2022

State of the McKenzie Watershed Report

Eugene Water & Electric Board

Susan Fricke, Nancy Toth,
David Donahue and Lisa Erkert

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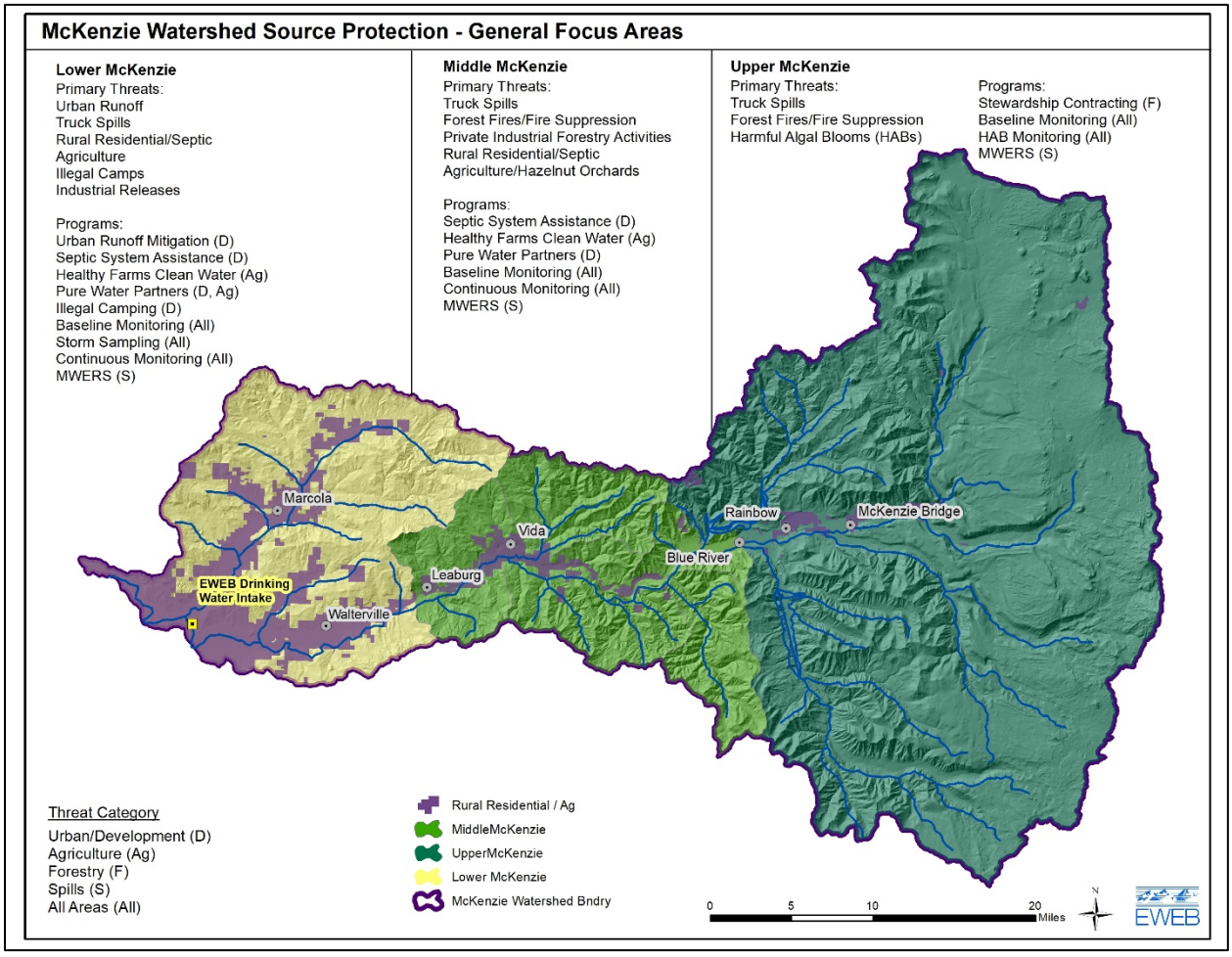
1.0 Executive Summary

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 conducts property assessments to evaluate needs and opportunities for replanting in riparian areas, invasive species control, fire fuels reduction, erosion control, and naturescaping. 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 for fuels reduction, replanting, large floodplain restoration projects, etc. EWEB is also partnering with Lane County, the Department of Environmental Quality, and others to distribute up to $3 million in septic system assistance grant funds from the American Rescue Plan Act (see Section 8).

Large-Scale Restoration Projects

We continue to work with The McKenzie Watershed Council (MWC), the McKenzie River Trust (MRT), and the U.S. Forest Service (USFS) to implement two different types of large-scale restoration projects. In 2022, we worked on large-scale wood placement at Gate Creek and floodplain restoration in Deer Creek. We also continued project design for Finn Rock Phase II and Quartz Creek. These types of restoration have numerous benefits including, mitigating floods, turbidity, and organic carbon by spreading out and attenuating flows, dropping out sediment, increasing the uptake of nutrients and organic carbon coming from upstream severely burned landscapes, water storage, increasing habitat for fish and wildlife, protection from fire, and increasing cold water refugia.

Figure 1-2: Gate Creek Large Wood Placement

Photo courtesy of MWC

Willamette Valley System Draft Environmental Impact Statement

The U.S. Army Corps of Engineers (Corps) prepared a draft Environmental Impact Statement (EIS) that was released on November 25th, 2022. The draft EIS proposes a number of different alternatives to balance operations and maintenance of the Willamette Valley System with Endangered Species Act (ESA) requirements. Several of the proposed alternatives would significantly alter the way Cougar Reservoir is managed. The Corps' preference, Alternative 5, would keep Cougar Reservoir drawn down to an elevation of 1,330 feet from mid-March to mid-June, and then again from mid-Nov to mid-December. Previously, the reservoir would typically be drawn down to minimum elevation of 1,532 feet. The proposed lower drawdown elevation will likely expose deeper lakebed sediments to erosion and scouring events, particularly during large spring rain-on-snow runoff events. If Alternative 5 is adopted, EWEB staff expect an increase in the frequency and magnitude of significant sediment/turbidity events in the South Fork McKenzie, at least during the first few years after implementation.

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 snowpack), 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 and restoration effort.

Our water quality monitoring staff continued to conduct baseline and storm event monitoring with a focus on tributaries both within the Holiday Farm Fire area and in the urban interface. EWEB worked with the United States Geological Survey (USGS) to install a stage/discharge and real-time water quality monitoring station in Quartz 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. The station will also provide pre- and post-floodplain restoration water quality data to evaluate effectiveness of the project. 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 in 2022 (see Section 3).

Urban runoff and hazardous material spills remain high priority threats to water quality. The destruction from the HFF and subsequent salvage logging created conditions on Hwy 126 that could lead to more accidents or 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 be a source 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.

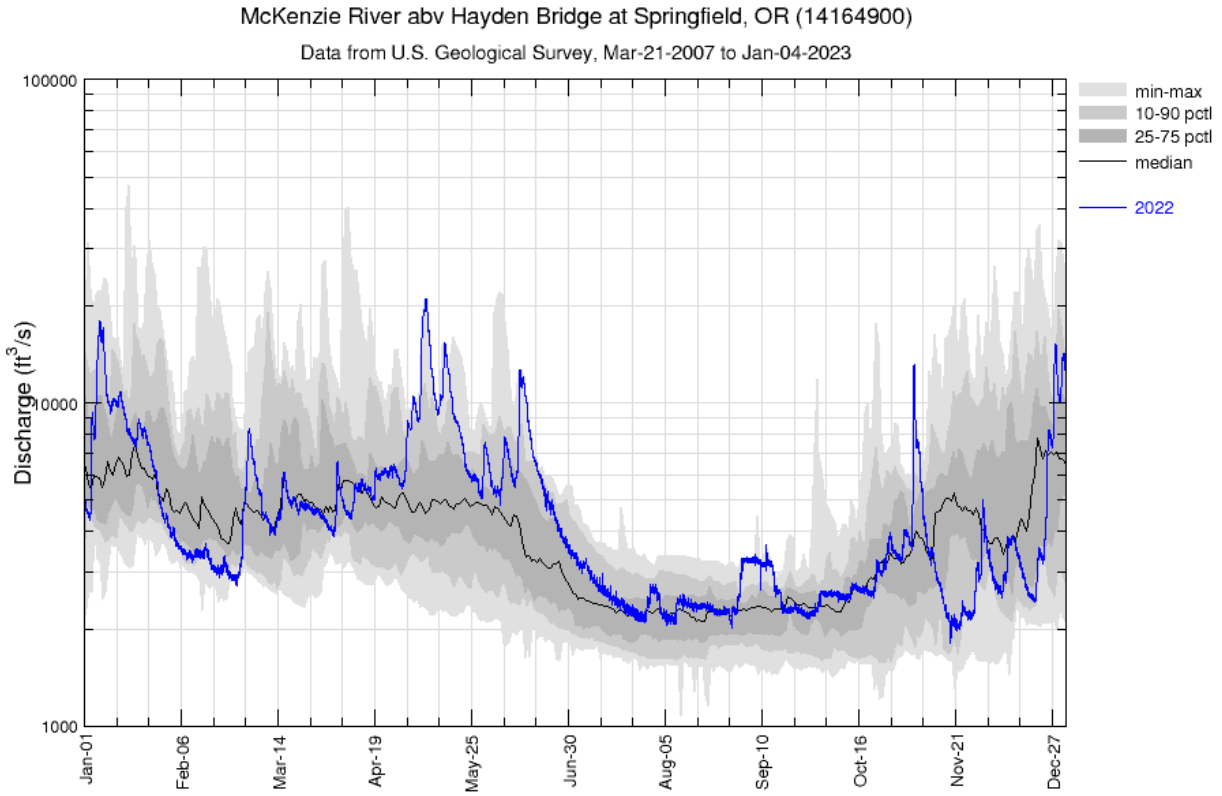
2.0 Water Year

Total precipitation amounts in the upper McKenzie Watershed for the 2021/2022 water year (10/1/2021 thru 9/30/2022) were above median values when compared to a 30-year period from 1991 to 2020, according to figures from the USDA/NRCS National Water and Climate Center. The McKenzie SNOTEL site received 102.2 inches of precipitation for the 2021/2022 water year, or about 105% of the median value. The Roaring River SNOTEL site, which is in the southeast corner of the South Fork McKenzie River watershed, received 75.3 inches of precipitation for the 2021/2022 water year, or about 111% of the median value. Fortunately, a series of large rain events moved through the area in May and June of 2022, which helped total precipitation values climb above median values for the water year. Current water year precipitation and snow water equivalent levels through December 2022 at both sites were

below respective median values, with most of Lane County still in an abnormally dry category according to the National Drought Monitor.

Flow in the McKenzie River at Hayden Bridge during the 2022 calendar year generally stayed close to median values (see Figure 2-1). Notable exceptions include a period of lower flow during a prolonged dry stretch in February, followed by higher-than-normal flows in May and June as a result of several large, late spring storm events. Cougar Reservoir was also bypassing higher flows in May, which contributed to higher mainstem McKenzie flows late spring and into early summer. After a large storm system passed through the area in early November, flows dropped again by mid-November and into December with lower-than-normal precipitation amounts falling mostly as snow in the higher elevations. The highest flow observed at Hayden Bridge during 2022 was 20,900 cubic feet per second (cfs), which occurred on May 7th.

