

Chapter 1: Water Quality Action Plan

Poor water quality can impact human health as well as aquatic life. Bacteria, toxics (e.g., metals, pesticides, microplastics, etc.), sediment (in the form of turbidity), and nutrients are pollutants that can directly affect human health. There are three general ways in which people can be exposed to these pollutants: drinking (surface water and groundwater sources), recreational contact (swimming, boating, and fishing), and the consumption of fish, oysters, clams and crabs.



Fish and aquatic life can also be affected by poor water quality. Elevated temperature, toxics, sediment, low dissolved oxygen, microplastics, and other emerging water quality concerns in the water column can adversely affect aquatic life in various ways. Aquatic life is in direct and constant contact with water pollution and therefore can be significantly impacted by it.

Human Health

Fecal bacteria (bacteria that occur in the guts of warm blooded animals and humans) concentrations in water are used as indicators of potential for spread of water-borne diseases. When bacteria levels exceed the water quality standards, people experience an elevated risk of exposure to pathogens from direct contact with water or from ingestion of food products, such as shellfish, which have been exposed to contaminated water. Tillamook and Netarts Bay support commercial oyster operations. Tillamook Bay also supports limited commercial clam harvesting. Nehalem, Tillamook, Netarts, Sand Lake, and Nestucca provide opportunities for recreational clamming. Commercial shellfish harvesting in Tillamook Bay is regulated by Oregon Department of Agriculture (ODA) and is periodically closed due to bacterial pollution. Streams, rivers, sloughs, and estuaries regularly exceed recreational use contact criteria for bacteria. Additionally, water contact advisories occur periodically at north coast beaches due to bacterial contamination. Sources of the contamination can include agricultural and dairy operation runoff, failing on-site septic systems, and urban runoff.

In addition to direct exposure to contaminated water while recreating, human health can be affected by contaminated drinking water. A majority of the drinking water in the north coast of Oregon comes from surface water streams and has minimal treatment. These coastal surface drinking water source streams are periodically affected by high turbidity levels which may limit a treatment plant's ability to process water or may form toxic pollutants when organics interact with treatment processes. Groundwater wells, used as drinking water sources to a lesser degree, are vulnerable to bacteria and nutrient contamination. Pesticides are an on-going concern related to surface drinking water source streams on the coast. However, preliminary investigations have shown limited impacts from pesticides. Other toxics such as arsenic have been identified in shellfish (softshell clams) at levels of concern. However, agencies have determined with proper preparation of clams, exposure to arsenic can be avoided.

Aquatic Life Requirements

Coho and Chinook salmon, steelhead and cutthroat trout are present throughout most of the streams, sloughs, and estuaries of the TEP focus area. Coho are currently listed as a threatened species and steelhead are listed as

a species of concern. Chum salmon also occupy the lower reaches of some streams, rivers and estuaries. All of these fish have specific habitat requirements and many of the water quality criteria adopted by the State of Oregon are based on providing salmon with their specific life-cycle requirements.

Temperature, sediment, nutrients and dissolved oxygen have been identified as pollutants that affect these fish and other aquatic life when not at appropriate levels. Micro-plastics and other emerging pollutants of concern have the potential to negatively impact fish and aquatic life. Conditions that contribute to elevated water temperature are inadequate streamside shading and vegetation, discharges of warm water from urban and rural landscapes, and point source discharges from industrial or municipal facilities. High temperatures and excessive nutrient and sediment loads can reduce the amount of oxygen in the water. Threatened and sensitive salmon species rely on cold oxygenated water to thrive.

Carbon from the atmosphere has been dissolving in the Pacific Ocean at an ever-increasing rate, changing its acidity (pH). This condition is termed ocean acidification. In addition, nutrient rich and oxygen poor waters with lower pH levels are driven up to the coast of Oregon by seasonal currents. These conditions, combined with nutrient runoff, coalesce in estuaries to negatively affect shellfish, and other aquatic life. The commercial aquaculture and shellfish in general, depend on specific acidity in estuary habitats to grow and mature.

The Challenge

The State of Oregon, TEP, and its partners have determined that the following pollutants are of primary concern in the watersheds of TEP's focal area: bacteria, dissolved oxygen, sediment, and temperature. Toxics and nutrients have been identified as pollutants of possible concern, while the impacts of ocean acidification are also a concern. While there has been progress made on addressing bacteria pollution in TEP's focal area, all these parameters remain at levels that are having a negative impact on people and aquatic life.

Existing Efforts in Water Quality

The State water quality standards have been established to be protective of the most sensitive beneficial use. The Oregon Department of Environmental Quality (DEQ) has included the following water quality parameters on the State's 303(d) list of impaired waters: temperature, bacteria, dissolved oxygen, and sediment. In the early 2000s, after the completion of the TEP's 1999 CCMP, DEQ developed Total Maximum Daily Loads (TMDLs) for temperature and bacteria in the North Coast Subbasins (Nehalem), Tillamook Bay, and Nestucca Bay Watersheds. Each TMDL includes a Water Quality Management Plan (WQMP) that outlines how to implement the TMDL for land uses or categories contributing to water pollution. The 1999 CCMP formed the basis for the Tillamook Bay TMDL WQMP. With TEP's focal area expansion, the WQMP from the Nestucca and North Coast Subbasins TMDLs have guided the strategies included in the CCMP Revisions.

