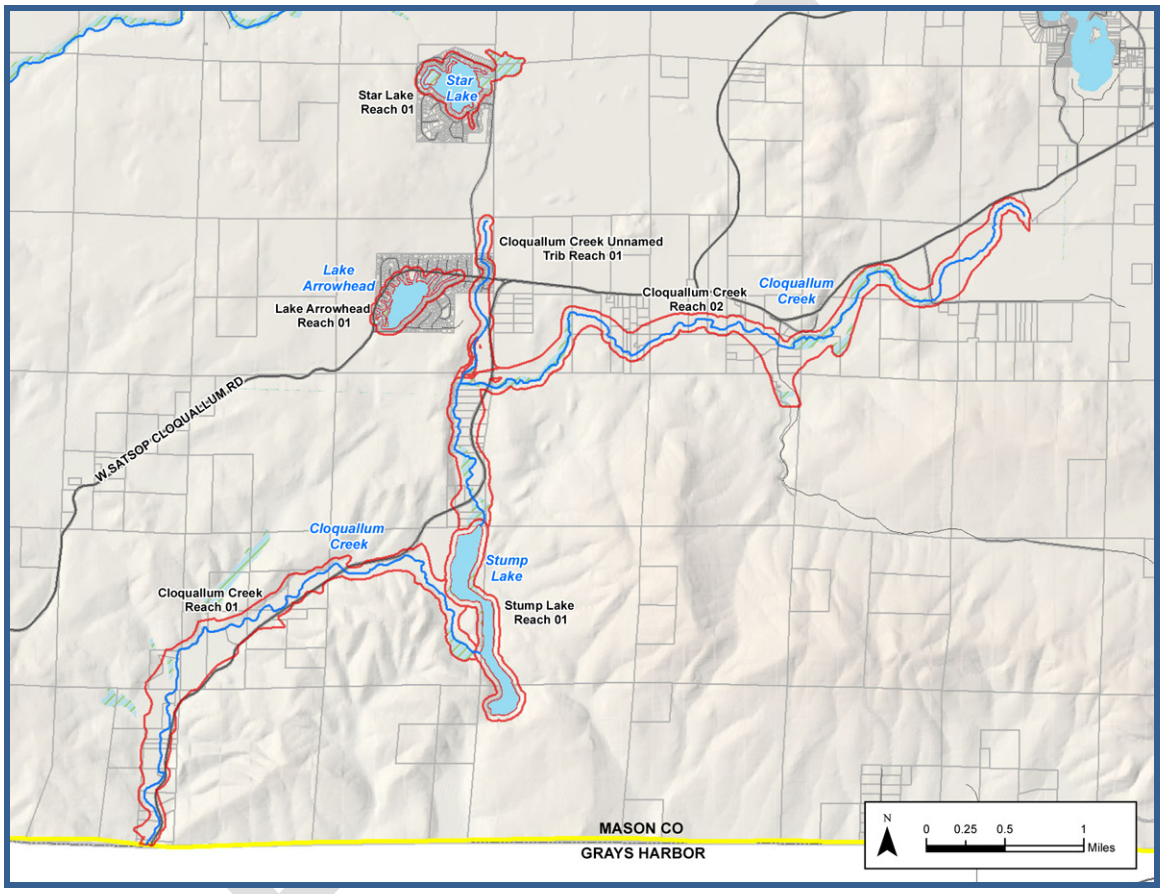
CHAPTER 9.
WRIA 22: LOWER CHEHALIS

9.1 Cloquallum Creek and Tributaries (Star Lake, Arrowhead Lake, Stump Lake)



9.1.1 Physical Characterization and Modifications

Cloquallum Creek and its tributaries have a drainage area of about 70 square miles starting from the low hills of the southern Olympic mountains east of the Satsop River near the town of Elma (Smith and Wenger, 2001; Chehalis River Basin Plan, 2010). The main tributaries are Wildcat Creek and Rock Creek. Land use in the watershed is primarily rural residential in the lower Cloquallum Creek floodplain, with some small livestock pastures. Land use in the upper basin is private timberland management of second growth forest (Smith and Wenger, 2001). Much of the commercial forests have been previously harvest in this basin.

The three main tributary lakes to Cloquallum Creek are Stump, Star, and Arrowhead lakes. The creek flows through Stump Lake near RM 12. Star (aka Lystair) and Arrowhead (aka Simpson) lakes are located in a small drainage that enters Cloquallum Creek at RM 14 (Chehalis Basin, 2010). Stump Lake is undeveloped with some private logging activity. Star and Arrowhead lakes have been heavily developed for recreation and residential development (Smith and Wenger, 2001).

Cloquallum Creek, tributaries, and lakes have been altered by historic land uses and resource extraction. Some of the process modifications include:

- Logging practices in the upper watershed resulting in removal of trees from riparian areas and an increase in sedimentation from logging roads;
- Adjacent single-family rural residential development;
- Agricultural practices causing removal of native vegetation and use by livestock; and
- Conversion of pervious to impervious surfaces.

9.1.2 Water Quality

No data on water quality were available for Cloquallum Creek, Stump Lake, Arrowhead Lake, or Star Lake (Ecology, 2008). These waterbodies have not been tested by Ecology as part of the 303(d) list testing in 2008. However, there is a TMDL for Wildcat Creek, a tributary to Cloquallum Creek. The TMDL for Wildcat is for ammonia, BOD (biological oxygen demand), and fecal coliform.

Simpson Northwest Timberlands are part of a temperature TMDL targeting long term commercial timber land in Mason, Thurston, and Grays Harbor counties (Ecology, 2000). Measures to restore stream water quality and maintain fish habitat in these timberlands are being implemented to improve high stream temperatures and reduce sediment loading.

