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5.2	**TER 2**	**Habitat Evaluation Procedure (HEP) Study**
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	Appendix 2	Lewis River HEP Models
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ACRONYMS AND ABBREVIATIONS

4WD	4-wheel drive
ac	acres
AD	adipose fin clipping
ADAAG	Americans with Disabilities Act Accessibility Guidelines for Buildings & Facilities
APE	Area of Potential Effect
APEA	Applicant-Prepared Environmental Assessment
ARG	Aquatics Resource Group
ATS	Advanced Telemetry Systems
ATV	all terrain vehicle
BLM	Bureau of Land Management
BP	Before Present
CCCP	Cowlitz County Comprehensive Plan
CCSCP	Cowlitz County Shoreline Management Master Program
CDF	critical dewatering flow
CIT	Cowlitz Indian Tribe
cm	centimeters
Corps	U.S. Army Corps of Engineers
CRG	Cultural Resource Group
CS plants	culturally sensitive plants
dbh	diameter at breast height
DEQ	(Oregon) Department of Environmental Quality
DNR	Washington Department of Natural Resources
DO	dissolved oxygen
DSF	day-second feet
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FCC	Freshwater Chronic Criteria
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FIRM	Flood Insurance Rate Map
FR	Forest Road
FWS	U.S. Fish and Wildlife Service
GIS	geographic information system
GPNF	Gifford Pinchot National Forest
GPS	global positioning satellite
ha	hectares
HCC	Hydro Control Center
HCP	Habitat Conservation Plan
HEP	Habitat Evaluation Procedure
Hg	mercury
HPC	Hydrometeorological Prediction Center
HPMP	Historic Properties Management Plan
HSC	Habitat suitability criteria

HSI	Habitat Suitability Index
HUD	Department of Housing and Urban Development
IDL	Instrument Detection Limits
IFIM	Instream Flow Incremental Methodology
IHA	Index of hydraulic alteration
IP	International Paper
KOP	Key Observation Point
KSFD	1,000 second feet per day
LAC	Limits of Acceptable Change
LVAD	left ventral adipose fin
LWD	large woody debris
NESC	Northwest Energy Services Company
NGO	non-governmental agency
NGVD	National Geodetic Vertical Datum
NOAA	National Oceanic and Atmospheric Administration
NOECs	No observable effects concentrations
NPDES	National Pollutant Discharge Elimination System
NPPC	Northwest Power Planning Council
NRHP	National Register of Historic Places
NRPA	National Recreation and Parks Association
NSOs	natural sequence orders
NTU	nephelometric turbidity unit
NWPP	Northwest Power Pool
NWS	National Weather Service
OAHP	Office of Archaeology and Historic Preservation
OHWL	Ordinary High Water Level
O&M	operations and maintenance
PAH	polycyclic aromatic hydrocarbon
PAOT	persons-at-one time
PCB	polychlorinated biphenyl
PCC	Portland Control Center
PHABSIM	Physical Habitat Simulation
PHS	Priority Habitat Species
PM&E	Protection, Mitigation, and Enhancement Measure
PPL	Pacific Power and Light
PSMFC	Pacific States Marine Fisheries Commission
PUD	Public Utility District
PWC	personal watercraft
QA/QC	Quality Assurance/Quality Control
QPF	Quantitative Precipitation Forecast
READ	Resource Enhancement Alternatives Document
RM	River Mile
RMAP	Road maintenance and abandonment program
ROS	Recreation Opportunity Spectrum
ROW	rights-of-way
RRG	Recreation Resource Group

RRMP	Recreation Resource Management Plan
RV	recreation vehicle
RVD	recreation visitor day
RVAD	right ventral adipose fin
SBR	Swift bypass reach
S/M species	survey and manage species
SCORP	Statewide Comprehensive Outdoor Recreation Plan
sd	standard deviation
SI	Suitability Indices
SOP	Standard Operating Procedures
SR	State Route
TCP	Traditional Cultural Property
TDG	total dissolved gas
TES	threatened, endangered, or sensitive species
TPH	total petroleum hydrocarbon
TPN	total persulfate nitrogen
TRG	Terrestrial Resource Group
TWG	Technical Work Group
TY	Target Year
USFS	United States Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VAF	velocity adjustment factors
VECC	Variable Energy Content Curves
WAC	Washington Administrative Code
WDF	Washington Department of Fisheries
WDFW	Washington Department of Fish and Wildlife
WDG	Washington Department of Game
WDOE	Washington Department of Ecology
WNHP	Washington Natural Heritage Program
WSDOT	Washington State Department of Transportation
WSEL	water surface elevation
WSWCB	Washington State Weed Control Board
WUA	Weighted Usable Area
WY	Water Year
YN	Yakama Nation

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ACRONYMS AND ABBREVIATIONS

BLM	Bureau of Land Management
DNR	Department of Natural Resources
ESA	Endangered Species Act
ILM	Integrated Landscape Management
IP	International Paper
GMU	Game Management Unit
PHS	Priority Habitats and Species
ROW	Right-of-way
SoC	Species of Concern
S/M	Survey/Manage
TES	Threatened, Endangered, and Sensitive
TNC	The Nature Conservancy
TRG	Terrestrial Resources Group
USFWS	U.S. Fish and Wildlife Service
USFS	U.S. Forest Service
WDFW	Washington Department of Fish and Wildlife

5.3 ANALYSIS SPECIES ASSESSMENT (TER 3)

Several of the planning sessions for Lewis River watershed studies included discussions on the use of analysis species for terrestrial resource studies related to relicensing. The purpose of selecting analysis species was to focus relicensing studies on commonly occurring, as well as rare and declining, taxa that represent guilds requiring specific habitats and/or habitat features. To focus studies for the Lewis River Projects, the Terrestrial Resources Group (TRG) identified 1 plant, 1 invertebrate, 3 amphibians, 7 birds, and 6 mammals as analysis species, as well as 5 unique habitat types and elements (Table 5.3-1). The HEP Study (TER 2) addresses 6 of the wildlife species; surveys for cottonwood (*Populus tricocarpa*) were included in the Botanical Resource Studies (TER 4); and oak woodlands, wet meadows, and other wetlands were mapped as part of the Vegetation Cover Type Mapping Study (TER 1).

Table 5.3-1. Analysis species and unique habitats/elements.

Species[1]	TRG Selection Criteria	Federal and State Status		
		USFWS[2]	USFS[3]	WDFW[4,5]
Cottonwood*	Dispersal and establishment are closely tied to fluvial geomorphic processes, instream flows, and floodplains.	--	--	--
Papillose tail-dropper	Riparian-associated mollusk that is a weak disperser and sensitive to fragmentation and isolation of sub-populations.	--	--	--
Larch Mountain salamander	Associated with talus and old-growth habitat.	SoC	S S/M	SS P1
Cascade torrent salamander	Associated with headwater streams and cold water temperatures, and sensitive to forest harvest practices.	--	S	SC P1
Northern red-legged frog**	Associated with wetlands and stillwater habitats.	SoC	--	--
Wood duck	Cavity-nesting waterfowl species associated with large snags near stillwater and wetland habitat.	--	--	P3
Bald eagle	Fish-eating raptor associated with old-growth habitat and large trees near water.	FT	--	ST P1
Cooper's hawk	Top predator of birds and associated with late-successional woodland habitat.	--	--	--
Northern spotted owl	Associated with large blocks of old-growth in low elevations.	FT	--	ST P1
Pileated woodpecker**	Cavity-nesting species requiring large snags and down wood in conifer forests.	--	--	SC P1
Yellow warbler**	Associated with shrub and deciduous riparian habitat.	--	--	--
Savannah sparrow**	Associated with grassland habitat and dry meadows.	--	--	--
Pacific Townsend's big-eared bat	Dependent on caves and mines for roosting; highly sensitive to disturbance.	SoC	S	SC P1&2
American marten/fisher	Marten requires large interconnected late seral forest at high elevations, while fisher requires similar habitat at lower elevations; both species sensitive to disturbance.	SoC (fisher)	S (fisher)	SE (fisher) P1 (fisher) P2 (marten)

Table 5.3-1. Analysis species and unique habitats/elements.

Species[1]	TRG Selection Criteria	Federal and State Status		
		USFWS[2]	USFS[3]	WDFW[4,5]
Beaver	Strong ecological indicator, creating and maintaining habitat important to other species.	--	--	--
Mink**	Associated with wetlands and riparian habitat.	--	--	P3
Northern flying squirrel	Cavity-nesting species important as prey for spotted owl and disperser of fungi symbiotic with conifer species.	--	--	--
Elk**	Dependent on low-elevation winter range in project area and interconnected movement corridors.	--	--	P3
Great blue heron rookeries	Habitat for great blue heron, a priority species.	--	--	SM P2
Peregrine falcon eyries	Protected sites for listed state-species; cliff habitat.	SoC	S	SS P1
Mineral sites	Habitat for band-tailed pigeons.	--	--	--
Oak woodlands***	PHS habitat.	--	--	PH
Wet meadows***	PHS habitat; important habitat for rare plant species.	--	--	PH

[1] Bolded species and habitats are covered in the Analysis Species Assessment.
* Species is covered in the Botanical Resources Studies (TER 4)
** Species is included in the HEP Study (TER 2). Elk are covered by both the HEP Study and the Analysis Species Assessment.
*** Habitat is addressed in the Vegetation Cover Type Mapping Study (TER 1).

[2] U.S. Fish and Wildlife Service (USFWS) Status:
FT = Federal Threatened: Listed as threatened under the Endangered Species Act (ESA) – those species likely to become endangered within the foreseeable future.
SoC = Species of Concern: Former Category 2 candidate species for listing – species needs additional information to support a proposal to list as threatened or endangered; not protected under ESA.

[3] U.S. Forest Service (USFS) Status:
S = On the Region 6 Forester's Sensitive Animal Species List (2002).
S/M = Survey and Monitor Species, as designated by the Northwest Forest Plan (USFS and BLM 1994 and 2000)

[4] Washington Department of Fish and Wildlife (WDFW) Listing Status:
SE = State Endangered: Any wildlife species native to the state of Washington that is seriously threatened with extinction throughout all or a significant portion of its range within the state.
ST = State Threatened: Any wildlife species native to the state of Washington that is likely to become an endangered species within the foreseeable future throughout a significant portion of its range within the state without cooperative management or removal of threats.
SS = State Sensitive: Any wildlife species native to the state of Washington that is vulnerable or declining and is likely to become endangered or threatened throughout a significant portion of its range within the state without cooperative management or removal of threats.
SC = State Candidate: Species that WDFW will review for possible listing as State Endangered, Threatened, or Sensitive; species have sufficient evidence to suggest that its status may meet the listing criteria.
SM = State Monitor.

[5] WDFW Priority Habitat and Species Status:
P = Priority species: Species that requires protective measures for their perpetuation due to their population status, sensitivity to habitat alteration, and/or recreational, commercial, or tribal importance. Priority species include State Endangered, Threatened, Sensitive, and Candidate species (P1); animal aggregations considered vulnerable (P2); and those species of recreational, commercial, or tribal importance that are vulnerable (P3).
PH = Priority Habitats: Habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type or dominant plant species, a described successional stage, or a specific structural element.

The Analysis Species Assessment addresses 16 wildlife analysis species (or associated habitat elements) that are not included in the HEP or other studies:

- Cascade torrent salamander (*Rhyacotriton cascadae*),
- Northern red-legged frog (*Rana aurora*),
- Larch Mountain salamander (*Plethodon larselli*),
- Pacific Townsend's big-eared bat (*Corynorhinus townsendii*),
- Bald eagle (*Haliaeetus leucocephalus*),
- Papillose tail-dropper (*Prophysaon dubium*)
- Northern flying squirrel (*Glaucomys sabrinus*),
- Beaver (*Castor Canadensis*),
- Marten/fisher (*Martes americana*/*M. pennanti*),
- Elk (*Cervus elaphus*),
- Peregrine falcon (*Falco peregrinus*) eyries,
- Cooper's hawk (*Accipiter cooperii*),
- Northern spotted owl (*Strix occidentalis*),
- Wood duck (*Aix sponsa*)
- Great blue heron (*Ardea herodias*) rookeries, and
- Band-tailed pigeon (*Columba fasciata*) mineral sites

The elk is the only species that is covered in both the HEP Study and the Analysis Species Assessment. In addition, the Analysis Species Assessment addresses wildlife designated as Survey and Manage (S/M) species requiring strategic pre-disturbance surveys under the Northwest Forest Plan as amended (USFS and BLM 2001). The following 8 S/M wildlife species (6 terrestrial mollusks and 2 amphibians) were identified as potentially occurring in USFS lands in the vicinity of Lewis River Projects:

- Larch Mountain salamander
- Van Dyke's salamander (*Plethodon vandykei*)
- Puget oregonian (*Cryptomastix devia*)
- Warty jumping slug (*Hemphillia glandulosa*)
- Malone jumping slug (*Hemphillia malonei*)
- Panther jumping slug (*Hemphillia pantherina)*
- Evening field slug (*Derocerus hepserium*)
- Blue-gray tail-dropper *(Prophysaon coeruleum)*

5.3.1 Study Objectives

The objectives of the Analysis Species Assessment are to:

- Document the abundance and distribution of select analysis species in the primary study area;
- Analyze the factors affecting the distribution of selected analysis species in the primary study area; and

- Identify and locate species designated as Survey and Manage (S/M) under the Northwest Forest Plan (USFS and BLM 1994) on USFS land near Drift Creek, a tributary to Swift Reservoir.

5.3.2 Study Area

The Analysis Species Assessment was conducted within the primary study area for the Lewis River Projects, which includes the area within about 0.5 mi (0.8 km) of each reservoir and all lands owned by the utilities in the Lewis River drainage (see TER 1 for map and further description). Some of the analysis species were surveyed prior to 1999 as part of relicensing studies conducted for the Yale Project (FERC Project No. 2071). Additional surveys were conducted in the Yale project vicinity in 2000 and 2001 for analysis species not covered by the earlier relicensing studies. In addition, a number of sites around the Yale Project were surveyed incidental to other fieldwork activities. Surveys for S/M species were limited to USFS land near Drift Creek.

5.3.3 Methods

The general methodology for the Analysis Species Assessment study included: (1) a review of existing data for all analysis species; (2) field surveys for select analysis species; (3) field surveys for S/M species on USFS lands near Drift Creek; (4) the preparation of potential habitat maps and/or information summaries for species not covered by field surveys; (5) the development of a database including all wildlife observations (both incidental and targeted); and (6) the mapping of documented occurrences of threatened, endangered, or sensitive (TES) species and WDFW priority species. Specific methodology for this study as described in pages TER 3-5 through 3-9 of the Study Plan Document (PacifiCorp and Cowlitz PUD 1999) is summarized below.

5.3.3.1 Review of Existing Data

Various public agencies, private entities, and conservation organizations were consulted to compile the most recent information regarding the occurrence of all analysis species in the study area. The following data sources were reviewed for the Analysis Species Assessment:

- WDFW Integrated Landscape Management (ILM) for the Lewis-Kalama watershed – Basin-wide habitat information (WDFW 1998).

- WDFW Priority Habitats and Species (PHS). The database shows range, occurrence, and distribution of Washington State Priority species.

- USFS – Provided data on habitat and analysis species distribution on USFS land; S/M species.

- USFS Pacific Northwest Research Lab – Provided data on select analysis species, particularly the fisher and marten.

- USFWS – Provided information on analysis species that are federally listed as threatened or endangered, candidates for federal listing, or species of concern.

- PacifiCorp – Provided range maps and distribution data on analysis species for Yale Project, and bald eagles for all projects.

- Washington Gap Analysis (Cassidy et al. 1997) – Habitat for analysis species in the Lewis River drainage.

In addition to the information provided by the above sources, a general literature survey was conducted for each analysis species. Literature search and data review information was then used to specifically inform and direct the field studies described below.

5.3.3.2 Analysis Species Surveys

Existing information on analysis species distribution, abundance, and use of lands within the primary study area was augmented by specific field surveys for 6 of the 16 analysis species addressed in this study, and for S/M species on USFS lands near Drift Creek. Analysis species covered by specific targeted field surveys included the Cascade torrent salamander, northern red-legged frog, Larch Mountain salamander, Pacific Townsend's big-eared bat, bald eagle, and papillose tail-dropper. These species were selected for survey because there is relatively little known about their distribution in the study area. In addition, they have limited mobility and/or are typically associated with a few specific habitats, making field surveys a relatively straightforward means of determining their occurrence and location in the study area.

Field surveys associated with this study were conducted by PacifiCorp, USFS and WDFW staff, and consultant biologists. Specific methodologies for all analysis species field studies, including longer-term monitoring surveys continued through the 2000 and 2001 field season, are described below.

Cascade Torrent Salamander

Surveys for Cascade torrent salamanders focused on riparian/streamside and lotic habitats within the Swift No. 1 and Merwin Project vicinities; habitats associated with the Yale Project were surveyed in 1997 (PacifiCorp 1999). Survey methodology consisted of the walking of tributary stream shorelines by at least 2 biologists to visually examine shallow pools, seeps, and under cover objects in the floodplain and splash zone (Corn and Bury 1990). Small patches of unique habitat – such as waterfalls, talus, and seeps – encountered were searched completely. Two surveys were conducted in those areas deemed high quality habitat for the species. Areas determined to have a low potential for supporting torrent salamanders during the first survey period were not revisited.

Figure 5.3-1 shows the location of all Cascade torrent salamander surveys included in the Analysis Species Assessment. Streams were located by following the shoreline of each reservoir in a boat and stopping at each flowing stream. Surveyors began at the mouth of each stream and moved upward, turning over rocks and debris in areas of suitable habitat for torrent salamanders. Surveys continued until a Cascade torrent salamander was

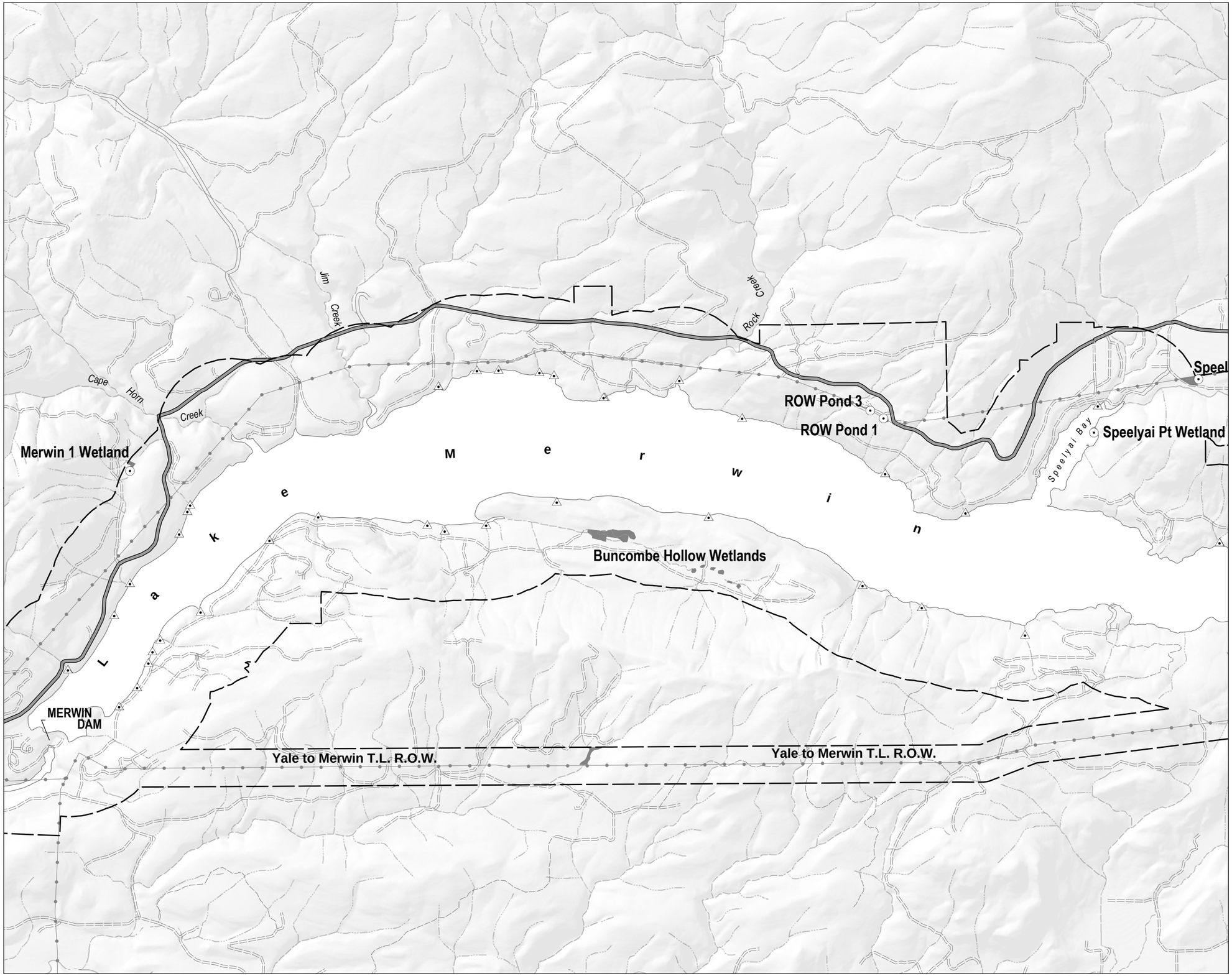
found, or the stream became impassable, or 1 full hour passed. Surveys were conducted June 18-22 and July 11-13, 2001. In total, 71 streams were surveyed, totaling approximately 1.6 miles (2.6 km) and 1.3 miles (2.1 km) at Lake Merwin and Swift Reservoir, respectively. Level of survey effort totaled 47 staff hours at Lake Merwin and 29 staff hours at Swift Reservoir. A number of mapped streams, particularly at Swift Reservoir, had no flowing water at the time of the surveys and were not included. Three streams (2 on Swift Reservoir, 1 on Lake Merwin) were not surveyed because they could not be accessed safely from the reservoirs.

