

CHAPTER 2. TECHNICAL INFORMATION

2.1 WHAT IS A HEALTHY WATERSHED?

The goals of the technical assessment for the WRIA 19 Watershed Plan were: to assess current subbasin conditions, identify data gaps and make recommendations for future technical studies. Because each subbasin has unique anthropogenic and environmental conditions, each was individually evaluated using general guidelines from the “Matrix of Pathways and Indicators” developed by National Oceanic and Atmospheric Administration (NOAA) Fisheries, state water quality standards, and other pertinent documents.

Section 2.2 provides a general description of each major subbasin, followed by discussions of watershed characteristics relating to hydrology, water allocation and use, instream flow, water quality, and habitat. Based on the conclusions drawn from the analysis of each subbasin, this chapter concludes with a table that outlines the policy implications of the technical assessment for watershed management decisions. Detailed descriptions of the technical information are included in Appendices G-L.

2.1.1 The Qualities of Healthy Streams



Typical Streams, (left to right) upper watershed, middle watershed and lower watershed (river mouth)

An essential element of the watershed planning effort is diagnosing the ecological “health” of streams in the watershed and the riparian zones that surround them. Identifying problems in streams and riparian zones requires an understanding of what an intact, healthy stream system looks like. Appendix G provides detailed discussion and numerical measurements that can be used to assess whether a stream is healthy. In a very general sense, the characteristics of a healthy stream vary with the location in the stream’s watershed.

- In the upper watershed, where the terrain is steepest, streams typically flow in narrow channels with little or no adjacent floodplain or off-channel habitat. These streams feature numerous plunge pools, boulders and large woody debris (LWD). The water is supplied by snowmelt and is cold and clear. Steep gradients, physical barriers and the lack of refuge areas make the upper watershed streams generally inhospitable to fish.
- As the terrain becomes less steep in the middle watershed, the stream channel widens somewhat. Cascades, pools, riffles, debris dams and sediment bars are common features in middle watershed streams. Supplied by a combination of snowmelt, rainfall and groundwater, the water is slightly warmer in these stream reaches than in the upper watershed. More fish can access these reaches because of the shallower gradients.

- In the relatively flat lower watershed, streams flow in wide channels surrounded by wide valleys and floodplains. Free to move back and forth across the floodplain over time, lower-watershed streams form side channels, oxbows and complex off-channel habitats. They often form “braided” systems of multiple channels, all of which can be used by fish during high flows. The exchange of surface and groundwater is common in the lower watershed. Because the channels are wider and cannot be completely shaded by vegetation, the water is warmer in these reaches.

2.2 SUBBASIN DESCRIPTIONS

Although some of the technical analyses needed for the WRIA 19 watershed planning effort can be applied to the entire watershed, for others it is best to divide the watershed into smaller “subbasins” for evaluation. Figure 1-1 shows the subbasins that make up WRIA 19. Because it is on the Makah Indian Reservation, the Neah Bay subbasin is not analyzed for this plan. The other subbasins are briefly described below. Appendix H provides more detailed descriptions of the subbasins.

2.2.1 Salt Creek Subbasin

Four main streams flow directly into the Strait of Juan de Fuca in the 45-square-mile Salt Creek Subbasin: Coville Creek, Salt Creek, Whiskey Creek, and Field Creek. These creeks flow from headwaters in the foothills of the Olympic Mountains into a wide terrace where several tributaries join the creeks’ main stems. The lower reaches of Salt Creek flow through tidal emergent wetlands onto the alluvial fan at its mouth into Crescent Bay. Coville Creek drains into Freshwater Bay east of Salt Creek, and Whiskey and Field Creeks flow into the Strait of Juan de Fuca west of Salt Creek. Emergent, scrub-shrub, and forested wetlands are sparsely scattered throughout the subbasin. Soils in the subbasin are generally well-drained.

Highway 112 runs east-west through the Salt Creek Subbasin, just north of the foothills. This state highway connects several small communities including Coville, Ramapo, Joyce, and Disque. Camp Hayden Road runs north-south from Highway 112 along the east bank of Salt Creek to the mouth. This riparian road prevents lateral migration and disconnects the stream from side channel habitats. Two roads enter the town of Joyce: Piedmont Road from the foothills to the south and Crescent Beach Road from Crescent Bay to the north. The Chicago-Milwaukee-St. Paul and Pacific Railroad grade runs roughly parallel to and north of Highway 112.

Half of the subbasin is zoned commercial forestry, 45 percent rural, and less than 1 percent each tribal, public, industrial, and commercial. Aerial photos dated 1990 show significant land clearing throughout the subbasin, particularly in the central and western areas.

Key features of the natural and human landscapes in this subbasin are shown on Figures 2-1 and 2-2.

