

5.3 Middle Chehalis River Ecological Region

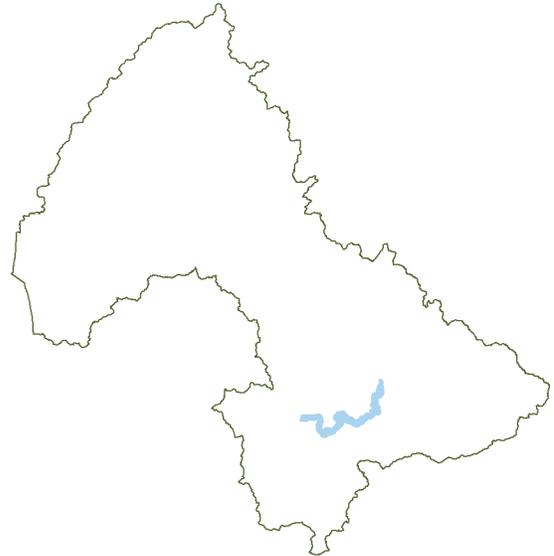
5.3.1 Overview

The Middle Chehalis River Ecological Region encompasses the mainstem Chehalis River and its floodplain from approximately RM 97 (Rainbow Falls) to RM 67 (Skookumchuck River confluence; Figure 5-5). This ecological region encompasses 26 square miles (nearly 17,000 acres) and represents approximately 1% of the overall Chehalis Basin. The entire ecological region is low-elevation alluvial valley ranging from about 300 feet in elevation near Rainbow Falls to about 180 feet in elevation in Centralia.

The mainstem middle Chehalis River floodplain geology is predominantly recent alluvium; however, continental glacial ice sheets extended more than once into the Chehalis Basin. The Middle Chehalis River Ecological Region was affected by glacial outwash and the deposition of coarse glacial outwash sediments as far south as Centralia, as well as the formation of a glacial lake that extended from the Skookumchuck River to the Newaukum River confluence and deposited fine-grained lacustrine sediments (Bretz 1913, cited in Gendaszek 2011). The Doty Fault Zone extends east of Centralia and Chehalis, through the Middle Chehalis River Ecological Region.

Precipitation in this ecological region is dominated by rainfall; however, average annual precipitation varies from 43 to 50 inches in the Middle Chehalis River Ecological Region lowlands—a relatively lower precipitation range than many other regions in the basin (Gendaszek 2011).

