Appendix A

Data Sources

This report includes information from the Department of Environmental Quality (DEQ), Bureau of Land Management, Oregon Health Authority, Oregon Department of Fish and Wildlife, U.S. Geological Survey, volunteer water quality monitoring data collected by Watershed Councils, Limiting Factors Analyses conducted for the Mid Coast Watershed Council to identify core coho habitat areas (MCWC is cited, but reports are prepared by Bio-Surveys, LLC and Sialis Company), and technical reports written by the Independent Multidisciplinary Science Team (IMST) to the Governor's Natural Resources Office regarding meeting the goals of the Oregon Plan for Salmon and Watersheds. Also, the Natural Resources Conservation Service prepares 8-Digit Hydrologic Unit Profiles that discuss water quality concerns.

Several IMST reports provide context on water quality regulations and areas of scientific agreement regarding water quality needs for salmonid recovery in western Oregon. For more information about IMST and a list of reports, visit the state's webpage for the Oregon Plan for Salmon and Watersheds. To access Limiting Factors Assessments, visit MCWC's Landowner Toolbox. It is important to note that many of these assessments were created several years ago and conditions may have changed in some areas due to completed restoration and changes in land use management. Up-to-date, comprehensive assessments of smaller watersheds were not readily available.

Oregon Health Authority (OHA) keeps a database of water providers and prepares Source Water Assessments that help water providers understand risks to their water supply. OHA's website was used to identify water providers and to access Source Water Assessments. These can be found at OHA's web page on Assessment and Water Quality Monitoring. DEQ maintains information regarding water quality in a number of areas. DEQ documents water bodies that are water quality limited, leaking underground storage tanks, resource conservation and recovery act (Superfund) sites, and point-source pollutant discharge locations and permits. Various DEQ databases were used to access this water quality information, including Oregon's 2012 Integrated Report Assessment Database and 303(d) List, Environmental Cleanup Site Information Database, and the Wastewater Permits Database. Additionally, DEQ is in the process of developing water temperature models and septic source analyses for the Mid Coast. This information is included for watersheds where it is complete and available.

To collect information regarding water quality monitoring and funding and fiscal needs for water quality projects, a table was sent to organizations managing water quality to be completed. DEQ's water quality monitoring database manager was also contacted for volunteer water quality monitoring information. For state agencies managing water quality, information was collected directly from the state agency and also from Secretary of State Audit Reports. For more information, visit Oregon's Local Government Audit Report Search.

All Cities with raw water treatment plants have monitoring information for water quality. Oregon Health Authority's Drinking Water Data Online search engine allows you to access data on public water systems, including water quality testing, violations, enforcements, public notices, and basic system information.

More Information:

- Analysis of continuous dissolved oxygen data from Oregon's Mid Coast Rivers in 2008 and implications for TMDL development
- Oregon Department of Environmental Quality Mid Coast Basin

Useful Tools and Resources		
Topic	**Link to Tool**	**Purpose**
Water Quality	Oregon Drinking Water Protection Program Interactive Map Viewer	Identify land uses and potential sources of pollutants using an interactive map tool. Locate drinking water source areas, water quality limited streams, etc.
Water Quality (Beaches)	Beacon 2.0 Beach Advisory and Closing On-line Notification	Provides an interactive map with information on advisories and monitoring data, historic water quality reports that include pollutant sources found and their potential sources (if identified), and monitoring frequency for each season. The mapping tool also includes contact information for the OHA staff associated with each beach.
Water Quality	Polluted Runooff: Nonpoint Source Pollution	United State Environmental Protection Agency website with resources about nonpoint source pollution.
Water Quality (Temperature)	Interactive Stream Temperature Scenario Viewer NorWest	View observed and modeled future stream temperatures. Find summaries of observed stream temperature.
Water Quality	Basin Summary Report: Statewide Water Quality Toxics Assessment Report	Includes an overview of toxins found in the Mid Coast from 18 locations sampled in April, September, and November, 2013.

Appendix B

Terminology

- **Dissolved Oxygen:** The concentration of oxygen dissolved in water from the atmosphere and from groundwater discharging into streams. It is measured in parts per million (ppm), mg/L or percent saturation. Areas where water moves fast and turbulent, such as in riffles, tend to contain high levels of dissolved oxygen while more slow moving areas such as pools typically contain lower levels. Temperature also affects dissolved oxygen, with colder water containing more dissolved oxygen than warmer water. Aquatic vegetation affects dissolved oxygen by increasing DO when plant vegetation grows and decreasing DO when bacteria consume oxygen while decaying plants (USGS, 2017). DO levels also fluctuate on a daily basis due to temperature and aquatic vegetation respiration. DO levels are important for macroinvertebrate and fish species. In Western Oregon, DEQ requires that in basins with Salmonids, freshwater shall not be less than 90% of saturation and seasonal, or less than 95% of saturation when spawning starts.

