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5.5 WETLAND INFORMATION SYNTHESIS (TER 5)

5.5.1 Study Objectives

The objectives of the Wetland Information Synthesis are to provide the following:

- Information on the location, extent, and relative quality of wetlands in the study area and their use by wildlife.
- An assessment of the potential effects of project operations on associated wetlands, wetland buffers, and analysis species inhabiting these wetlands.
- Potential management measures that will protect and improve wetland conditions within the study area.

5.5.2 Study Area

The Wetland Information Synthesis focuses on the primary study area, as defined in the Vegetation Cover Type Mapping (TER 1). This study area includes lands in the vicinity of the Merwin, Swift No. 1, and Swift No. 2 projects; riparian habitats along the Lewis River downstream to Eagle Island; and Eagle Island, which is about 6 miles (9.6 km) downstream of Merwin. The Wetland Information Synthesis study area also includes the wetlands associated with the Yale Project, which were inventoried during Yale relicensing studies (Dueker and Paz 1995; PacifiCorp 1999) and further characterized as part of the HEP Study (TER 2).

5.5.3 Methods

The methods for the wetland information synthesis are described below. This study synthesizes information from other studies to describe the wetland resources in the study area and included 3 tasks, as outlined below.

5.5.3.1 Wetland Extent and Distribution

Information on wetland extent and distribution within most of the study area was collected primarily as part of the Vegetation Cover Type Mapping Study (TER 1), methods for which can be found on pages TER 1-4 – TER 1-10 of the Study Plan Document (PacifiCorp and Cowlitz PUD 1999, as amended). Wetlands associated with the Merwin, Swift No. 1, and Swift No. 2 projects and Eagle Island were delineated on aerial photographs and field verified in 2000 and 2001. Wetlands on Yale Project lands had been previously identified and mapped during Yale relicensing studies (Dueker and Paz 1995; PacifiCorp 1999). A Geographical Information System (GIS) was used to produce maps and calculate wetland acreage.

5.5.3.2 Wetland Characterization

Characteristics of selected wetlands in the study area were obtained from a variety of sources, including the HEP Study (TER 2), Analysis Species Assessment (specifically, the amphibian surveys) (TER 3), Botanical Surveys (TER 4), and Yale relicensing studies (Dueker and Paz 1995; PacifiCorp 1999). These studies provided information on wetland vegetation, species composition, structure and hydrology, and wildlife use.

5.5.3.3 Wetland Water Level Fluctuation

One of the models selected by the HEP Team required an estimate of water level fluctuation in wetlands during the amphibian breeding season. Although it appeared that many study area wetlands support breeding amphibian populations, the HEP Team suggested installing staff gages in a few select wetlands to obtain information on the general magnitude and timing of water level changes. Information available from the Yale relicensing studies suggests that April water levels in the Beaver Bay and International Paper (IP) wetlands (shown on Figure 5.5-1), which are both natural wetlands and hydrologically connected to Yale Lake, fluctuate about 2 and 3 inches (5 and 7.6 cm), respectively (PacifiCorp 1999). However, little was known about water level fluctuations in other wetlands in the study area, particularly the many created wetlands and wetlands not hydrologically connected to the reservoirs.

Staff gages were installed in 5 wetlands—2 in the Swift bypass reach, 1 in the largest of the Yale ponds, 1 in Bankers Pond, and 1 in Cedar Grove Pond (Figure 5.5-1, Sheets 2, 3, and 4). These 5 wetlands were selected because they were easily accessible and included several different wetland types and hydrological regimes. The gages were installed in February 2000 and monitored through December 2001 in conjunction with other field activities. Water levels were checked approximately every 2 to 3 weeks between February and May 2000, and then every month or so through December 2001.

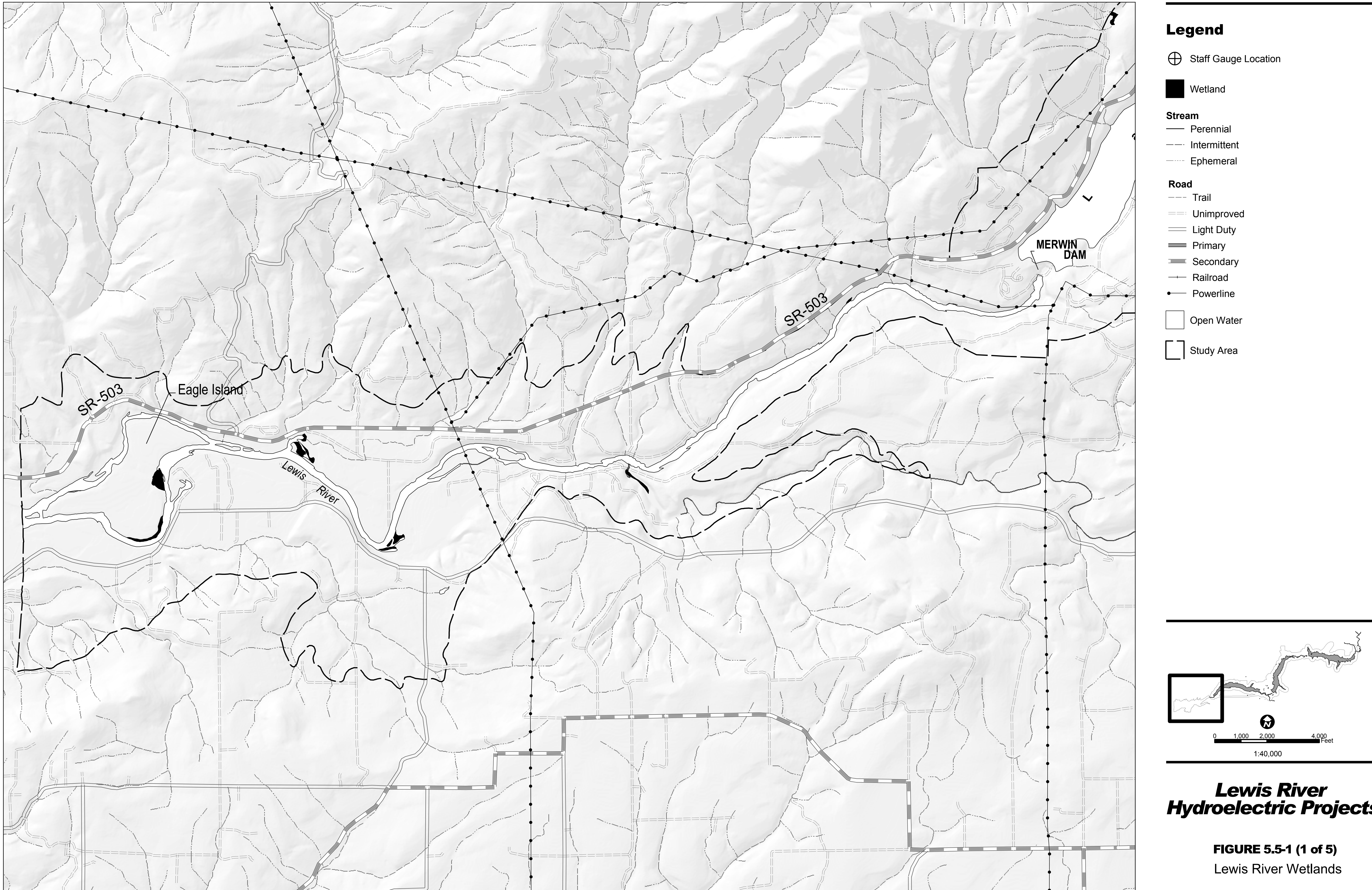
PacifiCorp also collected additional hydrological data for the Beaver Bay wetland, which is hydrologically connected to Yale Lake. A transducer and a staff gage were installed and maintained at this site from September 27, 2000 to October 9, 2001. The transducer recorded daily water levels and data were downloaded once a month by PacifiCorp staff. Yale Lake water levels were obtained from PacifiCorp operators and compared to those in Beaver Bay wetland.

5.5.4 Key Questions

Results of the Wetland Information Synthesis can be used to address the some of the following "key" watershed questions identified during the Lewis River Cooperative Watershed Studies meetings.

- Where do wetlands currently exist in the basin and what are their characteristics?

A map of wetlands in the basin is provided in Figure 5.5-1; characteristics of most wetlands in the study area are described in Table 5.5-2.



