Rogue Basin Toxics Summary

December 2020

State of Oregon
Department of
Environmental
Quality

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DEQ is a leader in restoring, maintaining and enhancing the quality of Oregon's air, land and water.

DEQ20-LAB-0039-TR
Version 1.1
Last updated: 12/18/2020

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Executive Summary

In 2015, the Oregon Department of Environmental Quality conducted water quality and sediment sampling of seven rivers and streams in the Rogue River Basin. Oregon Department of Fish and Wildlife staff assisted with collection of fish tissue samples in 2014. This sampling effort builds on previous water quality sampling that DEQ conducted in 2011. The goals of this sampling, and of the Toxics Monitoring Program as a whole, are to gather information on chemicals of concern, to identify potential sources, to make the information available to the public, and to work with internal and external partners to reduce pollutant concentrations.

DEQ staff collected water samples three times in 2015 at 10 locations across the Rogue River Basin. Sampling was scheduled during the spring, summer and late fall to capture both the wet and dry periods of the year. Sediment sample collection at 10 locations and tissue sample collection at one location occurred only once because chemical concentrations are more stable in these media. DEQ analyzed samples for over 500 chemicals from nine chemical groups including current-use pesticides, consumer use products, combustion by-products, dioxins and furans, flame retardants, industrial chemicals, legacy pesticides, PCBs, and metals. Across all media, 152 chemicals were detected. Among the most commonly detected chemicals were arsenic, diuron, and sulfamethoxazole in water samples; DDT and PCBs in sediment samples; and PCBs and mercury in fish tissue samples.

Several of the evaluated chemicals had levels that exceeded applicable state and federal water quality standards or benchmarks for aquatic life, wildlife and human health. Bear Creek, which flows through the communities of Ashland, Talent, Phoenix, Medford and Central Point before joining the Rogue River, had the highest number of chemical detections. Throughout the Rogue Basin, mercury concentrations in fish tissue exceeded the DEQ human health criterion (DEQ 2014). This criterion was established to protect all users including subsistence consumers. Thus, the criterion assumes a consumption rate of 175 grams per day. Anglers are encouraged to know and follow the consumption guidelines when consuming fish or shellfish in the basin (OHA 2013). Concentrations of PCBs and DDT in sediment samples at several locations in the basin exceeded DEQ bioaccumulation screening levels (DEQ 2007). These screening levels indicate a concentration below which adverse effects to human health are not expected.

Based upon the results of this study, DEQ staff selected four monitoring locations that will become a part of the Toxics Monitoring Program's trend network (Figure 1). Chemical detections, exceedances of applicable criteria, spatial coverage, classification in the 2018/2020 Integrated Report, and the need for background or reference sites were all considered when selecting which monitoring locations to include in the statewide trend network. The Toxics Monitoring Program will sample these locations annually rather than every five years as in previous efforts, which will help DEQ understand trends over the broadest geographical area while maximizing limited lab and staff resources. Sample collection will follow the established protocols noted above. The results from this study may also be used to inform permitting and regulatory programs such as total maximum daily load (TMDL), national pollutant discharge elimination system, and stormwater programs. The results may also be used in the Integrated Report, which reports the status of Oregon's waters to EPA, or as a part of the toxics reduction strategy, a cross media program that supports ongoing toxics reduction efforts within DEQ, or to prioritize the drinking water source areas for other partnership programs.

Introduction

In 2007, the Oregon Legislature funded the Oregon Department of Environmental Quality to begin the Statewide Water Quality Toxics Monitoring Program. The program identified four main goals:

1. Gather information to characterize the presence and concentration of chemicals of concern in Oregon's waters.
2. Use this information to identify potential sources of these chemicals.
3. Present and make available information gathered for public benefit.
4. Work with DEQ internal groups, community groups, and Oregon citizens to identify opportunities for reducing these pollutants.