9.1.3 Critical or Priority Habitat and Species

The entire 20.2 mile length of the Cloquallum mainstem is low gradient and accessible to salmon (Smith and Wenger, 2001). Cloquallum Creek supports significant runs of chum, fall Chinook and coho Salmon. The lower ten miles of the creek provide spawning habitat for Chinook and chum. The majority of coho spawn in the upper reaches of the creek and its tributaries. Cloquallum also supports cutthroat trout and winter steelhead and the state sensitive species, Olympic mudminnow. Lakes in the subbasin are known to contain rainbow and Eastern brook trout (Chehalis River Basin Non-Point Action Plan).

Limiting factors for salmon in the Cloquallum River drainage are: fish passage barriers due to culverts under logging roads; degraded riparian habitats due to timber harvest and agriculture; and water quality and quantity issues (Basin Plan 2010).

9.1.4 Land Use

Land uses in the Cloquallum watershed are a mix of forestry, residential and vacant lands. Rural residential uses are located in the lower floodplain and private timber land in the upper watershed. The confluence of the Cloquallum River and the Chehalis River (in Grays Harbor County) has a high density of agricultural land uses. Commercial timber lands occur largely upstream of RM 7 on the river (Chehalis Basin 2010). Star Lake and Arrowhead Lake have been mostly developed with residential land uses. Stump Lake is mostly in forestry use.

9.1.5 Land Cover

Riparian areas are predominantly alder regrowth with sparse distribution of conifers because there were no forest practice guidelines for streamside buffers until the 1980s (Smith and Wenger, 2001). Land cover in the Cloquallum watershed is mostly a mix of closed canopy (53 percent), non-forested (19 percent) and other natural vegetation (19 percent) (PNPTC, 2011).

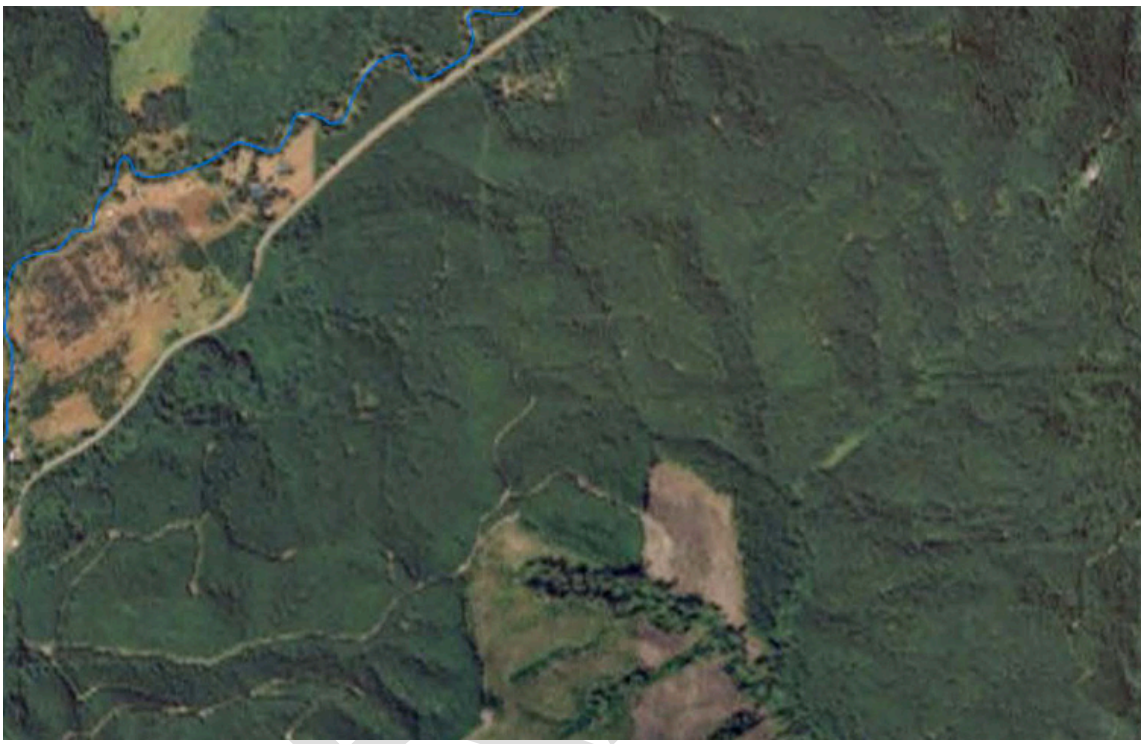
9.1.6 Summary of Key Management Issues

PLACEHOLDER

9.1.7 Reach Analysis

CLOQUALLUM CREEK - REACH 01

SHORELINE LENGTH	REACH AREA
4.3 MI	361.0 AC



PHYSICAL AND ECOLOGICAL FEATURES

HYDROLOGY (MAPS 4 AND 10)

Floodplain - 71% (255 acres) of the reach, excluding open water, is mapped as FEMA 1% annual chance floodplain

HAZARD AREAS (MAP 12)

3% Erosion.

LAND COVER (MAP 15)

20% agriculture, 40% forest, 40% floodplain/riparian (GAP, 2009)

Riparian vegetation: 50% forest cover, 26% non-forest, 23% other natural vegetation, 1% water (PNPTC, 2011)

HABITATS AND SPECIES (MAP 8)

Coastal cutthroat trout, fall Chinook salmon, fall chum salmon, coho salmon, winter steelhead trout; wetland-14 acres (4% of the reach); wetland habitats include palustrine scrub-shrub and emergent

WATER QUALITY (MAP 13)

Not listed as a 303(d) impaired waterbody

BUILT ENVIRONMENT AND LAND USE

EXISTING LAND USES (MAP 18)

Land Use – Forestry (71%), Vacant (12%), remaining 17% is a mix of Residential; Transportation; Parks, Open Space, and Recreational Areas; and Agriculture.

SHORELINE MODIFICATIONS (MAP 16)

There are 8 road crossings ranging from the southwestern to northeastern portions of the reach, 6 along W Cloquallum Rd and 1 each at GD 3500 and GD 3620.