In 2011, DEQ completed the North Coast Basin Water Quality Status and Action Plan report based on EPA's Watershed Approach strategy. This report summarized DEQ's knowledge of the water quality conditions and includes an overview of implementation for the North Coast Subbasin, which encompasses the entire TEP focal area. The Action Plan identified issues and gaps that DEQ uses to guide its management of water quality in the future. This report summarizes past management history, water quality studies and assessments. TEP has partnered in the acquisition of much of the information that formed the basis for this assessment. The actions identified in this report have been used to guide the development of issues and actions outlined in the water quality sections of the CCMP, including the goals, objectives, and actions identified below.

The TMDLs and Watershed Approach have identified the water quality issues in the area and outlined strategies to address them. Many Federal, State and local partners have developed and are implementing programs that work to address these water quality issues. TEP has incorporated the most relevant and effective efforts of its partners, alongside its own work, into the Water Quality Actions in the CCMP Water Quality chapter. Actions identified in this chapter are generally designed to address a specific water quality parameter or a suite of



parameters. However, actions that improve one water quality parameter will also provide improvements to additional water quality parameters. TEP has categorized the benefits of these actions as having a “Primary” and “Related” water quality parameter benefit. An example of this benefit category is temperature and dissolved oxygen. Actions taken to limit high water temperatures will also improve dissolved oxygen given that cooler water can hold more oxygen. This distinction is outlined in the Objectives section.

Watershed Commonalities and Variations

It is important to note that water quality issues and strategies (TMDLs and Watershed Approach) and partners’ jurisdictions have significant similarities across TEP’s focal area. Water quality and pollution sources are affected by the land uses present in a given watershed. There are some minor variations between watersheds within TEP’s focal area, driven primarily by land use and land ownership. TEP will implement efforts identified in this section’s actions throughout its entire focal area guided by land use and land ownership. Where appropriate TEP will shift its partners or strategies to align with minor variations in water quality issue and partners jurisdictions.

Challenges to Addressing Water Quality

Information Gaps

Regulatory and Compliance: Many programs that implement water quality improvement projects in the region do not have strategies in place or resources to quantify and report the actions taken or the amount of compliance with current regulations. TEP relies on agency programs to implement water quality improvement but the statistics from these programs are not readily available. There is also limited information to directly link actions taken on the landscape to associated environmental changes measured in the waterbodies.

Water Quality Monitoring: TEP has established an extremely robust and useful Volunteer Water Quality Monitoring Program (VWQMP) that collects bacteria data for use in determining water quality status and trends over time. In addition, TEP has been working closely with DEQ to establish a long-term temperature monitoring plan. There are other water quality parameters that are of concern but no monitoring plans or strategies are in place: dissolved oxygen, sediment, nutrients, and ocean acidification (low pH). There are challenges associated with these parameters, such as lack of numeric standards or understanding of local environmental effects, which have limited TEP and its partners’ ability to devise appropriate monitoring strategies. However, without a complete suite of monitoring programs in place, it will be challenging for TEP and its partners to determine if actions are effective at addressing all the water quality parameters of concern.

Barriers

Landowner participation: Many of the programs and projects used to address water quality issues in the area are implemented on a voluntary basis. Without landowner cooperation it can be challenging to reach the critical mass needed on the landscape to measure any environmental effect. This barrier highlights the importance of developing and maintaining a robust community engagement program.

Community Resources: TEP’s focal area encompasses a largely rural landscape. There are limited opportunities to engage well-funded partners or donors to assist with the environmental actions and organizational infrastructure required to address the scope and scale of the issues faced in the area. In addition, political will and industry goals can be in conflict with restoration efforts. Individuals in leadership do not always recognize and monetize the ecosystem services provided by healthy and properly functioning watersheds.

Budgets: The State of Oregon is a significant partner in many of the programs identified throughout the CCMP. However, budget and funding limitations have not always allowed State programs to track project implementation and regulatory compliance. Incomplete scientific understanding and lack of political will have led to regulations or implementation strategies that have limited and ineffective requirements.

GOAL

Maintain and improve the beneficial uses of estuaries and watersheds for humans and native aquatic and terrestrial species

- Objective** **Reduce water pollution from agriculture land use activities.**
Primary Water Quality Parameters: Bacteria, Nutrients, Temperature, Sediment
Related Water Quality Benefit: Dissolved Oxygen
- Objective** **Reduce water pollution from rural residential and urban infrastructure.**
Primary Water Quality Parameters: Sediment, Nutrients, Bacteria, Toxics
Related Water Quality Benefit: Temperature, Dissolved Oxygen
- Objective** **Increase properly functioning riparian communities throughout the watershed and across land uses to improve water quality.**
Primary Water Quality Parameters: Temperature, Sediment
Related Water Quality Benefit: Dissolved Oxygen, Nutrients
- Objective** **Increase restored channel features and hillslope management to improve sediment storage and routing.**
Primary Water Quality Parameters: Sediment
Related Water Quality Benefit: Temperature
- Objective** **Determine if the beneficial uses of the sloughs, rivers, and estuaries are meeting water quality criteria.**
Primary Water Quality Parameters: Bacteria, Temperature
Related Water Quality Benefit: Sediment, OAH, Nutrients, Dissolved Oxygen, Toxics

List of Actions

- WAQ-01** Improve farm management practices to address water quality
- WAQ-02** Improve rural residential and urban infrastructure to address water quality
- WAQ-03** Enhance riparian and in-stream areas throughout the watersheds to improve water quality
- WAQ-04** Restore channel features and hillslope management to Improve sediment storage and routing to address water quality
- WAQ-05** Identify status and trends and quantify changing environmental conditions in water quality to inform adaptive management strategies impacting TEP's priority areas





Improve farm management practices to address water quality

What: The Oregon Department of Agriculture (ODA) has established a variety of water quality programs to prevent and control waste and runoff from agricultural activities. These programs include the Agricultural Water Quality Management Program (AWQMP), the Pesticide Program, the Confined Animal Feeding Operations (CAFO) Permit Program, and Soil and Water Conservation Program.

