2021

State of the McKenzie Watershed Report

Eugene Water & Electric Board

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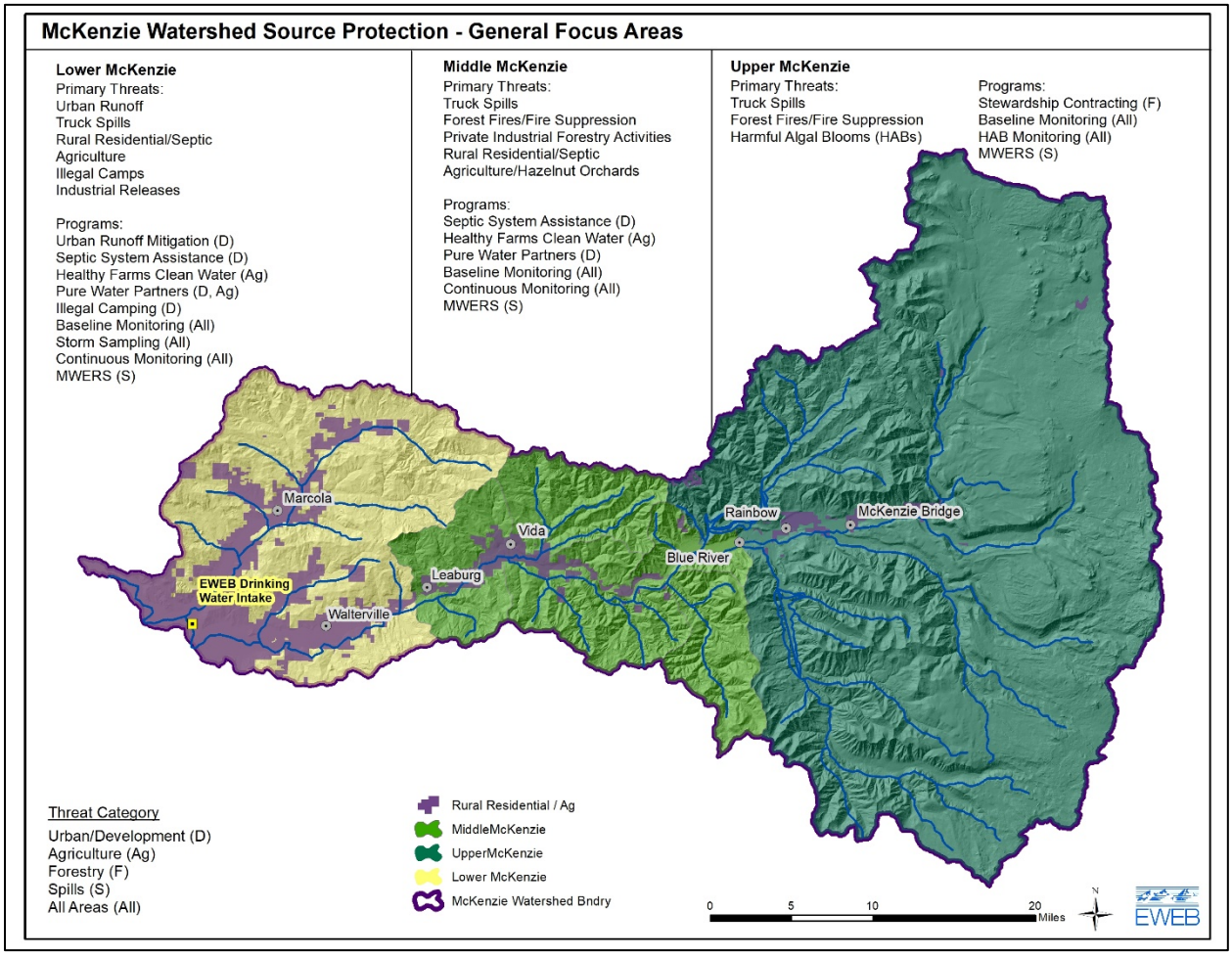
1.0 Executive Summary

The purpose of the State of the McKenzie Watershed Report (SMWR) is to highlight water quality trends, activities that threaten water quality, significant watershed events, and programs designed to mitigate or reduce impacts to water quality. This report is produced annually to show progress being made or challenges encountered as EWEB implements the Drinking Water Source Protection (DWSP) Program 10-year strategic plan throughout the McKenzie Watershed (see Figure 1-1). To keep the report brief, background information and programs details are contained in the Strategic Plan Technical Report and the previous SMWR. Both can be found at: http://www.eweb.org/community-and-environment/mckenzie-watershed-protection/drinking-water-source-protection-plan.

The report layout is designed to address goals and objectives, highlight major events in the watershed that had significant positive or negative impact and provide a summary of the health of the McKenzie Watershed (Section 1), followed by brief discussions of water quantity and quality trends and highlights (Section 2-3) and updates on the priority threats to water quality and how EWEB programs are responding to these threats (Sections 4-10). The final section focuses on operationalizing source protection as well as looking at efforts under development and future opportunities (Section 11).

Figure 1-1: Map of DWSP Program



1.1 Source Protection Goals & Objectives

The overarching goal of EWEB's Drinking Water Source Protection (DWSP) program is to measure the balance between watershed health and human use over time and implement actions that maximize the benefits EWEB receives through its investments in the McKenzie River Watershed. The primary objectives to accomplish this goal include:

1. Plan and implement actions that maintain source water quality in a way that balances risks with benefits in partnership with others;
2. Prioritize source protection efforts that provide the greatest benefit to water treatment and electric generation in the McKenzie Watershed; and,
3. Promote public awareness and stewardship of a healthy watershed through targeted actions and programs.

1.2 Watershed Highlights

Post-Fire Restoration Efforts Continue to be Critical for Landowners

In year 2 after the Holiday Farm Fire, the Pure Water Partners (PWP) Program, of which EWEB is a participating member, continues to work with a significant number of watershed landowners on restoration efforts. The PWP redesigned property assessments to include opportunities for replanting in riparian areas, invasive species control, fire fuels reduction, and erosion control needs. Landowners who participate in PWP sign 7-year Watershed Stewardship Agreements which allow work to be completed on their properties and maintained over time (see Section 7).

In addition, EWEB has brought in 11.4 million dollars of funding (with another 7.9 million pending) for fuels reduction, replanting, large floodplain restoration projects, etc. We are currently anticipating working with Lane County to distribute $1.5 million from state wildfire recovery funds to landowners in order to repair and replace septic systems within the Holiday Farm Fire perimeter (see Section 8).

Deer Creek and Finn Rock Floodplain Restoration

We continue to work with The McKenzie Watershed Council, the McKenzie River Trust, and the U.S. Forest Service (USFS) to implement large-scale floodplain restoration in Deer Creek and Finn Rock with an eye towards other watersheds like Quartz and Ennis Creek in the coming years. This type of restoration can mitigate floods, turbidity, and organic carbon by spreading out and attenuating flows, dropping out sediment, and increasing the uptake of nutrients and organic carbon coming from upstream severely burned landscapes. These projects also have numerous co-benefits including water storage, increasing habitat for fish and wildlife, protection from fire, and increasing cold water refugia.

Figure 1-2: Finn Rock Floodplain Restoration Area (drone shot courtesy of Brent Ross with McKenzie River Trust)

Blue River Reservoir Turbidity Event

Reservoir operations by the Corps of Engineers in Blue River Reservoir brought the lake level down rapidly in November. However, water levels fell below the water control diagram at one point, exposing lakebed sediments to the scouring forces of channel flow. The result was a dramatic rise in turbidity levels downstream in both Blue River and the McKenzie River. Turbidity levels (the cloudiness of the water) in Blue River reached values above 500 Formazin Nephelometric Units (FNU) which rivals some of the highest turbidity values observed immediately after the Holiday Farm Fire during storm events. Increased turbidity was observed in the McKenzie River (Figure 1-3) all the way down to Hayden Bridge for several days.

Figure 1-3: Major Turbidity Event in Blue River (McKenzie in background/Blue River in foreground)

1.3 Statement of Overall Health

In the 2019 State of the McKenzie Watershed Report we indicated "it is anticipated that climate change impacts in the McKenzie will show up as extreme weather events (including flooding, drought, and loss of snow pack), resulting in increased wildfires, harmful algal blooms, and property damage in riparian and floodplain areas". The 2020 Holiday Farm Fire (HFF) was an example of such an extreme event that had a significant impact on the McKenzie Watershed. Since the HFF, EWEB has been hard at work to mitigate the water quality threats from the HFF by working closely with our federal, state, and local partners in a well-coordinated response.

Our water quality monitoring staff continued to conduct baseline and storm event monitoring with particular emphasis on tributaries within the Holiday Farm Fire area. EWEB worked with the United States Geological Survey (USGS) to install an additional real-time water quality monitoring station in Gate Creek. The station will provide another early warning opportunity to assess rapidly changing conditions due to fire impacts and give Hayden Bridge staff time to make treatment adjustments if necessary. Routine harmful algal bloom (HAB) monitoring was carried out as planned from spring until fall. Although the McKenzie River has faced some major challenges in 2020 and 2021, overall water quality remains excellent (see Section 3).

Urban runoff and hazardous material spills remain high priority threats to water quality. The destruction from the HFF and subsequent hazard tree removal and salvage logging have created conditions on Hwy 126 that could lead to more accidents and major spills. The McKenzie Watershed Emergency Response System (MWERS) and years of interagency drills continues to provide the platform for effective communication and coordination in response to these incidents.

