

**TR-04 INVASIVE PLANTS STUDY
INTERIM 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

BC Parks	British Columbia Parks
BLM.....	Bureau of Land Management
CABI.....	Center for Agriculture and Biosciences International
CGCWMA	Columbia Gorge Cooperative Weed Management Area
CIPC.....	California Invasive Plant Council
City Light.....	Seattle City Light
CoSD.....	City of Seattle datum
EDRR.....	Early Detection Rapid Response
ELC.....	North Cascades Environmental Learning Center
EPMT	North Coast-Cascades Network Exotic Plant Management Team
FERC.....	Federal Energy Regulatory Commission
GIS	Geographic Information System
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
IMISWG	Inter-Ministry Invasive Species Working Group
ISR	Initial Study Report
JCNWCB	Jefferson County Noxious Weed Control Board
KCNWCB.....	King County Noxious Weed Control Board
LP.....	licensing participant
NAISMA.....	North American Invasive Species Management Association
NAVD 88.....	North American Vertical Datum of 1988
NCSU.....	North Carolina State University
NISIMS.....	National Invasive Species Information Management System
NPS	National Park Service
O&M.....	operations and maintenance
OSU.....	Ohio State University
PAD.....	Pre-Application Document
PCA.....	Plant Conservation Alliance
PCNWCB.....	Pierce County Noxious Weed Control Board
PME	protection, mitigation, and enhancement
PRM.....	Project River Mile

Project	Skagit River Hydroelectric Project
QA/QC	quality assurance/quality control
RLNRA	Ross Lake National Recreation Area
ROW	right-of-way
RSP	Revised Study Plan
SFEG	Skagit Fisheries Enhancement Group
SICWMA	Southern Indiana Cooperative Weed Management Area
SR.....	State Route
SRSC	Skagit River System Cooperative
TCNWCB	Thurston County Noxious Weed Control Board
TRREWG.....	Terrestrial Resources and Reservoir Erosion Work Group
TWG	Terrestrial Work Group
USDA.....	U.S. Department of Agriculture
USFS	U.S. Forest Service
USGS	U.S. Geological Service
USR.....	Updated Study Report
WISC.....	Washington Invasive Species Council
WSNWCB.....	Washington State Noxious Weed Control Board

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1.0 INTRODUCTION

The TR-04 Invasive Plants Study 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, Washington State Department of Ecology, and Washington Department of Fish and Wildlife). The June 9, 2021 Notice proposed no changes to the Invasive Plants Study as described in the RSP.

In its July 16, 2021 Study Plan Determination, FERC approved the Invasive Plants Study without modification.

This interim report on the 2021 study efforts is being filed with FERC as part of City Light’s Initial Study Report (ISR). City Light will perform additional work for this study in 2022 and include a report in the Updated Study Report (USR) in March 2023.

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 Invasive Plants Study is to document occurrences of a target list of plant species designated as invasive, which could potentially be spread by Project operations and maintenance (O&M) and Project-related recreation activities, and to assess effects. Specific objectives of this study are as follows:

- Develop a target list of invasive plant species that have the potential to cause significant ecological or economic damage within the study area.
- Identify locations within the study area where there are Project-related disturbances and pathways² for invasive plant species dispersal.
- Develop a map depicting invasive plant species locations based on existing data and field verification.
- Describe the status, distribution, likely vectors,³ and limiting factors⁴ for target invasive plant species.

² The U.S. Department of Agriculture (USDA) defines pathways as the means and routes by which invasive plant species are introduced into new environments (USDA 2022).

³ Vectors are the transfer mechanisms responsible for the introduction and spread of invasive species in a certain area (Ruiz and Carlton 2003).

⁴ Several sources define limiting factors as a variable in the environment that restricts the size of a population.

3.0 STUDY AREA

The study area for the Invasive Plants Study consists of the land within the Project Boundary and the banks of the Skagit River to the confluence with the Sauk River.

To organize the results of the study, the study area was divided into the seven segments described below (**in bold**) and shown in Figures 3.0-1 through 3.0-3.

- **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 properties). For reporting purposes, this segment is further divided into the following sub-segments:
 - Ross Lake exclusive of Big Beaver Valley;
 - Big Beaver Valley;⁵
 - 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;
 - The approximately 8.5 miles of transmission line ROW between the southern end of Gorge Lake and Bacon Creek;
 - Study routes;⁶ and
 - Recreation facilities and Project facilities.
- **Transmission Line ROW and Other Survey Location 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**) and other survey locations, as shown in Attachment A, from Bacon Creek to the Sauk River crossing. This study area segment also includes the Taylor, Illabot, and Powerline spawning channels. The lower approximately 2.5 miles of this study area segment occurs within the Sauk River basin.

⁵ Big Beaver Valley is part of the study area but is not part of the survey area since it is not affected by Project O&M.

⁶ Study routes include segments of road and trail within the Project Boundary maintained by City Light plus non-public roads and trails outside the Project Boundary that City Light uses to access the transmission line right-of-way and other City Light facilities that support the Project that are inside or outside of the Project Boundary. Segments of roads that are abandoned or serve to access private residences or farms were not included as study routes. The specific study routes included in the Invasive Plants Study are based on the defined study area and objectives of this study.

- **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**) and other survey locations, as shown in Attachment A, 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 and other survey locations, as shown in Attachment A, from Oso to SR 528. The northern portion of this segment is within the Stillaguamish River basin, and the southern portion 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 and other survey locations, as shown in Attachment A, from SR 528 to the Bothell substation. The lower approximately 1.5 miles of this segment is in the Lake Washington basin.
- **Fish and Wildlife Mitigation Lands:** This study area segment includes all fish and wildlife mitigation lands within the RLNRA, and South Fork Nooksack, Sauk, and Skagit river basins.
- **Skagit River:** This study area segment includes the shorelines of the 30.7 miles of the Skagit River from Gorge Dam to the confluence with the Sauk River (approximately Project River Mile [PRM] 66.5 to PRM 97.2).

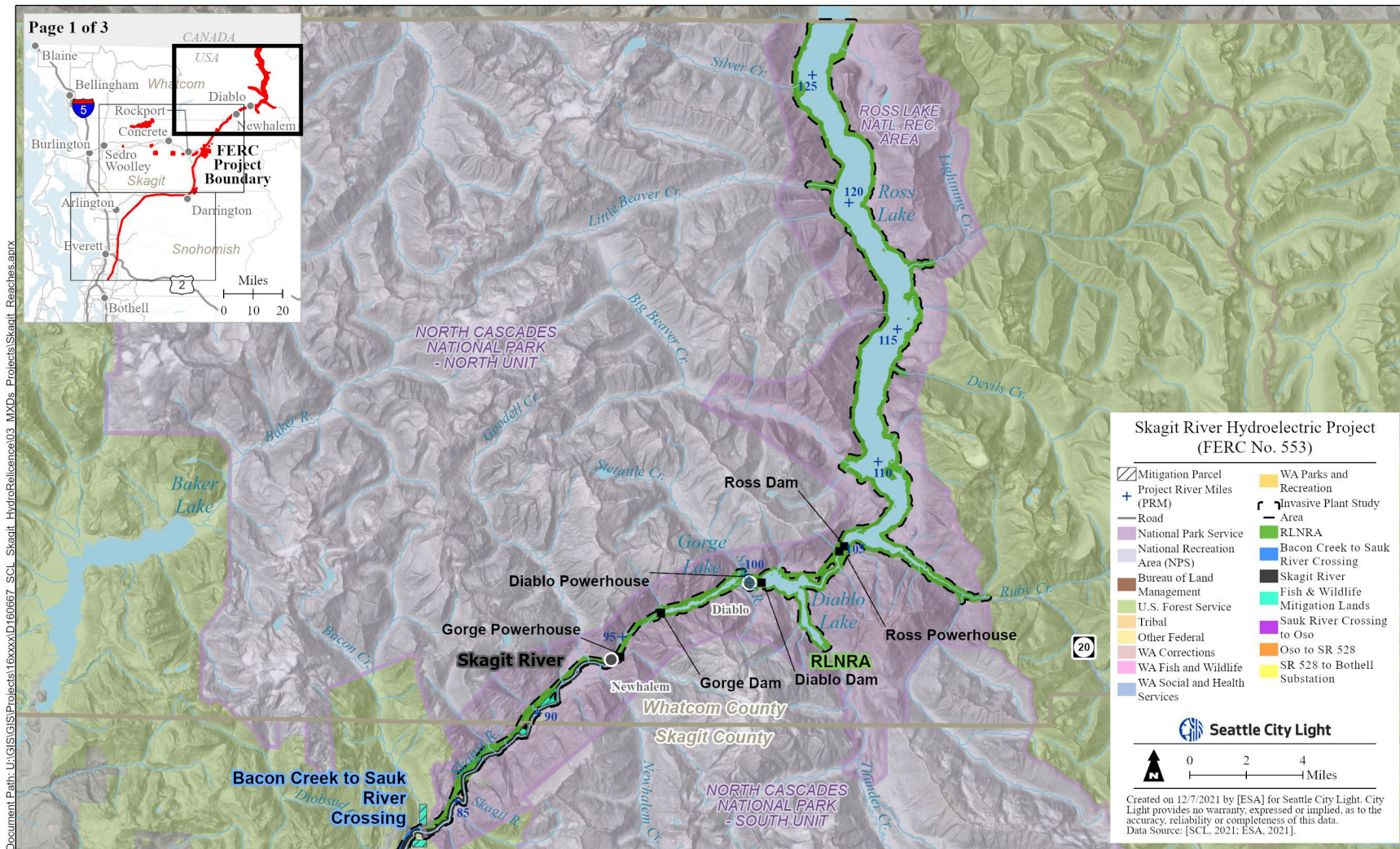


Figure 3.0-1. Study area segments for the Invasive Plants Study (north).

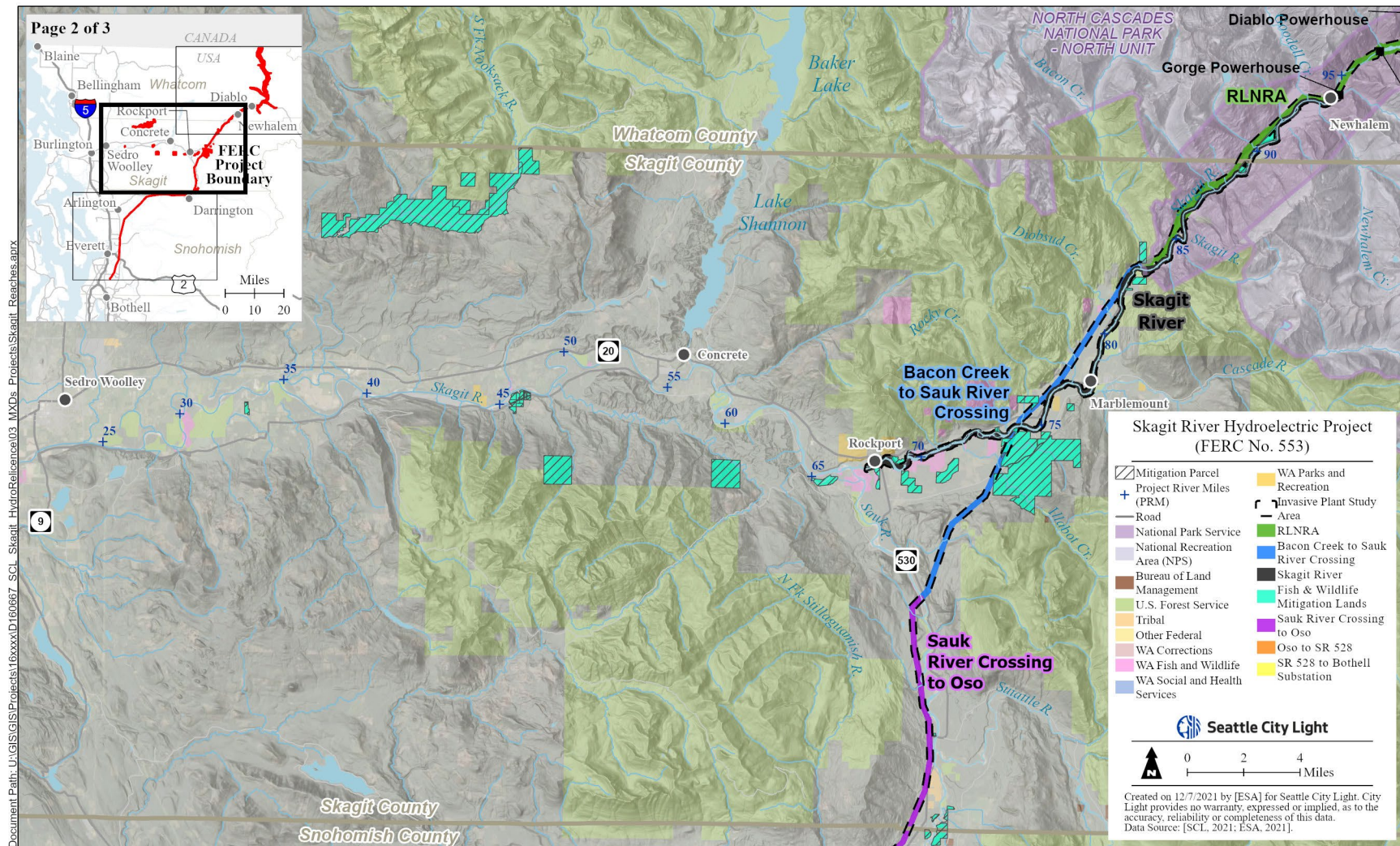


Figure 3.0-2. Study area segments for the Invasive Plants Study (central).

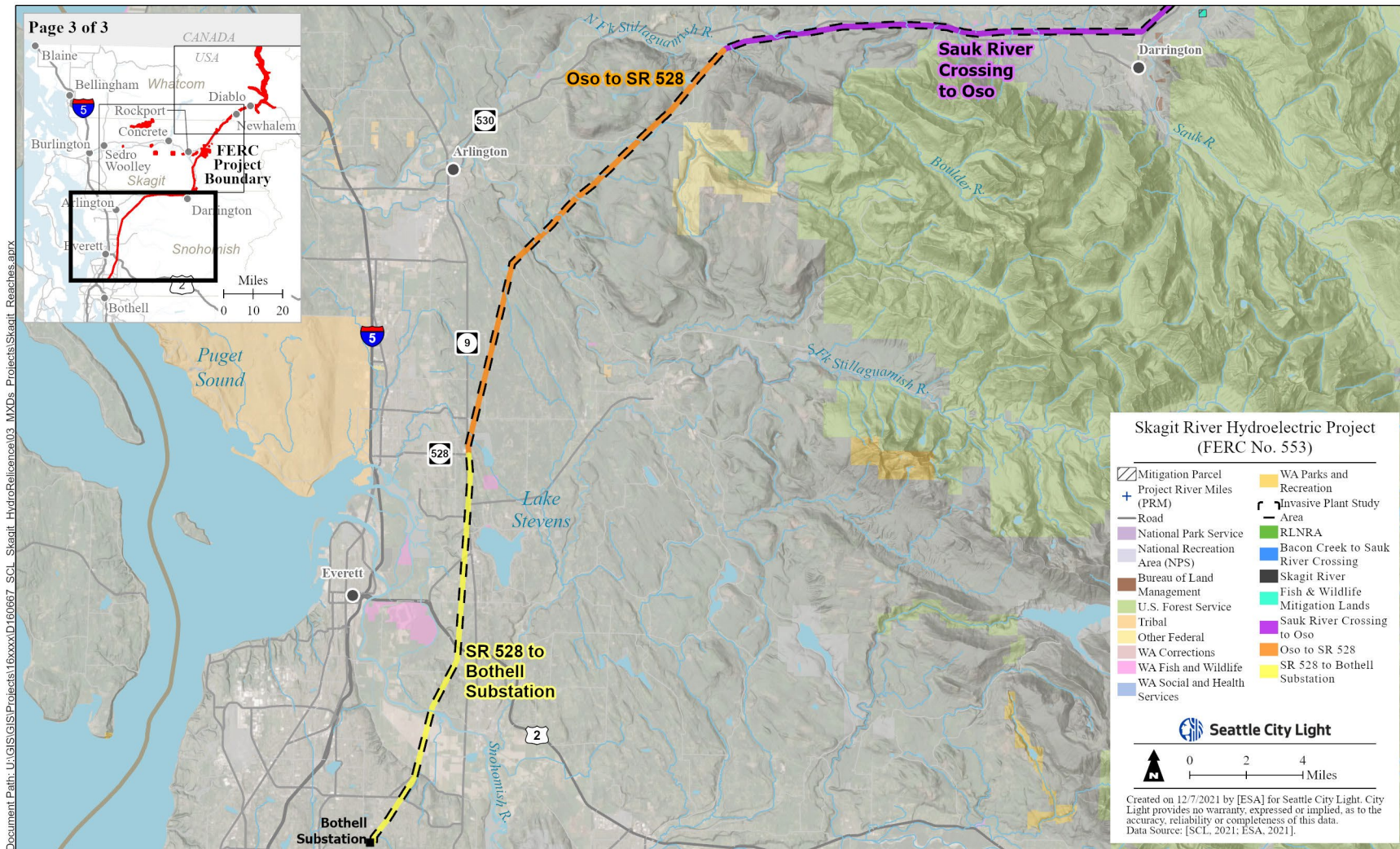


Figure 3.0-3. Study area segments for the Invasive Plants Study (south).

4.0 METHODS

The first step in the Invasive Plants Study was to review existing information and develop a target list of invasive plant species reasonably likely to occur in the Project vicinity. This step was initially described in Sections 2.6.1.1 and 2.6.1.2 of the RSP. The second step was to determine survey locations as initially described in Section 2.6.2 of the RSP. The third and fourth steps were to gather data and prepare for the field effort and to conduct field surveys. These were initially described in Sections 2.6.3 and 2.6.4 of the RSP, respectively. The next step was to process data as described in Section 2.6.5 of the RSP, and the final step was to prepare maps and a report as originally described in Section 2.6.6 of the RSP. Each step is described below in more detail.

4.1 Review Existing Information and Develop Target List

The study team compiled and reviewed the following information pertaining to invasive plant species presence within the study area:

- Aerial imagery of the study area;
- TR-01 Vegetation Mapping Study (City Light 2022a) and TR-02 Wetland Assessment (City Light 2022b);
- Skagit River Cooperative Weed Management Area – Upper Skagit Knotweed Control Program Skagit Fisheries Enhancement Group 2019 Report (Miller 2020);
- Strategy for Invasive Plant Management and Habitat Restoration for Newhalem and Diablo 2016–2017 (City Light 2016a);
- Assessment of the Ecological Impacts of Non-Native Trees in and Around the Town of Newhalem, WA (City Light and Seattle University 2015);
- NPS reed canarygrass (*Phalaris arundinacea*) mapping in Big Beaver Valley (NPS unpublished data 2017–2020);
- Goodell Creek Fire, Weed Management Memo (City Light 2016b);
- Invasive Non-Native Plant Management, Environmental Assessment (NPS 2011);
- Exotic Plant Inventories in Mount Rainier, North Cascades, and Olympic National Parks (Rochefort et al. 2016);
- Newhalem Riparian Restoration Project, Seattle City Light (Skagit Fisheries Enhancement Group [SFEG] 2015);
- North Cascades 2015 Fires Post-Fire Response Plan (NPS 2015);
- Ross Lake Invasive Weed Survey by Boat (NPS 2017a) and treatment of target weeds using Integrated Pest Management;
- NPS National Invasive Species Information Management System data (NPS 2018);
- Sycamore Maple Control Along the Skagit River Through Newhalem (City Light 2017);

- National Invasive Species Information Management System (NISIMS) weed mapping data for much of the Project Boundary (Bureau of Land Management [BLM] 2021);⁷ and
- Available information on invasive plant species in Canada, as relevant to the Project.

The study team then developed an initial target list of invasive plant species that could occur in the Project vicinity. This list included plant species that fall into one of the following categories:

- All species listed as Class A or Class B weeds by the County Noxious Weed Boards of Skagit, Whatcom, and Snohomish counties. The classifications of noxious weeds are defined as follows (Washington State Noxious Weed Control Board [WSNWCB] 2021; Revised Code of Washington 17.10.010):
 - **Class A Weeds** — Non-native species with a limited distribution in the state. Eradication is required by state law.
 - **Class B Weeds** — Non-native species established in some regions of Washington but of limited distribution or not present in other regions of the state. Because of differences in distribution, treatment of Class B weeds varies between regions of the state. In regions where a Class B weed is unrecorded or of limited distribution, prevention of seed production is required. In these areas, the weed is a “Class B designate,” meaning it is designated for control by state law. In regions where a Class B species is already abundant or widespread, control is a local option. In these areas, the weed is “Class B-selected,” with containment, gradual reduction, and prevention of further spread being the chief goals. County noxious weed control boards may also designate Class B weeds for required control.
- Species identified by NPS as ornamental species that have escaped from historical cultivation in Newhalem, also known as “First Priority Species” (NPS 2011) and listed in the Pre-Application Document (PAD) (City Light 2020a).⁸
- Species identified as target species during the 2019 Study Plan Development Process (i.e., reed canarygrass, Japanese knotweed [*Fallopia japonica*], traveler's-joy [*Clematis vitalba*], petty spurge [*Euphorbia peplus*], and sycamore maple [*Acer pseudoplatanus*]).
- Other non-native species recommended by City Light and/or LPs and assessed. This included several Class C noxious weeds that City Light biologists observed on the fish and wildlife mitigation lands and the transmission line ROW. Class C weeds are non-native species that are already widely established in Washington or of special interest to the state’s agricultural industry. Counties may enforce control if locally desired or choose simply to provide education or technical consultation to county residents.

⁷ This source was reviewed but did not lead to any pertinent or useful information for this study.

⁸ The PAD and RSP refer to “First Priority Species” as “Highest Priority Species” as NPS documents appear to use both terms (as well as “Top Priority Species”). This report uses First Priority Species based on terminology used in the Invasive Non-Native Plant Management Environmental Assessment (NPS 2011), which was prepared to address the control and prevention of new infestations of invasive, non-native plants within North Cascades National Park Complex.

These lists formed the basis of the target list of invasive plant species for this study. The target list was then refined to include known and predicted occurrences. The revised target list was distributed to LPs for review in May 2021 before field surveys commenced. No comments were received from LPs. The final target list of invasive plant species includes 141 species and is presented in Attachment B of this study report. The target list includes:

- 36 species listed as Class A noxious weeds.
- 67 species listed as Class B noxious weeds.
- 13 species listed as Class C noxious weeds.
- 21 species listed as First Priority Species by NPS.
- 2 species that were identified during study planning and not listed as noxious weeds or First Priority Species (i.e., traveler's-joy and petty spurge).
- 2 species added by City Light that are not listed as noxious weeds or First Priority Species (i.e., bishop's goutweed [*Aegopodium podagraria*] and cheatgrass [*Bromus tectorum*]).

4.2 Prioritization of Survey Locations

City Light identified portions of the study area where potential Project-related disturbances or pathways for invasive plant species establishment or spread could occur. Study teams prioritized these areas for field investigation and analysis. These areas included:

- Within and adjacent to the reservoir fluctuation zone and areas of known Project-related reservoir erosion management locations.
- Tributary inlets and low gradient shorelines with wetlands along Project reservoirs.
- Riparian margins of the Skagit River downstream of Gorge Dam to the Sauk River confluence.
- Riparian areas within the transmission line ROW and 50-foot buffer.
- Areas with active vegetation management in the transmission line ROW and within a 50-foot buffer.
- Study routes and within a 50-foot buffer.
- Portions of fish and wildlife mitigation lands along riverbanks or affected by City Light, recreationists, or unauthorized activities.
- Project facilities and within a 50-foot buffer.
- Townsites and wildland interface.
- Project recreation facilities and within a 50-foot buffer shown in Figures 4.0-1 and 4.0-2, including:
 - Skagit Tour Dock;
 - West Ferry Landing (parking and dock);
 - East Ferry Landing;
 - North Cascades Environmental Learning Center (ELC);

- Ross Lodge Picnic Shelter;
- Gorge Boat Launch;
- Ladder Creek Falls Trail and Gardens;
- Trail of the Cedars;
- Gorge Powerhouse Overlook;
- Gorge Powerhouse Visitor Gallery;
- Skagit Information Center;
- Gorge Inn Museum; and
- Newhalem Facilities:
 - Picnic Sites.
 - Parking Area (Main Street).
 - Parking Area (SR 20).
 - Interpretive Displays (standalone).
 - Playground.
- Accessible Project-related salmon spawning channels, including Newhalem Ponds; County Line Ponds; and Taylor, Powerline, and Illabot spawning channels.
- Areas of soil excavation and compaction, specifically the storage facility near the Newhalem Ponds site.

4.3 Gather Data and Prepare for Field Efforts

The above survey locations were compiled in a mapbook and uploaded to an iPad to guide the survey crews during field efforts⁹ (Attachment A). The mapbook was also distributed to LPs in May 2021 before field surveys commenced. No comments were received. (This mapbook contains the entire survey area, including some areas that were not surveyed in 2021 that will be surveyed in 2022.)

Additionally, prior to the start of field surveys, the survey crew reviewed the Burke Herbarium Image Collection (Giblin and Legler 2021) and weed images provided online by the WSNWCB (2021) to gain familiarity with the morphological characteristics of target invasive plant species.

4.4 Conduct Field Surveys

Field crews conducted surveys between June 2021 and September 2021 concurrent with field surveys for the TR-03 Rare, Threatened, and Endangered Plants Study (City Light 2022c). Surveys were conducted following the qualitative “exploratory” method outlined and described by Rew and Pokorny (2006) and the Intuitive Controlled Survey method used by the BLM (BLM 2017;

⁹ Available data on known occurrences of target invasive species in the study area were reviewed in advance of fieldwork; data were not extensive within the study area and it was determined unnecessary to include on field maps.

Whiteaker et al. 1998). Some incidental observations of invasive plant species along the transmission line ROW were recorded during field efforts for the TR-02 Wetland Assessment between July and September 2020.

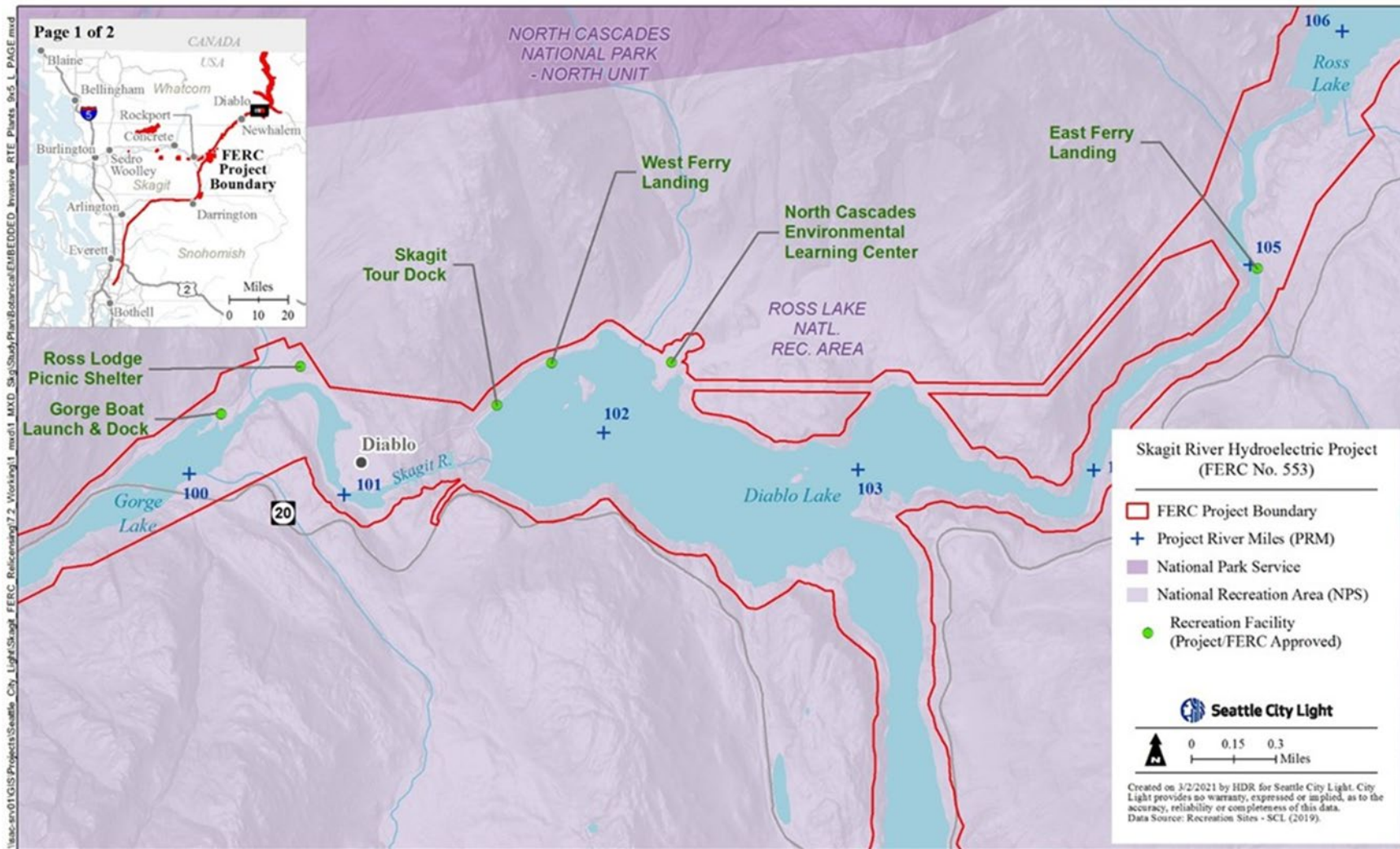


Figure 4.0-1. Study area associated with recreation facilities at and around Diablo and Gorge lakes.

