Chapter 9

Case Studies of Community Water Systems

Emily Jane Davis

Photo: Emily Jane Davis, © Oregon State University

We conducted three case studies to delve deeper into how managers of forested drinking water supply watersheds identify and address management concerns that have affected or could affect source water. This includes how they collaborate with other landowners and managers to identify, monitor and respond to these concerns. Case studies followed the following procedures.

9.1. Background

9.1.1. Case study selection

Survey respondents were stratified by location (Coast, Dryside or Valley), primary landownerships in source watersheds and size of systems. We then purposively chose three case studies, one from each location. Cases were also selected to represent a range of relevant contexts and issues:

1. A private industrial forestland context and a small system (Oceanside).
2. A public lands context with a proximate wildland-urban interface and extensive collaboration on source watershed management (Ashland).
3. A public lands context with less proximity, collaboration and public engagement (Baker City).

9.1.2. Case study data collection

In each case, documentation was gathered and reviewed, including survey responses, source water assessments, forest management plans and information (if available) and any other relevant documents found online. We used this information to develop a draft profile of each case. We then contacted representatives involved in the management of each drinking water system and the source watersheds. Four interviews were conducted in each study location. Interview questions focused on verifying draft profiles and obtaining additional insights into forest management concerns and any collaboration to address them. Detailed notes were taken during each interview. Tours were also conducted of drinking water supply facilities, including plants, intakes and any applicable sites where past, current or future effects to drinking water could be observed. Following data collection, draft profiles were updated and content verified by all interviewees.

9.2. Ashland Water Department

Communities served: Ashland
Population served: 21,505
Source watersheds: Ashland Creek, Rogue River subbasin
Source water area size: 19.9 sq. miles/12,735 acres
Stream miles in drinking water source area: 82.88
Land ownership: 98% federal (Rogue River-Siskiyou National Forest); 2% local government
Public access: Open to public except for water treatment facility and reservoir areas
PWS #: 4100047

9.2.1. About the Ashland Water Department

- Organized as a municipal department with 14 full-time staff.
- Primary source is Ashland Creek; backup sources for late summer are Talent Irrigation District (Howard Prairie and Hyatt Lakes) and City of Medford (Big Butte Springs or Lost Creek Lake). Ashland Creek is 303(d) listed for sediment above the dam.
- Treatment system: piped from Hosler Dam on Reeder Reservoir (Figure 9-1) to a flocculation basin and sand filters. One treatment plant is located in watershed.
- Winter daily production is 1.75 million gallons per day; summer is 5 million gallons per day; total storage capacity for the entire system is approximately 6 million gallons.

Photo: Emily Jane Davis, © Oregon State University
Figure 9-1. Reeder Reservoir in November 2018.

- Has a Source Water Assessment updated in 2018; does not have a Drinking Water Source Protection Plan.
- Conducts monitoring of algal species and toxins by collecting samples prior to treatment for blooms, and collects physical data with a multiparameter sonde.
- Contributes a ratepayer fee to the Ashland Forest Resiliency (AFR) project for fuels and forest management in Ashland Creek watershed. The organization is a multipartner effort to restore characteristic fire regimes and forest health in the watershed and adjacent areas.

9.2.2. Management concerns

Blue-green algae. Although the reservoir's elevation (approximately 2,800 feet) and cold winters help, there is concern about growth from warmer water temperatures and sunlight exposure.

Erosion and debris flows. Given the soil composition of decomposed granite, number of stream miles in erodible soils (62.45), percentage of soil erosion potential (75%) and steep slopes, sediment is accumulating at the bottom of Reeder Reservoir. Two small reservoirs above it provide some containment. Winter storm events can exacerbate sedimentation. Suspended sediment has not been a major issue and has been manageable through treatments.

The risk of wildfire. Given the forest types and hazardous fuels conditions

Potential pollution sources identified in Source Water Assessment, 2018

- Forest fire hazard.
- Unstable soils.
- TV tower underground storage tank.
- Septic system at Mount Ashland ski area.
- Sedimentation.
- Alkalinity, ammonia, chloride, dissolved oxygen, pH and phosphate phosophorus.
- Stream crossings.
- Road density.

in the watershed and the region's tendency for lightning-caused fires, concern for suppression and postfire impacts include erosion and multiple years of sedimentation, use of retardant in large quantities, loss of tree cover and impacts to water treatment infrastructure.

Public access and use. The majority of the watershed is public land and open to the public. There are few roads, but numerous trails that can contribute to erosion. Dispersed camping can contribute to elevated *E. coli* levels downstream.

Future water quantity. Hosler Dam is not large enough to capture more water, and the infrastructure costs to change this are prohibitive.