Urban runoff continues to deliver the highest levels of pollutants to the river in the lower watershed. The multi-partner Urban Waters & Wildlife Program continues to design and implement green infrastructure in partnership with local businesses to treat storm runoff onsite before it enters the stormwater system above EWEB's intake. This partnership has received significant funding from the U.S. Environmental Protection Agency (EPA) to scale these efforts up in Springfield and surrounding areas.

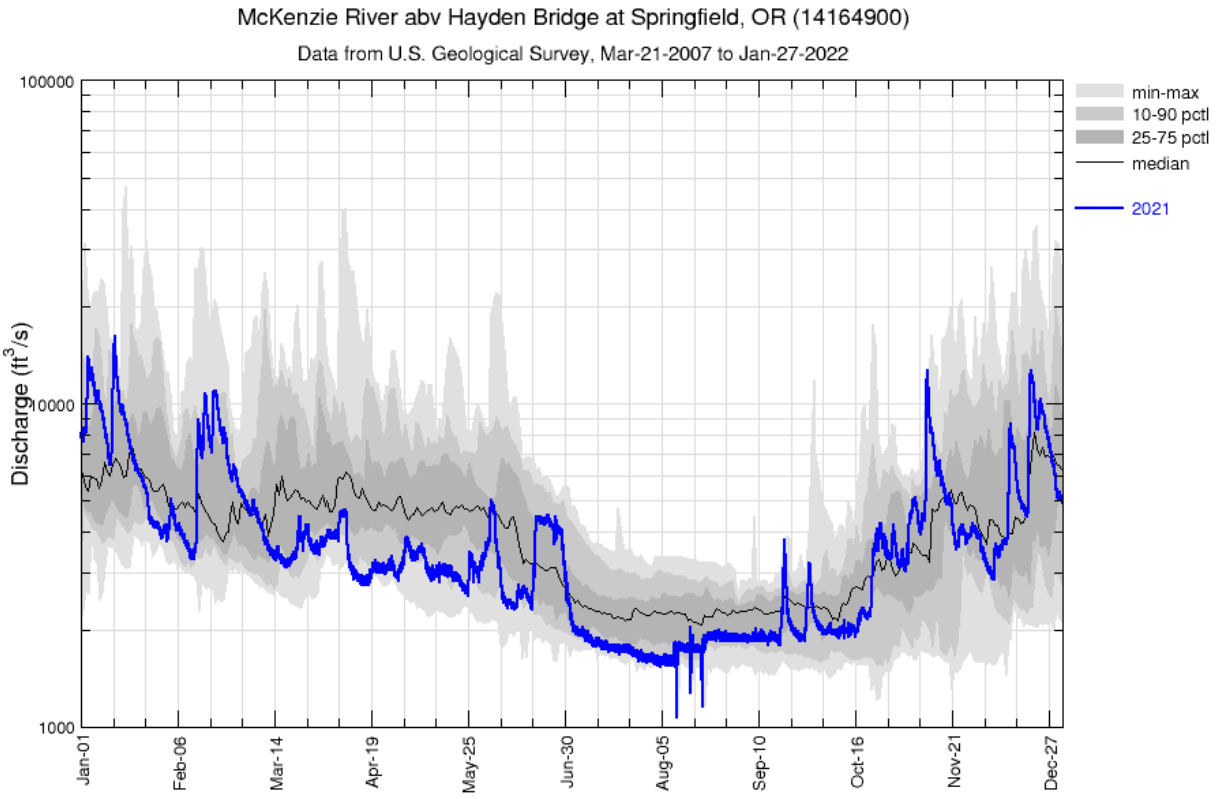
The remainder of this report provides details of these and other efforts to protect the McKenzie Watershed as the lifeblood of EWEB, our customers, and the region, respond to the Holiday Farm Fire and maintain or improve the excellent water quality we enjoy for future generations.

2.0 Water Year

Precipitation amounts in the upper McKenzie for the 2020/2021 water year (WY) fell approximately 10-15% below average when compared to a 30-year period from 1991 to 2020. However, La Niña conditions for the 2021/2022 WY, which began on October 1st, brought a series of warm atmospheric river events to the region resulting in significant precipitation. Fortunately, temperatures dropped in December bringing significant snowfall to the Cascades. Current WY precipitation and snow water equivalent levels through December are at or above historical averages, although most of Lane County is still in a moderate drought category according to the National Drought Monitor.

McKenzie River flow at Hayden Bridge during the 2021 calendar year was generally below historical median flows (see Figure 2-1). Flows approached historical minimum levels during the month of April, and again in July/August, but eventually climbed closer to median flows later in the fall. The highest flow observed at Hayden Bridge during 2021 was 16,100 cubic feet per second (cfs), which occurred on January 13th.

Figure 2-1: Historic Flow Comparison, McKenzie River above Hayden Bridge



3.0 Water Quality and Watershed Health

EWEB's Source Water Protection Program utilizes multiple long-term monitoring efforts year-round to assess water quality conditions throughout the watershed. Water quality conditions are tracked through a combination of extensive continuous monitoring and discrete sampling. The results are used by staff to better understand overall watershed health, contaminant sources and emerging drinking water threats. In addition to long-term monitoring projects, continued emphasis in 2021 targeted post-fire impacts from the 2020 Holiday Farm Fire.

3.1 Continuous Monitoring Network

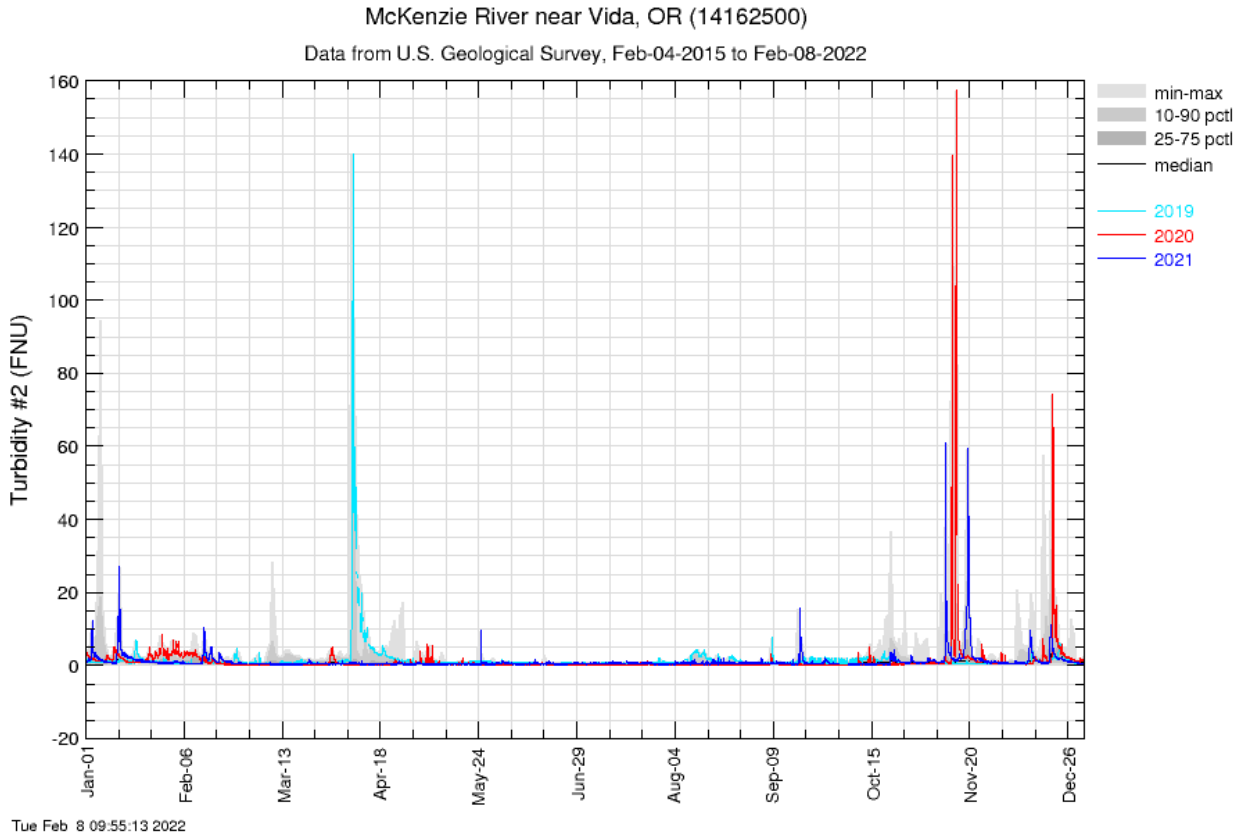
With our continuous monitoring, we measure fDOM (fluorescent dissolved organic matter), the amount of organic matter in the water, as well as turbidity, the cloudiness of the water. Both of these constituents harbor pathogens that may impact public health (bacteria, viruses, etc). By quantifying these constituents, we are able to understand what treatment type and amount will be most effective

EWEB's continuous monitoring network was expanded in 2021 to include two additional USGS water quality stations, one in Gate Creek, and the other in the McKenzie River below Trail Bridge Reservoir. Although the Trail Bridge location is primarily funded by Generation, Source Protection funding was added to include fDOM and total algae sensors. In addition to the USGS stations, EWEB staff also

installed monitoring stations in Bear and Simmonds Creek for real-time access to water quality data within the Holiday Farm Fire area. .

