The Clackamas River Water Providers

Drinking Water Protection Plan
2021 Update

Serving

City of Estacada
City of Lake Oswego
City of Tigard
Clackamas River Water
North Clackamas County Water Commission
South Fork Water Board
Sunrise Water Authority

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Executive Summary

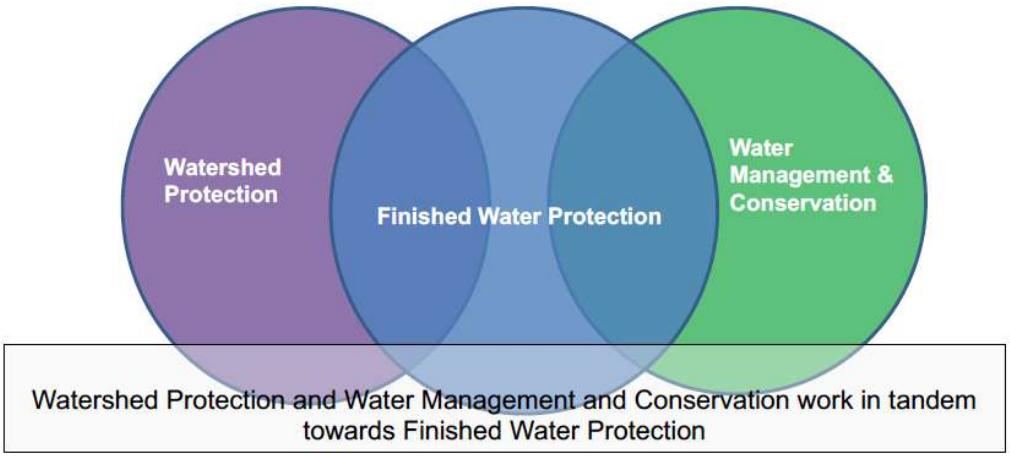
The Clackamas River is a drinking water source for over 300,000 people in Clackamas and Washington Counties and is identified in the Regional Water Supply Plan[1] as a source to meet future water demand. There are five municipal surface water intakes on the Clackamas River represented by the Clackamas River Water Providers (CRWP): City of Estacada, Clackamas River Water, North Clackamas County Water Commission (Sunrise Water Authority, Oak Lodge Water Services and the City of Gladstone) South Fork Water Board (Oregon City and West Linn), and the Lake Oswego -Tigard Water Partnership (City of Lake Oswego and the City of Tigard).

Source water protection is the foundation of any drinking water utility and is one of the primary ways to reduce the risk to a source from contamination or decline in production. Source water protection not only helps the utility identify its risk, it is also necessary part of educating regulatory agencies, permitting authorities, and the community about the impacts their actions can have on drinking water source water quality and quantity.

Source water protection can also:

- Reduce the need for additional treatment to meet water quality standards.
- Help a utility be prepared and reduce the impacts and cost of an emergency when they understand the risk to source quality from contamination or reduce quantity due to climate change.
- Help sustainability when an alternative source of water may not be available or cost prohibitive.

Source water protection is one of the first key steps in a multiple barrier approach to providing clean drinking water which involves several consecutive steps including: high quality source water, source water protection, optimized water treatment, distribution system maintenance and water quality monitoring.



[1] Regional Water Supply Plan Update, December 2004

The purpose of this document is to provide the CRWP with a road map of potential strategies and programs to continue to implement over the next decade to preserve the Clackamas River as a high-quality drinking water source and to minimize future drinking water treatment costs. In addition, the intent is to also address water quantity issues to ensure the long-term viability of the Clackamas River as a drinking water source. This document is intended to provide guidance to the CRWP but it should be recognized that as we learn more about the watershed, climate change, and as drinking water regulations change over time, the priorities of the programs and strategies identified in this plan may shift and change. Each year during the development of its annual budget and workplan the CRWP will examine the long-term strategies and 5-year workplan and determine if those priorities listed are still relevant to the ultimate goals of the organization.

Who We Are

The water providers in the Clackamas River Basin have been working together on various water resource issues for more than two decades. During the summer of 2007 these efforts were expanded to include water conservation and broader water resource issues with the signing of the Intergovernmental Agreement creating the Clackamas River Water Providers (CRWP).

The organization is made up of representatives from City of Estacada, City of Lake Oswego, City of Tigard, Clackamas River Water, the North Clackamas County Water Commission, South Fork Water Board, and Sunrise Water Authority and currently includes two staff people, a Water Resource Manager and a Public Outreach and Education Coordinator. The purpose of the organization is to fund and coordinate efforts regarding water source water protection and water conservation.

Since the creation of the Clackamas River Water Providers and the adoption of the 2010 Drinking Water Protection Plan the CRWP has been actively pursuing and implementing source water protection programs and public education and outreach efforts. To date this includes an annual budget of around $600,000 per year to support these efforts. Many of these projects have been conducted in partnership with a variety of organizations including Portland State University, US Geological Service, Clackamas County, the Clackamas Soil and Water Conservation District, and the Clackamas River Basin Council.

Plan Goals and Objectives

Protecting sources of drinking water is an effective way to reduce risks to public health, instill customer confidence, and control water treatment costs. Addressing water quality concerns at the source also has many other environmental and societal benefits that aren't seen from treatment alone.

The overall concept of source protection is to have the ability to measure the balance between watershed health and human use over time and implement actions that maintain a healthy balance for production of exceptional water quality. This requires not only being aware of all the different human activities going on, and their risks to drinking water, within the watershed but also understanding the limits of what the river can handle and still maintain a high level of water quality. In addition, CRWP members recognize the need to better understand climate change and the potential future impacts to water quality and quantity that a changing climate may have

on our watershed and water source. By doing this we will be able to ensure the long-term viability of the Clackamas River as a drinking water source.

The Water Providers have three primary goals for the source water protection program for the Clackamas River. They are to:

1. Identify, prevent, minimize and mitigate activities that have known or potentially harmful impacts on drinking water quality so that the Clackamas River can be preserved as a high-quality drinking water source that meets human future needs and minimizes drinking water treatment costs.