ZONING AND COMPREHENSIVE PLAN DESIGNATIONS (MAP 21)

Zoning districts: County - Inholding Lands (58%) and Long Term Commercial Forest (42%).
Comprehensive Plan Designations - Inholding Lands (58%) and Long Term Commercial Forest (42%).

Existing SED: 100% Conservancy.

PUBLIC ACCESS (MAP 14)

No formal parks or public access.

IMPERVIOUS SURFACES (MAP 16)

2.8% of the reach is mapped as containing impervious surfaces (NOAA CCAP, 2006). Aerial photos from 2009 show a mixture of agricultural land and forest in the reach, with some rural residential development and a road.

AREAS OF SPECIAL INTEREST

According to the Ecology facilities/sites database, there are no listed facilities or contaminated sites.

CULTURAL AND ARCHAEOLOGICAL RESOURCES

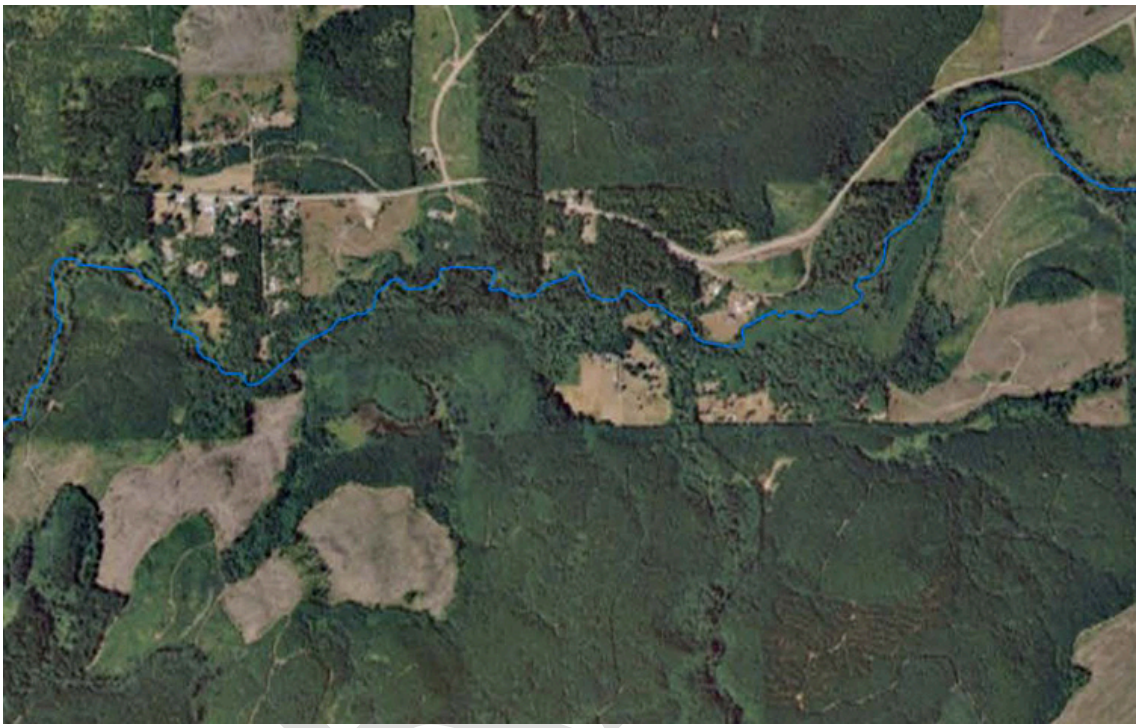
There are no listed cultural resources or state or federally listed historic properties. Resource mapping suggests there is a very low probability of finding unknown artifacts within this reach.

OPPORTUNITY AREAS (MAP 23)

KEY MANAGEMENT ISSUES

CLOQUALLUM CREEK - REACH 02

SHORELINE LENGTH	REACH AREA
6.6 MI	537.2 AC



PHYSICAL AND ECOLOGICAL FEATURES

HYDROLOGY (MAPS 4 AND 10)

Floodplain - 63% (337 acres) of the reach, excluding open water, is mapped as FEMA 1% annual chance floodplain

HAZARD AREAS (MAP 12)

No listed erosion or landslide areas.

LAND COVER (MAP 15)

7% agricultural, 32% forest, 2% wetland, 59% floodplain/riparian (GAP, 2009)

Riparian vegetation: 59% forest cover, 17% non-forest, 23% other natural vegetation, 2% water (PNPTC, 2011)

HABITATS AND SPECIES (MAP 8)

Coastal cutthroat trout, fall chum salmon, coho salmon, winter steelhead trout, reticulate sculpin; wetland-114 acres (21% of the reach); wetland habitats include palustrine forested, scrub-shrub, and emergent

WATER QUALITY (MAP 13)

Not listed as a 303(d) impaired waterbody

BUILT ENVIRONMENT AND LAND USE

EXISTING LAND USES (MAP 18)

Land Use – Forestry (63%), Residential (18%), remaining 19% is a mix of Vacant; Agricultural; Parks, Open Space, and Recreation Areas; and Transportation.

SHORELINE MODIFICATIONS (MAP 16)

There are 2 road crossings in the eastern portion of the reach at W Cloquallum Truck Trail and W Bulb Farm Rd.

ZONING AND COMPREHENSIVE PLAN DESIGNATIONS (MAP 21)

Zoning districts – Long Term Commercial Forest (54%), Inholding Lands (42%), and Agricultural Resource Lands (4%). Comprehensive Plan Designations - Long Term Commercial Forest (54%), Inholding Lands (42%), and Agricultural Resource Lands (4%).

Existing SED – 100% Conservancy.

PUBLIC ACCESS (MAP 14)

Over 2,340 feet of Washington State DNR trails are mapped in the northwestern portion of the reach.

