CHAPTER 8 LEWIS RIVER

8.1 Lewis River

This chapter describes the shoreline waterbodies within the Lewis River basin, part of the Lewis River watershed which is designated as Water Resource Inventory Area (WRIA) 27. Waterbodies that drain directly to the Lewis River and lakes within the floodplain of the Lewis River are included. The Lewis River basin includes three shorelines of statewide significance (Lewis River, Lake Merwin and Yale Reservoir), and 11 other shorelines of the state (see Maps 8-1 through 8-4 included at the end of this chapter for location of waterbodies and reach breaks). Waterbodies are organized with shorelines of statewide significance listed first, and then shorelines of the state listed in geographic order moving from downstream to upstream.

8.1.1 Physical and Biological Characterization

8.1.1.1 Drainage Basin and Tributary Streams and Associated Wetlands

Lewis River, otherwise known as the North Fork Lewis River, is a shoreline of statewide significance, and forms the northern border of Clark County. Siouxon Creek and Cedar Creek are two of the largest tributaries. The Lewis River originates on the south slopes of Mount St. Helens and Mount Adams. From its point of origin in Skamania County, the Lewis River flows 93 miles through portions of Skamania, Clark, and Cowlitz Counties, effectively draining an area of 1,050 square miles (EA Engineering, 1999).

The Lewis River flows southwesterly, entering three impoundments including Swift Reservoir (river mile [RM] 47.9), Yale Lake (RM 34.2), and Lake Merwin (RM 19.5) before entering the Columbia River at RM 88 (Wade, 2000). The reservoirs are complete barriers to upstream migration of anadromous salmonids, which has eliminated 80 percent of historically accessible reaches of the Lewis River (WDW/WDF, 1993). The lower and middle sections of the Lewis River form the boundary between Clark and Cowlitz Counties (Appendix A, Map 4). The lower 12 miles of the Lewis River is within a broad flat floodplain, with the lower 11 miles being tidally influenced by the Columbia River (Wade, 2000).

Major tributaries entering the Lewis River from below Lake Merwin and on the Clark County side (left bank) include: Cedar Creek (RM 15.7), Siouxon Creek, and the East Fork Lewis River (RM 3.5). Numerous smaller tributaries also discharge to the Lewis River.

The upper portion of the Lewis River watershed is forested and large areas are managed as commercial timberland. The U.S. Forest Service manages over half of the watershed (LCFRB, 2006). Yale Reservoir and Lake Merwin are impoundments of the upper Lewis River within the shoreline planning area. A third impoundment, Swift Reservoir, is located upstream of Yale Reservoir in Skamania County.

Below the reservoirs, the river flows through rural, agricultural, and low-density residential areas with patches of forest. The area around Woodland near Horseshoe Lake is more urbanized. The
lowermost reaches downstream of I-5 flow through agricultural lands; while this area is tidally influenced, farms are protected by dikes.

Eight-hundred and eighty-eight acres of wetland habitat are mapped in the Lewis River shoreline planning area. Most of the wetlands are located in the river floodplain downstream of the reservoirs. Wetland habitat types mapped by the National Wetland Inventory (NWI) include palustrine forested, scrub-shrub, and emergent. Large wetland complexes are mapped near the mouth of the river, around the East Fork Lewis River confluence, and just upstream of Woodland.

8.1.1.2 Process and Channel Modifications

Primary process and channel modifications in the Lewis River watershed include:

- Dams and reservoirs that control flows, limit channel migration and interrupt the transport of large woody debris (LWD) and sediment;
- Lower seven miles of the Lewis River is almost completely diked primarily to protect agricultural uses (R2 Resource Consultants, 2004a);
- Lower seven to 15 miles of the Lewis River has been riprapped to protect residential and road development (R2 Resource Consultants, 2004a);
- Increase in impervious area;
- Levees and gravel extraction;
- Bank armoring and dredging;
- Floodplains that may have existed above the dams have been inundated, in part, by reservoirs;
- Historical clearing of riparian areas and removal of LWD; and
- Development adjacent to river.

Historically, the Lewis River deposited sediment in a delta that reached into the Columbia River floodplain. The Lewis River migrated across the delta as sediment built up in delta distributary channels (R2 Resource Consultants, 2004a). This resulted in widening of the floodplain. Human activities adjacent to and in the river have resulted in a floodplain area that is 88 percent less than the former unconstrained floodplain for the lower 15.5 miles of the Lewis River (R2 Resource Consultants, 2004a). The area for natural geomorphic processes to occur, such as sediment deposition, bank erosion, channel migration, and off-channel habitat development, has been reduced dramatically. The change in these processes was the result of placing dams on the river to generate hydropower and impoundment of the Lewis River creating the Yale Reservoir and Lake Merwin.

8.1.1.3 Geologic and Flood Hazard Areas

Flood hazards along most of the Lewis River are associated with high streamflow and large rainfall events. The floodplain extends from less than 0.1 mile wide in the area immediately downstream of Lake Merwin and Yale Lake to approximately a mile wide in a low-lying area, northeast of Woodland (Appendix A, Map 6). The Lewis River is classified as having a moderate-low to high potential for channel migration (Olson, 2010; Appendix A, Map 27). Severe erosion hazards are located adjacent to the upstream reaches of the Lewis River.
(Appendix A, Map 12). Unconsolidated sediment is located in the lower reach and semi-consolidated sediment in the middle reach. The furthest upstream reach includes consolidated sediment. Seismic hazards are highest closer to the confluence with the Columbia River (Appendix A, Map 13) where more unconsolidated sediment is located. Areas of potential instability and slopes greater than 15 percent occur adjacent to the Lewis River, resulting in landslide hazards (Appendix A, Map 14).

8.1.1.4 Critical or Priority Habitat and Species Use

The lower Lewis River below Lake Merwin supports a number of anadromous salmonids including summer and winter steelhead, fall and spring Chinook salmon, coho salmon, fall chum salmon, and sockeye salmon (Appendix A, Map 16). The Lower Columbia River (LCR) populations of all of these fish species as well as bull trout are federally listed as threatened under the Endangered Species Act.

The historic distribution of spring Chinook salmon extended above Swift Reservoir into the upper reaches of the Lewis River and several tributaries in Skamania County; however, the vast majority of habitat became inaccessible following completion of the dam on Lake Merwin. Currently, spring Chinook salmon spawn in the reach between Cedar Creek and the outlet from Lake Merwin (RM 15 to RM 19.5) (WDFW 2008a; WDFW, 2009b). Rearing generally occurs from RM 15 downstream to the confluence with the Columbia River. Fall Chinook salmon historical distribution extended partially into the Lake Merwin reservoir. Spawning and rearing habitat is similar to that of spring Chinook. Fall Chinook (“brights”) in the lower Lewis River are the only fall Chinook stock in the lower Columbia River to maintain a healthy wild population with negligible hatchery influence.

Coho salmon were once abundant within the Lewis River, with their distribution extending as far upstream as RM 60 (WDW/WDF, 1993). With the construction of the Merwin Dam in 1931 and subsequent construction of the Yale Lake Dam, access to 80 percent of historic spawning and rearing habitats was eliminated (WDW/WDF, 1993). Coho salmon within the Lewis River are now managed for hatchery production with the vast majority of returns spawning in tributary streams such as Cedar Creek (WDF, 1973).

Winter steelhead spawn from the confluence of Staples Creek (Cowlitz County) upstream to the outlet of Lake Merwin and likely rear within all accessible reaches of the mainstem and tributary streams (WDFW, 2009a; WDFW, 2009b). Summer steelhead are indigenous to the Lewis River watershed (Wade, 2000). The majority of spawning occurs in the East Fork Lewis River. Chum salmon spawn and migrate within the lower portion of the Lewis River, with observations of spawning adults as far upstream as the Lake Merwin Dam (Wade, 2000; R2 Resource Consultants, 1999). The Washington Department of Fish and Wildlife (WDFW) Priority Habitats and Species (PHS) database indicates documented presence upstream to the Lake Merwin Dam (WDFW, 2009a and WDFW, 2009b).

The Lewis River within Clark County is designated as critical habitat for LCR populations of steelhead, chum salmon, and Chinook salmon from RM 0 to the outlet of Lake Merwin at RM 19.5 (70 FR 170). The Lewis River also contains designated critical habitat for LCR bull trout.
from RM 0 to RM 19, one-half mile downstream of the Lake Merwin Dam. Critical habitat for LCR coho salmon has not been designated at this time and is currently under review.

Other priority fish species identified as occurring within the Lewis River include resident coastal cutthroat trout, rainbow trout, and mountain whitefish. Other priority habitats and species, as identified by WDFW (Appendix A, Map 11), along the Lewis River include riparian habitat, wetlands, cavity nesting ducks, bald eagles, elk, and oak woodlands (WDFW 2009a).

The Washington Department of Natural Resources (WDNR) Natural Heritage Program identified the vegetation association of Pacific willow / Columbia willow within the Lewis River shoreline planning area (WDNR, 2008).

8.1.1.5 Instream and Riparian Habitats

The system of dams on the Lewis River is the most significant limiting factor for anadromous salmonids within the system. Construction of the Merwin Dam eliminated nearly 80 percent of available steelhead habitat in the mainstem Lewis River, above the confluence with the East Fork Lewis River (Wade, 2000).

The lower seven miles of the Lewis River is almost entirely disconnected from the historical floodplain due to extensive diking, which protects farmlands to the north near Woodland and the city of Woodland. Bank stability in the diked areas is considered “good”. Above RM 7 extending to RM 15, many areas have been armored with riprap to protect roads and residential development; however there are some areas where the stream is still connected to wetlands and off-channel habitats, especially around Eagle Island (RM 9.9 to RM 11.8) and the Happa Boat Launch at RM 14 (Wade, 2000). Above RM 15, the channel is confined within a narrow canyon and floodplain access is not an issue.

The Lewis River is tidally influenced to approximately RM 11 and is essentially a backwater to the Columbia River. The lower seven miles extending upstream to the city of Woodland is one continuous pool when the Columbia River is high. Pool conditions are considered “good” from RM 7 to RM 15; although this habitat is more similar to glide habitat (Wade, 2000). Pool habitat from RM 15 to Merwin Dam is largely controlled by the bedrock channel, and pool quantity and quality are considered similar to that which would have occurred under historical conditions (Wade, 2000). As a result, the amount, size, and condition of LWD, as well as potential for future recruitment within the system, are considered “poor.”

Bank stability is somewhat correlated with floodplain connectivity. Areas where diking has occurred are protected with riprap armoring and, therefore, the lower seven miles are fairly stable. Some areas of mass wasting occur above Woodland. The stream reach above RM 15 is confined within a bedrock canyon and bank stability is excellent (Wade, 2000). Fine substrates comprise the lower 11 miles of tidally influenced river channel. The condition of substrate below the spawning reaches has not been documented. However, gravel conditions assessed by Stillwater Sciences in 1998 in reaches below Merwin Dam indicated that spawning gravels are in “good” condition and embeddedness with fine sediment is fairly minimal (Wade, 2000).
Riparian conditions below RM 15 have been altered by residential development and farming activities and are in “poor” condition. Above RM 15 up to Merwin Dam, these conditions improve dramatically, especially on the south side of the river in Clark County.

Flows are largely managed by PacifiCorp who operates the dam under the Merwin Project licensing agreement with the Federal Energy Regulatory Commission (FERC). WDFW has worked with PacifiCorp to increase spring flows to protect fall Chinook salmon rearing habitat under an amendment to Article 49 of the PacifiCorp Licensing Agreement (Wade, 2000).

8.1.1.6 Water Quality

According to the 2008 Washington State Water Quality Assessment (Ecology, 2008), the Lewis River has two 303(d) Category 5 listings for total dissolved gas (TDG) (Appendix A, Map 15). The Lewis River has six other Category 5 listings for temperature and TDG, which are documented in the portion of the Lewis River in Skamania County. The Lewis River has seven Category 1 listings for temperature within the Clark County portions of the Lewis River and one Category 2 listing for TDG in the Skamania County portion of the Lewis River. Category 1 listings indicate that the stream meets tested criteria for that parameter. Category 2 indicates a water of concern for that parameter.

8.1.2 Shoreline Use Patterns

8.1.2.1 Existing Land and Shoreline Uses

The Lewis River shoreline planning area runs from the Merwin Dam to the Columbia River and from the upstream end of Yale Lake to the county boundary. Downstream from Merwin Dam, the river flows through rural and agricultural lands, with development density increasing as the river flows west. The planning area is completely within unincorporated Clark County. Existing uses in the shoreline planning area are characterized by the Merwin Dam, undeveloped riparian areas along the river’s canyon walls, rural residential development and small scale agriculture on the uplands. There are also significant park lands within the planning area.

Residential development intensity increases in the vicinity of the city of Woodland, where the river bends to the south. Immediately south of the East CC Street Bridge there is a mobile home park with homes located directly on the water’s edge. Downstream of I-5 and the city of Woodland, existing uses in the shoreline planning area are less intense, consisting of rural residential development, agricultural uses and undeveloped lands.

Upstream of Yale Lake, the shoreline planning area is completely within WDNR lands and uses are related to forestry. There is a bridge across the river, which connects to Lewis River Road on the north shore.

The Lewis River shoreline is crossed by the East CC bridge, I-5 and the Burlington Northern railroad, and near the county boundary north of Yale Lake. There are several minor roads and access roads within the shoreline planning area. There are no other shoreline modifications mapped along the river. Water-oriented uses include the Merwin and Yale Dams as well as boating facilities.
8.1.2.2 Environment Designations, Zoning and Other Regulations

The Lewis River lies almost entirely within the jurisdiction of Clark County, with a small portion in the City of Woodland urban growth area (UGA). More than half of the Lewis River shoreline planning area has a Rural environment designation, intended for intensive agriculture and recreation. Other designations in this area include Conservancy, intended for more limited development, and a small portion of Urban reserved for higher intensity development. This area is surrounded mostly by property zoned as forest and single-family residential. There is also some land zoned as agriculture, and small portions of parks and open space and industrial. A summary of the zoning designations along the Lewis River is shown in Table 8-1.

Table 8-1. Lewis River Zoning

<table>
<thead>
<tr>
<th>Zoning Designation</th>
<th>Acreage</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>238</td>
<td>13%</td>
</tr>
<tr>
<td>Forest</td>
<td>730</td>
<td>39%</td>
</tr>
<tr>
<td>Industrial</td>
<td>19</td>
<td>&lt; 1%</td>
</tr>
<tr>
<td>Parks &amp; Open Space</td>
<td>20</td>
<td>&lt; 1%</td>
</tr>
<tr>
<td>Residential – Single-Family</td>
<td>875</td>
<td>47%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,882</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

8.1.2.3 Existing Public Access

There are relatively few formal public access opportunities along the free-flowing section of the Lewis River. Eagle Island is an undeveloped area planned for conservation and management as a natural area with critical habitat. The Haapa Boat Launch facilities, located just west of the Cedar Creek confluence with the Lewis River, also provide camping, swimming, and picnic facilities. In addition, this planning area has several miles of planned trails and public lands owned by WDNR and WDFW. A summary of the Lewis River public access facilities is shown in Table 8-2. See also public access for Lake Merwin and Yale Lake.

