Environment, Natural Resources, and Economy of Oregon's Mid-Coast

(Note: This section is a summary from Step 2 of the planning process. For citations, please refer to the actual technical reports produced in 2018 (Appendix B). All data and information provided in this section originate from these 2018 reports unless more recent numbers are available).

General Overview

About 50,000 people currently live within the Mid-Coast Planning Area of Oregon. Population projections indicate that the region will grow by almost 10,000 people during the next 40 years. The projected demographic shift is slowly toward an older population.

Land use is primarily private, state, and federal forests (87%). Other land uses include agriculture (primarily livestock grazing), rural residential development, industrial, commercial, and urban development, primarily along the Highway 101 corridor.

Tribal Nations. The Lincoln County population has a higher percent Non-Hispanic Indian or Alaskan Native than the state average (OHA, 2018). The Confederated Tribes of Siletz Indians[6] is a federally recognized confederation of over 30 bands, that occupies a 3,666-acre reservation located in Lincoln County. The Siletz Tribe has a well-established Tribal government to manage its resources, oversee and implement the many services and programs offered to Tribal members. The Siletz Tribal Natural Resources Department is responsible for management of all natural resource programs. The Tribe's management approach is that of wise use and stewardship of the Tribe's timber lands, waterways, wetlands, prairies, and other natural resources now and in the future.

The Tribe has multiple conservation properties with three of these being in the Siletz Basin. These total over 4,500 acres. Each property has a conservation easement and conservation management plan associated with it. These lands as well as private waterway and wetland properties in the Mid-Coast Basin area are of cultural importance to the Siletz Tribe. The Natural Resources Department also works with private landowners to make improvements on their own properties in effort to restore the land. Other restoration efforts that the Tribe has implemented include but are not limited to projects to restore streamflow, banning the trapping of beavers to promote their presence, and establishing wider riparian buffers on rural, commercial, and ag lands. The Tribe is also working on infrastructure upgrades to make the Tribe's facilities and structures more efficient and implement water conservation measures such as low flow toilets and reduced lawn watering. In recent years, the Tribe has partnered with the U.S. Fish and Wildlife Service and the Mid-Coast Watersheds Council to work collaboratively to implement waterway and wetland habitat projects and find funding.

[6] https://www.ctsi.nsn.us/tribal-services/

The economy is comprised of personal income, pensions, investments, tourism, and natural resources. The natural resources economy consists of commercial fishing (40%), tourism (33%), commercial timber (26%), and to a lesser extent agriculture (1%).

Demographics. Ethnicity, income, education. Based on OHA data[7], Lincoln County residents are currently older, more Caucasian, represent a higher percentage on social security/retirement income, and there is a slightly higher overall poverty rate than the state average. Over 12% of Lincoln County identifies as Hispanic, which is higher than the average for Oregon.

Stream flows are rain-dominated and are fed by shallow groundwater when it is not raining. Most precipitation occurs November–March, and dry conditions occur in the summer, often extending into late October. Most groundwater aquifers generally have low yield and poor storage capacity. Groundwater is recharged by rain during the wet season and groundwater levels and spring discharge generally declines during the dry season.

Out-of-stream water use and rights. There are about 1,637 water rights in the Mid-Coast planning area allocated to 29 different uses. Domestic use has the greatest number of water rights (n=703) followed by irrigation (n=419), instream (n=110), and municipal (n=82). Figure 2 displays the estimated number of water rights by type. The largest water use category (amount of water used) in the planning area is for self-supplied industrial use, followed by water used by hatcheries and water provided by community water systems for domestic and industrial use. The largest water users in the region all draw water from the Siletz River and have water rights that are senior to the instream water right.

Instream water needs and rights. Fifty-one streams have existing instream water rights, but these instream rights inadequately capture the full range of flows needed to protect current instream ecosystems. Summer streamflows are insufficient in some areas of the Mid-Coast (see Water Quantity Report from Step 2 & OWRD Water Rights Summary (October 2021) – Appendix B) to meet the instream water needs of fish and wildlife. Low streamflows contribute to water quality impairments (e.g., high temperatures and reduced dissolved oxygen) that negatively affect fish and wildlife. Climate change impacts and increased demand from municipal and rural water users are expected to further limit available water in the summer for all uses.

Conservation Opportunity Areas. Of the 206 designated Conservation Opportunity Areas (COAs) in Oregon, seven of them are within Oregon's Mid-Coast region: Siletz Bay-Ocean COA, Siletz River COA, Depoe Bay Area COA, Yaquina Bay COA, Beaver Creek COA, Alsea Estuary-Alsea River COA, and Yachats River Area COA (Oregon Department of Fish and Wildlife 2020). Conservation Opportunity Areas are places where broad fish and wildlife conservation goals can best be met. Focusing investments in these areas can increase the likelihood of long-term success,

[7] https://www.oregon.gov/dhs/ABOUTDHS/DataDocuments/County-Quick-Facts-2018.pdf

maximize effectiveness over larger landscapes, improve funding efficiency, and promote cooperative efforts across ownership boundaries.

