# TR-02 WETLAND ASSESSMENT
# DRAFT REPORT

## SKAGIT RIVER HYDROELECTRIC PROJECT
## FERC NO. 553

**Seattle City Light**

**Prepared by:**
**Environmental Science Associates**

**March 2022**
**Initial Study Report**

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## List of Acronyms and Abbreviations

AUC .....area under curve
City Light .....Seattle City Light
CMZ .....channel migration zone
CoSD .....City of Seattle datum
DLA .....Draft License Application
DNR .....Department of Natural Resources (Washington State)
Ecology .....Washington State Department of Ecology
FEMA .....Federal Emergency Management Agency
FERC .....Federal Energy Regulatory Commission
GIS .....Geographic Information System
GPS .....Global Positioning System
HGM .....hydrogeomorphic
HRLC .....High Resolution Land Cover
ISR .....Initial Study Report
LiDAR .....Light Detection and Ranging
LP .....licensing participant
m .....meter
MMU .....minimal mapping unit
NPS .....National Park Service
NWI .....National Wetlands Inventory
OOB .....out of bag
PEM .....Palustrine emergent
PFO .....Palustrine forested
PHS .....Priority Habitats and Species
PME .....protection, mitigation, and enhancement
PRM .....Project River Mile
Project .....Skagit River Hydroelectric Project
PSS .....Palustrine scrub-shrub
PUB .....Palustrine unconsolidated bottom
RLNRA .....Ross Lake National Recreation Area
ROW .....right-of-way

RSP .....Revised Study Plan
RTE.....rare, threatened, and endangered
SGCN.....Species of Greatest Conservation Need
SR.....State Route
SWAP .....State Wildlife Action Plan
TRREWG.....Terrestrial Resources and Reservoir Erosion Work Group
TWG .....Terrestrial Work Group
UGA.....urban growth area
USACE .....U.S. Army Corps of Engineers
USFWS .....U.S. Fish and Wildlife Service
USGS .....U.S. Geological Survey
USNVC.....U.S. National Vegetation Classification System
WDFW.....Washington Department of Fish and Wildlife
WHCV .....Wetlands of High Conservation Value
WIP .....Wetland Intrinsic Potential
WNHP.....Washington Natural Heritage Program

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# 1.0 INTRODUCTION

The TR-02 Wetland Assessment is being conducted in support of the relicensing of the Skagit River Hydroelectric Project (Project), Federal Energy Regulatory Commission (FERC) No. 553, as identified in the Revised Study Plan (RSP) submitted by Seattle City Light (City Light) on April 7, 2021 (City Light 2021). On June 9, 2021, City Light filed a "Notice of Certain Agreements on Study Plans for the Skagit Relicensing" (June 9, 2021 Notice)[1] that detailed additional modifications to the RSP agreed to between City Light and supporting licensing participants (LP) (which include the Swinomish Indian Tribal Community, Upper Skagit Indian Tribe, National Marine Fisheries Service, National Park Service [NPS], U.S. Fish and Wildlife Service [USFWS], Washington State Department of Ecology [Ecology], and Washington Department of Fish and Wildlife [WDFW]). The June 9, 2021 Notice proposed no changes to the Wetland Assessment as described in the RSP.

In its July 16, 2021 Study Plan Determination, FERC approved the Wetland Assessment without modification.

An early version of this report was distributed to LPs on August 10, 2021 for comment. The report was also discussed with the Terrestrial Work Group (TWG; formerly known as the Terrestrial Resources and Reservoir Erosion Work Group [TRREWG]), at the Terrestrial Studies Update Meeting on August 17, 2021, and with TWG participants who attended a field meeting held August 31, 2021. This study is complete and a draft report of the study efforts is being filed with FERC as part of City Light's Initial Study Report (ISR).

[1] Referred to by FERC in its July 16, 2021 Study Plan Determination as the "updated RSP."

# 2.0 STUDY GOALS AND OBJECTIVES

The goal of the Wetland Assessment is to map and describe wetlands within the study area that may be affected by Project operations and to rate the capability of these wetlands to provide water quality, hydrologic, and habitat functions. The study also evaluates the overall condition of the wetlands and existing sources of impairment. Specific objectives of this study are:

- Gather information on wetlands currently mapped within the study area and downstream to the Sauk River confluence.
- Refine existing maps derived from remote sensing and map wetlands in a uniform manner based on the USFWS' Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al. 1979) classification system.
- Identify potential Project-related disturbances to prioritize field survey efforts.
- Document plant species in sampled wetlands.
- Use the Washington State Wetland Rating System for Western Washington (Hruby 2014) to assess wetland functions and values.
- Identify possible sources of any observed impairments.
- Provide basic habitat-related data to inform other efforts, such as the rare, threatened, and endangered (RTE) plant, invasive plant, beaver habitat, and amphibian studies, as well as the geomorphology and other fish and aquatics studies.
- To the extent possible, provide basic habitat mapping for select wildlife Priority Habitats and Species (PHS) (https://wdfw.wa.gov/species-habitats/at-risk/phs/list) and WDFW Species of Greatest Conservation Need (SGCN) (https://wdfw.wa.gov/species-habitats/at-risk/swap) within the study area, as well as species of concern for NPS.
- To the extent possible, provide information for assessing important Tribal resources, including forage for culturally important wildlife and culturally important plants.

# 3.0 STUDY AREA

The study area for the Wetland Assessment is approximately 42,980 acres and consists of the area within the Project Boundary and the channel migration zone (CMZ, mapped by NPS), specifically from Gorge Powerhouse to the confluence of the Sauk and Skagit rivers. Field sampling emphasized wetlands where there is the greatest potential for Project effects (e.g., reservoir fluctuation zone and adjacent to Project facilities, buildings, and infrastructure) or Project-related recreational facilities, whereas wetlands not affected by the Project were not field assessed (i.e., desktop analysis).

To organize the results of the study, the study area is divided into six similarly sized segments. These segments are based solely on geography and not on ecological function or position in the landscape (e.g., watershed position). The six segments are described below and shown in Figures 3.0-1 through 3.0-3:

- Reservoir Segment:
  - **Ross Lake National Recreation Area (RLNRA):** This study area segment occurs within the upper Skagit River basin and includes all lands of the Project Boundary that lie within the RLNRA, including the transmission line right-of-way (ROW) to the confluence of Bacon Creek and the Skagit River, **excluding the fish and wildlife mitigation lands** (i.e., Newhalem Ponds and County Line Ponds parcels). For reporting purposes, this segment is further divided into the following sub-segments:
    - Ross Lake, exclusive of Big Beaver Valley;
    - Big Beaver Valley, (as indicated in Section 2.4 of the RSP, because there are no City Light activities that affect this portion of the Project vicinity and NPS reed canarygrass (*Phalaris arundinacea*) mapping in Big Beaver Valley is adequate for use in rating the wetland complex, no wetland fieldwork was conducted here; wetlands are mapped here, however);
    - Diablo Lake, including the approximately 3.6 miles of the transmission line ROW from the Ross Powerhouse to the Diablo Powerhouse;
    - Gorge Lake, including the approximately 3.5 miles of the transmission line ROW from the Diablo Powerhouse to the southern end of Gorge Lake; and
    - The transmission line ROW (approximately 8.5 miles) between Gorge Lake and Bacon Creek.

- Transmission Line ROW Segments:
  - **Bacon Creek to Sauk River Crossing:** This study area segment occurs primarily within the upper Skagit River basin and includes the 14.3 miles of transmission line ROW **(excluding all fish and wildlife mitigation lands that fall within this segment)** from Bacon Creek to the Sauk River crossing. This study area segment also includes the majority of the CMZ outside of the RLNRA, as well as the Taylor, Illabot, and Powerline[2] spawning

[2] The Taylor, Illabot, and Powerline spawning channels were developed under the current license but are not considered fish and wildlife mitigation parcels.

channels. The lower approximately 2.5 miles of this study area segment occurs within the Sauk River basin.

- **Sauk River Crossing to Oso:** This study area segment includes the 25.6 miles of transmission line ROW **(excluding all fish and wildlife mitigation lands that fall within this segment)** from the Sauk River crossing to the community of Oso. The eastern part of this study area segment is located in the Sauk River basin from the Sauk River crossing to near Darrington. The remainder of this segment to the west, from Darrington to Oso, is located in the North Fork Stillaguamish River basin.
- **Oso to State Route (SR) 528:** This study area segment includes the 17.5 miles of transmission line ROW from Oso to SR 528. The northern portion of this segment is located within the Stillaguamish River basin, and the southern portion of this segment is located within the Snohomish River basin.
- **SR 528 to Bothell Substation:** This study area segment is located primarily within the Snohomish River basin and includes the 14.4 miles of transmission line ROW from SR 528 to the Bothell substation. The lower approximately 1.5 miles of this segment is located in the Lake Washington basin.

- Mitigation Lands Segment:
  - **Fish and Wildlife Mitigation Lands:** This study area segment includes all fish and wildlife mitigation lands within the study area (including fish and wildlife mitigation lands that geographically fall within a transmission line ROW segment above). For reporting purposes, they are separated by the watershed within which they occur (i.e., the Skagit, Sauk, and South Fork Nooksack river basins).