IMPERVIOUS SURFACES (MAP 16)

2.1% of the reach is mapped as containing impervious surfaces (NOAA CCAP, 2006). Aerial photos from 2009 show a mixture of agricultural land and forest in the reach, with some rural residential development, wetland, and a road.

AREAS OF SPECIAL INTEREST

According to the Ecology facilities/sites database, there are no listed facilities or contaminated sites.

CULTURAL AND ARCHAEOLOGICAL RESOURCES

There are no listed cultural resources or state or federally listed historic properties. Resource mapping suggests there is a moderate-low probability of finding unknown artifacts within this reach.

OPPORTUNITY AREAS (MAP 23)

KEY MANAGEMENT ISSUES

STUMP LAKE

SHORELINE PERIMETER	WATERBODY AREA	REACH AREA
3.1 MI	74.9 AC	151.7 AC

PHYSICAL AND ECOLOGICAL FEATURES

HYDROLOGY (MAPS 4 AND 10)

Floodplain - 59% (45 acres) of the reach, excluding open water, is mapped as FEMA 1% annual chance floodplain

HAZARD AREAS (MAP 12)

26% Landslide.

LAND COVER (MAP 15)

10% open water, 39% forest, 4% wetland, 46% floodplain/riparian (GAP, 2009)

Riparian vegetation: 60% forest cover, 2% non-forest, 17% other natural vegetation, 20% water (PNPTC, 2011)

HABITATS AND SPECIES (MAP 8)

Coastal cutthroat trout, fall Chinook salmon, fall chum salmon, coho salmon, winter steelhead trout; wetland-15 acres (20% of the reach); wetland habitats include palustrine forested, scrub-shrub, and emergent

WATER QUALITY (MAP 13)

Not listed as a 303(d) impaired waterbody

BUILT ENVIRONMENT AND LAND USE

EXISTING LAND USES (MAP 18)

Land Use – Forestry (63%), Residential (18%), remaining 19% is a mix of Vacant; Agricultural; Parks, Open Space, and Recreation Areas; and Transportation.

SHORELINE MODIFICATIONS (MAP 16)

Aerial imagery from 2006 shows a road crossing in the southwestern portion of the reach at Bush Creek Rd.

ZONING AND COMPREHENSIVE PLAN DESIGNATIONS (MAP 21)

Zoning districts – Long Term Commercial Forest (98%) and Inholding Lands (2%). Comprehensive Plan Designations - Long Term Commercial Forest (98%) and Inholding Lands (2%).

Existing SED – Natural (51%) and Conservancy (49%).

PUBLIC ACCESS (MAP 14)

No formal parks or public access.

IMPERVIOUS SURFACES (MAP 16)

No impervious surfaces are mapped in this reach (NOAA CCAP, 2006). Aerial photos from 2009 show the reach to be forested with forestry roads.

AREAS OF SPECIAL INTEREST

According to the Ecology facilities/sites database, there are no listed facilities or contaminated sites.

CULTURAL AND ARCHAEOLOGICAL RESOURCES

There are no listed cultural resources or state or federally listed historic properties. Resource mapping suggests there is a moderate-low probability of finding unknown artifacts within this reach.

OPPORTUNITY AREAS (MAP 23)

KEY MANAGEMENT ISSUES

LAKE ARROWHEAD

SHORELINE PERIMETER	WATERBODY AREA	REACH AREA
2.9 MI	33.5 AC	88.5 AC

PHYSICAL AND ECOLOGICAL FEATURES

HYDROLOGY (MAPS 4 AND 10)

Floodplain - 50% (27 acres) of the reach, excluding open water, is mapped as FEMA 1% annual chance floodplain

HAZARD AREAS (MAP 12)

11% Landslide.

LAND COVER (MAP 15)

7% developed, 26% open water, 59% forest, 2% wetland, 6% floodplain/riparian (GAP, 2009)

Riparian vegetation: 35% forest cover, 29% non-forest, 3% other natural vegetation, 33% water (PNPTC, 2011)

HABITATS AND SPECIES (MAP 8)

No fish presence mapped; blunt-leaved pondweed; wetland-5 acres (9% of the reach); wetland habitat includes palustrine forested

WATER QUALITY (MAP 13)

Not listed as a 303(d) impaired waterbody

BUILT ENVIRONMENT AND LAND USE

EXISTING LAND USES (MAP 18)

Land Use – Residential (31%), Vacant (29%), Transportation (25%), remaining 15% is a mix of Parks, Open Space, Recreation Areas, and Forestry.

SHORELINE MODIFICATIONS (MAP 16)

According to 2006 aerials, 11 docks and piers are mapped along Lake Arrowhead. There are 3 road crossings in the western and northeastern portions of the reach at Satsop-Colquallum Rd.

ZONING AND COMPREHENSIVE PLAN DESIGNATIONS (MAP 21)

Zoning districts –Inholding Lands (96%) and Long Term Commercial Forest (4%). Comprehensive Plan Designations - Inholding Lands (96%) and Long Term Commercial Forest (4%).

Existing SED – 100% Urban Residential.

PUBLIC ACCESS (MAP 14)

No formal parks or public access.

IMPERVIOUS SURFACES (MAP 16)

20.3% of the reach is mapped as containing impervious surfaces (NOAA CCAP, 2006). Aerial photos from 2009 show rural residential development and associated roads with some forest.

AREAS OF SPECIAL INTEREST

According to the Ecology facilities/sites database, there are no listed facilities or contaminated sites.

CULTURAL AND ARCHAEOLOGICAL RESOURCES

There are no listed cultural resources or state or federally listed historic properties.

