TR-07 NORTHERN GOSHAWK HABITAT ANALYSIS DRAFT REPORT

SKAGIT RIVER HYDROELECTRIC PROJECT FERC NO. 553

Seattle City Light

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Initial Study Report

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List of Acronyms and Abbreviations

BMP .....best management practice
CBI.....Conservation Biology Institute
City Light.....Seattle City Light
dbh.....diameter at breast height
DNR .....Department of Natural Resources (Washington State)
FERC.....Federal Energy Regulatory Commission
GIS .....Geographic Information System
ISR .....Initial Study Report
LiDAR.....Light Detection and Ranging
LP.....licensing participant
NPS .....National Park Service
PFA .....post-fledgling family area
PHS .....Priority Habitats and Species
PRM .....Project River Mile
Project .....Skagit River Hydroelectric Project
RLNRA .....Ross Lake National Recreation Area
ROW .....right-of-way
RSP .....Revised Study Plan
SR.....State Route
USFS .....U.S. Forest Service
USFWS .....U.S. Fish and Wildlife Service
WDFW.....Washington Department of Fish and Wildlife

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1.0 INTRODUCTION

The TR-07 Northern Goshawk Habitat Analysis is being conducted in support of the relicensing of the Skagit River Hydroelectric Project (Project), Federal Energy Regulatory Commission (FERC) No. 553, as identified in the Revised Study Plan (RSP) submitted by Seattle City Light (City Light) on April 7, 2021 (City Light 2021). On June 9, 2021, City Light filed a "Notice of Certain Agreements on Study Plans for the Skagit Relicensing" (June 9, 2021 Notice)[1] that detailed additional modifications to the RSP agreed to between City Light and supporting licensing participants (LP) (which include the Swinomish Indian Tribal Community, Upper Skagit Indian Tribe, National Marine Fisheries Service, National Park Service [NPS], U.S. Fish and Wildlife Service [USFWS], Washington State Department of Ecology, and Washington Department of Fish and Wildlife [WDFW]). The June 9, 2021 Notice proposed no changes to the Northern Goshawk Habitat Analysis as described in the RSP.

In its July 16, 2021 Study Plan Determination, FERC approved the Northern Goshawk Habitat Analysis without modification.

This study is complete and a draft report of the study efforts is being filed with FERC as part of City Light's Initial Study Report (ISR).

1.1 Background

The northern goshawk (*Accipiter gentilis*) occurs in a wide variety of boreal and montane forests in North America and Eurasia (WDFW 2021a). Goshawks inhabit all forested regions of Washington and prefer to nest in coniferous stands, although they are also known to nest in red alder (*Alnus rubra*) (WDFW 2010) and aspen (*Populus* spp.) groves (WDFW 2021a). The breeding season, including post-fledgling activity, in Washington generally ranges from March through September.

WDFW estimates there were 338 goshawk breeding territories statewide in 2003, but the current number of territories is unknown (WDFW 2021a). These woodland raptors are opportunistic foragers that prey on a variety of small to medium mammals and birds, including Douglas squirrel (*Tamiasciurus douglasii*), snowshoe hare (*Lepus americanus*), and grouse (*Dendragapus obscurus* and *Bonasa umbellus*) (Watson et al. 1998). Their diet also includes passerine birds, woodpeckers, and chipmunks (WDFW 2021a).

In Washington State, the northern goshawk is identified as a Priority Species under WDFW's Priority Habitats and Species (PHS) Program and is considered a state candidate species for listing as sensitive, threatened, or endangered (WDFW 2021b). Goshawk productivity and survival are highly dependent upon the availability of suitable prey and nesting habitat. There is evidence to suggest that timber harvest can fragment nesting habitat or otherwise adversely affect nest site selection and nesting rates (WDFW 2021a). Goshawks are also known to be sensitive human activities, including those that generate loud noises, especially during the breeding season (McClaren et al. 2015). Pedestrian activities as well as the use of heavy equipment near active nests may cause nest abandonment and failure (Squires and Kennedy 2006). Other evidence suggests that goshawks can adapt to regular vehicular noise, such as truck traffic on logging roads

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

near nest sites. Nesting goshawks exposed to regular logging truck activity in Arizona did not exhibit discernible responses to the noise, and all three nesting pairs successfully fledged young (Grubb et al. 2013). McGrath et al. (2003) found that goshawk nests in central Washington and northeastern Oregon occurred closer to forest roads compared with random sites, indicating some tolerance of human presence (e.g., periodic car and truck traffic). Irregular and loud noises (pile-driving/blasting) and pedestrian intrusion close to nests are anticipated to be more disruptive than regular activities that are farther away or less severe (McClaren et al. 2015).

1.2 Observations in Study Area

According to PHS data, only one potential goshawk nest has been identified within the study area (defined in Section 3.0 of this study report). The potential breeding area was observed in June 1987 at Roland Point on Ross Lake. Several goshawk sightings have been reported, including a juvenile goshawk that collided with a window at the Diablo Powerhouse in 2014. Following this incident, City Light conducted acoustic broadcast goshawk surveys in 2015 along the lower portions of the Stetattle Creek Trail and Sourdough Trail for evidence of nesting goshawks, but no goshawks were detected. Survey methods were based on a Washington Department of Natural Resources (DNR) protocol and approved by NPS staff (Tressler 2019).

Goshawks were detected 12 times during Landbird Inventory and Monitoring surveys conducted by the NPS in the North Cascades National Park Complex from 2008-2018 (Ray et al. 2018; NPS 2020), and twice during northern spotted owl (*Strix occidentalis caurina*) surveys in 1995 (NPS 2020). The NPS wildlife observation records documented a total of 32 goshawk observations during 1995-2018 (NPS 2020), and several recent goshawk sightings within the Project Boundary and general Project vicinity are noted in the eBird database (eBird 2021).

2.0 STUDY GOALS AND OBJECTIVES

The goal of this study is to identify suitable northern goshawk nesting habitat within and near (i.e., within 0.5 mile) the Project Boundary. The WDFW requested this habitat analysis, and City Light agreed to conduct the study as there is a mutual natural resource management interest. The objective of the study is to develop a map of suitable goshawk nesting habitat within the study area.

City Light intends to use the report and associated map products to minimize potential adverse effects of Project-related activity on nesting goshawks if occurring within the study area. Specifically, City Light will identify potential goshawk breeding areas prior to tree clearing and other non-routine Project activities that generate noise. Noise generated from non-routine work may be subject to individual project evaluations and best management practices (BMP), which will be developed later in the relicensing process. Noise analyses will rely on results of the RA-04 Project Sound Assessment (City Light 2022a) and other information in the license application.

3.0 STUDY AREA

The study area for the Northern Goshawk Habitat Analysis is approximately 142,220 acres. The study area consists of land within the Project Boundary as well as the area within 0.5 mile of the Project Boundary, as shown in Figure 3.0-1.

To organize the results of the study, the study area was divided into the following six segments as described below and shown in Figures 3.0-1, 3.0-2, and 3.0-3. Each study area segment includes the Project Boundary and associated lands within 0.5 mile.

- **Ross Lake National Recreation Area (RLNRA):** This study area segment occurs within the upper Skagit River basin and includes the Project Boundary within the RLNRA, including the transmission line rights-of-way (ROW), to the confluence of Bacon Creek with the Skagit River, but excluding City Light-owned fish and wildlife mitigation and other lands (e.g., the Newhalem Ponds [forested portions outside of the operational zone used for materials storage] and County Line Ponds). For reporting purposes, this segment is further divided into the following sub-segments:
  - Ross Lake exclusive of Big Beaver Valley;
  - Big Beaver Valley;
  - Diablo Lake;
  - Gorge Lake, including the approximately 3.5 miles of the transmission line ROW from the Diablo Powerhouse to the southern end of Gorge Lake; and
  - An approximately 8.5-mile corridor between Gorge Lake and Bacon Creek that includes the transmission line ROW and the Skagit River.
- **Transmission Line ROW Segments**
  - **Bacon Creek to Sauk River Crossing:** This study area segment occurs primarily within the upper Skagit River basin and includes the 14.3 miles of transmission line ROW **(excluding all fish and wildlife mitigation lands that fall within this segment)** from Bacon Creek to the Sauk River crossing. The lower approximately 2.5 miles of this segment occurs within the Sauk River basin.
  - **Sauk River Crossing to Oso:** This study area segment includes the 25.6 miles of transmission line ROW **(excluding all fish and wildlife mitigation lands that fall within this segment)** from the Sauk River transmission line crossing to the community of Oso. The eastern part of this segment is located in the Sauk River basin from the Sauk River crossing to near Darrington. The western portion of this segment, from Darrington to Oso, is located in the Stillaguamish River basin.
  - **Oso to State Route (SR) 528:** This study area segment includes the 17.5 miles of transmission line ROW from Oso to SR 528. The northern portion of this segment is located within the Stillaguamish River basin, and the southern portion of this segment is located within the Snohomish River basin.

- **SR 528 to Bothell Substation:** This study area segment is located primarily within the Snohomish River basin and includes the 14.4 miles of transmission line ROW from SR 528 to the Bothell substation. The lower approximately 1.5 miles of this segment is located in the Lake Washington basin.