Source: EDAW, Inc., 2002

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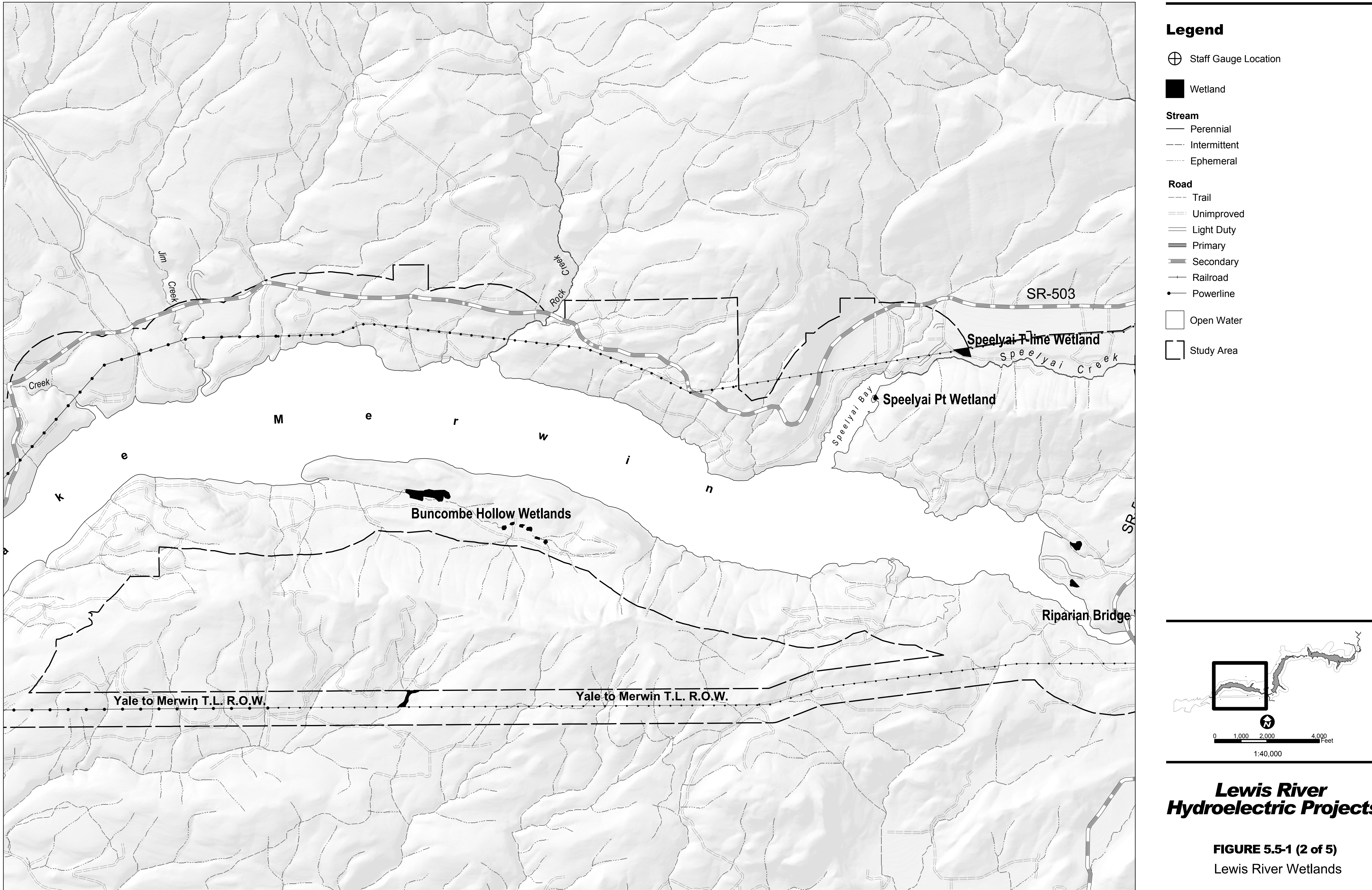
Lewis River Hydroelectric Projects

FIGURE 5.5-1 (1 of 5)

Lewis River Wetlands



Lewis River Hydroelectric Projects

FIGURE 5.5-1 (2 of 5)

Lewis River Wetlands

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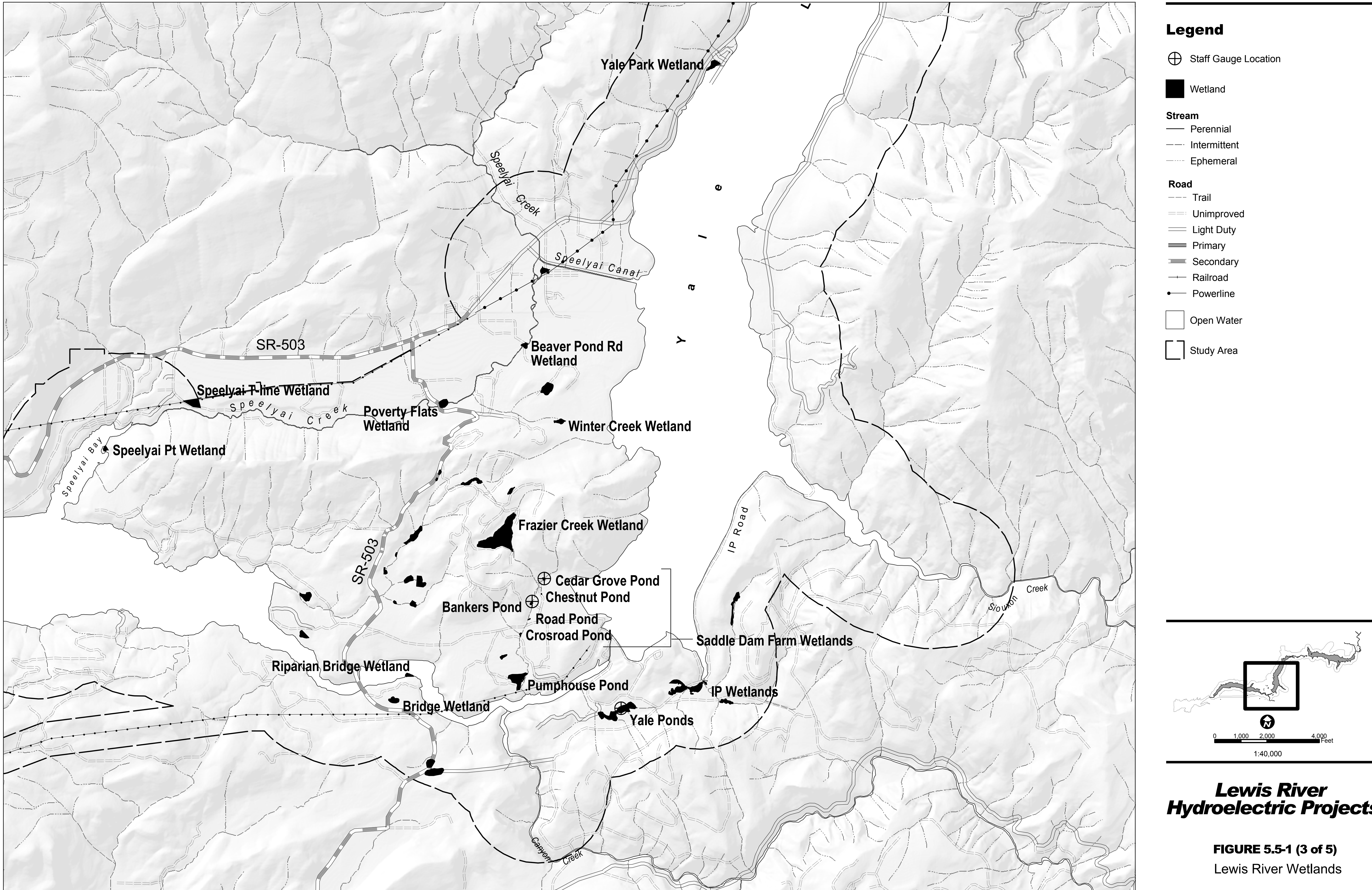

Lewis River Hydroelectric Projects

FIGURE 5.5-1 (3 of 5)

Lewis River Wetlands

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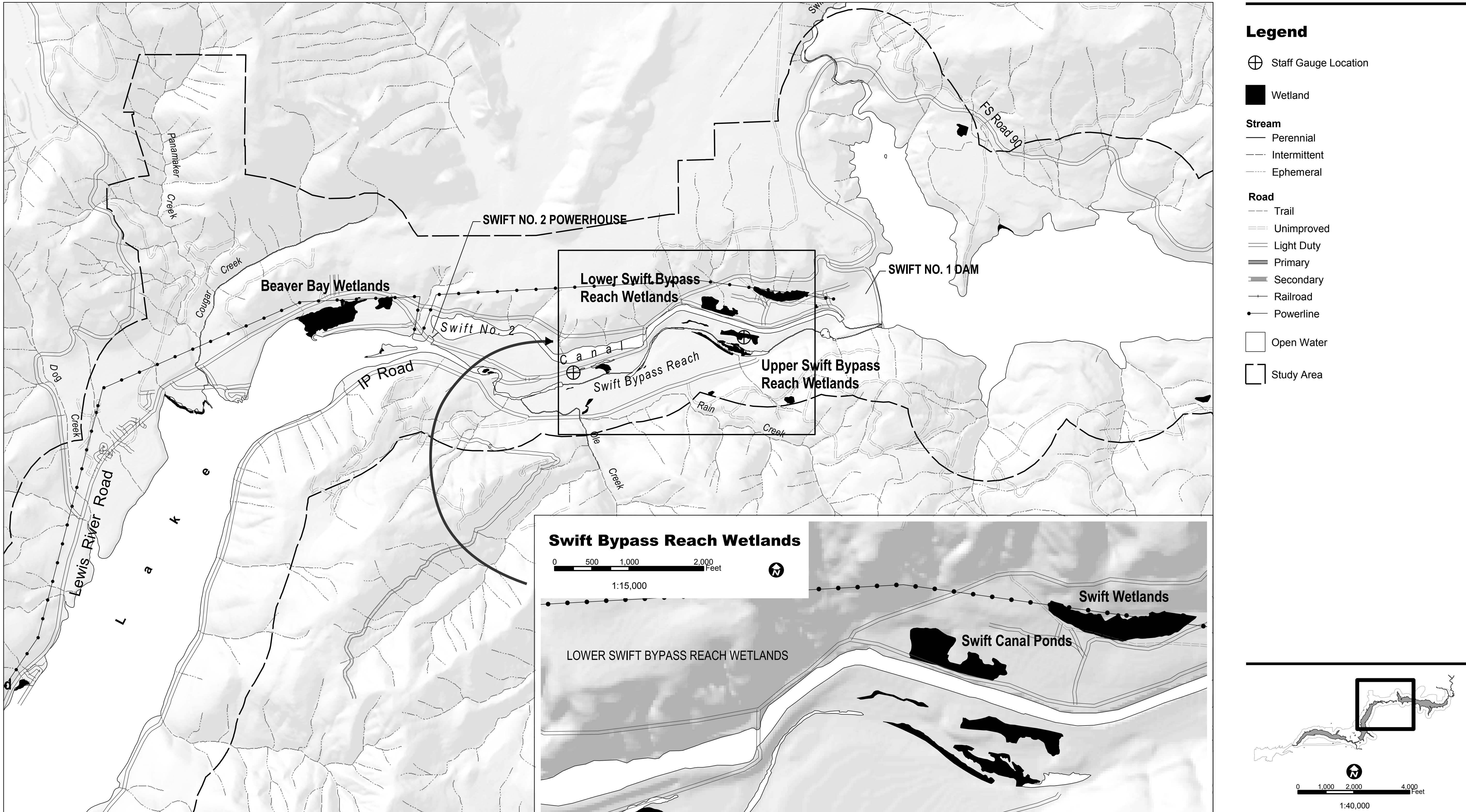