- **Temperature:** Solar radiation is the primary factor controlling stream temperatures. . Variability in stream temperature results from the interaction of atmospheric conditions (sun's position in the sky, air temperature, wind speed, cloud cover and humidity) and local conditions such as stream channel morphology, surrounding topography, streamside vegetation, and natural and human disturbances. Other characteristics of a stream such as its volume, surface area and velocity, which influence the heat capacity, moderate the rate of thermal energy exchange between the water and its environment. Temperature and dissolved oxygen concentration are linked, and both parameters are critical to the reproduction survival of anadromous fish. Temperature affects water chemistry and impacts the species that can survive in the water. Temperature also affects biological triggers for salmon migration, spawning, and egg hatching. In lakes, cold water sinks and warmer water floats, creating layers of water with similar temperature gradients. Temperature stratifications do not always follow this simple pattern, however, and depend on seasonal temperatures and lake depth (USGS, 2017; Bladon et al., 2016).

- **Turbidity:** A measure of how clear water is, and more specifically, is "an expression of the amount of light that is scattered by material in the water when a light is shined through the water sample," (USGS, 2017). Turbidity is caused by clay, silt, inorganic and organic matter, algae, plankton, and other microscopic organisms (USGS, 2017). High turbidity levels limit plant growth, are an indicator for pathogens, and can lead to sedimentation that harms fish habitat. Turbidity is measured in nephelometric turbidity units (NTUs) (it is also measured in FTU's and FBU's). Turbidity varies naturally in different stream systems depending on the prevalent geology and soils in the system. High turbidity typically occurs during high flow events, but is also affected by the time of year and landscape characteristics. Turbidity is generally low during the summer during the absence of high flow events. DEQ completed a six-year study monitoring ambient turbidity levels in all or Oregon's eight regions and found that median turbidity levels are approximately 1 NTU (ODEQ, 2014). High turbidity levels can also be linked

to high bacteria counts because the nutrients and particles in suspended sediment provide habitat for bacteria.

- **Bacteria:** The EPA sets three main types of bacteria standards, including enterococcus for estuarine systems, E. coli (*Escherichia coli*) for freshwater systems, and fecal coliform standards for shellfish. Enterococcus concentration predicts illness in coastal waters due to contact recreation such as swimming or surfing. E. coli is a bacteria that can be used as an indicator for the presence of other bacteria that make humans and animals sick through contact recreation. The most common source for E. coli is human or animal waste, especially on-site sewage disposal systems (OSDS or Septic Tanks) and overflow from municipal wastewater treatment plants during high flow events. Fecal coliform levels indicate the risk of getting an illness from ingesting shellfish, clams, oysters, or mussels (ODEQ3, 2017). The Oregon Health Authority administers the Oregon Beach Monitoring Program, which posts advisories when bacteria levels exceed EPA standards for recreation.

- **Specific conductance:** A measure of the water's ability to conduct electricity, which is directly related to the amount of salinity in water. Specific conductance is typically measured in units called microSiemens (uS/cm). Distilled water is between 0.5 to 2 uS/cm. Salinity can increase from storm surges, pollution, road salt, or even failing septic tanks. Salinity can also increase with saltwater intrusion, which is the movement of saltwater into inland stream and groundwater systems, can occur from sea level rise, storm surges, excessive pumping of groundwater aquifers with certain characteristics. Salinity levels vary naturally based on geologic conditions, but significant changes in salinity can affect plant communities, and drinking water quality (USGS, 2017)

- **Total Maximum Daily Load (TMDL):** "The calculated pollutant amount that a waterbody can receive and still meet Oregon water quality standards," (ODEQ2, 2017). To determine water quality standards, DEQ takes into account the total amount of pollutants from point sources and non-point sources as well as background water conditions.

- **Load or loading:** An amount of man-made or natural matter or thermal energy that is introduced into a receiving water (USEPA, 2017).

- **Hazardous waste:** Waste with properties that make it dangerous or capable of having a harmful effect on human health or the environment (USEPA, 2017). Hazardous waste is sometimes referred to as "toxic waste."

- **Biological criteria**: A criteria of water quality that is measured by the aquatic life present in a water body. Macroinvertebrates, which are small, bottom-dwelling insects such as caddisflies and mayflies, are sensitive to dissolved oxygen, temperature, sediments, and other water characteristics. They serve as indicators of water quality.

