Medford Water's

SOURCE WATER PROTECTION PLAN

October 2024

MEDFORD WATER

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Executive Summary

Medford Water believes that Source Water Protection aligns with our organization's Vision: "To be the Rogue Valley's trusted municipal water provider for present and future generations through responsible stewardship, accountability, and the pursuit of excellence." This includes the stewardship of the quality and quantity of our source water resources.

We believe that Source Water Protection is our first treatment barrier to achieving our Mission: "To safeguard public health by providing a reliable, high-quality water supply at the best value."

To guide our Source Water Protection program, we have developed this plan to protect both the quality and quantity of our drinking water sources—Big Butte Springs and the Rogue River—while prioritizing the restoration of degraded ecosystem functions in our Source Water Protection Areas.

Our plan addresses a wide range of risks within our Source Water Protection Areas, which encompass over a million acres of diverse landscapes. These risks include pollution from agricultural practices, potential industrial spills, wildfires, and climate-induced droughts that threaten water availability.

Medford Water has established clear priorities to mitigate these risks, including increasing water availability in Big Butte Creek, improving water quality in Little Butte Creek, reducing wildfire risk, and enhancing emergency spill prevention and response. We support actions that protect and restore the water resources of the Rogue Basins, focusing on areas most directly impacting our water supplies.

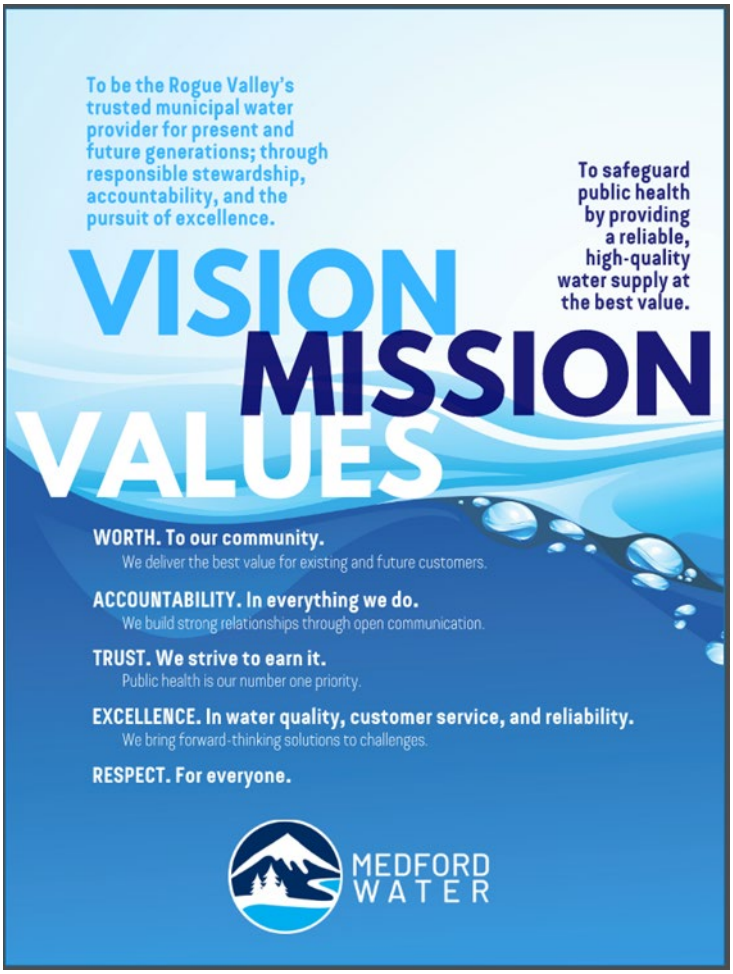
Key strategies include Partnerships and Collaboration, Land Use Management, Ecological Restoration, Spill Response, Community Outreach, and Monitoring. Partnerships are the cornerstone of our protection efforts, helping to expand project scope, secure funding, and maximize impact. We also advocate for source water protection through policy engagement, direct project implementation, and financial support to key partners.

By integrating immediate and long-term actions, leveraging partnerships, and pursuing joint funding opportunities, the plan offers a proactive, adaptable approach to safeguarding drinking water resources. With clear objectives and measurable outcomes, Medford Water is committed to ensuring safe, clean water for future generations.

Introduction

Medford Water believes that Source Water Protection aligns with our organization's Vision: "To be the Rogue Valley's trusted municipal water provider for present and future generations through responsible stewardship, accountability, and the pursuit of excellence." This includes the stewardship of the quality and quantity of our source water resources.

We believe that Source Water Protection is our first treatment barrier to achieving our Mission: "To safeguard public health by providing a reliable, high-quality water supply at the best value." We must protect our source water from contamination and degradation, safeguarding both its quality and quantity while also working to restore ecosystems impacted by previous damage.

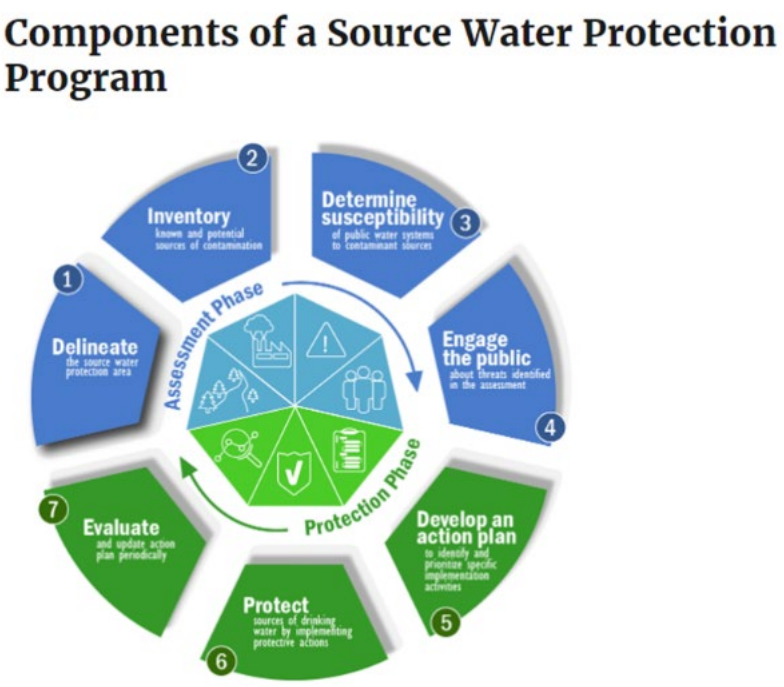


Our Source Water Protection Plan is designed to complement and work in alignment with several key Medford Water organizational plans, including the Forest Management Plan, Water Rights Master Plan, Water Management and Conservation Plan (which includes the Emergency Contingency Plan), the Source Water Protection Sampling and Analysis Plan, and the Capital Improvement Plan. A complete list of the resources and documents reviewed during the development of this Source Water Protection Plan can be found in Appendix D.

Medford Water's Source Water Protection Program is committed to safeguarding its water sources through proactive planning, collaborative efforts, and strategic actions. This Drinking Water Source Protection Plan provides a comprehensive overview of the current program, evaluates present and future risks to source water, identifies key protective strategies, and outlines the program's future direction to address current and emerging threats. With a focus on long-term water security, the plan is guided by the standards of the Oregon Department of Environmental Quality (DEQ), the Oregon Health Authority (OHA), the Environmental Protection Agency (EPA), and the American Water Works Association (AWWA). These agencies underscore the importance of proactive source water protection to ensure a safe, clean, and reliable drinking water supply for the community.

This plan serves as a comprehensive roadmap for source water protection, identifying natural and human-related risks while outlining strategic actions to mitigate them. It was developed through a collaborative process involving various stakeholders and is designed to be dynamic and adaptable. Medford Water is committed to continuous improvement based on ongoing monitoring and assessments.

The structure of the plan is as follows:



1. **Drinking Water Sources and Source Water Protection Areas (SWPA)**: This section defines the physical areas that supply water to Medford Water's system, including the Big Butte Springs and the Rogue River, and delineates the SWPAs and zones of vulnerability.
2. **Drinking Water Contaminants & Regulations**: A brief overview of the contaminants regulated under the federal Safe Drinking Water Act and specific Oregon regulations enforced by the Oregon Health Authority.
3. **Potential Contaminant Sources and Threats to Source Water**: This section identifies contamination sources that can introduce regulated and unregulated pollutants into source water. These sources include point and non-point pollution risks such as agricultural runoff, industrial spills, urban stormwater, and natural events like wildfires.
4. **Risks and Source Water Assessment**: Building on the DEQ's 2018 Source Water Assessment of Medford Waters sources, this section evaluates the risk levels of various potential contaminant sources in Medford Water's SWPA, assigning priority based on threat levels and vulnerability.
5. **Action Plan for Source Water Protection**: Our plan details strategies to reduce risks to source water, emphasizing key partners and specific strategies for spill prevention, wildfire risk reduction, and improving water quality and availability. The adaptive plan enables Medford Water to respond to evolving challenges while remaining focused on our priorities.
6. **Implementation**: This final section provides a detailed timeline for implementation, outlines necessary resource needs, and identifies Expected outcomes and measures of success to track the plan's effectiveness.

This plan is a key component of Medford Water's commitment to sustaining water quality and availability, aligned with Oregon's guidelines for water system resilience. As the plan is implemented, Medford Water will continue to work closely with regulatory agencies and local partners to ensure the community's water needs are met well into the future.

Drinking Water Sources and Source Water Protection Areas

Geographic Setting

Medford Water has two exceptional water sources: BBS, a groundwater source, and the Rogue River, a surface water source. These sources supply high-quality drinking water to Medford, Central Point, Eagle Point, Jacksonville, Phoenix Talent, and intermittently Ashland, which total approximately 160,000 people.

TABLE 1. FINISHED WATER QUALITY PARAMETERS EXCERPT FROM MEDFORD WATER 2023 ANNUAL WATER QUALITY ANALYSIS REPORT.

GENERAL PARAMETERS @ EP				
Analyte	**EP-Big Butte Springs**	**EP-Duff WTP, Rogue River**	**MCL or Standard Level**	**Unit**
Million Gallons	7249	3185	N/A	Gallons
Free Chlorine Residual	0.6	0.9	4	ppm
Temperature	9.2	15.3	N/A	Deg C
pH	7.0	7.3	BBS > 6.8 Duff > 7.0	pH Units
Specific Conductance	112	84	N/A	µS/cm
Alkalinity as $CaCO_3$	51	34	N/A	ppm
Potassium	1.3	< 1.2	N/A	ppm
Total Hardness as $CaCO_3$	41	27	N/A	ppm
Magnesium	5.2	2.6	N/A	ppm
Calcium	7.6	6.6	N/A	ppm
Silica, SiO_2	37	26	N/A	ppm
Sodium	6.3	5.3	20*	ppm
Total Dissolved Solids	79	65	500*	ppm
Total Organic Carbon	< 0.4	1.4	N/A	ppm
Turbidity (Year Average)	0.3	0.03	N/A	NTU
*Secondary standards				

The BBS source supplies 60-75% of the total system demand. Typically, the flow is sufficient to meet the community's demand from March to November. When water demand surpasses what the BBS source can supply, the Duff WTP on the Rogue River is brought online.

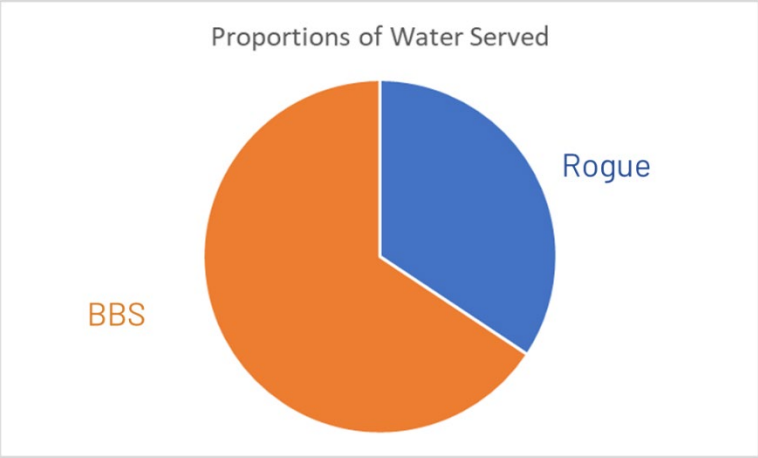


Figure 1. Proportions of water served from the BBS and rogue sources

The watersheds of the Rogue and BBS as drinking water sources are referred to as Source Water Protection Areas.

A Source Water Protection Area (SWPA) is a designated zone or area around a source of drinking water, such as a well, spring, or surface water body (like a river, lake, or reservoir), where special protections and management practices are applied to prevent contamination. The goal is to safeguard the quality of the water before it reaches a public water system. Medford Water has established the entire watersheds above our springs and our WTP intake as our SWPAs. For a typical groundwater source,

a wellhead protection area is delineated. However, the BBS spring system is not a well but a once free-flowing spring that has been captured. As a result, the Groundwater Drinking Water Source Area functions similarly to a surface water source area with the BBS springs located at the lowest elevation. In this plan, the BBS source water area, or "watershed," is called the BBS SWPA.

The SWPAs for both sources are located almost entirely in Jackson County in the Upper Rogue Sub Basin, HUC 17100307, of the Rogue River Basin.

The BBS SWPA is nested entirely within the Rogue River SWPA. Medford's Rogue SWPA is virtually the entire Upper Rogue Subbasin, which extends approximately 84 miles in a northeast direction from the intake on the Rogue River (River Mile 131) and encompasses a total area of 1,617 square miles or 1,035,066 acres. It includes a variety of landscapes, from steep, rugged terrain to expansive, relatively flat ancient lava flows to valley bottoms and riparian areas. The SWPA ranges in elevation from 1,175 feet at the water treatment plant intake on the Rogue River to 9,493 feet at the summit of Mt. McLoughlin.

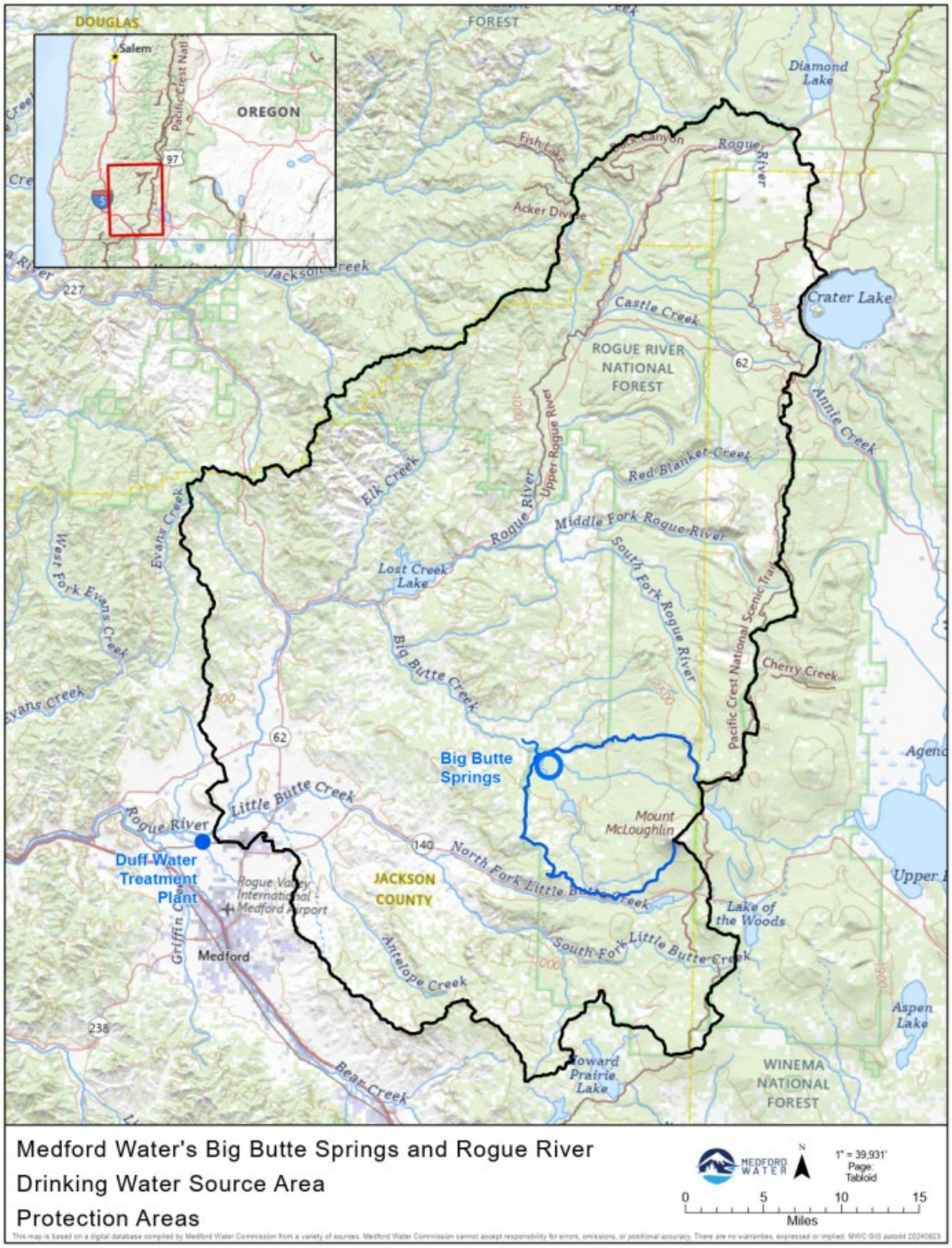


FIGURE 2. MEDFORD WATER'S SWPAS (SWPA) FOR THE ROGUE RIVER AND THE BBS VICINITY MAP.

Geologic Setting

The geology of the Upper Rogue is comprised of the volcanic terrains of the Southern Cascades, which can be divided into the Western Cascades and the High Cascades. These volcanic terrains, rocks, and soils produce high groundwater infiltration rates, fast groundwater transmission times, and frequent seeps and springs, such as the BBS system.

Climatic Setting

The climate is generally Mediterranean, with mild, wet winters and warm, dry summers. Annual precipitation in the watershed ranges from less than 20 inches in the valley bottom around Medford to approximately 80 inches on the upper slopes of Mt. McLoughlin and the High Cascades. The median precipitation is 54.5 inches, and the median daily temperature is 42.3 degrees Fahrenheit.

Ecoregion Setting

The Upper Rogue River Basin lies in the southern extreme of the Cascades ecoregion and the northeast extreme of the Klamath Mountain ecoregion. The Cascades ecoregion extends the entire length of Oregon, but the southern section is considerably warmer and drier than the northern section. The terrain consists of gently sloping mountains, broad valleys, long summer drought, and high vegetation diversity.

Land Use/Type Setting

Approximately 82% of the land in Upper Rogue is forested, most of which is federally managed. The USFS primarily manages the headwaters and upper reaches under the Rogue River-Siskiyou National Forest and the Bureau of Land Management (BLM) for multiple uses, including timber production, recreation, grazing, wildlife, and drinking water. Agricultural and rural land covers approximately 18% of the Upper Rogue, and urban land use occupies less than one percent. The region's largest urban areas, including Medford and surrounding cities of Ashland, Central Point, Jacksonville, Phoenix, and Talent, are not in the SWPA. They are in the Bear Creek watershed, which enters the Rogue River below Medford Water's WTP intake on the Rogue River. The urban areas of Eagle Point, White City, and Shady Cove fall within the Rogue SWPA. Land use for both sources is further described in the sections that follow.

TABLE 2. LAND USE IN THE UPPER ROGUE RIVER SUB-BASIN.

Land Use	Ownership	Percent of Drinking Water	Area in Square Miles
Agricultural / Rural 18%	Agricultural	11%	180
	Private Rural	7%	120
Forest / Woodland 82%	USFS	42%	672
	BLM	15%	241
	Private Industrial	18%	284
	Other Fed lands (NP, USACE)	7%	111
Urban < 1%	Private (Commercial, Residential, Industrial)	>1%	5
	Local Govt	>1%	2
The total Source Area is 1,035,066 acres or 1,617 square miles * DEQ Source Water Assessment, 2018, Table 1.			

The BBS Source and SWPA

Location and Area

The BBS is approximately five miles east of Butte Falls in Jackson County, Oregon (see Figure 1, Vicinity Map). The SWPA for BBS covers the entire recharge or zone of contribution area for the springs and spans 56,744 acres of private and public lands. This area includes three subbasins: Fourbit, Skeeter, and Willow Creek.

Springflow and Water Use

The BBS complex discharges an average of 48 cubic feet per second (cfs) (31 million gallons per day (mgd)), with flows ranging from a high of 60 cfs during wet conditions to a low of 36 cfs during prolonged drought. Medford Water diverts between 30–40 cfs (20–26 mgd) from the springs year-round.

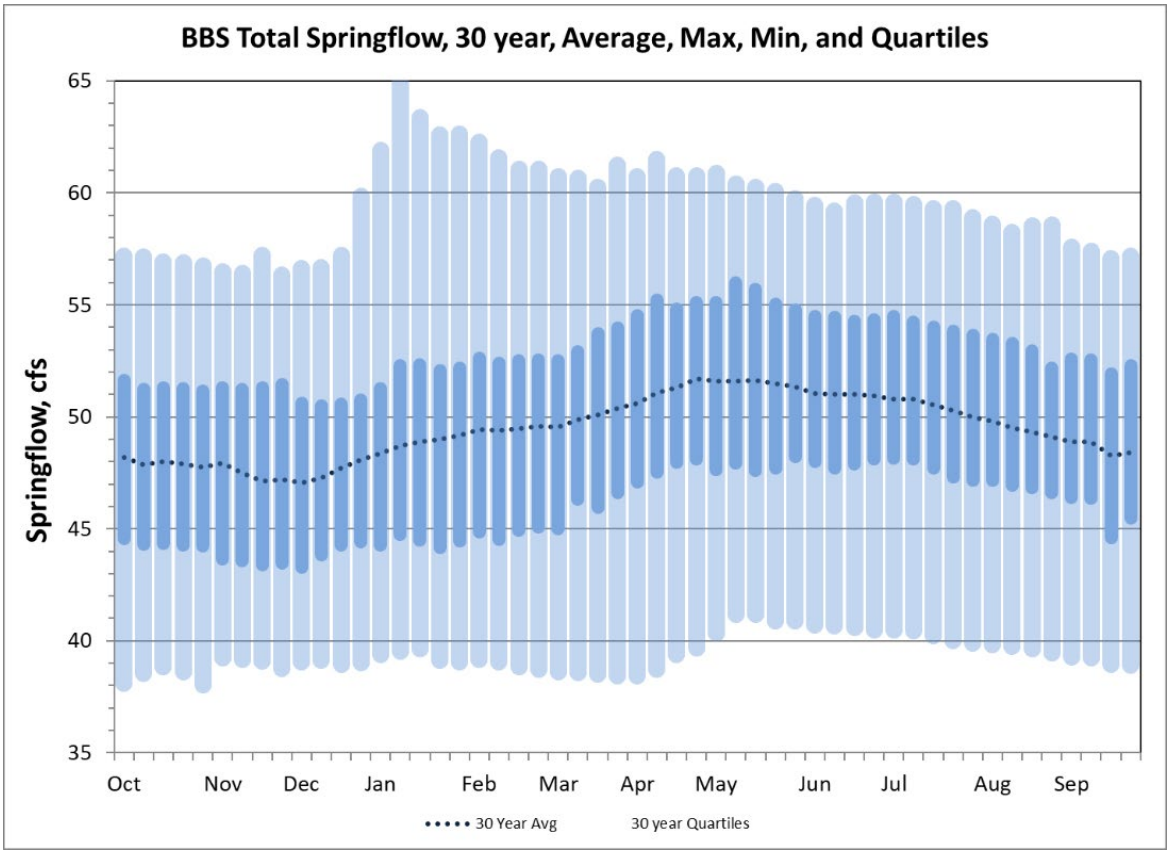


FIGURE 3. BBS TOTAL SPRINGFLOW, 30-YEAR, AVERAGE, MAX, MIN, AND 1ST AND 3RD QUARTILES.

Water Quality

The springs provide exceptionally high-quality water, consistently cold and clear, with relatively low mineral content (see Table 1 for general water quality parameters). The spring water is collected underground, requiring minimal treatment (chlorine disinfection) to meet current water quality standards. Due to the shallow collection at Rancheria Spring, ultraviolet treatment is an additional barrier for potential surface-water interaction.

Water Storage and Distribution

Medford Water owns and operates Willow Lake in the BBS SWPA, which has an impoundment capacity of up

to 8,320 acre-feet. Water from Willow Lake is released to the Eagle Point Irrigation District (EPID) as part of a water trade agreement. When the Natural flow of Big Butte Creek cannot fulfill Medford Water and EPIDS water rights, lake releases replace BBS diversions beyond Medford Water's proportional share of water, ensuring no injury to the EPIDs water right, which has the same priority date as Medford Water's. This maximizes the use of this pristine source for drinking water purposes.

Geohydrology of the BBS

A comprehensive geohydrological study of BBS was conducted between 1987 and 1990 in collaboration with the U.S. Forest Service (USFS). The study, known as the Big Butte Springs Geohydrologic Report (GeoHydro Report), defined recharge area boundaries, groundwater flow patterns, and hazard zones. The GeoHydro Report delineated the BBS SWPA as covering 55,802 acres. This boundary was updated in 2022 by Medford Water using the latest USGS watershed boundaries, now totaling 56,744 acres.

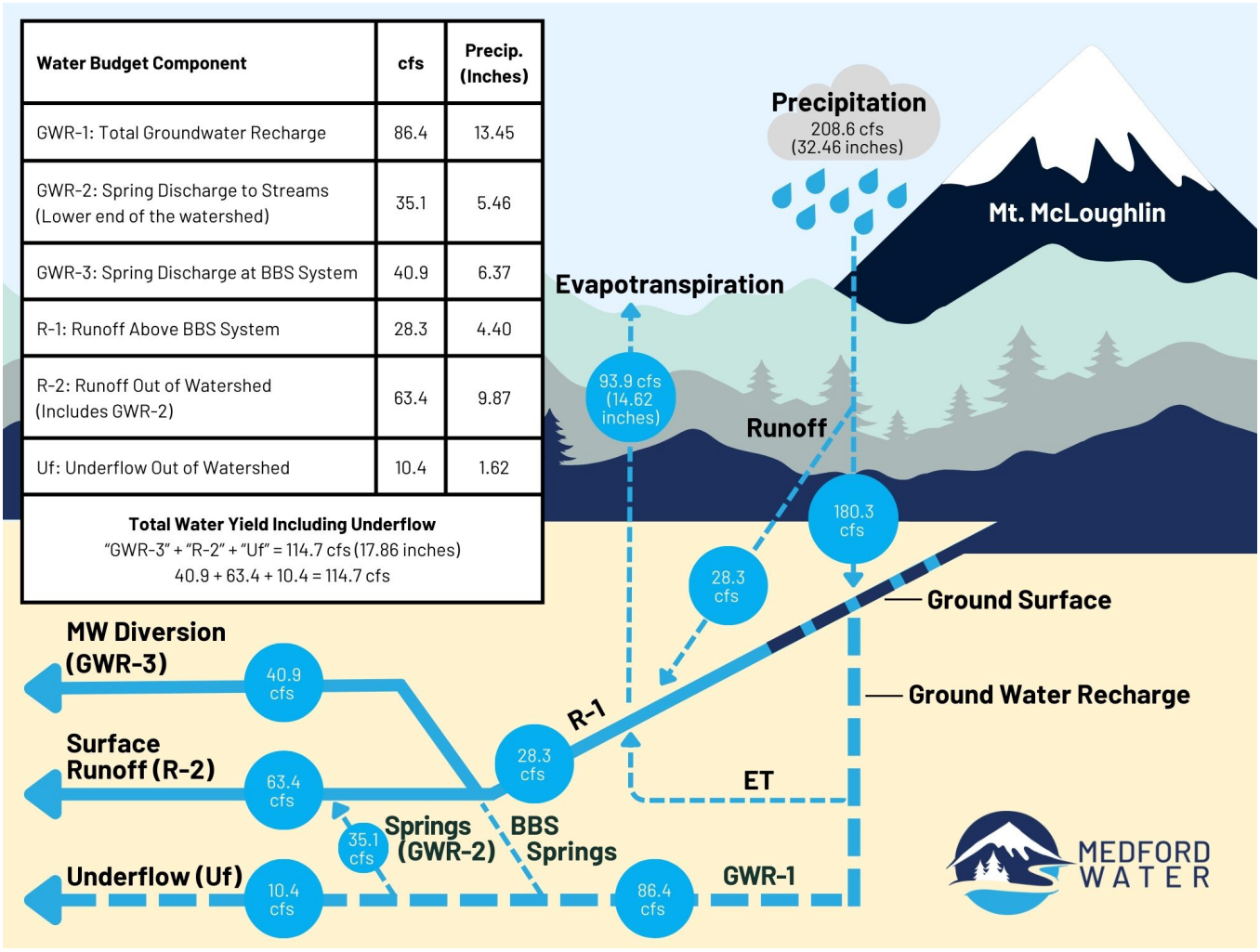


FIGURE 4. ADAPTION OF BBS WATERSHED BUDGET FROM 1990 GEOHYDRO REPORT

The primary aquifer of the BBS is composed of highly permeable Young High Cascade (YHC) lava flows from Mt. McLoughlin, with smaller contributions from areas of older OHC terrains and lava flows. The YHC lava flows are thin-bedded, and formed as successive layers as the lava flowed over the landscape. Interflow zones developed between these layers, allowing groundwater to move laterally.

The lava filled a pre-existing valley as it flowed downslope over streams, where it cooled, cracked, and formed fractured rock. These fractures and layered structure allow precipitation and surface water to rapidly infiltrate the lava and move quickly downslope through "conduit zones" until it reaches an impermeable ash layer that form an aquitard, forcing water to the surface as springflow.

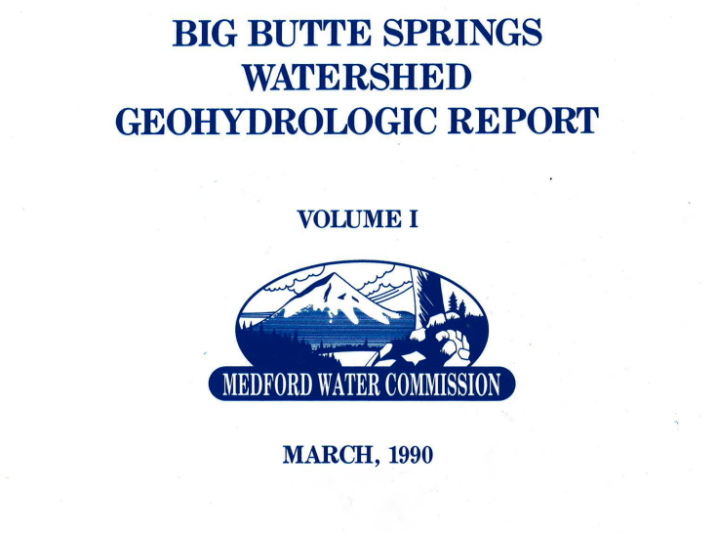


FIGURE 5. BIG BUTTE SPRINGS WATERSHED GEOHYDROLOGIC REPORT 1990

The conduit zones create efficient pathways for groundwater to travel quickly at velocities of up to 146 feet per day. For example, water infiltrating a natural sink high in the watershed called Skeeter Swamp can reach the springs in as little as 205 days, and rainfall infiltrating near the springs can result in increased spring discharge within days. Figure 4 above is an adaption of BBS Watershed Budget from 1990 GeoHydro Report. The budget was from a low precipitation year but highlights the extensive ground water recharge and spring flow in the watershed. Table 3 below summarizes the watershed budget as proportions of the total water supply with 36 to 29% of the total water supply leaving the system as spring flow.

TABLE 3 BBS WATERSHED BUDGET PROPORTIONS ADAPTED FROM 1990 BBS GEOHYDROLOGIC REPORT

BBBS Watershed Budget Proportions		
Watershed Budget Component	Period of Low Precipitation	Periods of High Precipitation
Evapotranspiration	45%	45%
Groundwater Recharge	36%	29%
Stream Flow	14%	21%
Underflow	5%	5%
Total Water Supply	100%	100%

The average annual precipitation in the BBS watershed ranges from 40 to 52 inches, with higher amounts at higher elevations. Due to the volcanic nature and highly permeable lava, a significant portion of precipitation infiltrates the ground, recharging the aquifer and emerging as spring flow. The YHC terrains exhibit infiltration rates of 49%, with some areas of complete and immediate infiltration in blocky lava flows. Areas such as these and Skeeter Swamp are described as "direct windows" into the groundwater aquifer. The older WC soils have much lower infiltration rates, around 15%, contributing less to groundwater recharge and more to surface runoff. These areas of older flows and soils are referred to as diffuse zones that slowly contribute groundwater

to the conduit zones in the YHC. Much of the surface runoff from these areas is captured by Willow Lake Reservoir. This direct connection between precipitation, infiltration, and discharge emphasizes the importance of protecting recharge areas to sustain and protect the groundwater supply. In Figure 6 below the connection between precipitation and springflow can be seen with spring flows rebounding quickly with above average precipitation but falling quickly. Sustained springflow above 40 cfs is dependent on average or above precipitation up to 4 years prior.