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



3.0 Water Quality and Watershed Health

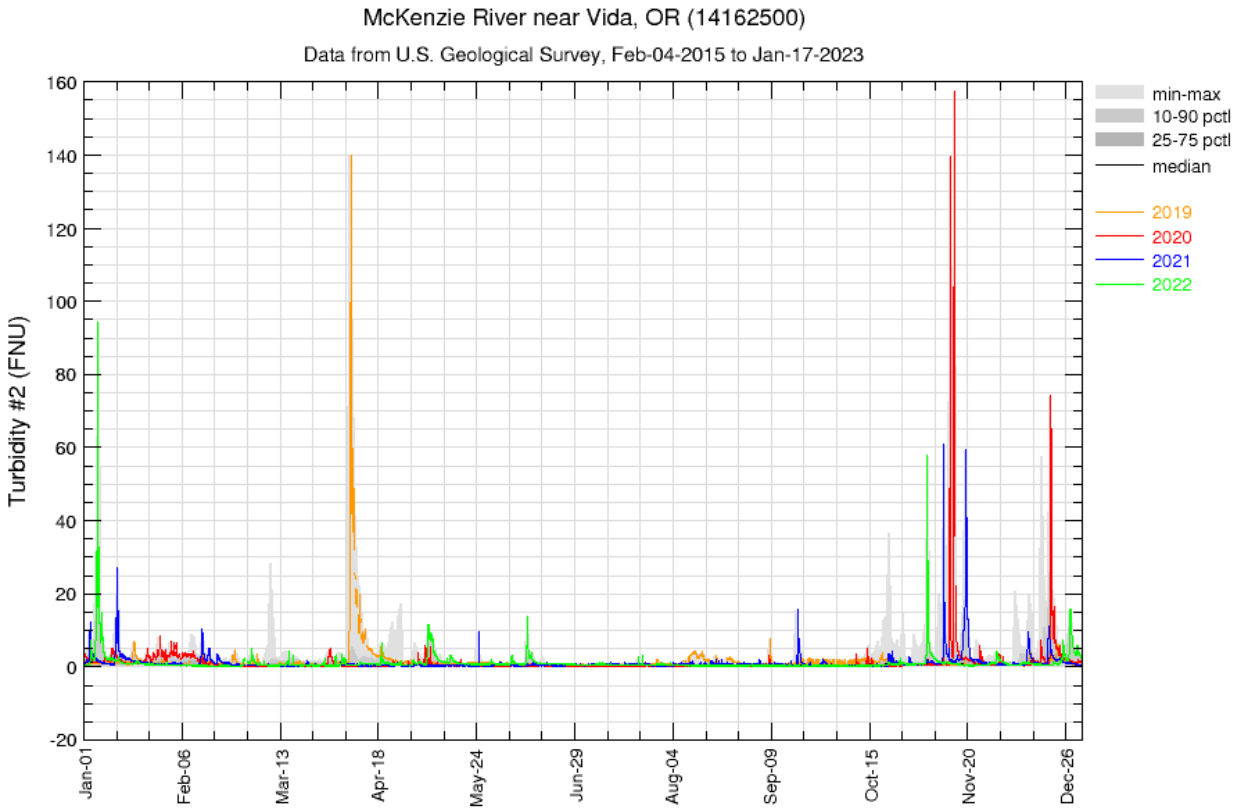
EWEB's Source Water Protection Program utilizes multiple long-term monitoring efforts year-round to assess water quality conditions throughout the watershed. Water quality conditions are tracked through a combination of extensive continuous monitoring stations and discrete sampling. The results are used 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 2022 targeted post-fire impacts from the 2020 Holiday Farm Fire.

3.1 Continuous Monitoring Network

Continuous monitoring stations, whether managed by EWEB or the USGS, use multi-parameter water quality sondes to monitor conditions. Two key parameters, turbidity, or the cloudiness of the water, and fluorescent dissolved organic matter (fDOM), provide meaningful information to staff about rapidly changing conditions. Both parameters can also be viewed as surrogates for additional contaminants potentially entering local waterways. By monitoring these parameters, staff can react accordingly with additional sampling or treatment process adjustments if necessary.

EWEB's continuous monitoring network was expanded in 2022 to include water quality and stage-discharge in Quartz Creek. Operation of the water quality station was transitioned to USGS staff and data is now available through the National Water Information System (NWIS). The lower- and mid-portions of the Quartz Creek watershed were extensively burned during the 2020 Holiday Farm Fire. This area also coincides with extensive private forestry logging operations as well as a significant floodplain restoration project planned in the lower watershed.

Figure 3-1: Major Turbidity Event Comparison, McKenzie River near Vida, 2019-2022



As illustrated in Figure 3-1 above by the green line, turbidity levels (measured in FNU) in the McKenzie River near Vida peaked in 2022 during storm events on January 6th (94.5 FNU) and again on November 5th (57.8 FNU). Turbidity levels in the McKenzie River near Vida are typically less than 2 FNU during most of the year. One interesting note is that from 2015 to 2019 there were only two events that exceeded

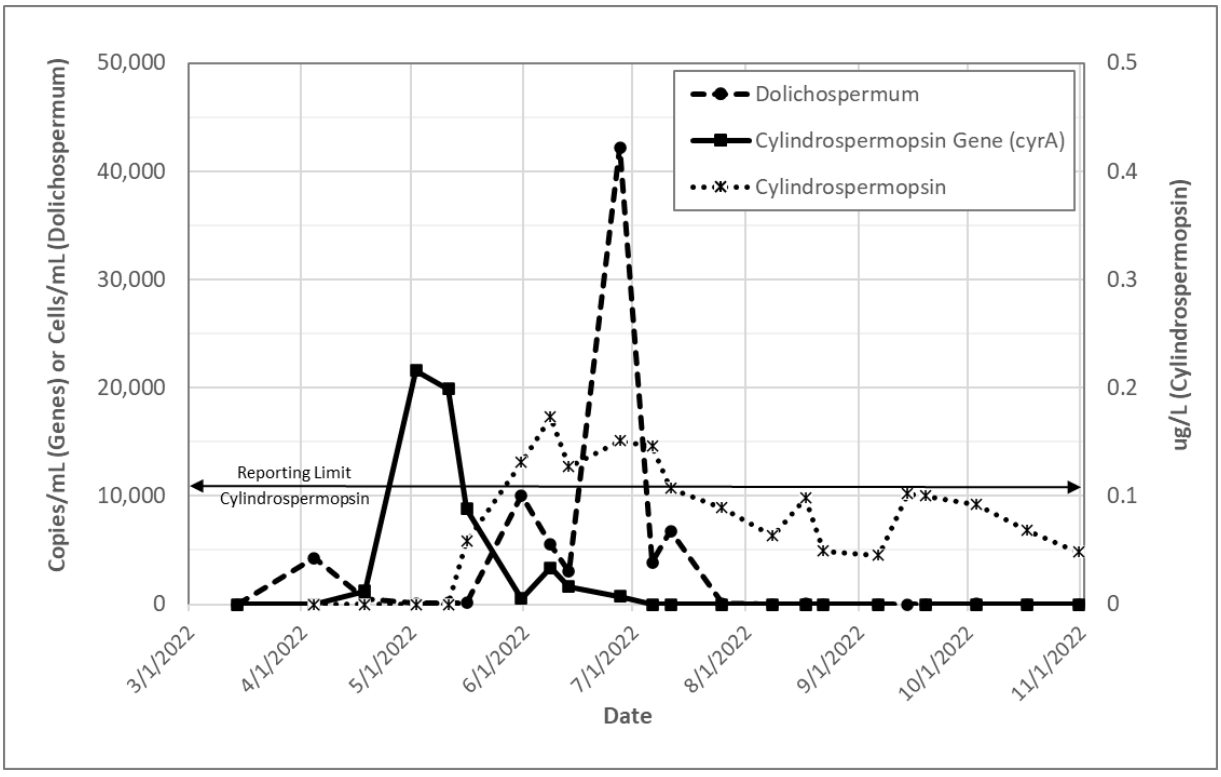
50 FNU over a 5-year period. Since the Holiday Farm Fire, there have been 6 events (2 per year) exceeding 50 FNU over the past three years from 2020 through 2022.

3.2 Harmful Algal Bloom (HAB) Monitoring

Cyanobacteria are photosynthetic bacteria found naturally in lakes, streams, ponds, and other surface waters. Under certain conditions, like warm, slow-moving water, cyanobacterial harmful algal blooms (HABs) can form that impair water quality and potentially generate toxins that are harmful to humans and pets. Increased nutrients, such as nitrogen and phosphorus, can further exacerbate the formation of HABs. The Oregon Health Authority (OHA) has adopted drinking water and recreational use advisory levels for some of the toxins produced by HABs. Additional information on cyanotoxins can be found on OHA's Cyanotoxin Resources for Drinking Water and Cyanobacteria Bloom pages.