Northern Red-Legged Frog

Visual searches for egg masses are an efficient method for determining the presence of breeding red-legged frogs (Thoms et al. 1997). Red-legged frogs typically deposit grapefruit-sized egg masses attached to vegetation in lentic aquatic habitat (Corkran and Thoms 1996; Leonard et al. 1993). This species breeds between January and March, depending on elevation and weather conditions (Leonard et al. 1993). Breeding typically occurs over 1 to 2 weeks, with about 4 weeks between incubation and hatching (Leonard et al. 1993). Egg masses often detach or become filled with algae as time after laying increases, making location and identification more difficult.

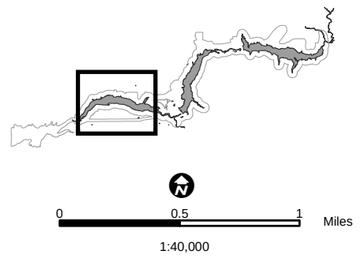
To identify a survey period that would allow egg masses to be detected over the range of elevations between Swift Reservoir and Lake Merwin, selected wetlands were checked approximately every 2 weeks for the presence of egg masses beginning on February 18, 2000. USFS biologists were also consulted regularly. The first egg masses were noted in the Beaver Bay wetlands along Yale Lake the week of March 13, 2000. Intensive surveys for red-legged frog egg masses were conducted in the vicinity of the Swift and Merwin Projects from March 20-24, 2000, and were focused on wetlands and ponds that provide shallow open water habitat suitable for breeding. Surveys for breeding red-legged frogs in wetlands near the Yale Project were conducted in 1997 (PacifiCorp 1999), although several ponds were surveyed again incidentally. In March 2001, EDAW and PacifiCorp biologists also conducted surveys of a few wetlands along Speelyai Creek. In total, 26 wetlands were surveyed—11 on Merwin Project wildlife lands near Merwin and Yale reservoirs, 9 in or near the Swift bypass reach, 3 near Swift Reservoir, and 3 along or near Speelyai Creek (Figure 5.3-1).

Survey methods for red-legged frog egg masses involved biologists walking in and along suitable habitat areas and visually inspecting shallow still-moving water. Most of the wetlands were small and shallow enough to be searched in their entirety. Surveys of larger wetlands, such as Yale Pond, were limited to shoreline and shallow water areas. Data collected at each wetland survey site included date, weather, time of survey, habitat description, observers, air temperature, and water temperature. Information recorded for egg masses included species, substrate, water depth, location in water column, and attachment (reed canarygrass [*Phalaris arundinacea*], branch, etc.). For adult frogs, behavior was noted, as well as gender, if possible. Surveys also resulted in data on other amphibian species that use habitats similar to those of the red-legged frog.



Legend

- Cascade Torrent Salamander Stream Survey
- Northern Red-Legged Frog Egg Mass Survey
- Papillose Tail-Dropper & S/M Species Survey
- Larch Mountain Salamander Survey
- Wetland
- Perennial Stream
- Intermittent Stream
- Ephemeral Stream
- Secondary Road
- Light Duty Road
- Unimproved Road
- Trail
- Railroad
- Powerline
- Study Area



0 0.5 1 Miles

1:40,000

Lewis River Hydroelectric Projects

FIGURE 5.3-1 (1 of 4)

Analysis Species Survey Locations, 2000-2001

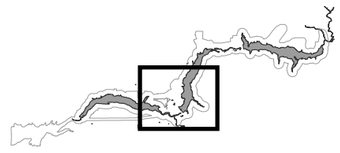
Source: EDAW, Inc., 2003

P:\8e30501\GIS\mxd\Figure5.3-1.mxd

Yale Park Wetland
Speelyai Creek
Speelyai Canal
SR-503
Beaver Pond Rd Wetland
Speelyai T-line Wetland
Speelyai Creek
Poverty Flats Wetland
Winter Creek Wetland
Speelyai Bay
Speelyai Pt Wetland
Frazier Creek Wetland
IP Road
SR-503
Cedar Grove Pond
Chestnut Pond
Bankers Pond
Road Pond
Crossroad Pond
Saddle Dam Farm Wetlands
Siouxon Creek
Riparian Bridge Wetland
Pumphouse Pond
IP Wetlands
Bridge Wetland
Yale Ponds
Canyon Creek
Yale Lake

Legend

- Cascade Torrent Salamander Stream Survey
- Northern Red-Legged Frog Egg Mass Survey
- Papillose Tail-Dropper & S/M Species Survey
- Larch Mountain Salamander Survey
- Wetland
- Perennial Stream
- Intermittent Stream
- Ephemeral Stream
- Secondary Road
- Light Duty Road
- Unimproved Road
- Trail
- Railroad
- Powerline
- Study Area



N

0 0.5 1 Miles

1:40,000

Lewis River Hydroelectric Projects

FIGURE 5.3-1 (2 of 4)

Analysis Species Survey Locations, 2000-2001

Source: EDAW, Inc., 2003

P:\8e30501\GIS\mxd\Figure5.3-1.mxd

Lower Swift Bypass Reach Wetlands

Swift Canal Ponds

Swift Wetlands

SWIFT NO. 1 DAM

Upper Swift Bypass Reach Wetlands

Swift Canal

Swift Bypass Reach

Rain Creek

Ole Creek

Legend

- Cascade Torrent Salamander Stream Survey
- Northern Red-Legged Frog Egg Mass Survey
- Papillose Tail-Dropper & S/M Species Survey
- Larch Mountain Salamander Survey
- Wetland
- Perennial Stream
- Intermittent Stream
- Ephemeral Stream
- Secondary Road
- Light Duty Road
- Unimproved Road
- Trail
- Railroad
- Powerline
- Study Area

0 500 1,000 2,000 Feet

1:15,000

Lewis River Hydroelectric Projects

FIGURE 5.3-1 (3 of 4)

Analysis Species Survey Locations, 2000-2001

Source: EDAW, Inc., 2003

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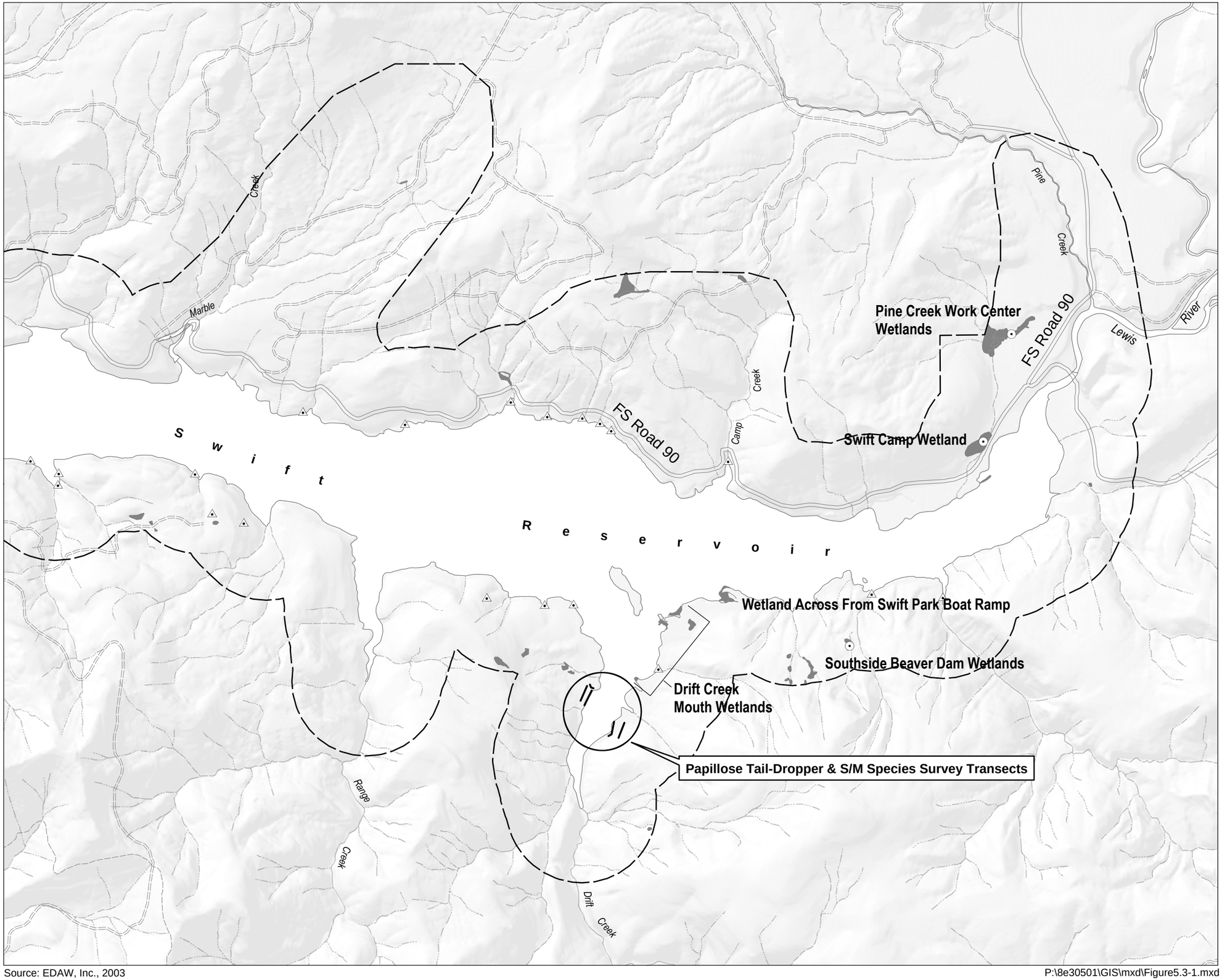


Legend

- Cascade Torrent Salamander Stream Survey
- Northern Red-Legged Frog Egg Mass Survey
- Papillose Tail-Dropper & S/M Species Survey
- Larch Mountain Salamander Survey
- Wetland
- Perennial Stream
- Intermittent Stream
- Ephemeral Stream
- Secondary Road
- Light Duty Road
- Unimproved Road
- Trail
- Railroad
- Powerline
- Study Area

0 0.5 1 Miles

1:40,000

Lewis River Hydroelectric Projects

FIGURE 5.3-1 (4 of 4)

Analysis Species Survey Locations, 2000-2001

Source: EDAW, Inc., 2003

P:\8e30501\GIS\mxd\Figure5.3-1.mxd

Larch Mountain Salamander

Surveys for the Larch Mountain salamander on USFS lands near Drift Creek were conducted as part of the S/M species surveys; the methodology for these surveys is described in a following section. In other parts of the Lewis River basin, surveys for the Larch Mountain salamander were conducted in appropriate habitat by the USFS with support by PacifiCorp. The USFS conducted surveys for Larch Mountain salamanders on the faces of Yale and Swift dams in 1999 and 2000, respectively (Figure 5.3-1). Survey methodology included traversing and visually inspecting the entirety of the dam faces while turning rock, talus, and debris to expose suitable salamander refugia.

Pacific Townsend's Big-Eared Bat

Pacific Townsend's big-eared bats have historically used Moss Cave, located near the Swift No. 1-Swift No. 2 transmission line, for night roosting (letter from C. Senger, Biologist, Western Washington University, Bellingham, Washington, July 1990). PacifiCorp has assisted The Nature Conservancy (TNC) biologists with exit surveys for Pacific Townsend's big-eared bats at Moss Cave since 1997, and these surveys were continued through the 2000 and 2001 field seasons. Exit surveys were conducted by at least 2 biologists stationed just outside the cave who counted big-eared bats leaving the cave for night foraging. TNC biologists also visited Moss Cave annually to assess productivity and use of the cave as a maternity site. Additional surveys for this species included field searches for alternative roost caves and the visual inspection of the undersides of bridges and other suitable artificial structures for the presence of bats. No additional caves were located. Field examination of potential roost sites at artificial structures were conducted in conjunction with other field studies.

Bald Eagle

PacifiCorp monitors bald eagle winter use and nesting in the study area through twice-yearly aerial surveys conducted by helicopter, and these surveys were continued in 2000 and 2001 as part of the Analysis Species Assessment. Wintering bald eagle surveys are typically performed in February, and breeding surveys are conducted in June. The protocol for bald eagle helicopter surveys involves flying aerial transects over the entire primary study area while surveying the ground below to count bald eagle adults and locate roost sites, perch sites, and nests. Nests are visually inspected from above to count eggs and/or chicks and collect additional information on nest use and productivity. Helicopter surveys are also intended to locate any peregrine falcon eyries or heron rookeries in the project vicinity, as well as document osprey (*Pandion haliaetus*) nests.

Papillose Tail-Dropper

Surveys for the papillose tail-dropper and other terrestrial mollusks were conducted as part of surveys for S/M species on USFS lands near Drift Creek. S/M species survey methodology is described below. The papillose tail-dropper was removed from the USFS S/M species list in November 2000 (USFS and BLM 2001) and, as a result, is addressed as an analysis species not an S/M species throughout this document. Figure 5.3-1 shows the location of all areas surveyed for papillose tail-droppers in the primary study area.

5.3.3.3 S/M Species Surveys

Surveys for the 8 S/M species potentially occurring in the Lewis River drainage and the papillose tail-dropper were requested by the USFS on the 40 acres (16 ha) of land near Drift Creek (Table 5.3-2). This area is managed by the USFS and includes numerous dispersed boat-in recreational sites along the reservoir shoreline, which may affect habitat for S/M species. Survey methodology followed USFS protocol for terrestrial mollusks (Furnish et al. 1997). Because little if any habitat suitable for the 2 S/M amphibian species (Larch Mountain and Van Dyke's salamanders) occurred in the survey area, no targeted amphibian protocol surveys were conducted around Drift Creek. Instead, informal searches for amphibians were conducted in and between the plots established for terrestrial mollusks.

Table 5.3-2. Survey and Manage species potentially occurring on USFS lands near Drift Creek.

Species	Habitat Requirements
Amphibians	
Larch Mountain salamander *(Plethodon larselli)*	Forested and non-forested talus areas, often with sparse understories, high litter content, and little mineral soil (Crisafulli 2000). In the Lewis River drainage, populations of this species are associated with late seral Douglas-fir (*Pseudotsuga menziesii*) and western hemlock (*Tsuga heterophylla*) forests growing on steep slopes (>40%) with a substrate of deep sandy loam derived from pumice, a well-developed litter layer, and conspicuous rock outcrops or cliffs (Trippe 1999). Although the 40 ac of USFS lands near Drift Creek support old-growth Douglas-fir forest, this area lacks talus, rock outcrops, or cliffs.
Van Dyke's salamander *(Plethodon vandykei)*	Occurs in a variety of habitats over a wide range of elevations (Jones 1999). It has been found in upland forests, along lake and stream shorelines, at cave entrances, and in seeps. This species is very rare, and only a few individuals have been found in the Lewis River drainage.
Terrestrial Mollusks	
Warty jumping slug *(Hemphillia glandulosa)*	Associated with conifer logs and/or heavy ground cover of low vegetation, litter, and debris.
Malone jumping slug *(Hemphillia malonei)*	Occurs in forest habitats with a strong mixed hardwood component; found on the ground under debris or hardwood bark.
Panther jumping slug *(Hemphillia pantherina)*	Known from only 1 site near the Lewis River; found in deep forest floor litter near a stream.
Puget Oregonian *(Cryptomastix devia)*	Found on or under logs and leaf litter, rocks, talus; also occurs in the litter beneath swordferns (*Polystichum munitum*) growing under hardwood trees and shrubs, especially big-leaf maple (*Acer macrophyllum*).
Evening field slug *(Deroceras hesperium)*	Associated with a variety of low vegetation, litter, debris, and rocks.
Blue-gray tail-dropper *(Prophysaon coeruleum)*	Found in open to moist conifer and mixed conifer forests; usually associated with partially decayed logs, leaf and needle litter, mosses, and moist plant communities (big-leaf maple and swordfern associations).
Papillose tail-dropper[1] *(Prophysaon dubium)*	Strongly associated with hardwood logs and leaf litter, particularly at sites with fungal fruiting bodies (BLM 1999). Most often found in late-successional stands of moist conifer forests with a hardwood component, as well as in riparian habitats (Burke 2000).

[1] Removed from the list of Survey and Manage species in November 2000 (USFS and BLM 2001).

The USFS terrestrial mollusk survey protocol incorporates intensive time-constrained surveys in plots and extensive surveys of key habitat features between plots. The protocol calls for at least 2 plots per 10 acres (4 ha) of suitable habitat; each plot has a 16.4-foot (5 m) radius and is 860 square feet (80 m^2) in size. In 2000, surveys for S/M species were conducted along 5 transects, 3 on the east side and 2 on the west side of Drift Creek. Transects were established in suitable habitats for terrestrial mollusks in and adjacent to areas currently affected by recreational activities, as generally defined by maps provided by the USFS. Transects covered both shoreline and upland areas and were about 2,400 and 2,800 ft (731 and 853 m) long on the east and west sides of the creek, respectively. Fourteen plots were surveyed along the transects, covering a total of approximately 0.28 acre (0.11 ha). Total plot observation time was 4.6 hours, and total transect observation time was 7.9 hours, for a total survey time of 12.5 hours. The same general transects and plots were resurveyed in 2001 but the crew size was larger, resulting in a total of 39.8 hours of observation time. Because recreational activities are concentrated along the shorelines of Swift Reservoir, there was not enough unaffected shoreline in the Drift Creek vicinity to allow for comparison of disturbed and undisturbed shoreline habitats.

Surveys in 2000 were conducted on May 15, 16, and 18. Weather conditions were sunny to partly sunny, with temperatures between 54 and 64°F (12 and 18°C). Soil temperatures varied between 40 and 42°F (4 and 6°C). Surveys in 2001 were conducted on May 22 and 23 under warmer weather conditions. Air temperatures ranged from 69 to 86°F (21 to 29°C) and soil temperatures were between 46 and 55°F (8 and 13°C). In both 2000 and 2001, air and soil temperature, soil moisture conditions, and time of year were suitable for terrestrial mollusks and S/M amphibians.

5.3.3.4 Potential Habitat Mapping and/or Information Summaries

Specific field studies were not conducted for 10 of the 16 analysis species addressed in this Analysis Species Assessment. Analysis of distribution, abundance, and potential for project-related impacts for these species is based on existing information from the literature, previously collected resource agency field data, incidental observations, and known species/habitat associations. Methodology and specific resources used to map potential habitat and/or summarize distribution information for each of these 10 species (or species groups) is described below:

- Northern Flying Squirrel – Methodology for the mapping of potential northern flying squirrel habitat within the study area was based upon the species' known dependence upon contiguous old-growth or late-successional coniferous and mixed conifer forest types in the Pacific Northwest (Carey 1991). The potential habitat map developed for the northern flying squirrel in the study area reflects this known habitat dependence by indicating existing suitable large-pole, conifer-dominated forest stands within the primary study area. The potential habitat mapping also designates potential secondary habitat for the species, which includes mature hardwood and pine forests and riparian/wetland areas with a dense overstory.

- Beaver – Mapping of beaver habitat within the study area was largely based on observations of this species collected incidental to other fieldwork. Potential habitat

mapping was intended to show localized areas within the project vicinity used by beavers based on repeated observations of the species. Anecdotal information provided by agency personnel confirmed historical use of these areas by beaver. The potential habitat map for beaver also indicates areas that meet known habitat requirements for the species but may not be currently used.

- Marten/Fisher – The fisher and marten are both WDFW priority species. WDFW PHS maps and data were reviewed to map known occurrences of marten and/or fisher in the primary study area. In addition, potential habitat maps for the marten and fisher were developed based on known habitat requirements–primarily closed-canopy mature coniferous forest–for these 2 rare species.

- Elk – The distribution, migration and localized movements of both Roosevelt elk (*Cervus elaphus roosevelti*) and Rocky Mountain elk (*C. e. nelsoni*) are well-documented in and around the project vicinity. The elk is a WDFW priority species. Maps of known elk wintering and calving (summer) habitat are based on confirmed WDFW PHS information. Elk movement corridors and migration patterns within the project vicinity were identified based on WDFW PHS data and other information provided by WDFW (WDFW 1995a and 1998).

- Peregrine Falcon – Surveys for peregrine falcon eyries and individuals were conducted in conjunction with helicopter eagle surveys. However, as no direct evidence of peregrine use of the study area was noted during these surveys, additional methodology for this species included the identification of potential nesting ledges in the project vicinity. In addition, analysis of the potential for occurrence of this species in the study area included a review of WDFW PHS data. Potential habitat in the study area was not mapped.

- Cooper's Hawk – Cooper's hawks hold no official state or federal status and, thus, are not typically monitored by WDFW or other regulatory agencies. Assessment of the potential for occurrence of this relatively common raptor is based on a comparison of known habitat requirements for the species with available habitat types in the project vicinity. Potential habitat in the study area was not mapped, but observations of this species during field surveys were noted.

- Northern Spotted Owl – The northern stopped owl is listed as threatened by both the state and the USFWS and is therefore a WDFW priority species. WDFW keeps extensive records of northern spotted owl breeding territories and known habitat. Known and potential habitats for the spotted owl were assessed based on WDFW spotted owl management circles identified in the PHS database. WDFW delineated spotted owl management circles generally define confirmed and presumed spotted owl breeding territories. Potential spotted owl habitat was identified in the primary study area where suitable habitat (i.e., contiguous, late-successional Douglas fir-dominated coniferous forest) exists peripheral to these known or presumed breeding territories. The centers of known breeding territories in and near the study area were mapped, based on WDFW PHS data.