Lewis River Hydroelectric Projects

FIGURE 5.5-1 (4 of 5)

Lewis River Wetlands

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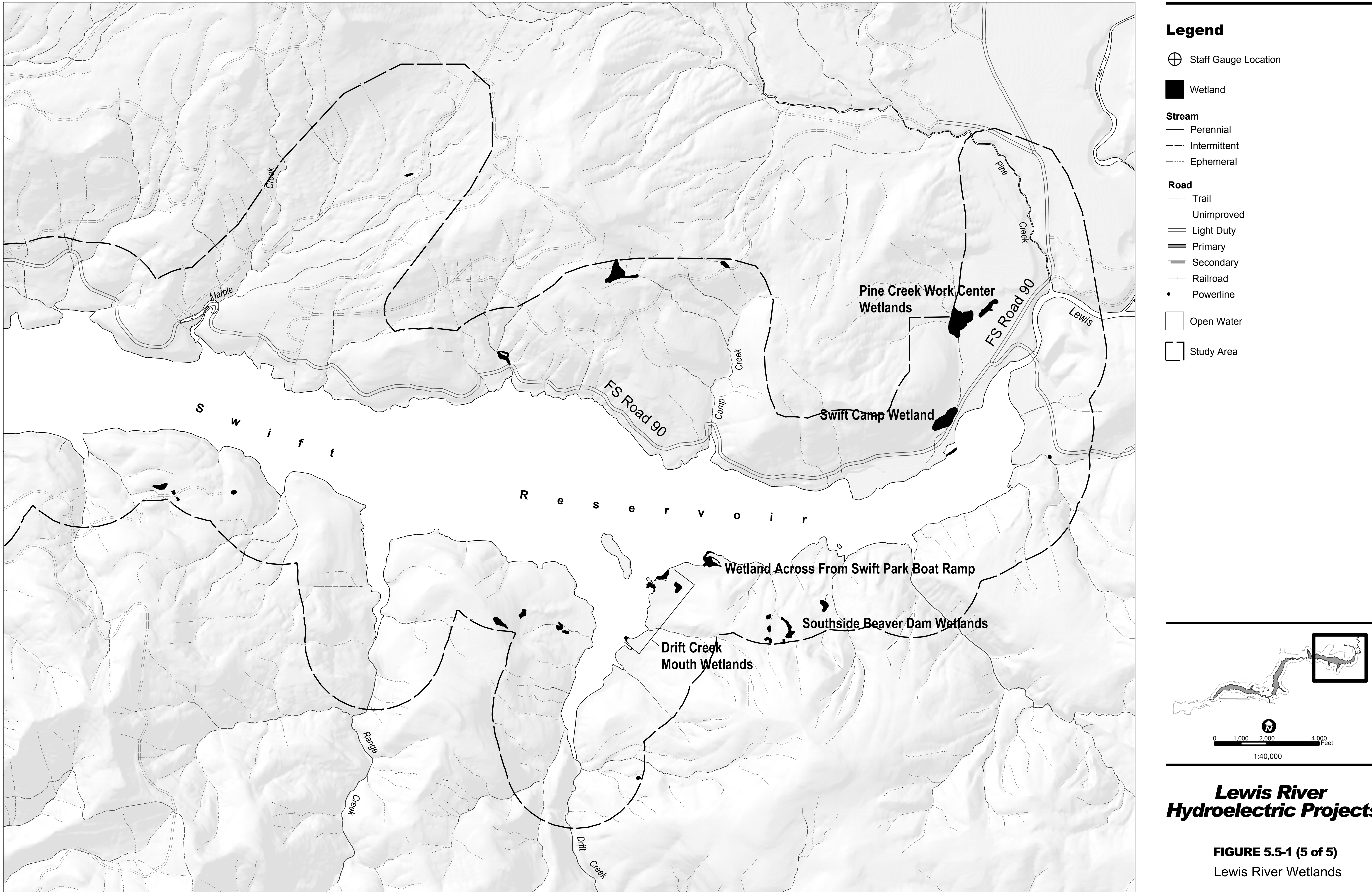

Lewis River Hydroelectric Projects

FIGURE 5.5-1 (5 of 5)

Lewis River Wetlands

Source: EDAW, Inc., 2002

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- What quality of habitat exists in each wetland and what are the likely causes of habitat degradation (e.g., grazing, timber harvest, roads) for each?

  Habitat quality was assessed for the several HEP analysis species that use wetlands (see TER-2, Section 5.2). Potential causes of habitat degradation for the large wetlands in the study area are listed in Table 5.5-2.

- What types and amounts of habitats are currently available for aquatic and riparian species at reservoir sites?

  Wetland types and amounts for each project are listed in Table 5.5-1. Wetland use by analysis species they support is shown in Table 5.5-2.

- How do project operations and other watershed disturbances affect the distribution, quality, quantity, and functional roles of wetlands in the basin?

  The effects of project operation and other disturbances on wetlands are described in the discussion section of this report (Section 5.5.6).

- What are the current and historical distributions, abundances, and use patterns of populations of wetland-associated species in the basin?

  The current distribution and abundance of wetlands in the study area is described in Section 5.5.5.1 and shown graphically in Figure 5.5-1. Wetland acreages are reported in Table 5.5-1.

- What would be the benefits of protecting, enhancing, restoring, enlarging, or creating wetlands in the basin for water quality and populations of wetland-associated species?

  Recommendations for wetlands protection and enhancement are provided in the discussion section of this report (Section 5.5.6).

- What can PacifiCorp do to cooperate with other basin landowners in protecting wetland habitats?

  The Wetlands Information Synthesis Study does not identify any specific cooperative efforts with other basin landholders.

5.5.5 Results

5.5.5.1 Wetland Extent and Distribution

Results of the vegetation cover type mapping indicate that there are 217 individual wetland polygons in the study area-3 on Eagle Island; 10 along the Lewis River between Merwin Dam and Eagle Island; 37, 90, and 40 on Merwin, Yale, and Swift lands, respectively; 18 in the Swift bypass reach; 18 associated with the Swift Canal; and 1 along the transmission line ROW (Table 5.5-1; Figure 5.5-1). Most of these polygons are small and rarely occur individually. Typically, 2 or more polygons are clustered to form a complex of different wetland types. The Beaver Bay wetland, for example, is a complex of 21 individual polygons representing palustrine unconsolidated bottom, emergent, scrub/shrub, and forested types.

Wetlands cover only 279 acres (113 ha), or less than 1 percent, of the 54,599-acre study area. Scrub-shrub wetlands are the most extensive, but all 5 wetland types, except for aquatic bed, are well represented. A small area (1.6 acres [0.6 ha]) of palustrine aquatic bed was discovered in 2001 near the mouth of Drift Creek along the shore of Swift Reservoir. Over 30 percent of the wetland acreage and 40 percent the wetland polygons in the study area are associated with the Yale Project, which includes several large wetland complexes, as well as a number of artificially created and maintained wetlands that are part of the lands in the Merwin Wildlife Management Program. Lands surrounding the Merwin and Swift reservoirs include about 18 and 25 percent of the total wetland acreage, respectively. Several relatively large wetland complexes are also associated with the Swift canal and the bypass reach.

5.5.5.2 Wetland Characteristics

Most of the wetlands in the study area are relatively small and isolated. All of the larger wetlands were visited and characterized during other studies. Only a few wetlands appear to be hydrologically connected to the reservoirs. These include a small wetland dominated by cattails in Speelyai Bay at Merwin; the Beaver Bay and IP wetlands at Yale; and an aquatic bed wetland in the Drift Creek inlet at Swift. All of the other wetlands in the study area are either upslope and distant from the reservoirs and/or artificially created and maintained. Characteristics of most study area wetlands are summarized in Table 5.5-2. In addition to the qualitative assessment of wetlands, a number of habitat parameters were measured as part of the HEP field studies for forested, scrub-shrub, emergent, and unconsolidated bottom (pond) types. These habitat parameters included tree and shrub canopy cover, hydrophytic shrub and vegetation cover, and shrub height (Table 5.5-3).