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

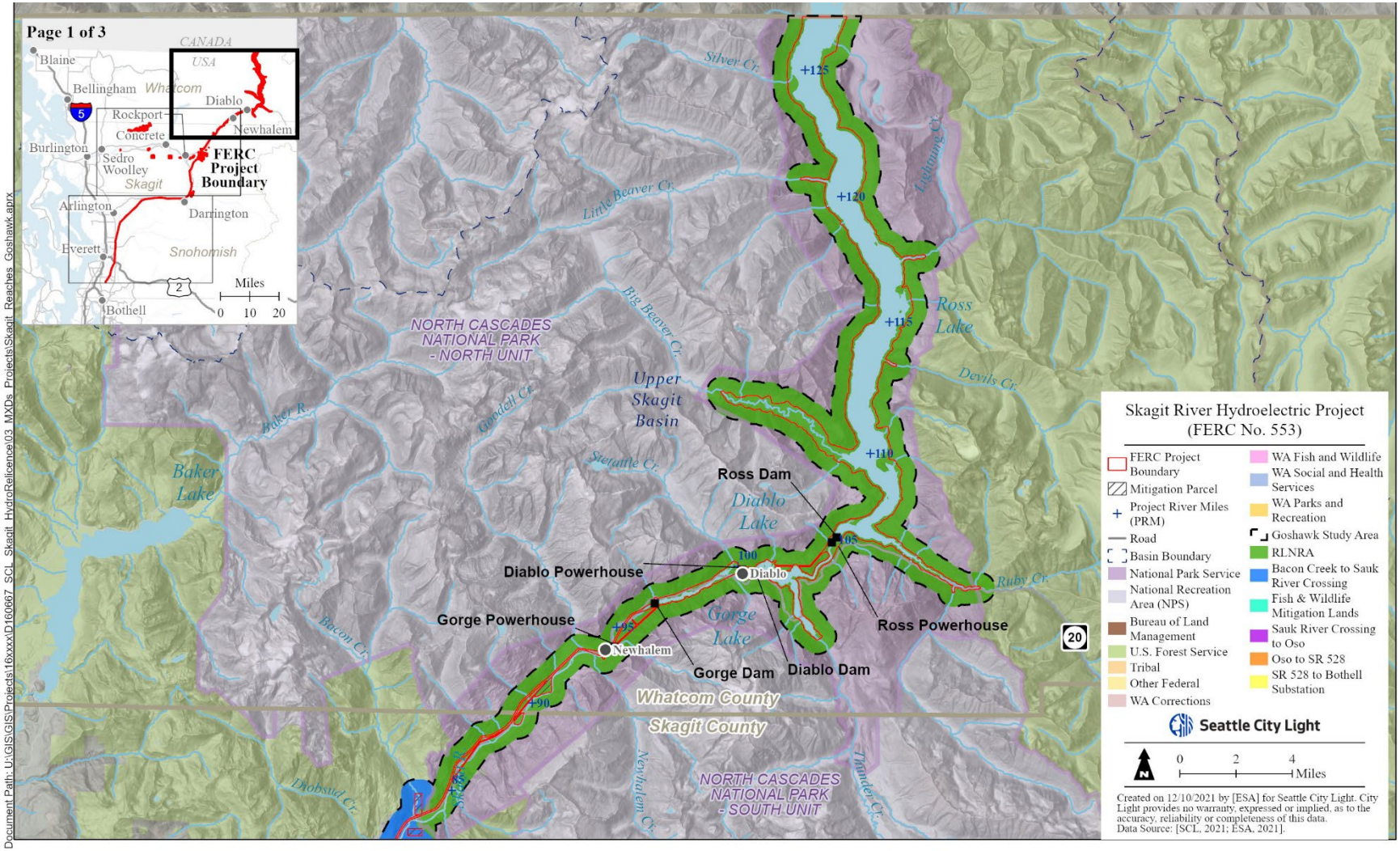

Figure 3.0-1. Study area segments for the Northern Goshawk Habitat Analysis (north).

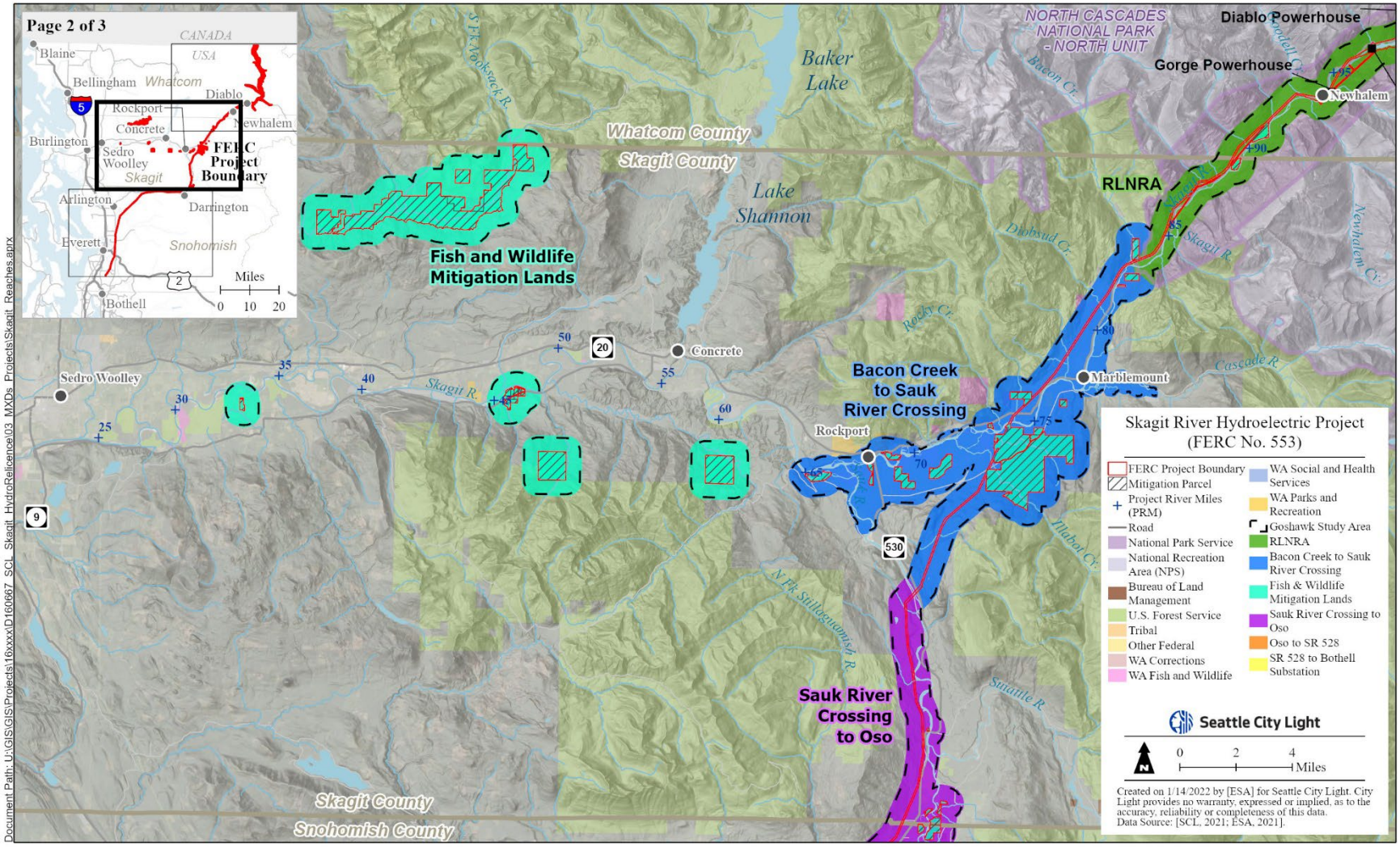

Figure 3.0-2. Study area segments for the Northern Goshawk Habitat Analysis (central).

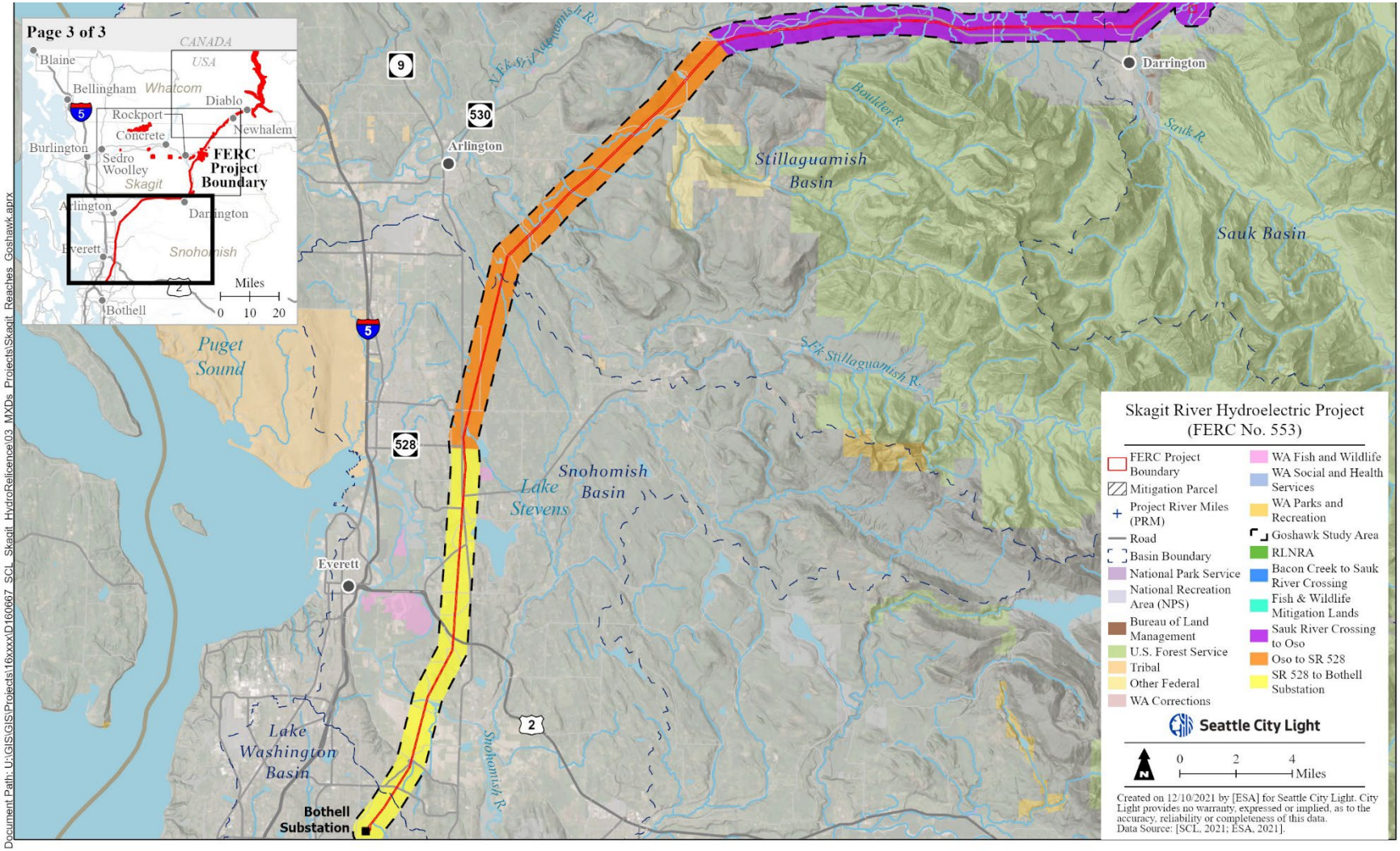

Figure 3.0-3. Study area segments for the Northern Goshawk Habitat Analysis (south).

4.0 METHODS

Methods used to develop a map of potentially suitable goshawk nesting habitat involved the following steps: (1) using existing information from relevant scientific literature and consultation with species experts and agency staff to identify goshawk nesting habitat suitability criteria (as described in Section 2.6.1 of the RSP); and (2) using a Geographic Information System (GIS) to combine the mapped habitat parameter layers to identify potentially suitable goshawk nesting habitat elements in a tiered manner (as described in Section 2.6.2 of the RSP). These steps are detailed below.