As illustrated in Figure 3-1 by the blue line, turbidity levels (measured in FNU) in the McKenzie River near Vida peaked in 2021 during a storm event on November 11th (61 FNU) and again on November 19th (59 FNU) due to an erosional event in Blue River Reservoir. Over the past three years turbidity levels have been elevated during certain runoff events in the McKenzie River near Vida. In 2020, turbidity climbed to 158 FNU during a heavy rain event following the Holiday Farm Fire, and 140 FNU after a significant rain on snow event in April of 2019. Turbidity levels in the McKenzie River near Vida are typically less than 3 FNU during most of the year.

Figure 3-1: Major Turbidity Event Comparison, McKenzie River near Vida, 2019-2021



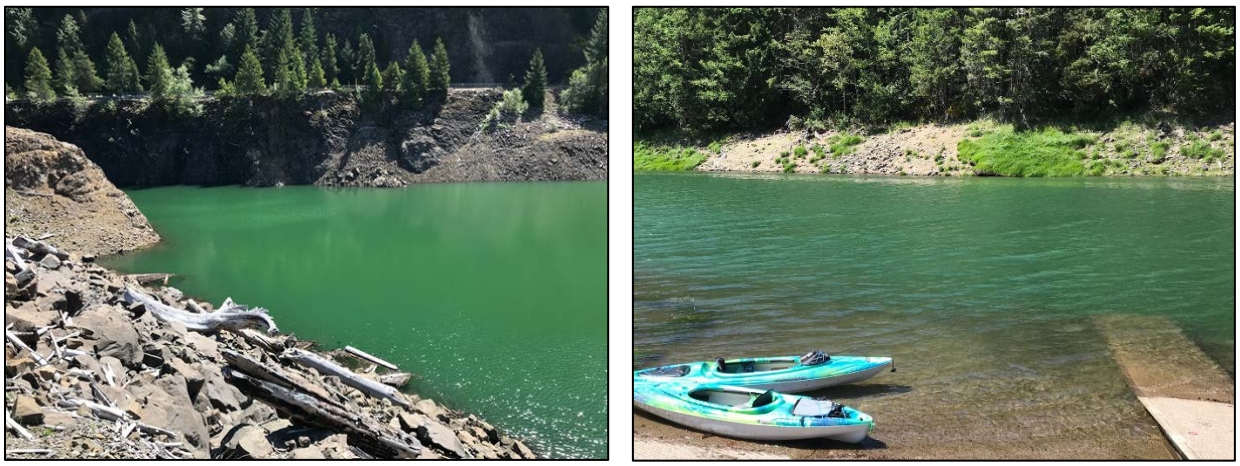
3.2 Harmful Algal Bloom (HAB) Monitoring

Cyanobacteria are photosynthetic bacteria that are found naturally in lakes, streams, ponds, and other surface waters. Under certain conditions, like warm, slow-moving waters that are rich in nutrients (high in phosphorus and/or nitrogen), cyanobacteria harmful algal blooms (HABs) can form that impair water quality or generate toxins that are harmful to humans and animals. Nutrients can enter lakes and rivers from natural sources, such as volcanic rock and forests, or from man-made sources, such as fertilizer runoff, stormwater outfalls, septic tank overflows and pet waste. In our state, the Oregon Health

Authority has adopted drinking water and recreational use advisory levels for some of the toxins produced by HABs.

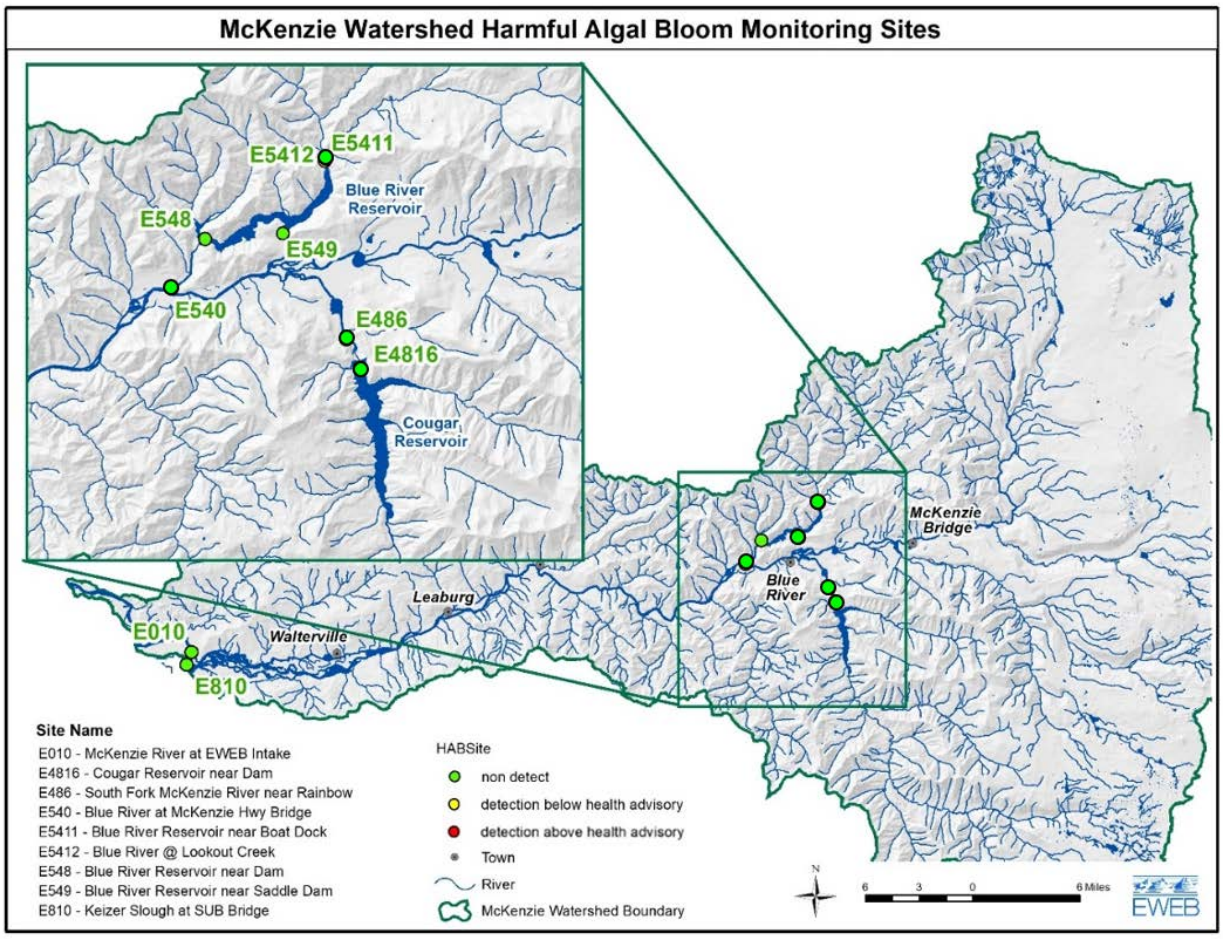
Cyanobacteria blooms in both Blue River Reservoir (BRR) and Cougar Reservoir (CR) during 2021 followed a similar pattern as previous years. *Dolichospermum* first appeared in BRR beginning in April, and then in CR by May. *Dolichospermum* concentrations peaked in May (see Figure 3-2) for both BRR (28,700 cells/mL) and CR (16,700 cells/mL) before quickly dissipating in June. Numbers stayed relatively low through the remainder of the year, apart from a slight increase in CR mid-September. However, there were a few notable exceptions in 2021 as compared to previous years. High concentrations of *Planktolyngbya* (117,000 cells/mL) and *Cyanodictyon* (119,000 cells/mL) were observed in BRR in June and July, while a significant drop in reservoir levels during the summer likely contributed to suppressed *Gloeotrichia* numbers in the fall. In CR, Aphanizomenon (39,700 cells/mL) concentrations peaked in early October.

Figure 3-2: Cougar Reservoir (left) and Blue River Reservoir (right) on 5/17/2021



Some species of cyanobacteria, including those within the *Dolichospermum* genus, can produce cyanotoxins. Although toxigenic genes capable of producing cylindrospermopsin were detected in both reservoirs during *Dolichospermum* blooms, cyanotoxins were not detected at any site above method reporting limits in 2021 (see Figure 3-3).

Figure 3-3: Harmful Algal Bloom Monitoring Results – Cyanotoxins, 2021



3.3 Baseline & Storm Data Analysis (including Holiday Farm Fire impacts)

All routine baseline sampling events were completed as scheduled in 2021. Storm sampling events targeting peak flow conditions in both urban stormwater outfalls and Holiday Farm Fire (HFF) sites were completed in the spring and fall. For the discussion below, a selection of baseline and storm data were compiled into the following four groups: Metals, Nutrients, Solids/Bacteria and Organic Compounds.

Similar to 2020, most peak values observed in 2021 were associated with prolonged rain events in urban areas of eastern Springfield or within the HFF area. An important departure from previous years was the Blue River Reservoir turbidity event this past November. Samples collected during this unusual event resulted in some of the highest values ever observed by Source Protection staff in the McKenzie Watershed for several analytes. Fortunately, the event was relatively short-lived and only lasted for a few days.