- Wood Duck – Wood ducks, and other cavity-nesting duck species, are WDFW priority species. The WDFW PHS database identifies areas known to support high densities of cavity-nesting duck species. The potential for wood duck occurrence and use of lands in the project vicinity was assessed based on WDFW delineated cavity-nesting duck areas; wood duck observations collected incidental to other field studies; a review of PacifiCorp and WDFW wood duck nest box monitoring reports; and, the identification of suitable wetland and pond wood duck habitat. Potential habitat in the study area was not mapped, but observations of this species during field surveys were noted.

- Heron Rookeries – Heron rookeries and the breeding locations of other colonial wading birds are WDFW priority habitat. Methodology for assessing the potential for breeding great blue herons in the primary study area included both the collection of incidental field observation on herons and a review of the WDFW PHS database. In addition, potential heron rookery habitat was identified based on the extent and structure of overstory vegetation in study area riparian and wetland habitats.

- Band-Tailed Pigeon Mineral Sites – Band-tailed pigeons use natural and artificial mineral sites to augment their diet. These mineral sites and locations where large numbers of band-tailed pigeons aggregate are identified by WDFW as priority habitat. Methodology for identifying band-tailed pigeon mineral sites in the project vicinity included a review of the WDFW PHS database; a review of literature pertaining to the species in Washington State; communication with area biologists and species experts; and analysis of incidental observations of band-tailed pigeons in the primary study area.

5.3.3.5 Wildlife Observation Database

During all Lewis River terrestrial fieldwork, biologists recorded data on wildlife species observed. These data included species, number of individuals, activity, location, habitat, and comments. These data were then entered into a database using Microsoft Access and combined with data from the Yale Project relicensing studies. The database includes all species recorded during analysis species surveys and S/M species surveys, in addition to wildlife observed incidentally during the HEP sampling and other field studies. The emphasis of most incidental observation was on species that were not commonly observed or are non-native species that potentially affect populations and/or habitat of native fauna. The wildlife observation database was used to develop a species/habitat matrix for the project.

5.3.3.6 TES and WDFW Priority Species Maps

Locations of TES and WDFW priority species observed during analysis species surveys and incidental to other fieldwork were mapped onto project base maps. These data were then entered into the GIS and used to create a map showing occurrences of TES and WDFW priority species in the study area. These maps also incorporated locational data for TES and WDFW priority species from the Yale Project relicensing studies.

5.3.4 Key Questions

Study methodology and analysis were designed to address the following "key" watershed questions identified during the Lewis River cooperative watershed studies meetings:

- What is the distribution and abundance of TES species in the basin that are associated with unique habitats and habitat elements?

  The distribution and abundance of TES species in the project vicinity is described in detail for each individual TES analysis species in Section 5.3.5.

- Which habitat types and locations may be vulnerable to degradation or destruction in the short and long term?

  Habitat types and site-specific features particularly susceptible to degradation or destruction are described in Section 5.3.5 as applicable to specific analysis species. Section 5.3.6 identifies habitat types and features broadly important to many wildlife species or species groups.

- What potential benefits might be gained from enhancement of anthropogenic features for wildlife use (e.g., ledges on concrete arch dams, making bridges more user-friendly for bats)?

  Potential for habitat enhancement is described as applicable to specific analysis species in Section 5.3.5.

- How can unique habitats and habitat elements best be protected?

  Protection of habitat and habitat elements important to specific analysis species is covered in Section 5.3.5. Section 5.3.6 describes habitat and associated elements important to multiple analysis species or species groups.

- What are the current and historical distributions, abundances, and use patterns of populations of wetland-associated species in the basin? Note: This study only addresses current and future conditions.

  Trends in distribution and abundance of wetland-associated analysis species are described in Section 5.3.5.

- Which areas provide important habitat for at-risk, threatened, endangered, and sensitive species of wildlife?

  Habitats in the project vicinity suitable for at-risk, threatened, endangered, and sensitive analysis species are identified and described in Sections 5.3.5 and 5.3.6.

- What were the historical habitat conditions and population estimates for elk and deer, and what are the current habitat conditions and population estimates for these species? Note: this study only addresses current conditions.

Habitat conditions and population estimates for elk are described in Section 5.3.5. For WDFW Region 5, which includes the Lewis River Projects, WDFW estimates black-tailed deer (*Odocoileus hemionus*) density at 10.45 deer per square mile (pers. comm., E. Holman, WDFW Wildlife Biologist, January 21, 2003). Given this density factor, which is based upon 1997 WDFW sex/age/kill modeling, the deer population in the 1,050-sq mile (271,949 ha) Lewis River watershed is estimated at approximately 11,000. The 54,608-acre (22,099 ha) study area may support a consistent population of approximately 85 individuals.

- What unique habitats and habitat elements are important to plants and animals in the basin? Where are the unique habitats and habitat elements located in the basin? What are the current conditions of unique habitats and habitat elements?

  Unique habitats are identified and mapped in TER 1. Habitats and associated elements that are important to plants and animals in the Lewis River basin are identified in Sections 5.3.5 and 5.3.6. Section 5.3.5 describes the current conditions of unique habitats and elements located in the project vicinity as applicable to individual analysis species. Section 5.3.6 summarizes the importance of these habitats to all wildlife.

5.3.5 Results

The sections below summarize the results of analysis species surveys, S/M species surveys, and potential habitat mapping. In addition to presenting results on species habitat and distribution, each sections also include brief a discussion of requirements for the continued existence of the species in the study area and potential threats. The species/habitat association matrix that resulted from the wildlife observation database and a map of TES and WDFW priority species observations in the study area are also presented.

5.3.5.1 Analysis Species Survey Results

Specific field surveys were conducted for the Cascade torrent salamander, northern red-legged frog, Larch Mountain salamander, Pacific Townsend's big-eared bat, bald eagle, and papillose tail-dropper. Survey results for each of these species are summarized below.

Cascade Torrent Salamander

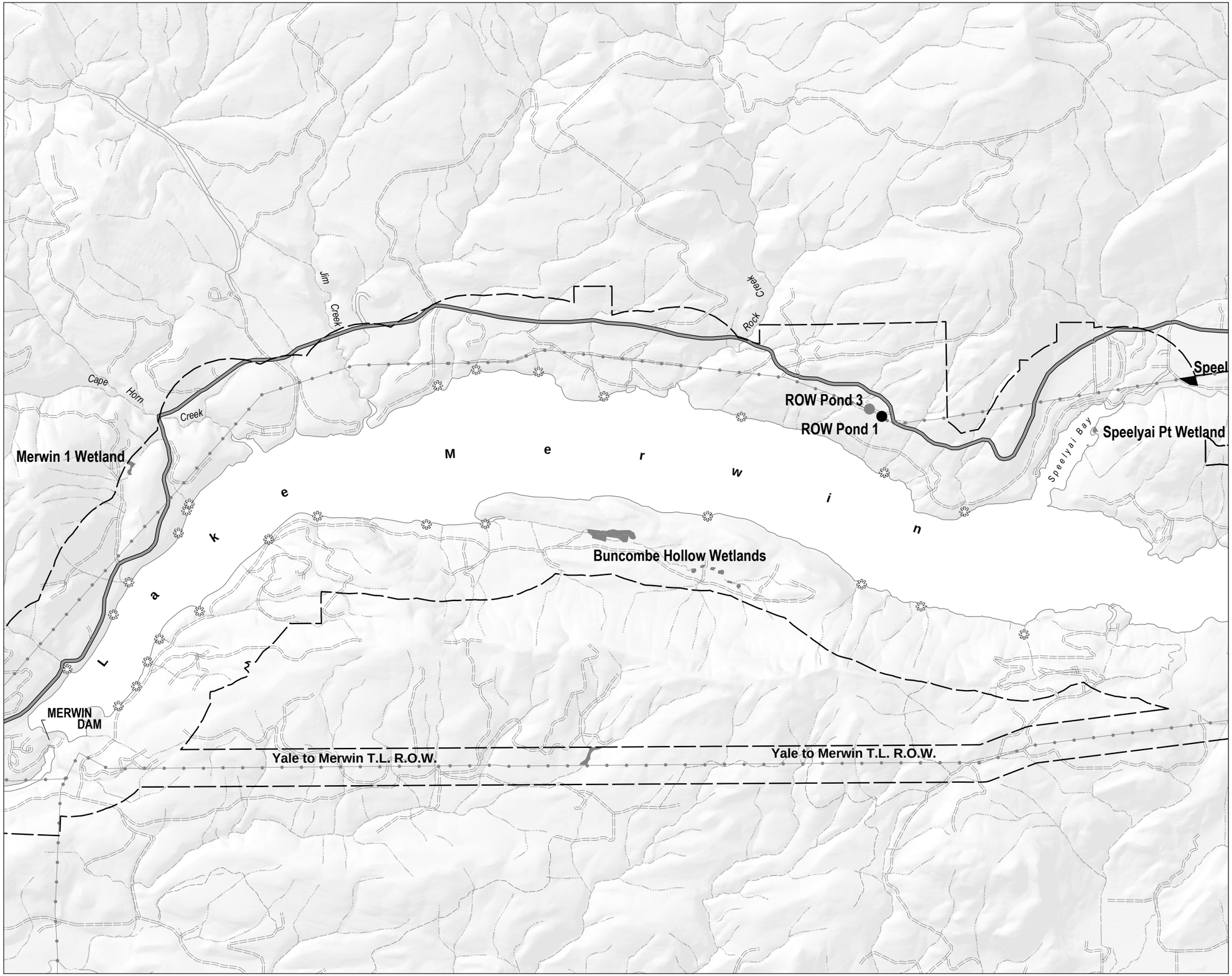
Surveys for Cascade torrent salamanders found this species to be common to locally abundant throughout the primary study area depending upon the amount of available suitable habitat. Of the 48 streams surveyed at Lake Merwin, 37 (78 percent) supported Cascade torrent salamanders. At Swift Reservoir, 7 of the 23 streams (30 percent) surveyed supported Cascade torrent salamanders. Many of the Cascade torrent salamanders were found in small seeps along the sides of streams, especially those which flowed over loose or unvegetated gravel slopes. Figure 5.3-2 shows the location of all Cascade torrent salamander observations recorded during 2001 surveys at Merwin and

Swift reservoirs. Observations of torrent salamanders recorded during the 1996-1998 Yale Project relicensing studies are summarized in PacifiCorp (1999). Other amphibian species encountered during torrent salamander surveys in 2001 included neotenic and larval Pacific giant salamanders (*Dicamptodon tenebrosus*), adult tailed frogs (*Ascaphus truei*), adult western red-backed salamanders (*Plethodon vehiculum*), adult rough-skinned newts (*Taricha granulosa*), and adult red-legged frogs. No amphibians were found in 4 streams (8 percent) at Merwin and 6 streams (26 percent) at Swift.

Data collected on distances show that Cascade torrent salamanders were found within 121 feet (37 m), on average, from the edge of Lake Merwin, and 75 feet (27 m) from the shoreline of Swift Reservoir. However, this species was often found in seeps close to reservoir shorelines, particularly at Lake Merwin (Figure 5.3-3). For example, Cascade torrent salamanders were found within 33 feet (10 m) of the shoreline for approximately 27 percent of the surveyed streams along Lake Merwin, but only 9 percent of tributaries to Swift Reservoir. Distance data were not recorded for all observations of other species, but most were found within 164 feet (50 m) of the mouths of tributary streams.

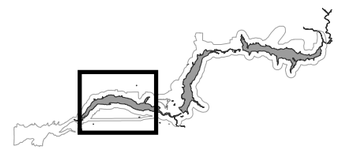
The incidence of Cascade torrent salamanders in particular, and of amphibians in general, was much higher in tributaries to Lake Merwin than those to Swift Reservoir (Figure 5.3-4). This may be due to differences in habitat quality associated with differences in geology and surrounding land uses. The Cascade torrent salamander lives in aquatic or semi-aquatic habitat during both the larval and adult stages of its life cycle, favoring saturated gravel or cobble substrates and cold, clear water (Leonard et al. 1993). They prefer summer temperatures between 46 and 54°F (8 and 12°C) (Nussbaum et al. 1983). Ideal habitat for Cascade torrent salamanders exists where cold groundwater emerges as a seep that flows over bedrock with enough fractures to provide cover. Many of the streams at Lake Merwin meet these specific habitat requirements with clean, cool water that cuts through bedrock composed of basalt and andesite, which is fractured and easily transports subsurface flow, but is also very hard and resistant to erosion. Torrent salamanders were also found in alluvial streams along Lake Merwin, but they were typically confined to the splash zones of small waterfalls or shallow water flowing through cobble along stream margins.

There is less consolidated basalt and andesite in the lithology underlying Swift Reservoir. The northwestern portion of the reservoir is bordered by relatively young, unconsolidated Quaternary volcaniclastic material, which is highly erodible. The few streams through this material do not represent suitable habitat for torrent salamanders largely due to a paucity of microhabitat refugia. The eastern half of the reservoir is mostly bordered by older, more-consolidated volcaniclastic rocks, which are moderately erodible. However, much of this area was also clearcut in the last 20 years, and many of the associated streams show evidence of siltation and have very narrow riparian zones, which may affect water temperatures. Cascade torrent salamanders were found in only 2 streams in this area. Most of the tributaries to Swift Reservoir that support torrent salamanders are located along the southwestern portion of the reservoir, an area underlain primarily by andesite and surrounded by older forests.



Legend

- Cascade Torrent Salamander
- Northern Red-Legged Frog Adult
- Cascade Torrent Salamander & Northern Red-Legged Frog Adult
- S/M Mollusk Species
- Larch Mountain Salamander
- Northern Red-Legged Frog Egg Mass
- Wetland
- Perennial Stream
- Intermittent Stream
- Ephemeral Stream
- Secondary Road
- Light Duty Road
- Unimproved Road
- Trail
- Railroad
- Powerline
- Study Area



0 0.5 1 Miles

1:40,000

Lewis River Hydroelectric Projects

FIGURE 5.3-2 (1 of 4)
Analysis Amphibians, Mollusks, and USFS S/M Species Detections

Source: EDAW, Inc., 2003

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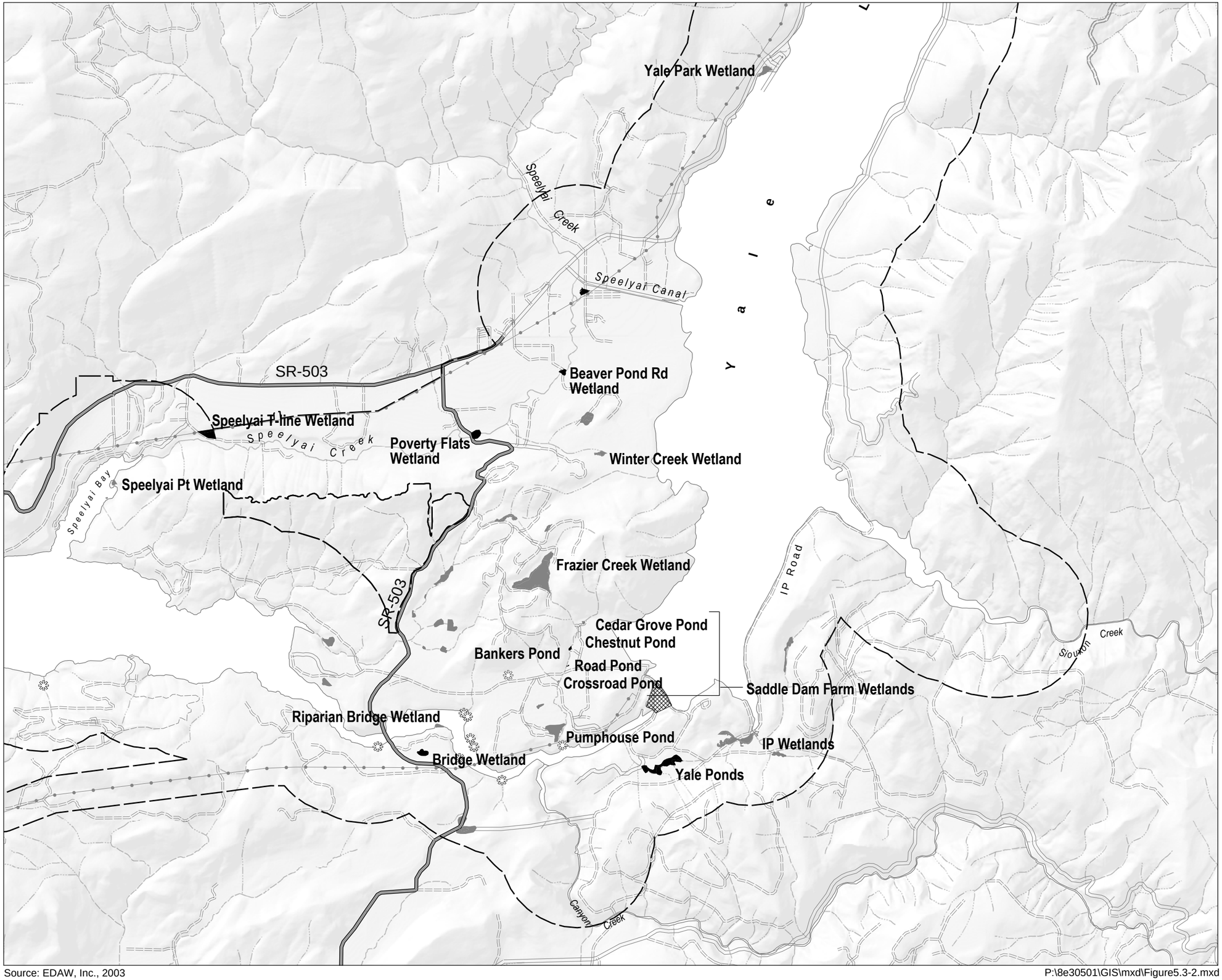

Legend

- Cascade Torrent Salamander
- Northern Red-Legged Frog Adult
- Cascade Torrent Salamander & Northern Red-Legged Frog Adult
- S/M Mollusk Species
- Larch Mountain Salamander
- Northern Red-Legged Frog Egg Mass
- Wetland
- Perennial Stream
- Intermittent Stream
- Ephemeral Stream
- Secondary Road
- Light Duty Road
- Unimproved Road
- Trail
- Railroad
- Powerline
- Study Area

0 0.5 1 Miles

1:40,000

Lewis River Hydroelectric Projects

FIGURE 5.3-2 (2 of 4)
Analysis Amphibians, Mollusks, and USFS S/M Species Detections

Source: EDAW, Inc., 2003

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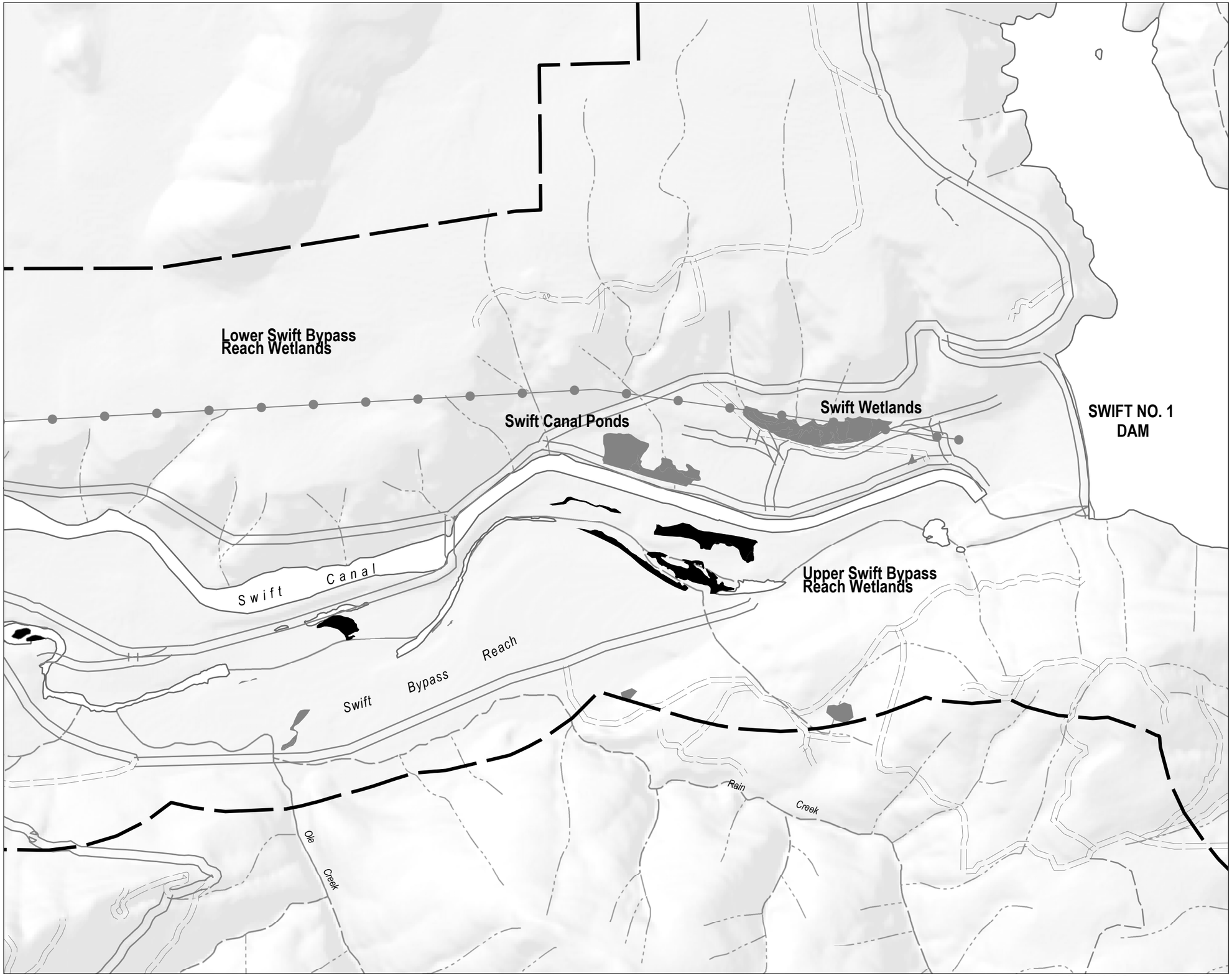

