Appendix F
Wildlife Habitat Evaluation

MEMORANDUM

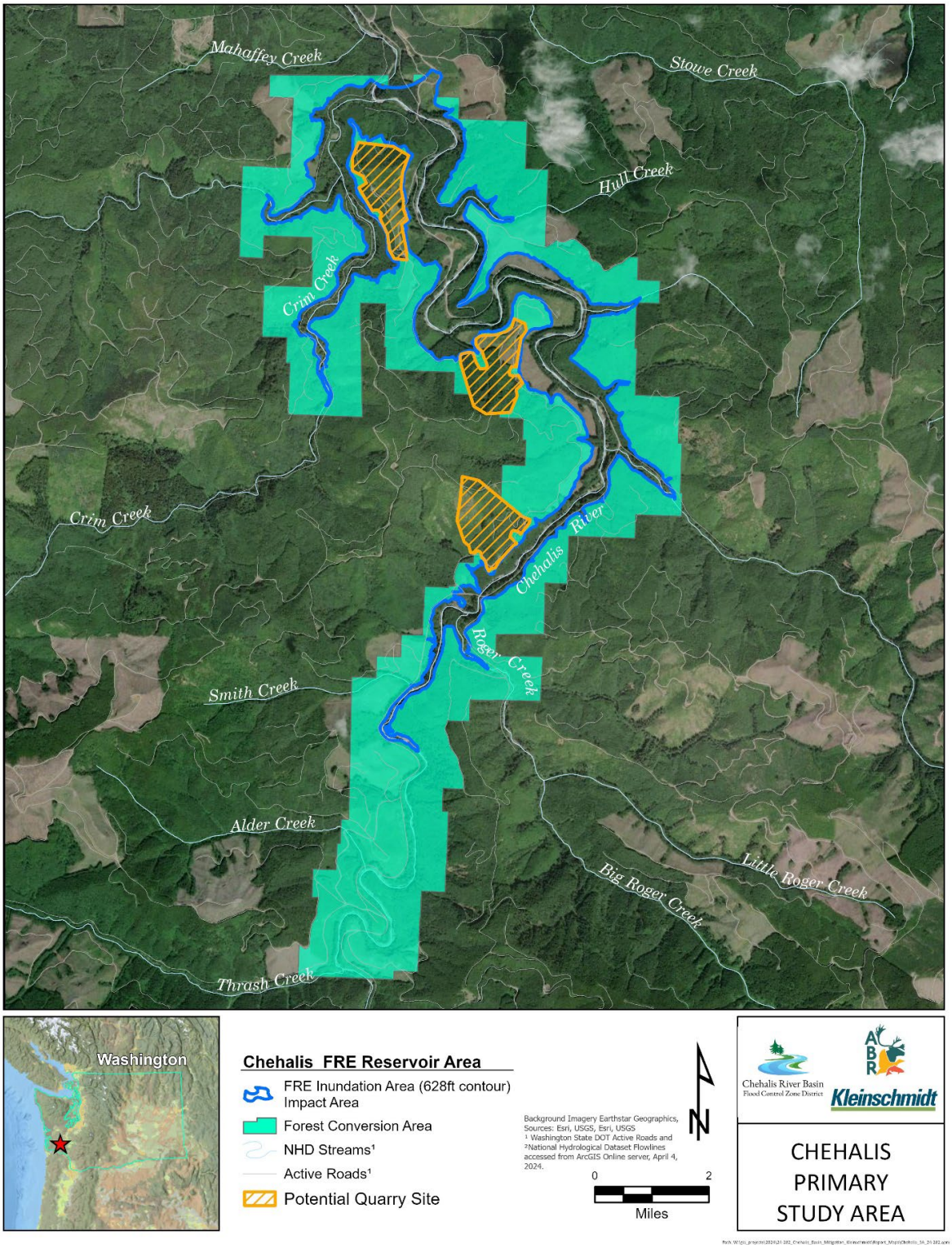
Date: June 14, 2024
To: MaryLouise Keefe, Ph.D., Kleinschmidt Associates
From: Joe Welch and Terry Schick, ABR, Inc.
Cc: Betsy McGregor, Kleinschmidt Associates
Re: Wildlife Habitat Evaluation

Introduction

The Chehalis River Basin Flood Control Zone District (Applicant) is proposing to build a flood retention expandable (FRE) facility on the upper Chehalis River (Proposed Action) to minimize the impacts of winter flooding in the downstream river basin. The facility would be constructed approximately 1 mile upstream (south) of the town of Pe Ell, Washington (Figure 1) and would only be operated during major or greater flood events. Details on the construction and operation of the FRE facility and the temporary inundation area are included in Chapter 2 of the Revised Mitigation Plan (RMP) (Kleinschmidt 2024).

Construction of the proposed FRE facility would represent a permanent loss of wildlife habitat at the FRE facility footprint (37 acres) and within the inundation area due to the construction and improvement of access roads (2.4 acres) and development of the debris sorting yard (4.6 acres). During construction, approximately 151.2 acres of habitat would be temporarily disturbed outside (98.1 acres) or within (53.1 acres) the inundation area and up to 80 acres of habitat associated with quarries would also be disturbed. Wildlife habitat within the 825-acre inundation area, between 425 and 628 water surface elevation (WSEL), would be affected from recurring temporary retention of flood waters during major or greater flood events. Wildlife disturbance would include behavioral displacement during construction and operation of the FRE facility; and mortality of species not capable of leaving the area during major flood events, such as amphibians, invertebrates, and small mammals.

Figure 1
Chehalis River Basin Flood Damage Reduction Project Flood Retention Expandable Inundation Area, Forest Conversion Area, and Potential Quarry Sites Near Pe Ell, Washington.



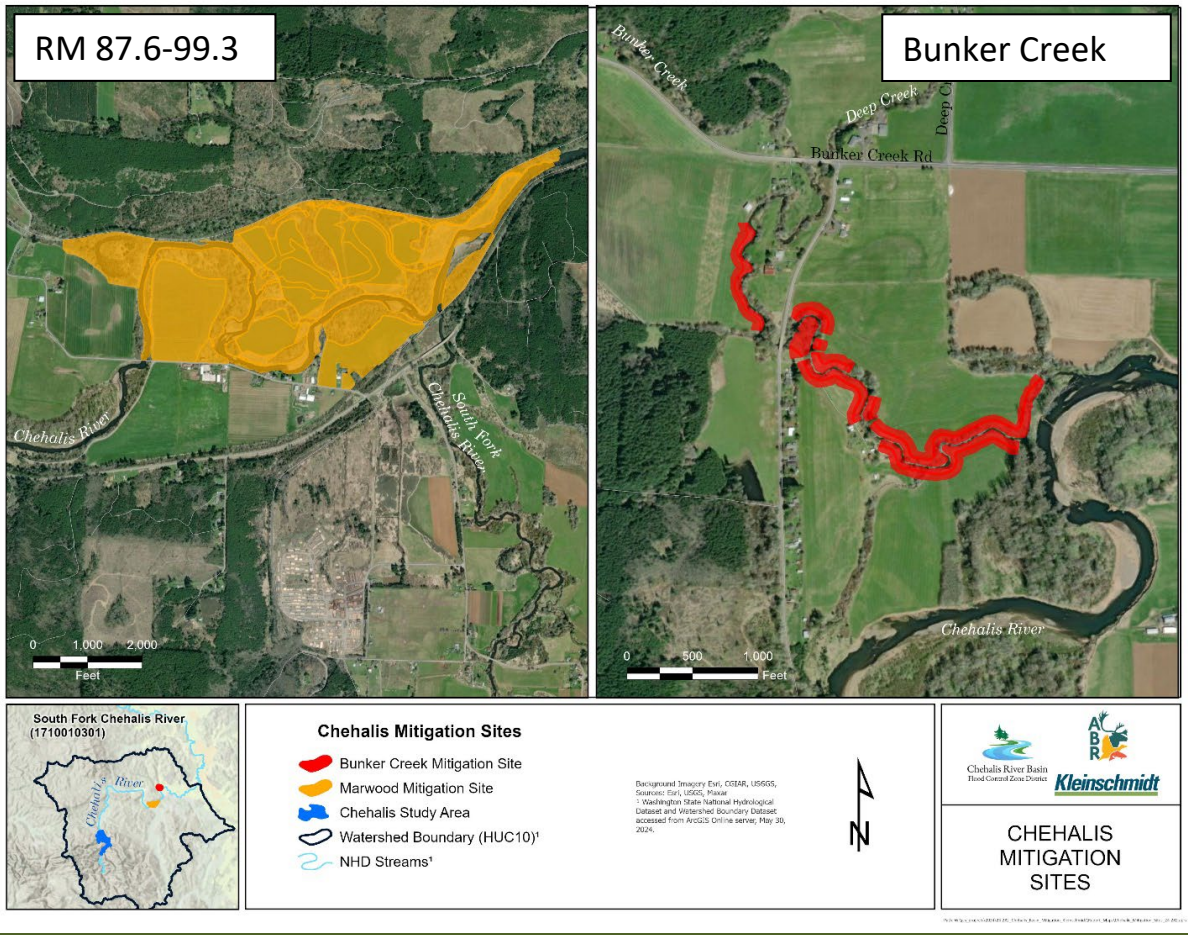
To minimize and mitigate these potential impacts, the Applicant is proposing to implement this wildlife habitat evaluation. As a part of that plan, this memorandum outlines how impacts to wildlife habitats in the FRE inundation area from operations would be minimized by planting flood-tolerant species prior to operations and rehabilitating post-flooding land cover types to improve wildlife habitat availability as described in the Vegetation Management Plan (Appendix D in Kleinschmidt 2024). In addition, the Applicant proposes to mitigate for residual wildlife habitat loss and degradation in the inundation area where it is anticipated that recurring temporary flood retention operations would affect the species and structural composition of the habitats, and limit the establishment of mature forest in portions of the inundation area.

Mitigation would occur at a minimum of three different sites in the Chehalis River basin (Figures 1 and 2). These include the acquisition, enhancement, and conservation of 1,921 acres of adjacent timberlands in the proposed Forest Conversion Area; the rehabilitation and enhancement of 380 acres of riparian and floodplain habitat and agricultural land at the RM 87.6-99.3 mitigation site; and the rehabilitation and enhancement of riparian habitat downstream of the FRE facility along 4.7 miles of lower Bunker Creek and along 16. 6 miles of the mainstem Chehalis River.

The Forest Conversion Area is composed of private commercial timberlands located directly adjacent to and upslope and upstream of the proposed FRE inundation area and gravel mine sites. The area is ecologically similar to the timberlands that occur in the FRE inundation area and includes upstream reaches of the Chehalis River and tributary streams (Figure 1). These lands were chosen for mitigation because of their proximity to the FRE inundation area and because the current forest and riparian habitats (see below) are of lower value to wildlife; hence, the lands provide a good opportunity to create ecological lift for forest-dwelling wildlife species.

The RM 87.6-93.3 mitigation site is composed primarily of private agricultural lands dominated by introduced and invasive plant species, but some riparian wetlands and lowland forests along the Chehalis River also occur. The site is located approximately 19 miles downstream of the FRE inundation area. It was selected for mitigation because of the potential to create ecological lift for aquatic, wetland, and riparian habitats and associated wildlife species. The non-agricultural lands are composed of various aged deciduous and mixed forests, and wetlands with black cottonwood (*Populus trichocarpa*), red alder (*Alnus rubra*), bigleaf maple (*Acer macrophyllum*), Douglas fir (*Pseudotsuga menziesii*), and western red cedar (*Thuja plicata*) dominating the tree canopies, and willow (*Salix* spp.), red alder, trailing blackberry (*Rubus ursinus*), Himalayan blackberry (*Rubus discolor*), elderberry (*Sambucus* sp.), and young trees present in the understory.

Figure 2
RM 87.6-99.3 and Bunker Creek Mitigation Sites for the Chehalis River Basin Flood Damage Reduction Project, Chehalis River, Washington.



The Bunker Creek mitigation site is another agricultural site with degraded riparian habitats. Bunker Creek is a tributary of the Chehalis River located near RM 84.5. The site is located along the lower portions of Bunker Creek and is composed primarily of agricultural land, a narrow buffer of shrubs with sparse deciduous trees along Bunker Creek, and a narrow band of deciduous (cottonwood) forest along the Chehalis River. Only the aquatic and riparian habitats at Bunker Creek are being planned for mitigation because the adjacent agricultural land will remain in production. Currently, the streambanks of Bunker Creek are nearly vertical, unvegetated, and eroding in places. The Bunker Creek site was selected for mitigation actions for similar reasons as the RM 87.6-93.3 site, but also because it provides a good opportunity to create high-value off-channel habitat for Chehalis River aquatic species, primarily fish and amphibians.

An additional 131 riparian reforestation mitigation sites were selected downstream of the FRE facility as part of the Applicant's Shade Analysis (Appendix G in Kleinschmidt 2024) and for purposes of wildlife

habitat value, we expect them to be similar to the RM 87.6-99.3 and Bunker Creek sites in terms of the existing habitats and the potential for ecological lift for wildlife.

Objectives

The objectives of this wildlife habitat evaluation include:

- Evaluating the wildlife habitat benefits of implementing the VMP (Appendix D in Kleinschmidt 2024) in the FRE inundation area to minimize possible long-term impacts of the proposed project on wildlife species.
- Evaluating the wildlife habitat benefits of purchasing private industrial forest parcels in the Forest Conversion Area, located adjacent to the proposed FRE inundation area, and implementing treatments to develop more species-rich and structurally complex mature forests, and eventually, over the long term, old-growth forests.
- Evaluating the wildlife habitat benefits of improving existing agricultural and riparian habitats at the RM 87.6-93.3 mitigation site located in the historical floodplain of the Chehalis River downstream of the proposed FRE facility.
- Evaluating the wildlife habitat benefits of protecting and expanding in-stream and riparian habitats along the Chehalis River and tributary streams downstream of the FRE facility at the Bunker Creek mitigation site and other similar riparian mitigation sites.

Methods

Current and Future Habitat Availability

To estimate the wildlife habitat improvement provided by minimization efforts in the FRE inundation area, the target habitats to be developed after implementation of the VMP were ranked for habitat values for a set of wildlife species that are of concern in southwestern Washington and are known or expected to occur in the Project Mitigation Area (see Wildlife Species of Concern below). For the three mitigation sites, the amount of ecological lift provided by the mitigation efforts was assessed by ranking habitat values for the same set of wildlife species, for both current and target habitats at 50 years of project operations (hereafter, future conditions).

Fine-scale land cover mapping for the FRE inundation area, after implementation of the VMP, was prepared in ArcGIS by ABR, Inc. to reflect the habitats that are anticipated to develop following the VMP impact-minimization treatments (Appendix D in Kleinschmidt 2024). These land cover types represent the target wildlife habitats to be managed on an ongoing basis after each major flood event when the FRE facility is operated.

Fine-scale habitat data for current conditions were not available for the Forest Conversion Area. To develop a map of current conditions in the Forest Conversion Area, the same fine-scale habitats currently found within the FRE inundation zone and mapped in the VMP were assumed present but at higher elevations. Existing forest stand age data for the Forest Conversion Area were summarized

(Appendix I in Kleinschmidt 2024) and were incorporated into the map of current conditions. The forest stand age data were also used to help develop target habitat types for the area.

The mapping of current wildlife habitat conditions at the RM 87.6-99.3 mitigation site was prepared based on field data collected in October and November 2023 (Appendix J in Kleinschmidt 2024) and high-resolution satellite imagery acquired on August 20, 2023 and obtained from Google Earth. For the analysis of ecological lift for wildlife, similar riparian wetlands habitats were aggregated by tree size to yield 12 distinct habitat classes.

Fine-scale baseline wildlife habitats have not been delineated at the Bunker Creek site, but based on satellite imagery from the summer of 2023, site photos, and dominant vegetation in the area, it was assumed that wildlife habitats at the site included five types: i) improved agriculture; ii) mixed environment agriculture; iii) perennial stream; iv) riparian hardwood forest; and v) riparian shrub.

Target habitats under future conditions in the Forest Conversion Area were based on the proposed mitigation treatments for the area (see Table 1 and Section 8.3 of Kleinschmidt 2024) and included 50–90 year-old diverse conifer forests and forested wetlands with well-developed understories, some with hardwoods mixed into the canopy, and riparian deciduous forest and shrub habitats. Untreated habitats were assumed to mature into 50–90 year-old second-growth conifer and mixed transitional forests with dense canopies, limited species diversity, and an undeveloped understory.

Table 1
Habitat Treatment Plans at Three Proposed Mitigation Sites for the Chehalis River Basin Flood Damage Reduction Project.

MITIGATION SITE	TREATMENTS
Forest Conversion Area	• Identify any stands in the understory initiation stage >60 years old. If the canopy is still primarily closed, selected cutting/thinning and tree girdling should be implemented to open up the canopy. Tree girdling has the added benefit of creating tree snags and eventual Large Wood Material (LWM) on the ground. The largest trees and any with massive and twisted limbs should be preserved as these are most likely to be used by marbled murrelets (*Brachyramphus marmoratus*) in the future. No more than 50% of the total stand basal area should be removed or girdled. • Stands in the competitive exclusion phase 30+ years old should have Douglas fir trees selectively cut/thinned and girdled at variable spacing, treating no more than 50% of the total stand basal area. Small (<2 acres) clearcut patches should be created and a diversity of non-Douglas fir tree and shrub species should be planted in the clearings and open forest understory. Retention of >75% of the original stand is recommended to limit windthrow. Slash should be burned or chipped. • Stands in the canopy closure stage approximately 10-30 years old should have Douglas fir trees thinned with variable spacing and only large trees should be girdled to create snags. In contrast to 30+ year old stands, treatments should emphasize creating open patches and replanting with a diversity of non-Douglas fir trees and shrubs. Slash should be burned or chipped. • Recent clearcuts in the cohort establishment stage <10 years old should have a large proportion of recently planted Douglas fir treated by ground-based spraying or mechanical or hand thinning, and a diversity of non-Douglas fir species of trees and shrubs should be planted to initiate a more diverse forest. Plantings should be <300 seedlings/acre.
RM 87.6 - 99.3	• Conservation of existing forest habitats. • Increasing forest structure and plant species diversity through tree and shrub plantings. • Creation of depressional palustrine wetlands in the historical floodplain with an emphasis on tree- and shrub-dominated wetlands. • Recontouring existing off-channel flow-paths in agricultural fields to increase connectivity to the Chehalis River and expansion of an existing perennial tributary. • Native tree and shrub planting along flow-paths to develop riparian forest habitats.
Bunker Creek	• Excavation of the inset floodplain on one or both sides of Bunker Creek and laying back the near-vertical streambanks to create a more stable planting surface, reduce flood stage and energy during high flows in Bunker Creek, create floodplain connectivity for Bunker Creek during low-water conditions in the Chehalis River, and reduce erosion and sediment deposition in the channel. • Planting of native deciduous and coniferous trees and shrubs on the laid-back bank and inset floodplain. Enhanced riparian vegetation would improve overall channel stability, provide shade and instream cover, facilitate insect drop, and provide sources of future large woody material. • Installing large wood pieces within the channel for habitat complexity. • Removing a culvert and agricultural crossing structure upstream to enhance fish passage. • Riparian shrub and tree plantings for shade mitigation along the Chehalis River 75 feet out from the ordinary high-water line.