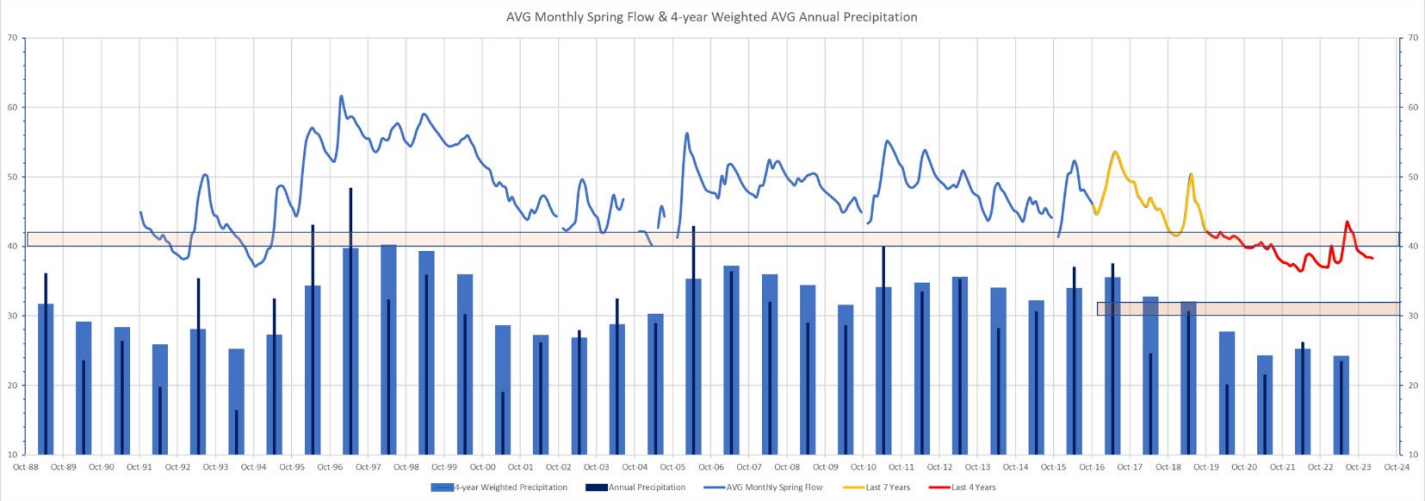


FIGURE 6. HISTORIC BBS SPRINGFLOW AND PRECIPITATION.

Note that shaded horizontal bars represent spring flow levels that force reducing BBS diversion from our full capacity of approximately 40 cfs down to 30 cfs and from 30 cfs down to 20 cfs. This is due to air entrainment that occurs at diversion pipe flow rates other than full and half pipe capacities. A full and larger version of this chart is provided in Appendix C.

BBS Protection Area Vulnerability Zones

The high infiltration rates and rapid groundwater travel make the BBS source vulnerable to contamination from surface activities. The limited treatment barriers at our BBS facility compound the vulnerability to contamination. All the land within the BBS SWPA contributes recharge to the groundwater system and, therefore, could potentially contribute contaminants to the springs. However, areas near the springs and of higher permeability pose a greater risk than areas of lower permeability far from the springs.

The 1990 GeoHydro Report included a Groundwater Hazard Zonation Map that designates and ranks individual hazard areas for potential groundwater contamination based on volcanic rock and soil types, infiltration rates, time of travel, and surface water flow. Updated and simplified Protection Area Vulnerability Zones from these hazard zones have been delineated within the BBS SWPA to guide land management and source water protection strategies. These zones adapt the hazard zones into estimated time of travel (TOT) zones typically delineated in groundwater drinking water protection areas.

The Protection Area Vulnerability Zones include three zones of high, moderate, and low vulnerability, delineated based on the TOT from groundwater infiltration to springs discharge and the following vulnerability and administrative criteria: infiltration rates, distance to BBS, depth to groundwater, groundwater velocity, direct or indirect connection to surface influence geohydrologic uncertainty, and land use.

Protection Area Vulnerability Zones:

Zone I: High Vulnerability
This zone has a time of travel (TOT), or residence time, of less than one year from groundwater infiltration to spring discharge, making it the most critical for protection. It requires the highest level of protection and the strictest management guidelines. Zone I includes two separate areas:

- The Skeeter Swamp Area, where all precipitation and surface flow infiltrate into the conduit zones.
- The area directly surrounding the springs and where potential contaminants are more likely to reach the springs quickly due to short travel times.

Zone II: Moderate Vulnerability
With a TOT of 1 to 5 years, Zone II requires intermediate protection and management guidelines. It includes three key areas of

- Ash, Indian, and Horse Creek areas have low infiltration, steep terrain, and high runoff, posing a moderate contamination risk.
- Upper moderate zone, including Fourbit and Skeeter Creek, has high infiltration and lava flow areas, contributing to groundwater recharge.
- East branch Willow Creek that transmits surface water to groundwater as a losing stream.

Zone III: Low Vulnerability
Zone III has the lowest vulnerability with a TOT of greater than five years. It requires less protection than Zones I and II but still follows some management guidelines. Lower infiltration rates, reduced groundwater transmissivity, and longer residence times characterize this zone. It includes three areas:

- The northern half of Fourbit Creek Basin,
- The Juniper Ridge area, and
- The Willow Basin area.

Figure 7. below is the 1990 BBS Geohydrologic Report Hazard zones, and Figure 8 shows the simplified BBS Protection Area Vulnerability Zones. Note that the pink area has the highest hazard, followed by green and brown. The Simplified Protection Area Vulnerability Zones were established from these hazardous zones The full BBS Protection Area Vulnerability Zone map can be found in Appendix B.

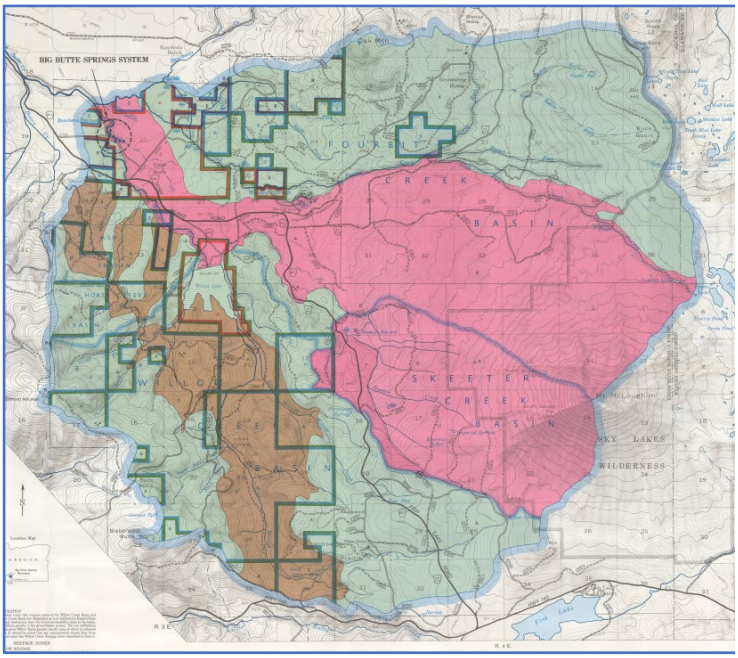


FIGURE 7. GROUNDWATER HAZARD ZONATION MAP FROM THE 1990 BBS GEOHYDRO REPORT

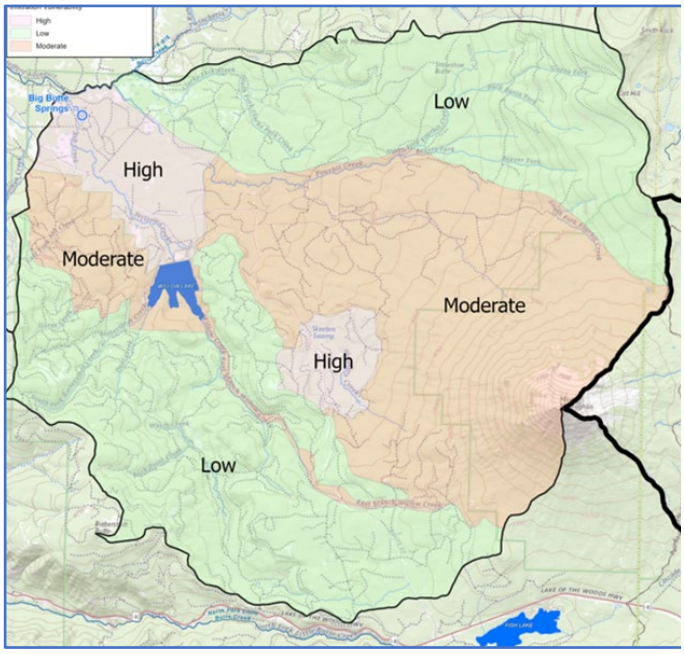


FIGURE 8. THE SIMPLIFIED BBS PROTECTION AREA & VULNERABILITY ZONES.

Rogue River Source and SWPA

When the system demand for water surpasses what BBS can supply, the Robert A. Duff Water Treatment Plant is brought online with treated water from the Rogue River. The Duff WTP typically operates from as early as April to as late as November. Currently, the plant has a capacity of 45mgd. However, with population growth increasing demand and prolonged droughts reducing spring flow, the plant's operating season continues to lengthen. The plant's capacity will be expanded to 65 mgd by 2025 to meet future needs. With BBS limited to a capacity of 20-26 mgd due to pipeline constraints, Medford Water will increasingly rely on the Rogue River to meet growing demand.

FIGURE 9. DUFF WTP INTAKE ON THE ROGUE RIVER

Rogue River Source Water Protection Area (SWPA)

Medford Water's Rogue SWPA lies within the Upper Rogue River Subbasin (HUC 17100307) of the Southern Oregon Coastal Basin. This SWPA stretches approximately 84 miles northeast from the intake on the Rogue River at River Mile 131, covering an area of 1,035,066 acres or 1,617 square miles. The Rogue SWPA encompasses rugged terrain, valley bottoms, and ancient lava flows, with elevations ranging from 1,175 feet at the Duff WTP intake to 9,485 feet at the summit of Mt. McLoughlin.

The hydrology of the Rogue River at the Duff WTP intake is influenced by the region's Mediterranean climate, volcanic geology, the impoundment at Lost Creek Lake, irrigation districts, and stream flows from the major tributaries below Lost Creek Dam.

Stream Flows in the Upper Rogue

Stream flows in the Upper Rogue and its tributaries are lowest in summer and early fall, rising with fall rains and peaking in early spring with snowmelt and spring storms. The annual mean daily flow of the Rogue at Medford Water's intake is approximately 2,500 cfs, ranging from a low of 1,312 cfs in October to a high of 3,438 CFS in January. The historic peak flow at Dodge Bridge, which is upstream of Little Butte Creek, was 87,600 CFS on December 22, 1964. Following the construction of Lost Creek Lake, the highest flow recorded was 32,500 CFS on December 30, 2006. The lowest flow recorded pre-Lost Creek Dam was 640 CFS in 1977, and post-dam, the lowest was 830 CFS in 2002.

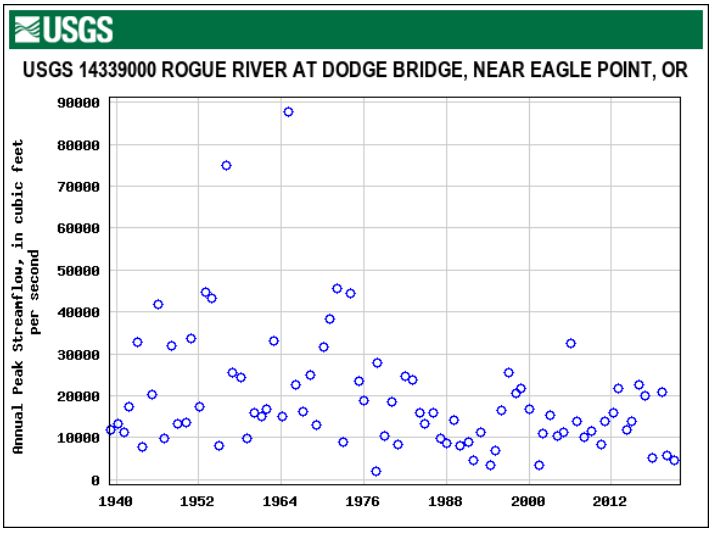


FIGURE 10. HISTORIC ANNUAL PEAK FLOWS AT USGS GAGGING STATION ON THE ROGUE RIVER AT DODGE BRIDGE ABOVE MEDFORD WATER'S WTP INTAKE.

Lost Creek Reservoir

Lost Creek Reservoir, located at river mile 157 on the Rogue River, is managed by the Army Corps of Engineers (USACE) primarily for flood control but also supports fisheries, recreation, power generation, and irrigation. The reservoir holds 465,000 acre-feet of water and collects runoff from a 674-square-mile area. This impoundment acts as a buffer from storm surges high in the SWPA.

Releases from Lost Creek Reservoir are carefully controlled to benefit fish migration, using a multi-port intake tower and turbidity flume to manage water temperature and sediment. On average, Lost Creek Reservoir contributes around 70% of the Rogue River's flow at Medford Water's intake, though this can vary from 94% in summer to as low as 47% in winter. Daily releases range from 1,059 cfs in October to 2,705 cfs in May but can drop as low as 700 CFS during drought conditions.

Irrigation Districts

Several irrigation districts operate within the Rogue SWPA, including Eagle Point Irrigation District (EPID), Rogue River Valley Irrigation District (RRVID), and Medford Irrigation District (MID). These districts divert water from the Rogue and its tributaries to irrigate farmland, and much of the diverted water eventually returns to streams. These diversions and those from individual irrigators impact water quality and quantity within the Rogue SWPA.

Tributaries to the Rogue River

The major tributaries to the Rogue River below Lost Creek Reservoir and upstream of the Duff Water Treatment Plant intake—Little Butte Creek, Big Butte Creek, and Elk Creek—play a critical role in source water protection. These tributaries, lacking significant impoundments in their lower watersheds, are considered "flashy," meaning their flows can rise rapidly during storms. They are subject to varying degrees of management and modification due to irrigation diversions and impoundments.

Annually, these tributaries contribute approximately 30% of the total flow in the Rogue River at Medford Water's intake. However, this percentage fluctuates with seasonal precipitation patterns and releases from Lost Creek Reservoir. During winter months, particularly in February, tributaries can account for over 50% of the Rogue's flow at the intake when winter rains increase stream levels, and reservoir releases are reduced to fill Lost Creek. Conversely, in August, when stream flows naturally decline and releases from Lost Creek Reservoir are higher to maintain cooler water temperatures for migrating salmon, tributary contributions may drop to less than 10%.

The water quality of the major tributaries ranges from very good in a tributary such as Big Butte Creek to very poor in Little Butte Creek. However, most are listed as impaired for temperature, dissolved oxygen, and E. coli due to the warm summers of Southern Oregon, low flows, irrigation diversions and returns, and municipal diversions.

Little Butte Creek

Little Butte Creek is the largest tributary within Medford Water's SWPA downstream of Lost Creek and disproportionately influences source water quality. At the confluence of Little Butte Creek and the Rogue River, the flow from Little Butte hugs the river's left bank, with minimal mixing downstream. This significantly degrades water quality, as Medford Water's intake is also located on the Rogue's left bank. Little Butte Creek is considered the most impaired tributary in the SWPA, contributing high levels of turbidity, metals, and E. coli, especially during storm events.

An internal study quantifying the disproportional influence of Little Butte Creek found that, on average, Little Butte Creek (including Antelope Creek) contributes over 20% of the water at Medford Water's intake. This contribution can exceed 60% during storm events despite Little Butte making up only 13% of the volume. This is due to the lack of mixing between the Rogue River and Little Butte Creek, as seen in Figure 11, drone footage from a sedimentation event in July 2019.

Antelope Creek is a major tributary of Little Butte Creek, joining it about 2.5 miles upstream of its mouth. Antelope Creek is often dry in summer in certain reaches but receives significant irrigation returns in others.

Elk Creek is the third-largest tributary to the Rogue below Lost Creek, entering at river mile 151.5. Due to its geology, Elk Creek is flashier, with peak flows higher than Little Butte and Big Butte creeks during storms but lower summer flows.

Big Butte Creek is the second-largest tributary in Medford Water's SWPA, originating in the BBS watershed and joining the Rogue downstream of Lost Creek Reservoir at river mile 155. It has the coldest water, likely due to the many springs in the basin.

Minor tributaries contribute around 140 cfs or 6% of the flow to Medford Water's source supply. These include Trail, Reese, Dry, Long Branch, and Indian Creeks, with Trail and Reese being the most significant.

FIGURE 11. AERIAL PHOTO OF THE ROGUE RIVER AND LITTLE BUTTE CREEK CONFLUENCE DURING A SEDIMENTATION EVENT CAUSED BY A LANDSLIDE IN THE HEADWATERS.

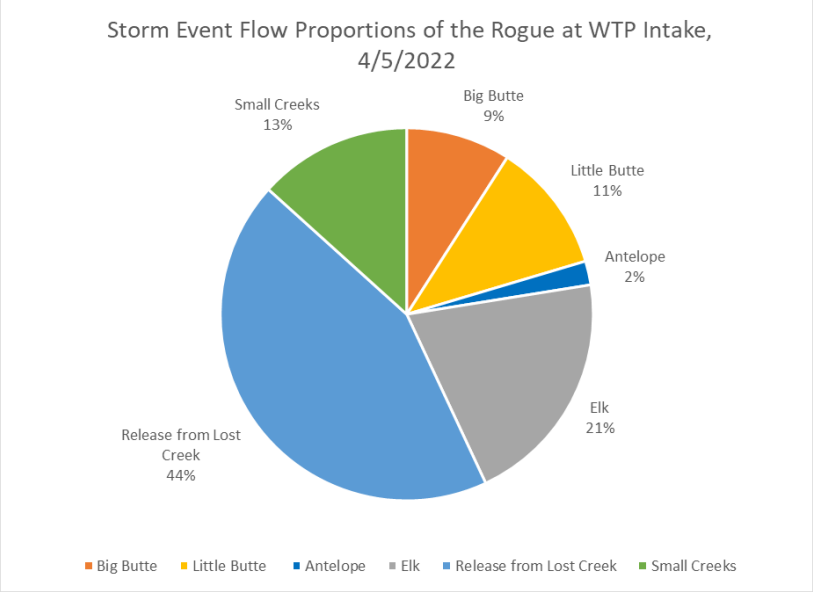


FIGURE 12. ROGUE RIVER FLOW CONTRIBUTION PROPORTIONS FROM TRIBUTARIES RESERVOIR RELEASES AT THE WTP INTAKE DURING A TYPICAL SPRING STORM.

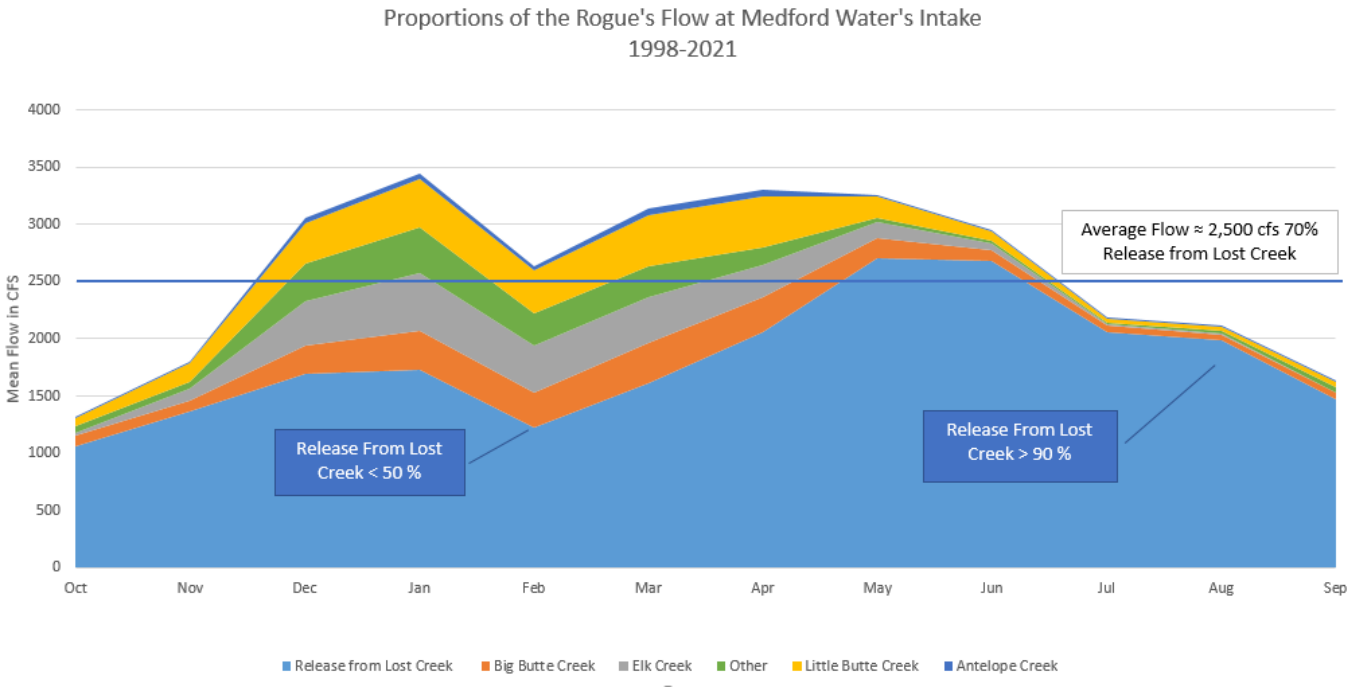


FIGURE 13. THE PROPORTIONS OF FLOW OF THE ROGUE AT THE WTP FROM TRIBUTARIES AND RESERVOIR RELEASES BASED ON THE AVERAGE MONTHLY FLOW.

Stream Flow Travel Time

To address potential spills or discharges, Medford Water follows OHA and DEQ recommendations for an 8-hour travel time in assessing contaminant sources within the SWPA. DEQ's Source Water Assessment determined this 8-hour boundary based on stream velocities. As seen in Figure 9 Medford Water Rogue SWPA Protection Area/Vulnerability Zones Map., this boundary is an arc originating at the intake and extending up 13.6 stream miles up the Rogue just past the town of Shady Cove and just downstream of the confluence of

North and South Forks of Little Butte Creek. Under certain conditions, changes in reservoir releases have been observed to extend this boundary further upstream, potentially reaching Lost Creek Reservoir.

Protection Area Vulnerability Zones

Medford Water has delineated individual Protection Area Vulnerability Zones within the Rogue and BBS SWPAs based on the geographic and hydrologic characteristics that affect the vulnerable to contamination to prioritize source water protection activities. The following protection area/vulnerability zones make up the entirety of the SWPA:

Below Lost Creek Reservoir (The Rogue and Tributaries): Moderate Vulnerability

Little Butte Creek: High Vulnerability

Above Lost Creek Lake: Low Vulnerability

Urban Industrial Zone (White City & Eagle Point): High Vulnerability

BBS managed for Groundwater protection as described above: High Vulnerability

The BBS Protection area lies within the Rogue SWPA but is managed for groundwater protection, as detailed above in the BBS SWPA section.

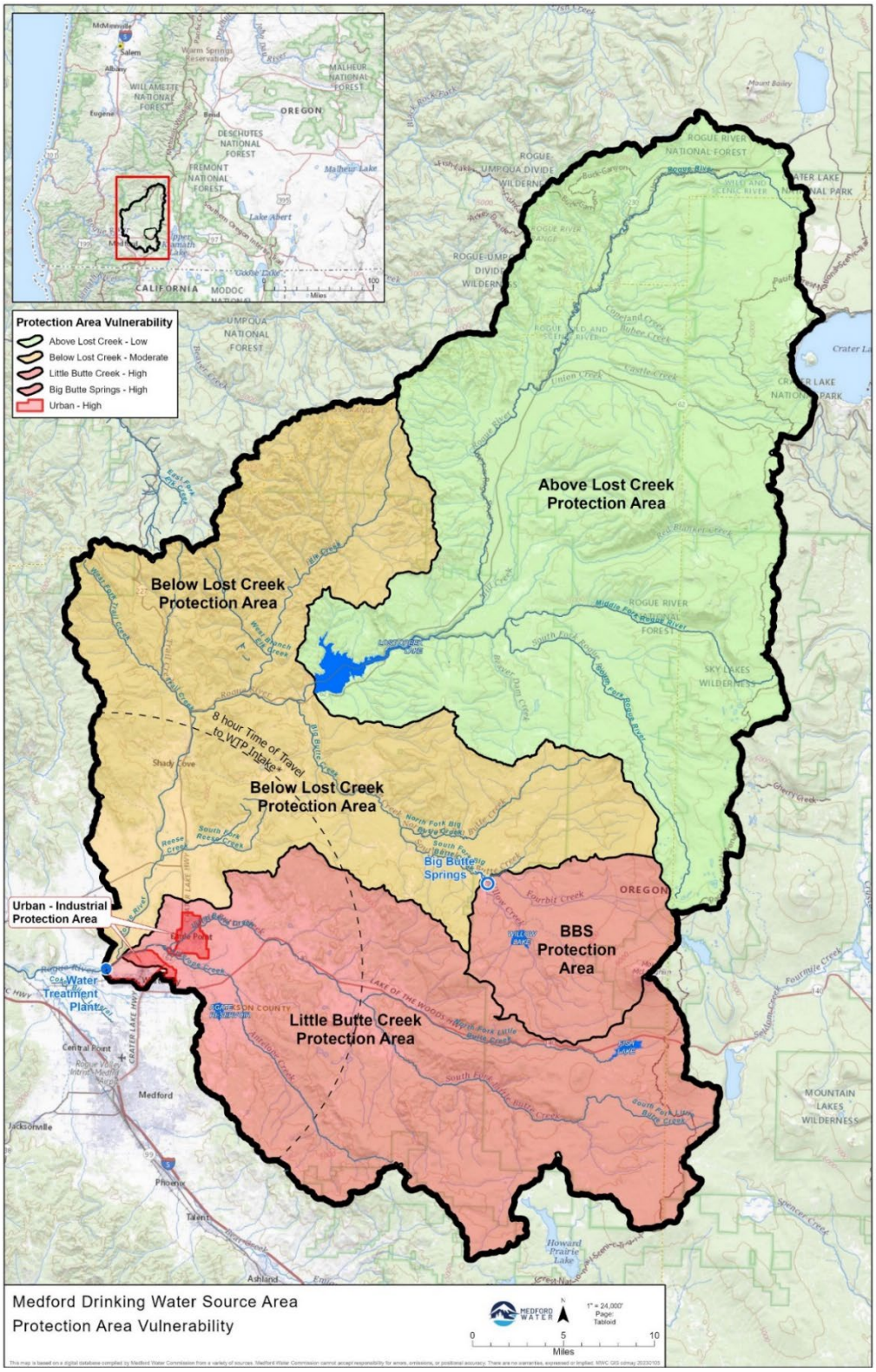


FIGURE 14. MEDFORD WATER ROGUE SWPA PROTECTION AREA/VULNERABILITY ZONES MAP.

Little Butte Creek Protection Area

Due to Little Butte Creek's disproportionate influence on Medford Water's Rogue source water quality described above, the sub-basin of Little Butte Creek and all its tributaries are included as a High Vulnerability protection area. This protection area encompasses much of the 8-hour time of travel boundary delineated by DEQ. The lack of stream mixing and significant influence on the Rogue, proximity to the intake, and short time of travel, along with the flashy nature and lack of physical barrier, amount to high vulnerability to contamination of Medford's source water in this protection zone.

Below Lost Creek

The Below Lost Creek Protection Area begins at the intake on the Rogue River and extends 26 river miles up to the dam of Lost Creek Lake. It includes all the tributary subbasins below Lost Creek except Little Butte and Antelope Creeks. The stream flow originating in this zone accounts for 20% on average of Medford Waters Source water supply, mostly coming from the tributaries to the Rogue entering below Lost Creek Lake. These relatively flashy tributaries can temporarily make up significantly larger proportions of the flow during storm events, and contamination inputs are not buffered or detained by a lake or reservoir. However, unlike flows from Little Butte Creek, the inputs from these tributaries and PCSs are more diluted by the cool, clean water released from Lost Creek Reservoir. This protection zone also encompasses much of the 8-hour time of travel boundary delineated by DEQ.

The proximity to the intake and short time of travel, the flashy tributaries, and the lack of physical barrier, coupled with the dilution factor from Lost Creek, amount to a moderate vulnerability to contamination of Medford's source water from PCS in this protection area.

Above Lost Creek

This protection zone covers 687 square miles and is 42% of the Rogue SWPA. It starts at Lost Creek Reservoir and extends up to the crest of the Cascades, including the west slopes of the Crater Lake Rim. Although the zone makes up only 42% of the SWPA, it accounts for 70% of the flow in Rogue River at the intake by annual mean flow due to higher precipitation levels and springs in the area. Lost Creek is a potential source of Harmful Algal Blooms (HABs). The Army Corps of Engineers manages reservoir releases. Medford Water receives notifications of changes in release and can monitor water volume on the gaging stations on the Rogue below the lake. The water quality and, specifically, HABs remain a blind spot with no real-time or regular water quality monitoring occurring on Lost Creek Reservoir or on the Rogue downstream of the reservoir except at the WTP intake, which does not allow for an early warning.

Lost Creek Reservoir is a complete and temporary detainment of all water sources in this protection zone. This impoundment acts as a barrier from contamination, where contaminants are detained, highly diluted, and have time to settle or possibly be removed. This is a significant benefit to source water protection and amounts to a Low Vulnerability factor for this protection area.

Urban Industrial

The Urban and Industrial Protection Area stands apart from the rest of Medford Water's SWPA as the only significant urban area where engineered municipal stormwater conveyance is the dominant hydrologic factor. The zone covers 3520 acres and includes the White City industrial area, a portion of the White City residential area, some rural and state lands, and the City of Eagle Point. Although the area only makes up less than 1 % of the SWPA, it has the potential to significantly affect source water due to the proximity to Medford Waters Intake, the lack of mixing and dilution of stormwater runoff, and the increased and flashy runoff of the urban area and stormwater conveyance system.

To mitigate potential contamination from this area, including future industrial development, a stormwater diversion system was built during the construction of the Duff WTP to divert the flow of two drainages in the White City area so that they enter the Rogue downstream of the intake.

FIGURE 15. PHOTO OF STORMWATER CONVEYANCE DIVERSIONS IN THE WHITE CITY INDUSTRIAL AREA.

These diversions act as an effective and complete barrier from flow and potential contamination from the drainage basin. However, this depends on the diversion system's proper function and operation. Furthermore, the Denman Wildlife Refuge ponds and the Dutton Pound stormwater system also act as temporary buffers and barriers to flows and potential contamination that could be utilized for spill response.

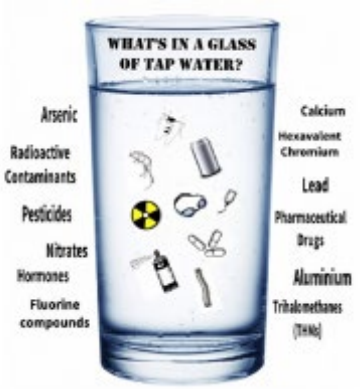
All flow from the White City and Eagle Point urban zones flows into the Rogue or Little Butte Creek below the online water quality monitoring station and is, therefore, not captured by our near real-time early warning instruments other than the raw water monitoring instrument at the WTP intake.

Medford Water has carefully delineated protection areas and vulnerability zones within the Rogue and BBS SWPAs by assessing the geographic and hydrologic factors influencing contamination risks. This approach enables the quantification and ranking of contamination risks, allowing source water protection strategies to be tailored and prioritized effectively. By addressing these specific vulnerabilities, Medford Water can better safeguard its water sources from current and emerging threats.

Drinking Water Contaminants & Regulations

Municipal water providers are responsible for supplying safe and reliable drinking water to the public. They are regulated by federal, state, and local rules to ensure the safety and quality of the water. The Safe Drinking Water Act, passed by Congress in 1974, was established to protect the public from naturally occurring and artificial contaminants that may be found in drinking water. The act defines contaminants as “any physical, chemical, biological, or radiological substance or matter in water” grouped into four general categories.

Drinking Water Contaminants:



Physical contaminants primarily impact water's physical appearance or other physical properties. Examples of physical contaminants are sediment or organic material suspended in the water of lakes, rivers, and streams from soil erosion.

Chemical contaminants are elements or compounds. These contaminants may be naturally occurring or artificial. Chemical contaminants include nitrogen, bleach, salts, pesticides, metals, toxins from bacteria, and human or animal drugs. SOCs, VOCs, IOCs, Emerging Contaminates (Pharm, PFOA)

Biological contaminants are organisms in water. They are also referred to as microbes or microbiological contaminants. Examples of biological or microbial contaminants include bacteria, viruses, protozoa, and parasites.

Radiological contaminants are chemical elements with an unbalanced number of protons and neutrons, resulting in unstable atoms that can emit ionizing radiation. Examples of radiological contaminants include cesium, plutonium, and uranium.

Federal Regulations and Contaminants

The SDWA authorizes the EPA to set national health-based standards to protect against chemical contaminants and pathogens that can occur in lakes, rivers, streams, groundwater, and some other sources. The EPA’s National Primary Drinking Water Regulations (NPDWR) sets primary standards that limit the levels of over 90 contaminants that can occur in drinking water with legally enforceable Contaminant Levels. The NPDWR includes microorganisms, disinfectants, disinfection byproducts, disinfection byproduct precursors, chemical contaminants, and radionuclides.

TABLE 4. MEDFORD WATER SOURCE WATER PROTECTION SUMMARY OF NPDWR CONTAMINANTS TABLE.

General Types of Regulated Drinking Water Contaminants				
Contaminant Types		Examples of Contaminant	Potential Health Effects	Common Sources of Contaminants in Drinking Water
	Microorganisms	Cryptosporidium, Bacteria, Giardia	Gastrointestinal illness	Human and Animal Waste
	Disinfectants	Chlorine, Chloramines	Eye/nose irritation; stomach discomfort, anemia; infants and young children: nervous system effects	Water additive used to control microbes
	Disinfection Byproducts	Bromate,	Increased risk of cancer	A byproduct of drinking water disinfection
	Inorganic Chemicals	Metals, Nutrients, and Other Elements	Kidney, liver, cancer	Runoff, Discharges
	Organic Chemicals, SOC & VOC	Pesticides, Petroleum by-products.	Cancer, Organ damage, Circulatory system, Nervous system, & Reproductive system disorders	Runoff, Discharges
	Radionuclides	Uranium, Radon	Kidney, liver, cancer	Runoff, Discharges

Oregon Health Authority (OHA) Drinking Water Regulations

In Oregon, the EPA Safe Drinking Water Act is implemented and enforced by The Oregon Health Authority (OHA) as the primary drinking water regulatory authority under the Oregon Drinking Water Quality Act enacted in 1981 "to assure safe drinking water at all water systems which serve the public, and to promote coordination between the programs for supervising water systems which the Authority and the U.S. Environmental Protection Agency conduct." This allows OHA to enforce additional state-specific regulations, such as those for cyanotoxins released from cyanobacteria during Harmful Algae Blooms (HABs).