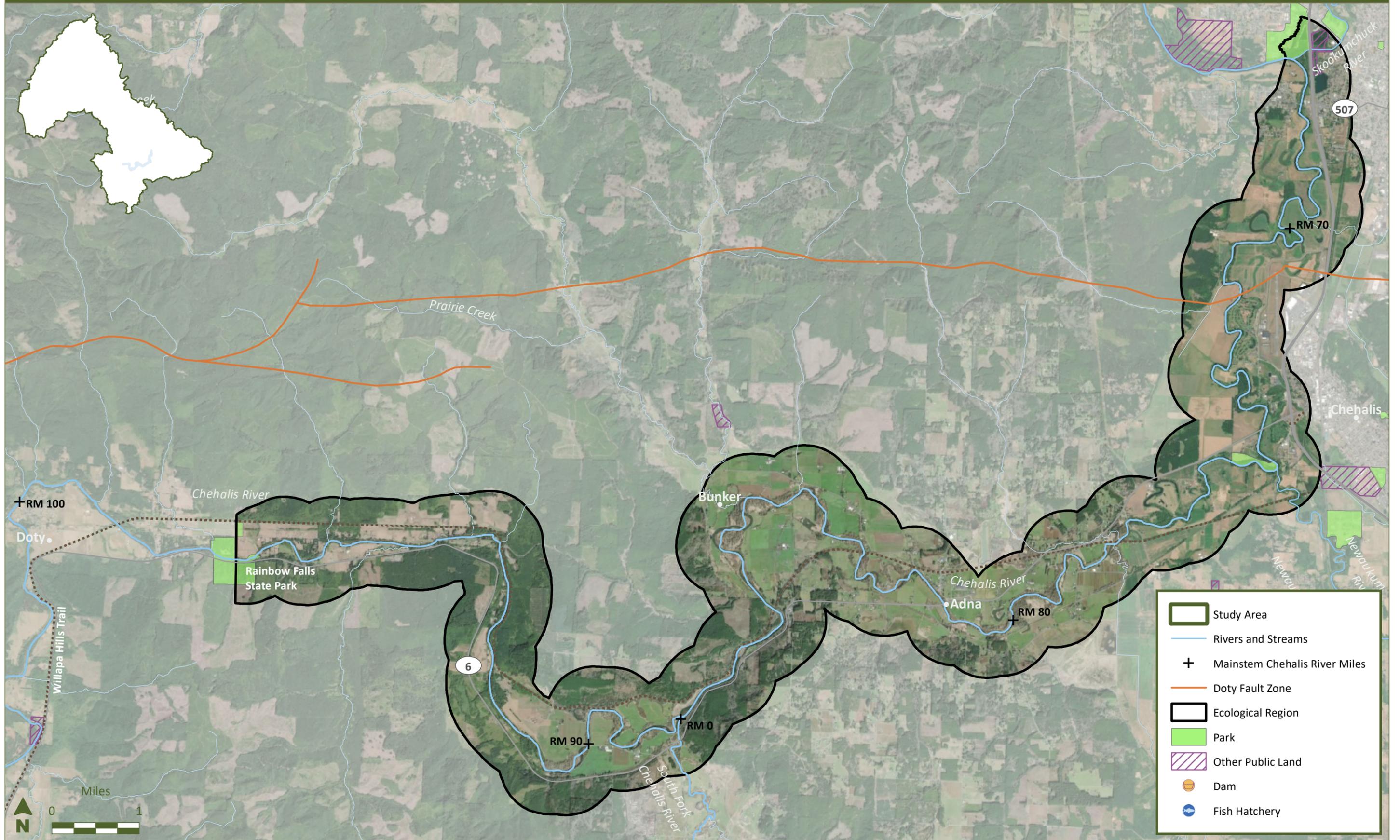
The Middle Chehalis River Ecological Region is entirely within Lewis County. The town of Adna is within this ecological region, and the cities of Chehalis and Centralia are adjacent to the ecological region.



Important Features and Functions

- Migratory fish from all sub-basins in the upper Chehalis Basin pass through this region, making its ecological function more impactful to large areas.
- The ecological region is characterized by a large and deep incised river channel and a large series of off-channel aquatic habitats, including oxbows.
- Many invasive fish species, especially centrarchid fishes (basses, crappies, and sunfishes), are found in off-channel habitats and in the mainstem Chehalis River.

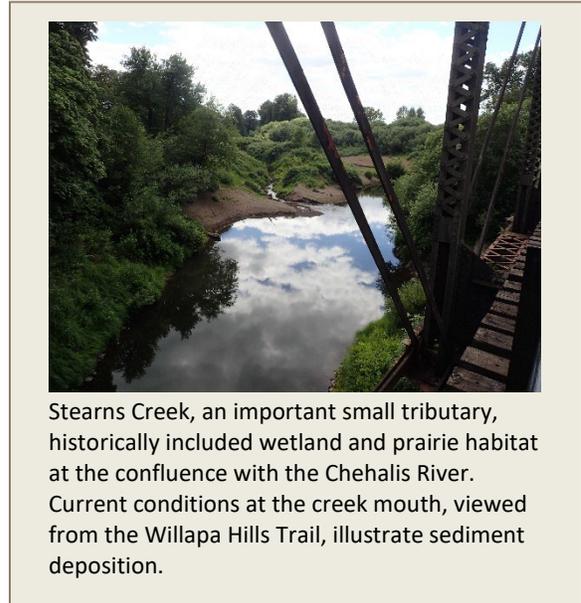
Figure 5-5
Middle Chehalis River Ecological Region Map



Aerial Photo Source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

5.3.2 Historical Conditions and Changes

Historical records for pre-Euro-American settlement conditions are not available, but available historical records and maps indicate that the Middle Chehalis River Ecological Region below the South Fork Chehalis River was dominated by sloughs, oxbows, prairies, brush, and timber. Survey notes from GLO mapping indicate a wide cottonwood riparian zone fringing on the river channel. Upstream of the confluence with the South Fork Chehalis River, as the floodplain narrows, mapping indicates more coniferous timber (fir). Numerous prairies were present in the alluvial valleys, including both wet prairies that were typically inundated each spring and dry prairies that were not inundated (WNPS 1994). GLO maps show a large prairie north of the river extending along RMs 78 to 81.



