaver dam)	Unconstricted <sup>1</sup> surface outlet (beaver dam)	4 vegetation classes: AB, EM, SS, FO <sup>2</sup>		
	Unit A		Persistent vegetation > 95% of area	Marks of ponding <0.5 ft.	3 hydroperiods: PF, SF, SO <sup>3</sup>		
			Seasonal ponding <1/4 total	Upstream basin is 10 to 100 times area of the wetland	High species richness <sup>4</sup>		
			area	Opportunity to reduce flooding	High interspersion of habitats		
			No opportunity to improve water quality	and erosion	4 Special habitat features: CWD <sup>5</sup> , snags, amphibian habitat, <25% invasive plants		
					Good buffer condition. Good connections to other habitats		
					2 WDFW Priority habitats		
					3 other wetlands within ½ mile		
<sup>1</sup> Beaver dams are permeable, and are considered unconstricted or slightly constricted permanently flowing outlets. <sup>2</sup> Vegetation classes: $AB = aquatic bed EM = emergent SS = scrub/shrub FO = forested$							
<sup>3</sup> Hydroperiods: $PF =$ permanently flooded, $SF =$ seasonally flooded, $OF =$ occasionally flooded, $SO =$ saturated only, $PFS =$							
permaner	tly flowing strea	m 19 species mo	derate 5 10 species low ~	5 species			
$\frac{5}{10}$ CWD =	= coarse woody d	ebris	$\sim 17$ species, $10W <$	J species			

wetiand #	Name/Location	Wetland Category	Water Quality Function	Hydrologic Function	Habitat Function	
5	Chaplain Marsh Unit B	111	Unconstricted <sup>1</sup> surface outlet (beaver dam) Persistent vegetation > 95% of area Seasonal ponding >1/2 of total area No opportunity to improve water quality	Unconstricted <sup>1</sup> surface outlet (beaver dam) Marks of ponding <0.5 ft. Upstream basin is 10 to 100 times area of the wetland Opportunity to reduce flooding and erosion	<ul> <li>3 vegetation classes: AB, EM, SS<sup>2</sup></li> <li>4 hydroperiods: PF, SF, SO, PFS<sup>3</sup></li> <li>High species richness<sup>4</sup></li> <li>High interspersion of habitats</li> <li>6 Special habitat features: CWD<sup>5</sup>, snags, undercut banks, steep slopes, amphibian habitat, &lt;25% invasive plants</li> <li>Good buffer condition. Good connections to other habitats</li> <li>3 WDFW Priority habitats</li> <li>3 other wetlands within ½ mile</li> </ul>	
<sup>1</sup> Beaver dams are permeable, and are considered unconstricted or slightly constricted permanently flowing outlets. <sup>2</sup> Vegetation classes: AB = aquatic bed, EM= emergent, SS = scrub/shrub, FO = forested <sup>3</sup> Hydroperiods: PF = permanently flooded, SF = seasonally flooded, OF = occasionally flooded, SO = saturated only, PFS = permanently flowing stream <sup>4</sup> Species richness: High >19 species, moderate 5 – 19 species, low < 5 species						

Wetland #	Name/Location	Wetland Category	Water Quality Function	Hydrologic Function	Habitat Function	
5	Chaplain Marsh	11	Unconstricted <sup>1</sup> surface	Unconstricted <sup>1</sup> surface outlet	4 vegetation classes: AB, EM,	
	Unit C		Persistent vegetation > 95%	Marks of ponding between 2 ft to $<3$ ft	2 hydroperiods: PF, PFS <sup>3</sup>	
			Seasonal ponding >1/4 of	Upstream basin is 10 to 100	High species richness <sup>4</sup>	
			total area	times area of the wetland	High interspersion of habitats	
			No opportunity to improve water quality	Opportunity to reduce flooding and erosion	6 Special habitat features: CWD <sup>5</sup> , snags, undercut banks, steep slopes, amphibian habitat, <25% invasive plants	
					Good buffer condition. Good connections to other habitats	
					3 WDFW Priority habitats	
					3 other wetlands within 1/2 mile	
<sup>1</sup> Beaver dams are permeable, and are considered unconstricted or slightly constricted permanently flowing outlets. <sup>2</sup> Vegetation classes: AB = aquatic bed, EM= emergent, SS = scrub/shrub, FO = forested						
<sup>3</sup> Hydroperiods: $PF =$ permanently flooded, $SF =$ seasonally flooded, $OF =$ occasionally flooded, $SO =$ saturated only, $PFS =$						
<sup>4</sup> Species	richness: High >	11, SFS = sease $19$ species, mo	derate 5 – 19 species, low <	5 species		
$^{5}$ CWD =	= coarse woody d	ebris		- Sheered		