2. Identify climate mitigation and adaption strategies that will help ensure a more resilient watershed and drinking water source.

3. Promote public awareness and stewardship of healthy watershed ecology in collaboration with other stakeholders.

This Plan will lay out a number of broad implementation strategies that the CRWP can use as a map and/or work plan and will help prioritize where staff time, resources, and funding should be focused. More specific strategies will be outlined in the 5-year workplan.

What Management Strategies does the Plan Recommend?
The overall drinking water protection strategy includes nine elements which outline management measures, programs, and strategies to accomplish the goal of addressing the various threats to water quality and water quantity and to ensure the long-term viability of the Clackamas River as a drinking water source.

1. **Basin Analysis: Studies, GIS, Modeling and Water Quality Monitoring Subprogram.** The objective of this program is to better understand the Clackamas River watershed and the potential drinking water threats, the Clackamas River water providers need to have the ability to measure the balance between watershed health and human use over time and implement actions that maintain a healthy balance for production of exceptional water quality. This includes watershed studies, use of GIS to map land use and potential threats, pollutant load modeling, and maintaining a comprehensive water quality monitoring program.

2. **Climate Change/Water Supply Subprogram.** The objective of this program is to better understand how climate change may impact the future of the Clackamas River in terms of both water quality and water quantity. This include looking at climate adaptation strategies as well as water supply planning.

3. **Education and Research Assistance Subprogram**. The objective of this subprogram is to encourage and promote work with college students and professors on research issues related to watershed health, and protection of the Clackamas River as a valuable resource. Programs under this subprogram will also help to promote future professional interest in watershed topics.

4. **Point Source Evaluation and Mitigation Subprogram**. The objective of the point source subprogram is to inventory, track, evaluate, and monitor point sources (water quality and other permits) of potential pollution to understand these potential threats and work with regulatory agencies, facilities, and permittees to reduce these potential threats to drinking water.

5. **Nonpoint Source Evaluation and Mitigation Subprogram.** The objective of the nonpoint source subprogram is to inventory, track, evaluate, monitor, and identify ways to mitigate for nonpoint sources of potential pollution. Stormwater runoff from urban and rural areas, and from agricultural and forestry activities is the biggest contributor to nonpoint source pollution in the Clackamas watershed. Programs identified in this subprogram will identify ways to work with other stakeholders to reduce non-point source pollution.

6. **Disaster Preparedness and Response Subprogram.** The purpose of the disaster preparedness and response subprogram is for the CRWP to recognize and be prepared for events that may have a low probability of occurring, but if they happen may cause extensive problems for the CRWP member's drinking water source.

7. **Public Outreach and Information Sharing Subprogram**. The objective of the public outreach and information sharing subprogram is to widely disseminate data and information collected as part of the source protection program as well as information on how to conserve water to CRWP water customers, Clackamas River watershed residents, and other stakeholders through the CRWP Public Outreach and Education Program. The overarching goal is for water customers, and the watershed community to help conserve and protect the water quality of the Clackamas River and be engaged in implementing this Plan.

8. **Watershed Land Use Tracking and Management Subprogram**. The objectives of the land use tracking and management subprogram are to gain a thorough understanding of current land use activities and zoning regulations in the watershed; to develop a mechanism for tracking land use activities; and, become an active participant in shaping land use and zoning policy in the watershed to protect the Clackamas River as a drinking water source.

9. **Land Acquisition Subprogram**. The objective of the land acquisition subprogram is to target critical properties in the Clackamas River watershed for purchase or conservation easement in order to protect the watershed over the long term as a high quality source of drinking water.

Next Steps

A separate 5 year workplan will be developed to outline implementation of the strategies and programs in this Plan. There are more strategies and programs identified in the Drinking Water Protection Plan than the CRWP will be able to accomplish under current staffing and funding levels. The purpose of the 5 year workplan is to provide an estimated budget for plan implementation. The implementation schedule and estimated budget will help guide the CRWP's annual workplan and budget process but will be flexible enough to allow for changes as drinking water rules and regulation change and as more watershed data is collected that could shift program priorities.

Drinking Water Protection Plan

Forward

The Clackamas River is a drinking water source for over 300,000 people in Clackamas and Washington Counties and is identified in the Regional Water Supply Plan[2] as a source to meet future water demand. There are five municipal surface water intakes on the Clackamas River represented by the Clackamas River Water Providers (CRWP): City of Estacada, Clackamas River Water, North Clackamas County Water Commission (Sunrise Water Authority, Oak Lodge Water District and the City of Gladstone) South Fork Water Board (Oregon City and West Linn), and the Lake Oswego -Tigard Water Partnership (City of Lake Oswego and the City of Tigard). Below is a map of the of the water provider intakes in lower basin. It does not include the City of Estacada's intake higher up in the watershed.

Source water protection is the foundation of any drinking water utility and is one of the primary ways to reduce the risk to a source from contamination or decline in production. Source water protection not only helps the utility identify its risk, it is also necessary to education regulatory agency, permitting authorities, and the community about the impacts their actions can have on drinking water source water quality and quantity.

Source water protection can also:

- Reduce the need for additional treatment to meet water quality standards.
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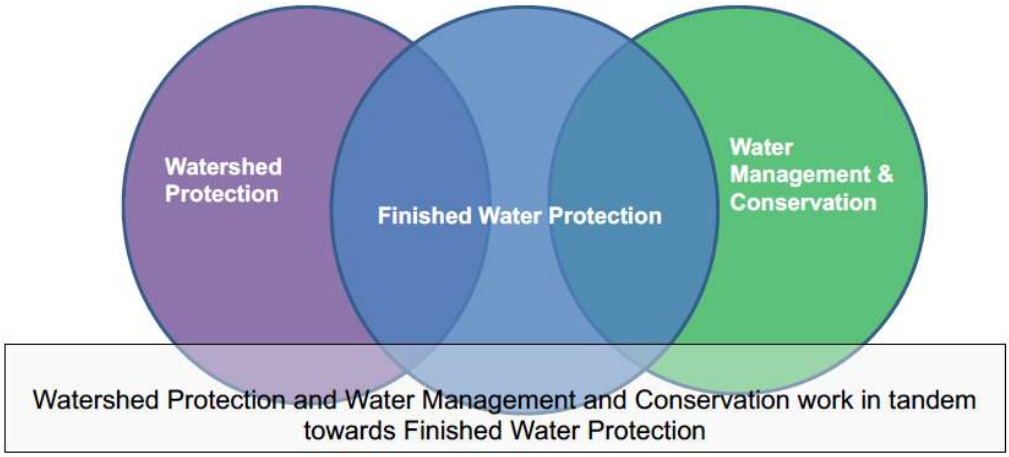
Source water protection is one of the first key steps in a multiple barrier approach to providing clean drinking water which involves several consecutive steps including: high quality source water, source water protection, optimized water treatment, distribution system maintenance and water quality monitoring.