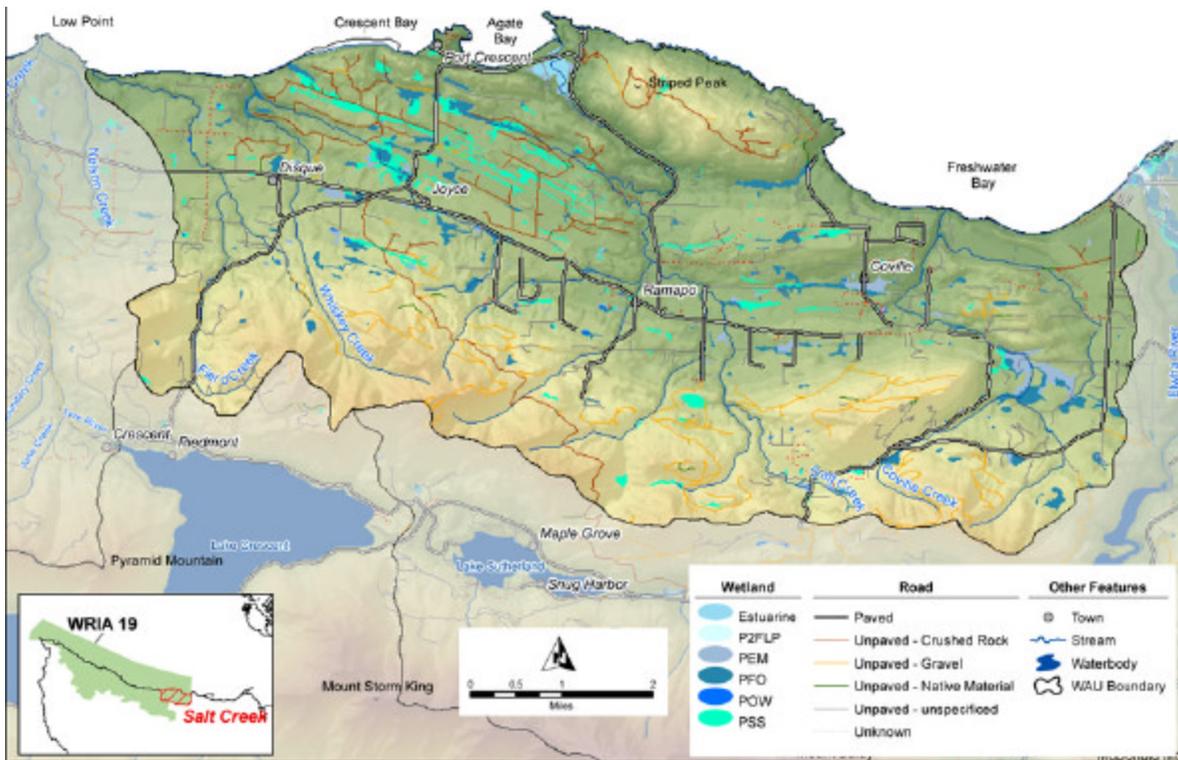


Figure 2-1. Salt Creek Subbasin Natural Landscape

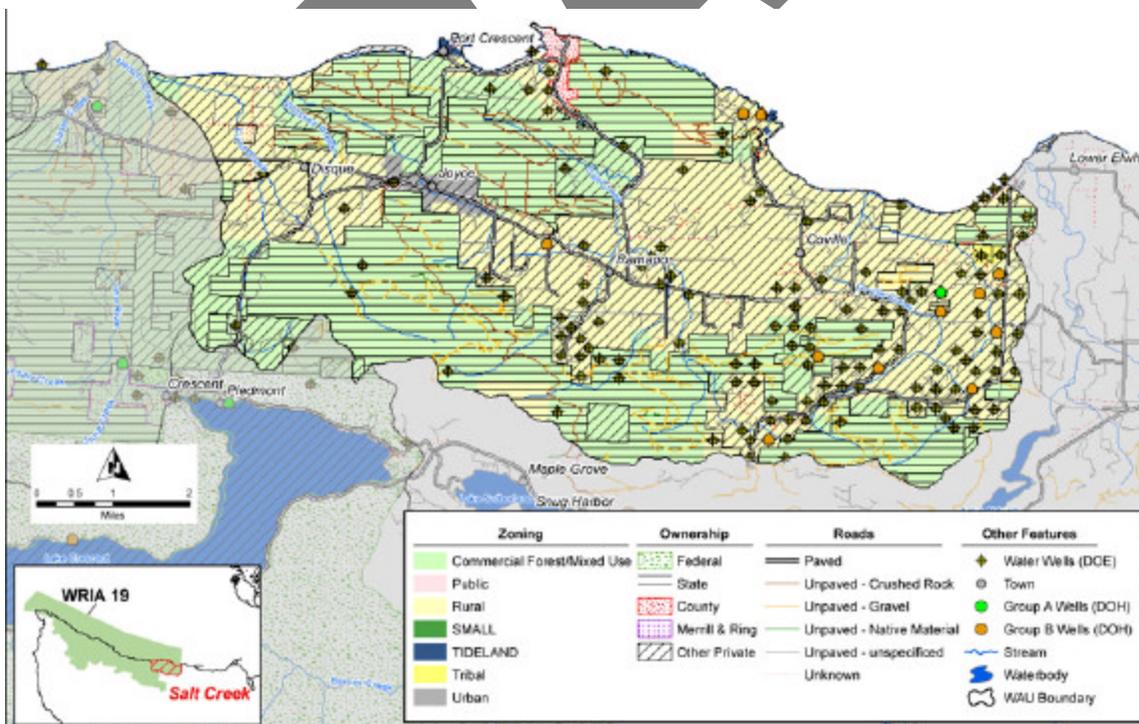


Figure 2-2. Salt Creek Subbasin Human Landscape

2.2.2 Lyre River and Lake Crescent Subbasins

Because of the sparse level of development in the 49.5-square-mile Lake Crescent Subbasin, it is combined with the 67.5-square-mile Lyre River Subbasin in the analyses and discussions provided in the Watershed Plan. The Lyre River is the only stream in the Lyre River Subbasin that flows directly to the Strait of Juan de Fuca, and the only stream in WRIA 19 that is fed by a lake (Lake Crescent). June Creek and Boundary Creek join the Lyre River in the Olympic foothills, and Susie Creek and Nelson Creek join it near its mouth. Several streams flow directly into Lake Crescent, including Cross, Lapoel, Aurora, Smith, Falls and Barnes Creeks. Highway 112 runs east-west across the lower Lyre River Subbasin, and US Highway 101 runs east-west along the southern shore of Lake Crescent.

There are large emergent and forested wetlands located north of Highway 112 and west of Nelson Creek. There is a significant scrub-shrub wetland located just south of the headwaters of Nelson Creek, between an old railroad grade and a power line right-of-way. Soils in the subbasin are generally well-drained.

Land in the Lyre River and Lake Crescent subbasins is zoned 23 percent commercial forestry, 2 percent rural, and 36 percent public lands. There is very little community establishment in the Lyre River Subbasin, with minor residential developments located near Lake Crescent and along Highway 112. Aerial photos dated 1990 show significant land clearing in the middle and lower portions of the Lyre River Subbasin.

Key features of the natural and human landscapes in this subbasin are shown on Figures 2-3 and 2-4.

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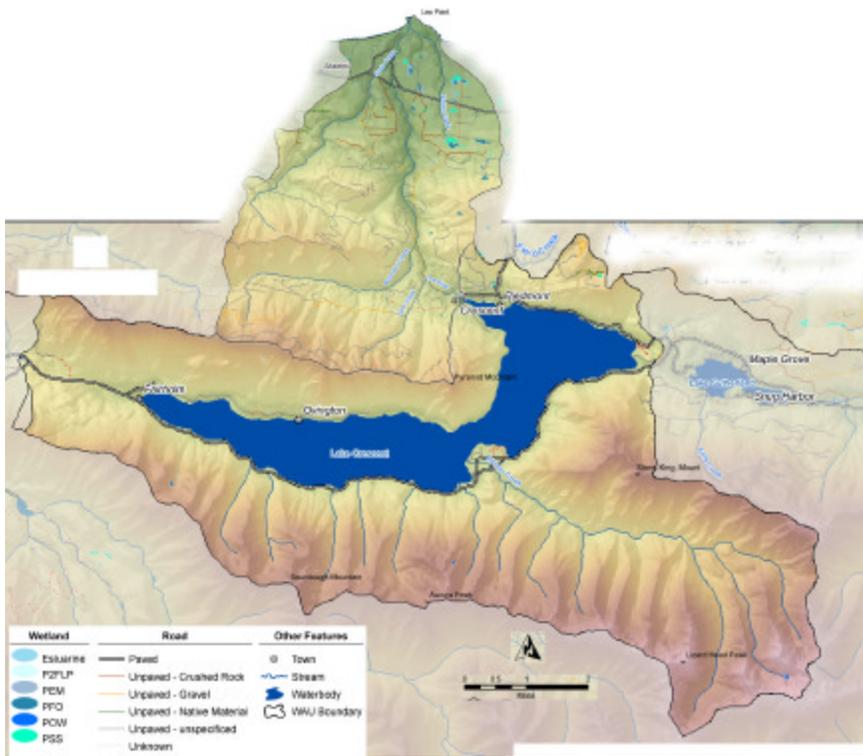


