

Summary of the Watershed Health Indicators for the Oregon Coast Coho ESU 2007

Report Prepared for:

Oregon Watershed Enhancement Board



Completed in cooperation with the Oregon Coast Watershed Councils

January 09, 2008

Summary of the Watershed Health Indicators for the Oregon Coast Coho Evolutionarily Significant Unit

2007

Oregon Watershed Enhancement Board

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Completed in cooperation
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Appendix C. Watershed Health Indicators: Definitions and Criteria.

1.0 INTRODUCTION

This report identifies factors limiting watershed health within selected Oregon watersheds draining to the Pacific Ocean. The characterization of Watershed Health Indicators focuses on a “ridgetop-to-ridgetop” perspective, encompassing all habitat types. This broad watershed context is the basis for identifying the key factors limiting fish and wildlife populations, biological diversity, and water quality.

The geographic scope of this report is the twelve Watershed Council Areas comprising most of the coastal tributaries north of the Rogue River. The area ranges from the Coquille Watershed Association in the south to the lower Columbia Watershed Council in the north (Figure 1; Appendix A, Watershed Council Contacts). The primary emphasis is on watersheds within the extent of the Oregon Coast Coho Evolutionarily Significant Unit (ESU). The reporting was extended beyond the Oregon Coast Coho ESU to include watersheds covered by the North Coast Watershed Association (Youngs River and Big Creek) and the Lower Columbia Watershed Council (Clatskanie River), both of which are within the range of the Lower Columbia River Coho ESU. The Umpqua River Basin, where there is a similar ongoing project to identify watershed limiting factors, is not included in this report.

The consulting team worked with watershed council staff to develop and describe a range of watershed health characteristics, called Watershed Health Indicators that are indicative of environmental conditions (e.g., stream habitat quality) and processes (e.g., stream flows). These conditions and processes shape aquatic and terrestrial habitat, and affect fish and wildlife populations and water quality. The Watershed Health Indicators are organized by the major watershed habitat components represented in this coastal ecosystem – aquatic, riparian, wetland, upland, and estuarine.

The Watershed Health Indicators were identified by watershed council staff based on information contained in local watershed assessments, aquatic habitat inventories, monitoring and other studies. The primary output from this project is a list of Watershed Health Indicators organized by the 5th-field watersheds within each watershed council area. In some cases, watershed council staff compiled indicators for 6th-field watershed. All of the information is contained in an on-line database. This document concentrates on reporting the Watershed Health Indicators for the 5th-field watersheds.

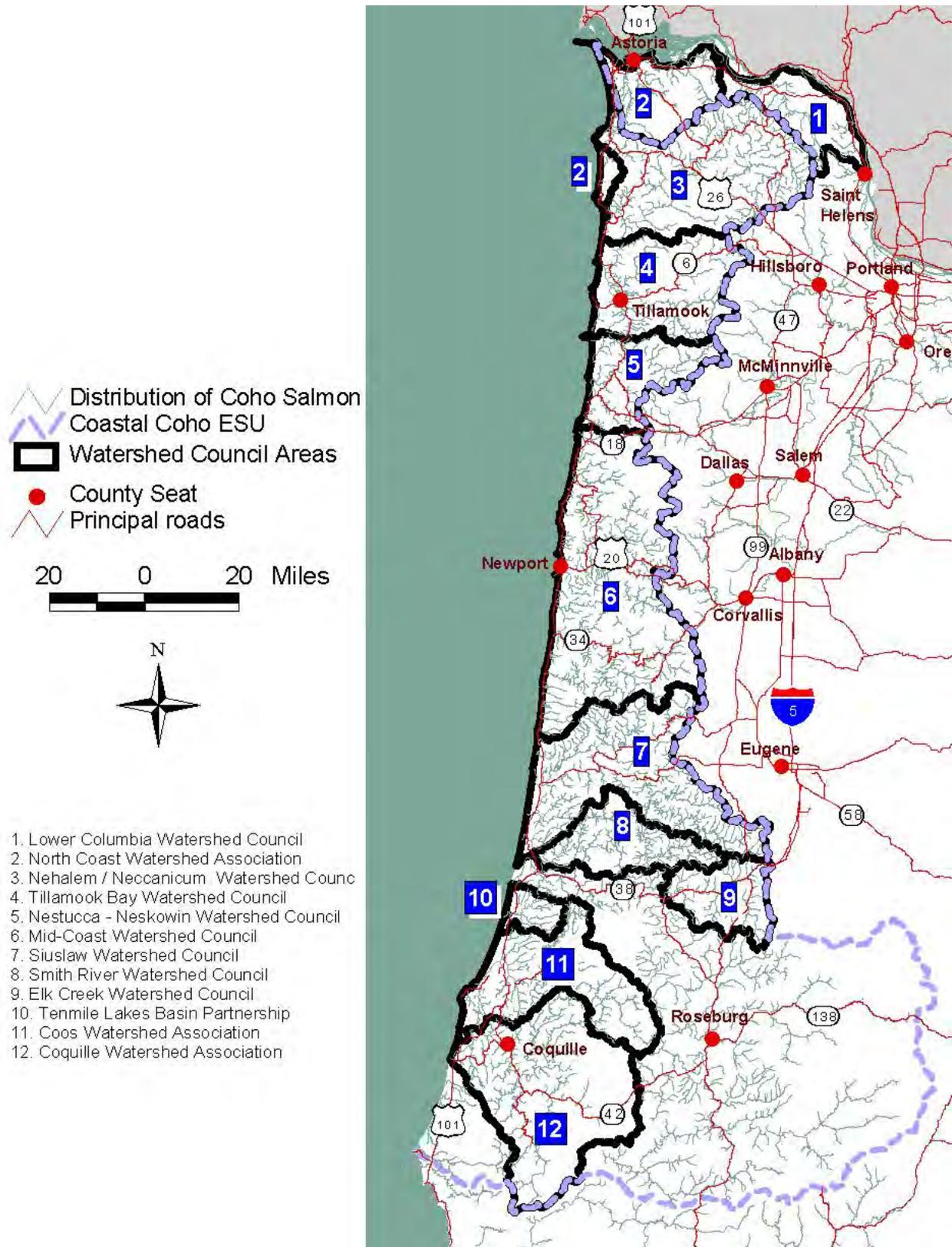


Figure 1. Watershed Council area boundaries and extent of the Oregon Coast Coho ESU.

1.1 GOALS AND OBJECTIVES

The goal of this project was to summarize Watershed Health Indicators that are limiting the health of watersheds, with a primary focus on the Oregon Coast Coho ESU. This report fulfills the Oregon Watershed Enhancement Board's legislative mandate to establish priorities that will help guide funding decisions.

The specific tasks were to:

- 1) Develop a template to facilitate compilation of data regarding watershed conditions as reported in watershed assessments, water quality plans, the conservation plan for the Oregon Coast Coho ESU, and the Oregon Conservation Strategy, and other documents;
- 2) Ensure that the template guides the synthesis of Watershed Health Indicators in a manner that is consistent with work accomplished in previous OWEB river basins;
- 3) Work with watershed councils and other stakeholders to extract information from source documents and place it in the template, thus developing a consistent matrix of Watershed Health Indicators; and
- 4) Produce a report that summarizes Watershed Health Indicators within the Oregon Coast Coho ESU region that can be used to guide restoration funding.

1.2 BACKGROUND

An overarching goal for the Oregon Watershed Enhancement Board (OWEB) is to fund watershed projects that have the greatest potential for restoring fisheries, water quality, and watershed processes. This goal was established by enabling legislation for OWEB as provided in Oregon law. The Oregon Revised Statutes (ORS) 541.371 (1) (c) direct the OWEB Board to *“establish statewide and regional priorities that shall become the basis for funding decisions by the board. In adopting such goals and priorities, the board shall adopt priorities for grant funding based on the Oregon Plan and on measurable goals.”*

The policy framework to meet this requirement was outlined in the 2004 report, “OWEB Prioritization Framework: Improvement Priorities at Basin and Watershed Scales” (OWEB, 2004). This document establishes a general conceptual strategy to prioritize improvement projects based on sound ecological concepts (Beechie et al. 2003, Bilby et al. 2003, and Naiman et al. 1992). The strategy consists of five fundamental principles:

Principle 1: Restore Watershed Connectivity Limiting Key Fish and Wildlife Populations.

Principle 2: Restore Watershed Processes Impacting the Aquatic System, Water Quality Limited Streams, and Wildlife Habitat.

Principle 3: Restore Key Habitats and Water Quality For ESA-Listed Species.

Principle 4: Reduce or Eliminate Human Impacts and Inputs into Watersheds from Land Use Activities in the Basin.

Principle 5: Address the Symptoms of Disturbance that Impact Fish and Wildlife Populations and Water Quality-Limited Streams.

These principles are consistent throughout the planning processes implemented in the Oregon Plan for Salmon and Watersheds. The Oregon Watershed Enhancement Board's *Watershed Assessment Manual* (WPN, 1999) directs watershed assessments that evaluate watershed functions and identifies improvement priorities at the watershed scale. The *Oregon Coast Coho Conservation Plan for the State of Oregon* (ODFW, 2007) presents a strategy for improving fish habitat to ensure continued viability of coastal coho at a population scale. The *Oregon Conservation Strategy* (ODFW, 2006) considers fish and wildlife from a statewide perspective, with a focus on limiting factors and conservation actions for a suite of species and habitats in greatest need of conservation attention at an ecoregion scale. Water quality documents, such as water quality management plans (WQMPs) and total maximum daily loads (TMDLs) also provide information about factors impacting aquatic habitats.

All of these efforts serve as a foundation for identifying factors that limit watershed health. In 2005 OWEB initiated a process of summarizing habitat restoration priorities in major basins by compiling limiting factors in the Willamette River Basin (OWEB, 2005). The limiting factors were organized by major watershed habitat components – aquatic, riparian, wetland, and upland. A similar process for identifying factors limiting watershed health was expanded to include other Oregon basins: the Lower Columbia River Basin, the Rogue River Basin, and South Coast Watersheds. These previous evaluation frameworks served as the general starting point for adapting Watershed Health Indicators to the Oregon Coast Coho ESU.

2.0 METHODS

2.1 LIMITING FACTORS / WATERSHED HEALTH INDICATORS

The approach to identifying statewide and regional habitat investment priorities is to first summarize the anthropogenic factors that limit aquatic habitat and water quality. The ecological definition of “limiting factor” emphasizes the constraints imposed on the productivity of a specific species’ population: “A requirement such a food, cover or spawning gravel that is in shortest supply with respect to all resources necessary to sustain life and thus limits the size or retards production of a fish population.” (<http://www.streamnet.org/pub-ed/ff/Glossary/index.html>). The *Oregon Coast Coho Conservation Plan* (ODFW, 2007) described a set of aquatic limiting factors that constrain coho populations within the ESU. In addition to identifying instream factors that specifically constrain fish populations, this effort expanded the scope beyond factors that constrain a specific species’ population to include habitat characteristics and watershed processes that affect a variety of aquatic and terrestrial wildlife and influence water quality. These factors, such as forest fragmentation, erosion, and invasive species, are used as *indicators* of watershed health. For the purposes of this project, we refer to the entire set of limiting factors and environmental conditions as ***Watershed Health Indicators***.

The set of Watershed Health Indicators were developed based on lessons learned from the previous OWEB projects completed in other river basins, including the Willamette, Upper Columbia, Rogue River, and South Coast. In addition to this foundation, the limiting factors described in the *Oregon Coast Coho Conservation Plan* (ODFW, 2007) were adapted to this process. Finally, based on input from watershed council staff, we integrated the councils’ analysis of watershed conditions and proposed rating systems, particularly the work of the Coos Bay Watershed Association (<http://www.cooswatershed.org/>) and Mid-Coast Watershed Council (<http://www.midcoastwatershedscouncil.org/>). For example, Stream Complexity (primarily winter habitat quality) was a key limiting factor identified in the *Conservation Plan*. Based on work completed by the watershed councils, this Stream Habitat Complexity was developed into two factors based on juvenile salmonid rearing habitat quality – summer rearing habitat complexity and winter habitat complexity.

The watershed health factors were identified for aquatic, riparian, freshwater wetland, upland, and estuary habitat components. The estuary system was divided into three major components – the tidal wetland, tidal flats, and sub-tidal zone. See Appendix B for a description the development of the estuarine factors.

Criteria were identified for each Watershed Health Indicator to rate the degree to which the indicator is impacting watershed health; the rating categories are: 1) Limiting; 2) Moderate; 3) Adequate; and 4) Insufficient Information. The definitions of for the categories were adapted from the Rogue Basin Coordinating Council (Rogue Basin Council, 2006):

Limiting: indication of degraded watershed health and a significant amount of restoration action is needed to improve watershed conditions.

Moderate: indication of less than desirable watershed health and moderate to significant levels of restoration action is needed to improve watershed conditions.

Adequate: indication of functional watershed health and minimal restoration activities are needed to maintain existing watershed conditions.

Insufficient Information: There is insufficient information to rate the Watershed Health Indicator.

Table 1 lists the Watershed Health Indicators. The criteria for rating each of the indicators were developed in collaboration with watershed council staff and, where applicable, were based on other habitat evaluation frameworks such as the Oregon Department of Fish and Wildlife’s aquatic habitat benchmarks. Appendix C lists the definitions and criteria for the Watershed Health Indicators.

The *Variability* (High, Moderate, Low) of the indicator within the watershed and the *Rating Confidence* (High, Moderate, Low) were also documented. Variability describes the degree to which the Indicator varies across a watershed. If stream temperature, for example, was consistently limiting across a watershed then it would be documented as “Low Variability” for water quality. Conversely, if there were observations of abundant large wood within scattered stream reaches and low levels of wood abundance in other stream reaches, then the watershed would be documented as “High Variability” for large wood.

The *Confidence* rating (High, Moderate, Low) is a measure of the certainty in the condition rating. This is a qualitative evaluation of the Indicator Rating based on the quality, completeness, and degree of documentation of the underlying data sources. High confidence sources include quantitative or measured parameters (e.g., temperature, percent pools, or measured occurrence of spawning gravel), particularly recent data collection efforts using accepted protocols. Moderate confidence sources include indirect measures, partial coverage of the watershed, and dated information. Low confidence sources include subjective ratings and minimal data coverage within the watershed.

Each rating includes a rationale that documents the reasoning behind the rating. An example of the rationale for water quality: “Monitoring at ODEQ WQI sites indicates increased fecal coliform bacteria associated with agricultural animal waste practices. (ODEQ WQI, 2006)”.

Finally, the source of information for the Watershed Health Indicator rating is documented. Typical sources include watershed assessments, aquatic habitat inventories, water quality monitoring reports, and fish passage barrier inventories.

Table 1. List of Watershed Health Indicators.

<p style="text-align: center;">Aquatic</p> <p>Water temperature Water quality Water quantity Spawning gravel quantity Spawning gravel quality Stream complexity: winter rearing habitat Stream complexity: summer rearing habitat Large wood Barriers Channel modification Invasive species Hatchery impacts</p>	<p style="text-align: center;">Riparian/Wetlands</p> <p>Riparian stand condition Riparian roads Invasive species Wetland habitat loss Wetland habitat function Wetland connectivity</p> <p style="text-align: center;">Uplands</p> <p>Hydro-modification Fine sediment sources Invasive species Habitat Fragmentation Upland Large Wood Recruitment</p>
<p style="text-align: center;">Tidal Wetlands</p> <p>Hydro-modification Sediment regime Water quality Vegetation modification Invasive species Wetland loss (Complete)</p> <p style="text-align: center;">Tidal Flats</p> <p>Hydro-modification Sediment regime Water quality Invasive species Tidal flat loss (Complete)</p>	<p style="text-align: center;">Sub-tidal Zone</p> <p>Hydro-modification Sediment regime Water quality Invasive species Sub-tidal zone loss (Complete)</p>

2.2 DATA ENTRY METHOD

An online database was created for capturing the Watershed Health Indicators (<http://www.oregonwatersheds.net/coast/>). The database consisted of two interactive databases, one for rating the Watershed Health Indicators and the second database for entering the report citations.

The data entry system, as shown below, documents the person and organization submitting the data; provides a drop down selection of 5th or 6th field HUCs; a drop down menu for the Watershed Health Indicator rating, confidence in the rating, and variability. A text field is used for explaining the rationale and source of information for the rating.

[Home](#) | [Insert](#) | [Search](#) | [Show all](#) | [Help](#) | [Top](#)

Insert a new record. Please fill in the following fields (where applicable).

Added_by	<input type="text"/>	Name of the person entering the information
Organization	<input type="text"/>	Name of the organization the person entering the data is affiliated with
5th/6th-Field HUC	<input type="text"/>	Please choose the fifth or sixth-field watershed
Mid-Coast WC 6th-Field subwatershed	<input type="text"/>	The MCWC has information summarized by a different 6th-field HUC system. Use these subwatersheds if you prefer.
7th-field watershed, stream reach, or other identifier	<input type="text"/>	If desired, enter the name of the 7th-field watershed, stream reach, or other identifier
Aquatic/ instream: Water Temperature.	<input type="text" value="n/a"/>	Please choose the impact rating, associated confidence in the rating, and spatial variability in the results.
Water Temperature Rationale	<input type="text"/>	Please provide the rationale for the impact rating and confidence call

An example data entry for water temperature from the Coquille River Basin is shown below:

Example of Detailed Information Contained in the Database	
Added By	Dan Delaney
Last Updated	12 October 2007
5th/6th Field HUC	171003050402: Middle Creek-Cherry Creek
Water Temperature	Limiting (M)
Water Temperature Rationale	There are 13 major streams, including the mainstem, in this subwatershed. Five are 303(d) listed for temperature (ODEQ 2004/06).