[2] Regional Water Supply Plan Update, December 2004



The purpose of this document is to provide the CRWP with a road map of potential strategies and programs to continue to implement over the next decade plus to preserve the Clackamas River as a high-quality drinking water source and to minimize future drinking water treatment costs. In addition, the intent is to also address water quantity issues to ensure the long-term viability of the Clackamas River as a drinking water source. This document is intended to provide guidance to the CRWP but it should be recognized that as we learn more about the watershed, climate change, and as drinking water regulations change over time, the priorities of the programs and strategies identified in this plan may shift and change. Each year during the development of its annual budget and workplan the CRWP will examine the long-term strategies and 5-year workplan and determine if those priorities listed are still relevant to the ultimate goals of the organization.

As we take action to protect and conserve our drinking water source we also act as stewards of the watershed protecting fish and wildlife as well as the health of our customers. By using a proactive approach to addressing water quality issues and potential drinking water impacts we strive to use the Clackamas River on the most sustainable basis possible keeping water treatment requirements and costs at a minimum while ensuring optimum water quality for our communities. It will also allow us to look at strategies to ensure we have a resilient watershed to ensure there is enough water for people, fish and other resources needs. It should be noted that this plan only addresses the Clackamas River as a surface water source and does not address wellhead protection for those CRWP members that also have groundwater sources.

Background

The water providers in the Clackamas River Basin have been working together on various water resource issues since the early 1990's. During the summer of 2007 these efforts were expanded to include water conservation and broader water resource issues with the signing of the Intergovernmental Agreement creating the Clackamas River Water Providers (CRWP).

The organization is made up of representatives from City of Estacada, City of Lake Oswego, City of Tigard, Clackamas River Water, the North Clackamas County Water Commission, South

Fork Water Board, and Sunrise Water Authority and currently includes two staff people, a Water Resource Manager and a Public Outreach and Education Coordinator. The purpose of the organization is to fund and coordinate efforts regarding water resource planning and management, water quality, water conservation and the development of the Clackamas River on a sustainable basis.

Since the creation of the Clackamas River Water Providers and the adoption of the 2010 Drinking Water Protection Plan the CRWP has been actively pursuing and implementing source water protection program and public education and outreach efforts. To date this includes an annual budget of around $600,000 per year to support these efforts. Many of these projects have been conducted in partnership with a variety of organizations including Portland State University, US Geological Service, Clackamas County, the Clackamas Soil and Water Conservation District, and the Clackamas River Basin Council.

Through the CRWP model Clackamas water providers are able to fund projects and studies that benefit all the providers, but which would be beyond the scope of the individual organizations. This also fosters closer relationships with each other as intra-basin water suppliers, and the ability to speak in one voice when working with other stakeholders in the basin such as PGE.

It also allows us to realize the economies of scale by sharing in the costs of staff to manage and coordinate programs that benefit all our member agencies. This Drinking Water Protection Plan helps outline ways we can continue to work together to conserve and protect our natural resources to ensure clean, affordable, drinking water for years to come.

Plan Goals and Objectives

As the primary supply of drinking water for the communities served by the CRWP systems, it is essential to protect the Clackamas River from degradation. Protecting sources of drinking water is an effective way to reduce risks to public health, instill customer confidence, and control water treatment costs. Addressing water quality concerns at the source also has many other environmental and societal benefits that aren't seen from treatment alone. The purpose of this plan is to address the various threats to water quality and the long-term viability of the Clackamas River as a drinking water source.

The overall concept of source protection is to have the ability to measure the balance between watershed health and human use over time and implement actions that maintain a healthy balance for production of exceptional water quality. This requires not only being aware of all the different human activities going on and their risks to drinking water within the watershed, but also understanding the limits of what the river can handle and still maintain a high level of water quality. In addition, CRWP members recognize the need to better understand climate change and the potential future impacts to water quality and quantity that a changing climate may have on our watershed.

The Water Providers have three primary goals for the source water protection program for the Clackamas River:

1. Identify, prevent, minimize and mitigate activities that have known or potentially harmful impacts on drinking water quality so that the Clackamas River can be preserved as a high-quality drinking water source that meets human future needs and minimizes drinking water treatment costs.

2. Identify climate mitigation and adaption strategies that will help ensure a more resilient watershed and drinking water source.

3. Promote public awareness and stewardship of healthy watershed ecology in collaboration with other stakeholders.

To achieve these goals the CRWP will need to be an active participant in the watershed and promote activities that reduce potential contaminants including nutrients, bacteria, pesticides, volatile organic compounds (VOC's), pharmaceuticals and personal care products (PCP's), fine sediments, and other byproducts associated with urban, agricultural, forest, land development, and road uses that could impact the quality of the treated drinking water. The CRWP will also need to pursue more coordinated water supply agreements and drought contingency planning as summers get longer and hotter and summer river flows decrease.