Table 8-2. Lewis River Public Access Facilities

<table>
<thead>
<tr>
<th>Facility Name</th>
<th>Facility Type</th>
<th>Area or length within Shoreline</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eagle Island</td>
<td>Natural Area</td>
<td>307 acres</td>
<td>Undeveloped</td>
</tr>
<tr>
<td>Haapa Boat Launch</td>
<td>Regional Park</td>
<td>11 acres</td>
<td>Developed</td>
</tr>
<tr>
<td>DNR</td>
<td>Natural Area</td>
<td>25 acres</td>
<td>Undeveloped</td>
</tr>
<tr>
<td>WDFW</td>
<td>Natural Area</td>
<td>36 acres</td>
<td>Undeveloped</td>
</tr>
<tr>
<td>PacifiCorp</td>
<td>Quasi-public</td>
<td>&lt; 1 acre</td>
<td>--</td>
</tr>
<tr>
<td>North Fork Lewis River Trail</td>
<td>Trail</td>
<td>2.8 miles</td>
<td>Proposed</td>
</tr>
<tr>
<td>Unnamed Trails</td>
<td>Trail</td>
<td>5.4 miles</td>
<td>Proposed</td>
</tr>
</tbody>
</table>
8.1.2.4 Historical and Cultural Resources

Archaeological Resources

There is only one recorded archaeological site within the Lewis River shoreline planning area, a pre-contact lithic material / pre-contact camp site. As with other shoreline reaches in Clark County without recorded archaeological sites, there remains a significant probability that unknown resources are present in the shoreline planning area (Clark County, 2003).

Historic Sites

Historic resources are documented through a variety of sources. Official registers include the National Register of Historic Places and the Washington State Heritage Register. The Washington Information System for Architectural and Archaeological Records Data (2010) was used to identify state and federal historic resources within the Lewis River shoreline planning area, as well as other shoreline areas in Clark County.

There is one registered historic site in the Lewis River shoreline planning area, the Judge Columbia Lancaster House (Photo 8-1). Built around 1850, it is probably the oldest frame mansion in the State of Washington (National Register of Historic Places Registration Form – Judge Columbia Lancaster House, 1975).

Photo 8-1. Judge Columbia Lancaster House.

8.1.2.5 Areas of Special Interest

According to the Ecology facilities/sites data base, there is one monitored Underground Storage Tank, and one Leaking Underground Storage Tank (Ecology, 2010) in the Lewis River shoreline planning area (sub-reach LEWI_RV_02a).
8.1.3 Opportunity Areas

8.1.3.1 Restoration and Protection

The Salmon and Steelhead Limiting Factors report for WRIA 27 (Wade, 2000) identifies that the main limitation to salmonid habitat on the Lewis River is the system of dams, which block access to historic habitat areas. Restoration opportunities include reconnecting the lower river to off-channel and floodplain habitats, and replanting degraded areas with native conifers. Protecting off-channel habitat around Eagle Island and spawning habitat in the mainstem between Merwin Dam and Cedar Creek is also recommended.

In addition to managing flows from the hydropower system, restoration opportunities for the middle Lewis River include addressing agricultural and rural/suburban development impacts to floodplains and riparian areas, and using land use planning to protect habitat and watershed processes. In the upper basin, restoration should address agricultural and forestry impacts to stream corridors (LCFRB, 2006).

A wetland mitigation bank is proposed at the confluence of Gee Creek, the East Fork Lewis River, and the Columbia River, encompassing Lancaster Lake (within reach LEW_RV_01). The property consists of several thousand acres of pastureland located north of Ridgefield National Wildlife Refuge. The site provides an opportunity to restore degraded pasture to floodplain wetlands, and to provide habitat connectivity between the wildlife refuge, the rivers, and surrounding agricultural fields (Clark County Mitigation Partners, 2007).

8.1.3.2 Public Access

The Lewis River shoreline planning area consists predominantly of rural residential uses. There is very little public access available currently. Potential opportunity areas for additional public access could include street ends and riparian buffers, particularly in the areas south and west of Eagle Island.

8.1.4 Reach Scale Assessment

The Lewis River has been divided into four reaches based upon criteria described in Chapter 2.3.2. Table 8-3 provides a brief description of each reach and highlights key modifications, unique features and restoration opportunities.
Table 8-3. Reach Assessment for Lewis River

<table>
<thead>
<tr>
<th>Reach Number</th>
<th>Reach Location</th>
<th>Reach Length (miles)</th>
<th>Use Descriptions</th>
<th>Modifications</th>
<th>Unique Features</th>
<th>Riparian Zones</th>
<th>Restoration Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEWI_RV_01</td>
<td>From the confluence with the Columbia River to the confluence with the East Fork of the Lewis River</td>
<td>3.4</td>
<td>Rural. Agriculture. Limited development.</td>
<td>Major levees Railroad bridge crossing</td>
<td>Approximately 313 acres of high quality wetland. Tidal influence</td>
<td>Mix of forested patches and areas cleared for agriculture. Agriculture extends to river bank. Little to no shrubs or trees.</td>
<td>Enhance fish habitat and restore migration. Enhance associated wetlands Restore riparian zones by planting trees. Reconnect river to floodplain.</td>
</tr>
<tr>
<td>LEWI_RV_03</td>
<td>From the confluence with Cedar Creek to the dam on Lake Merwin.</td>
<td>3.9</td>
<td>Rural. Agriculture. Small residential developments.</td>
<td>Dam; upstream section ends at Merwin Dam Fish hatchery Steep slopes and canyon</td>
<td>Forested riparian zone.</td>
<td></td>
<td>Enhance river for fish habitat and restore migration. Protect intact riparian areas.</td>
</tr>
<tr>
<td>LEWI_RV_04</td>
<td>Upstream of Yale Lake to the Clark /Skamania County boundary.</td>
<td>1.0</td>
<td>Rural. Forested.</td>
<td>River flows into impounded reservoir; reach upstream of Yale Lake Southern land is DNR owned public lands.</td>
<td>Moderate. Dense forest in surrounding area but shoreline has been modified.</td>
<td>Protect intact riparian zones</td>
<td></td>
</tr>
</tbody>
</table>
8.2 Lake Merwin

8.2.1 Physical and Biological Characterization

8.2.1.1 Drainage Basin and Tributary Streams

Lake Merwin is a 4,090-acre impoundment of the Lewis River created by the construction of 240-foot-high Merwin Dam at RM 20 of the Lewis River. Merwin Dam is the first of three dams constructed along the Lewis River. Lake Merwin and the Lewis River form the boundary between Clark and Cowlitz Counties. The area of Lake Merwin within Clark County is approximately 2,128 acres with a shoreline length of 27.45 miles. In addition to the Lewis River, Buncombe Hollow Creek, Cougar Creek, and numerous small unnamed tributaries feed into Lake Merwin along the Clark County shoreline. Water flows from Lake Merwin through the spillway at Merwin Dam to the Lewis River below (Reach 3).

Eighty-three acres of the Lake Merwin shoreline planning area are mapped as wetland by Clark County. PacifiCorp identified numerous wetlands on their properties along Lake Merwin; they are mainly palustrine scrub-shrub but also include forested and emergent habitat types. Most of the PacifiCorp property wetlands are located upslope from the reservoir, or are artificially created and maintained, with only a few wetlands hydrologically connected to the reservoir (PacifiCorp and Cowlitz PUD, 2004b).

8.2.1.2 Process and Channel Modifications

Lake Merwin was built in 1931 on the Lewis River. The Merwin Dam is an arch type dam that is 313 feet high (Lewis River Valley, 2010). The reservoir controls flow downstream along the Lewis River and encompasses an area of 4,040 acres. The Merwin Dam is located 20 miles upstream of the confluence of the Columbia and Lewis Rivers and serves as a re-regulating facility to control downstream flows (HDR and EES, 2006). The lake has changed the Lewis River hydroperiod and natural geomorphic processes downstream of the lake. The Lewis River channel downstream of Lake Merwin is confined.

8.2.1.3 Geologic and Flood Hazard Areas

The Lake Merwin floodplain is confined by the dam (Appendix A, Map 6). As long as the dam is functioning properly, the flood risk adjacent to the lake is minimal. Flooding at Lake Merwin would primarily occur during high streamflow and rainfall events in the winter months. Lake Merwin was historically in an area that was part of the Lewis River channel migration zone (CMZ). There are severe erosion hazards adjacent to the reservoir (Appendix A, Map 12). Most of the reservoir and adjacent land has semi-consolidated sediment and some earthquake hazard (Appendix A, Map 13). There are landslide hazards in areas with slopes greater than 15 percent and areas of potential instability (Appendix A, Map 14).

8.2.1.4 Critical or Priority Habitat and Species Use

Anadromous salmonid access to over 80 percent of historically accessible habitat was blocked by the construction of four hydroelectric projects on the Lewis River (two Swift Dams, Yale and Merwin Dams) (Wade, 2000). Today, Lake Merwin still contains a resident population of bull
trout, which is listed as threatened under the Endangered Species Act (WDFW, 2009a; WDFW, 2009b).

Other priority habitats and species, as identified by WDFW, which occur adjacent to Lake Merwin and within the shoreline planning area include: Rocky Mountain and Roosevelt elk wintering range, bald eagle concentrations, and bald eagle communal roosts (WDFW, 2009a).

The WDNR Natural Heritage Program has not identified priority plant species or vegetation communities within the Lake Merwin shoreline planning area (WDNR, 2008).

8.2.1.5 Instream and Riparian Habitats

Habitat conditions within and adjacent to Lake Merwin are not well documented. A few free-flowing reaches between Merwin and Yale Reservoirs and between Yale Reservoir and Swift Reservoir in Skamania County do exist. Other than water quality parameters, assessment of habitat conditions is not readily available. Bull trout do occur within the reservoirs, but they spawn in upper reaches of tributary streams.

8.2.1.6 Water Quality

According to the 2008 Washington State Water Quality Assessment (Ecology, 2008), Lake Merwin has one 303(d) Category 5 listing for PCBs in tissue samples. In addition, Lake Merwin has 18 Category 1 listings for a variety of contaminants sampled for in tissues. Contaminants include both heavy metals and pesticides, among others. Category 1 listings indicate that the waterbody meets tested criteria for that parameter. Lake Merwin also has one Category 2 listing for 2,3,7,8 – TCDD (Ecology, 2008). Category 2 indicates a water of concern for that parameter.

8.2.2 Shoreline Use Patterns

8.2.2.1 Existing Land and Shoreline Uses

Lake Merwin extends approximately 6.5 miles, measured from Merwin Dam to Yale Dam. All of the lands within the shoreline planning area are owned and managed by PacifiCorp. Only the south shore of the lake is in the Clark County shoreline planning area. Existing uses in the general vicinity of the lake are predominantly forestry. Within the shoreline planning area, uses are characterized by undeveloped forest lands. Lands adjacent to the lake are used for recreation.

Approximately midway up the lake there are a limited number of privately held lots that contain homes and/or mobile homes; however there are no structures in the shoreline planning area. Further up-lake, approximately 1.5 miles west of the SR 503 bridge, the Lake Merwin Campers Hideaway offers vacation amenities and RV structures near the shoreline. There is a boat lunch and trailer parking, a swimming area and a moorage dock associated with this facility.

There are limited transportation facilities within the shoreline planning area. A roadway allows cars access to the boating, parking and recreational facilities associated with the Lake Merwin Campers Hideaway. SR 503 crosses the lake via a suspension bridge. There are no other roadways within the planning area.
8.2.2.2 Shoreline Environment Designations and Zoning

Lake Merwin lies entirely within County lands. All 284 acres of this shoreline planning area are zoned for forest uses and have the shoreline environmental designation of Conservancy. The WDNR owns approximately three acres of this area.

8.2.2.3 Existing Public Access

Public access to Lake Merwin is available at the north end of the lake in Cowlitz County. There are several campgrounds and boat launch facilities. There is currently no public access to Lake Merwin from the Clark County shoreline planning area. A portion of the proposed North Fork of the Lewis River Trail will cross the Lake Merwin shoreline planning area. A summary of the public access opportunities is shown in Table 8-4.

<table>
<thead>
<tr>
<th>Facility Name</th>
<th>Facility Type</th>
<th>Area or length within Shoreline</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>DNR Natural Area</td>
<td>Natural Area</td>
<td>3 acres</td>
<td>Proposed</td>
</tr>
<tr>
<td>PacifiCorp</td>
<td>Quasi-public</td>
<td>194 acres</td>
<td>Undeveloped</td>
</tr>
<tr>
<td>North Fork of the Lewis River Trail</td>
<td>Trail</td>
<td>1.1 miles</td>
<td>Proposed</td>
</tr>
</tbody>
</table>

8.2.2.4 Historical and Cultural Resources

Archaeological Resources

Cultural resources within the Lake Merwin shoreline planning area include four pre-contact sites, all characterized as lithic material sites. In addition there is an unregistered historic object documented along the lake shoreline. Many of the archaeological sites in the Lake Merwin shoreline planning area were likely inundated during the development of the reservoir.

Historic Sites

Historic resources are documented through a variety of sources. Official registers include the National Register of Historic Places and the Washington State Heritage Register. The Washington Information System for Architectural and Archaeological Records Data was used to identify all state and federal historic resources within the Lake Merwin shoreline planning area, as well as all other shoreline areas in Clark County.

There is only one registered site within the shoreline planning area, the Yale Bridge (Photo 8-2). The bridge was designed by H.H. Gilbert and built in 1932 in a joint agreement between Clark and Cowlitz Counties (National Register of Historic Places Registration Form – Cedar Creek Grist Mill, 1982).
8.2.5 Areas of Special Interest

The Lake Merwin shoreline planning area contains three Ecology-listed sites: two Underground Storage Tanks and one Leaking Underground Storage Tank that was cleaned up in 2002. These sites are located within County jurisdiction (MERW_LK_01).

8.2.3 Opportunity Areas

8.2.3.1 Restoration and Protection

To offset habitat impacts resulting from continued operation of its hydroelectric projects on the Lewis River, PacifiCorp Energy manages 10,085 acres around the reservoirs in accordance with the Lewis River Wildlife Habitat Management Plan. The plan includes wildlife habitat goals, objectives, and management actions for the several types of habitat found on these properties (e.g., forest, old growth, riparian areas, wetlands, etc.) and includes measures for managing invasive species (PacifiCorp, 2008). The licenses for the dams include plans to reintroduce anadromous fish to 170 miles of habitat upstream of the dams (PacifiCorp, 2009). In addition, PacifiCorp administers the Lewis River Aquatics Fund, which supports projects to enhance and improve wetlands, riparian, and riverine habitats in support of salmonid recovery (PacifiCorp and Cowlitz PUD, 2009).

8.2.3.2 Public Access

This area is undeveloped and used for habitat conservation. Other than the proposed trail, no other opportunities are identified at this time.
8.2.4 Reach Scale Assessment

Lake Merwin has been divided into reaches based upon unique features. Table 8-5 provides a brief description of each reach and highlights key modifications, unique features and restoration opportunities.

Table 8-5. Reach Assessment for Lake Merwin

<table>
<thead>
<tr>
<th>Reach Number</th>
<th>Reach Location</th>
<th>Reach Length (miles)</th>
<th>Use Descriptions</th>
<th>Modifications</th>
<th>Unique Features</th>
<th>Riparian Zones</th>
<th>Restoration Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>MERW_LK_01</td>
<td>From Merwin Dam to narrowing of lake into a canyon to the east.</td>
<td>21.3</td>
<td>Rural. Forested. Agriculture.</td>
<td>Impoundment by Merwin Hydroelectric Project</td>
<td>Marina. Approximately 61 acres of wetland.</td>
<td>High quality. Shrubs and trees extend to shoreline.</td>
<td>Invasive species control and removal. Protect riparian zones and existing habitat.</td>
</tr>
<tr>
<td>MERW_LK_02</td>
<td>From narrow entrance to lake to confluence with Canyon Creek.</td>
<td>4.6</td>
<td>Rural. Forested. Agriculture.</td>
<td>Yale Bridge crosses lake via suspension bridge.</td>
<td>Approximately 22 acres of wetland.</td>
<td>High quality. Shrubs and trees extend to shoreline.</td>
<td>Invasive species control and removal. Protect intact riparian zones and existing habitat.</td>
</tr>
<tr>
<td>MERW_LK_03</td>
<td>From Canyon Creek to Yale Dam.</td>
<td>1.8</td>
<td>Rural. Forested. Agriculture.</td>
<td>Yale Reservoir Dam.</td>
<td>High quality. Shrubs and trees extend to shoreline.</td>
<td></td>
<td>Invasive species control and removal. Protect intact riparian zones and existing habitat.</td>
</tr>
</tbody>
</table>
8.3 Yale Reservoir

8.3.1 Physical and Biological Characterization

8.3.1.1 Drainage Basin and Tributary Streams

Yale Reservoir, or Yale Lake, is an impoundment of the Lewis River located approximately 15 miles upstream of Lake Merwin in a forested and rural agricultural area south of Highway 90. The reservoir is 10.5 miles long with a surface area of 3,800 acres (PacifiCorp and Cowlitz PUD, 2004a).