Deciduous shrub cover and shrub height was highest in palustrine scrub-shrub (PSS) habitats. Hydrophytic shrub cover was recorded as a subset of deciduous shrub cover and was again highest in scrub-shrub wetlands. Hydrophytic species were those identified by the National Wetland Inventory (NWI). Species were considered hydrophytic if they were obligate wetland species, which are those that occur almost always under natural conditions in wetlands; facultative wetland species, which are those that usually occur in wetlands, but occasionally found in non-wetlands; and facultative species, which are equally likely to occur in wetlands or non-wetlands. Palustrine forested wetlands had the highest overall cover of hydrophytic species, as well as the highest mean tree cover.

Table 5.5-1. Wetland acreage and distribution in the study area.

Study Area Segment	Palustrine Forested Wetland (PFO)		Palustrine Scrub-shrub Wetland (PSS)		Palustrine Emergent Wetland (PEM)		Palustrine Unconsolidated Bottom (PUB)		Palustrine Aquatic Bed (PAB)		Wetland Totals	
	Acres	**# Polygons**	**Acres**	**# Polygons**	**Acres**	**# Polygons**	**Acres**	**# Polygons**	**Acres**	**# Polygons**	**Acres**	**# Polygons**
Eagle Island	6.0	1	6.1	2	0	0	0	0	0	0	12.1	3
Lower River	2.7	1	4.6	4	7.1	5	0	0	0	0	14.3	10
Merwin	18.6	11	4.3	3	19.9	16	10.9	7	0	0	53.7	37
Yale	30.4	24	13.8	13	19.6	37	23.9	16	0	0	87.7	90
Swift	24.0	8	9.2	6	27.1	17	7.0	8	1.6	1	68.9	40
Swift Bypass Reach	6.4	3	9.4	9	2.5	2	0.5	4	0	0	18.8	18
Swift Canal	2.7	4	3.9	5	5.9	4	8.0	5	0	0	20.5	18
Transmission Line ROW	0	0	3.0	1	0	0	0	0	0	0	3.0	1
Study Area Totals	86.2	62	54.3	67	79.7	94	50.2	41	1.6	1	271.9	217

Table 5.5-2. Characteristics of selected wetlands in the Lewis River study area.

Wetland	Size (ac)	Types[1]	Hydrology[2]	Dominant Plant Species[2]	Analysis Species Observed[2,3,4]	Sources of Potential Habitat Disturbances/ Degradation[2,3]
MERWIN						
Buncombe Hollow Wetland	11.6	PFO, PEM	Natural riparian wetland fed by Buncombe Hollow Creek	Not visited. Wetland is on private property	--	None
Speelyai Point Wetland	0.6	PEM	Shoreline wetland totally dependent on Lake Merwin	Reed canarygrass	Beaver	Recreation, reservoir water level fluctuations
Speelyai T-line ROW Wetland	3.2	PFO, PEM	Natural riparian wetland maintained by a small tributary Speelyai Creek	Reed canarygrass, slough sedge, soft rush, needle spike rush	Red-legged frog, elk	Transmission line maintenance, nearby development
Bridge Wetland	1.6	PFO, PEM, PUB	Artificially enlarged natural wetland fed by 1 stream	Horsetail, soft rush, slough sedge, skunk cabbage, green ash, willow, western red cedar, salmonberry, stink currant	Pileated woodpecker, northern red-legged frog	None
Riparian Bridge Wetland	0.7	PEM	Natural shoreline wetland, dependent on Lake Merwin	Salmonberry, red alder, reed canarygrass, interrupted sedge	Pileated woodpecker	Recreation, reservoir water level fluctuations
YALE						
Pumphouse Pond	5.1	PEM, PUB, PSS	Created wetland maintained by a stand pipe and berm in a small drainage	Cattail, reed canarygrass, elderberry, pondweed, red alder, western red cedar	Wood duck	None
Frazier Creek Wetland	19.8	PSS, PEM, PUB	Natural wetland originally created by beaver dam on Frazier Creek; currently maintained by gabion dam	Cattail, reed canarygrass, pondweed, slough sedge, willow, salmonberry	Pileated woodpecker, wood duck, yellow warbler, mink, elk	Upslope timber harvest, road
Saddle Dam Farm Wetlands (includes Cedar Grove, Chestnut, Bankers, Road, and Crossroad ponds)	1.3	PEM, PUB, PSS	Created wetlands maintained by a series of stand pipes and berms along Frazier Creek and a small diversion from Frazier Creek	Reed canarygrass, slough sedge, salmonberry, red alder	Northern red-legged frog, beaver, elk	None

Table 5.5-2. Characteristics of selected wetlands in the Lewis River study area (cont.).

Wetland	Size (ac)	Types[1]	Hydrology[2]	Dominant Plant Species[2]	Analysis Species Observed[2,3,4]	Sources of Potential Habitat Disturbances/ Degradation[2,3]
Yale Ponds	7.6	PFO, PSS, PEM, PUB	Originally borrow pits for Yale Dam, fed by rainfall and surface water drainage, maintained by large beaver dam	Red alder, western red cedar, reed canarygrass, cattails, floating-leaved pondweed	Northern red-legged frog, wood duck, elk	None
IP Wetlands	7.3	PFO, PSS, PEM, PUB	Natural wetlands fed by 3 small streams and enhanced by beaver activity; hydrologically connected to Yale Lake	Cattail, bulrush, sedges, horesetail, salmonberry, red alder, smartweed, stinging nettle	Pileated woodpecker, wood duck, northern red-legged frog, beaver	Road, blackberry encroachment
Yale Park Wetland	0.5	PEM	Shoreline wetland totally dependent on Yale Lake	Sedges, spike rush	Elk	Recreation, reservoir water level fluctuations
Beaver Bay Wetland	36.6	PFO, PSS, PEM, PUB	Natural wetland fed by 2 streams; hydrologically connected to Yale Lake, maintained by beaver dams	Reed canarygrass, floating-leaved pondweed, slough sedge, soft rush, skunk cabbage, willow, red alder	Pileated woodpecker, bald eagle, wood duck, northern red-legged frog, beaver, elk	Recreation, reservoir water level fluctuations
SWIFT CANAL/BYPASS						
Swift Canal Ponds	9.0	PFO, PSS, PEM, PUB	Originally old borrow pits, fed by 1 stream and some drainage from Swift wetlands. Connected to Swift canal by a culvert.	Hardstem bulrush, rushes, skunk cabbage, red alder, willow	Beaver	Roads, changes in canal water levels
Swift Wetlands	10.4	PFO, PSS, PEM, PUB	Natural wetland fed by 2 streams. Appears to have been enhanced by seepage from Swift Dam, beaver activity, and diking and diversion of a stream	Willow, red alder, salmonberry, sedges, cattail, reed canarygrass, common rush, pondweed, bur-reed, marsh buttercup	Yellow warbler, bald eagle, northern red-legged frog, beaver	Upslope road
Swift Bypass Reach Wetlands	18.0	PFO, PSS, PEM, PUB	Some floodplain wetlands, others maintained by beaver dams and seepage from Swift canal	Red alder, cottonwood, willow, reed canarygrass, marsh buttercup, Himalayan blackberry	Cottonwood, pileated woodpecker, yellow warbler, wood duck, bald eagle, northern red-legged frog, beaver, elk	Large spill events from Swift Reservoir or canal

Table 5.5-2. Characteristics of selected wetlands in the Lewis River study area (cont.).

Wetland	Size (ac)	Types[1]	Hydrology[2]	Dominant Plant Species[2]	Analysis Species Observed[2,3,4]	Sources of Potential Habitat Disturbances/ Degradation[2,3]
SWIFT						
Swift Camp Wetland	9.6	PFO, PEM, PSS	Unnamed stream feeds the wetland which appears to be partially created by the highway berm as well as beaver activity	Red alder, salmonberry, reed canarygrass, sedges, skunk cabbage, soft rushes	Beaver, elk	Roads
Southside Beaver Dam Wetlands	6.8	PFO, PUB	Series of small beaver dams on 3 small tributaries to Swift Reservoir; maximum depth about 6 ft	Red alder, salmonberry	Red-legged frog, beaver, elk	None
Pine Creek Work Center Wetland	18.2	PFO, PUB, PEM, PSS	Two wetland complexes separated by a beaver dam	Skunk cabbage, red alder, salmonberry	Beaver, elk, red-legged frog	Roads
Wetland across from Swift Park boat ramp	1.8	PFO	Narrow channel that dips into riparian forests	Water parsley, red alder, salmonberry, skunk cabbage	Pileated woodpecker sign	Dispersed camping
Drift Creek Mouth Wetland	1.6	PAB	Aquatic beds in swales below the normal high water level	Pondweed, rush spp., sedge spp.	Western toad larvae and toadlets	Reservoir water level fluctuations

[1] PFO = Palustrine forested wetland; PSS = Palustrine scrub-shrub wetland; PEM = Palustrine emergent wetland; PUB = Palustrine unconsolidated bottom (open water); PAB= Palustrine Aquatic Bed.

[2] Source: Dueker and Paz (1995) and field studies in 2000 and 2001.

[3] Source: Dueker and Paz (1995), PacifiCorp (1999); and field studies in 2000 and 2001

[4] Analysis Species: See Section 5.3 for list of analysis species and definition. Cascades frog and western toad are not analysis species but were noted because they are unusual in the study area.

Table 5.5-3. Habitat parameters of wetland types in the Lewis River study area.