Metals

When comparing results across all sites in 2021, peak values for 19 total metal species were almost all associated with the Blue River Reservoir turbidity event. While not all that surprising given the

extremely high suspended sediment loads during the event, some values, such as total aluminum, were nearly 5 times higher than the next highest value across all other sites. Elevated total metal concentrations were also associated with urban sites during a first fall flush in September, and during prolonged rain events in the HFF area near the beginning of the year and in November (see Figure 3-4).

While most peak dissolved metal concentrations were typically associated with high flow conditions in urban and HFF locations, as well as Camp Creek, a few occurred during summer baseflow conditions. Dissolved antimony, arsenic, cadmium, chromium, lead, manganese, strontium, thallium, and vanadium were reported at or near peak concentrations during baseline conditions. Although most peak concentrations were focused in the middle to lower watershed, dissolved vanadium levels were highest in the upper watershed, likely due to the close proximity of young volcanic rock.

Figure 3-4: Keizer Slough (9/18/21) and Hatchery Creek flowing into Leaburg Lake (2/18/21)

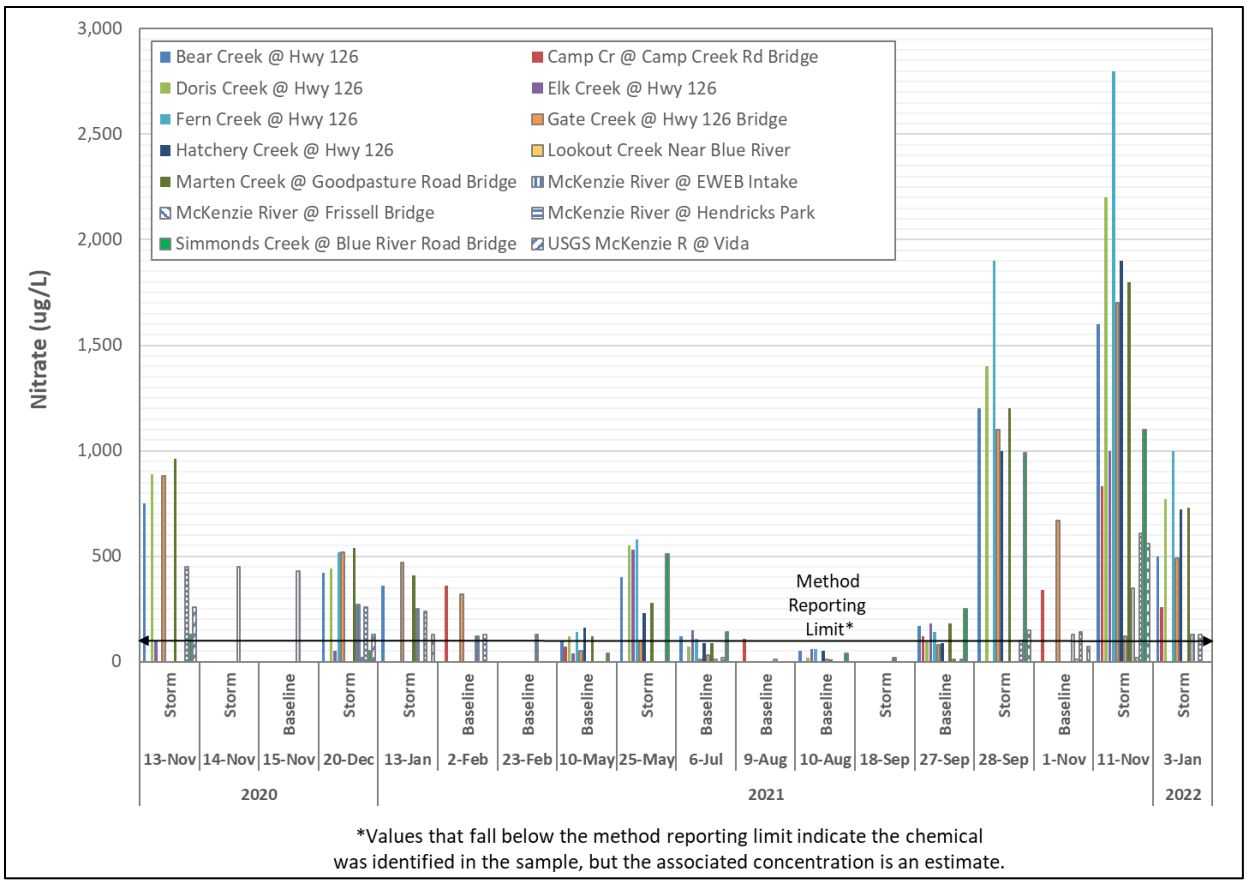
Nutrients

High nutrient levels can cause HABs, impact ecosystem function, and are a concern for drinking water treatment (e.g. nitrate and nitrite). Nutrient samples were collected frequently at several mainstem and tributary locations every two weeks from April through October, and during large winter storm events. Overall, nutrient levels in 2021 at mainstem McKenzie locations were similar to previous years during baseflow conditions, typically April through September. The once exception was total Kjeldahl nitrogen (TKN), with levels fluctuating considerably during baseflow conditions, even during summer months. Notable nutrient increases, particularly for nitrate, were observed during significant rainfall/runoff events in January, September, and November. The magnitude of nitrate increases during storm events appears to be increasing over time at HFF sites (see Figure 3-5). The nitrate increases are likely associated with natural processes in post-forest fire environments, particularly the proliferation of nitrifying soil bacteria with access to abundant nutrients.

Although elevated total phosphorus and orthophosphate concentrations were observed across numerous sites during storm events, maximum values were generally lower when compared to storm events in 2020 immediately following the Holiday Farm Fire. This was not the case for the Blue River Reservoir turbidity event. Phosphorus and orthophosphate levels downstream of the reservoir during the turbidity event were an order of magnitude higher than all other locations throughout the year.

Significant increases in total and dissolved organic carbon (TOC and DOC respectively) were observed across multiple sites during the first fall flush event in September. While a number of HFF sites experienced large DOC increases during this event, including 8.8 mg/L in Gate Creek, these levels were considerably lower than values observed at urban outfalls in Springfield. The highest DOC concentration observed was 45.7 mg/L in the 52nd stormwater channel. TOC and DOC levels at most sites during ambient conditions appeared normal.

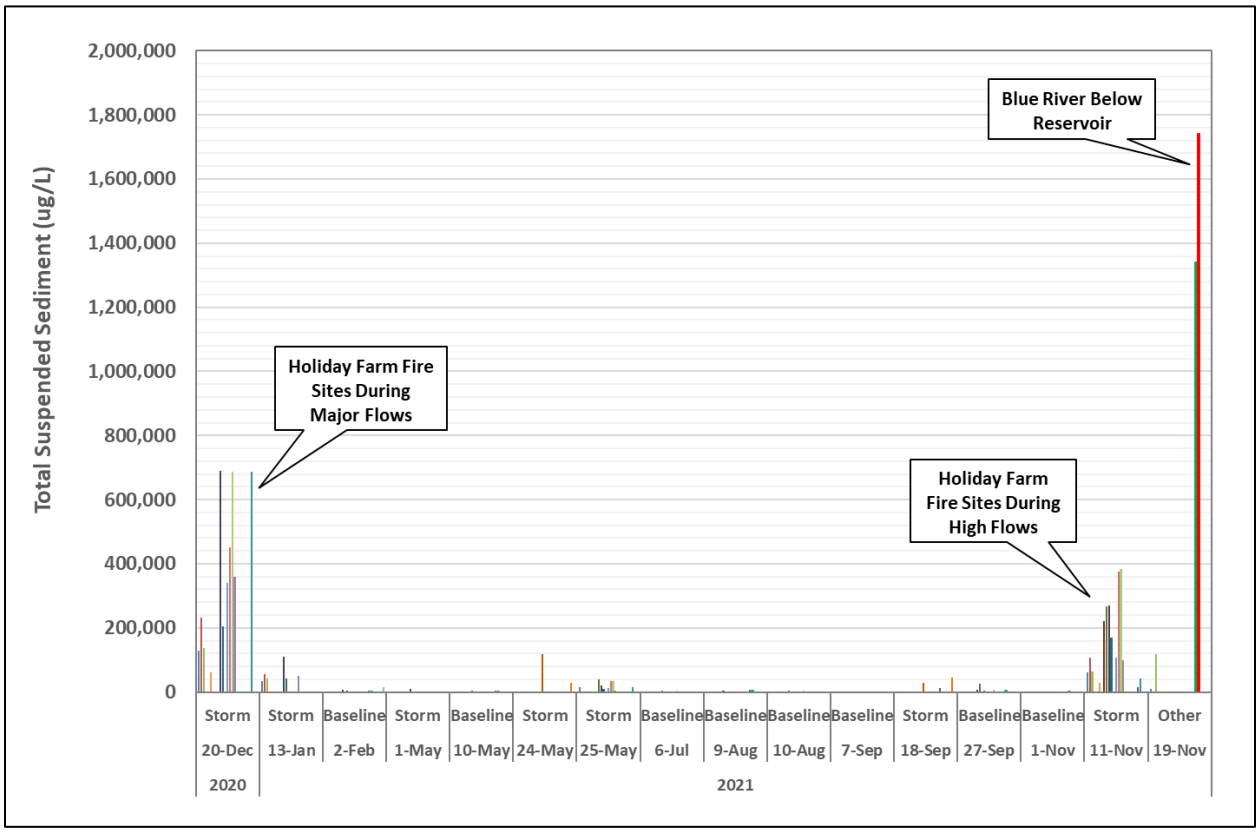
Figure 3-5: Nitrate Results, Holiday Farm Fire Monitoring Locations



Solids, Bacteria and General Chemistry

Solids can carry contaminants and pathogens through the watershed impacting ecosystem function as well being a concern for drinking water treatment. Results for total suspended solids (TSS) and total solids (TS) were generally typical across most sites throughout 2021. Modest TSS and TS increases were observed during rainfall events, with the most significant increase occurring during high flow conditions in November. However, similar to other analytes previously discussed, the Blue River Reservoir turbidity event generated some of the highest sediment loads observed across the entire McKenzie Watershed over the past 20 years. TSS values downstream of the reservoir reached 1,740 mg/L this past November, compared to the peak TSS value of 691 mg/L reported for Gate Creek during major flow conditions in 2020 immediately after the HFF (See Figure 3-6).