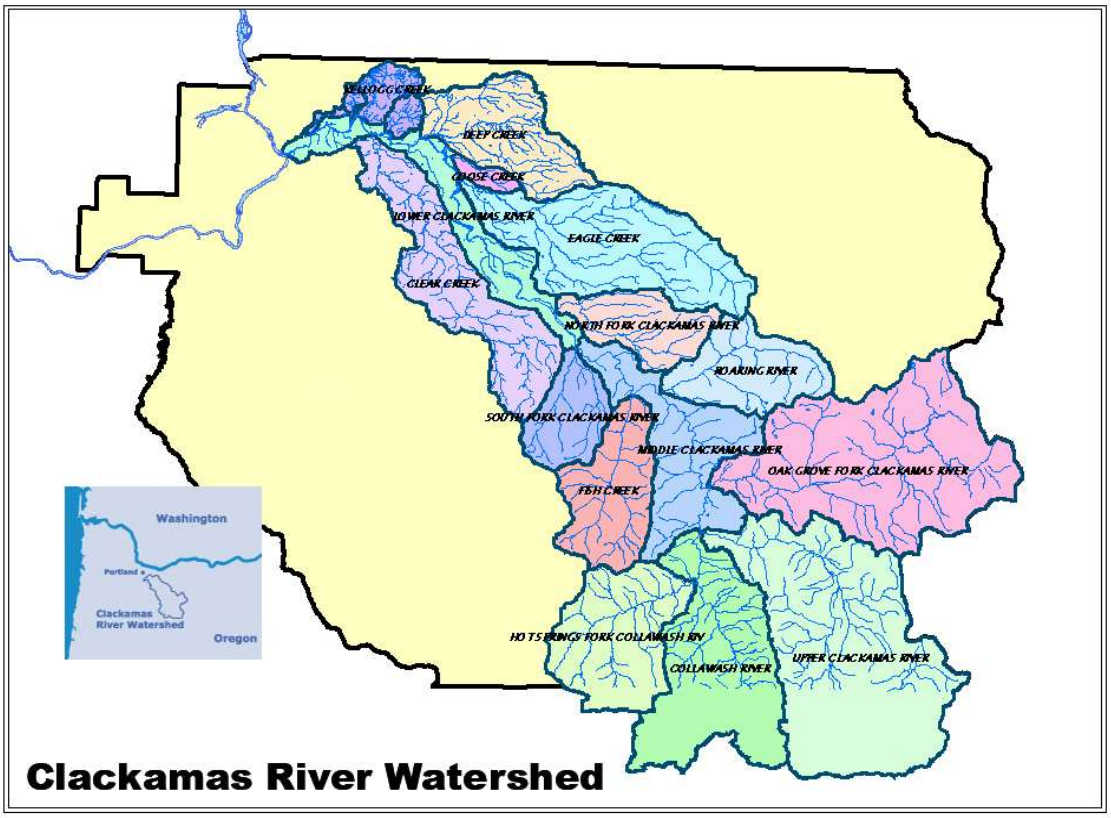
To accomplish these goals and objectives, the CRWP will need to:

1. Take a leadership role in the protection of the Clackamas River.
2. Promote the CRWP's mission of interagency water provider cooperation through implementation of these source water protection mitigation strategies and programs and water supply planning outlined in this plan.
3. Seek and develop partnerships with agencies, landowners, stakeholders, and academia to solicit feedback and to identify opportunities to develop long term relationships so that water quality objectives, data and information can be shared.
4. Collaborate with partners/stakeholders to maximize opportunities to develop and implement long term solutions for the protection of drinking water supplies, as well as the enhancement of water quality for fish and wildlife.
5. Conduct additional sub-basin analysis through studies, Geographic Information Systems (GIS) analysis, pollution load modeling, and water quality monitoring to help prioritize or reprioritize Best Management Practices (BMPs) and mitigation strategies.
6. Promote public education, awareness and cooperation in the watershed that support voluntary watershed protection and water conservation activities.
7. Provide funding and resources to implement mitigation strategies and programs identified in this Plan, recognizing that grants and other outside resources will also be needed.
8. Identify and monitor high quality lands which contribute to improved water quality and preserve their function.

This Plan will lay out a number of broad implementation strategies that the CRWP can use as a map and/or work plan and will prioritize where staff time, resources, and funding should be focused.

Characteristics of the Watershed

The Clackamas River watershed is located in Clackamas and Marion Counties, Oregon, southeast of the Portland Metropolitan area. The Clackamas River is the last major tributary to the Willamette River, entering the Willamette at approximately river mile (RM) 25 downstream of Willamette Falls. Portions of the cities of Sandy, Gladstone, Oregon City, Happy Valley, and all of Estacada are located within the watershed. Important transportation routes passing through the Basin include State Highways 211, 212, 213, and 224; US Highway 26, Interstate Highway 205, and the north-south mainline of the Union Pacific Railroad.



The Clackamas River begins on the slopes of Olallie Butte, a High Cascade volcano. The river flows 82.7 miles from its headwaters (elevation 6,000 ft) to its confluence with the Willamette River near Gladstone and Oregon City (elevation 12 ft) and is made up of 16 sub-watersheds. The watershed drains more than 940 sq miles, or 600,700 acres. The watershed crosses two counties and includes federal land, state land, and private land. About 72% of the watershed is publicly owned, 3% is tribally owned, and 25% is privately owned.

The Clackamas watershed can roughly be divided in half. Nearly all the upper watershed is within the Mt. Hood National Forest and managed by the USFS. In contrast, most of the lower reaches flow through agricultural and densely populated areas. The area in between the national forest and the lower watershed include parcels of land owned by private timber companies and the BLM. In addition to being a drinking water source for over 300,000 people in Clackamas and Washington Counties, the watershed supports naturally spawning anadromous fish including Chinook, and Coho salmon, as well as steelhead trout. It also provides important habitat for

many wildlife species, both game and non-game, and supports recreational activities such as fishing, boating, and camping.

PGE operates three hydroelectric dams on the Clackamas River mainstem: River Mill (west of Estacada), Faraday (just east of Estacada), and North Fork (upstream from Faraday). These dams all have adult fish passage facilities. Faraday and River Mill also have juvenile fish bypass facilities. The Oak Grove Fork of the Clackamas River has two dams: Lake Harriet (23 miles east of Estacada) and Timothy Lake.