The reservoir was created by the construction of the 300-foot-high Yale Dam at approximately RM 34 of the Lewis River. Yale Dam is the second of four dams constructed along the Lewis River. Yale Lake and the Lewis River form the boundary between Clark and Cowlitz Counties. The area of Yale Lake within Clark County is 1,840 acres with a shoreline length of 21 miles. In addition to flows from the Lewis River, Siouxon Creek and numerous small unnamed tributaries feed into Yale Lake along the Clark County shoreline.

Approximately 37 acres of the Yale Reservoir shoreline planning area is mapped as wetland by Clark County. Wetland habitat types include palustrine unconsolidated bottom, forested, scrub-shrub, and emergent (PacifiCorp, 1999).

8.3.1.2 Process and Channel Modifications

The Yale Reservoir was built in 1953. The Yale Dam is an earth fill embankment dam that is 323 feet high (Lewis River Valley, 2010). The reservoir controls flow downstream along the Lewis River and encompasses an area of 3,780 acres. The reservoir serves as a peaking facility associated with Lake Merwin, downstream, and Swift Dam, upstream. The reservoir has changed the Lewis River hydroperiod downstream of the reservoir and natural geomorphic processes downstream of the reservoir. The channel downstream of the reservoir now has a confined floodplain.

8.3.1.3 Geologic and Flood Hazard Areas

The Yale Reservoir floodplain is confined to the reservoir area itself (Appendix A, Map 6). As long as the reservoir is functioning properly, the flood risk adjacent to the lake is minimal. Historically, the Yale Reservoir was in an area that may have been part of the Lewis River CMZ. There are severe erosion hazards adjacent to the reservoir (Appendix A, Map 12). Most of the reservoir and adjacent land has consolidated sediment and minimal or no earthquake hazard (Appendix A, Map 13). There are some landslide hazards in areas with steep slopes (Appendix A, Map 14).

8.3.1.4 Critical or Priority Habitat and Species Use

Due to the construction of the Yale and Merwin Dams, anadromous salmonid access to over 80 percent of historically accessible habitat was blocked (Appendix A, Map 16) (Wade, 2000). Today, Yale Lake still contains a resident population of bull trout, which is listed as threatened.
under the Endangered Species Act (WDFW, 2009a; WDFW, 2009b). Yale Lake also supports a recreational fishery for kokanee and cutthroat trout.

Other priority habitats and species, as identified by WDFW, which occur adjacent to Yale Lake and within the shoreline jurisdiction include: elk wintering ranges, deer range areas, bald eagle concentrations, and bald eagle communal roosts (WDFW, 2009a).

The WDNR Natural Heritage Program has not identified priority plant species or vegetation communities within the Yale Reservoir shoreline planning area (WDNR, 2008).

8.3.1.5 Instream and Riparian Habitats

Habitat conditions within Yale Lake are not well documented. A few free-flowing reaches between Merwin and Yale Reservoir and between Yale Reservoir and Swift Reservoir in Skamania County do exist. Other than water quality parameters, assessments of habitat conditions was not readily accessible. Reintroduction of anadromous fish to Swift Reservoir is planned as part of the PacifiCorp’s FERC licensing agreement. Bull trout do occur within the reservoirs, but they spawn in upper reaches of tributary streams.

8.3.1.6 Water Quality

According to the 2008 Washington State Water Quality Assessment (Ecology, 2008), Yale Lake has no 303(d) Category 5 listings for impaired water quality. However, Yale Lake does have one Category 1 and two Category 2 listings for temperature and Total Dissolved Gas (TDG) respectively (Ecology, 2008). Category 1 listings indicate that the water body meets tested criteria for that parameter. Category 2 indicates a water of concern for that parameter.

8.3.2 Shoreline Use Patterns

8.3.2.1 Existing Land and Shoreline Uses

Yale Lake is the reservoir created behind the Yale Dam, which was constructed in the 1950s. The Clark County shoreline planning area is predominantly in state or PacifiCorp ownership and is largely undeveloped. The lake and nearshore areas are used for recreation and boating. The upland areas are in forestry uses. There is an undeveloped County park approximately two miles upstream of the dam (Siouxon Park). A private road (IP 100) runs the length of the shoreline and offers access to some beaches.

A portion of the Yale Dam is in the downstream end of the shoreline planning area. Other than Yale Dam itself, there are no other structures in the shoreline planning area, and no other shoreline modifications are mapped in the shoreline.

8.3.2.2 Shoreline Environment Designations and Zoning

The entire length of the Yale Reservoir shoreline planning area lies within Clark County and has an environmental designation of Conservancy, which is characterized by passive agriculture and recreation. Zoning around the Yale Reservoir is dominated by forest, with a small portion of parks and open space. A summary of the zoning designations surrounding the Yale Reservoir is
shown in Table 8-6. Portions of this planning area are owned by WDNR, and as such, are not subject to the County’s zoning ordinances. These lands are not included in the table below.

Table 8-6. Yale Reservoir Zoning

<table>
<thead>
<tr>
<th>Zoning Designation</th>
<th>Acreage</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest</td>
<td>249</td>
<td>95%</td>
</tr>
<tr>
<td>Parks &amp; Open Space</td>
<td>14</td>
<td>5%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>263</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

8.3.2.3 Existing Public Access

Access is available at the north end of the lake in Cowlitz County outside of the shoreline planning area. There are several campgrounds and boat launch facilities. No formal recreation facilities provide public access to the lake from the Clark County shoreline planning area. The majority of the shoreline, owned by PacifiCorp, is closed to the public for safety and habitat conservation (PP&L, 2008). However, over five miles of trails area planned along the shoreline on the Clark County side that would provide recreation and wildlife viewing. A summary of these public access areas is shown in Table 8-7.

Table 8-7. Yale Reservoir Public Access Facilities

<table>
<thead>
<tr>
<th>Facility Name</th>
<th>Facility Type</th>
<th>Area or length within Shoreline</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Siouxon Park</td>
<td>Special Facility</td>
<td>14 acres</td>
<td>Undeveloped</td>
</tr>
<tr>
<td>DNR</td>
<td>Natural Area</td>
<td>94 acres</td>
<td>Proposed</td>
</tr>
<tr>
<td>PacifiCorp</td>
<td>Quasi-public</td>
<td>209 acres</td>
<td>Undeveloped</td>
</tr>
<tr>
<td>Unnamed Trail</td>
<td>Trail</td>
<td>5 miles</td>
<td>Proposed</td>
</tr>
</tbody>
</table>

8.3.2.4 Historical and Cultural Resources

Cultural resources within the Yale Reservoir shoreline planning area include two recorded pre-contact sites, both containing lithic scatters. In addition there is an unregistered historic residential structure / refuse scatter. Many of the archaeological sites in the Yale Reservoir shoreline area were likely inundated with the construction of the hydroelectric projects.

There are no county-, state-, or federally-listed historic properties within the reservoir’s shoreline planning area (DAHP, 2010; Clark County, 2010D).
8.3.2.5 Areas of Special Interest

According to the Ecology facilities/sites data base there are no listed facilities or contaminated sites within the Yale Reservoir shoreline planning area.

8.3.3 Opportunity Areas

8.3.3.1 Restoration and Protection

To offset habitat impacts resulting from continued operation of its hydroelectric projects on the Lewis River, PacifiCorp Energy manages 10,085 acres around the reservoirs in accordance with the Lewis River Wildlife Habitat Management Plan. The plan includes wildlife habitat goals, objectives, and management actions for the several types of habitat found on these properties (e.g., forest, old growth, riparian areas, wetlands, etc.) and includes measures for managing invasive species (PacifiCorp, 2008). The licenses for the dams include plans to reintroduce anadromous fish to 170 miles of habitat upstream of the dams (PacifiCorp, 2009). In addition, PacifiCorp administers the Lewis River Aquatics Fund, which supports projects to enhance and improve wetlands, riparian, and riverine habitats in support of salmonid recovery (PacifiCorp and Cowlitz PUD, 2009). Other actions include:

- An ongoing invasive species management plan should be developed that involves the control and replacement of aggressive, weedy plants such as reed canarygrass, Himalayan blackberry, and purple loosestrife; and
- Work with PacifiCorp during relicensing of the Yale Project to reduce total dissolved gas (TDG) problems at the outlet of the reservoir.

8.3.3.2 Public Access

Because most of the area is closed to the public for safety reasons and for habitat conservation, the proposed trail facilities that are planned for the shoreline planning area will provide new opportunities for recreation and wildlife viewing.
8.3.4  Reach Scale Assessment

Yale Reservoir has been divided into reaches based upon unique features. Table 8-8 provides a brief description of each reach and highlights key modifications, unique features and restoration opportunities.

### Table 8-8. Reach Assessment for Yale Reservoir

<table>
<thead>
<tr>
<th>Reach Number</th>
<th>Reach Location</th>
<th>Reach Length (miles)</th>
<th>Use Descriptions</th>
<th>Modifications</th>
<th>Unique Features</th>
<th>Riparian Zones</th>
<th>Restoration Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>YALE_LK_01</td>
<td>Upstream of Lake Merwin</td>
<td>20.3</td>
<td>Rural, Forested, Agriculture.</td>
<td>Impoundment by the Yale Hydroelectric Project.</td>
<td>Approximately 37 acres of wetland. Parks and water access through the Pacific-Corp lands.</td>
<td>Moderate to high quality. Shrubs and trees extend to shoreline.</td>
<td>Invasive species control and removal.</td>
</tr>
</tbody>
</table>
8.4 Mud Lake

8.4.1 Physical and Biological Characterization

8.4.1.1 Drainage Basin and Tributary Streams

Mud Lake is located within the Allen Canyon Creek sub-basin and drains an area of approximately 3,871 acres. Allen Canyon Creek, a tributary to the mainstem Lewis River, is the inlet and outlet stream for Mud Lake. Several small tributaries drain the hillside slopes (wetlands) and enter Mud Lake. Mud Lake covers an area of 70 acres and has 2.28 miles of shoreline. The perimeter of Mud Lake is primarily forested; however, outside this area there are agricultural and residential uses.

Mud Lake is located in the floodplain near the mouth of the Lewis River. The lake is surrounded by rural, forested and agricultural areas. Approximately 51 acres of the Mud Lake shoreline planning area are mapped as wetland by Clark County. The NWI describes these as palustrine forested and palustrine emergent habitat types.

8.4.1.2 Process and Channel Modifications

Primary process modifications in the Mud Lake watershed include:

- Conversion of pervious to impervious surfaces;
- Gravel mining; and
- Conversion of forests to residential structures.

Although the perimeter of Mud Lake is surrounded by forest, there is residential development on the east side of the lake. The area to the north is forested and has minimal human modifications. Gravel mining occurs adjacent to the eastern shore of Mud Lake.

8.4.1.3 Geologic and Flood Hazard Areas

The Mud Lake floodplain connects with the Lewis River (Appendix A, Map 6). The FEMA FIRMs show the floodplain north of Mud Lake extends approximately one mile from the west to east and 0.5 mile to the north. The flooding at Mud Lake is primarily due to large rain events that increase flow in the drainages that connect to Mud Lake, as well as large river flows in the Columbia and Lewis Rivers. The area between Mud Lake and Lewis River may accumulate sediment in large flow events.

The area approximately 0.1 to 0.2 mile to the west and east of Mud Lake includes severe erosion hazards. There are additional hazard areas along the sides of the drainages that connect to Mud Lake (Appendix A, Map 12). The area to the north is made up of unconsolidated sediment and the area on all other sides is made up of semi-consolidated sediment (Appendix A, Map 13). Therefore, there are some seismic hazards throughout the area, but primarily in the area north of the lake. The slopes around Mud Lake are greater than 15 percent on west, south, and east, and include areas of potential instability that are associated with landslides (Appendix A, Map 14).
8.4.1.4 Critical or Priority Habitat and Species Use

Allen Canyon Creek and Mud Lake are presumed to contain coho salmon and winter and summer steelhead (Appendix A, Map 16), which are federally listed as threatened species under the Endangered Species Act. Allen Canyon Creek contains designated critical habitat for LCR steelhead (70 FR 170). Critical habitat for LCR coho salmon has not been designated at this time and is currently under review.

Other priority habitats and species, as identified by WDFW, occurring near Mud Lake include an outstanding bald eagle communal roost, which is used by up to seven birds at a time (WDFW, 2009a).

The WDNR Natural Heritage Program has not identified priority plant species or vegetation communities within the Mud Lake shoreline planning area (WDNR, 2008).

8.4.1.5 Instream and Riparian Habitats

Allen Canyon Creek serves as the inlet and outlet of Mud Lake, which eventually drains to the Lewis River at approximately RM 2.0. Several small tributaries also drain the hillside slopes and discharge into Mud Lake. Wetlands occur primarily at the north end of the lake and extend northward toward the Lewis River and also at the upstream end of the lake. An naturally occurring earthen dam is located at the outlet of Allen Canyon Creek from Mud Lake. The riparian corridor is fairly intact; however, agriculture, residential development, and a gravel mine on the eastern shore influence habitat conditions. The west side of the lake is less developed with agricultural uses.

Currently, the Washington Wildlife and Recreation Coalition (WWRC) is working with BPA, Clark County and the LCREP to acquire 341 acres along Mud Lake and the Lewis River, which will create a valuable link between the 5,280-acre Ridgefield National Wildlife Refuge and the 2,200-acre Lower East Fork River Greenway. Mud Lake and adjacent wetland and forest habitat provide valuable habitats for a variety of birds, mammals, amphibians, and reptiles.

8.4.1.6 Water Quality

There are no water quality related impairments identified for Mud Lake as part of the 303d list. Water quality violations at a local rock and gravel mine have been documented by the state (Ecology news release, July 2007). Turbidity and pH in surface waters released to Mud Lake were above state standards resulting in a violation notice. The mine installed a new sediment treatment system in 2007 to address water quality concerns.

8.4.2 Shoreline Use Patterns

8.4.2.1 Existing Land and Shoreline Uses

Mud Lake is located in the northwest section of the county west of La Center. The shoreline planning area is nearly all undeveloped forest land. Gravel mining occurs upstream of Mud Lake. Existing uses in the planning area are classified as forestry uses by the County. The southern end of the lake is within Mud Lake Park. There are no roadways with the lake’s shorelines and no shoreline modifications are mapped.
8.4.2.2 Shoreline Environment Designations and Zoning

The entire length of the Mud Lake shoreline planning area lies within Clark County and has an environment designation of Conservancy, intended for passive agriculture and recreation, as well as sustainable forestry. Mud Lake is surrounded by a mix of forest, parks and open space, and single-family residential zones. A summary of the zoning designations around Mud Lake is shown in Table 8-9.