Unregulated & Emerging Contaminants

Contaminants not regulated under current drinking water standards but suspected or known to pose risks to human health fall under the EPA Contaminant Candidate List (CCL) and Unregulated Contaminant Monitoring Rule (UCMR). These rules are used to monitor and evaluate currently unregulated contaminants known or anticipated to occur in public water systems for future regulation. For Example, The EPA has established health advisories for PFAS and an action plan for future proposed regulation.

Potential Contaminant Sources and Threats to Source Water

Point Source and Nonpoint Source Pollution

Pollution is the primary cause of Drinking Water contamination. It can generally be categorized as point-source or nonpoint-source pollution.

Point source pollution is typically attributed to a specific entity and location, such as the wastewater effluent from a plant or factory or stormwater outfalls from an urban area. If the pollution is discharged from a pipe, it is typically point source pollution. Point source pollution may be toxic contaminants such as chemicals and heavy metals. Identifying, quantifying, and regulating point source pollution is generally easier than nonpoint pollution.

Nonpoint source pollution generally enters waterbodies from rainfall or snowmelt moving over and through the ground, which moves natural and human-made pollutants into lakes, rivers, wetlands, and groundwaters. Common nonpoint source pollution includes runoff from agricultural lands, residential areas, construction sites, pet waste, abandoned mines, and more. According to the EPA, nonpoint source pollution is often the leading cause of water quality degradation.

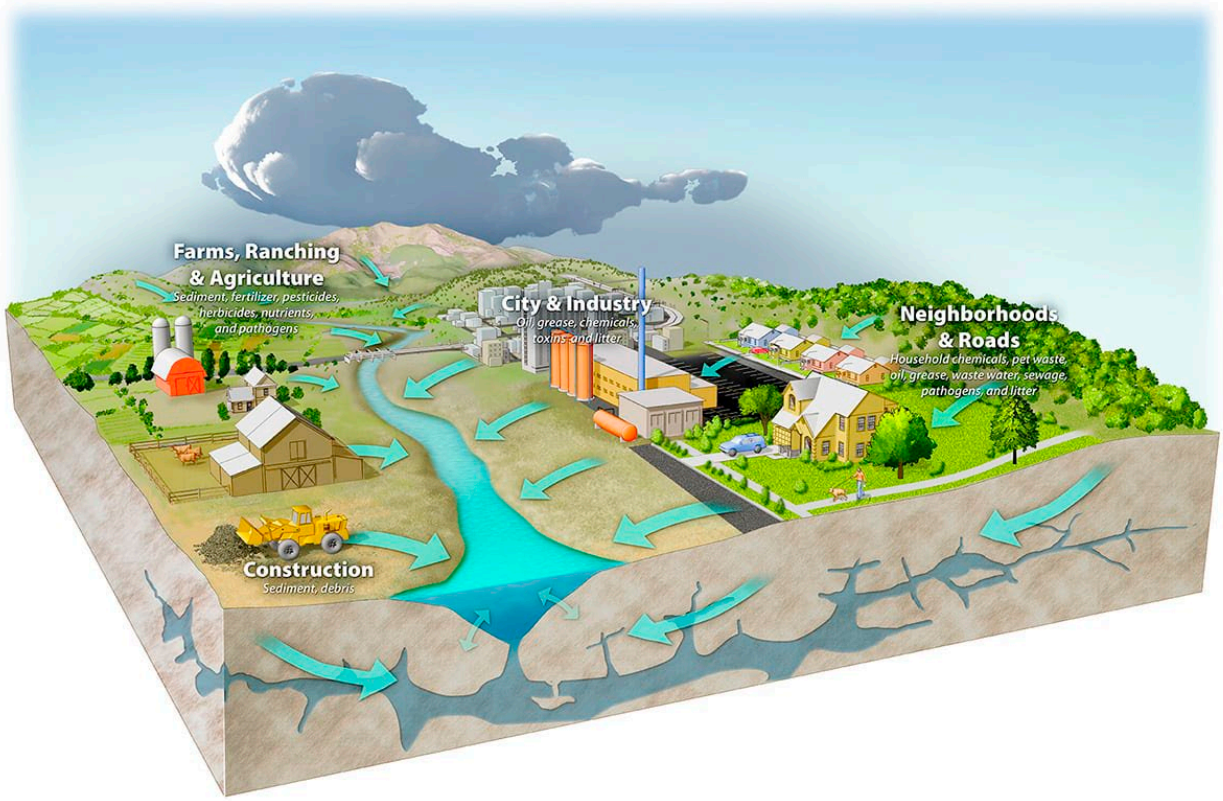
Due to its diffuse nature, identifying the cause or source of nonpoint source pollution is difficult. However, nonpoint source pollution can be grouped into land use management categories, which generally pose similar potential threats.

Potential Contaminant Source Categories

Protecting source water involves identifying pollution sources called Potential Contaminants (PCS). It is important to note that PCS are not necessarily a pollution source but have the potential to contaminate source water under all possible scenarios.

PCSs are numerous and can result from human activities such as chemical spills, natural processes, and human-altered natural processes such as stream bank erosion and sedimentation. They can include acute threats, such as a hazardous chemical spill that makes its way into a source water body, and chronic threats, such as background pollution from land mismanagement or repeated illicit discharges into a water body.

Additionally, natural events such as wildfires and harmful algae blooms can degrade source water quality and quantity or availability.



For this SWPP, PCSs are categorized as Land Use Management Practices, Inventoried PCSs, and Natural Events. Additionally, risks to water availability are evaluated.

Threats to Source Water:

Land Use Management Practices

Inventoried Point Source Contaminants (PCSs), spills, and discharges

Natural Events (e.g., wildfire)

Water Availability

Inventoried Potential Contaminant Sources

Inventoried PCS are typically point source pollution or an accidental spill or discharge from a specific location. They include wastewater treatment plants, municipal stormwater systems, and industrial or manufacturing discharges, regulated through a permit system where individual entities are issued discharge permits. The site-specific nature of point source pollution allows point source PCSs to be easily identified, inventoried, mapped, and categorized. The contaminants from Inventoried PCS are potentially the most hazardous. They can include the chemical pollutants of SOCs, such as pesticides, VOCs, petroleum products, and many emerging contaminants, such as pharmaceuticals and PFAS.

TABLE 5. CATEGORIES OF INVENTORIED POTENTIAL CONTAMINANT SOURCES

General Types of Inventoried & Mapped PCSs.	
Agricultural Feeding Operations	Mining Activities
Airports	Permitted Discharges
Automotive Services	Recreation
Chemical/Petroleum Processing/Storage	Reservoir/Dam
Commercial Food Processing	Septic System
Contaminated Sites	Solid Waste
Equipment Maintenance Shop	Stormwater
Fire Station	Stream Crossings
General Commerce	Transportation
Golf Courses/Parks/Heavy Landscaping	Underground Storage Tank
High-Density Housing	Utility Power Facilities
Landfill	Warehouse
Manufacturing	Wells
Medical Facilities	Wood Mills

Land Use Management

The land uses in a SPWA determine the probability and types of risks and potential contaminant sources to a drinking water provider's source water supply. Contamination from land use management is generally nonpoint source pollution and can include biological and microorganism contaminants such as giardia and chemical inorganic pollutants such as metals and nutrients. Additionally, nontoxic but problematic contaminants such as dissolved organics and sediment often come from land use management practices. It is important to note that land use under best management practices following the state and federal regulations has manageable impacts on source water. Furthermore, except in susceptible locations, Medford Water is not opposed to specific land uses or operations; instead, we advocate precautions and best management practices.

In this source water protection plan, land use management is categorized as follows:

Forest: Including Industrial, Public and Private

Agricultural / Rural: Including Crops, Pasture, Irrigation, Rural Homesteads, and Grazing Lands and Livestock

Urban: Residential, Commercial, Industrial, Transportation and Municipal Land

Other/Misc.: Mines, Quarries & Transportation Corridors

Forestry
The pollution level resulting from forest management and timber harvesting largely depends on the forestry practices implemented. Forest land use can range from industrial timber production to public forests managed for various resources.

The primary contaminants of concern are sedimentation and pesticides. Road erosion is generally considered the most significant threat from forest land use, although severe erosion events like slumps and shallow landslides are also possible.

Private industrial forestry poses a greater risk than publicly managed lands due to more intensive and frequent management practices. Industrial methods can increase the likelihood of compaction, erosion, and sedimentation through activities such as clearcutting, road construction, and site preparation.

Chemical contaminants from herbicides, rodenticides, and other forest management chemicals also present potential risks. However, these chemicals pose a relatively low threat when used and managed correctly.

Agricultural & Rural
Water bodies degraded by agricultural pollution pose potential human health risks and treatment challenges when used as a drinking water source.

Agricultural & rural land use management pollution is runoff from fields, pastures, and irrigation returns. Sediment, microorganisms such as E coli, nutrients such as phosphorus, organics, and pesticides are all potential contaminants from agricultural operations. The amount of pollution from agriculture depends on the operation type, landscape conditions, soils, climate, and farm or land management practices.

Agricultural practices such as flood irrigation, overgrazing, cattle activity in and around streams, and streamside vegetation removal increase the likelihood of source water contamination. Pollution from agricultural lands can also lead to other secondary contamination problems, such as HABs.

Rural homesteads have similar sources of pollution in addition to septic systems, heating fuel storage tanks, and hazardous household chemicals. However, the threat from these sources is typically low.

Urban - Industrial
The complex urban landscape includes residential, commercial, and industrial areas, transportation infrastructure, and municipal facilities such as parks and treatment plants.

The variety and number of pollutants and potential contaminate sources increase vastly in the urban environment, with most contamination coming as point source pollution from permitted or illicit discharges and spills from accidents. Contaminants and pollution from urban runoff include sediment, oil, grease and toxic chemicals from motor vehicles, pesticides and nutrients from lawns and gardens, viruses, bacteria and nutrients from pet waste and failing septic systems, road salts, heavy metals from roof shingles, motor vehicles, and other sources.

FIGURE 16. INDUSTRIAL DISCHARGE IN STORMWATER CONVEYANCE

Additionally, impervious surfaces that cover much of the urban and suburban environment do not allow rain and snow melt to

soak into the ground, significantly increasing the volume and velocity of stormwater runoff and the potential for contaminants to be washed into water bodies.

Other/Misc Land Use
There are potential contamination sources from mining, landfills, transportation corridors and reservoirs, military facilities, recreation, and motorized recreation in various land use settings. Transportation corridors, for example, pose similar risks in an urban environment as they do through a forested landscape. Spills from hauling hazardous waste are of particular concern when traveling over or adjacent to water bodies such as stream crossings. Abandoned mines and tailings can be a chronic source of sediment and heavy metals.

Natural Events

Natural catastrophes and events, including geologic, ecological, climatic, and severe weather events, also pose risks and sources of contamination to drinking water supplies. Human activities can exacerbate the likelihood and severity of many of these events.

Harmful Algae Blooms (HABs)
HABs and the cyanotoxins they produce are of recent concern for drinking water providers. HABs are common in lakes, ponds, and reservoirs but can occur in streams or travel downstream from an upstream reservoir. The toxins, such as microcystins and cylindrospermopsin, are dangerous at very low levels. Algae can also cause aesthetic taste and odor issues from compounds such as MIB and Geosmin. It is important to note that HABS are exacerbated by nutrient pollution, particularly phosphorus, of a water body from erosion and agricultural inputs.

Erosion
Erosion of hillslopes, roads, and stream banks can deliver sediment loads to streams that are chronic problems. Landslides can input an acute load of sediment that can render a source stream nearly unusable as a source of drinking water for a given time. These sources of erosion are exacerbated by improper land management.

Climate Change
Climate change is expected to increase the frequency and intensity of weather events, raising the likelihood of drought and wildfires. During droughts, low releases from the Lost Creek Reservoir and flash flows from Little Butte Creek during heavy storms can rapidly degrade water quality at the intake. These issues may become more prevalent as climate change progresses.

Drought
Drought can impact water availability and reliability. Low reservoir levels and stream flows can force drinking water providers to use more water from less desirable sources and even prompt the need for mandated water conservation and rationing. Water shortages from drought can agitate shared water rights and can be exacerbated by illicit or illegal withdrawals from lakes, rivers, and streams. A warmer climate with less snow and shifting weather patterns will reduce the quantity of water available and change the timing of water availability.

Wildfire
Wildfires are a heightened concern for Drinking water providers across the West, where high fuel loads, more frequent and prolonged drought conditions, and severe weather patterns such as low humidity and high winds have exacerbated the probability of large, high-severity fires.

Historical fire frequency in the forests of Medford's SWPA ranged from approximately every eight years in lower-elevation forests to 30–50 years in higher elevations. One hundred years of fire exclusion and climate change have increased fire intensities.

Wildfires pose many risks to drinking water, including infrastructure, degraded water quality, and changes to water availability. Reservoir storage can be dramatically reduced by extreme sedimentation following a fire. Water quality can be severely degraded with untreatable levels of sediment and TOC, and treatment and distribution infrastructure can be lost during a fire, thus disrupting the supply of water to a community. (*We may want to highlight this further and include risks, e.g., reservoirs, like Willow Lake and Lost Creek, filling with sediment.)

The aftermath of wildfires and runoff from burned areas can contribute to degraded water quality in the SWPA. The contaminants of concern from wildfire runoff include sediment, nutrients (such as nitrogen and phosphorus), high water temperatures, and organics. Stream temperatures can rise post-fire due to the elimination of streamside shading. Organics pose a high risk because they are challenging to treat at the water treatment plant and contribute to elevated DBPs in the finished water.

Water Availability

The threats to water availability are all based on water supply and demand. Water supply strictly depends on precipitation and storage capacity, while water demand is for all water uses, including evapotranspiration, aquatic ecosystem function, and human uses. When the water demand is greater than water availability, water scarcity occurs. Drought is the main factor that affects the source water availability. While precipitation varies from year to year, the demand for water increases year after year and increases in drought years. Furthermore, climate variability is expected to increase the frequency and severity of drought conditions. The major threats to water scarcity are:

- Reduced water supply, including reduced snowpack, reduced stream flow, and reduced spring flow
- Water use conflicts, including water rights, illegal water use, and fish persistence
- Natural disasters, including wildfires and earthquakes.

Risks and Source Water Assessment

A successful source water protection program aims to address the risks from PCSs found in the SWPA. A source water assessment (SWA) is needed to identify PCSs and determine their risk levels to prioritize resources and efforts.

DEQ conducts and provides SWAs to drinking water providers through the state water protection program, a collaborative effort between OHA and DEQ. These assessments are intended to be a starting point for understanding the threats of a SWPA. The risk assessment presented here expands upon DEQ's Updated Medford Water SWA conducted in 2018.

Table 1. Public Drinking Water System Land Use and Susceptibility Analysis Summary

(See Appendix 2 for Key to Tables and Notes)

Public Water System Name	Medford Water Commission
PWS ID	00513
County Served	Jackson
Population (includes wholesale buyers) [2]	131,867
Number of Public Water Systems Served [2]	7 (Note: MWC provides wholesale water to Cities of Central Point (PWS 00178), Eagle Point (PWS 00267), Jacksonville (PWS 00405), Pheonix (PWS 00625), Talent (PWS 00857) and Lake Creek Learning Center (PWS 95343)

	8-hr time-of-travel	Full SW Source Area	Groundwater wells	
Drinking Water Source Name	Rogue	Rogue	Rogue	The 8-hour time of travel area is provided as a planning tool for spills or releases at crossings or discharge points to the stream. Focus may need to extend further upstream for contaminants that are contributed to the stream over long time periods or recur frequently. See Note 1, Appendix 2.
Subbasin				
Drinking Water Source Area (DWSA) Size [1]	42.91	1617.29	88.68	
Stream Miles in DWSA	203	6,909	NA	

	Owner Type	Area (sq.mi.)	% of DWSA	Area (sq.mi.)	% of DWSA	Area (sq.mi.)	% of DWSA	Notes
Land Use / Ownership [3]	Agricultural	29	68%	180	11%	1	1%	The data on land uses is only approximate due to limitations within the GIS layers. Public water systems and communities could use tax lot data available from the counties or other datasets to further refine the analysis if higher accuracy is needed.
	Private Industrial Forest	0.0004	<1%	284	18%	16	18%	
	Private (Urban)	3	7%	5	0%			
	Private (Rural)	11	25%	120	7%	3	3%	
	Local Govt			2	<1%	2	2%	
	State Forest			1	<1%			
	Other State Lands	0.03	<1%	0.37	<1%			
	BLM	0.07	<1%	241	15%	0.10	<1%	
	USFS			672	42%	67	75%	
	Other Federal Lands			111	7%			
	Tribal							
	Other (Water)			0.01	<1%	0.01	<1%	

					Notes
Potential Pollutants (see Table 2 for potential pollutants based on regulatory database search and Figures for approximate locations)	Stream Miles in Erodible Soils [4]	156	5,244	NA	Erosion control measures ("best management practices") may be necessary for land management activities that disturb or leave bare soils in these areas. Maps and data of soil qualities without the 300-foot stream buffer in local areas can be provided to public water systems and communities if additional detail or scale is needed for place-based planning. See Note 4 in Appendix 2.
	High Soil Erosion Potential Percent [4] (% stream mi w/ high erosion located w/in 300' of the stream)	77%	76%	NA	
	Shallow Landslide Potential	see note	see note	NA	More details on shallow landslide susceptibility may be available. Contact DEQ Drinking Water Protection for additional information.
	Landslide Deposits [5] (DOGAMI - SLIDO 3.2)	limited areas - see note	areas throughout watershed - see note	NA	Includes earth and debris slides, flows, slumps, falls and complex landslide types. Does not include rock material landslide deposits.

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FIGURE 17. DEQ 2018 SOURCE WATER ASSESSMENT SUMMARY TABLE.

Risks to Medford Water's source water from the categories of Land Use Management Practices, Inventoried Potential Contaminant Sources (PCSs), and Natural Events have been assessed, along with an evaluation of risks to Water Availability.

Risks to Medford's Source Water:

Land Use Management Practices

Inventoried Point Source Contaminants (PCSs), spills, and discharges

Natural Events (e.g., wildfire)

Water Availability

Risk levels were assessed by considering the threat of the PCSs and our source water's vulnerability to the threat. Threat levels were rated as High, Moderate, or Low (1, 2, 3) based on the type, magnitude, and likelihood of occurrence. For example, a chemical plant poses a higher threat than a retail center, and a forest prone to wildfires poses a greater threat than one less likely to burn.

Vulnerability levels are also rated as high, moderate, or low (1, 2, 3) based on factors such as proximity to water sources, which protection zone it occurs in, and the time of travel to the drinking water intake. Generally, Medford Water is more vulnerable to PCSs closer to the intake, near water bodies, and in higher vulnerability zones.

Risk Levels are calculated by multiplying the threat level by the vulnerability level. Risk levels are categorized as Low (1), Moderately Low (2), Moderate (3&4), Moderately High (6), and High (9).

For example, a PCS that poses a high threat but occurs in a location with low vulnerability would pose a moderate risk level.

TABLE 6. RISK ASSESSMENT MATRIX. RISK = THREAT X VULNERABILITY.

Risk = Threat X Vulnerability				
Threat	High (3)	Moderate (3)	Moderately High (6)	High (9)
	Moderate (2)	Moderately Low (2)	Moderate (4)	Moderately High (6)
	Low (1)	Low (1)	Moderately Low (2)	Moderate (3)
		Low (1)	Moderate (2)	High (3)
	Vulnerability			

Risk Summary

With two sources of water and a SWPA covering over one million acres, there are numerous and diverse risks to Medford's source water. More, details of the SWA can be found in Appendix C. It is a detailed and thorough process following the general methodology described above. A narrative summary of identified priority risks and key examples of moderately high to high risks within each PCS category is presented here.

The risks of most concern to Medford's source water protection program can be summarized as follows:

Nonpoint source pollution from agricultural activities poses a significant threat to water quality, which Medford is particularly vulnerable to in the Little Butte Creek Protection Zone. Factors such as flood irrigation, livestock access to streams, and erosion contribute to a chronic and **Moderately High Risk** of organics, bacteria, and sediment contamination of Medford Source Water.

The Urban Industrial area SWPA poses a threat of potential spills and discharges of hazardous substances (inventoried PCS), including chemical/petroleum storage, stormwater conveyance, and mills. Located within an 8-hour travel zone and directly above the Water Treatment Plant intake, Spills and Discharges from Urban Industrial land use and transportation pose a **High Risk** of chemical and petroleum product contamination to Medford Source Water.

There is a significant wildfire threat in the forests of Medford Water's SWPA. Severe wildfires pose a **Moderately High Risk** to both water quality and availability and to water infrastructure in the Medford Water source area. These wildfires could affect water collection and disinfection facilities and endanger on-site personnel.

There is a **Moderately High Risk** to the quantity of Medford Water's source water supply. Climate projections for the Rogue Basin anticipate exacerbating drought intensity, duration, and wildfire risk, contributing to water scarcity and availability conflicts. Future conditions with more frequent water scarcity pose a moderate threat to source water availability, to which Medford Water's BBS source is vulnerable.

TABLE 7. RISK SUMMARY BY PCS AND SOURCE.

Summary of Risks to Source Water Contamination		BBS	Rogue
Land Use	Forestry	Moderate	Moderately Low
	Agricultural	Moderate	Moderately High
	Urban	NA	High
	Other/Misc.	Moderately High	Moderately High
Natural Events	Erosion	Moderate	Moderate
	HABS	Low	Moderately High
	Wildfire	Moderate	Moderately High
Inventoried PCS, Acute Spills, Discharges & Accidents		Moderately Low	Moderately High
Greatest Acute Risk		Loss of Critical Infrastructure from Fire and Hazardous Material Spills	Spills in Urban-Industrial Zone and Stream Crossings
Greatest Chronic Risk		Reduced Spring flow, Water Scarcity	Agricultural Runoff from Little Butte Creek

Risks by Land Use Management Practices

The land uses in a SWPA determine the probability and types of risks from potential contaminant sources. In this source water protection plan, land use management is categorized as follows:

Forest: Including Industrial, Public, and Private Woodlots

Agricultural / Rural: Including Crops, Pasture, Irrigation, Rural Homesteads, and Grazing Lands and Livestock

Urban: Residential, Commercial, Industrial, Transportation and Municipal Land

Other/Misc.: Mines, Quarries, Transportation Corridors, and Recreation

All land use management poses some level of threat to the degradation of source water. Forest land use generally poses a low threat, while agricultural, other/misc, and urban land use management pose an increasingly significant threat.

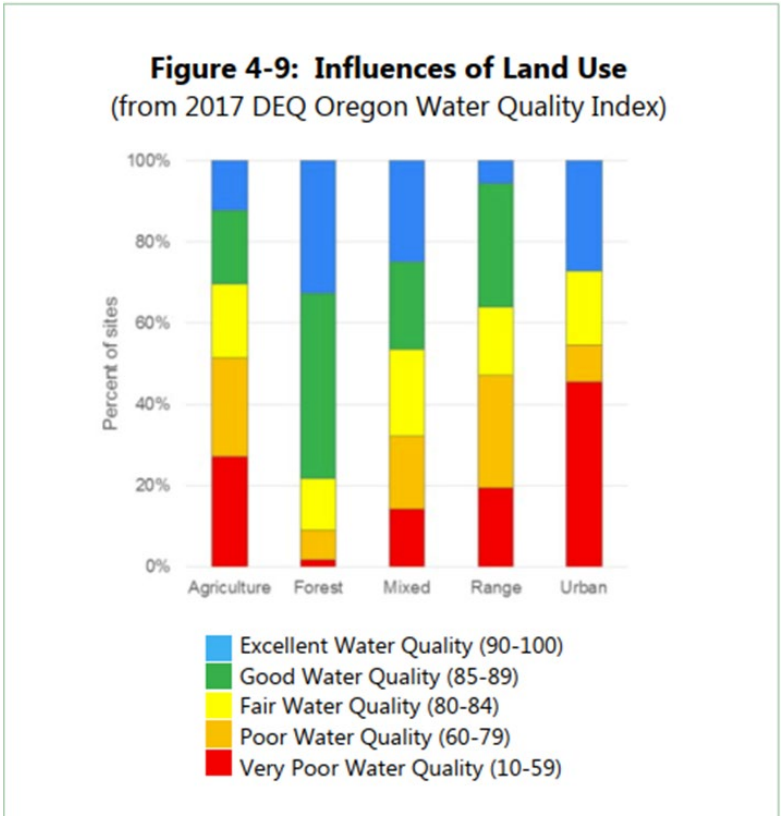


FIGURE 18. DEQ LAND USE WATER QUALITY INDEX CHART

The threat level within each land use category varies depending on the specific management practices. For instance, private industrial timber management typically poses a more significant threat than publicly managed forests—likewise, intensive agriculture and flood irrigation present higher threats than rural homesteads and drip irrigation. Similarly, residential areas generally pose less threat than industrial zones within the urban land use category.

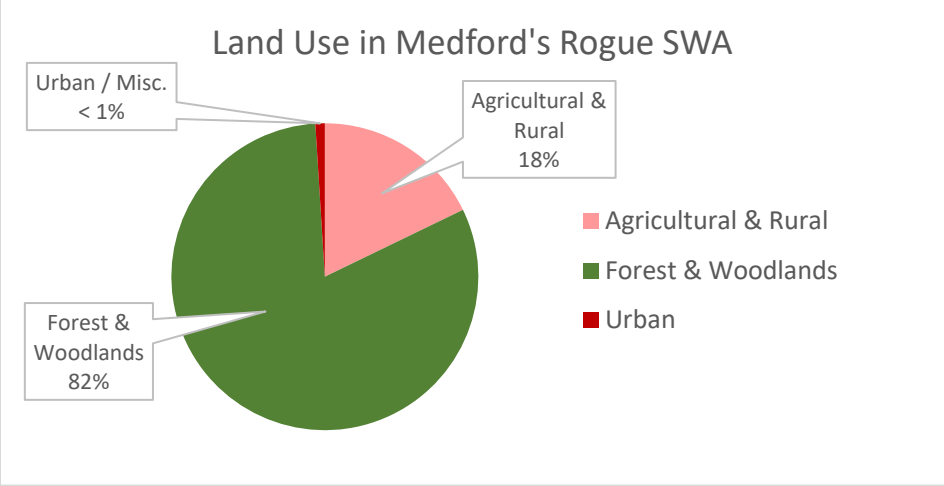


FIGURE 19. ROGUE SWPA LAND USE PROPORTIONS

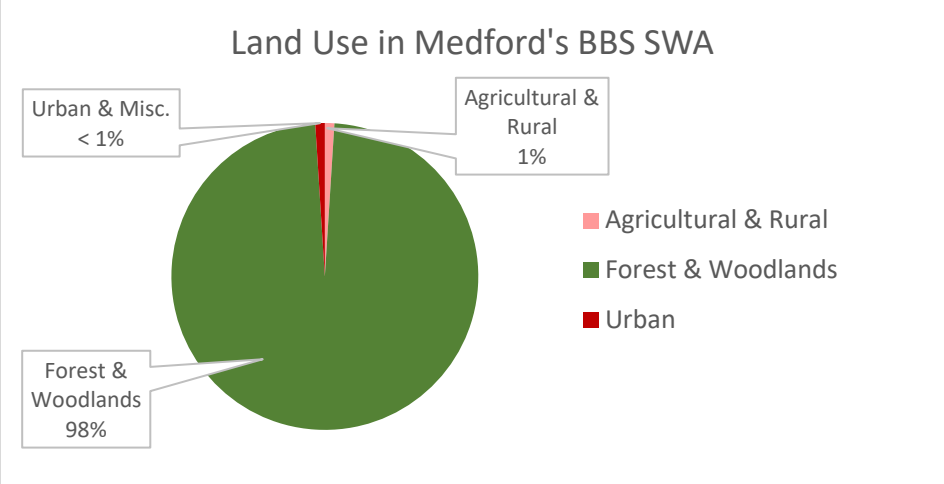


FIGURE 20. BBS SWPA LAND USE PROPORTIONS

Forestry Land Use poses a Moderately High Risk to the BBS Source and a Low Risk to the Rogue source.

Medford is fortunate to have forest land use, particularly publicly managed forests, as the dominant land use in the SWPA. Forest land use accounts for 82% of the land use in Medford's Rogue SWPA. It poses a low risk of source water contamination, primarily because most of it is publicly managed. However, in the BBS Protection Area, where the forestry is 98% of the SWPA, the risk is moderately high due to the vulnerability of the springs, and 17% of the land is managed as private industrial timber, of which some occurs in the High Vulnerability zones. Note that wildfire risks are discussed separately below.

Agricultural and Rural Land Use poses a Moderately Low Risk to the BBS source and a Moderately High Risk to the Rogue source.

Agricultural and rural land use comprises 18% of the Rogue SWPA, most within the 8-hour Time of Travel (TOT) near the intake and in the highly vulnerable Little Butte Creek Protection Area. This type of land use presents a moderately high overall risk due to irrigation conveyance returns into streams, nutrients, pesticides, organics, and bacteria from agricultural runoff, and sediment from erosion of riparian zones and stream banks in the Little Butte Creek Zone. Agricultural land use is minor in the BBS protection area but occurs in the high vulnerability zone.

Urban and Industrial Land Use poses a High Risk to the Rogue Source and does not occur in the BBS SWPA.

Although it covers less than 1% of the SWPA, there is a high risk of source water contamination from urban and industrial land use in Medford Water's Rogue SWPA. This is primarily due to the proximity of urban areas above the WTP Rogue River intake, and the significant concentrations and volumes of chemicals and potentially contaminated runoff in these areas. *Individual PCS locations are further assessed in the Inventoried PCS section below.

Misc. Land Use poses a Moderately High Risk to the BBS and Rouge Sources.

Recreation and the Butte Falls Fish Lake HWY transportation corridors pose a Moderately High Risk of water contamination in The BBS SWPA. These activities pose a moderate threat, but the BBS source is highly vulnerable to contamination from sources such as these due to the high groundwater infiltration rates and minimal treatment processes. Roads and highways such as 62, 140, and 138 travel through the vulnerable zones in the Rogue SWPA and pose a Moderately High risk. Hwy 140, for example, parrels Little Butte Creek for 23.0 miles and crosses the stream twice.

FIGURE 21. BURNT & ABANDONED VEHICLES AND RECREATION VEHICLES ON USFS LAND IN THE BBS SWPA.

TABLE 8. LAND USE RICK ASSESSMENT MATRIX.

Land Use Risk Assessment Matrix (Threat X Vulnerability = Risk)				
Land Use	Source & Percent of Land Use	Threat Level	Vulnerability Level	Risk Level & Primary Concern
Forest	BBS 98%	Low 81% Public 17% Private Industrial	High Private Industrial in High Infiltration/ High Vulnerability Zone	Moderate Pesticides Spills/Drift & Sedimentation of Roads
	Rogue 82%	Low 64% Public Forest 18% Private Industrial	Moderate Significant Private Industrial in Vulnerable Protection Zones of LBC and BBS	Moderately Low Erosion & Sedimentation from Roads on Public Lands in Below Lost Creek Zone
Agricultural Rural	BBS 1%	Low Small ranches	High Occur in Highly Vulnerable Zone Near Springs	Moderate Spills or leaks of Farm Chemicals
	Rogue 18%	Moderate 7% Rural 11% Agricultural	High Majority of Agricultural Use Within 8hr TOT and in Highly Vulnerable LBC	Moderately High Organics, Bacteria, Sediment from Agricultural Runoff & erosion of Riparian Zones & Stream Banks in Little Butte Creek Zone
Urban	BBS	NA, Does Not Occur		
	Rogue 82%	High Industrial, Commercial, Residential: White City, City of Eagle Point, Shady Cove	High Urban Land Use Within 8hr TOT, Directly Above WTP Intake	High Spills from Manufacturing and Transportation, Illicit Discharges in Stormwater Conveyance.
Mis. /Other Land Use (Transportation Corridors)	BBS < 1%	Moderate Butte Falls Fish Lake Hwy, Recreation	High Roads travel through and adjacent to the High Vulnerability Zone and near Skeeter Swamp.	Moderately High Spills Transportation & Recreation
	Rogue < 1%	Moderate Hwy 140, 62, 138 and others	High Within 8hr TOT, Directly Above WTP Intake	Moderately High Spills from Transportation.

Risks From Inventoried Potential Contaminant Sources

The risks from Inventoried Point Source Contaminants (PCSs) in Medford's SWPAs are primarily related to specific locations that can cause pollution, such as permitted and illicit discharges or spills from accidents.

The PCS inventory, compiled from the 2018 DEQ assessment, used various hazardous substance databases and categorized PCSs based on pollution source, type, and necessary protection strategies.

Currently, there are 760 inventoried PCSs, which collectively pose a Moderately High Risk to Medford's Rogue source water. They are concentrated in White City, Eagle Point, and Shady Cove, located upstream from the Rogue Water Treatment Plant. These risks include chemical contamination from manufacturing and transportation spills and illicit discharges into stormwater systems.

There are few PCS in the BBS SWPA; cumulatively, they pose a Moderately Low Risk.

It is important to note that while the inventory is thorough, it does not capture all potential PCSs due to database limitations, land use changes, and possible errors. On-the-ground surveys are needed to identify additional PCSs, verify their details, and update the inventory at least every five years.