OPPORTUNITY AREAS (MAP 23)

KEY MANAGEMENT ISSUES

STAR LAKE

SHORELINE PERIMETER	WATERBODY AREA	REACH AREA
2.1	40.8 AC	103.4 AC

PHYSICAL AND ECOLOGICAL FEATURES

HYDROLOGY (MAPS 4 AND 10)

Floodplain - 17% (11 acres) of the reach, excluding open water, is mapped as FEMA 1% annual chance floodplain

HAZARD AREAS (MAP 12)

LAND COVER (MAP 15)

10% agricultural, 29 open water, 13% forest, 19% wetland, 28% floodplain/riparian (GAP, 2009)

Riparian vegetation: 27% forest cover, 25% non-forest, 9% other natural vegetation, 39% water (PNPTC, 2011)

HABITATS AND SPECIES (MAP 8)

No fish presence mapped; wetland-37 acres (59% of the reach); wetland habitats include lacustrine limnetic aquatic bed, palustrine forested and emergent

WATER QUALITY (MAP 13)

Not listed as a 303(d) impaired waterbody

BUILT ENVIRONMENT AND LAND USE

EXISTING LAND USES (MAP 18)

Land Use – Residential (40%), Forestry (29%), Vacant (25%), remaining 6% is a mix of Transportation, Parks, Open Space, and Recreation Areas.

SHORELINE MODIFICATIONS (MAP 16)

According to 2006 aerials, 18 docks and piers are mapped along Star Lake. 2 road crossings exist in the southeast and northwest portions of the reach at W Star Lake Dr.

ZONING AND COMPREHENSIVE PLAN DESIGNATIONS (MAP 21)

Zoning districts – Inholding Lands (75%) and Long Term Commercial Forest (25%). Comprehensive Plan Designations - Inholding Lands (75%) and Long Term Commercial Forest (25%).

Existing SED – 100% Urban Residential.

PUBLIC ACCESS (MAP 14)

No formal parks or public access.

IMPERVIOUS SURFACES (MAP 16)

16.8% of the reach is mapped as containing impervious surfaces (NOAA CCAP, 2006). Aerial photos from 2009 show a mixture of rural residential and associated roads, wetland, and forest.

AREAS OF SPECIAL INTEREST

According to the Ecology facilities/sites database, there are no listed facilities or contaminated sites.

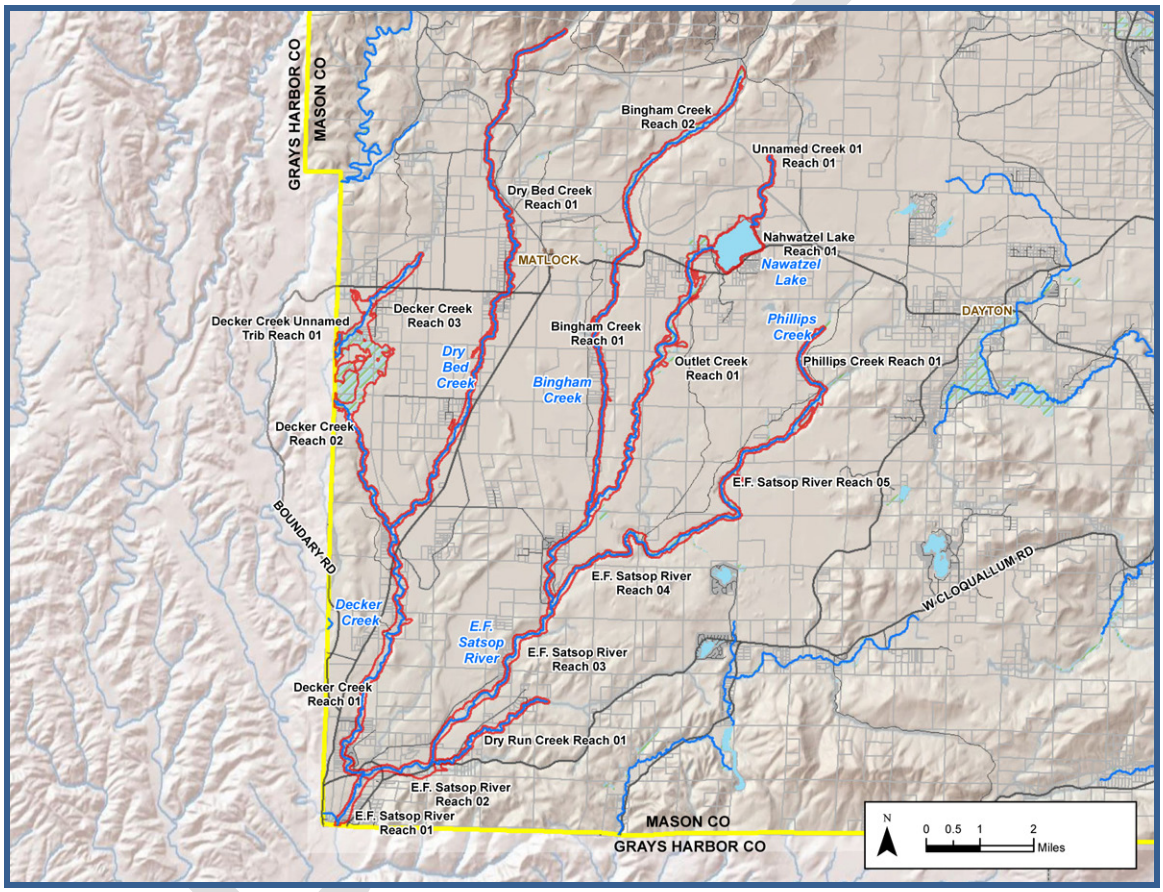
CULTURAL AND ARCHAEOLOGICAL RESOURCES

There are no listed cultural resources or state or federally listed historic properties. Resource mapping suggests there is a moderate-low probability of finding unknown artifacts within this reach.

OPPORTUNITY AREAS (MAP 23)

KEY MANAGEMENT ISSUES

9.2 East Fork Satsop River and Tributaries (East Fork, Dry Run Creek, Outlet Creek, Nahwatzel Lake, Unnamed Creek, Bingham Creek, Dry Bed Creek, Dry Creek, Decker Creek)



9.2.1 Physical Characterization and Modifications

The East Fork Satsop River flows from the southern hills of the Olympic Mountains and forms one of the major tributaries to the Satsop River. The East Fork is considered a continuation of the Satsop River mainstem (Smith and Wenger, 2001). The upper East Fork originates at the confluence of Stillwater and Phillips creeks.