#### 4.4 WETLANDS SURVEYED ON THE SULTAN RIVER AND VICINITY

Wetlands on the Sultan River and vicinity include Wetland 18 (Marsh Creek wetland); 17 and 19 on the lower Sultan River; and 21 on the upper Sultan River (Table 4-1, see maps in Appendix A). All of these wetlands were rated at depressional wetlands (Table 4-2). Indicators of wetland functions that were used to rate them are listed in Table 4-7.

The Sultan River below the Powerhouse has a number of unconsolidated gravel bars and islands that support hydrophytic vegetation. Plant species in these shrub/small tree communities include cottonwood, red alder, Pacific willow, and various wetland grasses and forbs. However, the gravel bars generally do not qualify as wetlands under the Wetland Rating System (Hruby 2004) because they are not inundated with sufficient frequency to have the potential to perform water quality or hydrologic functions. The condition for evaluating a site as a riverine wetland is that overbank flooding occurs at least once every two years. Flows in the Sultan River are regulated by Culmback Dam, and only infrequent spill events or even more infrequent flood events would be sufficient to inundate these gravel bars. It is possible that they did perform wetland functions historically before Culmback Dam was constructed and flooding was more frequent, but currently they do not appear to have either the potential or the opportunity to do so. For this reason they are noted here (and depicted in mapping in the Study Plan 18 Technical Report), but they were not evaluated in this wetland study.

In addition, shallows along the shorelines of the lower River support emergent wetland communities, but these were too small to be evaluated under the Wetland Rating System (Hruby 2004).

Wetlands 17 and 19 are located on the east bank of the lower Sultan River (see map in Appendix A) in a broad floodplain marked by many former river channels and terraces. The wetland is an open water/emergent feature in the channel of an old oxbow of the Sultan River, and drains into Winters Creek (photo) through a small beaver dam (photo), which appears to control water levels in the wetland. Wetland 17 receives flow through a culvert under Trout Farm Road (Winters Creek) and may receive drainage from a culvert under First Street in Sultan, although this culvert was higher than the channel at the time of the field visit (mid-June 2008), and there was no surface flow. The greatest portion of the wetland includes open water and a diverse emergent community, including several rush and sedge species, grasses including redtop (*Agrostis gigantea*) and reed canary grass, yellow pond lily, yellow flag iris (*Iris pseudoacorus*), cattails, buttercup (*Ranunculus repens*), and a fringe shrub zone of spirea, red osier dogwood (*Cornus stolonifera*) and ninebark (*Physocarpus capitatus*). Immediately downstream from the dry culvert the wetland supports a shrub zone with Pacific willow, twin berry (*Lonicera involucrate*), and spirea; and an emergent zone with skunk cabbage (*Lysichiton americanum*), yellow flag iris and reed canary grass.

Wetland 19 is also located in an oxbow of the Sultan River. Drainage from the east, probably through a culvert under Trout Farm Road, flows into this oxbow, which joins a second oxbow

adjacent to the Sultan River. The second oxbow receives flow from the Sultan River during annual high water periods (which included the field visit in early July 2008). Flow from the river follows a well-defined channel in the second oxbow through upland forested habitat for a short distance before flowing back into the Sultan River. During high water periods, water in the second oxbow creates the ponding upstream in the first oxbow by backing up its flow. The result is an emergent, scrub/shrub wetland.