Target habitats under future conditions at the RM 87.6-99.3 site were based on the proposed treatments at the site (Table 1). Target riparian and floodplain habitat types were developed and mapped by Kleinschmidt Associates. Originally, 14 different target habitats were envisioned. Prior to the wildlife value rankings, ecologically similar habitats were aggregated into a smaller set of 11 habitats by grouping by tree size. The wetland mitigation plan for RM 87.6-99.3 is presented in Appendix J of the RMP (Kleinschmidt 2024). Plans include creating depressional wetlands on the historical floodplain to be dominated by tree and shrub species that will provide high-value habitats for wildlife. These habitat types are currently in the conceptual stage, but for completeness, these target wetland habitats were included in the habitat evaluations.

Target habitats under future conditions at the Bunker Creek site were based on the proposed treatments at the site (see Table 1 and Section 3 in Kleinschmidt 2024) and are still in the conceptual stage. Target habitats are assumed to include improved agricultural, mixed environment agricultural, riparian conifer/hardwood forest, riparian hardwood forest, riparian shrub, and open water.

Currently, the mitigation plans for the three sites noted above are in the conceptual/design stage, with the plans more advanced at some sites than others. It is anticipated that target habitat types for future conditions at each site will be finalized during permitting. At that time, detailed site-specific reforestation and planting plans will be developed for the additional riparian shade mitigation sites downstream of the FRE facility and maps will be prepared of wildlife habitat treatment types, locations and target habitats to be developed 50 years after project implementation will be prepared.

Wildlife Species of Concern

To develop minimization measures and mitigation plans to offset the impacts to wildlife habitat associated with the FRE, the Applicant evaluated baseline wildlife habitat values in the FRE inundation area and at the three proposed mitigation sites for amphibian, bird, mammal, and invertebrate species of concern (SOC) that are known or expected to occur in the Project Mitigation Area. The wildlife habitat evaluations were conducted by creating matrices of wildlife SOC and habitats and assigning a categorical habitat-value ranking to each mapped wildlife habitat type for each species.

The upper Chehalis River Basin historically and currently provides habitat for a wide array of wildlife species. Based on the wildlife species ranges that overlap with the Project Mitigation Area, the information summarized on wildlife occurrence in the State Environmental Protection Act (Washington State Department of Ecology [Ecology] 2020) and National Environmental Protection Act (United States Army Corps of Engineers [Corps] 2020) draft EIS (DEIS) documents for the project, and the habitats available in the area, 255 vertebrate wildlife species were considered for SOC classification. See Table 2 for the scientific names of the vertebrate wildlife species discussed in this evaluation.

To develop a working list of wildlife SOC to assess for habitat values, the list of 255 vertebrate species was narrowed down to 46 vertebrate wildlife SOC (Tables 2 and 3). To be considered an SOC, a species

had to first be listed in the Washington State Wildlife Action Plan, Washington Priority Habitat and Species List, United States Fish and Wildlife Service (USFWS) Birds of Conservation Concern in BCC 5 (Washington Department of Fish and Wildlife [WDFW] 2008, 2015, 2023; USFWS 2021), or have been suggested by the WDFW due to their ecological importance. They also had to either occur in or be expected to occur annually within the Chehalis River HUC 8 boundary (HUC ID 17100103 Tables 2 and 3). The FRE inundation area and the three proposed mitigation sites along the Chehalis River are all located within this watershed. With input from the local wildlife biologists, several species were also ranked that are listed as endangered, threatened, or as species of greatest conservation need that occur outside of the watershed if their range could reasonably be expected to expand into the Project Mitigation Area.

In addition to vertebrates, there are numerous invertebrate species of greatest conservation need listed in the Washington State Wildlife Action Plan (Appendix A-5 in WDFW 2015). In general, most invertebrate species potentially occurring within the project area can be considered aquatic invertebrates, native prairie specialists, or moist habitat specialists (occurring in wetland seeps and humid, old-growth forest litter; Appendix A-5 in WDFW 2015). Occurrence and distributional data are lacking for many of these species. Only three species of insects (mardon skipper [*Polites mardon*], Taylor's checkerspot butterfly [*Euphydryas editha taylori*], and valley silverspot [*Speyeria zerene bremnerii*] that could occur in the region have adequate occurrence data to be included in WDFW potential range and habitat distribution maps (Appendix B in WDFW 2015). All are sedentary butterflies restricted to scattered prairie ecosystems. None are known to occur in the habitats currently present in the project area (Appendix B in WDFW 2015).

The mitigation measures described in above as well as the other described in Section 8 of the RMP (Kleinschmidt 2024) within the aquatic section of the project mitigation plan would benefit native aquatic, prairie, and moist habitat invertebrate species. However, due to the lack of occurrence and distributional data, invertebrate species groupings for aquatic species, native prairie specialists, and moist habitat specialists were included in the habitat evaluation process instead of individual species (Tables 2 and 3).

Table 2

Wildlife Species of Concern Assessed in the Habitat Evaluations for Target Habitats at the Proposed FRE Inundation Area and Three Proposed Mitigation Sites.

	SPECIES	SCIENTIFIC NAME
Bird	American dipper	*Cinclus mexicanus*
Bird	Bald eagle	*Haliaeetus leucocephalus*
Bird	Band-tailed pigeon	*Patagioenas fasciata*
Bird	Belted kingfisher	*Megaceryle alcyon*
Bird	Bufflehead	*Bucephala albeola*
Bird	Chestnut-backed chickadee	*Poecile rufescens*
Bird	Common goldeneye	*Bucephala clangula*
Bird	Evening grosbeak	*Coccothraustes vespertinus*
Bird	Golden eagle	*Aquila chrysaetos*
Bird	Harlequin duck	*Histrionicus histrionicus*
Bird	Hooded merganser	*Lophodytes cucullatus*
Bird	Marbled murrelet	*Brachyramphus marmoratus*
Bird	Northern spotted owl	*Strix occidentalis casuarina*
Bird	Olive-sided flycatcher	*Contopus cooperi*
Bird	Oregon Vesper Sparrow	*Pooecetes gramineus affinis*
Bird	Purple martin	*Progne subis*
Bird	Rufous hummingbird	*Selasphorus rufus*
Bird	Slender-billed white-breasted nuthatch	*Sitta carolinensis aculeata*
Bird	Sooty grouse	*Dendragapus fuliginosus*
Bird	Trumpeter swan	*Cygnus buccinator*
Bird	Tundra swan	*Cygnus columbianus*
Bird	Varied thrush	*Ixoreus naevius*
Bird	Vaux's swift	*Chaetura vauxi*
Bird	Western bluebird	*Sialia Mexicana*
Bird	Western screech-owl	*Megascops kennicottii*
Bird	Wood duck	*Aix sponsa*
Amphibian	Columbia torrent salamander	*Rhyacotriton kezeri*
Amphibian	Cope's giant salamander	*Dicamptodon copei*
Amphibian	Dunn's salamander	*Plethodon dunni*
Amphibian	Oregon spotted frog	*Rana pretiosa*
Amphibian	Van Dyke's salamander	*Plethodon vandykei*
Amphibian	Western toad	*Anaxyrus boreas*
Mammal	American marten	*Martes americana*
Mammal	American mink	*Neovison vison*
Mammal	Columbian black-tailed deer	*Odocoileus hemionus columbianus*
Mammal	Douglas Squirrel	*Tamiasciurus douglasii*
Mammal	Fisher	*Pekania pennanti*
Mammal	Hoary Bat	*Lasiurus cinereus*
Mammal	Keen's Myotis	*Myotis keenii*
Mammal	North American Beaver	*Castor canadensis*

	SPECIES	SCIENTIFIC NAME
Mammal	Pacific marten	*Martes caurina*
Mammal	Roosevelt elk	*Cervus canadensis roosevelti*
Mammal	Roosting big brown bats	*Myotis lucifugus*
Mammal	Roosting myotis bats	*myotis* spp.
Mammal	Silver-haired Bat	*Lasionycteris noctivagans*
Mammal	Townsend's big-eared bat	*Corynorhinus townsendii*
Mammal	Western spotted skunk	*Spilogale gracilis*
Invertebrates	Aquatics species	-
Invertebrates	Moist habitat specialists	-
Invertebrates	Prairie habitat specialists	-

Table 3

Wildlife Species of Concern Selected for Habitat Evaluations for the Chehalis River Basin Flood Damage Reduction Project.

GROUP	SPECIES	WDFW PRIORITY SPECIES[a]	WA SWAP[b]	USFWS BCC[c]	WA STATUS[d]	FEDERAL STATUS[d]
Amphibian	Oregon spotted frog[e]	n/a	X	n/a	n/a	n/a
Amphibian	Columbia torrent salamander	n/a	X	n/a	n/a	n/a
Amphibian	Cope's giant salamander	n/a	X	n/a	C	n/a
Amphibian	Dunn's salamander	n/a	X	n/a	C	n/a
Amphibian	Van Dyke's salamander	n/a	X	n/a	C	n/a
Landbird	Sooty grouse[f]	X	n/a	n/a	n/a	n/a
Landbird	Olive-sided flycatcher	n/a	n/a	X	n/a	n/a
Landbird	Chestnut-backed chickadee	n/a	n/a	X	n/a	n/a
Landbird	Vaux's swift	X	n/a	X	n/a	n/a
Landbird	Purple martin	X	X	n/a	n/a	n/a
Landbird	Belted kingfisher[g]	n/a	n/a	n/a	n/a	n/a
Landbird	Band-tailed pigeon	X	X	n/a	n/a	n/a
Landbird	Oregon vesper sparrow	n/a	X	n/a	E	90[d]
Landbird	Rufous hummingbird	n/a	n/a	X	n/a	n/a
Landbird	Slender-billed white-breasted nuthatch[h]	n/a	X	n/a	C	n/a
Landbird	Varied thrush	n/a	n/a	X	n/a	n/a
Landbird	Western bluebird	n/a	X	n/a	n/a	n/a
Landbird	Evening Grosbeak	n/a	n/a	n/a	E	T
Raptor	Golden eagle	X	X	n/a	C	n/a
Raptor	Bald eagle	X	X	n/a	n/a	n/a
Raptor	Western screech-owl	n/a	X	X	n/a	n/a
Raptor	Northern spotted owl[i]	n/a	X	n/a	E	T
Seabird	Marbled murrelet[j]	n/a	n/a	X	E	T
Waterbird	Trumpeter swan	X	n/a	n/a	n/a	n/a
Waterbird	Tundra swan[k]	X	n/a	n/a	n/a	n/a
Waterbird	Wood duck	X	n/a	n/a	n/a	n/a
Waterbird	Bufflehead	X	n/a	n/a	n/a	n/a
Waterbird	Common goldeneye	X	n/a	n/a	n/a	n/a
Waterbird	Harlequin Duck[g]	X	n/a	n/a	n/a	n/a

GROUP	SPECIES	WDFW PRIORITY SPECIES[a]	WA SWAP[b]	USFWS BCC[c]	WA STATUS[d]	FEDERAL STATUS[d]
Waterbird	Hooded merganser	X	n/a	n/a	n/a	n/a
Invertebrate	Aquatic invertebrates	n/a	X	n/a	X	X
Invertebrate	Moist habitat specialists	n/a	X	n/a	X	X
Invertebrate	Prairie habitat specialists	X	X	n/a	X	X
Mammal	American marten	n/a	n/a	n/a	n/a	n/a
Mammal	American mink[g]	n/a	n/a	n/a	n/a	n/a
Mammal	Pacific marten[g]	n/a	X	n/a	n/a	n/a
Mammal	Columbia black-tailed deer	X	n/a	n/a	n/a	n/a
Mammal	Fisher[g]	n/a	X	n/a	n/a	n/a
Mammal	Hoary bat	n/a	X	n/a	n/a	n/a
Mammal	North American Beaver	n/a	n/a	n/a	n/a	n/a
Mammal	Keen's Myotis[l]	n/a	n/a	n/a	C	n/a
Mammal	Roosevelt elk	X	n/a	n/a	n/a	n/a
Mammal	Roosting concentrations of big brown bats	X	n/a	n/a	n/a	n/a
Mammal	Roosting concentrations of myotis bats	X	n/a	n/a	n/a	n/a
Mammal	Silver-haired Bat	n/a	X	n/a	n/a	n/a
Mammal	Townsend's big-eared bat	X	X	n/a	T	n/a
Mammal	Western spotted skunk	n/a	X	n/a	n/a	n/a

a. Washington Department of Fish and Wildlife (WDFW), 2008. Priority Habitat and Species List. Olympia, Washington. 291 pp.

b. WDFW, 2015. Washington's State Wildlife Action Plan: 2015 Update. Washington Department of Fish and Wildlife, Olympia, Washington, USA.

c. U.S. Fish and Wildlife Service (USFWS), 2021. Birds of Conservation Concern 2021. United States Department of the Interior, U.S. Fish and Wildlife Service, Migratory Birds, Falls Church, Virginia. http://www.fws.gov/birds/management/ managed-species/birds-of-conservation-concern.php. Accessed April 2024.

d. Federally threatened (T) or 90-day (90d) finding that listing may be warranted. WDFW 2024. Threatened and endangered species website. https://wdfw.wa.gov/species-habitats/at-risk/listed. Accessed April 2024.

e. May not be in mitigation area. Potential habitat based on SWAP map but needs extensive emergent wetlands. State endangered, federal threatened.

f. Only on WDFW priority and habitat list. Recreationally important, vulnerable to habitat degradation.

g. Ecologically or culturally important. Priority species based on input from WDFW.

h. Potential habitat plus recent sightings near mitigation area.

i. State endangered, federally threatened. Potential habitat and known area based on SWAP. Rare to nonexistent in the area.

j. State endangered, federally threatened. Project area within potential habitat. Species has been reported in Chehalis mitigation area.

k. Possibly present in area, recreational/tribal value species.

l. May be present at the site. SWAP does not show this species in the area but says species is poorly known.

Like the three invertebrate species groups, the 46 vertebrate SOCs are of recognized importance for conservation, but also are representative of other species with similar habitat preferences. For detailed descriptions of the habitat preferences for each species and species group, please refer to Attachment 1. Roosevelt elk and Columbia black-tailed deer are habitat generalists that evolved in old-growth temperate rainforests but also benefit from recent clearcuts and agricultural fields. Western toads use main-channel and adjacent riparian habitats during different life-history stages and are found in the middle and upper Chehalis River Basin. Dunn's, Van Dyke's , Cope's giant, and Columbia torrent salamanders are adapted to headwater streams and riparian habitats, and benefit from cool, shaded waters and cool, terrestrial microhabitats. Northern spotted owls, marbled murrelets, evening grosbeaks, and many bats prefer old-growth forests with diverse, multi-age vegetation structure. Many of the other avian SOC also benefit from mature or old-growth forests during some portions of their life history, but some species also occur in uneven-aged managed forests, riparian shrub, and deciduous forests. Many of these bird species are dependent on snags and diseased trees for cavity nesting. By assessing habitat values for the 46 vertebrate species and three invertebrate species groups, numerous other species with similar habitat preferences are, by extension, also being evaluated.

Wildlife Habitat Evaluations

The habitat-value rankings (high, moderate, low, or negligible value; Table 4) were determined by focusing on wildlife use of habitats during important life-history stages (e.g., breeding, foraging, denning, migration, shelter, overwintering). Habitat-value rankings were derived in different ways for different species, depending on the data availability, to assess habitat use in each habitat type. Survey data in the Project area were only available for amphibians (Hayes et al. 2018; WDFW 2024). For the other species groups, published habitat-use and density data from nearby studies, studies from the greater Pacific Northwest, from other regions of North America when relevant, and/or professional judgment based on field observations and expertise were used. This habitat evaluation method has been used successfully to assess changes in wildlife habitat availability for individual species, both from industrial activities (Welch et al. 2023) and climate change (Marcot et al. 2015). In practice, the combination of high- and moderate-value habitats represents the set of habitats that are likely to be regularly used by wildlife species, and is the approach used in this mitigation plan to identify the important habitats under baseline conditions for each SOC.

For evaluations of target habitats after mitigation efforts, the climate was assumed to be warmer and drier in the summers and wetter in the winters (Mauger et al. 2016). Increased wildfires are likely to have substantial effects on the landscape if they became more prevalent under future drier and warmer summers. Fires would be expected to create large forest openings, which could benefit species that prefer large patches of early successional shrublands and forests, but would have negative effects on species that prefer closed canopy and mature conifer forests or landscapes with abundant edge habitat that is common in managed forests. Fires are likely to have a negligible effect on habitat generalists. Given the uncertainty in the specific locations and occurrence of wildfires in the future, for this

evaluation, it was assumed that future habitat conditions would not be affected by wildfires in the next 50 years.

Table 4
Habitat-Value Classes Used in the Wildlife Habitat Evaluations.

WILDLIFE GROUP	RANKING SCORE	VALUE CLASS	DESCRIPTION
Birds	3	High	Known to be frequently used for nesting and/or foraging/hunting during the breeding season, these habitats also are often used during migration and in winter for resident species.
	2	Moderate	Moderate-value habitats may be regularly used during the breeding, migration, or wintering seasons for foraging/hunting, but less so than high-value habitats.
	1	Low	Low-value habitats would see little use by the species under consideration and in very low numbers.
	0	Negligible	The species is not expected to occur, or would occur very rarely, in negligible-value habitats.
Mammals	3	High	Known to be frequently used for breeding, shelter, denning, overwintering, and/or foraging/hunting during some portion of the year.
	2	Moderate	Moderate-value habitats may be regularly used for foraging/hunting and as travel corridors, but less so than high-value habitats.
	1	Low	Low-value habitats would see little use by the species under consideration and in very low numbers.
	0	Negligible	The species is not expected to occur, or would occur very rarely, in negligible-value habitats.
Amphibians	3	High	Aquatic habitats and adjacent habitat types known to be frequently used for breeding and foraging.
	2	Moderate	Moderate-value habitats may be regularly used for foraging, but less so than high-value habitats.
	1	Low	Low-value habitats would see little use by amphibians and in very low numbers.
	0	Negligible	Amphibians are not expected to occur, or would occur very rarely, in negligible-value habitats.