- **Biosolids:** The solids derived from primary, secondary, or advanced treatment of domestic wastewater that have been treated through one or more controlled processes to significantly reduce pathogens and reduce volatile solids or chemically stabilize solids to the extent that they do not attract vectors. Almost all the biosolids generated by domestic wastewater treatment facilities in Oregon are applied to the land for agriculture, silviculture, and horticulture use. All wastewater facilities operate under either a National Pollutant Discharge Elimination System or Water Pollution Control Facility permit (ODEQ1 2017).

- **Point source pollution:** Point source pollution comes from any "discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft from which pollutants are or may be discharged. This term does not include agricultural storm water discharges and return flows from irrigated agriculture," (USEPA, 2017).

- **Nonpoint source pollution:** Nonpoint source pollution is any pollution that does not meet the legal definition of point source pollution.

Appendix C

Department of Environmental Quality

Water Quality Monitoring Programs

Watershed Monitoring (TMDLs development and implementation):

DEQ's Watershed Monitoring conducts water column and physical habitat monitoring in order to identify "current conditions" for Total Maximum Daily Loads (TMDLs) development and implementation in waters of the state that have been identified as "impaired" and placed on the Clean Water Act Section 303d list (Category 5). These monitoring projects are conducted based on the spatial and temporal scale of the impairment, including: segment (specific location or river miles), catchment or watershed, beneficial use and season. Methods and results of these monitoring projects and analyses (e.g., statistical or physical models) are documented in the draft TMDLs issued for public review. Preliminary reports for review by stakeholders, including advisory committees, are prepared in advance of issuing TMDLs. The following link is for the February 2017 MidCoast TMDL status update that was sent to the Local Stakeholder Advisory Committee: http://www.oregon.gov/deq/FilterDocs/LSACmemo0217.pdf. For more information about TMDLs and specific information for the MidCoast basin, see: http://www.oregon.gov/deq/wq/tmdls/Pages/default.aspx. At this time, all technical documents prepared for the Midcoast TMDLs are preliminary. Many of these documents have received an initial TMDLs advisory committee review and comment.

Statewide Toxics Monitoring Program:

DEQ's Statewide Water Quality Toxics Monitoring Program collected and analyzed water samples between 2008 and 2013 in order to establish baseline data on the types and prevalence of toxic chemicals in waters of the state. DEQ tested for more than 500 different chemicals in Oregon rivers and estuaries. DEQ collected samples from 177 sites within 15 water basins throughout the state. Samples were collected in 2013 at 18 sites in the Midcoast Basin in the spring, summer and fall. Basin Summary Reports are found here: http://www.oregon.gov/deq/wq/Pages/WQ-Monitoring-Statewide.aspx

Chemicals detected in the Midcoast Basin included:

- Consumer product constituents (bis(2-ethylhexyl)adipate, Carbamazepine, DEET, Sulfamethoxazole, Venlafaxine)
- Current-use herbicides Atrazine, Diuron, Fluridone, Trifluralin
- Metals, including arsenic, barium, iron, copper, lead, manganese, nickel, zinc, and chromium
- Legacy pesticides
- Plant and animal sterols (detected at all sites)
- Combustion byproducts (Anthracene, Chrysene, Fluoranthene, Phenanthrene, Pyrene)
- Flame retardants (classified as PBDEs)

DEQ has not identified the specific source(s) of most of these chemicals. General sources include:

- Increased rates of soil erosion and land disturbance exacerbate the delivery of arsenic, mercury and other metals naturally occurring in soils and underlying geologic formations.

- Consumer product constituents and animal sterols are indicative of domestic wastewater sources. Animal sterols suggest livestock and wildlife sources.
- Atrazine is labeled for use in forestry and for agricultural crops.
- Fluridone is an aquatic herbicide often used to control invasive plants.
- Trifluralin is a commonly used pre-emergent herbicide.

Statewide Biomonitoring Program:

Oregon's Statewide Biomonitoring Program is primarily collaboration between DEQ and ODFW and implemented under the Oregon Plan for Salmon and Watersheds. The program was recently expanded to include partnership with federal natural resources agencies. Funding has been variable for the program and is currently inadequate to fully implement the biomonitoring as designed. Based on results from 1997-2007 & 2012, and subsequent comparison to reference site conditions, a number of stream segments were identified as "impaired" in the MidCoast Basin and placed on Oregon's 303(d) list in the 2010 Assessment cycle by U.S.EPA. Additional sites and stream segment are proposed for placement on Oregon's 303(d) list by EPA in the 2012 cycle (not yet final).