Wetland 18 (the Marsh Creek wetland, see map in Appendix A) is a large wetland (93 acres) that was rated only in the area affected by the Jackson Project's power pipeline right of way (5.4 acres). Surface flow from a number of tributaries and subsurface drainage converges and ponds in a flat terrace east of the Sultan River, forming the Marsh Creek wetland. The surveyed portion of this extensive wetland is located on the power pipeline corridor on both sides of the creek channel and access road, and consists of scrub/shrub habitat along the creek, although some contributing drainage through an adjacent forest stand to the east also ponds and supports herbaceous wetland vegetation. At the downstream end of the wetland, at the time of the field visit, Marsh Creek flow had overtopped its channel and was moving noticeably through a spirea thicket. Vegetation along the creek channel is very diverse, including an emergent zone with many herbaceous and grass species, rushes and sedges; and a scrub/shrub zone with cottonwood, spirea, willow red alder, and spruce (Picea sitchensis) saplings. Less than one acre is actually on the pipeline right of way. The area was subject to off-road vehicle activities until 1989, when the District placed rocks on the ROW to prevent vehicle access. The ROW subsequently revegetated with wetland species including willows, red alder saplings and cottonwood, spirea and many grass, sedge, rush, and herbaceous species. The ROW is mowed annually by the District.

Wetland 21 (6122 Road wetland) is a depressional/slope wetland located on a terrace adjacent to the south shore of the upper Sultan River and adjacent to the Forest Service 6122 access trail. The slope component of the wetland is the result of seeps on the hillside to the south of the terrace. Vegetation on the slope is dominated by salmonberry. At the base of the slope, the wetland is depressional, and its rating is based on this element. Several vegetation classes are present, including aquatic bed (algae), emergent plants (grasses, sedges, lady fern, skunk cabbage, devils club and other forbs), and scrub/shrub (primarily salmonberry and elderberry).

Table 4-7. Indicators of Depressional Wetlands	on the Sultan River and Vicinity that Affect
Wetland Functions	

Wetland #	Name/Location	Wetland Category	Water Quality Function	Hydrologic Function	Habitat Function	
π						
17	Oxbow 7	II	Unconstricted <sup>1</sup> surface outlet	Unconstricted <sup>1</sup> surface outlet	4 vegetation classes: AB, EM,	
				(beaver dam)	55, FO	
			Persistent vegetation > 95% of area	Marks of ponding <0.5 ft.	3 hydroperiods: PF, SF, PFS <sup>3</sup>	
			Second pending <1/1 total	Upstream basin is 10 to 100	Moderate species richness <sup>4</sup>	
			area	lines area of the wettand	High interspersion of habitats	
				Opportunity to reduce flooding	5	
			Opportunity to improve water	and erosion	5 Special habitat features: CWD <sup>5</sup> ,	
			quanty		banks, amphibian habitat	
					Moderate buffer condition	
					Moderate connections to other habitats	
					2 WDFW Priority habitats	
					3 other wetlands within 1/2 mile	
<sup>1</sup> Beaver	dams are permeal	ole, and are	considered unconstricted or s	lightly constricted permanently	flowing outlets.	
<sup>2</sup> Vegetati	ion classes: AB =	= aquatic be	ed, EM= emergent, SS = scrub	o/shrub, FO = forested		
<sup>3</sup> Hydroperiods: $PF =$ permanently flooded, $SF =$ seasonally flooded, $OF =$ occasionally flooded, $SO =$ saturated only, $PFS =$						
permaner	tly flowing stream	m 10 annaice	madamata 5 10 ana aire 1	< <b>5</b> ana aina		
$\frac{5}{10}$ CWD -	richness: High >	19 species,	moderate $5 - 19$ species, low	< 5 species		
CWD=	coarse woody de	edris				