Estuaries. There are five estuaries classified as major estuaries by the Oregon Department of Land Conservation and Development in the Mid-Coast Planning Area: Salmon River, Siletz Bay, Yaquina Bay, Alsea Bay, and Depoe Bay. Big Creek is classified as a "natural" estuary, whereas Beaver Creek and Yachats are classified as conservation estuaries (DLCD).[8]

Figure 6 provides a snapshot of the environment, natural resources, and economy of Oregon's Mid-Coast Planning Area.

[8] https://www.oregon.gov/lcd/Publications/TheOregonEstuaryPlanBook_1987.pdf

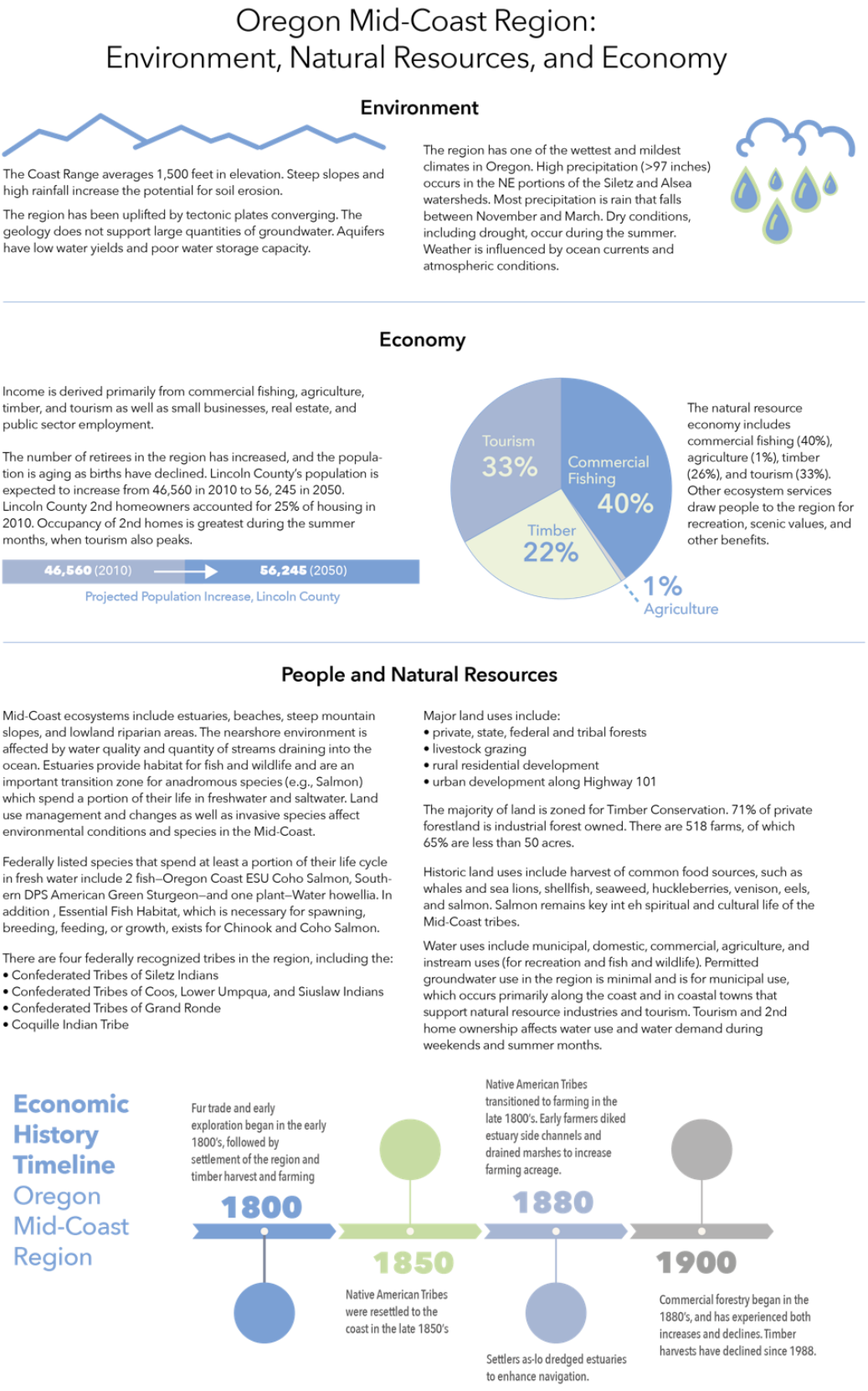

Figure 6. A snapshot of the environment, natural resources, and economy of Oregon's Mid-Coast.

Understanding Water Resources Quantity, Quality, and Ecological Issues

During Step 2 of the planning process, a series of reports were developed characterizing water quantity, water quality, ecology and built systems of the Mid-Coast region (see Appendix B). This section of the document summarizes the information presented in those reports.

Surface Water Quantity

Water resources (Figure 7) in the Mid-Coast support multiple uses, including providing drinking water, supporting fisheries and wildlife, supporting industry and commercial operations, providing recreational opportunities, and supporting estuaries that provide habitat for a diversity of native fish and wildlife species. Water uses have changed through time. Today, water resources in the Mid-Coast are increasingly valued for providing recreational opportunities and habitat for aquatic species.