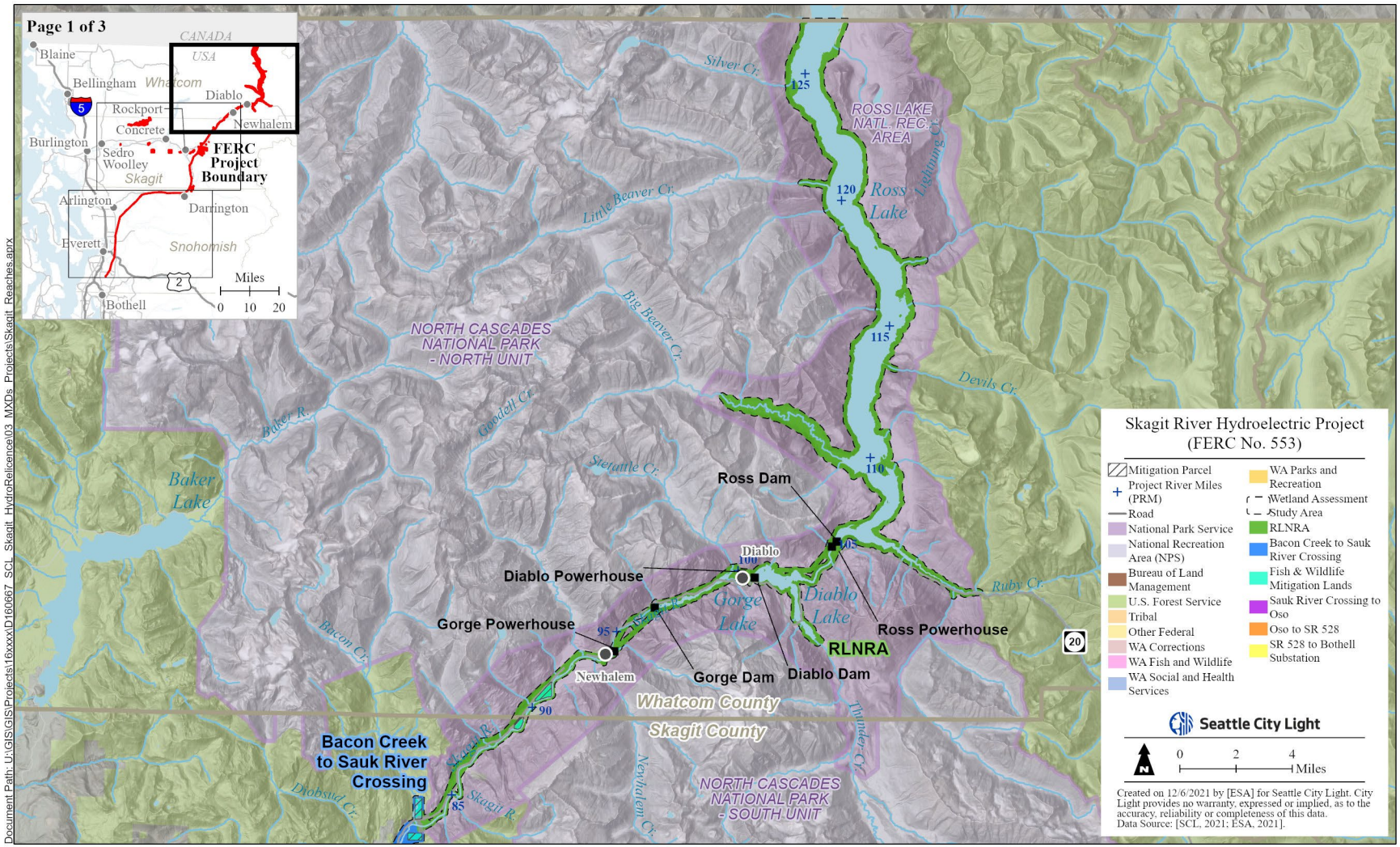


**Figure 3.0-1. Study area segments for the Wetland Assessment (north).**

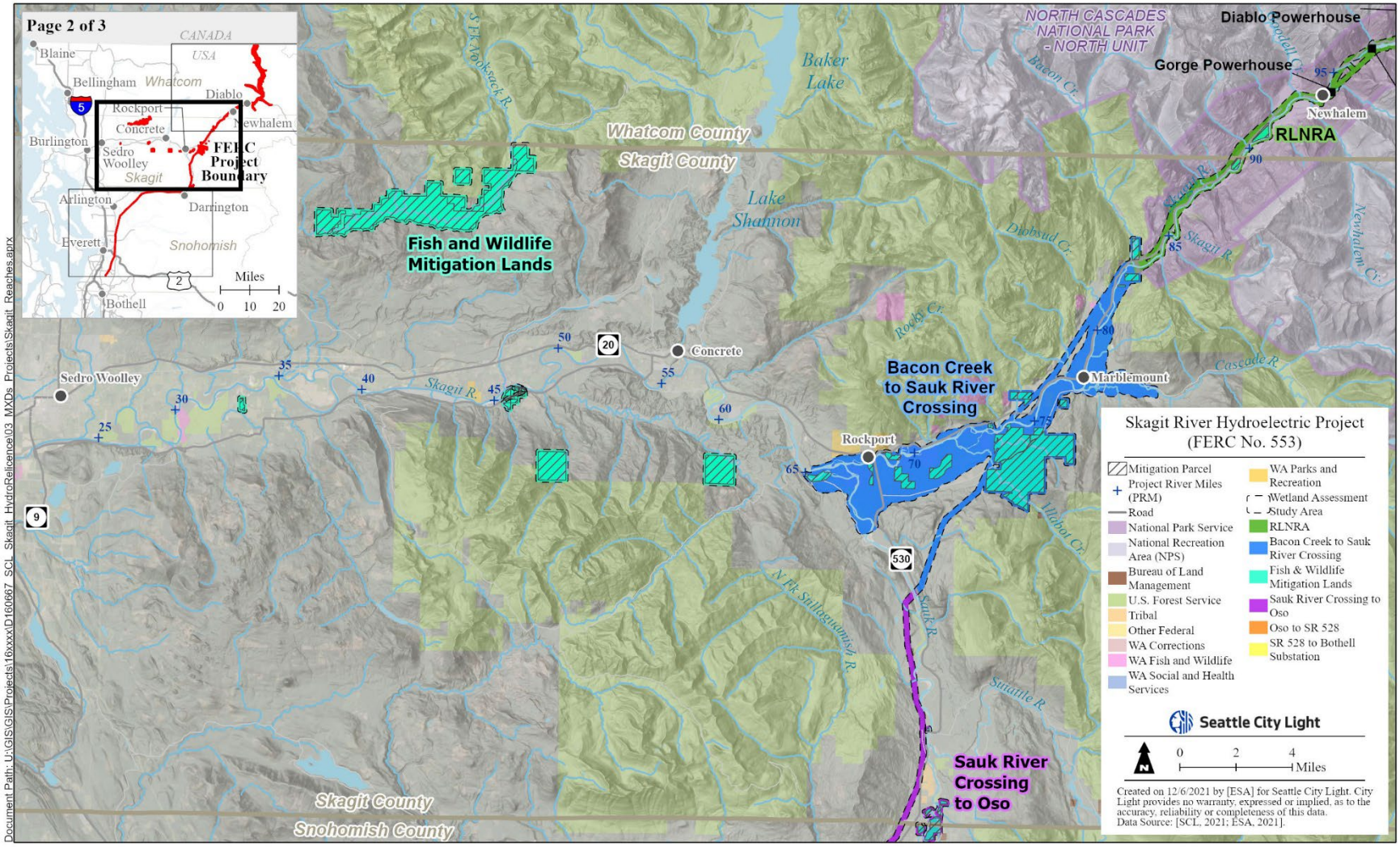


**Figure 3.0-2. Study area segments for the Wetland Assessment (central).**

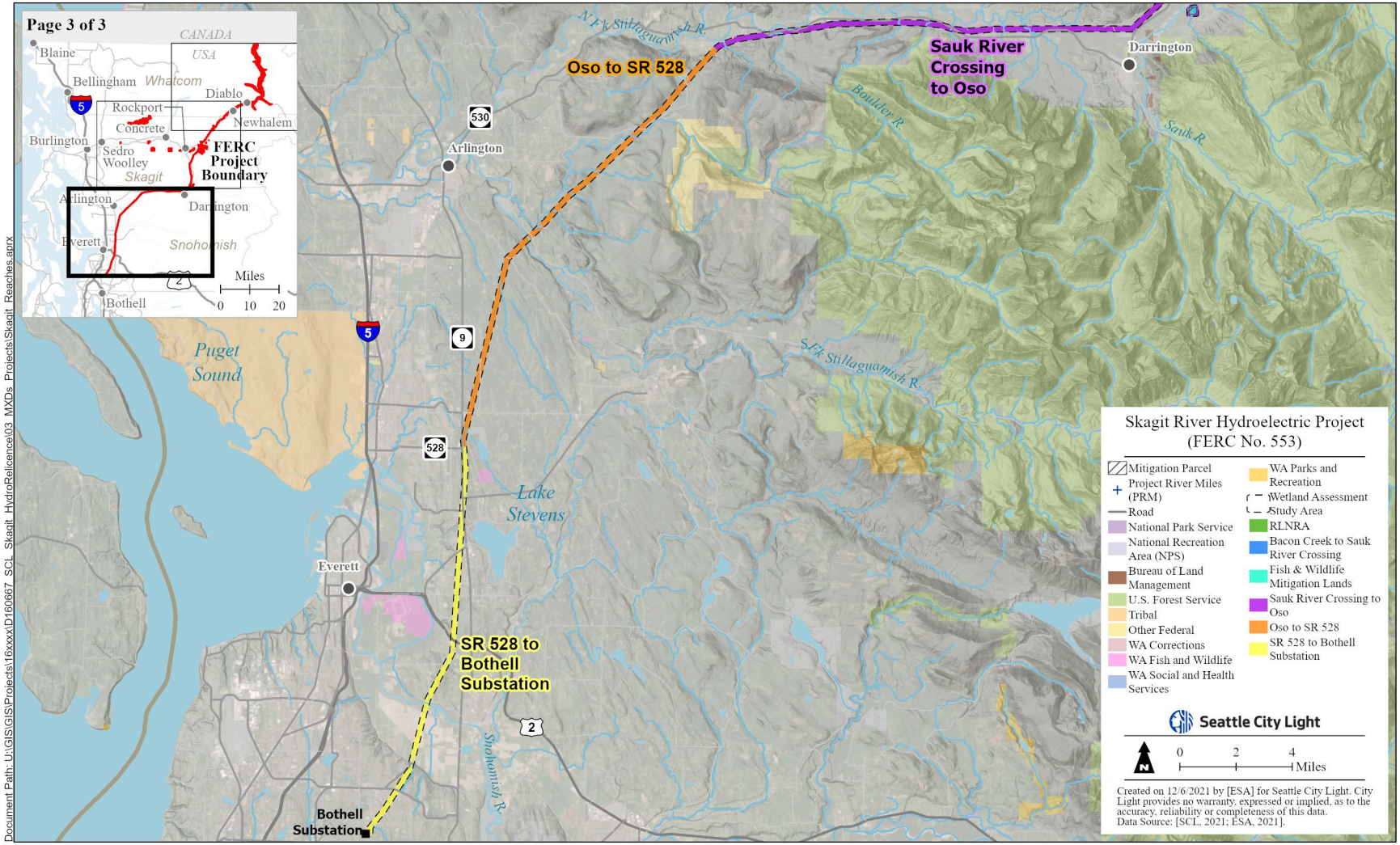


**Figure 3.0-3. Study area segments for the Wetland Assessment (south).**

# 4.0 METHODS

The first step in the study was to develop a comprehensive wetland map and geospatial dataset for the study area. This step was initially described in Sections 2.5.1 through 2.5.3 of the RSP. The second step was to identify areas that have a potential for Project-related disturbances and to conduct a field assessment of specific wetlands located in these areas, as initially described in Sections 2.5.4 through 2.5.5 of the RSP. The third step was data analysis and reporting, as initially described in Section 2.5.6 of the RSP.

## 4.1 Wetland Mapping and Dataset Compilation

The process of creating a comprehensive wetland map and geospatial dataset consisted of the following activities:

- Compile and review existing data to create a preliminary wetland map using existing wetland resource information. Data compiled included public data, as well as data provided by the TWG.
- Run a remote sensing analysis (i.e., a wetland mapping model) to identify and map wetlands in the study area. The analysis consisted of three steps:
  - Collect model training data in the field;
  - Run model (iterative); and
  - Assess accuracy, compile, and finalize data.

### 4.1.1 Preliminary Wetland Map

Review of the available datasets listed in Section 2.3 of the RSP determined that the following layers were the most useful for developing a preliminary wetland map in Geographic Information System (GIS):

- National Wetlands Inventory (NWI).
- The most current high-resolution aerial photography (2018, 6-inch resolution color digital orthophotography).
- The U.S. Geological Survey (USGS) National Hydrography dataset.
- The locations of water-related plant communities where potential wetlands may exist (identified using NPS's Vegetation Classification of Mount Rainier, North Cascades, and Olympic National Parks study [Crawford et al. 2009] and added to the preliminary map created using the data sources above).

### 4.1.2 Wetland Remote Sensing Analysis

The study team used a wetland mapping model, the Wetland Intrinsic Potential (WIP) tool, to map and describe wetlands in the study area that may be affected by Project operations. The model was recently developed by the University of Washington's Remote Sensing & Geospatial Analysis Laboratory and TerrainWorks (Miller and Halabisky 2019) and allows for more detailed mapping than the existing datasets. The study team used this mapping model to identify potential wetlands

that can be hard to detect and wetlands that may not be captured by the NWI or conventional aerial photo interpretation methods. These include wetlands that are seasonal or ephemeral in nature or forested wetlands where hydrology signatures are obscured by the tree canopy. The mapping model uses Light Detection and Ranging (LiDAR)-derived datasets (available for lands within and near to the Project Boundary) and aerial imagery to identify the likelihood that a given area is a wetland using a random forest model (Beiman 2001; Liaw and Wiener 2002).

The study team created several topographic indices as an intermediate step of the mapping model as inputs in the random forest model in GIS. The topographic indices were based on the high-resolution LiDAR as derivatives and included gradient, planform curvature, local relief, profile, slope, and topographic wetness index. Topographic indices were calculated at multiple scales (30 meters [m], 150 m, 300 m) based on recommendations in Miller and Halabisky (2019), and improve errors of omission created by hummocky wetlands under forest canopy. In addition to informing this study, these topographic indices are integral inputs into the remote sensing modeling effort designed to classify vegetation habitat classes in the TR-01 Vegetation Mapping Study (City Light 2022d). Therefore, running the model in the beginning of this study benefited both of these efforts.

The random forest model was trained using sample points derived from the NWI polygons and other wetlands identified during early wetland inventory compilation efforts and development of the preliminary map.[3] The random forest model outputs a raster where each pixel provides a probability (between 0 and 1) that an area is a wetland (vs. an upland). For interpretation of the dataset, the probability was multiplied by 100 to convert to an integer—this field is called the wetness index. Areas with a higher probability (wetness index >50) of being a wetland were then assessed through visual interpretation of aerial imagery, as an additional form of confirmation. The overall workflow to achieve the final wetland probability raster is shown in Figure 4.1-1.

The random forest model-generated wetness raster was then converted to vector format to generate wetland polygons using a segmentation algorithm in ArcGIS Pro. The mean wetness index score within each polygon was calculated; areas with a mean wetness index score below 50 (out of 100) were excluded as unlikely to be a wetland.[4] The remaining polygons were then overlaid with WDFW's High Resolution Land Cover (HRLC) layers to exclude developed, gravel, and open water areas. The updated polygon layer was then refined to merge all neighboring polygons and to incorporate slivers. Any polygons that did not meet the minimal mapping unit (MMU) size threshold of 5,000 square feet (0.115 acre) were discarded. This threshold was determined by reviewing other sources, including mapping standards for the Montana Natural Heritage Program (undated) as well as the USFWS (2020) wetland mapping standards. An updated mean wetness index score was calculated for the updated polygon areas and, again, those below 50 were excluded.

Finally, polygons in flat terrain that were farmland or grassland required a mean wetness index score of 75 out of 100 to be categorized as wetland due to the uniformity of the topography in those areas. Farmlands and grasslands in valleys can have high wetness index scores, as they are

[3] A version of the preliminary map was shared with LPs during the August 17, 2021 TWG meeting.

[4] The University of Washington's Remote Sensing & Geospatial Analysis Laboratory was consulted for this threshold and determined that 50 was an appropriate value to balance commission vs. omission error (Halabisky 2020).

likely areas where flow accumulates and deposits naturally because of low slopes and low relief; however, many of these areas were inaccessible, so City Light did not collect field data to train the model or confirm model results, as described in Section 4.1.3 of this study report. Therefore, given the uncertainty, a higher threshold was set for these areas, as confidence of their status as a wetland or not was low compared to areas where City Light was able to collect field training data.

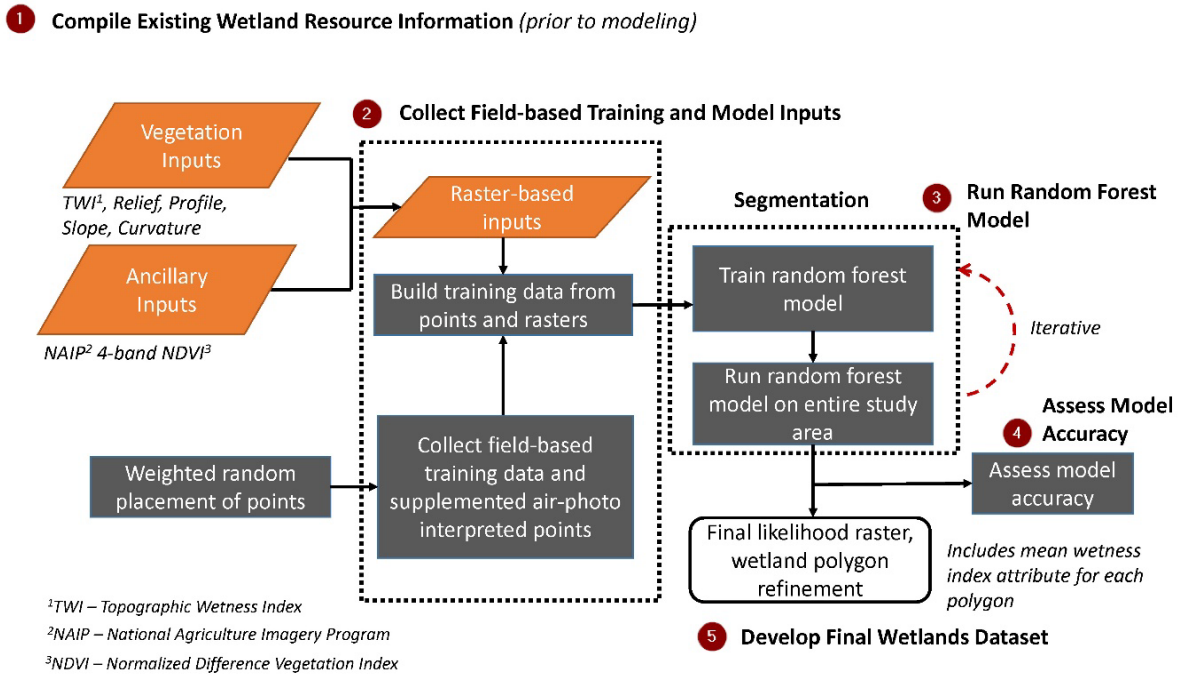


**Figure 4.1-1. Workflow for wetland mapping model.**

### 4.1.3 Collect Model Training Data

Following the preliminary model run (which only used points in the NWI polygons and other wetlands identified during early wetland inventory compilation efforts) the study team collected field data to "train" the model and refine the dataset. Field teams conducted preliminary field investigations at a representative sample of modeled study area wetlands to verify the wetland mapping and to investigate locations where the model indicated a high wetland probability. Data were also recorded at upland areas that were immediately adjacent to the sampled wetlands to increase the accuracy of the modeled wetland boundary. The sampled, modeled wetlands encompassed a broad range of wetland types and were distributed throughout the study area to refine the model output and to provide related information on plant species' occurrence and cover. The location, extent, vegetation type, and wetland class were documented in the field. These data were used to adjust the existing wetland dataset and the map created by the remote sensing wetland model.