Individual risks were calculated for all 760 inventoried PCSs based on the threat level assigned by DEQ and the vulnerability level assigned to the location in the SWPA. **Table 8.** PCS Inventory Categories and Risk Level summarizes the PCS inventory by category and provides the quantity of a given type of PCS and the average risk level.

For example, 21 agricultural operations have been identified, and on average, they pose a moderately high risk. Note that Agricultural operations identified here as inventoried PCS are point source risks, such as those from confined animal feeding operations (CAFOs). This is differentiated from the nonpoint source risks from general agricultural land use, as addressed separately in the Land Use Risk section above. Appendix C further details the PCS inventory.

TABLE 9. PCS INVENTORY CATEGORIES AND RISK LEVEL

PCS Inventory Category	Quantity	Average Individual Risk
Agricultural Operations (CAFOs, Irrigation Canals & Ponds, Stables)	21	Moderately High
Airport (Maintenance/Fueling Area)	11	Moderate
Automotive Services (Body Shops, Car Washes, Salvage Yards, etc.)	46	Moderately High
Chemical/Petroleum Processing/Storage (Manufacturing, Petroleum Processing, Pesticide/Herbicide Storage, etc.)	56	Moderately High
Commercial Food Processing	4	Moderately High
Contaminated Sites (Landfills, Plumes/Spills)	24	Moderate

Equipment Maintenance Shop (Machine Shops, Storage)	10	Moderate
Fire Station	8	Moderately Low
General Commerce (Lumber, Schools, Office Buildings, Retail, etc.)	63	Moderate
Golf Courses/Parks/Heavy Landscaping	21	Moderate
Housing (Apartments, High-Density Housing, Future Developments)	19	Moderate
Landfill (Landfills/Dumps, Industrial Landfill)	8	High
Manufacturing (Cement, Metal Plating, Finishing, etc.)	18	High
Medical (Medical/Vet Offices)	10	Moderate
Mining (Gravel, Sand, Rock, Soil)	70	Moderately Low
Other	4	Moderately High
Permitted Discharges (Stormwater, Industrial Wastewater, Sewage, etc.)	47	Moderately High
Recreation (Heavy Use Boat Launch, Campground)	13	High
Reservoir/Dam	3	Moderate
Septic System (Large Capacity Septic Systems, Rural Septic)	40	Moderately Low
Solid Waste (Waste Transfer/Recycling Stations)	1	High
Stream Crossings	126	High
Transportation (Trucking/Bus Terminals, Large Parking Lots, Railroad Yards, etc.)	18	Moderately High
Underground Storage Tank	77	Moderately Low
Utility Power (Powerplants, Transformer Storage)	12	Moderately High
Warehouses	9	Moderate
Wells	4	Moderate
Wood Mills (Composting, Preserving, Treating, Wood Mills, Paper Mills, etc.)	17	High
Average Risk	760	Moderately High

The chart below presents the cumulative risks associated with different categories of inventoried PCSs in Medford's SWPA. As an example, agricultural operations, while individually posing a moderately high risk on

average, contribute a moderately low risk in total due to the relatively low number of sites (21). In contrast, chemical and petroleum processing/storage locations, which number 56, present a high overall risk.

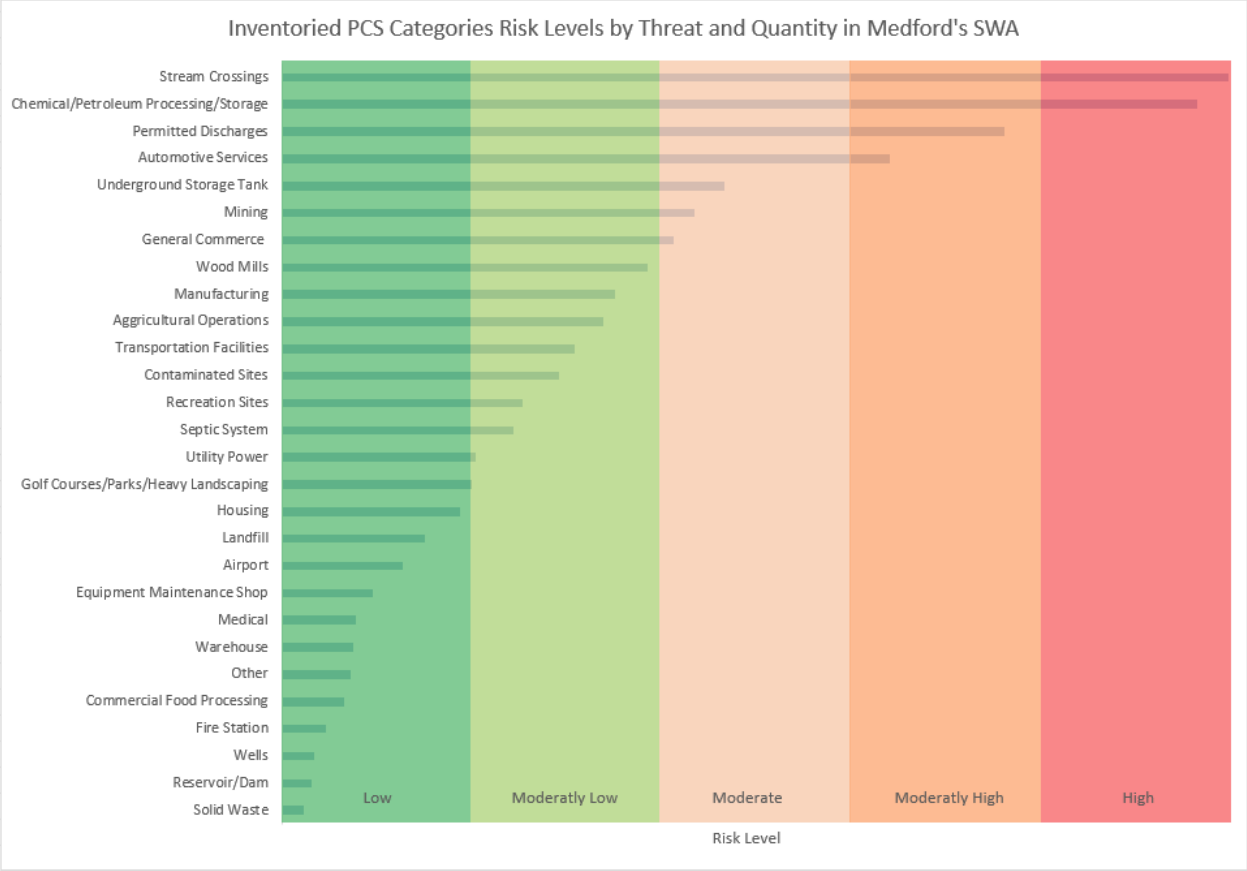


FIGURE 22. PCSS CUMULATIVE RISKS BY CATEGORY IN ROGUE SWPA.

From this analysis, the categories that pose moderately high and high risks to source water contamination in Medford's Rogue SWPA are:

- There is a high risk from the 126 stream crossings, where crashes on or over a bridge can potentially spill petroleum products into a waterway.
- There is a high risk from the 56 chemical/petroleum processing/storage facilities where faulty storage systems, accidents, or natural events such as a fire at the facility could cause leaks and spills that could travel overland and into the stormwater system.
- There is a moderately high risk from the 47 permitted discharges, where neglect, errors, or malfunctions could release pollutants exceeding authorized limits.
- There is a moderately high risk from the 46 automotive services facilities where the chemicals and petroleum products used could be mismanaged and or, by accident, spilled into a stream.

It is important to note that a more detailed and ground-truthed risk assessment is needed in the urban industrial area to identify individual PCSs that pose the most significant risk based on the amounts, types of chemicals used and stored, and methods and containment.

Risks From Natural Events

Wildfire

The risks to source water from wildfires are moderately high in Medford Water's SWPA. The threat to source water from wildfire is challenging due to the unpredictable nature of fire behavior and a landscape's response to wildfire. However, severe and intense wildfires are assumed to threaten source water quality and quantity substantially.

Historical fire frequency in the forests of Medford's SWPA ranged from approximately every eight years in lower-elevation forests to 30-50 years in higher elevations. One hundred years of fire exclusion and a warming climate have increased fire intensities.

In general, forested land is where the threat of wildfire is most significant, and forested land comprises 82% of the SWPA. Although most of the forested area lies outside of the 8-hour time of travel buffer, in the event of large wildfires, the sheer size of the forested area can potentially create severe impacts on drinking water supplies.

Wildfire poses a High Risk to the BBS infrastructure. The risk wildfire poses to BBS source water degradation is not fully understood. The protection zone is almost entirely forested, and fire hazard ranges from moderate to high in some of the steeper areas and the protection zone. The springs would likely be buffered to some extent from the water quality degradation from fire by the natural filtration process of groundwater infiltration. What is not known is the extent to which surface water degradation from wildfire would be transmitted to the springs in a system with the highly conductive infiltration and transmission rates found in the BBS system. The area above Willow Lake is also of concern due to the high fire hazard in the land surrounding the lake and the potential of post-fire erosion, sedimentation, nutrient loading, and potentially HABs.

HABs, Erosion, and Degraded Water Bodies

HABs

There is a low risk to Medford's BBS source from HABs and water quality limited water bodies. The streams in the BBS SWPA are generally healthy, and while HABs occur in Willow Lake, the threat posed to the BBS is minimal.

There is a moderately high risk to Medford's Rogue source from HABs and water quality limited water bodies. However, it is important to note that the Duff WTP treatment process includes disinfection by ozonation, a known effective barrier to cyanotoxins.

Algae blooms occur annually in the lakes and reservoirs in the Rogue SWPA. The Rogue, as a source of drinking water, is listed by OHA and DEQ as vulnerable to HABs and cyanotoxins. This listing requires regular sampling of the raw and the WTP intake for cyanotoxins. Toxins have been detected in some of these Lakes, such as the Lost Creek Reservoir, and recreation advisors have been issued. However, to date, cyanotoxins have not been detected in Medford's source water at the WTP intake. The most significant risk is a HABs in Lost Creek Reservoir that produces and conveys cyanotoxins downstream to the WTP intake.

FIGURE 23. ALGAE BLOOM IN WILLOW LAKE.

HABs pose a moderate risk in the Little Butte Creek protection zone, with Agate Reservoir occurring within the 8-hour time of travel boundary and Fish Lake occurring in the headwaters. Although not listed, Agate Lake has the potential for HABs and is listed by DEQ as Water Quality Limited for metals and other IOCs. Fish Lake is DEQ-listed for HABs, and algae blooms occur every summer.

Water Quality Impaired Streams

Nearly all streams in the SWPA are listed as water quality impaired or limited by Oregon DEQ. However, most are listed for water temperature, and although high temperature is a water quality concern, it is not as great a threat as toxic contaminants. Little Butte Creek and its tributary streams are listed as impaired for a suite of parameters, including nutrients, IOCs, and bacteria.

Near stream and stream bank erosion potential is also relatively high in the basin, posing a moderately high risk of sedimentation and elevated stream turbidity. Excessive sedimentation events occur every year in the Little Butte Creek Protection Area that can render the Rogue all but unusable as a potable source of water for hours or days. A severe recent event, seen in **Figure 24.** shows a slope failure in the upper Little Butte Creek Watershed caused the sedimentation event in June of 2018. The event was captured by aerial drone imagery and highlights the lack of mixing that occurs between the Rogue River and Little Butte for about a mile downstream of their confluence.

FIGURE 24. A SLOPE FAILURE IN THE UPPER LITTLE BUTTE CREEK WATERSHED CAUSED THE SEDIMENTATION EVENT IN JUNE OF 2018.

Earthquakes
This plan does not assess the risks of the degradation of source water from earthquakes.

Risks to Water Availability

Drought is the main factor that affects and exacerbates all risks to source water availability. Climate predictions are for an increase in the frequency and severity of drought conditions.

The risks to Medford Water's source water availability were assessed for the two sources individauly based on the following threats:

Reduced Water Supply, including reduced snowpack, reduced stream flow, and reduced spring flow.

Water Use Conflicts include water rights, illegal water use, fish persistence, and instream flow requirements.

Natural Processes & Disasters, including wildfire and stream geomorphology processes.

The BBS source is considered highly vulnerable to threats to source water availability due to the following: It is currently the primary year-round water source, the Big Butte Creek basin is water availability limited in years of below-average precipitation, Medford Water's water rights share a priority date with EPID. The BBS diversions are limited to stepped flow rates of 40, 30, and 20 cfs to prevent air entrainment, which means a total springflow near or below 40 cfs forces a reduced diversion rate down to 30 cfs. Groundwater recharge in years of below-average precipitation is insufficient to meet the full diversion rate of approximately 40 cfs.

The Rogue source is considered moderately vulnerable to threats to water availability due to the current seasonal use of the source, the variable diversion rate nature of the WTP, and the controlled storage and release of water from Lost Creek Reservoir by USACE.

There is a moderately high risk to water availability for Medford's BBS source to utilize the BBS source fully.

The BBS may be somewhat buffered from the impacts of reduced snowpack by the significant groundwater recharge and infiltration rates. However, reduced springflow due to drought and less precipitation poses a high risk. The current long-term drought and historic low spring flows have forced curtailed diversion rates of 30 rather than 40 cfs for five consecutive years beginning in 2019. Springflows have started to rebound with the recent years of near-average precipitation in 2023 and 2024. The BBS Spring Flow Precipitation chart on page 98 Appendix C highlights just how severe the recent drought has been, with the lowest spring flows in the last 30 years occurring recently.

Furthermore, drought, reduced precipitation, and ultimately reduced stream flow affect water use conflicts by limiting water availability to other Big Butte Creek Basin users. Willow Lake Reservoir is Medford's tool to mitigate and replace the diversion of the BBS that may cause harm to concurrent and senior water rights holders. However, historic and probable future drought conditions have, and likely will, reduced the inflows into Willow Lake. Though infrequent, there have been years that Willow Lake did not fill, causing reduced BBS diversions.

Figure 6 illustrates the spring's sensitivity to precipitation falling in the current year and 4 previous years.

Note that shaded horizontal bars represent spring flows levels that force reducing BBS diversion from our full capacity of approximately 40 cfs down to 30cfs and from 30cfs down to 20cfs. A full and larger historic BBS Springflow and Precipitation chart is provided in Appendix C on page 116. This chart highlights just how severe the recent drought has been, with the lowest spring flows in the last 30 years occurring recently.

As discussed in the Risks from Wildfire section, wildfires could reduce Willow Lake's storage capacity by increasing erosion and sedimentation. Furthermore, severe wildfire is known to change the hydrology of watersheds. While there is often more water yield in the years immediately following a fire, much of the increased yield is in flashy storm runoff with lower summer flows possible. The extent to which a severe wildfire might impact the quantity of the BBS springs is unknown. Still, there is the potential to negatively affect groundwater infiltration and shift more watershed flow to flashy surface flow runoff.

There is a moderate risk to water availability on the Rogue River. While no immediate threat would force withdrawal curtailments, fish persistence conditions pose a future moderate risk to Medford Water's use of the Rogue River above current withdrawal rates. The planned increased withdrawals from the Rogue River to meet future demands theoretically have the potential to affect fish, including ESA species, by increasing stream temperatures, and mitigation efforts may be required.

As discussed in the Risks from Wildfire section, the risk of reduced storage capacity and release capacity from Lost Creek Reservoir following a fire is unknown. It should be assessed further in the future.

Changes in the river morphology of the Rogue River at and directly above our intake also pose a moderate risk to the ability to divert the water. Current river channel conditions and flows have maintained adequate depth to operate the WTP during the current withdrawal rate and season of operation. However, studies conducted recently in 1999 (Klingeman) have shown that channel modifications occur and pose a "real threat" that must be monitored and mitigated.

TABLE 10. RISKS TO SOURCE WATER AVAILABILITY SUMMARY TABLE

Risk to Water Availability	BBS	Rogue
Reduced Water Supply	Moderately High	Moderate
Water Use Conflicts	Moderately High	Moderate
Natural Process & Disasters	Moderate	Moderate
Overall Risk	Moderately High	Moderate
Primary Concerns/Risks	Wildfire Drought & Reduced Spring flow Future Water Use Conflicts	Future Water Use Conflicts Channel Morphology

In summary, Medford Water's source water faces several significant risks, including pollution from agricultural runoff, industrial discharges, natural events like wildfires, and challenges to water availability due to recurring droughts. The risk assessment classified many of these threats as moderately high to high, underscoring the importance of comprehensive protective measures to safeguard water quality and availability. The following Action Plan outlines targeted strategies to address these risks, ensuring the long-term protection of Medford Water's drinking water sources.

Action Plan

Given that Medford Water has limited direct control over activities within our SWPAs, the success of the Source Water Protection Program relies on staff who advocate for compliance with state and federal water quality regulations, support the adoption of land use Best Management Practices (BMPs), and facilitate ecological restoration efforts.

The effectiveness of this program depends on securing strong stakeholder engagement and consistent funding, which may fluctuate over time. Therefore, Medford Water's approach is designed to be flexible, adaptive, and proactive, allowing the program to capitalize on opportunities as they arise. At the same time, to remain focused and strategic, we have established clear priorities based on the risks identified in our SWPAs.

Objectives, Priorities, and Strategies

Medford Water's Source Water Protection Program's overarching objective is safeguarding the Rogue River and BBS from potential natural or human contaminants. While we support and contribute to efforts that protect source water throughout the Rogue Basin, our primary focus remains on the Upper Rogue and BBS SWPAs, implementing projects that align with our prioritized areas of concern.

Medford Water's Source Water Protection Priorities:

1. **Spill/Discharge Prevention and Emergency Response**: Protect source waters from the risk of spills and discharges and establish robust emergency response measures.
2. **Improving Water Quality in Little Butte Creek**: Target improvements in water quality within the Little Butte Creek watershed, a critical source water area.
3. **Reducing Wildfire Risk**: Reduce the risk of catastrophic wildfires that threaten the forests of our source watersheds.
4. **Increasing Water Availability in the Big Butte Creek Basin**: Enhance water availability and watershed health within the Big Butte Creek Basin to ensure sustainable source water supplies.

Source Water Protection Strategies

Medford Water's strategies are focused on achieving our objectives through the following approaches:

- **Partnerships & Collaboration**: Engage with agencies, stakeholders, and local communities in collaborative efforts to protect our community's drinking water sources.
- **Land Use - Best Management Practices (BMPs)**: Advocate for adopting BMPs, regulations, permits, and land use plans that prevent contamination and protect water quality in our source areas.
- **Ecological Restoration and Protection**: Support and lead efforts to restore and protect ecosystems that contribute to the natural protection and resilience of our source waters.
- **Spill/Discharge Prevention and Emergency Response**: Prioritize spill and discharge prevention while maintaining a strong emergency response system to mitigate potential contamination incidents.
- **Outreach and Education**: Engage with the public and stakeholders through education and outreach to promote long-term source water protection practices.
- **Monitoring, Inspections, and Analysis**: Continuously collect, analyze, and act on data and information to guide source water protection efforts and inform water treatment operations.

Action Plan Structure

The following sections outline Medford Water's actions in implementing these strategies. We provide key project examples and describe future actions to be carried out over the next ten years, emphasizing flexibility in adapting to new challenges and opportunities in source water protection. The plan presents a table summarizing the strategies, actions, and partners we use to address our four protection priorities. Next, the plan provides a more detailed outline of how we use our six protection strategies. Finally, an implementation section with a timeline, resource needs, and expected outcomes provides a broad overview of the plan and a key example of implementing it. Note that spill/discharge prevention and emergency response are both priority objectives and strategies, and this plan addresses this critical topic in both ways.

Addressing Our Priorities

Improving Water Quality in Little Butte Creek Overview

TABLE 11. IMPROVING WATER QUALITY IN LITTLE BUTTE CREEK ACTIONS SUMMARY TABLE

Strategy	Key Actions	Key Partners	Expected Outcomes
Partnerships, Collaboration, & Planning	- Participate in Biannual Reviews of the ODA Inland Rogue Agricultural Water Quality Plan -Advocate for the Pesticide Steward Partnership to include Little Butte Creek.	JSWCD, NRCS, ODA, OSU	- Increased awareness and implementation of ODA Plan objectives
Land Use - Best Management Practices (BMPs)	- Support the Rogue NWQI Ag BMP program with financial and in-kind support	JSWCD, NRCS, Local Landowners	- Reduced runoff - Enhanced riparian health - Increased BMP adoption
Ecological Restoration and Protection	- Replant native vegetation along riparian zones on farms - Stabilize stream banks - Remove invasive species - Restore instream flow	RRWC, The Freshwater Trust, Trout Unlimited, JSWCD	- Improved habitat - Reduced sedimentation - Greater ecosystem resilience
Outreach and Education	- Reach out to landowners on BMPs and Pesticide Stewardship - Distribute materials on stream health	JSWCD, RRWC, ODA	- Increased landowner awareness - Reduced pesticide use - Stronger riparian protection
Monitoring, Inspections, and Analysis	Monitor pesticide levels - Increase water quality sampling during storm events. - Pursue online monitoring station for Antelope Creek	DEQ, JSWCD, RRWC, ODA	- Improved tracking of pollutants - Data-driven water quality improvements - Reduced pesticide levels

Spill/Discharge Prevention and Emergency Response Overview

TABLE 12. SPILL/DISCHARGE PREVENTION AND EMERGENCY RESPONSE ACTIONS SUMMARY TABLE

Strategy	Key Actions	Key Partners	Expected Outcomes
Partnerships, Collaboration, & Planning	- Complete Geographic Spill Response Plan (GRP) by 2025 - Conduct annual spill response drills - Establish mutual aid agreements with local responders	Jackson County, USFS, Local HazMat Teams, DEQ	- Spill Response Collaboration - Enhanced coordination - Prevention of major contamination incidents
Land Use - Best Management Practices (BMPs)	- Maintain Stormwater Diversion above WTP -Advocate for stormwater and containment BMPSs - Inspect transportation corridors for spill risks	RVCOG, DEQ, Jackson County, RVSS, ODFW, OPRD	-WTP intake protection - fewer illicit discharges -improved stormwater water quality - Stronger spill prevention practices
Ecological Restoration and Protection	- Restore wetlands and riparian zones to mitigate spill impacts - Support natural barrier creation in sensitive areas	RRWC, JSWCD, ODFW	- Enhanced natural protection for source waters - Reduced spill impact
Outreach and Education	- Educate industries in White City on spill prevention - Host annual spill prevention workshops - Engage local communities and businesses in emergency response planning	RVCOG, JSWCD, Rogue Riverkeeper, Local Businesses	- Increased awareness and compliance - Better community preparedness
Monitoring, Inspections, and Analysis	- Implement real-time water quality monitoring in high-risk areas - Conduct event-triggered monitoring after spills - Share water quality data with local agencies	RVCOG, DEQ, Local Emergency Responders	- Faster response to spills - Improved spill prevention and containment measures

Reducing Wildfire Risk Overview

TABLE 13. WILDFIRE RISK REDUCTION ACTIONS SUMMARY TABLE

Strategy	Key Actions	Key Partners	Expected Outcomes
Partnerships, Collaboration, & Planning	- Collaborate with USFS on the Snowy Butte Restoration Project - Utilize the ODF Landscape Resiliency Program (LRP) Grant for fuel reduction projects	USFS, ODF, Rogue Forest Partners, SOFRC	- Reduced wildfire risk in the BBS SWPA - Increased funding and resources for fire risk reduction
Land Use - Best Management Practices (BMPs)	- Explore financially feasible options for private landowners to conduct thinning for fire risk reduction	JSWCD, ODF, Local Private Timber	- More Timber Companies participating in fire risk reduction
Ecological Restoration and Protection	- Collaborate with SOFRC on ecological thinning to reduce fuel loads - Conduct prescribed fire in partnership with USFS to manage fire risk - Restore Forest health in alignment with fire risk reduction strategies	SOFRC, USFS, ODF	- Improved forest ecosystem resilience - Strategic fuels reduction and fire management through prescribed burns
Outreach and Education	- Work with ODF and JSWCD to secure LRP funding for fire risk reduction on private lands - Host workshops to educate landowners about fire risk reduction strategies	ODF, JSWCD, SOFRC	- Increased landowner engagement in fire prevention - More funding support for fire risk reduction efforts
Monitoring, Inspections, and Analysis	- Use remote sensing to monitor forest health and fuel loads - Collect post-treatment data on thinning and fire risk reduction	USFS, ODF, Rogue Forest Partners	- Data-driven fire risk management - Improved effectiveness of thinning and prescribed burns

Increasing Water Availability in the Big Butte Creek Basin Overview

TABLE 14. INCREASING WATER AVAILABILITY IN BIG BUTTE CREEK ACTIONS SUMMARY TABLE

Strategy	Key Actions	Key Partners	Expected Outcomes
Partnerships, Collaboration, & Planning	- Help Irrigation districts to modernize water delivery systems - Collaborate with EPID on the wise use of stored water in Willow Lake - Partner with Trout Unlimited on instream flow restoration	EPID, RRVID, MID, Trout Unlimited	- Increased water availability - Improved management of stored water in Willow Lake - Enhanced collaboration for watershed health
Land Use - Best Management Practices (BMPs)	- Upgrade irrigation infrastructure to reduce water loss - Encourage conversion from Flood irrigation	EPID, RRVID, MID, JSWCD	- Reduced water loss from irrigation - Enhanced water retention in riparian areas
Ecological Restoration and Protection	- Restore wetlands and riparian areas to enhance groundwater recharge - Water Right Instream Leases - Advocate for forest restoration to promote snow accumulation and increase watershed yield - Implement projects to improve water storage and ecosystem resilience	RRWC, Trout Unlimited, Freshwater Trust, USFS	- Increased water storage capacity - Improved watershed yield through forest and riparian restoration
Outreach and Education	- Engage landowners in water conservation practices - Collaborate with irrigation districts on public awareness campaigns	EPID, MID, JSWCD	- Increased landowner participation in conservation - Greater awareness of water management strategies
Monitoring, Inspections, and Analysis	- Reinstate stream gaging stations to track water availability - Monitor groundwater levels and stream flows for drought preparedness	OWRD	- Improved data on water availability - Better planning for drought and water shortages

Implementing our Strategies

Our protection strategies act as connected components of our source water protection program. While they can be implemented individually, they work best together. They are presented here individually to capture how we use each component to protect our source water.

Partnerships and Collaboration

Partnerships and collaboration are central to Medford Water's Source Water Protection strategy, with nearly all protection actions relying on these relationships. Given our limited direct control over activities within the SWPAs, the program's success depends on the strength of our partnerships. These collaborations amplify our efforts, enabling larger-scale projects, increasing the pace of implementation, and allowing us to secure funding collectively rather than competing for resources.

Our partners include land management agencies, regulatory bodies, emergency managers and responders, municipalities, local businesses and industries, private landowners, conservation organizations, and natural resource management NGOs. These partners help achieve our source water protection goals through shared responsibilities, mutual agreements, and resource pooling.

Medford Water plays various roles in these partnerships, depending on the context and needs of each project. Our approach includes advocacy, leading by example, providing in-kind and administrative support, and offering direct financial contributions to key partners and high-priority projects. This flexible and proactive approach allows us to seize opportunities for source water protection as they arise while focusing on long-term objectives.

Key Partners

Medford Water works with a diverse range of partners to ensure the success of our Source Water Protection Program. These key partners span regulatory agencies, conservation organizations, municipalities, industries, and private landowners. Each partner plays a unique role in achieving our source water protection goals. Below is a broad overview of our primary partner types:

Regulatory Agencies: We work closely with state and federal regulatory agencies such as the Oregon Department of Environmental Quality (DEQ), Oregon Water Resources Department (OWRD), and Oregon

Department of Agriculture (ODA) to align our efforts with water quality regulations, permitting processes, and compliance standards.

Conservation and Natural Resource Management Organizations: Nonprofit and governmental organizations, such as the Rogue River Watershed Council (RRWC), Jackson Soil and Water Conservation District (JSWCD), and The Freshwater Trust, play vital roles in implementing restoration projects, educating landowners, and securing funding for ecological initiatives.

Emergency Managers and Responders: Local HazMat teams, emergency responders, and the Local Emergency Planning Committee (LEPC) help manage spill response and ensure swift actions to protect water sources in the event of contamination or spills.

Municipalities and Public Works Departments: Medford Water collaborates with local municipalities, such as the city of Grants Pass, the City of Medford, and regional public works departments to manage stormwater, infrastructure maintenance, and emergency planning efforts in the SWPAs.

Private Industry and Landowners: Partnerships with private landowners and industries, particularly those in agriculture and urban-industrial areas, are crucial for implementing best management practices (BMPs) that prevent contamination and enhance water quality.

Drinking Water and Watershed Groups: Collaborative efforts with groups such as the Rogue Drinking Water Partnership (RDWP) and other water utilities enable shared strategies for protecting source water at a regional level.

Please refer to the corresponding sections of this plan for more details on how these partnerships function within specific areas, such as land use management, spill response, and outreach.

Types of Partnerships

Medford Water's Source Water Protection Program depends on various partnership structures, from formal agreements to voluntary collaborations. The specific goals, legal frameworks, and resource needs of each project or initiative determine the type of partnership we engage in:

Legally Binding Agreements: Formal agreements such as Intergovernmental Agreements (IGAs), Memorandums of Understanding (MOUs), and Master Partnership Agreements outline mutual responsibilities, share resources, and formalize collaboration between Medford Water and other agencies.

Voluntary Associations: Many partnerships are built on informal but mutually beneficial collaborations, where partners work toward shared goals without formal contracts. These include cooperative relationships with conservation organizations and community groups.

Contractor-Based Relationships: In some cases, Medford Water contracts with specialized organizations or consultants to implement specific projects, such as forest thinning or ecological restoration efforts. Project scopes, timelines, and deliverables define these partnerships.

Mutual Aid and Resource Sharing: Mutual aid agreements allow Medford Water to pool resources with other agencies and municipalities, particularly for emergency response, monitoring, and technical expertise. This collaboration enhances the overall capacity for source water protection across the region.

This variety of partnership structures allows Medford Water to be flexible and adaptive, ensuring that resources are used efficiently and that projects are implemented successfully.

Medford Water's Roles in Partnerships

Medford Water assumes roles tailored to the project's needs and our partners' capabilities in each partnership. The following outlines the roles we take in collaborative efforts:

Advocacy: We advocate for our source water protection priorities and goals with land management and regulatory agencies, implementation organizations, and policymakers. This includes promoting projects that align with our objectives, such as forest restoration and water quality improvements.

Leading by Example: Medford Water leads by example by directly implementing projects on our land, such as forest management, ecological restoration, and applying BMPs. These projects not only improve our lands but also serve as demonstrations of best practices for our partners and the community.

In-Kind and Administrative Support: We offer in-kind contributions such as staff time, technical expertise, and administrative assistance to help secure funding for partner-led projects. This may include letters of support, grant application support, providing justification narratives, and preparing maps or other planning documents.

Financial Support: Medford Water provides direct financial contributions to key partners or high-priority projects when additional funding is necessary. This financial support often serves as a match to unlock larger grants or other funding sources, amplifying the impact of the investment.

Examples of Partnership Successes

Medford Water has experienced success across multiple collaborative projects, demonstrating the value of partnerships in achieving source water protection goals. Some key examples include:

USFS Snowy Butte Landscape Restoration Project: Medford Water's advocacy efforts helped the U.S. Forest Service (USFS) launch the Snowy Butte Landscape Restoration Project, which covers over 20,000 acres of forest land in the BBS SWPA. This project focuses on protecting the BBS source by improving forest health, reducing fire risks, and ecological restoration of aquatic resources.

Rogue River Watershed Council (RRWC) Stream Restoration: Medford Water's financial contributions and in-kind support have helped the RRWC secure millions in grant funding for stream restoration projects in Little Butte Big Bute and Elk Creeks. These efforts have enhanced riparian habitats, improved water quality, and reduced sedimentation in key source water areas.

PACE Grant for Environmental Review of Forest Restoration: Medford Water facilitated the successful USFS grant application for a PACE (Planning Assistance and Categorical Exclusion) Grant with the Oregon Department of Forestry (ODF) to expedite the environmental review processes for the Snowy Butte Project.

Trout Unlimited Water Rights Transfers: Medford Water supported Trout Unlimited's water rights transfer project in the Rogue Basin, contributing $5,000 in match funding for a project to transfer water rights instream on Little Butte Creek. This will help improve instream flow and maintain ecosystem health.

Land Use – Best Management Practices

Land use Best Management Practices (BMPs) are the first line of defense in protecting source water. This section details Medford Water's strategy for managing forest, agricultural, urban, and miscellaneous land use to promote source water protection.

Forest Land Use Management

Forestry BMPs are critical in protecting Medford Water's Rogue and BBS SWPAs. This section outlines the specific actions under four key areas of forest management: Medford Water's internal forest management,

federal agency collaboration, private timber operations, and community and non-agency partnerships. Each of these areas contributes to achieving Medford Water's key objectives, including:

Fuels reduction projects—such as mechanical thinning and prescribed burns—are vital for **Reducing Wildfire Risk**. Implementing BMPs for forestry road use and construction in the headwaters of our SWPA will help reduce erosion and sedimentation, contributing to **Improving Water Quality in Little Butte Creek.** The careful and limited use of forestry herbicides is essential to **Prevent Spills**, particularly in the BBS protection area. Ecological forest management that promotes more open forest structures can also help sustain watershed yields and **Improve Water Availability in Big Butte Creek** and other basins by reducing evapotranspiration, enhancing snow accumulation, and allowing groundwater infiltration.

Medford Water Forest Management
Medford Water actively manages the 3,700 acres of forest we own, following the goals and principles outlined in the 2020 Medford Water Forest Management Plan.