All of the major river drainages in the Mid-Coast planning area, with the exception of the Yachats River, originate at the crest of the Coast Range in Polk and Benton Counties and extend to the coast. The planning area is divided into eight different sub-areas, which encompass the following waterways: Salmon River, Siletz Bay-Ocean Tributaries, Siletz River, Depoe Bay-Ocean Tributaries, Yaquina River, Beaver Creek-Ocean Tributaries, Alsea River, and Yachats River. See Figure 7 for relative water supply for each sub-area, which can also be accessed and explored online[9]. Many streams in the Mid-Coast are tidally influenced ocean tributaries, meaning that they drain directly into the ocean rather than draining to a river. The zone of tidal influence in these streams depends on the discharge of the stream and the tidal stage.

Water quantity and its management in the Mid-Coast region was summarized during Step 2 of the planning process as shown in the bulleted list below. The entire report on water quantity can be accessed in Appendix B.

- Streams in the Mid-Coast have high natural streamflow during the winter months (January-March) and low natural streamflow during the summer/Fall months (August-October) as a result of seasonal precipitation patterns.
- Streams in the Mid-Coast are rain-dominated and responsive to precipitation, reaching high flows during rainstorms. Groundwater inputs contribute base flows in streams during late summer and Fall months.
- The Mid-Coast has eight active real-time streamflow gage locations (Salmon River below Slick Rock Creek, Siletz River at Siletz, Sunshine Creek near Valsetz, Yaquina River near Chitwood, Alsea River near Tidewater, Drift Creek near Waldport, East Fork Lobster Creek, and Yachats River above Clear Creek).

[9] https://flo.uri.sh/visualisation/5093406/embed

- Information from river gages and water availability models help the Oregon Water Resources Department determine whether to issue new water rights. The water availability models consider estimates of supply and demand, and account for both instream and out-of-stream water rights to determine if water is available for new out-of-stream uses.

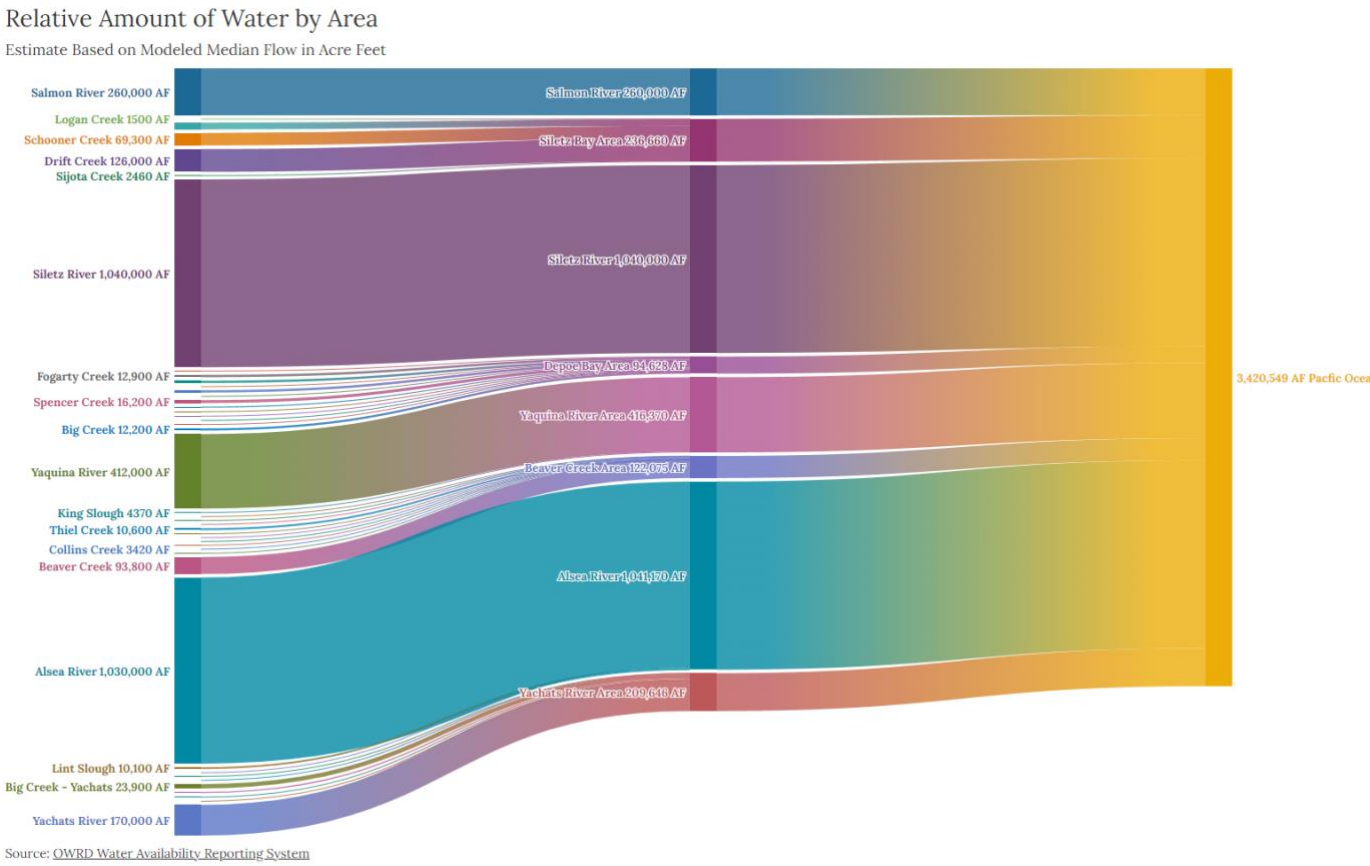

Figure 7. Total estimated average annual natural streamflow volume (in acre-feet) of surface water in streams and rivers in the Mid-Coast based on a 1958-1987 period of record. Note that these volumes do not reflect diversions for out-of-stream uses.