Oregon Beach Monitoring Program (OBMP):

DEQ partners with the Oregon Health Authority (OHA) to monitor the marine waters along Oregon's coastline under the Oregon Beach Monitoring Program (OBMP). The monitoring is funded by annual grants from EPA. Marine waters are tested for enterococcus, a fecal indicator bacterium for the presence of harmful microbes. Enterococcus is present in human and animal waste and can enter marine waters from a variety of sources such as streams and creeks, storm water runoff, animal and seabird waste, failing septic systems, sewage treatment plant spills or boating waste.

Since the program began, a number of samples along the central coast beaches have exceeded OHA's criterion for triggering a recreational water contact health advisory. This has resulted in Section 303(d) listings. Most advisories have been associated with development near urban or higher rural residential density (e.g., Agate Beach, D-River, Nye Beach, and Seal Rock). In order to address these water quality problems, DEQ is evaluating monitoring techniques (e.g., chemical tracers, fluorescence, microbial source tracking) that are indicators of human sources of bacteria, particularly septic sources, in order to address the highest potential health risks. DEQ will be working with local partners and governmental entities to implement these tools in the next few years in both developed and rural landscapes. The Surfrider Foundation's Blue Water Task Force also conducts beach and freshwater monitoring. That data is reviewed by the OBMP. More information including data access portal is found here: http://www.oregon.gov/deq/wq/Pages/WQ-Monitoring-Beach.aspx

Volunteer Water Quality Monitoring (VM program):

DEQ supports community based organizations (CBOs) in developing and implementing locally based water quality monitoring programs. DEQ utilizes results from VM programs to augment data collected for assessing water quality status and TMDLs development. VM programs are often supported, in part, by Oregon's Section 319 Nonpoint Source grant program. The CBOs

have a variety of objectives for their VM programs, including collecting baseline information, prioritizing further assessment and restoration efforts, and evaluating effectiveness of management actions (e.g., agricultural best management practices) over time. Where the VM data was used as a basis for 303(d) listing, DEQ's TMDLs watershed monitoring program often conducts confirmatory sampling and/or analyses. In the MidCoast Basin, four CBOs have DEQ-supported VM programs[1]. These programs produce information useful in evaluating and understanding water quality status and trends because: (a) the monitoring networks are spatially distributed to assess patterns in relation to land use and major tributaries, and (b) for many locations, monitoring has been conducted long enough (or nearly so) to produce data to evaluate both seasonal and annual trends. DEQ and the CBOs periodically review these monitoring plans (and the data produced) in assessing water quality status, developing restoration priorities, evaluating revisions to sampling and analysis plans, and in anticipation of future OWEB grant cycles along with other fundamental considerations.

Groundwater Monitoring:

DEQ implements a Groundwater Monitoring program in collaboration with OHA and other partners. For more information, see:
http://www.oregon.gov/deq/wq/programs/Pages/GWP.aspx#groundwater

DEQ's Clean-up and underground storage tanks (UST) program collects and evaluates groundwater monitoring data from individual industrial sites or private property where contamination is likely or known to exist. For more information, see:
http://www.oregon.gov/deq/Hazards-and-Cleanup/env-cleanup/Pages/ecsi.aspx

National Aquatic Resource Surveys

These surveys are funded by U.S. EPA and designed to gather data needed to provide statistically valid inferences about the overall condition of lakes or rivers and streams in Oregon (statewide) and nationally. For more information, see:
http://www.oregon.gov/deq/wq/Pages/WQ-Monitoring-NARS.aspx

[1] Salmon-Drift Creek Watershed Council (SDCWC), Lincoln Soil and Water Conservation District (LSWCD), Siuslaw Watershed Council (SWC), Devils Lake Water Improvement District (DLWID)

Appendix D

Additional Water Quality Information

Salmon River Watershed

Turbidity

While none of the streams in the Salmon River Watershed are listed for turbidity, the Salmon Drift Creek Watershed council has listed turbidity as one of their water quality concerns.

Dissolved oxygen

Fraser Creek and Rowdy Creek, which flow into the Salmon River Estuary, are not currently listed as water quality limited, but there have been discussions regarding a possible listing for dissolved oxygen criteria on these creeks (personal communication 7/31/17, Paul Robertson).

Fecal indicator bacteria

According to the Salmon Drift Creek Watershed Council, bacteria impacts are broad in the Salmon River Watershed due to rural residential developments with onsite sewage disposal systems (septic, OSDS). The Salmon River is listed for fecal coliform bacteria year-round, but a TMDL has not yet been developed.