The importance of forest management on Medford Water-owned land for wildfire risk reduction was recently highlighted when the Obenchain and Salt Creek wildfires burned within a few miles of our BBS facilities. Our Forest Management Goals are as follows:

1. Manage a forested landscape that consistently yields high-quality, cool, clean water.
2. Reduce wildfire risks and enhance resiliency to wildfires.
3. Improve and maintain forest health with ecological integrity and resiliency.
4. Create financial sustainability by utilizing revenue-generating activities to offset non-revenue-generating efforts over the long term.

Key Actions on Medford Water Property:

Active Forest Management and Collaboration
Medford Water will continue actively managing the 3,700 acres of forested land it owns in partnership with regional forest management groups such as the Southern Oregon Forest Restoration Collaborative and Rogue Forest Partners. These partnerships focus on implementing an all-lands approach to forest management, with a primary objective of reducing wildfire risk and enhancing overall forest health across the region.

Annual Thinning and Forest Health Maintenance
Medford Water will maintain an ecological thinning schedule, targeting approximately 200 acres of forest annually to reduce fuel loads and wildfire risks. All forest stands will be reassessed every 15 years as part of the Forest Management Plan to determine the need for commercial or non-commercial follow-up treatments.

Pursue Grants for Cost Offsetting
Medford Water will pursue additional funding opportunities to ensure the financial sustainability of its forest management efforts. Recently, Medford Water secured $525,000 from the Senate Bill 762 Landscape Resiliency Grant through the Oregon Department of Forestry (ODF) to accelerate non-commercial thinning projects to reduce wildfire risks. Future efforts will focus on identifying similar grants to support continued forest management activities.

Monitoring and Evaluation of Treatment Effectiveness
Medford Water will evaluate the effectiveness of past forest treatments, adjusting techniques and treatment frequency as needed based on data collected and changing forest conditions. The Forest Management Plan will be updated no later than 2030 to incorporate findings and ensure continued success in managing forest health and wildfire resilience.

Implementing Prescribed Fire/Broadcast Burns
In collaboration with the U.S. Forest Service (USFS), Medford Water will utilize the Wyden Authority to implement cross-boundary prescribed underburns and broadcast burns. A prescribed underburn is planned for Spring 2025, after which the effectiveness of using prescribed fire as a maintenance technique will be evaluated. Medford Water aims to conduct one prescribed burn every two years in partnership with the USFS.

Federal and State Forest Management
Federal agencies, particularly the U.S. Forest Service (USFS) and the Bureau of Land Management (BLM), are vital partners in managing the extensive forested public lands that comprise much of the Rogue and BBS SWPAs. Medford Water collaborates with these agencies to implement forest management practices that protect water resources and reduce wildfire risk.

U.S. Forest Service (USFS) Management

The USFS is the largest land management agency within the Rogue and BBS SWPAs. Medford Water works closely with the USFS to coordinate land management activities and to advocate for accelerated forest management to reduce wildfire risk and maintain forest health.

Key Actions:

1. **Quarterly Coordination:** Medford Water holds quarterly meetings with the USFS to discuss ongoing land management projects, with a focus on:
    - Wildfire risk reduction and fuels management.
    - Road maintenance to prevent erosion and sedimentation.
    - Recreation and dispersed camping management within the BBS SWPA.
    - Forest management practices, including prescribed fires, natural resource conservation, and wildlife management.
2. **Snowy Butte Landscape Restoration Project:** Medford Water advocated for and helped secure support for the Snowy Butte Landscape Restoration Project, which aims to restore 27,000 acres of federal land near the BBS watershed. The project focuses on fuels reduction, habitat restoration, and creating fuel breaks to reduce fire risks and increase ecosystem resilience to drought, invasive species, and insect infestations. Medford Water facilitated the successful application for two PACE Grant awards, expediting this project's NEPA process. This project will require continued support from Medford Water for the next ten years.
3. **Prescribed Fires:** Medford Water and the USFS will conduct a cross-boundary prescribed underburn in Spring 2025, with additional prescribed burns planned every two years to maintain forest health and wildfire resilience.

4. **Master Partnership Agreement:** Medford Water and the USFS are working toward a formal Master Partnership Agreement to be completed within the next two years. This agreement will define mutual goals and responsibilities for future projects such as prescribed burns, fence installations, and restoration efforts.

Bureau of Land Management (BLM)

The BLM manages over 150,000 acres of forest and rangeland in the Upper Rogue area. While Medford Water's recent collaborations with the BLM have been limited, there are significant opportunities for future cooperation on wildfire risk reduction and riparian restoration.

Key Actions:

- Medford Water will work to align our source water protection goals with BLM's forest management strategies.

Oregon Department of Forestry (ODF)

ODF regulates private forest management under the Oregon Forest Practices Act and provides wildland fire suppression efforts on private lands. ODF also offers grant funding for forest thinning projects, which Medford Water actively pursues.

Key Actions:

1. **Fire Protection Services:** ODF provides fire protection services for Medford Water's properties in the BBS watershed.
2. **Collaborative Thinning Projects:** ODF and Medford Water collaborate on forest thinning and fire risk reduction projects. Medford Water's award of $525,000 from ODF through the Landscape Resiliency Program grant is one example of these collaborative efforts.
3. **Outreach and Education:** Medford Water works with ODF and the JSWCD to educate private landowners near the BBS watershed on forest thinning programs and assist them in securing funding to implement fuels reduction projects.

Private Timber Forest Management

Private timber companies, such as Lone Rock and Silver Butte, manage a significant portion of the forested landscape within Medford Water's SWPAs. Medford Water engages with these companies to advocate using BMPs designed to protect water quality and reduce wildfires, especially in the BBS SWPA.

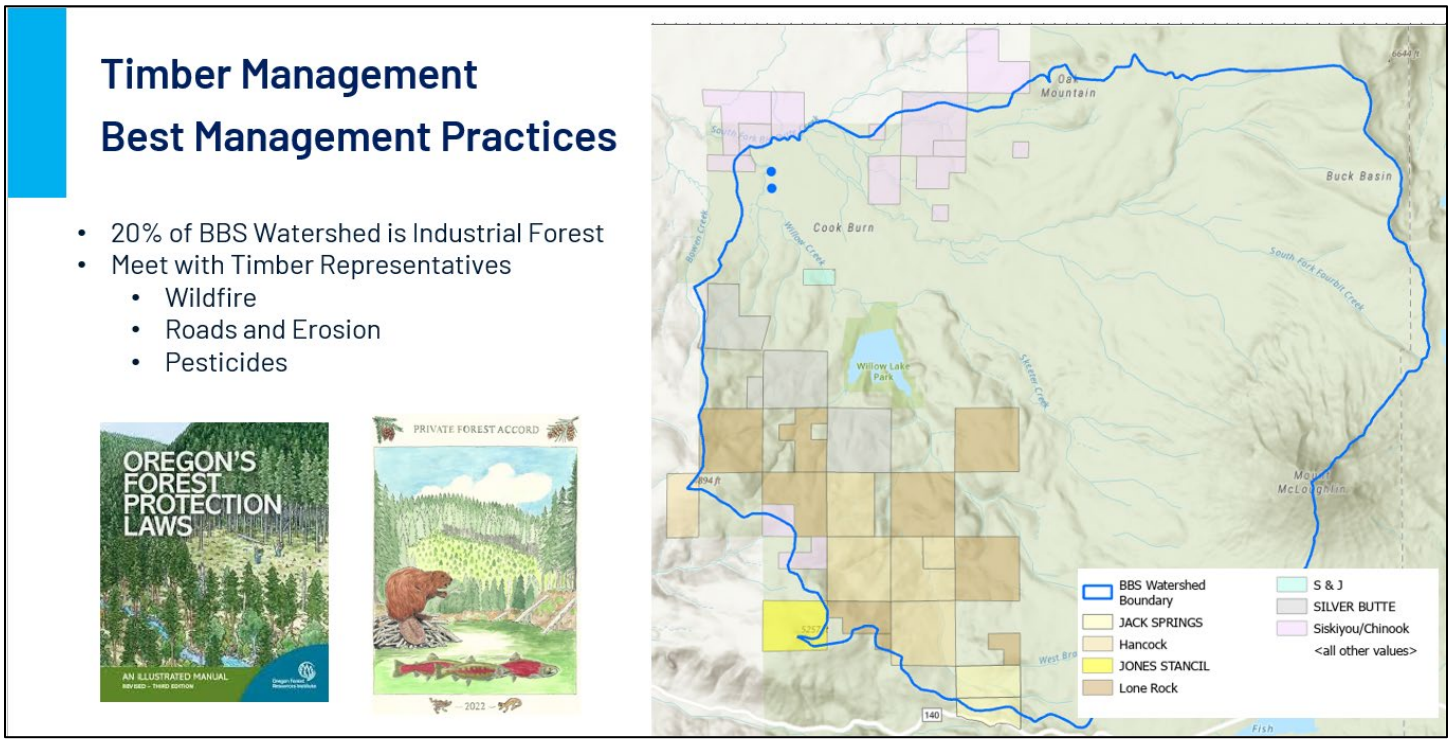


FIGURE 25. PRIVATE TIMBER MANAGEMENT IN THE BBS SWPA

Key Actions:

1. **Timber Harvest BMPs:** Medford Water promotes the adoption of BMPs from the Oregon Forest Practices Act and the Private Timber Accord. Key practices include:
    - **Limited and Less-Toxic Pesticide Use:** Encouraging as little pesticide use as possible and the least toxic pesticides to reduce the potential for water contamination.
    - **Riparian Buffers:** Maintaining adequate riparian buffers during timber harvest operations to protect water bodies from runoff and sedimentation.
2. **Erosion and Sediment Control:** Private timber companies are encouraged to implement road maintenance BMPs that prevent erosion and minimize compaction, which is critical for protecting water quality in forested areas.
3. **Cross-Boundary Thinning for Fire Risk Reduction:** Medford Water is exploring collaboration opportunities with private timber companies on cross-boundary thinning projects between harvest rotations to reduce fire risk. Medford Water supports economically viable thinning options to make these projects feasible for private companies.

Non-Agency and Community Forest Management

Medford Water works with neighboring organizations, landowners, and communities to promote forest health, wildfire resilience, and source water protection. These collaborations often focus on grant acquisition, forest management planning, and accelerated forest treatments.

FIGURE 26. ROGUE BASIN FOREST COLLABORATIVE MEET TO SEE MEDFORD WATER AND USFS FOREST MANAGEMENT.

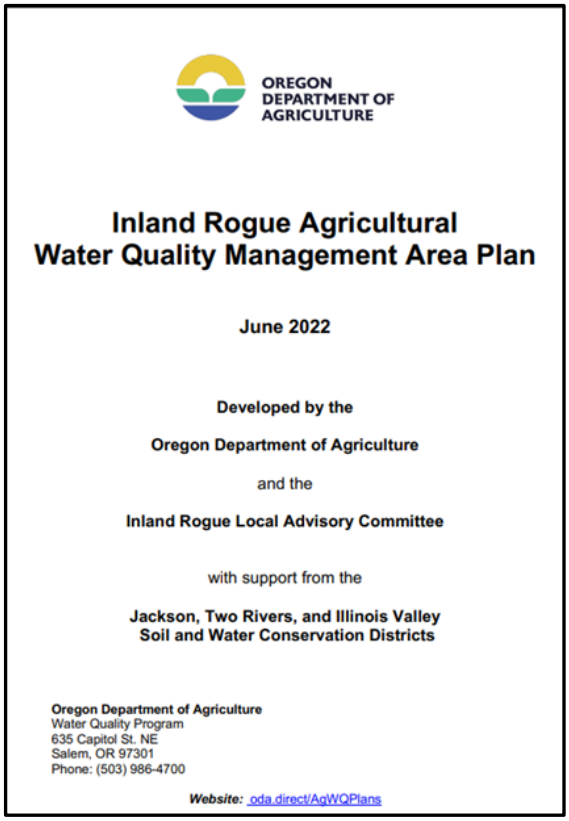
Key Partners:

1. **Rogue Forest Partners (RFP) and Southern Oregon Forest Restoration Collaborative (SOFRC):** Medford Water supports the all-lands approach to wildfire risk reduction championed by RFP and SOFRC. SOFRC leads the planning, while RFP handles implementation. Together, they work on restoring forest ecosystems and reducing wildfire risk across Southern Oregon.
2. **Lomakatsi Restoration Project:** Lomakatsi, which serves as Medford Water's forestry consultant for BBS forestland, is a leader in ecological forestry practices. They are critical in implementing forest management strategies to restore forest health and resilience.
3. **The Nature Conservancy (TNC):** TNC collaborates with Medford Water and other partners to research forest restoration and wildfire risk reduction. TNC's findings guide ecological treatments supported by SOFRC and used in the Medford Water Forest Management Plan.
4. **Blue Forest Conservation:** This nonprofit creates innovative funding mechanisms for large-scale forest treatments. Medford Water has partnered with Blue Forest Conservation on USFS projects in the Upper Rogue and will continue exploring future collaboration opportunities.
5. **Jackson Soil and Water Conservation District (JSWCD):** JSWCD assists with post-wildfire mitigation, thinning projects, and securing funding for wildfire risk reduction on private lands in the Big Butte Creek watershed. Medford Water is key in these efforts by facilitating landowner participation and obtaining grant funding.

Through this multi-tiered forest land use management strategy, Medford Water aims to achieve long-term forest health, reduce wildfire risk, protect water quality, and ensure a sustainable regional water supply. Collaboration with federal, state, private, and community partners is essential to the success of these efforts.

Agriculture and Rural Land Use Management

Agriculture and rural land use is the second-largest land use category within Medford Water's SWPAs, particularly dominating the lower portions of the Little Butte Creek protection area. Implementing Agricultural Best Management Practices (BMPs) is critical to **Improving Water Quality in Little Butte Creek**, can help prevent spills or discharges of farm chemicals, and can enhance water availability in the Big Butte Creek Basin.


OREGON DEPARTMENT OF AGRICULTURE

Inland Rogue Agricultural Water Quality Management Area Plan

June 2022

Developed by the

Oregon Department of Agriculture

and the

Inland Rogue Local Advisory Committee

with support from the

Jackson, Two Rivers, and Illinois Valley Soil and Water Conservation Districts

Oregon Department of Agriculture
Water Quality Program
635 Capitol St. NE
Salem, OR 97301
Phone: (503) 986-4700

Website: oda.direct/AgWQPlans

Agricultural BMPs address nonpoint source pollution from irrigation return flows, which carry organic materials, bacteria, and sediment into waterways. Medford Water advocates for the following BMPs to reduce the impact of agriculture on water quality and promote efficient water use:

Irrigation System Modernization: Upgrade irrigation systems by converting flood irrigation to sprinkler or drip systems and piping leaky canals to reduce or eliminate agricultural runoff.

Grazing Management Plans: Develop and implement grazing management strategies to improve upland landscape health and reduce runoff.

Fencing and Riparian Protection: Install fencing to control livestock access to streams and protect sensitive riparian zones, wetlands, and other vulnerable areas.

Riparian Buffer Enhancement: Restore degraded riparian buffers by removing invasive species and planting native vegetation to filter runoff and protect water bodies.

Livestock Waste Management: Ensure proper livestock waste management practices, such as covering manure piles, applying manure at agronomic rates, and avoiding application during periods of heavy precipitation.

Edge-of-Field Buffers: Implement vegetative buffers at the edges of fields to filter runoff from flood irrigation before it reaches streams.

Integrated Pest Management (IPM): Promote IPM practices that reduce chemical pesticides and fertilizers, encouraging less-toxic alternatives and non-chemical pest control methods like no-till farming and mulching.

Key Partners and Programs

Medford Water collaborates closely with the **Jackson Soil and Water Conservation District (JSWCD)**, which supports agricultural BMP implementation in the Little Butte Creek Basin. JSWCD provides outreach, education, and financial assistance to landowners to encourage participation in BMP programs. JSWCD also works with the USDA Natural Resources Conservation Service (NRCS) to offer additional conservation resources to rural landowners.

The **Rogue Agricultural Water Quality Improvement Plan** is a collaborative initiative between Medford Water, JSWCD, the Rogue River Watershed Council (RRWC), and the Rogue Valley Council of Governments (RVCOG). The plan aims to increase awareness of agricultural BMPs and secure funding for their implementation. Supported by a grant from the **National Water Quality Initiative (NWQI)**, the plan was completed in 2023 and

approved in 2024. Beginning in 2025, nearly $2 million in funding will be allocated to landowners for BMP implementation in Medford's Rogue SWPA with a focus on Little Butte Creek.

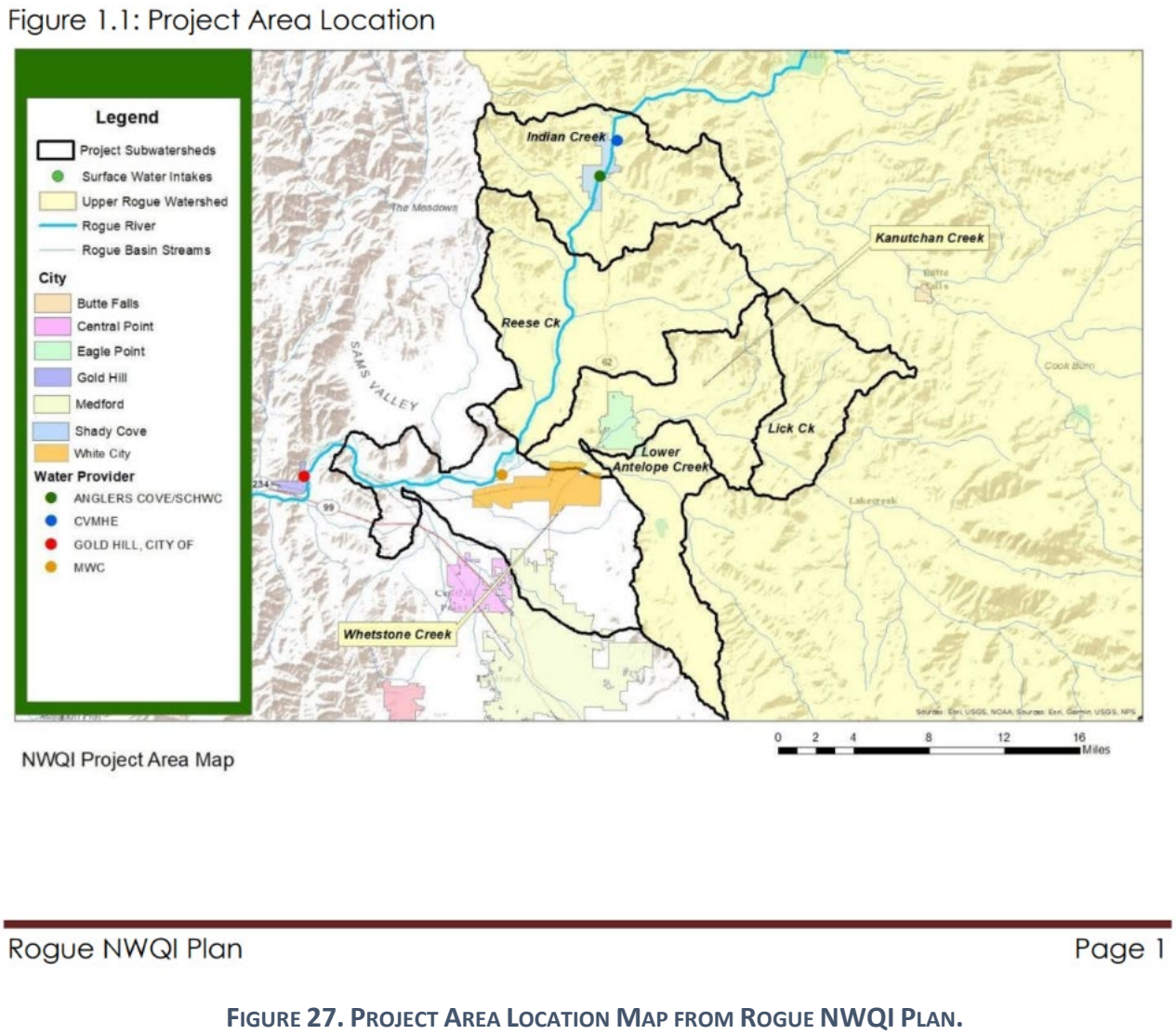


FIGURE 27. PROJECT AREA LOCATION MAP FROM ROGUE NWQI PLAN.

Key Actions

Increase BMP Implementation: Medford Water will continue to work with JSWCD, RRWC, NRCS, and other partners to increase the pace and scale of agricultural BMP utilization in the source watershed. This includes securing additional grants, advocating for BMP adoption, and providing limited financial support.

Financial Support for BMP Adoption: Medford Water will establish a fund to help landowners implement agricultural BMPs in the Little Butte Creek area in partnership with the JSWCD. While grant programs from JSWCD, NWQI, and NRCS exist, the financial burden remains a significant barrier to participation. To address this, Medford Water will provide in-kind contributions and financial support of $10,000 to $20,000 per project annually, helping reduce costs and increase BMP adoption. These contributions will also strengthen JSWCD's grant applications, expanding project capacity and the overall impact of BMPs in the watershed.

Irrigation Districts Collaboration

Irrigation districts play a significant role in managing water resources in the Big Butte and Little Butte Creek Basin and the broader Rogue SWPAs. Medford Water collaborates with local irrigation districts to coordinate water availability and enhance water management practices that protect water quality and optimize the use of available water resources.

Eagle Point Irrigation District (EPID): Medford Water works closely with EPID on the shared management of water resources in the Big Butte Creek Basin, including the operation of Willow Lake Reservoir. This collaboration focuses on ensuring the efficient use of stored water and addressing the impacts of canal operations on water quality in Little Butte Creek.

Rogue River Valley Irrigation District (RRVID) and Medford Irrigation District (MID): RRVID and MID divert water from Little Butte Creek. Medford Water strongly supports modernization projects within these districts, such as canal piping and irrigation system upgrades, to reduce water losses and improve water quality. Medford Water also encourages biannual meetings with irrigation districts to explore innovative water management practices and address shared concerns about water availability.

Piping and Modernization Projects: Medford Water advocates for and supports projects like the **Bradshaw Drop** project and other canal piping efforts that enhance water efficiency. Many local irrigation districts are working with the **Farmers Conservation Alliance (FCA)** to design and fund modernization projects to improve water delivery systems. These projects are vital for minimizing water loss, reducing runoff, and maintaining water quality in critical areas of the watershed. Medford Water's support adds drinking water protection to the list of benefits used when applying for grant funding.

Through continued collaboration with EPID, RRVID, MID, and FCA, Medford Water aims to implement long-term improvements in water use efficiency, benefiting agricultural operations and water quality in the region.

The **Pesticide Stewardship Partnership** is a collaboration between the Oregon Department of Agriculture (ODA), the Jackson County Oregon State University (OSU) Extension Center, and JSWCD to monitor pesticide contamination in streams and assist landowners in implementing BMPs to reduce contamination. Medford Water advocates for expanding this program to include the Little Butte Creek Basin and is willing to provide in-kind staff support and limited financial assistance for lab analysis.

Medford Water also aims to build stronger relationships with the ODA and participate in the Inland Rogue Agricultural Improvement Plan reviews to advocate for source water protection and better pesticide management practices.

Rural Landowner BMPs

Medford Water advocates for implementing rural BMPs that align with urban residential and agricultural practices, including reducing lawn and landscaping chemicals, controlling stormwater runoff, managing pet waste, monitoring and maintaining septic systems, safeguarding natural areas, and managing hazardous materials.

JSWCD will play a central role in engaging rural landowners and providing assistance to help implement these BMPs through outreach and educational efforts.

Medford Water seeks to increase agricultural BMP adoption, improve water quality, and ensure long-term water availability in its source watersheds through ongoing partnerships, financial support, and collaboration with federal, state, and local entities.

Urban Land Use Management

Managing urban land use within the Rogue SWPA is crucial in Medford Water's strategy to safeguard source water. As urban development and industrial activities increase, implementing BMPs is essential to **Prevent Spills**, manage stormwater runoff, and protect water quality. While urban land use is not the primary source of contamination in **Little Butte Creek**, BMPs in these areas are also crucial to maintaining and improving overall water quality.

Medford Water promotes the following BMPs to protect water quality in urban areas:

- **Runoff and Erosion Control:** Implement measures to manage construction site runoff, prevent erosion, and control sediment entering waterways.
- **Stormwater Management:** To minimize pollutants like pesticides, petroleum products, fertilizers, and road salts, ensure effective stormwater management from impervious surfaces.
- **Pollution Prevention:** Advocate for responsible motor vehicle maintenance, proper waste disposal, and pollution prevention practices for municipal, commercial, and industrial activities.
- **Chemical Spill and Illicit Discharge Management:** Monitor for and contain chemical spills and illicit discharges, particularly from industrial sites in the White City Industrial Area, to prevent contamination of nearby water sources.

Key Partners

To effectively implement BMPs and achieve long-term water protection, Medford Water collaborates with the following key partners:

- **Rogue Valley Council of Governments (RVCOG):** RVCOG provides essential intergovernmental services, supporting Medford Water with source water protection planning, watershed patrols, stormwater quality monitoring, and public outreach through the Stream Smart initiative.
- **Oregon Department of Environmental Quality (DEQ):** DEQ regulates water quality through the **TMDL** and **NPDES** processes, investigates water quality issues, and supports Medford Water through its statewide water protection program.
- **Rogue Valley Sewer Services (RVSS):** As the designated management agency for wastewater and stormwater conveyance in Jackson County, RVSS plays a critical role in monitoring and managing stormwater networks in White City and Eagle Point.
- **Private Landowners and Businesses:** Medford Water must engage with businesses, industries, and private landowners to implement BMPs and raise awareness of water quality protection measures. Large industrial companies in the White City Industrial Area—including chemical and manufacturing facilities, mills, scrap yards and recycling facilities, and automotive businesses—are critical stakeholders in spill response planning.

Key Actions

Medford Water has outlined several actions to support BMP implementation in urban areas and ensure continued protection of source water:

1. **Source Water Patrols:** Medford Water will partner with RVCOG to continue Source Water Patrols in the White City Industrial Area. These patrols document water quality concerns and notify the appropriate management or regulatory agency for further action. Medford Water's monitoring efforts are discussed in further detail below.

2. **Emergency and Spill Response Plan:** Medford Water will collaborate with partners to complete a comprehensive Emergency and Spill Response Plan by 2025. The plan will include implementation drills and coordination with key stakeholders to ensure an effective response to spills and other emergencies. Spill response as a strategy is discussed further below.
3. **Financial and Administrative Support for High-Priority Projects:** Medford Water will consider providing financial and administrative support for high-priority projects, such as hazardous waste collection events. We will also seek grants to alleviate costs associated with these projects and protect high-risk areas.
4. **Engagement with Industrial Stakeholders:** Medford Water will continue engaging with large industrial companies in the White City Industrial Area to improve spill response planning and raise awareness of the sensitivity of the Urban Protection Area and is working to reengage industry with the Local Emergency Planning Committee (LEPC).
5. **Participation in the Rogue Valley Stormwater Advisory Team (SWAT):** Medford Water will continue its participation in SWAT, providing input on stormwater management regulations, guidance documents, and outreach efforts aimed at improving stormwater BMPs in the SWPA.
6. **Advocacy for Upper Rogue Focus by DEQ:** Medford Water will advocate for DEQ to increase its focus on water quality issues in the Upper Rogue, particularly in Little Butte Creek and other streams directly upstream of the water treatment plant intake.
7. **Monitoring and Regulatory Compliance:** Medford Water will continue to advocate for regular monitoring, inspection, and regulatory compliance for high-impact urban land uses, including transportation networks, mining operations, and large-scale developments.

By working closely with these partners and implementing the BMPs outlined above, Medford Water aims to protect water quality from the risks posed by urban land use within the Rogue SWPA.

Other Miscellaneous Land Use Management

Miscellaneous land uses within Medford Water's SWPAs are primarily related to transportation networks, recreational activities, reservoir operations, and public lands that impact water quality. Many of the BMPs for these land uses overlap with those outlined in the Urban Land Use section and are focused on managing runoff, reducing pollution, and protecting water resources from various activities in these areas.

The BMPs for other miscellaneous land use areas within Medford Water's SWPAs focus on:

- **Transportation Network Management:** Implementing strategies to minimize runoff from roads and highways that traverse the SWPA, ensuring pollutants such as oils, heavy metals, and road salts do not enter water bodies.
- **Reservoir Conditions & Operations:** This involves monitoring the conditions of the waters impounded in the reservoirs and communicating with the resource managers about changing conditions and operations.
- **Recreational Area Management:** This involves managing the impact of recreational activities in parks, campgrounds, and public lands by controlling runoff, preventing erosion, and ensuring that wastewater systems are adequately maintained. This is particularly important in the BBS SWPA.

- **Pesticide and Herbicide Management:** Limiting the use of pesticides and herbicides, particularly along transportation corridors, recreation areas, and public lands, to reduce the risk of contamination. This is particularly important in the BBS SWPA.

Key Partners

Effective management of miscellaneous land uses within Medford Water's Source Water Protection Areas (SWPAs) requires coordination with several key partners and the implementation of targeted actions:

- **U.S. Army Corps of Engineers (USACE):** Medford Water collaborates with USACE on communications of Lost Creek Reservoir operations, water quality, and HABs management. Biannual meetings ensure ongoing communication, with plans to formalize long-term source water protection goals.
- **Oregon Parks and Recreation Department (OPRD):** OPRD manages Touvelle State Park, where Medford Water coordinates to maintain an industrial stormwater diversion system that protects the Duff Intake. Touvelle Park also serves as the site for Medford Water's intake protection and spill response strategy.
- **Jackson County Roads and Parks:** Medford Water works with the county to minimize the impact of road maintenance and recreational facilities, especially in sensitive areas like the BBS SWPA and Willow Lake Campground. Collaborative efforts include limiting pesticide use and managing wastewater treatment operations.
- **USFS:** Medford Water partners with USFS to manage recreational activities, road use, and dispersed camping within the BBS SWPA to prevent water contamination from dumping and poor road conditions.

Key Actions:

- Continue collaboration with USACE on reservoir operations and HABs occurrence.
- Manage recreational impacts in the BBS SWPA with USFS, focusing on road maintenance and waste management.
- Work with OPRD to protect water quality at Touvelle State Park through intake protection and spill response efforts.
- Coordinate with Jackson County Roads and Parks to limit pesticide use and oversee campground and road operations in sensitive SWPA areas.
- Update the Willow Lake Recreation Area IGA to address fire risks, hazardous trees, and campground operations.
- Explore a comprehensive IGA with Jackson County for road and park management, ensuring all activities align with water quality protection goals.

By collaborating with these partners and implementing BMPs across various land uses, Medford Water will further safeguard the region's water quality and ensure the sustainable management of transportation networks, recreational facilities, and public lands within its SWPAs.

Spill/ Discharge Prevention and Emergency Response

Medford Water's spill response strategy is essential to protecting the Duff Intake and BBS from spills and discharges. The threat above the Duff Intake is particularly high, due to its proximity to industrial areas, transportation networks, and other PCSs. Although BBS is at a lower risk due to its protected location, it remains susceptible due to the rapid groundwater infiltration in the area, requiring heightened protection measures.

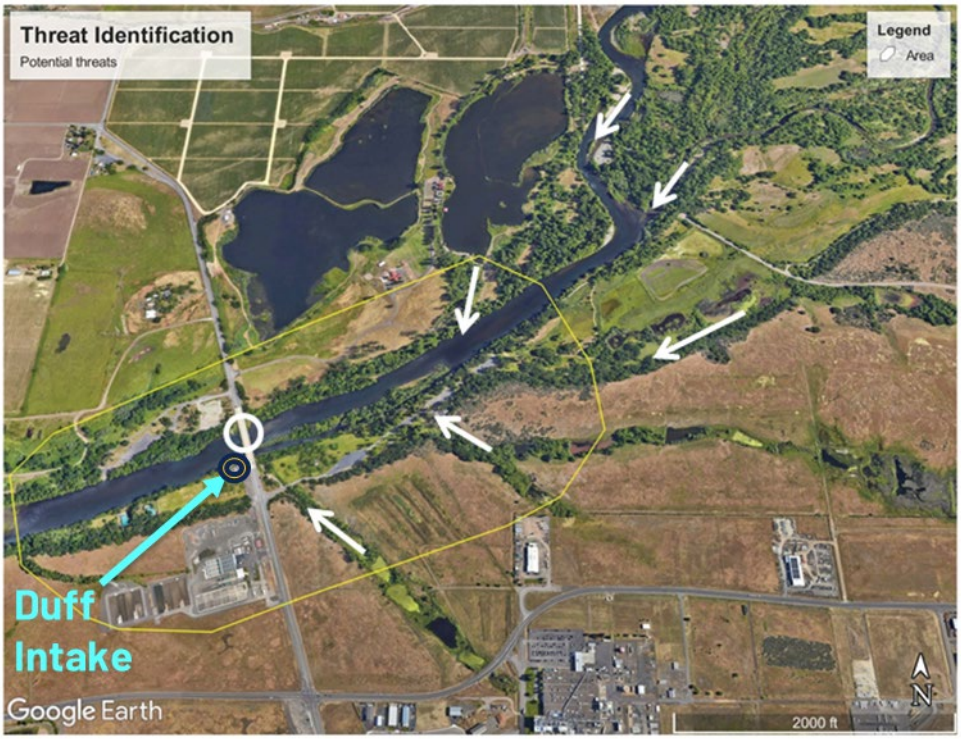


FIGURE 28. SPILL PATHWAYS ABOVE WTP MAP FROM GRP.

Best Management Practices (BMPs) and Partnerships for Spill Prevention

As described earlier, Medford Water's primary defense against spills is the proactive implementation of land-use BMPs. These BMPs, along with strategic partnerships, provide crucial preventive protection. However, when spills and discharges occur, Medford Water has developed several response strategies to mitigate risks and protect water quality.