ODA's Water Quality Program uses three major techniques to identify and implement water quality improvement actions and requirements. These are the Agricultural Water Quality Management Area Plans, Strategic Implementation Areas (SIA) and the Coordinated Streamside Management Program. ODA's Water Quality Program targets all agriculture operations and establishes requirements that apply to permitted operations as well as small operations that do not require permits through the CAFO program.

ODA, through its Pesticides Program, has been charged with the regulation and registration of pesticide use for the State of Oregon and has established the Pesticide Management Plan (PMP) that addresses pesticide use and enforcement throughout the state. ODA partnered with several different state agencies to form the Water Quality Pesticide Management Team (WQPMT). The group is responsible for protection of waters of the state from pesticide contamination.

The CAFO Permit Program addresses specific agricultural operations where animals are confined in a prepared area for a certain period and when manure and wastewater generated by the farm is stored under particular conditions. These operations are subject to a National Pollutant Discharge Elimination System (NPDES) General Permit. The permit ensures that specific requirements are met by the operation to manage the facility and its waste.

The ODA Soil and Water Conservation Program provides technical assistance and oversight to the Tillamook County Soil and Water Conservation District (SWCD). The Tillamook SWCD works with local landowners to properly manage natural resources on rural lands through development and implementation of Voluntary Farm Management plans based on Natural Resource Conservation Service (NRCS) management practices. Plans also include requirements set out in the North Coast Basin Agricultural Water Quality Management Area Plan.

Dairies are one of the major agricultural activities in Tillamook County. The Tillamook County Creamery Association (TCCA) is a cooperative of local dairy farms. TCCA encourages member farms to address water quality issues through its Stewardship Program. The Stewardship program works with other partners to assist members and other agricultural producers with infrastructure improvements, land management strategies, and operational efficiencies.

Oregon State University researchers and extension staff are constantly investigating ways to improve farm management practices. Much of the focus between the University and the Extension Office is bringing research to local agricultural communities to assist with issues important to day to day operations and farm management. Getting the latest information to farms can help improve farm management as well as improve water quality. TEP will work with OSU Extension to facilitate community outreach and event coordination. TEP also partners on agricultural related water quality research efforts.

Lead(s): ODA, Tillamook SWCD, TCCA, OSU Extension

Partner(s): TEP, DEQ, OWEB, Watershed Councils, and landowners

How

Activity 1: Implement the ODA Agricultural Water Quality Management Program.

Anticipated Cost/Source: \$\$\$/P

Timing: Ongoing

- ODA actively leads, with the assistance of the North Coast Local Advisory Committee (LAC), the review of the North Coast Basin Agricultural Water Quality Management Area Plan on a biennial basis. Updates occur as needed. The Area Plan includes prevention and control measures (PCMs), also referred to as Area Rules, to ensure that landowners prevent and control manure, nutrients, sediments, pesticides, and other agricultural wastes from entering waters of the state. ODA Water Quality staff will implement the program. TEP will contribute to the LAC process by providing water quality data to inform adaptive management of the Area Plan. TEP will also assist with the implementation of water quality improvement projects where appropriate.
- ODA's Water Quality Program also leads the establishment and execution of the Strategic Implementation Areas program. ODA focuses efforts in these areas to conduct Compliance Evaluations to identify potential sources of pollution from agricultural activities, provide technical and financial assistance as available, and enforce water quality regulations where problems persist. TEP assists ODA with project funding through grant writing and subsequent project implementation. TEP also contributes water quality information on status and trends for applicable parameters.
- Finally, ODA is currently collaborating with sister agencies and local partners to implement the Coordinated Streamside Management Program. The program develops monitoring plans that will be deployed at a watershed scale, partners with local organizations to increase incentive-based conservation in riparian areas and ensures compliance with area rules. TEP assists ODA with project funding through grant writing to the Oregon Watershed Enhancement Board or other funding sources and subsequent project implementation. TEP also contributes water

quality monitoring and information on status and trends for applicable parameters.

Activity 2: ODA continues to implement their Pesticide Program.

Anticipated Cost/Source: \$\$\$/P

Timing: Ongoing

- Analyze risk from pesticides use in watersheds,
- Partner to enable water quality monitoring activities and analysis of results,
- Promote pesticide management strategies through outreach and education of local stakeholder groups,
- Facilitate communication with partners at the state and federal levels as well as local producers and others about pesticides and water quality, and
- Implement adaptive management strategies based on results of monitoring and program success.

Activity 3: The Tillamook SWCD will continue to develop and implement Voluntary Farm Management plans based on NRCS management practices. Plans include requirements of the North Coast Basin Agricultural Water Quality Management Area Plan. TEP contributes water quality monitoring and information on status and trends for applicable parameters. In addition, TEP partners with Tillamook SWCD on riparian restoration associated with fencing projects.