The field and geospatial team also assessed the wetland probability rasters, added information collected during preliminary field investigations, and conducted additional model runs. These data were added to improve probability calculations within the study area for those wetlands that were not field verified.

### 4.1.4 Accuracy Assessment and Finalize Data

The random forest model selects a random set of training data to run in the decision tree process, known as a bootstrap method. As part of this bootstrap method, the random forest model used two analyses to assess the accuracy of the wetland model and the final data product. First, the random forest model provides model statistics in the form of a confusion matrix and out of bag (OOB) error. The OOB error is the overall classification error estimate and it serves as an internal error estimate of a random forest as it is being constructed. The OOB error estimate for the final wetland model yielded a 92.8 percent overall confidence, meaning that 92.8 percent of the points used to assess the accuracy of the model were correct. The random forest model is a series of decision trees whereby the error rate will decrease with an increase in the number of trees until a threshold is met where increasing the number of trees does not change the error rate.

As the second analysis to assess accuracy, the random forest model also provides the area under curve (AUC) metric, which is an aggregate measure of performance across all possible classification thresholds. The AUC is a value that ranges from 0.5 to 1.0, with 0.5 being a poor classifier and 1.0 being an excellent classifier. The final wetland model had an AUC score of 0.982 (Figure 4.1-2).

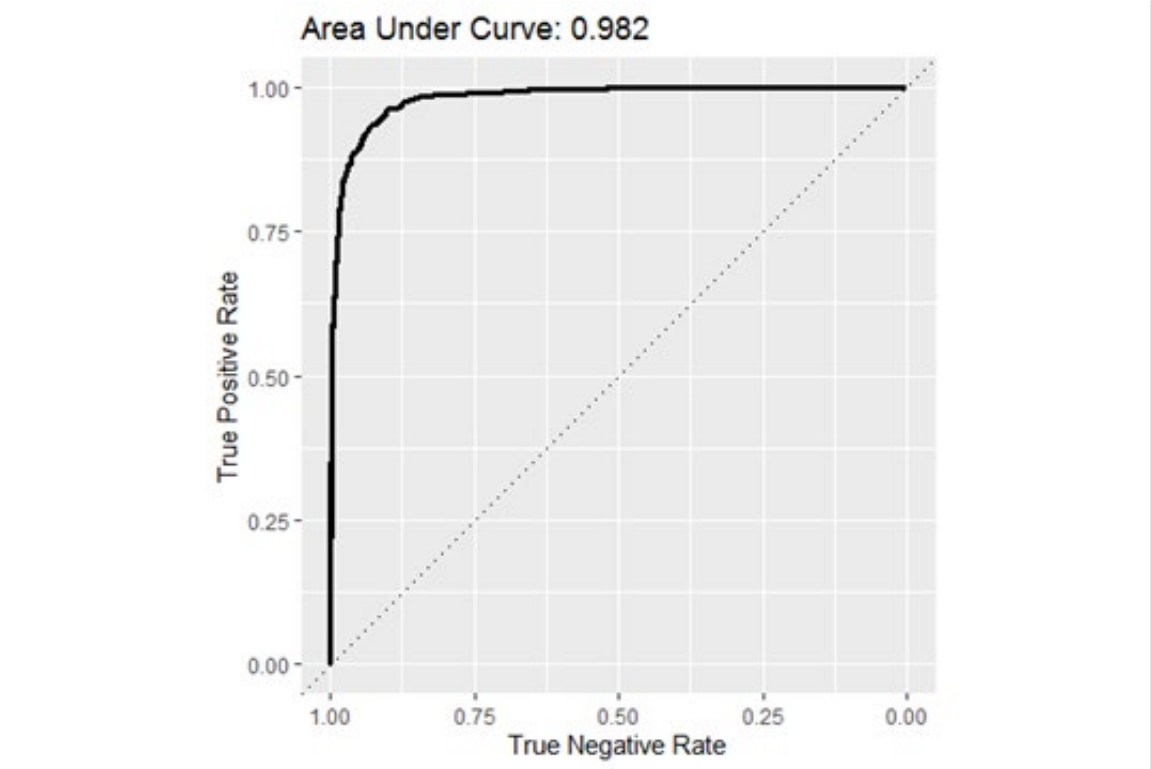


**Figure 4.1-2. Area under curve results for the wetland random forest model.**

In addition to the random forest model error and performance measures, the study team assessed accuracy through additional field assessments by verifying wetlands that were accessible, depending on ownership and safety considerations. The final polygon-based dataset includes fields that indicate whether the wetland was modeled and field-verified or only modeled and not field-verified. For wetlands on the City Light-owned Barnaby Slough parcel, located in this Skagit –

Sauk River confluence zone, wetland mapping data from previous work completed by the Skagit River System Cooperative (SRSC 2013) allowed for a comparison of on-the-ground mapping with the model's interpretation of wetland occurrence and for a comparison of interpreted cover classes.

Additionally, for modeled wetlands, there is a wetness index field with values ranging 0 – 100. A wetland with a wetness index value of 100 indicates that all decision trees made a wetland classification. Conversely, a wetness index value of 0 indicates that no decision trees made a wetland classification. All final wetland polygons included in the final output layer had a minimum wetness index value of 50. A majority of the wetlands mapped had an index value greater than 60.

## 4.2 Identify Potential Disturbance Areas in the Study Area

The study team identified portions of the study area that may be potentially affected by Project operations and maintenance and Project-related recreational activities; these areas were the focus of the field assessment and analytical portion of the study.[5] Specific sources of potential disturbance identified for the field assessment included:

- Areas affected by the fluctuation of the Project reservoirs. To assess areas where wetlands may be affected by reservoir fluctuations, shoreline erosion, and erosion treatment areas, wetlands were mapped along the three Project reservoirs to an elevation of 10 feet over the normal maximum water surface elevation;
- Areas of hydraulic modifications and influence. To assess where wetlands may be affected or influenced by modifications to hydrology, wetlands were mapped within the CMZ of the Skagit River between the Gorge Powerhouse and the Sauk River confluence;
- Project facilities;
- City Light-owned recreation areas;
- Along study roads;
- Privately and publicly owned areas along the transmission line ROW where vegetation is managed by City Light (portions of the ROW that are not managed by City Light account for approximately 15 percent of the total length of the ROW);
- Accessible Project-related salmon spawning channels, including Newhalem Ponds, County Line Ponds, and Taylor, Powerline, and Illabot spawning channels; and
- Areas of soil excavation and/or compaction, specifically the storage facility near the Newhalem Ponds site.

The identification of potential disturbance areas was intended to inform the baseline data collection and field assessment of wetlands in the study area. Along with the wetland map product, the layer would be used to review wetlands in areas with Project-related activities to guide an effects analysis in the license application and future management decisions.

[5] These areas were digitized on aerial imagery and compiled in a mapbook. This mapbook was shared with LPs for comment in May 2021. No comments were received.

### 4.2.1 Field Assessments of Wetlands Potentially Affected by the Project in the Study Area

Field teams visited accessible wetlands in the potential disturbance areas between July 2020 and September 2020, documenting dominant plant species observed within each wetland. Plant species were documented using plant taxonomy used in the University of Washington Burke Herbarium Image Collection (Giblin and Legler 2021). Indicators of hydrophytic vegetation and wetland hydrology per the Regional Supplement to the U.S. Army Corps of Engineers (USACE) Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (USACE 2010) were also recorded. The field teams did not complete jurisdictional wetland delineations, investigate subsurface soil conditions, or establish official wetland data plots. The field teams estimated wetland boundaries based on observations of hydrology and vegetation. Ecological functions were estimated by completing rating forms using the Wetland Rating System for Western Washington (Hruby 2014).

The field teams also collected additional data to inform the relicensing process. These data included sources of wetland hydrology, observed wetland impairments and possible sources of impairment, and incidental observational data relevant to other studies such as the TR-03 Rare, Threatened, and Endangered Plants Study (RTE Plants Study; City Light 2022e), TR-04 Invasive Plants Study (City Light 2022f), TR-08 Special-status Amphibian Study (City Light 2022g), and the TR-09 Beaver Habitat Assessment (City Light 2022h).

Additionally, incidental observations of plant species that Indian Tribes and Canadian First Nations consider as culturally important was recorded. A list of these species was created based on feedback from the Stillaguamish Tribe of Indians, the Sauk-Suiattle Indian Tribe, the Swinomish Indian Tribal Community, the Upper Skagit Indian Tribe, and the Nlaka'pamux Nation Tribal Council as part of TR-01 Vegetation Mapping Study (City Light 2022d).

The field teams identified the approximate boundaries of sampled wetlands based on dominant vegetation, hydrology, topography, and other visual indicators. iPads fitted with Global Positioning System (GPS) capability and aerial imagery were used to record selected boundary points in the field. Boundary points and polygons were drawn onto GIS maps in the field. Collecting data using electronic forms was efficient and reduced office time of transcribing data from field notebooks. It also provided a means of backing up data while in the field.

The study team classified all of the wetlands as palustrine wetlands based on the Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al. 1979). Palustrine wetlands include all nontidal wetlands dominated by trees, shrubs, persistent emergent vegetation, emergent mosses, or lichens. The Palustrine system is divided by the plant form or forms that constitute the uppermost layer of vegetation with an aerial coverage of at least 30 percent (Cowardin et al. 1979). Major vegetation classes of the Palustrine system include forested (PFO), scrub-shrub (PSS), and emergent (PEM). Wetlands with multiple vegetation classes met the 30 percent cover threshold in the uppermost layer of vegetation for the respective vegetation classes. Wetlands that are largely open water were considered to be Palustrine unconsolidated bottom (PUB), which are wetlands that have a vegetated cover of less than 30 percent. Different hydrogeomorphic (HGM) types within palustrine systems in the study area include depressional, slope, riverine flow-through, and lake fringe. In addition to the Cowardin vegetation class, the geospatial dataset includes the HGM class for each wetland within the area of potential disturbance.

The field teams rated wetlands within potential disturbance areas according to the Wetland Rating System for Western Washington (Hruby 2014). Per the rating system guidance, the entire wetland unit was rated and not just the portion of the wetland that was observed in the field or that was within the study area. If wetlands near areas of potential disturbance could not be assessed in the field, the study team completed a preliminary wetland rating as a desktop exercise using remote sensing data. In general, field teams did not assess wetland sites in the field if they were on private property[6] or raised safety concerns for field staff. Additionally, as indicated in Section 2.4 of the RSP, although Big Beaver Valley is within the study area, the study team did not conduct field assessments within the valley for the following reasons: (1) the hydrology of Ross Lake does not affect wetlands in this area; (2) there are no City Light activities that affect this portion of the study area; and (3) NPS reed canarygrass mapping in Big Beaver Valley is adequate for use in rating the wetland complex.

A summary of the purpose of the rating system and a description for each category is excerpted from the rating system (Hruby 2014) and provided below. Ecology developed the wetland rating system as a functional assessment tool that differentiates wetlands based on sensitivity to disturbance, significance, rarity, ability to replace the wetland, and the beneficial functions that the wetland provides to society (Hruby 2014). Although this system is designed to qualitatively rate wetlands, it is based on the functions performed and the degree to which they are performed. The rating system provides a qualitative assessment of several wetland functions, including water quality improvement, flood flow alteration, and wildlife habitat. Points are assigned based on a series of questions regarding water quality, hydrologic, and habitat functions, and then scored into four categories:

- **Category I**[7] (total score 23 – 27 points) are those wetlands that represent a unique or rare wetland type, or are more sensitive to disturbance than most wetlands, or are relatively undisturbed and contain ecological attributes that are impossible to replace within a human lifetime, or provide a high level of function. These wetlands are rare and require a high level of protection.
- **Category II** (total score 20 – 22 points) are those wetlands that are difficult, although not impossible, to replace and that provide high levels of some functions. These occur more commonly than Category I wetlands, although still need a high level of protection.
- **Category III** (total score 16 – 19 points) are considered to be wetlands with a moderate level of function, can often be adequately replaced with a well-planned mitigation project, generally have been disturbed in some ways, and are often less diverse or more isolated from other natural resources than Category II wetlands.
- **Category IV** (total score is less than 16 points) are often heavily disturbed and are wetlands that should be able to be replaced and, in some cases, be able to be improved.

The potential and opportunity for wetlands to provide specific functions, such as improving water quality, storing water, and providing habitat, can be weakened or impaired by a wetland's location or position in the landscape and by other geomorphic attributes, including size, shape, depth, etc. (Brinson 1993). Wetland functions can also be affected by the presence of one or more

[6] Private property was only accessed where permission was granted by the property owner.
[7] No Category I wetlands were mapped within the study area.

impairments. Common impairments to wetland functions that were noted during site visits included:

- Low plant species richness;
- Presence of invasive plant species;
- Alteration to hydrologic regime;
- Disconnection to wetland buffer and/or nearby habitats;
- Proximity to land uses that could contribute excess pollutants;
- Proximity to land uses that result in stormwater runoff;
- Filling and/or grading of wetlands;
- Vegetation removal or trampling; and
- Shoreline and bank erosion.

The identified impairments are discussed as part of the functional assessments in the Results section of this study report. These impairments may or may not have a nexus with the Project. In some cases, the impairment may be due to factors or conditions unrelated to Project activities or to a combination of Project-related and non-Project-related factors. For example, an infestation of invasive plant species in a wetland may be related to infestations upwind or outside the study area, and a disconnect between a wetland and its buffer could be the result of either a Project facility or a non-Project facility.

The results of the rating forms are intended to be a baseline assessment of wetland conditions throughout the study area. The baseline assessment will be used to inform an effects analysis in the Draft License Application (DLA) and future management decisions.

## 4.3 Data Analysis and Reporting

This Wetland Assessment includes the following information as described in the RSP:

- Summary data divided by geographic segments of the study area;
- A list of dominant plant species observed in each wetland assessed in the field;
- An analysis of ecological functions and values of wetlands that were field assessed; and
- A description of possible sources of observed functional impairments.