A similar screen is used to enter the literature citation, as shown below. The database captures both the rating and the source of information. By using the database system we are able to summarize information without losing the underlying detail. This provides an opportunity for reviewers to evaluate the source and rationale of the rating when needed. It also provides the opportunity of readily revising the Watershed Health Indicators if and when additional information becomes available.

[Home](#) | [Insert](#) | [Search](#) | [Show all](#) | [Help](#) | [Top](#)

Insert a new record. Please fill in the following fields (where applicable).

*Author Author(s)

*date Date of publication

*Title Title of the source document

*publisher Publisher, or entity that can be contacted for unpublished materials

Link to materials Link to the doument or materials (if available)

3.0 RESULTS

3.1 ON-LINE DATA REPORTS

An online database was used for data entry and editing. Watershed Councils had the option of entering data by USGS fifth-field HUC, USGS sixth-field HUC, or (in the case of the Mid-Coast Watershed Council) by locally developed sixth-field HUCs. In addition to the data entry form there was an additional database form to enter literature citations and unpublished data sources. This document summarizes the limiting factor ratings by fifth-field HUC, however, the rationale for these calls, along with the more detailed sixth-field information (where available), can be viewed by using an online data summarization tool. The online reports were loaded to the WPN server for the short term (<http://www.oregonwatersheds.net/coast/reports/>), and will be available in the future at the OWEB website (<http://www.oregon.gov/OWEB/>).

3.2 WATERSHED HEALTH INDICATORS BY COUNCIL AND WATERSHED

The following section summarizes Watershed Health Indicators by fifth-field HUC. This section is organized by Watershed Council area, from north to south along the coast. Three-dimensional summary ratings are provided that give the following information:

- Limiting factor rating: “Limiting”, “Moderate”, or “Adequate”.
- Confidence in the rating can be inferred from the font: **Bold font indicating high confidence**, normal font indicating moderate confidence, and *italicized font indicating low confidence*.
- Spatial variability is summarized with a suffix of (H) for highly variable; (M) for moderate variability, and (L) for low variability.
- Attributes that were either not rated or not applicable were denoted with a “-“.
- Areas where there was insufficient information to make a call were denoted as a “Data Gap”.

3.2.1 Lower Columbia Watershed Council

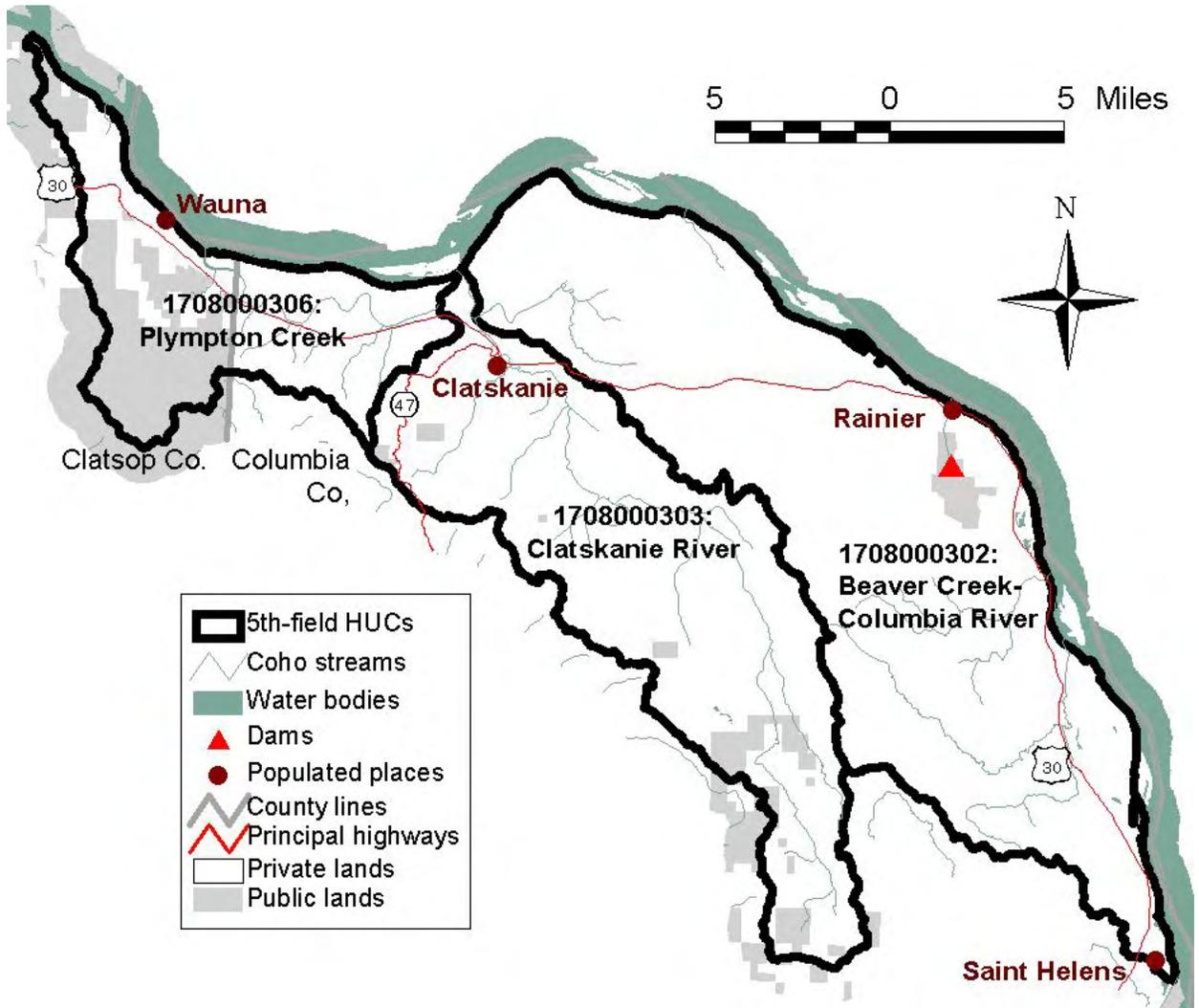


Figure 2. Lower Columbia Watershed Council area map.

Table 2. Lower Columbia Watershed Council aquatic/instream Watershed Health Indicators by 5th-field HUC.

5th-Field HUC	Water Temperature	Water Quality	Water Quantity	Spawning gravel quantity	Spawning gravel quality	Complexity: winter rearing habitat	Complexity: summer rearing habitat	Large Wood	Barriers	Channel Modification	Aquatic invasive species	Hatchery impacts
1708000302: Beaver Creek-Columbia River	Moderate (M)	Limiting (M)	Limiting (M)	<i>Limiting (L)</i>	<i>Limiting (L)</i>	Data Gap	-	Data Gap	Data Gap	Limiting (L)	<i>Limiting (L)</i>	Limiting (L)
1708000303: Clatskanie River	Limiting (L)	Limiting (L)	Limiting (M)	Limiting (L)	Limiting (L)	Limiting (M)	-	Limiting (L)	Limiting (L)	Limiting (L)	<i>Limiting (L)</i>	Limiting (L)
1708000306: Plympton Creek	Adequate (L)	Moderate (M)	Limiting (M)	Limiting (L)	Moderate (M)	Limiting (M)	-	Limiting (L)	Adequate (L)	Moderate (L)	<i>Moderate (L)</i>	Limiting (L)

Table 3. Lower Columbia Watershed Council riparian, wetland, and upland Watershed Health Indicators by 5th-field HUC.

5th-Field HUC	Riparian:			Freshwater Wetlands:			Uplands:				
	Stand condition	Roads	Invasive species	Habitat loss	Habitat function	Connectivity	Hydro modification	Fine sediment sources	Invasive species	Habitat fragmentation	Large wood recruitment
1708000302: Beaver Creek-Columbia River	Limiting (H)	Limiting (M)	Limiting (L)	Data Gap	Data Gap	Limiting (L)	Limiting (L)	Limiting (L)	Data Gap	Data Gap	Data Gap
1708000303: Clatskanie River	Limiting (L)	Limiting (M)	Limiting (L)	Limiting (L)	Limiting (L)	Limiting (L)	Limiting (L)	Limiting (L)	Moderate (M)	Limiting (L)	Limiting (L)
1708000306: Plympton Creek	Limiting (L)	Adequate (L)	Moderate (L)	Limiting (L)	Limiting (L)	Moderate (L)	Moderate (L)	Adequate (L)	Moderate (L)	Limiting (L)	Moderate (L)

Table 4. Lower Columbia Watershed Council tideland Watershed Health Indicators by 5th-field HUC.

5th-Field HUC	Tidal Wetlands:						Tidal Flats:					Sub-tidal:				
	Hydro modification	Sediment regime	Water quality	Vegetation modification	Invasive species	Tidal Wetland Loss	Hydro modification	Sediment regime	Water quality	Invasive species	Tidal flat loss	Hydro modification	Sediment regime	Water quality	Invasive species	Sub-tidal area loss
1708000302: Beaver Creek-Columbia River	Limiting (L)	Limiting (H)	Limiting (L)	Limiting (M)	Limiting (M)	Limiting (M)	-	-	-	-	-	-	-	-	-	-
1708000303: Clatskanie River	Limiting (L)	Limiting (H)	Limiting (L)	Limiting (M)	Limiting (M)	Limiting (M)	-	-	-	-	-	-	-	-	-	-
1708000306: Plympton Creek	Limiting (L)	Limiting (H)	Limiting (M)	Limiting (M)	Limiting (M)	Limiting (M)	-	-	-	-	-	-	-	-	-	-

3.2.2 North Coast Watershed Association

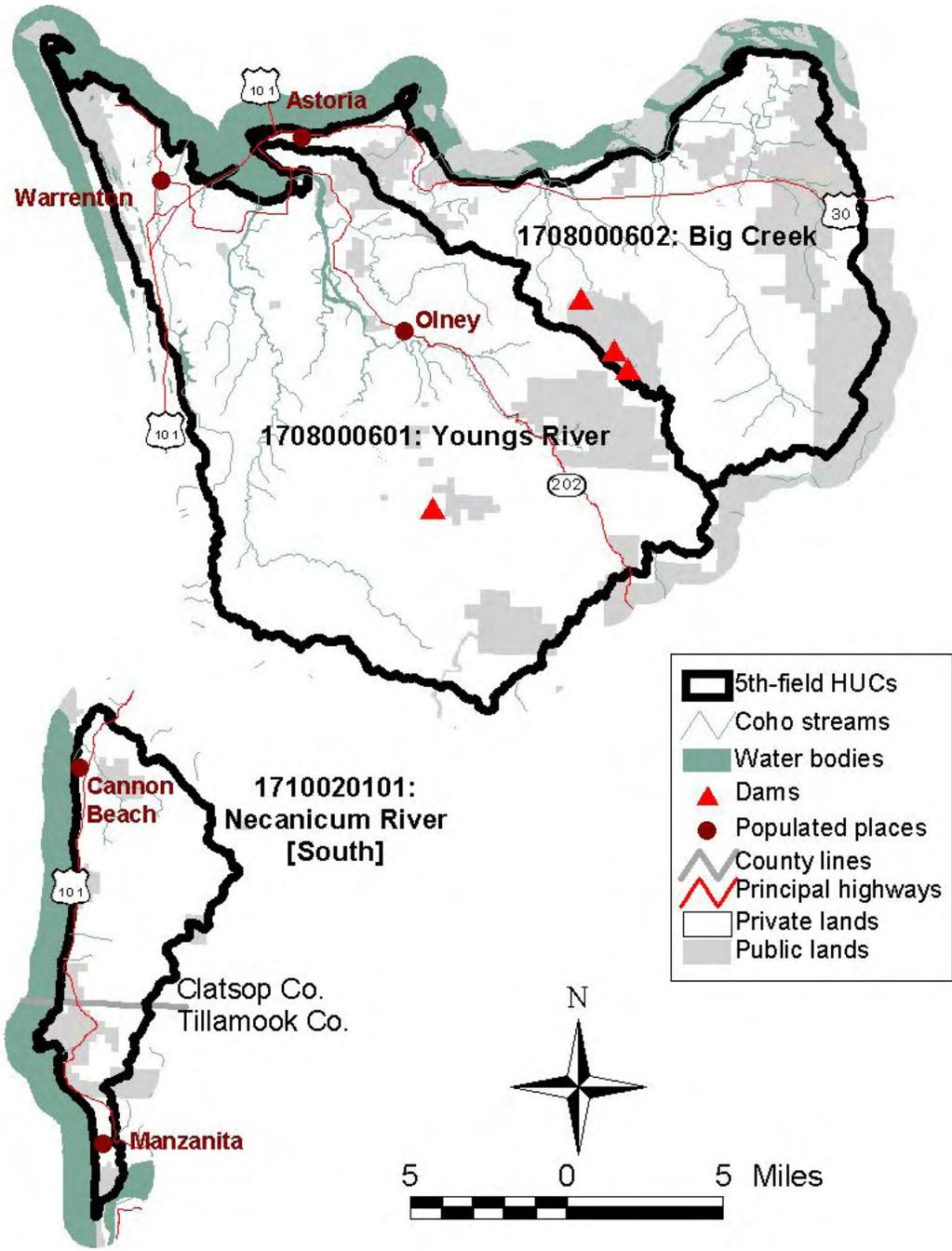


Figure 3. North Coast Watershed Association area map.

Table 5. North Coast Watershed Association aquatic/instream Watershed Health Indicators by 5th-field HUC.

5th-Field HUC	Water Temperature	Water Quality	Water Quantity	Spawning gravel quantity	Spawning gravel quality	Complexity: winter rearing habitat	Complexity: summer rearing habitat	Large Wood	Barriers	Channel Modification	Aquatic invasive species	Hatchery impacts
1708000601: Youngs River	Moderate (H)	Limiting (L)	Limiting (H)	Moderate (M)	Limiting (M)	Limiting (L)	Limiting (L)	Limiting (L)	Limiting (L)	Limiting (L)	Limiting (L)	Limiting (M)
1708000602: Big Creek	Limiting (M)	Limiting (L)	Limiting (M)	Moderate (M)	Moderate (M)	Moderate (M)	Moderate (M)	Limiting (M)	Limiting (L)	Limiting (M)	Limiting (L)	Limiting (M)
1710020101: Necanicum River [South]												

Table 6. North Coast Watershed Association riparian, wetland, and upland Watershed Health Indicators by 5th-field HUC.

5th-Field HUC	Riparian:			Freshwater Wetlands:			Uplands:				
	Stand condition	Roads	Invasive species	Habitat loss	Habitat function	Connectivity	Hydro modification	Fine sediment sources	Invasive species	Habitat fragmentation	Large wood recruitment
1708000601: Youngs River	Limiting (L)	Limiting (L)	Limiting (M)	Moderate (M)	Limiting (M)	Limiting (M)	Data Gap	Moderate (H)	Data Gap	Limiting (L)	Limiting (M)
1708000602: Big Creek	Limiting (L)	Limiting (L)	Moderate (M)	Moderate (M)	Moderate (M)	Moderate (M)	Data Gap	Moderate (H)	Data Gap	Moderate (M)	Limiting (M)
1710020101: Necanicum River [South]											

Table 7. North Coast Watershed Association tideland Watershed Health Indicators by 5th-field HUC.