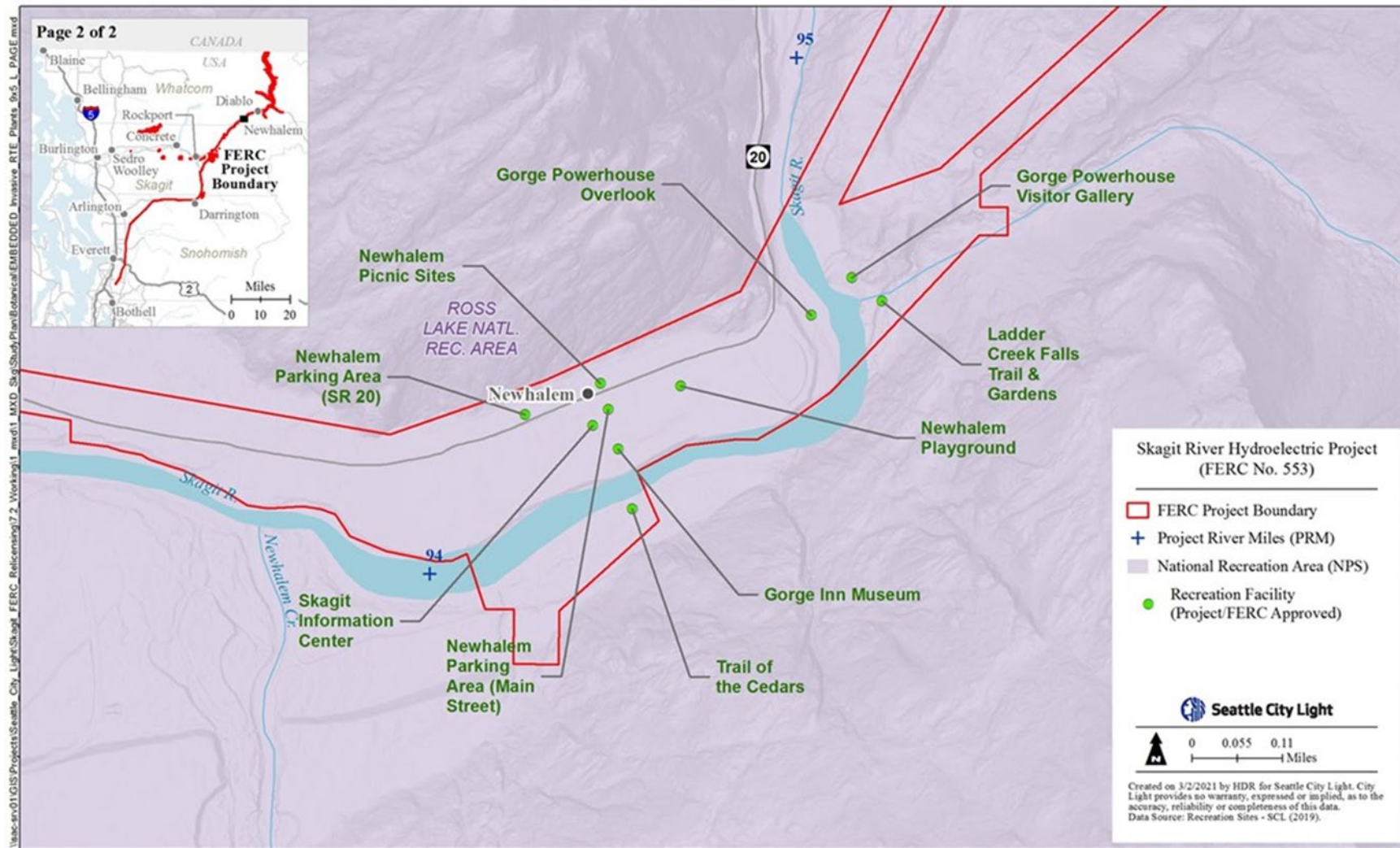


Figure 4.0-2. Study area associated with recreation facilities at and around Newhalem.

The shorelines of Ross, Diablo, and Gorge lakes and the Skagit River were primarily surveyed by boat. Surveying the shoreline of Ross Lake was challenging due to low reservoir water surface elevations in early June 2021 and steep, often unstable slopes. Where safe, crews conducted surveys on foot in locations where target invasive plant species were suspected to occur. When the field crews determined that foot access was unsafe, they surveyed the shore from the boat using binoculars.

Most of the remainder of the study area was surveyed by foot. In some portions of the transmission line ROW, primarily where long stretches of target invasive plant species were observed, crews conducted windshield surveys instead of pedestrian surveys. This involved one biologist slowly driving the alignment while the other biologist(s) looked for invasive plant species from the vehicle using binoculars. In these instances, when a target invasive plant species was observed, survey crews would exit their vehicles and conduct surveys according to the Intuitive Controlled Survey method used by the BLM (BLM 2017; Whiteaker et al. 1998). Using this method, biologists traversed the area to see a representative cross section of the habitat.

Survey crews used Global Positioning Systems (GPS) to record locations of target invasive plant species in the landscape and to estimate the extent of the area infested. If the infestation continued outside the survey area, the survey area was expanded to include the full extent of the occurrence or to the Project Boundary, whichever was less. Crews collected data using iPad tablets installed with the ArcGIS Collector application, the Fulcrum mobile data application, and an Eos Arrow or Bad Elf Global Navigation Satellite System (GNSS) receiver.

At each observation, the following data were collected on an electronic data form which is consistent with mapping standards of the North American Invasive Species Management Association (NAISMA 2021):¹⁰

- Date/time/observer name;
- Unique undesirable plant feature ID;
- Location;
- Species' common and scientific name;¹¹
- Where growing or general habitat type (e.g., roadside, under tower, wetland, stream, mixed conifer forest);
- Life stage/phenology;
- Stem density within polygon, when applicable;
- Actual stem count, when applicable;
- Percent canopy cover¹² for larger populations;

¹⁰ The data form was also shared with LPs in May 2021 along with survey areas and the target invasive plant species list. No comments were received.

¹¹ Plant species were documented using plant nomenclature from the University of Washington Burke Herbarium Image Collection (Giblin and Legler 2021), which is based on Flora of the Pacific Northwest 2nd Edition (Hitchcock and Cronquist 2018) but includes some recent name changes.

¹² Canopy cover is considered the projection of the outermost perimeter of the spread of foliage.

- Photographs of the species and its habitat;
- Existing ground disturbance; and/or
- Potential pathways.

In areas where invasive plant species cover was sparse, an electronic data form was filled out for each species occurrence. Where invasive plant cover was dense and/or where species covered a large area, such as along the transmission line ROW, survey crews defined specific study “sub” areas in the field. These “sub” areas were defined by Project features (e.g., every five tower spans within the transmission line ROW). In these instances, percent cover was filled out for each species. Ubiquitous species (e.g., St. John’s-wort [*Hypericum perforatum*] and oxeye daisy [*Leucanthemum vulgare*]) were assigned a percent cover in each of these “sub” areas.

Point data were collected for populations less than 10 feet in circumference, where there were fewer than 200 stems for a graminoid species, 10 stems for a forb or herbaceous species, and one stem for a shrub or tree species. For infestations larger than 10 feet in circumference, survey crews collected polygon data. If more than one species was present in the polygon, survey crews recorded percent cover of each species. Where an infestation followed a linear pathway, such as a road or lakeshore, occurrences were represented with line data.

At target invasive plant observations, the pathways or disturbance due to Project O&M or Project-related recreation activities that have a potential to spread invasive plant species were collected as described in Section 2.6.4 of the RSP.

4.5 Process Data and Review for Quality

Following field surveys, all spatial data were placed on an ArcGIS webmap for internal review. Data on the webmap were compared with field notes and spatial data were adjusted, as needed. Additionally, all electronic data forms underwent quality assurance/quality control (QA/QC) procedures, such as ensuring electronic data forms followed the same nomenclature of the collected spatial data, reviewing and revising species codes to ensure accuracy, and revisions due to typographical errors. Data taken in Collector, electronic field forms, and field notes were all cross-referenced with Geographic Information System (GIS) maps during QA/QC procedures.

5.0 PRELIMINARY RESULTS

The information and sources reviewed before field work began informed study implementation and analysis. Field surveys occurred between June and September 2021. Survey efforts were typically 40 hours per week and survey crews spent a collective 1,200 person hours collecting data during the 2021 field season. Surveys were conducted along the three reservoirs, all accessible portions of the transmission line ROW, along the routes in 16 fish and wildlife mitigation lands, and along approximately 9 miles of the left bank of the Skagit River (approximately PRM 87.5 to PRM 90 and PRM 66.5 to PRM 73). Over 7,600 occurrences and/or populations of invasive plants were recorded. The entire study area was surveyed during the 2021 field season except for the following:

- The routes in the O'Brien Slough and Finney Creek fish and wildlife mitigation land properties;
- The approximately 30.7 miles of the right bank of the Skagit River from the Gorge Dam to the confluence with the Sauk River (approximately PRM 66.5 to PRM 97.2); and
- Approximately 22.7 miles of the left bank of the Skagit River (approximately PRM 97.2 to PRM 90; PRM 88 to PRM 73).

Biologists did not complete surveys of the above locations because of time constraints and lack of boat and boat driver availability. This work will be completed in 2022 in coordination with field surveys for TR-03 Rare, Threatened, and Endangered Plants Study (City Light 2022c).¹³ Comprehensive results will be presented in a study report to be included with the USR.

A large amount of data was collected during the 2021 field surveys. This study report summarizes the locations of invasive plant species that have a high potential to affect ecosystems.

General descriptions are provided for areas where invasive plant species cover is sparse. Attachment C identifies the locations where survey crews observed these species (by specific Project location). The mapbook in Attachment D further details where data on these species were collected. This mapbook shows all data collected within the RLNRA and the fish and wildlife mitigation lands. Along the transmission line ROW, point data were omitted for common species (e.g., reed canarygrass, Scot's broom [*Cytisus scoparius*]), and only large populations are displayed. Ubiquitous species such as St. John's-wort and oxeye daisy are not mapped. If multiple species were observed in an infestation, the dominant species is represented in the mapbook. Additional data, such as percent cover of observed populations, are included in an ArcGIS webmap and the accompanying geodatabase, which will be available upon request once the study is complete. In addition to percent cover, the geodatabase will include additional data collected as part of the electronic data form including stem density, latitude and longitude of observation, life stage, other non-dominant invasive plant species observed, existing ground disturbance, and potential Project-related disturbance.

¹³ The need for field surveys in 2022 was shared with LPs during the October 7, 2021 Terrestrial Work Group (TWG), formally known as the Terrestrial Resources and Reservoir Erosion Work Group (TRREWG), meeting.

The results of this assessment provide a detailed and accurate overview of invasive plant species occurrence within the study area. This baseline assessment, in combination with other relicensing studies, provide data to inform the effects analyses to be presented in the Draft License Application and to inform potential protection, mitigation, and enhancement (PME) measures.

5.1 Surveys for Invasive Plant Species

A total of 45 target invasive plant species were observed during field surveys and are described below. Observed target invasive plant species by location are in Table C-1 of Attachment C. The sections below provide a brief description of observations, by study area segment or specific study area location.

5.1.1 RLNRA

Thirty-seven different target invasive plant species were observed within the RLNRA. Common invasive plant species, such as Canadian thistle (*Cirsium arvense*), herb-Robert (*Geranium robertianum*), and flannel mullein (*Verbascum thapsus*), are widespread and occur in several portions of the RLNRA study area sub-segments. The townsites of Newhalem and Diablo contain the highest number of target invasive plant species, including many species previously used for ornamental landscaping, such as honesty (*Lunaria annua*), cherry-laurel (*Prunus laurocerasus*), and creeping bellflower (*Campanula rapunculoides*). These ornamental species are sparse, occur as individuals or small populations, and are confined to the townsites. The species highlighted in the discussion below are those that are the most prolific in each study area sub-segment or those with a high potential to alter ecosystems. The highlighted species are not presented in any particular order.

5.1.1.1 Ross Lake Excluding Big Beaver Valley

Fourteen target invasive plant species were observed along the shoreline of Ross Lake (see Attachment D, pages 1 through 16). Surveys along Ross Lake occurred between June 3 and June 10, 2021. Ross Lake has a normal maximum water surface elevation of 1,608.76 feet North American Vertical Datum of 1988 (NAVD 88) (1,602.5 feet City of Seattle datum [CoSD]). During the survey period, water surface elevations ranged from 1,574.16 to 1,586.36 feet NAVD 88 (1,567.9 to 1,580.1 feet CoSD). Ten invasive plant species observed in the Ross Lake study area sub-segment, including reed canarygrass, are in the drawdown zone, primarily along the northeast shore close to the Canadian border. This is consistent with the invasive plant species survey conducted north of the Canadian border. According to a 2006 survey, the Ross Lake Campground (approximately 0.1 mile north of the Canadian border) was noted as one of three areas of Skagit Provincial Park that require the highest degree of treatment and monitoring (McIntosh 2006).¹⁴ Species observed near the Ross Lake Campground include, but are not limited to, greater burdock (*Arctium lappa*), Canadian thistle, and flannel mullein.

¹⁴ The other two areas of the Skagit Provincial Park determined to require the highest degree of treatment and monitoring include the trail to Chittenden Meadow and the disturbed areas in Chittenden Meadow (McIntosh 2006), both located at the head of Ross Lake and accessible by the Ross Lake Campground.

Reed Canarygrass

Reed canarygrass, listed as a Class C noxious weed by WSNWCB and Whatcom County, is the most prolific invasive plant species observed within the Ross Lake study area sub-segment.¹⁵ In steeper portions of the shoreline, reed canarygrass was observed as scattered clumps along the normal maximum water surface elevation line of Ross Lake, in a 2- to 10-foot-wide band. Cover of reed canarygrass populations at the normal maximum water surface elevation line is low, and plants frequently appeared stressed (e.g., light in color, spindly, stunted growth) or growing with roots exposed, anchored on rocks or other unsuitable substrate (Figure 5.1-1).



Figure 5.1-1. Scattered clumps of reed canarygrass along the normal maximum water surface elevation line of Ross Lake.

In areas where the shoreline was at a lower gradient (e.g., various wetlands, areas near Hozomeen; see Figure 5.1-2) reed canarygrass was more extensive. Plants observed above the normal maximum water surface elevation line and the fluctuation zone appeared healthier, and some were in flower. These populations were typically observed as the sole species or co-dominant with cheatgrass.

¹⁵ According to recent studies, reed canarygrass may be a hybrid of native and non-native genetics strands (Kavova et al. 2018; Jakubowski et al. 2012).



Figure 5.1-2. Higher cover of reed canarygrass in low gradient wetland area near Hozomeen.

Approximately 250 scattered clumps were recorded during field surveys. This is in addition to denser linear populations along the shoreline that ranged from 140 feet to 2.2 miles in length, with the longest stretch being just south of Skymo Creek. The total linear extent of reed canarygrass around Ross Lake is estimated to be 34 miles, or 50 percent, of the approximately 68-mile shoreline. Populations appear fairly consistent on both the east and western shorelines. This is a much larger extent when compared to the NPS (2017a) reed canarygrass survey, which mapped the species occurring along approximately 8.3 miles of shoreline, primarily on the west side.

Other infestations are in wetlands and flat open areas around Ross Lake. This includes infestations in large wetlands in the northern reaches of Ross Lake, particularly on the eastern shore between the Canadian border and the public boat launch near the NPS Hozomeen Campground (see Attachment D, page 1). Reed canarygrass cover is approximately 75 to 100 percent in these wetlands and often co-dominant with native sedge species such as slough sedge (*Carex obnupta*) and Kellogg's sedge (*C. kelloggi*). Based on a review of aerial imagery, this infestation continues to the north, across the Canadian border. While conducting surveys in this northern portion of the lake during lower lake levels in June 2021, biologists observed that the grass was persisting down to about 16 feet below the normal maximum water surface elevation, despite being inundated during a large part of the growing season. In recent years, this area has typically been inundated from May or June through December, when the winter drawdown occurs. These populations are well established, in contrast to the distribution of the grass along the shore of Ross Lake in other areas. A similar infestation occurs in a wetland on the western shore near the NPS Silver Creek

Campground (see Attachment D, pages 2 and 3). In the areas of the forests immediately next to the wetlands that biologists could access, no reed canarygrass was observed. This suggests that the species is not actively establishing outside of the fluctuation zone of the reservoir. This is likely due to suppression by shade from trees and shrubs, which has an adverse effect on reed canarygrass rhizome survival (Waggy 2010). Other shaded areas within the lower gradient areas of the fluctuation zone also had sparse reed canarygrass cover, including the areas where large wood is naturally deposited.

Mouse-ear Hawkweed

One population (0.37 acre with 25 percent cover) of mouse-ear hawkweed (*Hieracium pilosella*), listed as a Class B species by WSNWCB and Whatcom County, was observed in the northern portion of Ross Lake, near the Canadian border (see Attachment D, page 1). This population is along a swath of dry gravelly soils colonized with non-native grasses such as silver hairgrass (*Aira caryophyllea*), common non-native forbs such as white clover (*Trifolium repens*), and oxeye daisy, and appears to extend north across the Canadian border. Mouse-ear hawkweed forms a dense carpet of rosettes. This species infests areas of bare to loose, gravelly soils (Thurston County Noxious Weed Control Board [TCNWCB] 2017), similar to the substrate along the shores of Ross Lake. According to City Light botanists, this infestation is the first of this species observed in Ross Lake. City Light alerted NPS and British Columbia Parks (BC Parks), who confirmed the infestation on the Canadian side of the border. BC Parks is part of the Inter-Ministry Invasive Species Working Group (IMISWG), which considers mouse-ear hawkweed an Early Detection Rapid Response (EDRR) species, or a species that should be eradicated before it becomes established and dispersed (IMISWG 2014). BC Parks planned to treat the population on the Canadian side of the border with an herbicide in the fall of 2021 (Hirner 2021).

Knapweed

Diffuse knapweed (*Centaurea diffusa*) and spotted knapweed (*C. stoebe*), both listed as Class B noxious weeds by WSNWCB and Whatcom County, occur in the northeast portion of Ross Lake within the drawdown zone (see Attachment D, page 1). One population of spotted knapweed occurs along approximately 600 feet of shoreline near the NPS Hozomeen Ranger Station, growing with oxeye daisy and colonial bent grass (*Agrostis capillaris*). A second population of spotted knapweed (0.13 acre with 5 percent cover) occurs with four small populations (less than 10 stems each) of diffuse knapweed near the NPS Winnebago Flats Campground, along trails immediately next to the lake. A third, and smaller, population containing only spotted knapweed (3 occurrences with less than 10 stems each) occurs south of the public boat launch near the NPS Hozomeen Campground. Overall, knapweed populations are sparse with few individuals (i.e., less than 10) and are within areas with loose, gravelly soils frequented by recreation.

Canadian Thistle

Canadian thistle, listed as a Class C noxious weed by WSNWCB and Whatcom County, occurs in four locations in the surveyed portions of Ross Lake. In the northern extent, three occurrences of a few scattered individuals were observed within patches of nonnative grasses, oxeye daisy, and St. John's-wort (see Attachment D, page 1). A larger population (815 square feet 60 percent cover) of approximately 50 to 75 individuals was observed near the Roland Point inlet (see Attachment D, page 14). This population was growing among reed canarygrass and bird's-foot trefoil (*Lotus corniculatus*) in the mid to upper reaches of the reservoir fluctuation zone.

5.1.1.2 Big Beaver Valley

As noted in Attachment A of the RSP, City Light has not received any evidence to suggest that Project operations are spreading reed canarygrass to wetlands upstream of the Project in Big Beaver Valley. The Project has no effect on the hydrology of these wetlands, which are located between about 0.8 and 2 miles from Ross Lake and above the normal maximum water surface elevation. Therefore, Big Beaver Valley is not included in the survey area. The information below is a summary of surveys conducted by NPS and a site visit conducted by NPS and City Light on August 20, 2020.

In 2017, the NPS North Coast-Cascades Network Exotic Plant Management Team (EPMT) surveyed locations and recorded population densities of reed canarygrass along Big Beaver Creek from its outlet on Ross Lake to its confluence with McMillan Creek (NPS 2017b). Some areas on the north side of the creek had concentrations of reed canarygrass. EPMT noted that there were likely more infestations in other areas, but large portions of the valley are inaccessible. The EPMT began control measures in 2017.

In 2019, the EPMT returned to Big Beaver Valley and treated two additional infestations of reed canarygrass. Approximately 0.7 acre of the estimated 3.5-acre infestation was treated at the site known as Hoe-dee-doe. Additionally, the entire 1.5-acre infestation at the site known as Purgatory was also treated (NPS 2019).

During the August 20, 2020 site visit, City Light and NPS observed reed canarygrass in some wetland areas, but overall, the wetlands supported a diversity of native species. The majority of the reed canarygrass patches were small (approximately 2 x 2 meter) and mixed with horsetail (*Equisetum* spp.). Larger patches were estimated to be up to 3 acres. Reed canarygrass was less prevalent and less well-established in wetlands that had a dense shrub stratum compared to wetlands that lacked a dense shrub layer. Herbaceous-dominated wetlands, determined to be disconnected from Ross Lake, have more patches than shrub-covered wetlands. NPS estimates that reed canarygrass cover is less than 1 percent of the wetland area in the valley (City Light 2020b). Based on the results of TR-02 Wetland Assessment, the estimated infestations at the Hoe-dee-doe and Purgatory sites cover approximately 0.7 percent of the 674-acre wetland.¹⁶ NPS has since conducted additional treatments of reed canarygrass. City Light will continue to coordinate with NPS and update information as it becomes available.

5.1.1.3 Diablo Lake

Surveys were primarily conducted along Diablo Lake from June 1 through June 3, and on June 16, 2021. The wetlands along Thunder Arm were surveyed on July 2, 2021. Diablo Lake has a normal maximum water surface elevation of 1,211.36 feet NAVD 88 (1,205 feet CoSD). During this survey period, water surface elevations ranged from 1,205.76 to 1,206.96 feet NAVD 88 (1,199.4 to 1,200.6 feet CoSD). Twelve target invasive plant species were observed along Diablo Lake, but occurrences were individuals or in small patches (fewer than 10 individuals). Survey crews observed two areas with concentrated invasive plant infestations: the Thunder Arm area (specifically near the Colonial Creek Campground facilities) and the northern shoreline near the

¹⁶ The NPS 2019 inventory did not cover the entire wetland area. NPS recently conducted a complete inventory of reed canarygrass within Big Beaver Valley. Once City Light receives the data this estimate will be updated and included in the USR.

North Cascades ELC (see Attachment D, pages 20 through 23). The majority of the species discussed below occur along Thunder Arm. The area next to the North Cascades ELC is addressed in Section 5.1.1.10 of this study report.

Common Tansy

Common tansy (*Tanacetum vulgare*), listed as Class C noxious weed by WSNWCB and Whatcom County, was the most frequently observed target invasive plant species along the shoreline of Diablo Lake. At Diablo Lake, this species occurs as individuals or small patches (fewer than 10 individuals), with overall trace cover. One area of dense cover occurs near the NPS Colonial Creek recreational areas, where this species is continuous along approximately 0.3 mile of the shoreline. This species also occurs along the rocky shoreline of the easternmost island on the lake in trace amounts. Common tansy populations along the shore of Diablo Lake were most frequently observed growing in rocky substrate with no associated plant species.

Reed Canarygrass

Overall cover of reed canarygrass along the shoreline of Diablo Lake is sparse. Two populations of this species occur on the eastern shoreline of Thunder Arm (see Attachment D, page 22). Both populations consisted of small plants of fewer than 10 individuals. Both populations were patchy, neither were observed flowering, and both were sparse and poorly established in the rocky soils.

Spotted Knapweed

One population (2,267 square feet with 25 percent cover) of spotted knapweed occurs near Colonial Creek in the vicinity of the NPS Thunder Knob Trail (see Attachment D, page 22). During the 2021 survey, the infestation was approximately 1,000 square feet in size with approximately 25 percent cover. It was growing among native willow species (*Salix* spp.) and between woody debris that had accumulated near the water line.

Scot's Broom

Three Scot's broom populations with fewer than 10 individuals each were found on Deer Island, the easternmost island within Diablo Lake (see Attachment D, page 20). This species, listed as a Class B noxious weed by WSNWCB and Whatcom County, was growing in small pockets of soil on the primarily rocky shore. No other occurrences of Scot's broom were observed along the shoreline.

Herb-Robert

Herb-Robert, listed as a Class B noxious weed by WSNWCB and Whatcom County, occurs in five small populations (fewer than 10 individuals each) along the shoreline of Diablo Lake. Four populations occur on the lakeshore along Thunder Arm near the NPS Colonial Creek recreational facilities (see Attachment D, page 22). The fifth population is near the boat ramp for the NPS Hidden Cove campsite (see Attachment D, page 21).

Flannel Mullein

Two individual flannel mullein, an NPS First Priority Species, were observed on the east bank of Thunder Arm, north of the SR 20 crossing. Both were growing on a rocky outcrop with loose, gravelly soils. Both plants were observed as rosettes (see Attachment D, page 21).

5.1.1.4 Gorge Lake

Eleven target invasive plant species were observed along Gorge Lake during surveys that occurred on June 30, July 1, and July 5, 2021. Gorge Lake has a normal maximum water surface elevation of 881.51 feet NAVD 88 (875 feet CoSD). During this time period, water surface elevations ranged from 876.91 to 878.01 feet NAVD 88 (870.4 to approximately 871.5 feet CoSD). Similar to the shoreline of Diablo Lake, invasive plant species along the shoreline of Gorge Lake are smaller populations composed of fewer than 50 individuals. The portion of Gorge Lake that abuts SR 20 has more target invasive plant species occurrences—these are described in Section 5.1.1.7 (Study Routes within the RLNRA) of this study report. The southern shoreline of Gorge Lake is dominated by native forest species, such as western red cedar (*Thuja plicata*), and has noticeably fewer occurrences of target invasive plant species.

Common Viper's Bugloss

The field team observed one population of common viper's bugloss (*Echium vulgare*), listed by WSNWCB and Whatcom County as a Class B noxious weed, along Gorge Lake (see Attachment D, page 25). The population was located on the northern shore, downstream from Gorge Creek and upstream from Gorge Dam. This population extended vertically up the rocky cliffs of the reservoir and included one large group of approximately 30 stems and 2 small occurrences nearby that were likely part of the same population. This infestation appears to be newly established, as no stems from previous seasons were observed. This species was growing in the thin, rocky soils with other target invasive plant species, primarily flannel mullein, and native grasses (*Agrostis* spp.). Survey crews did not observe Common viper's bugloss in any other locations of the study area.

Lesser Periwinkle

The field team observed one population of lesser periwinkle (*Vinca minor*), approximately 350 square feet in size with 60 percent cover, along the southern shoreline of Gorge Lake (see Attachment D, page 24). This species was growing in a dense patch that was partially submerged during the site visit. The field team also observed a few individual plants slightly farther upslope. This species was not observed elsewhere in the Gorge Lake area. NPS considers lesser periwinkle a First Priority Species.

Herb-Robert

Herb-Robert was the most commonly observed invasive plant species within the fluctuation zone of Gorge Lake (see Attachment D, pages, 23 and 24). Field crews observed this species growing in mats, which were frequently spreading outside of the study area and into the forest. Two large populations occur along the north shore: one upstream of the SR 20 crossing (0.9 acre with 20 percent cover) and one near the Gorge Boat Launch (1.1 acre with 30 percent cover). Cover of this species in these populations ranged from 15 to 25 percent. The majority of plants observed during the field surveys were mature and/or reproductive. Higher concentrations of this species also occur on the southern shoreline.

Flannel Mullein

The field team observed flannel mullein frequently (approximately 10 occurrences of less than 10 stems each) along the shores of Gorge Lake, primarily along the northern shore (see Attachment

D pages, 3 through 25). Individuals occurred in a scattered formation, usually 2 to 10 feet apart. Plants included mature and reproductive individuals that were well established, particularly in rocky areas with thin, gravelly soils.

Greater Burdock

Greater burdock, an NPS First Priority Species, occurs intermittently (approximately 6 occurrences of less than 10 stems each) throughout the northern shoreline of Gorge Lake, where weeds are more common (see Attachment D, pages 3 through 25). This species was growing as individuals or small populations (fewer than 10 species) within accumulations of woody debris, and near other target invasive plant species such as herb-Robert, common tansy, and St. John's-wort. The observed individuals were mature.

5.1.1.5 Transmission Line ROW – Ross Lake to the Southern End of Gorge Lake

The transmission line ROW from Ross Lake to the southern end of Gorge Lake was surveyed on June 2 and July 2, 2021 and encompasses several different habitat types (see Attachment D, pages 19, 20, 25, and 26). West of Ross Lake, Douglas-fir (*Pseudotsuga menziesii*) and lodgepole pine (*Pinus contorta* var. *latifolia*) dominate the forested areas. Some areas are sparsely vegetated and dominated by scree soils and boulders. Other portions of this study area sub-segment are dominated by native shrubs and ferns, primarily vine maple (*Acer circinatum*) and bracken fern (*Pteridium aquilinum*), respectively. Some portions too steep to access were surveyed using binoculars. Seven target invasive plant species were observed during the surveys. Overall, cover of invasive plant species in this area ranged from 0 to 5 percent, and species such as common tansy and St. John's-wort were ubiquitous. Other invasive plant species are in sections of the transmission line ROW that intersect with, or are next to, routes (e.g., species mapped at the western extent of Diablo Lake). Invasive plant populations documented in this area are summarized in Section 5.1.1.7 (Study Routes within the RLNRA) of this study report.

5.1.1.6 Transmission Line ROW – Southern End Gorge Lake to Bacon Creek

Portions of the transmission line ROW in this study area sub-segment are inaccessible due to steep slopes and were surveyed using binoculars (see Attachment D, pages 26 through 32). Surveys occurred on July 6, 7, and 9, 2021. Dense populations of native shrubs, trees, and forbs dominate this area. In areas where biologists could access the transmission line ROW, one sycamore maple and a few individual common tansy and herb-Robert occurred along the rocky slopes. As the field team traveled west along the transmission line ROW, no target invasive plant species were observed, although common weedy species (such as woodland ragwort [*Senecio sylvaticus*] and oxeye daisy) were observed. Invasive cover was most dense near the transmission line towers and maintenance roads, and included scattered occurrences of Scot's broom, tall hawkweed (*Hieracium piloselloides*), Canadian thistle, and one sighting of traveler's-joy. In total, 21 target invasive plant species were observed in this portion of the study area. Starting in 2018, City Light has initiated several invasive management projects, primarily along the transmission line ROW, including a project within this study area segment that focuses on eradication of traveler's-joy and Scot's broom.

Common Tansy

The common tansy populations within transmission line ROW in this study area sub-segment are prevalent in areas near SR 20. This species is concentrated in distinct bands along SR 20 but was also observed in large clonal patches along service roads and near transmission line towers, where brush-cutting is performed. Despite dense native species cover, these patches appeared to be well established and healthy, with an average estimate of over 200 stems per patch. Associated species include bracken fern, tall Oregon-grape (*Mahonia aquifolium*), and thimbleberry (*Rubus parviflorus*). The five largest patches in this study area segment ranged from 0.1 acre to 4.4 acres and had an average of 13 percent cover. Common tansy was also consistent along the transmission line ROW from Gorge Lake to the Gorge Powerhouse and had an average cover of 15 percent.