Key Partners

Medford Water collaborates with a wide range of key partners to ensure effective spill prevention and response:

- **Jackson County and USFS:** Collaborate to install and maintain infrastructure, such as guardrails along roads in sensitive areas like Skeeter Swamp, reducing the potential for spills.
- **Local HazMat 8 Team:** Provides specialized spill response capabilities for hazardous material spills.
- **DEQ:** Regulates water quality, provides technical assistance, and helps investigate spills and discharges through the TMDL, NPDES, and water quality complaint processes.
- **Emergency Managers and Responders:** Coordinate with Medford Water to execute spill response plans, including communication protocols, logistics, and on-the-ground spill management.
- **Sheriff's Department and Marine Division:** Monitor and assist with spills or incidents affecting water bodies, particularly those involving recreational or transportation activities on the Rogue River.
- **RVCOG:** This organization collaborates on Source Water Patrols, is contracted to develop the spill response plan, and works on other local water quality protection initiatives.
- **Rogue River Watershed Council and Rogue Drinking Water Partnership:** These organizations support watershed protection and water quality management and are collaborating on developing the Geographic Spill Response Plan (GRP).

- **Public Works Departments:** Assist with infrastructure and road management to minimize spill risks.
- **Eugene Water and Electric Board (EWEB):** Has provided critical support on developing the local GRP.
- **Water Treatment Plant (WTP) Operators are responsible** for responding operationally to spills, including taking immediate action to protect the intake.

Key Actions:

1. **Spill Containment Infrastructure at BBS:**
   The Butte Falls-Fish Lake Road runs through the BBS SWPA, with one section adjacent to Skeeter Swamp, an area highly vulnerable to groundwater contamination. Medford Water has constructed detention ponds in two drainages that flow from the road into the swamp. These ponds capture contaminants, allowing for their removal before infiltrating the groundwater. Medford Water will continue maintaining these detention ponds in collaboration with Jackson County and USFS.

FIGURE 29. SPILL DETENTION POND IN BBS SWPA HIGH VULNERABILITY ZONE

2. **Development of a Geographic Spill Response Plan (GRP):**
   Medford Water is developing a GRP, focusing on rapid spill notifications, communication redundancies, and response strategies. The plan, set for completion by Jan of 2025, will include:
   - **Spill Alert Systems:** The GRP will address potential communication failures in the existing alert systems, identifying redundant communication methods to ensure WTP staff are notified immediately of spills.
   - **Strategic Response Locations:** The plan will identify strategic response locations based on spill location and time of travel within the watershed, allowing for quicker and more effective containment.
   - **Response Materials and Equipment:** Each location will have specified materials and equipment to manage spills effectively.
   - **Roles and Responsibilities:** The plan will outline roles, responsibilities, and communication protocols for all responders, including the Local HazMat Team, emergency responders, and WTP operators.

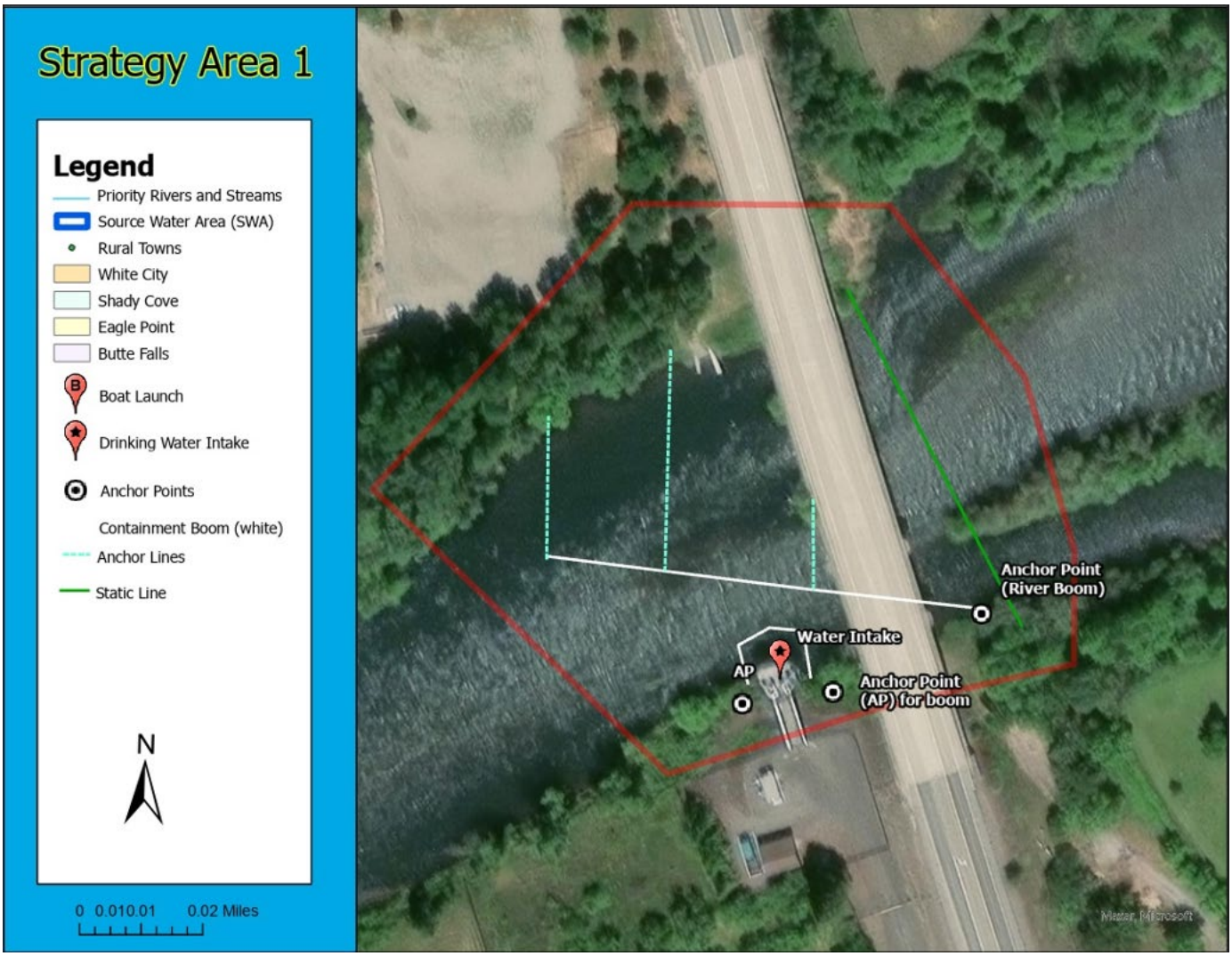


FIGURE 30. WTP INTAKE PROTECTION STRATEGY DIAGRAM FROM THE GEOGRAPHIC SPILL RESPONSE PLAN.

3. **Industrial Stormwater Conveyance Diversion Management:**
   The White City Industrial Area has the highest concentration of PCSs in Medford's SWPA. Three polluted streams from this area would naturally flow into the Rogue River upstream of the Duff Intake. However, one of these streams has been rerouted, and one is seasonally diverted to enter the Rogue Rive Down Stream of the WTP. Medford Water will continue to exercise and maintain these diversion systems, ensuring they are operational and effective in spill prevention.
4. **In-Depth Investigation of Urban Industrial PCSs:**
   Medford Water will further investigate the inventory of potential contaminant sources within the urban industrial zone directly upstream of the WTP. This investigation will focus on assessing the quantity and hazards of chemicals stored and used in the area and identifying potential risks to water quality. Medford Water will also implement a 5-year review of the entire inventory of PCSs across the SWPA to ensure updated risk assessments and mitigation strategies are in place.
5. **Collaboration with Local Industry:**
   Medford Water has engaged with several industrial businesses in the White City Industrial Area to raise awareness of their proximity to the WTP intake and the importance of preventing spills. Medford

Water will continue this direct outreach, educating businesses about the risks of hazardous material spills and collaborating on spill response efforts.

6. **Future Actions and Program Expansion:**
   Medford Water plans to expand its spill response program to include:
   - Regional Spill Response Collaboration: Engaging with downstream drinking water providers, such as Grants Pass, Gold Hill, and Rogue River, to develop spill response strategies that benefit the entire region.
   - Further Development of the GRP: Expanding the plan to include additional locations and strategies for capturing and removing contaminants.
   - Annual Spill Response Training and Drills: Medford Water will conduct annual training sessions and drills with partners to test communication effectiveness, partner engagement, and response strategies.
   - Advocacy for LEPC and Local Industry Engagement: Medford Water will continue advocating for the Local Emergency Planning Committee (LEPC) to reengage local industries and communities in spill prevention and response strategies to protect water sources. Additionally, Medford Water will maintain active outreach to businesses, particularly in high-risk areas like White City, ensuring awareness of source water protection and encouraging their participation in coordinated spill response planning.

Medford Water will regularly monitor spill response systems and continue to advocate for compliance with regulatory standards for PCS management and spill prevention. Through continued collaboration with local industries, government agencies, and emergency responders, Medford Water aims to strengthen its spill response capabilities and protect the Duff Intake and BBS.

Ecological Restoration and Protection

Restoring and protecting instream, riparian, and upland ecosystems is vital for safeguarding Medford Water's source water. Ecological restoration within the Rogue Basin offers numerous opportunities to protect and enhance water quality, quantity, and ecosystem health. Various governmental and non-governmental organizations at the local and state levels are actively working to advocate for, fund, and implement these projects to achieve diverse ecological and natural resource objectives.

Human activities can degrade water bodies and ecosystems, leading to the loss of critical ecological functions. While prevention and protection are the most effective strategies, restoration and enhancement activities can successfully repair environmental damage and restore natural functions to varying degrees. These activities may include instream work, riparian restoration, upland habitat improvements, pollution cleanups, and the protection of ecologically sensitive or special-use areas.

Medford Water supports and actively contributes to ecological restoration and protection efforts, particularly in the Upper Rogue Basin and SWPAs. Priority is given to projects focusing on achieving key objectives, including More Water in Big Butte Creek, Cleaner Water in Little Butte Creek, and Wildfire Risk Reduction. Additionally, projects that meet future mitigation requirements for Medford Water will receive the highest levels of support.

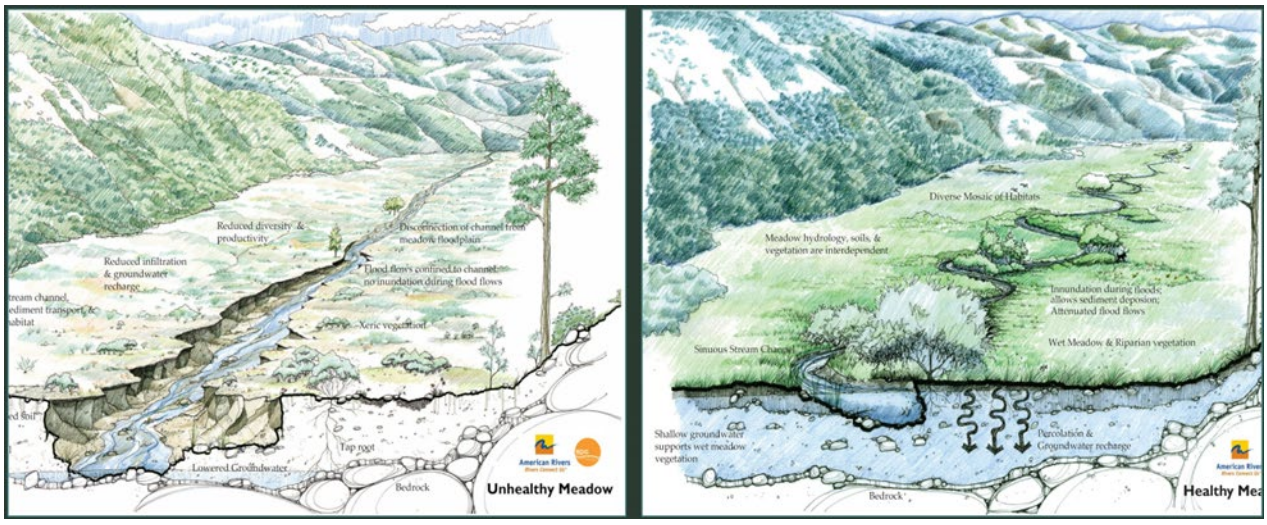


FIGURE 31. ILLUSTRATION OF THE GROUNDWATER RECHARGE BENEFITS OF HEALTHY STREAMS.

Medford Water prioritizes restoration and protection activities that enhance natural ecosystem functions and benefit water quality, including:

- **Instream Restoration:** Improving stream habitats to enhance water quality and support aquatic ecosystems. Examples include:
    - **Bank stabilization** to prevent erosion and reduce sedimentation.

FIGURE 32. EAGLE POINT LAGOON BANK STABILIZATION RESTORATION PROJECT YEAR 0

FIGURE 33. EAGLE POINT LAGOON BANK STABILIZATION RESTORATION PROJECT YEAR 3

  - **Floodplain reconnection** to restore natural water flow and storage.
  - **Beaver reintroduction** to create natural dams that improve water retention and habitat diversity.
- **Riparian Area Enhancement:** Restoring vegetation and stabilizing banks to reduce erosion, filter pollutants, and provide shade. This can include:
  - **Revegetation** with native plants to stabilize soil and improve wildlife habitat.
  - **Fencing off riparian areas** to prevent livestock access and reduce bank erosion.
  - **Wetland creation and restoration** to enhance filtration and groundwater recharge.

FIGURE 34. FUTURE MEDFORD WATER RESTORATION SITE OF A DEGRADED MEADOW THAT DITCHES HAVE PREVIOUSLY DRAINED

FIGURE 35. MEDFORD WATER RESTORATION REFERENCE SITE OF A WETLAND SYSTEM STORING WINTER WATER.

- **Upland Restoration:** Implementing projects that improve watershed health by controlling erosion, enhancing vegetation, and managing water flow. Examples include:
    - **Reforestation** to improve soil stability, reduce runoff, and increase water infiltration.
    - **Controlled burns or mechanical thinning** to reduce wildfire risk and restore natural forest structures.
- **Pollution Cleanup and Habitat Protection:** Cleaning polluted sites and protecting ecologically sensitive areas to restore natural functions and improve water quality. Examples include:
    - **Brownfield remediation** to clean up contaminated sites and prevent further pollution.
    - **Protection of key aquatic resource areas** through conservation easements or land acquisition.
    - **Fencing and signage** to protect sensitive aquatic resources from livestock intrusion.

Key Partners

Medford Water works closely with numerous partners to implement restoration and protection projects:

- **Rogue River Watershed Council (RRWC):** A key partner for stream and riparian restoration projects. RRWC focuses on improving fish habitat and water quality, and Medford Water provides financial support and collaborates on public outreach efforts.
- **Trout Unlimited (TU):** Works on water rights acquisition and instream flow restoration in the Rogue Basin. Medford Water has provided funding and supports TU's efforts, particularly in the **Big Butte** and **Little Butte Creeks**.
- **The Freshwater Trust:** Focuses on riparian restoration, including fencing and vegetation projects. Medford Water has supported their work in the **Little Butte Creek watershed** and plans to collaborate on future projects in the **Upper Rogue**.
- **Southern Oregon Land Conservancy (SOLC):** Explores land acquisitions and conservation easements to protect water quality. Medford Water engages with SOLC to discuss potential opportunities in the region.

- **Oregon Hunters Association (OHA):** Collaborates with Medford Water and **USFS** (as the land manager) to build fencing around sensitive wetland and riparian areas in the **BBS Watershed**, protecting these areas from degradation.
- **Jackson Soil and Water Conservation District (JSWCD):** Provides support and expertise for habitat restoration projects, particularly in agricultural areas, helping to reduce runoff and improve water quality.
- **Oregon Department of Fish and Wildlife (ODFW):** Works with Medford Water on restoring fish habitats and improving wildlife ecosystems in the **Upper Rogue Basin**.
- **Oregon Watershed Enhancement Board (OWEB):** A significant funding source for aquatic habitat restoration projects. OWEB provides grants for stream and watershed restoration efforts that benefit ecosystems and water quality, making it a key resource for Medford Water's ecological restoration initiatives.

Key Actions:

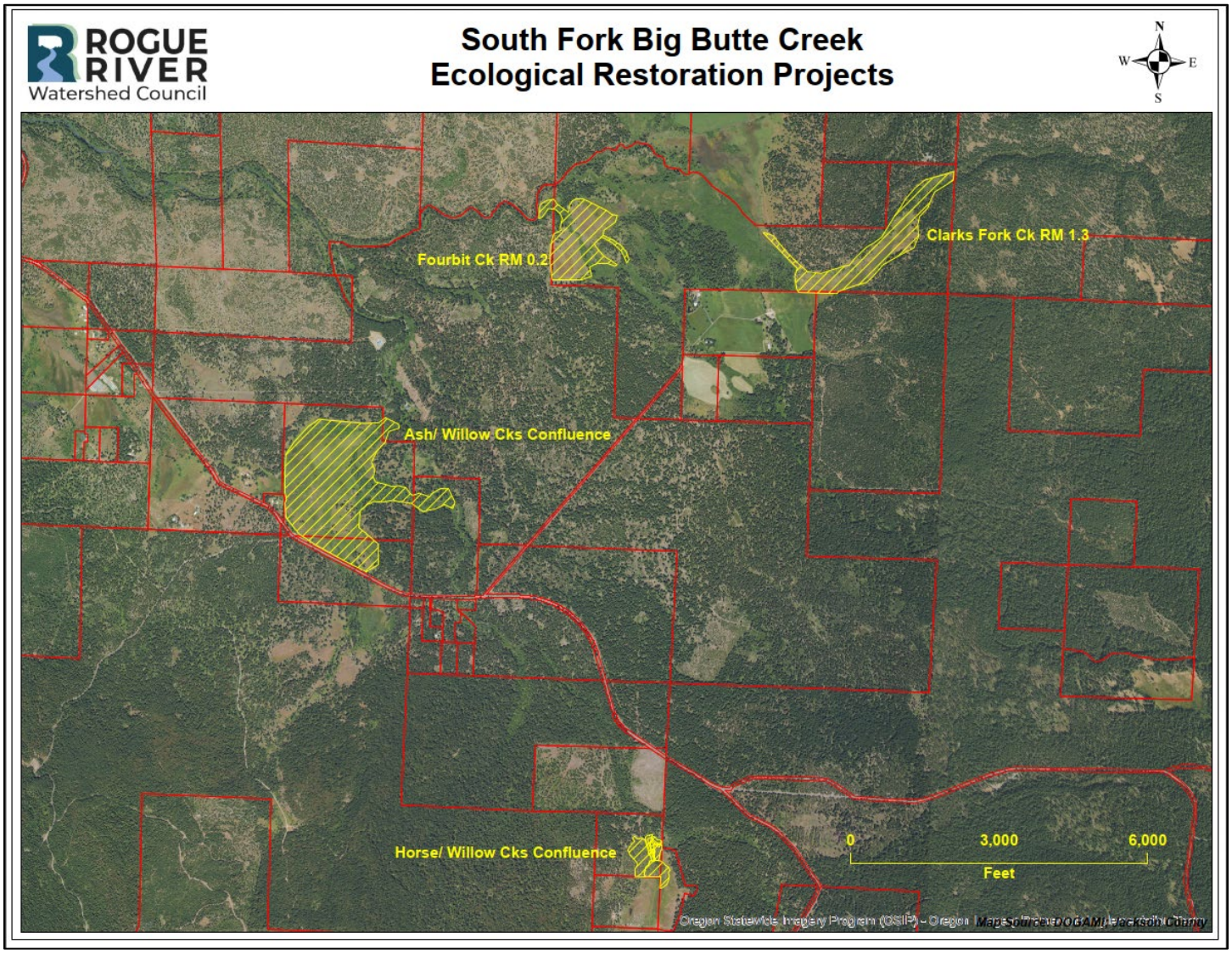
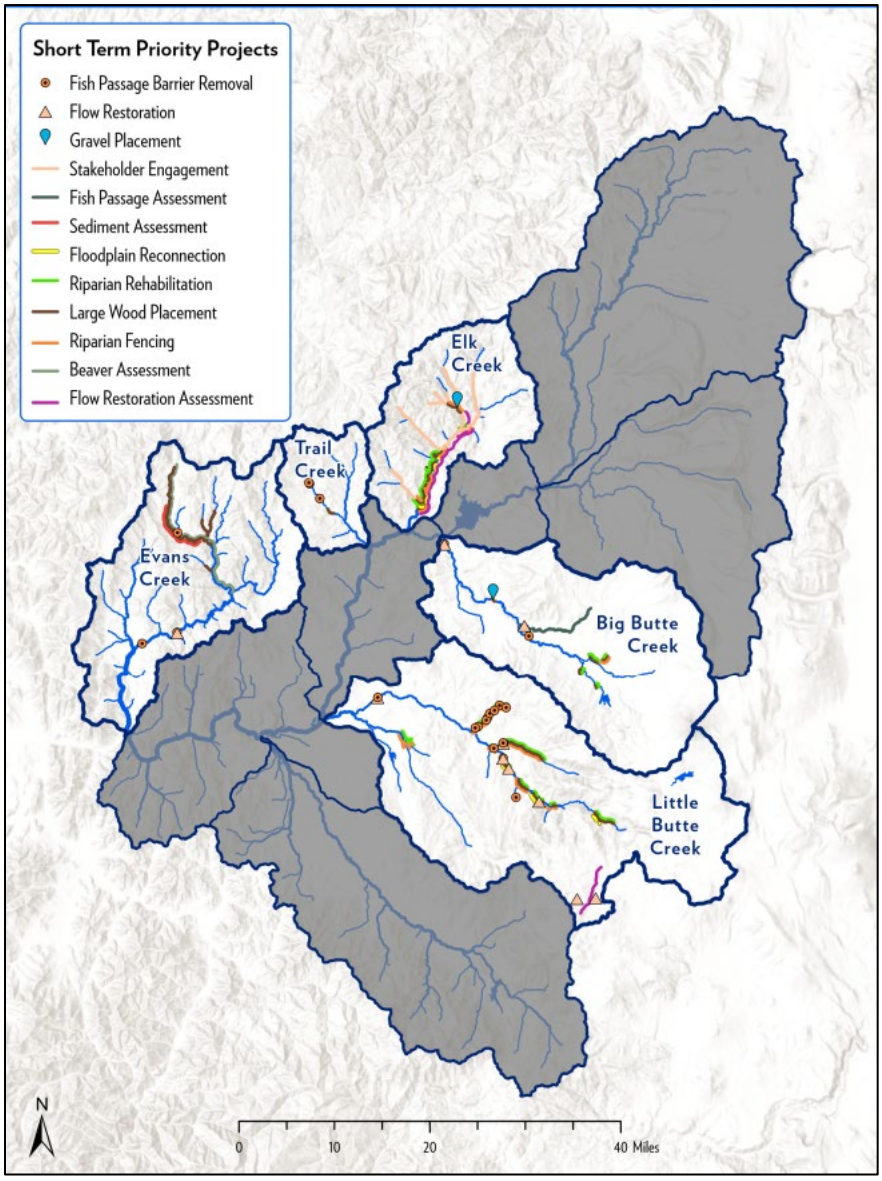


FIGURE 36. MAP OF FUTURE ECOLOGICAL RESTORATION PROJECTS ON MEDFORD WATER PROPERTY

1. **Current Restoration Projects with RRWC:**
   Medford Water provides financial support to **RRWC** for ongoing stream and riparian restoration projects in the **Upper Rogue**, including **Little Butte Creek** and **Elk Creek watersheds**. Medford Water also collaborates with RRWC on public outreach during Annual Drinking Water Week events.
2. **Restoration Projects on Medford Water Land:**
   Medford Water plans to implement restoration projects directly on its land, focusing on enhancements to instream, riparian, and wetland habitats in **Fourbit Creek**, **Clarks Fork**, **Horse Creek**, **Willow Creek**, and **Ash Creek**.



3. **Support for Coho Strategic Action Plan:**
The RRWC is developing the Coho Strategic Action Plan (Coho SAP) and focuses on restoring critical habitats for the threatened Coho salmon species within the Rogue River Basin. This multi-partner initiative aims to improve fish habitat and water quality by addressing key ecological challenges, such as riparian degradation and reduced stream and floodplain connectivity. This plan will unlock significant funding for ecological restoration in Medford's SWPA. Medford Water supports the implementation of the Coho SAP by collaborating with partners like the (RRWC) to implement projects in priority streams within Medford's (SWPA), including Big Butte Creek, Little Butte Creek, Elk Creek, and other tributaries. These efforts benefit salmon populations and contribute to long-term source water protection by enhancing overall watershed health.

FIGURE 37. EXCERPT MAP FROM DRAFT COHO SAP HIGHLIGHTING WORK SIGNIFICANT WORK PLANNED IN MEDFORD WATER'S SWPA

4. **Instream Lease of Water Rights:**
   Medford Water leases its irrigation water rights on land near **BBS** through the **Oregon Water Resources Department (OWRD) Instream Lease Program**. This 5-year lease preserves water rights while maintaining instream flow for aquatic ecosystems.
5. **Direct Implementation of Ecological Restoration Sites (2020 Forest Management Plan):**
   Medford Water will implement ecological restoration projects outlined in its **2020 Forest Management Plan**, which focuses on restoring ecological systems that store winter water. A new restoration project

will be completed approximately every two years, with support from aquatic habitat restoration grants such as those offered by **OWEB**.

6. **Advocacy and Support for Partner-Implemented Restoration Projects:**
   Medford Water will continue to advocate for and support ecological restoration projects led by partners like **RRWC**, **OWEB**, **USFS**, **ODFW**, and **JSWCD**. These projects will focus on improving water storage in environmental systems and protecting source water.
7. **Continued Collaboration with Trout Unlimited (TU):**
   Medford Water will continue collaborating with **TU** on projects to restore stream flow and protect water rights in the **Big Butte** and **Little Butte Creek** watersheds. Medford Water previously provided a $5,000 match for a TU project acquiring senior water rights for **Little Butte Creek** and plans to support similar projects.
8. **Collaboration with The Freshwater Trust:**
   Medford Water will work with **The Freshwater Trust** on future riparian restoration projects in the **Upper Rogue**. These projects will focus on fencing, alternative livestock watering, and vegetation restoration.
9. **Partnership with Southern Oregon Land Conservancy (SOLC):**
   Medford Water will continue exploring land acquisition and conservation easement opportunities with **SOLC** to protect water quality in the most vulnerable areas of the SWPA that are ecologically significant or particularly sensitive.
10. **Oregon Hunters Association (OHA), USFS Fencing Projects:**
    Medford Water will continue collaborating with **OHA** and **USFS** (as the land manager) to build and maintain fencing around sensitive wetlands and riparian areas in the **BBS SWPA**, protecting these areas from degradation.

Future Actions

Medford Water will monitor the effectiveness of these restoration projects and seek additional opportunities to enhance ecological functions in the SWPAs. Restoration efforts will be prioritized based on their potential to improve water quality, increase water availability, and reduce wildfire risks.

Monitoring

Goal

Medford Water's monitoring program protects source water quality and quantity by providing real-time data, detecting trends, identifying potential contaminants, and enabling timely responses. This program serves as a foundation for effective water management, triggering appropriate actions such as restoration, remediation, and regulatory enforcement. Monitoring also ensures that land use changes and activities are tracked to prevent degradation and maintain an up-to-date inventory of Potential Contaminant Sources (PCS).

Best Management Practices (BMPs) Advocated by Medford Water for Monitoring

- **Data Collection and Analysis:** Implement robust monitoring strategies to assess water quality and detect potential contaminants continuously.
- **Collaborative Monitoring:** Work with regulatory and resource management agencies to maintain a shared understanding of water conditions and respond to changes.
- **Proactive Identification of Risks:** Regularly update the inventory of PCSs and ensure that land use changes are monitored to identify emerging risks.

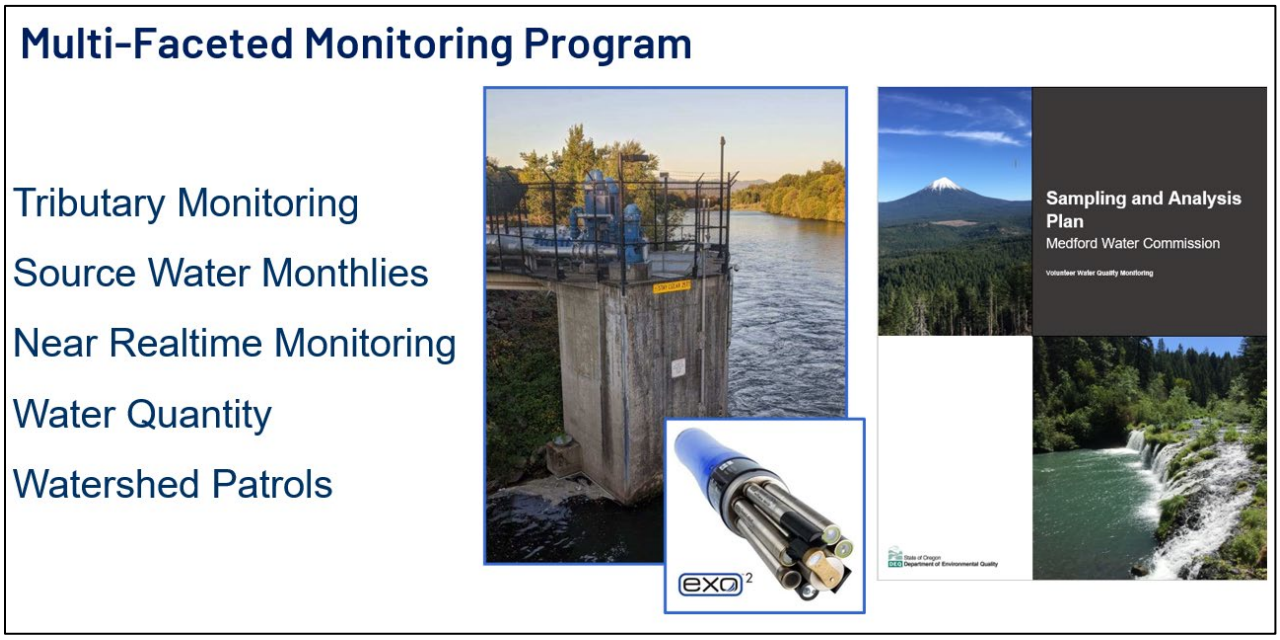
Key Partners for Monitoring

Medford Water collaborates with several key partners to support its monitoring efforts:

- **Rogue Valley Council of Governments (RVCOG):**
  RVCOG coordinates with Medford Water on watershed protection efforts, including public outreach and data sharing through the **Stream Smart** program, and supports GIS-based surveys to track water quality issues.
- **Oregon Department of Environmental Quality (DEQ):**
  Collaborates with Medford Water on refining the **Sampling and Analysis Plan (SAP)**, ensuring that data collected can inform statewide water quality improvement initiatives.
- **USGS:**
  Provides expertise and support for water quality and quantity monitoring stations, particularly for installing new monitoring sites and data analysis.
- **Jackson County Watermasters Office and Oregon Water Resources Department (OWRD):**
  The Watermasters Office, a field office of OWRD, collaborates with Medford Water on water quantity monitoring, stream flow tracking, and water rights enforcement. Together, they maintain stream gaging stations, monitor groundwater levels, and ensure compliance with water rights agreements in Medford's SWPAs.
- **Rogue River Watershed Council (RRWC):**
  RRWC supports tributary and watershed monitoring efforts, helping to implement projects that improve water quality in key areas like Little Butte Creek and Big Butte Creek.
- **Local Emergency Responders, HazMat Teams, and Public Works:**
  Collaborate with Medford Water to monitor and respond to emergency spill events and promptly implement water quality monitoring and mitigation efforts.

Medford Water's comprehensive monitoring program includes the following components:

- Sampling and Analysis Plan (SAP)
- Continuous Near Real-Time Monitoring
- Monthly Lab Analyses Profile
- Tributary Monitoring
- Source Water Patrols
- Source Water Supply Monitoring
- Event-Triggered Monitoring
- BBS Pesticide Monitoring



Key Actions

Sampling and Analysis Plan (SAP):
Medford Water operates under a detailed Sampling and Analysis Plan that guides water sampling and analysis. The goal is to align data collection with DEQ standards, allowing the data to be used for state-level water quality improvement efforts. Medford Water will continue working with DEQ to refine the SAP, ensuring that the data collected can be utilized for regulatory purposes and water quality assessments at the state level.

Continuous Near Real-Time Monitoring:
Continuous monitoring is conducted in near real-time at the Duff WTP intake on the Rogue River and Little Butte Creek. Key parameters include stream temperature, turbidity, organics, algae, conductivity, and pH, with dissolved oxygen also monitored on Little Butte Creek. This monitoring provides critical early warnings of contamination risks. Upgrade the Little Butte Creek station for more frequent data transmissions (every 15 minutes). Establish additional stations upstream of the WTP intake on the Rogue River and Antelope Creek to improve early detection capabilities.

Monthly Lab Analyses Profile:
A multi-parameter analysis of Medford's source waters is conducted monthly. Samples are taken from key locations and sent to third-party labs to detect inorganics, nutrients, organics, and bacteria. This dataset

provides insight into baseline conditions and long-term trends in water quality. Expand in-house lab capabilities to detect acute contamination events and return to normal conditions after spills. This will reduce reliance on third-party labs and increase response speed.

Tributary Monitoring:
Monitoring tributaries in Medford's SWPAs focuses on Little Butte Creek, Below Lost Creek, and BBS Protection Areas. Key parameters measured include temperature, turbidity, and conductivity. Monitoring occurs during the late spring to fall season and is essential for tracking seasonal changes and land use impacts on water quality. Expand field analysis to include organic matter and algae detection. This will enhance spill response capabilities and provide more significant insights into contamination sources.