The river has several major tributaries, such as Decker Creek, Dry Run Creek, and Bingham Creek (RM 17.4). Outlet Creek joins Bingham Creek at RM 2.2 and drains Nahwatzel Lake. The lake is about 269 acres and located 11 miles west of Shelton (Ecology, 2011).

The lake tends to dry up in the summer (Smith and Wenger, 2001). Historically, screens were placed in Outlet Creek to keep trout in the lake for fishing. These screens prevented the use of the lake for rearing by coho and changed the flow of water in the vicinity. Recently, the screens were removed (Smith and Wenger, 2001). The East Fork Satsop River, including many of the tributaries, and lake have experienced a significant loss of tree canopy due to logging. Despite this, natural off-channel wetland habitat is abundant in the East Fork Satsop (Owen, 1989). Historically, splash dams were located along the East Fork Satsop River.

The East Fork Satsop River, tributaries, and Nahwatzel Lake have been altered. Some of the process modifications include:

- Logging practices;
- Roads;
- Culverts; and
- Splash dams.

9.2.2 Water Quality

No recent water quality data exists for the East Fork Satsop River or its shoreline tributaries within Mason County (Ecology, 2010). Unpublished data from the Olympic National Forest (submitted by Dale Hom on 15 January 2003) show elevated temperatures in the East Fork Satsop in August 2001. The East Fork Satsop River is not currently included on the 2008 303d list of impaired waters in Mason County likely due to lack of testing (Ecology 2010).

Much of WRIA 22 in private timber ownership is the subject of a temperature TMDL (Cleland et al, 2000). This TMDL has been developed to address fisheries concerns on several tributaries of the lower Chehalis and includes waters located on land formerly owned by Simpson Timber Company (now Green Diamond). Excessive

summer water temperatures in some of these streams reduce the quality of rearing habitat for coho salmon as well as for steelhead and cutthroat trout.

According to data collected in the 1990s, Nahwatzel Lake was considered to be oligotrophic (Washington Department of Ecology, 1997) and therefore would have had excellent water quality. No recent data was identified. No water quality data or assessments were identified for Lystair Lake, Simpson Lake, or Stump Lake. None of these lakes are included on Ecology's 303 (d) list of impaired waters.

9.2.3 Critical or Priority Habitat and Species

The East Satsop River basin supports Fall Chinook, summer Chinook salmon, coho salmon, cutthroat trout, winter steelhead, chum salmon and bull trout (WDFW, 2010). Many of the tributaries to the East Fork Satsop, including Decker Creek, Dry Run Creek and Bingham, each support salmon populations. Bingham Creek is documented to provide spawning areas for chum, coho and coastal steelhead. Stillwater Creek provides steelhead spawning and rearing habitat for a one mile section up and downstream of its confluence with Phillips Creek. East Fork Satsop River has documented Chinook spawning and rearing habitat (WDFW 2010).

Approximately 79% of the mainstem Satsop River riparian corridor is lacking vegetation or is dominated by hardwoods only (i.e., no conifers) (Chehalis Basin Partnership 2010). This condition is attributed to past land use practices associated with agriculture and forestry, occurring both in Mason and Grays Harbor Counties. In addition, numerous road crossings have undersized culverts that do not allow for adequate fish passage (Mason Conservation District, 2004). These undersized structures inhibit the movement of streambed sediments downstream as well as block fish passage upstream.

9.2.4 Land Use

Land uses in the East Satsop River area are predominantly long term commercial forestry with some limited areas with rural residential. Green Diamond Timber Resources is the primary landowner of the timber lands surrounding the East Satsop River subbasin. Most of the timber has been harvested in the last few decades and the remaining forest is 30 years old or younger. Nahwatzel Lake is partially developed with single-family residential structures on the east, southeast and southwestern shores. Most residential houses have a private dock/pier. The shores of East Fork Satsop River and Decker Creek contain rural residential development near the confluence of these two streams.

Transportation corridors include the Decker Creek Bridge on Matlock-Brady Road. The Shelton-Matlock Road crosses Bingham Creek Reach 2 and Outlet Creek Reach 1. To the south, a bridge crosses over the East Fork Satsop River in Reach 2.

Schaefer State Park is located near the confluence of East Fork Satsop and Dry Run Creek in East Fork Satsop River Reach 02. Schafer State Park is a 119-acre camping park on the Satsop River, in between Olympia and Ocean Park. The park provides abundant fishing for steelhead, cutthroat trout and salmon on the Satsop River. Wading and swimming are important recreational features. (Washington State Parks, 2011). There is a public boat launch managed by WDFW that provides access to Nahwatzel Lake.

9.2.5 Land Cover

Land cover along East Fork Satsop River, Decker Creek and their tributaries is primarily second growth timber or clearcut. Forest cover and trees are generally limited to narrow zones within the riparian area and clearcuts are observed outside of those set aside zones. Riparian areas in the NW Simpson ownership are managed under a 50 year Habitat Conservation Plan (Simpson Timber, 2000). A general conversion of coniferous forest to deciduous trees has been noted along Middle and East Fork Satsop Rivers due to historic logging practices. Very limited impervious surface is found in this basin. Land cover is mostly a mix of closed canopy (57 percent) and other natural vegetation (27 percent) (PNPTC, 2011).

9.2.6 Summary of Key Management Issues

Several key management issues are identified for East Fork Satsop River, its tributaries, and Decker Creek and tributaries:

- Lack of coniferous forest in riparian zones as a result of timber harvest and conversion to hardwoods.
- Sedimentation due to upstream culverts and logging roads.
- Control of invasive noxious weeds, primarily knotweed (Simon et al, 2006).