To achieve these goals, the DEQ Laboratory and Environmental Assessment Division developed a five-year monitoring plan. The initial phase of this plan followed a rotating basin approach to conduct reconnaissance sampling of the state's waters and was completed in 2013. DEQ published the water and tissue sampling results from this initial phase of sampling available in two separate statewide reports (2015 Statewide Water Quality Toxics Assessment Report, 2017 Statewide Aquatic Tissue Toxics Assessment). The purpose of this summary is to combine the sampling results from all media types collected in the Rogue Basin during the initial phase of Toxics Monitoring Program sampling with the most recent phase, completed in 2015.

Throughout this summary, chemical concentrations are compared to media specific criteria, benchmarks or screening levels. Oregon's human health criteria are designed to protect people who consume fish and shellfish collected from Oregon waters, and also use the waterbody as a primary source of drinking water. DEQ's aquatic life criteria apply to waterbodies where the protection of fish and aquatic life is a beneficial use as outlined by the Oregon Administrative Rules (https://go.usa.gov/xyxSj). EPA's aquatic life benchmarks were developed for 635 current use pesticides based on toxicity values supported by scientific studies. Concentrations below EPA's aquatic life benchmarks are not expected to harm aquatic life (EPA 2014), and these benchmarks were only used when DEQ did not have established criteria for a particular chemical.

Screening levels for chemicals in sediment estimate the likelihood that a chemical poses a threat to humans or wildlife as a result of eating fish, shellfish, or other aquatic organisms from a particular location (DEQ 2007). DEQ's human health criteria for fish and shellfish assume a consumption rate of 175 grams daily or twenty-three 8-ounce meals per month. Additionally, these criteria are intended to ensure that waterbodies support the beneficial use of "fishing" and that fish are safe to consume, rather than how much fish is safe to eat (DEQ 2017). Consequently, DEQ's standard is more stringent than most other state fish tissue standards and are protective of subsistence consumers. Oregon Health Authority (OHA) fish advisory program's screening levels identify concentrations of contaminants in fish that are not expected to harm human health assuming a consumption rate of four 8-ounce meals per month (OHA 2013). Acceptable tissue levels for humans and wildlife are concentrations of bioaccumulative chemicals in fish tissue that are too low to cause adverse effects on the organisms that consume fish from the sampling locations (DEQ 2007). If no DEQ criterion or screening level existed, then the lowest regional or national criterion or screening level was used to ensure a conservative report of exceedances across the basin for each media type.

The initial monitoring location selection process for the 2011 sampling effort focused on locations that receive integrated water from multiple watersheds within the basin. Water samples from one monitoring location were sampled in conjunction with South Coast Basin sampling in 2013 for logistical reasons. Results from this location were considered part of the 2015 sampling effort for this summary because the analyte list and analytical methods were similar. For the 2015 sampling effort, most monitoring locations were selected based on land use, point and non-point source pollution, and input from local stakeholders and basin coordinators. Three locations were sampled during both sampling efforts (Table 1). Figure 1 indicates the matrices collected and sampling effort during which each monitoring location was sampled in the basin. Water samples were collected three times (June, August, and November), sediment and tissue samples were collected only once. Tissue sample collection occurred in 2010, to accommodate the

Gold Ray Dam removal, and 2014, in conjunction with Oregon Department of Fish and Wildlife sampling underway in the basin. A short, basin specific summary of the tissue results from the previous sampling efforts are presented at the end of this report. Appendices A-C detail the detection results from both sampling efforts by media type.

Table 1 – Rogue Basin sampling locations. Asterisks indicate sites included in the Toxics Monitoring Network.