Results

To assess wildlife habitat value in the FRE inundation area after implementation of the VMP and ecological lift at the three habitat mitigation sites, 46 vertebrate species and species groups and three invertebrate species groups were identified as SOC and assessed for habitat values (Tables 2 and 3).

Detailed descriptions of each species or species groups' known habitat associations are included in Attachment 1. The 46 vertebrates species or species groups included 7 waterbirds, 1 seabird, 14 landbirds, 4 raptors, 5 amphibians, 4 terrestrial meso-carnivores, 2 aquatic furbearers, 2 large mammals, 1 small mammal, and 6 bats. The three invertebrate wildlife species groups assessed include aquatic invertebrates, prairie specialists, and moist habitat specialists.

Habitat Evaluations After VMP Implementation

FRE Inundation Area

After 50 years of FRE operations and VMP implementation within the inundation area, it is anticipated that the Final Evacuation Area would be dominated by open herbaceous habitats and shrublands, the Debris Management Evacuation Area would be dominated by shrublands, and the Initial Evacuation Area would support flood-tolerant tree species and some forested habitats. These target habitats, which provide additional ecological benefits beyond habitat for wildlife, would primarily benefit wildlife species associated with open areas, shrublands, and open-canopy mixed forests (Attachment 2). Plantings of flood-tolerant plant species would begin a few years before initial operation of the FRE facility to increase resiliency of these habitats to flooding. In addition, efforts would be made to reestablish herbaceous vegetation, trees, and shrubs as quickly as possible after inundation events by planting fast-growing and flood-tolerant species. Specific efforts would be made to control invasive plant species, and, to the extent possible, downed logs, stumps, and snags would be retained for wildlife habitat, though these features are likely to be from younger trees over time. These conditions contrast markedly with the DEIS conditions that anticipated pre-operations tree removal within the lowermost 600 acres of the inundation area, ongoing removal of trees greater than 6 inches in diameter throughout the FRE inundation area, no revegetation efforts, and the proliferation of invasive plant species.

After implementation of the VMP treatments, 16 wildlife habitat types are expected to develop in the FRE inundation area. In this area, 784 species-by-habitat combinations for 49 wildlife SOC and 16 target habitat types were evaluated (Attachment 2). Of the 784 species-by-habitat combinations, 20.0% are considered to be high or moderate value. Approximately 8.9% of waterbird, 17.4% of landbird, 25.0% of raptor, 31.7% of mammal, 16.3% of amphibian, and 6.3% of invertebrate species-by-habitat combinations are considered to be of high or moderate value.

Most of the suitable waterbird combinations were for one species, the wood duck. The only other waterbird species with high- or moderate-value habitat rankings was the hooded merganser. Eleven of the 13 landbird species assessed had high- or moderate-value habitat rankings in two or more habitats, primarily in riparian habitats and mixed transitional forests. Bald eagles were considered to have moderate-value habitat in the riparian forest communities, golden eagles in the herbaceous/grass and herbaceous/shrub habitats, and all the forested habitats were considered to be of high or moderate value for western screech-owls. The northern spotted owl is the only raptor that was not considered to have any high- or moderate-value habitat in the FRE inundation area under future habitat conditions

(but see Forest Conversion Area section below). All non-bat mammals, except fisher and the two species of marten, would have several high- or moderate-value habitats in the FRE inundation area. Hoary bats, Keen's myotis, and roosting concentrations of big brown bats would potentially have high- or moderate-value habitat, with hoary bats considered to have the most high- or moderate-value habitat. Several aquatic and terrestrial habitats were considered to be of moderate value for different western toad life-history stages. The Chehalis River would be of moderate-value habitat for many aquatic invertebrates, in particular in the periods between flooding events, and prairie specialist invertebrates would also find the herbaceous/grass and herbaceous/shrub, or any habitat where wildflowers are planted and/or proliferate, to be of high or moderate value. All habitats for the single seabird species assessed (marbled murrelet) were considered to be of negligible value as mature forests are not identified as a target habitat in the FRE inundation area (but see Forest Conversion Area section below), even though mature forests would likely develop over time and persist in the uppermost elevations of the inundation area.

Habitat Mitigation Plans

To offset the residual impacts to wildlife habitats in the FRE inundation area after implementation of the VMP, the Applicant proposes vegetation treatments for three of the mitigation sites that are summarized below.

In the Forest Conversion Area, private industrial forest parcels located upslope and upstream of the proposed FRE inundation area (Figure 1) would be acquired and set on a vegetation succession pathway toward more open, structurally diverse, and more species-rich mature forests, and eventually, over the long-term, old-growth forests (Table 1). The upland areas of these parcels currently consist of predominantly even-aged Douglas fir stands ranging in age from recent clearcuts to ~50 years with little species or structural complexity. Mitigation treatments in the Forest Conversion Area would generally follow forest management guidelines for black-tailed deer (Nelson et al. 2008), which is a good representative for old-growth associated wildlife species. Treatment activities in the Forest Conversion Area would focus on opening the canopy to allow light to penetrate to the forest floor, planting understory shrubs for more vegetation structure diversity and as seed sources for future shrub expansion, and planting non-Douglas fir conifer and hardwood trees to promote the development of a diverse forest canopy. These forests would then be allowed to mature, gradually resulting in diverse, open- and closed-canopy forests on a trajectory toward old growth. Snag trees would be preserved and created by girdling trees, and LWM would be retained, particularly adjacent to wetlands and streams, as snags and LWM are highly valuable for numerous wildlife species. The oldest existing forests as well as streams, wetlands, and sites near known marbled murrelet activity, such as near Big Roger Creek or other areas identified from field surveys (Mack et al. 2003), would be prioritized for mitigation treatments. Open sites in the Forest Conversion Area would gradually diminish in extent as clearcuts and grasslands are planted with native shrubs and non-Douglas fir conifer and hardwood trees and allowed to mature into forest stands.

At the RM 87.6-99.3 mitigation site (Figure 2), mitigation treatments currently include a number of different actions focused on rehabilitating agricultural fields and creating habitat improvements for native fishes, frogs, and terrestrial wildlife (Table 1). Existing riparian and gallery forests in between agricultural fields would be maintained and expanded, and efforts would be made to remove invasive species over time, primarily by shading them out as forests expand and mature. Native shrub and tree plantings would be implemented to increase forest structure and species diversity. An existing tributary stream would be recontoured to improve aquatic habitat, and water flow-paths in existing swales would be recontoured to develop off-channel habitat and better connectivity with the Chehalis River. Shrub and tree plantings along those drainage features would be made to develop riparian vegetation, and large portions of existing agricultural fields in the historical floodplain would be converted into depressional wetland habitats (Appendix J in Kleinschmidt 2024). These restored wetlands would be planted with shrubs and trees to develop high-value wildlife habitats.

At the Bunker Creek mitigation site (Figure 2), mitigation efforts would involve expanding and enhancing in-stream and riparian habitats in Bunker Creek and along the mainstem Chehalis River (Table 1). Bunker Creek currently has nearly vertical streambanks that are largely unvegetated and eroding in places, so there is abundant opportunity to improve aquatic and riparian habitats at the site. The mitigation plans at Bunker Creek are restricted to enhancement of stream waters and riparian areas as the privately-owned agricultural fields will remain in production. Inset floodplains along Bunker Creek would be excavated and the streambanks laid back to create a gradual slope and provide a more stable surface for revegetation. The streambanks and inset floodplains would be planted with native riparian shrubs and deciduous and coniferous trees to stabilize the stream channel and provide shade, reduce high-energy flows and flood stage during flood events, and provide habitat for terrestrial wildlife. These efforts would also create additional floodplain connectivity for Bunker Creek during periods of low water in the Chehalis River, and would reduce erosion and sedimentation in the stream channel. The riparian plantings would also provide instream cover and associated terrestrial insect drop, as well as providing future sources of LWM. LWM would be placed in the stream channel to provide aquatic habitat complexity, and a culvert and stream crossing structure upstream would be removed to facilitate increased fish passage. Along the mainstem Chehalis River, riparian shrub and tree plantings 75 feet out from the ordinary high-high water line would provide shade for aquatic species and habitat for terrestrial wildlife.

Habitat Evaluations at Proposed Mitigation Sites

Forest Conversion Area

Baseline wildlife habitat evaluations for existing conditions were conducted for 14 habitat types expected to occur in the Forest Conversion Area currently and for the 13 target habitats expected to occur 50 years after mitigation (Attachment 2). Of the 686 baseline wildlife species-by-habitat combinations assessed, 159 (23.2%) are considered to be of high or moderate value. Conservation and mitigation treatments to develop target habitats within the Forest Conversion Area would result in an

abundance of forest stands >50 years old, which would provide some of the functions of mature forests. These changes would result in 241 (37.8%) species-by-habitat combinations having high- or moderate-value habitat rankings, which is a substantial increase over baseline conditions.

Compared to baseline conditions, the habitat evaluation data indicate that the percentage of high- and moderate-value species-by-habitat combinations for waterbirds would increase from 7.1% to 11.0%. All the high- and moderate-value habitats for waterbirds were for wood duck and hooded merganser. For landbirds, the high- and moderate-value habitat rankings increase from 16.8% to 26.4% from baseline to target habitat conditions. Habitat value for landbird SOC would increase primarily as more mature forests with open canopies are developed; five landbird SOC would find these new target habitats as high value. For raptors, high- and moderate-value species-by-habitat combinations would increase from 17.9% to 34.6% from baseline to target habitat conditions. Bald eagle and western screech-owl would see the expansion of suitable mature trees and forests for nesting, and northern spotted owls could see moderate-value habitat develop in the oldest forests. The high- and moderate-value species-by-habitat combinations for mammals were considered to increase from 31.4% to 37.2% as forests canopies are opened to promote development of an understory layer and more ground cover. Similarly, bat habitat value increases with stand age and diversity. For amphibians, high- and moderate-value species-by-habitat combinations increase markedly from 51.4% to 78.5% as riparian corridors and wetlands are protected and mature forests develop. A modest increase in habitat value is expected for invertebrates (16.7% to 28.2% of species-by-habitat combinations), primarily as habitat value increases for moist habitat specialists. Lastly, for marbled murrelets, it is possible that moderate-value habitat could develop in the oldest forest stands after mitigation treatments and a 50-year time period.

RM 87.6 -99.3

Habitat evaluations were conducted for the 12 existing habitat types that occur at this mitigation site and the 14 target habitats after mitigation (Attachment 2). Of the 588 species-by-habitat combinations assessed for baseline conditions, only 97 (16.2%) were considered to be of high or moderate value. With implementation of the mitigation plan, ecological lift is expected for some species as agricultural fields are converted to habitats dominated by native species, existing forests and shrublands are enhanced and expanded, depressional wetlands are created in the historical floodplain, tributary water is consolidated and re-routed to create off-channel habitat, and Chehalis River riparian forests are enhanced for stream shading, resulting in numerous new habitat types (Attachment 2). Of the 686 species-by-habitat combinations assessed for target habitats in 50 years, the number of high- and moderate-value habitat combinations is expected to increase to 146 (21.3%).

Compared to baseline conditions, the number of high- and moderate-value species-by-habitat combinations for waterbirds would increase from 9.5% to 17.3% as bufflehead, common goldeneye, hooded merganser, and wood duck would all find suitable habitat in the target wetland and riparian habitats. For landbirds, the percentage of high- and moderate-value species-by-habitat combinations

would increase from 17.2% to 27.2%, with nine of the landbird SOC having at least one suitable habitat. The percentage of high- and moderate-value species-by-habitat combinations for raptors would increase from 18.8% to 25.0% as screech-owl and bald eagle habitat is expected to increase in value. For mammals, the percentage of high- and moderate-value species-by-habitat combinations would increase from 22.2% to 35.7% as riparian forests age and trees grow larger, creating moderately suitable bat roosting habitat. Some increases in habitat value are also expected for elk, deer, spotted skunk, and mink as understory and ground cover vegetation increase in abundance and diversity. There would be a small increase in high- and moderate-value species-by-habitat combinations for amphibians (from 8.3% to 11.4%), all accounted for by wetland mitigation improvements in western toad habitats. A small increase in habitat value for invertebrates (from 5.6% to 7.3%) is expected as the wetland mitigation efforts would improve habitat value for aquatic invertebrates.

Bunker Creek and other Riparian Enhancements

Habitat evaluations were conducted for the five (5) existing habitat types that occur at the Bunker Creek mitigation site and the six (6) target habitats after mitigation (Attachment 2). Of the 245 species-by-habitat combinations assessed for baseline conditions, only 14 (5.7%) are considered to be of high and moderate value. With mitigation improvements, ecological lift is expected as instream habitats improve and the vegetated riparian corridor is improved and expanded. Of the 294 species-by-habitat combinations assessed for target conditions in 50 years, the number considered to be of high and moderate value increases noticeably to 45 (15.3%).

Compared to baseline conditions, the percentage of high- and moderate-value species-by-habitat combinations for waterbirds would increase from 11.4% to 14.3% as wood duck would see an increase in suitable nesting habitat in the improved riparian forests. The percentage of high- and moderate-value species-by-habitat combinations for landbirds would increase from 1.4% to 7.1% as the increase in riparian conifer/hardwood forests would create suitable habitat for band-tailed pigeon, evening grosbeak, rufous hummingbird, varied thrush, and western bluebird. For raptors, the percentage of high- and moderate-value species-by-habitat combinations would increase from 10.0% to 16.7% as more suitable screech-owl and bald eagle nesting habitat is created. For mammals, the percentage of high- and moderate-value species-by-habitat combinations would increase markedly from 8.0% to 26.7% as the riparian corridor increases in value by providing cover, forage, and hunting habitat for elk, deer, beaver, mink, and spotted skunk. A small but noticeable increase in high- and moderate-value species-by-habitat combinations for amphibians (from 4.0% to 13.3%) would occur, all accounted for in improvements in western toad habitat. For invertebrates, the percentage of high- and moderate-value species-by-habitat combinations would increase from 0% to 5.6% as the instream conditions improve for aquatic invertebrates.

Discussion of Wildlife Species Benefits

FRE Inundation Area

With implementation of the VMP, native, flood-tolerant plant species would come to dominate the landscape. The Final Evacuation Area would be composed of flood-tolerant grasses, forbs, shrubs, and tree saplings, many of which would be planted through implementation of the VMP. Away from the riparian corridor, herbaceous species would be planted to provide erosion and landslide protection and to establish a native prairie ecosystem between flood events. The Debris Management Evacuation Area would likely be composed of flood-tolerant trees (cottonwoods) and shrubs (willows) planted after a flood, and young trees and shrubs that colonize between flood events. The Initial Evacuation Area would likely lose some or most of the Douglas-fir trees inundated after the first flood, but some of the deciduous trees and shrubs could survive depending on depth and duration of flooding. More flood-tolerant conifers, such as western hemlock (*Tsuga heterophylla*), western red cedar, and Sitka spruce (*Picea sitchensis*) are expected to survive, as well, depending on inundation depth and duration. Deciduous trees and shrubs of various age classes and abundant early successional plants would likely proliferate in the post-flood periods. At higher elevations in the Initial Evacuation Area, the duration and frequency of floods is expected to be quite low, and therefore, impacts to vegetation and wildlife would be far less pronounced. Efforts would be made to reestablish vegetation as quickly as possible after inundation events by planting fast-growing species that would stabilize slopes, intercept runoff, provide nutrient cycling, and help moderate stream temperatures. To the extent possible, downed logs, stumps, and snags be retained for wildlife habitat, though these features are likely to be from younger trees.

While the habitat in the FRE inundation area would change substantially from existing conditions, implementation of the VMP is expected to result in habitats dominated by native species that will benefit numerous wildlife species. The VMP target habitats would provide abundant suitable habitats for wildlife species that benefit from prairie, shrub, and open canopy deciduous forests, particularly in the Final Evacuation Area. Currently, with the exception of clearcuts that are promptly planted with Douglas fir, these open habitats are uncommon in the upper Chehalis River watershed, where the landscape is dominated by closed forest commercial timberlands. This expansion of open habitats dominated by a mixture of native species would result in an overall improvement in the diversity of available habitats for vertebrate and invertebrate wildlife species in the upper watershed.

For example, the hoary bat, which forages in open areas, could see an increase in habitat value in the FRE inundation area. Additionally, for this species, the improvement in conditions in the adjacent Forest Conversion Area could provide suitable nearby roosting habitat in 50 years. Native prairie in the FRE inundation area would also be high-value foraging habitat for Roosevelt elk and the area may become a high-use area for this large mammal. These new open habitats could also provide suitable nesting habitat for Oregon vesper sparrow and numerous other non-SOC birds that nest in shrublands. Golden eagles may also find the newly developed open prairies and shrublands to be high-value hunting habitat.

For invertebrates, after flood events, the VMP specifications call for seeding open habitats with native prairie plants, which would also directly benefit numerous prairie-adapted invertebrate species.

With implementation of the VMP, habitats within the Debris Management Evacuation Area would have open canopies that should promote the growth of abundant grasses, forbs, shrubs, and young colonizing trees; all of which provide high-quality forage for deer and elk. Fruiting shrubs would provide abundant food for many SOC and non-SOC birds and mammals. Western spotted skunks would see an overall loss in the abundance of high-value riparian forests and shrubland habitats, but the upland mixed forests and shrublands expected to replace the upland conifer forests and older clearcuts could provide good cover habitat for skunks. Assuming the shrub layer is dense enough, these habitats could also provide good cover and forage for beaver, deer, and elk.

Under the VMP, target forest habitats in the Initial Evacuation Area would provide a more diverse overstory and understory and would also benefit many of the same species that would benefit from treatments in the Debris Management Evacuation Area. With the absence of commercial timber harvests, any Douglas fir trees that survive the flood would benefit from continued growth, and after 50 years, any trees that survive the floods would be substantially larger than today and would be intermixed with early successional trees and shrubs. In the Initial Evacuation Area, most of the landbird SOC would find high- and moderate-value habitat, primarily in the shrubland, woodland, and forest habitats, though western bluebirds, sooty grouse (in winter), and rufous hummingbirds would find some moderate-value habitat in more open areas. Species like the rufous hummingbird, western bluebird, and western screech-owl have more flexibility in their nesting and foraging habitat requirements and would find the target habitats in the FRE inundation area more valuable than under the DEIS-predicted conditions. Additionally, preservation of the adjacent Forest Conversion Area would provide access to diverse, mature forests for cover, while access to clearcuts on non-Project managed forests adjacent to the Forest Conversion Area would still be available. Compared to DEIS-described conditions of heavy forest clearing, the value of rivers and streams would be enhanced by planting cottonwoods and other flood-tolerant trees and shrubs in the riparian corridors and allowing them to mature, as outlined in the VMP. Large live and dead trees near rivers are important for nesting bald eagles and wood ducks, and overstory cover on streams is important to American dippers. Additionally, almost all of the non-bat mammal SOC would find most of the target woodland, forest, and shrublands in the FRE inundation area to provide high- and moderate-value habitats. These habitats would provide good ground cover and hunting habitat for mink and western spotted skunks, while species like elk and black-tailed deer would benefit from abundant forage from herbaceous groundcover and deciduous browse.