Legend

- Cascade Torrent Salamander
- Northern Red-Legged Frog Adult
- Cascade Torrent Salamander & Northern Red-Legged Frog Adult
- S/M Mollusk Species
- Larch Mountain Salamander
- Northern Red-Legged Frog Egg Mass
- Wetland
- Perennial Stream
- Intermittent Stream
- Ephemeral Stream
- Secondary Road
- Light Duty Road
- Unimproved Road
- Trail
- Railroad
- Powerline
- Study Area

0 500 1,000 2,000 Feet

1:15,000

Source: EDAW, Inc., 2003

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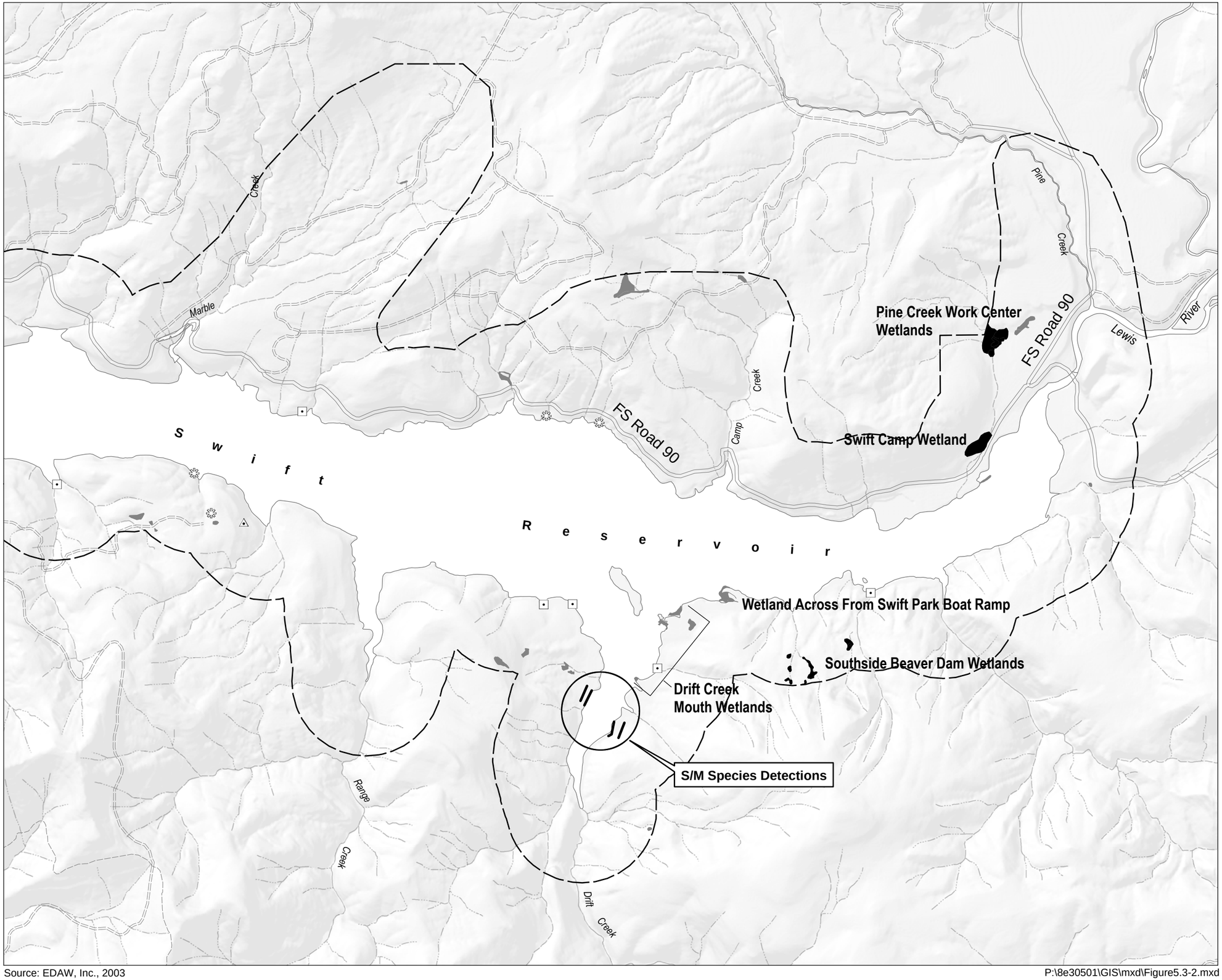
Lewis River Hydroelectric Projects

FIGURE 5.3-2 (3 of 4)
Analysis Amphibians, Mollusks, and USFS S/M Species Detections



Legend

- Cascade Torrent Salamander
- Northern Red-Legged Frog Adult
- Cascade Torrent Salamander & Northern Red-Legged Frog Adult
- S/M Mollusk Species
- Larch Mountain Salamander
- Northern Red-Legged Frog Egg Mass
- Wetland
- Perennial Stream
- Intermittent Stream
- Ephemeral Stream
- Secondary Road
- Light Duty Road
- Unimproved Road
- Trail
- Railroad
- Powerline
- Study Area

0 0.5 1 Miles

1:40,000

Lewis River Hydroelectric Projects

FIGURE 5.3-2 (4 of 4)
Analysis Amphibians, Mollusks, and USFS S/M Species Detections

Source: EDAW, Inc., 2003

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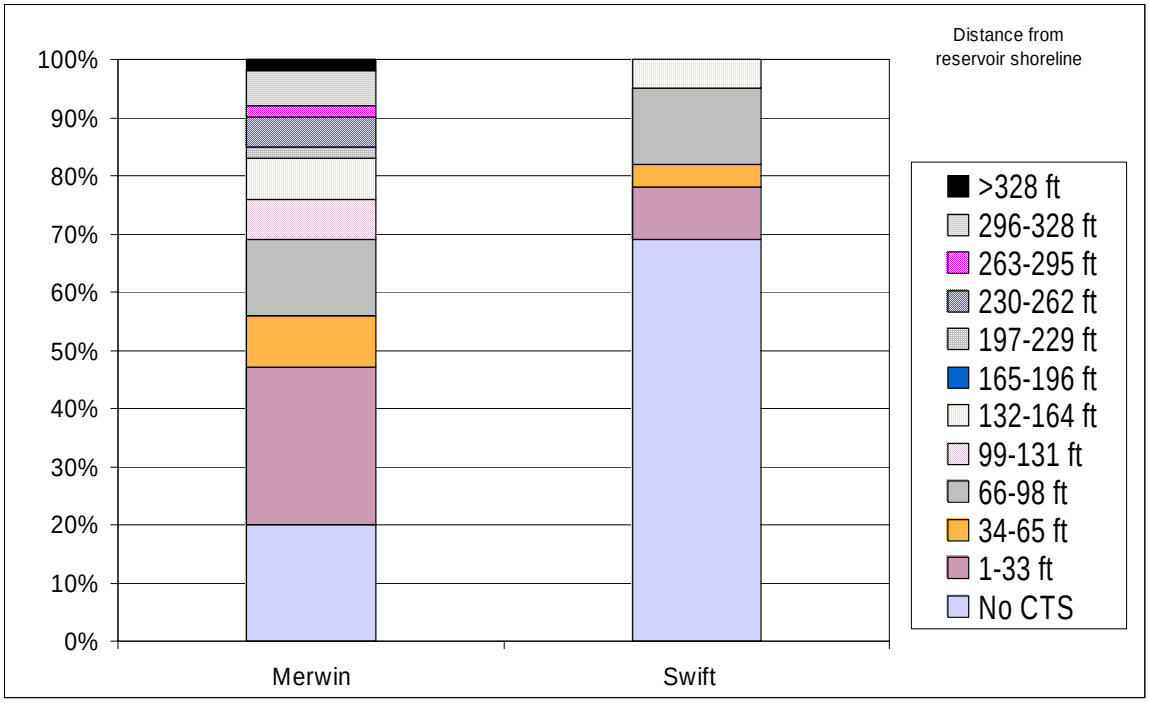


Figure 5.3-3. Minimum distances from the reservoirs recorded for Cascade torrent salamanders, by percent of total streams surveyed.

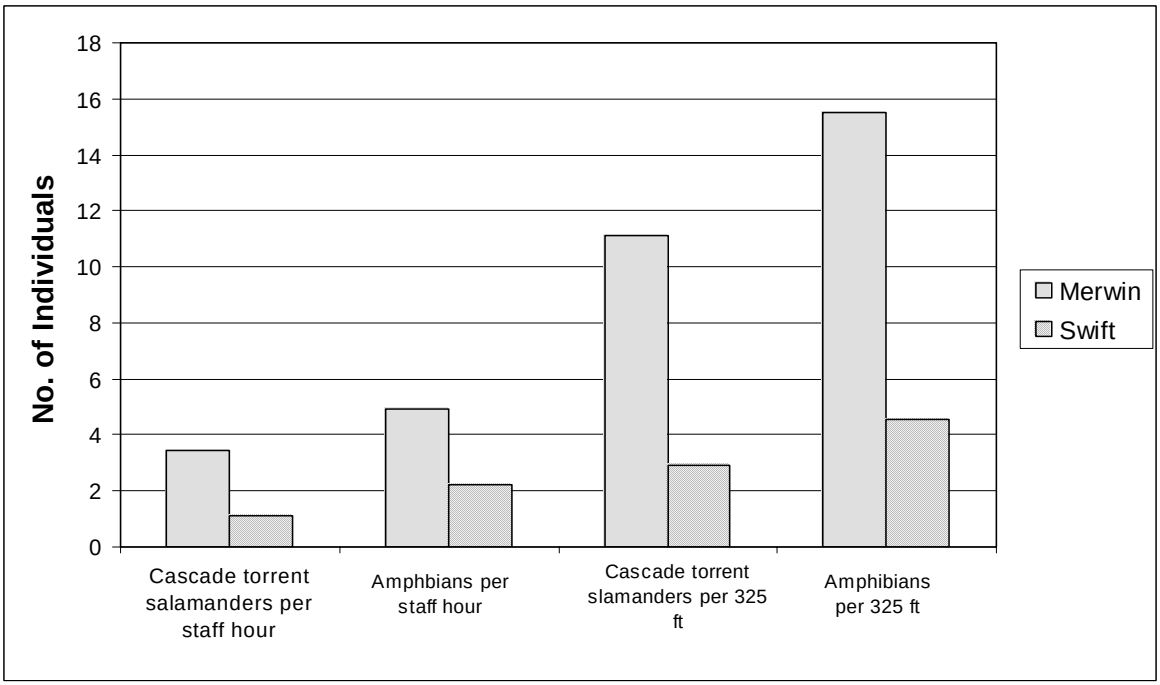


Figure 5.3-4. Abundance of Cascade torrent salamanders and other amphibians at Swift and Merwin reservoirs.

Cascade torrent salamanders were observed in 78 percent (14 of 18) of the tributary streams surveyed around Yale Lake (PacifiCorp 1999), an observation rate similar to that of Lake Merwin. Like Lake Merwin, the lands surrounding Yale Lake are underlain by consolidated basalt and andesite bedrock, which is often exposed or located at a relatively shallow depth below the surface. At Yale Lake, these habitat parameters were met in several locations outside of stream environments – notably in moist talus slopes and isolated talus seeps. Large, localized densities of torrent salamanders were noted in these unique microhabitats, with over 50 individuals noted within a 0.2-acre (0.08 ha) talus seep associated with the Swift bypass reach at the upper end of Yale Lake (PacifiCorp 1999).

Survey results from 1997-1998 and 2001 indicate that portions of the study area for the Lewis River Projects provide nearly optimal habitat for the Cascade torrent salamander. The relative abundance and distribution of this species within the study area will be maintained only to the extent that water quality in these unique habitat areas is not significantly impacted by surrounding land use practices.

Northern Red-Legged Frog

Red-legged frogs egg masses were documented in 17 of the 26 wetlands surveyed in the study area (Figure 5.3-2). Ten or more northern red-legged frog egg masses were found in the following locations: Bankers Pond (30 egg masses), in 4 small wetlands in the Swift bypass reach (10 - 39), and in 2 wetlands along Speelyai Creek (10 – 20) (Table 5.3-3). Most red-legged frog egg masses were in water less than 3 feet (0.9 m) deep and were attached to stems of reed canarygrass or small sticks. Summer/fall field work recorded numerous red-legged frog adults on Eagle Island and along Swift Reservoir, Speelyai Creek, and the Lewis River below Merwin Dam.

Overall, egg mass surveys recorded 6 amphibian species, including 3 salamander and 3 frog species. Of the 25 wetland sites surveyed, all but 2 supported pond breeding amphibians (Table 5.3-3; Figure 5.3-2). Northwestern salamanders (*Ambystoma gracile*) and rough-skinned newts were documented in 13, and 10 wetlands, respectively. Amphibians detected as part of the Yale Project relicensing study are described in the Yale FTR (PacifiCorp 1999).

A variety of habitats are likely important to the continued maintenance of existing red-legged frog populations in the project vicinity. Red-legged frogs breed in cool, usually well-shaded ponds, wetlands, or lake edges in water typically 2 to 6 feet (0.6 to 1.8 m) in depth though sometimes deeper (Corkran and Thoms 1996). Because the species has relatively short egg and tadpole stages, it can make use of ephemeral pools and temporarily ponded areas for breeding. As adults red-legged frogs may be found in uplands habitats near wetlands or in riparian area (Corkran and Thoms 1996). Still, although red-legged frogs make use of a wide variety of habitats throughout their life cycle, maintenance of current populations within the study area will likely be dependent upon preservation of suitable breeding wetlands and ponds.

Table 5.3-3. Amphibians recorded during red-legged frog surveys in 2000 and 2001[1].

	Long-toed Salamander (*Ambystoma macrodact-ylum*)	Northwestern Salamander (*A. gracile*)	Rough-skinned Newt (*Taricha granulosa*)	Northern Red-legged Frog (*Rana aurora*)	Pacific Treefrog (*Pseudacris regilla*)	Bullfrog (*Rana catesbeiana*)	Unidentified Frog Species
Merwin Wildlife Lands near Lake Merwin (2000)							
Merwin 1	—	—	—	—	—	—	—
Speelyai Point Wetland	—	—	—	—	—	—	—
Bridge Wetland	—	1 egg mass	—	3 egg masses	—	—	—
ROW 1 Pond	3 egg masses	4 egg masses	5 adults	1 egg mass	—	—	—
ROW 3 Pond	—	2 egg masses	2 adults	—	—	—	—
Merwin Wildlife Lands near Yale Lake (2000)							
Yale Ponds	—	1 egg mass	21 adults	5 egg masses	2 egg masses 5 adults	—	1 larvae 1 adult
Bankers Pond	—	—	46 adults	30 egg masses	—	—	—
Cedar Grove Pond	—	—	25 adults	—	1 adult	—	—
Frazier Diversion[2]	—	—	—	—	—	—	1 adult
Road Pond	—	7 egg masses	15 adults	1 egg mass	—	1 larvae	—
Pumphouse Pond	—	5 egg masses	48 adults	—	—	—	—
Swift Bypass Reach (2000)[3]							
Wetland Point 1	—	5 egg masses	—	1 egg mass	—	—	—
Wetland Point 2	—	—	—	2 egg masses 1 adult	—	—	—
Wetland Point 3	—	4 egg masses	2 adults	39 egg masses	1 adult	—	—
Wetland Point 4	—	2 egg masses	—	—	—	—	—
Wetland Point 5	—	1 egg mass	—	10 egg masses	—	—	—
Wetland Point 6	—	—	—	2 egg masses	—	—	—
Wetland Point 7	—	1 egg mass	—	20 egg masses	2 adults	—	—
Wetland Point 8	—	—	—	13 egg masses	—	—	—
Swift Canal Ponds	—	—	—	—	—	—	—
Swift Project Vicinity (2000)							
Swift Camp Pond	—	—	—	—	—	—	—
Southside Beaver Pond Wetland	—	—	—	1 egg mass	—	—	—
Pine Creek Wetlands	—	—	—	18 egg masses	—	—	—
Speelyai Creek (2001)							
Poverty Flats Wetland	—	—	—	5 egg masses	—	—	—
Beaver Pond Road Wetland	—	8 egg masses	1 adult	20 egg masses	—	—	2 egg masses
Speelyai T-Line Wetland	—	19 egg masses	11 adults	10 egg masses	—	—	1 egg mass
TOTALS	**3 egg masses**	**60 egg masses**	**176 adults**	**181 egg masses 1 adult**	**2 egg masses** 9 **adults**	**1 larva**	**2 egg masses 1 larva 2 adults**

[1] Dashes indicate no species observations.
[2] Mapped as part of Cedar Grove Wetland.
[3] For purposes of this study, each point is considered a separate wetland within a hydrologically linked wetland complex.

Declines in native red-legged frog populations throughout the Pacific Northwest and the west coast in general are often attributed to the introduction and establishment of the bullfrog (*Rana catesbeiana*), a species native to the eastern United States (Csuti et al. 1997). Bullfrogs decimate native amphibian populations through competition for habitat and, most notably, through direct predation. Bullfrog populations are typically most dominant around urban centers and areas impacted by human development. Within the study area, bullfrogs were found to be present but not abundant. They were found to be most common in several ponds associated with Saddle Dam Farm and in the Frazier Creek wetland. All of these wetlands include large areas of open, shallow, unshaded, warm water – areas suitable for bullfrog proliferation. Increased development and changes in land use practices in the project vicinity may result in conditions favoring bullfrog populations, which may in turn negatively affect the abundance and distribution of native red-legged frog populations in the primary study area.

Larch Mountain Salamander

Surveys conducted by the USFS and PacifiCorp on Yale Dam (Figure 5.3-2) in 1999 found Larch Mountain salamanders to be abundant, with 80 individuals recorded in 3,854 feet (1,175 m) of survey transect and a minimum population estimate of 176 (Crisafulli 1999a). Western red-backed salamanders were also common, with 97 observations. This species was more abundant lower on the dam and increased with distance upslope; the opposite occurred for the Larch Mountain salamander (Crisafulli 1999a). The Larch Mountain salamander was not found during surveys of Swift Dam (Crisafulli 2000) or the Drift Creek vicinity. The WDFW PHS database documents the occurrence of Larch Mountain salamanders at Moss Cave along the ROW for the Swift Nos. 1 and 2 transmission line. No surveys were conducted at this site since it is also used by a colony of Pacific Townsend's big-eared bats.

Relatively little is known about the Larch Mountain salamander's range, distribution, or breeding ecology. No nests have ever been found for the species. It was originally thought to occur only in talus habitats in the Columbia River Gorge, but recent studies have resulted in known range expansions to the north (Corkran and Thoms 1996). When field studies for the Yale Project were initiated in 1997, Larch Mountain salamander occurrence had only been confirmed in the Columbia Gorge and in isolated talus and forested areas extending north to Mount St. Helens. The face of Yale Dam was first surveyed in 1997 because it was recognized that the loose rock fill on this structure was similar to the natural talus habitat used by Larch Mountain salamanders. Larch Mountain salamanders were found to be abundant on the face of Yale Dam and represented a first discovery of use of an "artificial talus habitat" by the species. The 1999 surveys confirmed Yale Dam as a unique habitat feature supporting a distinct population of Larch Mountain salamanders (Crisafulli 1999a).

Like Yale Dam, Swift Dam is also composed of rock earthen fill, but surveys of this structure in 2000 did not find any Larch Mountain salamanders. These seemingly disparate results may be explained by differences in microhabitat between the 2 dams and the proximity of suitable native habitat potentially supporting salamander populations. The rock comprising the face of Yale Dam is much smaller and has a greater number of smaller interstitial spaces than the rock on Swift Dam. Smaller rock sizes, such as

cobbles, are more frequently used as cover objects by Larch Mountain salamanders than boulders because the large interstitial spaces that occur between boulders are more subject to drying than smaller spaces. The lack of fine detritus in larger spaces may also limit prey availability. In addition, the east side of Yale Dam is bordered by a shaded cliff that is likely the source of the salamander populations on the dam; a nearby habitat for a source population is lacking at Swift (Crisafulli 1999b, 2000).

Pacific Townsend's Big-eared Bat

Moss Cave is the only cave in the project vicinity known to support Pacific Townsend's big-eared bats. Located along a portion of the transmission line corridor near the Yale Project, the land associated with the cave is owned by the Washington Department of Natural Resources (DNR) and TNC. Surveys of Moss Cave in 1988 indicated that it was used by big-eared bats as a maternity site, and PacifiCorp adopted specific protective management practices along the transmission line in the vicinity of the cave in 1991. Gates were installed in 1997 and 1998 at cave entrances using designs that prevent vandalism but allow bats to enter and exit the cave (memo from L. Cornelius, Biologist, TNC, Seattle, WA, November 10, 1999).

PacifiCorp has assisted TNC biologists with exit surveys for Pacific Townsend's big-eared bats at Moss Cave since 1997. Surveys in 1997 and 1998 documented 56 and 127 bats, respectively. In 1999, only 5 bats were recorded at the main entrance, and a search of the cave suggested that it had not been used as a maternity site that year (memo from L. Cornelius, Biologist, TNC, Seattle, WA, November 10, 1999). Exit surveys at the cave in 2000 were conducted on May 8, June 12, and August 8, recording 21, 4, and 5 bats, respectively. The low numbers of bats observed in 1999 and 2000 led to concern by TNC that installation of the gate at the main cave entrance may have been detrimental to the colony (memo from L. Cornelius, Biologist, TNC, Seattle, WA, February 21, 2001).