5th-Field HUC	Tidal Wetlands:						Tidal Flats:					Sub-tidal:				
	Hydro modification	Sediment regime	Water quality	Vegetation modification	Invasive species	Tidal Wetland Loss	Hydro modification	Sediment regime	Water quality	Invasive species	Tidal flat loss	Hydro modification	Sediment regime	Water quality	Invasive species	Sub-tidal area loss
1708000601: Youngs River	Limiting (L)	Limiting (L)	Limiting (L)	Limiting (L)	Limiting (L)	Limiting (M)	Limiting (L)	Limiting (L)	Limiting (L)	Data Gap	Limiting (L)	Limiting (L)	Limiting (L)	Limiting (L)	Limiting (L)	Data Gap
1708000602: Big Creek	Limiting (M)	Limiting (M)	Limiting (L)	Limiting (M)	Limiting (L)	Limiting (M)	Limiting (L)	Limiting (L)	Limiting (L)	Data Gap	Data Gap	Limiting (L)	Limiting (L)	Limiting (L)	Limiting (L)	Data Gap
1710020101: Necanicum River [South]																

3.2.3 Nehalem / Necanicum Watershed Council

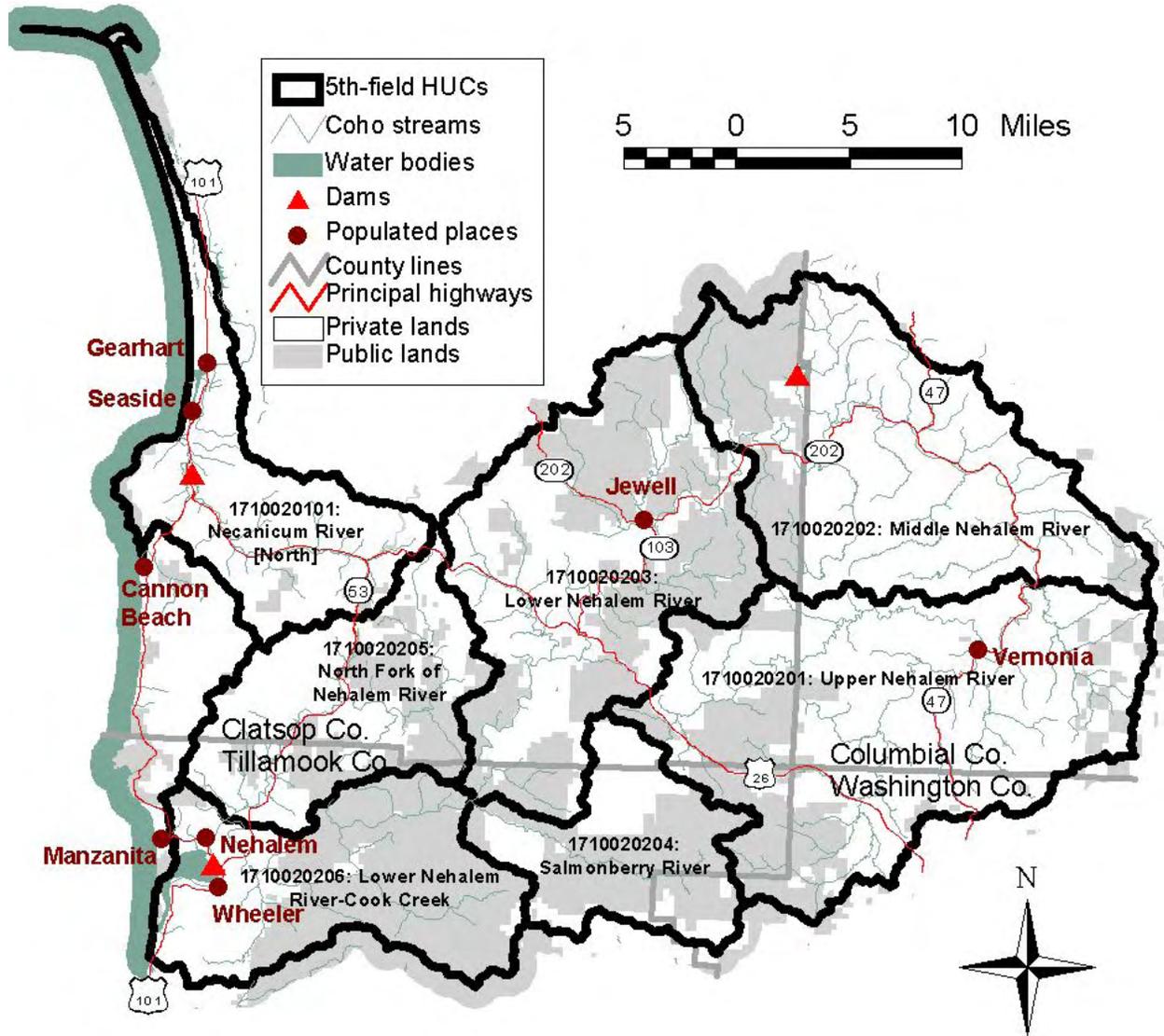


Figure 4. Nehalem / Necanicum Watershed Council area map.

Table 8. Nehalem / Necanicum Watershed Council aquatic/instream Watershed Health Indicators by 5th-field HUC.

5th-Field HUC	Water Temperature	Water Quality	Water Quantity	Spawning gravel quantity	Spawning gravel quality	Complexity: winter rearing habitat	Complexity: summer rearing habitat	Large Wood	Barriers	Channel Modification	Aquatic invasive species	Hatchery impacts
1710020101: Necanicum R. [North]	Moderate (M)	Limiting (M)	Limiting (M)	Adequate (M)	Adequate (M)	Limiting (L)	Limiting (M)	Limiting (L)	Moderate (H)	Limiting (L)	Data Gap	Data Gap
1710020201: Upper Nehalem River	Limiting (H)	Limiting (M)	Limiting (M)	Adequate (M)	Moderate (H)	Limiting (M)	Moderate (H)	Limiting (M)	Adequate (M)	Limiting (M)	Adequate (L)	Moderate (M)
1710020202: Middle Nehalem River	Limiting (H)	Limiting (H)	Limiting (L)	Moderate (H)	Moderate (M)	Moderate (M)	Moderate (H)	Moderate (M)	Adequate (L)	Limiting (M)	Data Gap	Moderate (H)
1710020203: Lower Nehalem River	Moderate (H)	Moderate (H)	Data Gap	Adequate (M)	Adequate (M)	Moderate (M)	Moderate (H)	Moderate (M)	Adequate (L)	Moderate (L)	Adequate (L)	Limiting (M)
1710020204: Salmonberry River	Moderate (H)	Moderate (H)	Data Gap	Moderate (M)	Adequate (L)	Limiting (M)	Moderate (H)	Limiting (L)	Adequate (L)	Moderate (H)	Adequate (L)	Limiting (M)
1710020205: North Fork of Nehalem R.	Moderate (H)	Moderate (H)	Adequate (H)	Moderate (H)	Moderate (H)	Limiting (L)	Limiting (M)	Limiting (L)	Adequate (L)	Adequate (L)	Adequate (L)	Limiting (L)
1710020206: Lower Nehalem R.-Cook Cr	Limiting (L)	Limiting (H)	Limiting (H)	Adequate (H)	Adequate (H)	Moderate (M)	Moderate (M)	Limiting (M)	Moderate (H)	Moderate (H)	Data Gap	Limiting (M)

Table 9. Nehalem / Necanicum Watershed Council riparian, wetland, and upland Watershed Health Indicators by 5th-field HUC.

5th-Field HUC	Riparian:			Freshwater Wetlands:			Uplands:				
	Stand condition	Roads	Invasive species	Habitat loss	Habitat function	Connectivity	Hydro modification	Fine sediment sources	Invasive species	Habitat fragmentation	Large wood recruitment
1710020101: Necanicum R. [North]	Moderate (M)	Moderate (M)	Moderate (H)	Moderate (M)	Limiting (M)	Limiting (M)	Data Gap	Data Gap	Data Gap	Moderate (M)	Limiting (L)
1710020201: Upper Nehalem River	Limiting (M)	Limiting (H)	Moderate (H)	Data Gap	Data Gap	Limiting (M)	Limiting (M)	Limiting (H)	Moderate (H)	Limiting (L)	Limiting (M)
1710020202: Middle Nehalem River	Limiting (M)	Limiting (M)	Moderate (M)	Data Gap	Data Gap	Data Gap	n/a	Moderate (M)	Moderate (H)	Moderate (M)	Moderate (M)
1710020203: Lower Nehalem River	Moderate (H)	Limiting (M)	Limiting (H)	Data Gap	Data Gap	Data Gap	Moderate (M)	Moderate (M)	Moderate (H)	Moderate (H)	Moderate (H)
1710020204: Salmonberry River	Adequate (M)	Moderate (H)	Data Gap	Data Gap	Data Gap	Data Gap	Limiting (H)	Moderate (H)	Data Gap	Moderate (H)	Moderate (H)
1710020205: North Fork of Nehalem R.	Limiting (H)	Moderate (M)	Moderate (H)	Data Gap	Data Gap	Data Gap	Moderate (M)	Moderate (M)	Moderate (M)	Limiting (L)	Limiting (M)
1710020206: Lower Nehalem R.-Cook Cr	Moderate (M)	Limiting (M)	Limiting (M)	Limiting (H)	Moderate (M)	Moderate (M)	Limiting (M)	Moderate (H)	Data Gap	Moderate (M)	Limiting (M)

Table 10. Nehalem / Necanicum Watershed Council tideland Watershed Health Indicators by 5th-field HUC.

5th-Field HUC	Tidal Wetlands:						Tidal Flats:					Sub-tidal:				
	Hydro modification	Sediment regime	Water quality	Vegetation modification	Invasive species	Tidal Wetland Loss	Hydro modification	Sediment regime	Water quality	Invasive species	Tidal flat loss	Hydro modification	Sediment regime	Water quality	Invasive species	Sub-tidal area loss
1710020101: Necanicum R. [North]	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Moderate (M)	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap
1710020201: Upper Nehalem River	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1710020202: Middle Nehalem River	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1710020203: Lower Nehalem River	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1710020204: Salmonberry River	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1710020205: North Fork of Nehalem R.	Limiting (L)	n/a	n/a	Limiting (L)	Adequate (L)	Limiting (L)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1710020206: Lower Nehalem R.-Cook Cr	Limiting (H)	Moderate (L)	Data Gap	Moderate (H)	Data Gap	Limiting (M)	Limiting (L)	Limiting (M)	Moderate (H)	Adequate (M)	Data Gap	Limiting (M)	Data Gap	Data Gap	Data Gap	Data Gap

3.2.4 Tillamook Bay Watershed Council

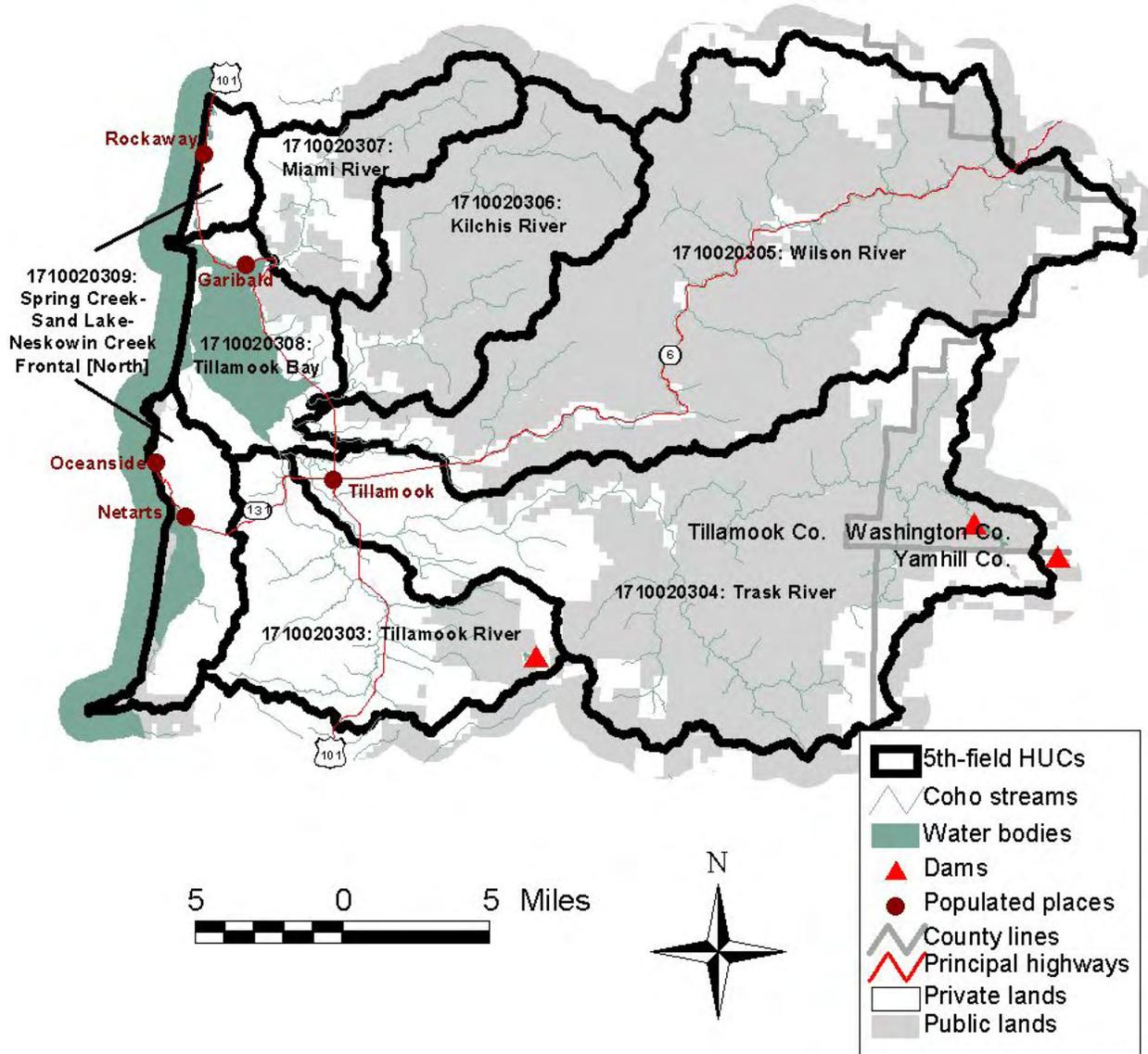


Figure 5. Tillamook Bay Watershed Council area map.

Table 11. Tillamook Bay Watershed Council aquatic/instream Watershed Health Indicators by 5th-field HUC.

5th-Field HUC	Water Temperature	Water Quality	Water Quantity	Spawning gravel quantity	Spawning gravel quality	Complexity: winter rearing habitat	Complexity: summer rearing habitat	Large Wood	Barriers	Channel Modification	Aquatic invasive species	Hatchery impacts
1710020303: Tillamook River	Limiting (M)	Limiting (H)	Data Gap	Limiting (H)	Limiting (H)	Limiting (L)	Limiting (L)	Limiting (L)	Data Gap	Limiting (L)	Moderate (H)	Adequate (H)
1710020304: Trask River	Limiting (M)	Limiting (M)	Moderate (M)	Adequate (L)	Limiting (M)	Limiting (M)	Limiting (M)	Limiting (L)	Limiting (M)	Limiting (M)	Data Gap	Adequate (L)
1710020305: Wilson River	Limiting (L)	Limiting (M)	Moderate (H)	Moderate (M)	Moderate (M)	Limiting (L)	Limiting (L)	Limiting (L)	Limiting (H)	Limiting (H)	Moderate (H)	Data Gap
1710020306: Kilchis River	Limiting (L)	Limiting (H)	Data Gap	Adequate (H)	Moderate (H)	Limiting (M)	Limiting (M)	Limiting (M)	Moderate (M)	Data Gap	Data Gap	-
1710020307: Miami River	Limiting (M)	Limiting (M)	Moderate (L)	Moderate (M)	Moderate (M)	Limiting (H)	Moderate (H)	Limiting (M)	Limiting (L)	Limiting (H)	Data Gap	Moderate (H)
1710020308: Tillamook Bay	-	-	-	-	-	-	-	-	-	-	-	-
1710020309: Spring Creek-Sand Lake-Neskowin Creek Frontal [North]	Data Gap	Moderate (H)	Data Gap	Data Gap	Data Gap	Limiting (H)	Limiting (H)	Limiting (L)	Limiting (L)	Limiting (M)	Moderate (M)	Data Gap

Table 12. Tillamook Bay Watershed Council riparian, wetland, and upland Watershed Health Indicators by 5th-field HUC.

5th-Field HUC	Riparian:			Freshwater Wetlands:			Uplands:				
	Stand condition	Roads	Invasive species	Habitat loss	Habitat function	Connectivity	Hydro modification	Fine sediment sources	Invasive species	Habitat fragmentation	Large wood recruitment
1710020303: Tillamook River	Limiting (M)	Limiting (L)	Data Gap	Data Gap	Data Gap	Data Gap	Limiting (L)	Data Gap	Data Gap	Limiting (L)	Data Gap
1710020304: Trask River	Limiting (H)	Moderate (M)	Moderate (M)	Limiting (M)	Limiting (M)	Limiting (M)	Limiting (M)	Limiting (H)	Adequate (M)	Data Gap	Limiting (M)
1710020305: Wilson River	Limiting (L)	Adequate (M)	Limiting (M)	Limiting (M)	Data Gap	Limiting (M)	-	Limiting (H)	Data Gap	Data Gap	Limiting (H)
1710020306: Kilchis River	Moderate (H)	Data Gap	Moderate (H)	Limiting (L)	Limiting (H)	Limiting (H)	Data Gap	Limiting (M)	Data Gap	Data Gap	Limiting (M)
1710020307: Miami River	Limiting (M)	Moderate (H)	Limiting (H)	Moderate (H)	Data Gap	Data Gap	Limiting (M)	Limiting (M)	Data Gap	Adequate (M)	Limiting (L)
1710020308: Tillamook Bay	-	-	-	-	-	-	-	-	-	-	-
1710020309: Spring Creek-Sand Lake-	Moderate (M)	Limiting (M)	Moderate (M)	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Adequate (M)	Data Gap

Neskowin Creek Frontal [North]																
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Table 13. Tillamook Bay Watershed Council tideland Watershed Health Indicators by 5th-field HUC.