Methods also included a review of scientific literature and resource agency guidelines to summarize noise disturbance thresholds for goshawks (as described in Section 2.7 of the RSP). Sources reviewed are cited in the references section of this study plan.

4.1 Determining Goshawk Nesting Habitat Suitability Criteria

The study team reviewed state and federal agency reports and management plans, peer-reviewed published literature, NPS survey data, eBird records, and published literature to develop a Nesting Habitat Suitability Model. The model was based on habitat characteristics important to nesting goshawks. Sources reviewed or consulted for this study include, but are not limited to:

- WDFW PHS data, breeding area records 1987 to 2010;
- Management Recommendations for Washington's Priority Species – Northern Goshawk (Desimone and Hays 2003);
- Effects of landscape and local habitat attributes on Northern Goshawk site occupancy in western Washington (Finn et al. 2002a);
- North Cascades National Park Service Complex: Natural resource condition assessment (Hoffman et al. 2015);
- Unpublished data on goshawk detections (NPS 2020); and
- eBird goshawk records (2021).

Additionally, species experts and agency staff at NPS, U.S. Forest Service (USFS), and WDFW were consulted on habitat parameters for goshawk nesting and on the modeling approach. Suitable goshawk nesting habitat criteria were provided to staff from WDFW and NPS in the fall of 2021 (September 22 and September 29, 2021); no responses have been received to date. USFS was also provided the same information in the fall, and details of this coordination are included in Section 4.2 of this study report.

4.2 Identifying Potentially Suitable Goshawk Nesting Habitat

Habitat parameters identified in the literature and discussed below were incorporated into a Nesting Habitat Suitability Model to map and quantify potentially suitable goshawk nesting habitat within the study area. Analysts built the Nesting Habitat Suitability Model in GIS using a series of data layers, including results from the TR-01 Vegetation Mapping Study (City Light 2022b), which will be available to interested LPs upon request. The Nesting Habitat Suitability Model does not

attempt to delineate specific goshawk territories or home ranges but identifies where goshawks may be expected to nest within the study area based on forest cover characteristics.

Goshawks use a range of habitats, but nest sites tend to be in areas with a high proportion of late seral stage forest (Finn et al. 2002a), and foraging habitat is typically in mature and old-growth forests where understory is somewhat open (Reynolds et al. 1992). Goshawks require large forested landscapes to fulfill life requirements and can use a mix of forest types (Brewer et al. 2009). While goshawks generally prefer mature forests, they are not obligate old-growth forest breeders (Brewer et al. 2009). Feedback from USFS species experts on nesting habitat criteria included that goshawk nest sites in the Mount Baker-Snoqualmie National Forest tend to be in mature and old-growth forests; however, nest habitat can vary widely, and even small acres with suitable nest trees may be used (Reed 2021).

The three main components of the goshawk home range, in order of increasing size, are: (1) nest stands, (2) the post-fledgling family area (PFA), and (3) foraging areas (Reynolds et al. 1992). Goshawks may defend the nest stand and PFA portions of their home range (Reynolds et al. 1992). Measurable components of nest stands and PFAs were used to develop a Nesting Habitat Suitability Model in this study.

A goshawk nest area or stand is a relatively homogenous patch of tall trees adjacent to or surrounding a nest tree (Brewer et al. 2009). However, there is no standard definition of a "tall" tree in this context. According to the literature, goshawks can nest in a variety of forest types, and most studies report nest stand characteristics in seral stage, in diameter at breast height (dbh), or by age. For example, Finn et al. (2002a) found that 64-75 percent of occupied nest areas on the Olympic Peninsula were in late-seral forest, and the average age of trees at occupied nest stands was 147 years (Finn et al. 2002b). One study on the Olympic Peninsula (Fleming 1987) reported that goshawks typically nested in trees taller than 89 feet. Another study from Oregon suggests that goshawk nest sites are strongly associated with mid- and late-successional habitat (Desimone 1997). Mid-successional is defined as moving toward maturity but still possessing characteristics of a younger forest.

Nest stands which may contain one or more alternate nests are typically within a larger PFA that may consist of younger trees or a mix of seral stages (Reynolds et al. 1992; Clough 2000). The PFA is important for fledgling goshawks to learn to hunt and to avoid predation and provides foraging habitat for adult females (Reynolds et al. 1992; Kennedy et al. 1994; Squires and Kennedy 2006). This context of a nest stand of tall trees surrounded by a larger forested area of trees that may be younger provides the basis of the parameters for suitable goshawk nesting habitat.

WDFW defines goshawk nest stands as being a minimum of 30 acres and located within a PFA (Desimone and Hays 2003). WDFW characterizes PFAs as being 420 acres or greater, while Clough (2000) defines PFAs as at least 69 acres. The study team chose to use the smaller area for this mapping effort to avoid omitting or underestimating potentially suitable habitat.

Given the habitat requirements for goshawk nest stands within a surrounding PFA, a tiered approach was used to create the habitat suitability map (i.e., each tier is inclusive of all tiers preceding it); the first two tiers describe potentially suitable PFA, and the last two tiers define potentially suitable nesting habitat (within the PFA). The first tier consists of forested areas with

a mean height greater than 20 feet. The second tier includes Tier 1 areas that encompass 69 or more continuous acres. The third tier includes Tier 1 and Tier 2 areas with tree heights of 75 feet or higher. The fourth tier includes areas that meet all requirements of the previous three tiers and were at least 38 acres in area. A threshold of 75 feet was chosen because it is the minimum nest tree height recorded in WDFW PHS goshawk breeding records from 1987 to 2010 (WDFW 2010). The maximum nest tree height recorded is 150 feet, with 113 feet as the average nest tree height. To capture the range of forest types and tree heights that may be selected, a tall tree (≥ 113 feet) overlay is added to Tier 4 to show both location and density of the taller trees throughout the study area, representing potential highly suitable habitat. Justification for using particular habitat components in the tiered approach is provided in Table 4.2-1.

Table 4.2-1. Nesting Habitat Suitability Model (potentially suitable goshawk nesting habitat components tiered approach).

Tier[1]	Habitat Component	Thresholds		Justification
		Not Likely Suitable	Potentially Suitable	
1	PFA: mean tree height	Mean tree height ≤ 20 feet	Mean tree height > 20 feet	PFA is important for fledgling goshawks. Clough (2000) reported a relatively high abundance of "small-sized" trees (> 5-inch dbh, and > 50 percent canopy cover) adjacent to occupied nest areas. An average tree height of 20 feet is used to approximate forested conditions adjacent to a nest stand.
2	PFA: area	PFA < 69 acres	PFA ≥ 69 acres	Based on the mean distance from an occupied nest site to a forested edge, 299 meter or 981 feet, which translates to a 69-acre wooded area (Clough 2000).
3	Nest area (stand): mean tree height	Mean tree height < 75 feet	Mean tree height ≥ 75 feet	Goshawk nest tree height in western WA ranges from 75 to 150 feet and averages 113 feet (WDFW 2010); the low end of the range is used (75 feet) as an inclusive mean tree height requirement. A taller tree overlay (≥ 113 feet) was added to Tier 4 to differentiate the more mature/higher complexity canopies that may be potential highly suitable for nesting goshawks.
4	Nest area (stand): area	< 38 acres of mature trees	≥ 38 acres of mature trees	Goshawk nest areas vary widely in size depending on local conditions (1-148 acres; Brewer et al. 2009). A nest area of 38 acres from a habitat study in west-central Montana (Clough 2000) is used for this study.

1 Tier 4 is inclusive of Tiers 1-3 and contains all components of potentially suitable goshawk nesting habitat.

5.0 RESULTS

This section presents results from the Nesting Habitat Suitability Model and results from a review of noise disturbance thresholds for northern goshawks. Results from the literature review to support the Nesting Habitat Suitability Model may be found in Sections 1.1, 1.2, and 4.2 of this study report.

5.1 Summary of Goshawk Nesting Habitat Suitability Model Results

Potentially suitable goshawk nesting habitat is shown in Attachment A of this study report and summarized in the tables below. The results of this study are organized by study area segment. As shown in the maps, Tier 4 (which is inclusive of Tiers 1-3 criteria) represents potentially suitable goshawk nesting habitat. Areas within Tier 4 polygons with taller trees are shown as black pixels. The Nesting Habitat Suitability Model indicates that 20,889 acres, or approximately 15 percent of the entire study area, is potentially suitable nesting habitat (Table 5.1-1).

Table 5.1-1. Potentially suitable goshawk nesting habitat (Tier 4) acreage in the study area by segment.

Segment	Acreage of Potentially Suitable Habitat (% of segment)			Acreage of Total Study Area Segment
	Project Boundary	0.5 mile Buffer	Project Boundary + Buffer	
RLNRA	1,504 (3%)	9,411 (16%)	10,915 (19%)	56,598
Bacon Creek to Sauk River Crossing	5 (0.02%)	4,907 (19.08%)	4,912 (20%)	24,099
Sauk River Crossing to Oso	950 (5%)	754 (4%)	1,704 (9%)	19,659
Oso to SR 528	0	0	0	11,810
SR 528 to Bothell Substation	0	0	0	9,953
Fish and Wildlife Mitigation Lands	47 (0.23%)	3,311 (16.77%)	3,358 (17%)	20,101
Total	**2,506 (2%)**	**18,383 (13%)**	**20,889 (15%)**	**142,220**

The largest amount of potentially suitable goshawk habitat is located in the northern-most study area segment (RLNRA), and no potentially suitable goshawk habitat is identified for the southern segments (Oso to SR 528 and SR 528 to Bothell Substation). Approximately 19 percent (10,915 acres) of the RLNRA study area segment consists of potentially suitable goshawk habitat, including 3 percent within the Project Boundary (Table 5.1-1). Approximately 20 percent (4,912 acres) of the Bacon Creek to Sauk River Crossing study area segment is identified as potentially suitable goshawk habitat, with less than 1 percent occurring within the Project Boundary (Table 5.1-1). Of the study area segments that contain potentially suitable goshawk habitat, the smallest amount is found in the Sauk River Crossing to Oso study area segment, which has 9 percent or 1,704 acres. Seventeen percent (3,358 acres) of the fish and wildlife mitigation lands study area segment consists of potentially suitable goshawk habitat.

Table 5.1-2 presents the distribution of the four habitat tiers across the six study area segments. Even though each mapped tier is inclusive of areas within lower tiers (i.e., Tier 4 habitat also meets thresholds for Tiers 1-3), Table 5.1.2 and others presented here (i.e., Tables 5.1-5, 5.1-8, and 5.1-

10) report the *unique* and exclusive acreages for each tier (i.e., Tier 2 area in Table 5.1-2 includes only habitats that meet *all* Tier 2 requirements and *only* Tier 2 requirements), and do not incorporate the sum of acres in the lower tiers; as the Tiers increase, the areas presented are additive, and not cumulative.