Groundwater Quantity

Geology in the Mid-Coast limits available groundwater resources. Mid-Coast geology is generally composed of marine sedimentary rocks with minor volcanic deposits. The aquifer systems these rocks host can be characterized as low-permeability and low-storage capacity aquifers. The Tyee Formation makes up roughly 57% of the Mid-Coast area and consists of sandstone and siltstone deposits that do not hold or convey much water, except through fractures (USGS, 2022). See Figure 8 for an image of the Tyee Formation. Other parts of the Mid Coast are composed of sedimentary rocks that post-date the Tyee Formation and in a few places, volcanic rocks can be found. These formations host aquifers that are, on average, slightly more productive but are limited in areal extent. There are a few areas of the Mid Coast where sand and gravel dominate the geology and

aquifers hosted by these rocks tend to produce more water, but they mostly are limited to river channels and the coast margin. Aquifers close to river channels are typically hydrologically connected to surface water. Areas significantly close to the coast may be at risk of saltwater intrusion if the hydraulic head or pressure is not maintained in the freshwater deposits but the high amounts of precipitation in the Mid Coast likely reduces this risk. Additional information on the relative yields of various units can be found in the Mid-Coast Water Resources Characteristics: Water Quantity report (GSI, 2018).

Figure 8. Photograph of the Tyee formation. Photo Credit: Stanford Project on Deepwater Depositional Systems (https://spodds.stanford.edu/tyee-basin-oregon)

Aquifers in this region are predominantly fractured rock aquifers, where groundwater moves through tiny fractures within the rocks, and which are characterized by low storage and low well yields. A conceptual diagram of a fractured rock aquifer as well as a map showing the well density and average well yield by section can be found in the Water Use Summary for the Mid-Coast Place-Based Planning Area (OWRD, 2021). The aquifer system recharges with precipitation and discharges continuously to springs, streams, and wells that are pumped. Groundwater is the primary source of water that sustains baseflows in streams and rivers when it is not raining.

According to an analysis performed by the Oregon Water Resources Department, the median well yield in the planning area is 6 gallons per minute (OWRD, 2021). Generally, the well yield, especially those producing from fractured rock aquifers, is low and may only produce enough water to support rural domestic and livestock uses. Well yields in many areas may be insufficient to support uses with higher water needs, such as for irrigation or industrial use, which can limit future development. Well yield will generally decrease during the dry season as groundwater drains out of

the aquifer and water levels drop in wells. Wells with higher yields are likely to be in areas where there is a greater hydraulic connection to surface water, such as near rivers.

There are three OWRD Observation Wells in Lincoln County that have been used to collect static water level data since the early 1960s. One well (LINC 1138) is located near the City of Toledo, a second (LINC 444) is located near the unincorporated community of Otis, and a third (LINC 820) is located near the City of Siletz. Measurements for the observation well near the City of Toledo (LINC 1138) ended in 2015 due to concerns over well construction issues that may lead to measurements that do not accurately represent the aquifer. A new observation well (LINC 52601) on Weyerhaeuser property within the Coast Range was added to the network in 2019 thanks to new relationships formed and opportunities identified through the planning effort.

The hydrographs for the observation wells with the longest periods of record generally show annual discharge and recharge cycles. It should be noted that some of the data in the hydrographs below represent pumping levels (water levels that are measured when the well is on, or shortly after it has been turned off and represent water level in the well) rather than static water levels (water levels that are stationary and represent the water level in the aquifer). Both LINC 444 and LINC 820 show little overall change in aquifer levels since monitoring has begun.

Water Quality

Water quality status and regulation in the Mid-Coast region was summarized during Step 2 of the planning process as shown in the bulleted list below. The entire report on water quality can be accessed in Appendix B. However, some of the water quality status information is outdated.

- Water quality affects the extent to which water bodies can support beneficial uses, such as drinking water, industrial, agricultural, fish and aquatic life, and wildlife.
- Numerous government agencies manage water protection programs in the region (within the parameters established by the 1972 Clean Water Act), including:
    - Oregon Department of Environmental Quality, which establishes water quality standards for Oregon's surface waters in accordance with the Clean Water Act, issues discharge permits, and develops TMDLs, or watershed plans for controlling nonpoint source pollution.
    - Oregon Department of Agriculture regulates agricultural practices to prevent water pollution and meet water quality standards in accordance with the Agricultural Water Quality Management Act.
    - Oregon Department of Forestry regulates forestry operations to prevent water pollution and meet water quality standards in accordance with the Forest Practices Act.
    - Oregon State Parks manages potable water supply in state parks.
    - Oregon Health Authority implements regulations to ensure drinking water standards are met in accordance with the Safe Drinking Water Act.