Multiple seismic, landslide and wildfire vulnerabilities at current treatment plant site.

Flooding. Particularly after rain-on-snow events, flooding can affect the treatment plant and sedimentation.

9.2.3. Addressing concerns

Algae monitoring and treatment. The Ashland Water Department visually inspects daily and tests as needed for various algal species, obtaining results about type and enumeration from a certified lab. The department typically treats reservoir water two to three times a year in most summers by broadcasting a "Green Clean" hydrogen peroxide pellet product by boat. They also monitor sediment and nutrients that can encourage algal growth.

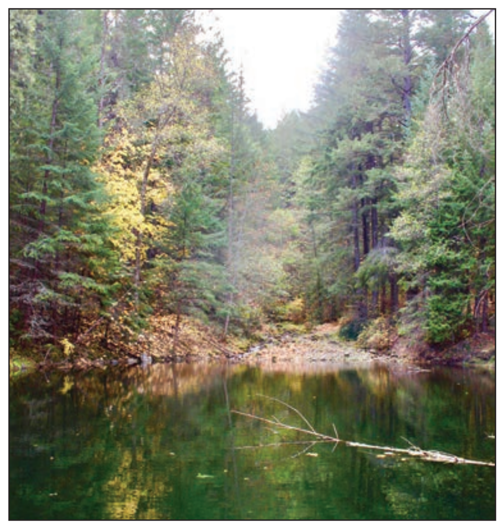


Photo: Emily Jane Davis, © Oregon State University
Figure 9-2. Small reservoir above Reeder.

Sedimentation. The Ashland Water Department monitors amount and extent of sediment deposits on the floor of Reeder Reservoir (Figure 9-1), but there is no easy way to remove these. Historical sluicing and some catching in two small reservoirs upstream from Reeder help (Figure 9-2), but sediment deposition is increasing with time.

This intersects with concerns about erosion and increased sedimentation from wildfire. Sediment levels are routinely monitored and will be addressed when they begin to affect water quality.

Ashland forest resiliency

The City of Ashland (led by the Fire Department) participates in the Ashland Forest Resiliency project, a multistakeholder effort to restore forest health and reduce the risk of uncharacteristic wildfires on the Forest Service lands that comprise the Ashland Creek watershed (Figure 9-3). The organization was preceded by many years of community interest in forest management activities, beginning with a cooperative agreement between the City and the Forest Service that was signed in 1929 to codify a need for community consultation on any actions in the watershed. Protests over a planned timber sale to fund fuel breaks in the 1990s spurred the development of the Ashland Watershed Protection Project with input from community members through the Ashland Watershed Stewardship Alliance, then the creation of a larger, landscape-level plan for the watershed. The City of Ashland and partners worked to develop a “community alternative” for that plan, which became the Resiliency project. The AFR decision, signed in 2009, authorized 7,600 acres of the watershed for treatments, including hand and mechanical thinning and prescribed fire. Its goals include the reduction of wildfire risk, particularly to prevent fires from moving from lower to higher elevations, and the enhancement of large trees and wildlife habitat.

Photo: Emily Jane Davis, © Oregon State University
Figure 9-3. Madrone and oak area in the Ashland watershed.

To implement the Ashland Forest Resiliency project, the Rogue River-Siskiyou National Forest entered into a 10-year master stewardship agreement with the City of Ashland, The Nature Conservancy, and Lomakatsi Restoration Project. The master stewardship agreement is based on mutual benefit and allows these partners central roles in accomplishing the treatments. Lomakatsi provides the implementation workforce through its own crews and contracts with additional entities. The Nature Conservancy leads an extensive collaborative monitoring program to understand ecological and other impacts of the work. The city provides funding through a ratepayer fee and manages community engagement. Some monitoring related to water quality has been supported, such as macroinvertebrate and substrate monitoring. AFR has attracted additional investment from the American Recovery and Reinvestment Act, Joint Chiefs Landscape Restoration Partnerships program, Forest Service’s Hazardous Fuels program, and Oregon Watershed Enhancement Board’s Focused Investment Partnerships program for management of the watershed and adjacent areas of public and private lands. Given the steep slopes and high costs of treating this landscape, as well as the potential transmission of fire risk outside of the watershed, these resources have been essential. Future opportunities and challenges include the need to treat more acres in strategic areas, and to utilize treatments that can more effectively reduce fuels, which will require additional Forest Service analysis and collaboration.