<table>
<thead>
<tr>
<th>Zoning Designation</th>
<th>Acreage</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest</td>
<td>33</td>
<td>49%</td>
</tr>
<tr>
<td>Parks &amp; Open Space</td>
<td>16</td>
<td>24%</td>
</tr>
<tr>
<td>Residential – Single-Family</td>
<td>18</td>
<td>27%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>67</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

8.4.2.3 Existing Public Access

There is one public access point, Mud Lake Park, on the south end of the lake. The remainder of the area is forest or single-family residential. The northern terminus of a proposed trail is also located in the Mud Lake shoreline planning area. A summary of these public access facilities is shown in Table 8-10.

<table>
<thead>
<tr>
<th>Facility Name</th>
<th>Facility Type</th>
<th>Area or length within Shoreline</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mud Lake Park</td>
<td>Regional Open Space</td>
<td>17 acres</td>
<td>Undeveloped</td>
</tr>
<tr>
<td>Unnamed Trail</td>
<td>Trail</td>
<td>409 feet</td>
<td>Undeveloped</td>
</tr>
</tbody>
</table>

8.4.2.4 Historical and Cultural Resources

There are no recorded archeological or unregistered historic sites within the Mud Lake shoreline planning area (DAHP, 2010). Clark County archaeological resource probability mapping, however, suggests there is a significant chance of finding unknown artifacts within almost all of the County’s shoreline planning areas (Clark County, 2003).

There are no county-, state- or federally-listed historic properties within the Mud Lake shoreline planning area (DAHP, 2010; Clark County, 2010d).
8.4.2.5 Areas of Special Interest

According to the Ecology facilities/sites data base there are no listed facilities or contaminated sites within the Mud Lake shoreline planning area.

8.4.3 Opportunity Areas

8.4.3.1 Restoration and Protection

The Clark County Legacy Lands Program has been working with other organizations to acquire Mud Lake as an important habitat link between Ridgefield National Wildlife Refuge and the East Fork Lewis River Greenway (Clark County, 2008). A habitat restoration plan is currently being developed by LCREP, Clark County and the BPA for the lower Allen Creek drainage and the portion of land between Mud Lake and the Lewis River.

An ongoing invasive species management plan should be developed that involves the control and replacement of aggressive, weedy plants such as reed canarygrass, Himalayan blackberry, and purple loosestrife. Other restoration opportunities include:

- Protect wetland habitat to minimize sedimentation and water quality concerns; and
- Look for opportunities to acquire properties adjacent to Mud Lake to improve vegetative buffer and increase habitat diversity.

8.4.3.2 Public Access

The County is in the process of assessing a portion of the property on the west side of Mud Lake to potentially purchase it for the purposes of conservation (Clark County, 2010a). This property could be used for public access to the shoreline and interpretive education as well as habitat conservation.
8.4.4 Reach Scale Assessment

Mud Lake has been evaluated as one reach. Table 8-11 provides a brief description of each reach and highlights key modifications, unique features and restoration opportunities.

Table 8-11. Reach Assessment for Mud Lake

<table>
<thead>
<tr>
<th>Reach Number</th>
<th>Reach Location</th>
<th>Reach Length (miles)</th>
<th>Use Descriptions</th>
<th>Modifications</th>
<th>Unique Features</th>
<th>Riparian Zones</th>
<th>Restoration Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUD_LK_01</td>
<td>Near Lancaster Lake</td>
<td>2.3</td>
<td>Natural area. Residential area to the east. Gravel mine to the east.</td>
<td>Conversion of forest to residential areas. Impervious surfaces. Nearby gravel and rock mining.</td>
<td>Approximately 51 acres are wetland. Allen Creek flows into Mud Lake.</td>
<td>High quality. Lake is surrounded by dense vegetation.</td>
<td>Groups are working to connect site to the nearby Ridgefield NWR. Protect floodplain wetlands. Acquire lands to protect habitat. Restore fish habitat in Allen Creek.</td>
</tr>
</tbody>
</table>
8.5 **Unnamed Lake 01**

8.5.1 **Physical and Biological Characterization**

8.5.1.1 **Drainage Basin and Tributary Streams**

Unnamed Lake 1 is located in the floodplain of the lower Lewis River southeast of Horseshoe Lake and east of I-5. Forest and grassland lie adjacent to the northern side of the lake, while I-5 runs along the southern shoreline. Thirty-one acres of the Unnamed Lake 1 shoreline planning area is mapped as wetland by Clark County. The NWI maps these as palustrine forested and palustrine emergent and aquatic bed habitats.

8.5.1.2 **Process and Channel Modifications**

Primary process modifications at Unnamed Lake 1 are:

- Pervious surfaces converted to impervious surfaces; and
- Runoff from adjacent highways, I-5 and NW Pacific Highway.

Unnamed Lake 1 has been modified by the building of the adjacent highways. The lake would have historically been directly connected to the Lewis River floodplain and wetlands adjacent to the Lewis River. Now the lake is isolated from the Lewis River channel and floodplain by the highways.

8.5.1.3 **Geologic and Flood Hazard Areas**

Unnamed Lake 1 has flood hazards associated with large rainfall events. Prior to the building of I-5, the flood hazards would have extended from the lake to the Lewis River. The flooding around the lake is confined by the highways (Appendix A, Map 6). The only severe erosion hazard that has been identified is north of the lake (Appendix A, Map 12). The lake and surrounding area are made up of unconsolidated sediment, so there is a high seismic hazard in this area (Appendix A, Map 13). The primary landslide hazards are north and south of the lake. This includes slopes of greater than 15 percent, areas of potential instability, and areas of previous landslides (Appendix A, Map 14).

8.5.1.4 **Critical or Priority Habitat and Species Use**

Unnamed Lake 1 is presumed to contain coho salmon (Appendix A, Map 16). The LCR coho salmon Evolutionarily Significant Unit (ESU) is federally listed as a threatened species under the Endangered Species Act. Critical habitat for the LCR coho salmon ESU has not been designated at this time and is currently under review.

Other priority habitats and species, as identified by WDFW, occurring near Unnamed Lake 1 include breeding habitat for cavity nesting ducks and oak woodlands (WDFW, 2009a). The majority of this shoreline would be classified as vegetated wetland.

The WDNR Natural Heritage Program has not identified priority plant species or vegetation communities within the Unnamed Lake 1 shoreline planning area (WDNR, 2008).
8.5.2 Shoreline Use Patterns

8.5.2.1 Existing Land and Shoreline Uses

Unnamed Lake 1 is located south of Horseshoe Lake on the east side of I-5. The shoreline planning area is undeveloped, although the County has classified part of the planning area as having one or more mobile homes. The western shoreline of the lake is bordered by the northbound lanes of I-5. There are no other shoreline modifications or roadways mapped.

8.5.2.2 Shoreline Environment Designations and Zoning

The zoning of Unnamed Lake 1 is under the jurisdiction of Clark County. This lake was not included in the existing Clark County SMP, and therefore, does not have a current shoreline environment designation. This rural lake is zoned mostly for agriculture with a small portion of single-family residential as shown in Table 8-12.

<table>
<thead>
<tr>
<th>Zoning Designation</th>
<th>Acreage</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>46</td>
<td>93%</td>
</tr>
<tr>
<td>Residential – Single-Family</td>
<td>4</td>
<td>7%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>50</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

8.5.2.3 Existing Public Access

There are no formal public access facilities within the shorelines of Unnamed Lake 1.

8.5.2.4 Historical and Cultural Resources

There are no recorded archeological or unregistered historic sites within the Unnamed Lake 1 shoreline planning area (DAHP 2010). Clark County archaeological resource probability mapping, however, suggests there is a significant chance of finding unknown artifacts within almost all of the County’s shoreline planning area (Clark County 2003).

There are no state or federally listed historic properties within the Unnamed Lake 1 shoreline planning area (DAHP, 2010; Clark County, 2010D).

8.5.2.5 Areas of Special Interest

According to the Ecology facilities/sites data base there are no listed facilities or contaminated sites within the Unnamed Lake 1 shoreline planning area.
8.5.3 Opportunity Areas

8.5.3.1 Restoration and Protection

Restoration opportunities for Unnamed Lake 1 include assessing and controlling invasive species, and replanting native riparian vegetation along the lakeshore.

8.5.3.2 Public Access

There are 0.36 miles of a planned trail that will pass through this shoreline planning area along the NW Pacific Highway.

The County could explore additional access, such as wildlife viewing areas, along with the development of the proposed trail near the Unnamed Lake 1 shoreline planning area. No other opportunity areas have been identified.

8.5.4 Reach Scale Assessment

Unnamed Lake 1 has been divided into reaches based upon unique features. Table 8-13 provides a brief description of each reach and highlights key modifications, unique features and restoration opportunities.

Table 8-13. Reach Assessment for Unnamed Lake 1

<table>
<thead>
<tr>
<th>Reach Number</th>
<th>Reach Location</th>
<th>Reach Length (miles)</th>
<th>Use Descriptions</th>
<th>Modifications</th>
<th>Unique Features</th>
<th>Riparian Zones</th>
<th>Restoration Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNNA_LK_01</td>
<td>East of I-5, south of Woodland</td>
<td>1.1</td>
<td>Residential, rural lands, I-5 to the west.</td>
<td>Highway abuts southwest shore. Historical connection to Lewis River has been removed.</td>
<td>Approximately 31 acres are wetland.</td>
<td>Mixed with forested areas and pasture. Southern shoreline is partially developed.</td>
<td>Invasive species control and removal. Restore riparian areas. Enhance existing associated wetlands.</td>
</tr>
</tbody>
</table>
8.6  Horseshoe Lake

8.6.1  Physical and Biological Characterization

8.6.1.1  Drainage Basin and Tributary Streams

Horseshoe Lake was formed following the construction of Highway 99 (now I-5) in 1940, which cut off a bend (oxbow) of the Lewis River, effectively isolating the bend from the mainstem (Appendix A, Map 4). Horseshoe Lake straddles the Clark County/Cowlitz County line and covers an area of approximately 85 acres with 2.71 miles of shoreline. The maximum depth of the lake is 16 feet with an average depth of approximately six feet. The area of Horseshoe Lake fluctuates during flood seasons (Ecology, 1995). The lake is located in the city of Woodland and is surrounded by residential development, parklands, and agricultural fields.

Twenty-six acres of the Horseshoe Lake shoreline planning area are mapped as wetland by Clark County. The NWI maps palustrine forested wetlands in the planning area. The wetlands are mapped within the interior portion of the oxbow.

8.6.1.2  Process and Channel Modifications

Horseshoe Lake was likely an oxbow of the Lewis River prior to the highway being built between what is now the lake and the free-flowing river. I-5 disconnects Horseshoe Lake from the Lewis River floodplain. There is significant residential development on the north end of Horseshoe Lake. The lake receives runoff from these adjacent areas, which has caused excess sedimentation in the lake. The lake level fluctuates with water levels and flooding in the Lewis River.

8.6.1.3  Geologic and Flood Hazard Areas

The flood hazards within Horseshoe Lake and adjacent areas west of I-5 are classified as areas located between the 100-year and 500-year floodplain. There are no severe erosion or landslide hazards in this area (Appendix A, Maps 12 and 14). The lake and surrounding area consist of unconsolidated sediment that is associated with seismic hazards (Appendix A, Map 13).

8.6.1.4  Critical or Priority Habitat and Species Use

There is no documented use of Horseshoe Lake by priority fish species and no critical habitat has been designated at this time. Other priority habitats and species, as identified by WDFW, include oak woodlands and cavity nesting ducks (WDFW, 2009a; WDFW, 2009b).

The WDNR Natural Heritage Program has not identified priority plant species or vegetation communities within the Horseshoe Lake shoreline planning area (WDNR, 2008).

8.6.1.5  Instream and Riparian Habitats

The isolation of Horseshoe Lake from the mainstem Lewis River and development of almost the entire shoreline has limited the ability of this lake to provide suitable habitat for native fish and wildlife species. Some patchy forested habitat is located within that portion of Horseshoe Lake...
shoreline within Clark County; however, this area has been severely degraded by surrounding uses.

8.6.1.6 Water Quality

High nutrient levels in Horseshoe Lake have caused excessive algal growth (Clark County, undated). Ecology has not identified other water quality impairments for Horseshoe Lake. In May 2009, grass carp were introduced to Horseshoe Lake to control the invasive aquatic plant, water milfoil. This sterile fish is used to keep the lake waters clean by eating invasive aquatic plants (http://lewisriver.com/horseshoe.html).

8.6.2 Shoreline Use Patterns

8.6.2.1 Existing Land and Shoreline Uses

Horseshoe Lake is located on the Cowlitz/Clark County boundary. I-5 defines the lake’s eastern shorelines. Only the interior portion of the U-shaped lake is within Clark County. Shorelines along the outer ring are in Cowlitz County. Most of the shoreline planning area is undeveloped land. A portion of the planning area, located on the north end of the interior, is developed. Existing uses in this area include a mobile home park and single-family residential development. Access roadways and residential streets are located in the shoreline planning area. There are five docks in the planning area. The eastern ends of the lake are riprap embankments that support I-5. No other shoreline modifications are mapped.

8.6.2.2 Shoreline Environment Designations and Zoning

The Horseshoe Lake shoreline planning area lies within the city of Woodland and in Clark County. It has a shoreline environment designation of Urban, intended for intensive development. This area is predominantly zoned as single-family residential, with a small portion in Woodland that is zoned for industrial uses (see Table 8-14).

Table 8-14. Horseshoe Lake Zoning

<table>
<thead>
<tr>
<th>Zoning Designation</th>
<th>Acreage</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial</td>
<td>4</td>
<td>8%</td>
</tr>
<tr>
<td>Residential – Single-Family</td>
<td>50</td>
<td>92%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>54</td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

8.6.2.3 Existing Public Access

Horseshoe Lake does not provide public access within Clark County; however, there are a few private docks and shoreline access points for the residences located on the north end of this shoreline planning area. The northern extent of a proposed regional trail would cross 0.25 miles of the Horseshoe Lake shoreline planning area, connecting to the Frenchman’s Bar Trail at its southern end, in the city of Vancouver. Horseshoe Lake Park is located within Cowlitz County in
the city of Woodland at the north end of the lake near I-5. The park is 6.5 acres in size and provides beach access to the lake.

8.6.2.4 Historical and Cultural Resources

There are no recorded archeological or unregistered historic sites within the Horseshoe Lake shoreline planning area (DAHP, 2010).

There are no county-, state-, or federally-listed historic properties within the lake’s shoreline planning area (DAHP, 2010; Clark County, 2010D).

8.6.2.5 Areas of Special Interest

According to the Ecology facilities/sites data base there are no listed facilities or contaminated sites within the Horseshoe Lake shoreline planning area.

8.6.3 Opportunity Areas

8.6.3.1 Restoration and Protection

High nutrient levels in Horseshoe Lake have caused excessive algal growth (Clark County, undated). Restoration opportunities include educating landowners about practices to reduce nutrient inputs, and replanting native trees and shrubs in areas affected by development and public access.

Other general restoration measures include:

- An ongoing invasive species management plan should be developed that involves the control and replacement of aggressive, weedy plants such as reed canarygrass, Himalayan blackberry, and purple loosestrife;
- Wetland habitat should be protected to minimize sedimentation and water quality concerns; and
- Riparian plantings should be enhanced to provide cover and habitat for wildlife species.

8.6.3.2 Public Access

Although zoned for residential use and privately owned, the majority of the Horseshoe Lake shoreline planning area appears to be undeveloped. The City of Woodland and Clark County could work cooperatively with the single property owner to develop public access to this shoreline in conjunction with construction of the proposed regional trail.
8.6.4 Reach Scale Assessment

Horseshoe Lake has been evaluated as one shoreline reach. Table 8-15 provides a brief description of this reach and highlights key modifications, unique features and restoration opportunities.