Figure 2-3. Lyre River/Lake Crescent Subbasin Natural Landscape

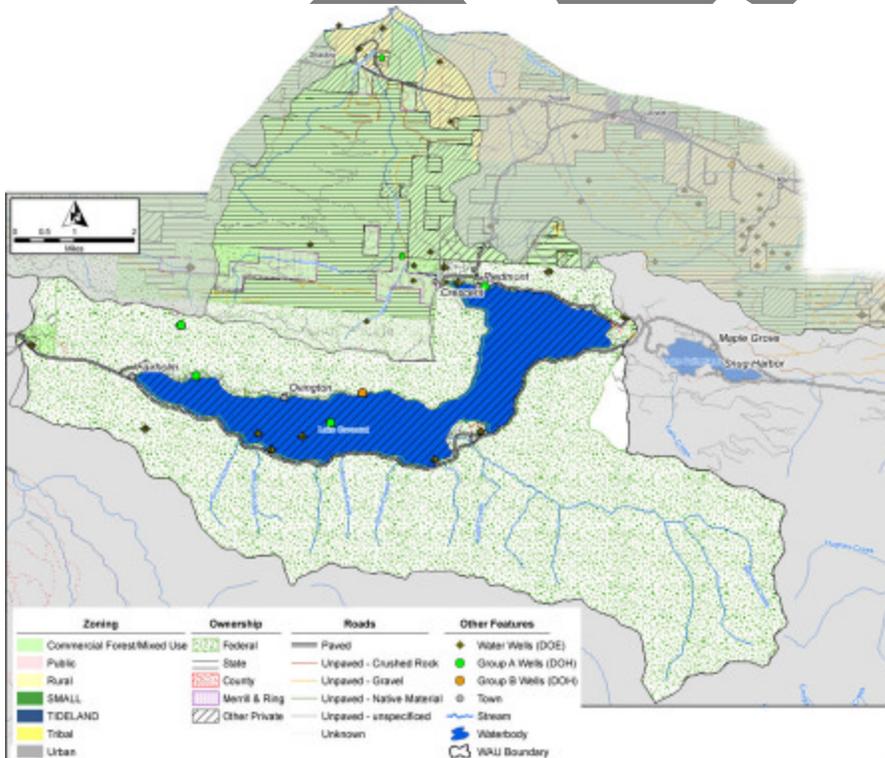


Figure 2-4. Lyre River/Lake Crescent Subbasin Human Landscape

2.2.3 Twin Rivers Subbasin

The 33-square-mile Twin Rivers Subbasin contains three streams that flow separately to the Strait of Juan de Fuca: the East Twin River, the West Twin River and Murdock Creek. Two unnamed tributaries join the West Twin River from the east and west where it moves from steep mountain slopes onto lower gradient hills. Near its mouth, another unnamed tributary joins the West Twin River on the west bank. State Highway 112 runs roughly east/west across the subbasin, crossing both rivers near their mouths.

Scattered wetlands exist along the western boundary of the East Twin River subbasin, including forested, emergent, and scrub-shrub types. There also exist significant tidal aquatic beds along the coast west of the Murdoch Creek mouth. There are no wetlands in the West Twin River Subbasin. The East and West Twin Rivers both flow through generally well-drained soils, except in the lowest reaches, where the soils are moderately to poorly drained.

The subbasin is almost exclusively zoned for commercial forestry. Aerial photos dated 1994 show scattered land clearing in the East Twin River Subbasin and extensive clearing in the West Twin Subbasin, particularly in the middle and lower western portion.

Key features of the natural and human landscapes in this subbasin are shown on Figures 2-5 and 2-6.

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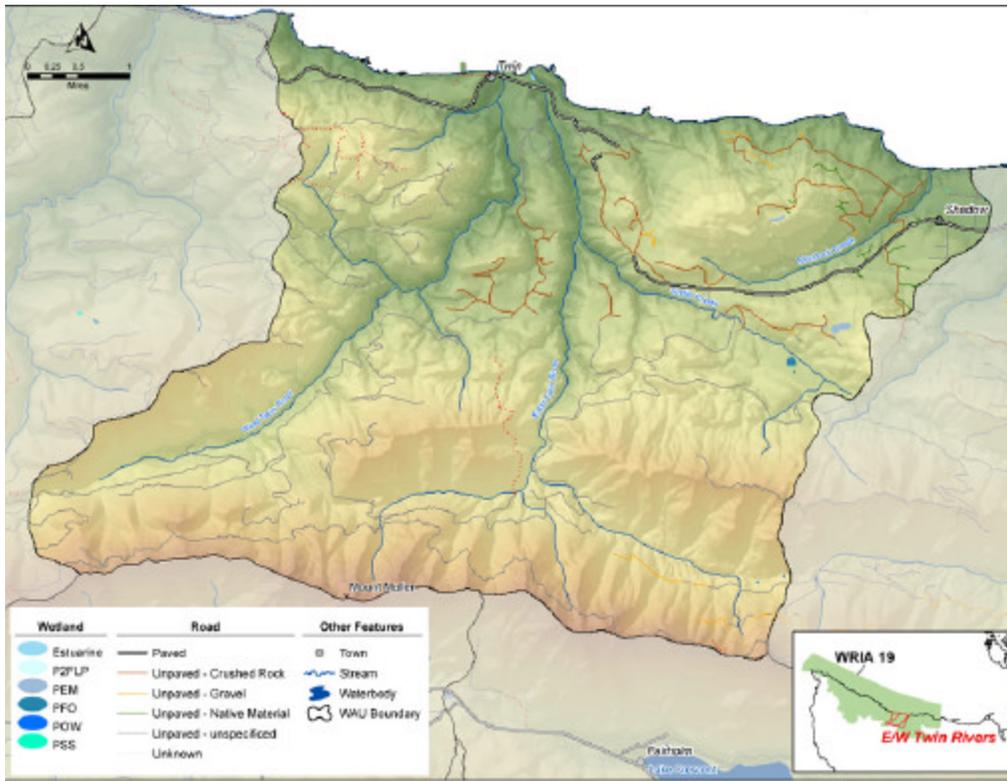