5th-Field HUC	Tidal Wetlands:						Tidal Flats:					Sub-tidal:				
	Hydro modification	Sediment regime	Water quality	Vegetation modification	Invasive species	Tidal Wetland Loss	Hydro modification	Sediment regime	Water quality	Invasive species	Tidal flat loss	Hydro modification	Sediment regime	Water quality	Invasive species	Sub-tidal area loss
1710020303: Tillamook River	Limiting (L)	Data Gap	Limiting (L)	Limiting (L)	Data Gap	Limiting (L)	-	-	-	-	-	-	-	-	-	-
1710020304: Trask River	Limiting (M)	Data Gap	Limiting (M)	Limiting (M)	Data Gap	Limiting (M)	Data Gap	Data Gap	Limiting (H)	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap
1710020305: Wilson River	Limiting (M)	Data Gap	Limiting (M)	Limiting (M)	Data Gap	Limiting (M)	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap
1710020306: Kilchis River	Limiting (L)	Data Gap	Limiting (L)	Limiting (H)	Data Gap	Limiting (L)	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap
1710020307: Miami River	Limiting (M)	Data Gap	Limiting (L)	Limiting (L)	Data Gap	Limiting (M)	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap
1710020308: Tillamook Bay	Data Gap	Data Gap	Data Gap	Limiting (L)	Data Gap	Limiting (L)	-	Data Gap	Limiting (M)	Moderate (H)	-	-	-	-	-	Limiting (L)
1710020309: Spring Creek-Sand Lake-Neskowin Creek Frontal [North]	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap

3.2.5 Nestucca - Neskowin Watershed Council

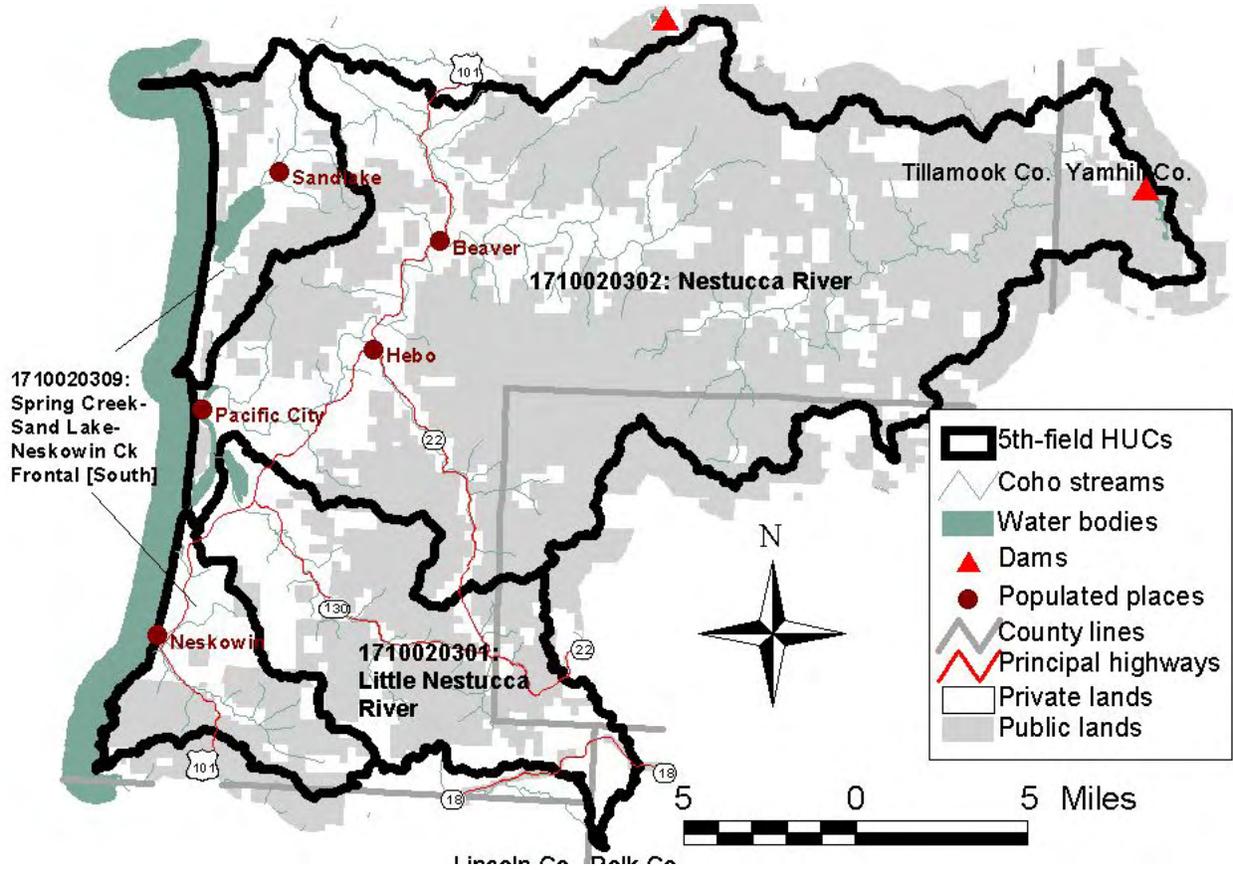


Figure 6. Nestucca - Neskowin Watershed Council area map.

Table 14. Nestucca - Neskowin Watershed Council aquatic/instream Watershed Health Indicators by 5th-field HUC.

5th-Field HUC	Water Temperature	Water Quality	Water Quantity	Spawning gravel quantity	Spawning gravel quality	Complexity: winter rearing habitat	Complexity: summer rearing habitat	Large Wood	Barriers	Channel Modification	Aquatic invasive species	Hatchery impacts
1710020301: Little Nestucca River	Limiting (M)	Moderate (M)	<i>Moderate (H)</i>	Moderate (H)	Moderate (M)	Limiting (M)	Moderate (H)	Limiting (H)	Moderate (H)	Limiting (H)	Adequate (L)	<i>Adequate (L)</i>
1710020302: Nestucca River	Limiting (H)	Limiting (M)	<i>Moderate (M)</i>	Moderate (M)	Adequate (H)	Limiting (H)	Moderate (H)	Limiting (H)	Limiting (H)	Limiting (H)	Adequate (L)	Moderate (M)
1710020309: Spring Creek-Sand Lake-Neskowin Creek Frontal [South]	Limiting (L)	Moderate (M)	Moderate (M)	Moderate (H)	Moderate (H)	Moderate (H)	Moderate (H)	Limiting (H)	Limiting (H)	Limiting (H)	Adequate (L)	Moderate (L)

Table 15. Nestucca - Neskowin Watershed Council riparian, wetland, and upland Watershed Health Indicators by 5th-field HUC.

5th-Field HUC	Riparian:			Freshwater Wetlands:			Uplands:				
	Stand condition	Roads	Invasive species	Habitat loss	Habitat function	Connectivity	Hydro modification	Fine sediment sources	Invasive species	Habitat fragmentation	Large wood recruitment
1710020301: Little Nestucca River	Moderate (H)	Moderate (M)	Moderate (H)	Limiting (H)	Moderate (H)	Limiting (H)	Moderate (H)	Moderate (H)	Moderate (M)	Limiting (M)	<i>Limiting (H)</i>
1710020302: Nestucca River	Moderate (H)	Limiting (H)	Moderate (H)	Moderate (H)	Moderate (H)	Moderate (H)	Limiting (M)	Limiting (H)	Moderate (H)	Limiting (M)	<i>Limiting (H)</i>
1710020309: Spring Creek-Sand Lake-Neskowin Creek Frontal [South]	Limiting (H)	Limiting (H)	Moderate (H)	Limiting (H)	Limiting (H)	Moderate (H)	Moderate (H)	Moderate (H)	Moderate (H)	Limiting (M)	<i>Limiting (H)</i>

Table 16. Nestucca - Neskowin Watershed Council tideland Watershed Health Indicators by 5th-field HUC.

5th-Field HUC	Tidal Wetlands:						Tidal Flats:					Sub-tidal:				
	Hydro modification	Sediment regime	Water quality	Vegetation modification	Invasive species	Tidal Wetland Loss	Hydro modification	Sediment regime	Water quality	Invasive species	Tidal flat loss	Hydro modification	Sediment regime	Water quality	Invasive species	Sub-tidal area loss
1710020301: Little Nestucca River	Limiting (M)	Limiting (L)	Limiting (L)	Limiting (L)	Adequate (M)	Limiting (L)	Limiting (L)	Moderate (M)	Data Gap	Data Gap	Adequate (L)	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap
1710020302: Nestucca River	Limiting (L)	Limiting (L)	Limiting (L)	Moderate (L)	Moderate (M)	Limiting (L)	Limiting (L)	Moderate (M)	Moderate (L)	Data Gap	Moderate (M)	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap
1710020309: Spring Creek-Sand Lake-Neskowin Creek Frontal [South]	Limiting (L)	Limiting (H)	Moderate (L)	Limiting (L)	Adequate (M)	Limiting (L)	Limiting (L)	Moderate (M)	Data Gap	Data Gap	Moderate (H)	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap

3.2.6 Mid-Coast Watershed Council

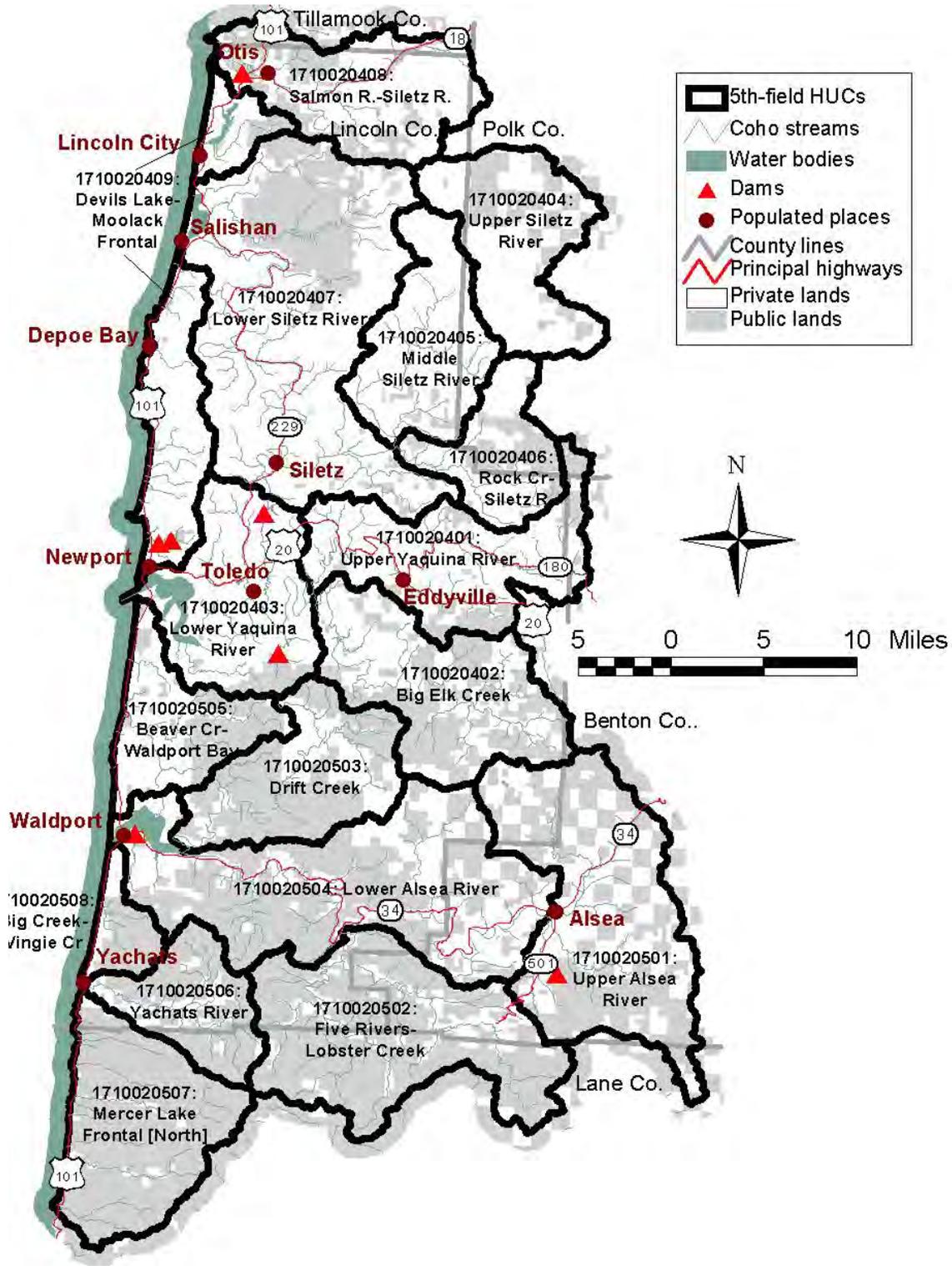


Figure 7. Mid-Coast Watershed Council area map.

Table 17. Mid-Coast Watershed Council aquatic/instream Watershed Health Indicators by 5th-field HUC.

5th-Field HUC	Water Temperature	Water Quality	Water Quantity	Spawning gravel quantity	Spawning gravel quality	Complexity: winter rearing habitat	Complexity: summer rearing habitat	Large Wood	Barriers	Channel Modification	Aquatic invasive species	Hatchery impacts
1710020401: Upper Yaquina River	Moderate (H)	Moderate (H)	Adequate (M)	Moderate (H)	Moderate (H)	Limiting (H)	Moderate (H)	Moderate (M)	Moderate (H)	Moderate (M)	Data Gap	Moderate (M)
1710020402: Big Elk Creek	Moderate (H)	Moderate (H)	Adequate (L)	Moderate (H)	Adequate (M)	Limiting (H)	Moderate (H)	Moderate (H)	Adequate (M)	Moderate (H)	Adequate (L)	Moderate (M)
1710020403: Lower Yaquina River	Moderate (M)	Moderate (M)	Adequate (H)	Moderate (H)	Moderate (H)	Moderate (H)	Moderate (M)	Limiting (L)	Moderate (H)	Moderate (H)	<i>Moderate (H)</i>	Adequate (L)
1710020404: Upper Siletz River	Adequate (L)	<i>Adequate (L)</i>	Adequate (L)	Adequate (L)	Adequate (L)	-	-	Limiting (H)	Moderate (H)	Adequate (L)	Data Gap	Adequate (L)
1710020405: Middle Siletz River	Adequate (L)	Moderate (L)	Adequate (L)	Adequate (M)	Moderate (M)	<i>Limiting (M)</i>	Limiting (M)	Moderate (M)	Adequate (L)	Adequate (L)	Data Gap	Moderate (M)
1710020406: Rock Creek-Siletz River	Moderate (H)	Moderate (M)	Adequate (L)	Moderate (H)	Adequate (M)	Limiting (M)	Moderate (M)	Limiting (L)	Adequate (M)	Adequate (L)	Data Gap	Moderate (M)
1710020407: Lower Siletz River	Moderate (H)	Moderate (H)	Moderate (H)	Moderate (H)	Moderate (H)	Limiting (H)	Moderate (H)	Moderate (H)	Adequate (H)	Adequate (H)	Moderate (M)	Moderate (M)
1710020408: Salmon River-Siletz River	Moderate (H)	Moderate (M)	Moderate (H)	Moderate (M)	Moderate (M)	Limiting (H)	Limiting (H)	Limiting (H)	Moderate (H)	Moderate (H)	Moderate (M)	Limiting (L)
1710020409: Devils Lake-Moolack Frontal	Moderate (H)	Moderate (H)	Moderate (H)	Limiting (H)	Moderate (M)	Moderate (H)	Moderate (H)	Moderate (H)	Moderate (H)	Moderate (H)	<i>Moderate (H)</i>	Moderate (H)
1710020501: Upper Alsea River	Moderate (H)	Adequate (H)	Adequate (L)	Moderate (H)	Adequate (H)	Limiting (M)	Moderate (M)	Moderate (H)	Adequate (H)	Adequate (H)	Data Gap	Moderate (M)
1710020502: Five Rivers-Lobster Creek	Moderate (H)	Adequate (M)	Adequate (H)	Moderate (H)	Adequate (M)	Limiting (H)	Moderate (H)	Moderate (H)	Adequate (H)	Adequate (H)	<i>Adequate (M)</i>	Moderate (M)
1710020503: Drift Creek	Moderate (H)	Adequate (L)	Adequate (L)	Adequate (L)	Adequate (M)	Limiting (H)	Moderate (H)	Moderate (H)	Adequate (L)	Adequate (L)	Limiting (H)	Moderate (M)
1710020504: Lower Alsea River	Moderate (H)	Moderate (H)	Moderate (H)	Moderate (H)	Moderate (M)	Limiting (H)	Limiting (M)	Limiting (H)	Adequate (H)	Adequate (H)	Moderate (H)	Moderate (H)
1710020505: Beaver Creek-Waldport Bay	Moderate (H)	Moderate (H)	Adequate (L)	Limiting (L)	Moderate (L)	Adequate (M)	Limiting (L)	Limiting (L)	Adequate (L)	Moderate (H)	<i>Adequate (L)</i>	Adequate (L)
1710020506: Yachats River	Moderate (H)	Limiting (M)	Moderate (H)	Moderate (H)	Moderate (M)	Limiting (M)	Moderate (H)	Limiting (M)	Adequate (L)	Moderate (H)	Adequate (L)	Adequate (L)
1710020507: Mercer Lake Frontal [North]	Adequate (L)	Adequate (L)	Adequate (L)	Adequate (H)	Adequate (H)	Limiting (M)	Moderate (H)	Moderate (H)	Moderate (H)	Adequate (L)	Adequate (L)	Adequate (L)
1710020508: Big Creek-Vingie Creek	Adequate (L)	Limiting (H)	Limiting (L)	Limiting (L)	Limiting (M)	Adequate (L)	Adequate (L)	Limiting (M)	Adequate (M)	Adequate (L)	Adequate (L)	Adequate (L)

Table 18. Mid-Coast Watershed Council riparian, wetland, and upland Watershed Health Indicators by 5th-field HUC.