Public use and management. Public activity in the watershed primarily occurs below the dam in Lithia Park, but trail networks still allow access upstream. The Forest Service has mapped trails in the watershed and partnered with the Ashland Woodlands and Trails Association (AWTA) to engage all trail user groups to develop the Master Trails Plan for the Ashland Watershed (Figure 9-4). The trails association raised necessary funding

Photo: Emily Jane Davis, © Oregon State University
Figure 9-4. Trail networks exist throughout the watershed.

for a third-party environmental analysis process to implement the Master Trails Plan, which can help control and direct public use of the watershed. The water department also monitors *E. coli* levels and will close Ashland Creek to swimming and access if they become unsafe.

Diversification of sources. The size of Hosler Dam (Figure 9-5) and the substantial costs of a new dam currently limit the ability of this system to capture more water. The water department has diversified to other backup drinking water sources that are typically used in late summer: Talent Irrigation District (since 1970s; Howard Prairie and Hyatt Lakes) and City of Medford (since 2013; Big Butte Springs or Lost Creek Lake). Talent Irrigation District water is pumped from a ditch to the Ashland plant, while Medford water is transferred via a pipeline.

Photo: Emily Jane Davis, © Oregon State University
Figure 9-5. Holser Dam.

New treatment plant. The Ashland Water Department treatment plant is in a narrow, steep-sided canyon of Ashland Creek, where it is threatened by potential landslides, seismic activity and wildfire (Figure 9-6). Major flood events have submerged the facility. A new plant planned and designed for a safer site is slated to become operational in 2021–2022.

Photo: Emily Jane Davis, © Oregon State University
Figure 9-6. Flocculation basin at treatment facility.

9.2.4. Key takeaways

- A multipartner effort like the AFR project is necessary to incorporate the diverse social, economic and ecological desires that the community of Ashland holds for the management of its watershed. This is particularly essential in the public lands ownership context, where the Forest Service must consider diverse public values in its decisions. Development of scientifically sound monitoring and robust community plans helps address questions and foster adaptation.

Photo: Emily Jane Davis, © Oregon State University
Figure 9-7. Crews at work thinning the forest.

- Activities necessary to reduce hazardous fuels and wildfire risk can be costly in areas with steep slopes and complex forest types. The partnership's strengths and ability to seek multiple authorities and programs to accomplish this work within and adjacent to the watershed is necessary; its partnerships expand outcomes beyond what the Forest Service alone could fund or accomplish (Figure 9-7).

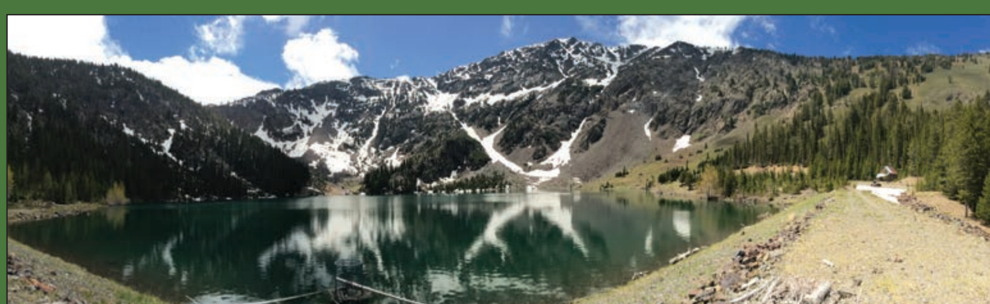
- The City of Ashland has been proactive in articulating its interest in the watershed and using formalized structures and tools (MOU, community alternative, Master Stewardship Agreement, ratepayer fee) to participate in active forest management. Its investment in forestry staff and the fire department provides the human capacity necessary to be part of collaborative efforts.

9.2.5. About the Ashland case study

Information from this study came from several sources, including Ashland's 2018 Source Water Assessment, a survey completed in summer 2018, and interviews with representatives from the Ashland Water Department, Ashland Fire Department and Rogue-River Siskiyou National Forest. One tour of the district's reservoir and treatment plant was also conducted. We wish to thank the interviewees for their generous time in providing information and the tour. The final case study report was reviewed by participants for accuracy.

9.3. Baker City Water Department

Communities served: Baker City
Population served: 9,880
Source watersheds: Powder Basin (Goodrich, Elk, Salmon, Little Salmon, Mill, Little Mill and Marble Creeks). Elk Creek is 303(d) listed for temperature.
Source water area size: 9,746 acres
Stream miles in drinking water source area: 11.9 miles
Land ownership: 99.8% federal (Wallowa-Whitman National Forest); 0.2% private
Public access: Not open to the public except for Marble Creek Road; seasonal hunting access by permit
PWS #: 4100073



9.3.1. About Baker City Water Department

- Organized as a municipal department with five full-time and 20 part-time staff.
- Additional water sources are an aquifer storage and recovery well. Watershed groundwater provides approximately 88% to 98% of municipal water supply.
- Treatment system: Water travels from 12 diversions across seven creeks into two pipelines that feed one plant in Baker City with a chlorine contact chamber and UV treatment system.
- Winter daily production is 1 million gallons per day and summer is 5.5–6 million gallons per day. Total storage capacity for the system is approximately 200 million gallons.