For each table, the differences between subsequent tiers should be considered when assessing trends in habitat suitability. For example, in Table 5.1-2, there is a large increase in areas that *only* meet the thresholds for Tier 1 (3,926 acres of 142,220 in the entire study area) to areas that *only* meet the thresholds for Tier 2 (52,952 acres). This reflects the fact that the majority of the area in Tier 1 (all area except for 3,926 acres) qualifies as Tier 2 and indicates that where woody vegetation is present, it tends to also occur in large enough patches to qualify for Tier 2.

Conversely, the acreage in Tier 3 (2,744 acres) is much lower for the entire study area in comparison to Tier 2. This reflects the fact that although there are large areas (≥ 69 acres) of trees taller than 20 feet, there are fewer areas, or only 2,744 acres, that only meet the 75-foot threshold needed for Tier 3 (and do not also meet Tier 4 requirements). Similar to transitioning from Tier 1 to Tier 2, most areas in Tier 3 will be included in Tier 4 which again, is reflected in the large increase in unique values from Tier 3 (2,744 acres) and Tier 4 (20,889), showing that the majority of trees 75 feet or taller are in stands at least 38 acres in size. The data are presented in an additive format to avoid calculated total sums that are erroneously greater in acreage than that of the total study area segment.

The model indicates that 37 percent or 52,952 acres of the total study area meet the criteria for PFA (Tier 2), but lack the nest site tree height and size to qualify for potentially suitable goshawk habitat. Based on the totals per tier and for the entire study area shown in Table 5.1-2, 43 percent of the study area is not mapped as either Tier 1, 2, 3, or 4.

Table 5.1-2. Acreage of areas that meet thresholds for Tiers 1, 2, 3, and 4 in the study area by segment.

Segment	Acreage by Tier (% of segment)				Acreage of Total Study Area Segment
	Tier 1	Tier 2	Tier 3	Tier 4	
RLNRA	321 (1%)	24,729 (43%)	371 (1%)	10,915 (19%)	56,598
Bacon Creek to Sauk River Crossing	244 (1%)	11,956 (50%)	927 (4%)	4,912 (20%)	24,099
Sauk River Crossing to Oso	769 (4%)	9,732 (50%)	1,016 (5%)	1,704 (9%)	19,659
Oso to SR 528	784 (7%)	5,825 (49%)	410 (3%)	0	11,810
SR 528 to Bothell Substation	1,808 (18%)	710 (7%)	20 (< 1%)	0	9,953
Fish and Wildlife Mitigation Lands	550 (3%)	10,524 (52%)	518 (3%)	3,358 (17%)	20,101
Total	**3,926 (3%)**	**52,952 (37%)**	**2,744 (2%)**	**20,889 (15%)**	**142,220**

Table 5.1-3 presents the range of potentially suitable goshawk habitat patches by size category. Sixty-nine acres is the minimum size for a PFA, and 420 acres is WDFW's recommended size. The majority of potentially suitable goshawk nesting habitat patches identified are less than 100 acres in size for all of the study area segments that contain potentially suitable goshawk nesting

habitat. Only 10 areas meet WDFW's recommended threshold of 420 areas (Table 5.1-3). Four of the Tier 4 polygons greater than or equal to 420 acres are located in the RLNRA study area segment; three are located in the Bacon Creek to Sauk River Crossing study area segment; and three are in the Fish and Wildlife Mitigation Lands study area segment (this includes two polygons in the North Fork Nooksack River properties [see Attachment A, pages 21 and 22] and one polygon in the Finney Creek property [see Attachment A, page 18]). These large Tier 4 patches are described in more detail in the sections below.

Table 5.1-3. Potentially suitable goshawk nesting habitat acreage in the study area by patch size.

Segment	Acreage of Potentially Suitable Habitat (Tier 4) by patch size			
	≥69 ac, < 100 ac	≥ 100 ac, < 420 ac	≥ 420 ac, < 1,000 ac	≥ 1,000 ac
RLNRA	344	11	0	4
Bacon Creek to Sauk River Crossing	139	10	3[1]	0
Sauk River Crossing to Oso	46	5	0	0
Oso to SR 528	0	0	0	0
SR 528 to Bothell Substation	0	0	0	0
Fish and Wildlife Mitigation Lands	23	5	2	1
Total	**552**	**31**	**5**	**5**

1 Portions of these polygons cross into the Bacon Creek, Corkindale Creek, and Illabot South properties (see Attachment A pages 13, 15, and 16).

Goshawk Nesting Habitat Suitability Model results for each study area segment are described in further detail below.

5.1.1 RLNRA

The RLNRA study area segment contains 10,915 acres of the overall potentially suitable goshawk nesting habitat, representing 19 percent of the segment area (Table 5.1-1). Table 5.1-4 summarizes potentially suitable goshawk habitat for five sub-segments of the RLNRA study area segment. The largest sub-segment, Ross Lake (exclusive of Big Beaver Valley), contains the largest amount (7,353 acres or 67 percent) of potentially suitable goshawk nesting habitat in the RLNRA. Ross Lake is the only sub-segment for the entire study area with a PHS record of a potential goshawk breeding area.

Large swaths (greater than 1,000 acres) of potentially suitable goshawk habitat occur on both sides of Ross Lake from Project River Mile (PRM) 123 to 128 (see Attachment A, page 1). This northern portion of the study area consists of densely forested hillslopes and includes several named and unnamed streams. One of the largest swaths of potentially suitable goshawk habitat (greater than 1,000 acres) is mapped on the east side of Ross Lake from PRM 108 to 113 (see Attachment A, pages 4 and 5). This area also has a relatively high density of tall trees, indicating greater forest complexity and potentially higher suitability. Smaller patches of potentially suitable goshawk habitat occur throughout the study area segment and are primarily associated with stream drainages, including Little Beaver, Arctic, and Lightning creeks, the lower reach of Big Beaver Creek, and Barry, Lillian, and Happy creeks (see Attachment A, pages 1-8). Another large swath (greater than 1,000 acres) of Tier 4 habitat occurs from Bacon Creek to Thornton Creek on the

west side of the Skagit River from PRM 84 to 90 (see Attachment A, pages 12 and 13). Several tall trees are mapped on the hillslopes in this area, indicating potentially higher suitability for breeding goshawks.

Table 5.1-4. Potentially suitable goshawk nesting habitat in the RLNRA study area segment by sub-segment.

RLNRA Sub-segments	Acreage of Potentially Suitable Habitat (% of segment)			Acreage of Total Study Area Sub-Segment
	Project Boundary	0.5 mile Buffer	Project Boundary + Buffer	
Ross Lake exclusive of Big Beaver Valley	1,287(3%)	6,066 (16%)	7,353 (19%)	37,350
Big Beaver Valley	45 (3%)	0	45 (3%)	1,373
Diablo Lake	0	477 (9%)	477 (9%)	5,355
Gorge Lake plus ~3.5 miles of transmission line ROW from Diablo Powerhouse to the southern end of the lake	11(< 1%)	29 (1%)	40 (1%)	3,215
The corridor between Gorge Lake and Bacon Creek including ~ 8.5 miles of transmission line ROW and the Skagit River	162 (2%)	2,838 (30%)	3,000 (32%)	9,306
Total	**1,505 (3%)**	**9,410 (17%)**	**10,915 (20%)**	**56,599**

Table 5.1-5 presents the distribution of the four habitat tiers across the five sub-segments of the RLNRA study area segment. The model indicates that only a small amount of Tier 1 habitat (321 acres or 1 percent of the study area segment) does not also meet Tier 2 criteria. Conversely, the majority of the area in Tier 1 (excluding 321 acres) qualifies as Tier 2 habitat and is indicative of the large amount of continuous forested areas in the RLNRA study area segment. The model also indicates that 24,729 acres or 44 percent of the RLNRA study area segment meet the criteria for PFA but lack the nest site tree height and stand size to qualify for potentially suitable goshawk nesting habitat. Additionally, only a small portion of Tier 3 (371 acres or 1 percent) does not also meet Tier 4 criteria in the RLNRA study area segment.

Table 5.1-5. Acreage of Tiers 1, 2, 3, 4 in sub-segments of the RLNRA study area segment.

Segment	Acreage by Tier (% of segment)				Acreage of Total Study Area Sub-Segment
	Tier 1	Tier 2	Tier 3	Tier 4	
Ross Lake exclusive of Big Beaver Valley	120 (< 1%)	14,790 (40%)	159 (< 1%)	7,353 (20%)	37,350
Big Beaver Valley	24 (2%)	821 (60%)	16 (1%)	45 (3%)	1,373
Diablo Lake	21 (< 1%)	3,351 (63%)	74 (1%)	477 (9%)	5,355
Gorge Lake plus the ~ 3.5 miles of transmission line ROW from the Diablo Powerhouse to the southern end of the lake	28 (1%)	2,170 (67%)	40 (1%)	40 (1%)	3,215
The corridor between Gorge Lake and Bacon Creek including ~ 8.5 miles of transmission line ROW and the Skagit River	128 (1%)	3,597 (39%)	82 (1%)	3,000 (32%)	9,306
Total	**321 (1%)**	**24,729 (44%)**	**371 (1%)**	**10,915 (19%)**	**56,599**

5.1.2 Bacon Creek to Sauk River Crossing

The Bacon Creek to Sauk River Crossing study area segment has 4,912 acres of potentially suitable goshawk nesting habitat, which represent 20 percent of this study area segment (Table 5.1-1). Potentially suitable goshawk nesting habitat is scattered throughout the study segment. The largest areas of Tier 4 occur around Bacon Creek, Corkindale Creek, and north and south of Rockport. The Tier 4 habitat at the confluence of Bacon Creek with the Skagit River is just under 420 acres, and the patch has convoluted edges and intrusions of Tier 3 habitat that may lower the suitability of the area. A few areas of relatively tall trees are mapped throughout, especially in the upper slopes at the northern study area boundary (see Attachment A, page 13). The Tier 4 habitat near Corkindale Creek exceeds 420 acres and occurs largely outside of the mitigation property, and relatively few tall trees are mapped for the area (see Attachment A, page 15). A relatively high concentration of tall trees in Tier 4 occurs on the forested hillslope northeast of Rockport and in the vicinity of the McLeod Slough mitigation property southwest of Rockport (see Attachment A, page 17).

5.1.3 Sauk River Crossing to Oso

The Sauk River Crossing to Oso study area segment contains 1,704 acres of potentially suitable goshawk nesting habitat, which represents 1 percent of the total study area (Table 5.1-1). The largest patches of potentially suitable goshawk nesting habitat and the highest concentration of tall trees occur north of Darrington on the west side of the Sauk River (see Attachment A, pages 25 and 26). Smaller patches occur as isolated areas west of Darrington (see Attachment A, pages 27 to 29).