Figure 2-5. Twin Rivers Subbasin Natural Landscape

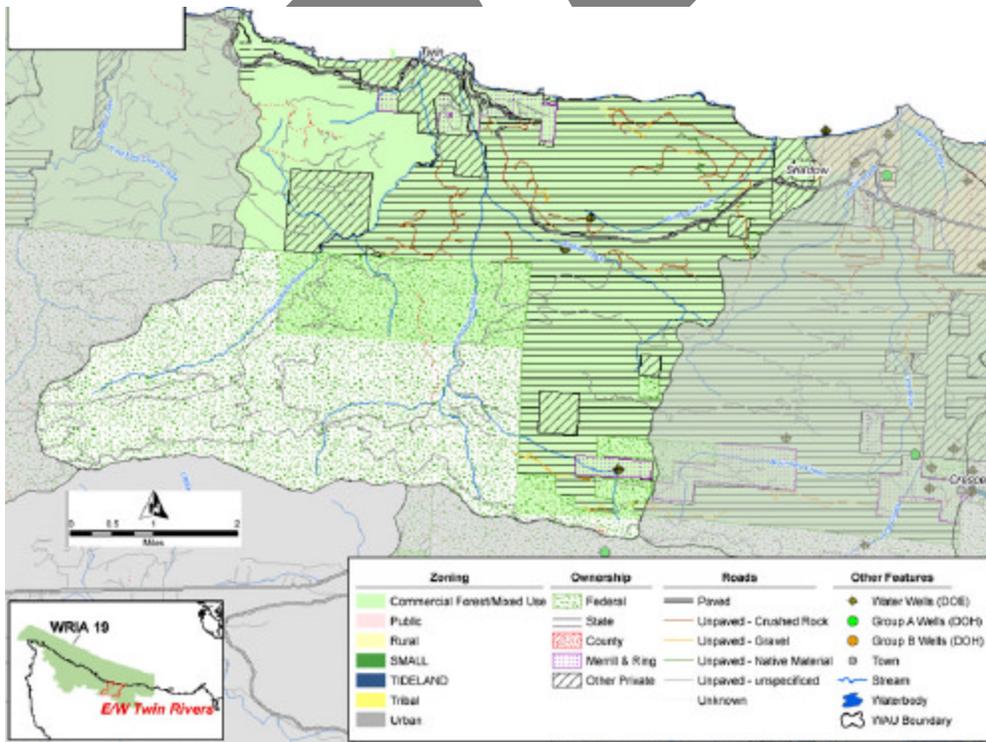


Figure 2-6. Twin Rivers Subbasin Human Landscape

2.2.4 Deep Creek Subbasin

Deep Creek is the only significant stream in the 18.2-square-mile Deep Creek Subbasin that flows directly into the Strait of Juan de Fuca. Two tributaries join Deep Creek on the east bank along its upper reaches. As it flows through foothills, the Deep Creek main stem is joined by its east and west forks. State Highway 112 runs roughly east-west across the Deep Creek subbasin, crossing very near the mouth.

There are small, scattered wetlands east and west of Deep Creek just south of where the east and west forks merge. These wetlands are scrub-shrub, forested, and aquatic beds. Aquatic tidal bed wetlands are located near the mouth of Deep Creek and along the coast east of Deep Creek. The creek flows through generally well-drained soils, except in the middle watershed, where the soils are moderately to poorly drained.

The entire Deep Creek Subbasin is zoned and used for commercial forestry. Aerial photos dated 1994 show extensive harvest activity throughout this subbasin, most intensely in the lower portion of the subbasin surrounding East Fork Deep Creek.

Key features of the natural and human landscapes in this subbasin are shown on Figures 2-7 and 2-8.

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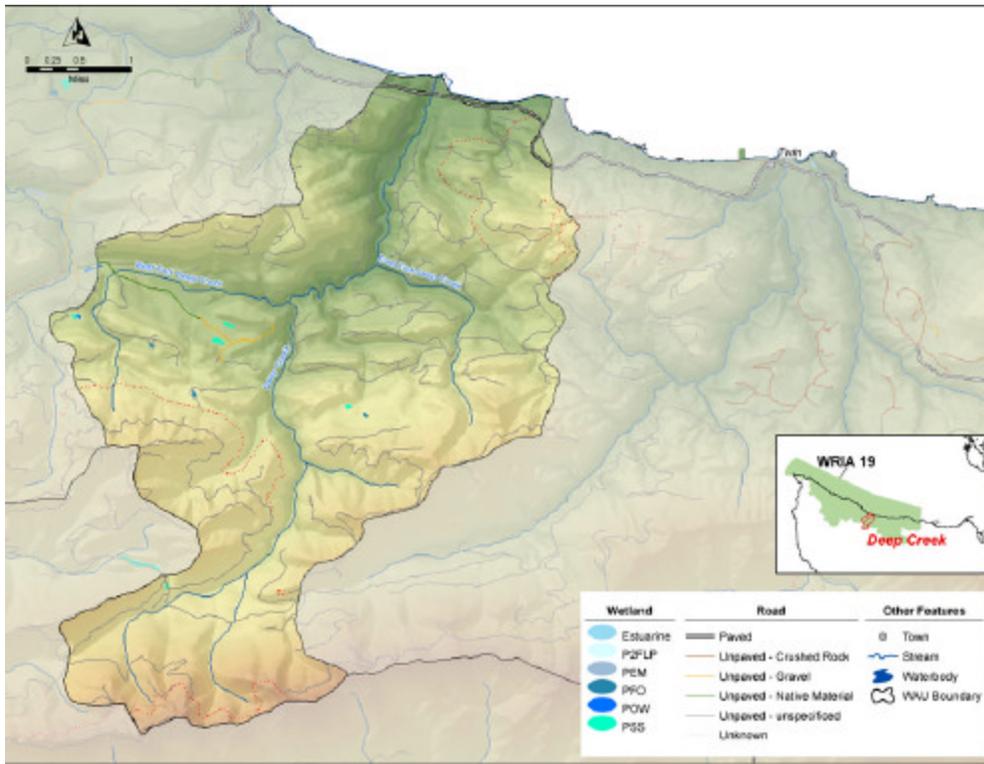