Stearns Creek, an important small tributary, historically included wetland and prairie habitat at the confluence with the Chehalis River. Current conditions at the creek mouth, viewed from the Willapa Hills Trail, illustrate sediment deposition.

This implies frequent connectivity between the river and its floodplain wetlands. Historically, this portion of the Chehalis River was far more connected to its floodplain as compared to its currently incised condition, as illustrated by the following quote from early settlers (Smith 1941):

“The flooded land (Chehalis valley) about a mile south of the Skookumchuck mentioned by Patterson Laurk was the section from the outlet of what is now Salzer Valley on towards the outskirts of the present city of Chehalis. Frequently, in winter, this whole area was like one large lake about four miles across. It is within the memory of many older residents that canoes often plied over this flooded section.”

Key changes that occurred in the Middle Chehalis River Ecological Region following Euro-American settlement were timber harvest and agricultural development throughout the floodplain and urban development associated with Chehalis and Centralia and the major transportation corridors (including I-5, railroad lines, State Route [SR] 6, and the Chehalis-Centralia Airport). Similar to other ecological regions, splash dams were used (see the description in Section 2.1). Two splash dams were known to have been used on the Chehalis River at or just above the Middle Chehalis River Ecological Region boundary (near Doty and Rainbow Falls; Wendler and Deschamps 1955), contributing to wood removal and channel incision. Agricultural development as well as road, bridge, and residential construction likely also moved and straightened some areas of the Chehalis River. An analysis of channel migration from 1945 to 2013 indicates that migration rates ranged from 1.8 to over 67 feet per year but occurred from typically slow bank erosion on the outside of meander bends (Watershed GeoDynamics and Anchor QEA 2014). Only a few reaches showed significant migration, located in the upper part of the ecological region (i.e., RMs 90 to 91, 86 to 88, and 83 to 86). Much of the mainstem channel downstream of the confluence with the South Fork Chehalis River has essentially stayed in place since the 1940s, as large-scale conversions to

agriculture had already occurred by that time. A recent study of floodplain land cover changes (Pierce et al. 2017) indicates that agricultural development continued at a slower rate from 1938 through the mid-1970s (approximately 16 acres per year converted to agriculture), but since the 1970s, there has been a slow decline in agricultural acreage (a loss of 7 acres per year) and a modest increase in conversion to development (a gain of 8 acres per year). Pierce et al. (2017) found there was an increase in forest canopy during both time periods. Modeling conducted by NOAA (Beechie 2018) for the ASRP indicated significant losses in marsh and beaver pond habitats in the middle Chehalis River floodplain—about 80% and 50%, respectively (primarily in the area between the South Fork Chehalis River and the Skookumchuck River).

To support the ASRP analysis and EDT modeling efforts, the SRT developed assumptions of the channel lengths and areas of floodplain habitat that were likely to be present in historical conditions relative to current conditions. These assumptions were based on the limited data available from GLO mapping from the late 1800s and interpretation of current LiDAR data that show remnant channels and other floodplain features.

This portion of the Chehalis River is unconfined and low gradient within a wide alluvial valley. Compared to historical conditions, the river channel length is not significantly reduced, but side channels would have historically been far more prevalent, and the river would have had 5 or more times the area of frequently connected floodplain. The middle Chehalis River appears more incised than most other parts of the basin. Large wood has been removed, and the riparian zone is very narrow. Abbe et al. (2016, 2018) estimated levels of channel incision in several locations in the Middle Chehalis River Ecological Region, from 6 to 24 feet and typically about 10 feet.