In 2001 TNC counted 48 Pacific Townsend's big-eared bats in Moss Cave on May 2; 141 on June 14; and 10 on July 19. However, no bats were observed at the nursery site. TNC also discovered that someone had managed to gain access to the cave by digging under the main gate (memos from L. Cornelius, Biologist, TNC, Seattle, WA, May 15, 2001 and January 17, 2002). In 2001, TNC biologists conducted the following activities at Moss Cave: (1) welded some additional bars to block the new access point as well as several other potential access locations; (2) installed temperature sensors; and, (3) made some modifications to the gate design by adding bars that can be removed to create a window for entry and exit (memos from L. Cornelius, Biologist, TNC, Seattle, WA, February 21, 2001 and January 17, 2002).

A new cave was identified in the project vicinity during field studies conducted in 2000. Located near Lake Merwin, it appeared be too small and damp to provide suitable habitat for Pacific Townsend's big-eared bats. Although it is possible that this species uses other caves in the study area, it is currently known to occur only in association with Moss Cave. Thus, the sustained viability of known big-eared bat populations in the study area will be contingent upon the continued protection of Moss Cave as a unique habitat element important to local populations of the species. PacifiCorp is aware of the importance of Moss Cave to big-eared bat populations and has been working, in

conjunction with TNC, to preserve this unique habitat feature since adopting specific protective management practices along the transmission line in the vicinity of the cave in 1991. However, in spite of extensive ongoing efforts to restrict access and minimize human disturbance at the cave, vandalism remains a major concern and could potentially threaten the largest known population of big-eared bats in the primary study area.

Through the PHS database, WDFW documents and monitors "cave-rich areas," areas with existing known caves or potential high densities of unknown caves (e.g., areas with extensive lava voids). WDFW has documented 2 cave-rich areas in the primary study area: one located on the west shore of Yale Lake north of Saddle Dam; and one located between the Swift No. 2 canal and bypass reach. Known and unknown caves in these WDFW-identified cave-rich areas may currently be important habitat features for big-eared bats or may be used by established colonies in the future. Regardless, continued identification and protection of big-eared bat roosting and maternity sites will remain important to maintain viability of Pacific Townsend's big-eared bat populations occurring in the project vicinity.

Bald Eagle

In total, 35 bald eagles—20 adults and 15 subadults—were documented between Woodland and the upper end of Swift Reservoir during late winter aerial surveys in 2000 (Table 5.3-4; letter from M. Garrett, PacifiCorp biologist, to WDFW, April 5, 2000). Only 5 bald eagles were observed during surveys on February 27, 2001.

Table 5.3-4. Numbers of bald eagles recorded during PacifiCorp's late-winter aerial surveys.

	Adults		Subadults		Total	
Location[1]	**2/29/00**	**2/27/01**	**2/29/00**	**2/27/01**	**2/29/00**	**2/27/01**
Merwin	4	0	8	0	12	0
Yale	3	2	1	0	4	2
Swift	6	0	5	0	11	0
Down river	7	2	1	1	8	3
Totals	**20**	**4**	**15**	**1**	**35**	**5**

[1] The area for each project is defined as tailrace to tailrace. For example, the Merwin Project extends from the Merwin tailrace to the Yale tailrace. The down river area extends from Woodland to just downstream of the Merwin tailrace.

Of the 4 known bald eagle nest sites located in the project vicinity, 2 were active in 2000. The active nests were at the Drift Creek and Swift Dam sites. Of these 2 nests, only the Swift Dam site was productive, with 2 young recorded (letter from M. Garrett, PacifiCorp biologist, to WDFW, July 11, 2000). The site on Siouxon Ridge along Yale Lake and the site along Lake Merwin appeared to be inactive. In 2001, the Drift Creek and Lake Merwin sites were both active and productive, with 2 and 1 young, respectively. The sites at Swift Dam and along Yale

Lake were inactive in 2001 (letter from M. Garrett, PacifiCorp biologist, to WDFW, June 28, 2001).

Lands associated with all 3 reservoirs provide important habitat for wintering and breeding bald eagle populations. Known bald eagle nests are located along each reservoir

with recently active (2000-2001) nest sites in the vicinity of Drift Creek and Swift Dam, and previously active nests on Siouxon Ridge near Yale Lake and along Lake Merwin. In addition, WDFW monitors bald eagle communal roost sites through the PHS database and identifies 7, 6, and 4 communal roost sites along Yale, Swift, and Merwin reservoirs, respectively. Both nest sites and communal roost sites represent unique habitat features integral to the continued viability of bald eagle populations in the primary study area.

Results from aerial helicopter surveys for bald eagles conducted in 1996-2001 indicate dramatic fluctuations in winter use of the primary study area. Forty-five bald eagles were detected during 1996 surveys, while only 5 individuals were located during surveys conducted in 2001. The substantially lower number of bald eagles recorded in 2001 may have been due to very low water levels and associated limited prey availability. Bald eagle monitoring by PacifiCorp, WDFW, and other resource agencies will continue to assess trends in use of the study area by this species.

Papillose Tail-dropper

The papillose tail-dropper, a terrestrial slug, was not observed during USFS S/M species surveys in the vicinity of Drift Creek or during any other field studies conducted as part of the Analysis Species Assessment. However, the species has been previously detected along the east fork of the Lewis River south of the project vicinity. The lack of recorded detections of papillose tail-dropper around Drift Creek likely reflects localized habitat suitability and not necessarily the abundance and distribution of the species in the general project vicinity (pers. comm., M. Wainwright, Wildlife Biologist, S/M Mollusk Research Group, Mount St. Helen's National Monument, USFS, Amboy, WA, November 4, 2002). Papillose tail-droppers were originally included as an USFS S/M species because they were thought to be relatively rare and a potential riparian indicator species. They have since been shown to be more abundant than originally thought and have now been dropped from the USFS S/M species list. Their occurrence is often associated with a dense forest understory of shrubby vegetation–typically dominated by vine maple (*Acer circinatum*), which is not a defining habitat characteristic in the Drift Creek area.

5.3.5.2 USFS S/M Species

Surveys at Drift Creek focused on suitable habitats for terrestrial mollusks in and adjacent to areas currently affected by recreational activities, as generally defined by maps provided by USFS biologists. Figure 5.3-5 shows examples of habitat surveyed near sites heavily impacted by recreation and sites removed from recreation areas. Recreation is generally confined to 2 large areas along the eastern and western shorelines of the Drift Creek inlet and lower portions of adjacent slopes.

Eight mollusk species were recorded during 2000-2001 surveys in the Drift Creek area (Table 5.3-5). Four mollusk species were observed in both 2000 and 2001: robust lancetooth (*Haplotrema vancouverense*), Puget oregonian (*Cryptomastix devia*), Pacific sideband (*Monadenia fidelis fidelis*), and northwest hesperian (*Vespericola columbiana*). The most abundant mollusk species observed in both survey years was the robust lancetooth. Each side of the Drift Creek drainage had a species richness of 6 and had 4 species in common—the robust lancetooth, warty jumping slug (*Hemphillia glandulosa*),

Pacific sideband, and northwest hesperian. The lancetooth (*Ancotrema* sp.) and scarlet-back tail-dropper (*Prophysaon vanattae*) were found only on the west side of the drainage; observations of the Malone jumping slug (*Hemphillia malonei*) and Puget Oregonian (*Cryptomastix devia*) were limited to the east side.

Example of site heavily impacted by recreational activities

Example of site not impacted by recreational activity.

Figure 5.3-5. Photographs of Drift Creek survey locations for S/M species.

Four amphibian species were documented during the surveys at Drift Creek: red-legged frog, Pacific treefrog (Pseudacris regilla), ensatina (Ensatina eschscholtzii), and western red-backed salamander. However, the 2 S/M amphibian species potentially occurring in the vicinity of Drift Creek—the Van Dyke's salamander and Larch Mountain salamander—were not observed during surveys in 2000 or 2001.

Three S/M mollusk species—the Puget Oregonian, warty jumping slug, and Malone jumping-slug—were observed on Drift Creek lands during 2000-2001 surveys. The Puget Oregonian and Malone jumping slug were located on the east side of the Drift Creek drainage, on the upland slopes (Table 5.3-5). The warty jumping slug was found in shoreline and upland areas on both sides of the creek. Observation of these species was not unexpected since they are all known to use mature to late successional moist forests (BLM 1999). The Puget Oregonian is also known to be associated with big-leafed maple (*Acer macrophyllum*), which was where it was observed in this study (BLM 1999). The 1 observed Malone jumping slug was located under a thick moss layer on a down log. This species is known to use down woody material (BLM 1999). The most common mollusk species observed during S/M species surveys was the robust lancetooth, which is not listed as a USFS S/M species. The frequency of occurrence of the robust lancetooth was not unexpected given the wide distribution range and relative abundance of this species in the Pacific Northwest.

Table 5.3-5. Terrestrial mollusk species observed within the Drift Creek area of Swift Reservoir, Lewis River, Washington in 2000 and 2001.

Species[1]	Location[2]								Totals	
	East Side Drift Creek Drainage				West Side Drift Creek Drainage					
	Shoreline		Upland		Shoreline		Upland			
	2000 (2.7 hr)	2001 (9.2 hr)	2000 (2.7 hr)	2001 (14.3 hr)	2000 (3.2 hr)	2001 (7.5 hr)	2000 (4.0 hr)	2001 (8.8 hr)	2000 (12.5 hr)	2001 (39.8 hr)
Terrestrial Mollusks										
Lancetooth (*Ancotrema* sp.)	0	0	0	0	2	0	1	0	3	0
Puget oregonian* (*Cryptomastix devia*)	0	1	1	5	0	0	0	0	1	6
Robust lancetooth (*Haplotrema vancouverense*)	4	15	12	15	6	22	21	26	43	78
Warty jumping slug* (*Hemphillia glandulosa*)	0	4	0	5	0	1	0	1	0	11
Malone jumping-slug* (*Hemphillia malonei*)	0	0	1	0	0	0	0	0	1	0
Pacific sideband (*Monadenia fidelis fidelis*)	1	8	5	4	1	2	3	0	10	14
Scarlet-back tail-dropper (*Prophysaon vanattae*)	0	0	0	0	0	1	0	1	0	2
Northwest hesperian (*Vespericola columbiana*)	5	3	2	4	3	6	1	2	11	15
Total Terrestrial Mollusk Species/Individuals (Individuals per staff hour)	3/10 (3.7)	5/31 (3.4)	5/21 (7.7)	5/33 (2.3)	4/12 (3.8)	5/32 (4.3)	4/26 (6.5)	4/36 (4.1)	6/69 (5.5)	6/126 (3.2)

[1] S/M species are designated with an asterisk (USFS and BLM 2001).
[2] Number of minutes includes plot survey time and survey time along routes between plots.

In 2000, the number of observations of terrestrial mollusks per hour was similar between the east and west side shoreline habitat areas of the Drift Creek inlet. The number of individuals observed per hour was also higher in upland sites than shoreline sites on both the east and west sides. Results from 2001 showed nearly opposite trends. The number of terrestrial mollusks observed per hour in upland sites was substantially different between the east and west sides of the creek, and was lower than shoreline sites. However, the small sample size, lack of comparable habitats between disturbed and undisturbed areas, and differences in survey conditions make it nearly impossible to draw any conclusions from the results. Species richness is similar in the shoreline and upland habitats on both sides of the Drift Creek inlet. Differences in the number of individual mollusk observations likely reflect differences in survey conditions, as well as other factors such as disturbance and variations in natural habitat suitability. Down wood and moist, loose soil are key habitat features for many terrestrial mollusk species. Since camping is known to reduce the amount of available down wood and cause soil compaction, this activity most likely has some effect on the carrying capacity of otherwise suitable habitats for terrestrial mollusks.

5.3.5.3 Habitat Mapping

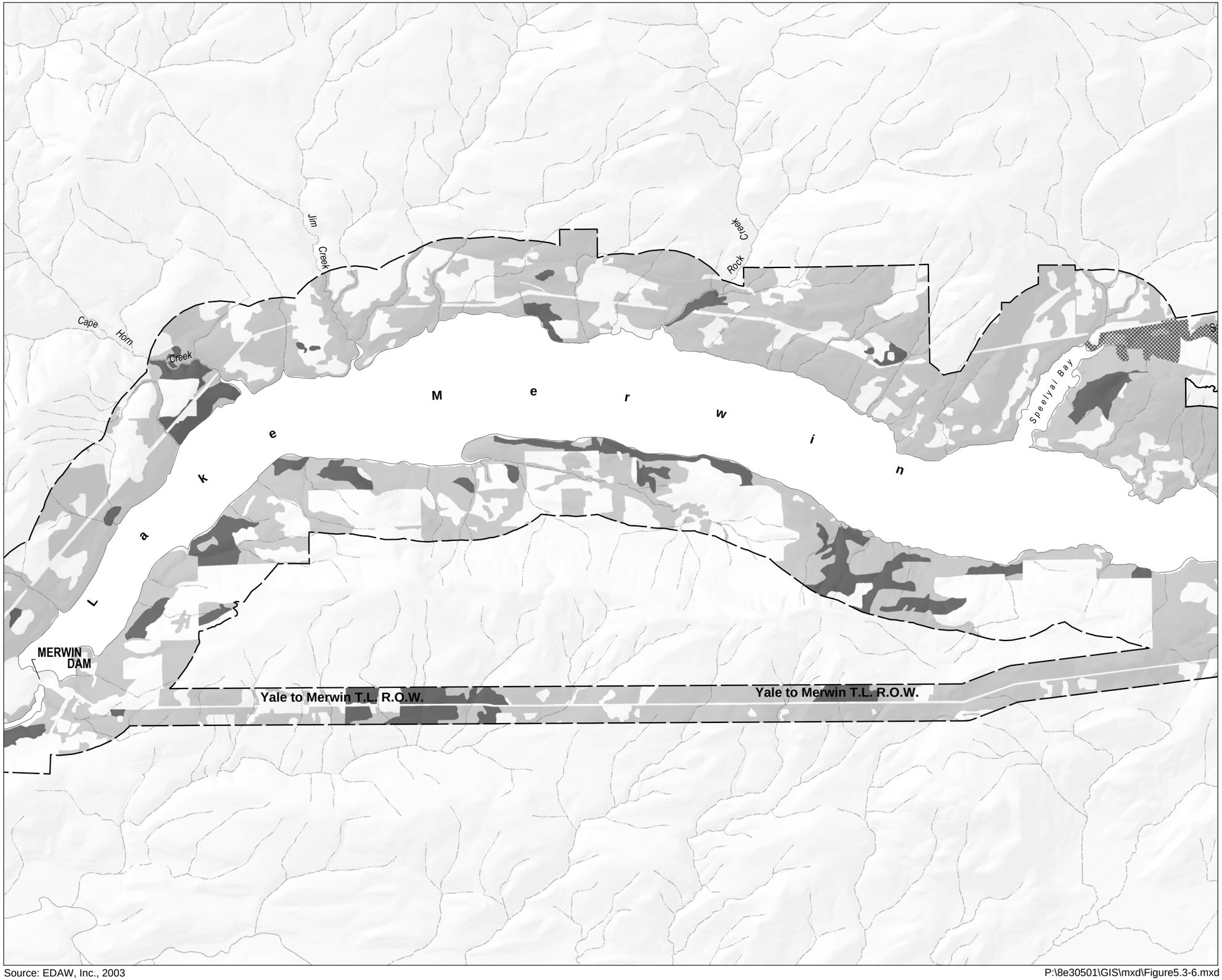
This section presents the potential habitat maps for the analysis species that were not surveyed and provides summaries and discussions on relevant data from the literature.

Northern Flying Squirrel

Limited anecdotal information is available on the occurrence of flying squirrels in the Lewis River drainage. From 1989 to 1993, PacifiCorp personnel occasionally observed flying squirrels using nest boxes designed for wood ducks (WDFW 1995a). This species often goes undetected but is likely common in many habitats in the project vicinity. Flying squirrels are typically associated with coniferous forest and mixed coniferous-deciduous forest and occasionally broad-leaf deciduous forest (Wells-Gosling and Heaney 1984). In the Pacific Northwest, flying squirrels are associated primarily with late-successional and old-growth mixed conifer-coniferous forest types. Hardwood, conifer, and riparian/wetland areas are considered to be secondary habitats (Brown 1985). Figure 5.3-6 shows potential primary and secondary habitat for the flying squirrel in the study area.

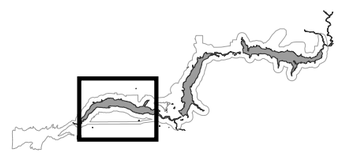
Within their primary habitat, flying squirrel densities in the Pacific Northwest generally range from approximately 0.2/acre (0.5/ha) to 1.5/acre (3.75/ha) (Carey 1991). Within less suitable forest types (e.g., early successional, small-pole coniferous managed forests), densities for this relatively ubiquitous species typically average 0.08/acre (0.2/ha). Flying squirrel densities have been found to be significantly affected by the presence of northern spotted owls, a main predator (Carey 1991). The WDFW PHS database indicates that spotted owls may occur in lands adjacent to the study area and, thus, may influence flying squirrel densities in some parts of the study area.

Little definitive data are available on flying squirrel abundance and distribution in the project vicinity. However, flying squirrels are thought to be common to abundant in forested habitats throughout the Pacific Northwest, and the species could potentially



Legend

- Beaver High-use Area
- Marten/Fisher and Primary Northern Flying Squirrel Habitat
- Secondary Northern Flying Squirrel Habitat
- Perennial Stream
- Intermittent Stream
- Ephemeral Stream
- Secondary Road
- Light Duty Road
- Unimproved Road
- Trail
- Railroad
- Powerline
- Study Area



0 0.5 1 Miles

1:40,000

Lewis River Hydroelectric Projects

FIGURE 5.3-6 (1 of 4)

Northern Flying Squirrel, Beaver & Marten/Fisher Potential Habitat & Study Area Distribution

Source: EDAW, Inc., 2003

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Legend

- Beaver High-use Area
- Marten/Fisher and Primary Northern Flying Squirrel Habitat
- Secondary Northern Flying Squirrel Habitat
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- Ephemeral Stream
- Secondary Road
- Light Duty Road
- Unimproved Road
- Trail
- Railroad
- Powerline
- Study Area

0 0.5 1 Miles

1:40,000

Lewis River Hydroelectric Projects

FIGURE 5.3-6 (2 of 4)

Northern Flying Squirrel, Beaver & Marten/Fisher Potential Habitat & Study Area Distribution

Source: EDAW, Inc., 2003

P:\8e30501\GIS\mxd\Figure5.3-6.mxd

Legend

- Beaver High-use Area
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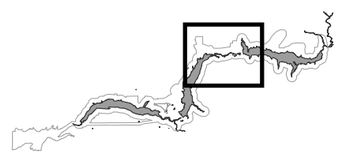


0 0.5 1 Miles

1:40,000

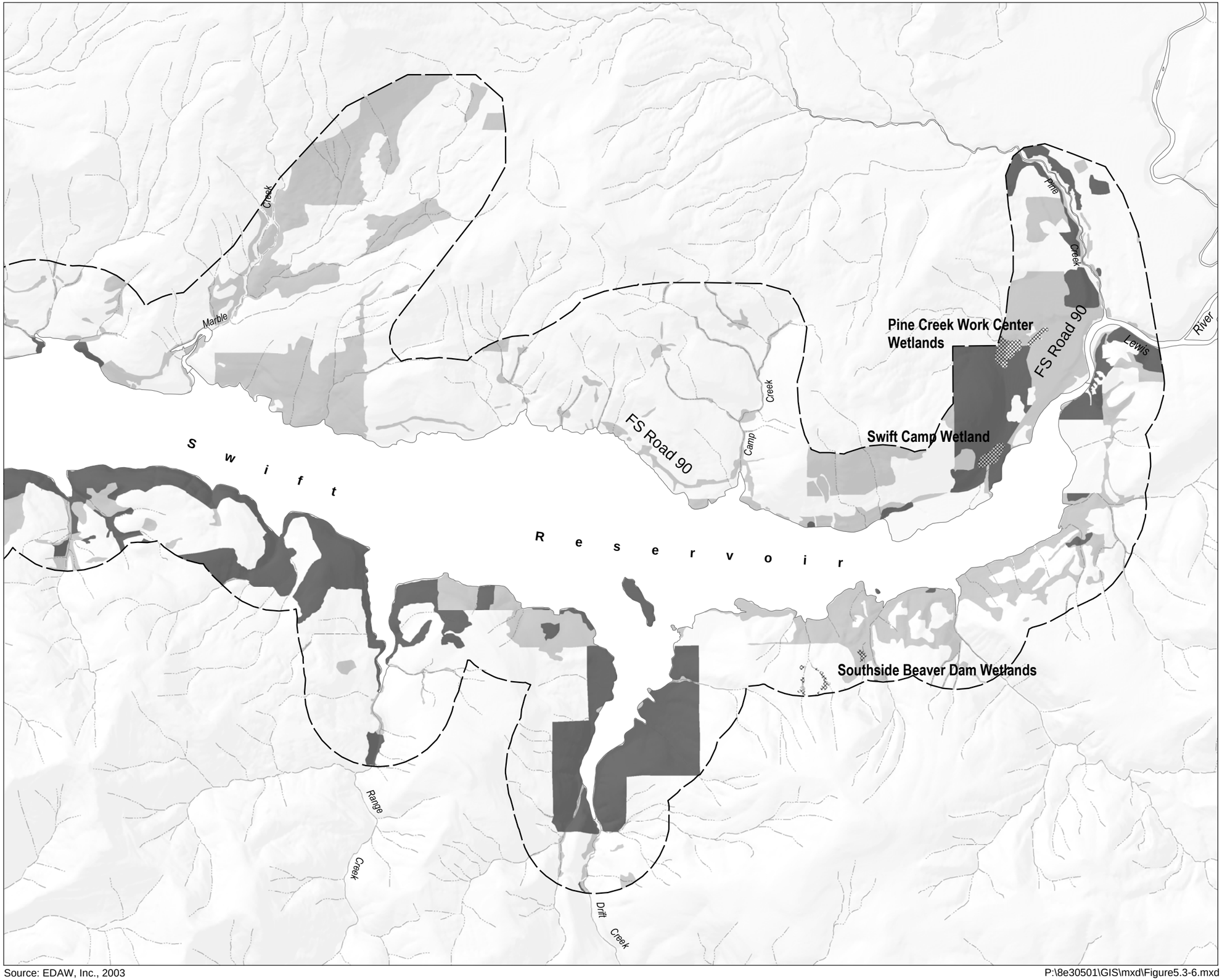
Lewis River Hydroelectric Projects

FIGURE 5.3-6 (3 of 4)

Northern Flying Squirrel, Beaver & Marten/Fisher Potential Habitat & Study Area Distribution

Source: EDAW, Inc., 2003

P:\8e30501\GIS\mxd\Figure5.3-6.mxd



Legend

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- Unimproved Road
- Trail
- Railroad
- Powerline
- Study Area

0 0.5 1 Miles

1:40,000

Lewis River Hydroelectric Projects

FIGURE 5.3-6 (4 of 4)

Northern Flying Squirrel, Beaver & Marten/Fisher Potential Habitat & Study Area Distribution

Source: EDAW, Inc., 2003

P:\8e30501\GIS\mxd\Figure5.3-6.mxd

occur in a wide range of habitats. No site-specific habitat features or unique habitat elements critical to the continued viability of northern flying squirrel populations were identified in the project vicinity from existing information or records available from local, state, and federal resource agencies. Flying squirrel populations are likely to be negatively impacted and suffer declines to the extent that land use practices and management result in the loss, degradation, and fragmentation of contiguous stands of late-successional forested habitat located in the project vicinity.