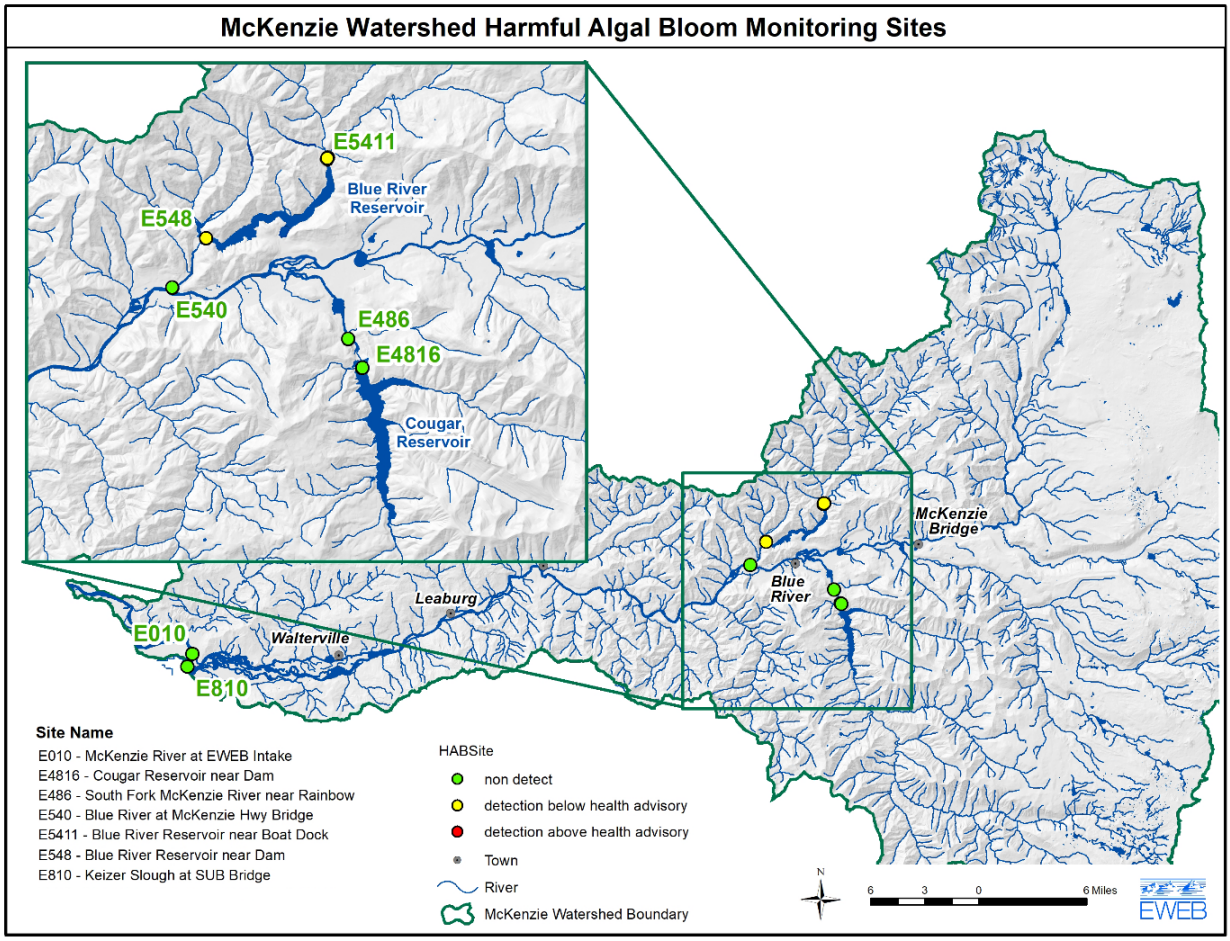
Cyanobacterial blooms in both Blue River Reservoir (BRR) and Cougar Reservoir (CR) during 2022 deviated slightly from typical patterns observed over previous years, with blooms peaking slightly later in 2022. *Dolichospermum* first appeared in BRR beginning in April, and then in CR around mid-June. *Dolichospermum* concentrations initially climbed in late May for BRR (15,400 cells/mL), but then declined in early June as wet weather conditions returned to the area (see Figure 3-2). Numbers in BRR rebounded and peaked in late June (42,200 cells/mL) near the dam, with a second peak occurring at the east end of BRR near the boat dock (27,040 cells/mL) around mid-July. *Dolichospermum* peaked in CR in early July. By early August *Dolichospermum* numbers were low in both reservoirs.

Figure 3-2: 2022 HAB result summary for Blue River Reservoir near the dam



Some species of cyanobacteria, including those within the *Dolichospermum* genus, can produce cyanotoxins. Toxigenic genes capable of producing cylindrospermopsin were detected in both reservoirs in 2022. While the presence of toxigenic genes does not always result in toxin production, cylindrospermopsin was detected above the method reporting limit in Blue River Reservoir from the end of May through early July (see Figure 3-3). The highest cylindrospermopsin concentration reported in Blue River Reservoir near the dam was .173 ug/L from a sample collected on 6/8. The highest concentration reported from the east end of Blue River Reservoir was .311 ug/L from a sample collected on 5/31. Cylindrospermopsin concentrations were not detected above method reporting limits in Blue River below the dam, or further downstream in the mainstem McKenzie. For reference, the OHA drinking water threshold for cylindrospermopsin for vulnerable people is .7 ug/L, and 3 ug/L for all other people. OHA also established a health advisory recreational use value for cylindrospermopsin, which currently stands at 15 ug/L.

Figure 3-3: Harmful Algal Bloom Monitoring Results – Cyanotoxins, 2022



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

All routine baseline sampling events were completed as scheduled in 2022. Storm sampling events targeting peak flow conditions in both urban stormwater outfalls and Holiday Farm Fire (HFF) sites were

completed in the winter, spring and fall. For the discussion below, a selection of baseline and storm data were compiled into the following five groups: Metals, Nutrients, Solids, Bacteria, and Organic Compounds. Similar to 2020 and 2021, most peak values observed in 2022 were associated with prolonged rain events in urban areas of eastern Springfield or within the HFF area.

Metals

Metals originate from a variety of natural and anthropogenic sources throughout the watershed. Consuming high levels of some metal species, particularly the heavy metals, such as cadmium and lead, can increase the risk for a variety of short- and long-term health effects.

Metal concentrations observed in 2022 for most baseline sites were similar to results from past years. When comparing peak results across all sites in 2022 for 18 metal species, almost all were associated with large rainfall/runoff events in January and November. Two HFF sites in particular, Fern Creek and Simmonds Creek (see Figure 3-4), registered peak concentrations for 16 of the 32 metal combinations (total vs dissolved). The 52nd and 42nd stormwater channels reported an additional 10 peak values. Notable heavy metal results include an elevated total lead detection (15.9 ug/L) in the 52nd stormwater channel, along with elevated total arsenic values in Fern and Simmonds Creeks (7.71 and 8.11 ug/L respectively). All three results were reported during the November storm event. For comparison, the EPA's drinking water action level for lead is 15 ug/L, while the drinking water maximum contaminant level (MCL) for arsenic is 10 ug/L.

Most peak dissolved metal concentrations were also typically associated with high flow conditions in urban and HFF locations. However, dissolved manganese, strontium, thallium, and vanadium were reported at or near peak concentrations during baseline conditions, suggesting these metals have stronger ties to groundwater sources. Similar to 2021 results, the highest dissolved metal concentrations were primarily located in the middle to lower watershed, although dissolved vanadium levels were highest in the upper watershed, likely due to the close proximity of young volcanic rock.

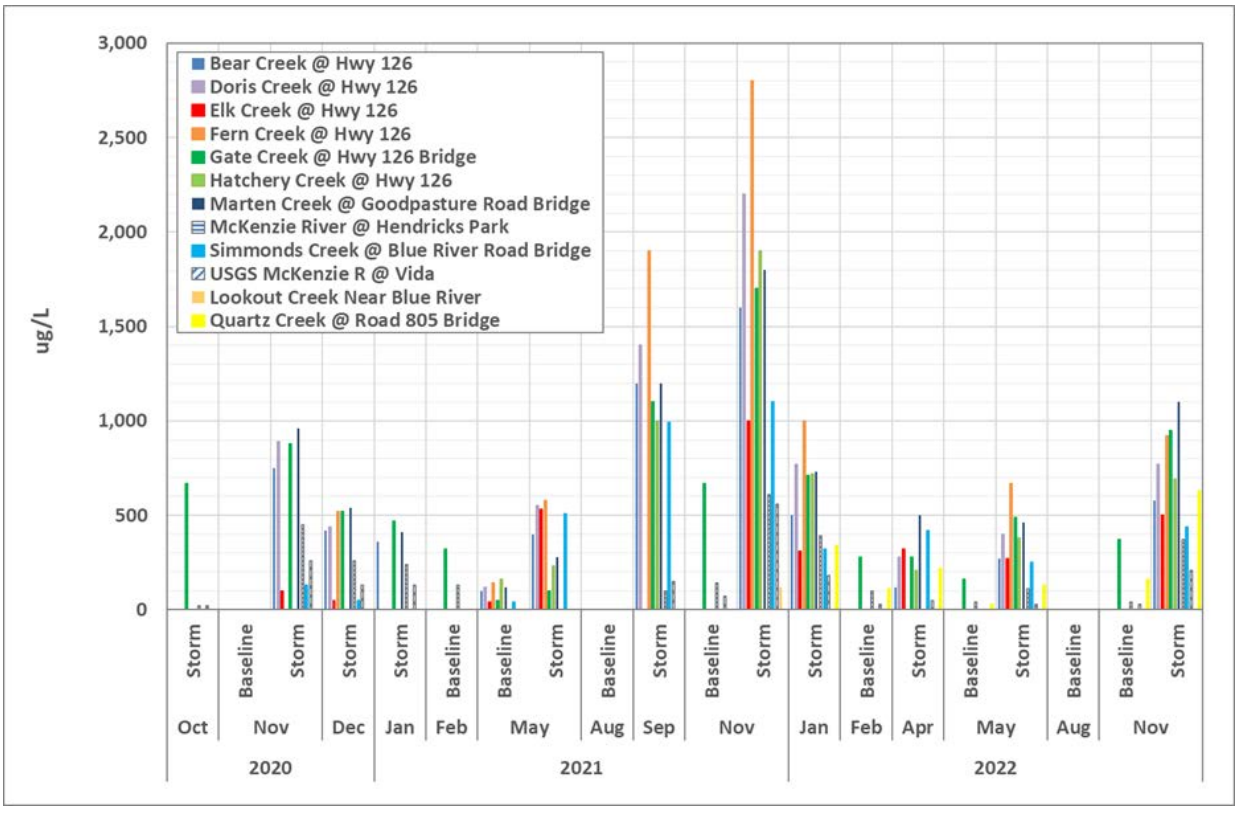
Figure 3-4: Fern Creek (1/5/22) and Simmonds Creek (1/6/22) entering Blue River during a Storm.

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 during routine HAB events, quarterly across all baseline sites, and at select sites during large storm events. Overall, nutrient levels in 2022 at mainstem McKenzie locations were similar to previous years during baseflow conditions. Winter and fall storm events yielded the highest number of elevated nutrient levels observed throughout the watershed. The one exception continues to be for total Kjeldahl nitrogen (TKN), with levels fluctuating considerably at different sites, particularly at HFF sites during spring storm and baseflow conditions. Dorris Creek reported a TKN concentration of 4.54 mg/L during an April storm event, which ended up being the highest concentration observed across all sites in 2022.

Nitrate levels at HFF sites during four different 2022 storm events were generally lower than results reported for storm events in 2021 (see Figure 3-5). HFF nitrate levels only exceeded 1 mg/L in 2022 on a single occasion when Marten Creek reached 1.1 mg/L during a storm event in November. The highest nitrate values observed in 2022 across all sites were found in the 52nd stormwater channel, with all 4 baseline values exceeding 1.5 mg/L. Keizer Slough (1.4 mg/L) and Cedar Creek (1.3 mg/L) reported the next highest values during a February baseline event. One site worth keeping an eye on is Cedar Creek, where over the past 5 years nitrate values during the 1st quarter appear to be on an increasing trend, with a peak value of 1.3 mg/L in 2022 (.65 mg/L in 2018). All of these values are well below the nitrate drinking water MCL at 10 mg/L.

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



Elevated total phosphorus and orthophosphate concentrations were observed across numerous HFF sites during the November 2022 storm event. Peak 2022 concentrations for both analytes were similar to peak concentrations observed immediately after the Holiday Farm Fire in 2020, with only a handful of historical results over the past 15 years exceeding the HFF results. Simmonds Creek reported the highest total phosphorus (1.29 mg/L) and orthophosphate (.52 mg/L) concentrations in 2022. Apart from the November storm event, most phosphorus levels at other sites were similar to previous years.