Table 8-15. Reach Assessment for Horseshoe Lake

<table>
<thead>
<tr>
<th>Reach Number</th>
<th>Reach Location</th>
<th>Reach Length (miles)</th>
<th>Use Descriptions</th>
<th>Modifications</th>
<th>Unique Features</th>
<th>Riparian Zones</th>
<th>Restoration Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>HORS_LK_01</td>
<td>Former oxbow of Lewis River. West of I-5, near Woodland</td>
<td>2.8</td>
<td>Urban. Residential developments.</td>
<td>Highway separates lake from Lewis River floodplain. Historical connection to Lewis River has been altered. Residential development on northern shore. 5 docks Eastern edges of the lake are rip-rapped.</td>
<td>Approximately 26 acres are wetland. Shoreline in Clark County is largely undeveloped.</td>
<td>Poor quality. Almost entire shoreline is developed lacking riparian forest, except wetland areas contain trees.</td>
<td>Reduce nutrient loads. Invasive species control and removal. Restore riparian zones with tree plantings.</td>
</tr>
</tbody>
</table>
8.7 Cedar Creek

8.7.1 Physical and Biological Characterization

8.7.1.1 Drainage Basin and Tributary Streams

Cedar Creek originates in the hills of eastern Clark County and flows westerly to its confluence with the Lewis River, downstream of Lake Merwin. The Cedar Creek watershed drains an area of 55.8 square miles (35,713 acres) and includes five sub-watersheds: Pup Creek, Chelatchie Creek, Middle Cedar, Lower Cedar, and Upper Cedar. Major tributaries include: Chelatchie Creek, Bitter Creek, Brush Creek, John Creek, and Pup Creek. Numerous unnamed tributaries also contribute flow to Cedar Creek. Cedar Creek is a major left-bank tributary to the Lewis River.

Existing uses within the upper watershed are primarily public and commercial forests with some low-density residential development. Existing uses within the middle watershed are primarily forest and agriculture with low-density residential development. Existing uses within the lower watershed are primarily low-density residential and agriculture with some forest activities.

Cedar Creek provides the majority of productive habitat for anadromous salmonids within the North Fork Lewis River basin (that portion of the Lewis River upstream of the confluence with the East Fork Lewis River).

Clark County maps 437 acres of the Cedar Creek shoreline planning area as wetland. Scattered wetlands are mapped along most of the Cedar Creek shoreline. Palustrine forested wetlands are dominant in the upper reaches, while palustrine scrub-shrub and emergent communities are also present along the lower portions of the stream.

8.7.1.2 Process and Channel Modifications

Primary process and channel modifications in the Cedar Creek watershed include:

- Rural residential and agricultural uses have impacted riparian areas and floodplains;
- Confined floodplain in some areas; and
- Deforestation has resulted in more sedimentation.

The Cedar Creek watershed has been modified by rural residential and agricultural development. There are no major dams obstructing flows along Cedar Creek. The lower reaches of Cedar Creek include unconfined floodplains and channel migration zones that are not limited by levees or structures (R2 Resource Consultants, 2004).

8.7.1.3 Geologic and Flood Hazard Areas

The Cedar Creek 100-year floodplain is relatively narrow (Appendix A, Map 6). Flooding generally occurs in the winter due to high streamflow associated with large rainfall events. The floodplain is widest downstream of Chelatchie Creek and near the confluence with the Lewis River. Cedar Creek is classified as having a moderate to high potential for channel migration (Olson, 2010; Appendix A, Map 27). There are severe erosion hazards along Cedar Creek.
Shoreline Inventory and Characterization

(Appendix A, Map 12). The area adjacent to the stream is composed primarily of semi-consolidated sediment associated with some seismic hazards. The upper reach of Cedar Creek is surrounded by consolidated sediment with little or no seismic hazards (Appendix A, Map 13). Adjacent to Cedar Creek are areas of potential instability and slopes greater than 15 percent associated with landslide hazards (Appendix A, Map 14).

8.7.1.4 Critical or Priority Habitat and Species Use

Cedar Creek supports a number of anadromous salmonids including summer and winter steelhead, fall and spring Chinook salmon, coho salmon, and fall chum salmon (Appendix A, Map 16). The lower Columbia River populations of these species are listed as threatened under the Endangered Species Act. In addition to these anadromous species, Cedar Creek also supports populations of resident rainbow trout and coastal cutthroat trout.

Cedar Creek contains designated critical habitat for the Columbia River chum salmon ESU, extending from the confluence with the Lewis River upstream to 250 feet above Grist Mill Road. Critical habitat for LCR steelhead Distinct Population Segment (DPS) and the LCR Chinook salmon ESU extends from RM 0 upstream to the headwaters (70 FR 170). The critical habitat for steelhead extends 500 feet farther upstream than the Chinook salmon critical habitat. Critical habitat for LCR coho salmon ESU has not been designated at this time and is currently under review.

The WDNR Natural Heritage Program has not identified priority plant species or vegetation communities within the Cedar Creek shoreline planning area (WDNR, 2008).

8.7.1.5 Instream and Riparian Habitats

Floodplain connectivity within the Cedar Creek watershed is not considered a limiting factor due to the lack of dikes and other factors. Bank stability is rated as fair within Cedar Creek. The lower reach below Pup Creek (RM 4.4) is considered “good” due to the presence of steep canyons with intact riparian buffers. The reach between Pup Creek and Chelatchie Creek (RM 11.2) was rated as “poor” due to past and present uses that resulted in the degradation of riparian buffers and subsequently led to streambank instability. The upper watershed is considered in “fair” condition (Wade, 2000).

In general, LWD and recruitment potential within Cedar Creek is considered in “poor” condition. However, the reach below Pup Creek has never been fully assessed (Wade, 2000). Logging, past efforts to clear LWD from streams, and lack of recruitment potential within the watershed have limited the ability of LWD to create complex habitats, retain spawning substrates, and provide cover and refugia (USFS, 1996).

Substrate conditions within Cedar Creek are rated in “poor” condition between Pup Creek and headwater areas (Wade, 2000). In general, livestock access to portions of Cedar Creek, reduced riparian vegetation, increasing bank instability, and to a limited degree, residential development are all contributing fine sediment to the watershed.

As discussed above, riparian conditions are good in the lower reach downstream of Pup Creek; however, the reach between Pup Creek and Chelatchie Creek is in “poor” condition due to
excessive cattle and horse grazing. Between Amboy and the town of Yacolt, riparian conditions are considered “fair”. The upper watershed has reduced canopy cover due to commercial logging activities (Wade, 2000).

Data on side-channel conditions or pool habitat within Cedar Creek are limited.

8.7.1.6 Water Quality

According to the 2008 Washington State Water Quality Assessment (Ecology, 2008), Cedar Creek has one 303(d) Category 5 listing for fecal coliform bacteria (Appendix A, Map 15). In addition, the river has four Category 1 listings for fecal coliform bacteria, pH, zinc and copper and two Category 2 listings for pH and temperature (Ecology, 2008). Category 1 listings indicate that the stream meets tested criteria for heavy metals. Category 2 indicates that pH and temperature are water quality concerns for Cedar Creek.

8.7.2 Shoreline Use Patterns

8.7.2.1 Existing Land and Shoreline Uses

Cedar Creek flows approximately 20 miles across the northern part of the county through timber lands and rural areas. The stream flows through a canyon for much of its length. As a result the shoreline planning area is largely unbuildable and forested. Adjacent uses throughout all three reaches are characterized by forestry uses, agricultures and pasture, and rural residential development. Forestry is more prominent in the upper reach and residential uses are more prominent in the lower reaches.

There are some small-scale commercial uses in the planning area, including a restaurant, in Amboy. The Cedar Creek Grist Mill, originally built in 1876, is located adjacent to Cedar Creek. It consists of the mill structure built on wooden piles and located on the streambank. A covered bridge crosses the stream and a flume runs alongside the stream.

Numerous roadways parallel or are located within the shoreline planning area. Five roadways cross the stream via bridges: NE Amboy Road, SR 503, NE Cedar Ridge Road, NE Cedar Creek Road, NE Grist Mill Road and NE Etna Road. The Chelatchie Prairie Railroad crosses the stream north of the town of Yacolt.

Other than the Grist Mill, there are no-water-dependent uses within the Cedar Creek shoreline planning area and no other shoreline modifications are mapped.

8.7.2.2 Shoreline Environment Designations and Zoning

Cedar Creek lies entirely within the jurisdiction of Clark County. The majority of the Cedar Creek shoreline planning area has an environment designation of Rural, while the furthest upstream reach has a designation of Conservation. Zoning here is dominated by forest and single-family residential designations, with some parks and open space, commercial, and agriculture. A summary of the zoning designations along Cedar Creek is shown in Table 8-16.
Table 8-16. Cedar Creek Zoning

<table>
<thead>
<tr>
<th>Zoning Designation</th>
<th>Acreage</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>1</td>
<td>&lt; 1%</td>
</tr>
<tr>
<td>Forest</td>
<td>502</td>
<td>42%</td>
</tr>
<tr>
<td>Commercial</td>
<td>6</td>
<td>&lt; 1%</td>
</tr>
<tr>
<td>Parks &amp; Open Space</td>
<td>33</td>
<td>3%</td>
</tr>
<tr>
<td>Residential – Single-Family</td>
<td>651</td>
<td>55%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,193</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

8.7.2.3 Existing Public Access

There is only one formal public access point within the Cedar Creek shoreline planning area, Amboy Territorial Park. There are 0.68 miles of planned trail that will cross this area, a portion of which would connect to the regional North Fork of the Lewis River Trail. A summary of the public access facilities is shown in Table 8-17.

Table 8-17. Cedar Creek Public Access Facilities

<table>
<thead>
<tr>
<th>Facility Name</th>
<th>Facility Type</th>
<th>Area or length within Shoreline</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amboy Territorial Park</td>
<td>Community Park</td>
<td>6.7 acres</td>
<td>Developed</td>
</tr>
<tr>
<td>North Fork of the Lewis River Trail</td>
<td>Regional Trail</td>
<td>0.5 miles</td>
<td>Proposed</td>
</tr>
<tr>
<td>Unnamed Trail</td>
<td>Trail</td>
<td>777 feet</td>
<td>Proposed</td>
</tr>
</tbody>
</table>

8.7.2.4 Historical and Cultural Resources

Archaeological Resources

There is only one recorded archaeological site within the Cedar Creek shoreline area, a pre-contact isolate, pre-contact lithic material site. Clark County archaeological resource probability mapping suggests there is a significant chance of finding unknown artifacts within almost all of the County’s shoreline planning area (Clark County, 2003).
Shoreline Inventory and Characterization

**Historic Sites**

There are two registered sites within the Cedar Creek shoreline planning area, the Cedar Creek Grist Mill (Photo 8-3) [National Register of Historic Places Registration Form] and the Amboy United Brethren Church [Clark County Heritage Register, 2010d].

**Photo 8-3. Cedar Creek Grist Mill from the east side, showing Cedar Creek in the foreground and the reconstructed flume.**

8.7.2.5 Areas of Special Interest

According to the Ecology facilities/sites data base there are no listed facilities or contaminated sites within the Cedar Creek shoreline planning area.

**8.7.3 Opportunity Areas**

**8.7.3.1 Restoration and Protection**

The Salmon and Steelhead Limiting Factors report for WRIA 27 [Wade, 2000] identifies Cedar Creek as an important stream for salmonid spawning and rearing. However, habitat is limited by high water temperatures, low summer flows, lack of LWD, and excessive fine sediments. Restoration opportunities for Cedar Creek include increasing and enhancing off-channel fish habitat and wetlands; decommissioning or repairing logging roads to prevent sedimentation; replanting riparian areas impacted by grazing, residential development, and logging; fencing livestock away from riparian areas; and repairing failing culverts.

The Cedar Creek Wildlife Area, managed by WDFW, is located on the south side of the stream (reach CEDA_CR_02). WDFW acquired the property in 1960 to protect a mineral spring used by band-tailed pigeons, and for stream restoration. WDFW has identified the need to survey for and control invasive weeds, and to maintain riparian plantings in the wildlife area (WDFW, 2010).
2006). The non-profit organization Fish First has restored eight miles of fish habitat on Cedar Creek (Fish First, 2007).

Other restoration actions include:

- Deter livestock access to the stream;
- Employ strategies to prevent riparian degradation and protect water quality;
- Reduce effective stormwater runoff from developed areas;
- Eradicate invasive weed species from riparian areas;
- Increase conifer component of riparian areas;
- Install LWD to increase cover, sediment retention, and increase habitat complexity; and
- Protect instream flows through stormwater infiltration and reducing withdrawals.

8.7.3.2 Public Access

There are few developed public access opportunities along Cedar Creek. Due to the large amount of undeveloped and residentially developed land in this area, other opportunities could include local parks and open spaces at road ends and within riparian buffers, or extension of existing trails.

8.7.4 Reach Scale Assessment

Cedar Creek has been divided into four reaches. Table 8-18 provides a brief description of each reach and highlights key modifications, unique features and restoration opportunities.

### Table 8-18. Reach Assessment for Cedar Creek

<table>
<thead>
<tr>
<th>Reach Number</th>
<th>Reach Location</th>
<th>Reach Length (miles)</th>
<th>Use Descriptions</th>
<th>Modifications</th>
<th>Unique Features</th>
<th>Riparian Zones</th>
<th>Restoration Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEDA_CR_01</td>
<td>From confluence with Lewis River to confluence with Pup Creek.</td>
<td>4.4</td>
<td>Rural. Agriculture. Forested. Minor development.</td>
<td>Conversion of forest to agricultural lands. 2 road crossings</td>
<td>Runs through a steep canyon. Approximately 87 acres of wetland.</td>
<td>Moderate to high quality. Shrubs and trees line most of the shoreline. Little development in floodplain.</td>
<td>Restore riparian areas. Protect intact riparian areas. Protect steep slopes and hillslope processes. Remove invasive species.</td>
</tr>
<tr>
<td>Reach Number</td>
<td>Reach Location</td>
<td>Reach Length (miles)</td>
<td>Use Descriptions</td>
<td>Modifications</td>
<td>Unique Features</td>
<td>Riparian Zones</td>
<td>Restoration Opportunities</td>
</tr>
<tr>
<td>--------------</td>
<td>----------------</td>
<td>----------------------</td>
<td>------------------</td>
<td>---------------</td>
<td>----------------</td>
<td>----------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>CEDA_CR_03</td>
<td>From confluence with Chelatchie Creek to 20 cfs point.</td>
<td>9.0</td>
<td>Rural. Forested. Forest resource use. Some agriculture.</td>
<td>Timber harvest</td>
<td>Approximately 177 acres of wetland. Steep slopes</td>
<td>Moderate to low quality. Majority of shoreline is vegetated with shrubs and trees. Forestry developments in floodplain.</td>
<td>Improve fish habitat. Restore riparian areas. Remove invasive species.</td>
</tr>
</tbody>
</table>
8.8 Pup Creek

8.8.1 Physical and Biological Characterization

8.8.1.1 Drainage Basin and Tributary Streams

Pup Creek originates on south-facing hillside slopes between Lake Merwin and the East Fork Lewis River and flows generally southwest to its confluence with Cedar Creek. The Pup Creek sub-basin drains an area of 5.2 square miles (3,330 acres). Existing uses within the basin are primarily managed forest land in the upper watershed and residential and vacant land within the lower reaches. Numerous unnamed tributary streams in the upper watershed and along the mainstem drain to Pup Creek.