Herb-Robert

Herb-Robert occurs along the section of the transmission line ROW nearest to SR 20 and is concentrated along maintenance roads that are shaded by big leaf maple (*Acer macrophyllum*) and native shrubs such as salmonberry (*Rubus spectabilis*) and thimbleberry. The herb-Robert populations occur in dense mats and, similar to observations on the Gorge Lake shoreline, comprise small emerging rosettes and mature reproductive individuals. Seven large populations occur within this study area segment and ranged from 0.1 acre to 4.3 acres with an average cover of 18 percent, the largest (4.3 acres with 20 percent cover) occurring where the transmission line crosses SR 20 near PRM 86.5 (see Attachment D, page 31).

Himalayan Blackberry

One large population (1.6 acres with 10 percent cover) of Himalayan blackberry (*Rubus bifrons*) is located in this study area segment in the storage area across SR 20 from Newhalem. Other larger infestations occur north of Bacon Creek and ranged from 0.5 to 3.0 acres in size. Populations along the riparian areas of Bacon Creek have 80 percent cover. A few individual vines and scattered patches occur through the remainder of this segment along the roadside within the transmission line ROW. These populations range from large monocultures with 100 percent cover to less dense brambles interspersed with common tansy and flannel mullein with a lower cover of up to 50 percent.

5.1.1.7 Study Routes within the RLNRA

Study routes within the RLNRA include maintenance roads, access roads to Project facilities and Project-related recreation sites, and SR 20. Invasive plant species such as oxeye daisy and St. John's-wort are ubiquitous along these roads. Other frequently observed species are described below.

Common Tansy

Common tansy was the most frequently observed target invasive plant species along all study routes. This species often formed dense patches within road prisms and showed signs of multigenerational colonies with senesced seed heads and juveniles emerging close by. Other species present were primarily introduced grasses, oxeye daisy, and St. John's-wort.

Diffuse and Spotted Knapweeds

Study teams observed numerous occurrences of both diffuse and spotted knapweeds along SR 20. These species were growing interspersed with other nonnative species such as oxeye daisy, herb-Robert, and common tansy. Populations of these species were primarily scattered mature and juvenile individuals; dense colonies were not observed.

Herb-Robert

Dense mats of herb-Robert occur frequently along SR 20, particularly in moist ditches, seeps, or areas shaded by shrubs such as creambush ocean-spray (*Holodiscus discolor*) and thimbleberry. The Ross Haul Road was the only road where this species was not observed.

Tall Hawkweed

This species frequently occurs as scattered individuals or smaller clumps (fewer than 10 individuals) along most routes in the RLNRA, often interspersed with introduced grasses and common tansy. Larger populations occur on the north side of Diablo Dam Road where cover sometime exceeds 40 to 50 percent along the roadside and extends onto the rocky outcrops above (see Attachment D, page 23). This species is present along approximately 0.2 mile of the 0.5-mile road from Diablo Dam to the North Cascades ELC.

Bristly Locust

The field team observed two populations of bristly locust (*Robinia hispida*) along the spur road from Diablo Dam to the top of the Incline Lift (see Attachment D, page 23). The population to the west was approximately 0.4 acre with 40 percent cover. The population to the east, and closet to the dam, was approximately 0.3 acre with 80 percent cover. Most seedlings were not yet mature at the time of the survey. However, a few fallen inflorescences, but no seed pods, were found. Flannel mullein, common tansy, English hawthorn (*Crataegus monogyna*), and Scot's broom seedlings were also present in this area. Bristly locust is an NPS First Priority Species.

Himalayan Blackberry

Along routes within the RLNRA, Himalayan blackberry occurs primarily as individual patches with trace cover, frequently observed in association with native shrubs such as beaked hazelnut (*Corylus cornuta*) and salal (*Gaultheria shallon*). The overall frequency of Himalayan blackberry increases near the town of Newhalem, with an estimated 15 percent cover within roadsides.

5.1.1.8 Diablo Townsite

The Diablo townsite was surveyed on June 17, 2021. In addition to 33 target invasive plant species, populations of escaped ornamental species were observed at the Diablo townsite (see Attachment D, page 23). The unoccupied area of Diablo—referred to as Reflector Bar—has the most target invasive plant species, particularly in the riparian area of Gorge Lake. Widespread species include common tansy, flannel mullein, Himalayan blackberry, herb-Robert, Scot's broom, St. John's-wort, and oxeye daisy. These species overlap with less common ornamental species such as golden chain-tree (*Laburnum anagyroidis*), European beech (*Fagus sylvatica*), dame's rocket (*Hesperis matronalis*), and target listed bishop's goutweed. These ornamentals were likely intentionally planted and have the potential to spread to other less-disturbed areas. In the occupied areas of Diablo—referred to as Hollywood—invasive cover was sparse overall. However, the recreational

areas near the Ross Lodge Picnic Shelter have some occurrences of greater burdock, bull thistle (*Cirsium vulgare*), and the ubiquitous species oxeye daisy and St. John's-wort. Invasive plant species are also common in the riparian areas of the Diablo townsite, which is likely the result of dumping yard waste over the bank. The more notable invasive occurrences in both Reflector Bar and Hollywood areas are summarized below.

Egg-Leaf Spurge

Two occurrences of egg-leaf spurge (*Euphorbia oblongata*), listed as a Class A noxious weed by WSNWCB and Whatcom County, were observed at the Diablo townsite. The first population is in a remnant landscape bed east of the substation in Reflector Bar. This population is growing with petty spurge and cypress spurge (*E. cyparissias*), as well as ornamental fir trees (*Abies* spp.). The population does not appear to be spreading outside of the concrete landscaped area. Within the landscaped area, however, spreading rhizomes were observed. Approximately 900 feet south of this area, 10 to 15 additional individuals were observed in a small clump near the Gorge Lake shoreline. They were growing within the root zone of a birch tree (*Betula* sp.) on gravelly substrate with English plantain (*Plantago lanceolata*). None of these individuals were in flower and all were juvenile.

Sycamore Maple

Several sycamore maples were observed within the southeast portion of Reflector Bar. In gravelly, disturbed substrate, over 10 individuals in varying life stages occur with other nonnative trees such as black locust (*Robinia pseudoacacia*) and European beech. A similar stand with fewer than 10 individuals, also in varying life stages, occurs on the shoreline of Gorge Lake west of the larger populations. Sycamore maples occur more often along the banks of Gorge Lake than along the streets or within the Reflector Bar townsite. No sycamore maples were observed in Hollywood.

Lesser Periwinkle

Study teams recorded one population of lesser periwinkle within Reflector Bar (2,193 square feet with 15 percent cover). This population is sparse and growing in gravelly soil with other invasive plant species such as common tansy, herb-Robert, and flannel mullein. Trailing stems appear to be rooting, indicating a potential spread to nearby areas. A second population (2,364 square feet with 20 percent cover) occurs along the shoreline of Gorge Lake, next to Diablo Road in Hollywood. This population extends nearly into the water of Gorge Lake and is co-dominant with common tansy.

5.1.1.9 Newhalem Townsite

Surveys of the Newhalem townsite were conducted on June 14 and 15, 2021. Several intentionally planted species grow interspersed with more common target invasive plants such as Himalayan blackberry, herb-Robert, bishop's goutweed, and reed canarygrass (see Attachment D, page 26). Overall, the Newhalem townsite area had a high occurrence of sycamore maple and other unlisted, non-native, ornamentally planted trees, most of which are well established and reproductive. Along recreational trails (e.g., the Trail of the Cedars), herb-Robert has accumulated in shaded forested areas and expanded into buffers of the trail outside of the study area. A total of 33 target invasive plant species were observed in the Newhalem townsite.

Invasive Tree Species

Sycamore maples are planted along roads, and seedlings have spread along the riparian areas of the Skagit River behind housing. Other listed invasive trees species within the town of Newhalem include Norway maple (*Acer platanoides*), black walnut (*Juglans nigra*), European mountain ash (*Sorbus aucuparia*), and bristly locust. Based on a separate, landscape tree inventory conducted in 2021, other unlisted, non-native, ornamental trees that appear to be spreading include, but are not limited to, red oak (*Quercus rubra*), English oak (*Quercus robur*), sweet cherry (*Prunus avium*).

Scot's Broom

Scot's broom occurs at high frequency in this study area segment. Overall, populations consist of both individual seedlings and woody, mature shrubs. Approximately 2 acres of plants were observed on cliff faces north of the Newhalem townsite (referred to as the Newhalem Slope). This population is scattered as individuals with cheatgrass—likely an effect of the Goodell Creek Fire of 2015. Cover is sparse and estimated at 5 percent. As with other invasive plant species observed in the study area, most larger populations are confined to roadsides and disturbed areas.

Traveler's-joy

Three individuals of traveler's-joy grow along the Trail of Cedars. Two other occurrences are located near the parking lot and trail up to the transmission line near Ladder Creek Gardens. These populations are mixed with other weeds such as common tansy, flannel mullein, and Himalayan blackberry.

Since 2013, City Light has expanded efforts to address invasive plant species at both Newhalem and Diablo townsites, and a number of species have been prioritized. Collaboration with NPS was initiated previously to identify problematic species and address weed populations that crossed property boundaries. After the 2018 Goodell Creek Fire, both City Light and NPS redoubled their coordinated efforts to prevent the spread of weeds into burned areas.

5.1.1.10 Recreational Facilities and Project Facilities

Newhalem facilities are largely landscaped and lack populations of widespread weeds (see Attachment D, page 26). Areas such as the interpretive display, playground, Gorge Powerhouse Visitor Gallery, Skagit Information Center, and Gorge Inn Museum are actively managed and planted with non-native ornamental plant species. The majority of the invasive trees are scattered seedlings from burgeoning populations of sycamore maple. Parking areas have higher occurrences of widespread weeds such as common tansy, reed canarygrass, Himalayan blackberry, and greater burdock. Additionally, a population (0.2 acre with 5 percent cover) of purple toadflax (*Linaria purpurea*) occurs near the entrance of Ladder Creek Gardens and is expanding downslope to the riverbanks, growing with flannel mullein and horseweed (*Conyza canadensis*). Herb-Robert is growing consistently along most of the Trail of the Cedars alignment, but plants are sparse. Three populations of traveler's-joy, one juvenile English hawthorn, and one mature European mountain ash also occur here.

Outside of Newhalem, the densest cover of invasive plants is at Diablo Lake near the Skagit Tour Dock (see Attachment D, page 23). Diffuse knapweed is present in areas surrounding the dock, parking lot, and road. It grows in patches with other weedy species, such as oxeye daisy, and is

scattered along rocky substrate. Other facilities, particularly the Gorge Boat Launch, have large populations of herb-Robert and common tansy. A large population of spotted knapweed (0.3 acre with 15 percent cover) is also present at the Gorge Boat Launch.

North Cascades ELC

The trails and roads within the North Cascades ELC facility have scattered, small and sparse populations of common invasive plant species such as St. John's-wort, oxeye daisy, and flannel mullein (see Attachment D, page 20). Surveys were conducted on June 3 and June 16, 2021. Individuals of two invasive tree species were observed here and included one juvenile European mountain ash and one mature sycamore maple. Common tansy is widespread along the main road and in the parking lot. One small population (fewer than 10 individuals) of tall hawkweed was observed along the main road immediately next to the parking lot to the north, and a small population (fewer than 10 individuals) of spotted knapweed was observed on the beach, bordering the parking lot to the south. A population of approximately 50 to 100 stems of mature and flowering Canadian thistle was also observed along the main road west of the parking lot.

5.1.2 Transmission Line ROW Outside of the RLNRA

These surveys included areas along the transmission line ROW and near study routes. Results of these surveys are described below (organized by study area segment). Outside of the RLNRA, target invasive plant species populations are more common and cover larger areas than within the RLNRA. They also contain several co-dominants of common or ubiquitous species. Therefore, this section provides a more general description of populations within these study area segments.

5.1.2.1 Bacon Creek to Sauk River Crossing

This study area segment was surveyed over several days between July 8 and July 21, 2021. Nineteen target invasive plant species were observed in this study area segment with concentrations along the main access road that traverses the center of the transmission line ROW through the majority of this study area segment (see Attachment D, pages 32 through 38, 50, and 52 through 55). Several portions of the transmission line ROW do not contain a main access road. These include the approximately 1.9 miles from Bacon Creek to Diobsud Creek; approximately 1.7 miles north of the Skagit River crossing that runs through agricultural field and rural residences; and 0.5 mile of forested transmission line ROW north of the Sauk River crossing.

From Bacon Creek south to Diobsud Creek, vegetation in the transmission line ROW is primarily a mix of small native regenerating trees, such as Douglas-fir and bigleaf maple, and native shrubs, primarily vine maple and red osier dogwood (*Cornus stolonifera*). Common tansy was the dominant invasive plant species observed, and populations were scattered with low stem counts. Other populations of target invasive plant species occurred as individuals or small patches and included Scot's broom, Himalayan blackberry, and flannel mullein. One large population of old man's bead occurred approximately 0.75 miles south of Bacon Creek. This population covered approximately 2,000 square feet with 80 percent coverage and was observed growing with Himalayan and trailing blackberry (*Rubus ursinus*). No other larger populations of this species were observed.

South of Diobsud Creek to the crossing of the Skagit River, the transmission line ROW intersects several rural residential and agricultural lands. Overall, observed invasive cover increased and

included patches of Himalayan blackberry and reed canarygrass. These patches are near the road and sometimes dense with 75 to 100 percent cover. Approximately 5.5 acres of reed canarygrass (with an average cover of 19 percent) was mapped between Diobsud Creek and the Skagit River crossing. Additionally, approximately 58 acres of Himalayan blackberry (with an average cover of 45 percent) was mapped, including an 11.2-acre area (with 100 percent cover) next to the Corkindale Creek fish and wildlife mitigation land property (see Attachment D, page 37). Small Scot's broom populations (fewer than 10 individuals) were frequently interspersed away from the roadway. City Light recently treated Scot's broom from near Bacon Creek to Dexter Lane. There remains a somewhat large population from Dexter Lane to Diobsud Creek. Upland native vegetation in the transmission line ROW is dominated by Scot's broom, salal, western sword fern (*Polystichum munitum*), and kinnikinnick (*Arctostaphylos uva-ursi*).

Following an on-site listening session with the Sauk-Suiattle Indian Tribe in 2020, City Light set up a pilot program to control Scot's broom, with one of two sites located near Diobsud Creek Road. The other site is near Spearhead Lake, west of the Sauk River. The objective of this program is to analyze and evaluate effectiveness of different control methods, and to determine if they promote more diverse habitat within the transmission line ROW. The three control treatment methods include: (1) cut only; (2) cut and treat with herbicide; and (3) cut and cover. The "cut and cover" method involves cutting select vegetation that is then covered to shade out new growth. City light intended to use wood chips to cover the cut area. Instead, the cut-up Scot's broom was chipped, and used to cover the cut stems due to wood chip delivery issues.

South of the Skagit River to the Sauk River crossing, the first 1.3 miles of transmission line ROW is within the Illabot North fish and wildlife mitigation property. This area is a mix of native trees, shrub, and forbs dominated by red alder (*Alnus rubra*), salal, and native ferns, respectively. Invasive plant species near the Skagit River, including the Powerline spawning channel, are primarily Himalayan blackberry and reed canarygrass. One mature population of traveler's-joy occurs near the Powerline spawning channel. Additionally, reed canarygrass is the dominant species along the O'Brian Creek channel. In recent years, City Light has implemented invasive plant species management in this area along Illabot Creek Lane. Management efforts are focused on Himalayan blackberry, Scot's broom, and traveler's-joy. Additional past control efforts have included the removal of one small patch of Japanese knotweed. Control efforts are still ongoing.

South of the Rockport-Cascade Road, common tansy consistently grows next to the road, and small populations of Canadian thistle are present. South to the Sauk River crossing, several larger populations of Scot's broom (between approximately 200 square feet and approximately 0.2 acre in size) begin to appear, with an estimated cover of this species at 5 to 25 percent.

Within this study area segment, the primary ubiquitous invasive plant species include St. John's-wort, common tansy, and flannel mullein. The majority of the populations have less than 25 percent cover.

5.1.2.2 Sauk River Crossing to Oso

Nineteen target invasive plant species were observed in this study area segment. Surveys of this portion of the transmission line ROW occurred over several days between July 22 and August 3, 2021. Vegetation communities shift distinctly after crossing the Sauk River (see Attachment D, pages 55 through 70). Scot's broom is the dominant target invasive plant species from the Sauk

River south to Darrington. Throughout the northernmost 4 miles of this segment, approximately 53 acres of Scot's broom occurs with an average cover of 44 percent. Areas along the transmission line access road frequently exceeded 60 percent cover. As surveys progressed south, invasive plant cover decreased. Occurrences of Scot's broom are intermittent and co-dominant with Himalayan blackberry, reed canarygrass, and common tansy. These species primarily occur along roadsides and transmission line towers and are not spreading into nearby forested areas. In 2020, City Light also implemented a pilot site in this portion of the transmission line ROW to test Scot's broom treatment methods, similar to the program near the Diobsud Creek road described above.

West from Darrington to the community of Oso, the transmission line travels through the low elevation river valley of the North Fork Stillaguamish River and borders developed areas such as SR 530 and rural residences. Larger populations of Scot's broom, similar to those to the north, are frequent. A total of approximately 91 acres of Scot's broom, with an average cover of 41 percent, was mapped from Darrington to Oso. Other dominant invasive plant species include Himalayan blackberry and reed canarygrass. Several individual or small populations of butterfly bush (*Buddleja davidii*) and Canadian thistle were also observed. Ubiquitous species, such as St. John's-wort and common tansy, cover less than 25 percent. City Light has also initiated invasive plant species management within this study area segment, including a project focusing on the management of Scot's broom near French Creek, as part of a tower replacement project.

5.1.2.3 Oso to SR 528

Eighteen target invasive plant species were observed in this study area segment, which was surveyed over several days between August 3 and August 12, 2021. From Oso south to the South Fork Stillaguamish River, this study area segment is predominantly located in timber and rural residential lands (see Attachment D, pages 71 through 82). Vegetation is disturbed, and large populations of Himalayan blackberry and reed canarygrass occur throughout this portion of the study area segment. North of the South Fork Stillaguamish River, approximately 43 acres of Himalayan blackberry and 57 acres of reed canarygrass were mapped, with an average cover of 50 and 43 percent, respectively. Several smaller populations (fewer than 10 individuals) of Scot's broom and Canadian thistle were also observed throughout.

South of the South Fork Stillaguamish River, Himalayan blackberry and reed canarygrass continue to be the dominant invasive plant species, frequently forming monocultures interspersed with neighboring pasture and rural residential lands. Larger infestations of Himalayan blackberry are scattered throughout this study area segment. South of the South Fork Stillaguamish River, approximately 30 acres of Himalayan blackberry and 35 acres of reed canarygrass were mapped, with an average cover of 35 percent and 40 percent, respectively. Fifteen individual European mountain ash, three English hawthorn, and two English holly trees (*Ilex aquifolium*) were also observed near the rural residences. Other dominant invasive species, primarily Scot's broom and Canadian thistle, were also observed throughout as individuals or in small populations. Common tansy occurs throughout this study area segment at less than 5 percent cover.

5.1.2.4 SR 528 to Bothell Substation

This study area segment is highly developed and characterized by residential land use (see Attachment D, pages 83 through 94). Twenty-one target invasive plant species were observed in this study area segment. Surveys were conducted over several days between August 12 and

September 9, 2021. Overall, dominant invasive plant species present are similar to the segment to the north (Oso to SR 528). However, invasive plant species occur much more frequently. Large brambles of Himalayan blackberry occur throughout. North of the Snohomish River crossing, approximately 89 acres of Himalayan blackberry and 23 acres of reed canarygrass were mapped, with an average cover of 55 percent and 42 percent, respectively. South of the Snohomish River crossing, approximately 34 acres of Himalayan blackberry and 5 acres of reed canarygrass were mapped, with an average cover of 50 percent and 41 percent, respectively. This study area segment also included observations of three Japanese knotweed populations. Two populations contained fewer than 10 stems. The third population was relatively large and was approximately 0.2 acre with 90 percent cover. Common tansy and oxeye daisy are ubiquitous within this study area segment at approximately 5 and 25 percent cover, respectively.

5.1.3 Fish and Wildlife Mitigation Lands

These surveys included areas within 50 feet of either side of study routes within the fish and wildlife mitigation lands. Similar to the transmission line ROW, common and ubiquitous invasive plant species are seen frequently, although they occur in smaller populations.

5.1.3.1 Fish and Wildlife Mitigation Lands Within the RLNRA

Newhalem Ponds

Invasive plant surveys of the Newhalem Ponds property were conducted on July 6, 2021. Healthy populations of greater burdock and herb-Robert occur along the road prism leading through the property (see Attachment D, page 28). The perimeter of the storage area is dominated by Himalayan blackberry, herb-Robert, and common tansy that is spreading into the neighboring forested areas. One patch (less than 50 square feet) of Japanese knotweed is also in this area, located on a gravel mound with Scot's broom, greater burdock, herb-Robert, common tansy, and oxeye daisy. Most target invasive plant species are confined to the gravel road and the maintenance area with the exception of reed canarygrass, which was observed around the perimeter of the western pond and the island within it. Additionally, a small population (fewer than 20 individuals) of purple toadflax was mapped on the western edge of the larger pond near the transmission line ROW. A total of 12 target invasive plant species were observed. In recent years, City Light has implemented invasive plant species management projects on this property. The site is currently being managed and monitored for several target invasive plant species including Himalayan blackberry, Scot's broom, lesser periwinkle, and English ivy (*Hedera helix*).

County Line Ponds

Twelve target invasive plant species were observed on the County Line Ponds property. Surveys were conducted of the property on August 5, 2021. Reed canarygrass is the dominant target invasive plant species at the County Line Ponds property (see Attachment D, page 29) and was often observed in association with salmonberry and thimbleberry shrubs. Several clumps along the banks were documented along the western ponds and larger populations occur at the ponds closer to the Skagit River. Four occurrences of greater burdock were observed on the westernmost pond, along with one population of traveler's-joy. This small population was approximately 150 square feet with an estimated 50 to 75 percent cover. Additionally, one mature individual English holly was observed at the pond to the north.

5.1.3.2 Fish and Wildlife Mitigation Lands within the Nooksack River Basin

Nooksack and Nooksack West

Surveys of the routes, and 50 feet to either side, within the Nooksack and Nooksack West properties were conducted on August 2, 2021. Ten target invasive plant species were observed. Herb-Robert is the dominant target invasive plant species within these properties and located next to the majority of the length of the road (see Attachment D, pages 45 through 50). Reed canarygrass is frequently interspersed throughout, along with several occurrences of Canadian thistle. Three small populations of butterfly bush, each containing fewer than 10 stems, were observed along the roadside. All were juvenile and not well established during the field surveys. The elk foraging area at the eastern extent of the Nooksack property lacks invasive plant species, outside of two small populations of common tansy and three small populations of Canadian thistle. Each year since the 14-acre elk forage area was created in 2016, the Upper Skagit Indian Tribe (under direction of City Light) has conducted manual hand-pulling of small clusters of Canadian thistle plants along the field perimeter. In 2021, City Light had a licensed applicator treat small patches of thistle with an approved herbicide.

5.1.3.3 Fish and Wildlife Mitigation Lands within the Sauk River Basin

North Everett Creek

Surveys of the North Everett Creek property were conducted on September 2, 2021. This property is primarily undisturbed and dominated by red alder with a salmonberry-dominant understory (see Attachment D, pages 61 and 62). The only target invasive plant species observed within this property was one small population (approximately 10 stems) of herb-Robert. In the past, the Sauk-Suiattle Indian Tribe and the SFEG have treated small knotweed patches in the riparian forest understory near the side channel of the Sauk River. Very little knotweed occurs in this property due to these efforts.

5.1.3.4 Fish and Wildlife Mitigation Lands within the Skagit River Basin

Bacon Creek

The Bacon Creek property was surveyed on July 8, 2021. Herb-Robert and Himalayan blackberry are the dominant invasive plant species, located along the access road that was primarily covered by native salmonberry (see Attachment D, page 32). A few intermittent patches of common tansy occur in the northern portion of the surveyed road. Oxeye daisy, St. John's-wort, and reed canarygrass were the only other target invasive plant species observed.

B&W Roads 1 and 2

These properties were surveyed on September 1, 2021. Herb-Robert was observed along the entire road as scattered plants (see Attachment D, page 33). No other target invasive plant species were observed.

Illabot North

A dense cover of herb-Robert occurs along the access road to the south as well as along the former recreational trail to the north (see Attachment D, pages 38 and 51). Along the spawning channel and watercourses, reed canarygrass is dominant along the Illabot spawning channel, with very little observed outside of inundated areas. The survey of this property was conducted on September 2,

2021. A total of 11 target invasive plant species were observed. Other species include Himalayan blackberry, Canadian thistle, and Scot's broom.

Illabot South

The Illabot South property was surveyed on July 20, 2021. A total of nine target invasive plant species were observed. The field team found the sole occurrence of Italian thistle (*Carduus pycnocephalus*) within the entire study area along the access road for the Illabot South property (see Attachment D, pages 38 and 51). One individual was observed growing in rocky substrate with woodland ragwort. Once noted, the field team conducted a thorough survey of the area to see if the species had a nearby source population. No other occurrences were observed. Other common target invasive plant species observed along the road include reed canarygrass, herb-Robert, and Himalayan blackberry.

Bogert and Tam

The Bogert and Tam property was surveyed on August 31, 2021. Eight target invasive plant species were observed (see Attachment D, page 39). Dominant invasive plant species observed within the Bogert and Tam property include Himalayan blackberry and herb-Robert. Himalayan blackberry grows in large brambles along the majority of the access road, as well as the western edge of the property, in dense monocultures with 20 to 80 percent cover. Herb-Robert covers the majority of the property, with cover ranging from 20 to 90 percent. English ivy was seen growing up the trunk of a western red cedar tree. Additionally, three juvenile black walnut trees occur on site.

Barnaby Slough

The access road and trail to the Barnaby Slough property were surveyed on August 25, 2021. Herb-Robert occurs as single plants or small patches along the roadside (see Attachment D, page 41). Himalayan blackberry grows along the majority of the recreational path that leads to the slough. Reed canarygrass grows along the path next to the slough. No other target invasive plant species were observed in this area. The western portion of the slough was not accessible due to construction along the trail.

False Lucas Slough

The access road through the False Lucas Slough property was surveyed on August 25, 2021. Invasive cover is sparse, with the majority being in a reed canarygrass-dominated wetland at the western end of the access road (see Attachment D, page 41). A single greater burdock was also observed here. Small patches of Himalayan blackberry and herb-Robert are also scattered along the trail and road. No other target invasive plant species were observed.

Corkindale Creek

The entirety of the Corkindale Creek property was surveyed on August 24, 2021. Himalayan blackberry is the dominant invasive plant species on this property, forming dense brambles that cover both banks of Corkindale Creek as well as the perimeter of the property (see Attachment D, page 37). Approximately 34.7 acres of Himalayan blackberry was mapped on the property, mostly along the perimeter of the recently purchased pasture and hayfield. Interspersed throughout these thickets and throughout the grassy open area is reed canarygrass and well-established clumps of common tansy. Canadian thistle was also observed as single plants or sparse clumps near

Corkindale Creek, with larger patches interspersed throughout the field. No other target invasive plant species were observed, although there is a non-native rose species that appears to be spreading in the pastures.

Savage Slough

A previously disturbed portion of this property, immediately adjacent to South Skagit Highway, was surveyed on September 2, 2021. The densest cover of target invasive plant species within the Savage Slough property occurs south of the South Skagit Highway where Himalayan blackberry forms large monocultures; reed canarygrass is also dense next to the open water (see Attachment D, page 44). Approximately 8.3 acres of reed canarygrass (with an average cover of 90 percent) and approximately 4.7 acres of Himalayan blackberry (with an average of 73 percent cover) were mapped on the property. Bands of herb-Robert were growing along South Skagit Highway, as well as the access road to the south (approximately 850 and 650 feet in length, respectively). No other target invasive plant species were observed.

Since 2011, a permittee has annually cut hay on approximately 10 acres where riparian reforestation has not taken place to aid in keeping weeds under control, and the Skagit River System Cooperative (SRSC) has been managing noxious weeds on 90 acres of this property. In 2020, SRSC treated tansy ragwort (*Jacobaea vulgaris*), Canadian thistle, and orange hawkweed (*Hieracium aurantiacum*) across 17.3 acres of the property; Himalayan blackberry and evergreen blackberry (*Rubus laciniatus*) over 13.6 acres of the property; and knotweed over 0.7 acre of the property. SRSC has mapped invasive plant species on the property since 2011 and has concluded that total invasive plant species coverage has decreased from 4.2 acres to 1.0 acre, but Scot's broom has increased by 0.2 acre. Additionally, orange hawkweed and policeman's helmet (*Impatiens glandulifera*), both observed in 2014, were not observed during the 2020 surveys (SRSC 2020).

McLeod Slough

The entire perimeter of the elk foraging area within the McLeod Slough property was surveyed on August 25, 2021. A total of five target invasive plant species were observed. Target invasive plant species occur around the majority of the perimeter of the meadow and are primarily Himalayan blackberry brambles (approximately 1.5 acres with 100 percent cover) interspersed with reed canarygrass (approximately 1 acre with 80 percent cover) and small patches of Canadian thistle (see Attachment D, page 43). Reed canarygrass is also the dominant species in the 1.4-acre wetland near the western edge of the property. A small patch of common tansy, approximately 100 feet in length, is present along the southern edge of the property; as well as a 0.2-acre population of herb-Robert (with 20 percent cover). Approximately five years ago, the Sauk-Suiattle Indian Tribe treated a small patch of knotweed near a wetland in the interior of the property and the species has not been observed there since.