Other

Salmon and Drift Creek Watershed Council monitors water quality in the area and found that pH was lower than 6.5 at all of their monitoring sites in late summer and fall in 2009 (SDCWC, n.d.). Devil's Lake has experienced algal blooms since the 1950's and algae bloom advisories are frequently issued for the lake during the summertime. In 2014, the lake was closed to recreation due to a harmful blue-green algae bloom (Oregonian, 2014). In 2008, a toxin-focused cyanobacteria and harmful algal bloom monitoring program was started in Devil's lake to monitor the highly impacted freshwater system. The Devils Lake Water Improvement District monitors water quality today for Microsystin, a liver toxin, which is often the most common toxin. Other toxins of concern for recreational water quality standards include neurotoxins (anatoxin-a, cylindrospermopsin, and saxitoxin), cells, and toxic species in scum (DLWID).

The Salmon Drift Creek Watershed Council is currently monitoring optical brightener, a product that is used in clothes and many laundry detergents, in several streams in the Salmon River Basin. The focus of this research is to determine whether optical brightener can be an indicator of human influence and help to locate the sources of other pollutants, such as E. coli.

Siletz River Watershed

Temperature

The Siletz River from mile 39 to mile 65 has documented temperature concerns in the summer and SDCWC 2016 monitoring found that temperatures frequently exceeded the 18C threshold on the Siletz River from below Moonshine Park to below Cedar Creek in August and increase approximately 3 degrees Celsius from Yeck's down to Cedar Creek. Drift Creek, which has exceeded its temperature requirement of 17.8 degrees for rearing, is designated by USFS as a Tier 1 Key Watershed, meaning that it contributes to conservation of at-risk salmon populations and has a high potential to be restored. The Salmon Drift Creek Watershed Council has measured average maximum temperatures between 18 and 20 degrees Celsius (64.4 to 68

Fahrenheit) for two months in the summer. Salmon Drift Creek Watershed Council also considers Drift Creek to be a high priority restoration area (Robertson & Katen, 2017). Steer Creek, a tributary to Rock Creek, which feeds into the Siletz is not on the 303(d) list of water quality limited streams, but has temperature concerns, according to the MCWC.

Turbidity

Sedimentation and high stream temperatures are a concern throughout the Siletz watershed, especially in the South Fork Siletz sub-watershed. There is no defined turbidity parameter, however turbidity concerns were added to the DEQ database for the Siletz River between mile 39 and 65. The current criteria requires that "the creation of tastes or odors or toxic or other conditions that are deleterious to fish or other aquatic life or affect the potability of drinking water or the palatability of fish or shellfish may not be allowed," (DEQ, 2012). In the Siletz-Yaquina watersheds, there are a total of 492.71 stream miles with erodible soils, comprising 34% of soils. In Tangerman Creek 86% (2.4 miles) of soils have high soil erosion potential (DEQ, 2016). Shallow landslide risk is high in the central Siletz Basin, adding additional potential sources of turbidity (MCWC, 2001).

Dissolved Oxygen

SDCWC collected a comprehensive set of dissolved oxygen data between August 23 and August 28th from below Moonshine Park to below Cedar Creek, finding that day to night fluxes in DO increase from upstream to downstream.

Fecal indicator bacteria

In 2005, an alert was issued at the City of Siletz where significant bacteria concentrations were detected. The City of Siletz has not had any violations of drinking water standards since 2005. The Salmon Drift Creek Watershed Council has sampled total coliform in Drift Creek and found numbers occasionally above 2,400. Thompson Creek, which flows into Devils' Lake, has been listed for fecal coliform since the 1990's (personal communication 7/31/17, Paul Robertson). The first two miles of the Creek is currently listed for fecal coliform during all seasons and a TMDL needs to be developed.

Devil's Lake Watershed (A sub-watershed of the Siletz River Watershed)

Temperature

Lincoln City holds a water right on Rock Creek, which it now shares with the Confederated Tribes of the Siletz Indians for use at the Chinook Winds golf course..According to a Limiting Factors Assessment completed for the Mid Coast Watersheds Council, thermal problems exists from Devil's Lake to river mile 1.6 where land use has impacted wetland habitats and altered flow regimes and sections of marshland are exposed to direct sunlight (MCWC, 2003). A more recent assessment of Rock Creek was not available.