8.8.1.2 Process and Channel Modifications

The process and channel modifications in the Pup Creek watershed include:

- Conversion of forests to agricultural development; and
- Road and rural residential development.

Although the areas adjacent to the stream are forested, there are agricultural lands to the west, as well as roads and rural residential development in the vicinity. This development may result in increased runoff into the stream, degraded water quality, and channel incision.

8.8.1.3 Geologic and Flood Hazard Areas

FEMA floodplain hazards have not been identified along Pup Creek (Appendix A, Map 6). Near the confluence with Cedar Creek, Pup Creek is classified as having a moderate-high potential for channel migration (Olson, 2010; Appendix A, Map 27). Erosion hazard and potential instability have been identified on both banks of the upper reach, upstream of the bend in the stream to the east (Appendix A, Map 12 and Appendix A, Map 14). Additionally, erosion and potential instability have been identified east of the lower reach, downstream of the bend. The lower reach and surrounding areas consist of semi-consolidated sediment associated with some earthquake hazards (Appendix A, Map 13). The upper reach includes areas of consolidated sediment associated with little or no earthquake hazards.

8.8.1.4 Critical or Priority Habitat and Species Use

Pup Creek is used by winter steelhead and coho salmon for spawning, is potentially used by fall chum salmon, and is presumed to be used by spring Chinook salmon (Appendix A, Map 16) (WDFW, 2009a; WDFW, 2009b). The lower Columbia River populations of these fish species are federally listed as threatened under the Endangered Species Act.

Pup Creek contains designated critical habitat for the LCR steelhead DPS and LCR Chinook salmon ESU. Critical habitat for steelhead extends approximately 2.0 miles upstream of the confluence with Cedar Creek. Critical habitat for Chinook salmon extends 0.6 miles upstream of the confluence with Cedar Creek to Spurrel Road (70 FR 170).
The WDNR Natural Heritage Program has not identified priority plant species or vegetation communities within the Pup Creek shoreline planning area (WDNR, 2008).

8.8.1.5 Instream and Riparian Habitats

While data about instream and riparian habitat conditions for Pup Creek are limited, the level of residential development and forestry activities in the basin have reduced the quantity and quality of riparian habitat. Therefore, many other instream habitats and processes are likely to be degraded.

8.8.1.6 Water Quality

There are no water quality related impairments identified for Pup Creek (Ecology, 2008).

8.8.2 Shoreline Use Patterns

8.8.2.1 Existing Land and Shoreline Uses

Pup Creek is a short tributary of Cedar Creek. It flows less than half a mile through rural lands. Existing uses in the shoreline planning area include forestry, rural residential development and vacant lands. There are no structures in the shoreline planning area.

8.8.2.2 Shoreline Environment Designations and Zoning

Pup Creek falls under the zoning jurisdiction of Clark County. The entire Pup Creek shoreline planning area, 23.28 acres, is zoned for single-family residential. There is no current shoreline environment designation available for this area.

8.8.2.3 Existing Public Access

There are currently no existing or proposed public access facilities within the Pup Creek shoreline planning area.

8.8.2.4 Historical and Cultural Resources

There are no recorded archeological or unregistered historic sites within the Pup Creek shoreline planning area (DAHP, 2010). However, due to the documented use of the Clark County area by Chinookan-speaking peoples, Clark County archaeological resource probability mapping suggests there is a significant chance of finding unknown artifacts within almost all of the County’s shoreline planning area (Clark County, 2003).

There are no county-, state-, or federally-listed historic properties within the Pup Creek shoreline planning area (DAHP, 2010).

8.8.2.5 Areas of Special Interest

According to the Ecology facilities/sites data base there are no listed facilities or contaminated sites within the Pup Creek shoreline planning area (Ecology, 2008).
8.8.3 Opportunity Areas

8.8.3.1 Restoration and Protection

Pup Creek has highly functioning shorelines and provides an excellent opportunity for protection.

8.8.3.2 Public Access

Although zoned for single-family residential, most of this shoreline area is undeveloped. Potential shoreline access areas could include development at road ends or within riparian buffer areas.

8.8.4 Reach Scale Assessment

Pup Creek has been evaluated as one reach. Table 8-19 provides a brief description of the reach and highlights key modifications, unique features and restoration opportunities.

<table>
<thead>
<tr>
<th>Reach Number</th>
<th>Reach Location</th>
<th>Reach Length (miles)</th>
<th>Use Descriptions</th>
<th>Modifications</th>
<th>Unique Features</th>
<th>Riparian Zones</th>
<th>Restoration Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUP_CK_01</td>
<td>From 20 cfs point to confluence with Cedar Creek.</td>
<td>0.5</td>
<td>Rural. Forested. Agriculture. Minor residential developments.</td>
<td>None apparent.</td>
<td>None.</td>
<td>High quality forested areas</td>
<td>Protect intact riparian zones.</td>
</tr>
</tbody>
</table>
8.9 Chelatchie Creek

8.9.1 Physical and Biological Characterization

8.9.1.1 Drainage Basin and Tributary Streams

Chelatchie Creek is a tributary of upper Cedar Creek. Chelatchie Creek originates on south-facing hillside slopes between Lake Merwin and the East Fork Lewis River and flows generally south to its confluence with Cedar Creek. The Chelatchie Creek sub-basin drains an area of 12.7 square miles (8,112 acres). Topography in the upper basin is moderate to steep, while the lower valley floor is flat (0.5 percent gradient) (Wierenga, 2005). Existing uses within the basin are primarily managed forest land in the upper watershed and residential and agricultural within the lower reaches. North Fork Chelatchie Creek is the major tributary to Chelatchie Creek, with several small unnamed tributary streams in the upper watershed and along the mainstem.

The Chelatchie Creek watershed consists of agricultural, forested, and low-density residential areas. Clark County has mapped 199 acres of the Chelatchie Creek shoreline planning area as wetland. NWI mapping shows these as palustrine emergent, scrub-shrub, and forested habitats.

8.9.1.2 Process and Channel Modifications

Chelatchie Creek has been modified for agricultural and rural residential purposes. There are areas in forest resource lands where logging has occurred but these areas are generally set back from the stream. No major hydromodifications are identified along the stream.

8.9.1.3 Geologic and Flood Hazard Areas

The Chelatchie Creek floodplain is relatively narrow and may have been modified by agricultural and rural development (Appendix A, Map 6). Chelatchie Creek is classified as having a moderate-high potential for channel migration (Olson, 2010; Appendix A, Map 27). Severe erosion hazards are located 0.2 miles south for the majority of the stream (Appendix A, Map 12). Close to the confluence with an unnamed tributary, severe erosion hazards are located within 0.1 mile from the stream. The area adjacent to the stream is composed primarily of semi-consolidated sediment associated with some seismic hazards (Appendix A, Map 13). Adjacent to Chelatchie Creek are areas of potential instability and slopes greater than 15 percent associated with landslide hazards (Appendix A, Map 14). There are minimal landslide hazards adjacent to the stream; to the north is a low-lying area and to the south are slopes greater than 15 percent in the lower reach (Appendix A, Map 14).

8.9.1.4 Critical or Priority Habitat and Species Use

Chelatchie Creek is used by winter steelhead and coho salmon for spawning, is potentially used by fall chum salmon for migration purposes, has documented use by fall Chinook salmon for migration, and is presumed to be used by spring Chinook salmon for migration (WDFW, 2009a; WDFW, 2009b). The lower Columbia River populations of these species are federally listed as threatened under the Endangered Species Act. Chelatchie Creek also supports both resident coastal cutthroat and rainbow trout.
Chelatchie Creek contains designated critical habitat for the LCR steelhead DPS and LCR Chinook salmon ESU. Critical habitat for both species extends 2.0 miles upstream of the confluence with Cedar Creek (70 FR 170). Critical habitat for LCR coho salmon ESU has not been designated at this time and is currently under review.

The WDNR Natural Heritage Program has identified the priority plant species hairy-stemmed checker-mallow (State Endangered Species) within the Chelatchie Creek shoreline planning area (WDNR, 2008).

8.9.1.5 Instream and Riparian Habitats

Riparian conditions within the sub-basin are generally poor (Wade, 2000). Overall watershed conditions are poor based on percent impervious surface area, road density, and land cover (LCFRB, 2004c). Fine sediments are also a concern within Chelatchie Creek primarily due to residential development and livestock access to streams. It should be noted that some livestock access issues have been repaired by local residents and Fish First. Sediment supply to the stream has been disrupted by roads adjacent to streams, and riparian degradation (Wade, 2000). LWD is rated poor due to logging activities, removal of instream LWD, and riparian degradation.

Little is known about side channel habitat or pool quantity and quality within Chelatchie Creek. A survey of a 0.75 mile reach near the confluence with the North Fork Chelatchie Creek, which is a reach within an unconfined, meandering, palustrine channel in the open valley floor, found that pool habitat was dominant and glide habitats were secondary. The bedforms associated with this reach were oscillating dune-ripple sequences formed of sand and small gravel, or weakly developed pool-riffle sequences where gradients steepened. Sand and gravel were the dominant substrates within this reach. LWD was found to be abundant; however, due to the highly erodible bed material, the LWD does not contribute as much to sediment storage or pool formation as it does for providing cover (Wierenga, 2005).

8.9.1.6 Water Quality

According to the 2008 Washington State Water Quality Assessment (Ecology, 2008), Chelatchie Creek has no 303(d) Category 5 listings for impaired water quality. However, Chelatchie Creek does have one Category 2 listing for dissolved oxygen in a reach of the stream within Skamania County (Ecology, 2008). Category 2 indicates a water of concern for that parameter.

8.9.2 Shoreline Use Patterns

8.9.2.1 Existing Land and Shoreline Uses

Chelatchie Creek flows west for four miles to Amboy and its confluence with Cedar Creek. Existing uses in the upper reach of the shoreline planning area are characterized by rural residential development, mobile home parks, small-scale agriculture and forestry uses. In the lower reach, the shoreline planning area includes more rural residential uses as well as the Amboy Middle School and some commercial uses in Amboy, including a café and small warehouse.
There are three roadway crossings over the stream. SR 503 parallels the stream to the north, and the Chelatchie Prairie Railroad parallels the stream to the south. Neither is in the shoreline planning area. There are no additional mapped shoreline modifications.

8.9.2.2 Shoreline Environment Designations and Zoning

Chelatchie Creek is completely within Clark County’s shoreline planning and zoning jurisdiction. This area has a shoreline environment designation of Rural, intended for intense agriculture and recreation. This shoreline planning area is predominantly zoned for agriculture, with some single-family residential and forestry uses. A summary of the zoning designations is shown in Table 8-20.

<table>
<thead>
<tr>
<th>Zoning Designation</th>
<th>Acreage</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>179</td>
<td>61%</td>
</tr>
<tr>
<td>Forest</td>
<td>35</td>
<td>12%</td>
</tr>
<tr>
<td>Commercial</td>
<td>3</td>
<td>1%</td>
</tr>
<tr>
<td>Residential – Single-Family</td>
<td>76</td>
<td>26%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>293</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

8.9.2.3 Existing Public Access

There are currently no public access facilities within the Chelatchie Creek shoreline planning area. The furthest upstream portion of this shoreline planning area crosses a planned 283-foot section of a trail that would connect the North Fork of the Lewis River Trail, north of this planning area, to other regional trails to the south.

8.9.2.4 Historical and Cultural Resources

Cultural resources within the Chelatchie Creek shoreline planning area include five pre-contact sites, all characterized as lithic material sites. Two of these sites were recorded as also having historical components. Chelatchie Prairie was historically used by the Chehalis and Klickitat tribes for horse racing.

There are no county-, state-, or federally-listed historic properties within the Chelatchie Creek shoreline planning area (DAHP, 2010; Clark County, 2010D).

8.9.2.5 Areas of Special Interest

The Ecology-listed sites within the Chelatchie Creek shoreline planning area consist of one monitored Underground Storage Tank (Ecology, 2010). The site is located within County jurisdiction (Reach CHEL_CR_02).
8.9.3 Opportunity Areas

8.9.3.1 Restoration and Protection

The non-profit organization Fish First has installed riparian plantings, rootwads, livestock fencing, and spawning gravel on Chelatchie Creek (Fish First, 2007). Additional riparian plantings would help to restore cover, shade, and organic matter to the stream. Other potential actions include:

- Protect and enhance wetland complexes in the lower two miles that provide important overwintering and rearing habitat for coho salmon;
- Use strategies to prevent riparian degradation and protect water quality;
- Work with property owners to minimize riparian degradation by deterring livestock access and promoting native vegetative growth along streambanks;
- Reduce effective stormwater runoff from developed areas;
- Eradicate invasive weed species from riparian areas;
- Increase conifer component of riparian areas;
- Install LWD to increase cover, sediment retention, and increase habitat complexity; and
- Protect instream flows through stormwater infiltration and reducing withdrawals.

8.9.3.2 Public Access

The planned trail segment will provide an opportunity for public access to the Chelatchie Creek shoreline planning area. In addition, the County could explore other regional and local trail connections for additional shoreline access and wildlife viewing. Other public access development opportunities could include road ends and riparian buffer areas.

8.9.4 Reach Scale Assessment

Chelatchie Creek has been divided into two reaches based upon unique features. Table 8-21 provides a brief description of each reach and highlights key modifications, unique features and restoration opportunities.
Table 8-21. Reach Assessment for Chelatchie Creek

<table>
<thead>
<tr>
<th>Reach Number</th>
<th>Reach Location</th>
<th>Reach Length (miles)</th>
<th>Use Descriptions</th>
<th>Modifications</th>
<th>Unique Features</th>
<th>Riparian Zones</th>
<th>Restoration Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEL_CR_01</td>
<td>From confluence with Cedar Creek to confluence with Chelatchie Creek Tributary.</td>
<td>0.6</td>
<td>Rural. Residential developments. Forested.</td>
<td>NE 221st Avenue crosses the river</td>
<td>Category 1 critical aquifer recharge area</td>
<td></td>
<td>Riparian protection and restoration. Removal of invasive species.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Moderate to low quality. Shoreline is periodically</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>vegetated with shrubs and trees. Residential</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>developments reside within floodplain.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHEL_CR_02</td>
<td>From confluence with Chelatchie Creek Tributary to 20 cfs point.</td>
<td>3.7</td>
<td>Rural. Agriculture. Minor residential developments.</td>
<td>Floodplain may be modified. 4 roadway crossings and</td>
<td>Approximately 175 acres of wetland.</td>
<td></td>
<td>Riparian protection and restoration. Removal of invasive species. Enhance associated</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>private driveways in shoreline planning area.</td>
<td></td>
<td></td>
<td>wetlands.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Moderate to low quality. Shoreline is sparsely</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>vegetated. Agriculture and minor</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>developments reside within floodplain.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Shoreline Inventory and Characterization
8.10 Unnamed Tributary to Chelatchie Creek

8.10.1 Physical and Biological Characterization

8.10.1.1 Drainage Basin and Tributary Streams

The unnamed tributary to Chelatchie Creek originates on south-facing hillside slopes between Lake Merwin and the East Fork Lewis River and flows south-southeast to the confluence with Chelatchie Creek. The stream is part of the Chelatchie Creek sub-basin, which drains an area of 12.7 square miles (8,112 acres). Topography in the upper basin is moderate to steep, while the lower valley floor is flat (0.5 percent gradient) (Wierenga, 2005). Existing uses are primarily managed forest land in the upper watershed and residential within the lower reaches. There are several unnamed tributary streams in the upper watershed and along the mainstem. Clark County maps 373 acres of the shoreline planning area as wetland.