5.1.4 Skagit River Banks

The field team surveyed the left bank of two sections of the riparian areas of the Skagit River during the 2021 field survey: PRM 90 to 88 (see Attachment D, pages 29 and 30) and PRM 73 to 66 (see Attachment D, pages 39 through 43). In both areas, biologists recorded infestations of traveler's-joy, which forms groundcover on sand and gravel bars, and climbs as high as 75 feet in some trees along the left bank. Additionally, Himalayan blackberry and reed canarygrass form dense thickets along the riverbanks that extend into the forested riparian areas, particularly on the

left bank from PRM 66 to 73. Scot's broom and common tansy also occur intermittently throughout both areas and have denser cover within the islands and gravels bars of the river. A total of 23 target invasive plant species were observed. The entire right bank from Gorge Dam to the confluence with the Sauk River (approximately PRM 66.5 to PRM 97.2) and the remaining portions of the left bank (approximately PRM 97.2 to PRM 90; PRM 87.5 to PRM 73) will be surveyed in 2022.

Butterfly Bush

This species occurs on gravel bars near SR 20, particularly within PRM 73 to 66. Ubiquitous species such as common tansy, oxeye daisy, and St. John's-wort are frequently co-dominants within these populations. Most individuals observed were mature and flowering. The largest population (1.5 acres with 20 percent cover) is at PRM 73.

Sycamore Maple

Approximately 20 sycamore maple seedlings and mature trees were observed on the left bank of the Skagit River from PRM 90 to 87.5 and frequently on gravel bars. Because these trees are difficult to discern within native vegetation, higher intensity surveys were required to identify younger individuals and seedlings. This species was not observed between PRM 73 and 66. The farthest downstream this species was observed was at approximately PRM 87.5 on a gravel bar with other invasive target species such as Scot's broom, English hawthorn, traveler's-joy, and European mountain ash.

Japanese Knotweed

The field team observed only one occurrence of Japanese knotweed along the riparian areas of the Skagit River. This distinct patch is along the left bank near the confluence with the Sauk River. When compared to data from surveys conducted by the Sauk-Suiattle Indian Tribe and SFEG in 2017, which shows continuous knotweed infestations along the left and right banks of the Skagit River, overall occurrences of the species were significantly lower, indicating that Project collaborations with Skagit Cooperative Weed Management Area and SFEG have been successful (Figure 5.1-3). Additional surveys have occurred, primarily along the Sauk River, that are not included in this figure. Management along these rivers has continued since 2017 and continues to be successful. According to SFEG, additional species of knotweed that occur in the upper Skagit River watershed include giant knotweed (*Fallopia sachalinensis*) and Bohemian knotweed (*Fallopia x bohemica*) (SFEG 2022).

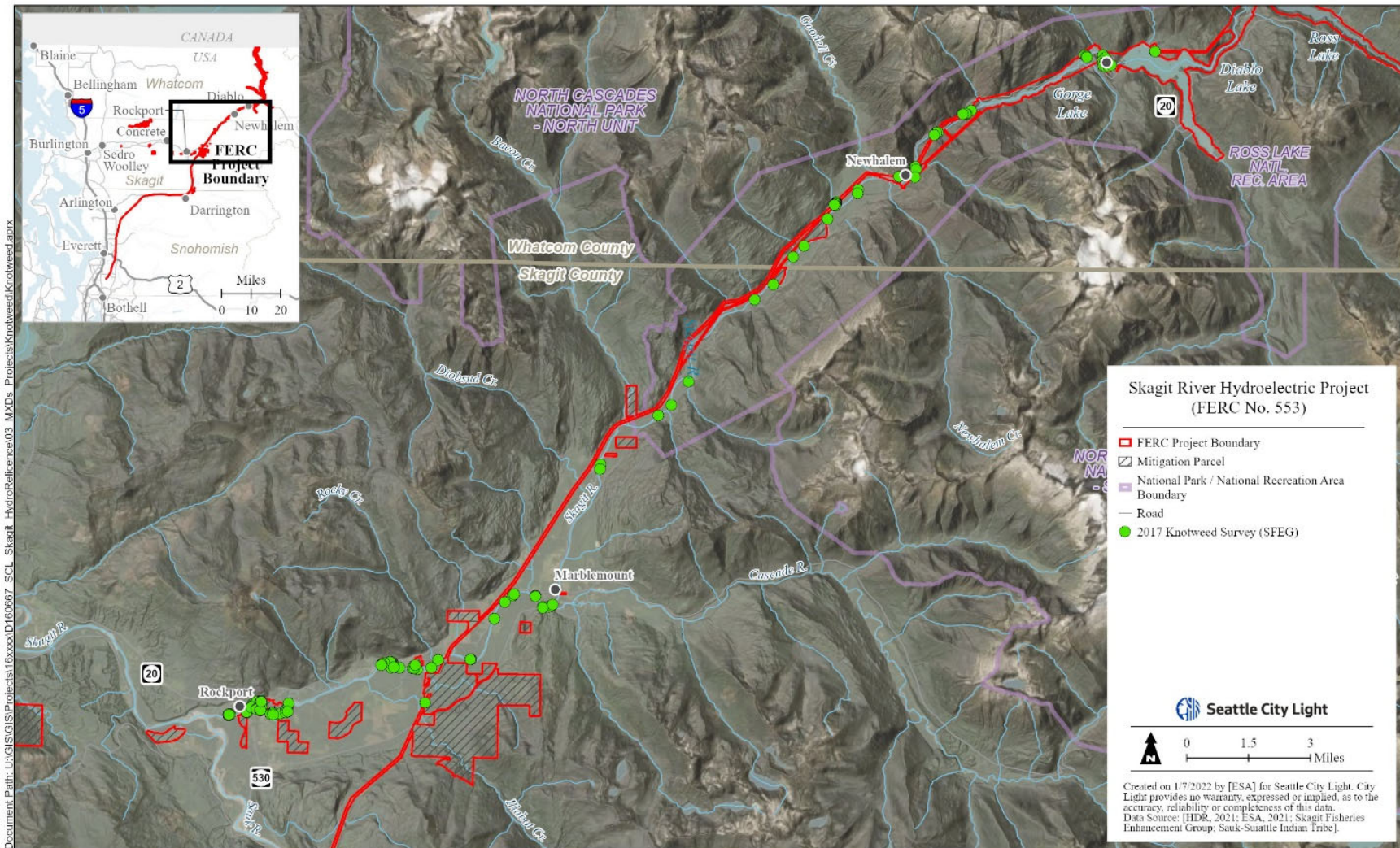


Figure 5.1-3. Results of 2017 SFEG knotweed survey along the Skagit River in the study area.

5.2 Pathways for Invasive Plant Species Within the Study Area

Ecological effects of the 45 observed invasive plant species are summarized in Table E-1 in Attachment E. A summary of pathways, vectors, and limiting factors for observed invasive plant species is provided below. Pathways and vectors are also summarized on a species-by-species basis in Table E-2. As part of the electronic data form, biologists recorded the latitude and longitude of Project-related disturbances and pathways that could contribute to the establishment or spread of invasive species, and these results will be included in the geodatabase.

5.2.1 Pathways and Vectors

Invasive species are introduced and spread through a variety of pathways and vectors. The U.S. Department of Agriculture (USDA) defines pathways as the means by which invasive plant species are introduced into new environments (USDA 2022). Vectors are the transfer mechanisms responsible for the introduction and spread of invasive species in a certain area (Ruiz and Carlton 2003). There are multiple pathways and vectors influencing the establishment and spread of invasive species in the study area. These are both natural, such as seed dispersal via wind or animals, and human-induced, such as spread by humans as they move through areas on foot, by boat, or via other vehicles. Six major pathways and associated vectors observed in the study area are summarized below.

5.2.1.1 Pathway: Reservoirs; Vector: Fluctuating Water Surface Elevations

Changes in reservoir water surface elevations expose shoreline substrates and can cause erosion of soils along the shorelines. Invasive plant species can establish in the disturbed and mineral substrates. Steep shoreline topography and long periods of inundation during the growing season can also interfere with or limit the establishment of native riparian vegetation.

5.2.1.2 Pathway: Reservoirs, River Use; Vector: Boats and trailers

Boating, Project-related or recreational, can be a pathway for transmitting invasive aquatic plant species in the reservoirs, Skagit River, or any other recreational waterbody within the study area. Common ways invasive species travel by boat include, but are not limited to, attaching to mud on propellers, contaminating bilge water, and attaching to boat trailers.

5.2.1.3 Pathway: Recreation sites; Vector: Anthropogenic

Recreational visitors to the RLNRA can bring invasive plant species from local or distant populations via their cars, clothing, shoes, or pets. This can also occur in portions of the transmission line ROW that are used for walking (e.g., near the Bothell Substation). Furthermore, areas used for recreation (e.g., roads, trails, boat launches, parking areas) often have disturbed or compacted soils where some invasive plant species thrive.

5.2.1.4 Pathway: Project Road Maintenance and Use; Vector: Vehicles and equipment

The use and maintenance of Project access roads provide a corridor to spread invasive plant species in the RLNRA, along the transmission line ROW, and within the fish and wildlife mitigation lands. Vehicles, equipment, and crews traveling on Project roads can inadvertently transmit seeds of local or distant populations. Vehicle use can also lead to soil disturbance and/or compaction and disturb

native vegetation, creating areas where invasive plant species can take root. Importing soil, gravel, and rock can also inadvertently introduce invasive species.

5.2.1.5 Pathway: Vegetation Management along the Transmission Line ROW; Vector: Heavy Equipment for Mowing, Brush Cutting, etc.

City Light maintains vegetation in the transmission line ROW and around Project infrastructure and townsites through cutting and mowing. Removing native overstory vegetation removes shade, which can create openings for species that thrive in exposed, open, and disturbed areas (Dudney et al. 2021). The use of heavy equipment in these areas can also compact or disturb soils, further limiting native plant species establishment and promoting invasive plant growth. In addition, machinery can actively spread seeds and vegetative fragments that can result in new populations of the invasive species.

5.2.1.6 Pathway: Landscaping; Vector: Ornamental Species Introductions

City Light maintains landscaping around infrastructure, townsites, and some recreation facilities. These sites are often planted with non-native, ornamental species. Some of these introduced species can begin to reproduce and spread, often after a “lag” or establishment period ranging from one year to several decades. A number of the target species, including but not limited to, sycamore maple, bristly locust, walnuts, lesser periwinkle, annual honesty, Bishop’s goutweed, and creeping bellflower, were likely introduced as ornamental species. In addition, imported garden soil and mulch can harbor weedy species.

5.2.1.7 Pathway: Agriculture; Vector: Hay and Feed

Portions of the transmission line ROW are used for agricultural purposes, such as for hay or cattle. The seeds of several target invasive plant species can be spread through contaminated feed.

5.2.2 Limiting Factors

Invasive species need to compete with native vegetation for required resources, such as light, space, air, water, and nutrients. These species are commonly successful at out-competing native plants due to following characteristics (U.S. Forest Service [USFS] 2022):

- Many species produce large quantities of seed that can easily be distributed by animals, wind, water, and other natural and anthropogenic pathways (e.g., cheatgrass, greater burdock).
- Many species thrive in disturbed soils (e.g., butterfly bush, flannel mullein).
- Many species have aggressive root systems that can spread long distances or can spread asexually (e.g., hawkweeds, knotweed).
- Many species have dense root systems that can smother surrounding vegetation (e.g., traveler's-joy, English ivy, reed canarygrass).
- Many species are allelopathic and can produce toxins that inhibit the growth of other plants around them (e.g., black walnut, Scot’s broom, knapweed).

The lack of required resources (such as light, space, air, water, and nutrients) can also be considered limiting factors for invasive species. Limiting factors are variables in the environment that restrict the size of a population. For most of the observed invasive plant species, the most

common limiting factor is shade. Limiting factors, including shade, can be applied through invasive species management strategies. An example of this is the “cut and cover” technique being tested along the transmission line ROW, where Scot’s broom is cut, then chipped up. The cut area is then covered with the chips in an attempt to shade out future Scot’s broom growth. Similarly, planting desirable, taller species (e.g., native willows) among an invasive plant population (e.g., reed canarygrass) can help weaken the invasive species.

Additionally, there are naturally occurring limiting factors. An example of this is the deposition of wood around the reservoirs due to water fluctuations. During field efforts, it was observed that shade from this wood appears to limit the growth of reed canarygrass. The growth of both narrow and wider populations of reed canarygrass around Ross Lake came to an abrupt stop when they reached deposited wood.

Conversely, another example of a limiting factor observed in the field is inundation in the reservoir fluctuation zone. Other than reed canarygrass, few other plant species were observed within the fluctuation zone. Species not tolerant of inundation cannot survive prolonged submersion, especially during the growing season when terrestrial plants need access to air for carbon dioxide for photosynthesis and oxygen to utilize the sugars produced during photosynthesis for plant growth (respiration).

Due to several factors (e.g., the size of the study area, Project operations, recreational access, etc.), manipulating limiting factors to limit the growth of invasive species may not always be a viable option. Instead, targeted invasive plant species management techniques, such as mowing small patches, solarization, and selective herbicide application, may be required to manage some populations.

6.0 SUMMARY

The majority of data collection for the Invasive Plants Study has been completed. The maps in Attachment D show the locations of all data collected within the RLNRA and the fish and wildlife mitigation lands. Along the transmission line ROW, point data for common species (e.g., reed canarygrass, Scot's broom) were omitted from the maps, and ubiquitous species such as St. John's-wort and oxeye daisy are not mapped. However, data omitted from the maps in Attachment D will be provided in the geodatabase along with percent cover estimates for these species at the study area segment and study area sub-segment level.

To fully meet the goals and objectives stated in the RSP and presented in Section 2.0 of this study report, the riparian areas of the Skagit River from Gorge Dam to the confluence with the Sauk River that the field team did not survey during the 2021 field season will be surveyed in 2022, as well as the routes and adjacent 50-foot buffer of the routes in the O'Brien Slough and Finney Creek fish and wildlife mitigation lands. Once these surveys and subsequent analyses are complete, the comprehensive results will be included in a study report to be included in the USR. Once field studies are complete, the study report will be revised to include any additional pertinent observations, including any additional project disturbances or pathways identified.

7.0 VARIANCES FROM FERC-APPROVED STUDY PLAN AND PROPOSED MODIFICATIONS

There was one minor variance to the study plan as it was approved by FERC. Section 2.6.6 of the RSP describes report deliverables and includes a population estimate of observed ubiquitous or widespread species in the Project. While population estimates for ubiquitous species were not calculated, percent cover of ubiquitous species were recorded. This information is included in the geodatabase and meets the intent of this deliverable and the goals and objectives of the study.

The schedule in the RSP stated that all fieldwork would be conducted in 2021. However, time constraints and lack of boat and boat driver availability prevented the field team from surveying the riparian margins of the Skagit River downstream of Gorge Dam to the Sauk River confluence, as well as the study routes in the O'Brien Slough and Finney Creek fish and wildlife mitigation land properties during the growing season. The schedule set forth in Section 2.8 of the RSP has been extended into 2022 for these surveys to occur within the growing season, consistent with the study goals and objectives and methodology. A revised study report will be included in the USR.

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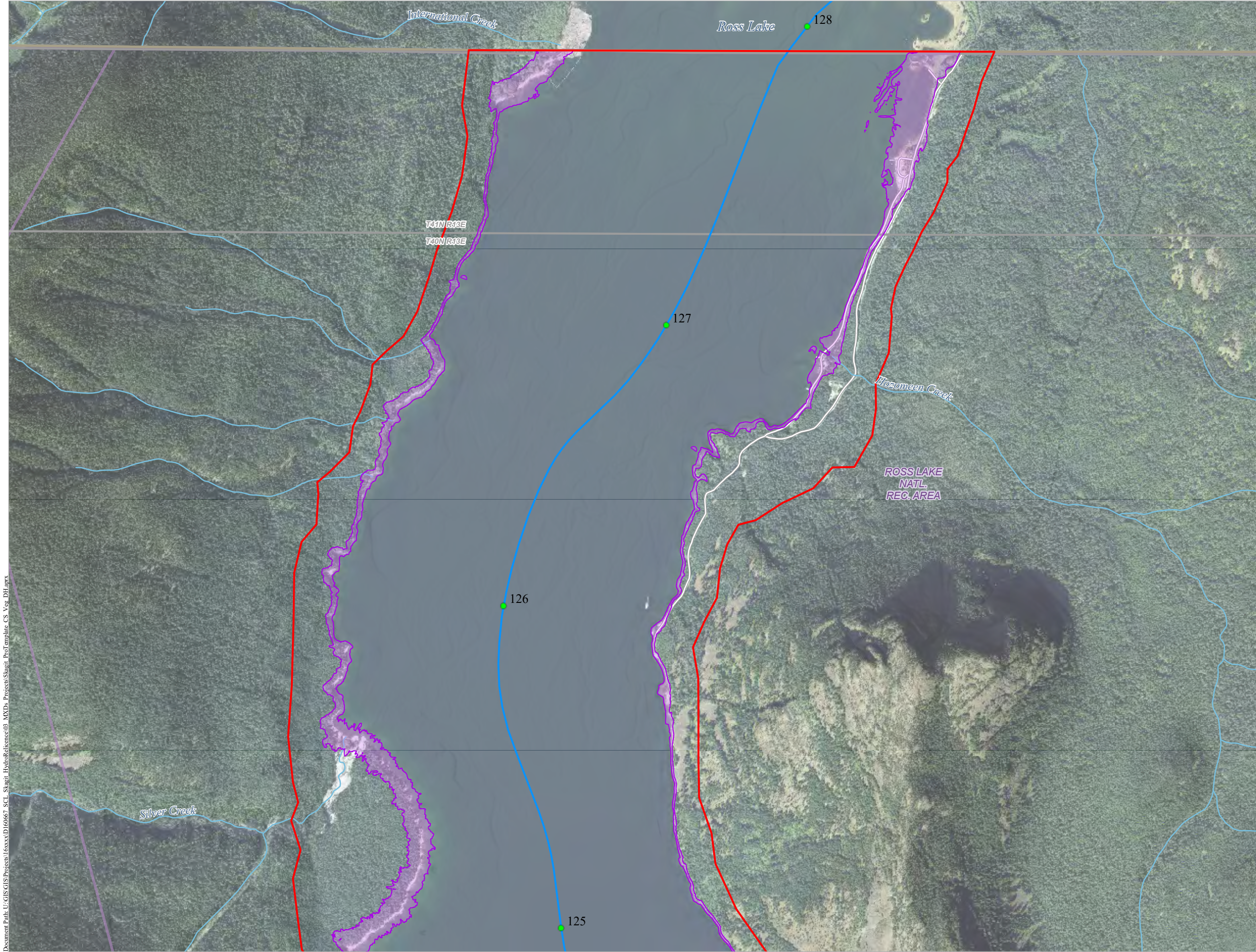
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INVASIVE PLANTS STUDY INTERIM REPORT

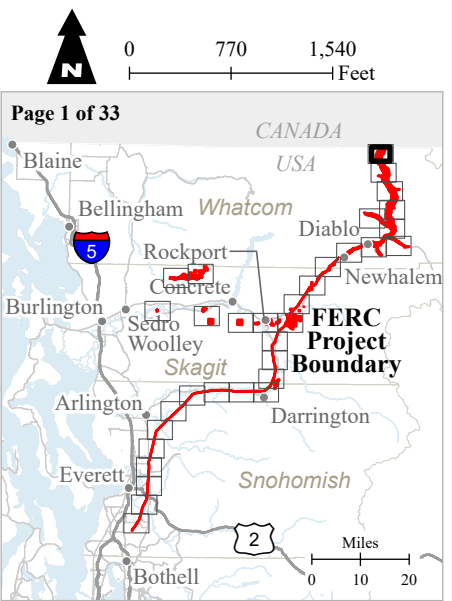
ATTACHMENT A

SURVEY LOCATIONS MAPBOOK



TR-03 INVASIVE AND TR-04 RTE PLANT STUDIES SURVEY LOCATIONS MAPBOOK

- FERC Project Boundary
- Project River Miles
- Project River Centerline
- City Light Facility Points
- National Park / National Recreation Area Boundary
- Other Road
- Survey Area
- Survey Study Route



Seattle City Light

SKAGIT RIVER HYDROELECTRIC PROJECT (FERC NO. 553)

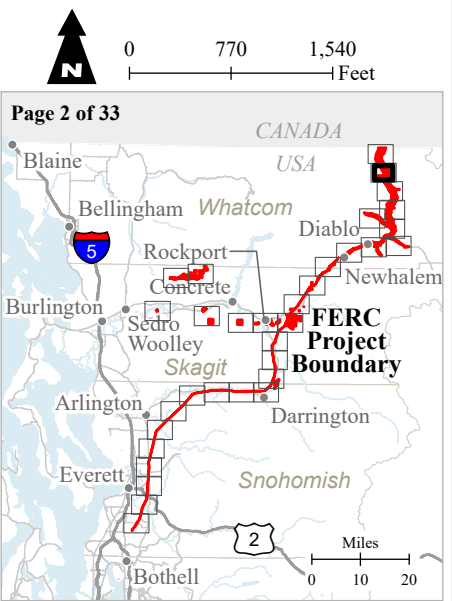
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**TR-03 INVASIVE AND
TR-04 RTE PLANT STUDIES
SURVEY LOCATIONS
MAPBOOK**

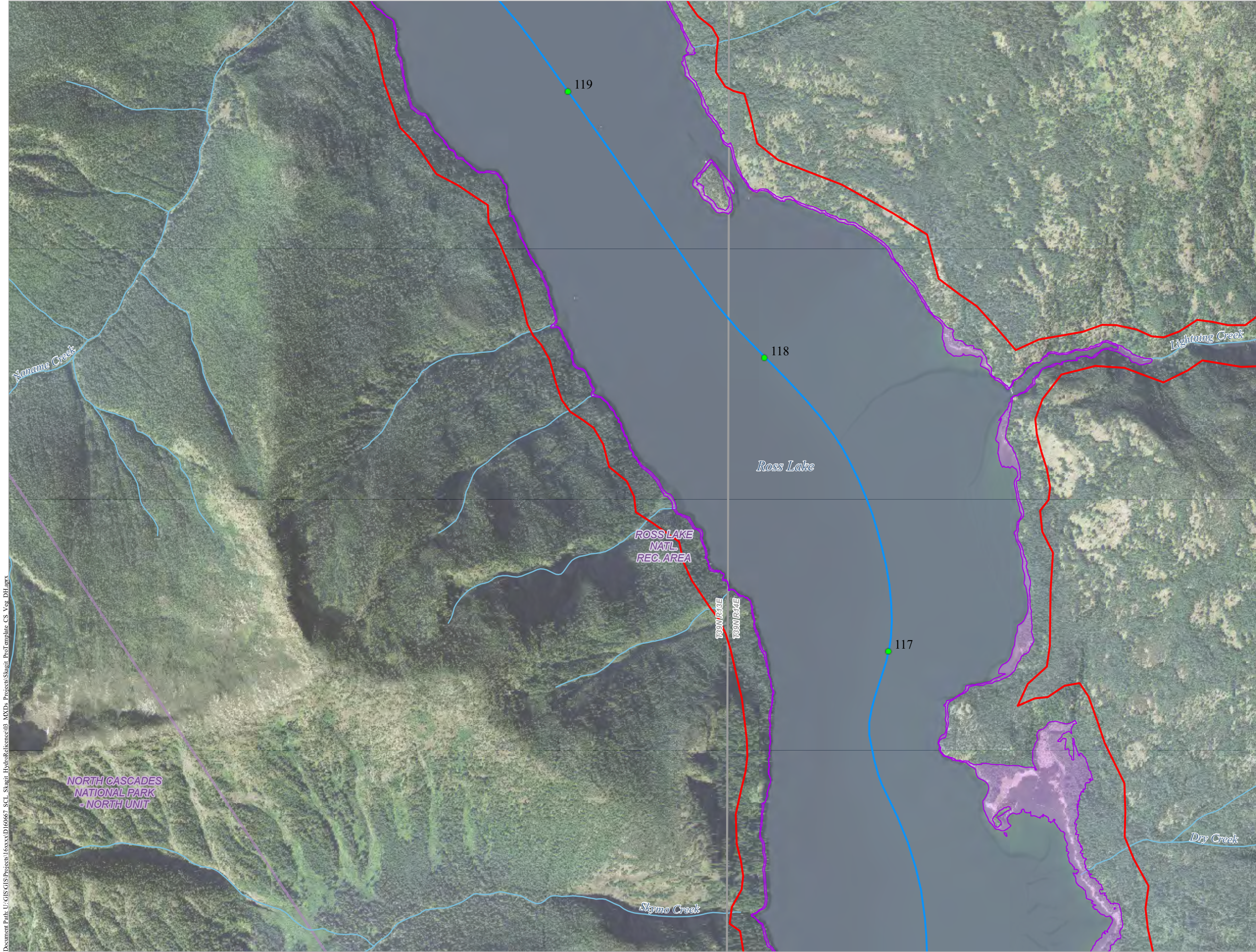
- FERC Project Boundary
- Project River Miles
- Project River Centerline
- City Light Facility Points
- National Park / National Recreation Area Boundary
- Survey Area
- Survey Study Route



Seattle City Light

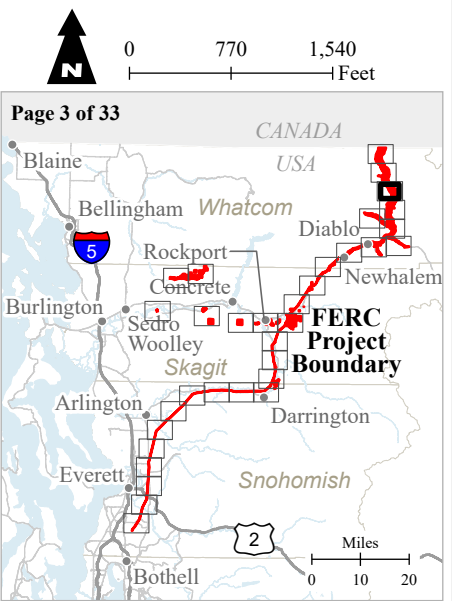
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TR-03 INVASIVE AND
TR-04 RTE PLANT STUDIES
SURVEY LOCATIONS
MAPBOOK

- FERC Project Boundary
- Project River Miles
- Project River Centerline
- City Light Facility Points
- National Park / National Recreation Area Boundary
- Survey Area
- Survey Study Route

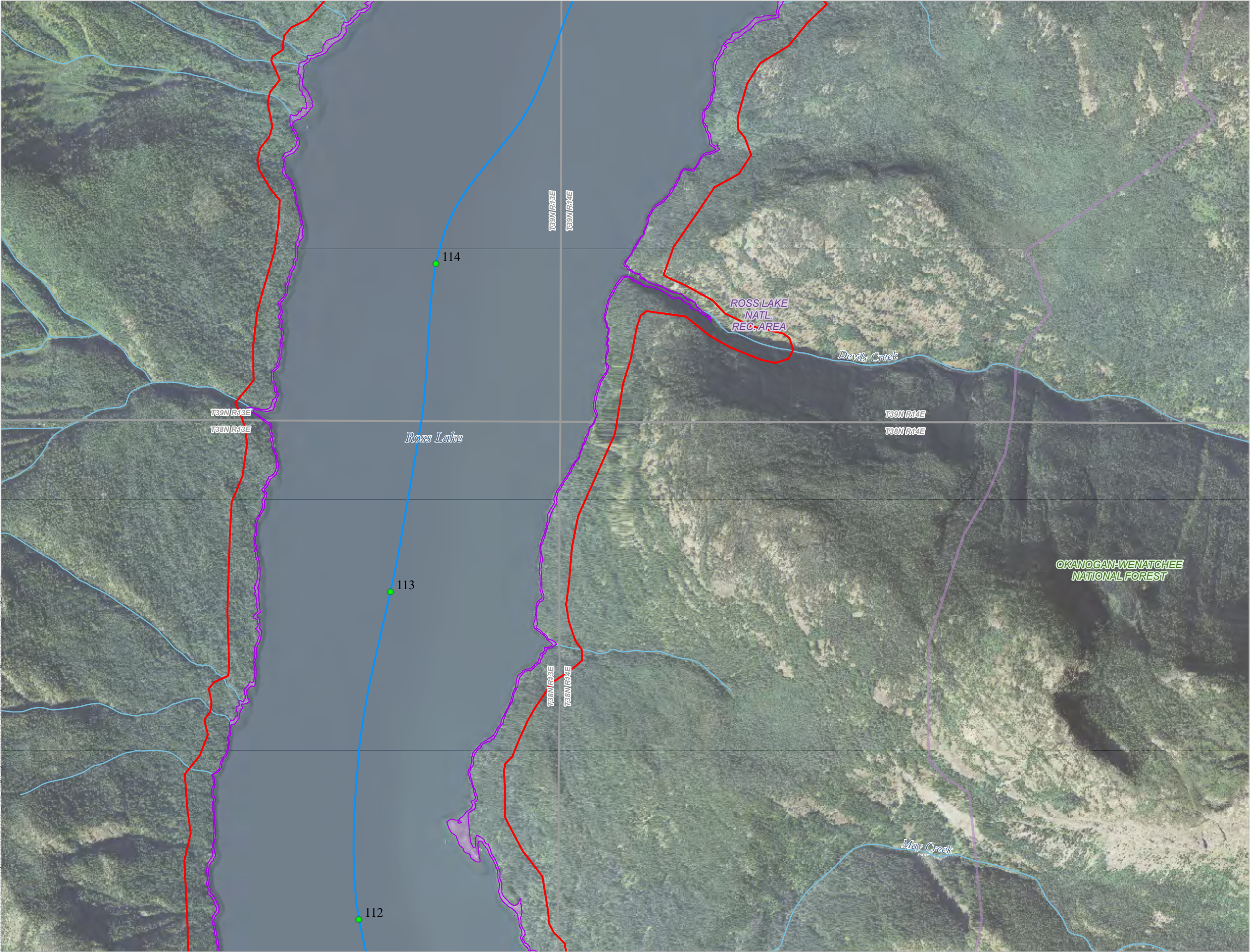


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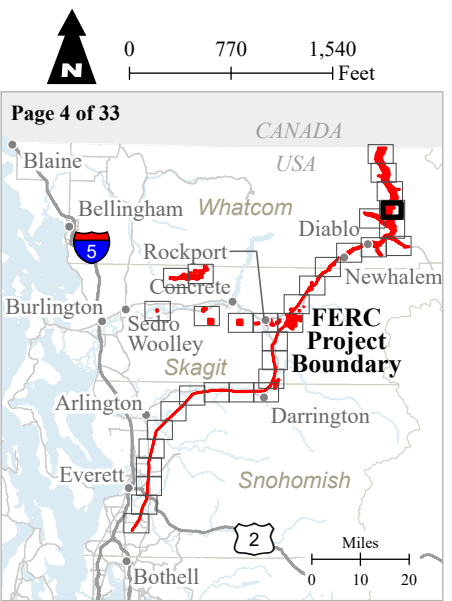
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TR-03 INVASIVE AND TR-04 RTE PLANT STUDIES SURVEY LOCATIONS MAPBOOK