Station	Site Description	Matrices Sampled in 2010-2011	Matrices Sampled in 2013-15
10414	Rogue River at Lobster Creek Bridge		Water
10418*	Rogue River at Robertson Bridge (Merlin)	Water, Tissue, and Sediment	
10422*	Rogue River upstream of Gold Ray Dam	Tissue	
10423	Rogue River at Hwy 234 (Dodge Park)	Water	Water and Sediment
10427	Grave Creek at mouth		Water and Sediment
10428	Applegate River at Hwy 199 (near Wilderville)	Water	
10434	Bear Creek at Valley View Road (North of Ashland)	Water	Water and Sediment
10602	Little Butte Creek at Agate Road (White City)	Water and Sediment	
11051*	Bear Creek at Kirtland Road (Central Point)	Water and Sediment	Water and Sediment
11375	Rogue River at Casey State Park	Water	
11461	Evans Creek at Palmerton Park		Water and Sediment
11482	Illinois River downstream of Kerby	Water and Sediment	
11840	Applegate River at Fish Hatchery Road Bridge		Water and Sediment
18390	Ashland Emigrant Lake	Tissue	
25814	Sucker Creek – Holland Bridge		Water and Sediment
26632	Little Butte Creek at bridge in town of Lakecreek		Water and Sediment
30195	Rogue River downstream of Gold Ray Dam		Water and Sediment
34860	Rogue River at RM 120.76, 200 yds. upstream of Gold Hill PWS intake	Water	
36283	Applegate Reservoir, SW Arm (Inlet of Cougar and Carberry Creeks)	Tissue	

37826*	Rogue River at RM 7.4	Tissue
38107	Rogue River at Lathrop County Park	Water and Sediment