5.3.3 Current Conditions

Current conditions in the Middle Chehalis River Ecological Region reflect ongoing agricultural land uses and residential and commercial development. Land cover is 36% agriculture, 13% deciduous forest, 11% prairie oak, 10% coniferous forest, 10% developed, 7% shrub, 3% wetland, 3% mixed forest, and small percentages of other cover¹³ (Figure 5-6).

An assessment of riparian conditions and functions by NOAA (Beechie 2018) indicates that the vast majority of the riparian areas in the Middle Chehalis River Ecological Region are impaired for wood recruitment, with only about 11% of the region containing larger trees that could provide cover. Overall, the Middle Chehalis River Ecological Region has very low levels of shading.

Middle Chehalis River Current Snapshot

Condition of Watershed Processes:

Hydrology – impaired
Floodplain connectivity – impaired
Riparian condition – impaired
Water quality – impaired

Restoration Potential: Moderate

Protection Potential: Low

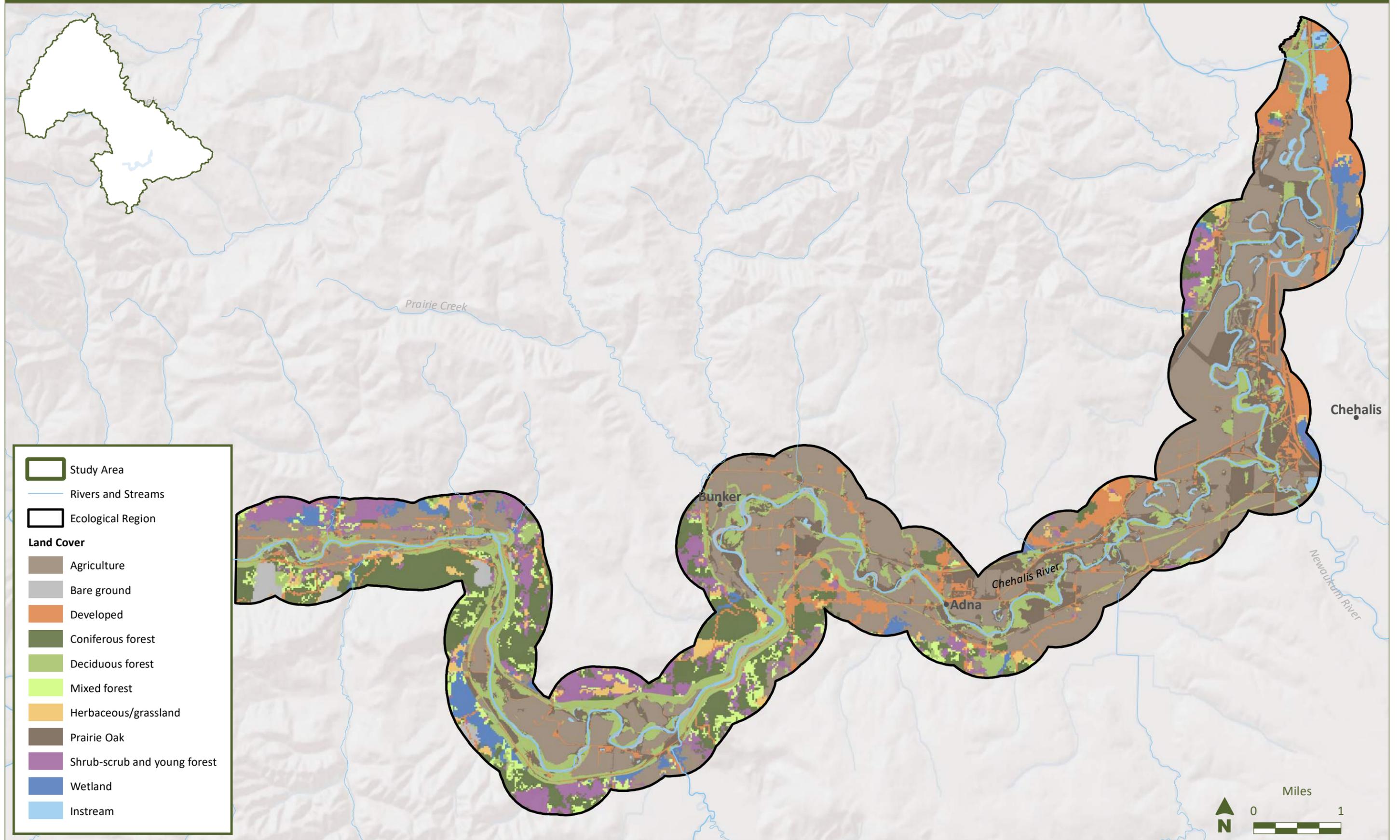
Geographic Spatial Units: Chehalis River Mainstem Reaches: Elk Creek to South Fork Chehalis River, South Fork Chehalis River to Newaukum River, and Newaukum River to Skookumchuck River