- FERC Project Boundary
- Project River Miles
- Project River Centerline
- City Light Facility Points
- National Park / National Recreation Area Boundary
- Survey Area
- Survey Study Route

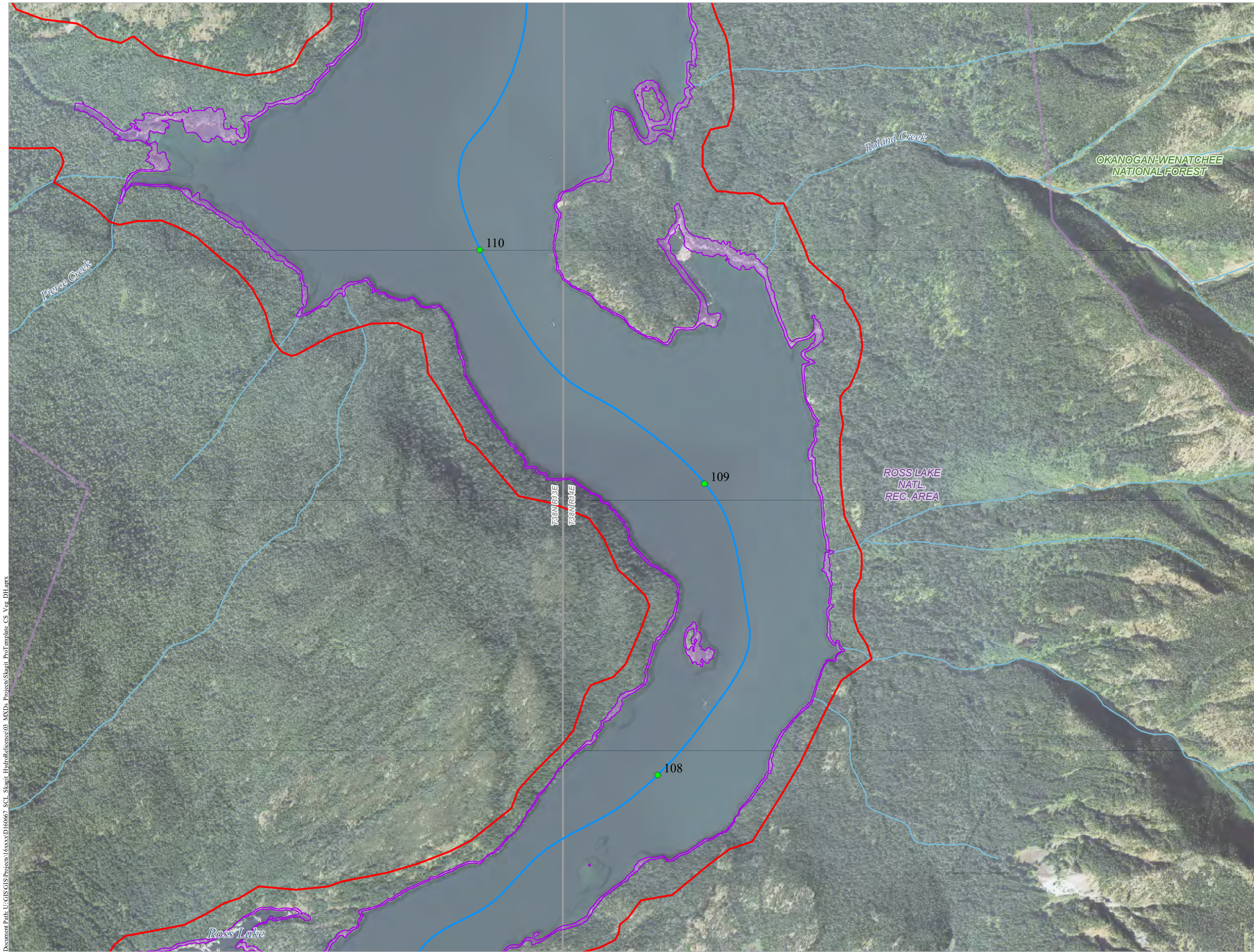


Seattle City Light

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

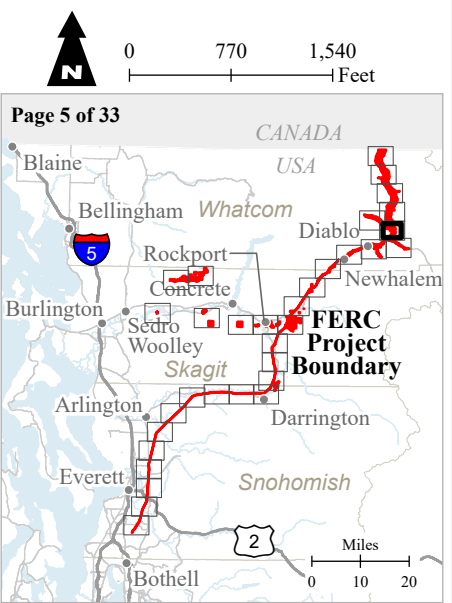
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TR-03 INVASIVE AND TR-04 RTE PLANT STUDIES SURVEY LOCATIONS MAPBOOK

- FERC Project Boundary
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- Survey Study Route



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SKAGIT RIVER HYDROELECTRIC PROJECT (FERC NO. 553)

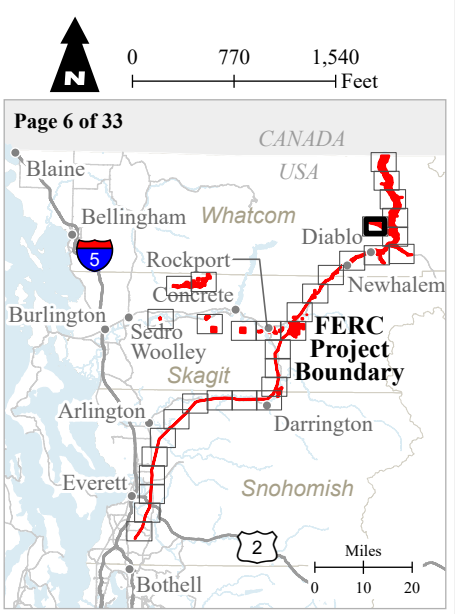
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TR-03 INVASIVE AND TR-04 RTE PLANT STUDIES SURVEY LOCATIONS MAPBOOK

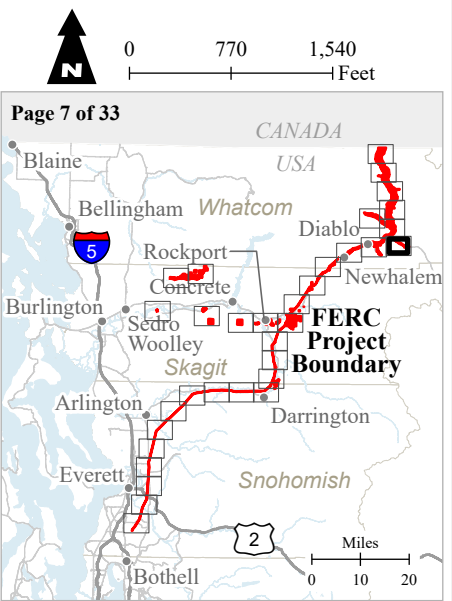
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- Project River Centerline
- City Light Facility Points
- National Park / National Recreation Area Boundary
- Survey Area
- Survey Study Route





TR-03 INVASIVE AND TR-04 RTE PLANT STUDIES SURVEY LOCATIONS MAPBOOK

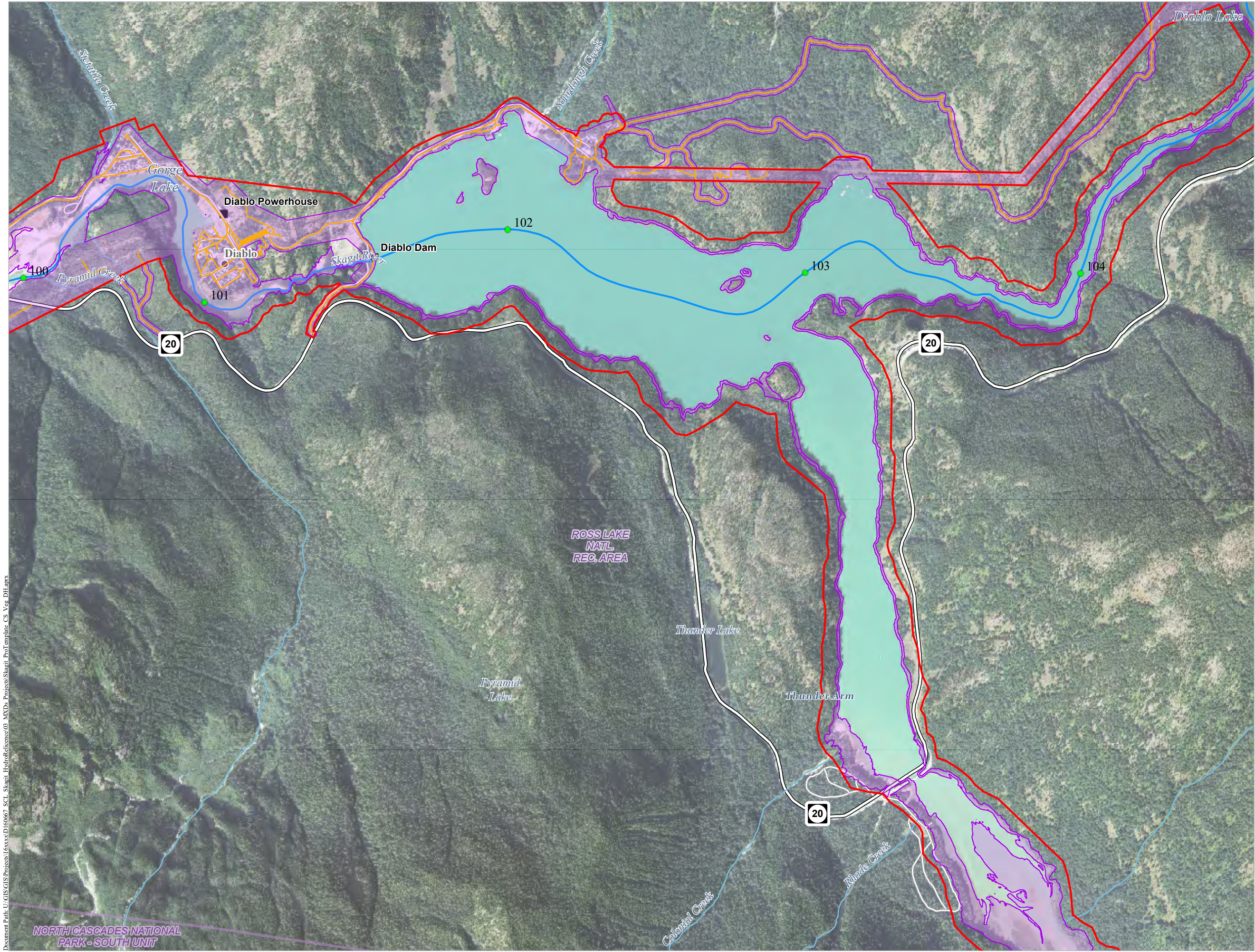
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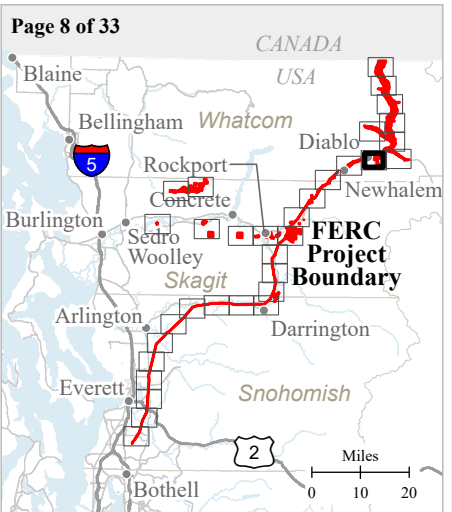
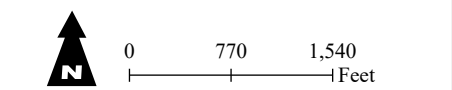
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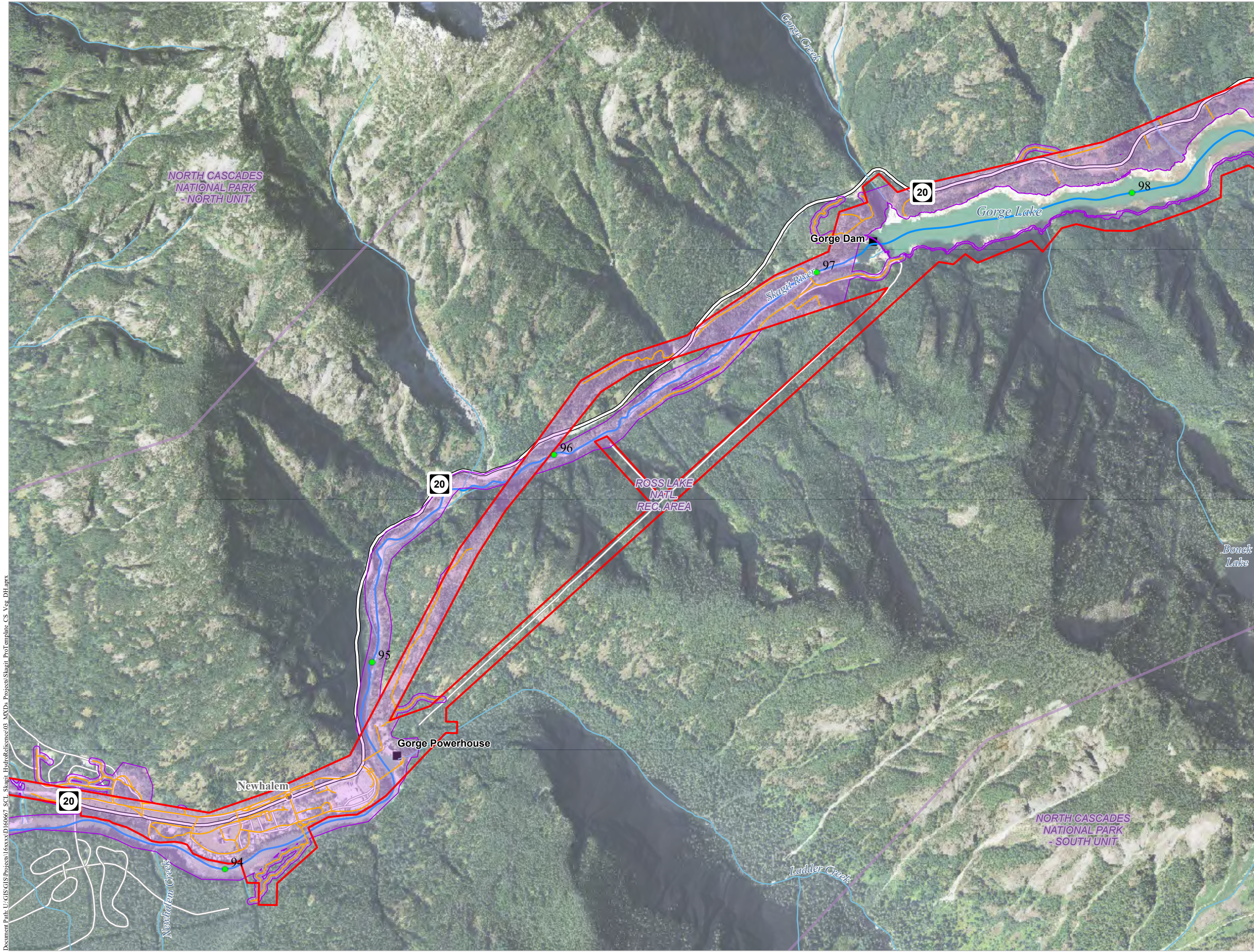
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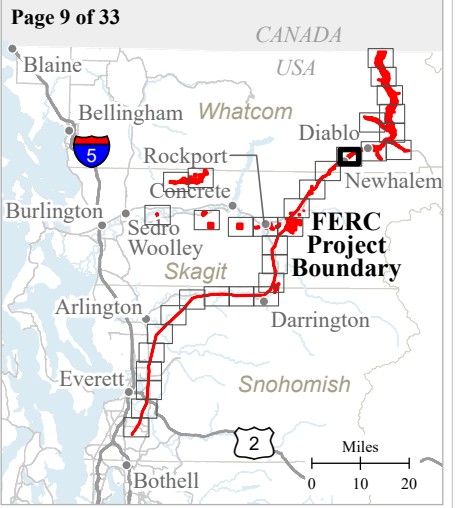
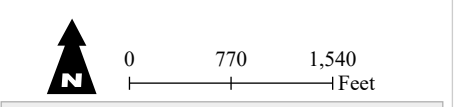
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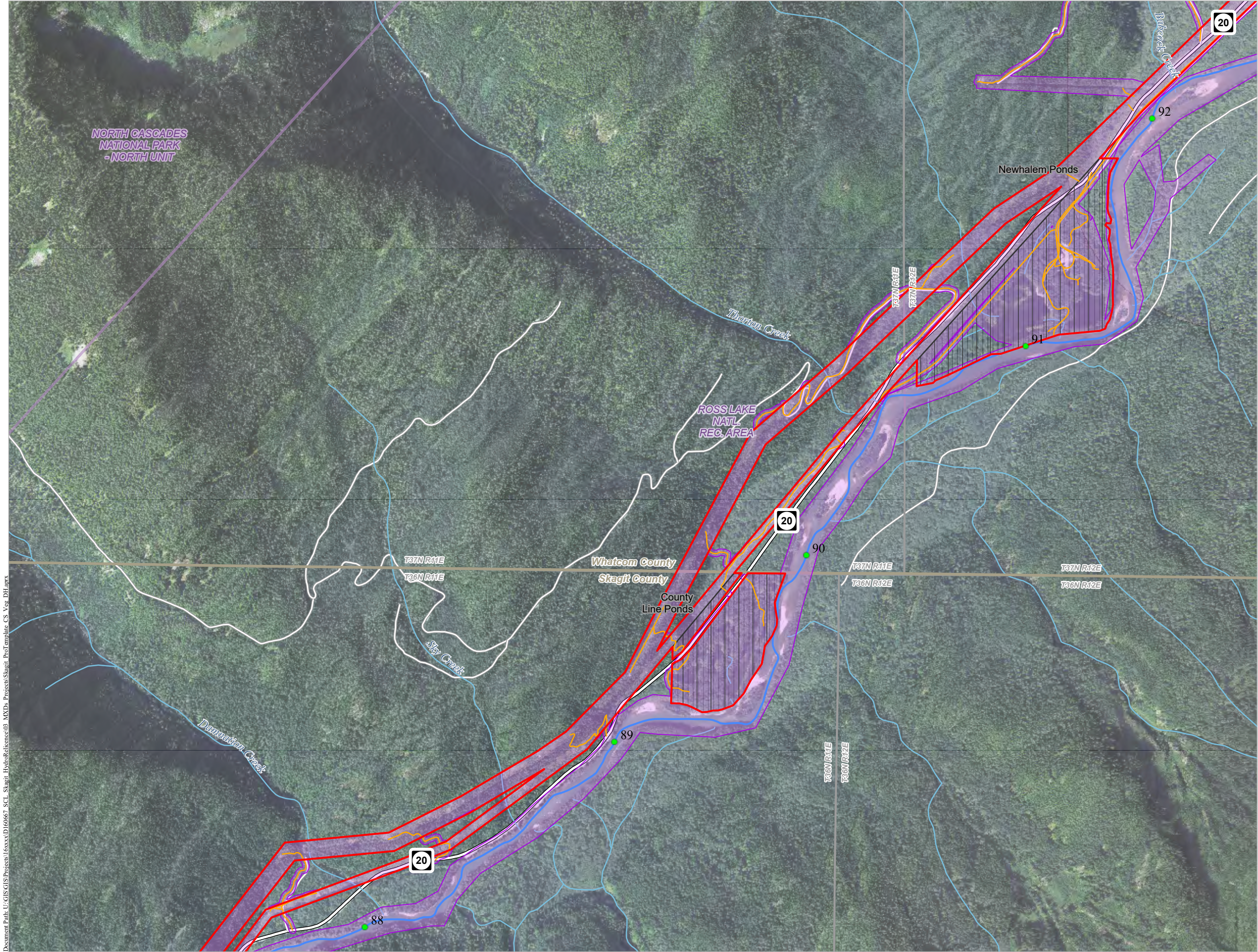
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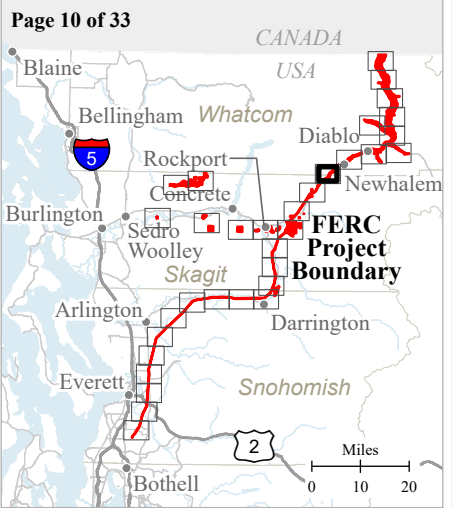
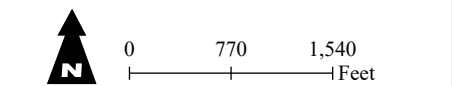
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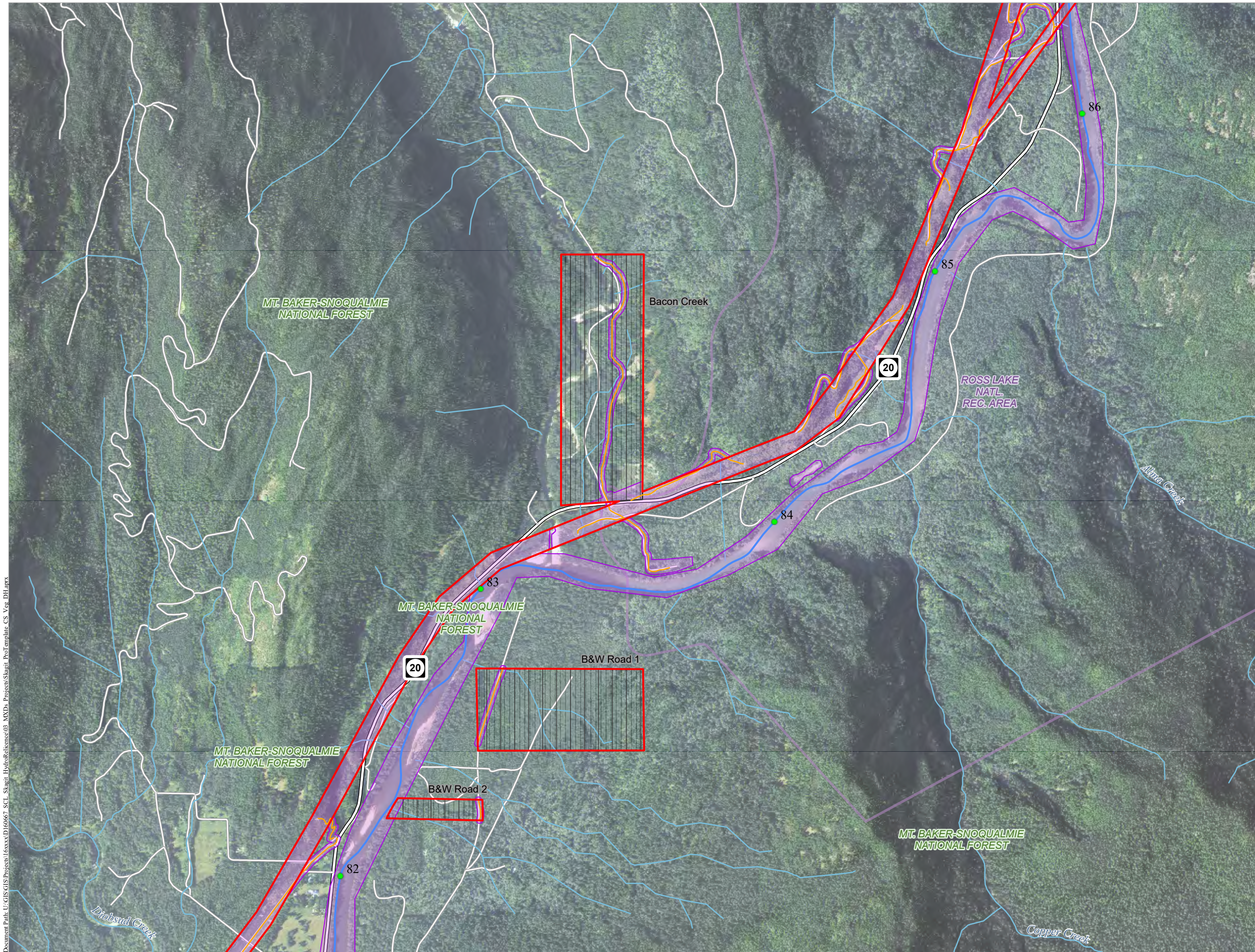
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Seattle City Light SKAGIT RIVER HYDROELECTRIC PROJECT (FERC NO. 553)

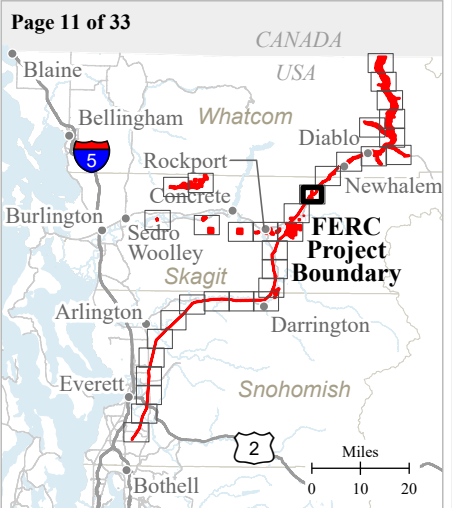
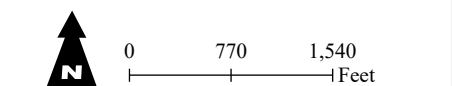
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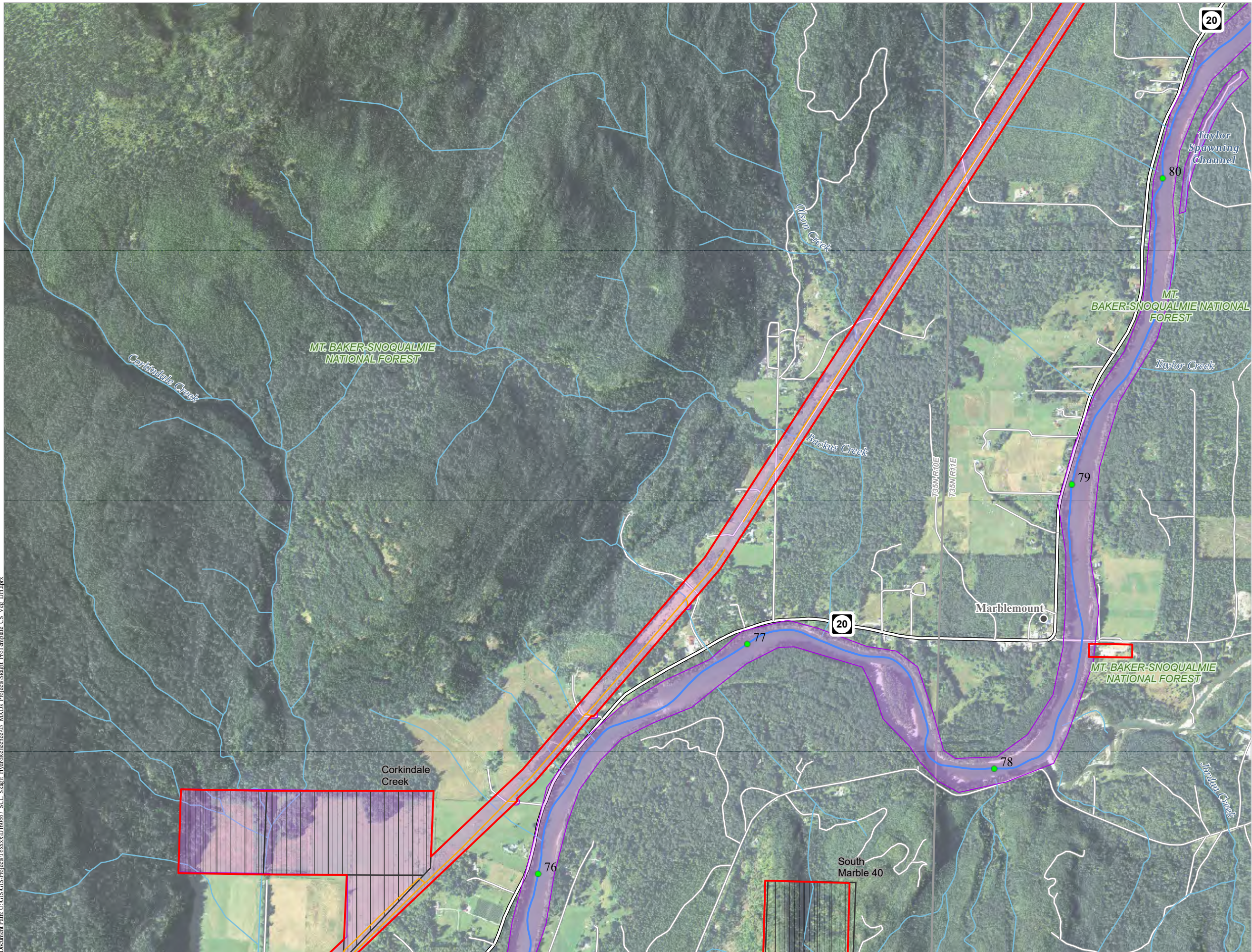