5th-Field HUC	Riparian:			Freshwater Wetlands:			Uplands:				
	Stand condition	Roads	Invasive species	Habitat loss	Habitat function	Connectivity	Hydro modification	Fine sediment sources	Invasive species	Habitat fragmentation	Large wood recruitment
1710020401: Upper Yaquina River	Moderate (H)	Moderate (H)	Moderate (M)	Limiting (H)	Adequate (L)	Moderate (H)	Moderate (M)	Moderate (M)	Moderate (M)	Moderate (M)	Limiting (M)
1710020402: Big Elk Creek	Moderate (H)	Moderate (H)	Moderate (M)	Limiting (H)	Adequate (H)	Adequate (M)	Moderate (M)	Moderate (M)	Moderate (M)	Adequate (M)	Limiting (M)
1710020403: Lower Yaquina River	Limiting (M)	Moderate (M)	Moderate (M)	Adequate (H)	Moderate (H)	Adequate (M)	Moderate (M)	<i>Moderate (M)</i>	Moderate (M)	Moderate (H)	Limiting (M)
1710020404: Upper Siletz River	Adequate (M)	Adequate (L)	Data Gap	<i>Adequate (M)</i>	Data Gap	Data Gap	Moderate (M)	Moderate (M)	Data Gap	Adequate (L)	Moderate (H)
1710020405: Middle Siletz River	Moderate (M)	Limiting (M)	Data Gap	Moderate (H)	Data Gap	Adequate (M)	Moderate (M)	Limiting (M)	Data Gap	Adequate (L)	Limiting (M)
1710020406: Rock Creek-Siletz River	Moderate (H)	Moderate (H)	Moderate (M)	<i>Moderate (L)</i>	Data Gap	Data Gap	Moderate (M)	Moderate (M)	Moderate (L)	Adequate (L)	Limiting (M)
1710020407: Lower Siletz River	Moderate (H)	Moderate (H)	Moderate (M)	Adequate (H)	<i>Adequate (M)</i>	Adequate (H)	Moderate (M)	Moderate (H)	Moderate (M)	Moderate (H)	Limiting (H)
1710020408: Salmon River-Siletz River	Moderate (H)	Moderate (H)	Limiting (H)	<i>Limiting (H)</i>	Limiting (M)	Limiting (L)	Moderate (H)	<i>Moderate (M)</i>	Moderate (M)	Moderate (H)	Limiting (M)
1710020409: Devils Lake-Moolack Frontal	Moderate (H)	Adequate (M)	Moderate (M)	Adequate (M)	Adequate (M)	Adequate (M)	Moderate (M)	Moderate (M)	Moderate (H)	Moderate (H)	Limiting (H)
1710020501: Upper Alsea River	Moderate (H)	Adequate (M)	Moderate (M)	<i>Limiting (H)</i>	Data Gap	<i>Limiting (M)</i>	Moderate (M)	Moderate (M)	Moderate (M)	Moderate (H)	Limiting (H)
1710020502: Five Rivers-Lobster Creek	Moderate (H)	Moderate (H)	Moderate (M)	<i>Moderate (H)</i>	Data Gap	Adequate (M)	Moderate (M)	Moderate (M)	Moderate (M)	Adequate (L)	Moderate (H)
1710020503: Drift Creek	Moderate (H)	Adequate (H)	Moderate (M)	Adequate (L)	Adequate (M)	Adequate (L)	Adequate (L)	Adequate (L)	Moderate (M)	Adequate (L)	Moderate (H)
1710020504: Lower Alsea River	Moderate (H)	Moderate (H)	Moderate (H)	Moderate (M)	<i>Moderate (H)</i>	Adequate (H)	Moderate (H)	Moderate (M)	Moderate (M)	Moderate (H)	Limiting (M)
1710020505: Beaver Creek-Waldport Bay	Moderate (H)	Adequate (M)	Moderate (M)	Adequate (L)	Moderate (H)	Moderate (H)	Adequate (M)	<i>Moderate (H)</i>	Moderate (M)	Moderate (M)	Limiting (H)
1710020506: Yachats River	Moderate (H)	Moderate (L)	Limiting (M)	Limiting (M)	Limiting (M)	Limiting (M)	<i>Adequate (L)</i>	Moderate (M)	Limiting (M)	Moderate (M)	Limiting (M)
1710020507: Mercer Lake Frontal [North]	Adequate (M)	Adequate (H)	Moderate (H)	Adequate (L)	Data Gap	Adequate (L)	Adequate (M)	Adequate (M)	Moderate (L)	Adequate (L)	Adequate (H)
1710020508: Big Creek-Vingie Creek	Adequate (L)	Adequate (L)	Adequate (L)	Adequate (L)	Adequate (M)	Adequate (L)	Adequate (L)	Adequate (M)	Adequate (M)	Adequate (M)	Adequate (H)

Table 19. Mid-Coast Watershed Council tideland Watershed Health Indicators by 5th-field HUC.

5th-Field HUC	Tidal Wetlands:						Tidal Flats:					Sub-tidal:				
	Hydro modification	Sediment regime	Water quality	Vegetation modification	Invasive species	Tidal Wetland Loss	Hydro modification	Sediment regime	Water quality	Invasive species	Tidal flat loss	Hydro modification	Sediment regime	Water quality	Invasive species	Sub-tidal area loss
1710020401: Upper Yaquina River	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1710020402: Big Elk Creek	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1710020403: Lower Yaquina River	Limiting (L)	Limiting (M)	Moderate (M)	Limiting (M)	Limiting (M)	Limiting (L)	Limiting (M)	Limiting (M)	Limiting (H)	Limiting (M)	Limiting (M)	Limiting (L)	Limiting (H)	Limiting (M)	Moderate (M)	Limiting (H)
1710020404: Upper Siletz River	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1710020405: Middle Siletz River	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1710020406: Rock Creek-Siletz River	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1710020407: Lower Siletz River	Limiting (L)	Limiting (M)	Moderate (L)	Moderate (M)	Moderate (M)	Limiting (L)	Moderate (M)	Limiting (L)	Moderate (M)	Moderate (M)	Adequate (L)	Moderate (H)	Adequate (L)	Moderate (M)	Moderate (M)	Adequate (M)
1710020408: Salmon River-Siletz River	Limiting (M)	Moderate (H)	Adequate (L)	Moderate (M)	Moderate (M)	Moderate (H)	Adequate (M)	Adequate (M)	Adequate (M)	Moderate (M)	Adequate (L)	Adequate (L)	Adequate (M)	Adequate (M)	Moderate (M)	Adequate (L)
1710020409: Devils Lake-Moolack Frontal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1710020501: Upper Alsea River	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1710020502: Five Rivers-Lobster Creek	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1710020503: Drift Creek	Adequate (L)	Data Gap	Adequate (M)	Moderate (M)	Moderate (M)	Adequate (M)	-	-	-	-	-	-	-	-	-	-
1710020504: Lower Alsea River	Limiting (M)	Limiting (M)	Moderate (M)	Limiting (M)	Adequate (M)	Moderate (H)	Moderate (H)	Limiting (H)	Moderate (M)	Limiting (M)	Adequate (H)	Moderate (H)	Moderate (M)	Moderate (M)	Moderate (M)	Moderate (H)
1710020505: Beaver Creek-Waldport Bay	Adequate (L)	Data Gap	Data Gap	Adequate (M)	Adequate (L)	Adequate (L)	-	-	-	-	-	-	-	-	-	-
1710020506: Yachats River	Adequate (L)	Data Gap	Limiting (M)	-	-	-	-	-	-	-	-	Adequate (M)	Data Gap	Limiting (M)	Adequate (L)	Adequate (L)
1710020507: Mercer Lake Frontal [North]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1710020508: Big Creek-Vingie Creek	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

3.2.7 Siuslaw Watershed Council

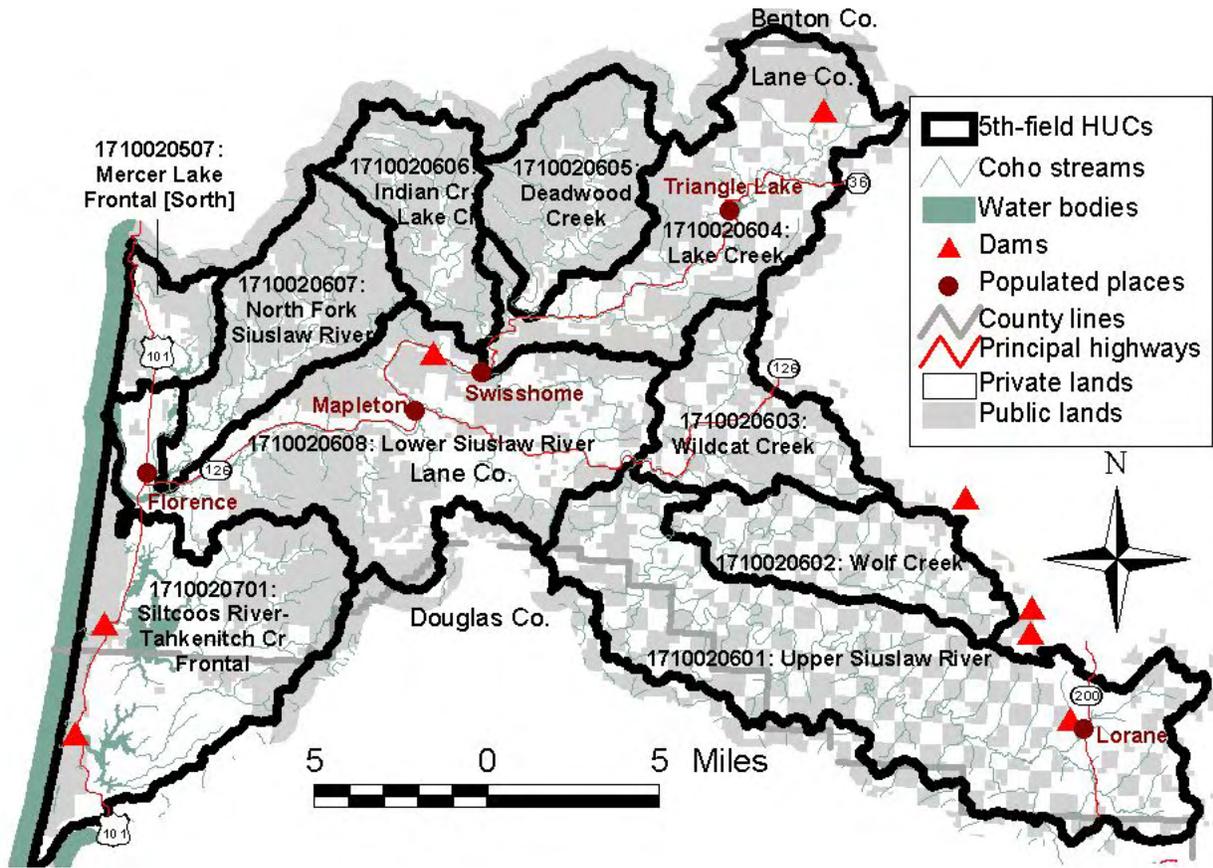


Figure 8. Siuslaw Watershed Council area map.

Table 20. Siuslaw Watershed Council aquatic/instream Watershed Health Indicators by 5th-field HUC.

5th-Field HUC	Water Temperature	Water Quality	Water Quantity	Spawning gravel quantity	Spawning gravel quality	Complexity: winter rearing habitat	Complexity: summer rearing habitat	Large Wood	Barriers	Channel Modification	Aquatic invasive species	Hatchery impacts
1710020507: Mercer Lake Frontal [South]	<i>Limiting (M)</i>	Limiting (M)	Data Gap	Limiting (H)	Limiting (H)	Limiting (L)	Limiting (M)	Limiting (H)	Moderate (M)	Limiting (L)	<i>Limiting (H)</i>	Adequate (M)
1710020601: Upper Siuslaw River	Limiting (M)	Moderate (H)	<i>Adequate (L)</i>	Limiting (H)	Limiting (H)	Limiting (L)	Limiting (M)	Limiting (H)	Moderate (M)	Limiting (M)	Data Gap	Adequate (L)
1710020602: Wolf Creek	Limiting (M)	Limiting (M)	Moderate (M)	Limiting (H)	Limiting (H)	Limiting (L)	Limiting (M)	Limiting (H)	Moderate (M)	Limiting (L)	Data Gap	Adequate (M)
1710020603: Wildcat Creek	Limiting (M)	Limiting (M)	Moderate (M)	Limiting (H)	Limiting (H)	Limiting (L)	Limiting (M)	Limiting (H)	Moderate (M)	Limiting (L)	Data Gap	Adequate (M)
1710020604: Lake Creek	Limiting (M)	Limiting (H)	Moderate (H)	Limiting (H)	Limiting (H)	Limiting (L)	Limiting (M)	Limiting (H)	Moderate (M)	Limiting (L)	Data Gap	Adequate (M)
1710020605: Deadwood Creek	Limiting (M)	Limiting (M)	Moderate (M)	Moderate (M)	Moderate (M)	Limiting (L)	Limiting (M)	Limiting (H)	Moderate (M)	Limiting (M)	Data Gap	Adequate (M)
1710020606: Indian Creek-Lake Creek	Limiting (M)	Limiting (H)	Moderate (H)	Moderate (M)	Moderate (M)	Limiting (L)	Limiting (M)	Limiting (H)	Moderate (M)	Limiting (M)	Data Gap	Adequate (M)
1710020607: North Fork Siuslaw River	Limiting (M)	Limiting (M)	Moderate (M)	Moderate (M)	Moderate (M)	Limiting (L)	Limiting (M)	Limiting (H)	Moderate (M)	Limiting (M)	Data Gap	Adequate (M)
1710020608: Lower Siuslaw River	Limiting (M)	Limiting (M)	Moderate (M)	Limiting (H)	Limiting (H)	Limiting (L)	Limiting (M)	Limiting (H)	Moderate (M)	Limiting (M)	Data Gap	Adequate (M)
1710020701: Siltcoos River-Tahkenitch Creek Frontal	<i>Limiting (H)</i>	Limiting (H)	Data Gap	Limiting (H)	Limiting (H)	Limiting (L)	Limiting (M)	Limiting (H)	Moderate (M)	Limiting (L)	Limiting (M)	Adequate (M)

Table 21. Siuslaw Watershed Council riparian, wetland, and upland Watershed Health Indicators by 5th-field HUC.

5th-Field HUC	Riparian:			Freshwater Wetlands:			Uplands:				
	Stand condition	Roads	Invasive species	Habitat loss	Habitat function	Connectivity	Hydro modification	Fine sediment sources	Invasive species	Habitat fragmentation	Large wood recruitment
1710020507: Mercer Lake Frontal [Sorth]	Limiting (H)	Limiting (M)	Limiting (M)	Limiting (L)	Limiting (L)	Limiting (M)	Limiting (H)	Limiting (M)	Moderate (M)	Limiting (M)	Limiting (M)
1710020601: Upper Siuslaw River	Limiting (H)	Limiting (M)	Limiting (M)	Limiting (L)	Limiting (L)	Limiting (M)	Limiting (H)	Limiting (M)	Moderate (H)	Limiting (M)	Limiting (M)
1710020602: Wolf Creek	Limiting (H)	Limiting (M)	Limiting (M)	Limiting (L)	Limiting (L)	Limiting (M)	Limiting (H)	Limiting (M)	Moderate (M)	Limiting (M)	Limiting (M)
1710020603: Wildcat Creek	Limiting (H)	Limiting (M)	Limiting (M)	Limiting (L)	Limiting (L)	Limiting (M)	Limiting (H)	Limiting (M)	Moderate (M)	Limiting (M)	Limiting (M)
1710020604: Lake Creek	Limiting (H)	Limiting (M)	Limiting (M)	Limiting (L)	Limiting (L)	Limiting (M)	Limiting (H)	Limiting (M)	Moderate (M)	Limiting (H)	Limiting (H)
1710020605: Deadwood Creek	Limiting (H)	Limiting (M)	Limiting (M)	Limiting (L)	Limiting (L)	Limiting (M)	Limiting (H)	Limiting (M)	Moderate (H)	Limiting (H)	Limiting (M)
1710020606: Indian Creek-Lake Creek	Limiting (H)	Limiting (M)	Limiting (M)	Limiting (L)	Limiting (L)	Limiting (M)	Limiting (H)	Limiting (M)	Moderate (H)	Limiting (H)	Limiting (M)
1710020607: North Fork Siuslaw River	Limiting (H)	Limiting (M)	Limiting (M)	Limiting (L)	Limiting (L)	Limiting (M)	Limiting (H)	Limiting (M)	Moderate (M)	Limiting (M)	Limiting (M)
1710020608: Lower Siuslaw River	Limiting (H)	Limiting (M)	Limiting (M)	Limiting (L)	Limiting (L)	Limiting (M)	Limiting (H)	Limiting (M)	Limiting (M)	Limiting (M)	Limiting (M)
1710020701: Siltcoos River-Tahkenitch Creek Frontal	Limiting (H)	Limiting (M)	Limiting (M)	Limiting (L)	Limiting (L)	Limiting (M)	Limiting (H)	Limiting (M)	Moderate (M)	Limiting (M)	Limiting (M)

Table 22. Siuslaw Watershed Council tideland Watershed Health Indicators by 5th-field HUC.