Anticipated Cost/Source: \$\$/P

Timing: Ongoing

- Provide technical assistance and assists in establishment of Voluntary Farm Managements Plans,
- Continue implementation throughout Tillamook County and its focus area as needed,
- Implement Livestock Exclusion Fencing and riparian projects, and
- Provide landowner introductions for other partner programs.



Activity 4: ODA continues to implement the CAFO Permit Program.

Anticipated Cost/Source: \$\$\$/P

Timing: Ongoing

- Maintain compliance with permit requirements,
- Respond to complaints and, where necessary, develop and insure implementation of correction plans in a timely manner,
- Conduct annual inspections at all facilities and unannounced inspections at 10% of CAFOs annually, and
- Where available prioritize CAFO resources to target areas based on water quality information.
- TEP contributes water quality monitoring and information on status and trends for applicable parameters to identify areas that need additional focus. TEP works with the CAFO Program to further information on bacteria source assessments through use of Microbial Source Tracking projects.

Activity 5: The TCCA will implement its Stewardship program throughout Tillamook County to:

Anticipated Cost/Source: \$\$/P

Timing: Short term

- Promote efficient water use,
- Encourage livestock exclusion fencing and riparian planting projects, and
- Provide technical assistance for land management strategies.

Activity 6: OSU Extension staff will implement educational opportunities in Tillamook County.

Anticipated Cost/Source: \$/P

Timing: Short term

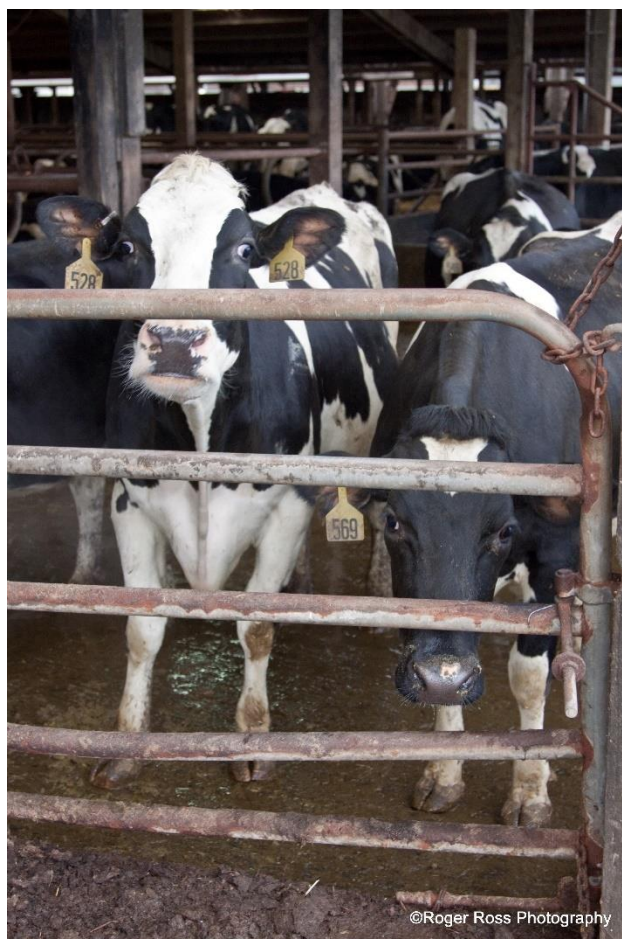
- Identify and design farm management curricula suitable for the North Coast Basin,
- Host "How To" Agricultural Communities Events, and
- Write articles for various agricultural publications.

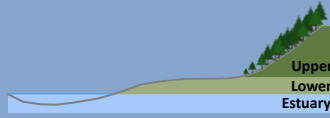
Why: Agriculture land uses have the potential to impact streams, sloughs, and bays within the TEP focal area. Bacteria is a major pollutant associated

with agricultural operations. Other water pollutants include sediment, nutrients, and increased water temperature from lack of stream side shade. Some toxics (e.g., pesticides) may also have the potential to be associated with farm activities as local farms produce more crops such as corn. These pollutants can impact human health through water contact and surface drinking water sources. Aquatic life may be directly affected by these pollutants or indirectly when the presence of pollutants contributes to other effects on water quality such as lowering levels of dissolved oxygen in the streams, sloughs and bays. ODA is responsible for ensuring that activities associated with various forms of farming, ranching and other agricultural operations work to achieve water quality standards by limiting water pollution.

Performance Measures:

- ✓ By 2028, TEP VWQMP data will indicate that 50% of the monitoring sites are generally meeting water quality standards based on DEQ assessment methodology.





Improve rural residential and urban infrastructure to address water quality

What: Pollution can be transported to waterbodies from urban and rural infrastructure. Stormwater runoff from impervious areas (e.g., streets, parking lots, and rooftops) often contain pollutants that can adversely affect water quality. Construction, industrial activities, and municipalities can also impact surface waters from runoff. Wastewater Treatment Plants (WWTPs) collect, treat and discharge water to rivers, sloughs, and bays. National Pollutant Discharge Elimination System (NPDES) permits are required for many activities, facilities and municipalities that have the potential to discharge stormwater.

There are three types of General NPDES Stormwater Permits that are typically found in the TEP focal area. These include permits that cover several industrial activities like WWTPs; permits specific to mining or asphalt/concrete, batch plant activities; and permits that cover construction activities. In addition, seafood processors are covered under NPDES permits and are typically located around estuaries.