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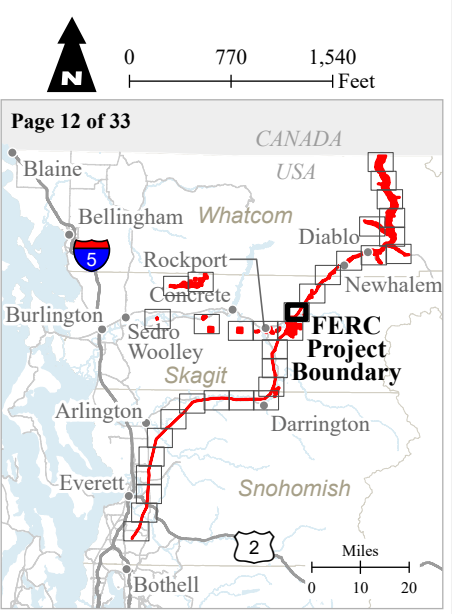
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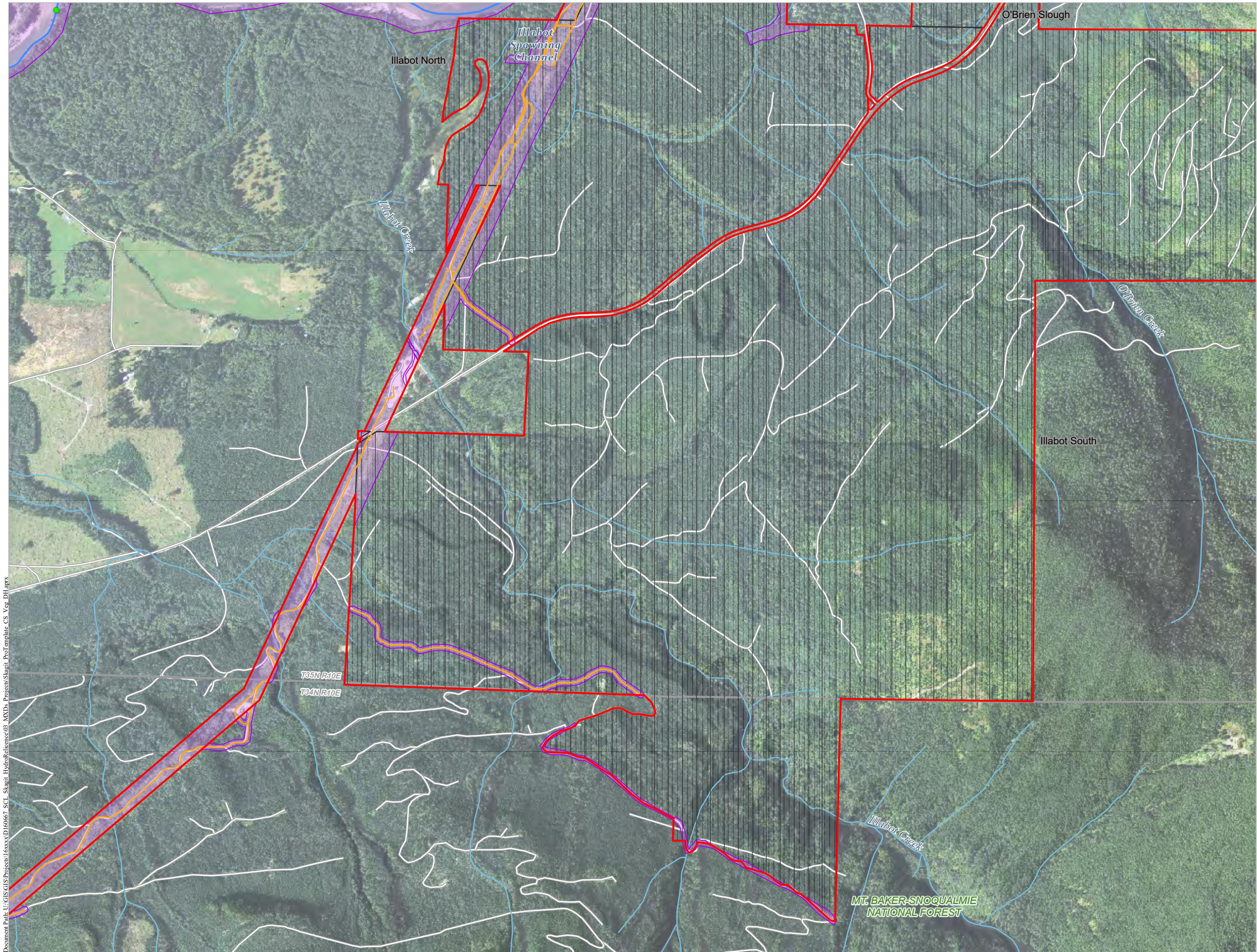


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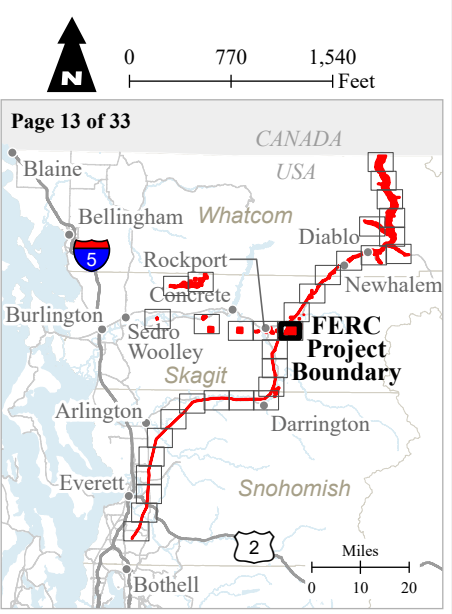


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TR-03 INVASIVE AND
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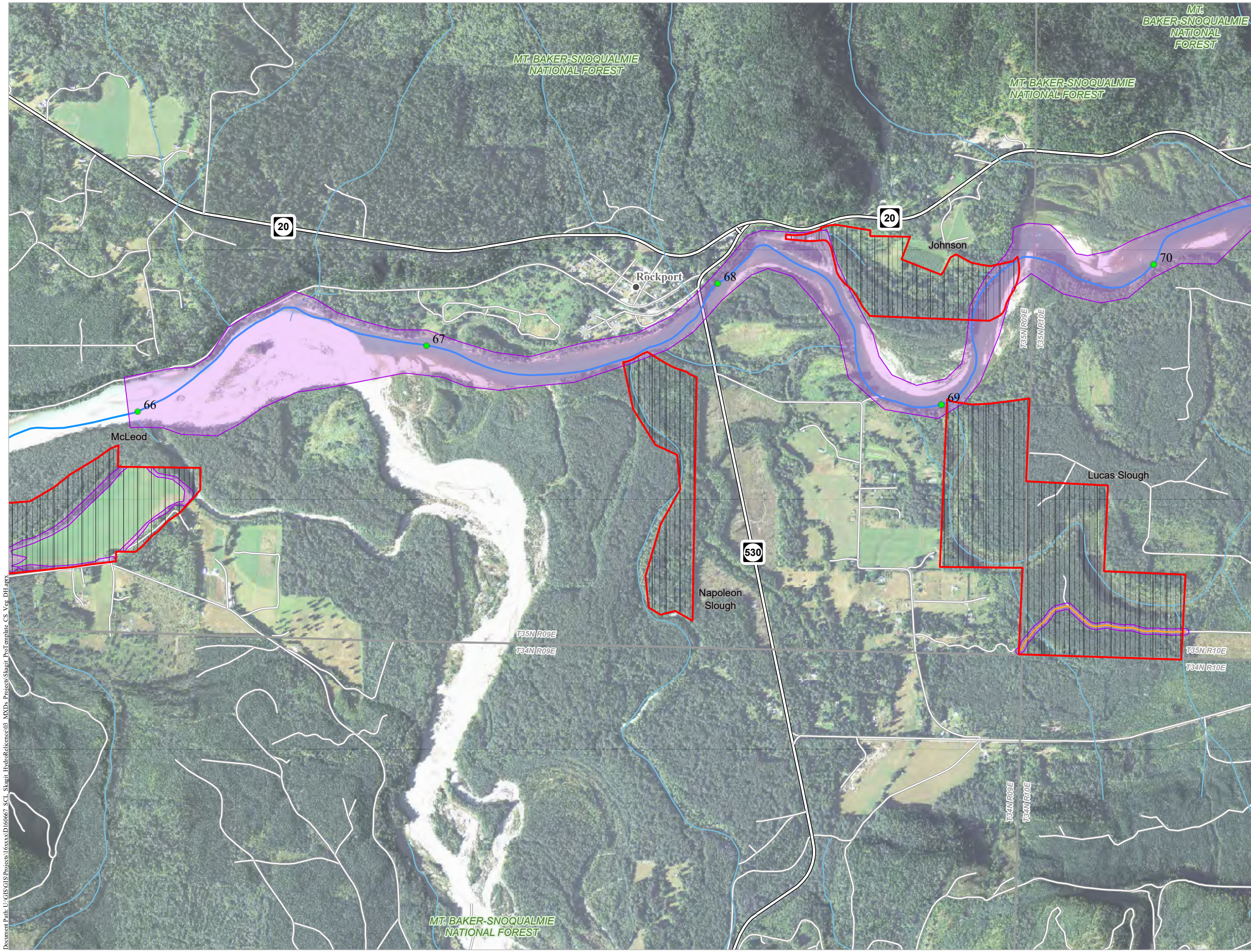
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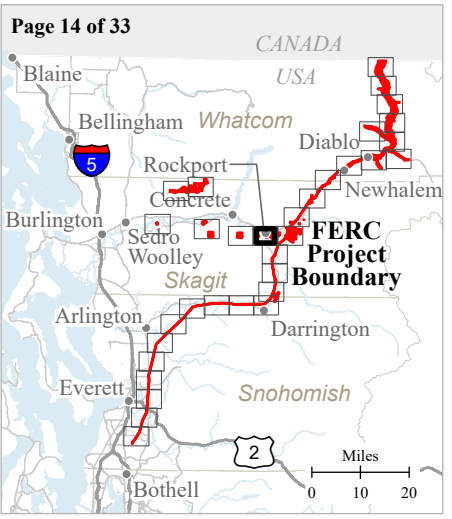
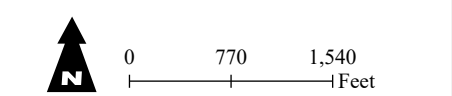
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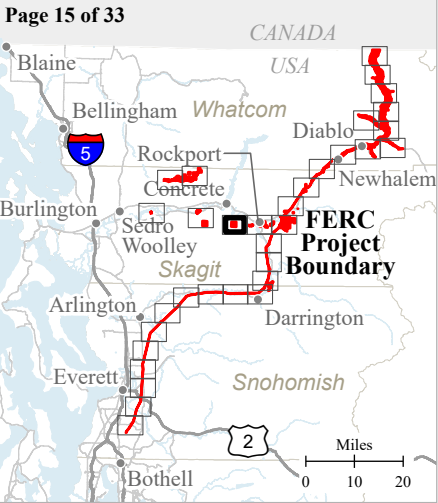
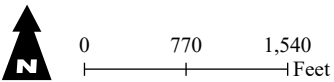


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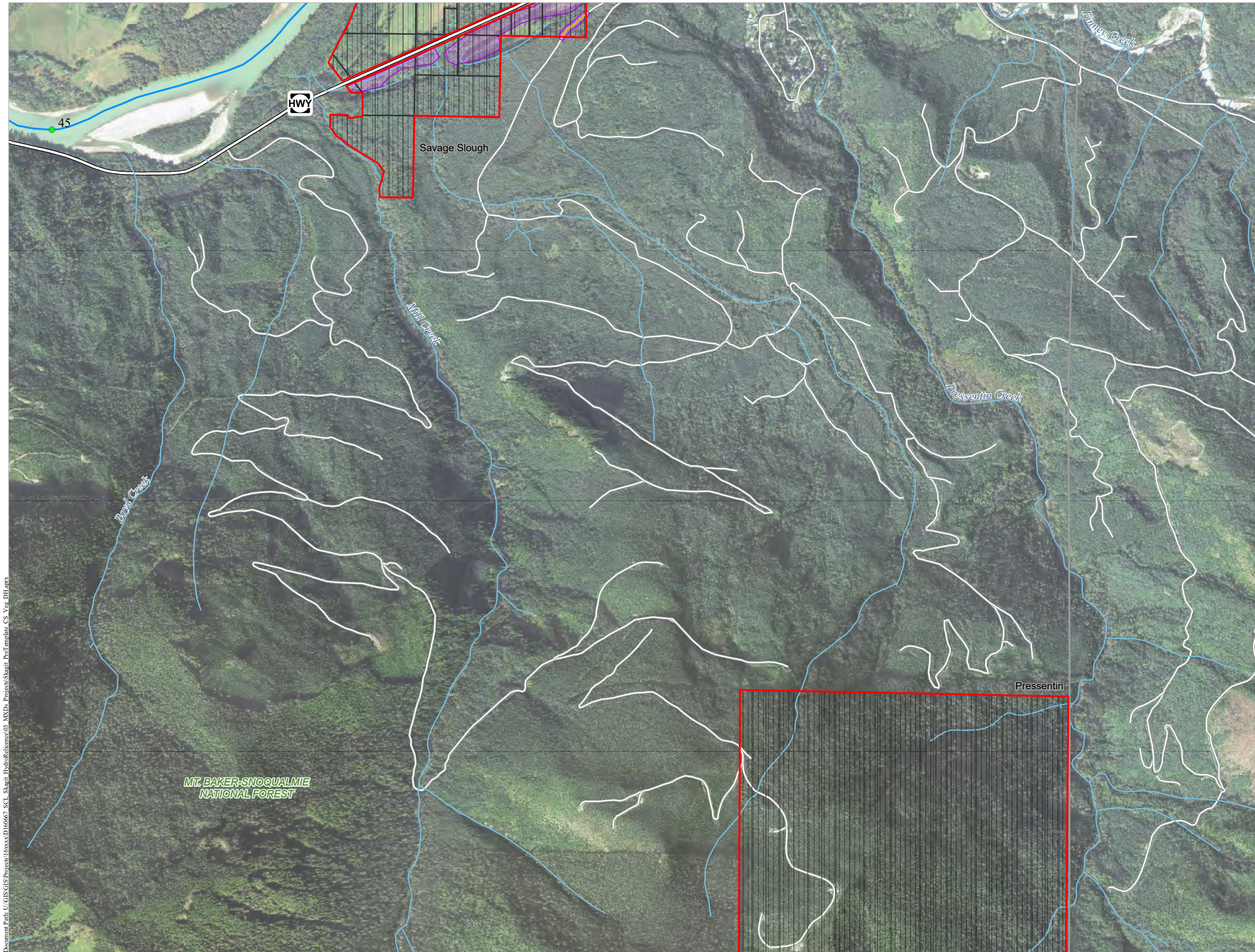
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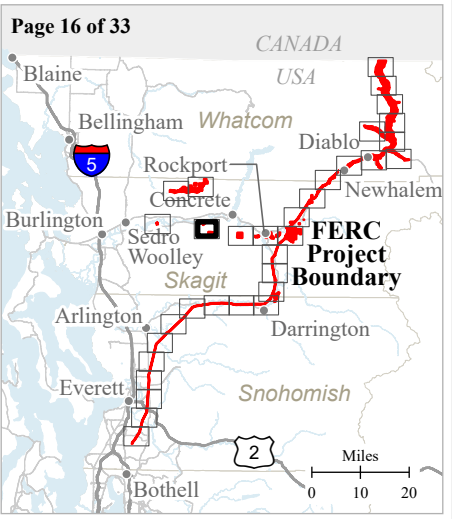
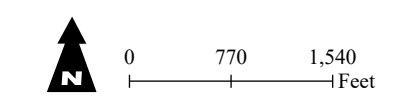
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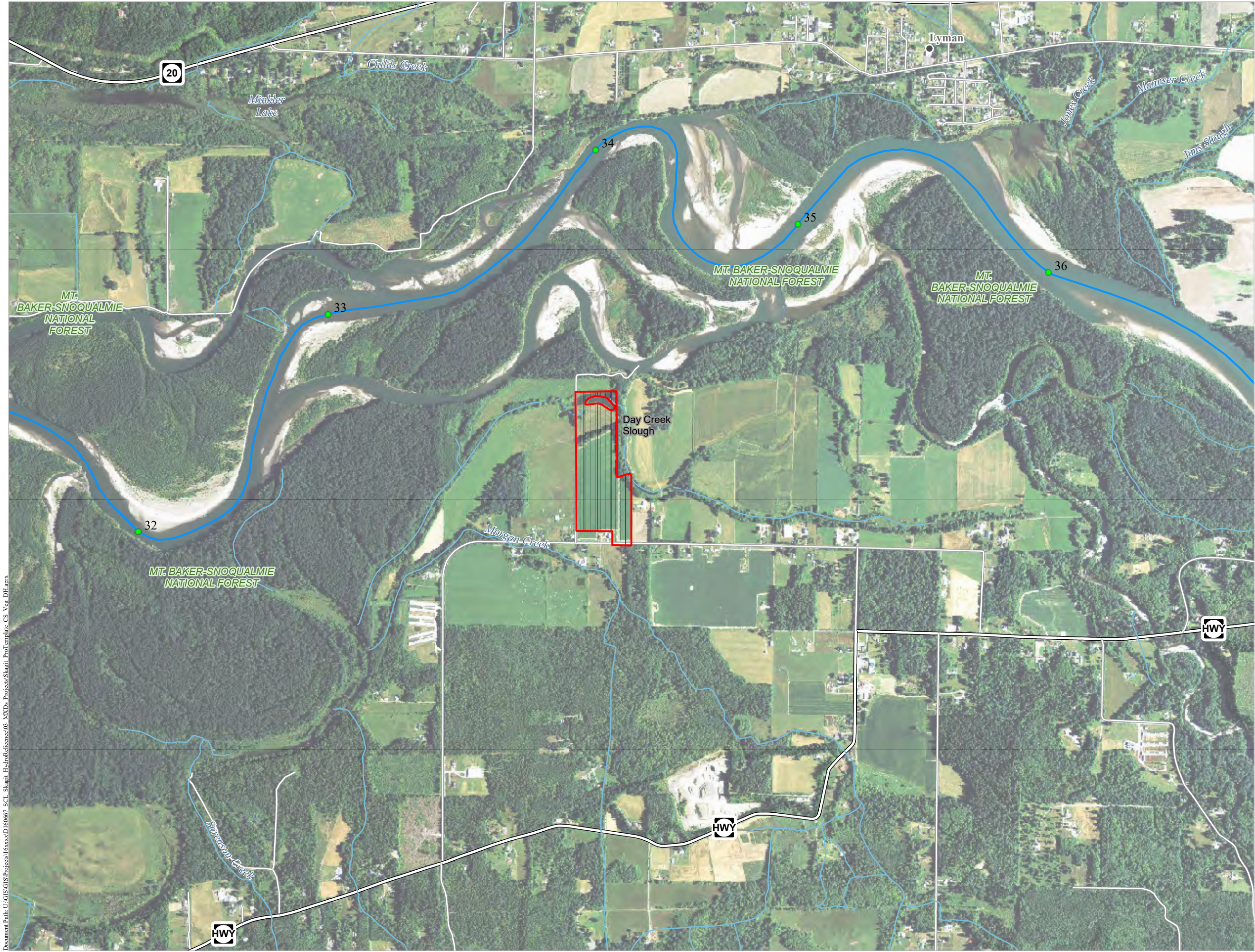
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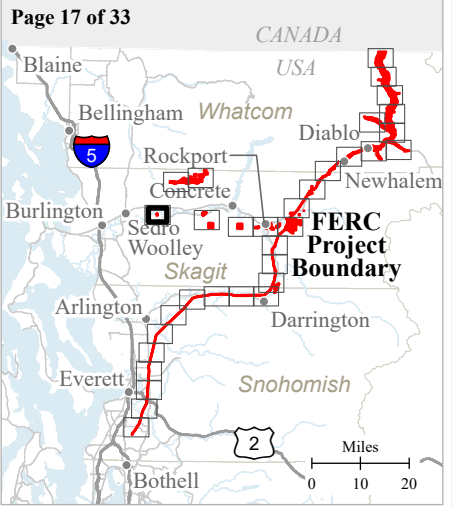
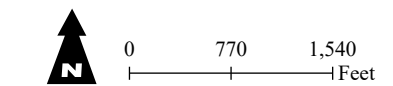
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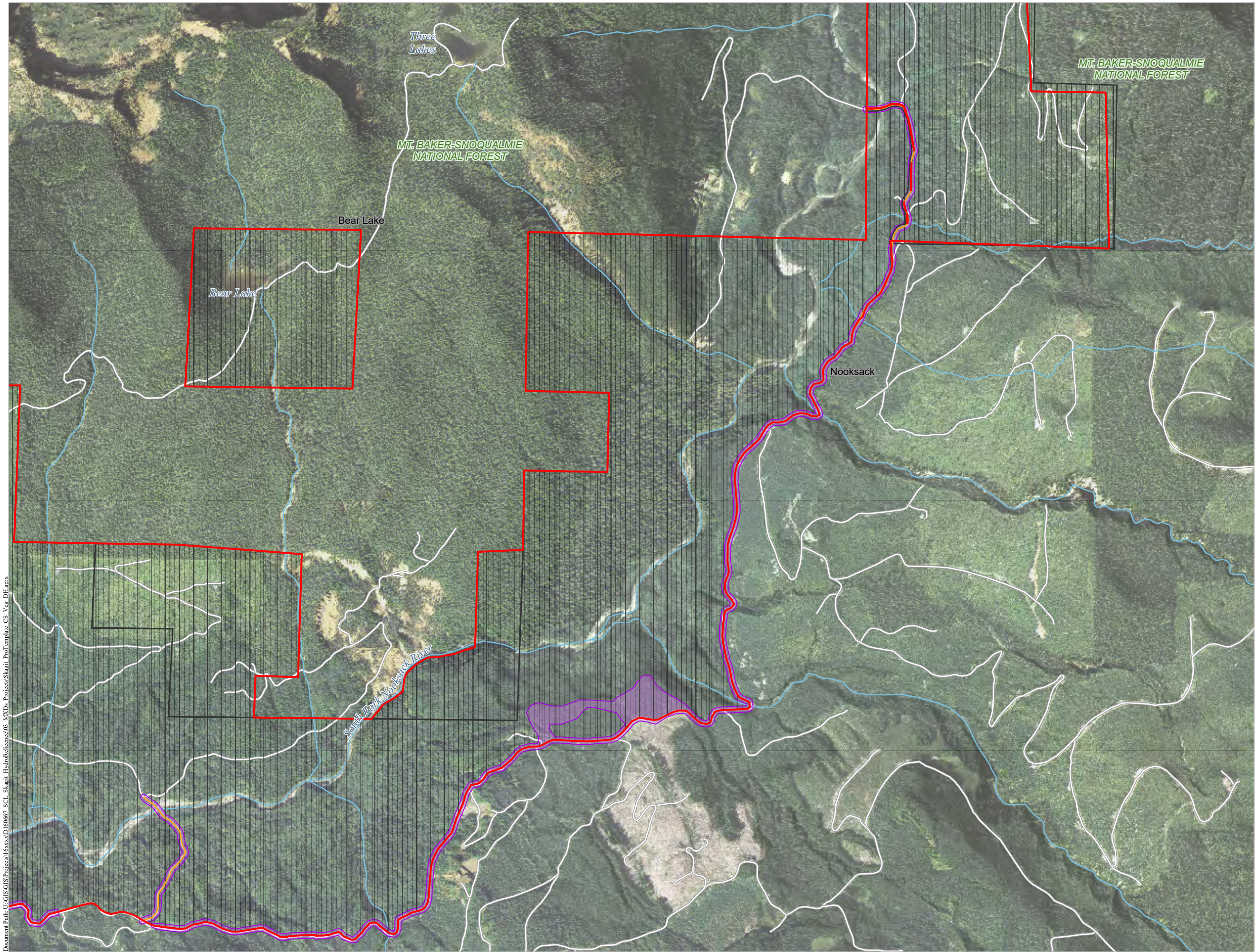


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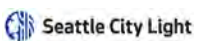
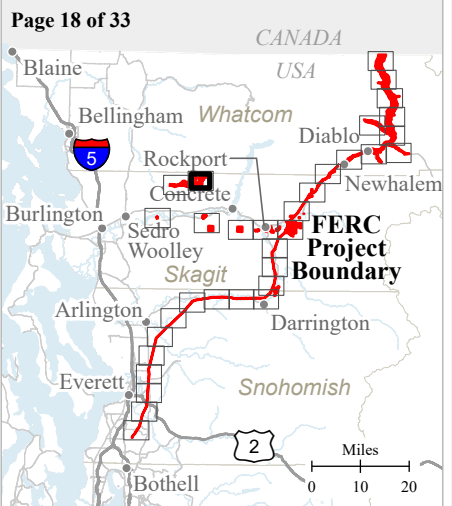
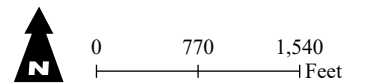
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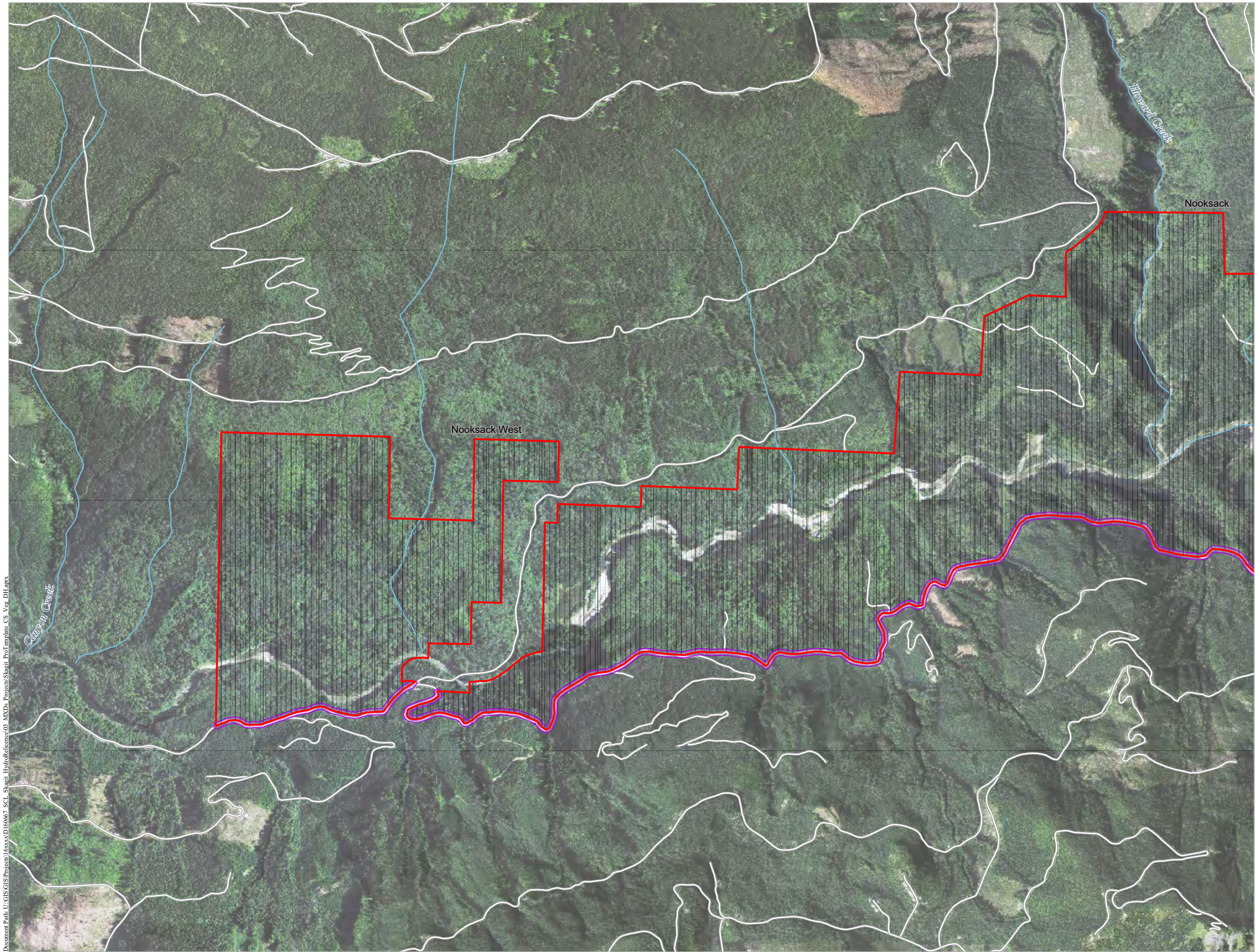
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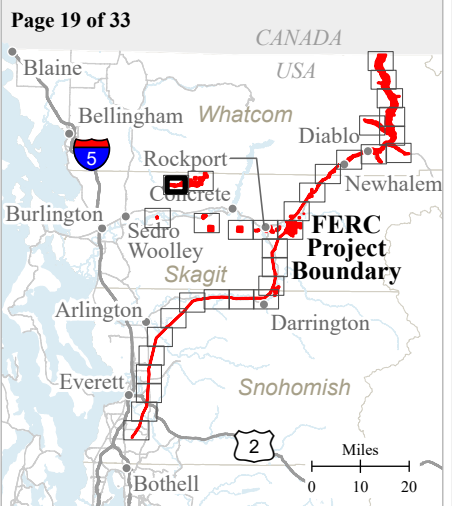
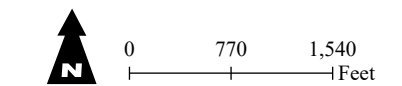
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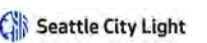
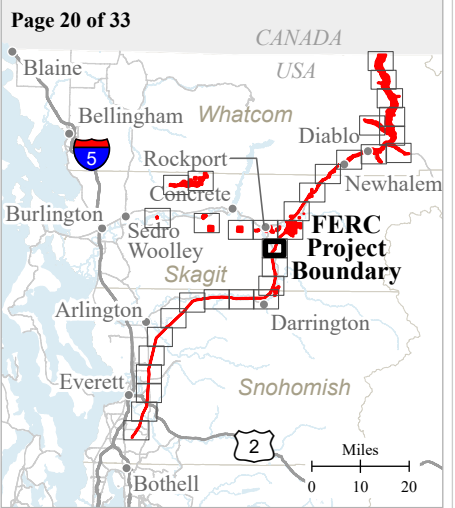
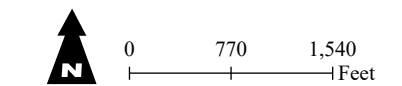
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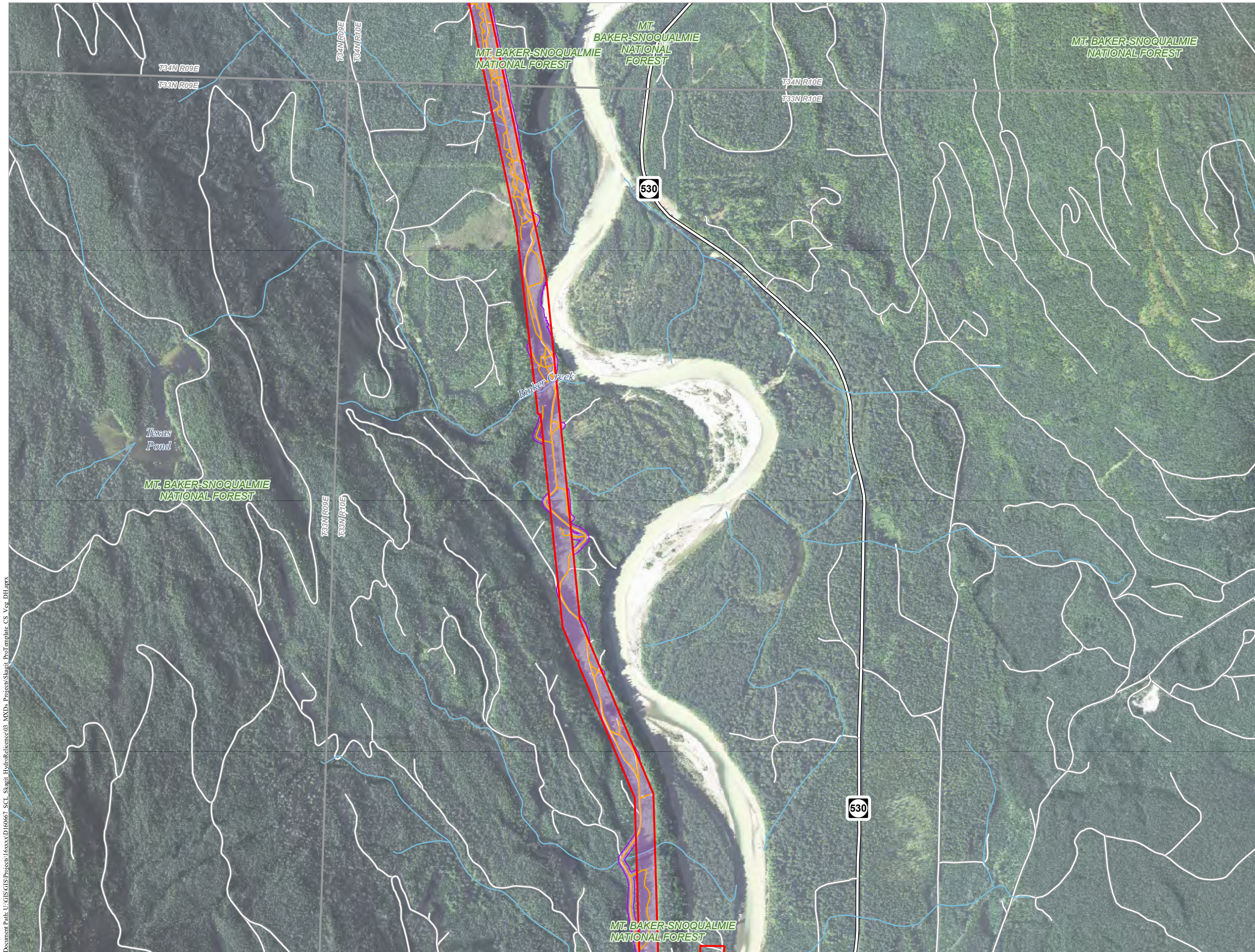
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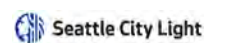
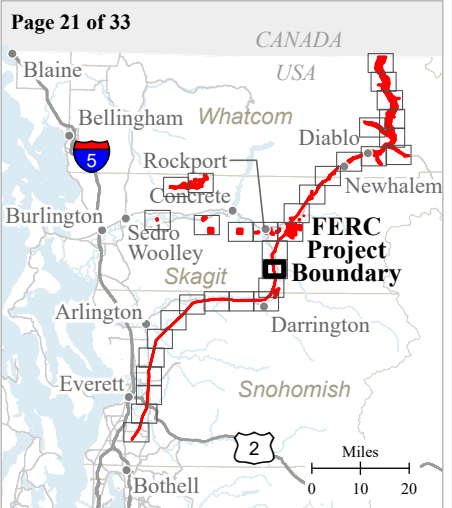
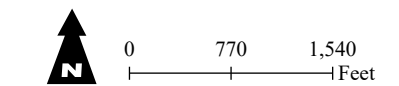
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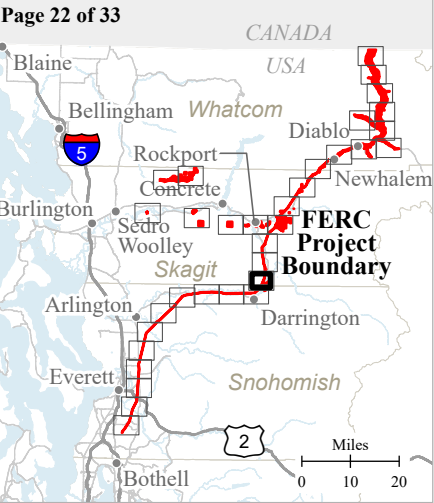
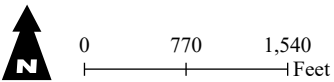
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Project River Miles