- Watershed was designated as municipal watershed in 1912 and is classified as two inventoried roadless areas (IRAs).
- Has a Source Water Assessment performed in 2003 and a 2014 Watershed Management Plan following EPA guidance. It does not have a Drinking Water Source Protection Plan but will complete one in 2019 through support from the Natural Resources Conservation Service's National Water Quality Initiative and state agencies.
- Partners with the Wallowa-Whitman National Forest through a Memorandum of Understanding signed in 1991.
- The Face of the Elkhorns was defined as a wildland-urban interface (WUI) area in the Baker County Community Wildfire Protection Plan (CWPP).
- Source water monitoring requirements follow the Surface Water Treatment Rule for surface systems without filtration.

9.3.2. Management concerns

Potential pollution sources identified

- Cutting and yarding of trees leading to increased erosion, turbidity and chemical changes
- Reservoir contributions to prolonged turbidity
- Erosion (near Goodrich Creek intake)

Wildfire risk, given the hazardous fuels conditions in the watershed. The forest is composed of ponderosa pine and mixed conifer stands, some of which are overstocked and dense. Recent large fires in the Baker City area (not in the watershed) such as the Cornet-Windy Ridge complex in 2015 contribute to this concern. Fires to date in the watershed have been under 10 acres and quickly contained. In addition to a fire start inside the watershed, there is concern for starts outside the watershed, particularly to the south-southwest, that could move into the watershed. There is a regional tendency for lightning-caused fires. Of the 12 diversions, those on Salmon, Marble, Mill and Goodrich creeks may be most vulnerable. Salmon Creek's vulnerability is due to continuous heavy fuels and limited access, and the others' to the threat of fires moving from private lands up in elevation to the watershed.

Postfire impacts, such as sedimentation and its effects on water treatment infrastructure, would pose issues. The water department's UV system does not provide sediment filtration, and the water department would be forced to switch to the backup groundwater source that likely provides only one month of supply. The location of intakes across multiple subwatersheds helps reduce vulnerability, but a large fire event could cover the entire watershed under certain fire conditions. In addition, the loss of riparian tree cover through wildfire is a concern for its potential contribution to ongoing erosion and sedimentation. The majority of slopes in the watershed exceed a gradient of 30%, and many are over 60%. Well-drained soils reduce risk of landslides.

Ability of watershed to meet supply demands based on the capacity of sources. Although the population of Baker City has not grown, there has been an increase in demand for water and a need to balance multiple users, including households, irrigators and municipal properties. Allowing enough water for agricultural producers is important given the economic significance of that sector to Baker County's economy. Years of drought and reduced snowpack in the Elkhorns can lower water quantity from the diversions and the amount of water in the Goodrich Reservoir. This challenge would be particularly severe if combined with the shutdown of intakes due to a wildfire.

Biological contamination. Livestock and wildlife can contribute biological contaminants. Although livestock are not allowed on the public lands of the watershed, straying and fence breaks can occur. A cryptosporidium outbreak occurred in the summer of 2013, sickening a number of local residents. Pathogen levels are monitored and minimal excepting this outbreak, but the experience has elevated water department and community concern about water quality.

9.3.3. Addressing concerns

Hazardous fuels reduction. There has been limited forest management and fuels reduction activity within the watershed (Figure 9-8).

Challenges to accomplishing fuels reduction and forest restoration there include road access and condition for machinery, regulations and limitations to management options in Inventoried Roadless Areas, and smoke management limitations to the application of prescribed fire near the community. However, inclusion of the watershed as a WUI area indicates that it is at high risk and that there is a high priority for action there. As it is National Forest, the watershed is subject to National Environmental Policy Act (NEPA) analysis requirements. Two NEPA projects that have occurred are the Washington/Watershed Project (Environmental Impact Statement, decision signed in 1995) and the Foothills Fuels Reduction Project (Categorical Exclusion, decision signed in 2004). Management actions under these decisions have included commercial thinning, precommercial thinning, whip felling, mechanized slash treatment, hand piling, pile burning and prescribed fire treatments. Thinning has been performed by helicopter and hand. An Environmental Analysis was also completed in 2016, and work has begun to improve the pipeline and road, burying the pipe more deeply and improving the road atop for safer passage of vehicles and equipment (Figure 9-9).