    - Oregon Department of State Lands manages the removal-fill program and coordinates in-water work permitting with the U.S. Army Corps of Engineers and Oregon Department of Environmental Quality's water quality certification program.
    - US Forest Service and US Bureau of Land Management implement the aquatic conservation strategy of the Northwest Forest Plan[10].
    - Lincoln County manages the onsite wastewater (septic) permitting program for most of the planning area.
    - Lincoln County has a riparian protection ordinance to reduce impacts of rural residential development and certain other land uses on near-stream conditions.
- Oregon's 2018/2020 Integrated Report and Assessment Database identifies Mid-Coast water bodies that are water quality limited for not meeting one or more water quality parameters, such as temperature, dissolved oxygen, or *E. coli*.
- The Oregon Health Authority issues health advisories for multiple beaches in the Mid-Coast during the past decade for elevated enterococcus levels, which can cause illness from contact recreation, such as swimming.
- Surface water is the primary source of drinking water for nearly all of the municipal and community water providers in the Mid-Coast.
- Several water providers in the Mid-Coast use groundwater. Common groundwater contaminants that are monitored include arsenic, lead, nitrates, and fecal coliform bacteria.
- Several organizations and various private entities conduct periodic water quality monitoring activities in the Mid-Coast.

A combination of state and federal statutes and implementing regulations direct the management of water quality in Oregon. Oregon Department of Environmental Quality administers the following water quality: Oregon's Groundwater Quality Protection Rules, Underground Injection Control Rules, National Pollutant Discharge Elimination System (NPDES) and Water Pollution Control Facility (WPCF) Permits Program Rules, Reclaimed Water Program Rules, Hazardous Waste Management Program, Underground Storage Tank Program, Municipal Solid Waste Program, the Oregon Groundwater Quality Protection Act of 1989, and Biosolids.

Water Quality Monitoring

The Mid-Coast Watersheds Council, Siletz Watershed Council, and the Yaquina Watershed Council collaborate with the Lincoln County SWCD, which periodically conducts water quality monitoring in the Mid-Coast. The Siletz Tribes has an established water quality monitoring program. Also, the Alsea Watershed Study[11] is a paired watershed study that assessed the impacts of private forest practices on water quality, aquatic habitat, and salmon.

[10] https://www.fs.fed.us/r6/reo/acs/

[11] http://watershedsresearch.org/alsea-study

The Oregon Department of Environmental Quality monitors and evaluates water quality via the Ambient Monitoring Network and Oregon Water Quality Index, watershed monitoring Total Maximum Daily Loads (TMDLs), toxics monitoring, biomonitoring, Oregon Beach Monitoring Program, Volunteer Water Quality Monitoring, Groundwater Monitoring, and National Aquatic Resource Surveys. Information about all of these programs and the water quality database can be found here. Water Quality Assessment/303d list information from DEQ can be found here. And a collection of DEQ's ambient water quality, watershed and groundwater monitoring project reports can be accessed here.

Water Quality Impaired Streams in the Mid-Coast

Oregon's 2018/2020 Integrated Report and Assessment Database[12] identifies the following classes of Assessment Units (AUs) for categorizing water quality status, including impaired waters not consistently meeting state standards for a specific water quality parameter:

1.) Rivers and Streams Assessment Units: The AUs for river/stream segments are 5th order and above streams. Impaired segments are summarized in Table 1 (below) by drainage basin.

- 50 river/stream AU segments are categorized as impaired for one or more parameters and/or pollutants and beneficial uses (366 stream miles);
- 46 river/stream AU segments are categorized as temperature impaired (357 stream miles)

2.) Watershed Assessment Units: AUs based on USGS 12-digit HUCs that include 1st through 4th order streams.

- 24 of 35 Watershed AUs within the Mid-Coast planning area exhibit one or more impairments;
- 21 Watershed AUs are categorized as temperature impaired

3.) Waterbody Assessment Units: Estuaries, lakes, and reservoirs with area > 20 hectares.

- 14 of 19 Waterbody AUs within the Mid-Coast planning area exhibit one or more impairments.

4.) Coastline Assessment Units: These AUs are linear features along the coast (beaches, rocky shorelines). 29 Coastline AUs are categorized as impaired based on shellfish consumption or recreational contact advisories issued by the Oregon Health Authority.

DEQ's interactive mapping application is the most effective method to search and view water quality status for areas of interest. Detailed AU definitions are found in DEQ's Integrated Report

[12] Source: Oregon's 2018/2020 Integrated Report and Assessment Database https://www.oregon.gov/deq/wq/Pages/epaApprovedIR.aspx

Assessment Methodology (DEQ, 2018):
https://www.oregon.gov/deq/wq/Documents/irMethodologyF1820.pdf

The Clean Water Act requires that Total Maximum Daily Loads (TMDLs) (or alternate pollution control plans) be developed for all water quality-limited waters. TMDLs set specific criteria for pollutant amounts in stream reaches that are water quality limited. DEQ is currently preparing the 2022 Integrated Report and will release that information for public review when it is ready. That Report will supersede the information in this Section.

Table 1. Summary of water quality limited streams by drainage basin.