Figure 3-6: Total Suspended Sediment Concentrations Across Multiple Sites, 2021. The Major Flow event in 2020 was a large winter storm, and the high flow event in 2021 was the first runoff event of 2021.



Bacteria levels were generally typical in 2021 across most sites when compared to previous years, although bacteria levels in several urban outfalls did rise dramatically during the first fall flush event in September. On September 18th, *E. coli* climbed to 19,863 MPN/100mL in the 52nd stormwater channel and 17,329 MPN/100mL in the 69th stormwater channel. These values are 2 orders of magnitude higher than all reported values for HFF sites in 2021. Given the lack of precipitation over the extended summer season, elevated *E. coli* levels in urban areas were not all that surprising in 2021.

Organic Compounds

With the assumption that water quality impacts from the HFF are expected to last for years to come, increased organic contaminant monitoring was extended into 2021. Over 500 compounds were analyzed at select sites during storm events, when contaminants are expected to be flushed into local waterways during heavy rainfall events. Several new methods targeting expanded pesticide lists were also utilized to monitor potential increases in pesticide use within the HFF area post-salvage logging. To accommodate the large amount of available data, only analytes with at least 1 reportable value in 2021 above applicable method reporting limits will be included in the discussion below.

Most organic compounds detected in 2021 originated from urban stormwater outfalls. As indicated in Figure 3-7, the 42nd stormwater channel registered the highest number of detections during a late spring storm event in May, and a first fall flush event in September. Detection counts for other stormwater

outfalls, as well as for Keizer Slough, were also elevated during these events. Both events captured runoff conditions in urban areas after considerable dry periods.

Figure 3-7: Organic Compounds Detected Above Method Reporting Limits by Site, 2021.

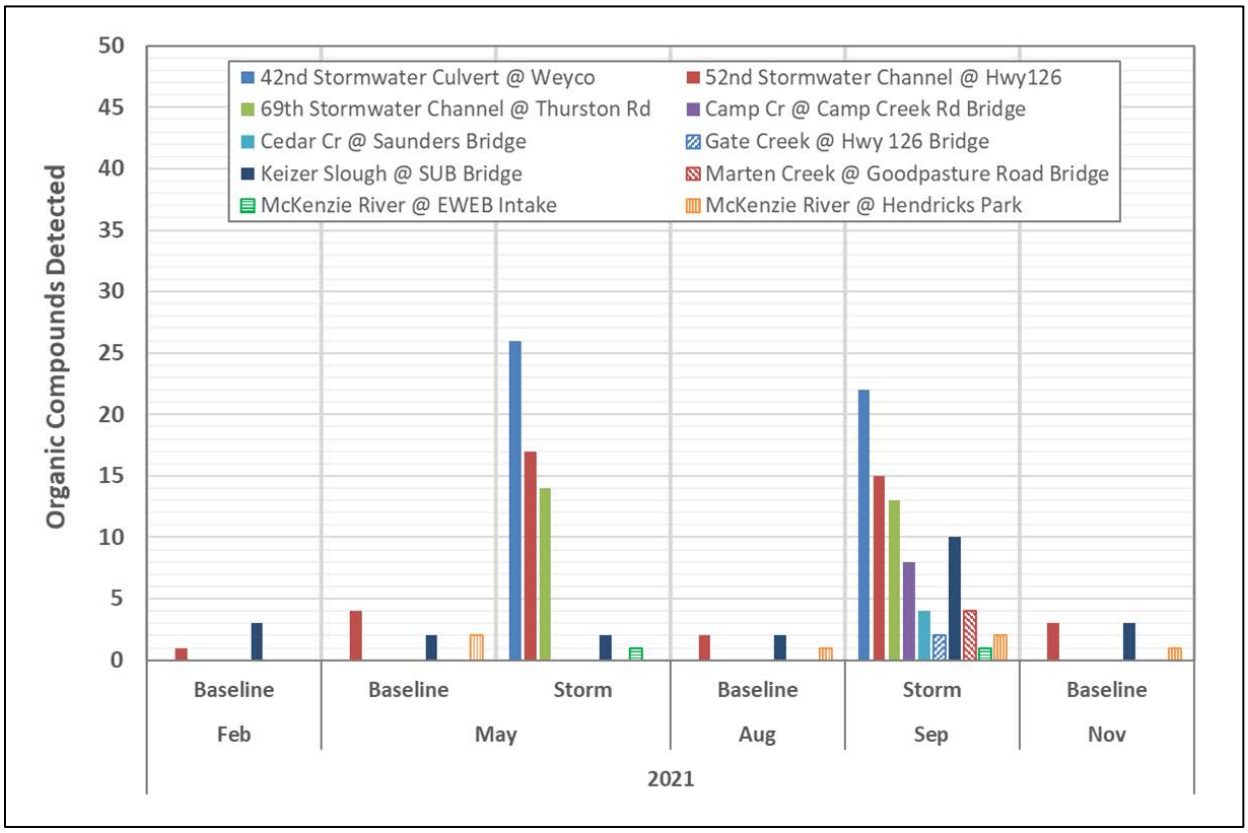


Table 3-1 summarizes total detections across all sites for multiple organic compound groups. Several key observations related to the organics data are worth pointing out. First, almost all of the detections are considered low level, and often less than 1 ug/L. Second, several per- and polyfluorinated substances (PFAS) were detected in multiple stormwater outfalls, particularly during large storm events. Low-level PFAS compounds have previously been detected in urban stormwater outfalls in prior years. Third, a broad-screen pharmaceutical and personal care product (PPCPs) method was used at multiple sites in 2021. This PPCP method provides very low-resolution detection of organic compounds in surface water and may account for the uptick in detections. Fourth, with a heavy focus on pesticides and semi-volatile organic compounds (SVOCs) this past year, numerous pesticides were detected, primarily in stormwater outfalls. While most pesticide detections are generally regarded as low level (<1 ug/L), there was a relatively high hit of glyphosate (55 ug/L) in the 52nd stormwater channel back in September 2021. However, it is also worth noting that the Federal maximum contaminant level (MCL) for glyphosate in drinking water is 700 ug/L, which is well above the concentration detected in the stormwater channel.

Lastly, Keizer Slough (E810) continues to be a source of volatile organic compounds (VOCs), with chloroform being the primary constituent. The peak chloroform concentration detected in Keizer Slough

in 2021 was 4.6 ug/L, which is well below the 80 ug/L drinking water MCL for Total Trihalomethanes (includes chloroform).

Table 3-1: Total Detections at or Above Method Reporting Limits for all Sites, 2021

Analyte Group	Baseline Event Count	Storm Event Count
General Organic Compounds, Other	0	10
General Organic Compounds, Pesticides	0	6
Per- and Polyfluorinated Substances (PFAS)	12	25
PPCPs, Food Additives	0	4
PPCPs, Pharmaceutical	0	21
SVOCs, Other	0	10
SVOCs, Pesticides	0	42
VOCs	8	6