Photo: Wallowa-Whitman National Forest
Figure 9-8. Ponderosa pine stand in the watershed.

Photo: Emily Jane Davis, © Oregon State University
Figure 9-9. Area of unimproved pipeline road.

There is desire from both the water department and the Wallowa-Whitman National Forest for further activity. The watershed is on the Forest Service's work plan for 2019, meaning that funding for a new NEPA process has been allocated. Work was slated to begin with the formation of an interdisciplinary team and initial data collection in summer 2019. During the NEPA process, the water department will be a major project proponent, and it is anticipated that other area stakeholders such as adjacent landowners and the Powder Basin Watershed Council will participate. The Wallowa-Whitman Forest Collaborative group may also have interest in collaborating on this project. Data analysis and stakeholder interests will shape the specifics of the approach, but the planning area will include the watershed and adjacent lands. Treatments that may be considered could include strategically located fuel breaks to prevent fire transmission at the private-public land interface around the watershed and pipeline road, and on ridges to reduce fire spread within the watershed. Areas adjacent to the road, particularly as it is improved, and in more pine-dominant stands offer more options for treatment.

Outside of the watershed, there have been several completed NEPA decisions to the south and southwest that have led to multiple years of fuels reduction and forest health restoration activities, including landscape-level prescribed burning that is now in the maintenance phase. These activities are still underway and may help reduce the risk of fire transmission from these areas into the watershed.

Future water supply. The water department is building system redundancy and additional capacity from available groundwater sources to help address concerns with future water supply from the source watershed (Figure 9-10). Excess water is available in winter for storage in the aquifer storage and recovery well, but there are challenges in balancing the city's water right for beneficial use of water during injection season with the needs of surrounding properties. The water department is in a predesign stage for a new groundwater well and has requested a modification to their existing groundwater rights in order to combine them into one right to use more effectively where they own land.

Photo: Emily Jane Davis, © Oregon State University
Figure 9-10. Water storage infrastructure.

Biological contamination. Management of sources of potential biological pollution includes monitoring, fence maintenance, and UV treatment (Figure 9-11). The 2014 Watershed Management Plan states that "increased monitoring, treatment, and preventative measures will be identified to reduce pathogen-inducing conditions. The key is to focus on prevention and reduction of turbidity, organics and pathogens." Monitoring must occur as required by the Surface Water Treatment Rule for surface systems without filtration. Access to the watershed for routine sampling is difficult given restrictions, but downstream sampling also provides data. The water department is also using aerial observation and cameras to monitor containment of cattle off the watershed, and any concentrations of ungulate populations. The water department has also taken infrastructure improvement steps, including the burying of a previously exposed settlement area and repair to fencing at the Elk Creek diversion. They have obtained a grant for ongoing maintenance and repair of fences to attempt to prevent future breaches, and partner with the adjacent allotment holders to monitor fence condition during the grazing season. In addition, the recent acquisition of support from Natural Resources Conservation Service and state agencies through the National Water Quality

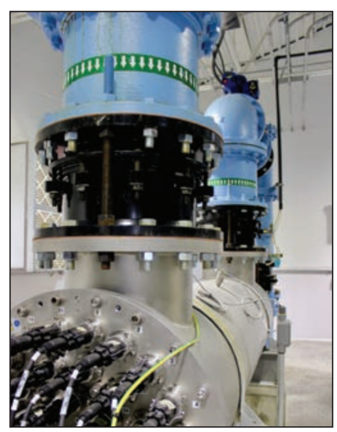


Photo: Emily Jane Davis, © Oregon State University
Figure 9-11. A component of the UV treatment system.

Initiative will allow the water department to develop a watershed assessment and outreach strategy to address agriculture-related water impacts and become eligible for future Farm Bill funding.

9.3.4. Key takeaways

- Regular, such as quarterly, communication between the Forest Service and a municipality with source watersheds on national forest land assists in maintenance of relationships and proactive capacity for identifying issues and opportunities. This helps keep drinking water source protection issues on the table when both partners are also busy with other responsibilities and projects.
- Field tours and opportunities to view the watershed and potential management issues together in person help increase mutual understanding of conditions, challenges and opportunities.
- Written documentation of agreements and meetings can assist in the creation of agreements and institutional memory, which is important in a context with the frequent personnel turnover that can occur in both the Forest Service and city management.
- There can be city and community frustration with the time and other requirements of the NEPA process for management actions on federal land. Increased experience and exposure can help build mutual understanding through the process. The pending NEPA process for the watershed should provide concrete opportunities to address concerns and plan new projects, which necessitated the Forest Service prioritizing the watershed area and obtaining funding to do so.
- Municipalities and other partners may aid federal partners in managing source watersheds by building political support and obtaining grant funding from sources not accessible to federal agencies.
- Having multiple intakes and diversions in several locations across a source water drinking water area requires management effort and cost, but also offers diversity of options; for example, by reducing vulnerability to wildfires or other effects.