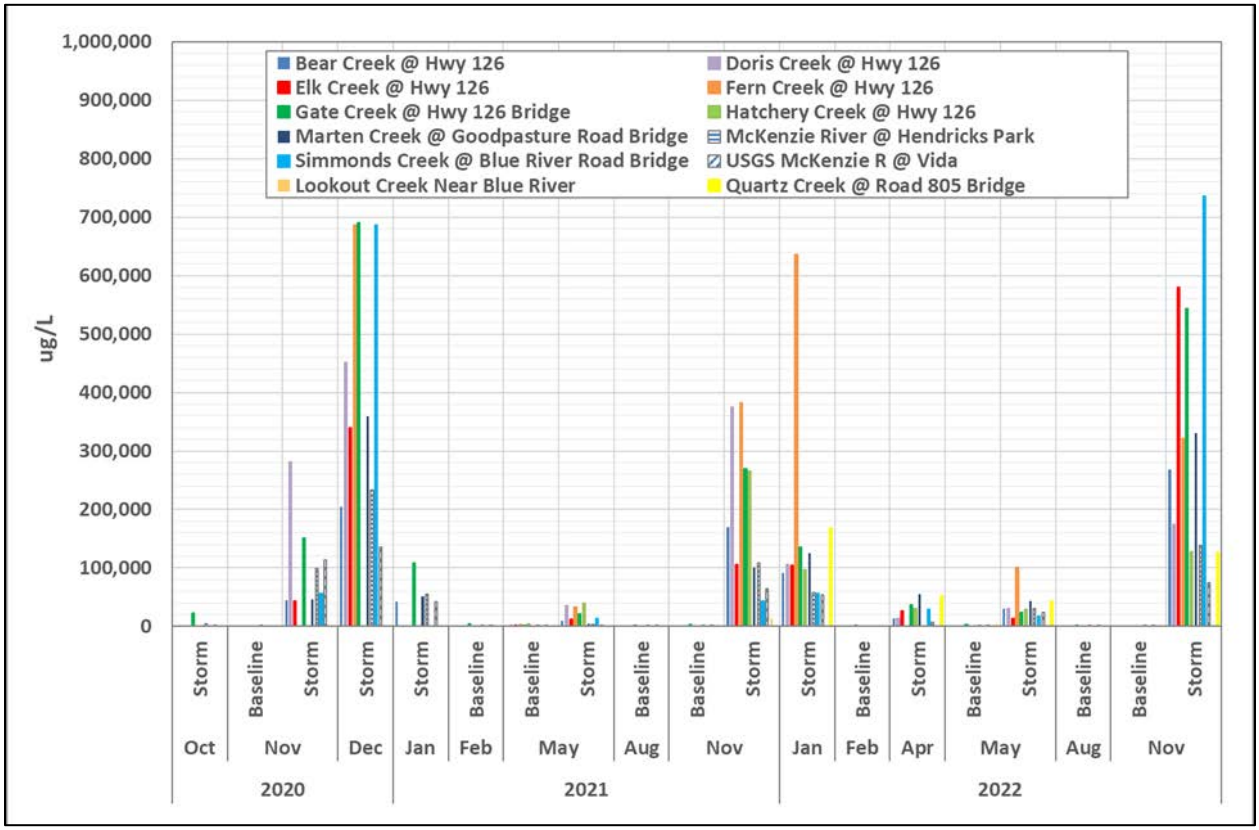
Comparable to analytes discussed above, peak total and dissolved organic carbon (TOC and DOC respectively) concentrations were primarily observed during storm events in 2022. While most sites see baseline TOC and DOC values fall under 1 mg/L, the November storm event generated values above 3 mg/L across multiple sites, particularly within the HFF perimeter. However, the highest TOC/DOC values occurred in urban stormwater channels during an April storm event with values exceeding 6 mg/L in both the 69th and 42nd stormwater channels. For the HFF sites, Hatchery Creek had the highest TOC/ DOC values (5.4/4.8 mg/L respectively) in November. Quartz Creek, which was added to the sampling pool in 2022, had the second highest HFF DOC concentration in November at 4.2 mg/L, as well as the highest HFF DOC concentration during an April storm (3.0 mg/L).

Solids

Solids can carry contaminants and pathogens through the watershed impacting ecosystem function as well as being a concern for drinking water treatment, particularly around filtration processes. Results for total suspended solids (TSS) and total dissolved solids (TDS) were typical across most sites during baseline conditions and relatively small storm events. However, unusually high TSS values were observed across multiple HFF sites in 2022 (see Figure 3-6), starting with Fern Creek (636 mg/L, or 636,000 ug/L) during a January storm event, and then across several sites following a large November storm event when the northeast portion of the watershed received nearly 4 inches of rain over a 36-hour period. Simmonds Creek reported the highest TSS concentration at 736 mg/L during the November storm event, along with some of the highest flows ever observed at this site post-HFF. Two other sites, Gate Creek and Elk Creek, both climbed above 500 mg/L during the same event. These values are similar in magnitude to those observed immediately after the Holiday Farm Fire during a particularly large storm event in 2020. Higher TSS values have only been observed on two other occasions over the past 15 years, including the 2021 Blue River Reservoir drawdown event (1,740 mg/L), and in 2018 following a storm event within the Terwilliger Fire burn area (Smith Creek at 1,330 mg/L and Boone Creek at 1,004 mg/L). In fact, when looking at all non-wildfire sites over the same 15 year period, TSS has only climbed above 300 mg/L on two occasions, first during a 2017 storm event (Camp Creek at 428 mg/L), and then more recently during the November 2022 storm (52nd stormwater channel at 446 mg/L). These results clearly demonstrate the impact large wildfires can have on mobilizing sediment, particularly during large storm events involving high rainfall intensities.

Contrary to the HFF TSS values, total dissolved solids (TDS) remain highest in urban stormwater systems when compared to all other sites. In 2022, the 52nd stormwater channel routinely exceeded 125 mg/L during baseline conditions, with a historical peak value of 250 mg/L following a rainfall event in September, 2020. With respect to HFF sites, Fern Creek reported the highest TDS concentration at 110 mg/L following a storm event near the start of 2022. This is somewhat remarkable considering no other HFF site has ever exceeded 75 mg/L.

Figure 3-6: Total Suspended Solids Across Multiple Holiday Farm Fire Sites, 2022.



Bacteria

Bacteria levels were typical in 2022 across most sites when compared to previous years. The notable exceptions were in the McKenzie River at Hendricks Bridge, and to a lesser degree near Hayden Bridge. During a baseline event on November 14th, *E. coli* was 1,236 MPN/100mL in the McKenzie River at Hendricks Bridge, which is ten times higher than the previous baseline maximum value for this location. During an earlier storm event on November 5th, *E. coli* reached 648 MPN/100mL in the McKenzie River near Hayden Bridge, nearly double the value of the previous storm event maximum. The unusually high *E. coli* value at Hendricks Bridge suggests a potential bacteria source somewhere upstream and relatively close, especially since bacteria levels further upstream in the McKenzie River at Bridge St. were relatively low (4.1 MPN/100mL) during the same event. For contrast, peak *E. coli* values in 2022 were observed in the 69th stormwater channel during storm events in May and November (9,208 and 7,270 MPN/100mL respectively). The 52nd stormwater channel also had a notably high *E. coli* value of 5,794 MPN/100mL during the May storm event, which is nearly double the maximum value of all other sites, apart from the 69th stormwater channel. For HFF sites, *E. coli* levels fell below 126 MPN/100mL for all events except the November storm event. During the November event, Fern Creek (446 MPN/100mL) and Hatchery Creek (410 MPN/100mL) both climbed above Oregon's recreational contact maximum guideline value of 406 *E. coli* organisms per 100 mL. Another 5 sites climbed above 126 MPN/100mL, confirming the significance of this major first fall storm event.

Organic Compounds

Over 400 compounds were analyzed at select sites during storm events in 2022, when contaminants are expected to be flushed into local waterways during heavy rainfall events. To accommodate the large amount of available data, only analytes with at least 1 non-estimated result in 2022 above applicable method reporting limits will be included in the discussion below.

Most organic compounds detected in 2022 originated from urban stormwater outfalls located in the eastern portion of Springfield. As indicated in Figure 3-7, the 42nd and 69th stormwater channels registered the highest number of detections during a spring storm event in April. The 52nd stormwater channel had the highest number of detections in the fall during an early November storm event.

Figure 3-7: Organic Compounds Detected Above Method Reporting Limits by Site, 2022.

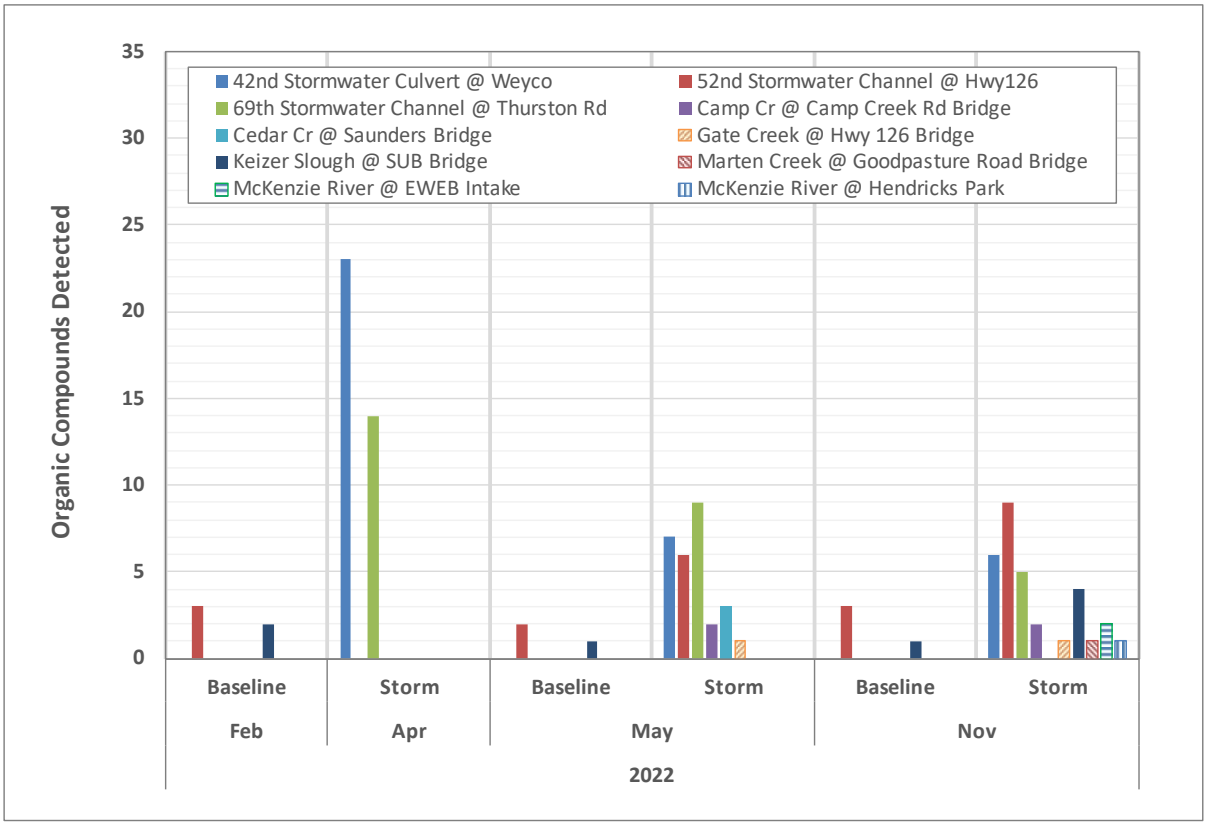


Table 3-1 summarizes total detections across all sites for multiple organic compound groups. Several key findings for 2022 related to organic contaminant monitoring are presented below.