3.4 Baseline Data Summary

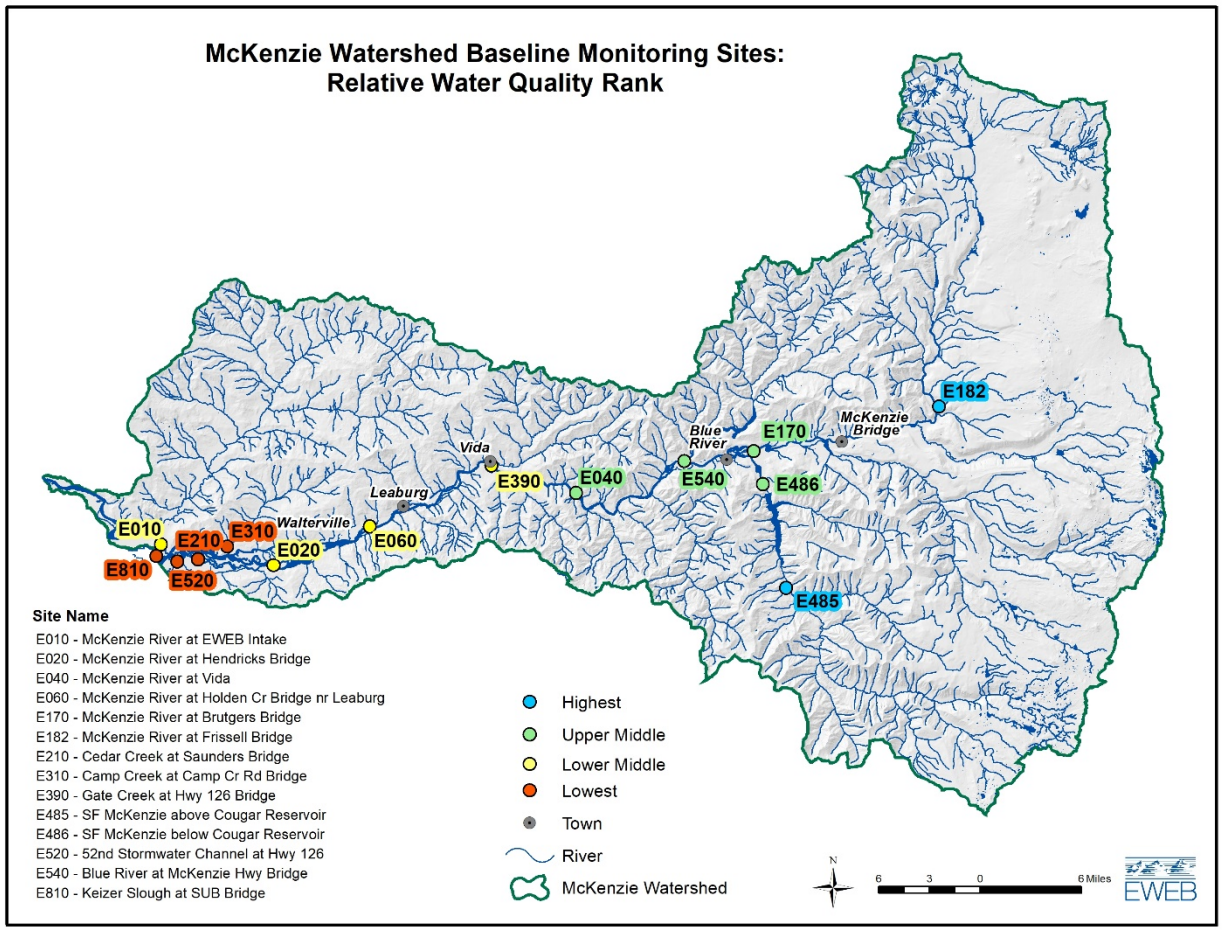
Water quality conditions in the McKenzie Watershed throughout most of 2021 were largely unremarkable, apart from the Blue River Reservoir turbidity event and climbing nitrate levels in HFF sites during major rainfall events. The increase in organic contaminant detections from previous years is likely a combination of factors that may include using a wider net with lower reporting limits and the prolonged dry spells prior to targeted storm event monitoring.

Low flows and abundant sunshine in spring typically translate into higher cyanobacteria concentrations in upstream reservoirs earlier in the season, but algae levels were typical and cyanotoxins were not detected in 2021 above method reporting levels. Very low rainfall amounts through the summer and into the fall brought river levels down and certainly had an impact on water temperatures, pH and conductivity. Fortunately, major precipitation events in November and December brought much needed snowpack to the Cascades and increased river flows throughout the system.

Figure 3-8 is a map illustrating the relative water quality rank of baseline monitoring sites across a variety of water quality parameters, including metals, nutrients, bacteria, and general chemistry. There is no change for rankings between 2020 and 2021 across all sites. Ranked values for numerous analytes were aggregated and assessed to determine how baseline sites compare to one another. The first group, colored blue, represents sites with the highest or best water quality conditions compared to other sites, and generally reflects the exceptional water quality conditions of the High Cascades. The second group, or the upper middle group highlighted in green, consists of sites with generally great water quality conditions throughout most of the year, but with slightly higher metal and nutrient values when compared to the first group. The third group, highlighted in yellow and designated the lower middle, consists of sites with very good water quality, but noticeable increases in most analytical concentrations when compared to upstream sites. The fourth group, or lowest ranked group, is highlighted in red. Water quality conditions at sites within the lowest ranked group are generally the

poorest and yield the highest analytical concentrations when compared to all other baseline sites within the watershed.

Figure 3-8: Map of Monitoring Locations with Relative Water Quality Rank



4.0 Hazardous Material Spills or Releases

Hazardous material spills remain a substantial threat in the McKenzie Watershed due to the presence of a major highway (126) running along the length of EWEB's sole source of drinking water. In addition, spills from urban areas reaching stormwater outfalls that discharge directly to the McKenzie River above EWEB's intake remain a significant concern. Finally, the Holiday Farm Fire also increased the risk of potential hazardous material releases, both during the fire, and after, with ongoing efforts focused on clean-up, restoration, logging and rebuilding.

4.1 Summary of Spills in the McKenzie Watershed

There were five reported spill incidents in the Oregon Watershed Emergency Response System (OWERS) system during 2021, three of which were in the McKenzie Watershed. In light of EWEB's future plans to add a second source on the Willamette and with SUB's investment in OWERS for the Middle Fork Willamette, we are also tracking hazardous material spills in the Middle Fork Watershed. We are also interested in spills in the Coast Fork Willamette, but our system does not yet extend to that geographic area.

Table 4-1: Reportable Spills/Releases recorded in OWERS, 2021 (MF&R-McKenzie Fire and Rescue)

Date	Responsible Party	Material Released	Quantity (gallons)	Details	Response
3/07/2021	Private	Vehicle fluids	Minor	Vehicle spill in marshy area, McKenzie	No details
6/27/2021	Private	Diesel	~200 gallons	Semi accident, Middle Fork Willamette	No details
7/13/2021	Private	Resin	Minor	Semi accident, Middle Fork Willamette	No details
9/30/21	Private	Gasoline, Oil	Major, but not a threat to water	Tanker truck head-on accident, McKenzie	MF&R, ODOT
10/18/21	Private	Vehicle fluids	Unknown	Pick-up truck crash, near Leaburg Powerhouse, McKenzie	MF&R, ODOT

4.3 Annual Spill Drill

EWEB worked with multiple partners to coordinate a multi-agency spill response drill on the McKenzie River this past fall (see Figure 4-1). Equipment from the McKenzie Watershed Emergency Response System (MWERS) was used to deploy boom across a segment of the river. The drill gives first responders an opportunity to familiarize themselves with equipment and to test out new response strategies.

Figure 4-1: Boom Deployment Drill, McKenzie River at Hendricks Bridge Park, 2021

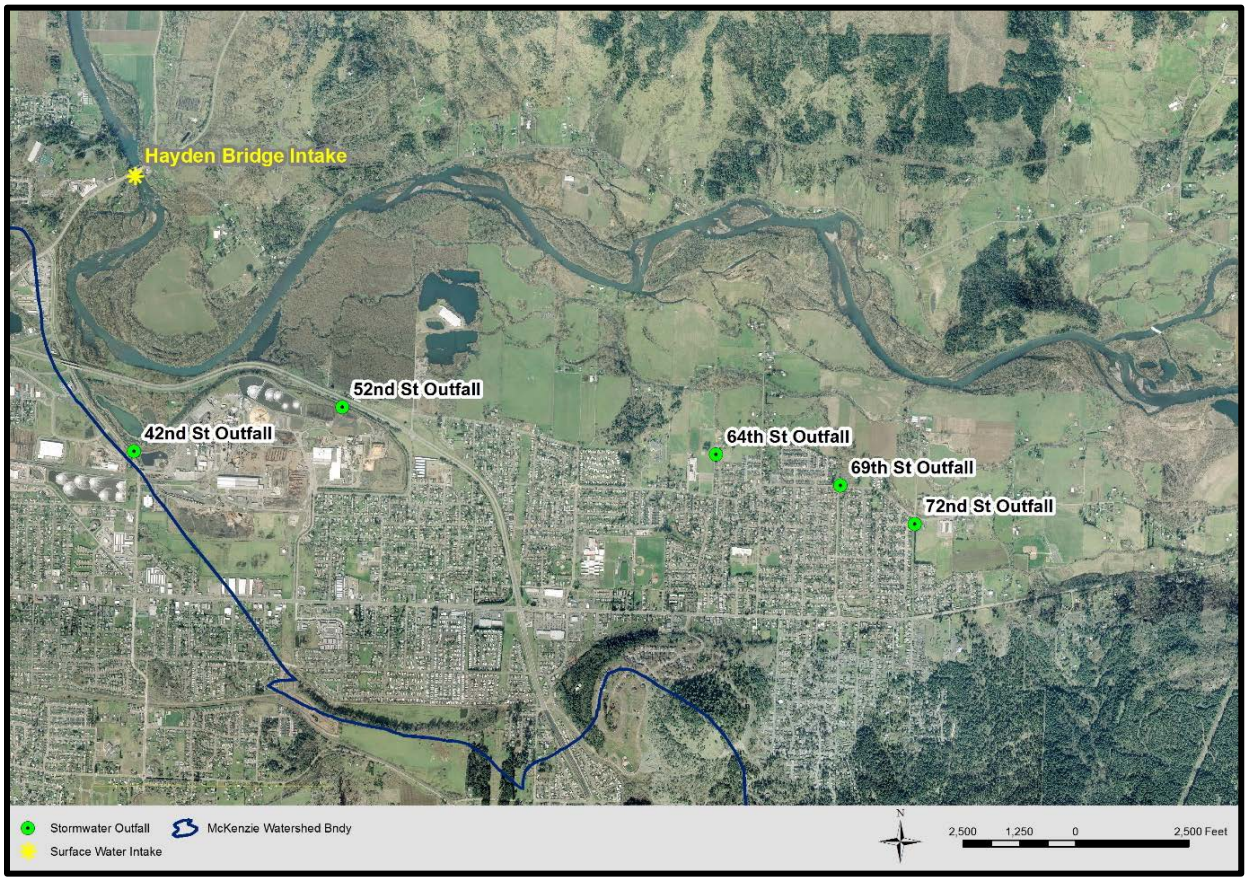
Photo courtesy of Region II Hazmat

5.0 Urban Runoff Mitigation

Urban runoff from developed areas (construction, roads, parking lots, roofs, and other impervious surfaces) can be a significant source of pollution during rainfall events. Stormwater runoff often contains a variety of metals, such as arsenic, cadmium, chromium, copper, iron, manganese, nickel, lead and zinc, petroleum products including poly aromatic hydrocarbons, nutrients from fertilizers, *E. coli* bacteria from pet waste, pesticides, and other chemicals. These pollutants present a significant threat to aquatic organisms for short duration and long-term exposures. In addition, they can also pose a risk to human health.