Wetland Type	Deciduous Shrub Cover (mean %)	Hydrophytic Shrub Cover[1] (mean%)	Hydrophytic Vegetation Cover[2] (mean %)	Tree Cover (mean %)	Shrub height (mean ft)
Palustrine forest	18.6	16.5	80.3	68.4	5.2
Palustrine scrub-shrub	47.6	44.8	72.0	0	7.8
Palustrine emergent	6.4	0.4	64.15	15.6	4.3
Palustrine unconsolidated bottom	6.3	6.3	51.4	---	---

[1] Hydrophytic shrub cover is a subset of deciduous shrub cover and is comprised of those plant species known to be hydrophytic (e.g., red alder, willow spp.).
[2] Wetland vegetation cover includes all hydrophytic plant species, forbs and grasses, and trees and shrubs.

5.5.4.3 Wetland Water Level Fluctuations

Data on water level fluctuations for the 6 wetlands with staff gages are presented in the following sections. Overall, the data suggest that the water levels in the wetlands were highest during the months of the greatest precipitation and lowest during the drier times of the years (Figure 5.5-2). In 2000 and 2001, the late-winter spring precipitation was among the lowest in nearly 20 years (Figure 5.5-3) and water levels in most wetlands show a general declining trend through 2000 and 2001.

Swift Bypass Reach Wetlands

There are 22 wetland polygons in the Swift bypass reach. Of these, at least 2 wetland complexes appear to be hydrologically connected to Swift canal, receiving water from several obvious surface seeps and, possibly from some subsurface flow. The lower wetland is clearly maintained by at least 1 old beaver dam. Both of these wetlands are several feet above the normal river level in the reach. Data from the staff gages indicate that the water levels in both of these wetlands were relatively stable during the late winter-spring amphibian-breeding period (February through April) in 2000, fluctuating by only 1 to 3 inches (2.5 to 7.6 cm) (Figures 5.5-4 and 5.5-5). Water levels in the upper wetland were also stable during the breeding season in 2001 (Figure 5.5-4).

Water levels in the upper Swift bypass reach wetland were the most stable of the 6 wetlands with staff gages, varying only 7 inches (18 cm) over nearly 2-years of measurements. Water levels in the upper wetland peaked in March 2000, declined in July/August 2000, and increased during fall and winter 2000/2001, peaking again in March 2001, about 3 inches (7.6 cm) below March 2000 (Figure 5.5-4). The overall stability of water levels in this wetland suggests that is it maintained primarily from Swift canal seepage and not rainfall or surface water.

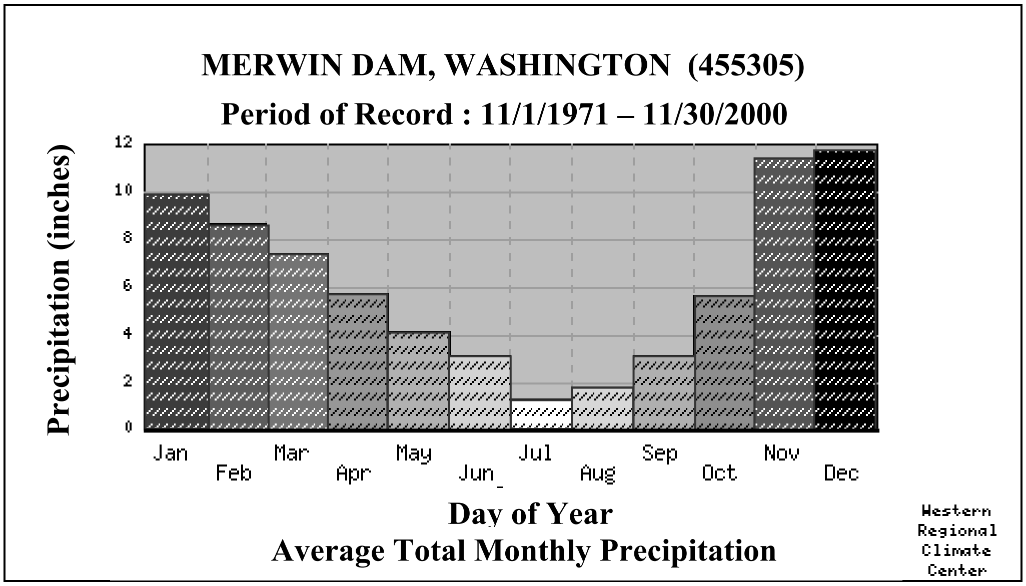

Figure 5.5-2. Precipitation Patterns at Merwin Dam, 1971–2000.

(Source: Western Regional Climate Center; http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?wamerw)

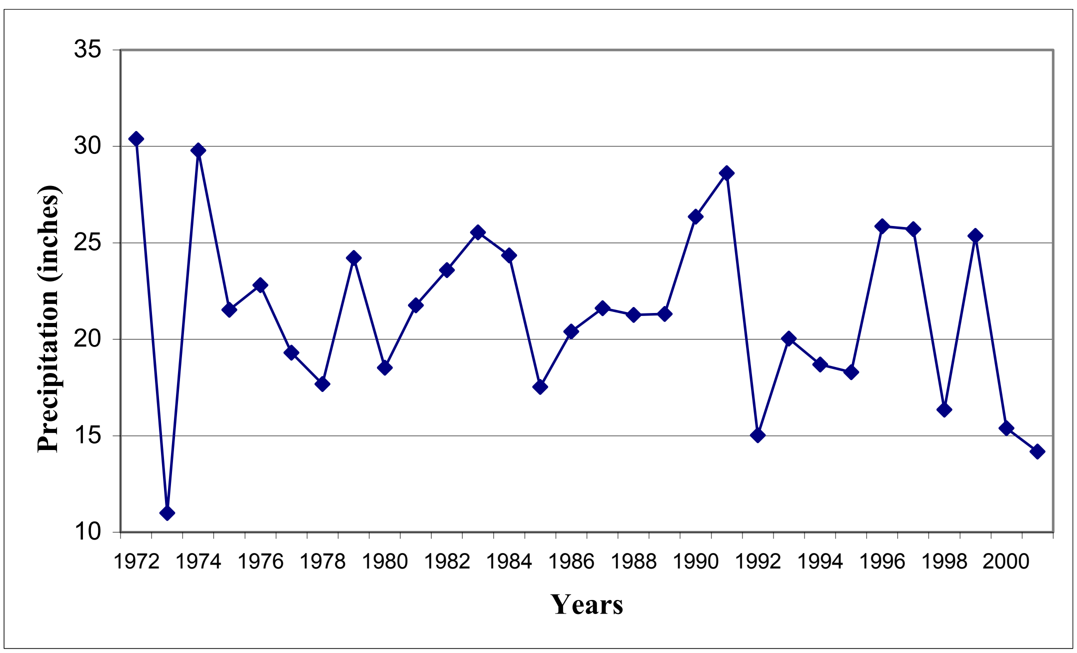

Figure 5.5-3. Precipitation totals for February through April, from 1972–2001 at Merwin Dam.

Source: Western Region Climate Center. (Source: http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?wamerw)

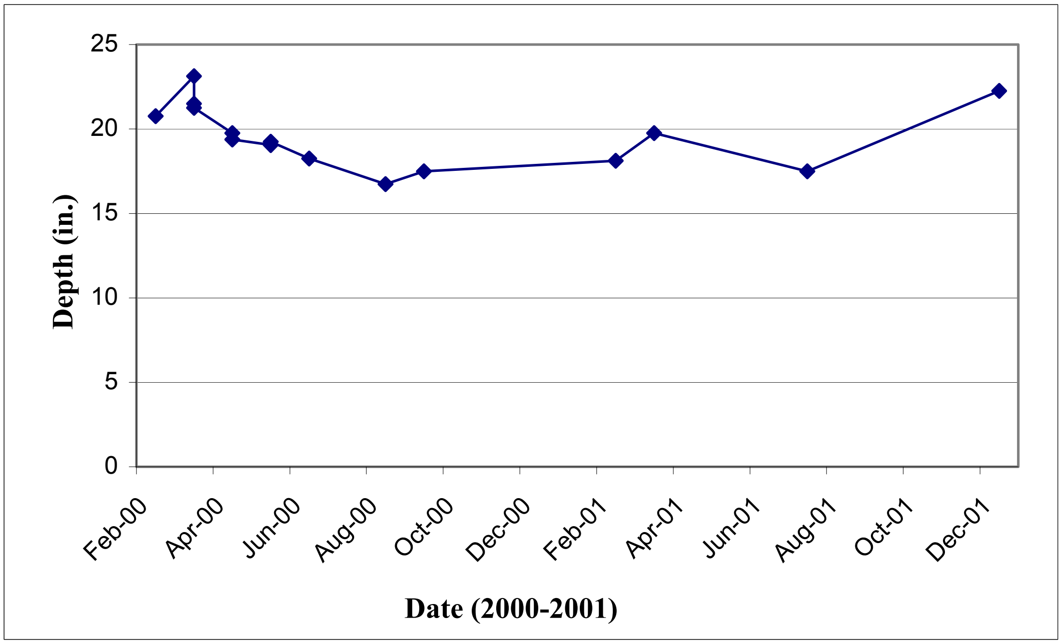

Figure 5.5-4. Water levels in the Swift bypass reach upper wetland.