1. Most detections are considered low level, often less than 1 ug/L. Of the approximately 110 organic compound detections observed in 2022, 10% were above 1 ug/L.
2. Multiple per- and polyfluorinated substances (PFAS) were detected in stormwater outfalls. The 69th stormwater channel reported 6 different PFAS compounds during a single storm event in May. Two PFAS compounds, Perfluorooctanesulfonic acid (PFOS) and Perfluorobutanesulfonic acid (PFBS), were commonly found in the 52nd stormwater channel during 2022 baseline or ambient conditions (max concentrations: PFOS 0.0069 ug/L and PFBS 0.0061 ug/L).

3. The most compounds detected (10 total) at a single site using a broad-spectrum pharmaceutical and personal care product (PPCP) method was at the 42nd stormwater outfall during a mid-April storm event.
4. The same April storm event at the 42nd stormwater channel also yielded the most non-pesticide, semi-volatile organic compounds (SVOCs) during a single event (5 total).
5. While most pesticide detections were generally regarded as low level (<1 ug/L), three herbicides were detected at concentrations above 1 ug/L. The 42nd stormwater channel had the highest glyphosate result at 11 ug/L, which is well below the MCL for glyphosate in drinking water at 700 ug/L. 2,4-D was detected most frequently (9 occurrences) across 4 sites, with the highest concentration again found in the 42nd stormwater channel (3.5 ug/L). Imazapyr was detected across the most sites (5 total) with the highest (4 ug/L) and second highest (1.2 ug/L) concentrations observed in Marten and Gate Creeks respectively during a large, early November storm event. Both sites are within the HFF perimeter.
6. Pentachlorophenol was detected in both the 42nd and 69th stormwater channels during three separate storm events. Although the maximum observed concentration of .31 ug/L in the 42nd channel is less than half the MCL (1 ug/L), the frequency of detection at these two sites indicates the compound is likely ubiquitous in the area.
7. Keizer Slough remains a source of low level volatile organic compounds (VOCs), with chloroform being the primary constituent. The peak chloroform concentration detected in Keizer Slough in 2022 was 2.3 ug/L, which is well below the 80 ug/L drinking water MCL for Total Trihalomethanes (includes chloroform). The chloroform source is unknown at this time.

Table 3-1: Total Detections at or Above Method Reporting Limits for all Sites, 2022

Analyte Group	Baseline Event Count	Storm Event Count
General Organic Compounds, Other	0	6
General Organic Compounds, Pesticides	0	1
Per- and Polyfluorinated Substances (PFAS)	7	13
PPCPs, Food Additives	0	8
PPCPs, Pharmaceutical/Hormone	0	23
SVOCs, Other	0	18
SVOCs, Pesticides	0	28
VOCs	5	1

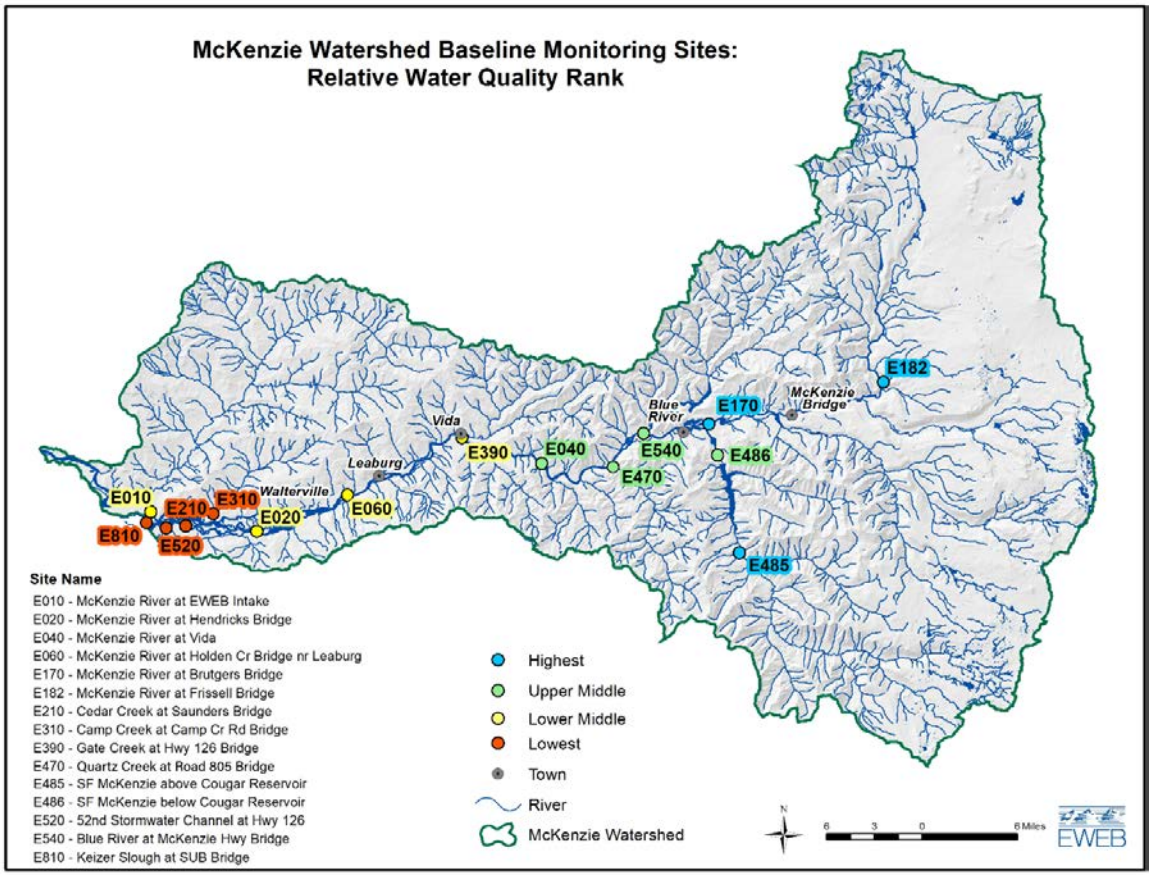
3.4 Baseline Data Summary

Overall, water quality remains excellent in the McKenzie River. Water quality conditions tracked throughout the McKenzie Watershed during 2022 were largely unremarkable, apart from the January and November storm events that resulted in elevated turbidity/sediment concentrations across multiple sites. Smaller storms in May and June brought some much-needed precipitation to the area following a relatively dry early spring. The additional flows helped dampen increasing pH swings in the mainstem McKenzie that were beginning to appear by mid-April, as well as keep in-river temperatures cooler through the first part of summer. Nutrient levels (nitrate, total phosphorus, orthophosphate) across all

mainstem McKenzie monitoring sites (6 in all) stayed below 100 ug/L during all quarterly baseline sampling events. Baseline mainstem metal concentrations also stayed well below all applicable drinking water MCLs. Bacteria levels in the lower mainstem were unusually high in the fall and may warrant additional monitoring follow-up.

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. The primary change in rankings between 2021 and 2022 stems from the addition of Quartz Creek to the baseline group. 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. However, even these higher analytical concentrations would generally still meet most drinking water standards.

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.

4.1 Summary of Spills in the McKenzie Watershed

There were four reported incidents in the McKenzie Watershed in 2022 that EWEB Source Protection staff tracked for potential water quality contamination in the McKenzie River. Two of the incidents involved single vehicle crashes into local waterways. However, vehicle fluids and/or battery releases were not observed by on-scene emergency crews following either accident. A third incident involved an abandoned vehicle on the side of the road that was reportedly leaking fluids. EWEB staff could not confirm the vehicle was leaking fluids during a subsequent site visit. The last incident involved a private citizen calling OERS to report herbicide spraying along roadways and stormwater outfalls in the Thurston Rd area. EWEB staff followed up with City of Springfield who then confirmed that one of their staff, a licensed pesticide applicator, was spraying an herbicide containing glyphosate in the area. EWEB Source Protection staff collected water samples for glyphosate analysis in a nearby stormwater channel later that day during a rain event. Glyphosate was detected in the stormwater channel at low levels, but significantly lower than applicable drinking water thresholds.

Table 4-1: Incidents/Spills/Releases Reported in 2022

Date	Responsible Party	Material Released	Quantity (gallons)	Details	Response
3/12/2022	Private	Vehicle fluids	Minor	Abandoned vehicle leaking fluids near Nimrod.	EWEB
4/18/22	City	Potential for Glyphosate release	Licensed pesticide application	Private caller reported City of Springfield was spraying along road.	City of Springfield, EWEB, DEQ
6/26/2022	Private	Potential for vehicle fluid release	No release observed	Single vehicle crash into Elk Creek. No reported leaks or sheen in water by ODOT.	ODOT, EWEB
9/16/2022	Private	Potential for lithium battery release.	No release observed, battery intact	Electric vehicle crash off Camp Creek Rd into the McKenzie River.	McKenzie Fire & Rescue

4.2 Annual Spill Drill

EWEB worked with multiple partners to coordinate a multi-agency spill response drill on the Willamette 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 Willamette River downstream of

Eugene. The drill gives first responders an opportunity to familiarize themselves with equipment and to test out new response strategies. Several MWERS partners are interested in deploying boom in the Willamette River since they would likely respond to actual spills anywhere in the Upper Willamette River Basin.