Urban runoff is a concern especially in the lower part of the McKenzie Watershed which includes parts of East Springfield. Several stormwater outfalls (i.e., 42nd St., 52nd St., 64th St., 69th St., and 72nd St.) discharge into Cedar Creek and Keizer Slough, and then into the McKenzie River just upstream from EWEB's intake (see Figure 5-1). This area also contains a number of Springfield Utility Board (SUB) and Rainbow Water municipal well fields.

Figure 5-1: Stormwater Outfalls in East Springfield



5.1 Continuous Monitoring Network Expansion

Plans to expand EWEB's continuous water quality monitoring network in 2020 and 2021 to include new monitoring stations at Keizer Slough (E810) and Cedar Creek (E210) were temporarily put on hold to accommodate increased monitoring efforts around the Holiday Farm Fire. Equipment originally destined for urban sites will either be returned or replaced as priorities are reassessed in 2022.

5.2 48th Street Channel Wetland Enhancements

The McKenzie Watershed Council continued work on maintaining and improving the 48th Street wetland enhancement project area. The purpose of the project is to enhance the wetland area and increase its ability to treat stormwater before it flows into Keizer Slough and then into the McKenzie River. This year's work included conducting site preparation activities, invasive species treatments in fall and spring, and interplanting a variety of native plants, including trees, sedges, and reeds. 2022 is the final year of the maintenance agreement with the McKenzie Watershed Council and will include additional interplanting and invasive control. Annual maintenance and interplanting over the past several years has been important in order to facilitate new trees and shrubs reaching 'free-to-grow' status.

5.3 Green Infrastructure/Urban Waters & Wildlife Program

The Urban Waters & Wildlife program (UWWP) is a regional expansion of the Long Tom Watershed Council's successful Trout Friendly Landscape (TFL) Program to engage businesses to install voluntary green stormwater infrastructure retrofits within the Upper Willamette Metropolitan area (Eugene, Springfield, Glenwood) and develop a monitoring framework to identify trends and effectiveness of treatment. The overall goals include a focus on improving water quality and wildlife habitat through the Eugene-Springfield area.

This year, partners continued work on a project in the Hayden Bridge area to address stormwater issues that involves Oregon Industrial Lumber, The Child Care Center, and EWEB's Hayden Bridge treatment plant. Part of this project is funded by a $30,000 Oregon Health Authority Source Water Protection grant. Contractors completed some blackberry removal around the Hayden Bridge boat ramp to facilitate surveying by a local engineering firm. Results will be used to refine a plan for project work in the area and prioritize areas of work for the initial phases of implementation in 2022.

The partnership is also applying for a second EPA grant to continue the work conducted under the first grant in the areas of: building program capacity, developing a sustainable financial model, engaging Latinx and other BIPOC partners, designing and implementing projects, and establishing a monitoring framework for projects.

5.4 Pentachlorophenol (PCP) Plume

International Paper (IP) was granted approval by the Oregon Department of Environmental Quality (DEQ) in 2021 to change their progress reporting from semiannual reporting to annual reporting. The annual report will be available in March for the preceding year. The following status update is based on findings in Progress Report Number 92, submitted by PES Environmental on behalf of IP to DEQ on April 15th, 2021, along with monthly email communications to EWEB staff regarding Springfield Utility Board/Rainbow Water District (SUB/RWD) well sampling results collected during operational periods (generally June through October).

Chlorinated phenolic and volatile organic compounds were not detected in SUB/RWD wells during the 2021 operational period. These wells are located downgradient of the PCP plume. Analytical results for groundwater monitoring wells sampled in 2020 (January and July) and in 2021 (January) show continued decreasing PCP concentrations at most intermediate and deep well depths. Two exceptions over the past few years are well MW-18D, where PCP concentrations are gradually increasing, and well MW-19D, where PCP concentrations have stalled after decreasing from peak concentrations back in 2012.

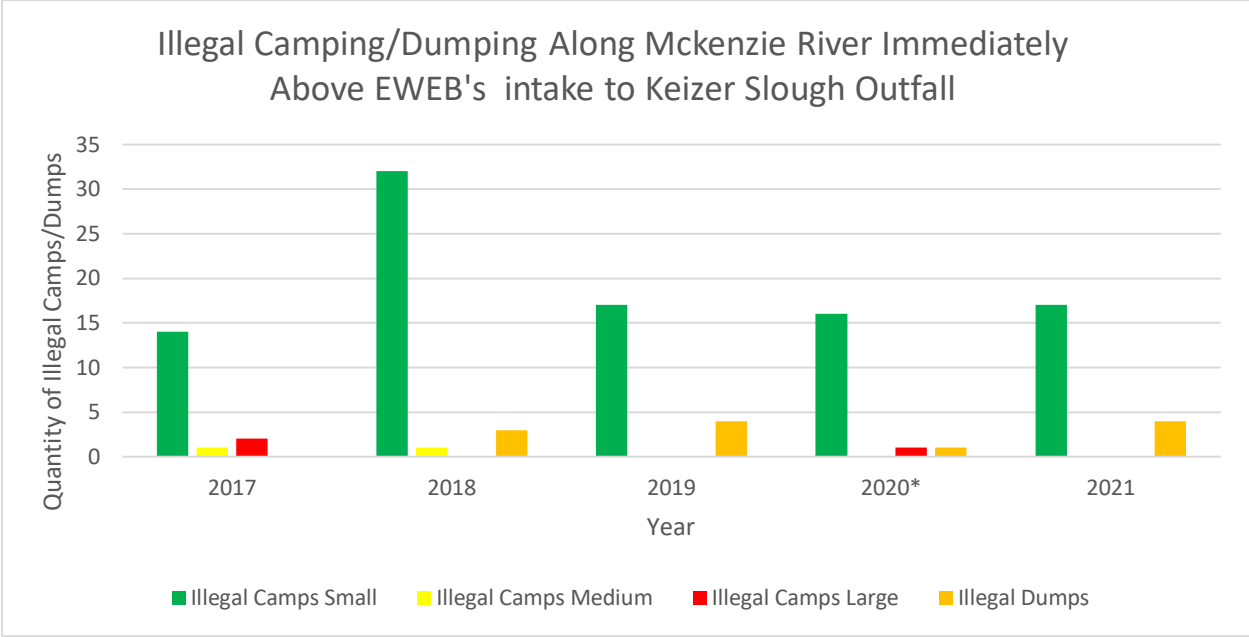
6.0 Illegal Camping

EWEB's Source Protection staff continue to partner with Willamalane Parks, City of Springfield, and Lane County to reduce the impacts of illegal camping and dumping in riparian areas along the McKenzie River immediately above EWEB's intake. Figure 6-1 shows the locations of illegal camps that were cleaned up in 2021. Figure 6-2 illustrates the downward trend of large, well established illegal camps due to the coordinated efforts of these agencies and use of the illegal camping application that identifies camps

early and notifies agencies of a camp's existence. There was an uptick in illegal dumping at the Hayden Bridge Boat Ramp dumpster; as a result, the dumpster was removed in the summer of 2021. This has led to less trash and illegal dumping at the boat ramp.

Figure 6-1: Map of Illegal Camps and Dumps, 2021

Figure 6-2: Illegal Camping/Dumping Activity, 2017-2021. Small camps are 1-3 tents and <1 cubic yard of trash. Medium camps are 4-7 tents and 1-10 yards of trash. Large camps are 7+ tents and 10+ cubic yards of trash.



7.0 Pure Water Partners (PWP)

The Pure Water Partners (PWP) Program was originally designed to reward McKenzie landowners who signed long-term agreements to protect high quality forest land along the river and assist landowners in restoring degraded areas, in order to help EWEB protect water quality and avoid increases in future water treatment costs (see 2018-2019 State of the Watershed report for more information).