Beaver

Beaver or beaver dams/lodges were repeatedly observed during field studies between 1996 and 2001 and appear to be concentrated in 11 primary locations within the study area (Figure 5.3-6), including the following:

- Swift Reservoir (4 dams/lodges observed): the Southside Beaver Dam wetlands, Swift Camp wetland, Road 50 wetlands, and Pine Creek Work Center wetland.

- Swift No. 2 vicinity (3): the Swift bypass reach, Swift Canal wetlands, and Swift wetlands (just downstream of Swift Dam).

- Yale Lake (4): Beaver Bay wetland complex, Saddle Dam Farm wetlands (includes Cedar Grove, Chestnut, Bankers, Road, and Crossroad ponds), International Paper (IP) Road wetlands, and Frazier Creek wetland.

- Speelyai Creek between the upper diversion and Lake Merwin.

However, beaver can be found within most any type of habitat associated with relatively stable, year-round water. The species prefers water bodies with an approximate depth of 2-3 feet (0.61-0.91m), or where such depth can be created with the construction of a dam (Csuti et al. 1997).

Because the species holds no official state or federal protective status, little information is available on the abundance, local range, or distribution of beaver in the Lewis River valley. However, beavers seem fairly common in study area wetlands and streams with shallow, slow-moving water. Many areas identified as supporting high densities of beaver during field studies are located in wetlands or shallow water bodies that either developed incidentally to project construction or were created as part of wildlife habitat enhancement programs. These areas represent unique, site-specific habitat elements integral to the continued viability of beaver populations existing in the project vicinity.

Marten/Fisher

Although the American marten and fisher are both forest carnivores in the Mustelidae family, they have very different ecological niches, ranges, and distributions within Washington State. Martens are generally a higher elevation species that preys on voles, mice, and other small mammals (USFS 1994). Fishers prey on porcupines and other larger mammals and are considered extremely rare to nearly extirpated from Washington

(Aubrey and Houston 1992). However, the 2 species share a similar habitat preference for late-successional coniferous forest with a dense, closed-canopy overstory.

Figure 5.3-6 indicates potential marten/fisher habitat in the primary study area based on the extent and distribution of mature to old-growth conifer habitat. Neither species was detected during 1996-1997 or 2000-2001 field studies, and no historical records for martens or fishers exist for the project vicinity. Regardless of the existence of potential habitat, a variety of factors including extensive forest fragmentation, large-scale degradation of suitable habitat, statewide population declines (or extirpation) and historically low densities make the probability of occurrence for these 2 species within the primary study area extremely low.

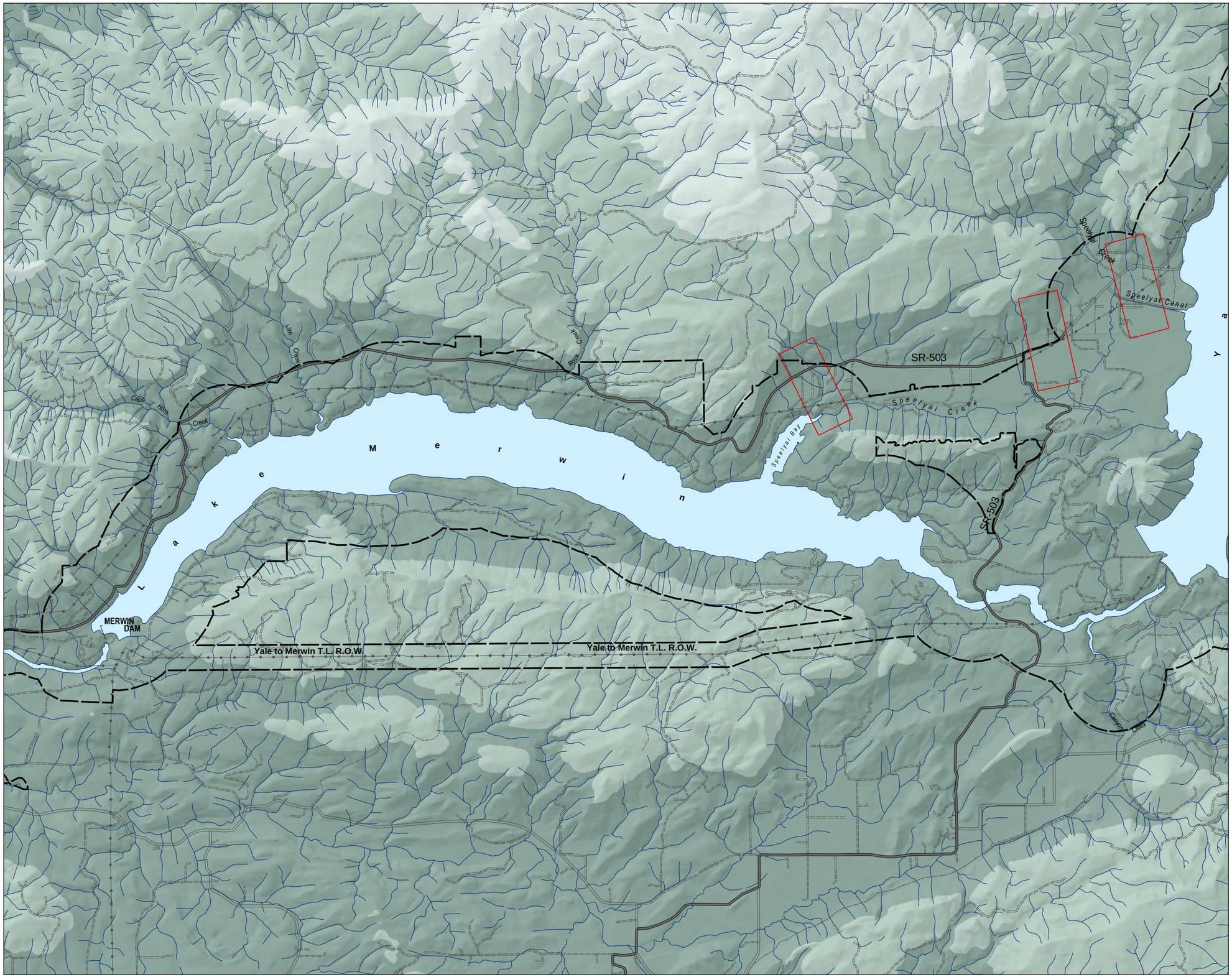
Elk

The WDFW PHS database documents known elk winter and summer grounds in the Lewis River project vicinity. In addition, an analysis of elk range and critical habitat in the Lewis River drainage is provided in WDFW (1995b). Data from these two sources and from the *Integrated Landscape Management for Fish and Wildlife* (WDFW 1998) were compiled to show elk winter habitat, summer habitat, and migration corridors in the project vicinity (Figure 5.3-7); locations of all elk observations during 2000-2001 field studies were also mapped.

In general, Roosevelt and Rocky Mountain elk are considered to be nonmigratory in the lower foothill regions of the cascade Mountains (WDFW 1998). Elk exhibit local seasonal movements from higher elevation summer grounds to lower elevations where they winter on lower slopes and adjacent valley floors. On USFS lands within and adjacent to the primary study area, elk winter range is generally defined as those areas below 2,200 feet (667 m) elevation. A 1995 WDFW elk study concluded that in the vicinity of the primary study area, elk winter range could be further refined to include only lands below 1,000 feet (330 m) elevation. PacifiCorp owns approximately 8.5 sq miles (22.0 km^2) of this primary elk wintering range (<1,000 feet [330 m]) around the Merwin and Yale reservoirs.

Roosevelt elk have likely always occurred in the area around the Lewis-Kalama River watershed, but the Rocky Mountain elk found in the region were thought to originate from a release of 80 elk in 1912 near Enumclaw, Washington (Parsons 1967). Population information from the early part of the 20th century is limited, but anecdotal reports indicate that the number of elk in the Lewis-Kalama River watershed has increased in response to the conversion of homogenous areas of old-growth forest to suitable foraging areas amidst fragmented patches of timber. In 1994, WDFW estimated the size of the elk herd using the 8 Game Management Units (GMU) comprising the Lewis-Kalama River watershed at approximately 14,000 animals (WDFW 1995b). Clearcuts from timber harvest activities in the region have likely increased suitable foraging habitat for elk.

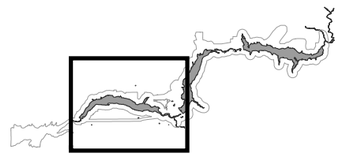
Key habitats for elk in the project vicinity include low elevation wintering areas and migration corridors typically used by elk to access their winter grounds (Figure 5.3-7). Data from marked elk and annual herd composition surveys indicate that most of the Lewis-Kalama watershed elk herd winter on the North Fork of the Lewis River along the



Legend

- Elk Migration/Movement Corridor[1]
- Critical Low-Elevation Elk Winter Habitat[2]
- USFS-Defined Elk Winter Habitat[3]
- Elk Summer Habitat[4]
- Stream
- Secondary Road
- Light Duty Road
- Unimproved Road
- Trail
- Railroad
- Powerline
- Study Area Boundary

[1] Identified by PacifiCorp and WDFW
[2] Defined as areas below 1000 ft (330 m) (WDFW 1995)
[3] Defined as areas below 2200 ft (667 m)
[4] Defined as areas above 2200 ft (667 m)



N

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Lewis River Hydroelectric Projects

FIGURE 5.3-7 (1 of 2)
Elk Habitat and Migration Corridors

Source: EDAW, Inc., 2003

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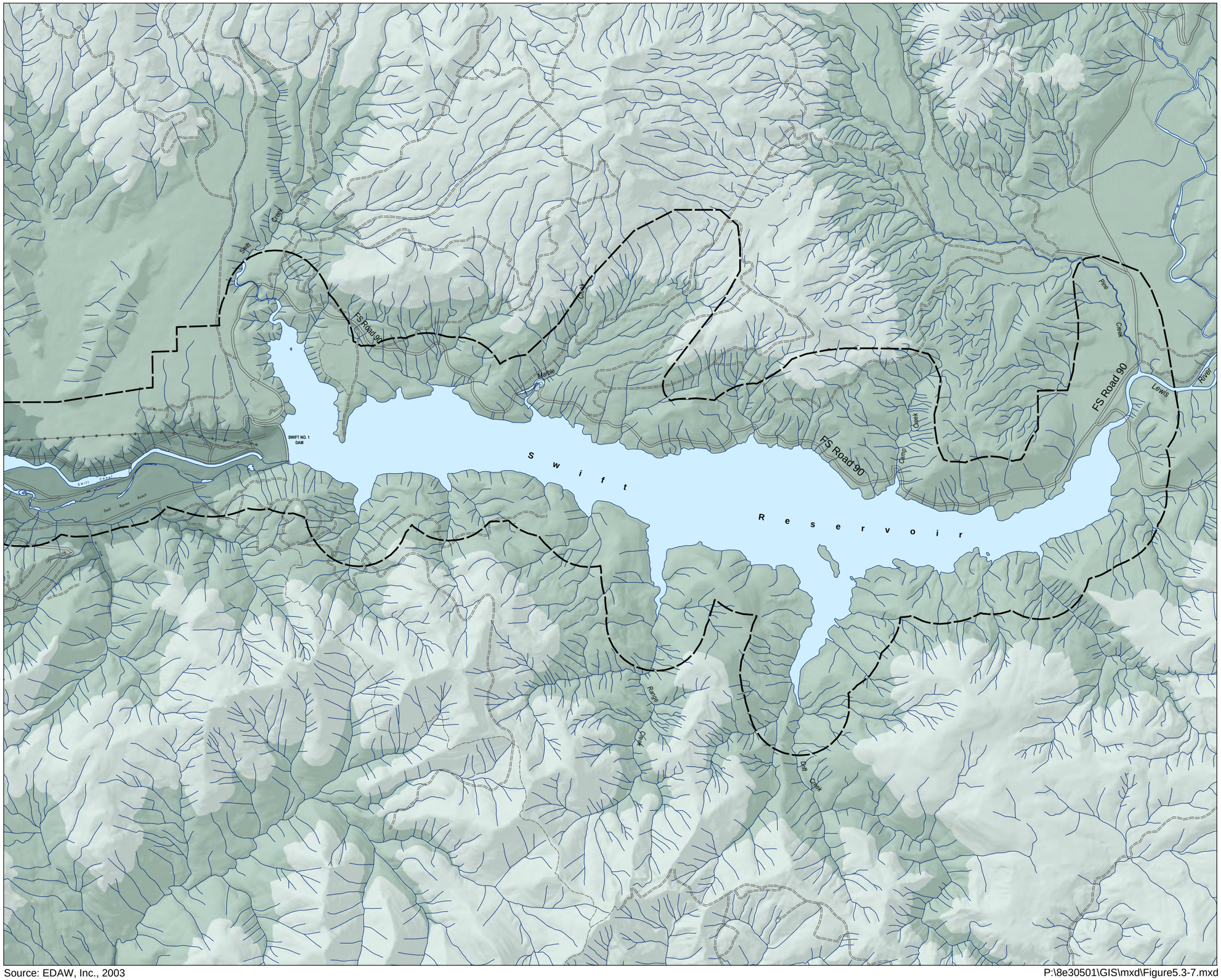

Legend

- Elk Migration/Movement Corridor[1]
- Critical Low-Elevation Elk Winter Habitat[2]
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[4] Defined as areas above 2200 ft (667 m)

0 0.5 1 Miles

1:60,000

Lewis River Hydroelectric Projects

FIGURE 5.3-7 (2 of 2)
Elk Habitat and Migration Corridors

Source: EDAW, Inc., 2003

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project reservoirs. Areas below 1,000 feet (305 m) elevation located around Merwin and Yale reservoirs has been identified as wintering habitat "of most concern … because of the likelihood of increased human development in the near future" (WDFW 1998). These lower elevation areas represents unique habitat for elk using study area lands. Preservation of the elk movement corridors shown in Figure 5.3-7 will also likely be critical to the continued viability of the elk population occurring in the project vicinity.

American Peregrine Falcon

The WDFW PHS database has no records of occurrence for the American peregrine falcon in the project vicinity. In addition, no peregrine falcons were detected during helicopter bald eagle surveys, during other field studies conducted in 2000-2001, or during Yale Project studies in 1996-1998. However, biologists inventorying wetlands in 1994 reported seeing a peregrine falcon flying over the Swift bypass reach. This species can be fairly wide ranging, particularly in winter, with foraging ranges of over 100 sq miles (259 km^2) (Csuti et al. 1997). All wetlands and water bodies in the primary study area represent suitable foraging habitat for the species, and occasional observations of peregrines in the project vicinity are likely.

The most critical habitat component for the regular occurrence of peregrine falcons is the presence of suitable nest sites, usually cliffs or rock ledges overlooking open areas with an ample food supply (Csuti et al. 1997). No peregrine eyries are known to exist in the study area, and none were detected during aerial helicopter surveys. However, Eagle Cliff located at the northeast end of Swift Reservoir may be suitable for establishment of an eyrie, and is the only potential peregrine falcon nesting habitat identified in the study area. The breeding population of peregrine falcons is expanding in the Pacific Northwest, and it is possible that a new territory could be established around Eagle Cliff or elsewhere in the Lewis River valley with suitable habitat. Until an active peregrine nest is established at Eagle Cliff or another suitable location in the larger project vicinity, peregrine falcons are likely to be restricted to a rare occurrence status in the study area.

Cooper's Hawk

Because the Cooper's hawk is not monitored by WDFW or other state or federal agencies, there is relatively little information available on this species. In Washington, the Cooper's hawk is considered uncommon in low and middle elevation conifer forests, preferring hardwood stands when available (Smith et al. 1997). It can be also be found in younger mixed coniferous forest, riparian forest stands, and forested wetlands. This species appears to have adapted to habitat fragmentation associated with increased human development. It is known to inhabit relatively urbanized areas, where it benefits from the large prey populations of city birds (Ferguson et al. 2001).

Within the study area, Cooper's hawks are most likely to occur in the upland deciduous forests and mixed conifer-deciduous forests with large hardwoods, such as big-leaf maple. These habitats are common, especially along Lake Merwin and Yale Lake. Cooper's hawks were observed once during relicensing field studies—along Speelyai Creek in September 2000. Cooper's hawk density is often relatively low, even in suitable habitat, with at least 2 miles (3.2 km) between nest site locations (Csuti et al. 1997). This

low density may, in part, explain the lack of documented observations of this relatively common forest species in the project vicinity.

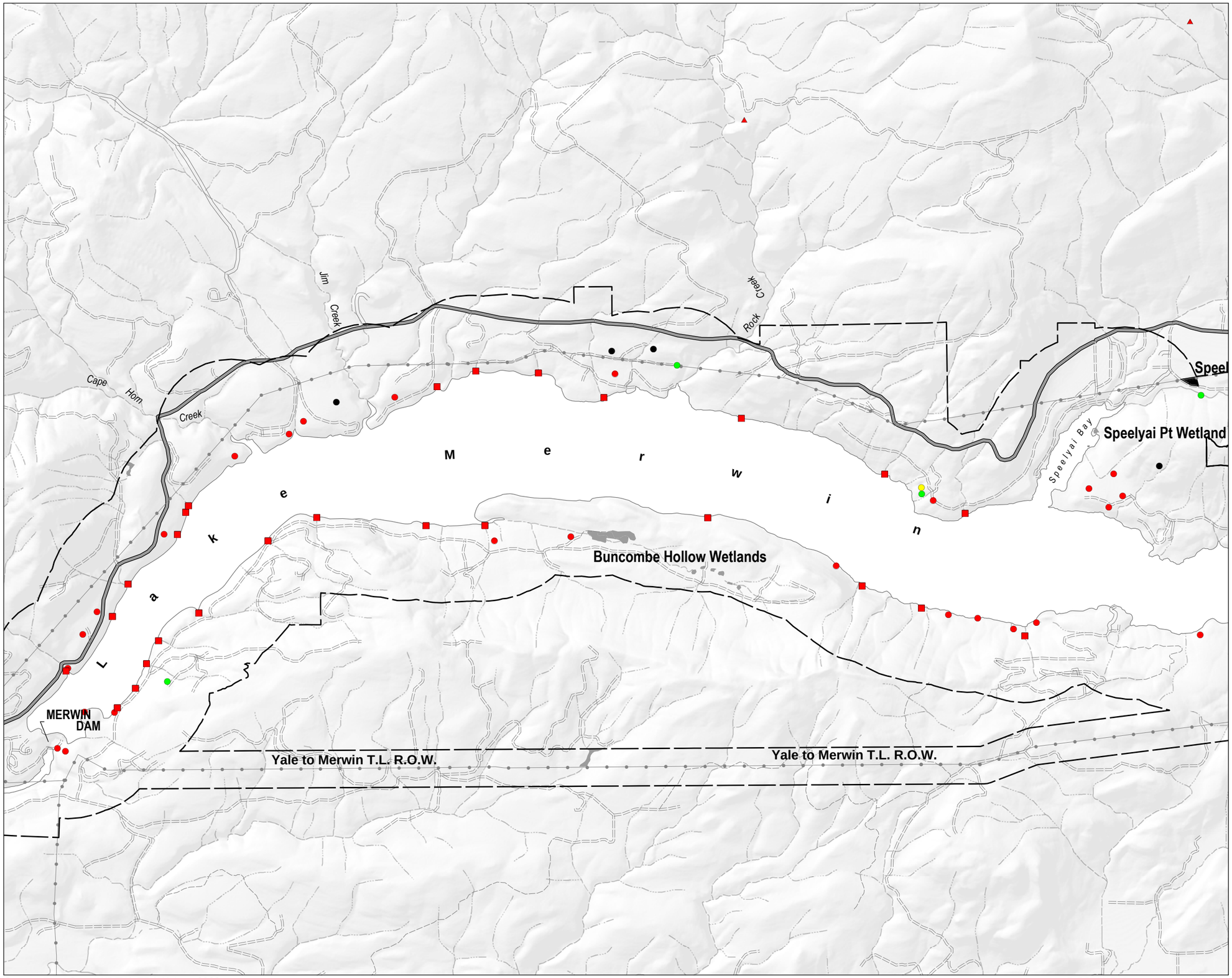
As a relative habitat generalist among the analysis species, no unique site-specific habitat features were found to be associated with the Cooper's hawk in the project vicinity. Populations are likely to be notably impacted only by significant alterations in land use patterns and increases in human development in lands peripheral to the study area.