Project River Centerline

City Light Facility Points

Secondary Highway

Other Road

Survey Area

Survey Study Route

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Blaine

Bellingham

Rockport

Concrete

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Burlington

Arlington

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Diablo

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Snohomish

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FERC Project Boundary

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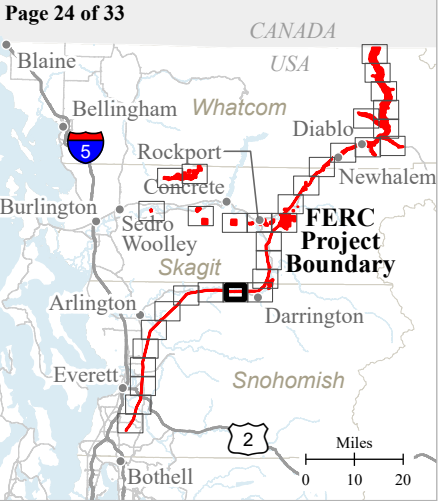
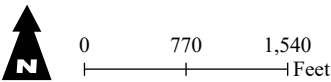
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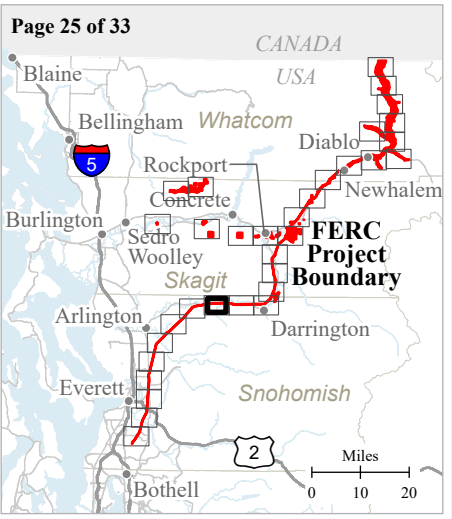
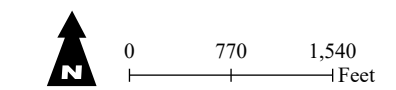
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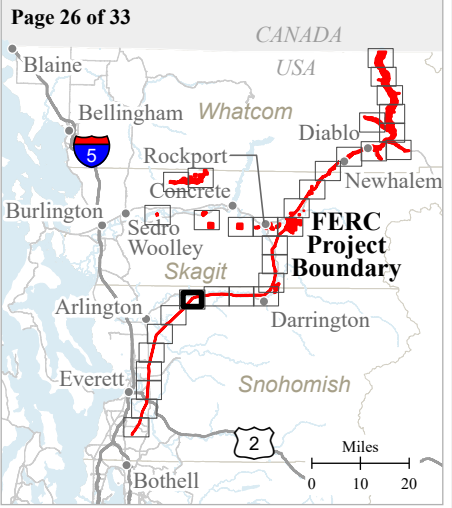
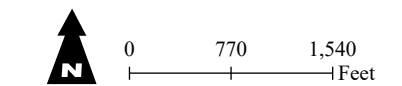
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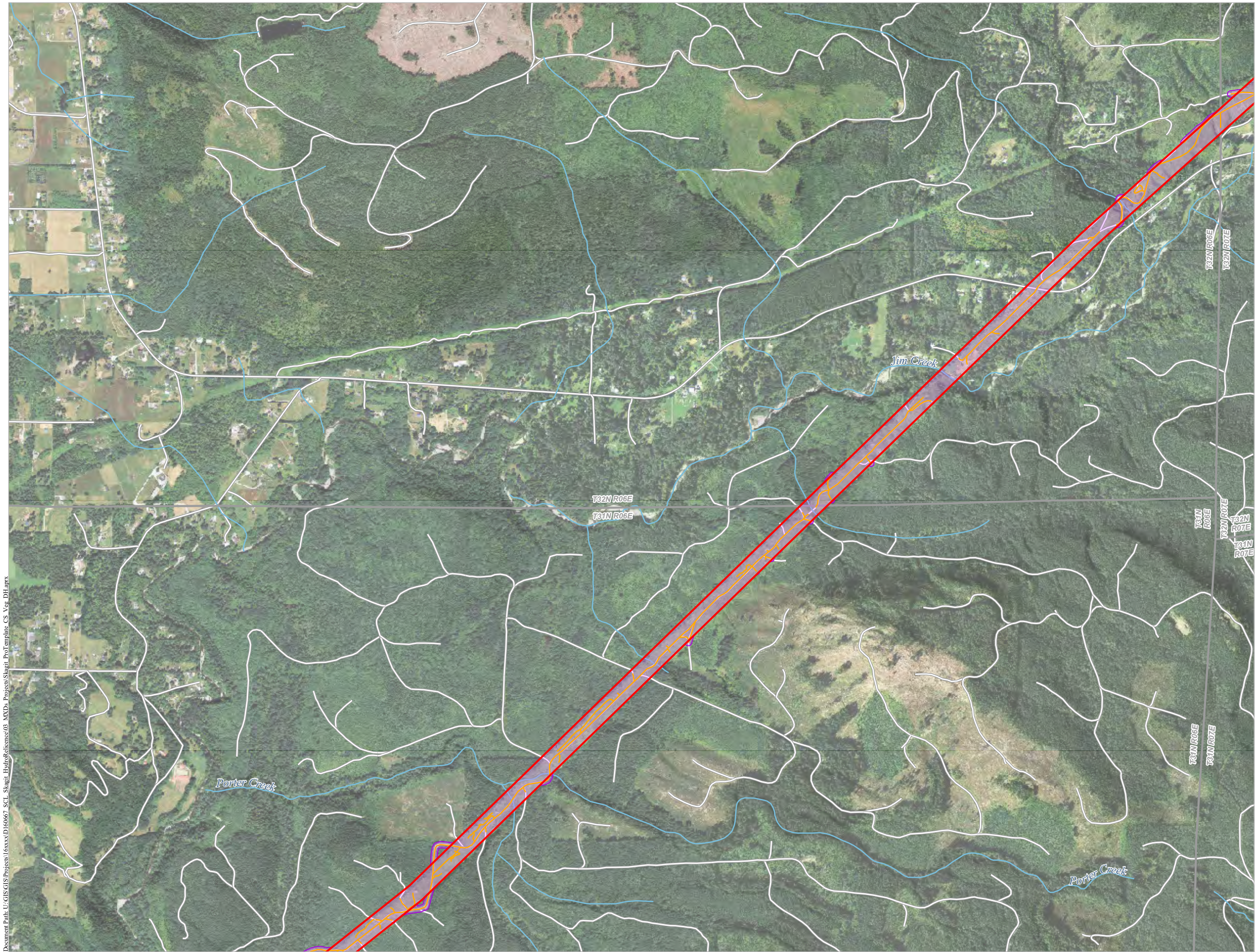
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SKAGIT RIVER HYDROELECTRIC PROJECT (FERC NO. 553)

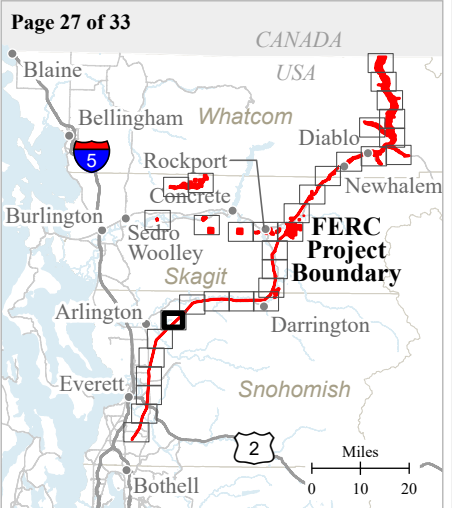
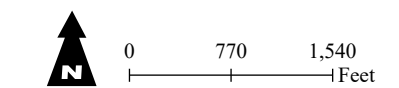
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TR-03 INVASIVE AND TR-04 RTE PLANT STUDIES SURVEY LOCATIONS MAPBOOK

- FERC Project Boundary
- Project River Miles
- Project River Centerline
- City Light Facility Points
- Other Road
- Survey Area
- Survey Study Route

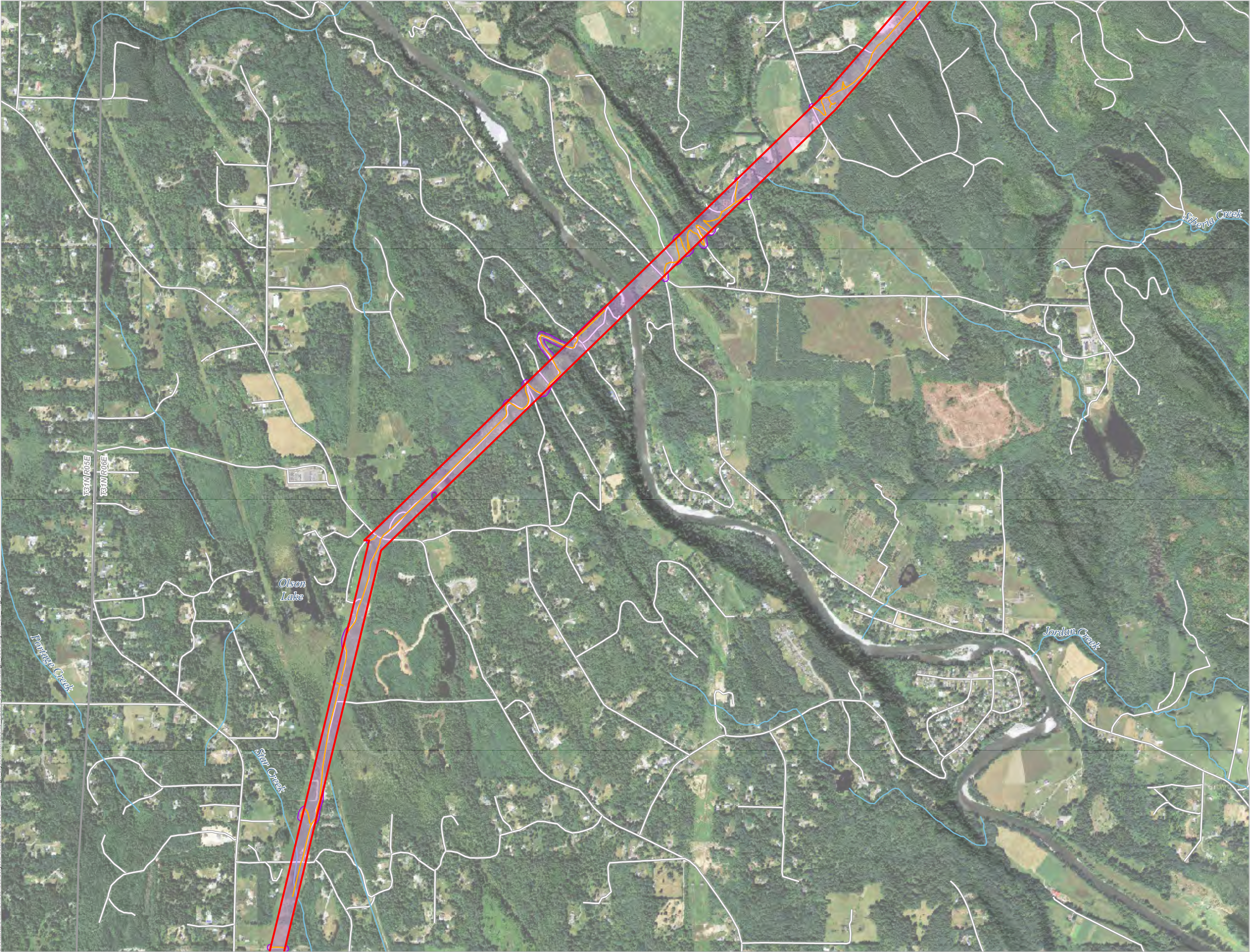


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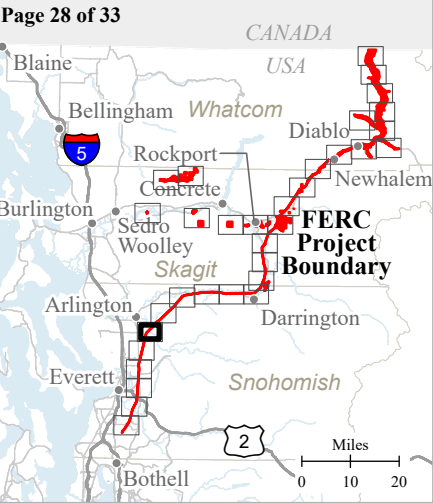
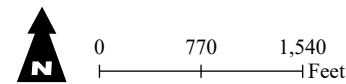
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TR-03 INVASIVE AND
TR-04 RTE PLANT STUDIES
SURVEY LOCATIONS
MAPBOOK

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- Survey Study Route



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

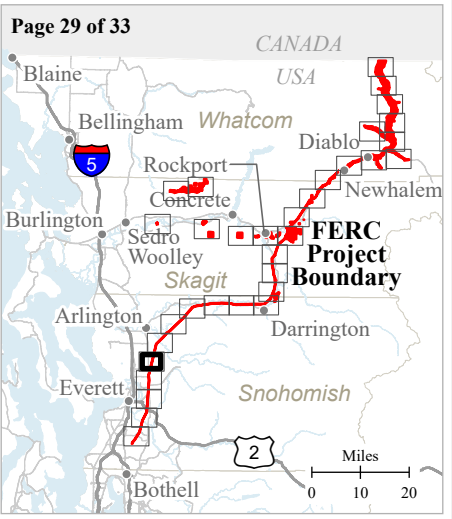
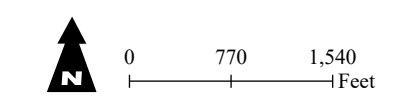
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TR-03 INVASIVE AND TR-04 RTE PLANT STUDIES SURVEY LOCATIONS MAPBOOK

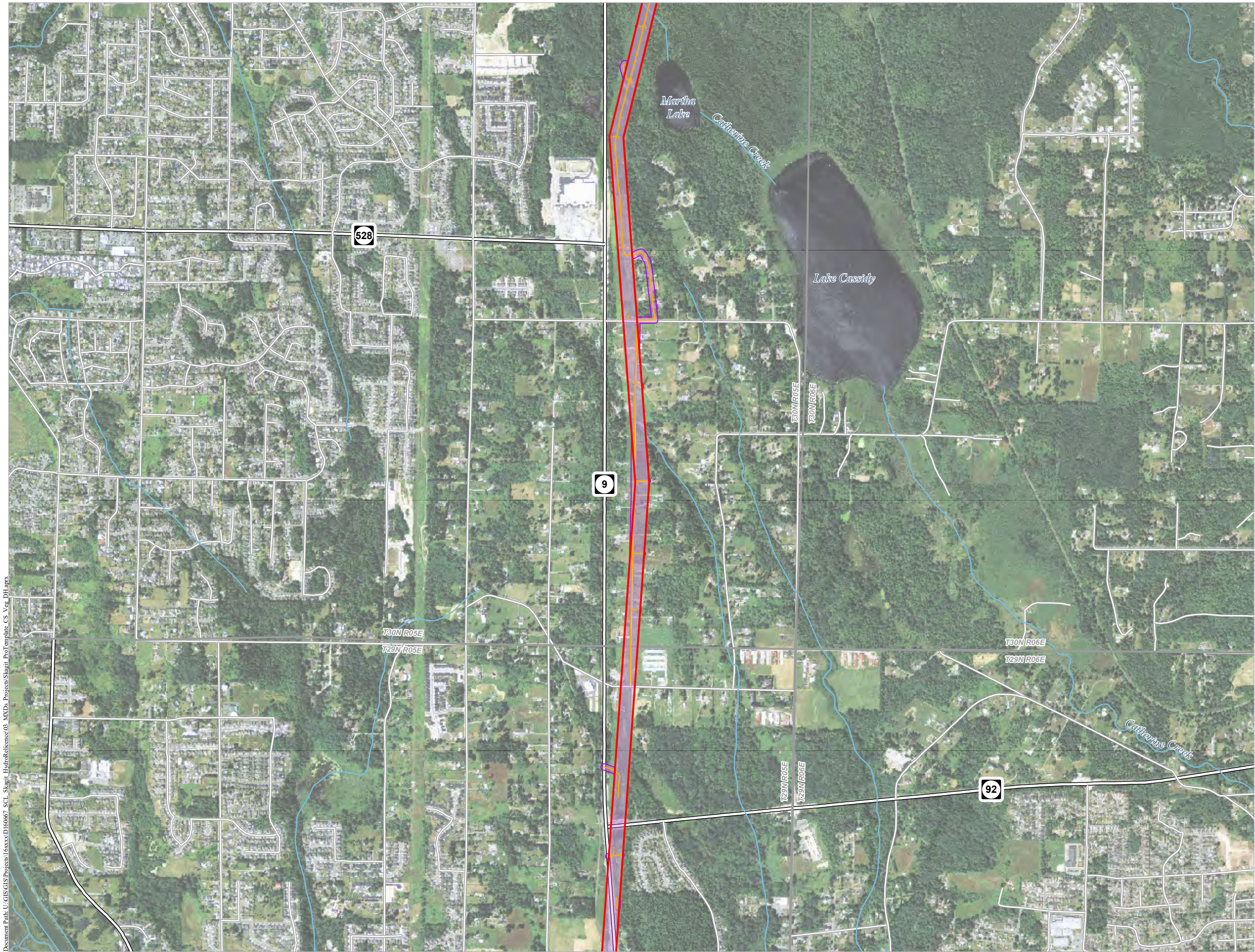
- FERC Project Boundary
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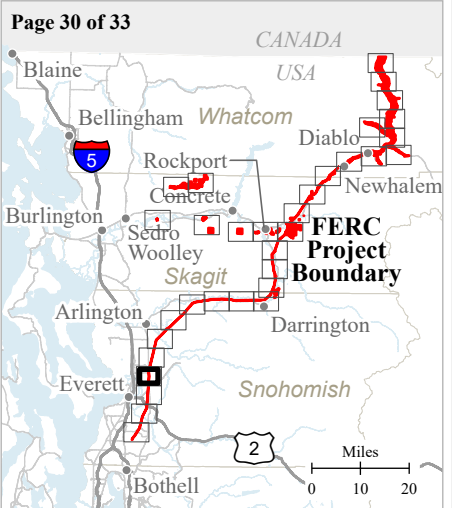
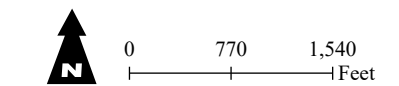
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TR-03 INVASIVE AND TR-04 RTE PLANT STUDIES SURVEY LOCATIONS MAPBOOK

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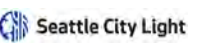
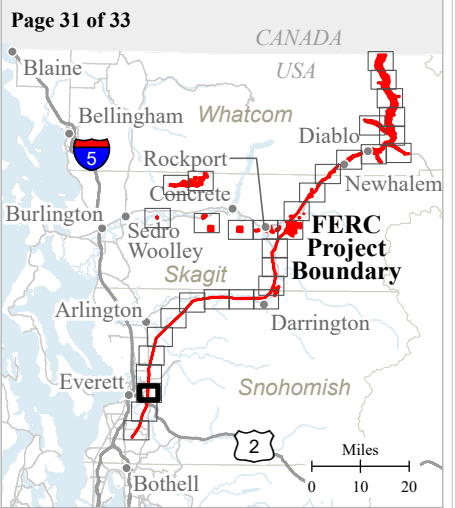
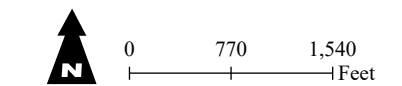
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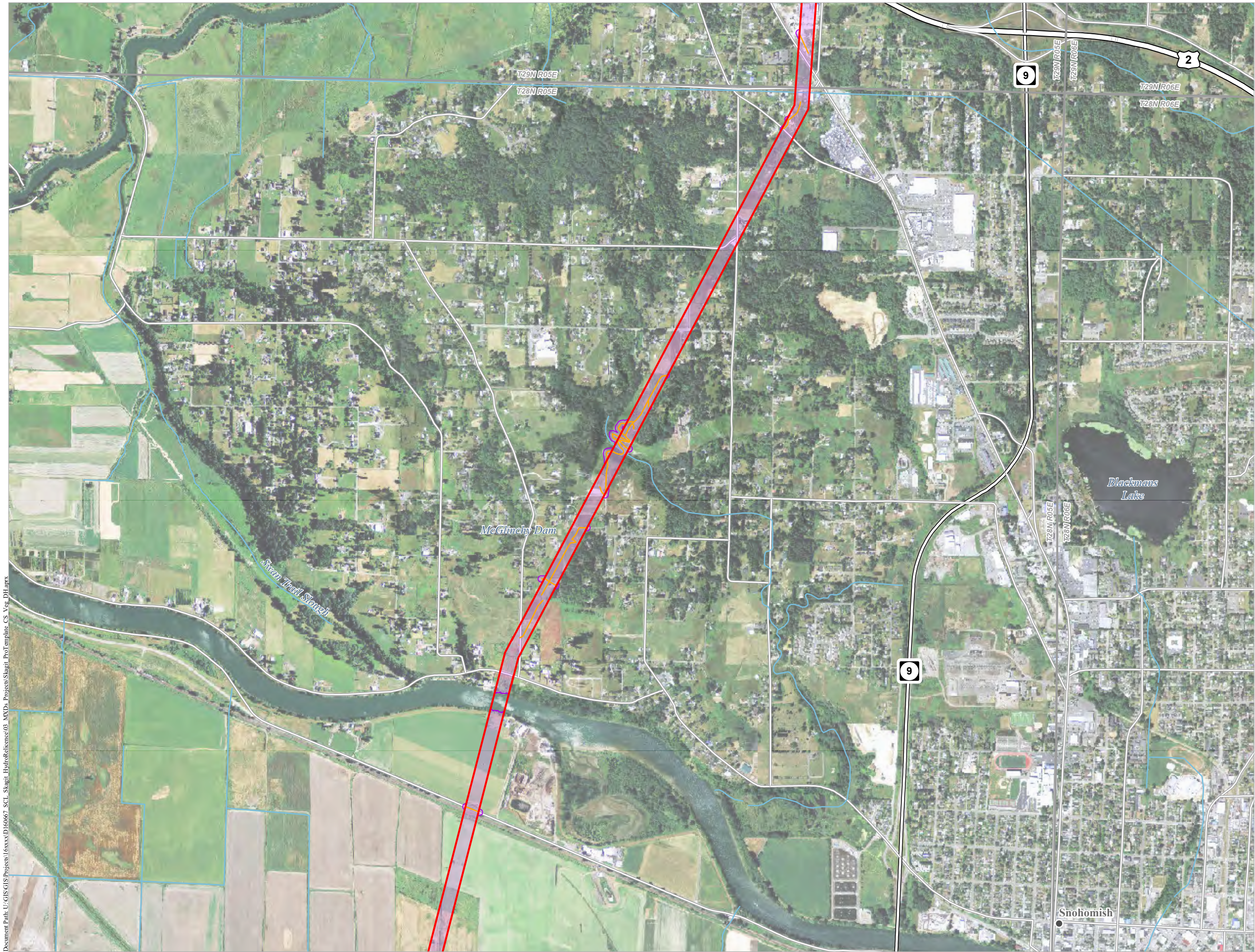
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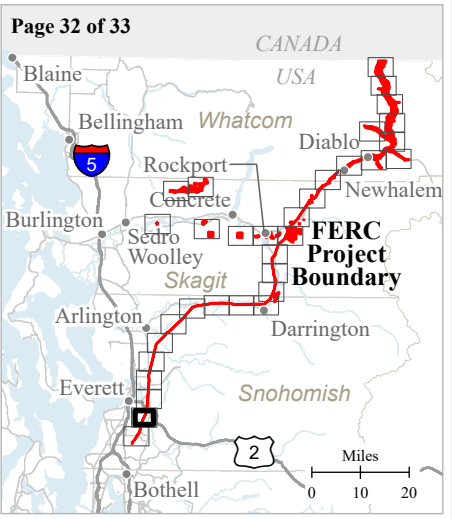
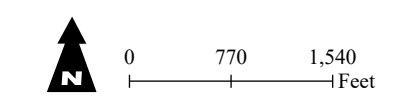
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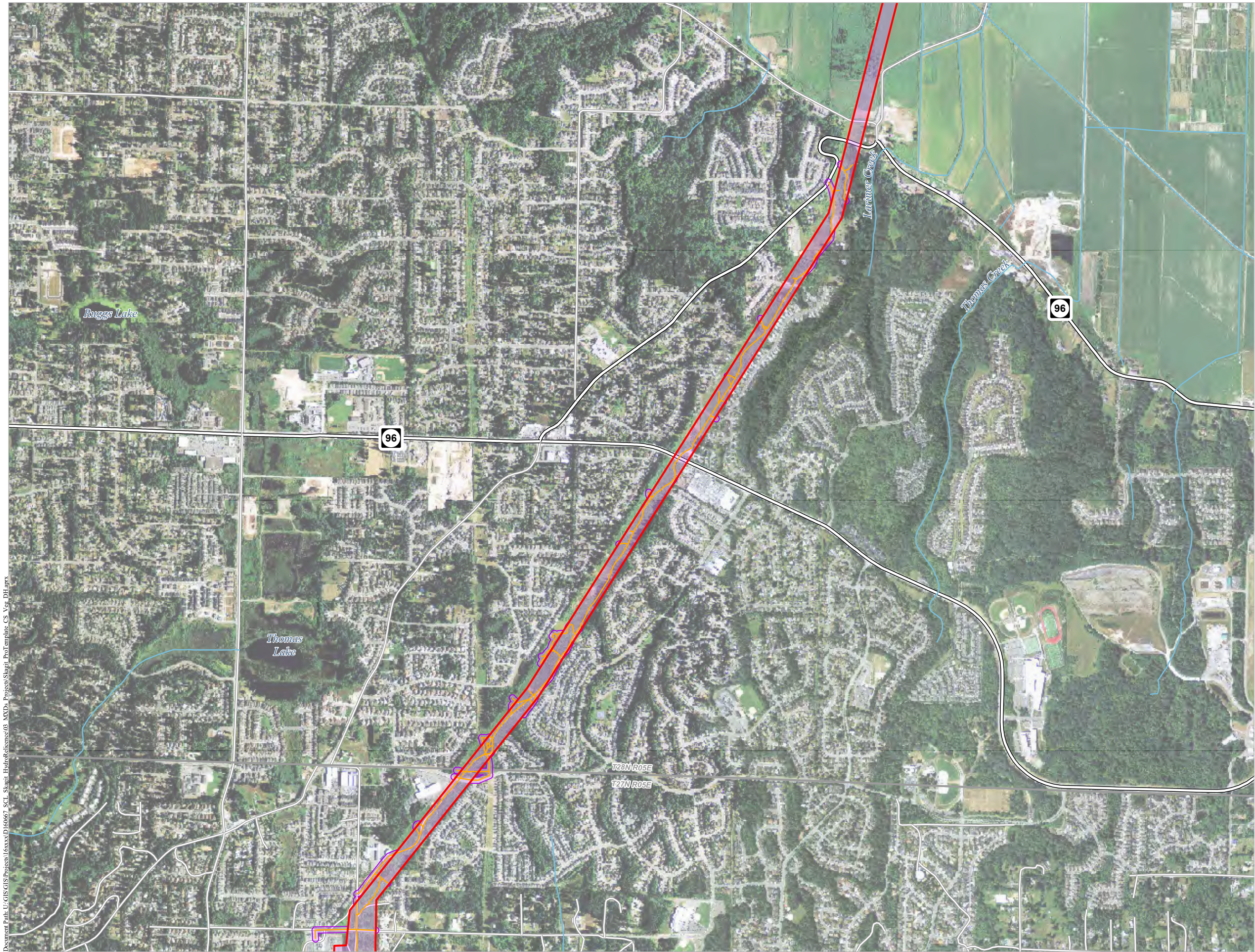


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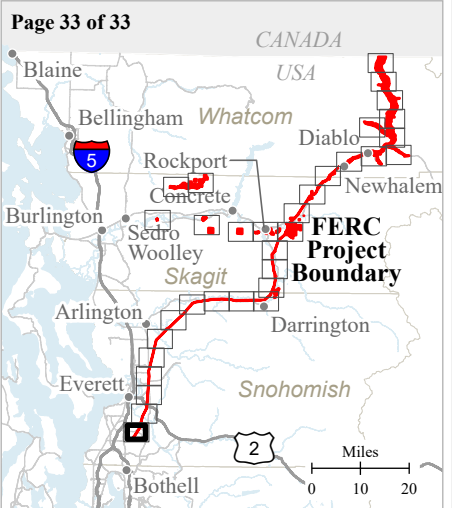
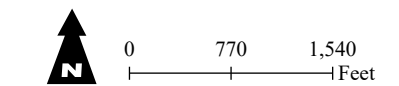
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INVASIVE PLANTS STUDY INTERIM REPORT

ATTACHMENT B

TARGET LIST OF INVASIVE PLANT SPECIES

Table B-1. Target list of invasive plant species.