Wetland #	Name/Location	Wetland Category	Water Quality Function	Hydrologic Function	Habitat Function	
# 18	Marsh Creek	II	No outlet (rated portion of wetland only) Persistent vegetation > 50% of area Seasonal ponding < ¼ total	No outlet (rated portion of wetland only) Marks of ponding <0.5 ft. Upstream basin is 10 to 100 times area of the wetland Opportunity to reduce flooding and erosion	3 vegetation classes: EM, SS, FO <sup>1</sup> 3 hydroperiods: SF,SO, PFS <sup>2</sup> High species richness <sup>3</sup> High interspersion of habitats 4 Special habitat features: CWD <sup>4</sup> , snags, amphibian habitat, invasive species <25% Moderate buffer condition Moderate connections to other habitats 2 WDFW Priority habitats	
					3 other wetlands within ½ mile	
<sup>1</sup> Vegetation classes: AB = aquatic bed, EM= emergent, SS = scrub/shrub, FO = forested <sup>2</sup> Hydroperiods: PF = permanently flooded, SF = seasonally flooded, OF = occasionally flooded, SO = saturated only, PFS = permanently flowing stream <sup>3</sup> Species richness: High >19 species, moderate 5 – 19 species, low < 5 species <sup>4</sup> CWD = coarse woody debris						

Wetland	Name/Location	Wetland Category	Water Quality Function	Hydrologic Function	Habitat Function					
π										
19	Oxbow 5	11	Unconstricted <sup>1</sup> surface outlet (beaver dam)	Unconstricted <sup>1</sup> surface outlet (beaver dam)	2 vegetation classes: EM, SS <sup>2</sup>					
					4 hydroperiods (PF, SF, OF,					
			Persistent vegetation > 50% of area	Marks of ponding <0.5 ft.	PFS) <sup>3</sup>					
			Seasonal ponding >1/4 total	Upstream basin is 10 to 100 times area of the wetland	High plant species richness <sup>4</sup>					
			area		High interspersion of habitats					
				No opportunity to reduce						
			Opportunity to improve water quality	flooding and erosion	5 Special habitat features: CWD <sup>5</sup> , snags, steep banks, amphibian habitat, <25% invasive plants					
					Moderate buffer condition Moderate connections to other habitats					
					2 WDFW Priority habitats					
					3 other wetlands within ½ mile					
<sup>1</sup> Beaver dams are permeable, and are considered unconstricted or slightly constricted permanently flowing outlets.										
<sup>2</sup> Vegetation classes: $AB =$ aquatic bed, $EM =$ emergent, $SS =$ scrub/shrub, FO = forested										
<sup>3</sup> Hydroperiods: $PF =$ permanently flooded, $SF =$ seasonally flooded, $OF =$ occasionally flooded, $SO =$ saturated only, $PFS =$										
permanently flowing stream										
<sup>4</sup> Species richness: High >19 species, moderate $5 - 19$ species, low $< 5$ species										
$^{\circ}$ CWD = coarse woody debris										

Wetland	Name/Location	Wetland Category	Water Quality Function	Hydrologic Function	Habitat Function				
#		Oalcyory							
21	6122 Road Wetland		Unconstricted <sup>1</sup> surface outlet	Unconstricted <sup>1</sup> surface outlet	3 vegetation classes: AB,EM, SS <sup>2</sup>				
			Persistent vegetation > 50%	Marks of ponding 2-3 ft.	2				
			of area		2 hydroperiods :PF, SF <sup>3</sup>				
			Second pending 1/4 total	Upstream basin is 10 to 100	Moderate plant aposice richnoos <sup>4</sup>				
			area	times area of the wettand	Moderate plant species fichness				
				Opportunity to reduce flooding	High interspersion of habitats				
			No opportunity to improve	and erosion					
			water quality		3 Special habitat features: CWD <sup>5</sup> , snags, <25% invasive plants				
					Good buffer condition, good connections to other habitats				
					4 WDFW Priority habitats				
					1 other wetland within ½ mile				
<sup>1</sup> Beaver dams are permeable, and are considered unconstricted or slightly constricted permanently flowing outlets.									
<sup>2</sup> Vegetation classes: $AB = aquatic bed$ , $EM = emergent$ , $SS = scrub/shrub$ , $FO = forested$									
<sup>3</sup> Hydroperiods: $PF =$ permanently flooded, $SF =$ seasonally flooded, $OF =$ occasionally flooded, $SO =$ saturated only, $PFS =$									
permanently flowing stream									
<sup>4</sup> Species richness: High >19 species, moderate 5 – 19 species, low $< 5$ species									
$^{\circ}$ CWD = coarse woody debris									