Following the 2020 Holiday Farm Fire, the Pure Water Partners program shifted its focus to carrying out restoration activities on properties impacted by the 2020 Holiday Farm Fire. This includes replanting in riparian areas, invasive vegetation removal, fire fuels reduction and erosion control. Currently the PWP is in the middle of the second winter season of replanting on private properties along the river (see Figure 7-1). This will include planting approximately 450,000 bare root trees and shrubs. In addition, the McKenzie Valley Long-Term Recovery Group that is working to help individuals and families recover from the Holiday Farm Fire has recently completed a Needs Assessment for McKenzie residents and has been able to refer additional landowners to PWP.

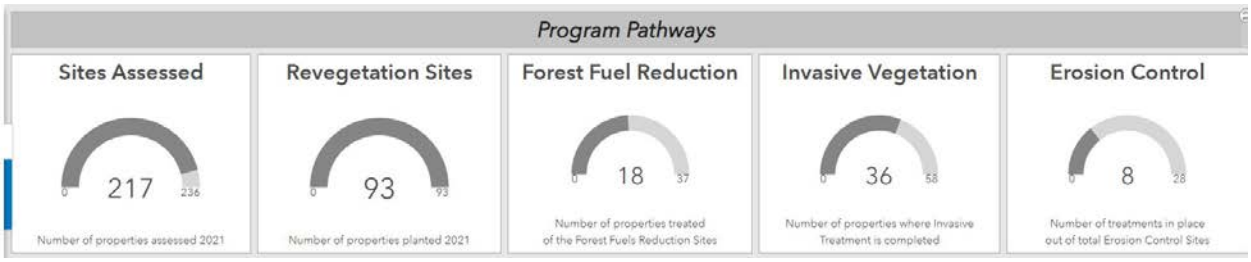
Figure 7-1: Replanting in the McKenzie Watershed, 2022

The PWP is planning to re-engage with non-fire-affected landowners in the spring/summer of 2022, following replanting season.

EWEB has also changed the structure and content of the PWP agreements to better reflect the post-fire environment. Most landowners will sign a 7-year Watershed Stewardship Agreement, which will enable PWP contractors and partners to do work (including the activities outlined above) on their properties and conduct monitoring and maintenance activities over the 7-year period. As landowners rebuild, the agreement also includes support and incentives for naturescaping activities. We currently have over 90 landowners who have signed watershed stewardship agreements since the fire. We continue to have additional landowners sign up for property assessments each week; therefore, more watershed stewardship agreements are expected this year.

Below is a snapshot of the types of activities we conducted in 2021. We are continuing this work into 2022.

Figure 7-2: PWP Activities in 2021*



* Please note that there were approximately 30 additional fuels reduction properties that were completed under an Oregon Dept of Forestry grant before this dashboard was developed.

8.0 Septic System Assistance

Since EWEB began its Septic System Assistance Program in 2008, over 1,000 septic systems have been inspected and pumped out (see Table 8-1). A number of systems were also repaired as needed. EWEB's program currently consists of two components:

1) ***Rebate program:*** This program provides homeowners with a $250 rebate to have their septic systems inspected and pumped out, if needed.

2) ***Zero-interest loan program:*** This program allows homeowners who need to make major repairs or replace their septic tank or drainfield to apply for a zero-interest loan of up to $20,000 from EWEB. Nineteen zero-interest loans have been issued to McKenzie homeowners and another 10 or so are in process. The program used to have a $10,000 limit but was re-evaluated following the Holiday Farm Fire. Alternative treatment septic systems are better for water quality, but come at a much higher price, so EWEB wanted to extend the upper limit to better reflect the cost of these systems.

See www.eweb.org/septic for more information about the program.

Feedback around this program has always been extremely positive. The septic system assistance program is now run by the Customer Solutions Department, though Source Protection staff collects data on septic system inspections/results by address in a database and in GIS. In 2021, 77 septic systems were inspected and pumped out (see Table 8-1).

Table 8-1: Septic System Participation 2008-2021

Septic Systems Inspected	
Average Inspections/Year	81
2021 Inspections	77
Cumulative Inspections	1,053

In 2022, EWEB is partnering with Lane County to facilitate the distribution of approximately $1.5 million of septic system assistance funds that has come through the state as part of fire recovery funds. EWEB is currently modifying our existing loan program to incorporate these funds as grants to homeowners, with an excess funds needed going through our loan process. Qualification criteria for these funds considers income level and proximity to the McKenzie River or a creek. Maximum grant funds will be $10,000 for a standard septic system and $20,000 for an alternative treatment system. This program is anticipated to roll out in the late winter/early spring of 2022.

9.0 Healthy Farms Clean Water

EWEB's Healthy Farms Clean Water Program is designed to support growers, helping to keep farmland as farmland (and not be sold off for development) and protect water quality. EWEB continues to offer free soil and leaf sampling to growers in the watershed, which helps them with nutrient management efforts. In addition, EWEB is working with the Upper Willamette Soil & Water Conservation District and local Natural Resources Conservation Service (NRCS) to offer growers cost-share assistance for projects which have a water quality benefit, such as fencing and off-stream watering, composting and nutrient management.

9.1 Hazelnut Pesticide Reduction Project

EWEB has been working with McKenzie hazelnut growers for years on mating disruption and monitoring to alleviate impacts of the filbert worm on their crops while reducing the amount of pesticides used. EWEB pays a contractor during the summer months to set up moth traps, monitor them throughout the growing season, and share this information with growers so that they can determine the best time to spray for filbert worm, if needed. Monitoring alone has helped to reduce pesticide use on hazelnut crops by up to 50% in some orchards.

10.0 Healthy Forests Clean Water

10.1 Forestry

The McKenzie Watershed is comprised of 88% forested land, with a mixture of private, state, and federally owned lands. Forested watersheds, like the McKenzie, produce better water quality than any other surface water source. However, forest management activities that may adversely impact downstream water quality include: the use of chemical applications for industrial forest stand treatment; road building; and various timber harvest techniques. These activities may adversely impact water quality due to increased runoff that carries pesticide residues and higher sediment loads that can increase turbidity levels, making it harder and more expensive to treat the water, as well as increasing the likelihood of producing disinfection by-products (DBPs).

Forest Spray and Harvest Tracking

Lane Council of Governments has been tracking forestry planned timber harvests and spray activities for EWEB since 2003. The data is collected by sub-watershed on industrial timberlands over time. The data reported by Oregon Department of Forestry provides only planned activities by timberland owners, but this at least provides an estimate of where harvest and spray activities are occurring over time. As a result of the Holiday Farm Fire, salvage logging in the McKenzie went up significantly in 2020 and 2021. particularly in Gate Creek, Marten Creek, Deer Creek and Quartz Creek. For more information and to explore an interactive map, see: FERNS Dashboard: Forestry Activities in the McKenzie Watershed (arcgis.com).

Stewardship Contracting

EWEB, the US Forest Service and a number of local partners have been participating in the McKenzie Watershed Stewardship Group (MWSG) for the past 8 years. Stewardship contracting is a mechanism where timber receipts from harvests designed to increase forest health and reduce wildfire risk remain in the watershed to fund restoration on public and private lands. Retained receipts may be used on either public or private lands for restoration work. This collaborative group meets monthly and works to discuss upcoming harvests and provide recommendations to the Forest Service around potential stewardship sales and how to spend retained receipts that result from these projects.

The pace of projects has slowed due to both Covid and the Holiday Farm Fire, as well as losing our facilitator but is expected to pick back up again in coming months. We have a new facilitator with strong experience in drinking water protection and public forest lands. There are also a couple of stewardship contracting sales that have recently sold or are anticipated to be sold this year, and we expect to prioritize projects for retained receipts in 2022

11.0 Operationalizing Source Protection

11.1 Hayden Bridge and Generation Integration Projects

Aquarius, a water data management system, was recently acquired by Source Protection staff to manage various types of time-series data collected for parameters like temperature, turbidity, dissolved oxygen, total algae, and FDOM throughout the McKenzie Watershed. While part of 2022 will involve setting up the system, loading historical data, and performing QA/QC, the software platform will provide both internal and external stakeholders better access to time-series data collected by Source Protection staff. This will be particularly useful for sites that do not have telemetry. The software platform will also provide quicker turnaround times on data, as well as enhanced data correction tools. Visualization tools will be set-up in 2022.

Source Protection staff worked with the USGS to install a water quality monitoring station in Gate Creek, which is one of the largest watersheds entirely within the Holiday Farm Fire burn perimeter. Real-time data from the station was added to the McKenzie River Information System (MRIS) and provides Hayden Bridge operators quick access to important water quality conditions upriver. A good example of this system in action occurred during the Blue River Reservoir turbidity event this past November. A similar water quality station that was installed in Blue River back in 2019 detected a rapid increase in turbidity following a drop in reservoir levels. Operators were able to see the turbidity increase in MRIS and follow the turbidity pulse down the mainstem McKenzie through the MRIS application, which gave them time to prepare. Meanwhile, Source Protection staff were able to head upriver and determine the source of the turbidity event and collect samples.

Source Protection staff also coordinated with Generation, Environmental and the Carmen Smith Relicensing staff, along with our USGS partners, to install a water quality monitoring station on the McKenzie River below Trail Bridge Reservoir. While Generation is covering most of the costs, Source Protection was able to provide funding for the addition of total algae and fDOM sensors. The sensors will provide an excellent upstream reference point for assessing impacts of the Holiday Farm Fire further downstream. Source Protection also worked with Dam Safety over the summer to conduct a dye-trace study around Trail Bridge Reservoir.