Salmon Use and Potential: Fall-run Chinook salmon, spring-run Chinook salmon, coho salmon, and steelhead

Non-Salmon Use and Potential: Western toad, northern red-legged frog, North American beaver, Olympic mudminnow, largescale sucker, mountain whitefish, Pacific lamprey, riffle and reticulate sculpin, speckled dace, Western ridged mussel, great blue heron, common goldeneye, and wood duck

¹³ Land cover data from Multi-Resolution Land Characteristics Consortium, National Land Cover Database 2011, augmented by WDFW Habitat Guild 2015 floodplain data where available.

Figure 5-6
Middle Chehalis River Ecological Region Land Cover



Base flows have been established upstream of the Newaukum River (75 cubic feet per second [cfs] from August 15 to September 15; WAC 173-522-020). If base flows drop below the required minimums, junior water rights holders can be required to curtail water withdrawals. In 2007, the first curtailment requests were made by Ecology. Similar requests were made in 2015 (Gallagher 2015) and 2016.

Water quality is impaired in multiple reaches in the Middle Chehalis River Ecological Region, primarily for temperature, low dissolved oxygen, and bacteria, although dioxins, polychlorinated biphenyls (PCBs), and non-native invasive species are found from the confluence with the South Fork Chehalis River downstream to near Centralia (Ecology 2018).

Recent temperature monitoring by Ecology indicates that temperatures at RMs 62 and 72.5 regularly exceed water quality standards (16°C [61°F] core summer salmonid habitat) from May through September, and they typically exceed the 13°C (55°F) supplemental spawning incubation criterion (September 15 to July 1) in September and May to July (Ecology 2016, 2011a).¹⁴ The *Upper Chehalis River Basin TMDL* (Ecology 2001) has designated a

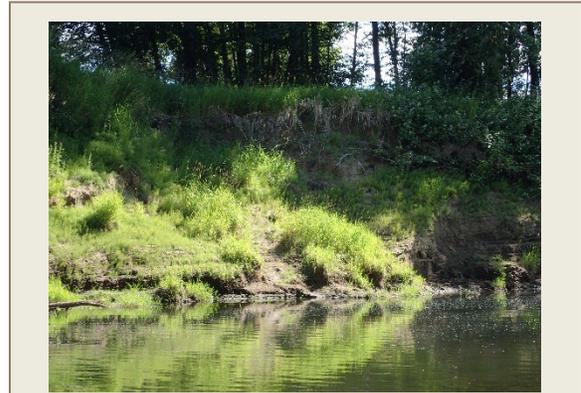
goal of 18°C (64°F) for the Chehalis River (down to RM 30), with the primary goals of increasing shading along the tributaries and mainstem as well as improving low flows.

WDFW's Thermalscape model indicates that from 2013 to 2018, all stream reaches (100%) of the Middle Chehalis River Ecological Region were characterized by mean August temperatures equal to or exceeding 16°C (61°F) (Winkowski and Zimmerman 2019). This condition is projected to continue with climate change.

The NOAA model that incorporates mature riparian conditions and anticipated climate change shows a likely future increase in summer water temperatures ranging from 0.5°C (0.9°F) to 1.5°C (2.7°F) by 2080 (Beechie 2018), which is lower than other ecological regions because this portion of the Chehalis River already has such high temperatures.