Biological criteria

Devil's Lake Improvement District monitors E. coli levels and harmful algal blooms in Devil's Lake and issues a weekly report of E. coli levels in the lake and issues warnings when water quality is low. In 2008, the Improvement District ranked septic tanks as the number one

priority to address excess nutrients in the lake. According to the Improvement District, approximately 33% of homes have septic systems that were installed before 1974, when permits were first required and approximately 50% are beyond their useful lifespan of 25 years. The Improvement District has mapped the distribution of septic systems along the lake and initiated a Septic Tank Revitalization Program in 2009 to inform landowners about septic tank maintenance and water quality concerns (Devil's Lake Improvement District, n.d.). Additionally, Lincoln City has an ongoing plan to provide small diameter, low-pressure sewer lines to properties on the East side of the lake that are currently on septic systems.

The Salmon Drift Creek Watershed Council (SDCWC) conducted microbial source tracking on Thompson Creek using DNA-based fingerprinting of bacteroides, an anaerobic bacteria, which is found alongside E. coli and which can determine the source locations for specific bacteria. Some of the bacteria from Thompson Creek was from human, canine, and avian sources (personal communication 7/31/17, Paul Robertson). The SDCWC is currently monitoring D-River, a river which flows 120 feet from Devil's Lake into the ocean (Oregon State Parks, n.d.), using the same monitoring technique and has found sources from seagulls, pigeons and crows, which are fed by many D-River Recreation Site visitors. Panther Creek and Rock Creek have not been listed for bacteria, but the SDCWC has monitored spikes of E. Coli above 2,400 in both systems, which they expect is from failing septic systems on Panther Creek and from the sewer treatment plant on Schooner Creek. DEQ is in the process of assessing potential septic risk in the Panther Creek watershed using detailed land ownership information, but results are not yet complete (personal communication, David Waltz, DEQ, 8/29/17).

Schooner Creek (A Tributary to Siletz River Estuary)

Schooner Creek (near Lincoln City) is a source water for Lincoln City that drains directly into the Pacific Ocean. The Creek is listed for temperature concerns for rearing from its mouth, to mile 9.7, but does not have a TMDL. Seasonal temperature in the creek is between 12 and 19 degrees Celsius (53.6 to 66.2 degrees Fahrenheit) in the summer leading to portions of the stream exceeding the 17.5 degree threshold for salmon rearing. South Fork Schooner Creek, a tributary to Schooner Creek (near Lincoln City) is also listed for exceeding the 18 degree 7-day average maximum for rearing and migration. Schooner Creek is not listed for turbidity, which ranges from 1.0 to 2.5 NTU (Lincoln City, n.d.). However, turbidity increases drastically during high flow events and during moderate rainfall events, reaching > 200 NTU (Lincoln City, n.d.).

Bacteria in Schooner Creek are a concern. Schooner Creek is listed as water quality limited due to E. coli concentrations during the summer. This may be related to sewage disposal challenges. There is a residence approximately 2 miles away from the North Fork drinking water intake for Lincoln City, but there are no residences above the South Fork intake. 17 residences are located within 50 feet of the main stem of Schooner Creek between the City's intake and the confluence of North and South Fork Schooner Creek and 11 residences between 50 and 100 feet of the stream (Lincoln City, n.d.).

Yaquina River Watershed

Turbidity/fine sediment

DEQ has not listed any streams in the Yaquina River Basin as water quality limited due to turbidity or fine sediment. The only TMDL for turbidity in the Mid Coast is on the Siletz, and the criteria are not established. Water quality monitoring in the Yaquina River Basin completed by Lincoln SWCD ranges from 0 to 103 NTU.

Alsea River Watershed

Water quality concerns in the Alsea River Watershed include suspended sediments and turbidity, water temperature, aquatic habitat suitability, and soil erosion from streambanks (NRCS, 2005). According to the NRCW 8-Digit Unit Hydrologic Profile for the Alsea River Watershed, land uses associated with these concerns include agriculture (grazing and pasture crops) and forest management (NRCS, 2005). Specifically, increases in stream temperature may be due to inadequate riparian shade and stream channel widening (NRCS, 2005). As of 2005, there was only one permitted Confined Animal Feeding Operation in the watershed with 50 permitted animals. The conversion of land from timber production to Christmas tree farming is also a concern due to increase in invasive, noxious weeds and poor management of small acreage areas (NRCS, 2005).