8.10.1.2 Process and Channel Modifications

The largest unnamed tributary to Chelatchie Creek has been modified for agricultural and rural residential purposes. There are no other major hydromodifications identified along this stream.

8.10.1.3 Geologic and Flood Hazard Areas

The unnamed tributary of Chelatchie Creek includes a floodplain that is relatively narrow throughout most of the reach (Appendix A, Map 6). The floodplain is slightly larger at the confluence of the unnamed tributary and Chelatchie Creek (Appendix A, Map 6). The unnamed tributary of Chelatchie Creek is classified as having a moderate potential for channel migration (Olson, 2010; Appendix A, Map 27). A small area north of the unnamed tributary has severe erosion hazards (Appendix A, Map 12). The unnamed tributary and the area between the unnamed tributary and Chelatchie Creek is made up of semi-consolidated sediment associated indicating potential seismic hazard. To the north of the unnamed tributary is an area of consolidated sediment (Appendix A, Map 13). There are areas to the north of the stream with slopes greater than 15 percent associated with landslide hazards (Appendix A, Map 14).

8.10.1.4 Critical or Priority Habitat and Species Use

The unnamed tributary to Chelatchie Creek is used by winter steelhead and coho salmon for spawning, is potentially used by fall chum salmon for migration purposes, has documented use by fall Chinook salmon for migration, and is presumed to be used by spring Chinook salmon for migration (WDFW, 2009a; WDFW, 2009b). The lower Columbia River populations of these species are listed as threatened under the Endangered Species Act. The tributary also supports resident rainbow trout.

The unnamed tributary to Chelatchie Creek contains designated critical habitat for steelhead for approximately 1,600 feet upstream of the confluence with Chelatchie Creek (70 FR 170). Critical habitat for LCR coho salmon ESU has not been designated at this time and is currently under review.
The WDNR Natural Heritage Program has identified the priority plant species hairy-stemmed checker-mallow (State Endangered Species) within the unnamed tributary to Chelatchie Creek shoreline planning area (WDNR, 2008).

8.10.1.5 Instream and Riparian Habitats

Riparian conditions within the sub-basin are generally poor (Wade, 2000). Overall watershed conditions are poor based on percent impervious surface area, road density, and land cover (LCFRB, 2004c). Sediment supply to the stream has been disrupted by roads adjacent to streams, and riparian degradation (LCFRB, 2004c). LWD is rated poor due to logging activities, removal of instream LWD, and riparian degradation (Wade, 2000).

Little is known about side-channel habitat or pool quantity and quality within the Chelatchie Creek watershed; however, pool habitat is a concern on the North Fork Chelatchie Creek (Wade, 2000).

8.10.1.6 Water Quality

There are no water quality related impairments identified for the unnamed tributary to Chelatchie Creek.

8.10.2 Shoreline Use Patterns

8.10.2.1 Existing Land and Shoreline Uses

Existing uses in the unnamed tributary of Chelatchie Creek near Amboy are similar to those along Chelatchie Creek. The shoreline planning area includes the stream and a large wetland complex east of the headwaters. Existing uses in the shoreline planning area are characterized by rural residential development, mobile home parks, small-scale agriculture and forestry uses.

There are several local access roads in the wetland complex. There are three roadway crossings over the stream. Two of the crossings are mapped as culverts. There are no additional mapped shoreline modifications.

8.10.2.2 Shoreline Environment Designations and Zoning

The unnamed tributary of Chelatchie Creek is completely within Clark County’s shoreline planning and zoning jurisdiction. This area has a shoreline environment designation of Rural, intended for intense agriculture and recreation. This shoreline planning area is predominantly zoned for agriculture, with some single-family residential and forestry uses. A summary of the zoning designations is shown in Table 8-22.
Table 8-22. Unnamed Tributary of Chelatchie Creek Zoning

<table>
<thead>
<tr>
<th>Zoning Designation</th>
<th>Acreage</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>188</td>
<td>48%</td>
</tr>
<tr>
<td>Forest</td>
<td>67</td>
<td>17%</td>
</tr>
<tr>
<td>Residential – Single-Family</td>
<td>136</td>
<td>35%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>391</td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

8.10.2.3 Existing Public Access

There are currently no public access facilities within the unnamed tributary to Chelatchie Creek shoreline planning area.

8.10.2.4 Historical and Cultural Resources

There are no recorded archeological or unregistered historic sites within the unnamed tributary of Chelatchie Creek shoreline planning area (DAHP, 2010). Clark County archaeological resource probability mapping suggests there is a significant chance of finding unknown artifacts within almost all of the County’s shoreline planning area (Clark County, 2003).

There are no county-, state-, or federally-listed historic properties within the unnamed tributary to Chelatchie Creek shoreline planning area (DAHP, 2010).

8.10.2.5 Areas of Special Interest

According to the Ecology facilities/sites data base, there are no listed facilities or contaminated sites within the unnamed tributary to Chelatchie Creek shoreline planning area.

8.10.3 Opportunity Areas

8.10.3.1 Restoration and Protection

General opportunities for restoration include:

- Employ strategies to prevent riparian degradation and protect water quality;
- Work with property owners to minimize riparian degradation by deterring livestock access and promoting native vegetative growth along streambanks;
- Eradicate invasive weed species from riparian areas;
- Increase conifer component of riparian areas;
- Install LWD to increase cover, sediment retention, and increase habitat complexity; and
- Protect instream flows through stormwater infiltration and reducing withdrawals.
8.10.3.2 Public Access

Public access development opportunities could include road ends and riparian buffer areas.

8.10.4 Reach Scale Assessment

The unnamed tributary is assessed as one reach. See Table 8-23 for key modifications, unique features and restoration opportunities.

Table 8-23. Reach Assessment for Unnamed Tributary to Chelatchie Creek

<table>
<thead>
<tr>
<th>Reach Number</th>
<th>Reach Location</th>
<th>Reach Length (miles)</th>
<th>Use Descriptions</th>
<th>Modifications</th>
<th>Unique Features</th>
<th>Riparian Zones</th>
<th>Restoration Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>UCHE_CK_01</td>
<td>From confluence with Chelatchie Creek to 20 cfs point.</td>
<td>1.7</td>
<td>Rural and agriculture uses. Minor developments. Forested.</td>
<td>Floodplain may be modified. 3 roadway crossings in this reach.</td>
<td>Approximately 373 acres of wetland. At moderate to poor quality. Shoreline is sparsely vegetated. Agriculture and minor developments reside within floodplain.</td>
<td>Riparian protection and restoration. Removal of invasive species. Protect and enhance associated wetlands.</td>
<td></td>
</tr>
</tbody>
</table>
8.11 Canyon Creek

8.11.1 Physical and Biological Characterization

8.11.1.1 Drainage Basin and Tributary Streams

Canyon Creek originates in the mountainous terrain of Skamania County and flows west for 7.98 miles from the Clark County boundary to its confluence with the Lewis River between Yale Reservoir and Lake Merwin. The Canyon Creek sub-basin drains an area of 10.6 square miles (6,799 acres) within Clark County. Major tributaries include Sorehead Creek, Jakes Creek, Pelvey Creek, Big Rock Creek and Puny Creek within Skamania County, Fly Creek within Clark County, and numerous unnamed tributaries in both Clark and Skamania Counties. Existing uses are dominated by forestry with some rural residential development.

Clark County maps 20 acres of the Canyon Creek shoreline planning area as wetland. These are palustrine forested communities, based on aerial photos.

8.11.1.2 Process and Channel Modifications

There are few process and channel modifications along Canyon Creek. The adjacent area is primarily forested. There are no major hydromodifications identified along this stream.

8.11.1.3 Geologic and Flood Hazard Areas

There are no FEMA flood hazards identified adjacent to Canyon Creek (Appendix A, Map 6). Sections of Canyon Creek are classified as having a moderate to moderate-high potential for channel migration (Olson, 2010; Appendix A, Map 27). There are severe erosion hazards identified adjacent to the stream (Appendix A, Map 12). The sediment is classified as consolidated, so the earthquake hazard is minimal (Appendix A, Map 13). The sediment in and adjacent to the stream is consolidated and associated with no or little earthquake hazard (Appendix A, Map 13). Canyon Creek is surrounded by areas of greater than 15 percent slope that are associated with landslide hazards (Appendix A, Map 14). Additionally, the stream is adjacent to three identified older landslide areas. Two of the identified older landslide areas are located downstream of the confluence with Fly Creek by 0.1 mile and 0.2 mile. The larger one, which is 0.2 mile downstream of the confluence, spans 0.3 mile along-channel and 0.5 mile across-channel. Additionally, there is an older landslide located 3.4 miles upstream of the confluence which spans 0.5 mile along-channel and 1.3 miles across-channel.

8.11.1.4 Critical or Priority Habitat and Species Use

Canyon Creek contains no anadromous salmonids due to the Lake Merwin Dam and Yale Lake Dam; however, bull trout have been documented in the lower reach of the stream (WDFW, 2009a; WDFW, 2009b). Bull trout are federally listed as threatened under the Endangered Species Act. Canyon Creek also supports resident rainbow trout and coastal cutthroat trout (WDFW, 2009a; WDFW, 2009b).

Other priority habitats and species, as identified by WDFW, occurring along Canyon Creek include: Rocky Mountain and Roosevelt elk wintering ranges, cliffs, bald eagle communal...
roosts, bald eagle wintering concentrations, and snag rich areas (Appendix A, Map 11) (WDFW, 2009a).

The WDNR Natural Heritage Program has identified no priority plant species or vegetation communities within the Canyon Creek shoreline planning area (WDNR, 2008).

8.11.1.5 Instream and Riparian Habitats

Information about habitat conditions within Canyon Creek is limited. Based on the topography and surrounding riparian vegetation, it appears that stream habitats are dominated by high gradient riffle/pool habitats with cobble, boulder, and bedrock substrates.

8.11.1.6 Water Quality

According to the 2008 Washington State Water Quality Assessment (Ecology, 2008), Canyon Creek has no 303(d) Category 5 listings for impaired water quality. However, Canyon Creek does have two Category 1 and one Category 2 listings for temperature in a reach of the stream within Skamania County (Ecology, 2008). Category 1 listings indicate that the stream meets tested criteria for that parameter. Category 2 indicates a water of concern for that parameter.

8.11.2 Shoreline Use Patterns

8.11.2.1 Existing Land and Shoreline Uses

Canyon Creek flows through eight miles of timber lands from the Skamania County boundary to Lake Merwin. Existing uses within the shoreline planning area are almost completely in forestry. Most of the land in the shoreline planning area in the upper reach is owned by Weyerhaeuser. In the lower reach lands are also owned by PacifiCorp. The stream is crossed by two bridges. There are no other shoreline modifications mapped in the planning area.

8.11.2.2 Shoreline Environment Designations and Zoning

All 434.42 acres of the Canyon Creek shoreline planning area lie within the unincorporated areas of Clark County. This entire area has a shoreline environment designation of Conservancy and is zoned for forest uses.

8.11.2.3 Existing Public Access

There are currently no formal public access opportunities within the Canyon Creek shoreline planning area. The lower several miles of Canyon Creek are popular for whitewater kayaking. A 488-foot section of a planned regional trail would cross the stream at its approximate mid-point. The northern extent of the stream, at the confluence with the Lewis River, is owned by PacifiCorp.
8.11.2.4 Historical and Cultural Resources

There are no recorded archeological or unregistered historic sites within the Canyon Creek shoreline planning area (DAHP, 2010). Clark County archaeological resource probability mapping suggests there is a significant chance of finding unknown artifacts within almost all of the County’s shoreline planning area (Clark County, 2003).

There are no county-, state-, or federally-listed historic properties within the Canyon Creek shoreline planning area (DAHP, 2010).

8.11.2.5 Areas of Special Interest

According to the Ecology facilities/sites data base there are no listed facilities or contaminated sites within the Canyon Creek shoreline planning area.

8.11.3 Opportunity Areas

8.11.3.1 Restoration and Protection

Restoration opportunities for Canyon Creek include decommissioning or repairing logging roads to prevent sedimentation, replanting riparian areas with native trees, and removing failing culverts. Other restoration opportunities include:

- Employ strategies to prevent riparian degradation; and
- Protect potential spawning areas for bull trout through riparian restoration and erosion/sedimentation control.

8.11.3.2 Public Access

The planned trail segment will provide an opportunity for public access to the Canyon Creek shoreline planning area.
8.11.4 Reach Scale Assessment

Canyon Creek has been divided into reaches based upon unique features. Table 8-24 provides a brief description of each reach and highlights key modifications, unique features and restoration opportunities.

Table 8-24. Reach Assessment for Canyon Creek

<table>
<thead>
<tr>
<th>Reach Number</th>
<th>Reach Location</th>
<th>Reach Length (miles)</th>
<th>Use Descriptions</th>
<th>Modifications</th>
<th>Unique Features</th>
<th>Riparian Zones</th>
<th>Restoration Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>CANY_CR_01</td>
<td>From confluence with Lake Merwin to confluence with Fly Creek.</td>
<td>2.9</td>
<td>Rural. Forested. Natural areas.</td>
<td>None apparent. Private driveway crossing.</td>
<td>Large pool formed off of creek. Steep slopes</td>
<td>Moderate to high quality. Area is densely populated with trees and shrub. Quality likely reduced by nearby forest practices.</td>
<td>Protect and restore riparian areas. Protect wildlife habitat and corridors.</td>
</tr>
<tr>
<td>CANY_CR_02</td>
<td>From confluence with Fly Creek to east border of Clark County.</td>
<td>5.1</td>
<td>Rural. Forested. Forest resource lands. Natural areas.</td>
<td>None apparent. Roadway parallels creek to the north.</td>
<td>Steep slopes</td>
<td>Moderate to high quality. Area is densely populated with trees and shrub. Quality likely reduced by nearby forest practices.</td>
<td>Protect riparian areas. Protect wildlife habitat and corridors.</td>
</tr>
</tbody>
</table>
8.12 Fly Creek

8.12.1 Physical and Biological Characterization

8.12.1.1 Drainage Basin and Tributary Streams

Fly Creek originates in the mountainous terrain of Clark and Skamania Counties and flows northwest to its confluence with Canyon Creek. Little Fly Creek is the major tributary to Fly Creek, with numerous unnamed tributaries also contributing to the hydrology of the sub-basin. Fly Creek is located within the Little Fly Creek sub-basin, which drains an area of 17.5 square miles (11,231 acres) within Clark County. Existing uses are primarily in forestry with little or no development activity.

The Fly Creek watershed consists of timberland, drained by numerous small tributary streams. Clark County maps 72 acres of the Fly Creek shoreline planning area as wetland. These are palustrine forested communities based on aerial photos.

8.12.1.2 Process and Channel Modifications

There are few process and channel modifications at Fly Creek. The adjacent area is primarily forested. There are no major hydromodifications identified along this stream.

8.12.1.3 Geologic and Flood Hazard Areas

There are no FEMA flood hazards identified adjacent to Fly Creek (Appendix A, Map 6). There are severe erosion hazards identified adjacent to the stream (Appendix A, Map 12). Sections of Fly Creek are classified as having a moderate-high potential for channel migration (Olson, 2010; Appendix A, Map 27). These sections are characterized by channel widening, erodible geology, and some braiding. The sediment is classified as consolidated, so the seismic hazard is minimal (Appendix A, Map 13). The stream is surrounded by areas of greater than 15 percent slope, which is associated with landslide hazards (Appendix A, Map 14).

8.12.1.4 Critical or Priority Habitat and Species Use

Fly Creek contains no anadromous salmonids or listed species (Appendix A, Map 16). Resident rainbow trout are documented as occurring in Fly Creek (WDFW, 2009a; WDFW, 2009b). Fly Creek contains no designated critical habitat for listed fish species (70 FR 170).