## 5.0 DISCUSSION AND CONCLUSIONS

Although most of the wetlands evaluated in this study are in relatively undisturbed (sometimes pristine) areas, most of their functional ratings were rather low. The explanation for low scores lies in the premises of the wetland rating system. A wetland is recognized as possessing the <u>potential</u> for performing a function, but its potential is qualified by its <u>opportunity</u> to perform that function. For example, wetlands that remove more pollutants are rated higher than those that remove fewer pollutants. The potential to perform this function is based on the physical, biological, and chemical characteristics of the wetland itself. Opportunity is based on the characteristics of the landscape in which the wetland located in a pristine area may have high potential to remove pollutants but no opportunity to do so because no pollutants ever reach it. In the Washington Wetland Rating System, the opportunity variable is a multiplier of 1 (no opportunity present) or 2 (opportunity present) for the potential variable. Thus the rating of this hypothetical wetland would be relatively low.

Many of the wetlands in this study received relatively low scores for water quality and hydrologic functions, primarily because they are located in remote areas that do not provide the opportunity to perform these functions. Their total scores are largely a reflection of the habitat functions they provide. The highest functional rating in this study was determined for Wetland 2 (the Lost Lake bog) because it has a special characteristic (i.e. bog habitat). If it were not a bog, its score would have rated Category II because it has a low opportunity to provide water quality and hydrologic functions. Several other wetlands scored Category II (including Marsh Creek, Chaplain Marsh, and the oxbow wetlands on the lower Sultan River), primarily on the strength of the habitat values they provide and because they are located where they can perform hydrologic functions for downstream resources.

Potential Project impacts to wetlands in this evaluation can be divided into a discussion of lakefringe wetlands on Spada Lake, wetlands on the lower Sultan River, and other wetlands. The lake-fringe wetlands at Spada Lake (Wetlands 1, 7, 8, 11, 15, 16 and 20) exist because of the reservoir; they were upland habitats before the Jackson Project was constructed. Their size varies from year to year depending on the timing and duration of inundation during the plants' growing season. Some of them are vulnerable to invasive plant infestations from adjacent roads and recreation sites, and most currently support stands of reed canarygrass at elevation 1435 and higher.

Other Spada Lake Tract wetlands are not affected by fluctuations of the reservoir, including depressional wetlands 4, 9, 10 and 14. Their hydrology comes from upslope. There is a potential for recreation-related impacts at wetlands 4 and 9 because they are close to Recreation Site 3, but impacts have not been observed. These wetlands are vulnerable to invasive plant infestations. Project operations involving upland construction, such as road maintenance, could affect these wetlands; however, all wetlands on Project lands are protected by buffer zones.

Wetlands located near Project roads, including Wetlands 4, 5 and 9, are subject to invasive weeds brought in by vehicles. Wetland 4 in particular illustrates the vulnerability of roadside wetlands to weed infestations, and an effort is underway to control weeds at this site. Wetlands 5 and 9 do not have significant weed populations. Lost Lake Wetlands 2 and 12 and Chaplain Marsh (Wetland 5) are vulnerable to vehicle-borne weeds, but do not currently support many invasive species because the level of traffic on these restricted-access roads is very low.