9.3.5. About the Baker City case study

Information from this study came from several sources, including Baker City's 2003 Source Water Assessment, 2014 Watershed Management Plan, a survey completed in summer 2018; and interviews with representatives from the Baker City Water Department and Wallowa-Whitman National Forest. One tour of the district's reservoir and treatment plant was also conducted. We wish to thank the interviewees for their time in providing information and the tour. The final case study report was reviewed by participants for accuracy.

9.4. Oceanside Water District

Communities served: Oceanside and Cape Meares
Population served: 650; 541 connections
Source watersheds: Short Creek (Oceanside) and Coleman Creek (Cape Meares), in the Netarts Bay/Sand Lake/NeskowinCreek Watershed in the Wilson-Trask-Nestucca Sub-Basin of the Northern Oregon Coast Basin. Short Creek is fish-bearing and Coleman Creek is not.
Source water area size: 2.04 square miles
Land ownership: 99.9% private industrial timberland; Stimson Lumber Company and Green Crow Corporation
Public access: None
PWS #: 4100585

Photo by Emily Jane Davis, © Oregon State University

9.4.1. About Oceanside Water District

- Organized as a special district under ORS Chapter 198, the Oceanside Water District has four staff (three full-time and one part-time) and a board of commissioners.
- Short Creek is the source watershed for Oceanside and Coleman Creek is the source for Cape Meares. Oceanside Water District tecently obtained access to Baughman Creek, where an intake may be established for future backup use.
- The district has two treatment plants. The Cape Meares plant can be fed from the Short Creek plant in case of emergency in Coleman Creek. The Oceanside plant has recently carried out $7.2 million in major system upgrades. Raw water treatment consists of an initial intake through a fish screen, then passage through a membrane filtration system.
- Winter daily water production is 50,000 to 60,000 gallons per day; summer is 130,000 to 140,000 gallons per day. Storage capacity for the system is approximately 750,000 gallons.
- The district has a Source Water Assessment completed in 2003 and used to identify potential areas of risk to the two creeks. Does not currently have a Drinking Water Source Protection Plan.
- Communicates with a small local committee of citizens, the Oceanside Clean Water Committee, a subcommittee to the Oceanside Neighbors Association, an officially recognized Citizens Advisory Committee.

9.4.2. Management concerns

Application of forest chemicals to plantations and roadsides. Forest managers use herbicides to enhance plantation productivity by reducing competition facing tree seedlings and to control noxious weeds and maintain roads. Spraying of herbicides is typically done on the ground by backpack or truck and not near open water in accordance with the Oregon Forest Practices Act. GPS tracks and visual marking of buffers guide application. The Oceanside Water District is concerned about spray spread by rainfall or aerial vapor drift or herbicide spills in creeks.

Potential pollution sources identified in Source Water Assessment, 2003

- Cutting and yarding of trees may contribute to increased erosion, resulting in turbidity and chemical changes.
- Overapplication or improper application of pesticides or fertilizers.
- Spills, leaks or improper handling of chemicals during transportation, use, storage and disposal.

The only governmental monitoring of source water is a Synthetic Organic Contaminant test carried out per state mandate once every three years at a randomly selected time. The district performs the required tests every three years on Short Creek, but quarterly on Coleman Creek as the creek was just recently brought on line.

Turbidity following forest operations and from forest roads. Clear-cut harvests have not occurred for approximately 40 years in the drinking water source area but are pending in the next two years. Road systems are being improved in preparation. There are 10.6 miles of Stimson roads and .49 miles of Green Crow roads within the Short Creek watershed, and .3 miles of Stimson roads within the Coleman Creek watershed There are two locations where roads on Stimson lands cross perennial tributaries of Short Creek and are of major concern from the perspective of the water district (Figure 9-12).

Runoff after winter storms, which can be significant in this coastal region. Sediment in Short Creek during extreme rainfalls has caused temporary shutdown of the Oceanside treatment plant in past events. Intake relocation and upgrades to this plant have helped reduce this challenge somewhat, but it is still necessary to close the raw water intake following an extremely heavy downpour. During this time, the water district operates off water stored in several storage tanks throughout the town.