Source Water Patrols (with RVCOG Support):
Medford Water conducts regular patrols throughout the SWPAs, focusing on areas with the highest risks, such as Urban Industrial, Little Butte Creek, and BBS Protection Areas. In collaboration with **RVCOG**, monthly patrol routes focus on monitoring the stormwater systems and smaller streams near industrial zones, identifying spills, illicit discharges, and other water quality threats. These patrols also include GIS-based surveys that document potential issues, which are shared across agencies for quicker responses. Share the Watershed Patrol GIS survey with partners like DEQ, RVSS, and RRWC to improve collaboration on source water protection efforts and ensure timely data sharing. Expand RVCOG's patrols to cover additional tributaries and stormwater discharge points in key industrial areas.

Source Water Supply Monitoring:
Monitoring the quantity of source water, particularly from BBS, involves tracking spring flow, groundwater levels, and stream flows. This data is essential for drought preparedness and managing water rights sharing agreements. Reinstate continuous data collection at the Fourbit Creek stream gauge in the BBS Wellhead Protection Area to support long-term water supply analysis and detect illegal water use.

Event-Triggered Monitoring:
After known events such as spills, algal blooms, or fires, Medford Water conducts targeted monitoring to assess the impact on water quality. This type of monitoring allows for quick contamination detection and supports timely remediation efforts. Expand event-triggered monitoring capabilities to include advanced detection methods for organic compounds, VOCs, and algae toxins. This will ensure rapid response to contamination events and support more comprehensive water quality assessments.

BBS Pesticide Monitoring:
Annual pesticide monitoring is conducted in the BBS SWPA to ensure that forest pesticide applications are properly managed and do not contaminate surface or groundwater sources. Continue monitoring pesticide applications and collaborate with applicators to ensure proper communication and sampling protocols are followed to protect water sources.

By implementing these monitoring actions and working with partners like **RVCOG**, Medford Water will continue to track the health of its source waters, identify potential threats, and ensure its water supply's continued safety and reliability. The monitoring program will evolve to meet emerging challenges and incorporate the latest real-time data collection and analysis technologies.

Outreach and Education

Goal
The primary goal of Medford Water's outreach and education strategy is to inform the public about the

importance of source water protection for clean drinking water. Outreach efforts must reach various demographics, including large property owners, recreation users, and agricultural operators. One-on-one or small group outreach is essential, especially to landowners managing large acreages. Medford Water will continue collaborating with numerous Rogue Basin partners on public outreach, including in-person events and online media.

Best Management Practices (BMPs) Advocated by Medford Water for Outreach and Education

- **Targeted Outreach:** Engage urban and rural communities with tailored messaging addressing specific land use and source water protection challenges.
- **Collaborative Education Efforts:** Work with key partners to amplify outreach through joint events, workshops, and media campaigns.
- **Site-Based Outreach:** Focus on high-priority protection areas with location-specific messaging and community engagement.

Key Partners for Outreach

Medford Water collaborates with many partners to promote water source protection:

- **Rogue River Watershed Council (RRWC)**: Provides restoration education and public outreach and supports the **Watershed Health Report Card**, a tool to assess and communicate watershed health to the public, helping them understand the impact of land use on water quality.
- **Jackson Soil and Water Conservation District (JSWCD)**: Leads outreach to agricultural landowners, helping them access funding and technical support for implementing BMPs.
- **Rogue Valley Council of Governments (RVCOG)**: Supports public outreach through the **Stream Smart** initiative and coordinates GIS-based surveys.
- **Rogue Drinking Water Partnership (RDWP)**: Works with Medford Water to engage communities on source water protection strategies.
- **Rogue Riverkeeper**: Advocates for water quality protection, engages the public in clean water initiatives, and raises awareness about pollution impacts on the Rogue River.
- **Civic Organizations**: Collaborates with groups such as Rotary and the League of Women Voters to raise awareness of water protection issues.
- Other Partners: Include the Jackson-Josephine Small Woodlands Association and other local groups.

FIGURE 38. PUBLIC OUTREACH EVENT FOCUSED ON PRIVATE LANDOWNERS NEAR THE BBS

Key Actions

1. **Outreach to Large Acreage Owners and Agricultural Landowners**
   Medford Water will focus on one-on-one outreach to owners and managers of large acreages in the BBS Watershed and the Rogue SWPA. Rural and agricultural outreach is crucial, especially since smaller operations like hobby farms contribute more pollutants per acre than larger commercial farms. **JSWCD** is the lead partner for engaging agricultural landowners and providing education and financial assistance through the **NWQI plan** to help implement BMPs.
2. **BBS Watershed Outreach**
   Public outreach efforts in the **BBS Watershed** will focus on specific audiences such as **recreational users (campers, boaters, hunters, ORV users)** and neighboring landowners (ranches, residences, and federal agencies). Methods include signage, media campaigns, and face-to-face meetings with key stakeholders, including **USFS** and **BLM**. Medford Water will also continue organizing the **BBS Neighbors Meeting**, a key outreach event to engage landowners, share updates on water quality protection, and address concerns about land use and its impact on the watershed.
3. **Public Education Programs and Events**
   Medford Water supports a variety of educational programs and events to promote water source protection:
   - **Salmon Watch**: Educates middle school students on salmon life cycles, riparian ecosystems, and the importance of habitat conservation.
   - **BBS Tours**: Offers guided tours of Medford Water's two sources and treatment systems to the public.
   - **Career Fairs and Rogue River Events**: Participation in local festivals, fairs, and events to raise awareness about water quality protection.
4. **Support for Public Engagement Programs**
   Medford Water will continue to support programs that engage the public in riparian health, water quality protection, and conservation practices:
   - **Stream Smart**: Educates the public on stream health and conservation practices through workshops and technical assistance, helping landowners maintain and restore riparian environments.
   - **Rogue Basin Partnership**: Focuses on watershed health initiatives, supporting community involvement in restoration efforts.
   - **Rogue Riverkeeper**: Engages the public in water quality protection and advocacy, focusing on keeping the Rogue River clean and healthy for ecological and drinking water purposes.
5. **Media and Online Outreach**
   Medford Water will expand its use of digital platforms, including social media, interactive story maps, and online dashboards, to reach broader audiences. **Stream Smart** and **RDWP** will remain key media partners for producing educational materials, including brochures, fact sheets, and online resources.
6. **Partner Engagement in Urban Areas**
   While most direct in-person outreach focuses on urban areas, partnerships with organizations like **JSWCD** and **RRWC** ensure that water protection messages are disseminated to rural landowners and agricultural operators. Medford Water will continue supporting **RVCOG's** efforts to engage the broader public.

7. **Advocacy for LEPC Engagement**
   Medford Water will continue advocating for the **Local Emergency Planning Committee (LEPC)** to reengage local industries and communities in spill-prevention strategies to protect water sources.\

Implementation

The Implementation section outlines the path forward for implementing Medford Water's Source Water Protection Plan, focusing on the practical execution of the Action Plan through estimated timelines, resource allocation, performance tracking, and anticipated outcomes. This section provides the roadmap for maintaining momentum in source water protection while ensuring that progress is measured and sustained over the long term.

Timeline

The timeline for implementing the Source Water Protection Plan is designed to be flexible, with key milestones established to guide the work over the next decade. The timeline is broken into recurring annual or semiannual actions and future, immediate, medium-term, and long-term actions and is presented in table 15 below.

TABLE 15. GENERAL ACTION PLAN IMPLEMENTATION TIMELINE

Strategy	Routine Actions	Immediate Actions (1–2 Years)	Medium-Term Actions (3–5 Years)	Long-Term Actions (5–10 Years)
Partnerships	- Meetings with USFS, USACE, etc. - Review/renew annual (e.g., EPID, RVCOG).	- Pursue 1st priority agreements (e.g., USFS Master Partnership, USACE Record of Intent).	- Pursue 2nd priority agreements (e.g., County, Cities, ODF).	- Sustain long-term partnerships -Review/renew agreements - Build on collaborations for water management, restoration
Land Use	- Thin (200 acres/year). - Participate in biannual ODA Plan reviews.	- Facilitate Ag BMP adoption via NWQI. - Support prescribed fire in BBS SWPA with USFS.	- Support USFS Snowy Butte startup - Continue BMP adoption (NWQI, others).	- Facilitate Snowy Butte maintenance support. - Update Forest Mgmt. Plan
Ecological Restoration	- Annual maintenance for weeds/invasives. - Review funding opportunities with partners.	- Collaborate on Coho SAP restoration projects. - Leverage grants for riparian/habitat restoration.	- Support large-scale restoration (Snowy Butte, RRWC Coho SAP). - Advocate for funding & facilitate project implementation.	- Long-term Snowy Butte follow-up & prescribed fires. - Assess the restoration success of Medford Projects and adjust as needed.
Spill Response	- Annual spill drills Stormwater diversion for White City. - Monitor spill systems.	- Complete GRP by 2025. - Purchase spill response equipment (OHA grant).	- Continue spill drills & update protocols. - Collaborate with LEPC/industries on spill prevention.	- Review/update GRP based on new risks/lessons. - Maintain long-term spill prevention in high-risk areas.
Outreach and Education	- Participate in events (Celebrate the Rogue, Salmon Watch, etc.). - Provide content for publications/social media.	- Reengage LEPC for industrial outreach. - Expand communication methods.	- Continue public education (BBS Neighbors Meeting, Stream Smart). - Increase community participation.	- Sustain/expand outreach platforms. - Build long-term landowner/community relationships to promote water quality & protection.
Monitoring	- Monitor Source water per SAP. - Submit reports to DEQ. - Routine Water Quantity.	- Expand real-time monitoring upstream of WTP. - Submit SAP for DEQ approval.	- Expand monitoring to additional tributaries (e.g., Antelope Creek). - Collaborate on integrated water monitoring.	- Review/update SAP with new data/lessons learned. - Utilize advanced monitoring tech & data-driven strategies for long-term water protection.

Resource Needs

Funding Requirements

Medford Water's current budget is sufficient to fund staff and ongoing projects using internal resources, primarily due to successfully obtaining external funding. No immediate increase to the Source Water Protection Budget is required, though future needs will be evaluated on a case-by-case basis.

Medford Water and its partners have leveraged external grant funding to support source water protection activities. Some funds are awarded directly to Medford Water, while most are allocated to our partners with our support.

Grant funding for source water protection and related ecosystem health initiatives remains abundant but highly competitive. Millions of dollars are awarded annually to Medford Water and its partners to protect both source water and ecosystem health in the Upper Rogue. Medford Water's success in securing these funds is primarily due to strong partnerships and our role in facilitating funding applications for our partners.

Leveraging Funding for Drinking Water and Ecosystem Protection

Medford Water has effectively accessed drinking water-specific protection funds and broader ecosystem restoration funds supporting source water protection. For drinking water protection, Medford Water secures grants from programs like the DEQ Clean Water State Revolving Fund (CWSRF), OHA Drinking Water Protection Grants (administered with DEQ), EPA Drinking Water State Revolving Fund (DWSRF), and the GEOS Drinking Water Provider Partnership (DWPP). For broader source water protection, Medford Water and its partners target ecosystem restoration and habitat conservation grants, including funds for watershed management, forest management, climate resilience, and water quality protection. While focused on broader ecological goals, these efforts directly benefit drinking water quality by maintaining the health and resilience of the surrounding ecosystems.

Beyond drinking water-specific grants, Medford Water collaborates with partners to secure funding for ecosystem and habitat restoration. These grants support various activities, such as watershed management, forest management, climate resilience, water quality protection, and threatened species conservation (e.g., salmon). This broader funding aligns ecosystem protection efforts with source water goals, enhancing our ability to protect drinking water.

Strategic Alignment with Partners

Medford Water collaborates annually with partners like RRWC, RVCOG, JSWCD, ODF, and ODFW to identify and pursue the best funding opportunities. By aligning our goals and project readiness with funding availability, we maximize the potential for securing appropriate resources for each project.

Examples of Funded Projects

- Medford Water's support helped RRWC secure approximately $300K for the Eagle Point Lagoon Bank Stabilization Project from OWEB, DWPP, OHA, USFS, BLM, and Freshwater Trust.
- OHA grants awarded to Medford Water and passed through to RRWC supported the RDWP, alongside an OWEB Collaboration grant awarded directly to RRWC.
- Medford Water, NRCS, and JSWCD secured $125K to develop the Rogue NWQI plan, which will fund up to $2 million in agricultural BMPs in Little Butte Creek over five years.
- Developing the Spill Response Strategy, including a Geographic Spill Response Plan and field training, was funded by OHA Drinking Water Protection Grants and HMEP grants from the State Fire Marshal, totaling $180,000.

- Medford Water, ODF, and JSWCD collaborated to secure nearly $2 million from Senate Bill 762 for wildfire risk reduction thinning near BBS.
- Medford Water, ODF, and USFS twice secured PACE funding for environmental planning for the Snowy Butte Restoration Project.

Examples of Unsuccessful Applications
While successful in many cases, not all funding applications result in awards:

- Medford Water, in partnership with ODFW, applied for Private Forest Accord Grant funds for riparian restoration on Denman Wildlife Refuge, but the application was not awarded.
- Similarly, Medford Water was unsuccessful and applied for OCRF funding for real-time water quality monitoring stations on the Rogue and Antelope Creek. These projects remain priorities, and we continue to seek funding for them, learning from these experiences to improve future applications.

Staffing Needs

Internal Capacity
Medford Water's internal team is well-equipped to implement and sustain the Source Water Protection Plan, bringing together expertise from leadership to fieldwork. This cohesive team collaborates to manage the various aspects of source water protection, from administrative oversight to on-the-ground activities to protect and enhance water quality.

Water Resource and Customer Service Manager: Oversees the entire watershed department, ensuring strategic alignment and supporting administrative operations to achieve the goals of the Source Water Protection Plan.

Watershed Coordinator: Leads the development and periodic updates of the Source Water Protection Plan while focusing on partnerships, agreements, internal planning, and grant writing. This role is pivotal in securing resources and ensuring that projects and plans move forward smoothly.

Watershed Specialist: Assists and supports the coordinator with responsibilities like grant writing and planning while overseeing water quality monitoring, GIS analysis, outreach efforts, forest management, and source water patrol. The Specialist provides essential technical support to ensure effective implementation of the plan.

Watershed Technician Intern (Seasonal): Assists the Watershed Specialist in fieldwork and data collection. Typically filled by a college student, this intern position provides practical experience and serves as an educational opportunity, promoting industry knowledge and source water protection awareness.

BBS Operations Staff: While conducting routine operations of the BBS system, the staff regularly patrol the area, maintain fences and roads, and monitor water quantity. These activities directly contribute to source water protection efforts in this critical area, helping to safeguard water quality and infrastructure.

Duff Water Treatment Plant (WTP) Staff: Essential to the spill response strategy, WTP staff work closely with the watershed team to monitor potential threats and execute spill prevention and response actions.

External Support

Contracted Support
Medford Water collaborates with specialized organizations to carry out essential components of its Source Water Protection Plan. These contractors offer expertise in forest management, ecological restoration, remote

sensing, and public outreach, ensuring that large-scale projects are managed effectively. Key partners like the Rogue Valley Council of Governments (RVCOG), Lomakatsi Restoration Project, and Rogue River Watershed Council (RRWC) provide vital services. Medford Water often facilitates these contracts through grant pass-through funding, ensuring efficient use of external expertise while adhering to budgetary limits and achieving project goals.

In-kind support from Partners and Stakeholders
Medford Water receives significant in-kind support from regional partners, including the U.S. Forest Service (USFS), Oregon Department of Forestry (ODF), and Jackson Soil and Water Conservation District (JSWCD). These partners contribute through technical expertise, labor, equipment, and collaborative planning. In some cases, they provide direct funding or services through joint initiatives aimed at mutual objectives such as source water protection, wildfire risk reduction, and habitat restoration. This cooperation enables Medford Water to expand its resource capacity and align efforts with broader regional environmental goals.

Expected Outcomes and Measuring Success

The expected outcomes and success measures are structured around Medford Water's four primary goals: spill/discharge prevention, water quality improvement, wildfire risk reduction, and increasing water availability. Success in these areas will be tracked through broad but meaningful indicators, ensuring that progress aligns with Medford Water's overall objectives.

Spill/Discharge Prevention and Emergency Response Expected Outcomes:

- A comprehensive spill response system, capable of rapid spill detection and containment to protect source waters from contamination, is in place.
- Local industries and key stakeholders are engaged and better equipped to prevent and respond to spills, reducing the likelihood of discharges into source waters.

Measuring Success:

- Response Time: Ability to respond swiftly and effectively to spill events.
- Spill Prevention Programs: Increased participation by businesses and industries in spill prevention programs.
- Spill Detection Systems: Expansion and effective use of spill detection infrastructure in high-risk areas.
- Partnership Engagement: Strong collaboration with local agencies and businesses for coordinated spill response.

Improving Water Quality in Little Butte Creek Expected Outcomes:

- Measurable improvements in water quality within the Little Butte Creek watershed, with reductions in contaminants such as pesticides, sediment, and bacteria.
- Increased adoption of agricultural BMPs by landowners, leading to healthier riparian zones and improved water quality in key tributaries.

- Water Quality Parameters: Track general reductions in turbidity, pesticide levels, and bacteria contamination within key tributaries.
- BMP Adoption: Increased BMP utilization by agricultural landowners in the Little Butte Creek area, demonstrated through cooperative programs with partners.
- Riparian Health: Improvements in the health of riparian zones and stream banks.
- Partner Collaboration: Active participation of key partners like JSWCD, RRWC, and NRCS in water quality projects.

Reducing Wildfire Risk Expected Outcomes:

- Significant reduction in wildfire risk through implementing forest management practices, including thinning and prescribed burns in SWPAs.
- Forested landscapes in the BBS and Rogue River watersheds are more resilient to wildfires, protecting water sources and infrastructure.
- Acres of Forest Thinned: Consistent progress in thinning projects, focusing on reducing wildfire risks near-critical water sources.
- Prescribed Burns: Completing prescribed burns in partnership with USFS and other agencies.
- Wildfire Preparedness: Community and landowner engagement in wildfire risk reduction workshops and outreach programs.
- Post-Treatment Forest Health: General improvements in forest health and reduced fuel loads through ongoing monitoring and evaluation.

Increasing Water Availability in the Big Butte Creek Basin Expected Outcomes:

- Enhanced water retention and improved watershed health in the Big Butte Creek Basin, ensuring sustainable water availability during dry periods.
- Efficient use of water resources through modernized irrigation systems and increased groundwater recharge.
- Increased Water Retention: Measurable improvements in water retention and streamflow in key areas, supported by restoration projects and forest management efforts.
- Water Management Efficiency: Implementation of water management practices such as irrigation modernization and canal piping projects.
- Hydrological Data: Monitoring improvements in groundwater recharge and streamflow stability through data collected from key monitoring sites.
- Collaboration with Irrigation Districts: Strengthened partnerships with irrigation districts to improve water efficiency and availability.

Additional Success Indicators

While Medford Water continues to develop specific metrics for success, some additional indicators will reflect the broader impact of the Source Water Protection Plan:

- Partnerships: Increased collaboration hours and partnerships with various stakeholders, including agencies, NGOs, and landowners, without a specific numerical goal.
- Restoration Projects: Consistent involvement in at least one active restoration project annually, either on Medford Water lands or collaborating with partners like RRWC.
- Funding: Securing and allocating funding for key projects, including direct grants to Medford Water and funds awarded to partners with Medford Water’s support.

- Outreach and Education: General increases in outreach events and community education efforts, focusing on increasing awareness and participation in source water protection activities.
- Monitoring Expansion: Adding new water quality monitoring sites and parameters, improving early detection of potential contaminants.

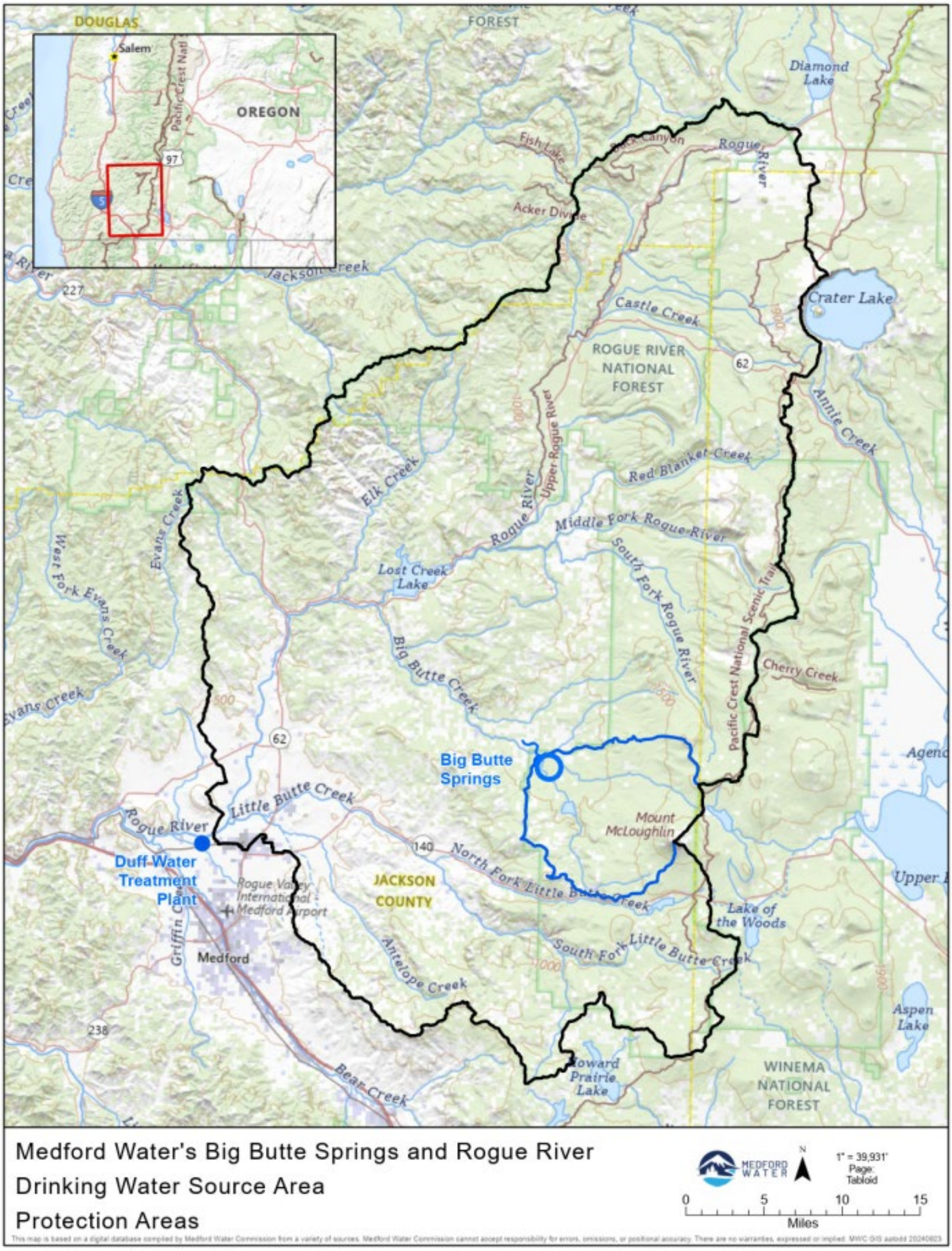
Medford Water's Source Water Protection Plan is a comprehensive strategy designed to safeguard drinking water sources through targeted actions in collaboration with key regional partners. The Action Plan provides a clear roadmap for achieving long-term source water protection goals, addressing critical areas such as spill prevention, water quality improvement in Little Butte Creek, wildfire risk reduction, and increasing water availability in the Big Butte Creek Basin. Medford Water is equipped to adapt to evolving challenges while meeting the goals outlined in this plan by leveraging partnerships, utilizing grant funding, and maintaining a flexible but focused timeline. Regular monitoring, collaboration, and outreach efforts will ensure continued progress, protecting the environment and the community's vital drinking water resources. With well-defined resource needs and measurable outcomes, this plan offers a sustainable approach to ensuring clean, safe drinking water for the future.

Appendices

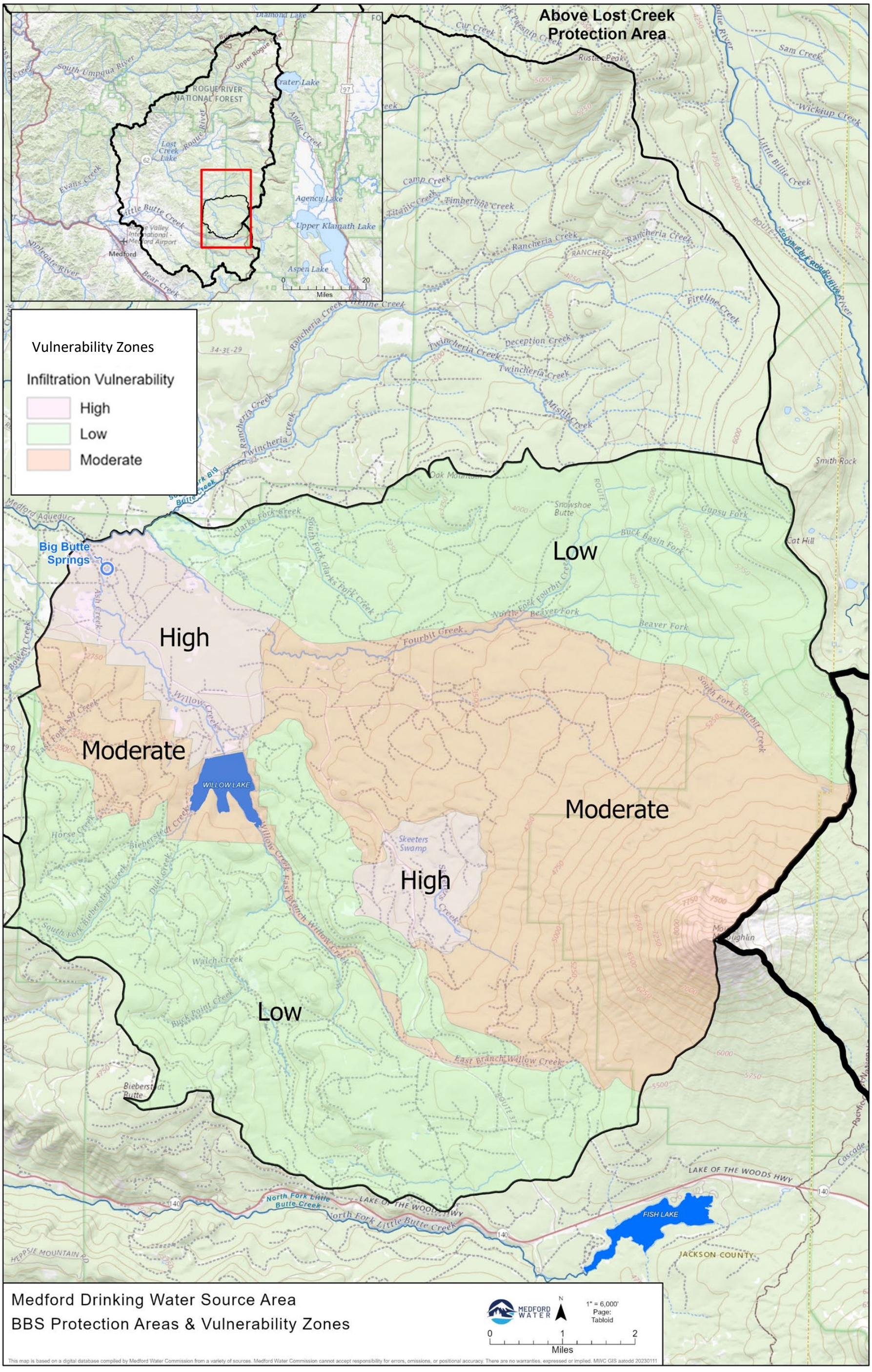
Appendix A. Acronyms

- **BBS** – Big Butte Springs
- **BMP** – Best Management Practices
- **BLM** – Bureau of Land Management
- **CFS**– Cubic Feet per Second
- **CWSRF** – Clean Water State Revolving Fund
- **DEQ** – Oregon Department of Environmental Quality
- **DWPP** – Drinking Water Provider Partnership
- **DWSRF** – Drinking Water State Revolving Fund
- **EPA** – Environmental Protection Agency
- **EPID** – Eagle Point Irrigation District
- **FCA** – Farmers Conservation Alliance
- **FWT** – Freshwater Trust
- **GIS** – Geographic Information System
- **GRP** – Geographic Response Plan
- **HAB** – Harmful Algal Bloom
- **HMEP** – Hazardous Materials Emergency Preparedness
- **IGA** – Intergovernmental Agreement
- **JSWCD** – Jackson Soil and Water Conservation District
- **LEPC** – Local Emergency Planning Committee
- **MID** – Medford Irrigation District
- **MGD**– Million Gallons per Day
- **NEPA** – National Environmental Policy Act
- **NGO** – Non-Governmental Organization
- **NRCS** – Natural Resources Conservation Service
- **NWQI** – National Water Quality Initiative
- **ODA** – Oregon Department of Agriculture
- **ODF** – Oregon Department of Forestry
- **ODFW** – Oregon Department of Fish and Wildlife
- **OHA** – Oregon Health Authority
- **OWEB** – Oregon Watershed Enhancement Board
- **OWRD** – Oregon Water Resources Department
- **PACE** – Planning Assistance and Categorical Exclusion
- **PCS** – Potential Contaminant Sources
- **RDWP** – Rogue Drinking Water Partnership
- **RRWC** – Rogue River Watershed Council
- **RVCOG** – Rogue Valley Council of Governments
- **RVSS** – Rogue Valley Sewer Services
- **SAP** – Sampling and Analysis Plan
- **SWA**– Source Water Assessment
- **SWAT** – Stormwater Advisory Team
- **SWPA** – Source Water Protection Area
- **TOT** – Time of Travel
- **TMDL** – Total Maximum Daily Load
- **TU** – Trout Unlimited
- **USACE** – U.S. Army Corps of Engineers
- **USFS** – U.S. Forest Service
- **WC** – Western Cascades
- **WTP** – Water Treatment Plant
- **YHC** – Young High Cascade