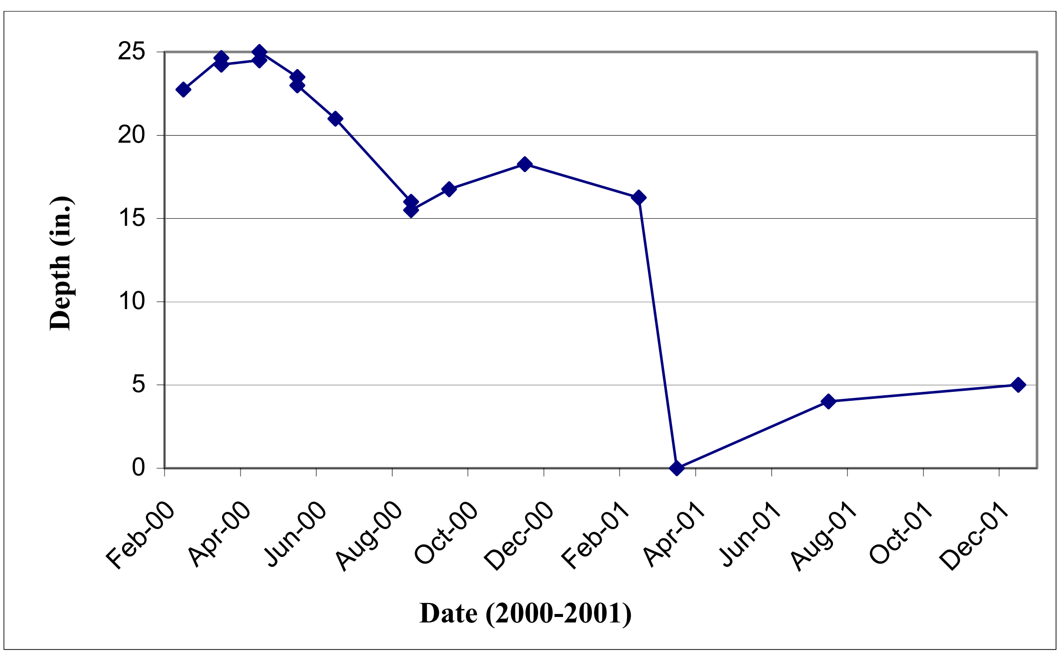

Figure 5.5-5. Water levels in the Swift bypass reach lower wetland.

The pattern of water level fluctuations in the lower Swift bypass reach wetland was similar to that of the upper wetland through 2000, varying about 9 inches (22.9 cm) overall. In 2001, however, the water level in this wetland declined dramatically between February and mid-March (Figure 5.5-5) and remained substantially lower than any month in 2000. Water levels in December 2001, after over 30 consecutive days of measurable rainfall, were still very low. The cause of the dramatic decline is uncertain; it is possible that one of the beaver dams maintaining the wetland broke or that a new beaver dam upstream diverted some portion of the flow. Water levels in Swift canal, which is upslope from this wetland and clearly a source of some inflow seeps, remained stable throughout 2001 (pers. comm., B. Fields, Hydro North Manager, PacifiCorp, November, 2001).

Bankers and Cedar Grove Ponds

Bankers and Cedar Grove ponds are both located on the Merwin mitigation lands at Saddle Dam Farm. Bankers Pond is 1 of 3 wetlands that were created along Frazier Creek by installing a series of drop inlet structures (stand pipes) (PacifiCorp 1990). Cedar Grove Pond was created by placing a small dam on Frazier Creek, which diverts some of the flow into a small canal and then to the pond. Outflow from Cedar Grove Pond is controlled by a stand pipe that delivers water to a ditch, which conveys water to Chestnut Pond. From there another ditch takes the drainage to Bankers Pond (PacifiCorp 1990). Although the staff gages in both the Bankers and Cedar Grove Pond wetlands were nearly dry during certain periods of this study, other portions retained water, and neither wetland dried out completely.

Water levels in Cedar Grove Pond are completely dependent on water management practices and precipitation. For example, the diversion to the pond is easily clogged by debris and needs to be periodically cleaned. When this occurred in March 2000, the diversion was inadvertently reset to divert more of the Frazier Creek flow into Cedar Grove, increasing pond water level by nearly 25 inches (63 cm) for several weeks (Figure 5.5-6). Once the diversion was set correctly, the water levels dropped and remained relatively stable through July 2000. Water levels in the pond decreased as flows in Frazier Creek dropped below the diversion level during the typical Northwest summer drought (see Figure 5.5-2). The standard operating procedure (SOP) for Cedar Grove calls for closing the diversion gate in November and December of every year (PacifiCorp 1990), so water levels would be expected to remain low during this period in 2000.

Reopening the diversion in January 2001, however, had very little effect on water levels in the pond. Less than 15 inches of rain fell at Merwin between February and April 2001, making this period one of the driest winters on record. Flows in Frazier Creek were generally below the diversion level, making the pond dependent on precipitation alone through October 2001. In November, the diversion was again closed and the water levels in the pond therefore remained low through the end of the study period despite high rainfall in November and December 2001.

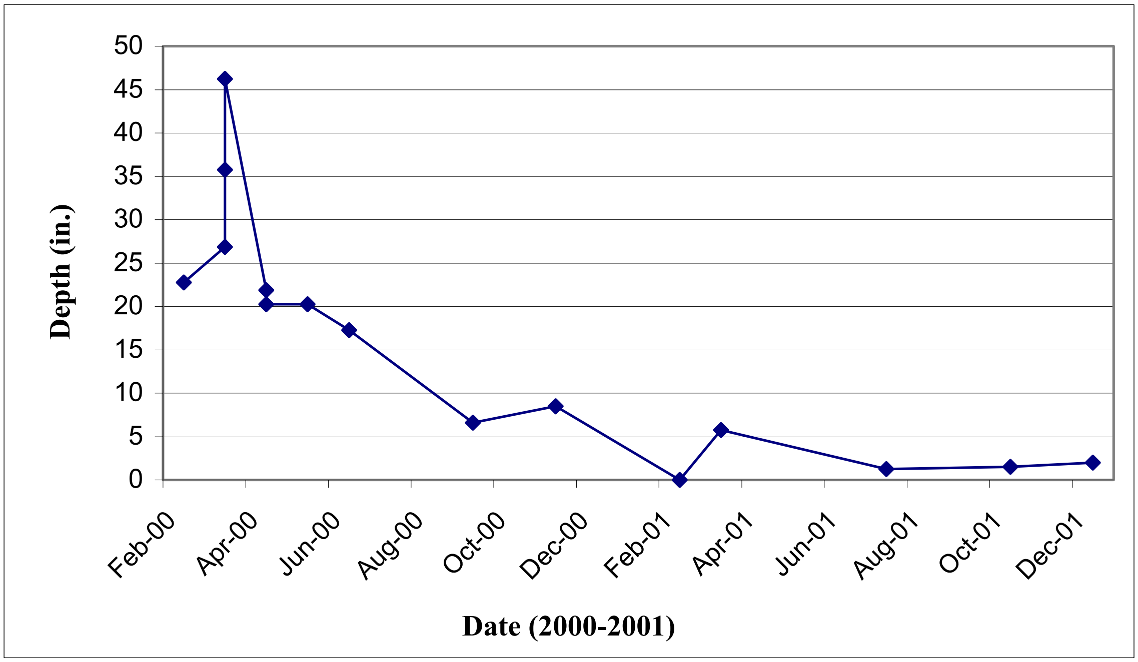

Figure 5.5-6. Water levels in Cedar Grove wetland.

Bankers Pond is fed by both Frazier Creek and drainage from Cedar Grove Pond, as well as precipitation. Consequently, when the diversion at Frazier Creek was inadvertently set to send more water into Cedar Grove in March 2000, the amount of water remaining in the creek and entering Bankers Pond was simultaneously reduced (Figure 5.5-6). As a result, water levels in Bankers Pond decreased about 7 inches (18 cm) between February and the end of April 2000 (Figure 5.5-7). Once the diversion was reset correctly, water levels increased. Normal low precipitation in summer 2000, and the resulting decreased flows in Frazier Creek, reduced direct input to Bankers Pond and the amount of overflow from Cedar Grove. Thus, water levels dropped sharply between June and October and remained low through the winter drought in early 2001. Rainfall between February and April 2001 apparently increased the flows in Frazier Creek enough to refill Bankers Pond, and water levels rose more than 15 inches (38.1 cm) in early March 2001 (Figure 5.5-7). Water levels in Bankers Pond remained surprisingly high throughout much of the 2001 summer, most likely the result of considerable beaver activity in the area, which blocked a number of drainage culverts.

Culverts were cleaned out in September of 2001, reducing water levels in October. High precipitation and associated flows in Frazier Creek resulted in high water levels in Bankers Pond in December 2001.

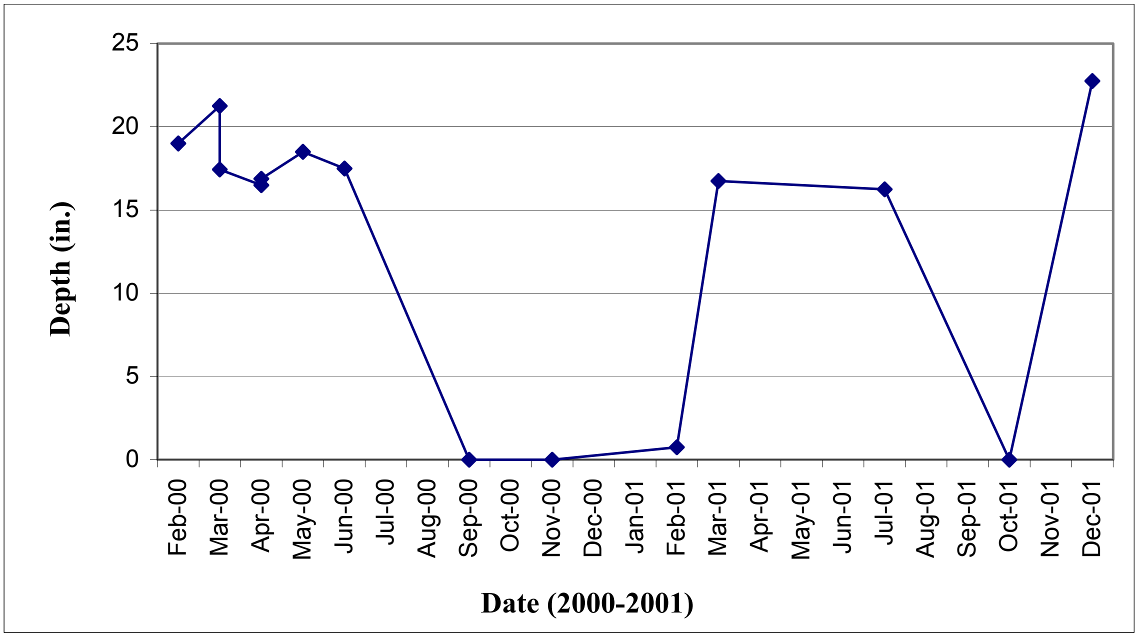

Figure 5.5-7. Water levels in Bankers Pond wetland.