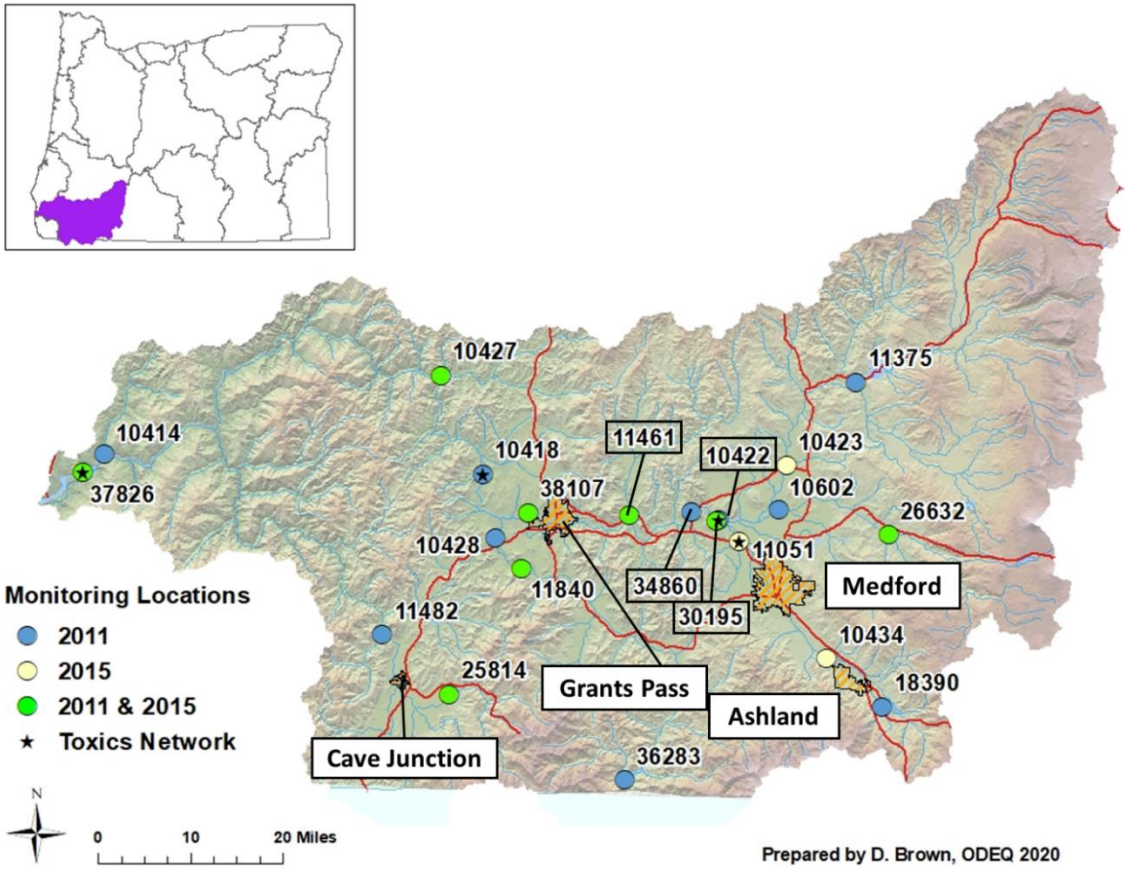

Figure 1 – Map of the study area with monitoring locations by sampling effort. Visit the Water Quality Toxics Monitoring Program webpage for a map of the whole state.

Water sample results

Seasonality

In order to capture seasonal use patterns and hydrologic differences, collection of water samples took place three times during each sampling year. These grab samples were collected from all monitoring locations over a week long period each spring, summer and fall/winter. The sampling schedule was chosen to reflect the descending, low water, and ascending phases of the hydrograph (Figure 2). Figure 3 shows the unique number of chemicals detected by chemical group in each of the seasonal sampling events. This figure does not include plant and animal sterols or chemical groups not detected during the 2011 and 2015 sampling efforts. Detections of the four sterols, however, occurred during each season. Current use pesticides were detected more frequently and in higher concentrations in the spring and fall sampling efforts than during the summer sampling effort. This is in line with the changing of the hydrograph and typical pesticide application timing. Legacy pesticides also displayed a slight seasonal tendency, however, it did not follow the same pattern as the current use pesticides. Legacy pesticides have a long residence time in sediment, are banned from current application, and would not be expected to follow typical application patterns.

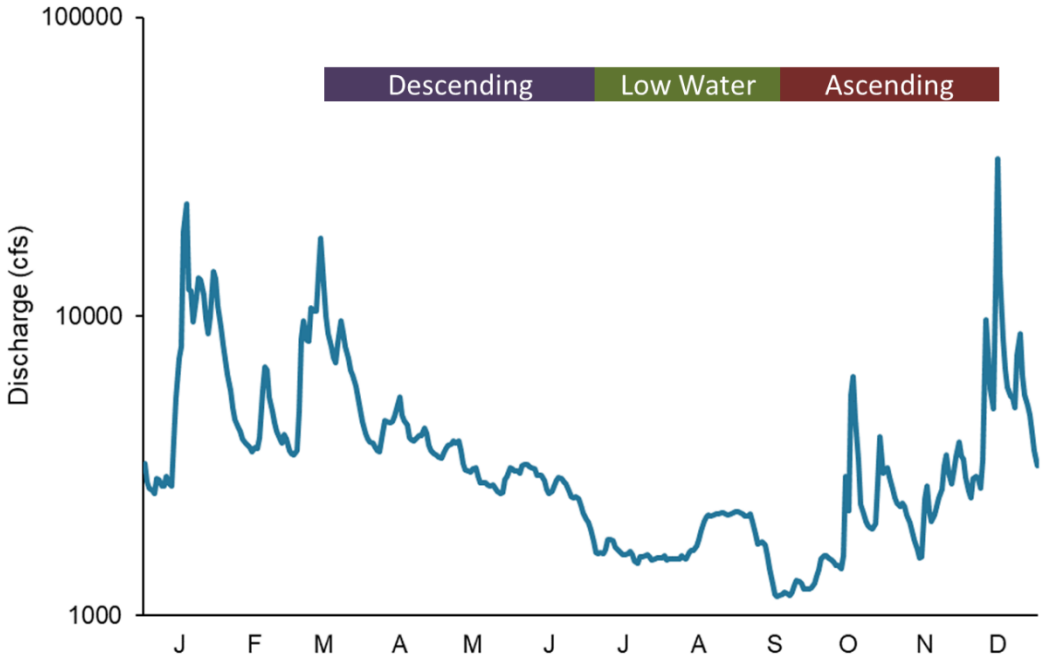

Figure 2. Hydrograph with the descending, low water, and ascending arms identified.