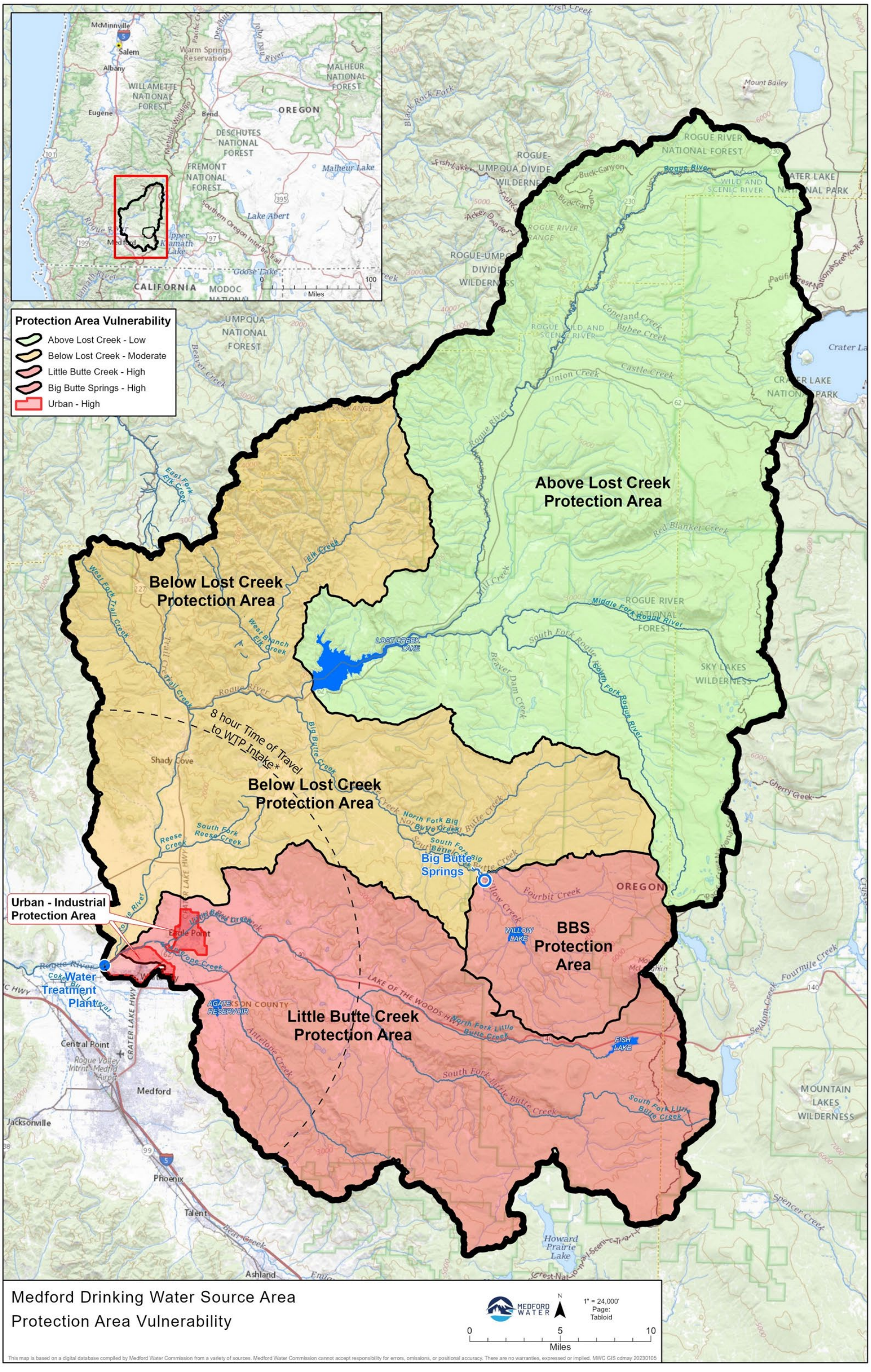
Appendix B. Maps



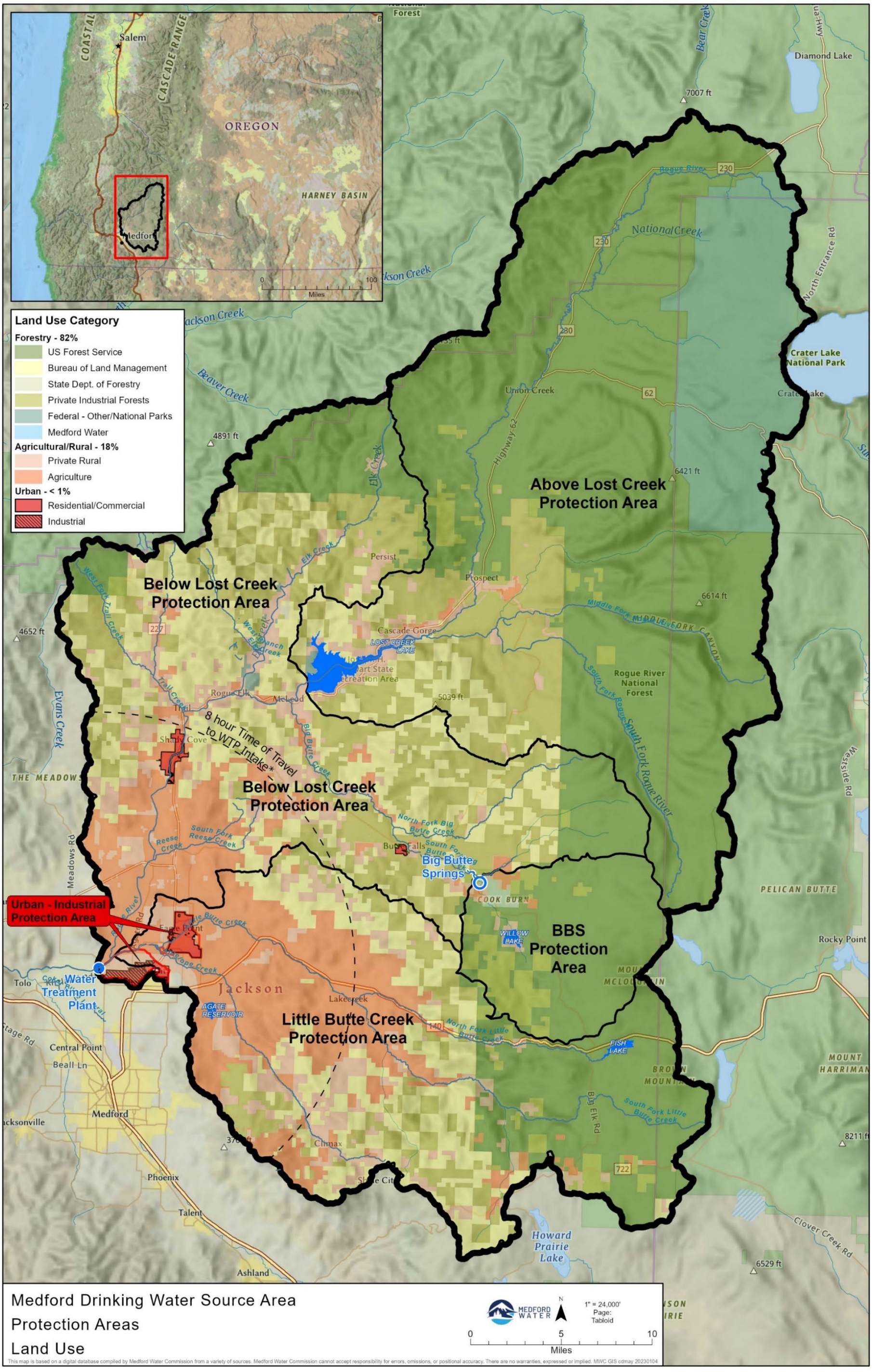
MAP 1. MEDFORD WATER'S SOURCE WATER PROTECTION AREAS VICINITY MAP



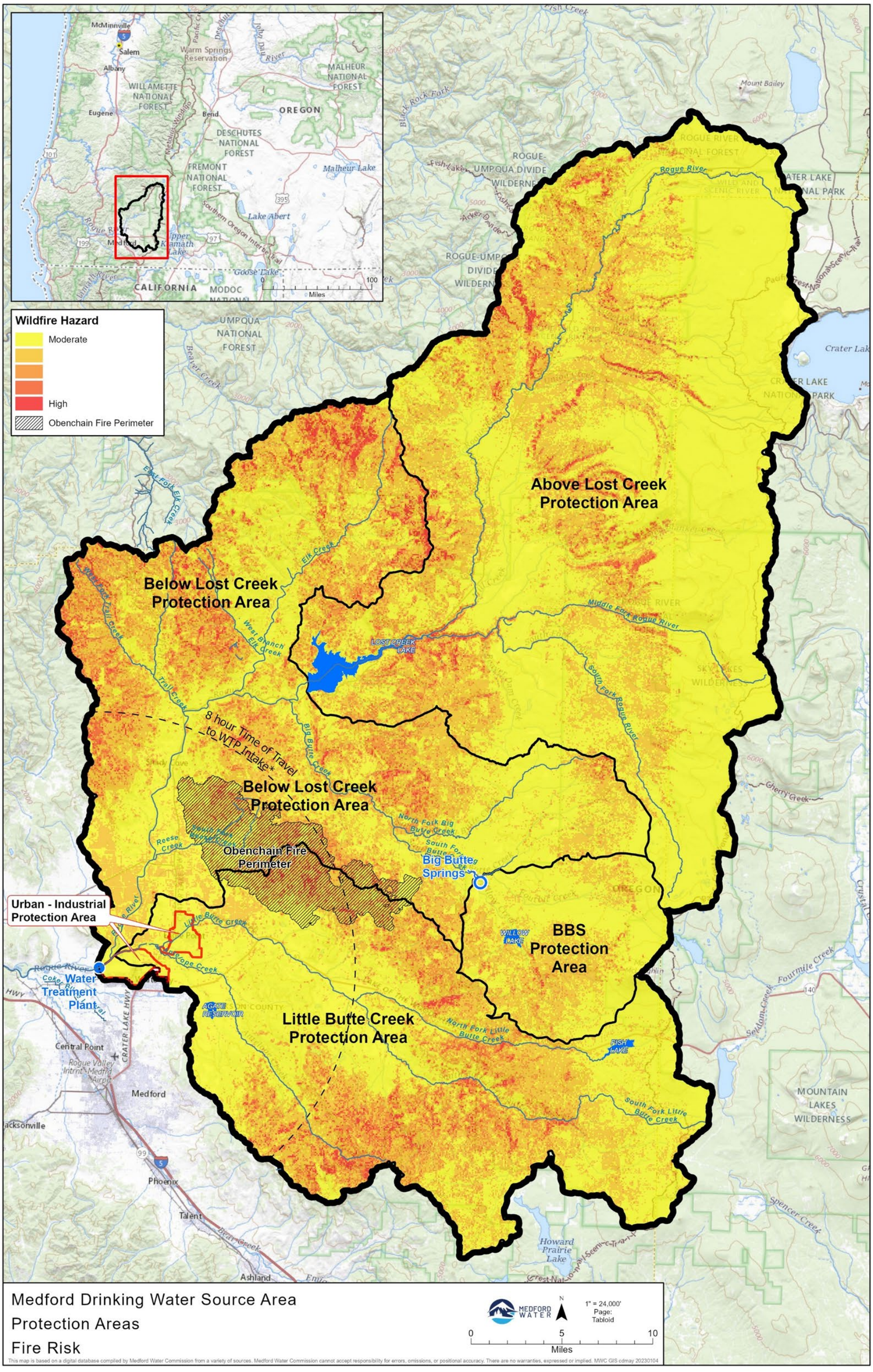
MAP 2. BBS SOURCE WATER PROTECTION AREA AND VULNERABILITY ZONES



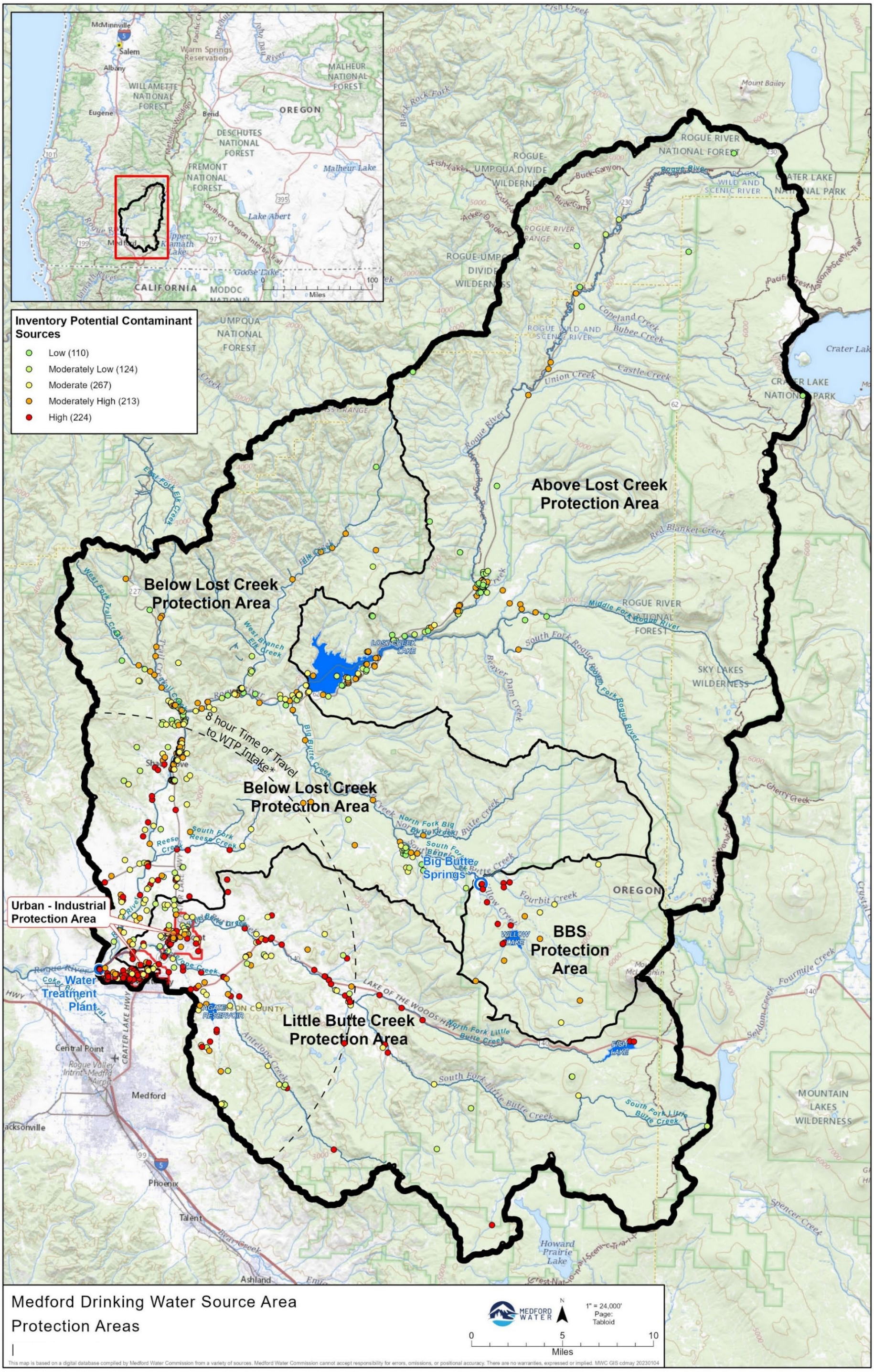
MAP 3. SOURCE WATER PROTECTION AREA VULNERABILITY ZONES



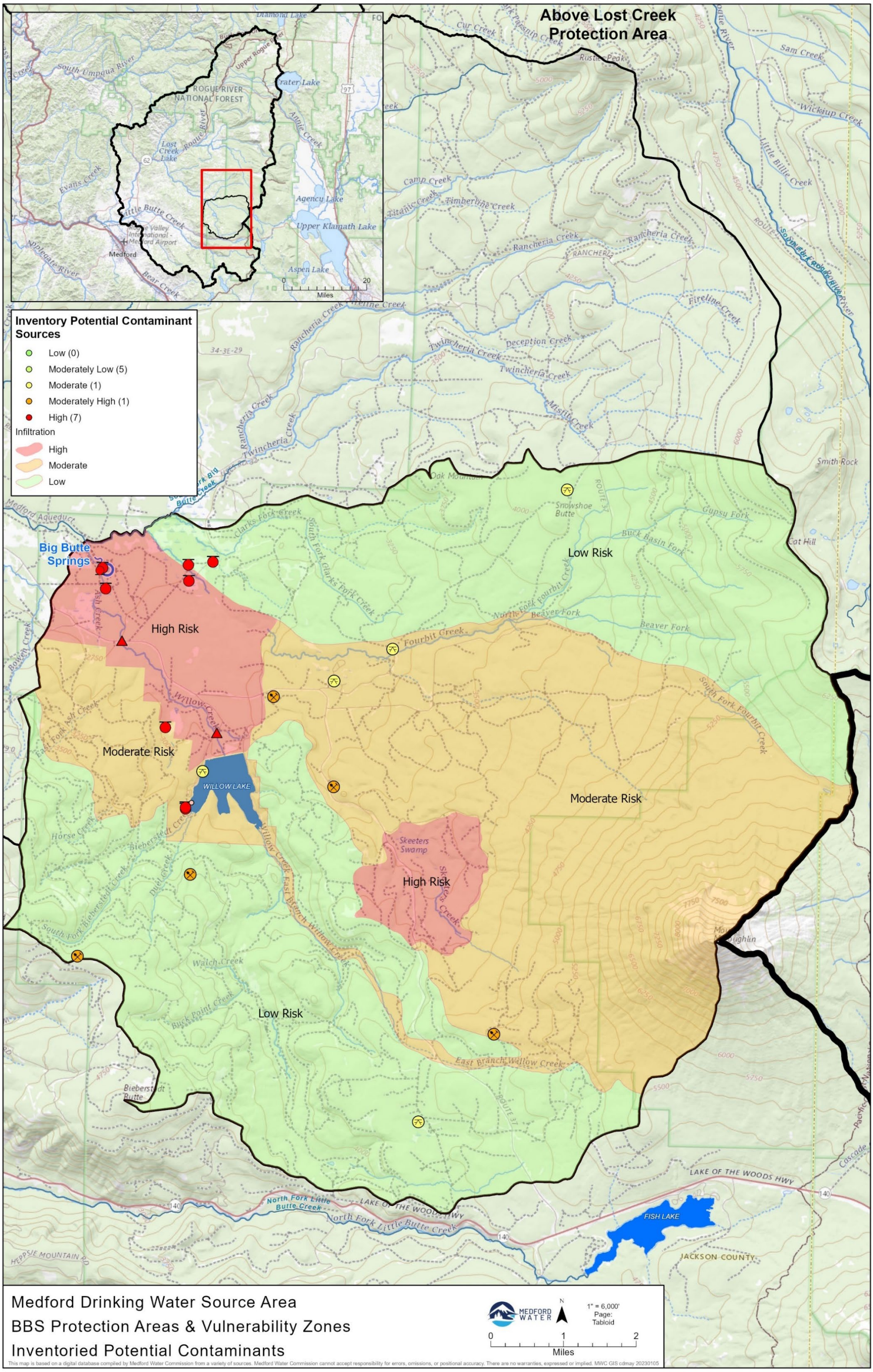
MAP 4. SOURCE WATER PROTECTION AREA LAND USE



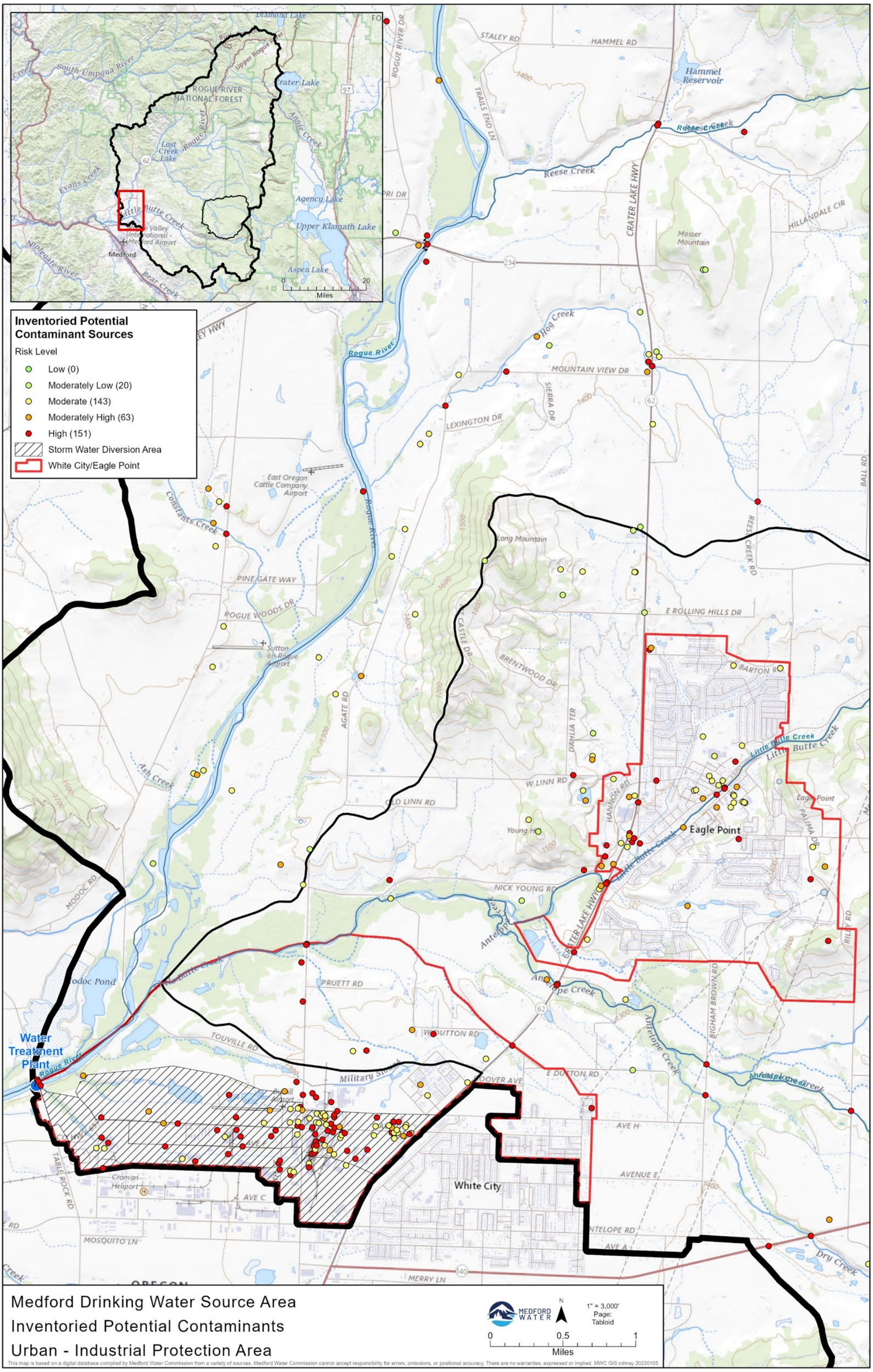
MAP 5. SOURCE WATER AREA WILDFIRE RISK



MAP 6. INVENTORY OF POTENTIAL CONTAMINANT SOURCES IN THE ROGUE SWPA



MAP 7. INVENTORY OF POTENTIAL CONTAMINANT SOURCE IN THE BBS SWPA



MAP 8. INVENTORY OF POTENTIAL CONTAMINANT SOURCES IN THE URBAN INDUSTRIAL AREA

Appendix C. Figures

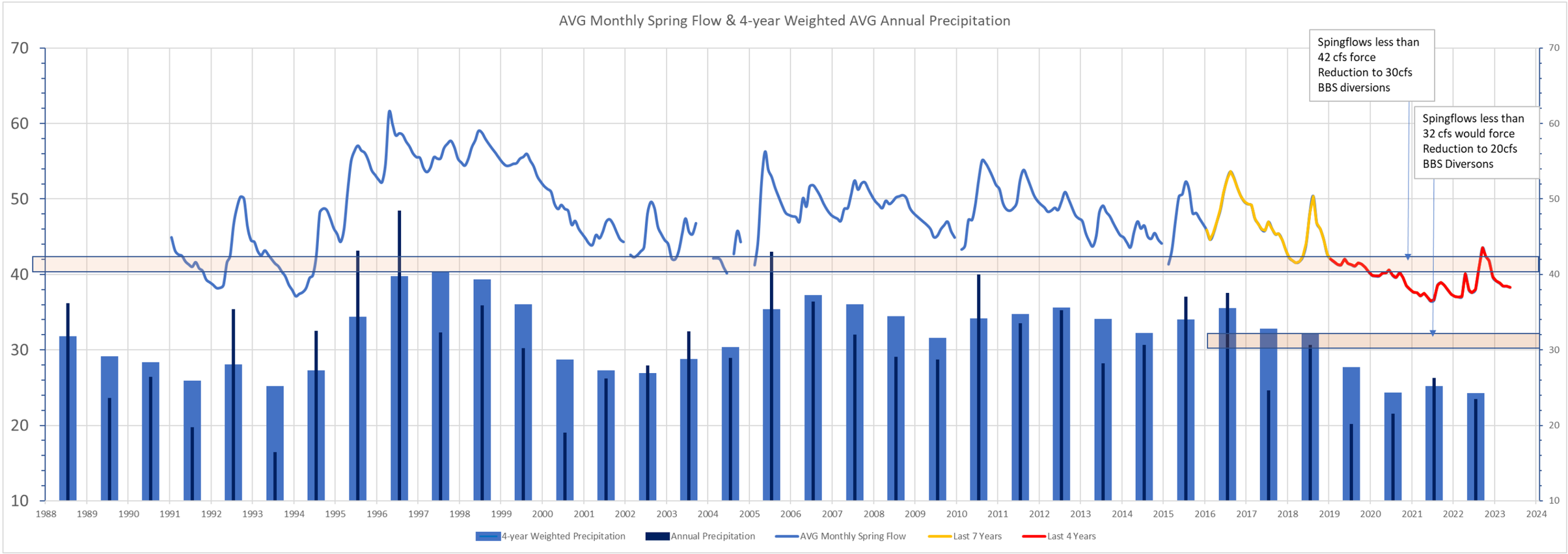


FIGURE 39. BBS SPRINGFLOW AND PRECIPITATION CHART

TABLE 16. PROTECTION AREA CHARECTERISTICS & VULNARBILITY FACTORS.

			Medford Waters Source Water Area Protection Zones				
			BBS Managed for Ground Water Potection	Little Butte Creek	Urban Industrial	Below Lost Creek	Above Lost Creek
Geography	Area in SqMi		90	373	5.5	465	687
	Nearest Distance Above Intake mi		0 for BBS	< 1	> 1	0	26
	TOT to Intake		> 8 hours	< 1 hour to > 8 hours	< 1 hour	0 to > 8 hours	> 8 hours
	Elevation AVG, Max, Min		4226, 9485, 2626	3403, 9485, 1202	1300	2747, 6455, 1193	4427, 8149, 1802
	Percent of Total Source Water Area		6%	23%	< 1 %	29%	42%
Hydrology	Percent of Surface Source Water on AVG		< 1% for Surface, 100% for Ground water	9% by Flow 20% by Water Quality	< 1%	20% including BBS Watershed	70%
	Precip			19 - 50 35.4 Avg	19		52
	Important Water Ways		Willow, and Fourbit Creek	Little Butte & Forks, Antelope, Nichols Branch, Lost, Lake, Joint Systems Canal	Little Butte Creek, Antelope Creek, Military Slough, Stormwater System	Rogue, Elk, Trial, BBC, Reese, McNeill	Forks of the Rogue, Red Blanket, Union Creek
	Significant Surface Water Bodies		Willow Lake	Fish Lake, Agate Lake	Denmen Storm Water Detention Ponds	None	Lost Creek Reservoir
	Irrigation		Minimal	Heavy	Minimal	Medium	Minimal
			Individual Rights	EPID, RRVID, MID & Many Individual Rights	Minimal Individual Resdential POD	EPID & Individual Water Rights	Individual Rights
Barriers	Physical Barrier to Flow		Partial	None*	Partial	None	Complete
			Detention Ponds and Willow Lake		Diversions & Stormwater Detention Ponds		Lost Creek Lake
	Early Warning	Flow	Yes	Yes	No	Yes	NA
		Water Quality	No	Yes 2 hour warning	No	No	No
Vulnerability Factor			High	High	High	Moderate	Low

TABLE 17. EXPANDED INVENTORY OF POTENTIAL CONTAMINANT SOURCES

PCS Inventory Category	Quantity	Average Individual Risk
Agricultural Operations	21	Moderately High
Boarding Stables	2	Moderately High
Confined Animal Feeding Operations (CAFOs)	2	Moderately High
Fish Hatchery/Aquaculture	3	Moderate
Grazing Animals - > 5 Large Animals or Equivalent/Acre	11	Moderately High
Irrigation Canal/Pond	3	High
Airport	11	Moderate
Airport - Maintenance/Fueling Area	11	Moderate
Automotive Services	46	Moderately High
Auto - Body Shops	1	Moderately High
Auto - Car Washes	3	Moderately High
Auto - Gas Stations	8	Moderate
Auto - Gas Stations - Historic	1	Moderately Low
Auto - Repair Shops	14	Moderately High
Boat Services/Repair/Refinishing	2	Moderately High
Junk/Scrap/Salvage Yards	6	High
RV/Mini Storage	8	Moderately Low
Waste tire carrier/storage	3	High
Chemical/Petroleum Processing/Storage	56	Moderately High
Chemical Manufacturing	1	High
Chemical/Petroleum Processing/Storage	31	Moderately High
Cleaning and Supply Services	1	Moderately High
Hazardous Waste Generator, Conditionally Exempt	17	High
Hazardous Waste Generator, Large Quantity	1	High
Hazardous Waste Generator, Small Quantity	3	Moderately High
Pesticide/Fertilizer/Petroleum Storage, Handling, Mixing, & Cleaning Areas	1	High
Petroleum Wholesaler	1	High
Commercial Food Processing	4	Moderately High
Food Processing	4	Moderately High
Contaminated Sites	24	Moderate

Historic Waste Dumps/Landfills	1	Moderately Low
Known Contamination listed as NFA (Sites/Plumes/Spills from ECSI)	11	Moderately Low
Known Contamination Sites/Plumes/Spills (ECSI)	12	High
Equipment Maintenance Shop	10	Moderate
Homesteads - Rural - Machine Shops/Equip Maintenance	5	Moderate
Maintenance Shop/Equipment Storage - Not Transportation Related	2	Moderately Low
Maintenance Shop/Equipment Storage - Transportation Related	2	Low
Miscellaneous Equipment Maintenance	1	High
Fire Station	8	Moderately Low
Fire Station	8	Moderately Low
General Commerce	63	Moderate
Communications Office	29	Moderately Low
Furniture/Lumber/Parts Stores	8	Moderately High
Office Buildings/Complexes	1	Moderate
Other - General Merchandise/Retail Store	3	Moderate
Others - Gov't/Business/NGO Services	2	Moderate
Schools	20	Moderately Low
Golf Courses/Parks/Heavy Landscaping	21	Moderate
Golf Courses	5	Moderately High
Lawn Care - Highly Maintained Areas	8	Moderate
Parks	8	Moderate
Housing	19	Moderate
Apartments and Condominiums	2	Moderate
Future Land Development - Residential	1	Moderately High
Housing - High Density - > 1 House/0.5 Acres	16	Moderate
Landfill	8	High
Landfill/Dumps	1	High
Municipal/Industrial Landfill	7	Moderately High
Manufacturing	18	High
Cement/Concrete Plants	1	Moderately High
Construction Company	2	Moderately Low
Construction/Demolition Area	2	Moderately High
Home Manufacturing	2	Moderately High
Metal Plating/Finishing/Fabrication	5	High
Miscellaneous Manufacturing	6	High
Medical	10	Moderate
Medical/Vet Offices	10	Moderate
PCS Inventory Category	Quantity	Average Individual Risk
Mining	70	Moderately Low
Mining Activities - Active - sand/gravel/rock	1	Moderate
Mining Activities - Active - sand/gravel/rock/soil	23	Moderate
Mining Activities - Inactive - other than sand/gravel/rock/soil	8	Moderately Low
Mining Activities - Inactive - sand/gravel/rock/soil	38	Moderately Low
Other	4	Moderately High
Others (List)	4	Moderately High
Permitted Discharges	47	Moderately High
DEQ Permitted Stormwater Discharges (NPDES or WPCF)	16	High
Graywater reuse/disposal or Industrial reuse	1	Moderate

Industrial or Process Wastewater - WPCF and NPDES/ Lagoons and Liquid Waste	14	Moderately High
Industrial/Commercial Injection Wells/Drywells/Sumps - Class V UICs	2	Moderate
Other Injection/Dry Wells, Sumps - Class V UICs	1	Moderate
Sewage Treatment Plants	3	Moderate
Stormwater Retention Basins	1	High
Stormwater Wastewater Injection/Dry Wells, Sumps - Class V UICs	4	Moderate
Wastewater Treatment Plants/Collection Stations	5	Moderately High
Recreation	13	High
River Recreation - Heavy Use Boat Launch and/or Campground	13	High
Reservoir/Dam	3	Moderate
Upstream Reservoirs/Dams	3	Moderate
Septic System	40	Moderately Low
Domestic Sewage Treatment with On-Site System/ Large Capacity Septic Systems Serving > 20	10	Moderate
Homesteads - Rural - Septic Systems < 1/Acre	16	Moderately Low
Large Capacity Septic Systems -Class V UIC (serves >20)	14	Moderately Low
Solid Waste	1	High
Waste Transfer/Recycling Stations	1	High
Stream Crossings	126	High
Transportation Corridors - Stream Crossing - Perennial	126	High
Transportation	18	Moderately High
Fleet/Trucking/Bus Terminals	5	Moderate
Parking Lots/Malls - > 50 Spaces	2	High
Railroad Yards/Maintenance/Fueling Areas	1	High
Transportation Corridors - Freeways/Highways or other heavy-use roads	9	Moderately High
Transportation Corridors - Railroads	1	High
Underground Storage Tank	77	Moderately Low
UST - Confirmed Leaking but listed as NFA - DEQ LUST List	61	Moderately Low
UST - Confirmed Leaking Tanks - DEQ LUST List	5	Moderate
UST - Upgraded and/or Registered - Active (may also have decommissioned tanks on site)	11	Moderately Low
Utility Power	12	Moderately High
Transmission Lines - Right-of-Ways	1	Moderate
Utility Stations - Maintenance/Transformer Storage (inc. Hydroelectric Power Equip.)	1	Moderately High
Utility Stations/Powerplants - Maintenance/Transformer Storage	10	Moderately High
Warehouse	9	Moderate
Warehouses	9	Moderate
Wells	4	Moderate
Wells - Abandoned	3	Moderate
Wells - Residential/Commercial/Industrial	1	Moderately Low
Wood Mills	17	High
Composting Facilities	2	Moderately High
Wood Preserving/Treating	5	High
Wood/Pulp/Paper Processing and Mills	10	High
Average Risk	760	Moderately High

Appendix D. References

The following Resources were used to inform Medford Water's Source Water Protection Plan

Medford Water:

1. Water Management and Conservation Plan (WMCP), for Medford Water by CH2M, June 2017
2. BBS Watershed Geohydrologic Report 1990
3. Big Butte Springs Wellhead Protection Plan 1997
4. Forest Management Plan 2020
5. Emergency Operations Plan 2003
6. BBS and RR DWPP Draft 2006
7. CIP Plan
8. Water Rights Master Plan 2010
9. Big Butte Springs and Robert A. Duff Water Treatment Plant Facility Plan, Dec. 2016
10. Water Distribution System Facility Plan 2017
11. Medford Intake (Duff 2) Biological Assessment DEA/ Medford Water 2016
12. Medford Intake (Duff 2) Biological Opinion, NMFS 2019

External Documents

13. RBP Rogue Restoration Action Plan, Dec. 2016, v. 1.1

RRWC:

14. Little Butte Creek Water Quality Implementation Plan 2019
15. Coho Strategic Action Plan, 2019
16. Watershed Assessments for upper and middle Rogue

The Freshwater Trust:

17. Sediment Load Model
18. Basin Scout

DEQ:

19. Rogue TMDL 2008
20. Water Quality Status and Action Plan 2011
21. Drinking Water Protection Program

OHA-DEQ:

22. Oregon Public Water Systems - Surface Water Resource Guide, Feb. 2019
23. Oregon Public Water Systems - Groundwater Resource Guide, Oct. 2017

ODFW:

24. Fall Chinook Conservation Plan 2013
25. Spring Chinook Conservation Plan 2007
26. Oregon Conservation Strategy 2006

ODA:

27. Inland Rogue Urban Water Quality Management Area Plan

Southern OR Forest Restoration Collaboration & The Nature Conservancy:

28. The Rogue Basin Action Plan for Resilient Watersheds and Forests in a Changing Climate 2013
29. Rogue Basin Cohesive Forest Restoration Strategy 2017

OWRD:

30. Rogue River Basin Study Jan. 1985
31. Integrated WR Strategy 2012
32. USACE – Rogue River Basin – Water Resources Development, Dec. 1961

Water for Irrigation, Streams and Economy (WISE)

33. Preliminary Feasibility Study, Bear Creek and Little Butte Creek Watersheds, Aug. 2009
34. Water Rights Master Plan for the Water for Irrigation, Stream and Economy (WISE) Project, Dec. 2017
35. WISE Alternatives Definition, Sept. 2017
36. WISE Water Allocation Modeling Methodology, Sept. 2017

37. WISE Alternatives Cost Comparison Memorandum, Sept. 2017

AWWA:

38. Source Water Protection Operational Guide to ANSI/AWWA Standard G300, Richard W. Gullick, 2017