Access to a web-based map is available upon request to City Light and provides geospatial data on wetlands in the study area. The geospatial dataset includes the Cowardin vegetation class (Cowardin et al. 1979), HGM determination used for the functional assessment, results of the functional assessment, observed dominant plant species, location of sample points, and photographs. A mapbook (Attachment A) was produced to display wetlands in the study area

according to Cowardin vegetation class and rating category.[8] Attachment B includes a mapbook that shows sources of potential disturbances identified for the field assessment. A table of the attributes listed above for wetlands assessed in the field is included in Attachment C of this study report.

Incidental data collected to inform other efforts, such as the TR-03 RTE Plants Study (City Light 2022e), TR-04 Invasive Plants Study (City Light 2022f), TR-08 Special-status Amphibian Study (City Light 2022g), and the TR-09 Beaver Habitat Assessment (City Light 2022h), were incorporated into the relevant study reports, as applicable. Additionally, incidental observations of culturally important plant species will be provided confidentially to appropriate LPs as part of the geodatabase developed for TR-01 Vegetation Mapping Study (City Light 2022d).

[8] The mapbook also shows wetlands that were modeled outside of the study area. The additional one-half mile area outside of the study area is referred to as the wetland modeling area as shown in the mapbook in Attachment A. Wetlands mapped within the wetland modeling area were not verified and are not included in any of the results or analysis presented in this report as they are not within the Project Boundary or the CMZ (i.e., the study area). However, these mapped wetlands are included here as they will inform the results of the TR-01 Vegetation Mapping Study.

# 5.0 RESULTS

The study team completed the Wetland Assessment between May 2020 and July 2021, and produced the preliminary wetland map in May 2020. The wetland remote sensing analysis also began in May 2020. The field team conducted the initial site visits to collect model training data in June 2020, and the majority of the field assessment was conducted July through September 2020. The final run of the model took place in October 2020, and the final analysis for this draft report occurred in July 2021.

The results of this assessment provide a detailed and accurate overview of wetlands within the study area. This baseline assessment, in combination with other relicensing studies, provides data to inform the effects analyses to be presented in the DLA and to inform development of protection, mitigation, and enhancement (PME) measures. The field methods described above provided a rapid assessment of wetland boundaries and ecological function for wetlands where there is the greatest potential for Project effects.

## 5.1 Summary of Overall Wetland Assessment Results by Study Area Segment

The section below summarizes the results of mapped wetlands throughout the study area, by segment (Table 5.1-1).

**Table 5.1-1. Wetland acreage by Cowardin vegetation class.[1]**

| Study Area Segment or Sub-Segment | | PFO | PFO/ PSS | PFO/ PEM | PFO/ PSS/ PEM | PSS | PSS/ PEM | PEM | PUB | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| RLNRA | Ross Lake (exclusive of Big Beaver Valley) | 8 (7) | 0 | 37 (4) | 0 | 0 | 0 | 168 (7) | 0 | **213 (18)** |
| | Big Beaver Valley | 0 | 0 | 0 | 674 (1) | 0 | 0 | 0 | 0 | **674 (1)** |
| | Diablo Lake | 16 (2) | 44 (4) | 0 | 0 | 1 (1) | 0 | 0 | 0 | **61 (7)** |
| | Gorge Lake | 0 | 2 (2) | 0 | 0 | 0 | 0 | 0 | 0 | **2 (2)** |
| | Gorge Lake to Bacon Creek[2] | 3 (6) | 4 (4) | 0 | 0 | 0 | 0 | 0 | 0 | **7 (10)** |
| Bacon Creek to Sauk R. Crossing[2] | | 205 (74) | 13 (4) | 13 (1) | 192 (11) | 8 (6) | 36 (12) | 316 (51) | 0 | **783 (159)** |
| Sauk R. Crossing to Oso[2] | | 3 (3) | 22 (4) | 6 (3) | 1 (1) | 10 (6) | 3 (2) | 2 (1) | 0 | **47 (20)** |
| Oso to SR 528 | | 2 (3) | 15 (6) | 5 (1) | 13 (1) | 5 (2) | 22 (8) | 6 (3) | 0 | **68 (24)** |
| SR 528 to Bothell Substation | | 0 | 1 (1) | 0 | 3 (3) | 4 (3) | 7 (7) | 0 | 0 | **15 (14)** |
| Fish and Wildlife Mitigation Lands | | 414 (119) | 7 (12) | 41 (6) | 165 (8) | 4 (3) | 0 | 34 (17) | 5 (1) | **670 (166)** |
| **Total** | | **651 (214)** | **108 (37)** | **102 (15)** | **1,048 (25)** | **32 (21)** | **68 (29)** | **526 (79)** | **5 (1)** | **2,540 (421)** |

1 Numbers in parenthesis are counts of individual wetlands.
2 These calculations do not include lands within the fish and wildlife mitigation parcels located in these segments. All fish and wildlife mitigation lands are included in the Fish and Wildlife Mitigation Lands study area segment of this table.

The study area encompasses approximately 2,540 acres of wetlands. Of this total, 1,775 acres (70 percent) are within the Project Boundary, and the remaining 765 acres (30 percent) are outside of the Project Boundary, primarily in the Skagit River CMZ portion of the study area. A total of 957 acres (38 percent) of all mapped wetlands occur within the various sub-segments of the RLNRA. This does not include wetlands mapped within the Newhalem Ponds and County Line Ponds parcels, which are included in the total for the fish and wildlife mitigation lands. Of the total acres of wetlands mapped within the RLNRA, 950 acres (99 percent) occur within the Project Boundary. The remaining 7 acres are located within several riparian areas of the Skagit River between Newhalem and Bacon Creek. Of the total 957 acres of wetlands mapped in the RLNRA, 276 acres (29 percent) are associated with the three Project reservoirs while 674 acres (70 percent) of mapped wetlands, are part of the PFO/PSS/PEM Big Beaver Valley wetland complex within the High Ross portion of the FERC Project Boundary.

The Washington Department of Natural Resources (DNR) maps Wetlands of High Conservation Value (WHCV) as part of the Washington Natural Heritage Program (WNHP) throughout Big Beaver Valley. The WNHP has identified these wetlands as either high quality, undisturbed wetlands or wetlands that support rare or sensitive plant populations (Washington DNR 2021). When applying the Washington State Rating System functional assessment, the Big Beaver Valley wetland complex receives a high habitat function due to its diversity of plants and plant structure, its diversity in hydroperiods and interspersion of habitats, and its ability to support a wide range of wildlife species due to the presence of habitat features such as streams, ponds, large downed wood, and snags. Additional information can be found in A Floristic Survey of Big Beaver Valley (Vanbianchi and Wagstaff 1987). WDFW's PHS mapping shows several occurrences of western toad (*Anaxyrus boreas*) within Big Beaver Valley, primarily in the large PEM portion of the wetland (WDFW 2021). The study team visited the Ross Lake – Big Beaver Creek confluence and observed several patches of reed canarygrass. The TR-04 Invasive Plants Study summarizes these observations, as well as NPS reed canarygrass inventory and treatment information for the Big Beaver Valley wetlands (City Light 2022f).

The area between the RLNRA and the Sauk River crossing encompasses an additional 31 percent of all mapped wetlands in the study area; 29 acres (4 percent) occur within the Project Boundary, primarily along the transmission line ROW, and the remaining 754 acres (96 percent) occur outside of the Project Boundary, primarily in the Skagit River CMZ that is included in this study area segment. These wetlands include a mixture of PFO habitats and PEM wetlands in farm fields within the CMZ, as well as the PFO/PSS/PEM slough complexes within the Skagit – Sauk River confluence. This does not include the wetlands in the fish and wildlife mitigation lands located in this study area segment.

The fish and wildlife mitigation lands encompass approximately 26 percent of all mapped wetlands in the study area. The majority are the PFO habitats within the Nooksack River basin parcels, and the PFO/PSS/PEM wetland complexes at the Skagit – Sauk River confluence within the McLeod, Napoleon, False Lucas, Barnaby, O'Brien, and Illabot sloughs mitigation lands. The remaining 130 acres (5 percent) of mapped wetlands within the study area are found primarily along the transmission line; this includes 68 acres between Oso and SR 528, 47 acres between the Sauk River crossing and Oso, and 15 acres between SR 528 and the Bothell substation. All wetlands within the fish and wildlife mitigation lands, as well as the transmission line, are within the Project

Boundary. The following sections describe wetlands within each of the study area segments and components.

## 5.2 Summary of Wetland Assessment Results within Study Area Segments and Areas of Potential Disturbance

The text and tables below summarize the Wetland Assessment results for each study area segment or sub-segment based on their Cowardin vegetation class, as well as the results of their functional assessment using the Wetland Rating System for Western Washington (Hruby 2014).

### 5.2.1 Wetlands Along the Reservoirs Within RLNRA

The study team mapped a total of 267 acres of wetlands around the three reservoirs (Table 5.2-1), with approximately 206 acres (77 percent) along Ross Lake (see Attachment A, pages 1 through 8), 59 acres (22 percent) around Diablo Lake (see Attachment A, pages 8 and 9), and 2 acres (less than 1 percent) along Gorge Lake (see Attachment A, pages 8, 10, and 11). The majority of these wetlands are lake fringe wetlands, with the reservoirs being the primary source of hydrology. However, small streams and drainages upslope, as well as groundwater, also likely feed the PFO and PSS wetlands. As mentioned above, the hydrology of Ross Lake does not affect wetlands in Big Beaver Valley, and these wetlands are not considered to be in an area of potential disturbance. Therefore, wetlands in Big Beaver Valley were not visited in the field and are not part of this assessment.

**Table 5.2-1. Wetland acreage by Cowardin vegetation class within an elevation of 10 feet over the normal maximum water surface in RLNRA.[1]**

| Reservoir | PFO | PFO/PSS | PFO/PEM | PSS | PEM | Total |
|---|---|---|---|---|---|---|
| Ross | 2 (2) | 0 | 35 (3) | 0 | 169 (7) | **206 (12)** |
| Diablo | 16 (2) | 42 (4) | 0 | 1 (1) | 0 | **59 (7)** |
| Gorge | 0 | 2 (2) | 0 | 0 | 0 | **2 (2)** |
| **Total** | **18 (4)** | **44 (6)** | **35 (3)** | **1 (1)** | **169 (7)** | **267 (21)** |

1 Numbers in parenthesis are counts of individual wetlands.

Wetlands on Ross Lake range from approximately 2,000 square feet to approximately 96 acres in size. The smallest wetlands are in a series of wetlands along Ruby Creek, upstream of Ruby Arm. The largest wetland is a large PEM wetland in the drawdown zone, on the east side of the lake near the Canadian border (#3860; see Attachment A, page 1). This wetland is also the wetland at the lowest elevation along Ross Lake. Wetlands along Ross Lake occur at elevations between 1,597 feet and 1,621 feet City of Seattle Datum (CoSD), compared to a normal maximum water surface elevation of 1,602.5 feet (Figures 5.2-1 and 5.2-2). Most of the wetlands along Ross Lake are lake fringe wetlands and have a PEM cover class that is submerged at normal maximum water surface elevation. Based on a review of aerial photography, wetland areas extend along the shore of Ross Lake into British Columbia. Reed canarygrass dominates 82 percent of the wetlands along Ross Lake. Wetlands at or above normal maximum water surface elevation are less diverse and contain primarily reed canarygrass and stunted soft rush (*Juncus effusus*). Wetlands below normal maximum water surface elevation have more species richness and include species such as jointleaf rush (*J. articulatus*), slough sedge (*Carex obnupta*), and lesser spearwort (*Ranunculus flammula*).

**Figure 5.2-1. Wetland #3788 along Ross Lake near normal maximum water surface elevation.**

**Figure 5.2-2. Wetland #3788 along Ross Lake below normal maximum water surface elevation.**

Wetlands on Diablo Lake range from 0.4 acre to approximately 37 acres in area. All wetlands are located within Thunder Arm (see Attachment A, page 8). Approximately 71 percent of the wetlands around Diablo Lake contain a mixture of PFO and PSS habitat and are primarily located within Thunder Arm at the outlet of Thunder Creek. Red alder (*Alnus rubra*) and western red cedar (*Thuja plicata*) dominate the forested cover, and red osier dogwood (*Cornus stolonifera*), willow species (*Salix* spp.), and salmonberry (*Rubus spectabilis*) dominate the shrub cover.

Gorge Lake includes two primary wetland habitats. A nearly 2-acre forested wetland (#3630; see Attachment A, page 10) occurs on the south side of the river, downstream of the Diablo Powerhouse. The field team could not access this wetland; however, based on aerial imagery, the forested cover is deciduous and likely includes red alder and black cottonwood (*Populus trichocarpa*). Another small wetland (#3992, 0.1 acre; see Attachment A, page 10) occupies a low-lying terrace on the south side of the Diablo townsite.

The field team visited 16 of the 21 identified wetlands, including 10 on Ross Lake, five on Diablo Lake, and one on Gorge Lake. For the five wetlands not visited, the study team assessed functions using remote sensing data.

**Functional Assessment**

The study team rated 85 percent of wetland acres mapped along the three Project reservoirs as Category III wetlands (Table 5.2-2). All 12 wetlands rated along Ross Lake are lake fringe wetlands. Five of the seven wetlands rated along Diablo Lake are near the outlet of Thunder Creek and are riverine wetlands. The remaining two wetlands along Diablo Lake are depressional wetlands. Both wetlands along Gorge Lake are riverine wetlands.

Wetlands along the reservoirs typically had a moderate level of water quality function. Although emergent vegetation that can effectively filter pollutants and sediments dominate these wetlands, due to their location in the RLNRA, there are few sources of pollution within the landscape. These wetlands also exhibit a moderate level of hydrologic function. Most wetlands along the reservoir shorelines lack shrubs or trees to reduce or prevent shoreline erosion from wave action, likely due to inundation by the reservoir, which prevents the establishment of woody plants during most of the growing season. Finally, these wetlands have a moderate to high level of habitat function. Although the plant species richness and structural diversity was determined to be moderate to low, these wetlands contain downed wood, are close to mature forests, and have not been subject to fragmentation and habitat loss, all of which increase their level of habitat function.

The study team rated 36 acres of wetlands around Ross Lake as Category II wetlands. These wetlands, including one near the mouth of Big Beaver Creek (#3716, approximately 12 acres; see Attachment A, page 5), rated higher due to more diversity in their hydrologic regimes and vegetation structure. A large Category II wetland located just north of Dry Creek (#3788, approximately 24 acres; see Attachment A, page 3) was observed to have special habitat features, such as downed wood and large snags. Both of these wetlands have more diverse native vegetation species composition and structure, partially due to NPS efforts to reduce reed canarygrass coverage through the installation of native sedges (Tressler 2021).