5.1.4 Oso to SR 528 and SR 528 to Bothell Substation

No potentially suitable goshawk nesting habitat was mapped in either the Oso to SR 528 or SR 528 to Bothell Substation study area segments (see Attachment A, pages 30 to 34). Rural and urban

development and forest fragmentation dominate the study area southwest of Oso. While some forested stands in this portion were tall and large enough in tree height and stand area to meet PFA criteria, stands with trees taller than 75 feet were small and scattered, and none were large enough to support a core nest area.

5.1.5 Fish and Wildlife Mitigation Lands

Tables 5.1-6 and 5.1-7 summarize potentially suitable goshawk nesting habitat on the fish and wildlife mitigation lands, including mitigation properties in the RLNRA (Newhalem/County Line ponds), South Fork Nooksack River basin, and Skagit River basin. No potentially suitable goshawk nesting habitat was identified in the Sauk River basin and, consequently, no table is presented for that basin.

The majority of potentially suitable goshawk nesting habitat on RLNRA mitigation lands was identified at the Newhalem Ponds (86 of 90 acres identified; see Table 5.1-6 and Attachment A, page 12).

Table 5.1-6. Potentially suitable goshawk nesting habitat on fish and wildlife mitigation lands, RLNRA study area segment, by property.

Property	Acreage of Potentially Suitable Habitat (% of property)	Acreage of Total Property Area
County Line Ponds	4 (2%)	56
Newhalem Ponds	86 (77%)	111[1]
Total	**90 (54%)**	**167**

1 Acreage includes approximately 4-acre storage area that is dedicated to Project operations.

In the South Fork Nooksack River basin, there were 1,324 acres of potentially suitable goshawk nesting habitat identified on City Light fish and wildlife mitigation lands, but the largest portion of habitat was mapped in the 0.5-mile buffer area outside of the mitigation lands (Table 5.1-7). The limited acreage of Tier 4 on the mitigation lands, excluding the buffer, is likely due to timber harvests that occurred in the 1970s-1990s prior to City Light purchasing the properties during the current license period. Continued forest management by industrial timberland owners and Washington DNR results in rotation of stand ages outside of the mitigation lands.

Table 5.1-7. Potentially suitable goshawk nesting habitat on fish and wildlife mitigation lands, South Fork Nooksack River basin, by property.

Property	Acreage of Potentially Suitable Habitat (% of property)	Acreage of Total Property Area
Bear Lake	0	155
Nooksack	949 (24%)	3,854
Nooksack West	375 (96%)	389
Outside Project Boundary[1]	5,673 (69%)	8,187
Total	**6,997 (55%)**	**12,585**

1 This includes the area outside of the fish and wildlife mitigation lands but within the 0.5-mile study area.

Table 5.1-8 presents the distribution of the four habitat tiers per property for the fish and wildlife mitigation lands in the South Fork Nooksack River basin. The model indicates that 53 percent or 6,610 acres of the South Fork Nooksack River basin, including 2,236 acres on mitigation properties, meet the criteria for PFA but lack the nest site tree height and stand area to qualify as potentially suitable goshawk nesting habitat.

Table 5.1-8. Acreage of Tiers 1, 2, 3, and 4 on fish and wildlife mitigation lands, South Fork Nooksack River basin, by property.

Property	Acreage by Tier (% of property)				Acreage of Total Property Area
	Tier 1	Tier 2	Tier 3	Tier 4	
Bear Lake	0	87 (56%)	0	0	155
Nooksack	7 (< 1%)	2,236 (58%)	106 (3%)	949 (25%)	3,854
Nooksack West	0	159 (41%)	4 (1%)	212 (54%)	389
Outside Project Boundary[1]	85 (1%)	4,128 (50%)	206 (3%)	1,254 (15%)	8,187
Total	**92 (1%)**	**6,610 (53%)**	**316 (3%)**	**1,466 (12%)**	**12,585**

1 This includes the area outside of the fish and wildlife mitigation lands but within the 0.5-mile study area.

Of the Skagit River basin fish and wildlife mitigation lands, large areas of potentially suitable goshawk nesting habitat were identified on the Illabot South (four areas totaling 473 acres), Finney Creek (373 acres), and Pressentin (302 acres) properties (Table 5.1-9) (see Attachment A, pages 16, 18, and 19). Both Finney Creek and Pressentin properties contain relatively large patches of Tier 4 that are moderately- to highly-convoluted. Pressentin has a relatively high concentration of tall trees compared to Finney Creek, which might make it more suitable for nesting goshawks.

Table 5.1-9. Potentially suitable goshawk nesting habitat on fish and wildlife mitigation lands, Skagit River basin, by property.

Property	Acreage of Potentially Suitable Habitat (% of property)	Acreage of Total Property Area
B&W Road 1	0	79
B&W Road 2	2 (18%)	11
Bacon Creek	78 (65%)	119
Barnaby Slough	142 (63%)	225
Bogert & Tam	0	17
Corkindale Creek	33 (23%)	143
Day Creek Slough	0	38
Day Creek Slough Outside Project Boundary[1]	0	888
False Lucas Slough	120 (59%)	204
Finney Creek	373 (58%)	642
Finney Creek Outside of Project Boundary[1]	64 (4%)	1,784
Illabot North	64 (9%)	726
Illabot South	473 (19%)	2,522
Johnson Slough	0	67
McLeod Slough	36 (28%)	126
Napoleon Slough	50 (80%)	62
O'Brien Slough	0	47
Pressentin	302 (47%)	637
Pressentin Outside of Project Boundary[1]	156 (9%)	1,779
Savage Slough	0	211
Savage Slough Outside of Project	0	1,378
South Marble 40	0	41
Total	**1,893 (16%)**	**11,476**

1 This includes the area outside of the fish and wildlife mitigation lands but within the 0.5-mile study area. Acreage mapped outside the Project Boundary, but within the 0.5-mile study area, for the rest of these properties is captured in the Bacon Creek to Sauk River Crossing study area segment in Table 5.1-1.

Table 5.1-10 shows the distribution of tiers per property for the fish and wildlife mitigation lands in the Skagit River basin. A large portion (57 percent or 6,516 acres) of the basin meets the criteria for PFA but lacks the stand size and tree height preferred for nesting sites.

Table 5.1-10. Acreage of Tiers 1, 2, 3, and 4 on fish and wildlife mitigation lands, Skagit River basin by property.

Property	Acreage by Tier (% of property)				Acreage of Total Property Area
	Tier 1	Tier 2	Tier 3	Tier 4	
B&W Road 1	0	67 (85%)	5 (6%)	0	79
B&W Road 2	0	6 (55%)	0	2 (18%)	11
Bacon Creek	1 (1%)	3 (3%)	0	78 (66%)	119
Barnaby Slough	1 (< 1%)	32 (14%)	0	142 (63%)	225
Bogert & Tam	0	12 (71%)	1 (6%)	0	17
Corkindale Creek	0	4 (3%)	0	33 (23%)	143
Day Creek Slough	3 (8%)	0	0	0	38
Day Creek Slough Outside Project Boundary[1]	258 (29%)	0	0	0	888
False Lucas Slough	0	27 (13%)	0	120 (59%)	204
Finney Creek	0	255 (40%)	3 (< 1%)	373 (58%)	642
Finney Creek Outside of Project Boundary[1]	3 (< 1%)	1,405 (79%)	26 (1%)	64 (4%)	1,784
Illabot North	0	567 (78%)	52 (7%)	64 (9%)	726
Illabot South	0	1,840 (73%)	25 (1%)	473 (19%)	2,522
Johnson Slough	1 (1%)	25 (37%)	17 (25%)	0	67
McLeod Slough	4 (3%)	30 (24%)	0	36 (29%)	126
Napoleon Slough	0	10 (16%)	0	50 (81%)	62
O'Brien Slough	0	33 (70%)	10 (21%)	0	47
Pressentin	0	205 (32%)	22 (3%)	302 (47%)	637
Pressentin Outside of Project Boundary[1]	1 (< 1%)	1,298 (73%)	146 (8%)	156 (9%)	1,779
Savage Slough	1 (< 1%)	129 (61%)	1 (< 1%)	0	211
Savage Slough Outside of Project	193 (14%)	536 (39%)	2 (< 1%)	0	1,378
South Marble 40	0	32 (78%)	0	0	41
Total	**466 (4%)**	**6,516 (57%)**	**310 (3%)**	**1,893 (16%)**	**11,476**

1 This includes the area outside of the fish and wildlife mitigation lands but within the 0.5-mile study area. Acreage mapped outside the Project Boundary, but within the 0.5-mile study area, for the rest of these properties is captured in the Bacon Creek to Sauk River Crossing study area segment in Table 5.1-1.

5.2 Noise Disturbance Thresholds

A review of the literature and agency guidelines conducted to inform the effects analysis that will occur in the license application indicated there is limited information on noise disturbance thresholds for northern goshawks. In the absence of species-specific noise thresholds, possible tools for determining whether a project may adversely affect nesting goshawks include the USFWS effect determination guidelines for marbled murrelet (*Brachyramphus marmoratus*) and the northern spotted owl (USFWS 2015). For example, USFWS guidance indicates that heavy

equipment operation (including chainsaws) greater than 0.25 mile away from an active nest site would have no effect on breeding murrelets or spotted owls. Similarly, heavy equipment activity that is at least 195 feet from an active northern spotted owl nest may affect the breeding pair, but not to the level of harassment (USFWS 2015). Additionally, WDFW recommends a protected buffer of 0.5 mile around active goshawk nests to exclude activities such as road building, logging, site preparation, and herbicide and pesticide application during the goshawk nesting season (Desimone and Hays 2003).

Northern goshawks have low to moderate tolerance levels for new disturbances near nest sites (Coast Forest Conservation Initiative 2012), and tolerance levels can vary by individual, condition, and experience of the breeding pair as well as nesting stage (Petty 1996). First-time nesters are more likely to abandon nests than more experienced pairs, and the availability of prey influences the tolerance levels of all nesting pairs (Petty 1996). Additionally, disruptions during the nest-building and egg-laying nest stages are more likely to result in nest abandonment than later stages when the goshawk pair is more invested in the site (Petty 1996; Reynolds et al. 1992).

In a review of goshawk territory occupancy and success in the Lake Tahoe area, researchers found that reproductive success was higher within frequently occupied territories where human activity was half the amount found in territories that were infrequently occupied (Morrison et al. 2009). Human activity included roads and trails within territories.