Figure 2-7. Deep Creek Subbasin Natural Landscape

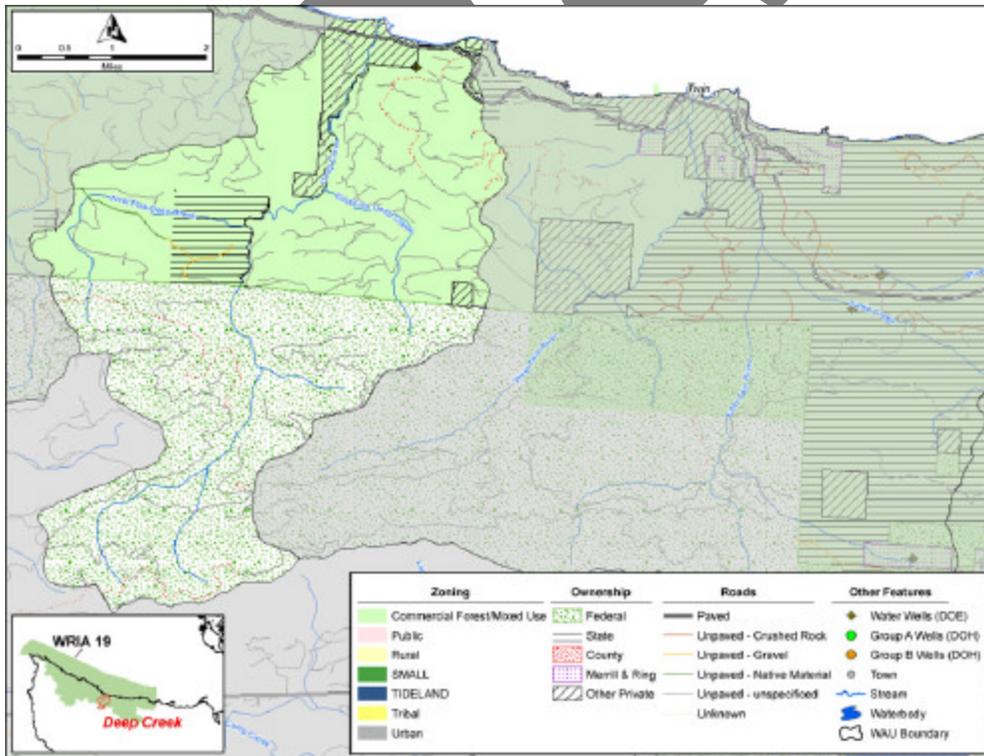


Figure 2-8. Deep Creek Subbasin Human Landscape

2.2.5 Pysht River Subbasin

Four streams in the 54-square-mile Pysht Subbasin drain directly into the Strait of Juan de Fuca: Joe, Jim, and Butler Creeks and the Pysht River. The Pysht River has an elaborate tributary system including the South Fork, the West Fork, and their associated tributaries. Tributaries of the South Fork include Middle and Salmonberry Creeks. Needham and Green Creeks flow into the middle reaches of the West Fork. Reed and Indian Creeks join the main stem of the Pysht River near its mouth. The main road in this subbasin is Highway 112, which runs immediately adjacent to the Pysht River from the mouth up to Highway 113.

Forested and scrub-shrub wetlands are present in the headwaters of Jim Creek, between Needham Creek and the South Fork, along the main stem of the Pysht River just south of the convergence of the forks, and in the headwaters of Green Creek. A large complex of forested and tidal emergent wetlands is found near the river's mouth. Tidal aquatic beds are located in the eastern and western corners of the subbasin shoreline. The Pysht River flows through generally well-drained soils, except in the middle watershed, where the soils are moderately to poorly drained.

The subbasin is zoned 98 percent commercial forestry and the remaining land is zoned rural. Aerial photos dated 1994 show extensive land clearing throughout the subbasin.

Key features of the natural and human landscapes in this subbasin are shown on Figures 2-9 and 2-10.

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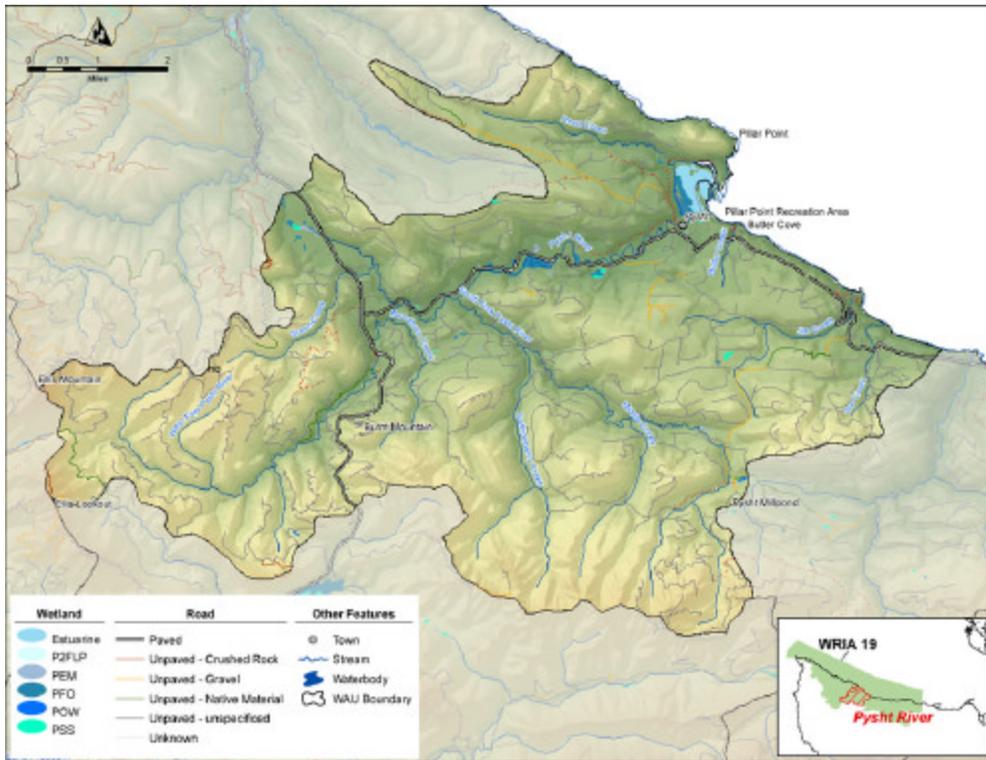