In 1988 Congress incorporated approximately 50 miles of the Clackamas River into the Federal Wild and Scenic River System. Four sections of the River are also designated as State Scenic Waterways. The purpose of these designations is to protect these segments' outstandingly remarkable values while maintaining and enhancing the natural integrity of the river. For more information about the physical and biological characteristics of the Clackamas River Watershed see the *Clackamas Basin Summary Watershed Overview,* prepared for the Clackamas River Basin Council in 2005. Or go to CRBC's website at http://clackamasriver.org/wp-content/uploads/2019/09/Clackamas_Overview_6-01-2005.pdf

Regulatory Authority

CRWP has no regulatory authority over activities, other than its own, with-in the Clackamas River watershed. There are multiple federal, state, and local authorities that do have existing and proposed rules, regulations, and programs that can protect water quality. Most agencies have a primary focus other than drinking water quality, and typically fall into two categories: 1) control or managing the use of the resource, or 2) protection of the environment. Most of these protective measures tend to focus in general on protecting or restoring water quality for fish and wildlife, with secondary benefits of protecting drinking water quality.

CRWP can support existing protective requirements, and positively affect proposed protections for the Clackamas River that also benefit drinking water, by doing the following:

1. Support regulatory efforts: promote protection of water quality and specifically address drinking water quality.
2. Track Changes in Regulations: monitor existing rules/regulations for changes and/or amendments that could impact drinking water quality.
3. Advocate for more protections for the source of our drinking water or prioritizing existing resources toward the drinking water resource and public health goals.
4. Work with regulators and partners to set pollution goals or targets: including Clackamas County Water Environment Services, the Oregon Department of Agriculture, US Forest Service, Oregon Department of Transportation, Department of Environmental Quality, Oregon Health Authority, and Oregon Department of Forestry.
5. Draw attention to and support the 3 Basin Rule: the 3-B Rule originally addressed only surface water discharges in three sub-basins of the Willamette River: Clackamas, McKenzie and North Santiam. The rule was substantially rewritten in 1994 and was adopted by the Environmental Quality Commission on February 16, 1995. The reworked version includes regulations for Water Pollution Control Facilities (WPCF) permits as

well as NPDES permits. The purpose of this rule is to protect large surface water sources that are also drinking water sources. The CRWP should monitor this rule to ensure no changes are made that could negatively impact the water quality in the Clackamas River.

6. Coordinate with the TMDL Implementation Plan partners regarding streams listed as water quality limited on the 303(d) list.
7. Track and influence land use changes at City and County level such as comprehensive plan development or changes in riparian ordinances, septic code, open space or floodplain development/restrictions.

Identified Drinking Water Risks – DEQ Source Water Assessment

In 2002-03 the Department of Environmental Quality and Department of Human Services with the assistance of the Clackamas Basin Watershed Council and the water providers completed four source water assessments on the Clackamas River for the USFS Timber Lake JCC, the City of Estacada, a joint assessment for South Fork Water Board, the North Clackamas County Water Commission and Clackamas River Water, and a fourth for the City of Lake Oswego. The purpose of these assessments was to identify surface water areas that supply public drinking water, identify sensitive areas, and potential contaminant sources that could adversely impact that source of water.

In 2019, the Oregon Health Authority and the Oregon Department of Environmental Quality updated the Source Water Assessments for the Clackamas River Public Water Systems. This time instead of four separate source water assessment, the assessment was combined into one document for all the Clackamas River Water Providers and their regional and wholesale customers. This updated assessment is intended to provide us with additional information and resources for implementing local drinking water protection efforts. Source water protection is recognized by the state as an important first step because starting with the best possible quality source water helps assure that water treatment can be effective at all times.

This updated assessment identifies natural and man-made potential sources of pollution that may impact our drinking water supplies serves over 300,000 citizens in Clackamas and Washington Counties. The updated Source Water Assessment identified over 3,000 potential sources of pollution with the 8-hour time-of -travel upstream of the lower Clackamas River intakes and 135 potential sources of pollution within 8-hour time-of –travel upstream of the Estacada intake.

This summary only includes potential sources of pollution within the estimated 8-hour time of travel area which is provided as a planning tool since eight hours should provide adequate response time to protect the integrity of the public water system intake after a spill or release at any crossing or discharge point to the stream. The State recommends that water systems and communities consider increased protection within this 8-hour travel time from the intake for spills and other acute risks. Focus may also need to extend further upstream for contaminants that are contributed to the stream over long time periods or recur frequently.

Many of these potential sources of pollution pose a moderate to high risk to the drinking water supply. Potential Contaminate sources fell into four broad categories: Agricultural/Forest, Commercial/Industrial, Residential/Municipal, and Miscellaneous which roughly translates into the various land uses with in the watershed.

The report can be found here: Clackamas River Public Water Systems USWA as well as on DEQ's web page at https://www.deq.state.or.us/wq/dwp/swrpts.asp).

Elements of Drinking Water Protection Plan for Source Water Protection

The overall strategy has been updated to include the nine elements listed below and will be described in more detail in the next sections of the Plan. The first element outlines continuing work that must be completed by the CRWP to better understand the watershed and to help prioritize mitigation strategies. The remaining elements outline a variety of mitigation strategies designed to protect drinking water. All nine elements are listed below:

1. Basin Analysis: Studies, GIS, Modeling and Water Quality Monitoring Subprogram
2. Climate Change/Water Supply Subprogram
3. Education and Research Assistance Subprogram
4. Point Source Evaluation and Mitigation Subprogram
5. Nonpoint Source Evaluation and Mitigation Subprogram
6. Disaster Preparedness and Response Subprogram
7. Public Outreach and Information Sharing Subprogram
8. Watershed Land Use Tracking and Management Subprogram
9. Land Acquisition Subprogram

Drinking Water Protection Strategies

Each of these elements describe an overarching strategy is to inventory, evaluate and track the risks to source water. To identify areas where mitigation can be implemented through technical and financial assistance and where the CRPW can be an advocate for drinking water through education and outreach to regulators, stakeholders, CRWP water customers and citizens who live in the watershed. For each of these source protection elements or subprograms, the following details will be discussed: a) objectives b) potential strategies, and c) long term goals.