Location	Limitation
Salmon River Drainage Area	20.9 miles of water quality limited streams
Siletz River Drainage Area	84.4 miles of water quality limited streams
Yaquina River Drainage Area	62.2 miles of water quality limited streams
Beaver Creek-Ocean Tributaries	17.1 miles of water quality limited streams
Alsea River Drainage Area	165.3 miles of water quality limited streams
Yachats River Drainage Area	15.2 miles of water quality limited streams
Beaches	1.7 miles (based on health advisories for water contact recreation)
Coastline, lower estuaries	73.9 miles (based on shellfish consumption advisories for toxins/inorganic arsenic)

Groundwater Quality

Several public water providers and multiple private residents in the Mid-Coast use groundwater as domestic water supply (see Water Quantity Report from Step 2 of the planning process – Appendix B). Many residents on private wells, or springs, have septic systems to manage wastewater. Owners of residential domestic wells are not required to conduct routine water quality testing or to treat contaminants. Testing is only required by owners during real estate transactions (e.g., the sale of a property) and is limited to arsenic, bacteria, and nitrate. There is limited understanding of groundwater quality in the Mid-Coast, which represents a data gap. Oregon's Domestic Well Safety Program (DWSP) partners with local health departments and water providers to promote proper maintenance and safety of domestic wells and improve local and state capacity to assess and manage risks associated with private wells. Lincoln County recently used a DWSP grant to perform well water testing.

Ecology

The ecology in the Mid-Coast was summarized in a report (Appendix B) as part of Step 2 of the planning process and was described as follows:

- The Mid-Coast supports a variety of habitats, with aquatic habitats being of particular interest because of their connection to human population water supply needs. Aquatic habitats include streams and springs, lakes, riparian areas, wetlands, and estuaries.

- The Oregon Conservation Strategy (OCS) identifies species of interest and areas of ecological importance in the different regions of the state. The Strategy identified 12 streams or estuary habitats as areas of ecological importance in the Mid-Coast because of the diverse habitats and species they support. For example, the Siletz Watershed has the only coastal origin population of summer Steelhead in Oregon.
- Aquatic species of interest and concern in the Mid-Coast include seven species of anadromous salmonids ((coho, Chum, Chinook (fall-run and spring-run), Steelhead (winter-run and summer run); sea-run Cutthroat Trout)), Green and White sturgeon, beaver, and three species of Lamprey (Pacific, Western River, and Western Brook). Oregon Coast Coho Salmon are listed as threatened under the Endangered Species Act, and large portions of the Mid-Coast are designated as critical habitat for coho. Green Sturgeon also are listed as threatened within the Southern Distinct Population Segment, which includes Yaquina Bay.
- Salmon are a keystone species in the Mid-Coast because of their influence on other plant and animal species. Salmon are an indicator species for habitat health because they require diverse quality habitats throughout their lifecycle that other species also require.
- Sources of habitat degradation include stream channel simplification and incision, warm stream temperatures, altered streamflow timing and watershed function, fine sediment and turbidity related to peak streamflow, and toxic and non-toxic pollutants.
  Aquatic habitat restoration efforts occur in the Mid-Coast to increase stream channel complexity and off-channel habitat, reduce fine sediment inputs and summer water temperature, address fish passage barriers, and encourage beaver dams, or similar structures.

Species and Habitat Needs

The Mid-Coast has many species that spend at least part of their life cycle in freshwater and are listed by state or federal agencies for protection or monitoring and/or are identified by the Oregon Conservation Strategy (OCS) as a "species of interest." Salmonids require unimpeded access to adequate amounts of cold water, large woody debris, deep pools, and spawning gravels to adequately support the various stages of their life cycle. Factors negatively impacting salmonids are low water availability (particularly in late summer and fall), impaired water quality (e.g., elevated stream temperatures), reduced stream complexity, and fish passage barriers (e.g., undersized culverts). Green and White Sturgeon are also species of interest in the Mid-Coast. Sturgeon are especially sensitive to estuary conditions, where they congregate during summer and fall.

Several species of lamprey (Pacific, Western River, and Western Brook) are also species of interest and require many of the same habitat characteristics as salmonids, yet have a very different life history.

Beavers are a species of interest because of their ability to build dams and create ponds that can store water, provide habitat for other wildlife, promote nutrient cycling, moderate flows, and recharge shallow alluvial aquifers, among other benefits. Beavers are also considered pests by many

landowners, and beavers are a constant topic of dispute. Consequently, the Oregon Department of Fish and Wildlife convened a beaver management workgroup.[13]

Other species of interest are invasive species, which are non-native species that have a disproportionate effect on the ecosystem that is typically negative, such as outcompeting and displacing native species and reducing species diversity.

Aquatic Habitats

Streams

Healthy stream habitats have adequate streamflow throughout the year, cool temperatures, high dissolved oxygen, low turbidity, riparian vegetation, and stream channel complexity. Stream health benefits from watersheds that store precipitation in springs, wetlands, beaver ponds, and in the streambanks/floodplains. In healthy streams, streamflow often overtops streambanks during flood events. When this occurs, floodwaters are slowed by streamside vegetation, providing refuge for aquatic species from high flows. Finer sediments, larger cobble, and boulders suspended in floodwaters are deposited in floodplains and store water that is later released into the stream channel. Stream health also benefits from a diversity of disturbances in the watershed, such as fire, debris slides, windstorms, and floods that increase habitat diversity. Floods move large substrate and large woody debris from upper reaches and tributaries to lower reaches within the watershed.