Figure 2-9. Pysht River Subbasin Natural Landscape

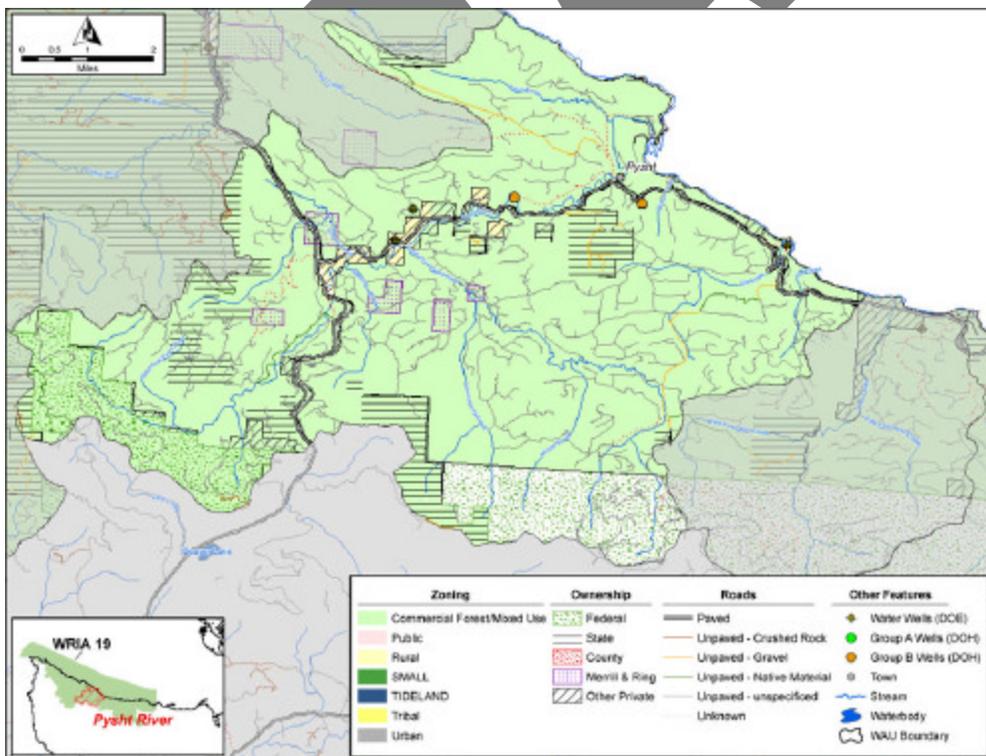


Figure 2-10. Pysht River Subbasin Human Landscape

2.2.6 Clallam River Subbasin

Two streams in the 36-square-mile Clallam River Subbasin drain directly into Clallam Bay: the Clallam River and Falls Creek. The upper reaches of the Clallam River twist east and west through very steep mountainsides, emerging onto the foothills where Blowder Creek joins it on the west bank. Near Clallam Bay, the river is joined by Charley Creek from the west and two creeks on the east: Last Creek and Pearson Creek. A sandbar at the mouth of the Clallam River has historically blocked flow into Clallam Bay during low flow periods. The main road passing through the Clallam River Subbasin is Highway 112, which runs closely along the Clallam River main stem from where Blowder Creek converges. The state highway crosses the main stem in several locations as it heads toward Clallam Bay.

Small forested, scrub-shrub and emergent wetlands are scattered throughout the subbasin, with a notable series of scrub-shrub wetlands along the Clallam River and Highway 112 between the Blowder and Charley Creek confluences. Large forested wetlands exist along the upper reaches of Last Creek and near the mouth of the Clallam River. The Clallam River flows through generally well-drained soils, except in the middle watershed, where the soils are moderately to poorly drained.

The Clallam River Subbasin is zoned 93 percent for commercial forestry. The remaining land is zoned rural, commercial, and industrial. Aerial photos dated 1994 show the headwater forests to be fairly intact.

Key features of the natural and human landscapes in this subbasin are shown on Figures 2-11 and 2-12.

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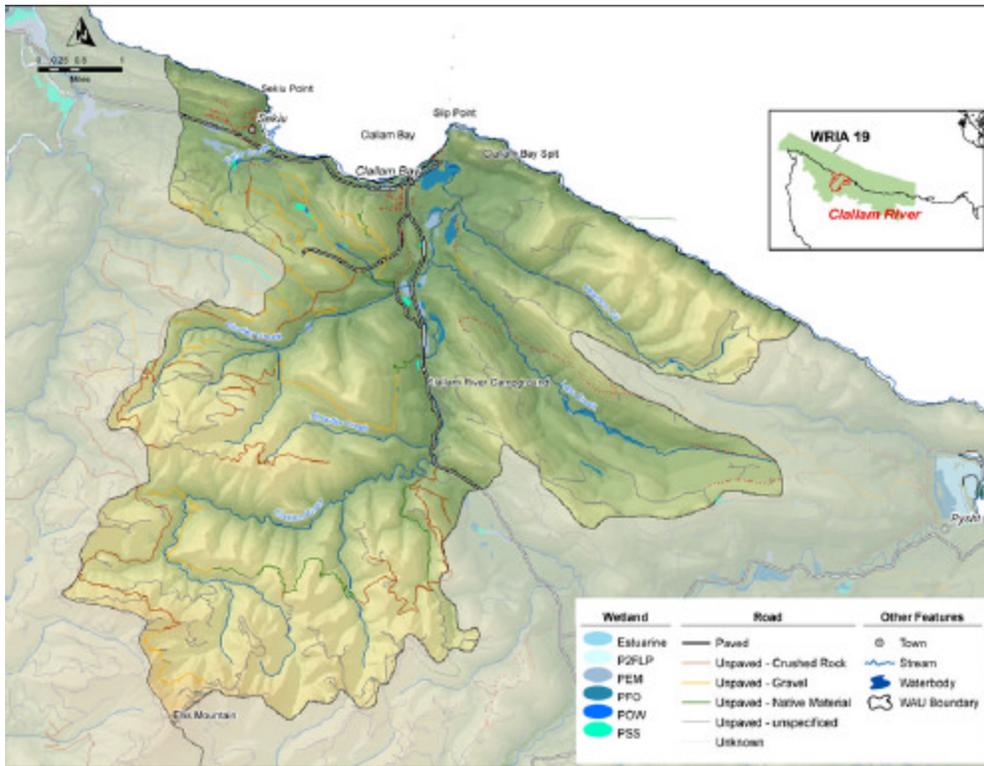