A separate 5-year workplan will be updated to outline in more detail the potential strategies and programs for implementation under this Plan. There continue to be more strategies and programs identified in the Drinking Water Protection Plan than the CRWP will be able to accomplish under current staffing and funding levels. The purpose of the 5-year workplan is to provide an estimated budget for plan implementation. The implementation schedule and estimated budget will help guide the CRWP's annual workplan and budget process but will be flexible enough to allow for changes as drinking water rules and regulation change and as more watershed data is collected that could shift program priorities.

1) Basin Analysis: Studies, GIS, Modeling & Water Quality Monitoring Subprogram

Objective: To better understand the Clackamas River watershed and the potential drinking water threats, the Clackamas River water providers need to have the ability to measure the balance between watershed health and human use over time and implement actions that maintain a healthy balance for production of exceptional water quality. This requires not only being aware of all the different human activities going on, and their risks to drinking water, within the watershed but also understanding the limits of what the river can handle and still maintain a high level of water quality. This includes watershed studies, use of GIS to map land use and potential threats, pollutant load modeling, and developing a comprehensive water quality monitoring program. These efforts will help inform decisions on how to better prioritize resources and mitigation strategies outlined later in the plan and allow the CRWP to monitor changes in water quality in the Clackamas River over time.

Strategies: Over the past decade the CRPW has worked with United States Geological Service (USGS), Portland State University (PSU) and other partners to conduct studies on pesticides and algae, to looking at watershed resiliency, to how groundwater impacts river flows. In 2012 the CRWP conducted GIS risk assessments on the different types of land uses with in the watershed. And in 2014 conducted pollutant load modeling to better understand the relative and cumulative impacts to the drinking water source quality related to watershed land uses. Because both the GIS analysis and the Pollutant load modeling were essentially snapshots in time efforts such as this will continue to need to be updated overtime as changes occur within the watershed.

In addition, a key element of the Basin Analysis Subprogram is water quality monitoring. Water quality monitoring and the associated data will address four issues: 1) provide a baseline so the CRWP can observe water quality trends over time; 2) will be used in tandem with the GIS mapping to verify identified hot spots; 3) be used to evaluate the relative success of restoration, other protection strategies, and BMP's over time; and, 4) will identify existing water quality monitoring gaps.

The CRWP currently supports and jointly funds three USGS gauges in the watershed and began a macroinvertebrate sampling program in 2013. The CRWP should continue to with all of these efforts and look for addition opportunities that will allow water providers to continue to evaluate water quality, biological health, and land use trends to pinpoint adverse trends that could become drinking water threats.

Numerous organizations, including the CRWP, currently conduct monitoring efforts on the Clackamas River. The CRWP should encourage and help support these efforts to ensure data consistency as well as a period of record long enough to draw statistically valid water quality conclusions. The CRWP should also continue to work with basin stakeholder to identify gaps where the additional water quality sampling and monitoring may be needed. Continuing to work with partners will help spread basin wide monitoring costs out between numerous agencies.

Long term goal: To have the data and tools to determine if water quality is improving (or not getting worse) over time and if mitigation strategies are successful. By utilizing GIS data,

monitoring data, and hydrologic/hydraulic model simulations, conservation, restoration, mitigation scenarios can be investigated, data gaps identified, and proposed efforts can be tested prior to implementation to determine the most cost-effective way to achieve CRWP's goals. The time spent doing this will ensure the long-term viability of the conservation, restoration, mitigation efforts and will result in lower maintenance/operations costs and a higher level of project success. One or all of the above elements of the Basin Analysis subprogram will help inform the CRWP regarding the state of the watershed and will provide information to help prioritize or reprioritize the mitigation strategies that are outlined below.

2) Climate Change/Water Supply Subprogram.

Objective: The objective of this program is to better understand how climate change may impact the future of the Clackamas River in terms of both water quality and water quantity. This include looking at climate adaptation strategies as well as water supply planning.

Strategies: Continue to work with partners such as Portland State University to better understand what climate changes means in terms of changes in temperature, rain and snow, impacts on water quality and quantity, wildfire risk, and how to engage with our basin stakeholders on climate change issues. This includes looking at adaptation strategies from bigger or new green and grey infrastructure for drinking, storm, and wastewater management; to alternative sources of drinking water; to alternative land management strategies that impact watershed health and function; to more aggressive water conservation strategies and drought management plans to implemented by water providers and consumers.

It also includes looking at supporting coordinated basin Water Management and Conservation and Curtailment Plans and other water supply planning efforts such as developing Drought Contingency Plans, aquifer storage and recovery, or water reuse efforts.

Long term goal: To prepare and position CRWP members to be able adapt to changing water conditions in the watershed as well as to support efforts such as the Clackamas County Climate Action Plan, local cities' climate action plans, US Forest Service climate vulnerability assessments, as well as supporting basin wide water supply planning efforts.

3) Education and Research Assistance Subprogram

Objective: The objective of this subprogram is to encourage and promote work with college students and professors on research issues related to watershed health, and protection of the Clackamas River as a valuable resource. Programs under this subprogram will also help to promote future professional interest in watershed topics. There are a number of areas that will require additional study that could utilize local universities or other CRWP partners. They include additional flow modeling on the lower basin, ensemble modeling, climate change studies, carbon studies, taste and odor/algal studies, ground water studies, additional flow balance studies, studies looking at the difference between treatment processes, how hydrocarbons get into the water, macroinvertebrate studies, and land use change modeling.

Strategies: The CRWP should continue to work with Portland State University and Clackamas Community College's Water Environmental Technology program and other higher learning institutions to provide internship opportunities for students. The CRWP should continue to work with partner organizations to identify issues or problems in the watershed that graduate student research could provide direct benefit, communicate with universities to find graduate or undergraduate programs that match the issues or problems, and offer research grant funding for universities to conduct research.

The CRWP has developed partnerships with PSU and Clackamas Community College, in addition to Clackamas County, USFS, DEQ, and the USGS and could explore cooperative efforts to continue to fund and promote research in the Clackamas River watershed. Other partnerships opportunities could be established with University of Oregon, Oregon State University, University of Portland, Washington State University Vancouver and other higher learning institutions, EPA, USDA, ODA, BLM, ODOF.

Long Term Goal: Is to provide an educational opportunity for undergraduate or graduate students and/or professors to develop research projects on real world problems while helping to answer questions and watershed issues which support the source water protection efforts in the Clackamas watershed.