Large Yale Pond Wetland

The 3 Yale ponds were borrow pits for construction of Yale Dam that appear to have been filled by rainfall, groundwater, and surface water drainage. The 3 ponds are hydrologically connected to each other, with drainage from the complex eventually flowing into the Lewis River below Yale Dam. The wetlands are not affected by reservoir or river levels. As would be expected from their origins as borrow pits, the ponds are quite deep (>5 feet [1.5 m]) in most locations, and drop steeply below the water line. There are, however, a few areas with accumulated sediment and relatively shallow water. The staff gage was placed in one of these shallow areas in the largest of the Yale ponds (Figure 5.5-8).

Staff gage data indicated that water levels in the largest Yale pond fluctuated only about 3 inches (7.6 cm) between February and the end of April in both 2000 and 2001 (Figure 5.5-8). In the late summer-fall of both years, however, water levels dropped up to 20 inches (50 cm). In September 2000, the staff gage location had no surface water, although the ground was saturated and the remainder of the pond still retained water. The October 2001 water levels were again quite low at only about 3 inches (7.6 cm). Rainfall during the winter and early spring was below normal during 2000 /2001, and remained low through the summer months.

Thus, a substantial drop in water levels in isolated wetlands is not unexpected. In other words, Yale pond depth closely follows, with an expected lag time, monthly precipitation patterns for the region (Figure 5.5-2).

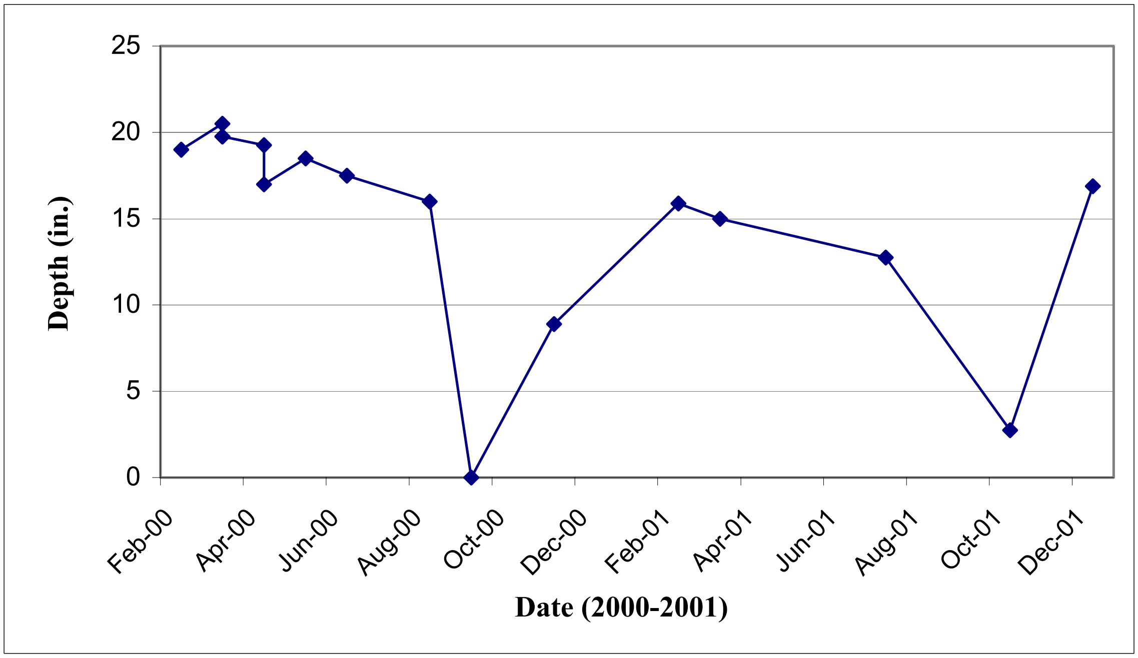

Figure 5.5-8. Water levels in the large Yale pond wetland.

Beaver Bay Wetlands

Water levels in Beaver Bay were monitored from September 2000 through October 2001 using the transducer and a staff gage. The transducer data are variable and the resulting patterns suggest operational failures. The data from the beginning of the study into January 2001 show no fluctuations in water level in the wetland and do not reflect staff gage readings over this period. The transducer appears to function properly from January through July only. In July 2001, the transducer data indicate that the Beaver Bay wetland completely dried up temporarily and, again, do not reflect staff gage readings. Consequently, only the staff gage data were used to evaluate water level changes in Beaver Bay wetlands. Although these measurements are not representative of actual water depths in the wetland, they show water level fluctuation patterns every month for a year (Figure 5.5-9).

Between September 2000 and May 2001, water levels in Beaver Bay wetland fluctuated about 6-7 inches (15.4–17.8 cm). Water levels were very stable during the late-winter and early spring, an important period for breeding amphibians, changing only about 3 inches (7.6 cm).

Overall, the water fluctuation patterns recorded by the staff gage correlate fairly well to the Yale Lake elevation patterns for this period (Figure 5.5-10), although the magnitude is much less. However, the fluctuations are not parallel and should not be expected to be. In addition to being hydrologically connected to Yale Lake, Beaver Bay wetland obtains water from 2 streams. In addition, several large beaver dams maintain much of the water storage.

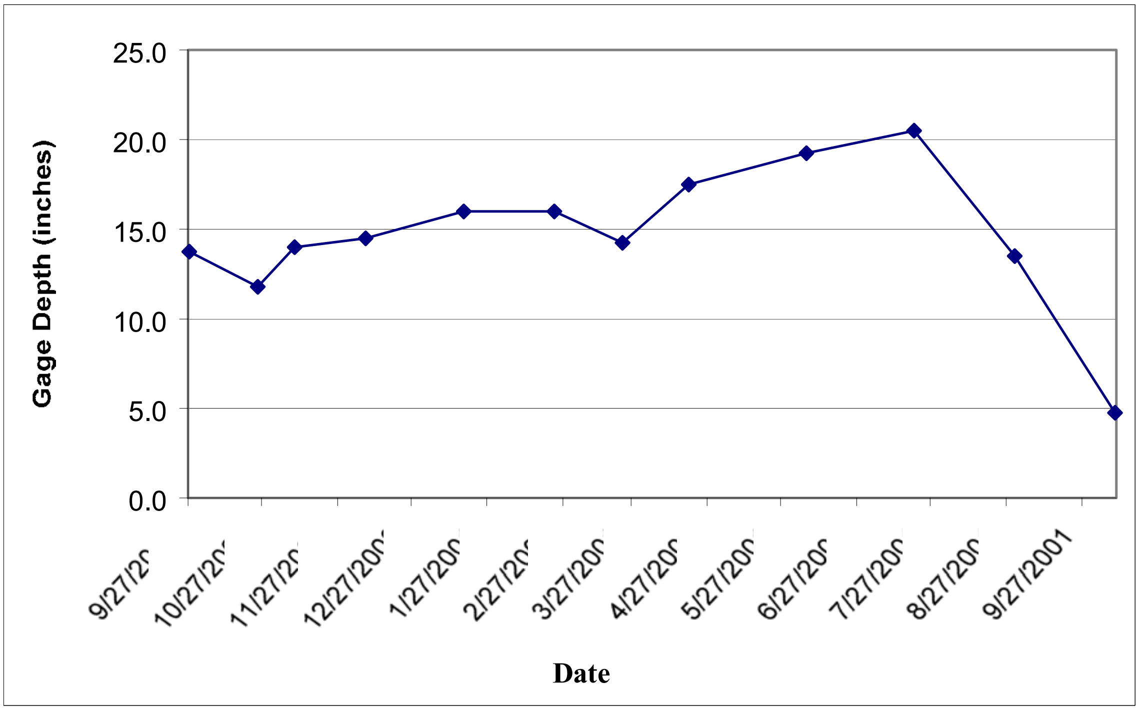

Figure 5.5-9. Gage depth data from Beaver Bay Wetland.

(Source: PacifiCorp)

It would appear the reservoir hydrology has the greatest influence on Beaver Bay water levels during times of low precipitation and inflow, particularly at the end of a drought year. The large reservoir water level decline (15 ft [4.5 m]) during the late summer/fall of 2001 was followed with a precipitous drop in wetland water levels (15 inches [38 cm]). However, the late summer decrease in water levels is a pattern seen in other wetlands monitored during this period and is likely due to low inflows related to normal low precipitation during this time. Although wetland water levels decreased by 15 inches (38 cm), there was little change in the total area of surface water.