Figure 2-11. Clallam River Subbasin Natural Landscape

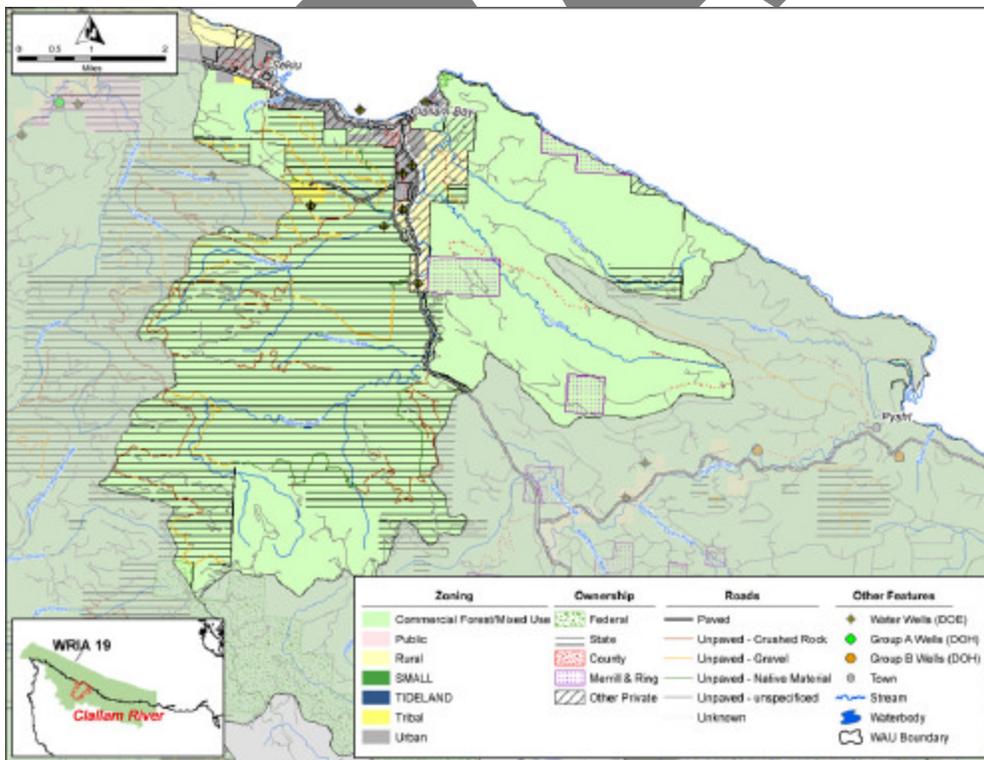


Figure 2-12. Clallam River Subbasin Human Landscape

2.2.7 Hoko River Subbasin

The Hoko River is the only stream that drains directly into the Strait of Juan de Fuca in the 71-square-mile Hoko River Subbasin. The headwaters of the main stem Hoko River are made up of several small tributaries that drain the moderately steep foothills, including Johnson, Cub, Bear, Ellis, and Herman Creeks, which drain into the main stem from the east, and Ossert and Brownes Creeks, which flow into the upper main stem from the west. The main tributary to the Hoko River is the Little Hoko River, which has several tributaries including Lamb, Coke, and Leyh Creeks. The estuarine zone extends over a mile upstream from the mouth. State Highway 112 runs east-west near the shoreline, and crosses the Hoko River. Hoko Ozette Road intersects with Highway 112 just east of the main stem, and runs immediately adjacent to the Hoko main stem as it heads southwestward.

Small forested, scrub-shrub, and emergent wetlands are sparsely scattered throughout the subbasin. A notable scrub-shrub/forested/emergent wetland complex is located along the main stem about a mile upstream of the river's mouth. The Hoko River flows through generally well-drained soils, except along the upper main stem, where the soils are moderately to poorly drained.

Ninety-five percent of the subbasin is zoned commercial forestry, and the remainder is zoned rural and industrial. Aerial photos from 1994 show moderate clearing scattered throughout the subbasin.

Key features of the natural and human landscapes in this subbasin are shown on Figures 2-13 and 2-14.

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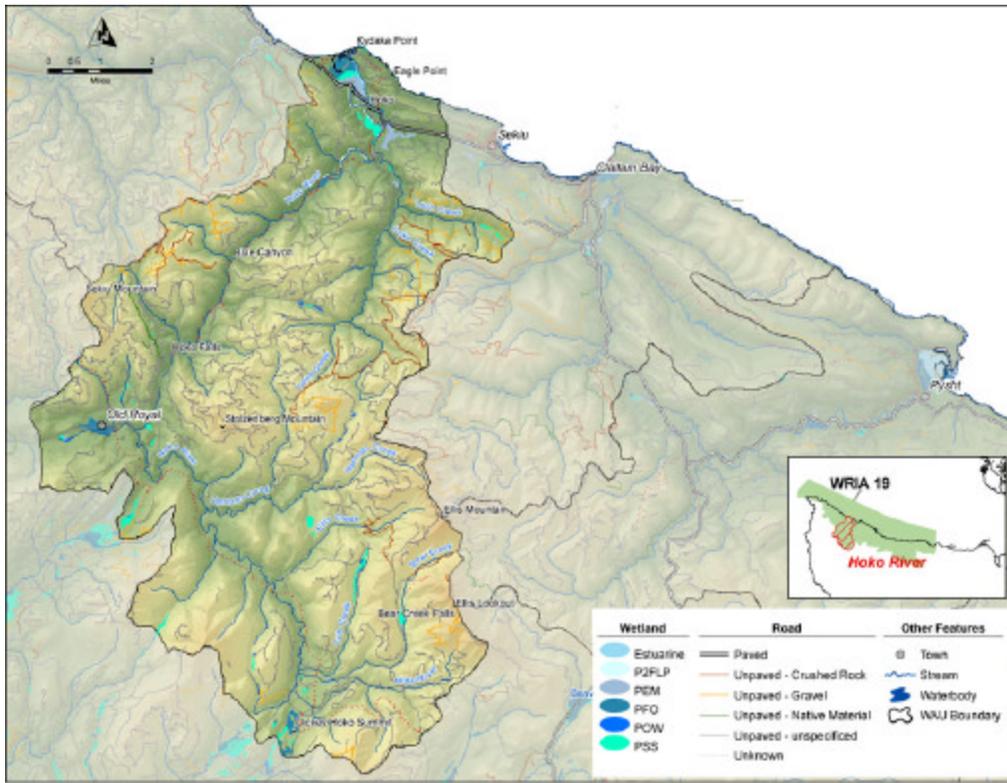