Between inundation events in all evacuation zones in the FRE inundation area, beaver may take advantage of abundant willows and early successional deciduous trees and colonize tributary streams. Additionally, western bluebirds could benefit from the installation of bluebird nest boxes throughout those woodland and riparian areas that are least likely to be flooded.

Habitat Mitigation Sites

Forest Conversion Area

To mitigate the impacts to wildlife habitats in the FRE inundation area and associated quarry sites, mitigation treatments are planned in the adjacent Forest Conversion Area (Table 1), which would result in substantial ecological lift for wildlife SOC (Attachment 2). In general, existing habitat conditions in the Forest Conversion Area (dominated by even-aged nearly monotypic Douglas fir stands and clearcuts) are better for SOC mammals and amphibians than for birds. The low complexity in vegetation structure in the commercial timberlands can explain the lower levels of high- and moderate-value habitats for birds. Recommended mitigation treatments in the Forest Conversion Area would focus primarily on opening up the closed Douglas fir canopies and planting other native shrub and tree species to set commercial timberlands on long-term trajectories toward diverse old-growth forests (Table 1). Old-growth forests have declined substantially across the Pacific Northwest over the last several hundred years, and it is well known that numerous native wildlife species depend on old-growth forests. Under the proposed mitigation plans in the Forest Conversion Area, the number of high- and moderate-value species-by-habitat combinations is expected to increase from 159 (baseline conditions) to 241 (target habitats), indicating substantial ecological lift for the wildlife SOC assessed.

Mitigation treatments and the development of mature, and eventually, old-growth forests should result in ecological lift for numerous SOC associated with mature conifer forests, such as elk, deer, mink, spotted skunks, Douglas squirrels, and numerous invertebrates, amphibians, and birds. Fisher and the two species of marten, which are not currently known to occur in the Project Mitigation Area, are likely to find the target mature forests more suitable and these furbearer species could re-colonize the Forest Conversion Area. Elk and deer, while capable of thriving in industrial forests, would also find a balance of cover and forage value in mixed-age conifer forests with well-developed understories.

Under mitigation treatments and after 50 years, marbled murrelets may find low- to moderate-value habitat develop as some coniferous forest stands start to surpass 80 years of age. Northern spotted owls could benefit from more mature forests with greater structural complexity. However, efforts would need to be made to reverse the current 4–8% annual decline and the species would need to engage in a range expansion into the project area to utilize these new habitats (Buchanan and Kohler 2024). In the past four decades, only 14 spotted owls have been located in southwest Washington and none of these were found upstream of the FRE inundation area (Buchanan and Kohler 2024).

Older forests could also provide some additional value for nesting golden eagles if open habitats for hunting are located nearby. Conserving and expanding riparian forests could increase nesting bald eagle habitat along the Chehalis River. Species like olive-sided flycatcher, band-tailed pigeon, evening grosbeak, and varied thrush would benefit from added structural complexity resulting from selective thinning, opening the canopy, and planting trees and shrubs. These species, as well as chestnut-backed chickadees would also benefit from presence of older, mature trees.

Species that prefer more open habitats and mid-seral stage forest and edges, such as purple martin and western bluebird, would likely see a reduction in habitat value in the Forest Conversion Area as clearcuts and grasslands are allowed to mature into forests. The loss of these open habitats would be mitigated, however, by the expansion of open habitats in the adjacent FRE inundation zone. Mature forests in the transitional areas between the Forest Conversion Area and the FRE inundation zone would provide valuable edge habitat for these species and would help offset the loss of clearcuts. Rufous hummingbirds and western screech-owls use a wide variety of habitats and would not likely see any noticeable difference in nesting habitat quality. Sooty grouse would see a reduction in breeding habitat as early successional habitats mature and canopy cover increases, but more mature forests could provide improved wintering habitat for this species. After 50 years, older snags in the forest could provide moderate-value cavity nesting habitat for purple martins, especially when near forest openings for foraging.

Many salamander species thrive in shaded, closed-canopy forests, which will begin to develop as forests mature in the Forest Conversion Area. Maintaining additional woody debris adjacent to streams would increase the quality of these high-value forest habitats. All four salamander species evaluated in this evaluation would benefit from the cessation of commercial harvests and the maturing of young forest stands in riparian areas in particular, since increased canopy cover would keep streams and the forest duff cooler. Denser shrub and herbaceous layers and a cessation of clearcutting should reduce the amount of fine sediments reaching streams, which would improve stream conditions for salamanders. Salamanders would also benefit from maintaining cobbles in the streams and protecting adjacent talus slopes. Western toad habitat would likely remain unchanged in the Forest Conversion Area, as this species is known to live in old-growth forest in addition to most other forest types that already occur in the area. Western toad tadpoles have been found in the Chehalis River above the FRE inundation area and throughout the middle and lower river as well, demonstrating their ability to tolerate the wide array of conditions likely to occur in the future.

It is important to note that improvement in habitat value in the Forest Conversion Area likely will take longer than 50 years to be realized. This is because some of the wildlife SOC assessed in this wildlife habitat evaluation require true mature and old-growth forests for successful completion of some or all portions of their life histories, and these mature forest types could take 100-200 years to develop.

RM 87.6-99.3

The habitat mitigation actions planned in the Chehalis River floodplain at the RM 87.6-99.3 site are outlined in Table 1, and the habitat evaluation results for the site (Attachment 2) indicate these actions would provide noticeable ecological lift for the wildlife SOC assessed.

Although the current conditions at this site currently provide high- and moderate-value habitat for a range of wildlife SOC, it provides only low- or negligible-value habitat for most species. Landbirds, raptors, and mammals have the greatest percentage of high- and moderate-value habitats. The site

currently does not provide much nesting habitat for SOC landbirds, however, and most would use the site only for foraging. Forest birds, including band-tailed pigeon, evening grosbeak, varied thrush, rufous hummingbird, and chestnut-backed chickadee would find moderate-value habitat in the forested areas and these same habitats would provide high- or moderate-value habitat for nesting western screech-owls and bald eagles. The riparian forests and adjacent fields provide moderate-value habitat for western bluebirds. Diving ducks have some riverine habitat available, and both hooded merganser and wood duck could utilize the freshwater pond during the wet season. The large riparian trees could provide high-value habitat for nesting wood ducks, and cavity nesting ducks have been noted breeding in the area (WDFW 2024).

Low- to moderate-value habitat for hoary bats and silver-haired bats is potentially present now at the RM 87.6-99.3 site as both species are known to forage in riparian corridors and meadows, though neither species is known to currently inhabit the area. Both Roosevelt elk and Columbian black-tailed deer use the agricultural fields along the middle Chehalis River, particularly from the end of hunting season through spring (WDFW, pers. comm.). In particular, the area around the RM 87.6-99.3 site receives more use by elk than other portions of the river corridor upstream of Chehalis (WDFW, pers. comm.). The site has moderate-value riparian and aquatic habitat for mink and beaver but low-value habitat for most other mammals.

Western toads have been documented breeding near the RM 87.6-99.3 site (Hayes et al. 2018; WDFW 2024), and the aquatic habitats at the site could provide high-value breeding habitat. The RM 87.6-99.3 site, however, currently provides poor habitat for the remainder of the amphibian SOC.

Under the proposed mitigation plans at the RM 87.6-99.3 site, the number of high- and moderate-value species-by-habitat combinations is expected to increase from 97 (baseline conditions) to 146 (target habitats), providing ecological lift for the wildlife SOC assessed. The wildlife SOC most likely to benefit are wetland-associated species. Aquatic insects, western toads and non-SOC amphibians, beaver, mink, and a variety of non-SOC birds are likely to take advantage of the expansion of new wetland and in-stream habitats. Beaver would likely colonize the area, engineering a natural wetland system. Western toads could see an expansion of available breeding habitat in both newly formed ponds and in-stream pools. Various dabbling duck species and shorebirds would undoubtedly take advantage of the new wetland habitats. Wood ducks would benefit from larger riparian trees that could provide nesting cavities. Bald eagles would see an improvement in waterfowl and shorebird hunting habitat and possibly an expansion of nesting habitat. The scrub-shrub and forested wetlands should provide good nesting habitat for common songbirds. Most landbirds could see a slight improvement in habitat quality with larger trees after 50 years, but habitat values would remain much the same since the improvements would not provide any new high quality nesting habitat.

The rehabilitated forests would provide valuable cover and forage habitat for Roosevelt elk and Columbian black-tailed deer due to the proximity of these habitats to neighboring agricultural fields.

Hoary and silver-haired bats prefer to roost in the foliage and cracks of mature and old-growth trees, so roosting habitat for these species may increase along the Chehalis River riparian corridor as larger trees on the property develop. The expansion of forest habitats would also benefit Douglas squirrel and other SOC closely associated with conifer and mixed forests.

Bunker Creek

At the Bunker Creek site, the in-stream and riparian habitat mitigation actions (Table 1) and the habitat evaluation results (Attachment 2) indicate substantial ecological lift would occur for the wildlife SOC assessed in this evaluation. At this site, in addition to the work along Bunker Creek, extensive riparian enhancement and restoration is also planned along the mainstem Chehalis River.

The Bunker Creek site currently provides low- or negligible-value habitat value for most of the wildlife SOC. This is primarily due to the small size of the site, the constricted stream channel, and because most of the SOC assessed are associated with conifer forests. However, the site does provide low- to moderate-value habitat for bald eagles and wood ducks and high-value habitat for western screech-owls. Landbirds and raptors associated with open areas including western bluebirds, purple martins, and golden eagles can use agricultural fields for foraging and hunting. But since these species are uncommon in the area now, these habitats are considered low-value currently. The agricultural fields (not slated for habitat improvements) provide high-value habitat for elk and deer. The current riparian habitat along the creek is limited in extent and would not provide much wildlife value. Spotted skunks prefer old-growth forests, but they are a habitat generalist and any skunks transiting though the area could use those riparian habitats.

Bunker Creek currently provides no habitat of value for aquatic-associated SOC salamanders, which prefer cool, shaded streams with cobble beds. Western toads have been documented breeding on the Chehalis River near Bunker Creek (Hayes et al. 2018; WDFW 2024) but they prefer shallow pools for breeding. Bunker Creek may be too deep or incised and swift to provide breeding habitat for toads; however, the adjacent riparian habitats along the Chehalis River could provide moderate-value habitat for adult western toads.

Under the proposed mitigation plans for Bunker Creek, the number of high- and moderate-value species-by-habitat combinations is expected to increase from 14 (baseline conditions) to 45 (target habitats), indicating that substantial ecological lift for the wildlife SOC assessed would occur. Most landbirds would see a slight improvement in migration habitat with the addition of conifers and fruit-bearing shrubs. In 50 years, existing trees would be older and larger, possibly creating moderate-value habitat for cavity-nesting wood ducks and roosting hoary or silver-haired bats. Increasing the riparian corridor along the creek and the Chehalis River would also increase cover habitat for mink, deer, and elk. The aquatic enhancements, focused on increasing the value of the habitat for fish, should benefit breeding western toads and aquatic invertebrates as well. Adult western toads would benefit from an expansion of riparian habitat, and the stream habitat may become suitable for egg-laying and tadpole

development if in-stream habitat improvements create shallow, slow-moving pools. Discrete habitat enhancement projects, such as building cavity nest boxes or enhancing the availability of snag trees could also benefit wood ducks. Purple martins could benefit from installing nesting gourds in an agricultural field, but these would have to be maintained to prevent invasive European starlings from outcompeting martins.

Regarding the additional riparian mitigation sites to be included in future revisions of this evaluation, site-specific conditions and mitigation actions will dictate the specific benefits to wildlife. In general, however, the benefits of the planned in-stream and riparian enhancements for wildlife at Bunker Creek would be representative of potential habitat-value improvements for wildlife at additional riparian mitigation sites in the Chehalis River Basin.

Conclusions

The actions outlined in this wildlife habitat evaluation outline how the Applicant plans to minimize and mitigate the potential impacts of the Proposed Action. Impacts to wildlife habitats in the FRE inundation area would be minimized by initiating the establishment of flood-tolerant plant communities pre-operations, and rehabilitating habitats following inundation from operations as described in the VMP (Appendix D in Kleinschmidt 2024). Future target habitats in the FRE inundation area would provide increased wildlife habitat value compared to the DEIS-predicted impact conditions (Ecology 2020; Corps 2020). In the impact analyses in both DEISs, clearcutting the lowermost 600 acres of the FRE inundation area was anticipated with no revegetation efforts, which is similar to what occurred at the Mud Mountain Dam flood retention facility on the White River in western Washington. This approach would result in approximately 90% loss of forested habitats and a drastic reduction in overall wildlife habitat quality. While commercial timberlands and riparian habitats would be lost in portions of the FRE inundation area, implementation of the VMP would promote open forest, woodland, and riparian forest habitats in the Initial Evacuation Area, as well as riparian woodland, shrubland, wetland, and herbaceous habitat in the Debris Management and Final Evacuation areas. These converted forest, woodland, and shrubland habitats would be of high and moderate value for many of the wildlife SOC assessed in this evaluation.

The DEIS impact analyses also anticipated the proliferation of invasive plant species in the FRE inundation area (Ecology 2020; Corps 2020). The VMP, however, includes efforts to control invasive species and promote the proliferation of native vegetation through targeted plantings before operation of the FRE facility and after flood events. Additionally, the impact analyses from both DEISs anticipated the permanent loss of wetlands and wetland buffer vegetation. Wetland habitats and the buffers surrounding them are prioritized for rehabilitation in the VMP with targeted plantings of native wetland species. With implementation of the VMP, a diversity of high-quality wildlife habitats would be developed in the FRE inundation area. Many of these would be open habitats dominated by native plants, which are uncommon types in the industrial forest landscape in the upper Chehalis River basin,

which is currently characterized by even-aged nearly monotypic Douglas fir stands and clearcuts actively replanted with Douglas fir. Overall, with implementation of the VMP, the FRE inundation area would provide additional habitat diversity in the upper river basin, with consequential benefits to wildlife.

Habitat enhancements in the Forest Conversion Area directly adjacent to the FRE inundation area are focused on mitigating impacts to habitats of wildlife species that rely on conifer forests, forested wetlands, and headwater streams. Many of the wildlife SOC assessed in this evaluation are dependent on mature and old-growth forests, and their included waterways, for most or part of their life history. Old-growth forests are in decline across Washington State from timber harvesting and are being replaced by commercial forest plantations, which provide little value for old-growth-associated wildlife SOC unless those species can also make use of early successional forests. For these reasons, conserving and enhancing industrial forest stands in the Forest Conversion Area and setting them on a trajectory toward mature and old-growth forests would result in improvements in habitat value and overall ecological lift in the upper Chehalis River watershed.

The RM 87.6-99.3, Bunker Creek, and additional riparian/floodplain mitigation sites would also provide substantial ecological lift to several wildlife SOC, but also many amphibians, waterbirds, and riparian wildlife species not assessed in this plan. Enhancing riparian forests would provide travel corridors, stabilize banks, and help moderate the temperature of the Chehalis River. Restoring floodplain wetlands not only provides wetland habitat for wildlife but also intercepts and filters runoff and buffers high-water flows.

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ATTACHMENT 1

HABITAT ASSOCIATION INFORMATION FOR WILDLIFE SPECIES OF CONCERN SELECTED FOR HABITAT EVALUATIONS

Amphibians

Habitat values were assessed for five amphibian species known to occur in the Project Mitigation Area (Attachment 2). Data from amphibian surveys conducted by Washington Department of Fish and Wildlife (WDFW) in the vicinity of the temporary reservoir between 2014 and 2017 were used to determine species distribution (Hayes et al. 2018; WDFW 2024).

Van Dyke's salamander (*Plethodon vandykei*) is a stream-associated, terrestrial amphibian endemic to western Washington and a candidate for state listing. It lives out its entire life-cycle, including egg-laying, on land and has no free-living larval stage (WDFW 2024). Van Dyke's salamanders typically require a dense canopy at either conifers or alder-hardwood trees of at least pole size and cool moist microclimates found near streams, moist seepages, or north-facing talus slopes (Blaustein et al. 1995; Nordstrom and Milner 1997; Bosakowski 1999; Olson and Crisafulli 2014; Wilkins and Peterson 2000). This species uses terrestrial woody debris and loose cobbles for shelter and nesting habitat (Hallock and McAllister 2005; Nordstrom 1997), and cool microenvironments protect nests from outside extreme temperatures (Olson and Crisafulli 2014). Jones (1989) found a nest cavity 18°C (32°F) cooler than the outside air temperature. Hayes et al. (2018) found Van Dyke's salamanders rare at elevations below 750 feet in the Chehalis River Basin.

Dunn's salamander (*P. dunni*) is a priority amphibian ranging from northwestern California to southwestern Washington and a candidate for state listing in Washington. It lives out its entire life-cycle, including egg-laying, on land and has no free-living larval stage (WDFW 2024). This species is associated with mossy rocks and moist soils often found in riparian zones, but has been found further upslope on talus and forested habitats (Nordstrom 1997; Hallock and McAllister 2009). Dunn's salamanders use downed logs and woody debris for cover and feeding (Hallock and McAllister 2009; Nordstrom 1997). Studies have shown this species in a variety of forest ages and management practices, but most observations are within 15 meters (m) of forested streams, and most studies point to the importance of wide (>20 m) riparian buffers which help keep cool microclimates (Vesely and McComb 2002; Olson and Crisafulli 2014). This species may become locally extirpated after clearcut logging (Wilkins and Peterson 2000), and it is sensitive to sedimentation (Nordstrom 1997).

Cope's giant salamander (*Dicamptodon copei*) is a stream breeding species endemic to the southwest Washington region that inhabits clear, cold, small to medium sized mountain streams in moist

coniferous forests (Blaustein 1995; Hallock and McAllister 2009). Most individuals live out their entire lives, including sexual maturity, in the aquatic larval stage; metamorphosed terrestrial adults are very rare (WDFW 2014). Blaustein (1995) did not find any significant effects of forest age on the presence of this species. Cope's giant salamanders are sensitive to increases in fine sediments which can fill spaces between cobbles that are used for resting and breeding (Blaustein 1995; Hallock and McAllister 2009; Wilkins and Peterson 2000), and temperature increases (Hallock and McAllister 2009) with critical temperature thresholds around 29°C (82.4°F; Foster and Olson 2014).