4) Point Source (Water Quality and other Permits) Evaluation and Mitigation Subprogram

Objective: The objective of the point source subprogram is to inventory, track, evaluate, and monitor point sources (water quality and other permits) of potential pollution to understand these potential threats and work with regulatory agencies, facilities, and permittees to reduce the potential threat to drinking water. This includes looking at the following types of permits:

1) National Pollution Discharge Elimination System (NPDES) permits for wastewater treatment, fish hatcheries, water pollution control facilities, sand and gravel mining, and stormwater which also include MS4 permits, 1200A, 1200C, 1200Z, and UIC permits
2) Confined Animal Feeding Operations (CAFO) permits,
3) Above and below ground storage tanks permits,
4) PGE dam permits and licenses, and
5) Other permits such as air contaminant discharge permits.

Much of point source pollution is regulated under the Clean Water Act through National Pollution Discharge Elimination System (NPDES) permits but there are other types of permits that will be worth the CRWP tracking in the future. The risks associated with these kinds of point sources/permits include spills, and contaminant releases to groundwater and surface water.

Strategy: By tracking and participating in the public comment process for these permits it provides the CRWP an opportunity to be an advocate for drinking water by emphasizing local issues (such as drinking water quality) and to look at ways to enhance permit requirements

as the permits and new management plans are written. Permits and best management practices are the main tools used for controlling these sources of pollution. These kinds of permits typically come up for public review about every five years.

In addition, by continuing to update inventories of all the water quality and other permits for commercial and industrial facilities, permitted stormwater discharges, and other point source dischargers within the Clackamas River watershed, this information can be evaluated using GIS to identify permits and facilities that have the potential to pose a higher risk to drinking water supply.

The CRWP should continue to establish and enhance its partnerships with critical agencies that regulate sources of pollution (EPA, DEQ, Fire Marshall, WES and the Cities in the watershed). In addition, the CRWP should continue to focus on providing education, technical and financial assistance regarding source water protection and hazardous material spill prevention to commercial and industrial facilities in the Clackamas Industrial Area.

Long Term Goal: By periodically updating inventories of all the water quality permits the CRWP to be able to continue to identify permits and facilities that have the potential to pose a higher risk to drinking water supply as the watershed changes overtime. With this information the CRWP can work with these facilities or permittee to help them become partners in protecting our water supply.

5) Nonpoint Source Evaluation and Mitigation Subprogram

Objective: The objective of the nonpoint source subprogram is to inventory, track, evaluate, monitor, and identify ways to mitigate for nonpoint sources of potential pollution. Nonpoint source pollution or stormwater runoff from urban and rural areas are some the biggest contributors to pollution in the Clackamas watershed and can result in elevated concentrations of fecal coliform bacteria, petroleum hydrocarbons, sediment, metals, nutrients, pesticides, chlorides, pharmaceuticals, and other organic compounds. It is important to understand the impact of urbanization, agricultural and forestry activities, in addition to septic systems and recreational uses (boats and floaters) and other land uses and nonpoint source pollution sources in the Clackamas watershed. Programs identified in this subprogram will identify ways to work with other stakeholders to reduce non-point source pollution. There are six primary areas of focus for this subprogram. They include:

- Agricultural Mitigation
- Septic System Mitigation
- Recreation Mitigation
- Forestry Mitigation
- Urban Area Mitigation
- Riparian Restoration

Strategy: Work with regulatory agencies, landowners, and business groups and other basin stakeholders to implement best management practices and mitigation strategies to reduce the

impacts of stormwater runoff on our drinking water source. These efforts should focus on "hot spots" which have been identified through the GIS risk assessments that have been conducted for high-risk activities taking place in the watershed. Mapped risk "hot spots" for each category provide a spatial context for both the geography and intensity of risk by activity that can be used by the CRWP to help prioritize mitigation efforts.

Provide education and outreach to the various groups that represent the activities associated with nonpoint sources (agricultural industry, forestry industry, builder and developer associations, etc.) regarding the potential degradation to community water supplies that could result from poor practices and provide information and assistance on how to implement best management practices. Develop Technical and Financial Assistance Programs to support these efforts.

It is also important to develop long-term relationships with watershed residents, developers, septic system installation contractors, and regulatory agencies to so that the CRWP can be an advocate for drinking water protection. The CRWP should also support opportunities for green infrastructure in the watershed which mimic natural hydrologic functions and incorporate the natural environment to treat stormwater where it falls.

Long Term Goal: The long-term goal is to engage watershed landowner, basin stakeholders and regulators in supporting actions that reduce the impacts of stormwater run-off and to be partners in solutions that improve downstream water quality. Voluntary programs and best management practices are the most effective tools for controlling nonpoint source pollution.

6) Disaster Preparedness and Response Subprogram

Objective: The purpose of the disaster preparedness and response subprogram is to recognize and be prepared for events that may have a low probability of occurring, but if they happen may cause extensive problems for CRWP members. Potential risks include hazardous material spills, forest fires, Cascadia, dam breaches, terrorism, landslides and volcanic activity (associated with Mt. Hood) which could threaten or impact the CRWP's drinking water source. It is also to ensure that there is quick efficient communication between CRWP member utilities if there is an incident of any kind. There are five area that this work should focus on:

CRWP Member Preparedness
Hazardous Material Spill
Forest Fire Preparedness
Dam Breach
Natural Disasters

Strategy: This strategy includes continuing to develop and promote relationships with federal, state, and local agencies to develop an emergency response system that would identify potential threats to drinking water as well as response strategies. Being a conduit to pass on emergency planning information from the State and County partners to CRWP members. It also includes helping coordinate CRWP member emergency response efforts and planning through delivering emergency training exercises and enhancing basin notification of water related events.

The CRWP has made great strides in the past 5 years in educating our stakeholders and first responder about how our water systems works, which communities could be impacted by a water related event, and how they can play a role in helping protect our drinking water source. In addition, the CRWP has also created a Geographic Response Plan for the lower river to help identify and respond to hazardous material spills as well as secured a notification system (ReGroup) to help water providers and stakeholders communicate more quickly and effectively if there is a water related event.