Residential septic systems, when not functioning properly, may impact water quality. All homes outside of a public WWTP area treat their wastewater using onsite septic systems. DEQ regulates the siting, design, installation and ongoing operation and maintenance of onsite septic systems. Without careful maintenance, septic systems can fail prematurely, resulting in polluted streams and groundwater.

In the North Coast, DEQ provides oversight of the onsite program that Tillamook County manages under contract with DEQ. DEQ and the County ensure that septic tank pumpers have the necessary equipment to safely pump and transport septage. In addition, DEQ has a certification and licensing program for installers, pumpers, and maintenance

providers. DEQ also reviews and approves products such as septic tanks, alternative treatment technologies, and alternative drainfield products.

Lead(s): TEP, DEQ, Tillamook County

Partner(s): TEP, Municipalities, DEQ, OWEB, Tillamook County, and Watershed Councils

How

Activity 1: TEP will assist municipalities with stormwater management improvement.

Anticipated Cost/Source: \$\$/E,S,O

Timing: Short term

- Collect information and water quality data,
- Share and analyze water quality data,
- Contribute water quality information on status and trends for applicable parameters, and
- Implement stormwater restoration projects (bio swales etc.).

Activity 2: DEQ Implements the NPDES program to address the varied facilities and activities included in the program. The WWTP Permit Program specifically addresses treatment plant upgrades, infrastructure collection improvements, and septic area conversion.

Anticipated Cost/Source: \$\$\$\$/P

Timing: Ongoing

- Improve outreach to small communities with aging wastewater infrastructure and integration of Enterococci bacteria limits in marine discharge permits and E. coli limits to freshwater discharge permits and establishing ultraviolet disinfection performance expectations.
- DEQ will work to develop a list of emerging persistent pollutants typically found in WWTP



effluent that have a documented effect on human health, wildlife and aquatic life.

- Presently no municipal source has a pretreatment program in the North Coast. However, if DEQ determines that analytical results show that there are constituents above specific levels, pretreatment may be required.
- DEQ works with domestic wastewater treatment facilities to assure biosolids are adequately stabilized and that land application operations and management meet federal and state regulations. Similar activities and requirements apply to wastewater solids generated by industrial facilities.
- DEQ requires monitoring and reporting on biosolids activities, review monitoring results, take prompt and appropriate action when potential issues arise, provide technical assistance for facility owners and operators when needed.

Activity 3: Tillamook County implements on-site septic program through DEQ designated authority.

Anticipated Cost/Source: \$\$\$/P

Timing: Ongoing

- Track septic system data,
- Complete septic survey on a 10-year schedule,
- Respond to complaints related to failing or improper septic applications, and
- Permit new installations of systems.

Activity 4: TEP acquires and formats information on septic systems for communication and general assessment purposes

Anticipated Cost/Sources: \$/E,S,O

Timing: Mid-Term

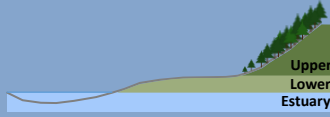
- Determine number of upgrades,
- Determine number and location of stream side septic systems, and
- Promote issues that are not being met (e.g., inspect drainfield during sale; currently only the tank is inspected).

Why: Various components of urban and rural infrastructure can be the source of, or the delivery mechanism for, pollution reaching streams, sloughs, and estuaries within Tillamook County. WWTPs and failing septic systems can be sources of bacteria, nutrient pollution, and toxics such as pharmaceuticals, personal care products, and micro plastics. All these pollutants can affect human health and use of waterways. Bacteria pollution can limit the use of rivers and bays for recreation. It can also contribute to the closure of commercial shellfish harvest in the estuaries in Tillamook County, primarily Tillamook Bay.

Surfaces that collect and transport rainwater to streams as well as facilities that use water for processing can contribute to water quality issues. Pollutants, such as metals, petroleum products, or any other product that collects or is dumped on streets, can enter waterbodies through runoff from stormwater infrastructure. Industrial activities that use water may deliver pollution to waterbodies that receive that effluent. In addition to the pollutants mentioned above, stormwater and industrial discharge water can have a higher temperature than what is required by native salmon and other aquatic life. Runoff and effluent from these sources can contribute to the elevated water temperature in local streams, sloughs and bays.

Performance Measures:

- ✓ Creation of septic system inventory which focuses on properties adjacent to streams, rivers, sloughs, and bays and which may be used to prioritize water quality improvement projects, by 2028.
- ✓ By 2028, TEP VWQMP data will indicate that 50% of the monitoring sites are generally meeting water quality standards based on DEQ assessment methodology.



Enhance riparian and in-stream areas throughout the watersheds to improve water quality

What: Water temperatures in streams, sloughs, and bays, higher than what is required by salmon and other aquatic life, have been identified throughout TEP’s focal area. The focal area includes three TMDL plans that protect for the beneficial use of fish and aquatic life related to temperature, for salmon migration, rearing and spawning.

Most of the land uses in TEP’s watersheds are in public and private forestry management. The Oregon Department of Forestry (ODF) manages State forest lands through the Northwest Oregon State Forests Management Plan. ODF also oversees private industrial timber operations through implementation of the Forest Practices Act (FPA).

On federal lands, the US Forest Service follows the Northwest Forest Plan and the Aquatic and Riparian Conservation Strategy (ARCS) for forest management to protect water quality among other goals. In addition, the Bureau of Land Management utilizes the National Riparian Service Team (NRST) to address and coordinate riparian restoration and management on its lands in the Western US. This program works with local partners to implement the Creeks and Communities Strategy (CCS). The CCS provides technical aspects to riparian restoration while incorporating social components to promote collaborative problem solving to address riparian restoration requirements. These processes coalesce in the Resource Management Plans of Western Oregon.