In contrast, some studies suggest that logging truck and other vehicle activity near or within 0.25 mile of an active nest may be allowable or at least not detrimental to nesting goshawks (Grubb et al. 2013; Goodell and Seager 2015). Grubb et al. (2013) observed the reactions of three nesting pairs of goshawks approximately 255, 470, and 550 feet away from logging truck activity and found that alert responses were inversely proportional to the distance from the nearest road, but no flushes were recorded due to the noise. The experiment was conducted in June on the Kaibab Plateau in northern Arizona, presumably during the late incubation/nestling phase. All three pairs successfully fledged young.

Despite the variety of factors influencing whether goshawks may or may not abandon a nest site, researchers in general recommend minimizing disturbance during the breeding season to the greatest extent possible to promote long-term breeding success (Coast Forest Conservation Initiative 2012; Reynolds et al. 1992; Desimone and Hays 2003). Specific measures for avoiding and minimizing effects may include:

- Conduct operations and maintenance activities and new projects outside of the breeding season (various citations);
- If complete avoidance of the breeding season is not feasible, avoid the most sensitive stages of nesting: nest construction (March to early April) and egg-laying/incubation (early April through May) (Petty 1996);
- Select projects that are screened from goshawk nest sites by topography to minimize disturbance (Petty 1996); and
- Limit disturbances to 1 year; human activities over multiple years in the same area are likely to cause abandonment of the nest site (Wisconsin DNR 2012).

6.0 DISCUSSION AND FINDINGS

This study has met the goals and objectives stated in the RSP and presented in Section 2.0 of this study report. The results of the study will be used in the license application to assess Project effects and to inform the development of goshawk protection BMPs for operations and maintenance activities and new construction in or near goshawk nesting habitat, if warranted.

The Nesting Habitat Suitability Model identifies 15 percent of the entire study area as potentially suitable goshawk nesting habitat, with the largest patches mapped on the east side of Ross Lake from PRM 108 to 113 and along the Skagit River from PRM 83 to 90. Approximately 37 percent of the entire study area is mapped only as Tier 2, indicating that adequate PFA is present but suitable nest stands are absent. Areas that only qualify as Tier 1 and Tier 3 cover only 3 and 2 percent of the entire study area, respectively; 43 percent of the study area does not meet any of the nesting criteria, indicating that the land cover is either water, developed, agricultural, pastureland, or young or newly planted forest. The tall tree overlay on Tier 4 allows identification of potentially older, multi-storied conifer forests and thus potentially more suitable for goshawk nesting habitat.

The Nesting Habitat Suitability Model does not account for human disturbance nor does it incorporate buffers into the identification of potentially suitable nesting areas, but Tier 2 (forested areas 69 acres or larger) excludes highly fragmented sites that are likely to have more frequent human activity, such as agricultural parcels, tree plantations, and rural residences. Other ecological factors that contribute to successful goshawk nesting habitat, such as adequate prey base and low fragmentation/low edge effect of suitable nesting habitat areas (e.g., shape of Tier 4 habitat patches), are not addressed by the Nesting Habitat Suitability Model and may influence whether a seemingly suitable nest site is occupied or not.

7.0 VARIANCES FROM FERC-APPROVED STUDY PLAN AND PROPOSED MODIFICATIONS

There were two minor variances to the study plan as it was approved by FERC. The RSP indicates that the Conservation Biology Institute (CBI) mapping of old-growth and late seral stage forests of the North Cascades would be combined in GIS with other data layers to model goshawk nesting habitat within the 0.5-mile study area buffer. However, after reviewing and comparing datasets, the CBI mapping data were not used in the Nesting Habitat Suitability Model because the Light Detection and Ranging (LiDAR) data and derivative TR-01 Vegetation Mapping Study products provided higher resolution canopy height data and more detailed habitat data and were therefore more appropriate (City Light 2022b). The CBI data is a public data set and can be viewed by LPs if interested.[2] By using higher resolution canopy data and more detailed habitat data, City Light met the intent of the study plan.

The study plan also indicates that limited field review would be used to help define potentially suitable goshawk nesting habitat components in the study area. Because the LiDAR data are high resolution, they proved more than adequate to identify potentially suitable goshawk nesting components within the study area, and field reviews were not needed. City Light met the intent of the study plan by using high resolution data, and the goals and objectives of this study were accomplished.

[2] CBI data can be found at the following link: https://databasin.org/galleries/90e11cbab3724db2aa801e67643d9151/.

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NORTHERN GOSHAWK HABITAT ANALYSIS DRAFT REPORT

ATTACHMENT A

POTENTIALLY SUITABLE GOSHAWK NESTING HABITAT MAPBOOK

TR-07 POTENTIAL SUITABLE GOSHAWK NESTING HABITAT MAPBOOK

- FERC Project Boundary
- Project River Miles
- Project River Centerline
- Other Road
- Goshawk Study Area

Suitable Nesting Habitat Tiers*

- Tier 1 – PFA forest height (mean tree height > 20 feet)
- Tier 2 – PFA stand size (area ≥ 69 acres)
- Tier 3 – Nest tree height (mean tree height ≥ 75 feet)
- Tier 4 – Nest stand size (core nest area ≥ 38 acres) = Potentially Suitable Goshawk Nesting Habitat
- Trees ≥ 113 feet within Tier 4

*Each tier builds on the previous tier. For example, Tier 2 includes Tier 1, Tier 3 includes 2 and 1. Tier 4 is the combination of Tiers 1 - 3.

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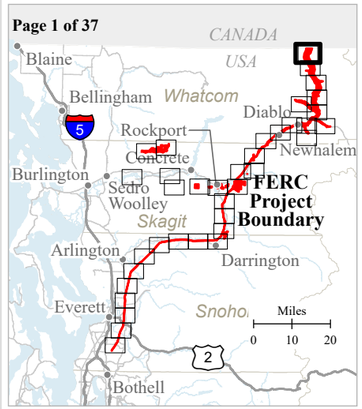

Seattle City Light

SKAGIT RIVER HYDROELECTRIC PROJECT (FERC NO. 553)

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TR-07 POTENTIAL SUITABLE GOSHAWK NESTING HABITAT MAPBOOK

- FERC Project Boundary
- Project River Miles
- Project River Centerline
- Goshawk Study Area

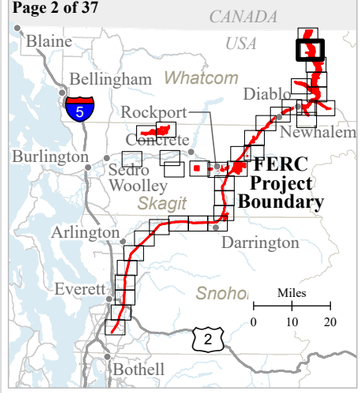
Suitable Nesting Habitat Tiers*

- Tier 1 – PFA forest height (mean tree height > 20 feet)
- Tier 2 – PFA stand size (area ≥ 69 acres)
- Tier 3 – Nest tree height (mean tree height ≥ 75 feet)
- Tier 4 – Nest stand size (core nest area ≥ 38 acres) = Potentially Suitable Goshawk Nesting Habitat
- Trees ≥ 113 feet within Tier 4

*Each tier builds on the previous tier. For example, Tier 2 includes Tier 1, Tier 3 includes 2 and 1. Tier 4 is the combination of Tiers 1 - 3.

N

0 1,000 2,000 Feet



Seattle City Light

SKAGIT RIVER HYDROELECTRIC PROJECT (FERC NO. 553)

Created on 12/29/2021 by ESA for Seattle City Light.

Data Source: [NAIP, 2015; NPS, 2020; SCL, 2020].

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TR-07 POTENTIAL SUITABLE GOSHAWK NESTING HABITAT MAPBOOK

- FERC Project Boundary
- Project River Miles
- Project River Centerline
- Goshawk Study Area

Suitable Nesting Habitat Tiers*

- Tier 1 – PFA forest height (mean tree height > 20 feet)
- Tier 2 – PFA stand size (area ≥ 69 acres)
- Tier 3 – Nest tree height (mean tree height ≥ 75 feet)
- Tier 4 – Nest stand size (core nest area ≥ 38 acres) = Potentially Suitable Goshawk Nesting Habitat
- Trees ≥ 113 feet within Tier 4

*Each tier builds on the previous tier. For example, Tier 2 includes Tier 1, Tier 3 includes 2 and 1. Tier 4 is the combination of Tiers 1 - 3.

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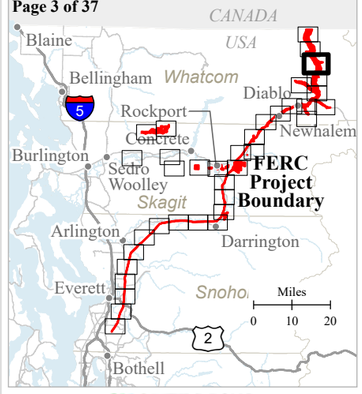

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TR-07 POTENTIAL SUITABLE GOSHAWK NESTING HABITAT MAPBOOK

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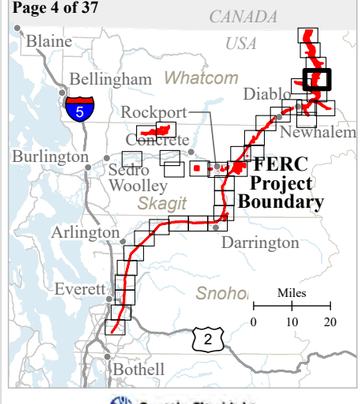