Columbia torrent salamander (*Rhyacotriton kezeri*) is a stream-adapted species endemic to northwest Oregon and southwest Washington reliant on steep gradient streams with loose, coarse sediment and canopy cover to keep streams cool (Blaustein 1995). They can also live in permanent seeps and channel splash zones (Hallock and McAllister 2005; Wilkins and Peterson 2000). During rainy periods, metamorphosed adults may venture into nearby wet forests, but in general, this is a stream-dependent species (WDFW 2024). Wilkins and Peterson (2000) observed this species in second-growth forest stands 50 years old, and Vesely and McComb (2002) observed more torrent salamanders in unlogged areas compared to managed forest stands. Russell et al. (2004) noted that maintaining cool water, free of fine sediment may be more important than actual habitat characteristics, and others have noted that torrent salamanders require streams with sediment-free substrates (Blaustein 1995; Nordstrom 1997). They cannot live in water warmer than 27.8-29.0° C (81.0-82.4°F) (Brattstrom 1963).

Western toad (*Anaxyrus boreas*) is typically a stillwater breeding species found throughout much of the western United States and Canada that relies on timbered landscapes (Blaustein 1995). This species prefers early successional areas where limited canopy cover allows for egg laying in shallow warm unvegetated water Hayes et al. 2017, and within the Chehalis River Basin, this species is known to breed almost exclusively in shallow (<20 centimeters [cm]), slow-moving (<0.04 centimeters/second [cm/s]) instream pools (Hayes et al. 2018; WDFW 2023). WDFW (2023) found that both riparian level and landscape level forest cover had a positive effect, and increased stream temperatures had a negative effect on the presence of western toads breeding in the upper Chehalis River. In Washington, breeding typically happens in April and May with tadpole development taking approximately 2 months (WDFW 2024). Outside of breeding, this species can use a variety of habitats including old-growth, regenerating forests, clearcuts, and prairies (Blaustein 1995; Deguise and Richardson 2009). Multiple studies have noted that adult Western toads select young regenerating forests (10-15 years old) outside the breeding season and female toads are more likely to select areas with dense shrub cover (Bartelt et al 2005; Deguise and Richardson 2009).

During amphibian surveys focusing on terrestrial stream-associated species between 2014-2017, researchers documented Dunn's and Columbia torrent salamanders and western toads within the proposed inundation area, and Van Dyke's salamanders were detected outside of the inundation area as close as just downstream of the confluence of Alder Creek and the Chehalis River (Hayes and Douville 2017). Researchers did not find any Cope's giant salamanders within the temporary reservoir and only

had one incidental observation of a possible individual further upstream (Hayes and Douville2017). Surveys focusing on western toads also began after discovering egg masses in the Chehalis River mainstem during the initial surveys.

Birds

Waterbirds

Habitat values for seven species of recreationally, commercially, and/or tribally important waterbirds were assessed (Attachment 2). Wood duck (*Aix sponsa*) is a year round resident, Harlequin Duck (*Histrionicus histrionicus*) has the potential to breed in the summer, and three species of cavity nesting diving ducks (bufflehead [*Bucephala albeola*], common goldeneye [*Bucephala clangula*], and hooded merganser [*Lophodytes cucullatus*]),along with tundra swans (*Cygnus columbianus*) and trumpeter swans (*C. buccinator*) are known to winter in the Chehalis River Basin (Hamer et al. 2017; Limpert et al. 2020).

Wood ducks nest in cavities in late successional and riparian forests near low gradient rivers, sloughs, and ponds (Lewis and Kraege 2004). While shallow wetlands with an abundance of downed logs are ideal for wood ducks (Lewis and Kraege 2004), they use streams in higher proportions than diving ducks (Lemelin et al. 2010) with emergent instream vegetation and riparian forests being important habitat requirements (Hepp and Belrose 2020). Elm and maple trees provide both food and nesting cavities, and other water tolerant trees species can also provide nesting cavities (Dugger and Fredrickson 1992; Hepp and Belrose 2020). Feeding typically occurs in shallow water that is less than 18 inches (McGilvrey 1966; Dugger and Fredrickson 1992), and scrub-shrub vegetation (including willow and alder) can provide cover when feeding away from water and brood rearing (Hepp and Belrose 2020). Hamer et al. (2017) observed wood ducks in the Chehalis River Basin below the FRE facility, but noted the area does not hold a significant number during the winter. That study also observed that prolonged periods of inundation close to spring migration increases feeding potential that is beneficial for females before nesting.

Harlequin ducks breed in fast-moving, high-energy streams with an abundance of aquatic insects (Robertson and Goudie 2020). Most streams with harlequin ducks in Washington had summer flows ranging from 158 to 695 cubic feet per second (Singleton and Long 2018). In North Cascades National Park, adults most frequently used non-braided rapids and riffles with mature forest overstory while broods used pools and backwater sections of rivers with mature and old-growth forest. All ages used cobble and boulder beds most frequently (Rine et al. 2022). Within Washington, this species primarily nests in the Olympic and Cascade mountains (WDFW 2024).

Common goldeneye, bufflehead, and hooded merganser all winter in the Chehalis River Basin (Hamer et al. 2017). In winter, common goldeneye and bufflehead feed in larger lakes and slow-moving rivers when not near preferred salt and brackish water habitats (Gauthier 2020; Eadie et al. 2020), and both

species can tolerate smaller, moderate gradient streams if more preferred habitat is unavailable. Hooded mergansers winter in diverse aquatic habitats ranging from estuarine bays to small ponds, rivers, and creeks (Hamer et al. 2017; Dugger et al. 2020). Since small streams are important to this species' breeding ecology (Lemelin et al. 2010), they are more tolerant of smaller wooded streams than other diving ducks. Like wood ducks, these three diving ducks likely benefit from prolonged periods of inundation before spring migration (Hamer et al. 2017).

Both tundra and trumpeter swans winter in the Chehalis River Basin (Limpert et al. 2020; Mitchell and Eicholz 2020). Swans typically feed in areas of abundant aquatic vegetation, including celery, pondweeds and crowfoot, but can feed in agricultural areas where they prefer winter wheat and corn (Earnst 1994; Johnsgard 2020; Davis et al. 2014; Weaver 2013). Varner (2008) reported trumpeter swans avoiding soybeans in Illinois, while Johnsgard (2020) mentioned soybeans as a crop eaten by swans in western Washington during the spring. In addition to food requirements, swans prefer open terrain that provides abundant visibility and space for takeoff (Banko 1960). In riverine habitats, swans require at least 100 m of open water in slow (<0.45 m/s), wide (>15 m) channels with little to no shrub cover. (Lockman et al. 1987).

Seabirds

The marbled murrelet (*Brachyramphus marmoratus*) is a federally- and Washington State-listed species that occurs within the Project Mitigation Area. Though primarily a marine species that spends more than 90 percent of life at sea, marbled murrelets typically nest inland in old-growth conifer-dominant stands from central California to the Aleutian Islands of Alaska. Birds at the northern end of this range also nest on sea-facing talus slopes (Nelson 2020). Most nests of this species are found within 60 kilometers (km) of the coast (Desimone 2016). Suitable nesting habitat for marbled murrelets outside of Alaska consists of mature conifers (>15 inches diameter at breast height [dbh]) situated in contiguous conifer-dominant (>60 percent) stands with at least one suitable nesting platform >33 feet (10 m) above ground level (Hamer and Nelson 1995). Nesting platforms are at least four inches wide and are typically composed of a wide branch covered with moss, lichen, mistletoe, witches' brooms, or other deformities (Hamer and Nelson 1995).

As coastal forests undergo clear-cutting and development, marbled murrelets are forced to search further inland for suitable nesting habitat. Timber harvest, development, and an overall increase in wildfires also increase habitat fragmentation and the creation of edge habitat that can lead to an increase in nest predation by predators like corvids (Hamer and Nelson 1995). These and other threats like changes in oceanic conditions have caused a rapid decline in the species' population thus resulting in marbled murrelets being listed as state-endangered in Washington, Oregon, and California and threatened under the federal Environmental Species Act.

Within the Project Mitigation Area, pockets of suitable marbled murrelet nesting habitat with potential nesting platforms are present within patches of mature coniferous forest in the headwater areas of the

upper Chehalis River Basin and may be present within the vicinity of the proposed temporary reservoir. While much of the area is in timber production and no old-growth forest is present, mature forest is present in linear patches along the stream corridors which may provide nesting habitat for marbled murrelets. Marbled murrelet activity has been documented in the upstream portions of the maximum temporary reservoir area. Additionally, circling marbled murrelets, which is indicative of nesting activity, were documented within 1 mile of the proposed temporary reservoir within the subcanopy of forest habitat.

Raptors

Habitat values for two species of eagles and two species of owls were assessed (Attachment 2). Bald eagles (*Haliaeetus leucocephalus*) can be found in the area year-round (Buehler 2022). Bald eagles nest in a variety of riparian habitats that have at least one large tree within 2 km of a reservoir or large river (Anthony et al. 1982; Anthony and Isaacs 1989; Hunt et al. 1992), and they typically spend the winter near open water or along streams with salmon runs (Watson and Roderick 2001; Buehler et al. 2022). In Pacific Northwest coniferous forests with tree composition similar to the project area, bald eagles select Douglas fir and Western hemlock, and those nesting along large riparian corridors nest in black cottonwood (Anthony et al 1982). Anthony et al. (1982) reported the average Douglas fir nest tree in Washington was 1.3 m dbh.

Golden eagles (*Aquila chrysaetos*) are most likely in the Willapa Hills outside of the breeding season (Katzner et al. 2020). Hansen (2017) and Watson et al. (2020) showed a small number of historic nests in the area, but Watson et al. (2020) only found evidence of nesting at 6 of 40 historic Golden eagle territories in Washington west of the crest of the Cascade Mountains. While golden eagles are typically associated with cliffs, in Washington they regularly nest in coniferous forests (Bruce et al. 1982; Katzner et al. 2020). They hunt medium-sized mammals such as mountain beaver (*Aplodontia tufa*), snowshoe hare (*Lepus americanus*), and European rabbit (*Oryctolagus cuniculus*) in nearby clearcuts and younger forest stands typically within 3 km of nest sites (Bruce et al 1982; Hansen 2017). Golden eagles continue to use coniferous forests adjacent to open areas during the winter, and more rugged terrain allows for more efficient hunting (Domenech et al. 2015).

The northern spotted owl (*Strix occidentalis casuarina*) is a federally- and state-listed species that is strongly associated with old-growth forest and requires large patches of closed canopy forest with complex structure for nesting, roosting, and foraging (Lesmeister et al. 2018). Based on the results of a number of surveys conducted during the last 17 years (reported in Kleinschmidt 2022), the presence of the northern spotted owl in upper Chehalis headwaters is extremely low and was limited to dispersing and foraging individuals.

Western screech-owls (*Megascops kennicottii*) can inhabit most forested habitats from old-growth to urban woodlots (Elliot 2006) and they are often associated with riparian areas (Cannings et al. 2020; COSEWIC 2002). Coastal populations tend to nest in coniferous or mixed forests (COSEWIC 2002), with

old-growth forest having the highest detection rates on Vancouver Island (Setterington 1998). Pileated woodpeckers and northern flickers provide nesting cavities for western screech-owls (Cannings et al. 2020). Elliot (2006) suggested that barred owls (*Strix varia*) can cause population declines due to predation, and also force western screech-owls to use smaller fragmented habitats <30 hectares.

Landbirds

Habitat values for seven resident, two short-distance migrant, and five neotropical migrant landbirds were assessed (Attachment 2). One resident species, the slender-billed white-breasted nuthatch (*Sitta carolinensis aculeata*), is not expected to occur in the proposed temporary reservoir. Slender-billed white-breasted nuthatch is a prairie oak obligate (Slater and Altman 2006) and only occurs locally near the town of Chehalis. The remaining landbird species use a variety of habitats throughout the proposed temporary reservoir.

Most resident species in the proposed temporary reservoir are associated with conifer forests for at least part of their life history. Sooty grouse (*Dendragapus fuliginosus*) prefer open canopy Douglas fir forests with <50% canopy closer and are not negatively impacted by clearcuts if some stumps are present (Bendell and Elliott 1966; Zwickel and Bendell 2020). Early successional forests and a well-developed understory are important for brood rearing and territorial males also prefer early successional forests (Zwickel and Bendell 1985). Conifer forests are the preferred winter habitat of this species (Zwickel and Bendell 2020).

Belted kingfishers (*Megaceryle alcyon*) rely on clear unvegetated water with nearby perches for feeding and nearly vertical banks for nesting (Kelly et al. 2020). Kingfishers avoid turbid waters and often hunt for fish in riffles in rivers and sheltered coves on lakes (Davis 1982). Brooks and Davis (1987) found the availability of suitable nesting banks, near vertical walls of mostly sand and <7% clay, as the main driver of kingfisher densities in Ohio and Pennsylvania.

American dippers (*Cinclus mexicanus*) reside near fast moving, clear streams and rivers throughout the year that are >2 m wide, and may have riffles, falls, and rocky bottoms (Osborn 1999; Kingery and Wilson 2020). Overstory cover has been correlated with increased productivity of this species (Loegering 1997). American dippers nest along stream cliffs and banks, behind waterfalls, and within logs with cavities and root wads (Loegering 1997; Kingery and Willson 2020). The presence of bridges can double the number of nesting pairs along a river (Osborn 1999).

Chestnut-backed chickadees (*Poecile rufescens*) live year-round in coniferous forests of various ages (Anthony et al. 1996). Forest thinning, distance to forest edge, and distance to salmon streams do not affect densities (Hagar et al. 1996; Brand and George 2001; Christie and Reimchen 2008). Chickadees nest in either snags or deciduous trees among conifers, and often choose broken-top trees for nesting (Mahon et al. 2007). Red alder hosts many arthropods that are important food sources for young chestnut-backed chickadees, and they also feed on shrubs like vine maple and huckleberry (Weikel and

Hayes 1999). During the breeding season, Anthony et al. (1996) found this species almost twice as abundant in old-growth forests compared to young forests, but during winter, they used old-growth, mature, and young forests similarly.

Evening grosbeaks (*Coccothraustes vespertinus*) transition from mature, dense conifer forests in the summer to younger conifer forests in the winter (Anthony et al. 1996; Bonter and Harvey 2008; Gillihan and Byers 2020). Several studies have found structural complexity associated with forest thinning increased evening grosbeak densities over unmanaged Douglas fir stands (Anthony et al. 1996; Hagar et al. 1996). Forest openings allow light to reach the ground, which promotes the growth of beaked hazel, a shrub often evening grosbeaks are often associated with, and other deciduous shrubs (Hagar et al. 1996).

Varied thrush (*Ixoreus naevius*) are potentially a year-round resident in the proposed temporary reservoir. During the breeding season, this species is associated with riparian habitats and prefers older conifer forests with a dense understory (Anthony et al. 1996; Brand and George 2001). Varied thrush occurrence was positively correlated with forest fragment size (Brand and George 2001), and clearcuts and forest edges could negatively affect their breeding density (Brand and George 2001; Manuwal and Manuwal 2002). However, varied thrushes will forage at forest edges where insects might be more abundant than the forest interior (Brown 2007). In the winter, varied thrushes occupy a broader range of habitats and will forage where fruits, seeds, and berries occur (George 2020).

Band-tailed pigeons (*Patagioenas fasciata*) prefer to nest in closed canopy conifer forests in Douglas fir trees (Leonard 1998; Pacific Flyway Council 2010), but can nest in deciduous trees, as well (Leonard 1998). They are habitat generalists for feeding (Sanders 2011). Keppie and Braun (2000) lists band-tailed pigeons as inhabiting red cedar, western hemlock, Douglas fir, and red alder, and Sanders (2011) lists oak, madrone, elder, dogwood, cherry, cascara, and huckleberry as important food sources for band-tailed pigeons. Trees 16-32 cm dbh in stands with two distinct layers provide optimal nesting habitat for this species, and forest structure may be more important for nesting than tree species (Leonard 1998). Band-tailed pigeons also depend on mineral sites for nutrients (Lewis et al. 2004; Overton et al. 2010), but these sites are highly localized and rare.

Western bluebirds (*Sialia mexicana*) nest in a variety of open canopy forested habitats, wooded riparian areas, grasslands, farmlands, burned, moderately logged, and edge areas (Kozma and Kroll 2010; Guinan et al. 2020). As cavity nesters, snags are important forest structures for nesting and perching (Slater and Altman 2011; Guinan et al. 2020). The decline of this species has been associated with the loss of nesting cavities, but nest boxes can provide a substitute (Slater and Altman 2011). Western bluebirds move to lower elevations during the winter, and breeders at lower elevations are non-migratory if winter food is abundant (Guinan et al. 2020).

Vaux's swifts (*Chaetura vauxi*), rufous hummingbirds (*Selasphorus rufus*), olive-sided flycatchers (*Contopus cooperi*), and purple martins (*Progne subis*) are long distance migrants that spend winters in Central and South America but could breed near the temporary reservoir. Vaux's swifts are cavity nesters that historically required large dead tree hollows in old-growth forests for nesting and night roosting (Bent 1940), but now they will also occasionally use chimneys in urban areas for nesting and frequently use chimneys for roosting during migration (Schwitters et al. 2021). In its natural habitat, this species is reliant on old-growth forest, nesting colonially in very large snags and rarely in younger trees (Manuwal and Huff 1987, Munuwal 1991). In Southern Washington, the abundance of Vaux's swifts was positively correlated with large live trees (>100 cm dbh) and snags (Schwitters et al. 2021). They feed wherever flying insects are present regardless of habitat (Manuwal 1991).

Rufous hummingbirds nest in a variety of forest habitats but have shown higher densities in riparian and old-growth forests (Anthony et al. 1996). In coniferous forests, this species can nest in stands from 16 to 120+ years (Healy and Calder 2020). Early season nests are typically built on branches lower in conifer trees while late season nests were built higher in deciduous trees (Horvath 1964).

Olive-sided flycatchers nest in coniferous forests, and are often associated with forest edges with perching snags for foraging and singing (Altman and Sallabanks 2020). The species is more abundant in late successional forests with natural or man-made openings and areas with <40% canopy cover (McGarigal and McComb 1995; Altman 1997). The decline of this species has been attributed to forest management practices such as clear-cutting and fire-suppression resulting in habitat loss or alteration (Altman 1997).