These State and Federal programs require forested buffers and other vegetation be preserved along streams, wetlands, and lakes to protect water quality and fish and wildlife habitat. On agricultural land, Oregon Department of Agriculture implements

measures through the North Coast Basin Agricultural Water Quality Management Area Plan (covered in WAQ-1). TEP will work with these partners to establish healthy and mature riparian areas through most appropriate avenues available. To consider a riparian area healthy and mature, it must have a diverse species composition and provide significant vegetation cover and stream shading.

Lead(s): TEP, ODF, USFS, BLM

Partner(s): TEP, Municipalities, Tillamook SWCD, DEQ, OWEB, Watershed Councils, and Private Landowners

How

Activity 1: TEP implements, and partners on, restoration projects that include riparian components.

Anticipated Costs/Source: \$\$/E,F,S,O

Timing: Ongoing

- Continue to implement Backyard Planting Program,
- Continue to manage and promote TEP’s native plant nursery,
- Assist with the implementation of the Nestucca, Neskowin, and Sand Lake Riparian Program and other watershed council efforts,
- Provide technical assistance to partners (Watershed Councils, SWCDs, Municipalities), and
- Implement stream-side wetland restoration, large woody debris (LWD), beaver analogs and other connectivity projects.



Activity 2: ODF implements the Board of Forestry workplan adopted in 2018 to identify efforts on the Tillamook State Forest around forest health and restoration.

Anticipated Costs/Source: \$\$\$/P

Timing: Ongoing

- Implement riparian standards identified in the Forest Management Plan,
- Facilitate restoration activities on private industrial forest lands through the FPA,
- Implement 10 Year and Annual Operations Plans,
- Implement in-stream and riparian restoration work and projects identified in the watershed assessments,
- Implement restoration projects where appropriate to accelerate natural processes, and
- Continue partnerships with watersheds councils for planning, implementation, and in-kind work.

Activity 3: ODF implements Forest Practices Act programs associated with riparian requirements and establishes compliance with the FPA through the Stewardship Forester Program.

Anticipated Costs/Source: \$\$\$/P

Timing: Ongoing

- Review pre-operations plans,
- Oversee operations,
- Ensure reforestation, and
- Investigate complaints and enforce corrective actions when violations occur.

Activity 4: USFS Implements activities identified in the Northwest Forest Management Plan.

Anticipated Costs/Source: \$\$\$\$/P

Timing: Ongoing

- Implement applicable components of the ESA Recovery Plan for Oregon Coast Coho Salmon on federal forest land,
- Implement actions identified in the Aquatic and Riparian Conservation Strategy (ARCS),
- Implement projects to enhance native riparian vegetation to provide bank stability and shade stream reaches, and
- Maintain and update Riparian Management Areas (RMAs) and Key Watershed protections.

Activity 5: BLM implements activities identified in the Northwest Forest Management Plan and Western Oregon Resource Management Plans.

Anticipated Costs/Source: \$\$\$\$/P

Timing: Ongoing

- Implement applicable components of the ESA Recovery Plan for Oregon Coast Coho Salmon on federal forest land,
- Develop and promote Creeks and Communities Strategy with local partners, and
- Implement projects to enhance native riparian vegetation to provide bank stability and shade stream reaches.

Why: Salmon and other native aquatic life require clear cold water to successfully complete their life-cycle. This is a critical factor in maintaining and restoring healthy salmon populations throughout Oregon. Stream temperature is influenced by hydrologic natural processes and two primary sources of heat, increased solar radiation due to lack of a healthy and mature riparian area, and heat from warm water point source and stormwater discharges. Additionally, seasonal warm water from the ocean impacts tidally influenced areas of the estuaries. The State has established temperature criteria that are based on maximum temperatures that will not limit salmon's ability to mature, reproduce, and survive. These criteria are different

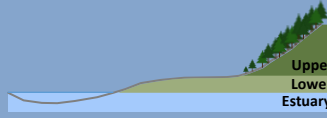
depending on location and habitat provided by the waterbody. When temperatures exceed these criteria, salmon experience an increased susceptibility to disease, inability to spawn, reduced egg survival, reduced juvenile growth and survival, increased competition for habitat and food, and inability to compete with species that are better adapted to higher temperatures (often introduced species). Temperature impacts result from alteration to riparian area. This influence can extend from the headwaters of a stream down to its confluence with a larger waterbody. Therefore, it is important to address riparian health throughout a watershed to

limit cumulative impacts of temperature. Riparian and stream restoration that improves streamside shade, also reduces sediment, bacteria and other associated pollutants such as dissolved oxygen.

Performance Measures:

- ✓ TEP will restore 15 miles of riparian areas by 2028.
- ✓ Partners will implement an additional 15 miles of riparian restoration projects within TEP's focal area by 2028.





Restore channel features and hillslope management to improve sediment storage and routing to address water quality

What: Sedimentation is the process of particles settling out of the water column and depositing on a streambed or estuary floor. In a healthy system, a balance between sediment deposition and sediment transport is maintained. Many factors affect the sediment balance including stream flow and slope, large woody debris (LWD), bank stability, and riparian, lower and upper watershed conditions. TEP and its partners will take actions to address both in-stream factors as well as landscape conditions that are sources of sediment or create an imbalance in sediment transport.