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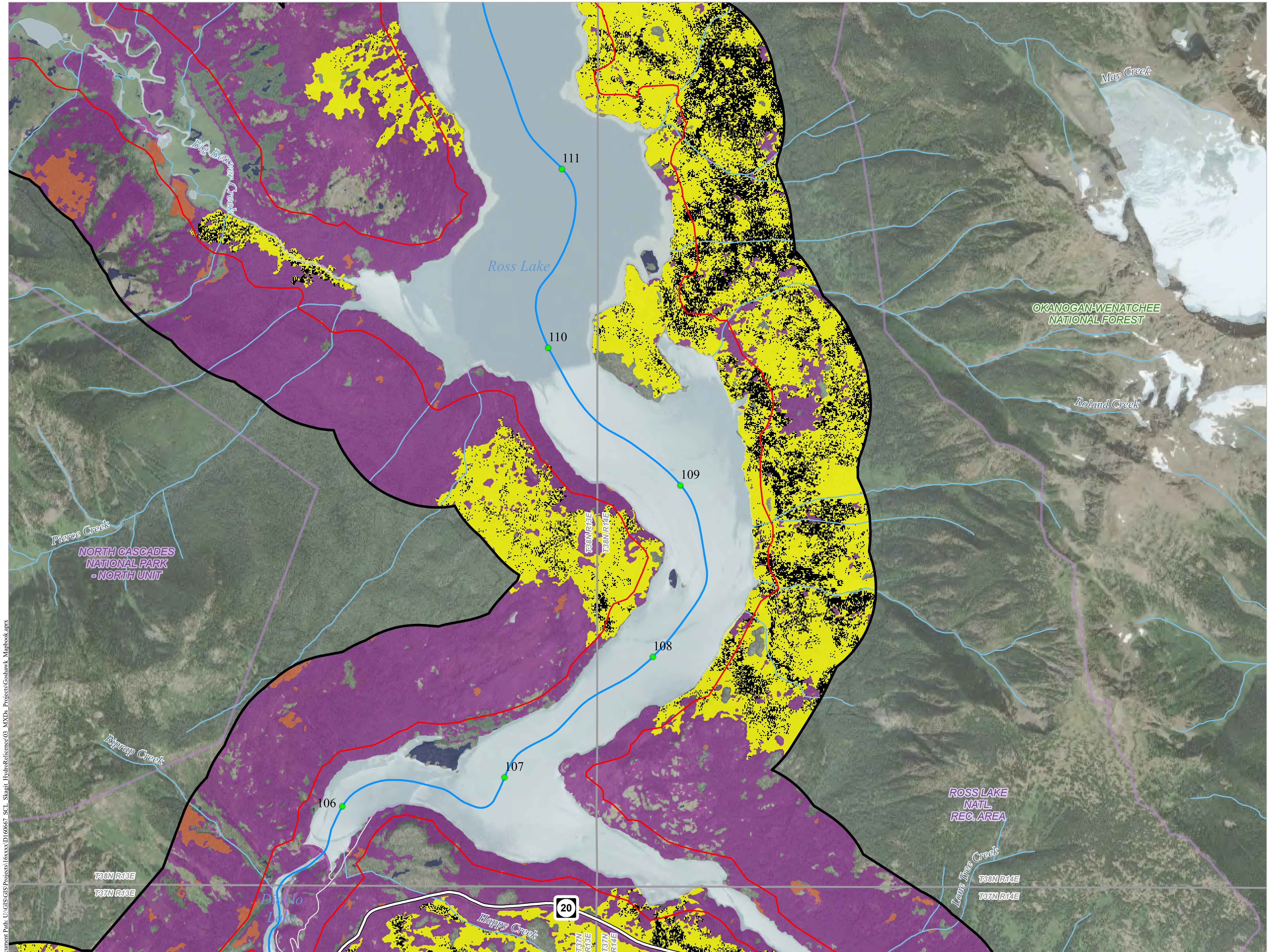

TR-07 POTENTIAL SUITABLE GOSHAWK NESTING HABITAT MAPBOOK

- FERC Project Boundary
- Project River Miles
- Project River Centerline
- Secondary Highway
- Other Road
- Goshawk Study Area

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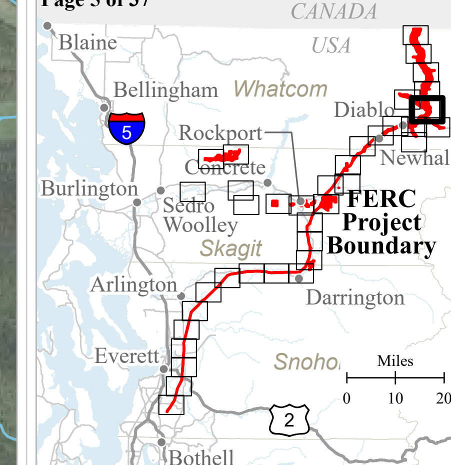

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TR-07 POTENTIAL SUITABLE GOSHAWK NESTING HABITAT MAPBOOK

- FERC Project Boundary
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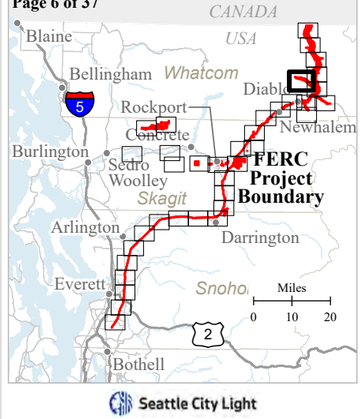

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SKAGIT RIVER HYDROELECTRIC PROJECT (FERC NO. 553)

TR-07 POTENTIAL SUITABLE GOSHAWK NESTING HABITAT MAPBOOK

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- Project River Miles
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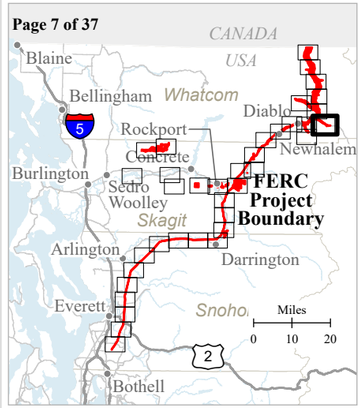

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TR-07 POTENTIAL SUITABLE GOSHAWK NESTING HABITAT MAPBOOK

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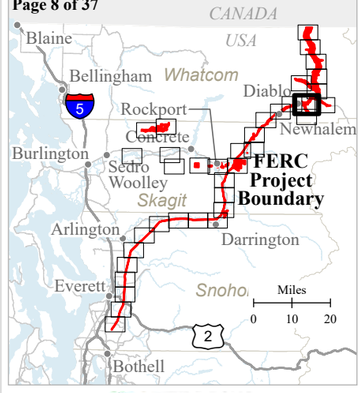

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TR-07 POTENTIAL SUITABLE GOSHAWK NESTING HABITAT MAPBOOK

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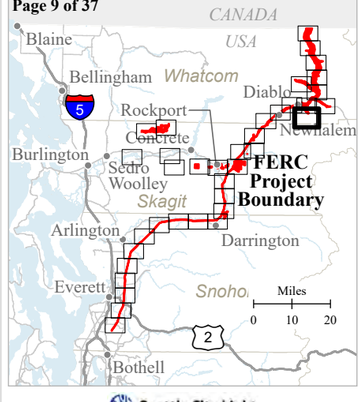

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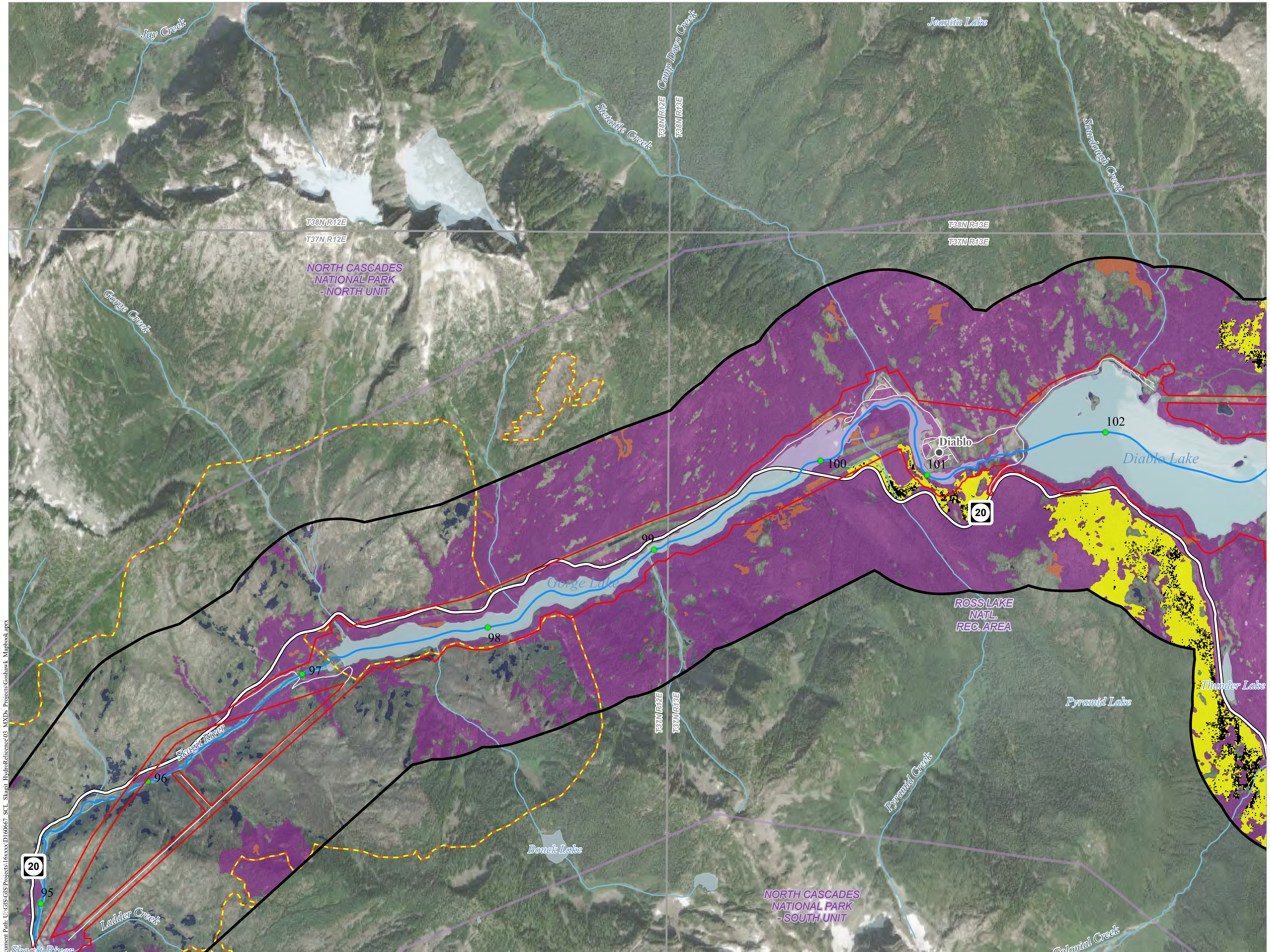

TR-07 POTENTIAL SUITABLE GOSHAWK NESTING HABITAT MAPBOOK

- FERC Project Boundary
- Project River Miles
- Project River Centerline
- Secondary Highway
- Other Road
- Goodell Fire Boundary
- Goshawk Study Area

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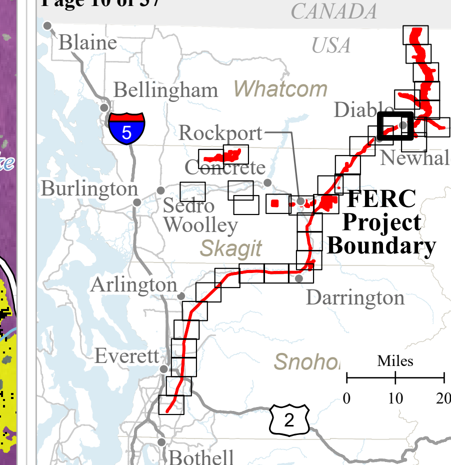