Figure 4-1: Boom Deployment Drill, Willamette River at Whiteley Landing County Park, 2022

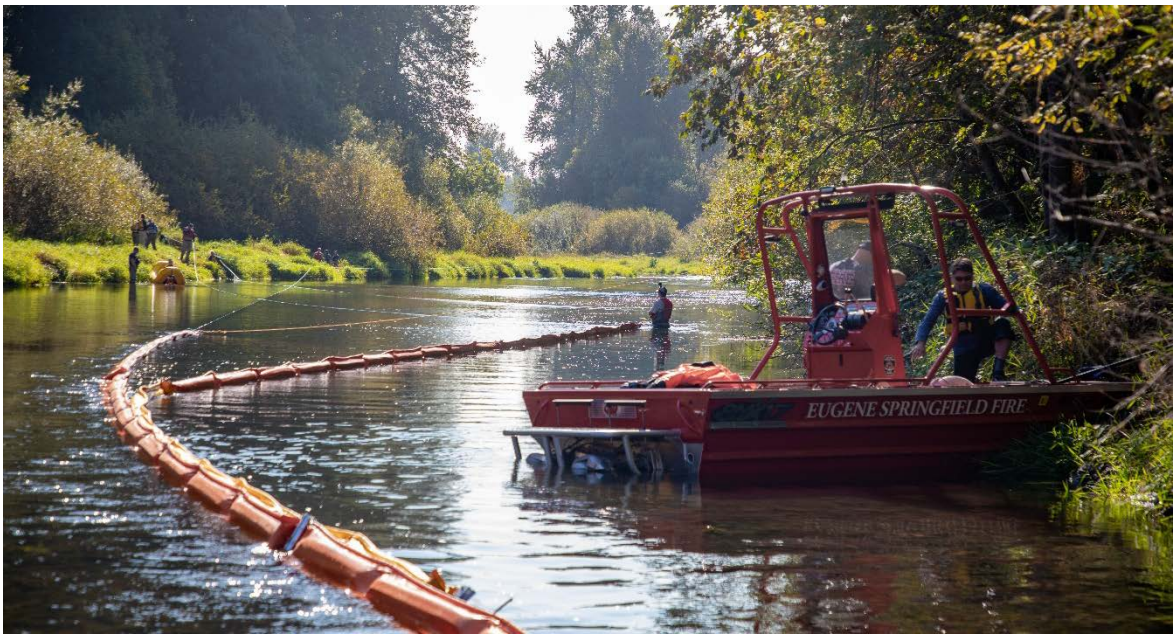


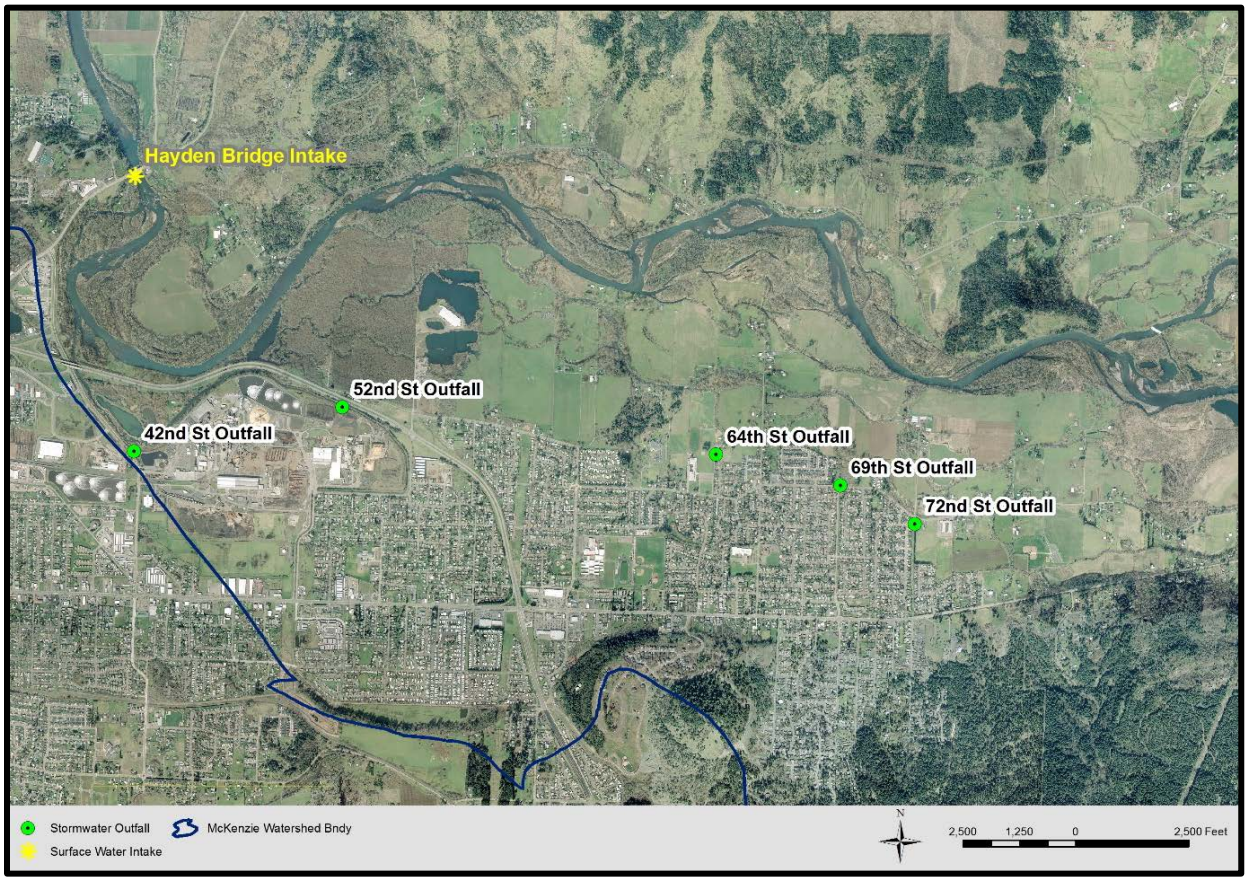
Photo: Adam Spencer

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 to include new monitoring stations at Keizer Slough (E810) and Cedar Creek (E210) were put on hold to accommodate increased monitoring efforts around the Holiday Farm Fire. Equipment originally destined for urban sites has either been returned or replaced with the goal of setting up the new sites in 2023. EWEB staff are currently in the process of securing a building permit from the City of Springfield for the Keizer Slough water quality station.

5.2 Green Infrastructure/Urban Waters & Wildlife Program

The Urban Waters & Wildlife program (UWWP) is a regional expansion of the Long Tom Watershed Council's (LTWC) 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. Partners include EWEB, SUB, Willamalane, the cities of

Eugene and Springfield, Lane County, the Upper Willamette Soil & Water Conservation District and several local watershed councils.

This year, the LTWC continued design 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 was funded by a $30,000 Oregon Health Authority Source Water Protection grant. This work has been slowed down by some complications with legal questions around property ownership and the ability to move stormwater across private and municipal properties. However, the group has made progress in engaging The Child Center and planning for some initial work on that property. The rest of the project will be divided up into phases, with an emphasis on shorter-term, simpler projects that can be implemented on one property at a time, rather than trying to navigate cross-boundary work. Efforts are also being made to look into longer-term plans for the Hayden Bridge Boat Ramp. Staff from the Long Tom Watershed Council will be working with EWEB Hayden Bridge maintenance staff on some ways to incorporate native plants into the planting scheme to mitigate for runoff.

In addition, the UWWP has applied for a Drinking Water Provider Partnership Grant to begin work on stormwater infrastructure on The Child Center. The Child Center is also hoping to participate in the Pure Water Partners program to help revegetate areas of the riparian bank above the drinking water intake.

The partnership also received 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.

5.3 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 93 and the 2021 Annual Report, submitted by PES Environmental on behalf of IP to DEQ on March 15th, 2022, 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). Accordingly, 2022 monitoring well results will not be available until March 15th, 2023, and will be presented in the 2024 State of the McKenzie Watershed Report.

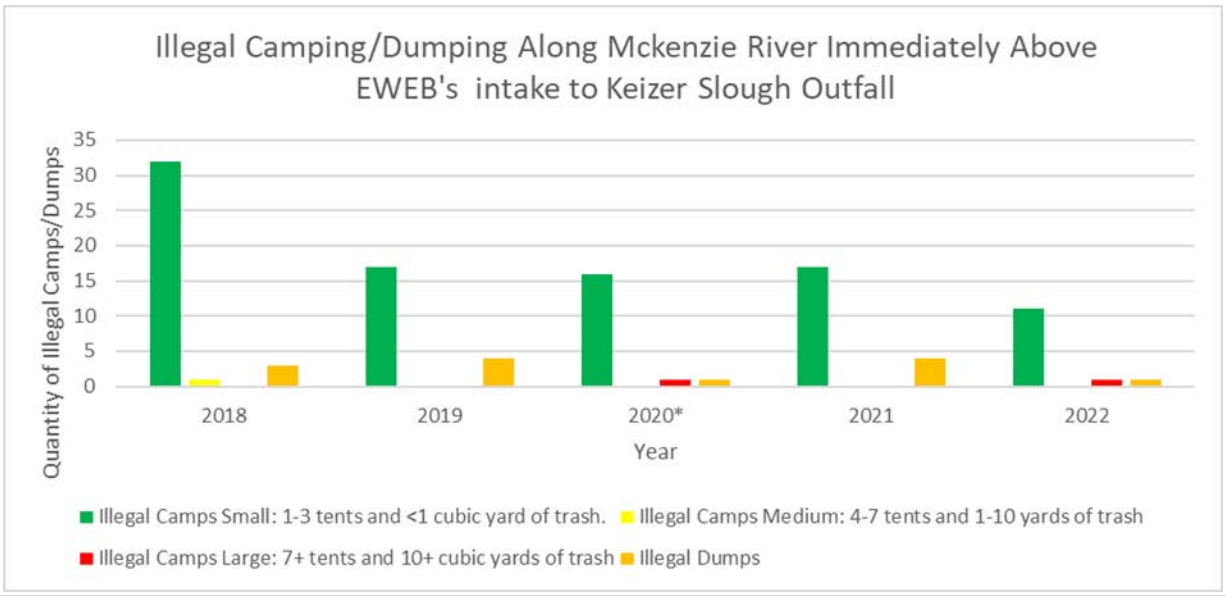
Chlorinated phenolic and volatile organic compounds were not detected in SUB/RWD wells during the 2022 operational period according to email communications. These wells are located downgradient of the PCP plume. Analytical results for downgradient groundwater monitoring wells sampled in 2021 (January and July/August) show continued decreasing PCP concentrations at most intermediate and deep well depths. Two exceptions are well MW-18D, where PCP concentrations (6.5 and 6.6 ug/L in 2021) are somewhat variable but show a gradually increasing trend since 2011 (1.6 and 1.9 ug/L in 2011), and well MW-19D, where recent PCP concentrations (10 and 13 ug/L in 2021) show some variability, although still decreasing from peak concentrations in 2012/2013 (32 ug/L). The long-term goal of monitoring efforts is to see groundwater PCP concentrations naturally attenuate below .5 ug/L.

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 2022. 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.

Figure 6-1: Map of Illegal Camps and Dumps, 2022

Figure 6-2: Illegal Camping/Dumping Activity, 2018-2022.



7.0 Pure Water Partners (PWP)

The Pure Water Partners (PWP) Program was originally designed to reward McKenzie landowners for protecting 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).