The CRWP should continue to enhance its partnerships with critical agencies that regulate sources of pollution (EPA, DEQ, Fire Marshall, WES and the Cities in the watershed) as well as continue to build relationships with the USFS Clackamas Range District and Portland General Electric regarding forest fire preparedness and mitigation, and dam operations.

Long Term Goal: To ensure that our first responders and basin stakeholders understand how our drinking water systems work, be active partners in protecting them and mitigating for risk while helping position water providers to be able to respond to any potential threats or critical emergencies.

7) Public Outreach and Information Sharing Subprogram

Objective: The objective of the public outreach and information sharing subprogram is to widely disseminate data and information collected as part of the source protection program as well as information on how to conserve water to CRWP water customers, Clackamas River watershed residents, and other stakeholders through the CRWP Public Outreach and Education Program. It is important to educate residents in the watershed about better stewardship practices (i.e., pesticide use, septic system maintenance, importance of riparian area, etc.), as well as provide information to CRWP member citizens on why source water protection efforts are important, and what actions they can take conserve and protect the watershed as a drinking water source. In addition, it is important to communicate with all audiences the challenges and trends in the watershed and how these can impact drinking water.

Strategy: Promote community awareness of the watershed as a drinking water source by developing educational materials and outreach programs that bridge the gap between public perception of the watershed and the technical information about the limiting factors affecting it. The primary focus of this program is on education and outreach efforts to the public regarding source water protection and watershed issues, drinking water treatment and distribution, indoor and outdoor water use, and water conservation. This allows us to provide a holistic view of how our water resources are connected and why it is important to protect and conserve the water we get from the Clackamas River.

Some of the CWRP strategies include implementing and/or participating in the following:

- Youth Education Program
- Community Events
- Presentation to neighborhood association or other groups

- Providing information via E-newsletter, website, and social media
- Summer conservation campaign
- Holding annual watershed tours

It also includes developing and implementing technical and financial assistance programs that support both watershed and water conservation efforts (Septic System Financial Assistance, Conservation Rebates and Landscape Water Audits). All of these efforts should be ongoing.

Long Term Goal: To have our CRWP member citizen as well as watershed residents and stakeholders be active participants in helping us conserve and protect our drinking water source.

8) Watershed Land Use Tracking and Management Subprogram

Objective: The objectives of the land use tracking and management subprogram are to gain a thorough understanding of current land use activities and zoning regulations in the watershed. To develop a mechanism for tracking land use activities, and, become an active participant in shaping land use and zoning policy in the watershed to protect the Clackamas River as a drinking water source. This will provide a means to better communicate the current state of the basin, as well as a method to assess proposed changes in land use.

Strategy: Take advantage of opportunities to provide public comment and input on land use activities and zone changes to advocate for drinking water protection. Use modeling and GIS to simulate the effects of land use changes on the basin and subbasin to get a better idea of the potential non-point source pollutants to prioritize strategies to change behavior.

There are also a number of different zoning tools that can be utilized to increase protection for source water quality. A drinking water protection ordinance is a regulatory tool implemented by local jurisdictions (e.g. city or county governments) to address proposed and existing development and its potential water quality impact. The ordinance typically defines the resource (as a mapped overlay area) and enacts specific requirements for land uses and development within these boundaries.

Long Term Goal: To ensure that growth and development within the Clackamas River watershed is not detrimental to the water quality of the Clackamas River.

9) Land Acquisition Subprogram

Objective: The objective of the land acquisition subprogram is to target critical properties in the Clackamas River watershed for purchase or conservation easement in order to protect the watershed over the long term as a high-quality source of drinking water. Land ownership of critical areas within a watershed provide some of the best assurances of long-term protections of a water supply. Protections could be provided by ownership accomplished through methods such as capital or bond fund programs, or through conservation easements and deed restrictions.

Strategy: The CRWP should work with organizations such as Metro, Clackamas County, the Clackamas Soil and Water Conservation District, and the Nature Conservancy to identify and acquire critical pieces of land. Data and information compiled from monitoring, point source, nonpoint source, and land use tracking and management subprograms should be used to identify areas that are threatened or degraded for protection or restoration, respectively. As these subprograms are implemented, hot spots of pollution, areas of high risk, and areas with zoning that is incompatible with protection strategies will be targeted for land acquisition. Hot spots are defined are areas where drinking water risks are in sensitive areas, in close proximity to Clackamas River and its tributaries, or in areas where risk is clustered (numerous risks in a small geographical area rather than spread out).

In addition, land acquisition should strive to enhance stream, river, riparian, and floodplain habitats and provide the largest ecological benefits. Intact riparian zones are one of the best defenses for keeping nonpoint source pollutants out of the river. Riparian areas protect water quality by processing nutrients, filtering contaminants from surface runoff, absorbing and gradually releasing floodwaters, maintaining fish and wildlife habitats, recharging groundwater, and maintaining stream flows.

Evolving carbon markets may create opportunities for additional land-based source water protection. Proposed federal climate change legislation may someday require regulated entities that generate carbon emissions to reduce them or purchase offset credits to meet emission reduction obligations. Offset credits are contracts purchased by a regulated emitter for project-based greenhouse gas emissions reductions or sequestration by an unregulated party.

Long Term Goal: To acquire property in the watershed that preserves watershed and ecological functions and processes and provide multiple benefits. Resource managers increasingly refer to phenomena such as this as "ecosystem services' or "watershed services," refining to the fact that the natural environment provides economically valuable services that would otherwise cost money to provide.

Conclusion

Source water protection is a key part of providing clean, safe drinking water. By being proactive and engaged in our watershed our goal is to continue to maintain a high-quality water source, minimize future drinking water treatment costs while being good stewards of the river. This plan offers the CRWP a road map for engagement and leadership as we continue our efforts in protecting our drinking water source. A separate 5-year workplan will outline in more detail specific strategies and programs that will be implemented over the next five years to reach the objectives of this Plan. It is expected that there are more strategies, and programs outlined in this plan and workplan than the CRWP will be able to accomplish under current staffing and funding levels.