Northern Spotted Owl

The WDFW PHS database documents breeding spotted owl pairs in the vicinity of Yale, Merwin, and Swift reservoirs. Figure 5.3-8 shows the location of WDFW PHS spotted owl site centers in the project vicinity. More than 20 breeding pairs of spotted owls are documented in the general project vicinity, with approximately 15 of these breeding pairs having territories contiguous with the primary study area. There are at least 7 known spotted owl breeding territories that at least partially overlap the study area: 1 along Swift Reservoir between Range and Drift creeks; 2 along the south side of the Swift bypass reach; 3 along the east shore of Yale Lake; and 1 north of Lake Merwin (Figure 5.3-8). The highest density of spotted owl breeding territories in the project vicinity is found in the area between Speelyai and Drift creeks, south of Swift Reservoir and east of Yale Lake. The density of breeding territories in this area is sufficient to create a large coterminous region of documented spotted owl habitat that includes portions of the primary study area as well as lands to the south. High densities of spotted owl breeding territories in this area may be attributed to relatively minimal development impacts and more late-successional coniferous forest. Aside from the extent of available habitat, no singular site-specific habitat element defines this broad area.

Given the known density of spotted owl breeding territories in the project vicinity, the species may occur incidentally in a variety of habitat types in the study area. However, spotted owls are typically associated with old-growth, late-successional Douglas-fir, or other conifer-dominated forests (Csuti et al. 1997), and the probability of occurrence for this species is highest in these habitat types in the study area. The most extensive stands of old-growth and late-successional conifer forest exist along the south shore of Swift Reservoir, especially in the vicinity of Drift Creek (see TER 1).

Continued loss, degradation, and — perhaps most importantly — fragmentation of late-successional forest stands located in the project vicinity will likely result in spotted owl population declines. However, spotted owl populations and breeding pairs are extensively monitored by WDFW, USFS, and other local, state, and federal resource agencies. PacifiCorp will continue to work with the resource agencies to develop strategic management practices on utility-owned lands beneficial to maintaining existing populations of the northern spotted owl.

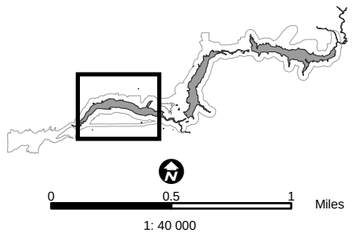


RTE Wildlife Observations [1,2]
- Bald Eagle +
- Bald Eagle Nest
- Osprey +
- Osprey Nest
- Common Loon +
- Great Blue Heron +
- Northern Spotted Owl +
- Olive-Sided Flycatcher
- Pileated Woodpecker +
- Vaux's Swift +
- Cascade Torrent Salamander +
- Cope's Giant Salamander
- Larch Mountain Salamander +
- Van Dyke's Salamander +
- Northern Red-Legged Frog
- Tailed Frog
- Pacific Western Big-Eared Bat
- Cascade Frog +

Priority Species Observations [1,3]
- Band-Tailed Pigeon
- Blue Grouse
- Bufflehead
- Hooded Merganser
- Wood Duck
- Mink
- Turkey
- Western Toad

- Northern Red-Legged Frog Egg Mass
- Wetland
- Perennial Stream
- Intermittent Stream
- Ephemeral Stream
- Secondary Road
- Light Duty Road
- Unimproved Road
- Trail
- Railroad
- Powerline
- Study Area

[1] Includes data from the WDFW PHS as well as 1996-2001 field observations
[2] Most TES species are also WDFW species, indicated by +
[3] WDFW priority species that are not also TES; observations of deer and elk were not mapped



Lewis River Hydroelectric Projects

FIGURE 5.3-8 (1 of 4)
RTE and Priority Species
Field Observations 1996-2001

Source: PacifiCorp, WDFW, EDAW, Inc., 2003

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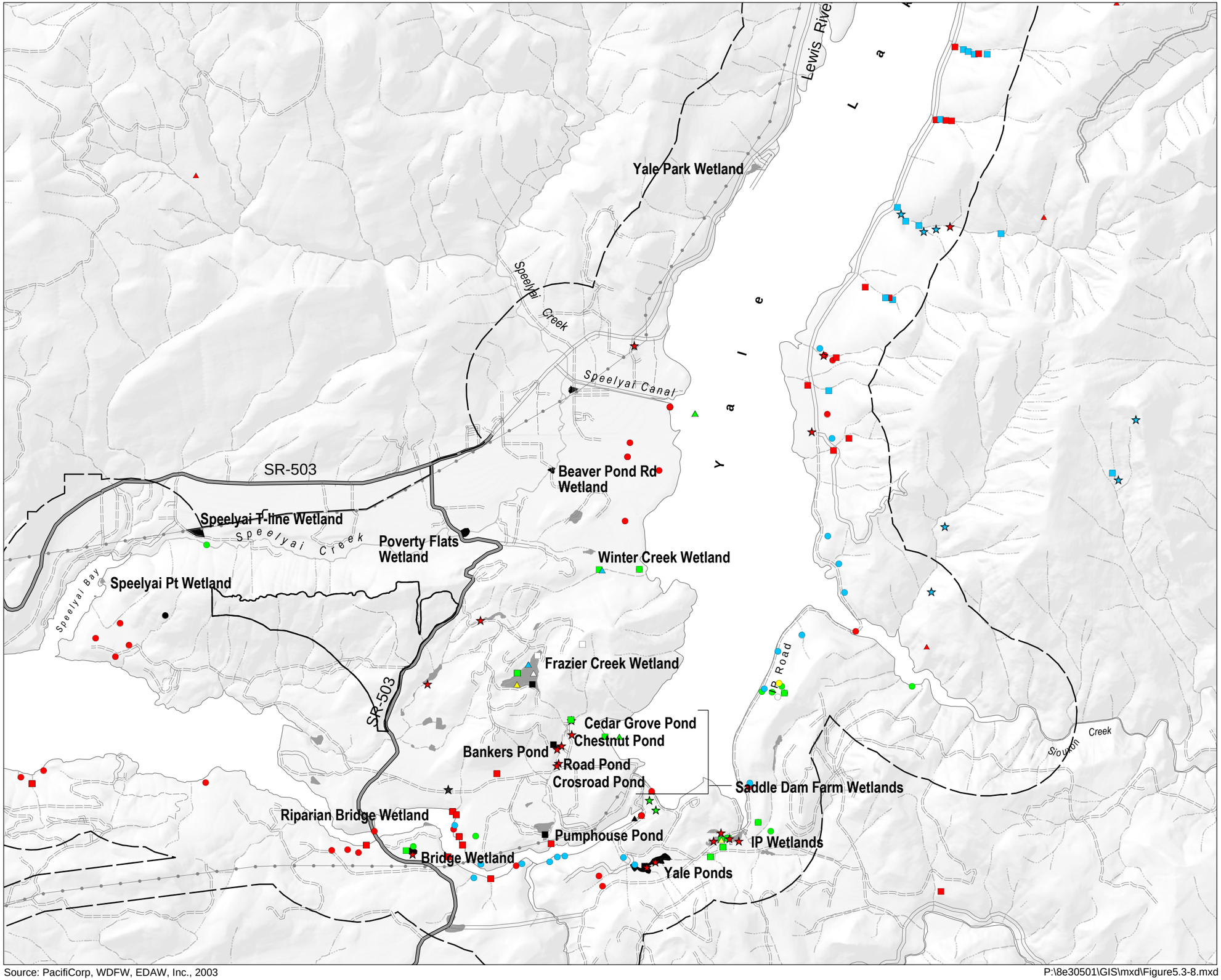

RTE Wildlife Observations [1,2]
- Bald Eagle +
- Bald Eagle Nest
- Osprey +
- Osprey Nest
- Common Loon +
- Great Blue Heron +
- Northern Spotted Owl +
- Olive-Sided Flycatcher
- Pileated Woodpecker +
- Vaux's Swift +
- Cascade Torrent Salamander +
- Cope's Giant Salamander
- Larch Mountain Salamander +
- Van Dyke's Salamander +
- Northern Red-Legged Frog
- Tailed Frog
- Pacific Western Big-Eared Bat
- Cascade Frog +

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0 0.5 1 Miles

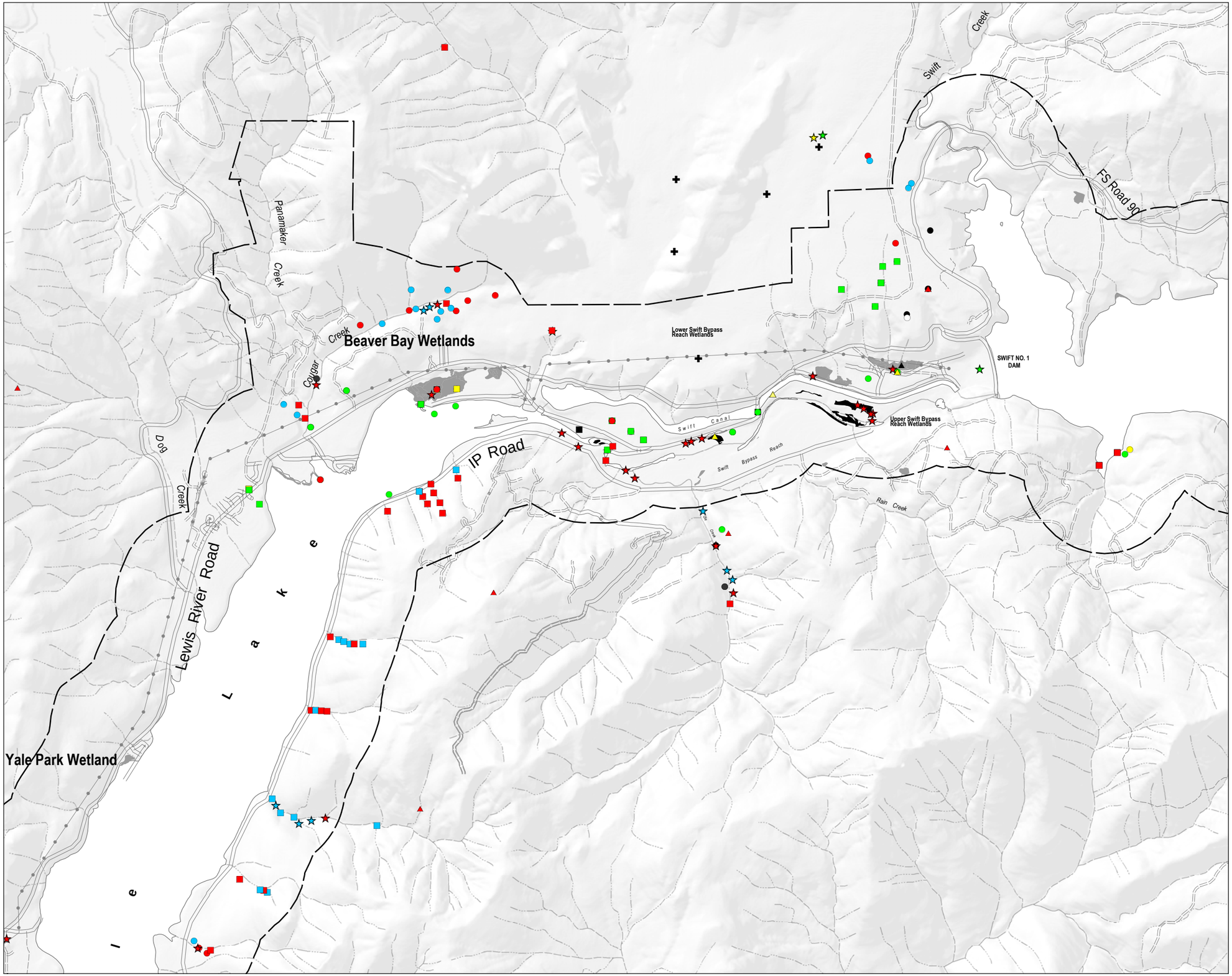
1: 40 000

Lewis River Hydroelectric Projects

FIGURE 5.3-8 (2 of 4)
RTE and Priority Species
Field Observations 1996-2001

Source: PacifiCorp, WDFW, EDAW, Inc., 2003

P:\8e30501\GIS\mxd\Figure5.3-8.mxd



Source: PacifiCorp, WDFW, EDAW, Inc., 2003

P:\8e30501\GIS\mxd\Figure5.3-8.mxd

RTE Wildlife Observations [1,2]

- Bald Eagle +
- Bald Eagle Nest
- Osprey +
- Osprey Nest
- Common Loon +
- Great Blue Heron +
- Northern Spotted Owl +
- Olive-Sided Flycatcher
- Pileated Woodpecker +
- Vaux's Swift +
- Cascade Torrent Salamander +
- Cope's Giant Salamander
- Larch Mountain Salamander +
- Van Dyke's Salamander +
- Northern Red-Legged Frog
- Tailed Frog
- Pacific Western Big-Eared Bat
- Cascade Frog +

Priority Species Observations [1,3]

- Band-Tailed Pigeon
- Blue Grouse
- Bufflehead
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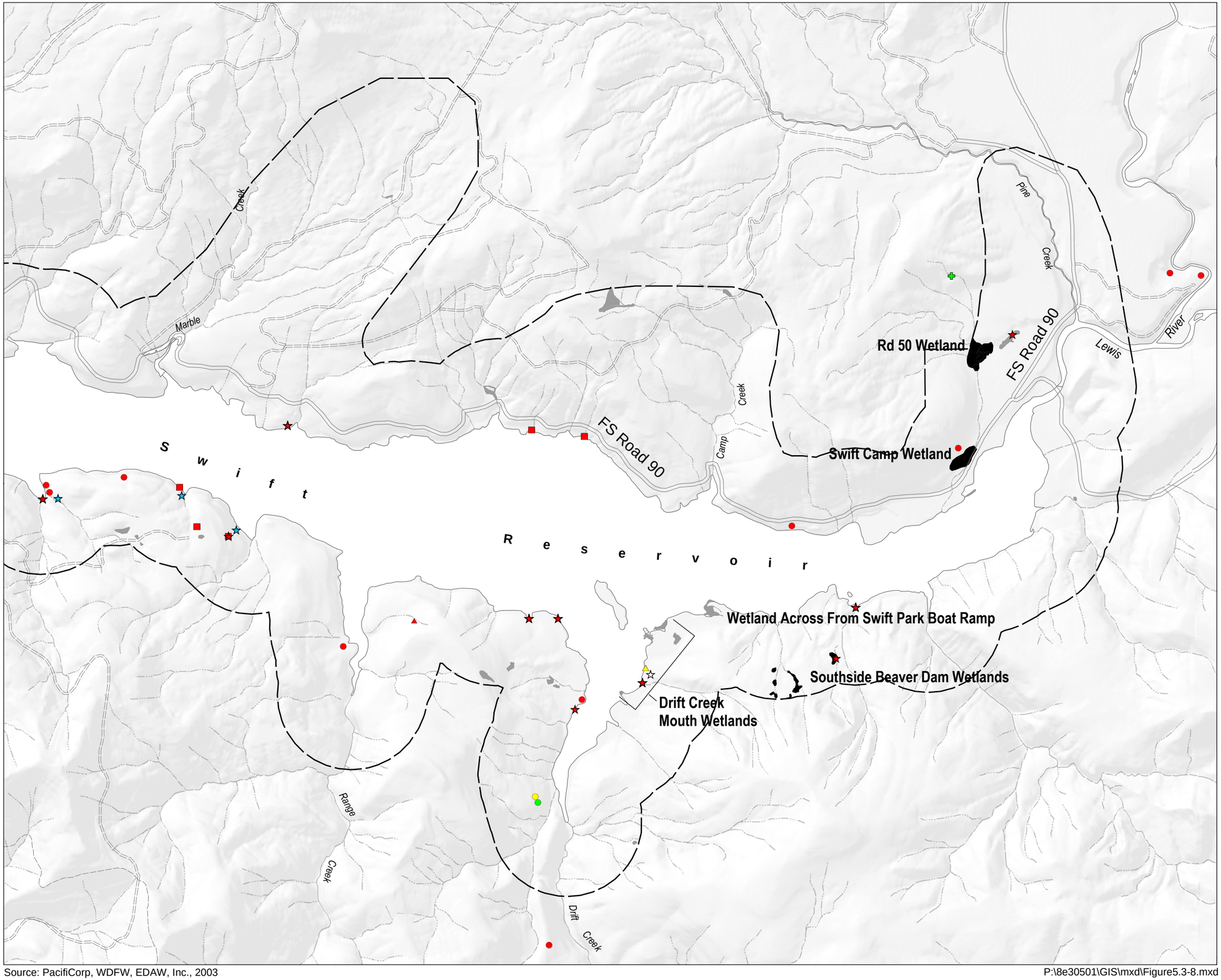
0 0.5 1 Miles

1: 40 000

Lewis River Hydroelectric Projects

FIGURE 5.3-8 (3 of 4)
RTE and Priority Species
Field Observations 1996-2001



RTE Wildlife Observations [1,2]
- Bald Eagle +
- Bald Eagle Nest
- Osprey +
- Osprey Nest
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- Olive-Sided Flycatcher
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- Larch Mountain Salamander +
- Van Dyke's Salamander +
- Northern Red-Legged Frog
- Tailed Frog
- Pacific Western Big-Eared Bat
- Cascade Frog +

Priority Species Observations [1,3]
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0 0.5 1 Miles

1: 40 000

Lewis River Hydroelectric Projects

FIGURE 5.3-8 (4 of 4)
RTE and Priority Species
Field Observations 1996-2001

Source: PacifiCorp, WDFW, EDAW, Inc., 2003

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Wood Duck

Wood ducks are known to occur in suitable habitat in the primary study area, primarily in isolated wetlands and secluded open water located near woodlands. Wood duck observations were recorded during both 2000-2001 field studies at Merwin and Swift (Figure 5.3-8) and 1996-1998 field studies associated with Yale relicensing (PacifiCorp 1999). Areas of wood duck abundance with confirmed breeding include Saddle Dam Farm, Frazier Creek, Yale Pond, and Beaver Bay wetlands. The wetlands along Speelyai Creek and those near the east end of Swift Reservoir also appear to be particularly suitable habitat, although wood ducks have not been observed in these locations.

In 1987, PacifiCorp identified areas of wood duck abundance and likely breeding in wetlands associated with Saddle Dam Farm and at Yale Pond. PacifiCorp installed and monitored a total of 14 boxes designed for wood duck nesting at these locations. Wood ducks were confirmed to nest in these boxes during the monitoring period from 1989-1993. Wood ducks nested in 2 to 5 boxes each year, with an overall success rate of 56 percent in 18 attempts (WDFW 1995a).

WDFW monitors the location of areas known to support breeding populations of cavity-nesting ducks. The wood duck is a cavity-nesting species that nests in natural cavities up to 65 feet (19.8 m) above the ground located in deciduous or coniferous trees near water bodies and in marshes (Csuti et al. 1997). The WDFW PHS database indicates an area with a high density of breeding cavity-nesting duck species in the Beaver Bay wetland at the north (upstream) end of Yale Lake. The WDFW PHS database does not indicate which duck species may be nesting in these identified high density breeding areas, and other potential cavity-nesting duck species (i.e., common [*Mergus merganser*] and hooded mergansers [*Lophodytes cucullatus*]) could potentially use this site. However, given the abundance of wood ducks observed in the study area, it is likely that this area is used for breeding predominantly by at least a few pairs.

The isolated wetlands and secluded water bodies located near woodlands, particularly those areas identified by WDFW and other resource management agencies and PacifiCorp, represent unique habitats for the wood duck. With increasing development, these areas may represent some of the best remaining breeding habitat for this species in the project vicinity. PacifiCorp has successfully managed some of the known wood duck nesting areas to increase the potential for successful breeding by this species. Continued management of these areas and other suitable breeding habitat for the species may ensure the continued viability of existing wood duck populations using the study area.

Heron Rookeries

The WDFW PHS database shows no records of heron rookeries within the primary study area. In addition, no evidence of rookeries was noted in the project vicinity during 2000-2001 field surveys or the 1996-1998 field studies associated with Yale relicensing. However, observations of wading bird species were recorded during both study periods (Figure 5.3-8). The great blue heron and cattle egret (*Bubulcus ibis*) were both recorded during 2000-2001 field studies. Great blue heron observations recorded during Yale studies are provided in PacifiCorp (1999).

Potential heron rookery habitat, or habitat capable of supporting an aggregation of nesting colonial wading birds, is practically defined as wetland or riparian areas with an overstory canopy and structure suitable for providing cover and physically supporting a number of large nests (although the species may occasionally nest on rocky ledges or in dense emergent vegetation) (Csuti 1997). Suitable potential heron rookery habitat exists within the study area in several locations including: (1) along Speelyai Creek; (2) throughout the Swift No. 2 bypass reach; (3) along the lower river in the vicinity of Eagle Island; and (4) in and around the Beaver Bay wetland. Colonial wading birds could potentially use these areas for nesting as well as any of the larger wetland areas with a dense adjacent forest structure. There may also be some suitable nesting habitat along reservoir shorelines, particularly Lake Merwin and Yale Lake.

Colonial wading birds known to breed in the project vicinity–primarily the great blue heron– are currently thought to nest in isolated pairs. It is unknown if the abundance and density of this species in the study area are sufficient to support a colonial nesting aggregation. Still, if a heron nesting colony were established, it would most likely be in a wetland or riparian area.