Purple martins nest in open canopy habitats with dead snags or man-made nesting structures, and are often associated with open water or wetlands (Brown et al. 2021; Sherman and Hagar 2021). Timber harvests with snag retention in large openings as well as nest boxes and gourds have provided nesting habitat for purple martins in the Pacific Northwest (Brown et al. 2021). In unaltered habitats, martins will most frequently nest in Douglas fir trees in some stage of decay near water and away (>100 m) from closed canopy forests, although other tree species can provide suitable nesting habitat (Scalici 2019; Sherman 2019). Invasive European starlings (*Sturnus vulgaris*) will outcompete purple martins for nest sites, and in remote areas where starlings were not present, martins nested in snags in forested uplands that were far from open water (Sherman 2019).

Oregon vesper sparrows (*Pooecetes gramineus affinis*) breed in large, dry, moderately short grass prairies with a high structural diversity of grasses and forbs (WDFW 2024). These prairies often have some tree and shrub cover (WDFW 2024; Cuevas 2020). An estimated 90% of the current Washington population occurs in the south Puget Lowlands, mostly on Joint Base Lewis-McChord, with an estimated 30 individuals nesting elsewhere including San Juan Island and the lower Columbia River (WDFW 2024). This species historically nested within the study area at the confluence of the south fork and the

mainstem of the Chehalis River, but the study area is not within the current breeding range for this species (Altman et al. 2020).

Mammals

Bats

Four species of bats (Hoary bats [*Lasiurus cinereus*]), Keen's myotis [*Myotis keenii*], silver-haired bats [*Lasionycteris noctivagans*], and Townsend's big-eared bats [*Corynorhinus townsendii*]) as well as roosting concentrations of *Myotis* spp. and roosting concentrations of big brown bats (*Myotis lucifugus*) were assessed for habitat values (Attachment 2). In general, bat detections are higher in old-growth and thinned managed forests compared to un-thinned managed forests; understory shrub cover was also positively correlated with bat activity (Humes et al. 1999). Old-growth and thinned forests also have larger snags present, which are important roosting substrates for many species of bats (Betts 1996; Sasse and Pekins 1996; Vonhof 1996; Ormsbee and McComb 1998; Humes et al. 1999; Arnett 2007). Most bats in Washington hibernate in small groups of <25 individuals, with the largest known wintering aggregation being approximately 300 Townsend's big-eared bats (Hayes and Wiles 2013).

Hoary bats hunt in open habitats (WDFW 2024), and are known to roost solitarily in deciduous and coniferous trees (Kunz 1982a; Shump and Shump 1982; Hayes and Wiles 2013; WDFW 2024). In conifer stands in Oregon, they preferred roosting in mature Douglas-fir/western hemlock forests over 200 years old (Perkins and Cross 1988). Other studies also found that hoary bats roost in large trees and prefer a forest with reduced tree density (Klug et al. 2012; Willis and Bingham 2005). This is likely because hoary bats are relatively fast fliers with limited maneuverability that forage in openings, so less dense forests, such as old-growth or thinned stands, would be more easily navigated and roosting foliage far from the ground and away from trunks would be easy to enter and exit.

The Keen's myotis is found primarily in coastal mature conifer stands, even for foraging (WDFW 2024; Boland 2007; Boland et al. 2009; Suring 2014) although riparian habitats are also important foraging habitats in southeast Alaska (Suring 2014; Parker et al. 1996). While they will roost in rock crevices, small caves, and buildings, they roost almost exclusively in the cracks and crevices of dead and dying conifer trees (WDFW 2024; Boland 2007; Boland et al. 2009). In southeast Alaska, female Keen's myotis only roosted in cedar trees while males preferred cedars but would also roost in hemlocks and other species (Boland 2007; Boland et al. 2009).

Silver-haired bats are solitary bats that roost in cracks and crevices of conifer trees, particularly Douglas fir, and thus prefer mature forests with a diverse, mixed-age structure (WDFW 2024; Perkins and Cross 1988). They forage along riparian corridors (WDFW 2024). Silver-haired bats are a migratory species and the consensus is most migrate south during winter (Izor 1979). However, in the Pacific Northwest, they may not be as migratory (Schowalter et al. 1978; Kunz 1982b; Cryan 2003) and will even remain active all winter when maximal daytime temperatures are as low as 6.0°C in mild areas, such as Olympia,

Washington (Falxa 2007). Winter high temperatures near the FRE facility are similar to high temperatures in Olympia, so it is possible silver-haired bats remain active all winter near the proposed temporary reservoir.

Townsend's big-eared bats have a scattered distribution and occur at low densities (WDFW 2024). They require caves or other large cavernous structures (buildings, some large tree cavities, mines) for reproduction and hibernation, and thus, their distribution is limited by the availability of these structures (WDFW 2024; Gruver and Keinath 2006; Hayes and Wiles 2013) They forage in a variety of habitats but are best suited for foraging in the canopies of mature forests and along forest edges and waterbodies, though they may avoid openings otherwise (WDFW 2024; Gruver and Keinath 2006).

Big brown bats primarily roost in conifer snags, selecting large snags of Douglas fir and western red cedar, while avoiding snags of western hemlock (Arnett 2007). They tended not to roost in forests <40 years old, did not select for snags left in clearcuts, and selected for snags with a higher density of snags nearby (Arnett 2007). Roosting concentrations of other myotis species found in western Washington (long-eared myotis [*Myotis evotis*], California myotis [*Myotis californicus*], little-brown bat [*Myotis lucifugus*], long-legged myotis [*Myotis volans*], and Yuma myotis [*Myotis yumanensis*]) are also often associated with mature conifer forests with abundant snags to roost in (Humes et al. 1999; Arnett 2007). Long-legged myotis selectively roost in large snags in forests >41 years old (Ormsbee and McComb 1998; Arnett 2007). Long-eared myotis preferentially roost in Douglas-fir snags in forests >40 years old, but in more recent clearcuts and younger forests <15 years old, select for stumps and downed logs of Douglas fir or western hemlock for roosts (Waldien et al. 2000; Arnett 2007; WDFW 2024). Long-eared myotis hibernate in caves, mines, and buildings (WDFW 2024).

Furbearers and Large Mammals

Elk are an important indigenous food source and recreational sport species in Washington. The proposed temporary reservoir is within the range of the Willapa Hills herd of Roosevelt elk (WDFW 2014; Holman et al. 2023). Roosevelt elk (*Cervus canadensis roosevelti*) are a native subspecies of elk, whereas east of the crest of the Cascade Mountain range, elk were nearly extirpated by the early 1900s (Rasmussen 1949) and re-introductions of Rocky Mountain elk from Yellowstone National Park have resulted in mixed-origin populations (WDFW 2014; Holman et al. 2023). The Willapa Hills herd was estimated at around 8,000-10,000 animals (WDFW 2014). At the proposed temporary reservoir, the Chehalis River is the boundary between game management units (GMU) 506 to the west and 530 to the east. The proposed downstream mitigation sites and the Chehalis River border GMU 501. These three GMUS are in a district of the state known for good elk densities and some of the highest harvest rates in the state (Holman et al. 2023).

Roosevelt elk evolved in and prefer old-growth forests as they provide all cover and forage needs (Starkey et al. 1982). In Olympic National Park where mature and old-growth forests are more common, elk select valley-bottom habitats in the summer, winter, and late-winter, and generally avoid western

hemlock forests during these seasons (Jenkins and Starkey 1984). In managed temperate rainforest ecosystems, habitat selection varies greatly by season (Witmer 1981; Schroer et al. 1993; Jenkins and Starkey 1984; Jenkins 1979), but generally, Roosevelt elk like meadows, more recent timber harvest lands, and areas where the canopy is open enough to promote ground cover growth, but they also rely on older forests with larger trees for cover (Russell, 2005; Weckerly 2005; WDFW 2014; WDFW 2024). Timber management practices have broadly benefitted elk by increasing the quality and quantity of forage provided by clearcuts and young stands (WDFW 2014; Holman et al. 2023). Scroer et al. (1993) recommended forest managers retain mature deciduous forests, 6-15 year old clearcuts, and mature bottomland conifer forests. Second-growth forests are less valuable as they provide less forage and have less ability to intercept heavy snow (Starkey et al. 1982). Elk may also use agricultural land (Russell 2005; WDFW 2014) and are known to move down from Bawfaw Peak and other higher elevation habitats to winter along the flats surrounding the West and East Forks of the Chehalis River, including the proposed temporary reservoir (WDFW pers. comm.).

Columbian black-tailed deer (*Odocoileus hemionus columbianus*) populations in District 10 are stable-to-increasing and yield some of the highest harvests in the state, with GMUs 506, 530, and 501 in the top seven for buck harvest (Holman et al. 2023). There was a harsh winter in 2016-2017 that led to a decline in the population, but mild winters since have led to good harvests again (Holman et al. 2023). Deer select for areas with high available browse in summer, but in colder or higher elevation areas, avoiding deep snow is more important (Gilbert et al. 2017; Vales et al. 2022). Black-tailed deer do well in managed forest settings, using openings, clearcuts, and young forests for high quality forage, and more mature forests for thermal cover and avoidance of predators and hunters (Hanley 1984; Loft and Menke 1984; Kremsater 1989; Schrautemeier 2017). Edge habitat is also beneficial as it provides easy access to both cover and forage (Suring 1974; Hanley 1983; Kremsater 1989; Kremsater and Bunnell 1992; Nelson et al. 2008; Eckrich et al. 2020; Vales et al. 2022). Second-growth conifer forests provide the least value to deer as they often are heavily shaded and provide little forage (Hanley 1984; Nelson et al. 2008).

The western spotted skunk (*Spilogale gracilis*) is an omnivorous mesocarnivore that prefers habitats with a dense understory (WDFW 2024; Dalquest 1948; Grinnell et al. 1937; Pearson 1964; Ingles 1965). They den in ground cover, such as rocky crevices, burrows of other species, and woody structures like logs, stumps, snags, and slash/brush piles that protect them from the elements (WDFW 2024). Riparian areas and early successional forests with substantial shrub cover can be particularly suitable (Maser et al. 1981; Brown 1985). They prefer elevations below approximately 500 m but have been trapped up to 880 m (Carey and Kershner 1996). Fragmentation from agriculture and urban development is detrimental to this species (Carey and Kershner 1996).

Fisher (*Pekania pennanti*) were once native to southwestern Washington, but overharvesting and habitat loss caused them to be extirpated from the State in the mid-1900s. This species has successfully been reintroduced to the Olympic Peninsula and the Cascade Mountains in the past two decades (WDFW 2024). Fisher are forest specialists, preferring coniferous or mixed coniferous-deciduous forests,

and they use areas with moderate to high canopy cover and avoid open areas, including grasslands and clearcuts (Lewis et al. 2016; WDFW 2024). Larger trees and logs with cavities provide resting and denning sites (WDFW 2024). Translocated fisher in the Olympic Mountains selected stands of mid-sized trees over stands with the tallest trees (Lewis et al. 2016). While reintroduced populations could provide a source for fishers in the Project Mitigation Area, Barry (2018) found that reintroduced fishers in the Oregon Cascades have failed to colonize suitable habitat outside of areas where this species was reintroduced in 1977.

The marten is associated with mature and old-growth conifer and riparian forests and avoid regenerating forests (WDFW 2024; Raphael and Jones 1997; Shirk et al. 2014). They prefer resting sites in snags and diseased silver fir, Douglas fir, and western cedar, and particularly western hemlock (Raphael and Jones 1997). Martens in Washington have been split into two species: Pacific marten (*Martes caurina*) and American marten (*M. americana*) (Zielinski et al. 2001; Aubry et al. 2012; Dawson and Cook 2012; Shirk et al. 2014; WDFW 2023, 2024). Currently, coastal populations of Pacific marten may be extirpated from all of their range in Washington except for the Olympic Peninsula, but American marten in the Cascade Range are doing well and are still a game species, with all reported marten harvest in the last few years occurring in Yakima, Chelan, and Skamania counties (Zielinski et al. 2001; Ruggiero et al. 1994; WDFW 2022, 2023). Marten are likely rare or possibly absent from the Project Mitigation Area.

Douglas squirrels (*Tamiasciurus douglasii*) are found in coniferous forests of the Cascade Mountains and in western Washington at any elevation with appropriate habitat (WDFW 2024). They rely on coniferous cones as their main food source (WDFW 2024). In a study site near the Columbia Gorge in southern Washington, Buchanan et al. (1990) found significantly higher Douglas squirrel winter abundance in old-growth forest compared to young forest stands (which had regenerated after wildfires and had not been logged) but did not find a significant difference in squirrel winter abundance by forest stand age in Mount Rainier National Park. Buchanan et al. (1990) hypothesized that managed even-aged Douglas fir adversely affects Douglas squirrel populations due to the lack of multiple vegetation strata and age classes as well as a lack of western hemlock, but Carey (2000) found Douglas squirrel densities in old-growth forest stands that were lower than in legacy and thinned stands.

North American beaver (*Castor canadensis*) reside in most habitat types that have riparian vegetation along streams in unconfined valleys (Pollock et al. 2023). Beavers are known for modifying stream morphology and hydrology, which can benefit a variety of fish and wildlife species (Kreuger et al. 2021). They prefer streams with slopes <3%, although they can occur in streams with slopes up to 6% (Dittbrenner et al. 2018). Habitat restoration projects for beavers often involve planting willows and cottonwoods since these shrub and tree species are preferred by beavers (Burgher et al. 2023). Beaver are found throughout the Chehalis River watershed, and their presence can greatly benefit habitat restoration and the protection of endangered aquatic species (Kreuger et al. 2021).

American mink (*Neovison vison*) are habitat generalists that are typically associated with water and habitats ranging from beaches and marshes to old-growth forest and riparian habitats (ADFG 2024). Hodder (2016) noted a paucity of literature on mink habitat use in North America, but the Hodder study found that wintering mink in British Columbia selected riparian habitats only at larger landscape-level scales.

Invertebrates

Invertebrate species of greatest conservation need (SGCN) listed in the Washington State Wildlife Action Plan (WDFW 2015) that have the potential to occur in the Project Mitigation Area can be grouped into aquatic invertebrates, native prairie specialists, or moist habitat specialists (Appendix A-5 in WDFW 2015). Aquatic invertebrates usually live the majority of their life in the aquatic larval state, metamorphosing into terrestrial adults for only a short time to breed. These include mayflies, dragonflies, damselflies, stoneflies, and caddisflies. Moist habitat specialists primarily include snails and slugs. Prairie species are predominantly butterflies and bumble bees.

Occurrence and distributional data is lacking for many of these species. Only three species of insects (mardon skipper [*Polites mardon*], Taylor's checkerspot butterfly [*Euphydryas editha taylori*], and valley silverspot [*Speyeria zerene bremnerii*]) have adequate occurrence data to be included in the WDFW potential range and habitat distribution maps (Appendix B in WDFW 2015); all are sedentary butterflies restricted to scattered occurrences of prairie ecosystems and none are known to occur in the Project Mitigation Area, but there is potential habitat nearby (Appendix B in WDFW 2015). All complete their entire life-cycle in the same location (Appendix A5 in WDFW 2015), so a flooding event could eliminate a colony. However, if flood intervals are long enough and source populations exist nearby, recolonization could occur between flood events.

Due to the lack of occurrence and distributional data, it would be difficult to evaluate habitat for individual invertebrate species. However, many of the mitigation activities described in this wildlife habitat evaluation could benefit some of these species. Therefore, three invertebrate species groups (aquatic invertebrates, native prairie specialists, and moist habitat specialists) were included in the habitat evaluation process (Attachment 2).

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ATTACHMENT 2

HABITAT EVALUATION MATRICES

Table F2-1

Habitat Evaluation Matrix For Target Habitats In The Proposed Fre Inundation Area.

GROUP	COMMON NAME	MIXED CONIFEROUS/DECIDUOUS TRANSITIONAL FOREST (INITIAL EVAC AREA ONLY)	DECIDUOUS SHRUBLAND	HERBACEOUS/GRASS	HERBACEOUS/SHRUB	DECIDUOUS RIPARIAN FOREST (INITIAL EVAC AREA ONLY)	DECIDUOUS RIPARIAN FOREST W/SOME CONIFER (INITIAL EVAC AREA ONLY)	DECIDUOUS RIPARIAN SHRUBLAND W/SOME TREES	DECIDUOUS RIPARIAN WOODLAND	DECIDUOUS RIPARIAN SHRUBLAND	TERRESTRIAL BARE GROUND/ROADS	TRIBUTARY STREAM	CHEHALIS RIVER (MOSTLY)	SCRUB-SHRUB WETLAND	SCRUB-SHRUB/HERBACEOUS WETLAND	FOREST/SCRUB-SHRUB WETLAND	FOREST/SCRUB-SHRUB/HERBACEOUS WETLAND
Waterbird	Bufflehead	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
Waterbird	Common Goldeneye	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
Waterbird	Harlequin Duck	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
Waterbird	Hooded Merganser	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	1
Waterbird	Trumpeter Swan	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Waterbird	Tundra Swan	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Waterbird	Wood Duck	2	1	0	0	2	2	2	2	2	0	2	2	0	0	0	1
Seabird	Marbled Murrelet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Landbird	American Dipper	0	0	0	0	1	1	1	1	1	1	2	2	0	0	0	0
Landbird	Band-tailed Pigeon	2	1	0	0	2	2	2	2	1	0	0	0	0	0	0	0
Landbird	Belted Kingfisher	1	0	0	0	2	2	0	2	0	0	2	2	0	0	0	0
Landbird	Chestnut-backed Chickadee	2	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0
Landbird	Evening Grosbeak	2	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0
Landbird	Olive-sided Flycatcher	2	1	1	1	1	2	2	2	1	1	1	1	0	0	1	1
Landbird	Oregon Vesper Sparrow	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Landbird	Purple Martin	0	0	1	1	1	1	2	2	0	0	1	1	1	1	0	0
Landbird	Rufous Hummingbird	2	1	0	0	2	2	2	2	1	0	1	1	1	1	2	2
Landbird	Slender-billed White-breasted Nuthatch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Landbird	Sooty Grouse	1	1	0	2	1	2	1	1	1	0	0	0	1	1	1	1
Landbird	Varied Thrush	1	1	1	1	1	2	1	1	1	0	0	0	1	1	1	1
Landbird	Vaux's Swift	1	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Landbird	Western Bluebird	3	1	2	2	2	2	2	2	1	0	0	0	1	1	1	1
Raptor	Bald Eagle	2	0	0	0	2	2	2	2	0	0	2	2	0	0	0	0
Raptor	Golden Eagle	0	1	3	2	0	0	1	1	1	1	0	0	0	0	0	0
Raptor	Northern Spotted Owl	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Raptor	Western Screech Owl	2	1	0	0	3	3	2	2	1	0	0	0	1	1	2	2
Furbearer	American beaver	2	2	0	1	3	3	2	1	2	0	3	3	2	2	2	2