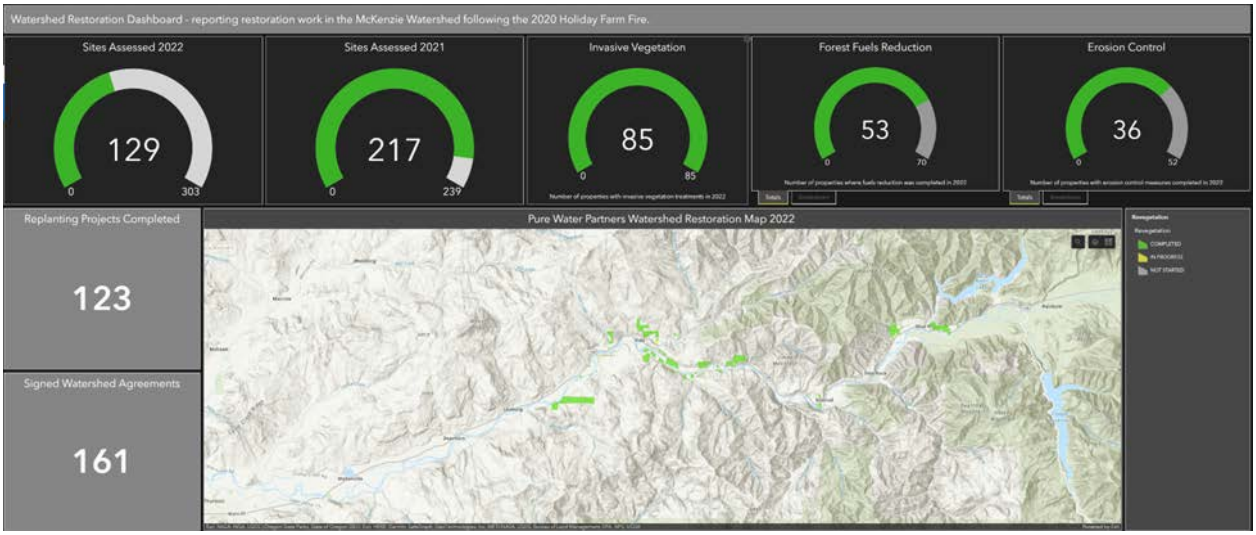
Following the 2020 Holiday Farm Fire, the Pure Water Partners program shifted its focus to carrying out restoration activities on properties impacted by the 2020 Holiday Farm Fire. This included erosion control, replanting in riparian areas, invasive vegetation removal, fire fuels reduction and naturescaping. In 2022, PWP planted approximately 500,000 native trees and shrubs on 123 properties in the watershed (see Figure 7-1). In addition, contractors removed invasive species on 85 properties and carried out fuels reduction on 53 (see Figure 7-2). Currently, 167 landowners have signed 7-year watershed stewardship agreements under the PWP program.

PWP hired several additional staff to assist with landowner assessments and managing work on the ground after the program attracted a large number of new landowners in early 2022. The program also has a person housed at the McKenzie Watershed Council who is dedicated to working with landowners on naturescaping practices and Firewise landscaping around their homes and near the river in an effort to protect riparian areas and water quality.

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

Below is a snapshot of the types of activities we conducted in 2022 and plan to continue into 2023.

Figure 7-2: PWP Activities in 2022



During 2022, the PWP program received several different grants that helped to fund the restoration efforts (see Figure 7-3). These grants included funding for invasive species removal, site preparation and replanting; large-scale floodplain restoration, acquisition of riparian properties that will not be rebuilt (50% match with McKenzie River Trust); and fuels reduction work. See Appendix A for more details on the various funding sources and the work supported by these funds.

Figure 7-3: Summary of Funding Sources for Watershed Restoration Activities

2022 Watershed Recovery Funding

Revenue

Watershed Restoration Fee:	$2,315,388
FEMA Reimbursement:	$1,363,859
Finn Rock Phase 2 Reimbursement:	$45,722
Finn Rock Floodplain Restoration Grant:	$325,000
ODF Fuels Grant:	$300,000
Large Wood Project Grant:	$517,872
Total Revenue:	$4,867,841
Net:	**($543,674)**

Expenses

Restoration Activities:*	$4,823,904
Finn Rock Phase 2 Implementation:	$59,939
Large Wood Project:	$527,672
Total Expenses:	$5,411,515

*Restoration activities include: water quality monitoring, landowner outreach, erosion control/stabilization, revegetation, invasives species control, fuels reduction, land acquisition and carbon sequestration work.

Expenses exceed revenues in Figure 7-3 for a variety of reasons. For some of our grant revenue, there is a delay from when we are approved for the funding to the time when we receive reimbursement and it shows up as revenue. While there is a slight risk in this strategy, we temporarily use the surcharge funds to cover this work. We anticipate more grant revenue coming in for 2023 to help offset costs as well. We are working diligently on cost containment by creating efficiencies and monitoring contractor performance.

In 2022, EWEB spent approximately $4.2 million of the watershed restoration fee on post-fire restoration activities ($12 million is anticipated over the 5-year life of the restoration fee). Funds went to:

a) ***Risk-based activities:*** on non-federal properties (invasive control, replanting, erosion control, fuels reduction and naturescaping) as described above.
b) ***Resiliency projects:*** including design, permitting, environmental assessment, sourcing large wood, and implementation of floodplain restoration and large wood projects on Finn Rock Reach, Gate Creek and Quartz Creek in the middle McKenzie section of the watershed.
c) ***Land Acquisition:*** two floodway properties were acquired in 2022 where remaining infrastructure will be removed and riparian areas restored under the PWP program.

In early 2021, the Board was provided an overview of the watershed restoration plan that justified and led to approval of a 5-year watershed restoration fee. Table 7-1 compares what was budgeted as part of the plan versus what was actually spent as part of recovery efforts through 2022.

Table 7-1: Comparison of Watershed Restoration Plan Budget with Actual Expenses (2021-2022)

Activity	2021 Plan	2021 Actual	2022 Plan	2022 Actual
Risk-Based	$2,250,000	$1,925,000	$2,150,000	$4,050,000
Floodplain Restoration	$50,000	$170,000	$150,000	$1,020,000
Land Acquisition	$1,500,000	$440,000	$1,500,000	$240,000
Strategic/Carbon	$150,000	$15,000	$150,000	$101,000
Expense Subtotal	**$3,950,000**	**$2,550,000**	**$3,950,000**	**$5,411,000**
Revenue	**N/A***	**$1,241,816**	**$2,453,421**	**$4,867,841**
Total Watershed Fee Revenue Spent	**$3,950,000**	**$1,223,737**	**$5,475,000**	**$3,545,846**

*The planning began in 2021, so we did not have a budget for the revenue in the 2021 plan.

EWEB partnered with the MWC, MRT, the USFS, and other partners to implement 2 different types of large-scale restoration projects in 2022. We worked on large-scale wood placement at Gate Creek and floodplain restoration for the fourth and final phase of Deer Creek. We also continued project design for Finn Rock Phase II and Quartz Creek. These types of restoration have numerous benefits including, mitigating floods, turbidity, and organic carbon by spreading out and attenuating flows, dropping out sediment, increasing the uptake of nutrients and organic carbon coming from upstream severely burned landscapes, water storage, increasing habitat for fish and wildlife, protection from fire, and increasing cold water refugia.

Gate Creek is a priority area for source water protection and supports a small run of Chinook salmon and provides critical habitat for rainbow trout and other native fishes. The BLM land on the North Fork Gate Creek was identified as an initial priority area for restoration work in the Gate Creek Watershed. The resulting restoration project, completed in August of 2022, added large wood to a 0.6-mile reach of North Fork Gate Creek. The wood for instream placement was sourced from hazard tree removal along the road adjacent to the project area. The project will increase the connection with nearly 10 acres of floodplain and help create pools and store spawning gravel. This project was completed in partnership between the McKenzie Watershed Council, BLM, and EWEB, the project funder (OWEB), and the skilled contractors who made the project happen (see Figure 7-4).

Figure 7-4: Floodplain Restoration on Deer Creek

Photo courtesy of MWC

For the Quartz Creek floodplain restoration project, EWEB secured an 82-acre long-term easement on Campbell Global property in the lower Quartz Creek floodplain. MRT is working to acquire additional land adjacent to the easement to secure the entire 2-mile Quartz Creek floodplain for restoration. EWEB source water protection and Carmen Smith relicensing staff are working together to put the trees that will be removed for an increased buffer along the transmission line to good use. Some of the trees will be used for the Quartz Creek floodplain restoration project, which requires over 8,000 trees. This will provide many thousands of trees without having to harvest them from elsewhere (see Appendix A for details).

EWEB continues to work with MRT on acquiring lands along the McKenzie where landowners have decided not to rebuild. This will prevent additional homes from being constructed on the banks of the river. To date, 9 parcels have been purchased, for a total of just under 40 acres. This includes a recent purchase of the 1.8-acre riparian piece of the old Lazy Days mobile home park. EWEB provided $100,000 to MRT to help acquire the former Lazy Days property.

EWEB continues to support the University of Oregon (UO) Soil-Plant-Atmosphere Laboratory under a 5-year IGA to conduct research at EWEB's 140-acre High Banks Road property. In 2022, approximately 32-acres were planted with variety of trees and shrubs to maximize carbon sequestration while providing biodiversity and other ecological benefits. EWEB and UO will continue looking for opportunities to scale-up this research in partnership with MRT, such as in Quartz Creek.

For more information on sources of funding flowing into and out of EWEB and PWP for watershed restoration work projected over the new few years, see Appendix A.

8.0 Septic System Assistance

Since EWEB began its Septic System Assistance Program in 2008, over 1,100 septic systems have been inspected and pumped out (see Table 8-1). A number of systems were also repaired as needed. EWEB's ongoing septic system assistance program currently consists of two components:

1) ***Rebate program:*** This program provides homeowners who are in close proximity to the McKenzie River 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. Thirty-three zero-interest loans have been issued to McKenzie homeowners since the beginning of the program, with 14 loans being issued in 2022 to homeowners affected by the fire.

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 does much of the outreach and collects data on septic system inspections/results by address in a database and in GIS. In 2022, 72 septic systems were inspected and pumped out (see Table 8-1).

Table 8-1: Septic System Participation 2008-2022

Septic Systems Inspected	
Average Inspections/Year	81
2022 Inspections	72
Cumulative Inspections	1,125

Federal funding issued through the American Rescue Plan Act (ARPA) is now available to help McKenzie River homeowners repair or replace septic systems damaged in the Holiday Farm Fire. To leverage this funding, EWEB has partnered with the Oregon Department of Environmental Quality, Lane County, and other agencies to implement this grant program. In total, about $3 million is available in grant funds via two different pathways:

1. $1.5 million is coming through Biz Oregon and Lane County, and EWEB will facilitate the distribution of these funds on the ground. The amount of grant funding depends on the average median income for Lane County. Homeowners at or below this threshold (which takes into account household size) will receive the full amount of grant funding. This is $15,000 for a traditional septic system and $35,000 for an alternative treatment system. Those homeowners with household incomes are above this threshold will be eligible for half of the full amount. These funds are applicable to homeowners who owned the property before the fire (or have transferred the property to a family member).
2. $1,592,410 was awarded to EWEB directly by DEQ to distribute to low- and moderate-income homeowners, based on 300% of federal poverty guidelines.

Both sources of grant funding have allowances for local businesses to receive grant funding as well. For each grant, if the cost of the septic system exceeds the grant amount, homeowners can take advantage of EWEB's zero-interest loan to cover the rest of the amount.

These grant funds are critical to many homeowners in the watershed who were underinsured and who are facing challenges in rebuilding or repairing their homes. Funds from both sources are retroactive to March 3, 2021, so homeowners who have already started the process are still eligible. Homeowners affected by the fire who already have zero-interest septic loans with EWEB may be eligible to have these loans paid off with grant funds.

For more information about any of the above septic system assistance programs, please visit: www.eweb.org/septic.

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. We did not have any of these projects in 2022.

9.1 Hazelnut Pesticide Reduction Project

EWEB has been working with McKenzie hazelnut growers for years on monitoring for filbert worm moth to alleviate impacts to their crops while reducing the quantity 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, and minimize the number of sprays during the summer. Monitoring alone has helped to reduce pesticide use on hazelnut crops by up to 50% in some orchards. In the summer of 2022, four hazelnut growers participated in this program, representing over 200 acres of hazelnut orchards. One grower did not spray at all this year due to the low moth counts found in their orchard through monitoring. We anticipate that additional growers may participate in future, as new hazelnut orchards are being planted and replanted with blight-resistant trees.