**Table 5.2-2. Wetland acreage by rating category within reservoir fluctuation zone in RLNRA.[1]**

| Reservoir | II | III | IV | Total |
|---|---|---|---|---|
| Ross | 36 (2) | 170 (10) | 0 | **206 (12)** |
| Diablo | 0 | 56 (6) | 3 (1) | **59 (7)** |
| Gorge | 0 | 2 (2) | 0 | **2 (2)** |
| **Total** | **36 (2)** | **228 (18)** | **3 (1)** | **267 (21)** |

1 Numbers in parenthesis are counts of individual wetlands.

Species diversity was typically low for wetlands along Ross Lake—reed canarygrass is the dominant species in emergent wetlands. Reed canarygrass is a resilient and aggressive grass that, with sufficient nutrients, sunlight, and moisture, can limit other native emergent species in wetlands. However, within the drawdown zone, it appears that reed canarygrass is not outcompeting existing vegetation as there is ample bare soil for other species to establish. There are likely multiple sources of reed canarygrass propagules (i.e., seed and root fragments) because these can be spread by water, wind, and animals. A large reed canarygrass-dominated wetland on the Canadian side of Ross Lake likely contributes to reed canarygrass dispersal via water. Although reed canarygrass is difficult to eradicate, shade from trees and shrubs can inhibit reed canarygrass growth; however, because these wetlands are inundated almost the entire growing season, it is difficult for woody cover to become established well enough to shade out reed canarygrass along the reservoir fringe. The TR-04 Invasive Plants Study includes additional information on reed canarygrass along Ross Lake (City Light 2022f).

### 5.2.2 Wetlands along the Transmission Line ROW Portion of the Project Boundary

The text below describes the results of the Wetland Assessment for areas along the Project transmission line by study area segment. This discussion includes only wetlands within the transmission line ROW portion of the Project Boundary, excluding any fish and wildlife mitigation lands that geographically fall within the transmission line ROW study area segments (those are discussed in Section 5.2.3 of this study report). No wetlands are mapped along the approximately 7-mile-long section of transmission line ROW from Ross Powerhouse to the southern end of Gorge Lake; therefore, these areas are not discussed below. The study team assigned a Cowardin class for all mapped wetlands within the transmission line and outside of the fish and wildlife mitigation lands. However, the functional assessment focused on the wetlands where City Light conducts more frequent vegetation management. City Light-managed portions of the transmission line ROW include privately and publicly owned parcels. Vegetated portions of the ROW that are not managed by City Light account for approximately 15 percent of the total length of the ROW.[9] A large portion of these wetlands are depressional HGM type systems supported by groundwater and precipitation. The majority of wetlands within the transmission line ROW portion of the Project Boundary (43 percent) occur within the Oso to SR 528 segment. The wetlands in this segment vary in size, with the majority covering 2 acres or less of the land within the transmission line ROW.[10] The largest wetland (#441; see Attachment A, page 32) is part of a 186-acre PFO/PSS/PEM

9 Portions of the transmission line ROW where City Light does not manage vegetation include areas where vegetation is managed by other entities (e.g., local parks departments, local school districts, Tribal entities, etc.).

10 These values are an estimate of the average area of each wetland within the Project Boundary and do not include wetland areas that may extend outside of the Project Boundary.

depressional wetland associated with Olsen Lake and several streams northeast of Marysville. Thirteen acres of this wetland occur within the transmission line ROW. Approximately 29 percent of the wetlands along the transmission line ROW occur within the Sauk River Crossing to Oso segment. Wetlands within this segment cover on average of 2 acres or less of the land within the transmission line ROW. The largest wetland (#776; see Attachment A, page 27) is a depressional PFO/PSS wetland located northeast of Darrington. Fourteen acres of this 39-acre wetland occur within the transmission line ROW. Eighteen percent of wetlands occur within the Bacon Creek to Sauk River Crossing segment, and the majority of these wetlands cover less than an acre of the land within the transmission line ROW. Wetland #1564 (see Attachment A, page 24) is a large wetland complex with a total of 233 acres in area and has 12 acres within the transmission line ROW. More information on Wetland #1564 is provided in the functional assessment discussion below. The remaining 10 percent of wetlands within the transmission line ROW occur within the SR 528 to Bothell Substation segment. Wetland #3954 (see Attachment A, page 35) covers the largest amount area within the transmission line ROW in this segment, with 3 of its 4 acres within the Project Boundary. Larger wetlands are located in this study area segment but are primarily located outside of the Project Boundary. The largest wetland in this segment (#60, 13 acres; see Attachment A, page 37) is in agricultural fields in the Snohomish River valley. No wetlands are associated with the transmission line ROW identified within the RLNRA (Table 5.2-3).

**Table 5.2-3. Wetland acreage by Cowardin vegetation class within the transmission line portion of the Project Boundary.[1]**

| Study Area Segment | PFO | PFO/ PSS | PFO/ PEM | PFO/ PSS/ PEM | PSS | PSS/ PEM | PEM | Total |
|---|---|---|---|---|---|---|---|---|
| RLNRA | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| Bacon Creek to Sauk R. Crossing[2] | 2 (2) | 1 (1) | 0 | 12 (1) | 1 (1) | < 1 (1)[3] | 13 (13) | **29 (19)** |
| Sauk R. Crossing to Oso | 1 (2) | 22 (4) | 6 (3) | 1 (1) | 10 (6) | 3 (2) | 2 (1) | **45 (19)** |
| Oso to SR 528 | 2 (3) | 15 (6) | 5 (1) | 13 (1) | 5 (2) | 22 (8) | 6 (3) | **68 (24)** |
| SR 528 to Bothell Substation | 0 | 1 (1) | 0 | 3 (3) | 4 (3) | 7 (7) | 0 | **15 (14)** |
| **Total** | **5 (7)** | **39 (12)** | **11 (4)** | **29 (6)** | **20 (12)** | **32 (18)** | **21 (17)** | **157 (76)** |

1 Numbers in parenthesis are counts of individual wetlands.
2 Only includes acreage of Powerline and Illabot spawning channels that occur within the transmission line ROW. Additional acreage of these channels that occurs outside of the transmission line ROW is included in Table 5.2-8 as they are part of the Illabot North wildlife mitigation land parcel.
3 The portion of the Powerline spawning channel within the transmission line ROW account for less than 1 acre of PSS/PEM within this study area segment.

The majority of wetland habitats within the transmission line are a mix of two or more Cowardin vegetation classes. This is largely a result of wetlands within the transmission line ROW extending outside of the transmission line beyond the extent of City Light vegetation management. Vegetation management conducted by City Light has included periodic mowing and/or the cutting of trees and large shrubs to maintain compliance with overhead transmission line clearance standards. For this reason, emergent or scrub-shrub habitats dominate the wetlands within the transmission line ROW, but transition to more structurally complex and diverse forested wetlands outside of the managed ROW (Figure 5.2-3). Per the rating system guidance, the entire wetland

unit is rated and not just the portion of the wetland within the study area, which results in multiple Cowardin classes for the majority of these wetlands. Douglas spirea (*Spiraea douglasii*) dominates the majority of wetlands within the transmission line ROW, occasionally interspersed with taller shrubs such as red osier dogwood and willows. Slough sedge, skunk cabbage (*Lysichiton americanus*), common cattail (*Typha latifolia*), and reed canarygrass are common understory species. Most of the 21 acres classified as PEM are in agricultural fields north of the Skagit – Sauk River confluence. The majority of the PFO wetlands are in areas with minimal vegetation management where the transmission lines cross river valleys, ravines, or other topographical areas with sufficient conductor clearance such that only tall trees need to be removed occasionally.

**Figure 5.2-3. Wetland #4016 exhibits typical scrub-shrub wetland vegetation under the transmission line ROW transitioning to forested cover outside of the transmission line ROW.**

The Powerline (#2297) and Illabot (#3998) spawning channels (see Attachment A, page 16) are located along the transmission line ROW within the Bacon Creek to Sauk River Crossing study area segment and are mapped as PSS/PEM and PFO/PSS, respectively. City Light constructed the Powerline spawning channel in 2003, creating 27,448 square feet (0.6 acre) of aquatic habitat. Invasive species dominate this spawning channel, including reed canarygrass and Himalayan blackberry (*Rubus bifrons*). City Light constructed the Illabot spawning channel in two phases and created 23,207 square feet (0.5 acre) of aquatic habitat in 1995 and an additional 40,978 square feet (0.9 acre) of habitat in 2002. This channel is less disturbed—red alder dominates the forested class and willows dominate the shrub class. However, reed canarygrass and Himalayan blackberry are still present along the banks of the channel.

### Functional Assessment

Of the 75 wetlands mapped along the transmission line ROW, 67 (89 percent) are on parcels where City Light conducts vegetation management. Of these 67 wetlands, the field team visited 32. Sixty-two of these wetlands were rated as depressional and the remaining five wetlands as riverine wetlands. Eighty-one acres, or 55 percent of the wetlands that occur in City Light-managed portions of the transmission line ROW, were Category III wetlands. An additional 49 acres (34 percent) were Category II wetlands; and the remaining 16 acres (11 percent) were Category IV wetlands (Table 5.2-4). The study team only assessed functions of wetlands on accessible parcels where City Light conducts vegetation management.

**Table 5.2-4. Wetland acreage by rating category along the transmission line portion of the Project Boundary.[1]**

| Study Area Segment | II | III | IV | Total |
|---|---|---|---|---|
| Bacon Creek to Sauk R. Crossing | 12 (1) | 4 (3) | 7 (9) | **23 (13)** |
| Sauk R. Crossing to Oso | 4 (2) | 32 (10) | 8 (5) | **44 (17)** |
| Oso to SR 528 | 32 (7) | 34 (15) | 1 (1) | **67 (23)** |
| SR 528 to Bothell Substation | 4 (3) | 11 (10) | 0 | **15 (13)** |
| **Total** | **52 (13)** | **81 (38)** | **16 (15)** | **149 (66)** |

1 Numbers in parentheses are counts of individual wetlands.

The majority of Category II wetlands within the Project Boundary are associated with large, diverse wetland complexes that extend outside of the Project Boundary. The largest wetland complex within the transmission line ROW in the Bacon Creek to Sauk River Crossing segment includes a Category II wetland (#1564; see Attachment A, page 24) that may be hydrologically connected to a wetland identified as a WHCV by the WNHP. WNHP identifies the upper approximately 55 acres of this wetland complex (which is located outside of the Project Boundary) as a WHCV. WHCVs are generally Category I wetlands that are known or suspected to contain a rare species or that represent a rare/high quality habitat or riparian community and are important for maintaining plant diversity (Washington DNR 2021). According to the WNHP website, the WHCV wetland has a cover type containing the U.S. National Vegetation Classification (USNVC) North Pacific Transitional Poor Fen and North Pacific Conifer Basin Swamp Subgroups. Although there is potential for a hydrological connection from the WHCV to the transmission line wetland (#1564), the WHCV is located upslope of and outside of the Project Boundary. Therefore, the portion of the wetland complex within the Project Boundary was rated separately, and categorized as a Category II wetland based on functions and lack of special habitat characteristics. Only the portion of this wetland complex within the Project Boundary was visited by the field team. The field team did not observe any rare or high-quality plant associations or rare plant species within the Project Boundary portion of this wetland complex. Twelve acres of this 233-acre wetland complex are within the Project Boundary.

Thirteen of the 32 acres of Category II wetlands within the Oso to SR 528 segment are associated with Olsen Lake (#441, 185 acres; see Attachment A, page 32) and several other large wetlands within the lower South Fork Stillaguamish River basin. These wetlands often scored high for water quality and hydrologic functions due to their large size compared to the contributing basin and because they are near developed areas, reflecting their potential to filter pollutants in surface

runoff, or because they are near an impaired stream listed as polluted by Ecology. Habitat function is also relatively high due to multiple hydroperiods and diverse vegetation structure.

The majority of Category III wetlands are located in the Sauk River Crossing to Oso and Oso to SR 528 study area segments. These wetlands typically scored moderate to high for water quality depending on their location. For instance, a wetland next to SR 530 would receive a higher water quality and hydrologic score because it can detain and filter road runoff. Wetlands within the Stillaguamish River basin also received a higher water quality score as there is an Ecology-approved Water Quality Improvement project for that basin. Conversely, wetlands in the adjacent Snohomish River basin, where there is not an approved Water Quality Improvement project, scored lower. Location also affects the habitat score. Wetlands near SR 530 or a study road have lower scores because roads fragment habitat and often break connectivity between areas of undisturbed or less-disturbed habitats. Wetlands entirely within the managed transmission line ROW likely scored low due to a lack of plant diversity and structural complexity that results from periodic clearing and maintenance; while wetlands that extend beyond the managed transmission line ROW are likely to be more diverse and scored higher.

The study team rated the Powerline and Illabot spawning channels as Category III wetlands within the Bacon Creek to Sauk River Crossing segment (see Attachment A, page 16). These wetlands scored low to moderate for water quality and hydrologic functions because they can receive and detain hyporheic flows and groundwater. Other than some dust from access roads, these wetlands do not receive pollutants found in stormwater runoff. However, the study team rated these wetlands as high for habitat function because they are structurally diverse, have a variety of hydroperiods, contain habitat features that provide refuge and riparian shading, and are largely connected to other undisturbed habitats.

Due to the vegetation management within the transmission line ROW, vegetation throughout the ROW is relatively disturbed, and the structure is less complex. Trees are generally absent from the portions of wetlands directly within the ROW, and tall shrubs are infrequent and provide little cover. The majority of wetlands are characterized by a monoculture of spirea, which provides minimal habitat diversity. Additionally, the access road network throughout the transmission line ROW can alter the natural hydrology of these areas as water flows adjacent to the roadbed and into culverts. Access roads are effective impervious surface areas and contribute to erosion and delivery of suspended sediments in stormwater runoff to some wetlands. Some erosion is caused by unauthorized off-road vehicle use. Roads can also fragment and disconnect these wetlands from their protective buffers and nearby habitats.