Scientific Name	Common Name	Predicted Occurrence	Known Location	Noxious Weed Classification ¹				Source
				State	Skagit	Whatcom	Snohomish	
<i>Abutilon theophrasti</i>	Velvetleaf	None	-	B	B-designated	B-designated	B-designated	County Lists
<i>Acer ginnala</i>	Amur maple	None	-	-	-	-	-	NPS - 1st Priority
<i>Acer negundo</i>	Box elder	Uncommon	Newhalem, Diablo	-	-	-	-	NPS - 1st Priority
<i>Acer platanoides</i>	Norway maple	None	-	-	-	-	-	NPS - 1st Priority
<i>Acer pseudoplatanus</i>	Sycamore maple	Common	Newhalem, Diablo	-	-	-	-	NPS - 1st Priority / 2019 Study Plan
<i>Acer rubrum</i>	Red maple	None	-	-	-	-	-	NPS - 1st Priority
<i>Aesculus hippocastanum</i>	Horse chestnut	Uncommon	Newhalem, Diablo	-	-	-	-	NPS - 1st Priority
<i>Aegopodium podagraria</i>	Bishop's goutweed	Uncommon	-	-	-	-	-	City Light
<i>Alhagi maurorum</i>	Camelthorn	None	-	B	B-designated	B-designated	B-designated	County Lists
<i>Alliaria petiolata</i>	Garlic mustard	None	-	A	A	A	A	County Lists
<i>Amorpha fruticosa</i>	Indigobush	None	-	B	B-designated	B-designated	B-designated	County Lists
<i>Anchusa arvensis</i>	Bugloss, annual	None	-	B	B-designated	B-designated	B-designated	County Lists
<i>Anchusa officinalis</i>	Bugloss, common	None	-	B	B-designated	B-designated	B-designated	County Lists
<i>Anthriscus sylvestris</i>	Wild chervil	None	-	B	B-designated	B-selected	B-designated	County Lists
<i>Arctium lappa</i>	Greater burdock	Common	Newhalem, Diablo, ROW, Newhalem penstock trail	-	-	-	-	NPS - 1st Priority
<i>Berteroa incana</i>	Hoary alyssum	None	-	B	B-designated	B-designated	B-designated	County Lists
<i>Brachypodium sylvaticum</i>	False brome	None	-	A	A	A	A	County Lists
<i>Bromus tectorum</i>	Cheatgrass	Common	-	-	-	-	-	City Light
<i>Bryonia alba</i>	White bryony	None	-	B	B-designated	B-designated	B-designated	County Lists
<i>Buddleja davidii</i>	Butterfly bush	Common	Riparian gravel bars, ROW, Boulder River	B	B-no control	B-selected	-	County Lists
<i>Butomus umbellatus</i>	Flowering rush	None	-	A	A	A	A	County Lists
<i>Cabomba caroliniana</i>	Fanwort	None	-	B	B-designated	B-designated	B-designated	County Lists
<i>Campanula rapunculoides</i>	Creeping bellflower	Common	Newhalem, Diablo	-	-	-	-	NPS – 1st Priority
<i>Carduus acanthoides</i>	Thistle, plumeless	None	-	B	B-designated	B-designated	B-designated	County Lists
<i>Carduus nutans</i>	Thistle, musk	None	-	B	B-designated	B-designated	B-designated	County Lists
<i>Carduus pycnocephalus</i>	Thistle, Italian	None	-	A	A	A	A	County Lists
<i>Carduus tenuiflorus</i>	Thistle, slenderflower	None	-	A	A	A	A	County Lists
<i>Cenchrus longispinus</i>	Longspine sandbur	None	-	C	C	-	B-designated	County Lists
<i>Centaurea calcitrapa</i>	Purple starthistle	None	-	A	A	A	A	County Lists
<i>Centaurea diffusa</i>	Knapweed, diffuse	None	-	B	B-designated	B-designated	B-designated	County Lists
<i>Centaurea jacea</i>	Knapweed, brown	None	-	B	B-designated	B-designated	B-designated	County Lists

1: A = Class A Noxious Weeds: Non-native species with a limited distribution in the state. Eradication is required by state law.
B = Class B Noxious Weeds: Non-native species established in some regions of Washington, but of limited distribution or not present in other regions of the state. Because of differences in distribution, treatment of Class B weeds varies between regions of the state. In regions where a Class B weed is unrecorded or of limited distribution, prevention of seed production is required. In these areas, the weed is a “Class B designate,” meaning it is designated for control by state law. In regions where a Class B species is already abundant or widespread, control is a local option. In these areas, the weed is a “Class B-selected,” with containment, gradual reduction, and prevention of further spread being the chief goals. County noxious weed control boards may also designate Class B weeds for required control.
C = Class C Noxious Weeds: Non-native species that are already widely established in Washington or of special interest to the state’s agricultural industry. Counties may enforce control if locally desired, or choose simply to provide education or technical consultation to county residents
Non-native status from the Washington State Noxious Weed Control Board (2021). https://www.nwcb.wa.gov/pdfs/2021-State-Weed-List_Scientific_Name-8.5x11.pdf.

Scientific Name	Common Name	Predicted Occurrence	Known Location	Noxious Weed Classification ¹				Source
				State	Skagit	Whatcom	Snohomish	
<i>Centaurea macrocephala</i>	Knapweed, bighead	None	-	A	A	A	A	County Lists
<i>Centaurea melitensis</i>	Malta starthistle	None	-	B	B-designated	B-designated	-	County Lists
<i>Centaurea nigra</i>	Knapweed, black	None	-	B	B-designated	B-designated	B-designated	County Lists
<i>Centaurea nigrescens</i>	Knapweed, Vochin	None	-	A	A	A	A	County Lists
<i>Centaurea solstitialis</i>	yellow starthistle	None	-	B	B-designated	B-designated	B-designated	County Lists
<i>Centaurea stoebe</i>	Knapweed, spotted	Uncommon	Diablo Lake boat ramp, Newhalem	B	B-designated	B-selected	B-designated	County Lists / NPS
<i>Centaurea x moncktonii</i>	Knapweed, meadow	None	-	B	B-designated	B-selected	B-designated	County Lists
<i>Chondrilla juncea</i>	Rush skeletonweed	None	-	B	B-designated	B-designated	B-designated	County Lists
<i>Cirsium arvense</i>	Canadian thistle	Common	ROW, Newhalem penstock, Diablo	C	-	C-selected	-	County Lists
<i>Cirsium vulgare</i>	Bull thistle	Common	-	C	C	C	-	County Lists
<i>Clematis orientalis</i>	Oriental clematis	None	-	A	A	A	A	County Lists
<i>Clematis vitalba</i>	Traveler's-joy	Common	ROW (scattered locations from Newhalem to Sauk), road to Camp Marion, Taylor spawning channel, bypass reach	-	-	-	-	2019 Study Plan
<i>Conium maculatum</i>	Poison hemlock	Common	ROW	B	B-selected	B-selected	B-designated	County Lists / NPS
<i>Convolvulus arvensis</i>	Field bindweed	Common	Reflector Bar	C	-	-	-	State List
<i>Crataegus monogyna</i>	English hawthorn	Common	Reflector Bar, Newhalem	C	-	C-selected	-	County Lists
<i>Crupina vulgaris</i>	Common crupina	None	-	A	A	A	A	County Lists
<i>Cynoglossum officinale</i>	Houndstongue	None	-	B	B-designated	B-designated	B-designated	County Lists
<i>Cyperus esculentus</i>	Yellow nutsedge	None	-	B	B-selected	B-designated	B-designated	County Lists
<i>Cytisus scoparius</i>	Scot’s broom	Common	ROW, Reflector Bar, Newhalem, Taylor spawning channel	B	B-selected	B-selected	-	County Lists / NPS
<i>Daphne laureola</i>	Spurge laurel	Uncommon	-	B	B-designated	B-designated	B-designated	County Lists
<i>Echium vulgare</i>	Common viper’s bugloss	None	-	B	B-designated	B-designated	B-designated	County Lists
<i>Egeria densa</i>	Brazilian elodea	None	-	B	B-designated	B-designated	-	County Lists
<i>Epilobium hirsutum</i>	Hairy willowherb	None	-	B	B-designated	-	B-designated	County Lists
<i>Euphorbia esula</i>	Spurge, leafy	None	-	B	B-designated	B-designated	B-designated	County Lists / NPS
<i>Euphorbia myrsinites</i>	Spurge, myrtle	None	-	B	B-designated	-	B-designated	County Lists
<i>Euphorbia oblongata</i>	Egg-leaf spurge	Uncommon	Near Diablo Dam	A	A	A	A	County Lists
<i>Euphorbia peplus</i>	Petty spurge	Common	Newhalem	-	-	-	-	2019 Study Plan
<i>Fallopia japonica</i>	Knotweed, Japanese	Uncommon	Riparian, ROW (not sure which species), Diablo	B	B-selected	B-designated	B-selected	County Lists / NPS / 2019 Study Plan
<i>Fallopia sachalinensis</i>	Knotweed, giant	Uncommon	Riparian, ROW	B	B-designated	B-designated	B-selected	County Lists
<i>Fallopia x bohemica</i>	Knotweed, bohemian	Uncommon	Riparian, ROW	B	B-no control	B-selected	B-selected	County Lists
<i>Ficaria verna</i>	Lesser celandine	None	-	B	B-no control	B-selected	-	County Lists
<i>Foeniculum vulgare</i> (except <i>F. vulgare</i> var. <i>azoricum</i>)	Common fennel (except bulbing fennel)	Uncommon	-	B	B-no control	B-designated	B-designated	County Lists
<i>Galega officinalis</i>	Goatsrue	None	-	A	A	A	A	County Lists
<i>Genista monspessulana</i>	French broom	None	-	A	A	A	A	County Lists
<i>Geranium robertianum</i>	Herb-Robert	Common	Newhalem, Diablo, ROW, habitat lands, Newhalem Ponds	B	B-no control	B-selected	-	County Lists / NPS
<i>Geranium lucidum</i>	Shiny geranium	Uncommon	-	B	B-designated	B-designated	B-designated	County Lists / NPS

Scientific Name	Common Name	Predicted Occurrence	Known Location	Noxious Weed Classification ¹				Source
				State	Skagit	Whatcom	Snohomish	
<i>Glyceria maxima</i>	Reed sweetgrass	None	-	A	A	A	A	County Lists
<i>Hedera helix</i>	English ivy	Common	Copper Cr. pit, Newhalem, Diablo	C	-	C-selected	-	County Lists
<i>Helianthus ciliaris</i>	Texas blueweed	None	-	A	A	A	A	County Lists
<i>Heracleum mantegazzianum</i>	Giant hogweed	None	-	A	A	A	A	County Lists
<i>Hieracium aurantiacum</i>	Hawkweed, orange	Uncommon	near Illabot Creek Road	B	B-designated	B-selected	B-designated	County Lists
<i>Hieracium</i> , subgenus <i>Hieracium</i>	Hawkweeds: All nonnative species and hybrids of the wall subgenus	Common	Newhalem, ROW	B	B-no control	B-selected	-	County Lists
<i>Hieracium</i> , subgenus <i>Pilosella</i>	Hawkweeds: All non-native species and hybrids of the meadow subgenus	None	-	B	B-designated	B-designated	B-designated	County Lists
<i>Hydrilla verticillata</i>	Hydrilla	None	-	A	A	A	A	County Lists
<i>Hypericum perforatum</i>	St. John's-wort	Common	-	C	C	C	-	City Light
<i>Ilex aquifolium</i>	English holly	Common	Newhalem, Diablo, ROW	-	-	-	-	NPS - 1st Priority
<i>Impatiens glandulifera</i>	Policeman's helmet	Uncommon	SR 20 along Gorge Lake, Comm line to Babcock cell tower; Taylor spawning channel	B	B-designated	B-selected	B-designated	County Lists
<i>Impatiens parviflora</i>	Small-flowered Jewelweed	Uncommon	-	A	A	A	-	County Lists
<i>Isatis tinctoria</i>	Dyer's woad	None	-	A	A	A	A	County Lists
<i>Jacobaea vulgaris</i>	Tansy ragwort	-	ROW	C	B-selected	B-selected	B-designated	County Lists
<i>Juglans nigra</i>	Black walnut	Common	Newhalem, Diablo	-	-	-	-	NPS - 1st Priority
<i>Juglans</i> spp.	Butternut	Common	Newhalem, Diablo	-	-	-	-	NPS - 1st Priority
<i>Kochia scoparia</i>	Kochia	None	-	B	B-designated	B-designated	B-designated	County Lists
<i>Lamiastrum galeobdolon</i>	Yellow archangel	None	-	B	B-designated	B-designated	-	County Lists
<i>Lepidium latifolium</i>	Perennial pepperweed	None	-	B	B-designated	B-designated	B-designated	County Lists
<i>Leucanthemum vulgare</i>	Oxeye daisy	Common	-	C	C	-	-	City Light
<i>Linaria dalmatica</i> ssp. <i>dalmatica</i>	Dalmatian toadflax	Uncommon	ROW, Diablo, Newhalem	B	B-designated	B-designated	B-designated	County Lists / NPS
<i>Linaria purpurea</i>	Purple toadflax	Common	Newhalem, ROW	-	-	-	-	NPS - 1st Priority
<i>Linaria vulgaris</i>	Yellow toadflax	Uncommon	ROW	B	C	-	-	County Lists
<i>Ludwigia hexapetala</i>	Water primrose	None	-	B	B-designated	B-designated	B-designated	County Lists
<i>Ludwigia peploides</i>	Floating primrose-willow	None	-	A	A	A	A	County Lists
<i>Lunaria annua</i>	Annual honesty	Common	Newhalem, Diablo	-	-	-	-	NPS - 1st Priority
<i>Lysimachia vulgaris</i>	Loosestrife, garden	Uncommon	-	B	B-designated	B-designated	B-designated	County Lists
<i>Lythrum salicaria</i>	Loosestrife, purple	Common	-	B	B-no control	B-designated	B-selected	County Lists
<i>Lythrum virgatum</i>	Loosestrife, wand	None	-	B	B-no control	(B-designated)	-	County Lists
<i>Mirabilis nyctaginea</i>	Wild four-o'clock	None	-	A	-	A	A	County Lists
<i>Myriophyllum aquaticum</i>	Parrotfeather	None	-	B	B-designated	B-designated	B-designated	County Lists
<i>Myriophyllum heterophyllum</i>	Variable-leaf milfoil	None	-	A	A	A	A	County Lists
<i>Myriophyllum spicatum</i>	Eurasian watermilfoil	None	-	B	B-no control	B-selected	B-selected	County Lists
<i>Nymphoides peltata</i>	Yellow floatingheart	None	-	B	B-designated	B-designated	B-designated	County Lists
<i>Onopordum acanthium</i>	Thistle, Scotch	None	-	B	B-designated	B-designated	B-designated	County Lists
<i>Persicaria wallichii</i>	Knotweed, Himalayan	Uncommon	Riparian, ROW	B	B-designated	B-designated	B	County Lists
<i>Phalaris arundinacea</i>	Reed canarygrass	Common	Ross Lake, Big Beaver, ROW, mitigation lands	C	C	C	-	County Lists / NPS / 2019 Study Plan

Scientific Name	Common Name	Predicted Occurrence	Known Location	Noxious Weed Classification ¹				Source
				State	Skagit	Whatcom	Snohomish	
<i>Phragmites australis</i>	Common reed (nonnative genotypes only)	None	-	B	B-designated	B-designated	B-designated	County Lists
<i>Picris hieracioides</i>	Hawkweed oxtongue	None	-	B	B-designated	B-designated	-	County Lists
<i>Potentilla recta</i>	Sulfur cinquefoil	Uncommon	ROW at Illabot Creek	B	B-designated	B-designated	B	County Lists / NPS
<i>Prunus avium</i>	Sweet cherry	Uncommon	Newhalem, Diablo	-	-	-	-	NPS - 1st Priority
<i>Prunus cerasifera</i>	Cherry plum	-	-	-	-	-	-	NPS - 1st Priority
<i>Prunus domestica</i>	Domestic plum	-	ROW	-	-	-	-	NPS - 1st Priority
<i>Prunus laurocerasus</i>	Cherry-laurel	-	Newhalem, Diablo	-	-	-	-	NPS - 1st Priority
<i>Pueraria montana</i> var. <i>lobata</i>	Kudzu	None	-	A	A	A	A	County Lists
<i>Rhaponticum repens</i>	Knapweed, Russian	None	-	B	B-designated	B-designated	B-designated	County Lists / NPS
<i>Robinia hispida</i>	Bristly locust	-	Near spray booth, Ladder Creek Garden, and road to top of Incline Lift	-	-	-	-	NPS - 1st Priority
<i>Rubus bifrons</i>	Himalayan blackberry	-	widespread ROW, Reflector Bar, Newhalem Ponds	C	-	C-selected	-	County Lists
<i>Saccharum ravennae</i>	Ravenna grass	None	-	B	B-no control	-	-	County Lists
<i>Sagittaria graminea</i>	Grass-leaved arrowhead	None	-	B	B-designated	B-designated	-	County Lists
<i>Salvia aethiopis</i>	Sage, Mediterranean	None	-	A	A	A	A	County Lists
<i>Salvia pratensis</i>	Meadow clary	None	-	A	A	A	A	County Lists
<i>Salvia sclarea</i>	Sage, clary	None	-	A	A	A	A	County Lists
<i>Schoenoplectus mucronatus</i>	Ricefield bulrush	None	-	A	A	A	A	County Lists
<i>Silybum marianum</i>	Thistle, milk	None	-	A	A	A	A	County Lists
<i>Solanum elaeagnifolium</i>	Silverleaf nightshade	None	-	A	A	A	A	County Lists
<i>Solanum rostratum</i>	Buffalobur	None	-	C	C	-	A	County Lists
<i>Sorbus aucuparia</i>	European mountain-ash	-	Newhalem, Diablo	-	-	-	-	NPS - 1st Priority
<i>Sorghum halepense</i>	Johnsongrass	None	-	A	A	A	A	County Lists
<i>Spartina alterniflora</i>	Cordgrass, smooth	None	-	A	A	A	A	County Lists
<i>Spartina anglica</i>	Cordgrass, common	None	-	A	A	A	A	County Lists
<i>Spartina densiflora</i>	Cordgrass, dense-flowered	None	-	A	A	A	A	County Lists
<i>Spartina patens</i>	Cordgrass, saltmeadow	None	-	A	A	A	A	County Lists
<i>Spartium junceum</i>	Spanish broom	None	-	A	A	A	A	County Lists
<i>Taeniatherum caput-medusae</i>	Medusahead	None	-	B	C	C	-	County Lists
<i>Tamarix ramosissima</i>	Saltcedar	None	-	B	B-designated	B-designated	B-designated	County Lists
<i>Tanacetum vulgare</i>	Common tansy	-	widespread ROW, Reflector Bar	C	-	C-selected	-	County Lists
<i>Thymelaea passerina</i>	Spurge flax	None	-	B	A	-	A	County Lists
<i>Tribulus terrestris</i>	Puncturevine	None	-	B	B-designated	B-designated	B-designated	County Lists
<i>Tussilago farfara</i>	European coltsfoot	None	-	B	B-designated	B-designated	-	County Lists
<i>Ulex europaeus</i>	Gorse	None	-	B	B-designated	B-designated	B-designated	County Lists
<i>Verbascum thapsus</i>	Flannel mullein	-	Newhalem, Diablo, ROW	-	-	-	-	NPS - 1st Priority
<i>Vinca minor</i>	Lesser periwinkle	-	Newhalem, Diablo, Reflector Bar	-	-	-	-	NPS - 1st Priority
<i>Zygophyllum fabago</i>	Syrian beancaper	None	-	A	A	A	A	County Lists

INVASIVE PLANTS STUDY INTERIM REPORT

ATTACHMENT C

OBSERVED INVASIVE PLANT SPECIES BY LOCATION

Table C-1. Observed invasive plant species by location. (X = presence in specific location).

Scientific Name	Common Name	RLNRA								Transmission Line ROW				Fish and Wildlife Mitigation Lands																Skagit River Banks Gorge Dam to the Sauk
		Ross Lake	Diablo Lake	Gorge Lake	Newhalem Townsite	Diablo Townsite	Ross Lake to Gorge Lake	Gorge Lake to Bacon Creek	Bacon Creek to Sauk River Crossing	Sauk River Crossing to Oso	Oso to SR 528	SR 528 to Bothell Substation	B & W Road	Bacon Creek	Bogert & Tam	Barnaby Slough	Corkindale Creek	County Line Ponds	False Lucas Slough	Illabot North	Illabot South	Illabot Spawning Channel	McLeod Slough	Newhalem Ponds	Nooksack	North Everett Creek	Powerline Spawning Channel	Savage Slough	Taylor Spawning Channel	
<i>Acer platanoides</i>	Norway Maple	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X
<i>Acer pseudoplatanus</i>	Sycamore Maple	-	-	-	X	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X
<i>Aegopodium podagraria</i> ¹	Bishop's goutweed	-	-	-	X	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Arctium lappa</i>	Greater burdock	X	X	X	X	X	X	X	X	-	-	-	-	-	-	-	-	X	X	-	-	-	-	X	-	-	-	-	-	X
<i>Bromus tectorum</i> ¹	Cheatgrass	X	X	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Buddleja davidii</i>	Butterfly-bush	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	X
<i>Carduus pycnocephalus</i>	Italian thistle	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-
<i>Campanula rapunculoides</i>	Creeping bellflower	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Centaurea diffusa</i>	Diffuse knapweed	X	-	-	X	X	-	X	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Centaurea ×gerstlaueri</i>	Meadow knapweed	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Centaurea stoebe</i>	Spotted knapweed	X	X	-	-	X	-	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Cirsium arvense</i>	Canadian thistle	X	X		X	X	-	X	X	X	X	X	-	-	-	-	X	-	-	X	-	-	X	-	X	-	-	-	-	X
<i>Cirsium vulgare</i> ¹	Bull thistle	-	-	-	X	X	-	-	X	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	X
<i>Clematis vitalba</i>	Traveler's-joy	-	-	-	X	X	-	X	X	-	-	-	-	-	X	-	-	X		X	-	-	-	-	-	-	X	-	X	X
<i>Convolvulus arvensis</i>	Field bindweed	-	-	-	X	X	-	-	-	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X
<i>Conium maculatum</i>	Poison hemlock	-	-	-	-	X	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Crataegus monogyna</i>	English hawthorn	-	X	-	X	X	X	X	X	X	X	X	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	X
<i>Cytisus scoparius</i>	Scot's broom	-	X	-	X	X	-	X	X	X	X	X	-	-	X	-	-	X		X	X	X	-	X	-	-	-	-	X	X
<i>Daphne laureola</i>	Spurge-laurel	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Echium vulgare</i>	Common viper's bugloss	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Euphorbia oblongata</i>	Egg-leaf spurge	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Fallopia japonica</i>	Japanese knotweed	-	-	-	-	-	-	X	-	X	X	X	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	X
<i>Geranium robertianum</i>	Herb-Robert	X	X	X	X	X	-	X	X	X	X	X	X	X	X	X		X	X	X	X		X	X	X	X	X	X	X	X
<i>Hedera helix</i>	English ivy	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Hieracium aurantiacum</i>	Orange hawkweed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X
<i>Hieracium pilosella</i>	Mouse-eared hawkweed	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Hieracium piloselloides</i>	Tall hawkweed	X	-	X	X	X	-	X	X	-	-	X	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	X
<i>Hypericum perforatum</i> ¹	St. John's-wort	X	X	X	X	X	X	X	X	X	X	X	-	X	-	-	-	X	-	X	X	X	-	X	X	-	-	-	-	X
<i>Ilex aquifolium</i>	English holly	-	-	-	X	X	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X
<i>Jacobaea vulgaris</i> ¹	Tansy ragwort	X	-	-	X	X	-	X	-	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Juglans nigra</i>	Black walnut	-	-	-	X	X	-	-	X	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X
<i>Leucanthemum vulgare</i> ¹	Oxeye daisy	X	X	X	X	X	X	X	X	X	X	X	-	X	X	-	-	X		X	X	-	-	X	X	-	X	-	X	X

Scientific Name	Common Name	RLNRA							Transmission Line ROW				Fish and Wildlife Mitigation Lands																	Skagit River Banks Gorge Dam to the Sauk
		Ross Lake	Diablo Lake	Gorge Lake	Newhalem Townsite	Diablo Townsite	Ross Lake to Gorge Lake	Gorge Lake to Bacon Creek	Bacon Creek to Sauk River Crossing	Sauk River Crossing to Oso	Oso to SR 528	SR 528 to Bothell Substation	B & W Road	Bacon Creek	Bogert & Tam	Barnaby Slough	Corkindale Creek	County Line Ponds	False Lucas Slough	Illabot North	Illabot South	Illabot Spawning Channel	McLeod Slough	Newhalem Ponds	Nooksack	North Everett Creek	Powerline Spawning Channel	Savage Slough	Taylor Spawning Channel	
<i>Linaria dalmatica</i>	Dalmatian toadflax	-	-	-	X	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Linaria purpurea</i>	Purple toadflax	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-
<i>Lunaria annua</i>	Honesty	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Phalaris arundinacea</i>	Reed canarygrass	X	X	X	X	X	X	X	X	X	X	X	-	X	-	X	X	X	X	X	X	X	X	X	X	-	X	X	X	X
<i>Potentilla recta</i>	Sulphur cinquefoil	-	-	-	-	-	-	-	X	X	-	X	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-
<i>Prunus cerasifera</i>	Cherry plum	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Prunus lauroceraasus</i>	Cherry-laurel	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Robinia hispida</i>	Bristly locust	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Rubus bifrons</i>	Himalayan blackberry	-	-	-	X	X	-	X	X	X	X	X	-	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X
<i>Sorbus aucuparia</i>	European mountain-ash	-	-	-	X	X	-	X	X	X	X	X	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	X
<i>Tanacetum vulgare</i>	Common tansy	X	X	X	X	X	X	X	X	X	X	X	-	X	X	-	X	X	-	X	X	-	-	X	X	-	X	-	X	X
<i>Verbascum thapsus</i>	Flannel mullein	X	X	X	X	X	X	X	X	X	X	X	-		X	-		X	-	X	X	-	-	X	X	-	-	-	-	X
<i>Vinca minor</i>	Lesser periwinkle	-	-	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

1 These species were not on the original target invasive plant list; however, they were included in mapping and reporting at the request of City Light.