Band-tailed Pigeon (Mineral Sites)

Band-tailed pigeons were observed frequently during field studies in 1999-2001, particularly in the vicinity of Lake Merwin. There appears to be a roost site for this species in a grove of bitter cherry (*Prunus emarginata*) along the north side of Lake Merwin in the vicinity of Woodland Park (Figure 5.3-8). The nearest known mineral source for this species is in the Canyon Creek drainage, which is south of Lake Merwin (pers. comm., L. Ackers, WDFW Biologist, 2002).

Band-tailed pigeons inhabit coniferous forests throughout the Pacific Northwest and typically nest in conifers in mature, closed-canopy stands (Leonard 1998). Aside from the importance of an ample food supply, the distribution of band-tailed pigeons is thought to be predicated upon the existence of natural or artificial mineral sites (Sanders 1999). It is hypothesized that ingesting mineral-laden substrate and/or mineral water provides band-tailed pigeons with necessary sodium, or potentially calcium, which they do not receive from a diet dominated by fruit and berries (Sanders and Jarvis 2000). Mineral sites are especially needed during the breeding season for egg and crop milk production (Sanders and Jarvis 2000). In some areas, such as the desert southwest where band-tailed pigeons are thought to incidentally ingest quantities of mineral grit, the availability of localized mineral soil sites is thought to decrease in importance (Braun 1994). However, in the Pacific Northwest, band-tailed pigeons often amass at mineral sites to glean nutrients not supplied by regional food sources. In the project vicinity, it is assumed that either: (1) local populations are sustained by dietary minerals or ambient mineral supplies; (2) populations of this highly mobile species rely upon the known mineral site in the Canyon Creek drainage; or (3) local undetected mineral sites are utilized by band-tailed pigeons in the project vicinity.

5.3.5.4 Wildlife Observation Database

The purpose of the wildlife observation database is to document the species that occur in the various study area habitats. The wildlife observations database was created by recording wildlife sightings that occurred while conducting any field work within the study area. The species, number of individuals observed, sex, behavior, and habitat were recorded on field forms or in a notebook and subsequently entered into a combined database.

The wildlife observation database for the Swift and Merwin projects was initiated when the terrestrial resource field studies began in 1999 and continued through 2001. The species in this database were combined with those in a similar database created for the Yale Project from 1996-1998. The result is a species-habitat association matrix for the Lewis River Projects (TER 3 Appendix 1). However, because seasonal bird surveys were conducted at the Yale Project, but not the other Lewis River Projects, there is more species habitat data for the Yale Project. Observations of avian species at the Swift and Merwin projects were incidental to other fieldwork and not comprehensive. Consequently, the combined database is appropriate for identifying species habitat associations for the Lewis River Projects as a whole or for the lower Lewis River basin, but not specifically by project area.

In total, 146 wildlife species—13 mammal, 113 bird, 4 reptile, and 16 amphibian—have been documented in the study area (TER 3 Appendix 1). Two new species of note that were observed in 2001 include the Cascades frog (*Rana cascadae*) and the western toad (*Bufo boreas*). The Cascades frog was recorded in a wetland north of Swift Reservoir, and the western toad was found in a wetland/riparian area just east of the entrance to the Drift Creek inlet.

5.3.5.5 TES Species Observation Map

In total, 16 wildlife species with TES status and another 8 WDFW priority species that are not TES were observed in the primary study area for the Lewis River Projects. TES and priority species observed in the study area during 2000-2001 field studies were combined with observations from the Yale Project relicensing surveys (1996-1998), and used to produce a comprehensive map showing the habitats and locations used by these species (Figure 5.3-8).

5.3.6 Summary and Discussion

This section provides a general discussion of commonalities among analysis species and an identification of the unique habitats and habitat elements in the project vicinity. Results of the analysis species assessment reveal trends in habitat use patterns among and between some of the species. In general, forested and wetland habitats were found to be most important to the maintenance and continued viability of analysis species populations in the study area. Most of the analysis species addressed by this study rely to some degree upon the existence of one or both of these general habitat types. Fourteen of the 16 analysis species included in this study use one or both of these habitat types directly. Two other species – the Cascade torrent salamander and the Larch Mountain salamander–

depend upon forests and wetlands indirectly or as secondary habitat. Several species–the wood duck, beaver, bald eagle, and great blue heron–require contiguous areas of forest with wetlands or open water.

Several specific areas or habitats in the project vicinity possess unique, site-specific elements important to one or more analysis species. These areas are identified and described below, with a discussion of how maintenance, protection, and/or enhancement of these unique habitat elements may affect the abundance, status and distribution of associated analysis species. Identification of these unique habitats and site-specific habitat elements directly addresses several of the key watershed questions (Section 5.3.4).

- Late-Successional Conifer-Dominated Forest. Late-successional conifer-dominated forest was found to be important to a large majority of the analysis species included in this study. Four analysis species–the northern flying squirrel, marten/fisher, Cooper's hawk, and northern spotted owl–utilize late-successional conifer forest as primary habitat. Other analysis species – including the Cascade torrent salamander, northern red-legged frog, Larch Mountain salamander, bald eagle, papillose tail-dropper, elk, and wood duck – use late-successional forested stands as secondary habitat for foraging, perching, cover refugia, and nesting. The habitat element important to many of these species is the size of the available forest stands or, conversely, the degree of fragmentation in late-successional forest. In particular, the northern spotted owl and marten/fisher are highly sensitive to forest fragmentation, and their occurrence in the project vicinity is dependent upon the existence of large contiguous late-successional forest stands. Late-successional conifer-dominated forest is most prevalent within the study area along the south shore of Swift Reservoir (see Figure 5.3-6 and TER 1).

- Wetlands. Study area wetlands represent habitat for 4 analysis species. Northern red-legged frogs, beaver, wood ducks, and colonial wading birds all use wetlands as primary habitat. In addition, the Pacific Townsend's big-eared bat, northern flying squirrel, and peregrine falcon use wetlands as secondary foraging habitat. The existence of wetlands also may affect all analysis species by playing a pivotal role in the maintenance of regional water quality. The wetland habitats found to be most important to associated analysis species include: Yale Pond, the IP wetlands, Saddle Dam Farm wetlands, Frazier Creek wetland, and Beaver Bay wetlands associated with Yale Lake, the Swift bypass reach, the Drift Creek mouth wetlands at Swift Reservoir, and the Speelyai Creek wetlands.

- Riparian Habitat. The number and quality of streams and riparian habitat directly affect the abundance and distribution of analysis species in the study area. Analysis species dependent upon streams for primary habitat include the Cascade torrent salamander and beaver. Riparian habitat is important as secondary habitat for the northern red-legged frog, northern flying squirrel, Cooper's hawk, wood duck, and colonial wading birds. Maintaining healthy riparian cover protects streams and regional water quality for analysis species, as well as other wildlife and fish.

- Yale Dam/Talus Slopes. Yale Dam and isolated talus slope habitat in the study area represent unique habitat features. The Larch Mountain salamander uses the Yale Dam face and isolated areas of talus–including talus habitat in and around Moss Cave–as primary habitat. Protection of these areas and localized talus seeps is important to maintaining the continued viability of Larch Mountain salamander populations in the project vicinity.

- Moss Cave. Moss Cave represents a unique study area habitat feature for two analysis species: the Pacific Townsend's big-eared bat and the Larch Mountain salamander. Big-eared bats were found to use the cave as a night roost and maternity site, while the Larch Mountain salamander is known to occur in the talus debris found inside and around the entrance to the cave. Protection of this important habitat element has been threatened by human disturbance and recurring vandalism. Continued management by PacifiCorp and TNC to ensure preservation of this site will be integral to maintaining the abundance and distribution of big-eared bats and Larch Mountain salamanders in the primary study area.

- Low-elevation Elk Winter Habitat. A review of existing information on elk distribution, status, and abundance in the project vicinity concluded that the protection of low-elevation elk winter habitat is important to the sustainability of the Lewis-Kalama river watershed elk herd. Low-elevation elk winter habitat is defined as those areas around Yale and Merwin reservoirs below 1,000 ft (305 m) elevation (Figure 5.3-7). Most of the 14,000 elk comprising the Lewis-Kalama watershed herd winter in these areas. These lower elevation areas have been identified as being susceptible to being impacted by human development. Land management practices designed to protect the wintering habitat, as well as the migration corridors accessing these areas, will help preserve habitat important to elk.

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TER 3 Appendix 1

Species / Habitat Associations

TER 3 Appendix 1. Species/habitat associations for the Lewis River Hydroelectric Projects[1]

Species[3]	Habitat Types[2]															
	LPP	**M**	**MD/AG**	**MS**	**MX**	**OG**	**OR**	**P**	**RI**	**RE**	**SH**	**SS**	**UD**	**WL**	**DST**	**ROCK**
AMPHIBIANS (16)																
western red-backed salamander					X	X			X						X	X
rough-skinned newt		X	X		X	X			X			X	X	X		
ensatina	X				X	X			X					X	X	X
Pacific giant salamander					X				X							
Cope's giant salamander									X							
Cascade torrent salamander*									X				X			X
Larch Mountain salamander*									X						X	X
Van Dyke's salamander*									X							X
long-toed salamander														X		
northwestern salamander									X					X		
frog (sp.)									X					X		
Cascade frog														X		
tailed frog									X					X		
Pacific treefrog		X	X	X		X			X				X	X		
northern red-legged frog						X			X					X		
bullfrog									X				X	X		
western toad*									X					X		
TOTAL AMPHIBIANS	1	2	2	1	4	5	0	0	14	0	0	1	4	10	3	5
REPTILES (4)																
garter snake (sp.)												X		X		X
northwestern garter snake														X		X
rubber boa																X
northern alligator lizard					X						X	X			X	X
painted turtle														X		
TOTAL REPTILES	0	0	0	0	1	0	0	0	0	0	1	1	0	2	1	3

TER 3 Appendix 1. Species/habitat associations for the Lewis River Hydroelectric Projects[1]

Species[3]	Habitat Types[2]															
	LPP	**M**	**MD/AG**	**MS**	**MX**	**OG**	**OR**	**P**	**RI**	**RE**	**SH**	**SS**	**UD**	**WL**	**DST**	**ROCK**
BIRDS (114)																
Waterfowl and Waterbirds (14)																
waterfowl (sp.)				X						X				X		
common loon*										X						
western grebe										X				X		
pied-billed grebe										X						
double-crested cormorant*										X						
Canada goose				X	X			X				X	X	X		
mallard									X	X				X		
American wigeon										X				X		
blue-winged teal														X		
wood duck*									X					X		
ring-necked duck														X		
lesser scaup														X		
bufflehead*										X				X		
common merganser									X	X				X		
hooded merganser*										X				X		
Total Waterfowl & Waterbirds	0	0	0	1	1	0	0	1	3	9	0	1	1	11	0	0
Gulls and Shorebirds (8)																
Caspian tern						X										
gull (sp.)	X								X	X				X		
glaucous-winged gull										X						
ring-bill gull										X						
California gull									X	X						
great blue heron*									X	X				X		
green heron														X		

TER 3 Appendix 1. Species/habitat associations for the Lewis River Hydroelectric Projects[1]

	Habitat Types[2]															
Species[3]	**LPP**	**M**	**MD/AG**	**MS**	**MX**	**OG**	**OR**	**P**	**RI**	**RE**	**SH**	**SS**	**UD**	**WL**	**DST**	**ROCK**
killdeer					X				X	X				X		
spotted sandpiper									X	X				X		
Total Gulls & Shorebirds	0	0	0	0	1	1	0	0	4	6	0	0	0	4	0	0
Raptors, Vultures, and Owls (9)																
bald eagle*	X					X		X	X	X				X		
sharp-shinned hawk	X											X	X			
red-tailed hawk	X	X		X	X				X		X	X	X	X		
osprey[#]	X	X		X	X	X		X	X	X		X	X	X		
owl (sp.)													X			
great horned owl	X															
barred owl				X												
northern spotted owl*		X														
pygmy owl						X		X						X		
turkey vulture	X		X						X	X		X		X		
Total Raptors, Vultures & Owls	6	3	1	3	2	3	0	3	4	3	1	4	3	5	0	0
Gamebirds (7)																
band-tailed pigeon*		X			X			X				X	X			
mourning dove									X	X		X		X		
blue grouse*						X						X				
ruffed grouse				X						X		X		X		
common snipe														X		
wild turkey*								X								
peacock												X				
Total Gamebirds	0	1	0	1	1	1	0	2	1	2	0	5	1	3	0	0
Nightjars, Swifts, and Hummingbirds (5)																
belted kingfisher	X				X				X	X				X		
Vaux's swift*												X		X	X	

TER 3 Appendix 1. Species/habitat associations for the Lewis River Hydroelectric Projects[1]

	Habitat Types[2]															
Species[3]	**LPP**	**M**	**MD/AG**	**MS**	**MX**	**OG**	**OR**	**P**	**RI**	**RE**	**SH**	**SS**	**UD**	**WL**	**DST**	**ROCK**
common nighthawk	X															
hummingbird (sp.)	X								X		X			X		
rufous hummingbird	X		X	X		X			X	X	X	X	X	X		
black-chinned hummingbird	X												X			
Total Nightjars, Swifts, and Hummingbirds	4	0	1	1	1	1	0	0	2	2	1	2	2	3	1	0
Woodpeckers (5)																
woodpecker (sp.)	X		X	X	X	X			X				X	X		
red-breasted sapsucker		X	X	X					X			X	X	X		
pileated woodpecker*	X	X	X		X	X		X	X	X		X	X	X		
northern flicker	X	X		X	X	X		X	X		X	X	X	X		
downy woodpecker	X				X	X		X	X	X		X	X	X	X	
hairy woodpecker		X		X		X			X		X	X	X	X		
Total Woodpeckers	3	4	2	3	3	4	0	3	5	2	2	5	5	5	1	0
Flycatchers and Swallows (11)																
flycatcher (sp.)					X											
Hammond's flycatcher	X	X		X	X	X			X	X	X		X	X		
alder flycatcher												X				
Pacific slope flycatcher		X	X	X	X	X		X	X	X	X	X	X	X		
willow flycatcher			X	X	X	X		X	X	X		X	X	X		
olive-sided flycatcher			X													
western wood-pewee		X		X	X								X	X		
swallow (sp.)	X	X			X					X		X	X	X		
tree swallow									X	X				X		
violet green swallow									X	X				X		
cliff swallow									X	X						
barn swallow			X						X	X			X	X		
northern rough-winged swallow									X	X				X		

TER 3 Appendix 1. Species/habitat associations for the Lewis River Hydroelectric Projects[1]

	Habitat Types[2]															
Species[3]	**LPP**	**M**	**MD/AG**	**MS**	**MX**	**OG**	**OR**	**P**	**RI**	**RE**	**SH**	**SS**	**UD**	**WL**	**DST**	**ROCK**
Total Flycatchers &Swallows	1	3	4	4	4	3	0	2	8	8	2	3	5	8	0	0
Jays, Crows, and Creepers (6)																
scrub jay	X												X			
Steller's jay	X	X	X	X	X	X		X	X	X	X	X	X	X		
American crow	X	X		X	X	X	X	X	X	X	X	X	X	X		
common raven	X	X	X	X	X	X		X	X	X	X	X	X	X	X	
brown-headed cowbird	X				X				X				X	X	X	
brown creeper		X				X										
Total Jays and Crows	5	4	2	3	4	4	1	3	4	3	3	3	5	4	2	0
Chickadees, Wrens, and Thrushes (17)																
chickadee (sp.)	X	X	X		X	X		X				X	X	X		
black-capped chickadee	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
mountain chickadee	X				X											
chestnut-backed chickadee	X	X		X	X	X		X	X	X	X	X	X	X	X	
bushtit												X	X	X		
red-breasted nuthatch	X	X		X	X	X		X		X	X	X	X	X		
white-breasted nuthatch													X			
winter wren	X	X	X	X	X	X		X	X	X	X	X	X	X	X	
marsh wren														X		
kinglet (sp.)					X									X	X	
ruby-crowned kinglet	X				X					X		X		X	X	
golden-crowned kinglet	X	X	X	X	X	X		X	X	X	X	X	X	X	X	
hermit thrush					X			X								
Swainson's thrush	X	X	X	X	X	X		X	X	X	X	X	X	X		
varied thrush	X	X		X	X	X		X		X	X	X	X	X	X	
American robin	X	X	X	X	X	X		X	X	X	X	X	X	X	X	
American dipper									X	X				X		
cedar waxwing			X	X	X		X		X	X	X	X	X	X		

TER 3 Appendix 1. Species/habitat associations for the Lewis River Hydroelectric Projects[1]

Species[3]	Habitat Types[2]															
	LPP	**M**	**MD/AG**	**MS**	**MX**	**OG**	**OR**	**P**	**RI**	**RE**	**SH**	**SS**	**UD**	**WL**	**DST**	**ROCK**
European starling									X	X			X	X	X	
Total Chickadees, Wrens, & Thrushes	10	8	6	9	12	8	2	9	9	12	9	11	12	14	7	0
Vireos and Warblers (13)																
Hutton's vireo					X	X					X	X		X	X	
Cassin's vireo				X						X	X		X	X		
warbling vireo	X				X			X	X	X	X	X	X	X		
warbler (sp.)													X			
orange-crowned warbler									X				X			
black-throated gray warbler	X	X	X	X	X	X		X	X	X	X	X	X	X	X	
yellow warbler									X		X	X		X		
yellow-rumped warbler					X								X	X		
Nashville warbler											X	X				
MacGillivray's warbler		X	X		X	X		X			X	X		X		
hermit/Townsend's warbler		X				X										
hermit warbler		X														
Wilson's warbler			X	X	X	X		X	X	X	X		X	X		
common yellowthroat		X	X						X	X	X		X	X		
Total Vireos &Warblers	2	5	4	3	6	5	0	4	6	5	9	6	7	9	2	0
Grosbeaks, Buntings, and Sparrows (11)																
black-headed grosbeak		X	X	X		X		X			X	X	X	X		
lazuli bunting			X													
evening grosbeak						X			X		X	X	X	X		
spotted towhee	X		X	X	X	X		X			X	X	X	X	X	
savannah sparrow			X													
song sparrow			X	X	X	X	X	X	X	X		X	X	X		
chipping sparrow												X				
dark-eyed junco	X	X	X	X	X	X		X	X	X	X	X	X	X		

TER 3 Appendix 1. Species/habitat associations for the Lewis River Hydroelectric Projects[1]

Species[3]	Habitat Types[2]															
	LPP	**M**	**MD/AG**	**MS**	**MX**	**OG**	**OR**	**P**	**RI**	**RE**	**SH**	**SS**	**UD**	**WL**	**DST**	**ROCK**
white-crowned sparrow	X		X	X	X	X		X	X	X		X		X		
golden-crowned sparrow			X					X								
pine siskin				X										X		
Total Grosbeaks, Buntings, & Sparrows	3	2	8	6	4	6	1	6	4	3	4	7	5	7	1	0
Blackbirds, Orioles, and Finches (7)																
red-winged blackbird										X				X		
Brewer's blackbird									X					X		
northern oriole														X		
western tanager	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
finch (sp.)												X				
American goldfinch	X					X	X		X	X	X	X	X	X		
red crossbill								X								
purple finch	X			X				X				X		X		
Total Blackbirds, Orioles, & Finches	3	1	1	2	1	2	2	3	3	3	2	3	2	7	0	0
TOTAL BIRDS	37	31	29	36	40	38	6	36	53	58	33	50	48	79	14	0
MAMMALS (13)																
Townsend's big-eared bat*																X
Townsend chipmunk						X							X			
Douglas squirrel	X	X		X	X	X		X		X	X	X	X		X	
beaver			X						X				X	X		
mink*									X	X				X		
coyote												X		X	X	
bobcat													X			
black bear				X	X											
elk*	X	X	X	X	X	X		X	X		X	X	X	X	X	
black-tailed deer*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	

TER 3 Appendix 1. Species/habitat associations for the Lewis River Hydroelectric Projects[1]

Species[3]	Habitat Types[2]															
	LPP	**M**	**MD/AG**	**MS**	**MX**	**OG**	**OR**	**P**	**RI**	**RE**	**SH**	**SS**	**UD**	**WL**	**DST**	**ROCK**
pocket gopher												X				
striped skunk				X		X					X					
raccoon														X		
TOTAL MAMMALS	3	3	3	5	4	5	1	3	4	3	4	5	6	6	4	1
Total No. of Species[3]	**41**	**36**	**34**	**42**	**49**	**48**	**7**	**39**	**71**	**61**	**38**	**57**	**58**	**98**	**22**	**9**

* WDFW priority species (1999).

Osprey is currently being reviewed for removal from the WDFW priority species list (pers. comm., N. Nordstrom, PHS Program, WDFW, Olympia, Washington, February 4, 1999).

[1] List is based on observations at Yale (1995-1998), Merwin (2000), and Swift (2000). The Swift bypass reach is included as part of the Yale Project; the Saddle Dam Farm area was included as part of the Yale Project in the 1995-1998 surveys, but observations in 2000 were recorded for Merwin. The amount of time spent at each project is not equivalent; observations at Yale included 6 bird surveys in different seasons and habitats, as well as incidental observations. Observations of birds at Merwin and Swift were all incidental to other field studies. Bird observations included species flying overhead.

[2] Habitat types: LPP-lodgepole pine, M-mature conifer, MD/AG-meadow/agriculture, MS-mid-successional conifer, MX-mixed conifer/deciduous, OG-old-growth conifer, OR-orchard, P-pole conifer, RI=riparian deciduous/riverine, RE-reservoir/shoreline, SH-shrubland, SS-seedling/sapling, UD-upland deciduous, WL-wetland, DST-disturbed, ROCK-rock/talus/cave.

[3] Wildlife not recorded to species (e.g., frog sp.) are not included in totals.