Stream temperature affects water chemistry and species survival. Shade, cool groundwater discharges into the stream, and water quantity moderate stream temperatures. Temperature and dissolved oxygen concentration are linked, and both parameters are critical to the reproduction and survival of resident and anadromous fish. Stream temperature affects biological triggers for salmon migration, spawning, and egg hatching. High stream temperatures and low dissolved oxygen as well as high turbidity can threaten fish survival at various life stages.

Riparian Habitats

Riparian habitat is at the interface between land and a river or stream. Plant and animal species may use all riparian habitats, or may specialize on a particular geomorphic surface within the riparian area. Rivers are constantly changing, eroding surfaces, and depositing material to create new surfaces. Similarly, vegetation communities in riparian areas change as they become inundated by floodwater, dried out because of a shift in channel location, or fall into the stream channel from bank erosion. Riparian habitat influences instream health, and upstream health influences downstream characteristics.

Estuary Habitats

Although the focus of this plan is on fresh water, the connection between freshwater and estuary habitats is critical to the life history of many fish and wildlife species in Oregon's Mid-Coast.

[13] https://www.dfw.state.or.us/wildlife/working_group/beaver_management.asp

The Mid-Coast has two types of estuaries: (1) drowned river mouth estuaries—river valleys that flooded about 10,000 years ago from sea level rise; and (2) tidally restricted coastal creek estuaries — streams that discharge directly into the ocean and experience inputs of ocean water during high tides. Mid-Coast estuaries, with the exception of the Depoe Bay Estuary and Yachats Estuary (which are small), are moderate in size and have large areas of salt marsh, eelgrass, and tidal flat habitat.

Estuaries provide a transition zone between freshwater and saltwater, and contain unique habitats that support a diversity of plants and animals adapted to a balance of saltwater and freshwater. Estuaries also filter pollutants, stabilize shorelines, and buffer human communities from storm surges. Estuaries are especially important for salmon during key points in their lifecycle. Estuary habitats are influenced by watershed size, geology, ocean tides, and freshwater-saltwater mixing. Although estuaries are dynamic systems that change with high tide and low tide, they are also sensitive to changes. Plant and animal communities in each estuary are adapted to a specific range of salinity. Changes to sea level, ocean currents, or freshwater inputs from streamflow can alter the balance of saltwater and freshwater and sediment dynamics, impacting plant and animal communities.

For more information about different types of estuaries, click here and here. The Coastal Atlas Estuary Data Viewer can be accessed here. For more information about individual estuary management plans, click here. During the initial development of this plan, several of Oregon's estuary management plans were being updated.

Wetland Habitats

The main types of wetlands in the Mid-Coast are aquatic beds, marshes, peatlands, wet prairies, scrub swamps, and forested swamps. One of the most important benefits that wetlands provide is their capacity to maintain and improve water quality. Water quality is supplied to downstream environments in several ways. By spreading out and slowing down flows, wetlands reduce erosion and prevent sediment being transported downstream where it might affect the ecology and productivity of other environments, in particular estuaries, seagrasses, and reefs. When healthy, wetland soils and vegetation can capture, process, and store nutrients and/or contaminants, and if the natural rhythms and flows of the wetland are undisturbed, the release of potential stressors, such as sediments, nutrients, acids, and/or metals from the soil can be prevented. Healthy wetlands can assist in removing harmful bacteria, and wetlands can also be important in the management of urban stormwater and effluent by improving the removal of nutrients, suspended material, and pathogens from water prior to its return to the environment.[14]

There are only several natural lakes in the Mid-Coast Planning Area. Devil's Lake (a natural lake near Lincoln City), Olalla Reservoir (formed by Olalla Dam on Olalla Creek), and Big Creek Reservoir

[14] https://www.environment.gov.au/system/files/resources/b7cd579b-89b0-4602-9ba8-118b4f55ab84/files/factsheet-wetlands-water-quality.pdf

(formed by Big Creek Dam on Big Creek). Valsetz Lake, which was formed by Valsetz Dam, was removed in 2012 on the South Fork Siletz River[15].

Wetlands are areas where water covers the soil, or is present either at or near the surface of the soil all year or for varying periods during the year, including during the growing season. Wetlands can be influenced by local geologic conditions that provide the parent material for soils, influence groundwater chemistry, and affect wetland vegetation. Wetlands in the Mid-Coast have either organic soils (muck, mucky peats, fibrous peats, or combinations of these) that are saturated perennially or mineral soils (sand, silt, and silty loams, sandy loams, or clay loams) that may be flooded in the winter and moist or dry in the summer. The main types of wetlands in the Mid-Coast, each with unique soils and vegetation communities, are aquatic beds, marshes, peatlands, wet prairies, shrub swamps, and forested swamps.

Mid-Coast Areas of Ecological Importance

ODFW established the Oregon Conservation Strategy (OCS), which identifies areas of ecological importance, or Conservation Opportunity Areas, where broad fish and wildlife conservation goals would best be met. The areas of ecological importance in the Mid-Coast, including the important habitat that exists in each location, are shown in Table 2.