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. However, as expected, salvage logging has decreased in 2022, by about 75%, from ~16,000 acres to ~4,000 acres across the watershed. Herbicide application has increased quite a bit this year, by about a factor of 4 in fire-affected watershed, as expected given replanting efforts post-fire. EWEB continues to monitor for pesticides and other contaminants during storm sampling events generally in the fall and spring. For more information see section 3.3 and to explore an interactive map, see: FERNS Dashboard: Forestry Activities in the McKenzie Watershed.

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 bi-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 some continued turnover with facilitation. The stewardship contracting sales that were expected have been delayed, so the group has primarily been working on setting up documentation for onboarding new members, and putting together an application and process for evaluating proposed restoration projects in the watershed that could eventually be funded with retained receipts.

11.0 Operationalizing Source Protection

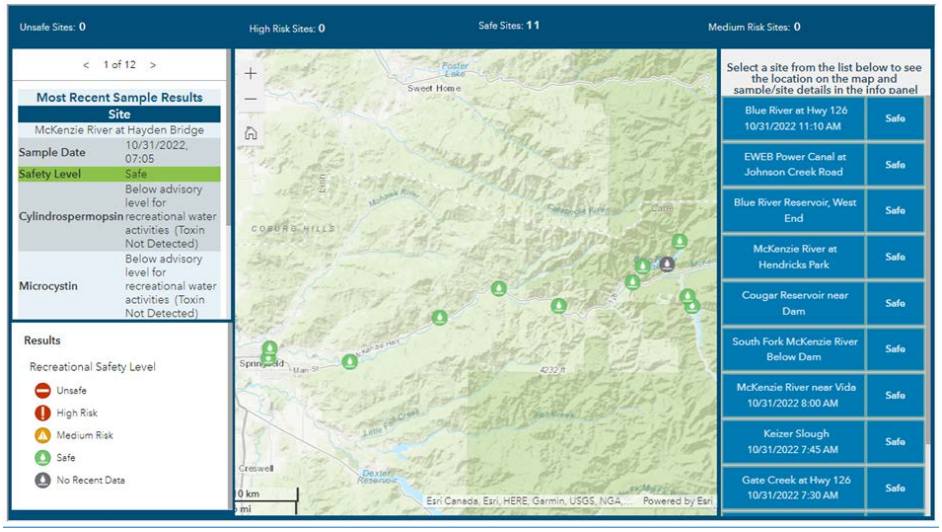
11.1 Hayden Bridge and Generation Integration Projects

Aquarius was acquired in 2022 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. Staff time in 2022 went to training and 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. The visualization tools will be set-up in 2023.

Source Protection staff worked with the USGS to install a stage/discharge and water quality monitoring station in Quartz Creek, which is one of the largest watersheds 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.

Water Quality staff developed a Harmful Algal Bloom Monitoring map (see Figure 11-1) that provides both external and internal audiences with the latest HAB monitoring data. Users can access the map through eweb.org to check the latest cyanotoxin results throughout the McKenzie Watershed.

Figure 11-1: Harmful Algal Bloom Monitoring Map



Appendix A Watershed Restoration Funding Flows

Figure A-1: Risk-Based Actions

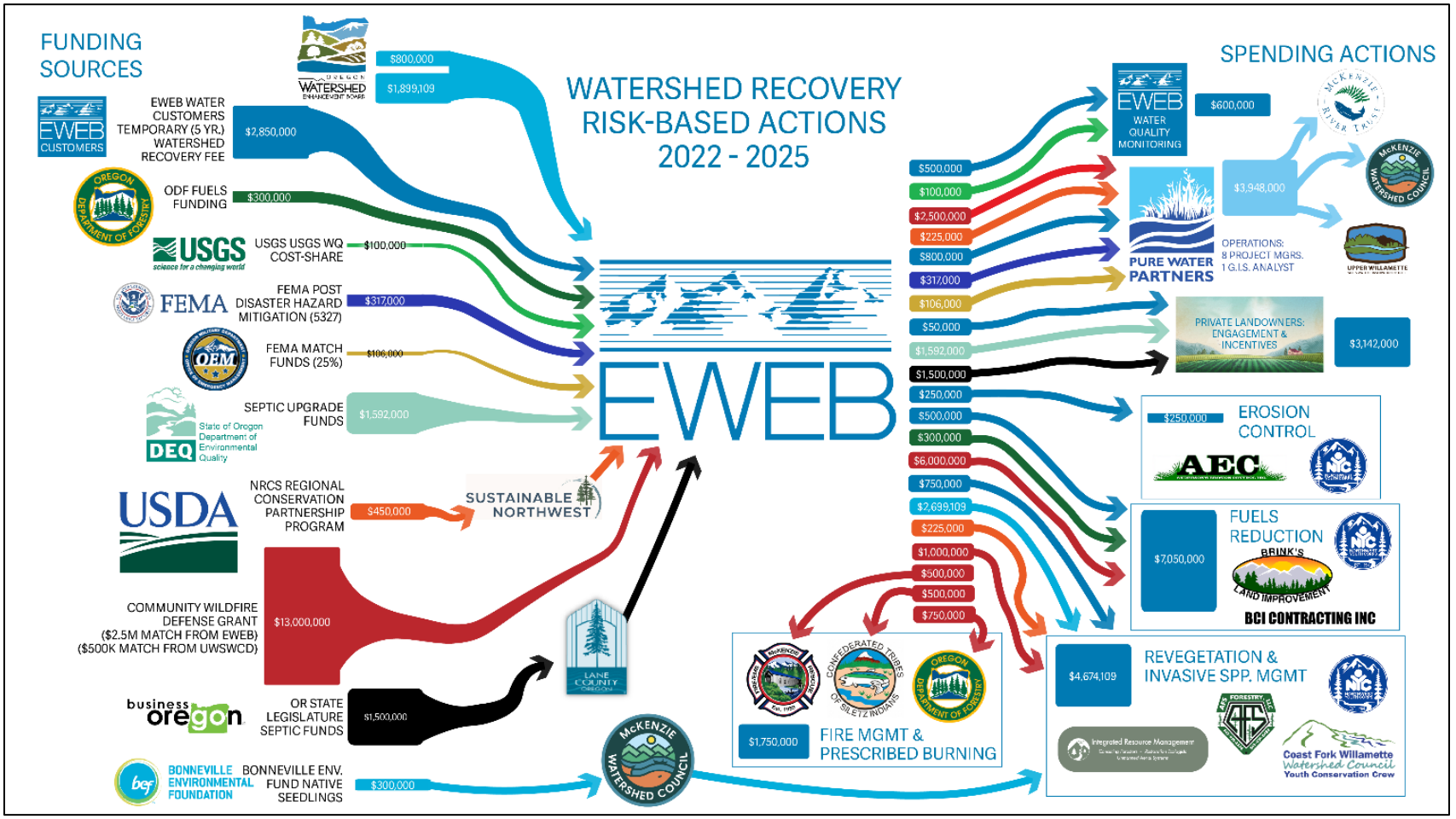


Figure A-2: Resiliency Based Actions

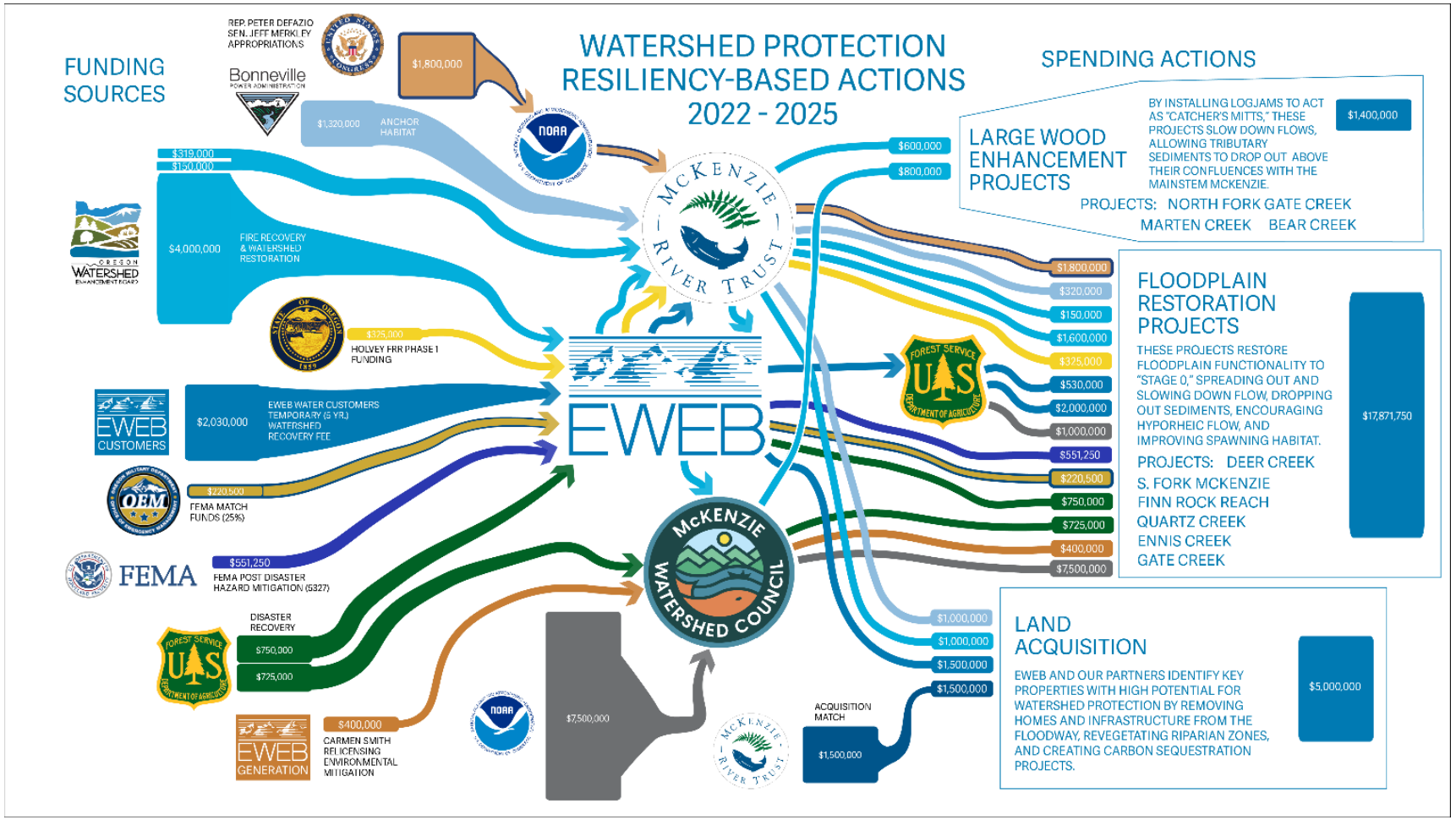


Figure A-3: Summary of Funding Sources for Watershed Restoration Activities