Wetlands on the lower Sultan River (Wetlands 17 and 19) have connections to the river and could be affected by future changes in instream flows. Wetland 17 discharges into Winters Creek, a tributary to the Sultan River, and does not receive flow from the river. However, Wetland 19 could potentially be affected by changes in Sultan River flows because the duration of its inundation is controlled by a live side channel of the river. Wetland 21 is located in the bypass reach of the Sultan River but receives its hydrology from upslope, so Project operations are unlikely to affect it. Wetland 18 (Marsh Creek) has been severely damaged in the past by off-road vehicles but the DNR and District have effectively blocked access by installing a gate on the access road and boulders at the wetland. The wetland is less vulnerable to damage from invasive weeds since public vehicle traffic was restricted.

In conclusion, the greatest concern for most wetlands on District lands in the upper Sultan Basin is invasive weeds brought in by vehicles. Future construction projects should be evaluated for potential impacts to adjacent wetlands, such as sediment or pollutant transport, vegetation clearing or alterations in hydrology. Monitoring and management of invasive weeds at these wetlands, and the Lost Lake and Lake Chaplain wetlands, is on-going. The potential for project impacts on wetlands on the Sultan River is unknown, and should be considered in any future evaluation of operational changes.

## 6.0 REFERENCES

- Hruby, T. 2004. Washington State Wetland Rating System for Western Washington Revised. Washington State Department of Ecology Publication #04-06-025.
- Smayda, K. 2007. Study Plan 7 Special Status Plant Survey. 2007 Technical Report prepared for P.U.D. No. 1 of Snohomish County, Everett, WA.
- Stillwater Sciences and Meridian Environmental. 2008. Study Plan 18 Riverine, Riparian, and Wetland Habitat Assessment. March 2008 Technical Report prepared for P.U.D. No. 1 of Snohomish County, Everett, WA.

Snohomish County PUD and City of Everett. 1988. Wildlife Habitat Management Plan.

Snohomish County PUD and City of Everett. 2006. Revised Study Plan.