Table 2. Areas of ecological importance.

Location	Important habitat
Alsea Estuary-Alsea River	Overwintering habitat for migrating waterfowl and rearing habitat for coastal salmonids
Beaver Creek	Diverse habitat from beach to old-growth forests
Depoe Bay Area	Productive rocky shore for fish and wildlife use
Devil's Lake	Peat marsh near mouth of Rock Creek, an important coho rearing stream
Salmon River Estuary-Cascade Head	Diverse habitats; includes Cascade Head Scenic Research Area; Habitat for three threatened and endangered species
Siletz Bay	Siletz estuary provides diverse and complex habitat
Siletz River	Sandstone/basalt river system with flashy winter river flow and private forestland
Yachats River Area	Narrow river channel with wide shallow mouth at ocean; steep coastal mountains
Yaquina Bay	Eelgrass beds, intertidal and subtidal shellfish beds, native oyster beds, and nesting eagles and ospreys along estuary

In addition to Conservation Opportunity Areas, ODFW is currently pursuing the development of a system of prioritization for streamflow protection and restoration. The assessment involves classifying stream reaches and watersheds based on current and future instream flows, summer water temperatures, degree of human impact, and species use. The prioritization system is expected to be completed in Spring 2022 and can be utilized to refine flow restoration and protection actions.

Effects of Land Use Activities on Aquatic Habitat

[15] https://www.americanrivers.org/wp-content/uploads/2020/02/DamsRemoved_1999-2019.pdf

Human-induced factors, such as habitat degradation, water diversions, and land use practices have contributed to the decline of Coho Salmon as well as other species. Salmon populations in streams with water quantity or water quality limitations, or simplified stream channels, are more sensitive to further habitat degradations that result in additional stress. Factors influencing regional habitat quality and salmon abundance include fluctuating ocean conditions, periodic droughts and floods, land use practices, and landslides. Land management practices can affect the rate at which fine sediments from the landscape are transported via runoff to streams and also can affect the magnitude of peak flows, which may combine to increase turbidity to levels that negatively affect aquatic species and impair water treatment for human consumption. The main effects to aquatic habitats from past land use activities in the Mid-Coast include:

- Reductions in stream complexity (e.g., channel simplification and incision from historically channelizing streams or removing riparian vegetation and large woody debris);
- Impairments or barriers to fish passage;
- Sedimentation (e.g., excess turbidity at periods of peak streamflow);
- Reduced water quality (e.g., warm stream temperatures from lack of riparian vegetation, reduced streamflow, and stream channel simplification); and
- Reduced water quantity or alterations in streamflow (e.g., altered timing and watershed function resulting from land management practices and streamflow withdrawals, both of which affect how water moves through the landscape).

The uncertainty that there is an adequate combination of voluntary and regulatory mechanisms to ensure success is limiting recovery of aquatic habitats. However, habitat and flow restoration projects are occurring throughout the Mid-Coast to improve habitat conditions and reduce further degradation. These projects include adding large woody debris into streams, increasing fish rearing areas off the main channel, supporting gravel substrate used for spawning and deep pools, increasing streamflow during key times of the year for fish species and in the summer to reduce settling of fine sediment inputs, maintaining riparian vegetation for shading (avoiding solar heat gain) and filtering, improving roads to reduce sediment inputs, and encouraging beaver dam formation.

Appendix C provides information on key locations and issues within each of the eight drainage basins in the Mid-Coast region.

Built Infrastructure in the Mid-Coast

Potable (drinking) water, wastewater, and stormwater systems are critical for the health of humans and the economy. Built Systems in the Mid-Coast region was summarized during Step 2 of the planning process. The entire report on water quality can be accessed here.

- The Mid-Coast has 52 potable water providers, 31 of which are required to have certified water treatment plant (WTP) operators. These 52 water providers include cities, water districts, RV and mobile home parks, and state parks.

- Few interconnections exist between water providers.
- Many cities and water districts implement water conservation measures, and nine have developed Water Management and Conservation Plans (WMCPs).
- The Mid-Coast has 14 entities (cities, resorts/hotels, and industries) with National Pollutant Discharge Elimination System (NPDES) permits to discharge treated wastewater.
- Discharge locations are the Pacific Ocean, Yaquina River and Bay, Siletz River and Bay, Schooner Creek, and Lint Slough. The discharge locations on streams are all downstream of potable water intakes.
- Information about wastewater systems and, particularly stormwater systems, is lacking.
- Cities are likely the only water providers managing stormwater systems.
- The Mid-Coast, like much of the rest of the United States, has aging infrastructure and insufficient revenue to address many needed upgrades. Consequently, water systems in the Mid-Coast must be managed for resiliency and recovery.
- Self-supplied water users across the planning area utilize a diverse range of supply, treatment, and distribution systems for handling domestic, agricultural, and industrial uses. Characterizing Self-Supplied infrastructure status and needs in the planning area is difficult because of the diversity of systems. Each of these systems is variably vulnerable to supply or treatment disruption, either through infrastructure failure, lack of maintenance, hydrologic extremes, or natural disasters. Residents and service providers in the region indicate a wide range of water infrastructure challenges for residents, agriculture, and industry.