9.2.7 Reach Analysis

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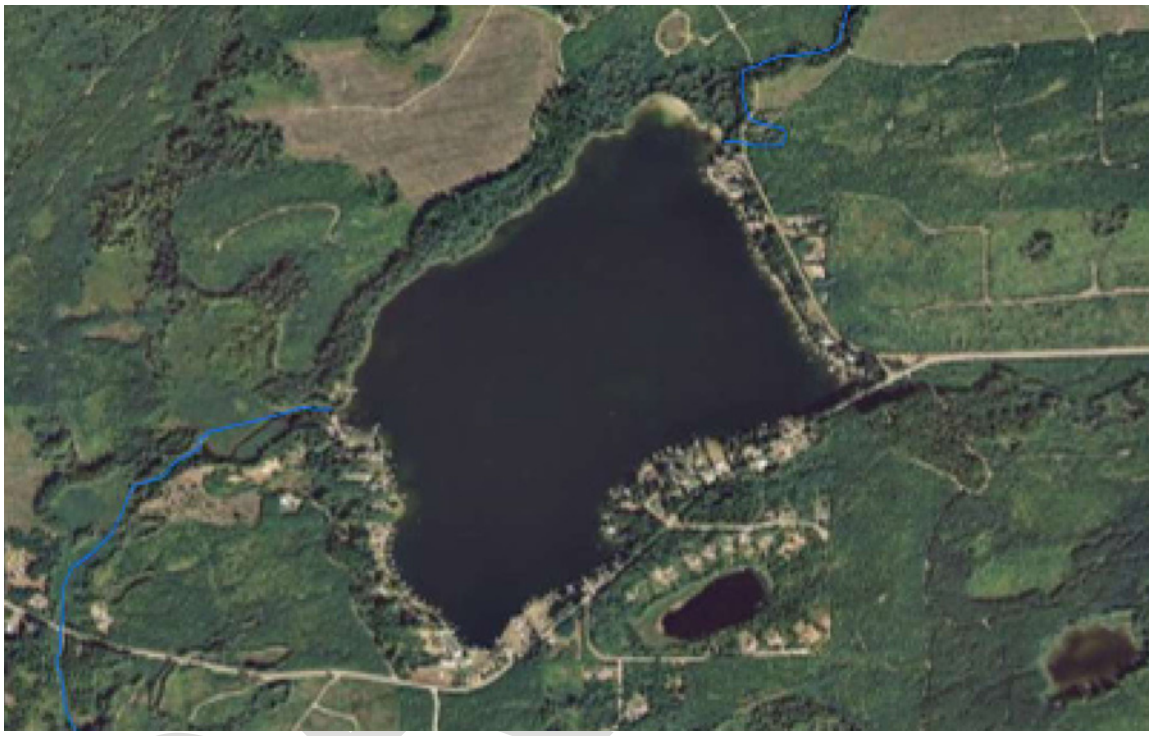
NAHWATZEL LAKE

SHORELINE PERIMETER	WATERBODY AREA	REACH AREA
3.0 MI	280.2 AC	361.7 AC



PHYSICAL AND ECOLOGICAL FEATURES

HYDROLOGY (MAPS 4 AND 10)

Floodplain - 40% (32 acres) of the reach, excluding open water, is mapped as FEMA 1% annual chance floodplain

HAZARD AREAS (MAP 12)

No listed erosion or landslide areas.

LAND COVER (MAP 15)

2% developed, 75% open water, 18% forest, 4% wetland (GAP, 2009)

Riparian vegetation: 12% forest cover, 9% non-forest, 78% water (PNPTC, 2011)

HABITATS AND SPECIES (MAP 8)

Coastal cutthroat trout and coho salmon; purple martin; water lobelia; palustrine forested and scrub-shrub

WATER QUALITY (MAP 13)

According to data collected in the 1990s Nahwatzel Lake was considered to be oligotrophic (Washington Department of Ecology 1997) and had excellent water quality. No more recent data was identified.

BUILT ENVIRONMENT AND LAND USE

EXISTING LAND USES (MAP 18)

Land Use – Residential (46%), Forestry (33%), Vacant (16%), and remaining 5% is a mix of aquaculture and transportation.

SHORELINE MODIFICATIONS (MAP 16)

There is 1 road crossing in the northeastern portion of the reach at W Nahwatzel Beach Dr. According to 2006 aerials, there are individual docks/piers associated with almost all single-family houses.

ZONING AND COMPREHENSIVE PLAN DESIGNATIONS (MAP 21)

Zoning districts: Rural Residential 5 Acres (65%) and Long Term Commercial Forest (35%). Comprehensive Plan Designations – Rural (65%) and Long Term Commercial Forest (35%).

Existing SED: 100% Conservancy.

PUBLIC ACCESS (MAP 14)

There is a WDFW boat launch that provides access to Nahwatzel Lake. The boat launch is a 12-foot wide launch (Washington Department of Fish and Wildlife WDFW Lands, 2011).

IMPERVIOUS SURFACES (MAP 16)

2.2% of the reach is mapped as containing impervious surfaces (NOAA CCAP, 2006). Aerial photos from 2009 show the north side of the lake as undeveloped forest and the remaining shoreline containing rural residential development.

AREAS OF SPECIAL INTEREST

According to the Ecology facilities/sites database, there are no listed contaminated sites.