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TR-07 POTENTIAL SUITABLE GOSHAWK NESTING HABITAT MAPBOOK

- FERC Project Boundary
- Mitigation Parcel
- Project River Miles
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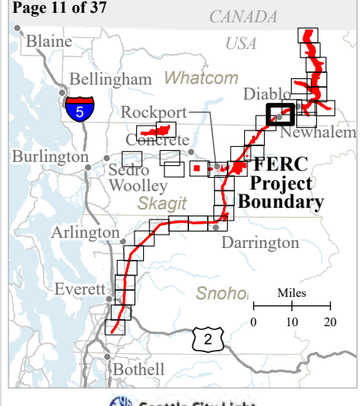

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TR-07 POTENTIAL SUITABLE GOSHAWK NESTING HABITAT MAPBOOK

- FERC Project Boundary
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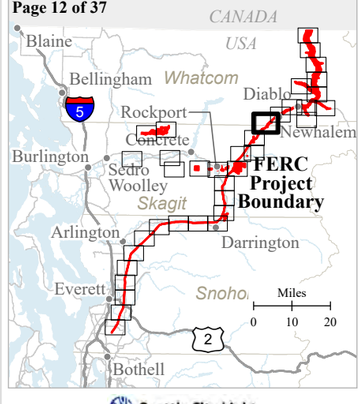

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TR-07 POTENTIAL SUITABLE GOSHAWK NESTING HABITAT MAPBOOK

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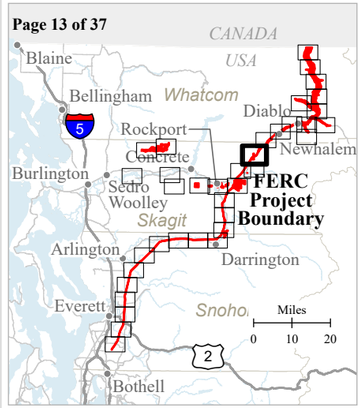

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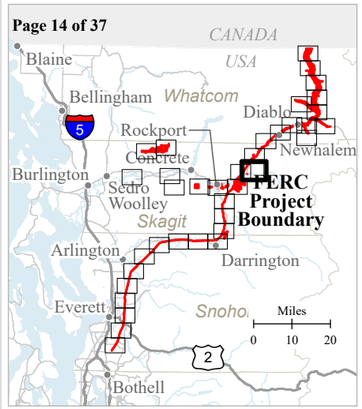

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TR-07 POTENTIAL SUITABLE GOSHAWK NESTING HABITAT MAPBOOK

- FERC Project Boundary
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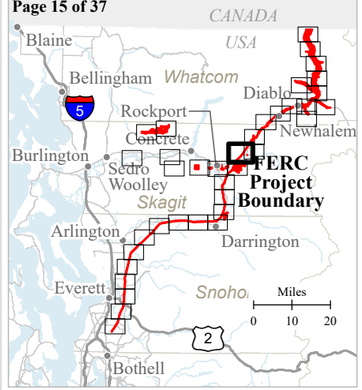

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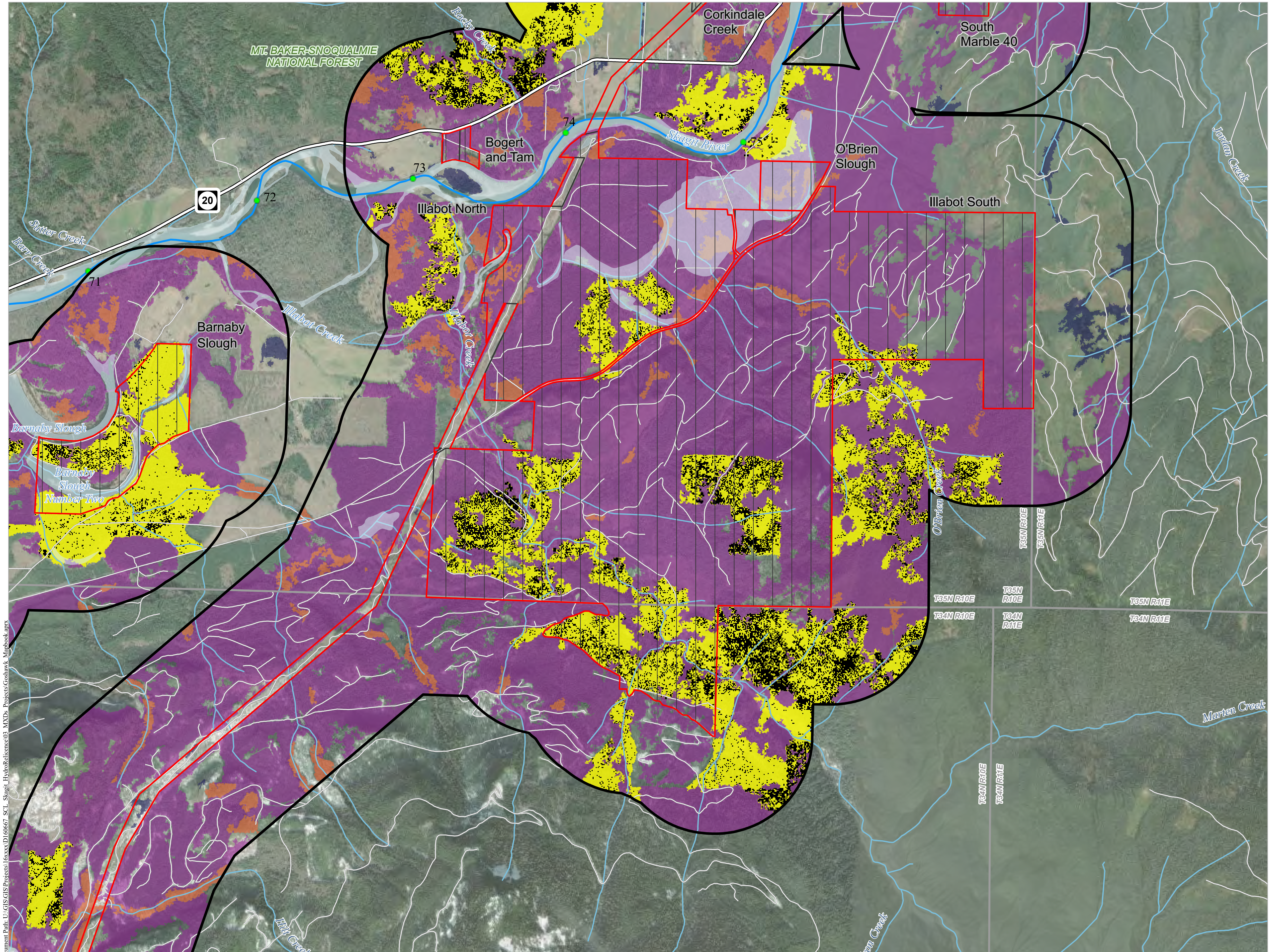

TR-07 POTENTIAL SUITABLE GOSHAWK NESTING HABITAT MAPBOOK

FERC Project Boundary
Mitigation Parcel
Project River Miles
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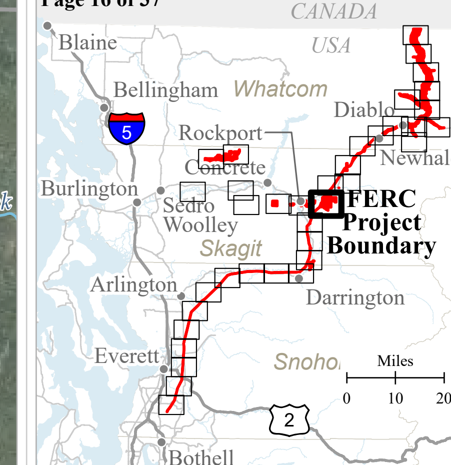

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TR-07 POTENTIAL SUITABLE GOSHAWK NESTING HABITAT MAPBOOK

- FERC Project Boundary
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- Project River Miles
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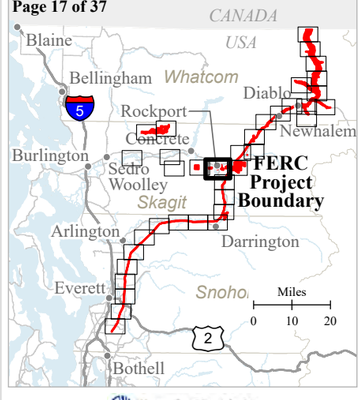

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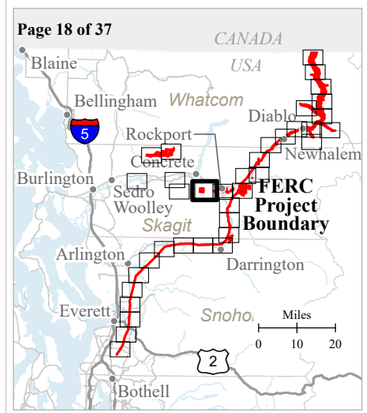

Seattle City Light

SKAGIT RIVER HYDROELECTRIC PROJECT (FERC NO. 553)

TR-07 POTENTIAL SUITABLE GOSHAWK NESTING HABITAT MAPBOOK

Mitigation Parcel

Other Road

Goshawk Study Area

Suitable Nesting Habitat Tiers*

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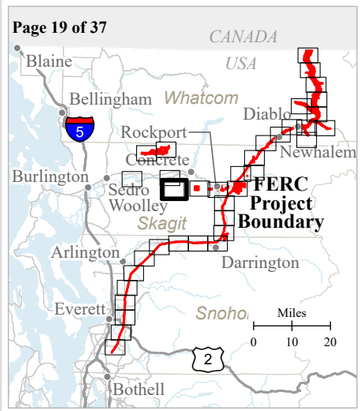

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*Each tier builds on the previous tier. For example, Tier 2 includes Tier 1, Tier 3 includes 2 and 1. Tier 4 is the combination of Tiers 1 - 3.

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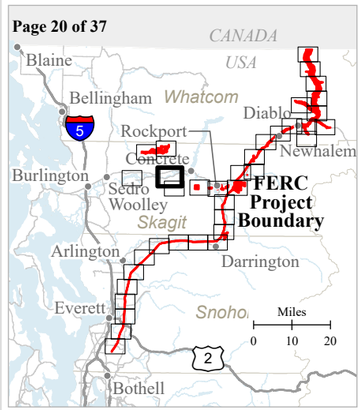
0 1,000 2,000 Feet



Seattle City Light

SKAGIT RIVER HYDROELECTRIC PROJECT (FERC NO. 553)

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Data Source: [NAIP, 2015; NPS, 2020; SCL, 2020].

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