### 5.2.3 Wetlands on Fish and Wildlife Mitigation Lands

The subsections below describe the wetlands mapped within the fish and wildlife mitigation lands, organized by those within the RLNRA or their respective river basin. As limited to no recent disturbance factors are expected on these lands, the discussion focuses on the vegetation cover of these wetlands; therefore, for the majority of these lands, the study team did not assess ecological functions. However, the study team assessed functions for wetlands within the Newhalem Ponds and County Line Ponds parcels because these wetlands may be affected by maintenance and restoration activities, respectively. The study team also assessed the wetlands on mitigation lands within the Skagit River CMZ since they are in an area of potential disturbance, as identified in Section 4.2 of this study report. To determine which wetlands have the highest potential for

connectivity to the Skagit River, and may be hydrologically influenced by Project operations, the study team conducted functional assessments of all wetlands that intersect the Skagit River 100-year floodplain (Federal Emergency Management Agency [FEMA] 2017), as summarized in Section 5.2.4 of this study report.

#### 5.2.3.1 RLNRA

The study team mapped wetlands within the Newhalem Ponds and County Line Ponds (see Attachment A, page 12). City Light constructed the spawning channels within these lands to improve salmonid habitat as part of the Fisheries Settlement Agreement of the current FERC license. City Light completed construction of the Newhalem Ponds and County Line Ponds in 1991, providing 81,000 square feet (1.9 acres) and 22,000 square feet (0.5 acre) of new or restored aquatic habitat, respectively. City Light expanded the County Line Ponds in 1996, providing an additional 730 square feet (0.2 acre) of habitat. Wetlands within these lands are primarily located around the edges of ponds that were created during past gravel extraction activities. The Newhalem Ponds parcel is still used as a storage facility for the Project as well as a site for depositing large woody debris into the Skagit River. The study team mapped a total of 9 acres of wetlands within these two parcels, as described below. In addition to determining vegetative cover, the study team conducted a functional assessment on these wetlands due to Project activities at the Newhalem Ponds, and beaver dam management at the County Line Ponds.

The study team mapped 6 acres of wetlands within the County Line Ponds, and 3 acres of wetlands at the Newhalem Ponds (Table 5.2-5). The banks of the Newhalem Ponds are fairly steep, and wetlands are located as a narrow fringe along the pond shore, or on small jetties extending toward the center. The shallow and low gradient banks along the County Line Ponds support wetlands along the majority of the ponds' shoreline. All wetlands had a forested component, with red alder dominant along the banks of the ponds. Douglas spirea and red osier dogwood dominated the shrub layer, while slough sedge dominated the emergent layer. The study team observed several areas of reed canarygrass along the shores of the ponds, more prominently at the County Line Ponds parcel.

**Table 5.2-5. Wetland acreage by Cowardin vegetation class at County Line Ponds and Newhalem Ponds.[1]**

| Parcel Name | PFO | PFO/PSS | PFO/PEM | Total |
|---|---|---|---|---|
| County Line Ponds | 1 (1) | 5 (1) | 0 | **6 (2)** |
| Newhalem Ponds | 0 | 1 (2) | 2 (4) | **3 (6)** |
| **Total** | **1 (1)** | **6 (3)** | **2 (4)** | **9 (8)** |

1 Numbers in parenthesis are counts of individual wetlands.

### Functional Assessment

The field team visited all wetlands on the County Line Ponds and Newhalem Ponds parcels, rating all as Category III wetlands. These wetlands have moderate water quality and hydrologic functions because they can hold water to trap sediment and detain water during high flows. However, wetlands at the Newhalem Ponds scored slightly higher due to the Project activities in the immediate vicinity, which can potentially contribute to pollutants (e.g., suspended sediment) in stormwater runoff. Wetlands at both parcels provide a high habitat function based on their structural diversity and multiple hydroperiods. Special habitat features observed during the site

visit included downed wood and standing snags. These wetlands also provide a connection to other habitats, particularly the Skagit River.

As described above, City Light uses the Newhalem Ponds parcel as a storage facility for the Project. Large wood, gravel, metal culverts, and heavy machinery are all stored at this site. Additionally, the machinery used to transport these materials to and from the site has compacted soils, which can lead to sedimentation and an excess of stormwater runoff to nearby wetlands. City Light is in the process of restoring forested habitats and reducing the footprint of the storage facility. Large woody debris piles have been created and plantings completed in an approximately 0.7-acre area adjacent to the east pond. Large amounts of concrete and asphalt debris from historical activities have been removed and disturbed areas were planted on November 10, 2021. Removal of 1,000 feet of the boat launch road was planned to be completed by the end of 2021. In addition, other road abandonment and restoration actions and control of invasive plants are being implemented as part of City Light's Aggregate Storage Facility Implementation Plan.

The County Line Ponds wetlands are not in the vicinity of any Project activity. However, there have been several accounts of beaver activity within the constructed spawning channels.

#### 5.2.3.2 South Fork Nooksack River Basin

The study team mapped a total of 317 acres of wetlands within mitigation lands in the South Fork Nooksack River basin (Table 5.2-6) (see Attachment A, pages 21 and 22). The field team only visited wetlands along the study roads that could be safely accessed. The majority of the wetlands mapped here are along the South Fork Nooksack River, away from study roads or other potential effects. Therefore, the study team primarily used a remote sensing analysis to map wetlands. As a result, wetland area might be overestimated, particularly in riparian areas. The majority of modeled wetlands within these parcels are palustrine forested wetlands that are hydrologically connected to the river. In total, the Nooksack parcel contains 295 acres (93 percent), and the Nooksack West parcel contains 14 acres (4 percent). The majority of wetlands within these parcels are narrow, forested bands along the banks of the South Fork Nooksack River. Aerial photos indicate that black cottonwood and red alder likely dominate these deciduous forests. Additional forested wetlands occur along several of the stream channels that flow into the South Fork Nooksack River from the south and east. The study team mapped the remaining 8 acres (3 percent) within the Bear Lake parcel, primarily in and around the lake. The study team mapped a small lake fringe emergent wetland on the northeast edge of Bear Lake that is likely inundated during higher lake levels.

**Table 5.2-6. Wetland acreage by Cowardin vegetation class on fish and wildlife mitigation lands within the South Fork Nooksack River basin.[1]**

| Parcel Name | PFO | PFO/ PSS | PFO/ PEM | PFO/ PSS/ PEM | PSS | PSS/ PEM | PEM | PUB | Total |
|---|---|---|---|---|---|---|---|---|---|
| Bear Lake | 0 | 0 | 0 | 0 | 0 | 0 | 3 (1) | 5 (1) | **8 (2)** |
| Nooksack | 285 (60) | 0 | 7 (1) | 0 | 0 | 0 | 3 (1) | 0 | **295 (62)** |
| Nooksack West | 14 (9) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **14 (9)** |
| **Total** | **299 (69)** | **0** | **7 (1)** | **0** | **0** | **0** | **6 (2)** | **5 (1)** | **317 (73)** |

1 Numbers in parenthesis are counts of individual wetlands.

#### 5.2.3.3 Sauk River Basin

The study team mapped a total of 14 acres of wetlands within the fish and wildlife mitigation lands within the Sauk River basin (Table 5.2-7) (see Attachment A, pages 26 through 27). The North Everett Creek parcel includes 12 acres (86 percent), and the North Sauk parcel includes 2 acres (14 percent). The Everett Creek, Sauk Island, and Dan Creek parcels include no mapped wetlands. The majority of wetlands are palustrine deciduous forested wetlands along North Everett Creek. Similar to other sloughs in the vicinity, red alder, black cottonwood, and western red cedar dominate these wetlands. Narrow shrub-dominated sloughs, predominantly covered by willow species, connect the larger forested wetlands. These sloughs are depressional-outflow HGM types that are likely supported hydrologically by the Sauk River and North Everett Creek during high flows and groundwater during the drier seasons.

**Table 5.2-7. Wetland acreage by Cowardin vegetation class on fish and wildlife mitigation lands within the Sauk River basin.[1]**

| Parcel Name | PFO | PFO/ PSS | PFO/ PEM | PFO/ PSS/ PEM | PSS | PSS/ PEM | PEM | Total |
|---|---|---|---|---|---|---|---|---|
| Everett Creek | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| North Everett Creek | 9 (3) | 0 | 0 | 0 | 3 (1) | 0 | 0 | **12 (4)** |
| North Sauk | 2 (2) | 0 | 0 | 0 | 0 | 0 | 0 | **2 (2)** |
| Sauk Island | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| Dan Creek | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| **Total** | **11 (5)** | **0** | **0** | **0** | **3 (1)** | **0** | **0** | **14 (6)** |

1 Numbers in parenthesis are counts of individual wetlands.

#### 5.2.3.4 Skagit River Basin

The study team mapped a total of 329 acres of wetlands within the fish and wildlife mitigation lands within the Skagit River basin (Table 5.2-8) (see Attachment A, pages 13 through 20 and 23).

**Table 5.2-8. Wetland acreage by Cowardin vegetation class on fish and wildlife mitigation lands within the Skagit River basin.[1]**

| Parcel Name | PFO | PFO/ PSS | PFO/ PEM | PFO/ PSS/ PEM | PSS | PSS/ PEM | PEM | Total |
|---|---|---|---|---|---|---|---|---|
| B&W Road 1 & 2 | 5 (3) | 0 | 0 | 0 | 0 | 0 | 0 | **5 (3)** |
| Bacon Creek | 3 (7) | 0 | 0 | 0 | 0 | 0 | 0 | **3 (7)** |
| Barnaby Slough | 0 | 0 | 0 | 35 (1) | 0 | 0 | 0 | **35 (1)** |
| Bogert and Tam | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| Corkindale Creek | 0 | 0 | 0 | 0 | 0 | 0 | 6 (7) | **6 (7)** |
| Day Creek Slough | 0 | 0 | 0 | 0 | 0 | 0 | 2 (1) | **2 (1)** |
| False Lucas Slough | 0 | 0 | 0 | 50 (2) | 0 | 0 | 0 | **50 (2)** |
| Finney Creek | 9 (9) | 0 | 0 | 0 | 0 | 0 | 0 | **9 (9)** |
| Illabot North | 6 (1) | 1 (4) | 0 | 73 (2) | 0 | 0 | 0 | **80 (7)** |
| Illabot South | 47 (13) | 0 | 0 | 0 | 0 | 0 | 0 | **47 (13)** |
| Johnson | 0 | 0 | 0 | 7 (1) | 1 (1) | 0 | 0 | **8 (2)** |
| McLeod Slough | 12 (2) | 0 | 0 | 0 | 0 | 0 | 0 | **12 (2)** |
| Napoleon Slough | 1 (2) | 0 | 0 | 0 | 0 | 0 | 0 | **1 (2)** |
| O'Brien Slough | 11 (1) | 0 | 0 | 0 | 0 | 0 | 0 | **11 (1)** |
| Savage Slough | 9 (2) | 0 | 31 (1) | 0 | 0 | 0 | 20 (3) | **60 (6)** |
| **Total** | **103 (40)** | **1 (4)** | **31 (1)** | **165 (6)** | **1 (1)** | **0** | **28 (11)** | **329 (63)** |

1 Numbers in parenthesis are counts of individual wetlands.

In total, 80 acres (24 percent) of wetlands are part of the Illabot North mitigation parcel (see Attachment A, page 16). These wetlands consist of large and diverse sloughs next to the southeast side of the transmission line ROW. Black cottonwood and red alder dominate these deciduous forested wetlands. The sloughs have defined channels with scrub-shrub cover in areas that are seasonally inundated and emergent vegetation in areas that are inundated most of the year. The field team could not access these sloughs and did not assess the dominant species in the understory (shrub and herbaceous species). These sloughs are depressional-outflow HGM types that are likely supported hydrologically by both surface and groundwater.

An additional 60 acres (18 percent) of wetlands within the Skagit River basin are part of the Savage Slough parcel (see Attachment A, page 20) located along the south side of the Skagit River, between the towns of Lyman and Hamilton. The majority of wetlands on these parcels are PFO/PEM along a side channel providing off-channel habitat for salmon. Additional wetlands are located within a large field covered by grass. City Light has recently installed mitigation plantings here to promote structural diversity.

The False Lucas Slough parcel includes approximately 50 acres (15 percent) of wetlands within these mitigation lands, the Illabot South parcel includes 47 acres (14 percent), and the Barnaby Slough parcel includes 35 acres (11 percent). A diverse PFO/PSS/PEM type covers the False Lucas Slough and Barnaby Slough parcels (see Attachment A, page 17). The field team visited the outer edges of the wetland area of these two sloughs. Red alder dominated the forested cover class. Twinberry (*Lonicera involucrata*), salmonberry, and willow were the predominant shrub species

observed. Lady-fern (*Athyrium filix-femina*), soft rush, slough sedge, skunk cabbage, and common cattail were the dominant emergent species. The Illabot South parcel exhibited a similar native plant composition; however, much of the shrub and emergent vegetation was under a closed forest canopy dominated by red alder. Dense reed canarygrass covered large areas in both Barnaby and False Lucas sloughs, and bittersweet nightshade (*Solanum dulcamara*) was also observed in portions of False Lucas Slough.

The remaining 57 acres (17 percent) of mapped wetland within mitigation lands in the Skagit River basin are located in the following parcels: McLeod Slough (12 acres; 4 percent); O'Brien Slough (11 acres; 3 percent); Finney Creek (9 acres; 3 percent); Johnson (8 acres; 2 percent); Corkindale Creek (6 acres; 2 percent); B&W Road 1 and 2 (5 acres; 2 percent); Bacon Creek (3 acres; 1 percent); Day Creek Slough (2 acres; 1 percent); and Napoleon Slough (1 acre; less than 1 percent). No wetlands were mapped within the Bogert and Tam parcel.

### Functional Assessment

Approximately 197 acres of wetlands within the fish and wildlife mitigation lands are located in the 100-year floodplain of the Skagit River. The study team conducted a functional assessment at these wetlands, which may be hydrologically influenced by the river by either overbank or hyporheic flows. Of the 20 wetlands, 13 are depressional wetlands and 7 are riverine wetlands. The field team only visited wetlands on the Barnaby Slough, False Lucas Slough, Illabot North, McLeod Slough, and O'Brien Slough parcels, and categorized the majority of these as Category II wetlands. One acre of wetland is mapped within the Napoleon Slough parcel and was a Category III wetland (Table 5.2-9).