Beaver Creek Watershed

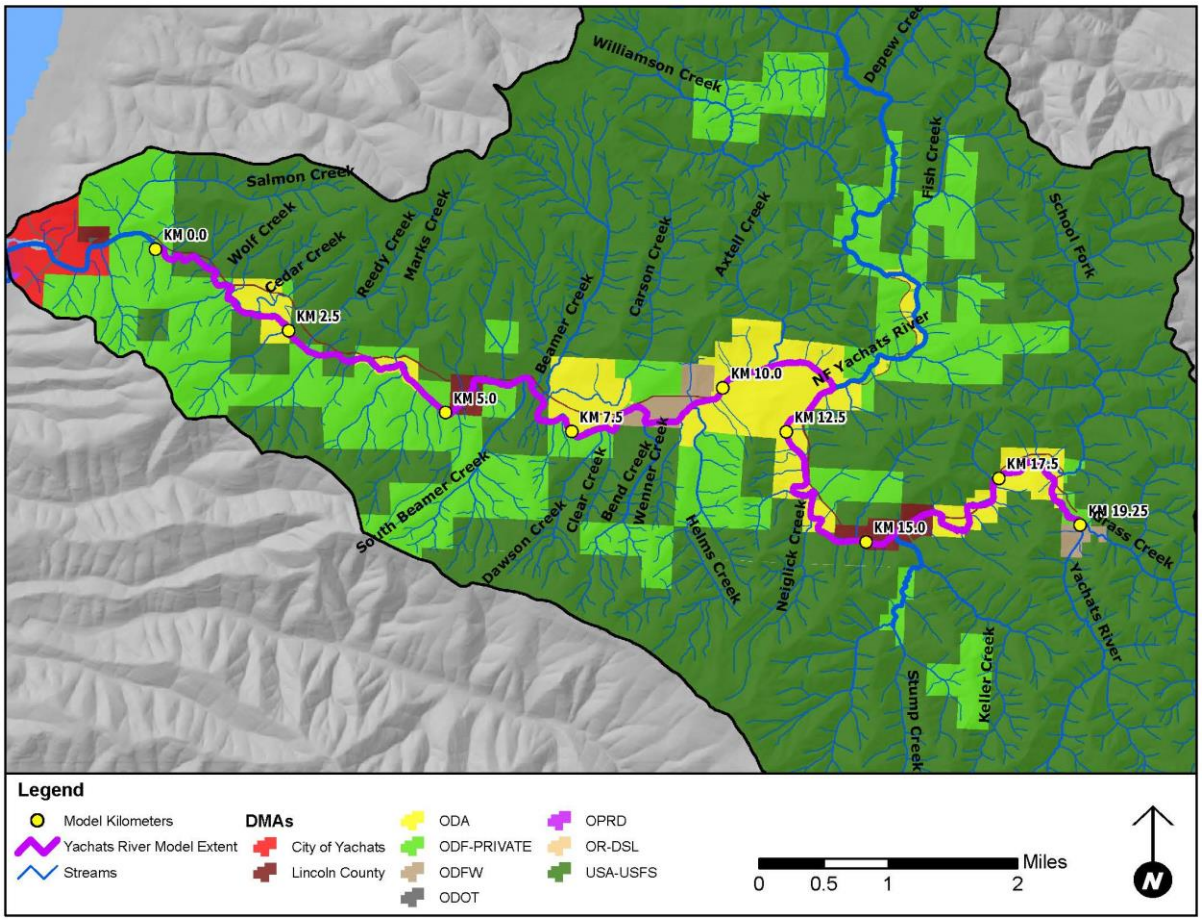
Beaver Creek, a tributary to the Pacific Ocean near Ona Beach sustained daily maximums that exceeded the 64 degree F threshold for salmonids for 37 consecutive days between July 14th and August 20th, according to 1994 monitoring (MCWC, 2003). USGS monitoring in Beaver Creek Estuary between 2010 and 2012 found that water temperatures exceeded water temperature standards at their Hwy 101 gage on 25% of monitoring days and exceeded standards on 20% of days at their South Beaver Creek monitoring site. They found no exceedances at a third monitoring site on NW beaver Valley Drive (Stonewall, 2016). High salinity occurs in Beaver Creek and Beaver Creek Estuary.

Yachats River Watershed

The Yachats River from its mouth to mile 13 is listed for temperature concerns in the summer months and a TMDL is needed. In July 1997 an Aquatic Habitat Inventory survey recorded temperatures in the main stem at the mouth of tributaries. According to a Habitat Suitability Assessment, monitoring records assessed found that temperatures usually exceed 14 degrees Celsius (57.2 degrees Fahrenheit) and the tributaries do not provide cool water input (MCWC, 2003). Main thermal concerns are on Williamson Creek and the main stem below, which contain some areas exposed to direct sunlight.