The WDNR Natural Heritage Program has identified no priority plant species or vegetation communities within the Fly Creek shoreline planning area (WDNR, 2008).

8.12.1.5 Instream and Riparian Habitats

Information about habitat conditions within Fly Creek is limited. Based on the topography and surrounding riparian vegetation, it appears that stream habitats are dominated by high gradient riffle/pool habitats with cobble, boulder, and bedrock substrates.
8.12.6 Water Quality

There are no water quality related impairments identified for Fly Creek (Ecology, 2008).

8.12.2 Shoreline Use Patterns

8.12.2.1 Existing Land and Shoreline Uses

Fly Creek flows north through timber lands to its confluence with Canyon Creek in the northeast corner of the county. Existing uses within the Fly Creek shoreline planning area are completely forestry. The entire shoreline planning area is owned by Weyerhaeuser. The stream is crossed by one roadway via a bridge. There are no other shoreline modifications mapped in the planning area.

8.12.2.2 Shoreline Environment Designations and Zoning

All 418.29 acres of Fly Creek lie within the unincorporated areas of Clark County. This entire area has a shoreline environment designation of Conservancy and is zoned for forest uses.

8.12.2.3 Existing Public Access

There are no existing public access facilities at Fly Creek. This entire shoreline planning area is used for active forest management on private lands.

8.12.2.4 Historical and Cultural Resources

There are no recorded archeological or unregistered historic sites within the Fly Creek shoreline planning area (DAHP, 2010).

There are no county-, state-, or federally-listed historic properties within the Fly Creek shoreline planning area (DAHP, 2010; Clark County, 2010D).

8.12.2.5 Areas of Special Interest

According to the Ecology facilities/sites data base there are no listed facilities or contaminated sites within the Fly Creek shoreline planning area.

8.12.3 Opportunity Areas

8.12.3.1 Restoration and Protection

Restoration opportunities for Fly Creek include decommissioning or repairing logging roads to prevent sedimentation, replanting riparian areas with native trees, and removing failing culverts. Other restoration opportunities include:

- Employ strategies to prevent riparian degradation;
- Eradicate invasive weed species from riparian areas; and
- Increase the conifer component of riparian areas.
8.12.3.2 Public Access

The area is used for active forest management on private land, public access may not be appropriate.

8.12.4 Reach Scale Assessment

Fly Creek is assessed as one reach. Table 8-25 highlights key modifications, unique features and restoration opportunities.

Table 8-25. Reach Assessment for Fly Creek

<table>
<thead>
<tr>
<th>Reach Number</th>
<th>Reach Location</th>
<th>Reach Length (miles)</th>
<th>Use Descriptions</th>
<th>Modifications</th>
<th>Unique Features</th>
<th>Riparian Zones</th>
<th>Restoration Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLY_CR_01</td>
<td>From confluence with Canyon Creek to 20 cfs point.</td>
<td>7.5</td>
<td>Rural. Forest resource lands. Natural areas.</td>
<td>None apparent.</td>
<td>Approximately 72 acres are wetland. (most high quality wetland) Steep slopes</td>
<td>Moderate to high quality. Area is densely populated with trees and shrub. Quality likely reduced by nearby forest practices.</td>
<td>Protect riparian areas. Remove invasive species.</td>
</tr>
</tbody>
</table>
8.13 Siouxon Creek

8.13.1 Physical and Biological Characterization

8.13.1.1 Drainage Basin and Tributary Streams

Siouxon Creek originates in the mountainous terrain of Skamania County and flows west for 4.45 miles from the Clark/Skamania County line to its confluence with Yale Reservoir. There is no development within the basin and the primary use is forestry. Major tributaries include: Calamity Creek, Chinook Creek, Wildcat Creek, Horseshoe Creek, West Creek (all within Skamania County), and numerous unnamed tributary streams in both Clark and Skamania Counties.

The Siouxon Creek watershed consists of timberland, drained by numerous small tributary streams. The headwaters are in Skamania County. Less than one acre of the Siouxon Creek shoreline planning area is mapped as wetland by Clark County.

8.13.1.2 Process and Channel Modifications

There are few process and channel modifications at Siouxon Creek. The adjacent area is primarily forested. There are no major hydromodifications identified along this stream.

8.13.1.3 Geologic and Flood Hazard Areas

There are FEMA flood hazards identified adjacent to the lower section of Siouxon Creek. The lower section spans from approximately 1.5 miles downstream of the confluence with North Siouxon Creek to Yale Lake. The flood hazard extends the furthest, 0.2 mile across-channel near the confluence with Yale Lake (Appendix A, Map 6). The stream is surrounded by severe erosion hazards (Appendix A, Map 12). The stream and floodplain are classified as semi-consolidated sediment and the area outside of the floodplain is classified as consolidated sediment (Appendix A, Map 13). Slopes are greater than 15 percent adjacent to the stream and are associated with landslide hazards (Appendix A, Map 14).

8.13.1.4 Critical or Priority Habitat and Species Use

Siouxon Creek contains no anadromous salmonids or listed species (Appendix A, Map 16). Resident rainbow trout and kokanee (landlocked sockeye salmon) are documented as occurring in Siouxon Creek (WDFW, 2009a; WDFW, 2009b).

Other priority habitats and species, as identified by WDFW, occurring along Siouxon Creek include Rocky Mountain and Roosevelt elk winter ranges, deer wintering ranges, and bald eagle communal roosts (Appendix A, Map 11) (WDFW 2009a).

The WDNR Natural Heritage Program has identified no priority plant species or vegetation communities within the Siouxon Creek shoreline planning area (WDNR, 2008).
8.13.1.5 Instream and Riparian Habitats

Information about habitat conditions within Siouxon Creek is limited. Based on the topography and surrounding riparian vegetation, it appears that stream habitats are dominated by high gradient riffle/pool habitats with cobble, boulder, and bedrock substrates.

8.13.1.6 Water Quality

According to the 2008 Washington State Water Quality Assessment (Ecology, 2008), Siouxon Creek has one 303(d) Category 5 listing for temperature. However, the impaired reach is outside (upstream) of Clark County within Skamania County (Ecology, 2008).

8.13.2 Shoreline Use Patterns

8.13.2.1 Existing Land and Shoreline Uses

Siouxon Creek is a tributary of the Lewis River. It flows west and north from the county boundary for five miles to Yale Lake. The shoreline planning area is completely within state-owned timberlands and the use is forestry. The stream is crossed by one bridge near its mouth. There are no other shoreline modifications mapped in the shoreline planning area.

8.13.2.2 Shoreline Environment Designations and Zoning

Siouxon Creek lies within the zoning and shoreline jurisdiction of Clark County. This entire area has a shoreline environment designation of Conservancy and is zoned for forest use.

8.13.2.3 Existing Public Access

There are currently no formal public access facilities within the Siouxon Creek shoreline planning area. Most of the area is owned by WDNR. Several miles of a proposed regional trail will cross this planning area. A summary of the public access opportunities in this shoreline planning area is shown in Table 8-26.

### Table 8-26. Siouxon Creek Public Access Facilities

<table>
<thead>
<tr>
<th>Facility Name</th>
<th>Facility Type</th>
<th>Area or length within Shoreline</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>DNR Natural Area</td>
<td>Natural Area</td>
<td>312 acres</td>
<td>Undeveloped</td>
</tr>
<tr>
<td>Unnamed Trail (IP Road)</td>
<td>Trail</td>
<td>5 miles</td>
<td>Proposed</td>
</tr>
</tbody>
</table>

8.13.2.4 Historical and Cultural Resources

There is only one recorded archaeological site within the Siouxon Creek shoreline planning area, a pre-contact lithic material site. Clark County archaeological resource probability mapping suggests there is a significant chance of finding unknown artifacts within almost all of the County’s shoreline planning area (Clark County, 2003).
There are no county-, state-, or federally-listed historic properties within the Siouxon Creek shoreline planning area (DAHP, 2010; Clark County, 2010D).

8.13.2.5 Areas of Special Interest

According to the Ecology facilities/site data base there are no listed facilities or contaminated sites within the Siouxon Creek shoreline planning area.

8.13.3 Opportunity Areas

8.13.3.1 Restoration and Protection

Restoration opportunities for Siouxon Creek include decommissioning or repairing logging roads to prevent sedimentation, replanting riparian areas with native trees, and removing failing culverts. Other restoration opportunities include:

- Employ strategies to prevent riparian degradation;
- Eradicate invasive weed species from riparian areas; and
- Increase the conifer component of riparian areas.

8.13.3.2 Public Access

With the construction of the proposed regional trail system, no other public access would be required for the Siouxon Creek shoreline planning area.

8.13.4 Reach Scale Assessment

Siouxon Creek is assessed as one reach. Table 8-27 highlights key modifications, unique features and restoration opportunities.

<table>
<thead>
<tr>
<th>Reach Number</th>
<th>Reach Location</th>
<th>Reach Length (miles)</th>
<th>Use Descriptions</th>
<th>Modifications</th>
<th>Unique Features</th>
<th>Riparian Zones</th>
<th>Restoration Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIOU_CR_01</td>
<td>From the confluence with Yale Lake to the eastern border of Clark County.</td>
<td>4.5</td>
<td>Natural areas. Forested.</td>
<td>None apparent. 2 roadway crossings.</td>
<td>Entire reach resides in DNR owned public land.</td>
<td>High quality. Surrounding area is densely forested and there is little to no development within the floodplain.</td>
<td>Protect intact riparian areas.</td>
</tr>
</tbody>
</table>
8.14 North Siouxon Creek

8.14.1 Physical and Biological Characterization

8.14.1.1 Drainage Basin and Tributary Streams

North Siouxon Creek is a tributary of Siouxon Creek, which in turn drains to Yale Reservoir. North Siouxon Creek originates in the mountainous terrain of Skamania County and flows southwest for 1.36 miles from the Clark/Skamania County line to its confluence with Siouxon Creek. There is no development within the basin and the primary use is forestry. Several unnamed tributary streams drain hillside slopes into North Siouxon Creek.

The North Siouxon Creek watershed consists of timberland, drained by numerous small tributary streams. There are small areas of palustrine forested wetland, based on aerial photos.

8.14.1.2 Process and Channel Modifications

There are few process and channel modification at North Siouxon Creek. The adjacent area is primarily forested. There is no major hydromodification identified along this stream.

8.14.1.3 Geologic and Flood Hazard Areas

There are no FEMA flood hazards identified adjacent to North Siouxon Creek (Appendix A, Map 6). There are severe erosion hazards identified adjacent to the stream (Appendix A, Map 12). The sediment is classified as consolidated, indicating that the seismic hazard is minimal (Appendix A, Map 13). The stream is surrounded by an older landslide area and areas of greater than 15 percent slope. The older landslide is 0.2 mile upstream of the confluence with Siouxon Creek, extending 0.4 mile along-channel and 0.6 mile across-channel.

8.14.1.4 Critical or Priority Habitat and Species Use

North Siouxon Creek contains no anadromous salmonids or listed species (Appendix A, Map 16). Resident rainbow trout are documented as occurring in North Siouxon Creek (WDFW, 2009a; WDFW, 2009b).

Other priority habitats and species, as identified by WDFW, occurring along North Siouxon Creek include Rocky Mountain and Roosevelt elk winter ranges (Appendix A, Map 11) (WDFW, 2009a).

The WDNR Natural Heritage Program has identified no priority plant species or vegetation communities within the North Siouxon Creek shoreline planning area (WDNR, 2008).

8.14.1.5 Instream and Riparian Habitats

Information about habitat conditions within North Siouxon Creek is limited. Based on the topography and surrounding riparian vegetation, it appears that stream habitats are dominated by high gradient riffle/pool habitats with cobble, boulder, and bedrock substrates.
8.14.1.6 Water Quality

There are no water quality related impairments identified for North Siouxon Creek. This does not necessarily mean that there are no water quality impairments; it may be an indication that the stream has not been assessed for water quality.

8.14.2 Shoreline Use Patterns

8.14.2.1 Existing Land and Shoreline Uses

North Siouxon Creek is a tributary of Siouxon Creek and the Lewis River. The stream flows from the eastern county boundary through state-owned timber lands. Existing uses in the shoreline planning area are forestry-related. The stream is crossed by one road. There are no other shoreline modifications mapped in the shoreline planning area.

8.14.2.2 Shoreline Environment Designations and Zoning

Similar to Siouxon Creek, North Siouxon Creek has a shoreline environment designation of Conservancy and is zoned for forest uses within unincorporated Clark County.

8.14.2.3 Existing Public Access

All 64.91 acres of the North Siouxon Creek shoreline planning area are public lands owned by WDNR. There are no formal public access opportunities in this area.

8.14.2.4 Historical and Cultural Resources

There are no recorded archeological or unregistered historic sites within the North Siouxon Creek shoreline planning area (DAHP, 2010). County archaeological resource probability mapping suggests there is a significant chance of finding unknown artifacts within almost all of the County’s shoreline planning area (Clark County 2003).

There are no county-, state-, or federally-listed historic properties within the North Siouxon Creek shoreline planning area (DAHP, 2010; Clark County, 2010d).

8.14.2.5 Areas of Special Interest

According to the Ecology facilities/sites data base there are no listed facilities or sites within the Siouxon Creek shoreline planning area.

8.14.3 Opportunity Areas

8.14.3.1 Restoration and Protection

Restoration opportunities for North Siouxon Creek include decommissioning or repairing logging roads to prevent sedimentation, replanting riparian areas with native trees, and removing failing culverts. Other restoration opportunities include:
- Employ strategies to prevent riparian degradation;
- Eradicate invasive weed species from riparian areas; and
- Increase the conifer component of riparian areas.

8.14.3.2 Public Access

Potential public access opportunities in this shoreline planning area could include a spur trail off of the proposed regional trail near Siouxon Creek.

8.14.4 Reach Scale Assessment

North Siouxon Creek is assessed as one reach. Table 8-28 highlights key modifications, unique features and restoration opportunities.

Table 8-28. Reach Assessment for North Siouxon Creek

<table>
<thead>
<tr>
<th>Reach Number</th>
<th>Reach Location</th>
<th>Reach Length (miles)</th>
<th>Use Descriptions</th>
<th>Modifications</th>
<th>Unique Features</th>
<th>Riparian Zones</th>
<th>Restoration Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSIO_CR_01</td>
<td>From confluence with the Siouxon Creek to the eastern border of Clark County.</td>
<td>1.4</td>
<td>Natural areas. Forested.</td>
<td>None apparent.</td>
<td>Entire reach resides in DNR owned public land.</td>
<td>High quality. Surrounding area is densely forested and there is little to no development within the floodplain.</td>
<td>Protect intact riparian areas.</td>
</tr>
</tbody>
</table>

8.15 Data Gaps

The inventory and characterization report relies on GIS data, review of aerial photographs, existing technical reports, existing map products, information from the technical advisory committee, and community input. While there was a wealth of information shared, that information was not always available at a consistent level of detail for the geography under investigation. Gaps in data and information are inherent in these types of reports. The following gaps in data or information were identified during this inventory and characterization of the lower Lewis River sub-watershed:

- Current quantifiable data on shoreline modifications;
- Current data on riparian quality;
- Known or potential barriers to anadromous fish;
- Water quality parameters not assessed by Ecology as part of the Section 303(d) list;
- Verification of the location and extent of associated wetlands;
Shoreline Inventory and Characterization

- County-wide inventory of invasive plants and noxious weeds; and
- Up-to-date GIS park and public access layer.

Comprehensive assessment of all water withdrawals and groundwater connections to streamflow is needed to help determine what proportion of any reduction in seasonal flows is due to groundwater wells or surface water diversions.