## Appendix A. Maps of Surveyed Wetlands



























## Appendix B. Photographs of Surveyed Wetlands



Wetland 1. South Shore Recreation Site

SP9: Wetlands Appendix B



Wetland 2. Lost Lake Wetland


Wetland 3. Lost Lake Tract SW Corner



Wetland 4. South Shore Road Wetland Complex



Wetland 5. Chaplain Marsh Wetland Complex



Wetland 6. Williamson Creek Wetland, East of Road



Wetland 7. Williamson Creek Arm Wetland



Wetland 8. North Fork Arm Wetland



Wetland 9. Upper South Shore Recreation Site Wetland Complex



Wetland 10. North Shore Wetland



Wetland 12. Lost Lake, West of Ford



Wetland 14. South Fork Wetland 1



Wetland 15. South Shore Wetland 1



Wetland 16. South Shore Wetland 2



Wetland 17. Oxbow 7, Sultan River



Wetland 18. Marsh Creek Wetland



Wetland 19. Oxbow 5, Sultan River



Wetland 20. South Fork Wetland Complex



Wetland 21. 6122 Road Complex

## Appendix C. Response to Stakeholder Comments on Draft Report

Tulalip Tribes – Filed 11/15/07 (comments and responses	District Response from January 10, 2008 ISR Response
below correspond to pagination of the 11/06/07 comments	to Comments Filing
sent to the co-licensees and attached to the 11/15/07 cover	
letter)	
<ul> <li>Page 7, RSP 9 – Wetland Surveys, #1</li> <li>Include analysis of whether more or less protection (buffers) of certain wetlands is warranted as an objective for future evaluations?</li> <li>Page 7, RSP 9 – Wetland Surveys, #2</li> <li>What about including opportunities for creation and restoration, not only enhancement, as an objective to mitigate for the direct and indirect impacts mentioned?</li> </ul>	<ul> <li>Response. Protection of wetlands will be addressed in the report for RSP 9. The first year Draft Technical Report will be sent to stakeholders for review in mid-January 2008.</li> <li>Response. The existing Wildlife Habitat Management Plan (WHMP) includes mitigation for impacts to wetlands as a result of Project construction and operation through 2060. The HEP analysis, conducted prior to the inclusion of 1,745 acres of land adjacent to Spada Lake indicated that the WHMP would provide full mitigation, over 140 percent for wetlands.</li> </ul>
<b>Page 7, RSP 9 – Wetland Surveys, #3</b> In section 9.2 the study summary indicates that they reviewed all the systems adjacent to the project features? Does this mean that all wetlands within the project area will not be surveyed as indicated in section 9.2 of the Study Plan?	<b>Response.</b> Ratings for this study are prioritized and completed for all wetlands that are located immediately adjacent to Project features, have a hydraulic connection to the Spada Lake reservoir, or are within the floodplain of the Sultan River below Culmback Dam. The nexus to the Project as described in Section 9.5 of the Revised Study Plan related the study of wetlands to potential project impacts. That is the focus for this study. All of the wetlands within the floodplain of the Sultan River below Culmback Dam and the sultan River below Culmback Dam will be surveyed during 2008. All other mapped wetlands on Project lands have been surveyed, but one. Other wetlands over <sup>1</sup> / <sub>4</sub> acre will be surveyed as they are encountered.
<b>Page 7, RSP 9 – Wetland Surveys, #4</b> In section 9.3 provide supplemental information regarding the beaver activity. Are there now additional wetlands to rate or has the beaver activity just changed the character of existing wetlands? How will the study plan be modified (if at all) to address changes in the wetlands/streams typically associated with beaver activity?	<b>Response.</b> The technical report for this study will address beaver activity at each surveyed wetland. The first year Draft Technical Report will be sent to stakeholders for review in mid-January 2008.

## Appendix C. Response to Stakeholder Comments on Draft Report

Page 7, RSP 9 – Wetland Surveys, #5	<b>Response.</b> Thirteen wetlands were evaluated from 2004 through 2006.
Did the team identify 13 wetlands or did they select 13 for rating? There are	Three more were added to the list (evaluated) in 2007 and some of the
16 (15 with a duplicate) wetlands on Table 9.3-1. Need clarification if 3 extra	previously surveyed wetlands were revisited. Wetland 7 was combined
wetlands were added.	with Wetland 13 when Wetland 13 was surveyed. The reservoir water
	level was lower at that time and the wetlands were connected so they
	were combined. The first year Draft Technical Report that will be sent
	to stakeholders in mid-January will provide additional information.
Page 7, RSP 9 – Wetland Surveys, #7	<b>Response.</b> The function and value of wetlands will be addressed in the
Section 9.3 section does not "detail the results of the surveys in terms of the	technical report for RSP 9. The first year Draft Technical Report will be
functions and values of each wetland" as indicated in the Study Plan. Also	sent to stakeholders for review in mid-January 2008. Data forms will be
include field observation notes, and the field surveyors' interpretation of the	available as an appendix.
function and values of the wetland	
Page 7, RSP 9 – Wetland Surveys, #8	Response. Incidental observations of botanical species will be noted on
Any incidental observations of botanical species identified by the Tulalips?	the data forms; data forms will be available as an appendix to the Final
No mention of yes or no.	Technical Report.
Page 7, RSP 9 – Wetland Surveys, #10	<b>Response.</b> This will be addressed in the technical report for RSP 9.
No analysis of the effects of Project operations and/or Project-related	The first year Draft Technical Report will be sent to stakeholders for
activities, if any identified, and discussion of any measures that may be	review in mid-January 2008.
needed to protect, mitigate or enhance wetland habitat.	
Tulalip Tribes – Email from Dustin Hinson, AMEC, dated	
9/23/2008	
Lake-fringe should be hyphenated (Lake-fringe) throughout	<b>Response.</b> This correction was made.
The Latin name of all plants should be given the first time they are mentioned	<b>Response</b> . This correction was made.
in the report. Just the common name is fine if they are mentioned again.	
Scrub/shrub is noted as shrub scrub, scrub/shrub, and just shrub. I prefer	Response. The term scrub/shrub has been applied throughout the
scrub/shrub, but as long as whatever they it throughout the report is	report.
consistent, I don't think it's a big deal.	
Note species as invasive as necessary, such as reed canary grass.	<b>Response</b> . Invasive species have been noted.
For appendix B, it might be helpful to have a map showing photo locations.	Response. All of the wetlands depicted in Appendix B can be found on
	Figures 4-1, 4-2, and 4-3.
Figure 1-1 is fuzzy, tough to read.	<b>Response</b> . The figure has been re-drawn.
Page 4, first paragraph, first sentence, (carried over from page 3): add	<b>Response</b> . The WHMP recognizes a wetlands vegetation cover type,
"vegetation" after the word "wetlands" (last word in sentence).	but it does not address wetlands vegetation in any detail.
Page 4, first paragraph (carried over from page 3), second to last sentence:	<b>Response.</b> The sentence has been edited to read "provide edge habitat."
protect the quality of wetlands and provide "edge". I would maybe get rid of	
the "and provide edge" part or maybe change "edge" to "edge habitat" or	
something like that. "Provide edge" is not descriptive enough.	
Page 4, third paragraph, first sentence: " to classify and evaluate the	<b>Response</b> . The sentence has been edited to read "to classify and
functional quality of each wetland." I would add "and values" after "quality".	evaluate the functional quality and values of each wetland."