Photo: Emily Jane Davis, © Oregon State University
Figure 9-12. Improvement of forest road on Stimson timberland for future harvest operations

Point source pollution from gravel quarries through discharge or runoff of holding ponds combined with rainfall affected Short Creek and caused a multiday plant shutdown in 2007 (Figure 9-13). Followup inspection from the Department of Geology and Mineral Industries reported no runoff and this pit is now in the process of reclamation.

Landslides. Short Creek has the potential for landslides after logging, given the steepness of its canyon and instability of sandy soils atop basalt bedrock on Cape Meares.

Photo: Emily Jane Davis, © Oregon State University
Figure 9-13. Portions of a prior harvest unit and the vicinity of a rock quarry, common activities that may occur in coastal watersheds. Area shown is adjacent to but not within the headwaters of Short Creek.

Future water quantity from Coleman Creek for the Cape Meares community.

Potential wildfire risk. Although there is not an immediate history of wildfires in the area, postfire erosion and reduced tree cover should a fire occur is a significant concern.

The rerouting of a county road in the Coleman Creek watershed. The intake for Coleman Creek is located upstream of the existing road, but the road will be rerouted up Cape Meares along Coleman Creek due to a landslide (Figure 9-14). This will result in the existing intake point being downstream of the road, where it would become susceptible to transportation-related spills.

Photo: Emily Jane Davis, © Oregon State University
Figure 9-14. Current intake on Coleman Creek for Cape Meares treatment plant.

9.4.3. Addressing concerns

The water district, private landowners and partner agencies are addressing issues of management concern in the source watersheds through *proactive communication*, *mitigation* and *planned monitoring projects*.

Planned forest operations and herbicide application. First, there is advance communication and information about planned operations. Water district staff and one of its board commissioners subscribe to and run queries in FERNS to obtain information about planned forest operations. They are able to view notifications of planned operations one year in advance when these are placed in the system.

Stimson also uses an internal communication checklist to ensure that all drinking water suppliers with intakes on their properties have timely communication about planned operations in accordance with Oregon's Forest Practices Act. Stimson notifies all water masters:

1. A minimum of 15 days prior to application.
2. On the planned date of application.
3. One day prior to the actual application day.
4. On the day of application, prior to starting the application and when it is completed.

Second, the water district, Stimson and Green Crow have also communicated proactively about potential source water management concerns. The water district has expressed its desire to gather data about potential effects of herbicide spraying. Stimson and Green Crow have agreed to further notify the district one week prior to a planned herbicide treatment so that the the district may take precautions and prepare its supply. Following this notification, the watermaster will charge all reservoirs to their maximum. The companies will notify the district again on the day of spraying, and the intake to the water processing plant will be closed. Then, with funds from the Oregon Health Authority and Department of Environmental Quality, the water district will take water samples from the intake synchronously with the spraying, using grab samples and polar organic chemical integrative sampler measurements for an extended period after the spraying. This experiment is anticipated to occur at the time of the next herbicide treatment. The companies will also notify the water district when they are preparing roads for future harvest, which may involve regrading, rocking and replacing culverts.

Turbidity. Major seasonal rain events have historically caused high turbidity in both creeks, the holding pond and intake, shutting down the the plant at times. The water district has relocated its Short Creek intake to the center of the creek, which has greatly reduced this issue. Improvements to the Oceanside treatment plant have also increased the capacity of the system to filter sediment (Figure 9-15). However, slope instability and potential landslides near this intake still pose a concern (9-16).

Photo: Emily Jane Davis, © Oregon State University
Figure 9-15. Membrane filtration system in the Oceanside treatment plant.

Transportation planning. Another concern for the water district is the potential contamination of Coleman Creek from a road. A paved county road connecting Oceanside to Tillamook by Cape Meares has been closed due to a landslide. Tillamook County Roads and Transportation is conducting feasibility analyses and planning to relocate this road around the landslide area. The eventual location of this road would be upstream from the current diversion point for Coleman Creek. There is concern about the potential for vehicle-related accidents, and hazardous material spills, trash and public access as a result. The water district is working with the county to evaluate relocation of this diversion point to above the new road route.

Photo: Emily Jane Davis, © Oregon State University
Figure 9-16. Intake on Short Creek for Oceanside treatment plant. Stability of bank slopes in this area is a management concern.

Diversifying drinking water sources. The water district is working to diversify and increase its future supply by developing a new intake on Baughman Creek (Figure 9-17). Rights to this creek were recently deeded to the district by the Rosenburg family. There is a historic access point and intake site on this creek. The district will be restoring road access to this site by clearing the road footprint and investigating the necessary steps and costs to install a new intake. This would allow them to draw drinking water from three different creeks on different parts of Cape Meares.