5th-Field HUC	Tidal Wetlands:						Tidal Flats:					Sub-tidal:				
	Hydro modification	Sediment regime	Water quality	Vegetation modification	Invasive species	Tidal Wetland Loss	Hydro modification	Sediment regime	Water quality	Invasive species	Tidal flat loss	Hydro modification	Sediment regime	Water quality	Invasive species	Sub-tidal area loss
1710020507: Mercer Lake Frontal [Sorth]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1710020601: Upper Siuslaw River	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1710020602: Wolf Creek	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1710020603: Wildcat Creek	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1710020604: Lake Creek	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1710020605: Deadwood Creek	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1710020606: Indian Creek-Lake Creek	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1710020607: North Fork Siuslaw River	Limiting (L)	Limiting (M)	Limiting (H)	Limiting (L)	Limiting (M)	Moderate (H)	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	-
1710020608: Lower Siuslaw River	Limiting (L)	Limiting (M)	Limiting (M)	Limiting (L)	Limiting (M)	Moderate (L)	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap
1710020701: Siltcoos River-Tahkenitch Creek Frontal	Moderate (L)	Data Gap	Data Gap	Data Gap	Data Gap	Moderate (L)	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap

3.2.8 Smith River Watershed Council

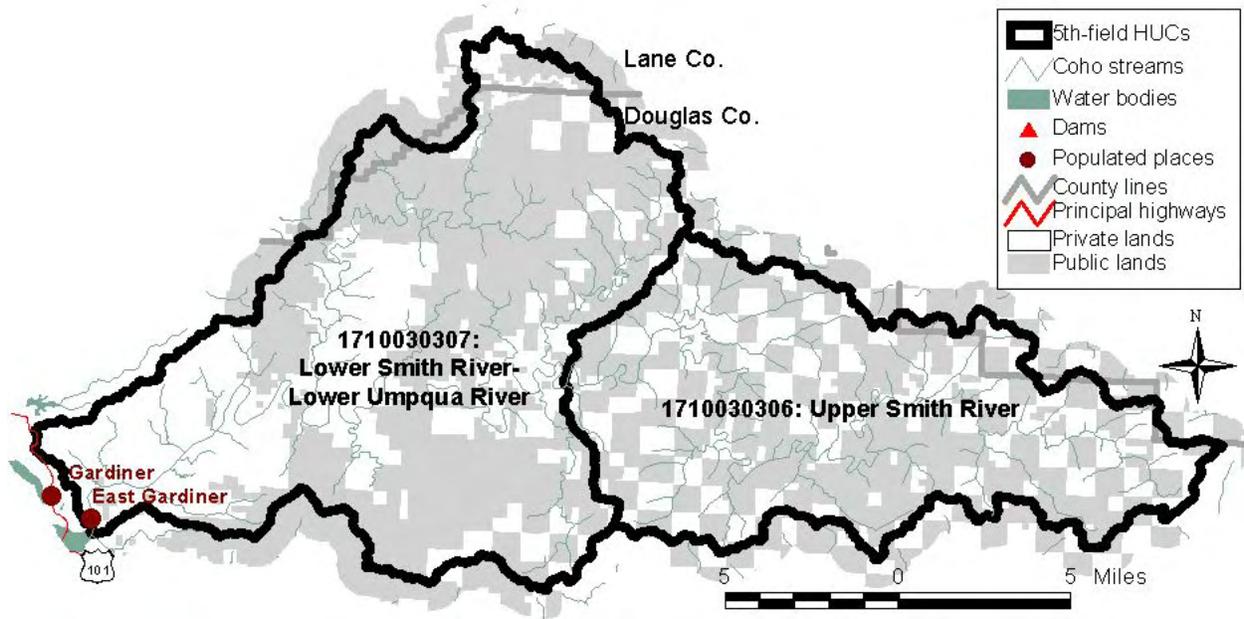


Figure 9. Smith River Watershed Council area map.

Table 23. Smith River Watershed Council aquatic/instream Watershed Health Indicators by 5th-field HUC.

5th-Field HUC	Water Temperature	Water Quality	Water Quantity	Spawning gravel quantity	Spawning gravel quality	Complexity: winter rearing habitat	Complexity: summer rearing habitat	Large Wood	Barriers	Channel Modification	Aquatic invasive species	Hatchery impacts
1710030306: Upper Smith River	Moderate (H)	Data Gap	Data Gap	Moderate (M)	Moderate (M)	Limiting (H)	Limiting (H)	Limiting (H)	Data Gap	Data Gap	Data Gap	Data Gap
1710030307: Lower Smith River-Lower Umpqua River	Moderate (H)	Data Gap	Data Gap	Moderate (M)	Moderate (M)	Limiting (H)	Limiting (H)	Limiting (H)	Data Gap	Data Gap	Data Gap	Data Gap

Table 24. Smith River Watershed Council riparian, wetland, and upland Watershed Health Indicators by 5th-field HUC.

5th-Field HUC	Riparian:			Freshwater Wetlands:			Uplands:					
	Stand condition	Roads	Invasive species	Habitat loss	Habitat function	Connectivity	Hydro modification	Fine sediment sources	Invasive species	Habitat fragmentation	Large wood recruitment	
1710030306: Upper Smith River	Limiting (H)	Limiting (M)	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap
1710030307: Lower Smith River-Lower Umpqua River	Limiting (M)	Limiting (M)	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap

Table 25. Smith River Watershed Council tideland Watershed Health Indicators by 5th-field HUC.

5th-Field HUC	Tidal Wetlands:						Tidal Flats:					Sub-tidal:				
	Hydro modification	Sediment regime	Water quality	Vegetation modification	Invasive species	Tidal Wetland Loss	Hydro modification	Sediment regime	Water quality	Invasive species	Tidal flat loss	Hydro modification	Sediment regime	Water quality	Invasive species	Sub-tidal area loss
1710030306: Upper Smith River	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1710030307: Lower Smith River-Lower Umpqua River	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap	Data Gap

3.2.9 Elk Creek Watershed Council

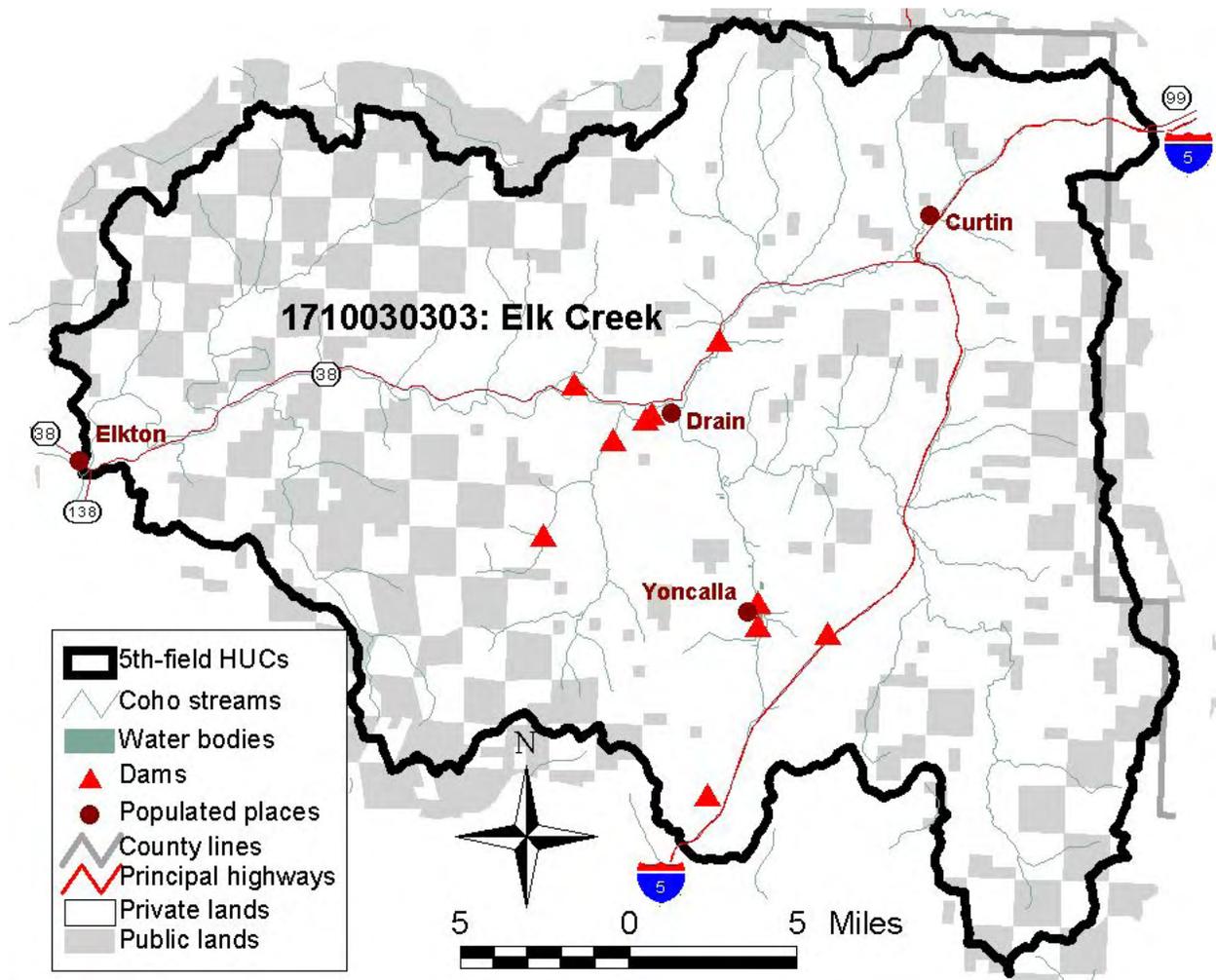


Figure 10. Elk Creek Watershed Council area map.

Table 26. Elk Creek Watershed Council aquatic/instream Watershed Health Indicators by 5th-field HUC.

5th-Field HUC	Water Temperature	Water Quality	Water Quantity	Spawning gravel quantity	Spawning gravel quality	Complexity: winter rearing habitat	Complexity: summer rearing habitat	Large Wood	Barriers	Channel Modification	Aquatic invasive species	Hatchery impacts
1710030303: Elk Creek	Limiting (L)	Limiting (H)	Limiting (L)	Moderate (M)	Limiting (M)	Limiting (L)	Limiting (L)	Limiting (L)	Limiting (M)	Limiting (L)	Moderate (H)	Adequate (M)

Table 27. Elk Creek Watershed Council riparian, wetland, and upland Watershed Health Indicators by 5th-field HUC.

5 th -Field HUC	Riparian:			Freshwater Wetlands:			Uplands:					
	Stand condition	Roads	Invasive species	Habitat loss	Habitat function	Connectivity	Hydro modification	Fine sediment sources	Invasive species	Habitat fragmentation	Large wood recruitment	
1710030303: Elk Creek	Limiting (L)	Limiting (L)	Limiting (L)	Limiting (L)	Limiting (L)	Limiting (L)	Limiting (L)	Limiting (L)	Limiting (L)	Limiting (L)	Adequate (L)	Limiting (L)

Table 28. Elk Creek Watershed Council tideland Watershed Health Indicators by 5th-field HUC.

5 th -Field HUC	Tidal Wetlands:						Tidal Flats:					Sub-tidal:				
	Hydro modification	Sediment regime	Water quality	Vegetation modification	Invasive species	Tidal Wetland Loss	Hydro modification	Sediment regime	Water quality	Invasive species	Tidal flat loss	Hydro modification	Sediment regime	Water quality	Invasive species	Sub-tidal area loss
1710030303: Elk Creek	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

3.2.10 Tenmile Lakes Basin Partnership

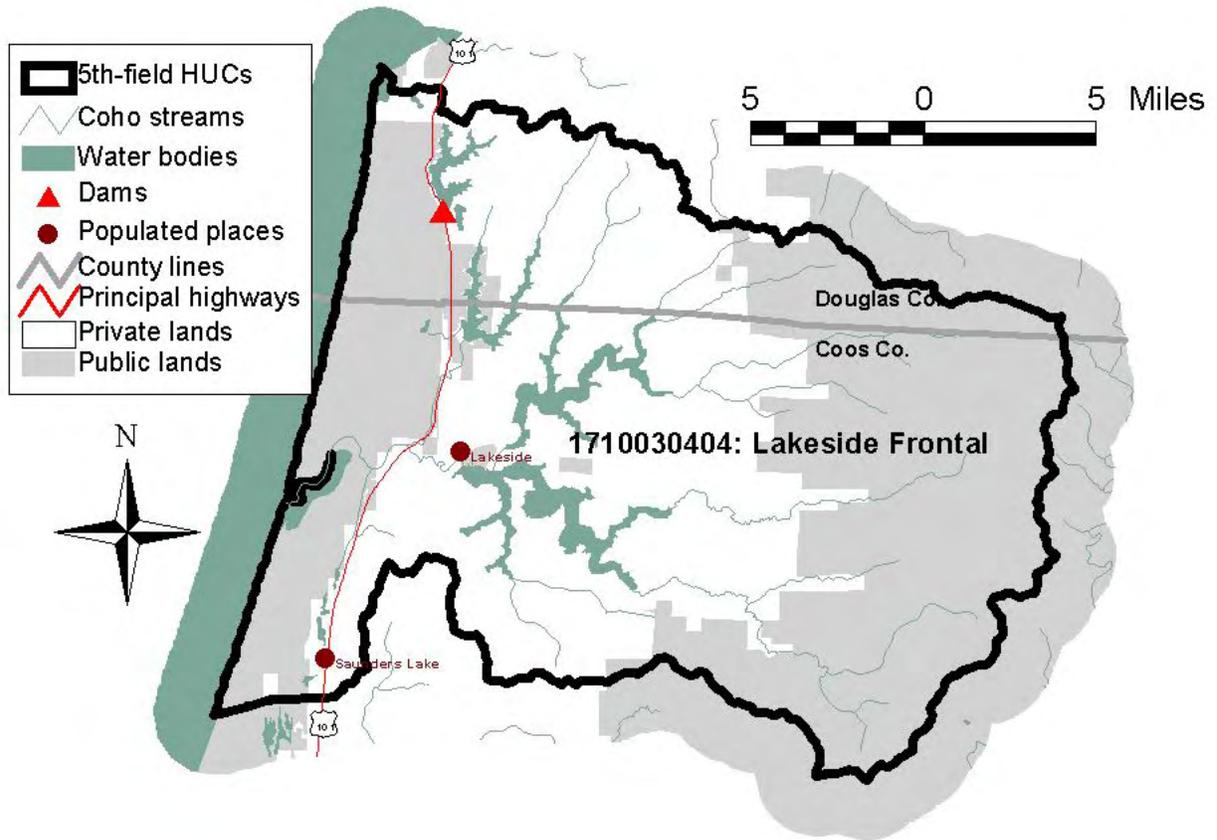


Figure 11. Tenmile Lakes Basin Partnership area map.

Table 29. Tenmile Lakes Basin Partnership aquatic/instream Watershed Health Indicators by 5th-field HUC.

5th-Field HUC	Water Temperature	Water Quality	Water Quantity	Spawning gravel quantity	Spawning gravel quality	Complexity: winter rearing habitat	Complexity: summer rearing habitat	Large Wood	Barriers	Channel Modification	Aquatic invasive species	Hatchery impacts
1710030404: Lakeside Frontal	Moderate (L)	Limiting (L)	<i>Limiting (H)</i>	Adequate (L)	Adequate (L)	Moderate (L)	Limiting (L)	Moderate (L)	Limiting (L)	Limiting (L)	Limiting (L)	-

Table 30. Tenmile Lakes Basin Partnership riparian, wetland, and upland Watershed Health Indicators by 5th-field HUC.

5th-Field HUC	Riparian:			Freshwater Wetlands:			Uplands:					
	Stand condition	Roads	Invasive species	Habitat loss	Habitat function	Connectivity	Hydro modification	Fine sediment sources	Invasive species	Habitat fragmentation	Large wood recruitment	
1710030404: Lakeside Frontal	Moderate (L)	Adequate (L)	Moderate (L)	Limiting (L)	-	-	-	-	-	-	-	-

Table 31. Tenmile Lakes Basin Partnership tideland Watershed Health Indicators by 5th-field HUC.

5th-Field HUC	Tidal Wetlands:						Tidal Flats:					Sub-tidal:				
	Hydro modification	Sediment regime	Water quality	Vegetation modification	Invasive species	Tidal Wetland Loss	Hydro modification	Sediment regime	Water quality	Invasive species	Tidal flat loss	Hydro modification	Sediment regime	Water quality	Invasive species	Sub-tidal area loss
1710030404: Lakeside Frontal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

3.2.11 Coos Watershed Association

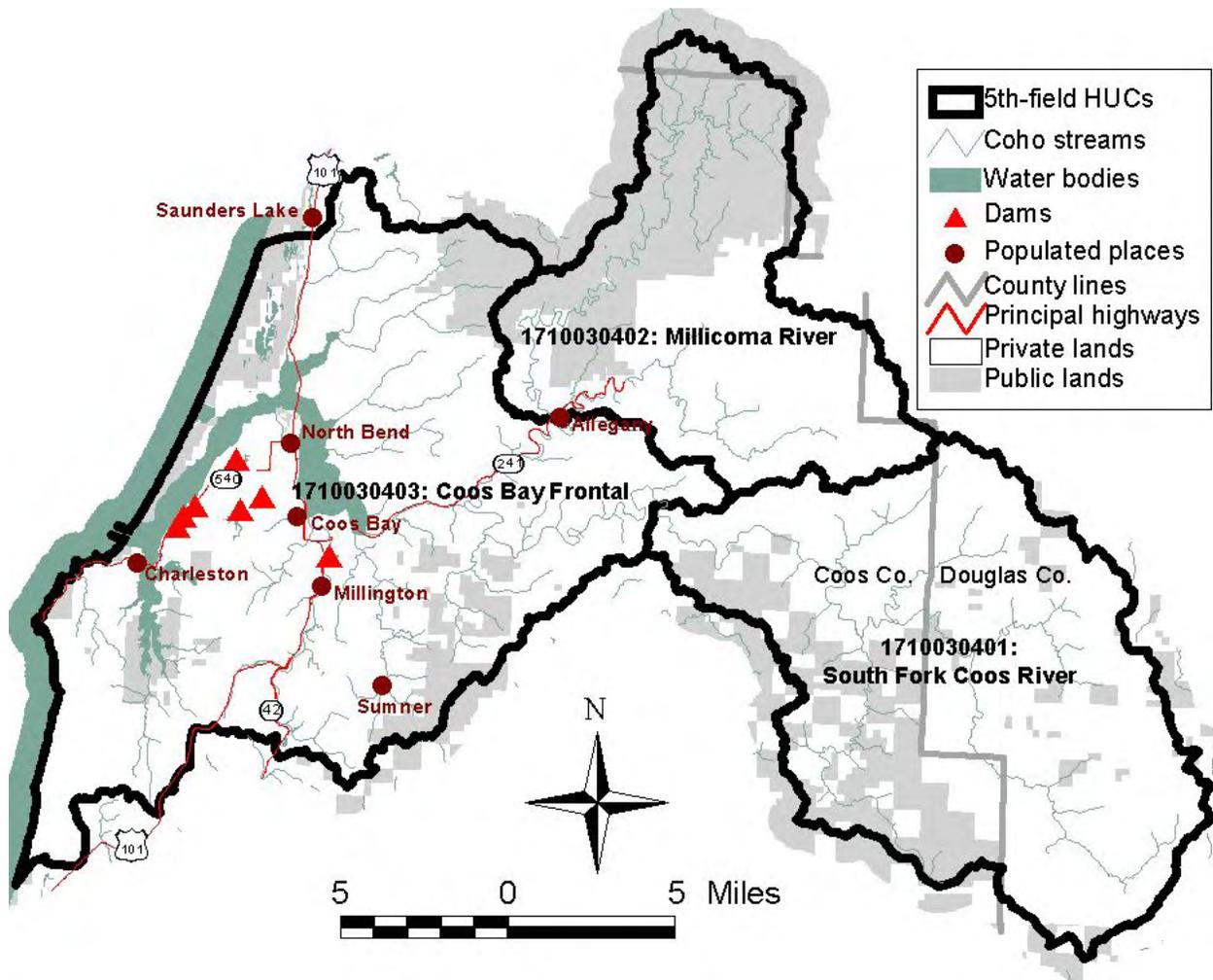


Figure 12. Coos Watershed Association area map.