**Table 5.2-9. Wetland acreage by rating category of fish and wildlife mitigation lands within the Skagit River 100-year floodplain.[1]**

| Parcel | II | III | Total |
|---|---|---|---|
| Barnaby Slough | 35 (1) | 0 | **35 (1)** |
| False Lucas Slough | 50 (2) | 0 | **50 (2)** |
| Illabot North | 79 (3) | 1 (5) | **80 (8)** |
| Johnson | 0 | 8 (3) | **8 (3)** |
| McLeod Slough | 0 | 12 (2) | **12 (2)** |
| Napoleon Slough | 0 | 1 (3) | **1 (3)** |
| O'Brien Slough | 11 (1) | 0 | **11 (1)** |
| **Total** | **175 (7)** | **22 (13)** | **197 (20)** |

1 Numbers in parenthesis are counts of individual wetlands.

Wetlands on the Illabot North and False Lucas Slough parcels make up the majority of the Category II wetlands, containing 79 acres (45 percent) and 50 acres (29 percent), respectively. The remaining Category II wetlands occur on the Barnaby Slough (35 acres; 20 percent) and O'Brien Slough (11 acres, 6 percent) parcels. These wetlands have a moderate water quality function because they are large, vegetated depressions with the ability to trap and filter pollutants, but much of their contributing basin is undeveloped and pollution sources are low. These large, vegetated depressions can detain large amounts of water during floods and high flow. These wetlands also provide a high habitat function as they have multiple hydroperiods and relatively diverse

vegetation structure, which increases habitat suitability for a larger array of wildlife. Several of the sloughs within the floodplain also provide off-channel habitat for salmonid species, including federally listed Chinook salmon.

The 12 acres of wetlands on the McLeod Slough parcel make up the majority of the acreage of Category III wetlands. They have moderate water quality and hydrologic functions because they are near sources of pollution and excess runoff, such as the Concrete – Sauk Valley Road and agricultural operations. These wetlands provide high habitat function due to their diversity in vegetative structure, multiple hydroperiods, and connectivity to other habitats, including the Skagit River. The same is true for the 8 acres of Category III wetland on the Johnson parcel. The 1 acre of Category III wetland on the Napoleon Slough parcel is located along a tributary that flows north into the Skagit River and is part of a larger wetland that continues outside of the parcel to the east. The 1 acre of Category III wetland on the Illabot North parcel includes the portions of the Illabot and Powerline spawning channels that are outside of the transmission line ROW. Similar to other wetlands in the watershed, these wetlands have depressions that detain floodwaters and trap pollutants, but pollutant input is relatively limited. They have a high habitat function, as they have a diverse vegetative structure and are near priority habitats (such as riparian vegetation) and habitat features (such as snags and logs).

Under the current Project license, City Light manages the fish and wildlife mitigation lands largely for preservation and restoration. Therefore, vegetation management or other Project-related activities would not be likely to reduce ecological function. Reed canarygrass dominates the emergent class of several wetlands on these parcels. This is not considered a potential Project-related impairment given that reed canarygrass was observed throughout these watersheds but is noted here to inform future management. Additionally, some of these wetlands are in close proximity to roads, which are a potential source of pollution and runoff, and disconnect wetlands from surrounding habitats.

### 5.2.4 Wetlands Within the Channel Migration Zone of the Skagit River

The text below summarizes the results of the Wetland Assessment for areas within the CMZ within the Bacon Creek to Sauk River Crossing segment. This discussion includes only those wetland areas that are located solely within the CMZ and does not include wetland acreage within the transmission line ROW or fish and wildlife mitigation lands (discussed separately). As described in Section 5.2.3 of this study report, the study team used the Skagit River 100-year floodplain to determine which wetlands have the highest probability of connectivity to the Skagit River,[11] and are possibly hydrologically influenced by Project operations. Therefore, the study team conducted a functional assessment of all wetlands that intersect the Skagit River 100-year floodplain. However, due to the inaccessibility of this area, the study team visited only five of these wetlands and conducted the majority of the functional assessments as a desktop exercise using remote

[11] The hydraulic model being developed in support of FA-02 Instream Flow Model Development Study will provide additional information related to flow connectivity in the Upper Skagit River downstream to Project River Mile (PRM) 64.95; the hydraulic model will allow for analysis of the main stem connection to side channels with significant fisheries habitat value at various flow levels; the model also includes, in lesser detail, the overbank floodplain out to the valley side walls (City Light 2022a).

sensing data. The results of the functional assessment are presented below and summarized in Table 5.2-11 of this study report.

The study team mapped a total of 754 acres of wetlands within the Skagit CMZ. Dominant cover types include PEM (303 acres or 40 percent), PFO (203 acres or 27 percent), and a combination PFO/PSS/PEM (180 acres or 24 percent). The remaining 68 acres, or 9 percent, represent a variety of PFO, PSS, and PEM cover (Table 5.2-10).

**Table 5.2-10. Wetland acreage by Cowardin vegetation class within the Skagit River CMZ.[1]**

| Study Area Segment | PFO | PFO/ PSS | PFO/ PEM | PFO/PSS/ PEM | PSS | PSS/ PEM | PEM | Total |
|---|---|---|---|---|---|---|---|---|
| Skagit River CMZ | 203 (73) | 12 (3) | 13 (1) | 180 (10) | 7 (5) | 36 (12) | 303 (41) | **754 (145)** |

1 Numbers in parenthesis are counts of individual wetlands.

Large PFO/PSS/PEM wetland habitats are primarily located next to (but not within) the Barnaby Slough, False Lucas Slough, and Illabot North fish and wildlife mitigation lands and likely have a hydrological connection to the majority of the wetlands mapped on those parcels. The majority of the PEM wetlands are portions of large agriculture fields south of Rockport and west of Marblemount. Large, forested wetlands are located to the east of the Skagit River near Marblemount, as well as along the north side of the river east of Rockport. Narrow forested wetlands are also common along the riparian areas of the Sauk River, as well as several smaller tributaries to the Skagit River.

The Taylor spawning channel is also within the CMZ of the Skagit River and is characterized by PFO/PSS/PEM cover. City Light constructed this channel in 1998, creating 5,694 square feet (0.13 acre) of new aquatic habitat. A forested wetland fringe is located along either side of the spawning channel and is characterized by primarily red alder cover. Shrub and emergent classes are located on the banks and shallow portions of the channel and are dominated by salmonberry and slough sedge, respectively.

## Functional Assessment

The study team mapped 560 acres of wetland within the Skagit River 100-year floodplain within the CMZ in the Bacon Creek to Sauk River Crossing segment. Fifty-one of these wetlands are riverine wetlands and 30 are depressional wetlands. In total, 202 acres (36 percent) of the wetlands are Category II wetlands, 188 acres (34 percent) are Category III wetlands, and the remaining 170 acres (30 percent) are Category IV wetlands (Table 5.2-11).

**Table 5.2-11. Wetland acreage by rating category within the Skagit River 100-year floodplain within the CMZ.[1]**

| Study Area Segment | II | III | IV | Total |
|---|---|---|---|---|
| Skagit River 100-year floodplain | 202 (8) | 188 (63) | 170 (10) | **560 (81)** |

1 Numbers in parenthesis are counts of individual wetlands.

The majority of Category II wetlands are located along the slough next to the Barnaby and False Lucas Slough mitigation land parcels. These wetlands exhibit a moderate water quality function and high hydrologic and habitat functions.

The Category III wetlands within the floodplain are forested wetlands along the Sauk River and several tributaries to the Sauk and Skagit rivers. Similar to other wetlands in the vicinity, these wetlands have a moderate water quality function as they have the ability to filter pollutants, but large pollutant sources are not present in the landscape. They also tend to have a moderate hydrologic function because they are narrow and only hold or slow minimal flows. These wetlands have a moderate to high habitat function because they connect to large areas of undisturbed habitat; however, they are likely only inundated during times of high flow, so the availability of sufficient aquatic habitat can be seasonal.

The Category IV wetlands are located entirely within the farm and hay fields in the floodplain. These wetlands exhibit low to moderate water quality, hydrologic, and habitat functions. Vegetation in these wetlands can filter pollutants from surrounding areas, and depressions can serve as water storage during flood flows; however, many of these wetlands appear to be connected to agricultural ditches, so the residence time of water in them is low. They provide some habitat, but the vegetation lacks diversity and is frequently disturbed during farming operations. They do, however, provide connectivity to larger undisturbed habitats that are likely used as stop-over habitat for waterfowl.

## 5.3 Correlation to SWAP and PHS

To show the intersection of wetlands with the habitat ranges of the 23 SGCN that are mapped as occurring within the study area, the study team overlaid the WDFW State Wildlife Action Plan (SWAP) habitats (https://wdfw.wa.gov/species-habitats/at-risk/swap) on the mapped wetland polygons. The tables in Attachment D briefly describe the habitat requirements for each of these species, as well as show where documented or potential habitat for these 23 species intersect with mapped wetlands. The study team conducted a similar analysis using WDFW PHS data. The tables in Attachment E briefly describe the one priority habitat and habitat requirements for the eight priority species that are mapped in the study area, as well as the presence or absence of these PHS in each wetland.

# 6.0 DISCUSSION AND FINDINGS

This study is complete and has met the goals and objectives stated in the RSP and presented in Section 2.0 of this study report. The overall goal of the Wetland Assessment is to provide baseline information about wetlands and their attributes within the defined study area. The wetland map product in Attachment A, as well as the web-based map product described in Section 4.3 of this study report, will be used to guide future management decisions. Potential Project effects to wetlands will be discussed in the DLA.

The results of this study will inform the development of wetland, habitat, and vegetation management plans. They also inform other studies proposed as part of this relicensing process, including:

- GE-01 Reservoir Shoreline Erosion Study (City Light 2022b);
- GE-02 Erosion and Geological Hazards at Project Facilities and Transmission Line Right-of-Way Study (City Light 2022c);
- TR-01 Vegetation Mapping Study (City Light 2022d);
- TR-03 RTE Plants Study (City Light 2022e);
- TR-04 Invasive Plants Study (City Light 2022f);
- TR-08 Special-status Amphibian Study (City Light 2022g); and
- TR-09 Beaver Habitat Assessment (City Light 2022h).

# 7.0 VARIANCES FROM FERC-APPROVED STUDY PLAN AND PROPOSED MODIFICATIONS

This study had the following two variances adopted to improve the safety and efficacy of field data collection. Neither refinement compromised the goals and intent of the study as it was approved by FERC:

(1) The study team did not field assess some mapped wetlands located in areas potentially influenced by the Project, particularly in the broad CMZ of the Skagit – Sauk River confluence zone, due to field team safety concerns and/or inaccessibility of these wetlands. In cases where wetlands under the potential influence of the Project were not visited, the study team rated the wetlands using high resolution aerial photographs and other publicly available data. The study team also reviewed other data, such as nearby accessible wetlands with similar characteristics, existing wetland and hydrology mapping, and LiDAR. The study team assigned the wetlands a rating category, and embedded wetland vegetation class type and attribute data into the electronic files, as with all mapped wetlands. Attributes also included whether a wetland was field assessed or not.

    Field methods in the RSP stated that analytical methods would be developed for an appropriate level of assessment and that wetlands in areas of potential Project-related disturbance would undergo a functional analysis using the Wetland Rating System for Western Washington. Although some wetlands could not be accessed in the field, a remote analysis of these wetlands was implemented nonetheless. Therefore, the goals and intent of the methods as described in the RSP have been met because these wetlands were also rated and an analysis of their capability to provide water quality, hydrologic, and habitat function was conducted.

(2) According to methods in the RSP, a list of plant species in each sampled wetland would be recorded. Instead, survey crews recorded the three dominant tree, shrub, and herbaceous species, based on a visual estimate, and not a comprehensive list of all plants encountered. This change was made in order to conduct a rapid assessment of each wetland visited in the field to complete the rating form and to enable the study team to minimize collection of data that would not feed into subsequent analyses. Therefore, the original goals and intent of the study were still met.

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# WETLAND ASSESSMENT DRAFT REPORT

# ATTACHMENT A

# DRAFT WETLAND MAPBOOK

# TR-02 WETLAND ASSESSMENT STUDY DRAFT WETLAND MAPBOOK

- FERC Project Boundary
- Mitigation Parcel
- Project River Miles
- Project River Centerline
- Wetlands Study Area
- Wetlands Modeling Area
- FEMA Floodplain
- NPS CMZ

Wetlands Rating Category

- Not Rated
- II
- III
- IV

Wetland Cowardin Class

- PEM
- PEM/PSS
- PSS
- PFO
- PFO/PEM
- PFO/PSS
- PFO/PSS/PEM
- PUB

Other Hydrological Features

- Gravel
- Open Water

N

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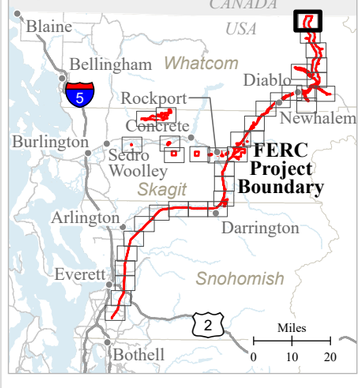


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**SKAGIT RIVER HYDROELECTRIC PROJECT (FERC NO. 553)**

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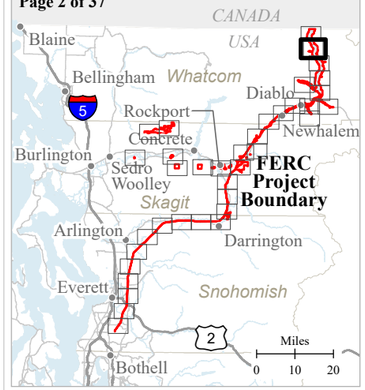


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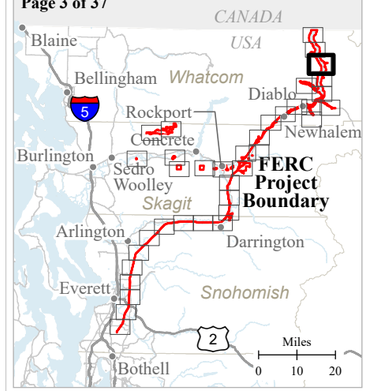