5.5.6 Discussion

Over 272 acres (110 ha) of wetlands are known in the study area. These wetlands represent 5 different habitat types, support a diversity of plant species, and are supported by a variety of hydrological regimes. They do, however, have some common characteristics. The larger wetlands in the study area all have an emergent wetland habitat component. Many of these wetlands have been invaded by exotic plant species, such as reed canarygrass (*Phalaris arundinacea*) and blackberry (*Rubus* spp.). These 2 exotics are not unique to wetlands in the study area, and the Botanical Surveys (TER 4) recorded these in many habitat types. Red alder (*Alnus rubra*), salmonberry (*Rubus spectabilis*), rushes (family *Cyperaceae*), and sedges (family *Juncaceae*) are common native plant species observed in the wetland areas.

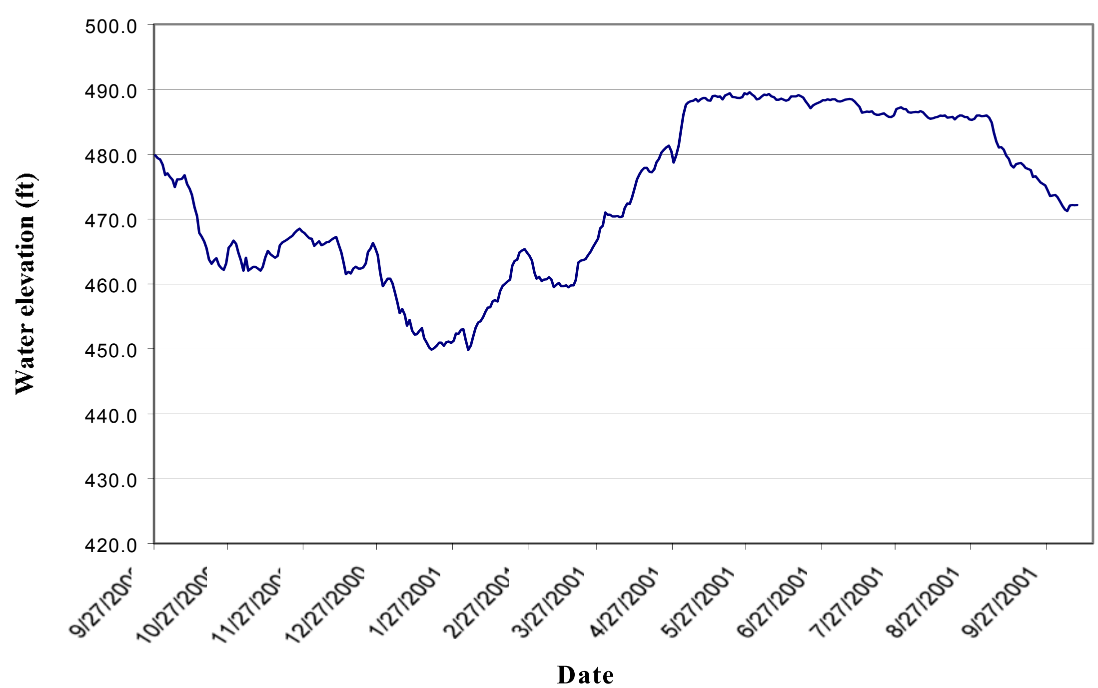

Figure 5.5-10. Water elevation data for Yale Lake.

Wetland hydrology in the study area appears to be substantially influenced by precipitation, at least seasonally. In addition, long-term precipitation trends for the Merwin Dam record station show a steady decline since the mid-1990s (Western Regional Climate Center 2001), and this trend is apparent in the water levels in many of the wetlands in the studied over the 2-year monitoring period. However, other hydrological influences, primarily beaver dams and the projects' standard operating procedures, also affect water levels of study area wetlands. Beaver activity is suspected to have influenced 5 out of the 6 wetlands monitored in 2000 and 2001. The Saddle Dam Farm area is especially impacted by beaver activity due to the reliance on culverts or channelized water to fill these wetlands. These structures are susceptible to blockage from beaver-built debris piles.

Project operations include the controlled drawdown of reservoir levels for power and flood management. Drawdowns affect study area wetlands that are hydrologically connected to the reservoirs. Relatively few wetlands in the study area, however, show evidence of a direct hydrological connection to project reservoirs. Wetlands that are influenced by reservoir water levels include the Beaver Bay, IP, and Yale Park wetlands at Yale; the Speelyai Point, Riparian Bridge, and Buncombe Hollow wetlands at Merwin; and the Drift Creek mouth wetland at Swift. Of these, Beaver Bay and IP have other water sources and do not appear to be greatly affected by reservoir drawdowns. Water levels in both of these wetlands are apparently stable enough to support pond-breeding amphibian species (PacifiCorp 1999). There is no evidence that amphibians successfully breed in the wetlands that do not have alternative sources of water, except the wetland at the mouth of Drift Creek. The shallow water in this aquatic bed wetland is apparently warm enough to provide breeding habitat for the western toad (*Bufo boreas*), a species thought to be declining throughout the Northwest. Tadpoles and toadlets were observed at this site in August 2001 and could be affected by drawdowns earlier in the summer if these wetlands dry out. This area was not surveyed in the March through April period, when Swift Reservoir is typically drawn down, so it is not known if there is enough water during this period to support amphibian species that typically breed in the spring.

Potential management measures to protect and improve wetland conditions in the study area include the following:

- **Water Level Control Structures** – Water levels in wetlands hydrologically connected to the reservoirs could potentially be protected from reservoir fluctuations through the use of control structures that would hold water in wetlands during drawdowns. However, the use of these structures would be limited to wetlands where hydrology and the physical setting would allow these control mechanisms to operate properly. Further study would be needed to determine if any of the reservoir-connected wetlands could be controlled in this manner.

  Water levels in the created wetlands in Saddle Dam Farm are directly controlled by drop inlets and culverts along Frazier Creek. These areas present a management challenge because of beaver activity and because debris can clog the water control structures. Frequent and consistent monitoring in the area may prevent water level fluctuations in wetlands, especially during critical periods for wildlife. These wetlands support breeding populations of red-legged frogs (Rana aurora), tree frogs (*Pseudacris regilla*), rough-skinned newts (*Taricha granulosa*), bullfrogs (*R. catesbeiana*), and northwestern salamanders (*Ambystoma macrodactylum*). It might be possible to enhance breeding for native species by reducing bullfrog populations by completely draining several of the wetlands in the fall.

- **Recreation Controls/Plans** – Recreational use currently impacts a few of the wetlands in the study area. The Beaver Bay wetland complex is adjacent to a developed campground. Although there are no apparent direct impacts from campers, the wetland has a history of flooding into the campground. In the past, several small berms have been constructed to prevent water from the wetland from flooding facilities. This problem could be addressed by developing an alternative water control plan, or by reconfiguring the campground.

  The wetland across from the boat ramp at Swift Camp has been impacted by dispersed camping, as seen through direct and indirect habitat disturbances. Direct disturbances include cutting trees and clearing shrubs for campsites and camping activities. Indirect impacts include vegetation trampling and waste dumping. These impacts could be managed by hardening the site, or by banning camping in this area. A recreational monitoring plan is currently being developed for PacifiCorp operations, and these wetlands should be protected from recreational activities and monitored in the future.

- **Habitat Restoration/Enhancement Activities** - Other management actions that would improve wetlands in the study area involve habitat restoration procedures. Measures to control exotic plant species would benefit most wetland areas. However, the control of species such as blackberry and reed canarygrass is labor-intensive and should be focused on wetlands with the greatest potential for success, such as smaller, hydrologically isolated wetlands in relatively pristine settings. Other habitat enhancements, such as planting native emergent vegetation and hydrophytic shrubs, and creating snags, are not as labor intensive. However, treatment sites must be chosen carefully and monitoring protocols need to be developed to ensure success.

5.5.7 Schedule

The Wetland Information Synthesis Study is completed; no additional tasks are anticipated for 2002.

5.5.8 References

Dueker, J.K and A.S. Paz. 1995. Inventory and assessment of, and management alternatives for wetlands at Yale Reservoir. Prepared for PacifiCorp. Portland, OR. 104 pp.

PacifiCorp and Cowlitz PUD. 1999, as amended. Study Plan Document for the Lewis River Hydroelectric Projects. Draft. Portland, OR, and Longview, WA. October 29, 1999, as amended.

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5.5.9 Comments and Responses on Draft Report

This section presents stakeholder comments provided on the draft report, followed by the Licensees' responses. The final column presents any follow-up comment offered by the stakeholder and in some cases, in italics, a response from the Licensees.

Commenter	Volume	Page/ Paragraph	Statement	Comment	Response	Response to Responses
WDFW – KAREN KLOEMPKEN	2	TER 05-28 Sec. 5.5.6 Discussion; para 1 on the page	Discussion on wetland at the mouth of Drift Creek.	Why wasn't this area surveyed during the March thru April period when Swift Reservoir is typically drawn down? Wasn't that the reason for choosing this wetland, to see what it does during the drawdown of Swift Reservoir?	This wetland was not surveyed in March-April for 2 reasons: (1) its presence was not known until 2001 summer surveys and (2) it is virtually impossible to reach when the reservoir is drawn down.	
WDFW – KAREN KLOEMPKEN	2	TER 05-28 Water Level Control Structures; para 2	Beaver activity and debris.	There are ways to modify culverts to keep beavers form clogging them up, and brush screens that would help the culverts from being clogged up.	Comment noted.	