Table 32. Coos Watershed Association aquatic/instream Watershed Health Indicators by 5th-field HUC.

5th-Field HUC	Water Temperature	Water Quality	Water Quantity	Spawning gravel quantity	Spawning gravel quality	Complexity: winter rearing habitat	Complexity: summer rearing habitat	Large Wood	Barriers	Channel Modification	Aquatic invasive species	Hatchery impacts
1710030401: South Fork Coos River	Limiting (M)	Limiting (M)	Adequate (L)	Limiting (M)	Limiting (H)	Limiting (L)	Limiting (L)	Limiting (L)	Limiting (H)	Limiting (H)	Data Gap	Moderate (M)
1710030402: Millicoma River	Limiting (M)	Limiting (M)	Adequate (L)	Limiting (M)	Moderate (M)	Limiting (M)	Limiting (M)	Limiting (L)	Moderate (H)	Moderate (M)	Data Gap	Moderate (H)
1710030403: Coos Bay Frontal	Limiting (M)	Moderate (H)	Adequate (M)	Moderate (H)	Adequate (M)	Limiting (M)	Limiting (L)	Limiting (L)	Moderate (L)	Limiting (L)	Adequate (L)	Limiting (H)

Table 33. Coos Watershed Association riparian, wetland, and upland Watershed Health Indicators by 5th-field HUC.

5th-Field HUC	Riparian:			Freshwater Wetlands:			Uplands:				
	Stand condition	Roads	Invasive species	Habitat loss	Habitat function	Connectivity	Hydro modification	Fine sediment sources	Invasive species	Habitat fragmentation	Large wood recruitment
1710030401: South Fork Coos River	Limiting (M)	Limiting (L)	Limiting (H)	Limiting (L)	Limiting (M)	Limiting (L)	Limiting (M)	Limiting (M)	Moderate (M)	Limiting (L)	Limiting (M)
1710030402: Millicoma River	Limiting (H)	Limiting (L)	Limiting (M)	Limiting (M)	Limiting (L)	Limiting (L)	Limiting (L)	Limiting (M)	Moderate (M)	Limiting (M)	Limiting (M)
1710030403: Coos Bay Frontal	Limiting (M)	Limiting (L)	Limiting (M)	Limiting (L)	Limiting (M)	Limiting (L)	Limiting (M)	Limiting (M)	Moderate (H)	Moderate (L)	Limiting (L)

Table 34. Coos Watershed Association tideland Watershed Health Indicators by 5th-field HUC.

5th-Field HUC	Tidal Wetlands:						Tidal Flats:					Sub-tidal:				
	Hydro modification	Sediment regime	Water quality	Vegetation modification	Invasive species	Tidal Wetland Loss	Hydro modification	Sediment regime	Water quality	Invasive species	Tidal flat loss	Hydro modification	Sediment regime	Water quality	Invasive species	Sub-tidal area loss
1710030401: South Fork Coos River	Limiting (M)	Limiting (M)	Data Gap	Limiting (L)	-	Limiting (M)	-	-	-	-	Adequate (L)	Limiting (L)	Limiting (M)	Limiting (L)	Data Gap	Adequate (L)
1710030402: Millicoma River	-	-	-	-	-	Moderate (L)	-	-	-	-	Adequate (L)	Limiting (M)	Limiting (M)	Limiting (M)	Data Gap	Adequate (L)
1710030403: Coos Bay Frontal	Limiting (M)	Limiting (H)	Moderate (H)	Limiting (L)	Moderate (L)	Limiting (L)	Limiting (M)	Moderate (L)	Moderate (M)	Moderate (M)	Moderate (L)	Moderate (M)	Moderate (M)	Moderate (L)	Moderate (L)	Moderate (L)

3.2.12 Coquille Watershed Association

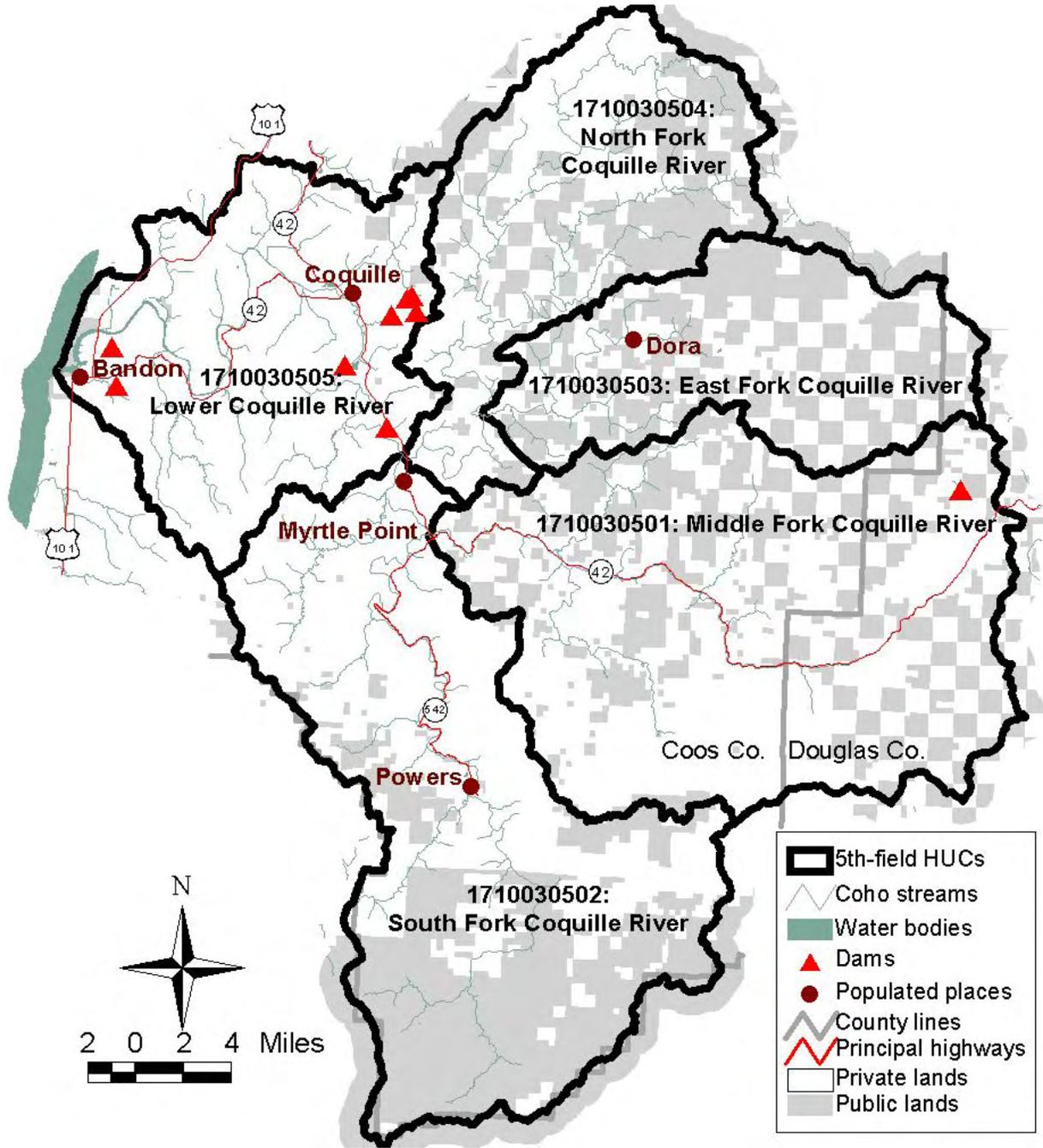


Figure 13. Coquille Watershed Association area map.

Table 35. Coquille Watershed Association aquatic/instream Watershed Health Indicators by 5th-field HUC.

5th-Field HUC	Water Temperature	Water Quality	Water Quantity	Spawning gravel quantity	Spawning gravel quality	Complexity: winter rearing habitat	Complexity: summer rearing habitat	Large Wood	Barriers	Channel Modification	Aquatic invasive species	Hatchery impacts
1710030501: Middle Fork Coquille River	Limiting (M)	Limiting (H)	Moderate (M)	Moderate (M)	Limiting (M)	Limiting (L)	Limiting (L)	Limiting (L)	Adequate (H)	Limiting (L)	Moderate (M)	Moderate (M)
1710030502: South Fork Coquille River	Limiting (M)	Moderate (M)	Moderate (H)	Adequate (L)	Moderate (L)	Limiting (M)	Moderate (M)	Moderate (M)	Limiting (H)	Moderate (M)	Limiting (H)	Moderate (M)
1710030503: East Fork Coquille River	Limiting (L)	Limiting (M)	Moderate (H)	Limiting (M)	Limiting (M)	Limiting (M)	Limiting (M)	Limiting (M)	Moderate (H)	Limiting (M)	Limiting (H)	Moderate (M)
1710030504: North Fork Coquille River	Limiting (M)	Moderate (L)	Moderate (H)	Moderate (M)	Limiting (M)	Limiting (M)	Limiting (M)	Limiting (L)	Moderate (H)	Limiting (M)	Moderate (H)	Moderate (M)
1710030505: Lower Coquille River	Limiting (H)	Limiting (M)	Limiting (M)	Limiting (H)	Limiting (M)	Limiting (L)	Limiting (M)	Limiting (L)	Limiting (M)	Limiting (M)	Limiting (M)	Moderate (M)

Table 36. Coquille Watershed Association riparian, wetland, and upland Watershed Health Indicators by 5th-field HUC.

5th-Field HUC	Riparian:			Freshwater Wetlands:			Uplands:				
	Stand condition	Roads	Invasive species	Habitat loss	Habitat function	Connectivity	Hydro modification	Fine sediment sources	Invasive species	Habitat fragmentation	Large wood recruitment
1710030501: Middle Fork Coquille River	Limiting (L)	Limiting (L)	Limiting (M)	Limiting (M)	Limiting (M)	Limiting (M)	Moderate (M)	Limiting (M)	Moderate (M)	Adequate (L)	-
1710030502: South Fork Coquille River	Limiting (M)	Limiting (L)	Limiting (M)	Limiting (M)	Limiting (M)	Limiting (M)	Moderate (H)	Moderate (H)	Moderate (M)	Adequate (M)	-
1710030503: East Fork Coquille River	Limiting (M)	Limiting (L)	Limiting (M)	Limiting (M)	Limiting (M)	Limiting (M)	Moderate (M)	Limiting (M)	Moderate (M)	Adequate (L)	-
1710030504: North Fork Coquille River	Limiting (M)	Limiting (L)	Moderate (M)	Limiting (M)	Limiting (M)	Limiting (M)	Moderate (M)	Limiting (M)	Moderate (M)	Adequate (M)	-
1710030505: Lower Coquille River	Limiting (L)	Limiting (L)	Limiting (L)	Limiting (M)	Limiting (M)	Limiting (M)	Limiting (M)	Limiting (M)	Limiting (M)	Moderate (L)	-

Table 37. Coquille Watershed Association tideland Watershed Health Indicators by 5th-field HUC.

5th-Field HUC	Tidal Wetlands:						Tidal Flats:					Sub-tidal:				
	Hydro modification	Sediment regime	Water quality	Vegetation modification	Invasive species	Tidal Wetland Loss	Hydro modification	Sediment regime	Water quality	Invasive species	Tidal flat loss	Hydro modification	Sediment regime	Water quality	Invasive species	Sub-tidal area loss
1710030501: Middle Fork Coquille River	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1710030502: South Fork Coquille River	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Fork Coquille River																
1710030503: East Fork Coquille River	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1710030504: North Fork Coquille River	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1710030505: Lower Coquille River	Limiting (M)	Limiting (L)	Limiting (M)	Limiting (L)	Limiting (M)	Limiting (L)	Moderate (M)	Moderate (M)	Data Gap	Moderate (M)	Data Gap					

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Appendix A: Watershed Council Contacts

Council	Coordinator	Phone	Email	Location
Coos WA	Jon Souder	(541) 888-5922	cooswa@cooswatershed.org	Coos Bay
Coquille WA	Jennifer Hampel	(541) 572-2541	jennifer.hampel@verizon.net	Coquille
Elk Creek WC	Lee Russell	(541) 836-7206	lee085@centurytel.net	Yoncalla
Lower Columbia WC	Margaret Magruder	(503) 728-9015	magruder@clatskanie.com	Clatskanie
MidCoast WC	Wayne Hoffman	(541) 265-9195	mcwc@midcoastpartners.org	Newport
Nestucca Neskowin WC	Alex Sifford	(503) 392-6134	nnwc@oregoncoast.com	Hebo
No. Coast WA	Lori Lilly	(503) 325-0435	llilly@columbiaestuary.org	Astoria
Siuslaw WC	Todd Miller	(541) 268-3044	watershed@siuslaw.org	Mapleton
	Gus Gates	(541) 997-1272	wcsswcd@oregonfast.net	Florence
Smith River WC	Troy Turney	541-217-5219	smithriver@toast.net	Reedsport
Tenmile Lakes Partnership	Mike Mader	(541) 759-2414	tlbp@presys.com	Lakeside
Tillamook WC	Denise Lofman	(503) 322-0002	tbwc@oregoncoast.com	Garibaldi
Upper Nehalem WC	Maggie Peyton	(503) 429-2401	maggie@nehalem.org	Vernonia

Appendix B:

Development of Estuarine Watershed Health Indicators

The importance of estuaries to salmon and other fisheries has stimulated various assessment and restoration ranking systems. We reviewed a number of assessment approaches used in Oregon to develop the approach in describing limiting factors and estuary health indicators used in this report. These methods included the National Coastal Assessment (National Estuary Program, 2007); OWEB's recently completed Estuary Assessment procedure (Brophy 2007); Coos Bay HGM Rapid Assessment procedure and science review (Adamas 2006, Adamas 2005), and procedures used in the National Coastal Zone Management Effectiveness Study (Good et al. 1998). We incorporated ideas from these procedures to develop the list of Watershed Health Indicators and rating system.

For the purposes of this assessment, the estuary was divided into three zones: 1) tidal wetlands, 2) tidal flats, and 3) sub-tidal zone based on descriptions from Brophy (2007), Good (1999), and recommendations from the participating watershed councils. These areas are as follows:

Tidal wetlands: Marshes and swamps; a vegetated wetland that is periodically inundated by tidal waters. Tidal wetlands include emergent, scrub-shrub, and forested wetland types.

Tidal flat: An area inundated by all high tides and exposed only at low tide. Some tidal flats have extensive growth of algae or seagrass; others are bare mud.

Sub-tidal zone: Subtidal estuarine habitats include channel bottoms, slope bottoms, and the open water above them.

Descriptions of anthropogenic alterations to estuary functions in Adamas (2005), Good et al. (1998), and Brophy (2007) were used to identify the categories of limiting factors/indicators that provide the basis of the ratings. Brophy (2007) describes the effects of anthropogenic alterations to estuary functions as follows: *“Dikes, culverts/tide gates, roads/railroads, and dams restrict tidal flow, reducing or altering nearly all tidal wetland functions. Ditches change tidal flow patterns and channel morphology, affecting nearly all tidal wetland functions. Tillage and grazing compact soils, contribute to erosion of channel banks, and reduce vegetation diversity and wildlife habitat. Channel armor and riprap cause erosion, reduce vegetation diversity and channel shading, and reduce salmonid habitat functions. Impoundments, excavation and dredged material disposal change wetland surface elevations, water flow patterns, and soil biology. Logging and driftwood removal reduces salmon habitat functions of formerly shaded tidal channels. Invasive species can completely alter the character of estuaries.”*

These stressors were grouped into categories and evaluated as estuarine health indicators:

Tidal Wetlands	Tidal Flats	Sub-tidal Zone
Hydro-modification	Hydro-modification	Hydro-modification
Sediment regime	Sediment regime	Sediment regime
Water quality	Water quality	Water quality
Vegetation modification	Invasive species	Invasive species
Invasive species	Tidal flat loss (Complete)	Sub-tidal zone loss (Complete)
Wetland loss (Complete)		

The definition and criteria used to rate the Watershed Health Indicators are listed in Appendix C. The qualitative method of rating these factors was adopted from the categorical rating suggested in Good et al. (1998). In their assessment, Good et al. (1998) used percent of alteration from historic condition to categorize the extent of change: 1) Limiting is Greater than 40%, 2) Moderate is 20 – 40%, and 3) Adequate is Less than 20% alteration.