DEQ is currently developing thermal models for temperature throughout the Mid Coast and has developed a heat source model for the Yachats Watershed. They are evaluating whether waterbodies are achieving water quality temperature standards, modeling thermal inputs from tributary inflows, and assessing model performance by comparing observed stream temperature data from multiple organizations with predicted stream temperature data. DEQ is examining land use (or zoning) & land cover characteristics at both the stream segment and watershed scales to understand the potential relationships between land cover and temperature (See Figure below)[1].

[1] The Heat Source model is used to illustrate where criteria are met and where exceeded based on actual data; the calibrated model is then used to manipulate factors that could potentially be changed to impact that relationship (i.e. , shade, flow, morphology) and evaluate whether temperature can be improved through various management strategies.


Williamson Creek
Depew Creek
Salmon Creek
Wolf Creek
Cedar Creek
Reedy Creek
Marks Creek
Beaver Creek
Carson Creek
Axtell Creek
Fish Creek
School Fork
KM 0.0
KM 2.5
KM 5.0
KM 7.5
KM 10.0
KM 12.5
KM 15.0
KM 17.5
KM 19.25
NF Yachats River
South Beaver Creek
Dawson Creek
Clear Creek
Bend Creek
Wenner Creek
Helms Creek
Neiglick Creek
Grass Creek
Yachats River
Keller Creek
Stump Creek
Legend
Model Kilometers
Yachats River Model Extent
Streams
DMAs
City of Yachats
Lincoln County
ODA
ODF-PRIVATE
ODFW
ODOT
OPRD
OR-DSL
USA-USFS
Miles
0
0.5
1
2
N

Appendix E

Drinking Water Providers
Using Groundwater
in the Mid-Coast

Drinking Water Providers Using Groundwater: Salmon River Watershed	Number of Connections	Treatment Class	Treatment
Riverbend Park Water System	78	None	
Echo Mountain Park	143	None	
Salmon River RV Park	45	None	
Road House	2	None	
Salmon River Mobile Village	38	None	
Guptil Subdivision	20	None	
Hiland WC – Westwood	81	None	Hypochlorination; calcite contractor
Westwind Stewardship Group	5	None	
Boulder Creek WS/Rose Lodge	140	1	Microscreening, filtration membrane, hypochlorination
Grand Ronde Community Water Association	950	None	

Other Water Providers Using Groundwater	Number of Connections	Treatment Class	Treatment
Lincoln City Resort	121	None	
Lincoln City KOA	81	None	Hypochlorination
Boiler Bay RV Park	28	None	
Otter Rock Water District	139	None	
Carmel Beach Water District	17	None	Hypochlorination, GWR r-Log Virus Compliance Mon

Drinking Water Providers Using Groundwater: Siletz River Watershed	Number of Connections	Treatment Class	Treatment
Coyote Rock RV Resort & Marina	10	None	Hypochlorination
Toketee Illahee RV Park	2	None	Hypochlorination; ph/alka adj-calcite contactor
Lincoln County Parks-Moonshine Park	2	None	Activated carbon; hypochlorination
Logsden Neighborhood Church	1	None	Hypochlorination

Drinking Water Providers Using Groundwater: Yaquina River Watershed	Number of Connections	Treatment Class	Treatment
Olalla Valley Golf Course	2	None	Activated carbon; hypochlorination
Lincoln County Parks: Elk City Park	1	None	Hypochlorination
Eddyville Charter School	No	None	Hypochlorination; ph/alka adj-calcine contactor
Lucas Pioneer Ranch & Lodge	2	Non	Ultraviolet radiation
OPRD: Ellmaker State Park	1	None	Hypochlorination
Fir Ridge Campground	31	None	Ultraviolet radiation

Drinking Water Providers Using Groundwater: Yahcats River Watershed	Number of Connections	Treatment Class	Treatment
USFS: Cape Perpetua Visitor Center	3	None	Hypochlorination

Drinking Water Providers Using Groundwater: Alsea River Watershed	Number of Connections	Treatment Class	Treatment
Kozy Acres Water System	19	None	Hypochlorination
Riverside Mobile Park	22	None	Hypochlorination
Westwood Village	81	None	Hypochlorination; ph/alka adj-calcite contactor
USFS Mike Bauer Picnic Grounds	1	None	Hypochlorination
USFS Blackberry Campground	11	None	Hypochlorination
Fall Creek Water District	46	None	Hypochlorination
Alsea County Service District	83	None	Hypochlorination
Benton County Parks Salmonberry Park	3	None	
Crooked Creek Trailer Park	9	None	Hypochlorination