GROUP	COMMON NAME	MIXED CONIFEROUS/DECIDUOUS TRANSITIONAL FOREST (INITIAL EVAC AREA ONLY)	DECIDUOUS SHRUBLAND	HERBACEOUS/GRASS	HERBACEOUS/SHRUB	DECIDUOUS RIPARIAN FOREST (INITIAL EVAC AREA ONLY)	DECIDUOUS RIPARIAN FOREST W/SOME CONIFER (INITIAL EVAC AREA ONLY)	DECIDUOUS RIPARIAN SHRUBLAND W/SOME TREES	DECIDUOUS RIPARIAN WOODLAND	DECIDUOUS RIPARIAN SHRUBLAND	TERRESTRIAL BARE GROUND/ROADS	TRIBUTARY STREAM	CHEHALIS RIVER (MOSTLY)	SCRUB-SHRUB WETLAND	SCRUB-SHRUB/HERBACEOUS WETLAND	FOREST/SCRUB-SHRUB WETLAND	FOREST/SCRUB-SHRUB/HERBACEOUS WETLAND
Mesocarnivore	American marten	1	1	0	0	1	1	1	1	1	0	0	0	1	1	1	1
Large Mammal	Columbia black tailed deer	2	2	1	2	2	2	3	3	2	1	1	1	2	2	2	2
Small Mammal	Douglas's Squirrel	2	0	0	0	1	2	1	1	0	0	0	0	0	0	0	0
Mesocarnivore	Fisher	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Mesocarnivore	Mink	3	2	1	1	3	3	3	3	3	1	3	2	1	1	1	1
Mesocarnivore	Pacific marten	1	1	0	0	1	1	1	1	1	0	0	0	1	1	1	1
Large Mammal	Roosevelt elk	2	3	3	3	3	3	3	3	3	1	1	1	2	2	2	2
Mesocarnivore	Western spotted skunk	2	2	1	1	2	2	2	2	2	0	2	0	2	2	2	2
Bat	Hoary Bat	1	2	3	3	2	2	2	2	2	1	2	2	2	2	2	2
Bat	Keen's Myotis	1	0	0	0	1	1	0	0	0	0	0	2	1	1	1	1
Bat	Roosting concentrations of big brown bats	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bat	Roosting concentrations of myotis bats	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bat	Silver-haired Bat	1	0	0	0	1	1	1	1	1	0	1	1	1	1	1	1
Bat	Townsend's big-eared bat	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1
Amphibian	Columbia torrent salamander	1	0	0	0	1	1	0	0	0	0	1	0	0	0	0	0
Amphibian	Cope's giant salamander	1	0	0	0	1	1	0	0	0	0	1	0	0	0	0	0
Amphibian	Dunn's salamander	1	0	0	0	1	1	0	0	0	0	1	0	0	0	0	0
Amphibian	Van Dyke's salamander	1	0	0	0	1	1	0	0	0	0	1	0	0	0	0	0
Amphibian	Western toad	2	2	1	1	2	2	2	2	2	0	2	2	2	2	2	2
Invertebrate	Aquatic Invertebrates	0	0	0	0	1	1	1	1	1	0	1	2	1	1	1	1
Invertebrate	Moist Habitat Invertebrates	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
Invertebrate	Prairie Specialist Invertebrates	0	0	3	2	0	0	1	1	1	0	0	1	1	1	1	1

Table F2-2

Habitat Evaluation Matrix for Current Habitats in the Proposed FRE Facility Forest Conversion Area.

GROUP	COMMON NAME	CONIFEROUS FOREST	DECIDUOUS RIPARIAN FOREST W/SOME CONIFERS	DECIDUOUS RIPARIAN SHRUBLAND	HERBACEOUS/GRASS	LOGGED, REPLANTED 0-5 YEARS	LOGGED, REPLANTED 5-15+ YEARS	LOGGED, UPDATED 2023	MIXED CONIFEROUS/DECIDUOUS TRANSITIONAL FOREST	TERRESTRIAL BARE GROUND/ROADS	TRIBUTARY STREAM	CHEHALIS RIVER (MOSTLY)	SLOPE WETLAND	DEPRESSIONAL WETLAND	RIVERINE WETLAND
Waterbird	Bufflehead	0	0	0	0	0	0	0	0	0	1	1	0	0	0
Waterbird	Common Goldeneye	0	0	0	0	0	0	0	0	0	1	1	0	0	0
Waterbird	Harlequin Duck	0	0	0	0	0	0	0	0	0	1	1	0	0	0
Waterbird	Hooded Merganser	0	0	0	0	0	0	0	0	0	2	2	0	0	0
Waterbird	Trumpeter Swan	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Waterbird	Tundra Swan	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Waterbird	Wood Duck	0	2	2	0	0	0	0	2	0	2	2	0	0	0
Seabird	Marbled Murrelet	1	0	0	0	0	0	0	1	0	0	0	0	0	0
Landbird	American Dipper	1	1	1	0	0	0	0	1	1	3	3	0	0	0
Landbird	Band-tailed Pigeon	2	2	2	0	1	1	0	2	0	0	0	0	0	0
Landbird	Belted Kingfisher	0	1	0	0	0	0	0	0	0	3	3	0	0	0
Landbird	Chestnut-backed Chickadee	3	1	0	0	1	1	0	2	0	0	0	0	0	0
Landbird	Evening Grosbeak	2	1	0	0	1	2	0	3	0	0	0	0	0	0
Landbird	Olive-sided Flycatcher	2	1	1	1	1	2	1	2	1	1	1	1	1	1
Landbird	Oregon Vesper Sparrow	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Landbird	Purple Martin	0	1	0	1	0	0	1	0	0	1	1	0	1	0
Landbird	Rufous Hummingbird	2	2	1	0	1	2	0	2	0	1	1	1	1	1
Landbird	Slender-billed White-breasted Nuthatch	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Landbird	Sooty Grouse	2	2	1	1	2	2	2	2	0	0	0	1	1	1
Landbird	Varied Thrush	2	2	1	1	1	1	1	2	0	0	0	1	1	1
Landbird	Vaux's Swift	1	1	0	0	0	0	0	1	0	0	0	0	0	0
Landbird	Western Bluebird	1	3	1	0	2	2	0	2	0	0	0	1	1	1
Raptor	Bald Eagle	2	2	0	0	0	0	0	2	0	2	2	0	0	0
Raptor	Golden Eagle	1	0	1	1	1	0	1	1	1	0	0	0	1	0
Raptor	Northern Spotted Owl	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Raptor	Western Screech Owl	2	3	1	0	0	1	0	2	0	0	0	2	1	2
Furbearer	American beaver	1	2	2	0	0	0	0	1	0	2	2	1	1	2

GROUP	COMMON NAME	CONIFEROUS FOREST	DECIDUOUS RIPARIAN FOREST W/SOME CONIFERS	DECIDUOUS RIPARIAN SHRUBLAND	HERBACEOUS/GRASS	LOGGED, REPLANTED 0-5 YEARS	LOGGED, REPLANTED 5-15+ YEARS	LOGGED, UPDATED 2023	MIXED CONIFEROUS/DECIDUOUS TRANSITIONAL FOREST	TERRESTRIAL BARE GROUND/ROADS	TRIBUTARY STREAM	CHEHALIS RIVER (MOSTLY)	SLOPE WETLAND	DEPRESSIONAL WETLAND	RIVERINE WETLAND
Mesocarnivore	American marten	1	1	0	0	0	0	0	1	0	0	0	1	1	1
Large Mammal	Columbia black tailed deer	1	2	2	2	2	2	3	2	0	2	1	2	2	2
Small Mammal	Douglas squirrel	2	2	0	0	0	1	0	2	0	0	0	0	0	0
Mesocarnivore	Fisher	1	1	0	0	0	0	0	1	0	0	0	0	0	0
Mesocarnivore	Mink	2	3	3	1	1	1	1	2	1	3	3	2	2	2
Mesocarnivore	Pacific marten	1	1	0	0	0	0	0	1	0	0	0	1	1	1
Large Mammal	Roosevelt elk	1	3	2	3	2	2	3	2	0	2	1	2	2	2
Mesocarnivore	Western spotted skunk	2	3	3	0	0	1	0	2	0	2	0	2	2	2
Bat	Hoary Bat	1	2	2	2	1	1	1	1	1	2	2	1	1	1
Bat	Keen's Myotis	1	1	1	0	0	0	0	2	0	1	2	1	1	1
Bat	Roosting concentrations of big brown bats	1	2	0	0	0	0	0	2	0	0	0	0	0	0
Bat	Roosting concentrations of myotis bats	1	2	0	0	0	0	0	2	0	0	0	0	0	0
Bat	Silver-haired Bat	1	2	2	1	1	1	1	1	0	2	2	1	1	1
Bat	Townsend's big-eared bat	1	2	2	1	1	1	1	1	0	2	2	1	1	1
Amphibian	Columbia torrent salamander	2	2	1	0	0	0	0	2	0	3	3	1	1	1
Amphibian	Cope's giant salamander	2	2	1	0	0	0	0	2	0	3	3	2	0	2
Amphibian	Dunn's salamander	2	3	2	0	0	0	0	2	0	3	3	2	1	2
Amphibian	Van Dyke's salamander	2	3	1	0	0	0	0	2	0	3	3	2	1	2
Amphibian	Western toad	2	2	2	1	1	1	0	2	0	3	3	2	2	2
Invertebrate	Aquatic Invertebrates	0	2	2	0	0	0	0	0	0	3	3	1	1	1
Invertebrate	Moist Habitat Invertebrates	1	1	0	0	0	0	0	0	0	0	0	2	2	2
Invertebrate	Prairie Specialist Invertebrates	0	0	0	1	1	0	1	0	0	0	1	0	1	0

Table F2-3

Habitat Evaluation Matrix for Target Habitats in the Proposed FRE Facility Forest Conversion Area.

GROUP	COMMON NAME	SECOND GROWTH CONIFEROUS FOREST, UNMITIGATED (50-90 YEARS OLD)	DECIDUOUS RIPARIAN FOREST W/SOME CONIFERS	DECIDUOUS RIPARIAN SHRUBLAND	CONIFER FOREST WITH SOME HARDWOODS, <50–60 YEARS OLD (HIGHEST SPECIES DIVERSITY AFTER PLANTING)	CONIFER FOREST WITH SOME HARDWOODS, 60-80 YEARS OLD (MODERATE SPECIES DIVERSITY)	MATURE CONIFER FOREST (80+ YEARS OLD DOUGLAS FIR WITH A MIXED UNDERSTORY)	MIXED CONIFEROUS/DECIDUOUS TRANSITIONAL FOREST (70-90 YEARS OLD)	TERRESTRIAL BARE GROUND/ROADS	TRIBUTARY STREAM	CHEHALIS RIVER (MOSTLY)	SLOPE WETLAND	DEPRESSIONAL WETLAND	RIVERINE WETLAND
Waterbird	Bufflehead	0	0	0	0	0	0	0	0	1	1	0	0	0
Waterbird	Common Goldeneye	0	0	0	0	0	0	0	0	1	1	0	0	0
Waterbird	Harlequin Duck	0	0	0	0	0	0	0	0	1	1	0	0	0
Waterbird	Hooded Merganser	0	0	0	0	0	0	0	0	2	2	0	0	0
Waterbird	Trumpeter Swan	0	0	0	0	0	0	0	0	0	1	0	0	0
Waterbird	Tundra Swan	0	0	0	0	0	0	0	0	0	1	0	0	0
Waterbird	Wood Duck	0	2	2	2	2	2	2	0	2	2	0	0	0
Seabird	Marbled Murrelet	1	0	0	1	2	2	1	0	0	0	0	0	0
Landbird	American Dipper	1	1	1	1	1	1	1	1	3	3	0	0	0
Landbird	Band-tailed Pigeon	2	2	2	3	3	3	3	0	0	0	0	0	0
Landbird	Belted Kingfisher	0	1	0	0	0	0	0	0	3	3	0	0	0
Landbird	Chestnut-backed Chickadee	3	1	0	3	3	3	2	0	0	0	0	0	0
Landbird	Evening Grosbeak	2	1	0	3	3	3	3	0	0	0	0	0	0
Landbird	Olive-sided Flycatcher	2	1	1	2	2	3	2	1	1	1	1	1	1
Landbird	Oregon Vesper Sparrow	0	0	0	0	0	0	0	0	0	0	0	0	0
Landbird	Purple Martin	0	1	0	0	1	2	0	0	1	1	0	1	0
Landbird	Rufous Hummingbird	2	2	1	2	2	2	2	0	1	1	1	1	1
Landbird	Slender-billed White-breasted Nuthatch	0	0	0	0	0	0	0	0	0	0	0	0	0
Landbird	Sooty Grouse	2	2	1	2	2	1	2	0	0	0	1	1	1
Landbird	Varied Thrush	2	2	1	3	3	3	2	0	0	0	1	1	1
Landbird	Vaux's Swift	1	1	0	0	1	2	1	0	0	0	0	0	0
Landbird	Western Bluebird	1	3	1	2	1	1	2	0	0	0	1	1	1
Raptor	Bald Eagle	2	2	0	2	2	2	2	0	2	2	0	0	0
Raptor	Golden Eagle	1	0	1	0	0	2	1	1	0	0	0	1	0
Raptor	Northern Spotted Owl	1	0	0	1	1	1	2	0	0	0	0	0	0
Raptor	Western Screech Owl	2	3	1	2	2	2	2	0	0	0	2	1	2
Furbearer	American beaver	1	2	2	1	1	1	1	0	2	2	1	1	2

GROUP	COMMON NAME	SECOND GROWTH CONIFEROUS FOREST, UNMITIGATED (50-90 YEARS OLD)	DECIDUOUS RIPARIAN FOREST W/SOME CONIFERS	DECIDUOUS RIPARIAN SHRUBLAND	CONIFER FOREST WITH SOME HARDWOODS, <50–60 YEARS OLD (HIGHEST SPECIES DIVERSITY AFTER PLANTING)	CONIFER FOREST WITH SOME HARDWOODS, 60-80 YEARS OLD (MODERATE SPECIES DIVERSITY)	MATURE CONIFER FOREST (80+ YEARS OLD DOUGLAS FIR WITH A MIXED UNDERSTORY)	MIXED CONIFEROUS/DECIDUOUS TRANSITIONAL FOREST (70-90 YEARS OLD)	TERRESTRIAL BARE GROUND/ROADS	TRIBUTARY STREAM	CHEHALIS RIVER (MOSTLY)	SLOPE WETLAND	DEPRESSIONAL WETLAND	RIVERINE WETLAND
Mesocarnivore	American marten	1	1	0	1	1	2	2	0	0	0	1	1	1
Large Mammal	Columbia black tailed deer	2	2	2	2	2	3	2	0	2	1	2	2	2
Small Mammal	Douglas squirrel	3	2	1	3	3	3	2	0	0	0	1	1	1
Mesocarnivore	Fisher	2	1	0	2	2	2	2	0	0	0	0	0	0
Mesocarnivore	Mink	2	3	3	2	2	2	2	0	3	3	2	2	2
Mesocarnivore	Pacific marten	2	1	0	1	1	2	2	0	0	0	1	1	1
Large Mammal	Roosevelt elk	1	3	2	2	2	2	2	0	2	1	2	2	2
Mesocarnivore	Western spotted skunk	1	3	3	2	2	2	2	0	2	0	2	2	3
Bat	Hoary Bat	1	2	2	2	2	2	2	1	2	2	1	1	1
Bat	Keen’s Myotis	1	1	1	1	1	2	2	0	1	2	1	1	1
Bat	Roosting concentrations of big brown bats	1	2	0	2	2	3	2	0	0	0	0	0	0
Bat	Roosting concentrations of myotis bats	1	2	0	2	2	3	2	0	0	0	0	0	0
Bat	Silver-haired Bat	1	2	2	2	2	2	2	0	2	2	1	1	1
Bat	Townsend’s big-eared bat	1	2	2	2	2	3	2	0	2	2	1	1	1
Amphibian	Columbia torrent salamander	3	2	1	3	3	3	3	0	3	3	1	1	1
Amphibian	Cope’s giant salamander	3	2	1	3	3	3	3	0	3	3	2	0	2
Amphibian	Dunn’s salamander	3	3	2	3	3	3	3	0	3	3	2	1	2
Amphibian	Van Dyke’s salamander	3	3	1	3	3	3	3	0	3	3	2	1	2
Amphibian	Western toad	2	2	2	2	2	2	2	0	3	3	2	2	2
Invertebrate	Aquatic Invertebrates	0	1	1	0	0	0	0	0	3	3	1	1	1
Invertebrate	Moist Habitat Invertebrates	2	2	1	2	2	2	2	0	0	0	2	2	2
Invertebrate	Prairie Specialist Invertebrates	0	0	0	0	0	0	0	0	0	0	0	0	0

Table F2-4

Habitat Evaluation Matrix for Baseline Habitats at the Proposed FRE Facility Marwood Farms Mitigation Site.