Sediment delivery to streams can have a negative impact on fish habitat and surface drinking water sources. Forest roads built prior to the current BMPs or development of the Oregon Forest Practices Act (FPA) pose an increased risk of contributing sediment to streams. These roads can be major sources of human-caused sediment runoff in forest areas. Improper road construction and maintenance also has the potential to contribute to landslides, another sediment source. Like forest roads, public roads can contribute fine sediments in streams. Tillamook County and ODOT own and maintain most of the public roads in TEP's focal area. Road authorities can reduce stream sediment impacts by ensuring that roads are designed and maintained to minimize erosion, sedimentation, and practices that lead to sediment accumulating on roadways. Upgrading of substandard roads and management and maintenance of existing roads can reduce sediment production and input to streams, benefiting fish and other aquatic life, and reducing the total amount of sediment transported to the lower rivers and bays.

Sediment sources from the landscape are only one component of the sediment issue. The physical

characteristics of a stream can also alter the balance of sediment transport. Bank stability and enough LWD will ensure a balance of sediment deposition and transport. Landslides of the right size and frequency can enhance fish habitat by supplying large woody debris, leading to channel complexity. Encouraging retention of vegetation so that large wood is available to be delivered to channels can reduce adverse effects of landslides. When landslides do occur, large woody debris can help retain and rework debris-torrent materials into productive fish habitat. Retaining healthy and mature trees and vegetation in large riparian areas will also supply future LWD to streams. In addition, it will stabilize bank structure, which will reduce sediment delivery from bank erosion. Both conditions will contribute to a balance sediment load and transport. In addition, placing LWD directly in streams that lack the appropriate quantity of wood will improve retention of sediment in the upper watershed and reduce sediment deposition in the lower watershed.

Lead(s): TEP, ODF, USFS, BLM, ODOT, Tillamook County, Municipalities

Partner(s): TEP, Tillamook SWCD, DEQ, OWEB, Watershed Councils, and Private Landowners

How

Activity 1: ODF, USFS, BLM implement FPA requirements associated with riparian, roads, and landslide requirements to protect water quality.

Anticipated Costs: \$\$\$/P

Timing: Ongoing

- Implement measures required under the Forest Practices Act that retain vegetation and improve the future recruitment of large wood in streams,

- Continue Implementation of Oregon State Forest Management Plan strategies for water quality and riparian protections,
- Improve the management of roads through BMP and FPA regulations by controlling timing and levels of use; road relocation, upgrades and closures and removals,
- Implement improvements of road elements such as road fills, stream crossings, and surface problems to reduce sediment runoff risk and improve fish passage and habitat,
- Continue to participate in the Salmon Super Highway Program,
- Implement road upgrades based on the list of priority sites and work through landowner BMPs and annual management goals and budgets,
- Implement the ODF compliance auditing program to determine the level of compliance with forest practices road maintenance rules. Use this information to determine if actions are needed to improve compliance and identify how compliance problems are best resolved,
- Implement stream-side wetland restoration, LWD, and connectivity projects,
- Implement silvicultural practices resulting in increased vegetation retention along streams, including Type N streams in especially high-risk areas, through the NW Oregon State Forest Management Plan for State Lands, and
- Submit latest scientific findings and recommendations of the Forest Practices Advisory Committee on Salmon and Watersheds to the Board of Forestry for rule review.

Activity 2: Reduce sedimentation from public roads. State and local (county and city) road authorities will evaluate appropriate road activities and functions for sedimentation effects and, wherever practicable, fish passage.

Anticipated Costs/Source: \$\$\$/P

Timing: Ongoing

- Ensure that road authority project development activities (ODOT and County), construction, and long-term development practices meet the guidance in Management Measures for Urban

Areas, Construction Activities and Roads, Highways, and Bridges, as required under the CZARA, Coastal Nonpoint Pollution Control Program.

- Tillamook County will work to initiate update of road standards to include stormwater management strategies to reduce sediment and other pollutants
- Tillamook County will investigate and, where appropriate, initiate road realignments to avoid landslide prone areas
- Tillamook County will continue to collaborate with partners to address stream crossings that limit proper sediment transport and fish passage.

Activity 3: TEP implements and partners with others to implement LWD Projects to maintain appropriate gravels, LWD, and sediments sorting and transport which will improve water quality and provide salmon habitat.

Anticipated Costs/Source: \$\$\$/E,F,S,O

Timing: Ongoing

Activity 4: TEP and partners implement Estuary Wetland Restoration Projects to address fine sediment sorting and changes in ocean levels. See HAB-06 for more information.

Anticipated Costs/Source: \$\$\$/E,F,S,O

Timing: Ongoing

Activity 5: TEP implements public and forest roads stormwater management and sediment improvement projects.

Anticipated Costs/Source: \$\$\$/E,F,S,O

Timing: Long-Term

Why: Physical stream channel characteristics and landscape conditions can alter the balance between sediment deposition and transport in streams and bays. This can lead to increased turbidity and deposition of fine sediments in salmon spawning areas. Turbidity and excess fine sediments can also limit drinking water processing capacity and increase costs for public and private drinking water systems. Conversely, the imbalance can also lead to a



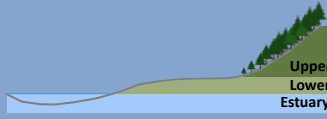
depletion of sands and gravels in the upper watershed causing scour and armoring of the stream bed. This scoured material will end up in the bays and estuaries, altering sediment characteristic and limiting habitat. Both conditions can adversely affect salmon egg and fry survival, spawning habitat quality, other aquatic life such as macroinvertebrates, and increase cost of drinking water production.