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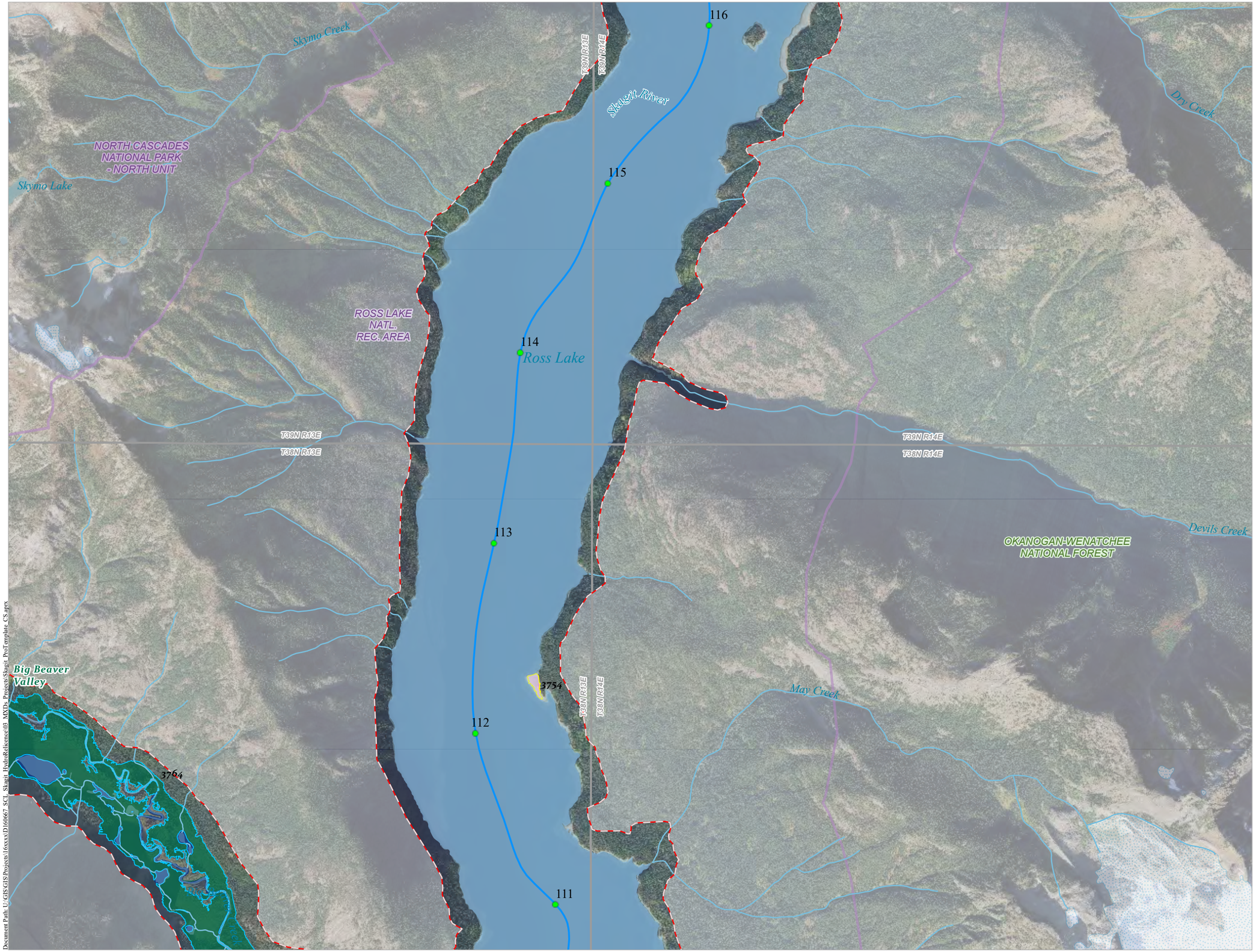


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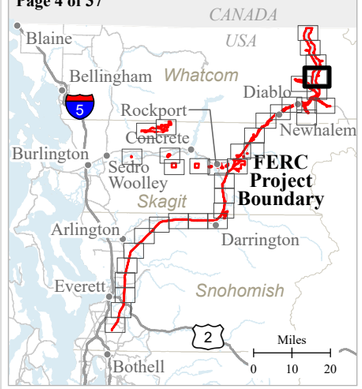


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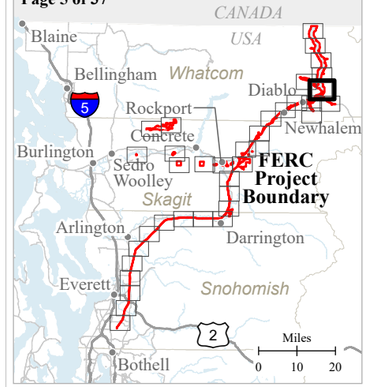


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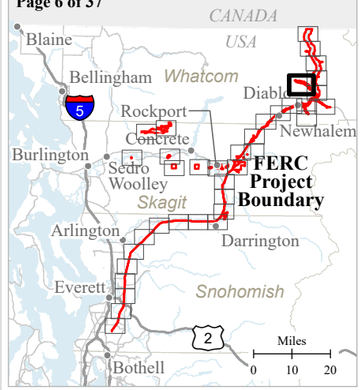


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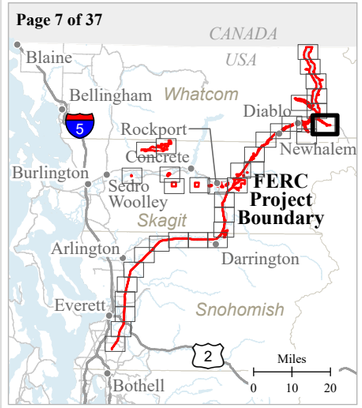


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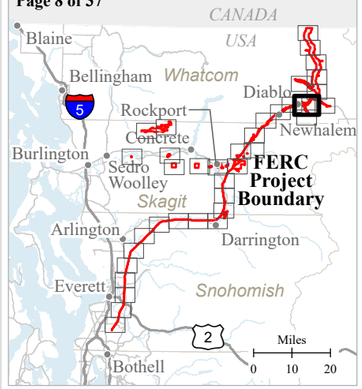


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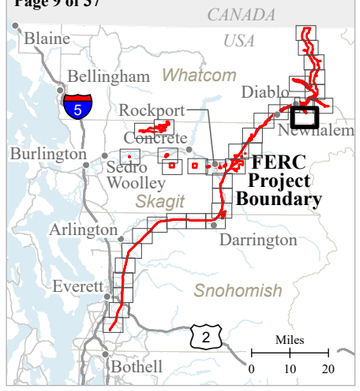


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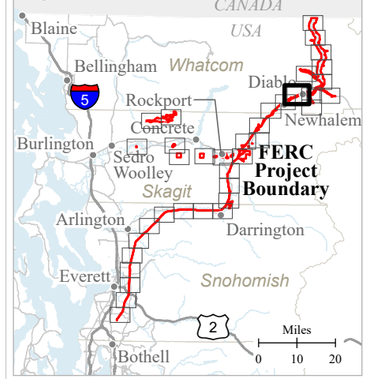


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Jay Creek
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T38N R13E
T37N R13E
NORTH CASCADES NATIONAL PARK - NORTH UNIT
Gorge Creek
Diablo
Diablo Lake
Pyramid Creek
Gorge Lake
ROSS LAKE NATL. REC. AREA
Skagit
Pyramid Lake
Thunder Lake
Skagit River
Bouck Lake
Ladder Creek
Colonial Creek
NORTH CASCADES NATIONAL PARK - SOUTH UNIT
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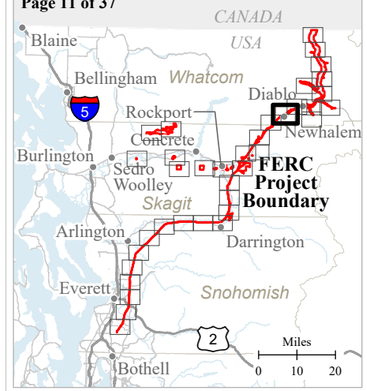


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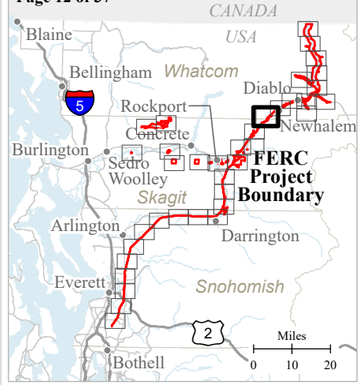


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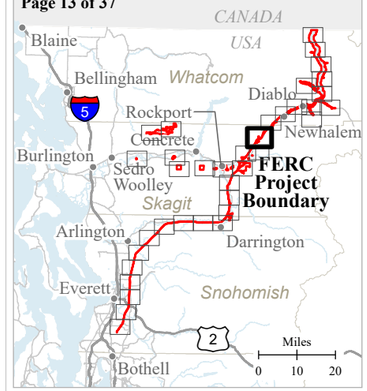


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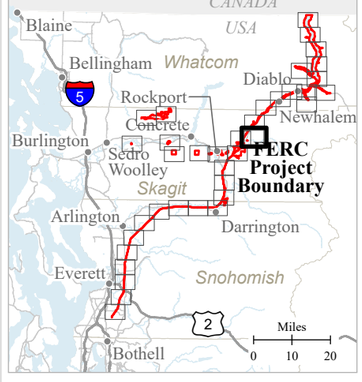


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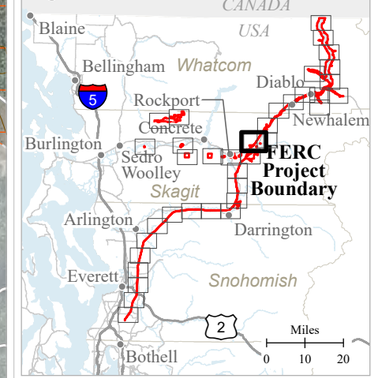


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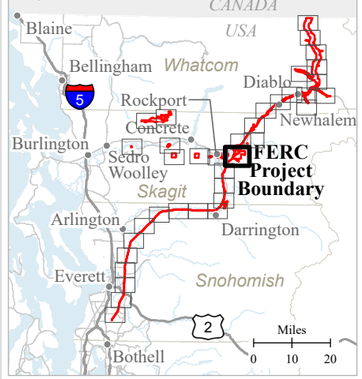


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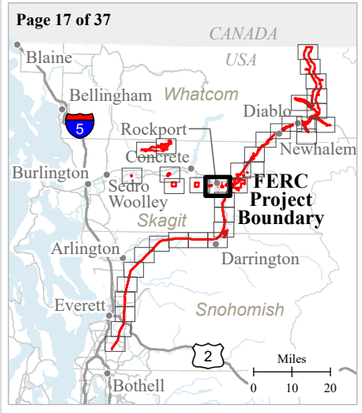
- PSS
- PFO
- PFO/PEM
- PFO/PSS
- PFO/PSS/PEM
- PUB

Other Hydrological Features
- Gravel
- Open Water

N

0 1,000 2,000 Feet






Seattle City Light

**SKAGIT RIVER HYDROELECTRIC PROJECT (FERC NO. 553)**

# TR-02 WETLAND ASSESSMENT STUDY DRAFT WETLAND MAPBOOK

- FERC Project Boundary
- Mitigation Parcel
- Project River Miles
- Project River Centerline
- Wetlands Study Area
- Wetlands Modeling Area
- FEMA Floodplain
- NPS CMZ

Wetlands Rating Category

- Not Rated
- II
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- IV

Wetland Cowardin Class

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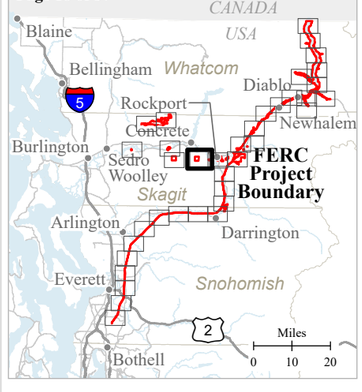


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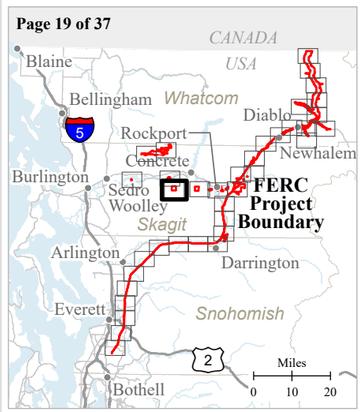


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**SKAGIT RIVER HYDROELECTRIC PROJECT (FERC NO. 553)**



Pressentin

2359 2366 2486 2347

Bond Creek

Mill Creek

Quarry Creek

Hatchery Creek

MT. BAKER-SNOQUALMIE NATIONAL FOREST

T34N R07E

T34N R08E

T35N R08E

T34N R08E

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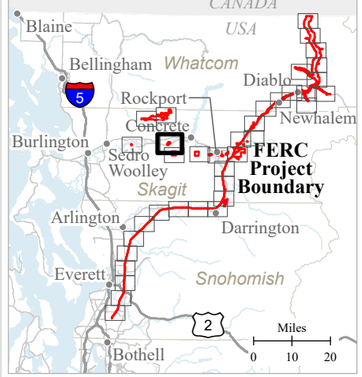


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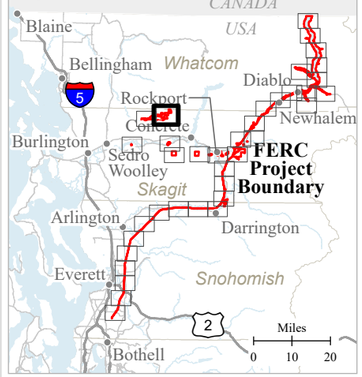


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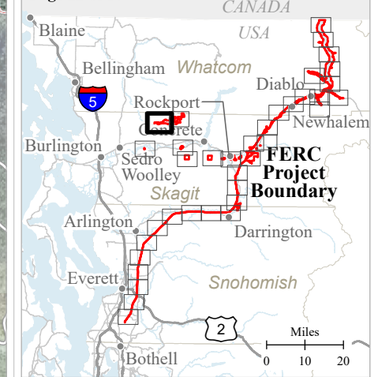


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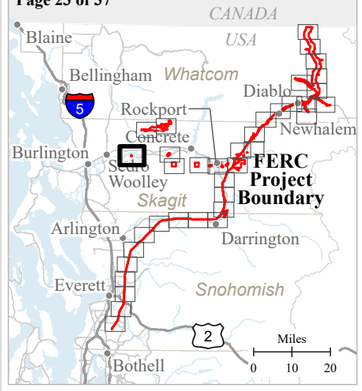


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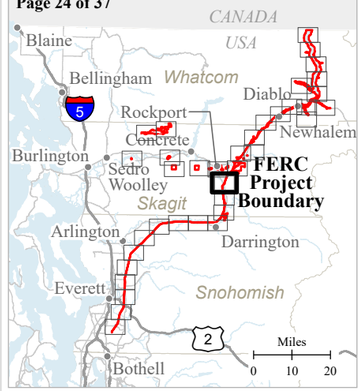


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