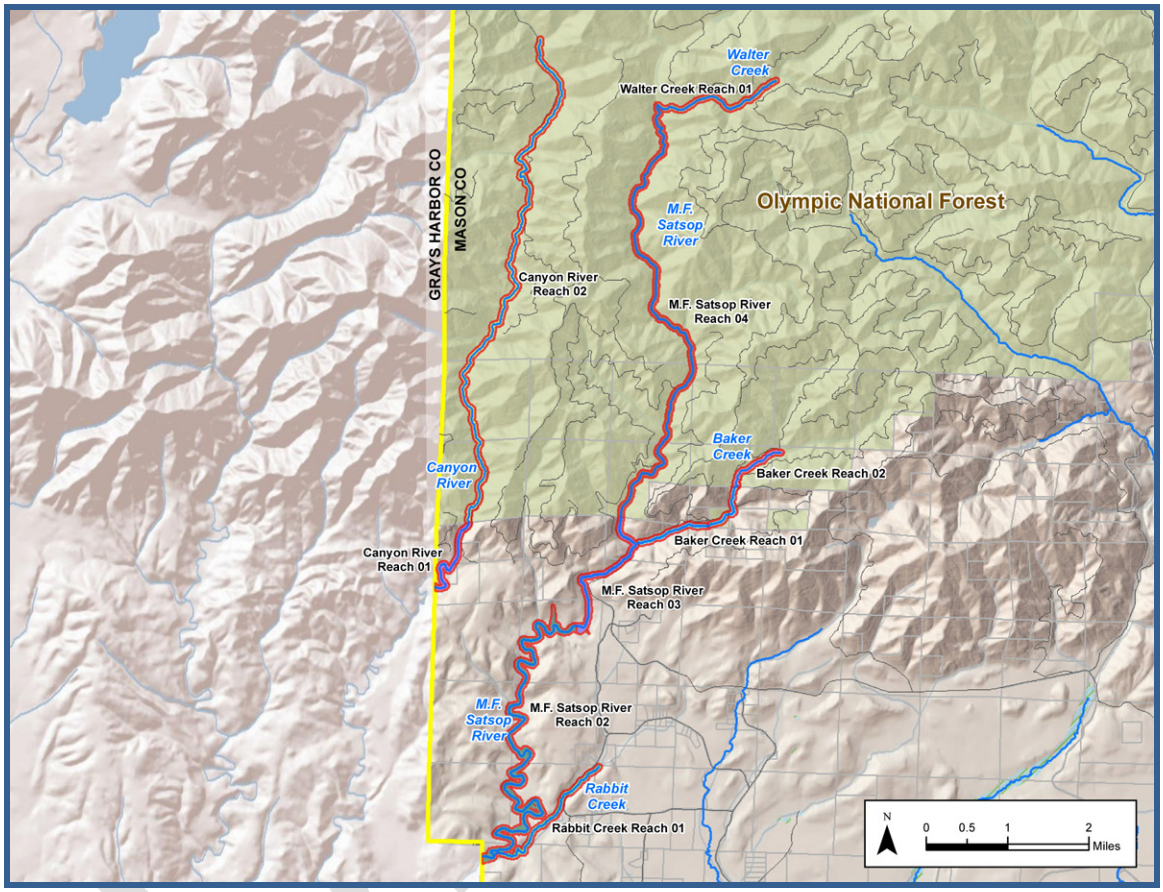
CULTURAL AND ARCHAEOLOGICAL RESOURCES

There are no listed cultural resources or state or federally listed historic properties. Resource mapping suggests there is a moderate-low probability of finding unknown artifacts within this reach.

OPPORTUNITY AREAS (MAP 23)

KEY MANAGEMENT ISSUES

9.3 Middle Fork Satsop River and Tributaries, (Rabbit Creek, Baker Creek, Walter Creek, Canyon River)



9.3.1 Physical Characterization and Modifications

The Middle Fork Satsop River flows from the foothills of the Olympic Mountains southerly through canyons and steep valleys from the confluence with Walter Creek (RM 30.2) to Baker Creek (RM 23.8). Downstream of Baker Creek, the surrounding land changes to valleys and prairies. The confluence of Middle Fork Satsop River with Rabbit Creek (RM 16.6) is located near the western boundary of Mason County. The Middle Fork Satsop River joins the East Fork Satsop River (RM 11), which is located approximately 5.6 miles downstream of Rabbit Creek. Canyon River joins the West Fork Satsop River at RM20. The West Fork and Middle Fork Satsop River flow into the Satsop River.

The Middle Fork Satsop River, Rabbit Creek, Baker Creek, Walter Creek, and Canyon River have been altered by historic land uses and roads. Some of the process modifications include:

- Splash dams changing flow patterns, increase channel instability, and channel incision; and
- Logging practices in the upper watershed resulting in removal of trees from riparian areas and an increase in sedimentation from logging roads.

9.3.2 Water Quality

PLACEHOLDER

9.3.3 Critical or Priority Habitat and Species

The Middle Fork Satsop River contains numerous salmonid species listed as priority species by WDFW. These are Chinook salmon, steelhead, coastal resident cutthroat trout, and coho salmon. Healthy runs of fall Chinook salmon, coho and chum are recorded for the Middle Fork Satsop River (Chehalis Basin Partnership, 2010). Breeding areas for golden eagle are recorded for the Middle Fork Satsop River drainage in the upper watershed (WDFW, 2011). Western toad, a federal species of concern, is also recorded. Northern spotted owl have documented habitat in the forested areas.

9.3.4 Land Use

Land use is almost entirely in forestry. According to 2006 aerials, shoreline modifications are limited to one road crossing in Canyon River Reach 02, located in the National Forest. There are no parks or public access facilities. Green Diamond

Timber Resources is the primary landowner of the timber lands surrounding the Middle Fork Satsop River subbasin.

9.3.5 Land Cover

Land cover is mostly a mix of forest cover (71 percent) and other natural vegetation (22 percent) (PNPTC, 2011).

9.3.6 Summary of Key Management Issues

PLACEHOLDER

9.3.7 Reach Analysis

9.4 Data Gaps

There are numerous data gaps for waterbodies within WRIA 22; these include:

- Water quality data and monitoring. Many of the rivers and lakes in WRIA 22 are not part of the Ecology 303(d) list testing.
- Habitats and fish passage. Less information is available regarding fish passage in these streams.
- Instream flow data. Much of the data on the rivers in WRIA 22 in Mason County is collected by private timber industries and is not available to the public.