Existing mapping of wetlands (Ecology 2011b) shows relatively large wetland areas in the following locations:

- North and south of the Chehalis River west of the Newaukum River confluence
- Around lower Salzer Creek within the floodplain



The Middle Chehalis River Ecological Region is limited by infrequent instream pools and inadequate riparian conditions. In this area upstream of the confluence with the Newaukum River, the Chehalis River shows channel incision, an eroding bank, and a lack of functioning riparian vegetation and wood.

¹⁴ The middle Chehalis River regularly exceeds 25°C (77°F) during July and August near RM 75 (below the Newaukum River confluence; [Ecology gage data]).

- West of the Chehalis River near RMs 68 to 69 and in the lower Scheuber Ditch area
- At the confluence with the Skookumchuck River

Only five fish passage barriers were incorporated into the EDT model¹⁵ for the Middle Chehalis River Ecological Region, with none on the mainstem river.

The percentage of fine sediment in streams was modeled by NOAA based on the density of roads and land uses; this modeling indicated 15% to more than 18% fines in the Chehalis River between Elk Creek and the South Fork Chehalis River and 17% to 21% fines in the Chehalis River from the South Fork Chehalis River to the Skookumchuck River. This is a substantial increase from modeled historical conditions (Beechie 2018) that ranged from 10% to 15% fines in the Chehalis River between Elk Creek and the South Fork Chehalis River and 14% to 18% fines in the Chehalis River from the South Fork Chehalis River to the Skookumchuck River.

There are recent invasive aquatic plant issues, particularly the presence of Brazilian elodea, in the Centralia reach of the mainstem Chehalis River. In 1998, Brazilian elodea was observed in the river, and multiple agencies and the Chehalis Tribe have conducted removal efforts since the early 2000s. The area of infestation has been substantially reduced (Thurston County 2019). However, the river is at risk for further invasions by a variety of invasive aquatic plants that tend to reduce dissolved oxygen and trap fine sediments.

The Middle Chehalis River Ecological Region is an important transportation corridor for spring-run Chinook salmon, fall-run Chinook salmon, coho salmon, and steelhead. Chinook salmon spawning (both runs) also occurs in the ecological region. Non-salmon indicator species present include Western toad, northern red-legged frog, Western ridged mussel, North American beaver, Olympic mudminnow, largescale sucker, mountain whitefish, Pacific lamprey, riffle and reticulate sculpin, and speckled dace. The bird indicator species present include great blue heron, common goldeneye, and wood duck. Floodplain habitats along the Chehalis River are of particular importance to northern red-legged frog and other stillwater-breeding amphibians, as well as both native and non-native fish species, such as smallmouth bass.

¹⁵ Fish passage barrier data from WDFW processed through EDT model.

5.3.4 Limiting Factors

Limiting factors for salmonids have been identified in several assessments of the Chehalis Basin, including the EDT (ICF 2019) and NOAA modeling (Beechie 2018) conducted for the ASRP and earlier studies (GHLE 2011; Smith and Wenger 2001). Additional limiting factors and a diagnosis of what is working and what is broken in the ecological region were determined by the SRT, drawing on local basin knowledge and reconnaissance conducted within the region.

The combined results of these assessments indicate that the major issues for salmonids in the region are as follows (in relative order of importance):

- High water temperatures
- Low habitat diversity (lack of side channels, floodplain wetlands, and large wood)
- Reduced quantity and quality of instream habitats
- Predation (non-native fish species)
- Sediment conditions (fine sediment accumulations)
- Poor riparian conditions
- Loss of floodplain habitat and beaver ponds
- Reduced channel length and increased channel width
- Flow conditions (both low and high flows)
- Channel instability (bed scour and gravel transport)

These identified issues for salmonids are consistent with earlier findings from Smith and Wenger (2001) and the Chehalis Basin Lead Entity (GHLE 2011), which indicated that the key limiting factors in this ecological region include riparian conditions, channel incision, water quality, floodplain conditions, lack of large wood, water quantity, and sediment conditions. Model results indicate similar priorities for the limiting factors. NOAA model results indicate that the lack of large wood and floodplain habitats have significant effects on fall-run Chinook salmon and fine sediment has a moderate effect on fall-run Chinook salmon.