Appendix C:

Watershed Health Indicator Definitions and Criteria

Aquatic

Indicator	Definition	Criteria
Water temperature	Changes in water temperature patterns that affect aquatic life.	Limiting: > 64 deg. F Moderate: 62 - 64 deg. F Adequate: 42 - 62 deg. F
Water quality	Changes in water quality, both harmful to fish and public health. Evaluated based on the extent to which parameters meet or exceed DEQ standards.	Limiting: Does not attain DEQ water quality criteria. Greater than 10% of the samples exceed the appropriate criteria. Moderate: Intermediate in severity or extent of water quality criteria violations. Adequate: Attains DEQ water quality criteria. Greater than 90% of the samples meet the appropriate criteria.
Water quantity	Inadequate summer stream flows that limit fish production and increase water temperatures. Elevated winter peak flow magnitudes that increase scour, bank erosion, and/or otherwise degrade channel function and fish habitat.	Measurement: Significant departure from normal stream flow regime. LOW FLOWS Limiting: Stream flow restoration priorities categories 3 (high) and 4 (highest) See example at this link. Moderate: Category 2 (moderate) Adequate: Category 1 (low) PEAK FLOWS Limiting/Moderate/Adequate: Can be estimated if watershed analysis or other studies have information that addresses peak flows; otherwise the rating will be Insufficient Information.
Spawning gravel quantity	Sufficient spawning gravel available to produce enough fry to seed the rearing habitat given adequate adult escapement, as defined by ODFW habitat benchmarks for percent of riffle area covered with gravel.	Measurement: Spawning gravel quantity (as measured by percent riffle area covered in gravels): Limiting: <15% Moderate: 15% - 35% Adequate: >35%
Spawning gravel quality	The quality of spawning gravel as measured by the degree of embeddedness in comparison to reference conditions for the stream type and geology, as defined by ODFW benchmarks for percent of riffle area covered with fine sediments.	Measurement: Spawning Gravel Quality as indicated by substrate embeddedness (percent riffle area in silt, sand, and organics). Limiting: Volcanic parent material: >15%; Sedimentary parent material: >20%; Channel gradient <1.5%: >25% Moderate: Volcanic parent material: 8% - 15% ; Sedimentary parent material: 10% - 20%; Channel gradient <1.5%: 12% - 25% Adequate: Volcanic parent material: <8%; Sedimentary parent material: <10% ; Channel gradient <1.5%: <12%
Stream complexity: winter rearing habitat	From Coho Conservation Plan (2006): "Stream complexity and high quality over-winter rearing habitat refer to the same thing." Present only in areas where the stream is fairly low gradient (less than 2%) and there are broad valley areas near the stream. Usually recognizable by one or more of the following features: large wood, pools, connected off-channel alcoves, beaver ponds, lakes, and connected	Limiting: A simple channel containing a fairly uniform flow and few of the high quality habitat types. Moderate: An unconfined stream network that contains few of the high quality habitat types. Adequate: A meandering stream network with complex channels containing a mixture of the high quality habitat types that provide areas with different velocity and depth for use at different fish life stages.

Indicator	Definition	Criteria
	floodplains and wetlands.	
Stream complexity: summer rearing habitat	Complex summer rearing habitat includes the components above with an emphasis on appropriate water temperatures, accessible areas of cold water refugia, and abundant complex pools with adequate depth, structure, and hiding cover.	<p>Limiting: A simple channel containing a fairly uniform flow and few of the high quality habitat types.</p> <p>Moderate: low-moderate percent of summer stream surface area is pools; or pools lack the complexity of large wood, or low overhanging riparian vegetation.</p> <p>Adequate: Much of stream surface area is in pools, with considerable woody structure in the pools for cover (submerged large wood, and/or riparian vegetation extending low over or into pools). Adequate habitat also includes beaver ponds and lakes.</p>
Large wood	Large in-channel wood (usually conifer) that forms pools and/or provides complex structure and hiding cover, as defined by ODFW benchmarks for number of pieces and/or volume.	<p>Measurement: Large wood volume (m³/100m stream length) and number of pieces (per 100 m stream length):</p> <p>Limiting: Pieces: >10; Volume: >20</p> <p>Moderate: Pieces: 10 - 20 ; Volume: 20 - 30</p> <p>Adequate: Pieces: >20 ; Volume: >30</p>
Barriers	Fragmented aquatic habitats that affect the dispersal of aquatic life and reduce access to key habitats. This includes structures blocking fish passage and unscreened water diversions. For example, reduced access to spawning/rearing habitat in tributaries from a culvert that is a barrier to fish passage.	<p>Assessment based on the percent of habitat blocked by barriers or degree of blockage.</p> <p>Limiting: Complete blockage to fish movement into high quality spawning and/or rearing habitat; or significant quantities of high quality habitat inaccessible due to barriers.</p> <p>Moderate: Barriers limit (partial blockage) fish movement into high quality spawning and/or rearing habitat.</p> <p>Adequate: There are no barriers.</p>
Channel modification	A stream channel that is altered from its normal channel movement, particularly providing an abundance of low velocity habitats. Typical channel modifications include gravel extraction, channel straightening, bank armoring and channel relocation. These actions reduce key habitat features such as pools, gravel bars, lateral scour pools, side channels and habitat complexity.	<p>Qualitative assessment:</p> <p>Limiting: The stream channel network has been impacted by extensive instream or riparian work (e.g., riparian area roads that confine the stream, or channelization). The stream channel network has been channelized or relocated, particularly in areas with potentially high habitat quality (low gradient streams that would be unconfined without the impact).</p> <p>Moderate: Some portions of the stream channel network have been impacted by channelization or other measures.</p> <p>Adequate: Natural channel; no human impacts.</p>
Invasive species	Non-native animal and plant species that affect the aquatic environment. Includes exotic fish species that compete with, prey on, or displace native fish species.	<p>Qualitative assessment incorporating both severity of impacts and spatial extent:</p> <p>Limiting: Abundant exotic fish species that impact coho production; key limiting factor for coho populations according to Coho Conservation Plan (i.e., primary lake systems: Siltcoos, Tahkenitch, and Tenmile); non-native plant species that affect aquatic productivity and/or water quality.</p> <p>Moderate: Exotic species are limited in spatial extent or moderate overall impact on aquatic productivity and/or water quality.</p> <p>Adequate: There are minimal or no non-native species present.</p>
Hatchery impacts	Impacts to wild anadromous fish populations from improper hatchery management, including the following possible risk factors: genetic (inbreeding, unintentional natural selection, etc), ecological (competition, carrying capacity, etc.), behavioral, diseases, and other factors.	<p>Qualitative assessment:</p> <p>Limiting: Substantial hatchery impacts to fish populations; key limiting factor for coho populations according to Coho Conservation Plan (i.e., Salmon Watershed).</p> <p>Moderate: Some hatchery impacts to fish populations.</p> <p>Adequate: There are no or minimal hatchery impacts.</p>

Riparian

Indicator	Definition	Criteria
Riparian stand condition	Riparian stand conditions that affect normal succession to native vegetation (for example, blackberry areas) or influence the recruitment of large wood to the aquatic system (for example, an alder stand where there would normally be conifers).	<p>Measurement: Stand composition, size and structure (within 150 feet of stream).</p> <p>Limiting : Current stand conditions do not provide reference functions; composition, size or structure are below reference condition. May include stands that are recently planted, and areas heavily impacted from invasive species or other factors that affect normal successional processes.</p> <p>Moderate: Stand composition is similar to reference condition for site; however stand size is too small to provide reference functions and/or stand composition is below reference conditions (e.g., conifer plantations with large tree size but lacking multi-storied structure).</p> <p>Adequate: Stand composition, size and structure are similar to reference condition for the given location.</p>
Riparian roads	Roads prevent establishment of native streamside vegetation, deliver sediment, interrupt ground water flow, and provide a pathway for non-native exotic species.	<p>Measurement: Lineal miles of road within the riparian area per mile of stream.</p> <p>Limiting: > 0.1 mile of road per mile of stream</p> <p>Moderate: > 0.1 but < 0.04 mile of road per mile of stream</p> <p>Adequate: < 0.04 mile of road per mile of stream</p>
Invasive species	Non-native plants and animals that modify riparian habitats and displace native species.	<p>Qualitative assessment:</p> <p>Limiting: Abundant invasive species are impacting riparian vegetation or normal successional processes.</p> <p>Moderate: Invasive species are limited in spatial extent or minimal overall impact on riparian function.</p> <p>Adequate: There are no or minimal invasive species present.</p>

Wetlands

Indicator	Definition	Criteria
Wetland habitat loss	Loss of wetlands due to drainage, dredging, deposition of dredged material, levees, diking, tiling, development, and other means. Loss of wetlands impacts water quality, water storage, flood abatement, and wildlife habitat.	<p>Qualitative assessment:</p> <p>Limiting: Wetlands have been impacted by extensive ditching, draining, filling, tiling, development, and other human-caused destruction.</p> <p>Moderate: Some wetlands have been impacted by draining, filling and other measures.</p> <p>Adequate: Naturally occurring wetlands present, no human impacts.</p>
Wetland habitat function	Alterations to existing wetlands that reduce wetland functions - water filtering, flood storage, and wildlife habitat.	<p>Limiting: <30% functional</p> <p>Moderate: 30-50% functional</p> <p>Adequate: >50% functional</p>
Wetland connectivity	Loss and/or degradation of the physical connection between surface water sources and wetlands. In the context of this assessment wetland connectivity relates primarily to the loss of access by juvenile salmonids to off-channel wetland habitats.	<p>Qualitative assessment:</p> <p>Limiting: Widespread wetland connectivity loss due to diking, impassible barriers, channel downcutting, or other physical barriers that restrict juvenile access to wetland habitats.</p> <p>Moderate: Some wetland connectivity loss, however opportunities for off -channel wetland use remain.</p> <p>Adequate: Naturally occurring wetland connectivity is present.</p>

Uplands

Indicator	Definition	Criteria
Hydro modification	Roads, impervious surfaces, and land uses that affect water runoff timing, magnitude of peak and low flows, and storage.	Measurement: Percent of watershed area in urban or agricultural use: Limiting: > 30% Moderate: 5%-30% Adequate: < 5%
Fine sediment sources	Increased sediment delivery to the aquatic system from changes in land use patterns and management. For example, road practices or other land use management that increase soil erosion rates and delivery to stream channels.	Qualitative assessment: Limiting: Roads or other land management activities are delivering significant quantities of sediment to the stream network. Moderate: Roads or other land management activities are delivering some quantities of sediment to the stream network; or sediment impacts are limited in spatial extent. Adequate: Minimal sediment contributions to the stream network from upland land movement activities.
Invasive species	Non-native plants and animals that modify terrestrial habitats and displace native species.	Qualitative assessment: Limiting: Abundant invasive species are impacting terrestrial habitat or normal successional processes. Moderate: Invasive species are limited in spatial extent or minimal overall impact on terrestrial habitat function. Adequate: There are no or minimal invasive species present.
Habitat Fragmentation	Fragmented terrestrial habitats that affect wildlife/plant dispersal and connectivity across the landscape. Human-caused forest fragmentation is one metric that can be used to evaluate the extent of habitat fragmentation in the Oregon Coast Range.	Measurement: Mean human-caused forest fragmentation rating (scale of 1-100): Limiting: Mean fragmentation rating greater than of 27 Moderate: Mean fragmentation rating of 8-27 Adequate: Mean fragmentation rating less than 8
Upland Large Wood Recruitment	Note: WPN investigated GIS support for this factor and provided the GIS layers to Councils that requested the information. A GIS-based solution could not be completed for the entire ESU.	INTENTIONALLY LEFT BLANK Limiting: Moderate: Adequate:

Tidal Wetlands

Indicator	Definition	Criteria
Hydro-modification	Man-made alterations that restrict tidal flow, hydrologic alterations can reduce or greatly alter nearly all tidal wetland functions, and in some cases completely eliminate those functions.	Extent of wetlands altered by restricted flow. Limiting: > 40% of historic wetland area modified Moderate: 20-40% of historic wetland area modified Adequate: <20% of historic wetland area modified
Sediment regime	Increased or reduced sediment delivery to the tidal wetlands from changes in land use patterns and management.	Qualitative assessment of the alteration of the sediment regime - both increased and decreased sediment delivery. Limiting: > 40% of wetlands affected by major change in sediment regime Moderate: 20 - 40% of wetlands affected by major change in sediment regime Adequate: < 20% of wetlands affected by major change in sediment regime
Water quality	Changes in water quality, both harmful to fish and public health. Evaluated based on the extent to which parameters meet or exceed DEQ standards.	Limiting: Does not attain DEQ water quality criteria. Greater than 10% of the samples exceed the appropriate criteria. Moderate: Intermediate in severity or extent of water quality criteria violations. Adequate: Attains DEQ water quality criteria. Greater than 90% of the samples meet the appropriate criteria.
Vegetation modification	Change or reduction of wetland vegetation through agricultural or other management practices. Tillage, grazing and logging compact soils, contribute to soil erosion of channel banks, and reduce vegetation diversity and wildlife habitat.	Qualitative assessment of the percent of vegetation in existing wetlands modified by land management practices. Limiting: > 40% of wetland vegetation modified by land management practices Moderate: 20 - 40% of wetland vegetation modified by land management practices Adequate: < 20% of wetland vegetation modified by land management practices
Invasive species	Non-native species that displace native species and alter the tidal wetland ecosystem. These species are characteristically adaptable, aggressive, and have a high reproductive capacity.	Limiting: Invasive species are having a significant effect on tidal wetland functions. Moderate: Invasive species are limited in spatial extent or moderate overall impact on tidal wetland functions. Adequate: There are no/minimal invasive species or they are exhibiting no measurable effect on tidal wetland function.
Wetland loss (Complete)	Wetland loss occurs with complete fill and conversion to developed uses, or other irreversible changes. In contrast to hydro-modification, this refers to historic conversion to cities, developments, etc. with no opportunity for restoration.	Rough measure of long term-direct impacts of human development of the coastal zone. Limiting: > 40 % complete fill or conversion Moderate: 20-40% complete fill or conversion Adequate: < 20% complete fill or conversion

Tidal Flats

Indicator	Definition	Criteria
Hydro-modification	Man-made alterations that restrict tidal flow.	Extent of tidal flats altered by restricted flow. Limiting: > 40% of historic tidal flat area modified Moderate: 20-40% of historic tidal flat area modified Adequate: <20% of historic tidal flat area modified
Sediment regime	Increased or reduced sediment delivery to the tidal flats from changes in land use patterns and management.	Qualitative assessment of the alteration of the sediment regime - both increased and decreased sediment delivery. Limiting: > 40% of tidal flats affected by major change in sediment regime Moderate: 20 - 40% of tidal flats affected by major change in sediment regime Adequate: < 20% of tidal flats affected by major change in sediment regime
Water quality	Changes in water quality, both harmful to fish and public health. Evaluated based on the extent to which parameters meet or exceed DEQ standards.	Limiting: Does not attain DEQ water quality criteria. Greater than 10% of the samples exceed the appropriate criteria. Moderate: Intermediate in severity or extent of water quality criteria violations. Adequate: Attains DEQ water quality criteria. Greater than 90% of the samples meet the appropriate criteria.
Invasive species	Non-native species that displace native species and alter the tidal flat ecosystem. These species are characteristically adaptable, aggressive, and have a high reproductive capacity.	Invasive species can have variable effects on tidal flats. Limiting: Invasive species are having a significant effect on tidal flat functions. Moderate: Invasive species are limited in spatial extent or moderate overall impact on tidal flat functions. Adequate: There are no/minimal invasive species or they are exhibiting no measurable effect on tidal flat function.
Tidal flat loss (Complete)	Tidal flat loss occurs with complete fill and conversion to developed uses, or other irreversible changes. In contrast to hydro-modification, this refers to historic conversion to cities, developments, etc. with no opportunity for restoration.	Rough measure of long term-direct impacts of human development of the coastal zone. Limiting: > 40 % complete fill or conversion Moderate: 20-40% complete fill or conversion Adequate: < 20% complete fill or conversion

Sub-Tidal Zone

Indicator	Definition	Criteria
Hydro-modification	Man-made alterations that restrict tidal flow.	Extent of wetlands altered by restricted flow. Limiting: > 40% of historic wetland area modified Moderate: 20-40% of historic wetland area modified Adequate: <20% of historic wetland area modified
Sediment regime	Increased or reduced sediment delivery to the sub-tidal zone from changes in land use patterns and management.	Limiting: > 40% of sub-tidal zone affected by major change in sediment regime Moderate: 20 - 40% of sub-tidal zone affected by major change in sediment regime Adequate: < 20% of sub-tidal zone affected by major change in sediment regime
Water quality	Changes in water quality, both harmful to fish and public health. Evaluated based on the extent to which parameters meet or exceed DEQ standards.	Limiting: Does not attain DEQ water quality criteria. Greater than 10% of the samples exceed the appropriate criteria. Moderate: Intermediate in severity or extent of water quality criteria violations. Adequate: Attains DEQ water quality criteria. Greater than 90% of the samples meet the appropriate criteria.
Invasive species	Non-native species that displace native species and alter the sub-tidal zone ecosystem. These species are characteristically adaptable, aggressive, and have a high reproductive capacity.	Invasive species can have variable effects on sub-tidal zone. Limiting: Invasive species are having a significant effect on sub-tidal zone functions. Moderate: Invasive species are limited in spatial extent or moderate overall impact on sub-tidal zone functions. Adequate: There are no/minimal invasive species or they are exhibiting no measurable effect on sub-tidal zone function.
Sub-tidal zone loss (Complete)	Sub-tidal wetland loss occurs with complete fill and conversion to developed uses, or other irreversible changes. In contrast to hydro-modification, this refers to historic conversion to cities, developments, etc. with no opportunity for restoration.	Rough measure of long term-direct impacts of human development of the coastal zone. Limiting: > 40 % complete fill or conversion Moderate: 20-40% complete fill or conversion Adequate: < 20% complete fill or conversion