Figure 2-13. Hoko River Subbasin Natural Landscape

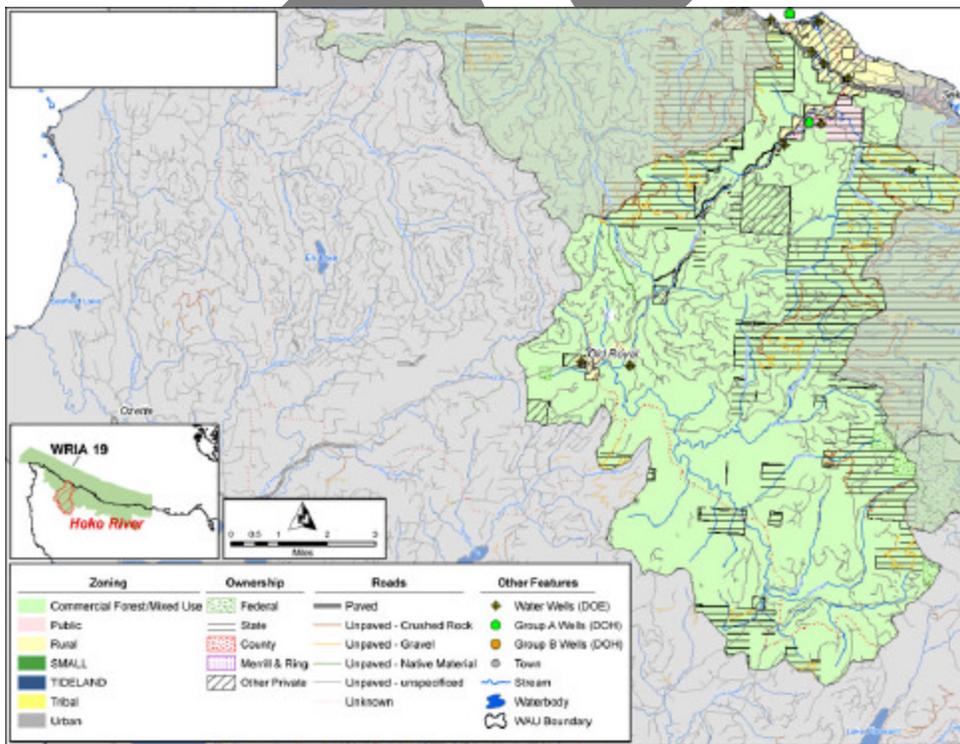


Figure 2-14. Hoko River Subbasin Human Landscape

2.2.8 Sekiu River Subbasin

The 45-square-mile Sekiu River Subbasin includes several streams on Makah Tribal lands. This watershed plan addresses only streams outside tribal boundaries. Six of these streams drain directly into the Strait of Juan de Fuca: Snow, Bullman, Rasmussen, Jansen and Olsen Creeks and the Sekiu River. Sekiu River tributaries include the North Fork, South Fork, No Name Creek, and Carpenters Creek. The main road that traverses the Sekiu River Subbasin is State Highway 112, which runs immediately adjacent to the coast.

Due to the steep terrain, very few wetlands exist in this subbasin. Small scrub-shrub wetlands are present in the headwaters of North Fork Sekiu and near the mouth of the main stem. Soils in this subbasin are generally well-drained.

The Sekiu River subbasin is zoned 96 percent commercial forestry. The remaining 4 percent is zoned as rural or tribal lands. Aerial photos dated 1994 show land clearing activities throughout the subbasin, particularly in the headwaters of Carpenter Creek, North Fork Sekiu, Jansen and Rasmussen Creeks.

Key features of the natural and human landscapes in this subbasin are shown on Figures 2-15 and 2-16.

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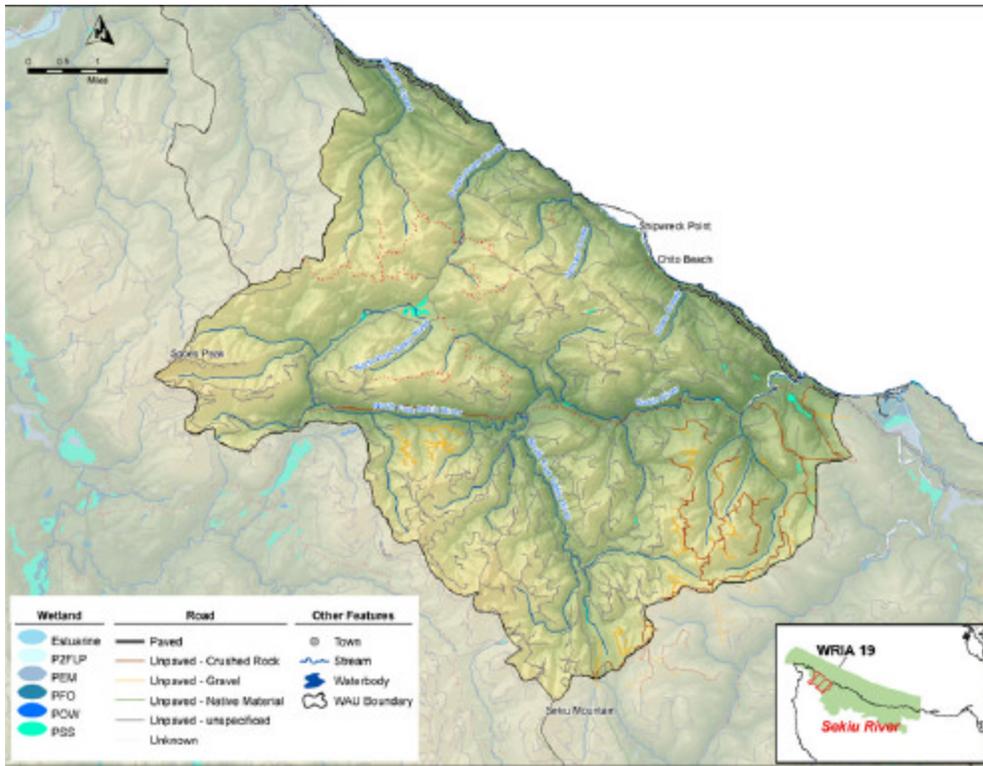


Figure 2-15. Sekiu River Subbasin Natural Landscape

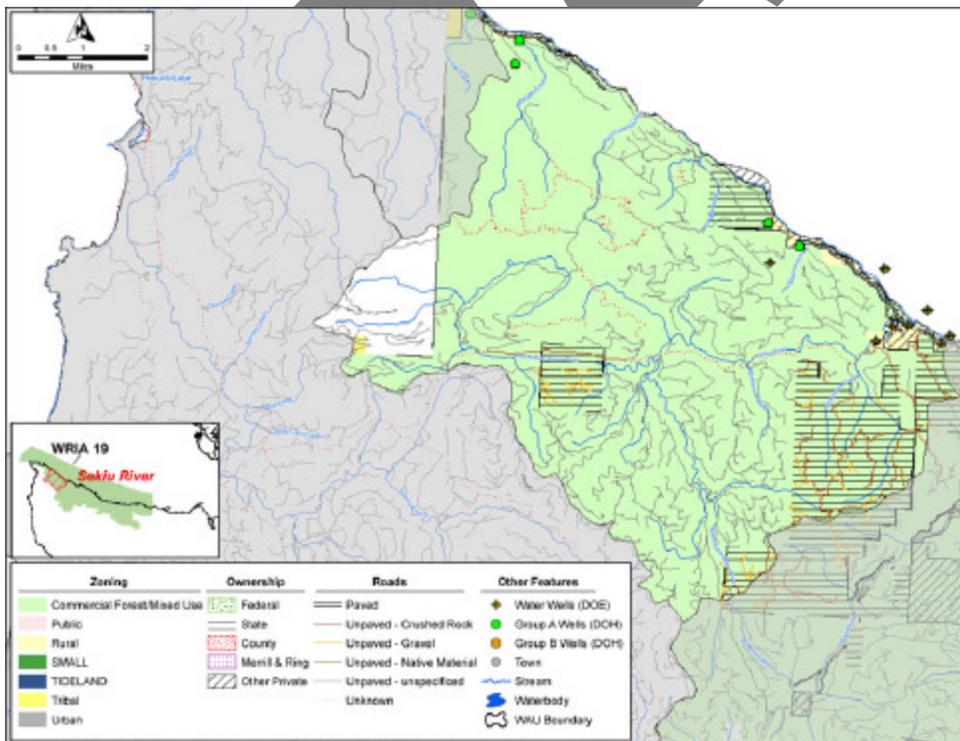


Figure 2-16. Sekiu River Subbasin Human Landscape