Page 4, fourth paragraph, first sentence: If the biologists were trained by	<b>Response</b> . The text has been edited to note that the authors of this study
Ecology, I would add that information as well.	were trained by Ecology.
Page 4, fourth paragraph, second sentence: "hydrologic" instead of	<b>Response.</b> This correction was made.
"hydraulic".	
Page 6, first paragraph: the second half of this paragraph, beginning with	Response. This information was added to the Methods section.
"Several wetlands are complexes that were subdivided" Should probably	
go into the Methods section, or this information should at least be mentioned	
in that section.	
Figure 4-2 looks good, but it looks like Wetlands 2 and 12 are the same	<b>Response</b> . The typo has been corrected.
wetland.	
I like how tables 4-1 and 4-3 are set up. They are easy to read and very	Response. Thank you.
informative. Actually, all the tables in the report look good.	
Page 15, second paragraph, second sentence: Replace "scored" with "rated".	<b>Response</b> . This correction was made.
Page 22, first paragraph, first sentence, " Five of which were treated as	<b>Response</b> . This correction was made.
wetland complexes because they are a series of ponds" Replace "are" with	
"include".	
Page 22, first paragraph, second sentence: I would replace the term	<b>Response</b> . This correction was made.
"dam/pond" with "dam/pond/wetland."	
Page 22, first paragraph, third sentence: Replace "ponds" with "units".	<b>Response</b> . This correction was made.
Page 38, first paragraph, second sentence: Sentence starts "They; they".	<b>Response</b> . This typo has been corrected.
Page 43, second paragraph, second to last sentence: "red alder saplings"	<b>Response</b> . This typo has been corrected.
instead of sapling red alder.	
Page 43, second paragraph, last sentence, Add period.	<b>Response</b> . This typo has been corrected.
The word "weed(s)" is used throughout this section, but I think "invasive	<b>Response</b> . Most references to weeds in this section use the phrase
species" would be better. There are weeds that are considered non-invasive	"invasive weeds". Reference to weeds in this report was intentionally
and invasive species that are not considered weeds.	generic because the District is in the process of developing a program
	and criteria for managing noxious and invasive plants on Jackson
	Project lands. Most of the management species are likely to be invasive,
	but some may not be.