Limiting factors and threats to non-salmon indicator species are not well understood but may include non-native predator species, high water temperatures, migration barriers, changes in flow conditions

Diagnostic Snapshot

- There is a lack of wood throughout this region.
- Channel migration and channel-forming processes have degraded over time. Over multiple decades, the banks of the mainstem have been artificially stabilized (e.g., riprap) by landowners desiring to protect property from the river. Artificial stabilization has resulted in less migration of the mainstem and creation of few off-channel areas, and now many of the existing off-channel areas are disconnected from the river and newer off-channel areas are not being created.
- Invasive fish species (especially centrarchid fishes such as basses, crappies, and sunfishes) and bullfrogs are widespread in this ecological region.
- The main channel is largely disconnected from its floodplain. Riparian zones are narrow to nonexistent in much of the reach.
- High water temperatures are a significant issue. Plumes of cooler water near the Chehalis River confluences with the Skookumchuck and Newaukum rivers may be critical to providing refuges during the summer months, especially for adult spring-run Chinook salmon.

and water level variations, fine sediments, and poor riparian conditions (as identified for Pacific lamprey by Clemens et al. [2017]).

5.3.5 Strategies and Actions in the Ecological Region

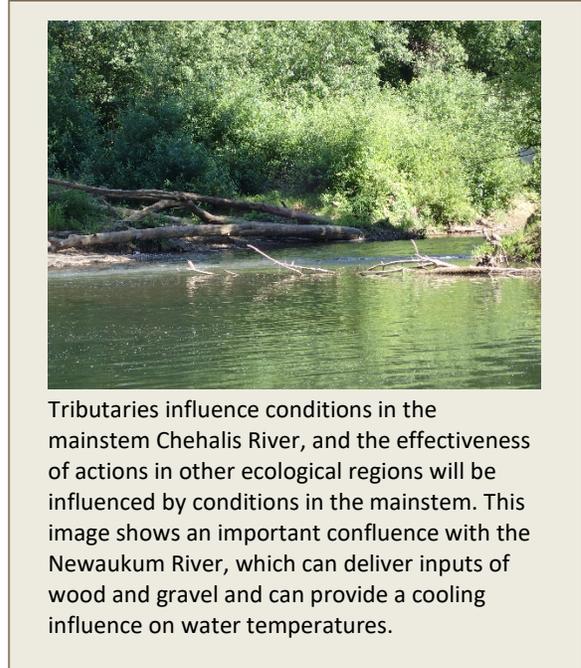
5.3.5.1 Habitat and Process Protection

Some of the protection actions described in Section 4.2.1 are not feasible in the Middle Chehalis River Ecological Region due to the existing level of development; however, particularly in areas less constrained by existing land uses, the following areas and actions are recommended for a protection focus:

- Protect existing wet prairie.
- Protect existing riparian forest.
- Protect and enhance cool-water inputs at tributary confluences.

The Middle Chehalis River Ecological Region is entirely within Lewis County, which has regulations and policies in place to maintain forest cover, increase riparian canopy, protect streams from development, and protect surface and groundwater and reduce withdrawals. The Lewis County SMP identifies priority habitat as those habitat types with unique or significant value to one or more species, including fish spawning habitat, and contains regulations that new development should not interfere with the process of channel migration (Lewis County 2017). The County has a policy to support projects from the Lewis County Shoreline Restoration Plan (Lewis County 2016), the ASRP, and the lead entities for salmon recovery.

As part of the community planning strategy (see Section 5.3.5.3), funding support to align County, Chehalis, and Centralia regulations with the ASRP and conduct enforcement will be considered.