Performance Measures:

- ✓ TEP will implement five (5) large woody debris (LWD) projects by 2028.
- ✓ Partners will implement an additional five (5) large woody debris (LWD) projects by 2028.



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Identify status and trends and quantify changing environmental conditions in water quality to inform adaptive management strategies impacting TEP's priority areas.

What: TEP and its partners have identified water quality issues that are having a negative effect on the beneficial uses of the stream, rivers, sloughs and estuaries in Tillamook County. TEP and its partners have also developed actions and activities that are designed to address these factors, including a monitoring program to determine if the restoration strategies are having the desired environmental outcomes. Monitoring results will be used to adjust strategies where findings indicate that goals and objectives are not being met.

Lead(s): TEP, DEQ

Partner(s): DEQ, ODA, Tillamook SWCD, NRCS, OWEB, OSU, OHSU, SSNERR, EPA, Watershed Councils, and Private Landowners

How

Activity 1: Determine where and if the beneficial uses of the sloughs, rivers, and estuaries are being met through attainment of water quality criteria.

Anticipated Costs/Source: \$/E,S

Timing: Ongoing

- Every two years TEP compiles the bacteria data for the VWQMP and, with the assistance of DEQ, determines the status at each monitoring location, whether bacteria levels meet the State criteria for recreation use at each monitoring location. TEP also works with DEQ to perform a trend analysis for each monitoring site to determine if bacteria concentrations are changing over time.

- TEP continues to partner with DEQ to implement its Long-term Temperature Monitoring program. Collect continuous time-series temperature data for a minimum of 10 years from identified waterbodies rotating through each watershed every two years and determine stream temperature status at each monitoring location as it relates to achieving the applicable water quality temperature standards.

Activity 2: TEP will work with partners to establish baseline information on carbonate chemistry and spatiotemporal patterns of coastal acidification in Tillamook Bay. Through partnerships, TEP will establish the fundamental information necessary to characterize the timing, extent, and persistence of Ocean Acidification and Hypoxia (OAH) processes and watershed drivers within the Tillamook estuary.

Anticipated Costs/Source: \$\$/E,S,O

Timing: Short term

- Implement initial grant funded project to describe the fundamental relationship between alkalinity and salinity in an estuarine setting. TEP will use alkalinity and salinity as a cost-effective way to track OAH conditions.
- Continue to participate in Oregon Ocean Acidification and Hypoxia Monitoring Group (OR-OMG). The OR-OMG is composed of a diverse group of water quality, ecology, and environmental monitoring professionals and natural resource managers that share an interest in marine or marine-influenced systems and a concern about the impact of Ocean Acidification and Hypoxia (OAH). The OR-OMG is charged with enhancing local partnerships and collaboration



around OAH and coastal acidification monitoring.

- Coordinate and collaborate with Whiskey Creek Hatchery and OSU related to Netarts Bay acidification efforts.

Activity 3: Work with DEQ to establish and implement an appropriate dissolved oxygen (DO) monitoring strategy.

Anticipated Costs/Source: \$\$/E,S,P

Timing: Mid-Term

Activity 4: Develop a monitoring strategy and restoration actions for Nutrients based on results and outcomes of EPA's ORD Tillamook Bay Project.

Anticipated Costs/Source: \$/E,S,P,O

Timing: Long-Term

Activity 5: Continue to partner with EPA Western Ecology Division. Also implement other collaborative projects when and where opportunities arise to provide additional information regarding water quality parameters of concern.

Anticipated Costs/Source: \$/E,S,O

Timing: Ongoing

Activity 6: Communicate water quality results to partners and determine effectiveness of current efforts. Work with partners to adjust where needed for continued improvements in management strategies and environmental results.

Anticipated Costs/Source: \$/E

Timing: Ongoing

- Evaluate Shellfish Growing Area Classifications.
- Update Shellfish Management Plan Closure Criteria.
- Update North Coast Agricultural Water Quality Management Plan water quality results and

inform CAFO Program on progress made and areas of concern.

- Update State of the Bays Health Reports and adjust TEP's restoration strategies where necessary.
- Work to inform municipalities on infrastructure improvements and septic program implementation.

Why: TEP and its many partners are working together to improve water quality, particularly related to parameters of highest priority in the focal area. To determine if the project and restoration strategies that TEP and its partner implement are having the desired effect on water quality. TEP needs to track water quality changes over time. Once results have been established, TEP brings this information to its partners and the public. TEP then works with partners to use the water quality information to adjust partners' actions and restoration strategies. This information exchange is a critical component of TEP's adaptive management strategy.

TEP needs strategies to assess progress towards meeting water quality and habitat goals within TEP's focal area. The assessment will focus on changes in ambient water quality conditions, ecological functions, and biological populations and communities. To effectively evaluate the success of CCMP Actions, it will be necessary to track both the extent to which the actions laid out in the CCMP are being implemented and the environmental effects.

Performance Measures:

- ✓ Maintain VWQMP and long-term temperature monitoring effort.
- ✓ Develop strategic monitoring plan for dissolved oxygen and nutrients by 2028.
- ✓ Complete status and trend analyses at appropriate frequency through 2028.