GROUP	COMMON NAME	AGRICULTURE-IMPROVED PASTURE	AGRICULTURE-MIXED ENVIRON	AGRICULTURE-UNIMPROVED PASTURE	LOWLAND CONIFER-HARDWOOD FOREST - GIANT TREE-MULTI STORY	LOWLAND CONIFER-HARDWOOD FOREST - LARGE TREE-MULTI STORY	MEDIUM SHRUB-CLOSED SHRUB OVERSTORY-MATURE	OPEN WATER - POND	OPEN WATER - STREAM PERENNIAL	RIPARIAN WETLANDS - LARGE TREE	RIPARIAN WETLANDS - MEDIUM TREE	RIPARIAN WETLANDS - SMALL TREE	RIPARIAN WETLANDS - SAPLING/POLE
Waterbird	Bufflehead	0	0	0	0	0	0	1	2	0	0	0	0
Waterbird	Common Goldeneye	0	0	0	0	0	0	1	2	0	0	0	0
Waterbird	Harlequin Duck	0	0	0	0	0	0	0	0	0	0	0	0
Waterbird	Hooded Merganser	0	0	0	0	0	0	2	2	0	0	0	0
Waterbird	Trumpeter Swan	2	1	1	0	0	0	0	1	0	0	0	0
Waterbird	Tundra Swan	2	1	1	0	0	0	0	1	0	0	0	0
Waterbird	Wood Duck	1	0	0	0	0	0	2	2	3	2	1	1
Seabird	Marbled Murrelet	0	0	0	0	0	0	0	0	0	0	0	0
Landbird	American Dipper	0	0	0	0	0	0	0	2	0	0	0	0
Landbird	Band-tailed Pigeon	1	1	0	2	2	2	0	0	2	2	1	0
Landbird	Belted Kingfisher	0	0	0	0	0	0	2	3	1	1	1	0
Landbird	Chestnut-backed Chickadee	0	0	0	2	2	0	0	0	2	1	0	0
Landbird	Evening Grosbeak	0	0	0	2	2	1	0	0	2	1	1	0
Landbird	Olive-sided Flycatcher	1	1	1	1	1	1	1	1	1	1	1	1
Landbird	Oregon Vesper Sparrow	0	0	1	0	0	0	0	0	0	0	0	0
Landbird	Purple Martin	1	1	1	1	1	1	1	1	1	1	1	1
Landbird	Rufous Hummingbird	1	1	1	2	2	2	1	1	2	2	2	1
Landbird	Slender-billed White-breasted Nuthatch	0	0	0	0	0	0	0	0	0	0	0	0
Landbird	Sooty Grouse	0	0	0	0	0	0	0	0	0	0	0	0
Landbird	Varied Thrush	0	0	0	2	2	1	0	0	2	1	1	0
Landbird	Vaux's Swift	0	0	0	0	0	0	0	0	0	0	0	0
Landbird	Western Bluebird	2	2	2	2	2	1	0	0	2	2	2	2
Raptor	Bald Eagle	0	0	0	2	2	0	1	3	2	1	0	0
Raptor	Golden Eagle	1	1	1	0	0	0	0	0	0	0	0	1
Raptor	Northern Spotted Owl	0	0	0	0	0	0	0	0	0	0	0	0
Raptor	Western Screech Owl	0	0	0	2	2	1	0	0	3	3	2	0

GROUP	COMMON NAME	AGRICULTURE-IMPROVED PASTURE	AGRICULTURE-MIXED ENVIRON	AGRICULTURE-UNIMPROVED PASTURE	LOWLAND CONIFER-HARDWOOD FOREST - GIANT TREE-MULTI STORY	LOWLAND CONIFER-HARDWOOD FOREST - LARGE TREE-MULTI STORY	MEDIUM SHRUB-CLOSED SHRUB OVERSTORY-MATURE	OPEN WATER - POND	OPEN WATER - STREAM PERENNIAL	RIPARIAN WETLANDS - LARGE TREE	RIPARIAN WETLANDS - MEDIUM TREE	RIPARIAN WETLANDS - SMALL TREE	RIPARIAN WETLANDS - SAPLING/POLE
Furbearer	American beaver	0	0	0	1	1	2	3	2	2	2	2	2
Mesocarnivore	American marten	0	0	0	0	0	0	0	0	0	0	0	0
Large Mammal	Columbia black tailed deer	2	1	2	2	2	2	2	2	2	2	2	2
Small Mammal	Douglas squirrel	0	0	0	2	2	0	0	0	1	1	0	0
Mesocarnivore	Fisher	0	0	0	0	0	0	0	0	0	0	0	0
Mesocarnivore	Mink	1	1	1	2	2	2	2	2	2	2	2	2
Mesocarnivore	Pacific marten	0	0	0	0	0	0	0	0	0	0	0	0
Large Mammal	Roosevelt elk	3	1	3	2	2	2	2	2	2	2	2	2
Mesocarnivore	Western spotted skunk	0	0	0	1	1	1	0	0	1	1	1	1
Bat	Hoary Bat	1	1	1	1	1	1	1	1	1	1	1	1
Bat	Keen's Myotis	0	0	0	0	0	0	0	0	0	0	0	0
Bat	Roosting concentrations of big brown bats	0	0	0	0	0	0	0	0	0	0	0	0
Bat	Roosting concentrations of myotis bats	0	0	0	0	0	0	0	0	0	0	0	0
Bat	Silver-haired Bat	0	0	0	1	1	1	1	1	1	1	1	1
Bat	Townsend's big-eared bat	0	0	0	0	0	0	0	0	0	0	0	0
Amphibian	Columbia torrent salamander	0	0	0	0	0	0	0	0	0	0	0	0
Amphibian	Cope's giant salamander	0	0	0	0	0	0	0	1	1	0	0	0
Amphibian	Dunn's salamander	0	0	0	0	0	0	0	0	0	0	0	0
Amphibian	Van Dyke's salamander	0	0	0	0	0	0	0	0	0	0	0	0
Amphibian	Western toad	0	0	0	1	1	1	2	3	2	2	2	1
Invertebrate	Aquatic Invertebrates	0	0	0	0	0	0	2	2	0	0	0	0
Invertebrate	Moist Habitat Invertebrates	0	0	0	1	1	0	0	0	1	1	1	1
Invertebrate	Prairie Specialist Invertebrates	0	0	1	0	0	0	0	0	0	0	0	0

Table F2-5

Habitat Evaluation Matrix for Target Habitats at the Proposed FRE Facility Marwood Farms Mitigation Site.

GROUP	COMMON NAME	AGRICULTURE-MIXED ENVIRON	LOWLAND-CONIFER/HARDWOOD FOREST - LARGE TREE-MULTI STORY	LOWLAND-CONIFER/HARDWOOD FOREST - MEDIUM TREE-MULTI STORY	LOWLAND-CONIFER/HARDWOOD FOREST - SMALL TREE-MULTI STORY	OPEN WATER - POND	OPEN WATER - STREAM PERENNIAL	RIPARIAN WETLANDS - GIANT TREE	RIPARIAN WETLANDS - LARGE TREE	RIPARIAN WETLANDS - MEDIUM TREE	RIPARIAN WETLANDS - SMALL TREE	DECIDUOUS RIPARIAN SHRUBLAND	EMERGENT GRAMINOID DOMINATED WETLAND	SCRUB-SHRUB WETLAND	FORESTED WETLAND
Waterbird	Bufflehead	0	0	0	0	1	2	0	0	0	0	0	2	0	0
Waterbird	Common Goldeneye	0	0	0	0	1	2	0	0	0	0	0	2	0	0
Waterbird	Harlequin Duck	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Waterbird	Hooded Merganser	0	0	0	0	2	2	0	0	0	0	0	2	0	2
Waterbird	Trumpeter Swan	1	0	0	0	0	1	0	0	0	0	0	1	0	0
Waterbird	Tundra Swan	1	0	0	0	0	1	0	0	0	0	0	1	0	0
Waterbird	Wood Duck	0	2	0	0	3	2	3	3	2	1	0	3	2	3
Seabird	Marbled Murrelet	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Landbird	American Dipper	0	0	0	0	0	2	0	0	0	0	0	0	0	0
Landbird	Band-tailed Pigeon	1	2	2	1	0	0	2	2	2	1	0	0	0	0
Landbird	Belted Kingfisher	0	0	0	0	2	3	1	1	1	1	0	0	0	0
Landbird	Chestnut-backed Chickadee	0	2	0	0	0	0	2	2	0	0	0	0	0	1
Landbird	Evening Grosbeak	0	2	1	1	0	0	2	2	1	1	0	0	0	1
Landbird	Olive-sided Flycatcher	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Landbird	Oregon Vesper Sparrow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Landbird	Purple Martin	1	1	1	1	1	1	1	1	1	1	1	1	1	2
Landbird	Rufous Hummingbird	1	2	2	2	1	1	2	2	2	2	1	1	1	2
Landbird	Slender-billed White-breasted Nuthatch	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Landbird	Sooty Grouse	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Landbird	Varied Thrush	0	2	1	0	0	0	2	2	1	1	1	0	1	2
Landbird	Vaux's Swift	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Landbird	Western Bluebird	2	2	2	1	0	0	2	2	2	2	1	1	1	1
Raptor	Bald Eagle	0	2	1	0	2	3	3	3	2	0	0	0	0	2
Raptor	Golden Eagle	1	0	0	0	0	0	0	0	0	0	0	0	0	0

GROUP	COMMON NAME	AGRICULTURE-MIXED ENVIRON	LOWLAND-CONIFER/HARDWOOD FOREST - LARGE TREE-MULTI STORY	LOWLAND-CONIFER/HARDWOOD FOREST - MEDIUM TREE-MULTI STORY	LOWLAND-CONIFER/HARDWOOD FOREST - SMALL TREE-MULTI STORY	OPEN WATER - POND	OPEN WATER - STREAM PERENNIAL	RIPARIAN WETLANDS - GIANT TREE	RIPARIAN WETLANDS - LARGE TREE	RIPARIAN WETLANDS - MEDIUM TREE	RIPARIAN WETLANDS - SMALL TREE	DECIDUOUS RIPARIAN SHRUBLAND	EMERGENT GRAMINOID DOMINATED WETLAND	SCRUB-SHRUB WETLAND	FORESTED WETLAND
Raptor	Northern Spotted Owl	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Raptor	Western Screech Owl	0	2	2	1	0	0	3	3	3	2	0	0	1	3
Furbearer	American beaver	0	2	2	2	3	2	3	3	3	3	3	2	3	2
Mesocarnivore	American marten	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Mammal	Columbia black tailed deer	1	2	1	1	1	1	1	1	1	1	1	2	2	2
Small Mammal	Douglas squirrel	0	2	2	2	0	0	2	1	1	0	0	0	0	0
Mesocarnivore	Fisher	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mesocarnivore	Mink	1	2	2	2	2	2	2	2	2	2	2	2	2	2
Mesocarnivore	Pacific marten	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mesocarnivore	Roosevelt elk	1	2	2	2	2	2	2	2	2	2	2	2	2	2
Mesocarnivore	Western spotted skunk	0	1	1	1	1	1	1	1	1	1	1	1	2	2
Bat	Hoary Bat	2	2	2	2	2	2	2	2	2	2	2	2	2	1
Bat	Keen’s Myotis	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bat	Roosting concentrations of big brown bats	0	1	0	0	0	0	1	1	0	0	0	0	0	1
Bat	Roosting concentrations of myotis bats	0	1	0	0	0	0	1	1	0	0	0	0	0	1
Bat	Silver-haired Bat	0	2	1	1	2	2	2	2	1	1	1	2	2	2
Bat	Townsend’s big-eared bat	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amphibian	Columbia torrent salamander	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amphibian	Cope’s giant salamander	0	0	0	0	0	1	1	1	0	0	0	0	0	1
Amphibian	Dunn’s salamander	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amphibian	Van Dyke’s salamander	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amphibian	Western toad	0	1	1	1	1	3	2	2	2	2	2	1	2	2
Invertebrate	Aquatic Invertebrates	0	0	0	0	3	2	1	1	1	1	0	2	1	1
Invertebrate	Moist Habitat Invertebrates	0	1	1	0	0	0	1	1	0	0	0	0	1	1
Invertebrate	Prairie Specialist Invertebrates	1	0	0	0	1	1	0	0	0	0	0	0	0	0

Table F2-6

Habitat Evaluation Matrix for Baseline Habitats at the Proposed FRE Facility Bunker Creek Mitigation Site.

GROUP	COMMON NAME	AGRICULTURE-IMPROVED PASTURE	AGRICULTURE-MIXED ENVIRON	RIPARIAN HARDWOOD FOREST	RIPARIAN SHRUB	OPEN WATER - STREAM PERENNIAL
Waterbird	Bufflehead	0	0	0	0	1
Waterbird	Common Goldeneye	0	0	0	0	1
Waterbird	Harlequin Duck	0	0	0	0	0
Waterbird	Hooded Merganser	0	0	0	0	2
Waterbird	Trumpeter Swan	2	1	0	0	0
Waterbird	Tundra Swan	2	1	0	0	0
Waterbird	Wood Duck	1	0	1	0	2
Seabird	Marbled Murrelet	0	0	0	0	0
Landbird	American Dipper	0	0	0	0	0
Landbird	Band-tailed Pigeon	0	0	1	0	0
Landbird	Belted Kingfisher	0	0	1	0	2
Landbird	Chestnut-backed Chickadee	0	0	0	0	0
Landbird	Evening Grosbeak	0	0	1	0	0
Landbird	Olive-sided Flycatcher	0	0	1	1	1
Landbird	Oregon Vesper Sparrow	0	0	0	0	0
Landbird	Purple Martin	1	1	0	1	1
Landbird	Rufous Hummingbird	0	0	1	1	1
Landbird	Slender-billed White-breasted Nuthatch	0	0	0	0	0
Landbird	Sooty Grouse	0	0	0	0	0
Landbird	Varied Thrush	0	0	1	1	0
Landbird	Vaux's Swift	0	0	0	0	0
Landbird	Western Bluebird	1	1	1	1	0
Raptor	Bald Eagle	0	0	2	0	1
Raptor	Golden Eagle	1	1	0	0	0
Raptor	Northern Spotted Owl	0	0	0	0	0
Raptor	Western Screech Owl	0	0	3	1	0
Furbearer	American beaver	0	0	2	1	2
Mesocarnivore	American marten	0	0	0	0	0

GROUP	COMMON NAME	AGRICULTURE-IMPROVED PASTURE	AGRICULTURE-MIXED ENVIRON	RIPARIAN HARDWOOD FOREST	RIPARIAN SHRUB	OPEN WATER - STREAM PERENNIAL
Large Mammal	Columbia black tailed deer	3	1	1	1	2
Small Mammal	Douglas squirrel	0	0	0	0	0
Mesocarnivore	Fisher	0	0	0	0	0
Mesocarnivore	Mink	1	1	1	1	1
Mesocarnivore	Pacific marten	0	0	0	0	0
Large Mammal	Roosevelt elk	3	1	1	1	2
Mesocarnivore	Western spotted skunk	0	0	1	1	1
Bat	Hoary Bat	1	1	1	1	1
Bat	Keen's Myotis	0	0	0	0	0
Bat	Roosting concentrations of big brown bats	0	0	0	0	0
Bat	Roosting concentrations of myotis bats	0	0	0	0	0
Bat	Silver-haired Bat	0	0	1	1	1
Bat	Townsend's big-eared bat	0	0	0	0	0
Amphibian	Columbia torrent salamander	0	0	0	0	0
Amphibian	Cope's giant salamander	0	0	0	0	0
Amphibian	Dunn's salamander	0	0	0	0	0
Amphibian	Van Dyke's salamander	0	0	0	0	0
Amphibian	Western toad	0	0	2	1	1
Invertebrate	Aquatic Invertebrates	0	0	0	0	1
Invertebrate	Moist Habitat Invertebrates	0	0	0	0	0
Invertebrate	Prairie Specialist Invertebrates	1	1	0	0	0

Table F2-7

Habitat Evaluation Matrix for Target Habitats at the Proposed FRE Facility Bunker Creek Mitigation Site.

	COMMON NAME	AGRICULTURE-IMPROVED PASTURE	AGRICULTURE-MIXED ENVIRON	RIPARIAN-CONIFER/HARDWOOD FOREST	RIPARIAN HARDWOOD FOREST	RIPARIAN SHRUB	OPEN WATER–STREAM PERENNIAL
Waterbird	Bufflehead	0	0	0	0	0	1
Waterbird	Common Goldeneye	0	0	0	0	0	1
Waterbird	Harlequin Duck	0	0	0	0	0	0
Waterbird	Hooded Merganser	0	0	0	0	0	2
Waterbird	Trumpeter Swan	2	1	0	0	0	0
Waterbird	Tundra Swan	2	1	0	0	0	0
Waterbird	Wood Duck	1	0	2	2	0	2
Seabird	Marbled Murrelet	0	0	0	0	0	0
Landbird	American Dipper	0	0	0	0	0	0
Landbird	Band-tailed Pigeon	0	0	2	1	0	0
Landbird	Belted Kingfisher	0	0	1	1	0	3
Landbird	Chestnut-backed Chickadee	0	0	1	0	0	0
Landbird	Evening Grosbeak	0	0	2	1	0	0
Landbird	Olive-sided Flycatcher	0	0	1	1	1	1
Landbird	Oregon Vesper Sparrow	0	0	0	0	0	0
Landbird	Purple Martin	1	1	0	0	1	1
Landbird	Rufous Hummingbird	0	0	2	1	1	1
Landbird	Slender-billed White-breasted Nuthatch	0	0	0	0	0	0
Landbird	Sooty Grouse	0	0	0	0	0	0
Landbird	Varied Thrush	0	0	2	1	1	0
Landbird	Vaux's Swift	0	0	0	0	0	0
Landbird	Western Bluebird	1	1	2	1	1	0
Raptor	Bald Eagle	0	0	2	2	0	1
Raptor	Golden Eagle	1	1	0	0	0	0
Raptor	Northern Spotted Owl	0	0	0	0	0	0
Raptor	Western Screech Owl	0	0	3	3	1	0

	COMMON NAME	AGRICULTURE-IMPROVED PASTURE	AGRICULTURE-MIXED ENVIRON	RIPARIAN-CONIFER/HARDWOOD FOREST	RIPARIAN HARDWOOD FOREST	RIPARIAN SHRUB	OPEN WATER–STREAM PERENNIAL
Furbearer	American beaver	0	0	2	2	2	2
Mesocarnivore	American marten	0	0	0	0	0	0
Large Mammal	Columbia black tailed deer	3	1	2	2	2	2
Small Mammal	Douglas squirrel	0	0	1	0	0	0
Mesocarnivore	Fisher	0	0	0	0	0	0
Mesocarnivore	Mink	1	1	2	2	2	2
Mesocarnivore	Pacific marten	0	0	0	0	0	0
Large Mammal	Roosevelt elk	3	1	2	2	2	2
Mesocarnivore	Western spotted skunk	0	0	1	1	1	1
Bat	Hoary Bat	2	2	2	2	1	2
Bat	Keen's Myotis	0	0	0	0	0	0
Bat	Roosting concentrations of big brown bats	0	0	0	0	0	0
Bat	Roosting concentrations of myotis bats	0	0	0	0	0	0
Bat	Silver-haired Bat	0	0	1	1	1	2
Bat	Townsend's big-eared bat	0	0	0	0	0	0
Amphibian	Columbia torrent salamander	0	0	0	0	0	0
Amphibian	Cope's giant salamander	0	0	0	0	0	1
Amphibian	Dunn's salamander	0	0	0	0	0	0
Amphibian	Van Dyke's salamander	0	0	0	0	0	0
Amphibian	Western toad	0	0	2	2	2	2
Invertebrate	Aquatic Invertebrates	0	0	0	0	0	2
Invertebrate	Moist Habitat Invertebrates	0	0	1	1	0	0
Invertebrate	Prairie Specialist Invertebrates	1	1	0	0	0	1