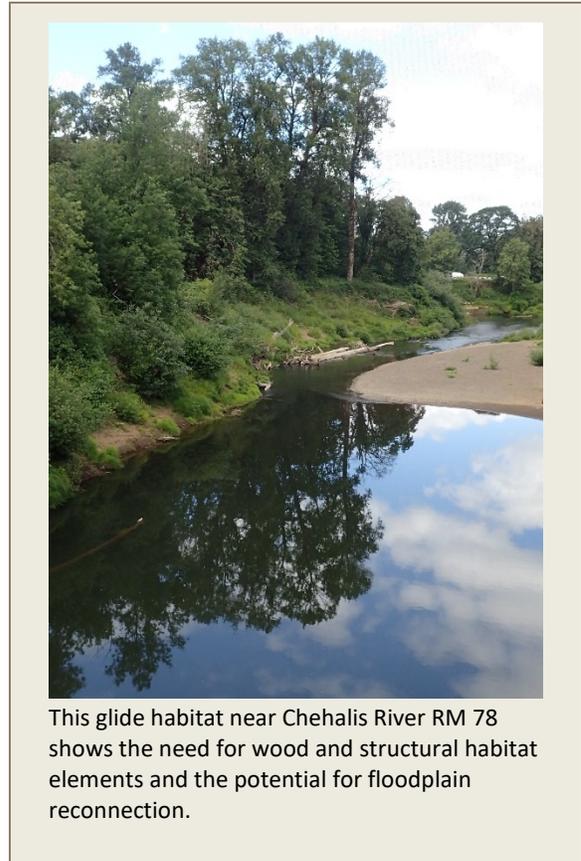


Tributaries influence conditions in the mainstem Chehalis River, and the effectiveness of actions in other ecological regions will be influenced by conditions in the mainstem. This image shows an important confluence with the Newaukum River, which can deliver inputs of wood and gravel and can provide a cooling influence on water temperatures.

5.3.5.2 Restoration

The restoration actions described in Section 4.2.2 are not all appropriate in the Middle Chehalis River Ecological Region due to the high level of incision and difficulty of reconnecting floodplains where there is significant development. Based on existing conditions, the following areas and actions are recommended for a restoration focus:

- Focus on restoration of habitat, such as reconnection of oxbows, using a “node” concept, wherein refuge areas would be spaced along the channel length and available to fish as they travel throughout the system. This may require more costly excavation due to the level of incision.
- Protect existing riparian forest and restore additional areas of riparian forest, particularly where this can be combined with habitat benches and nodes.
- Develop and test restoration of floodplain wetlands that dry out in the summer to minimize habitat opportunities for invasive species.
- Install stable large wood structures to promote trapping and stability of coarse gravel and to form deep pools, primarily upstream of the Newaukum River confluence.



Priority restoration areas in the Middle Chehalis River Ecological Region are remnant oxbows and other off-channel wetlands.

5.3.5.3 Community Planning

As noted in Section 4.2.3, community planning actions would be coordinated with state and local governments, landowners, and other stakeholders to ensure the long-term success of the ASRP. Focus programs and policies that could be developed or investigated in the Middle Chehalis River Ecological Region include the following:

- Discuss with Lewis County whether identified additional planning measures could effectively promote and protect the following:
 - Maturation of riparian zones and wood recruitment for retention of spawning gravel and sources
 - Cool water inputs and floodplain connectivity

- As the Chehalis Basin Strategy becomes more integrated, coordinate the ASRP with the CFAR Program to build habitat restoration and protection actions into community flood risk reduction efforts (such as restoring areas where structures and people have been relocated from floodplains).

5.3.5.4 Community Involvement

As noted in Section 4.2.4, community involvement and voluntary landowner participation are essential to the success of the ASRP, and the actions described in that section will be further evaluated for the Middle Chehalis River Ecological Region in Phases 2 and 3 based on the restoration and protection scenario selected. Based on the specific issues in this area, the following actions are recommended for focused community involvement:

- Continue outreach, engagement, and involvement processes to incorporate landowner expertise into ASRP planning and local implementation efforts.
- Partner with and support the efforts of existing local organizations (see Appendix E for a list of potential partner organizations).

5.3.5.5 Institutional Capacity

The institutional capacity strategy is intended to build on and support the work of existing organizations, as well as support creativity in how local organizations approach working toward the goals of the ASRP. The actions described in Section 4.2.5 will be further evaluated for the Middle Chehalis River Ecological Region in Phases 2 and 3 based on the restoration and protection scenario selected. Based on the specific issues in this area, the following focused institutional capacity actions are recommended:

- Provide technical training on process-based restoration practices and principles.
- Provide funding for groups and individuals interested in restoration projects.
- Build on and support the work of existing organizations with missions that overlap with the ASRP vision (see Appendix E for a list of potential groups).