9.4.4. Key takeaways

- More consistent and proactive communication between the water district and landowners (Stimson and Green Crow) has enhanced cooperation. Communication has historically been intermittent as it has been solely based around issues with quarry operations or planned forest operations. Establishing a schedule of regular meetings, such as quarterly, may be useful.

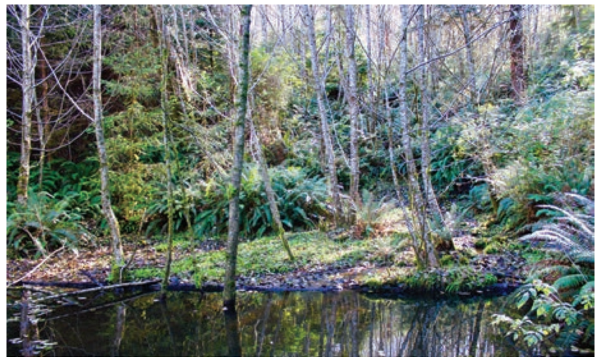


Photo: Emily Jane Davis, © Oregon State University
Figure 9-17. Site of potential future improved intake on Baughman Creek.

- Stimson's use of a process communication checklist is intended to help ensure that the water district and other water providers are notified beyond what is required by Oregon's Forest Practices Act.
- Opportunities to learn more about each other's goals and processes may have increased mutual understanding. Foresters for Stimson and Green Crow have toured the Oceanside treatment plant, and water district commissioners and the watermaster have toured parts of the watershed in the past.
- In this spatially smaller landscape with a limited number of landowners, individuals particularly matter. The interests and actions of the water district staff and board, and company foresters, have made cooperation possible.
- The ability to develop a monitoring project and obtain data is anticipated to help improve a cooperative relationship by addressing uncertainties, providing scientific information, and giving the the water district and Stimson opportunities to communicate and learn together. The financial support from Oregon state agencies for this project is also necessary.
- The future development of a Drinking Water Source Protection Plan for the water district may help codify these monitoring and cooperative efforts.

9.4.5. About the Oceanside case study

Information from this study came from several sources, including Oceanside's 2003 Source Water Assessment, a survey completed in summer 2018; and interviews with representatives from the Oceanside Water District, Stimson Lumber Company, and Green Crow Corporation. Two tours of the forested watershed and one tour of the district's intakes and treatment plant were also conducted. We wish to thank the interviewees for their generous time in providing information and tours, and Oceanside Water District Commissioner Paul Newman for providing information and arrangements. The final case study report was reviewed by participants for accuracy.

9.5. Lessons learned

Although the case studies were conducted in three different contexts, there were lessons learned from each case as well as common themes across cases that may offer broader insights.

9.5.1. Landownership frames the opportunities and challenges for managing source watersheds

The laws and regulations that govern different types of forestland ownerships set the stage for what management activities are permitted, how they are to be conducted and any public involvement. For example, Oregon's Forest Practices Act provides standards for the establishment, management, and harvest of trees on private industrial and nonindustrial forest lands. Public lands managed by federal agencies such as the U.S. Forest Service or the Bureau of Land Management are subject to an array of laws and policies, as well as land use designations and requirements for public participation in management decisions. Drinking water providers who seek to interact and collaborate with their source forestland managers must do so with understanding of these existing frameworks, and the time and effort that it may take to engage.

9.5.2. Regular communication provides a foundation for relationships

Regular communication between drinking water providers and source watershed land managers may assist the maintenance of relationships and proactive capacity for identifying issues and opportunities. This helps keep drinking water source protection issues on the table when both partners are also busy with other responsibilities and projects. Field tours and opportunities to view the watershed and potential management issues together in person may help increase mutual understanding of conditions, challenges and opportunities. The scope and scale of this communication may necessarily vary by context. For example, it may be more informal and involve far fewer parties in areas where source watersheds are spatially small and systems serve smaller populations. Regardless, the need for both land managers and drinking water providers to be intentional and proactive about communication with each other remains. Written documentation of agreements and meetings can assist in the creation of agreements and institutional memory, which is important when there is personnel turnover with any organization.

9.5.3. Specific projects offer opportunity to collaborate

Planning forest management activities, a source water protection plan, or a monitoring effort can offer concrete ways for drinking water providers to engage with source watershed managers. Depending on the ownership of the source watershed, providers may be able to provide project design input, develop community plans or create monitoring protocols. This may involve additional partners such as local nonprofits, government agencies and community leadership. The opportunity to participate directly may improve understanding of source watershed conditions and needs, particularly through monitoring that could address uncertainties with scientific information. It can also bring leveraged funds from other sources that help support monitoring or management activities.