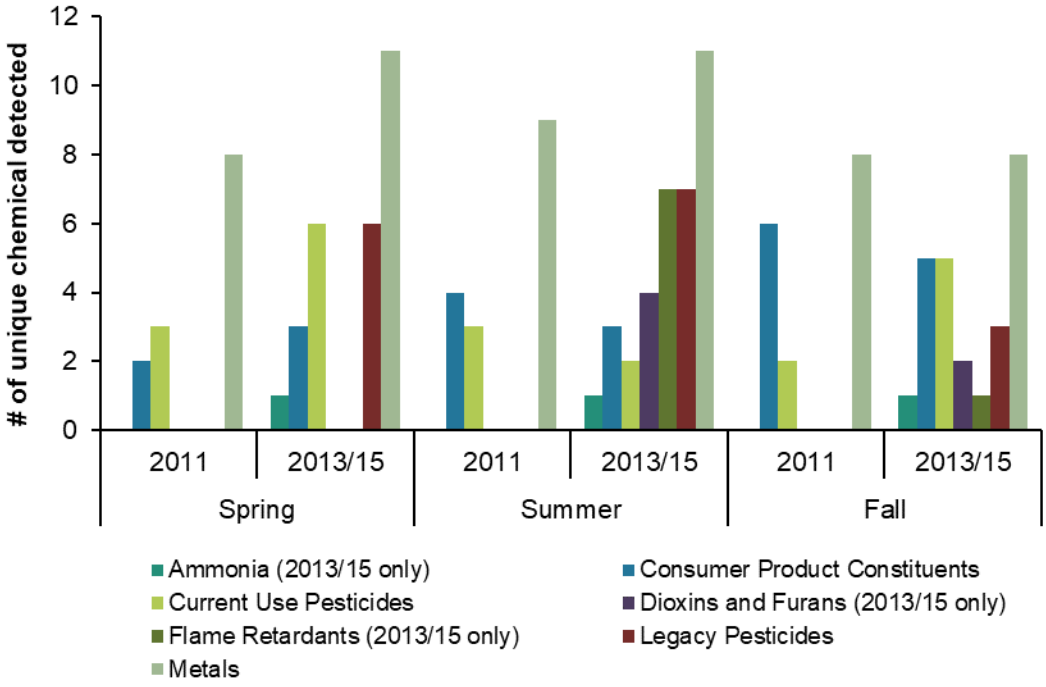

Figure 3. Seasonality of detections in the Rogue Basin water samples by chemical group and year.

Metals made up the majority of the unique detections in all seasons during both sampling years. Legacy pesticides, current use pesticides, flame retardants, and consumer product constituents also had high numbers of detections at times during the 2015 sampling effort. Seasonal samples during this effort

contained an average of 29 unique chemicals compared to an average of 15 unique chemicals in 2011. The difference in the averages was likely due to the use of analytical methods with lower minimum reporting limits for both current use and legacy pesticides in the analysis of 2015 samples. Additionally, the flame retardant and dioxin/furan chemical groups were not included in the analysis of the 2011 samples, due to lab capacity (Table 2).

Table 2 – Analytical methods added for the analysis of samples collected in 2013 and 2015.

Analytical Method	Chemical or Chemical Group
ASTM D6919-09	Ammonium
EPA 1699	Current use and Legacy Pesticides
EPA 1613	Dioxins and Furans
EPA 1614	Flame retardants
EPA 1668C	Polychlorinated Biphenyls (PCBs)
EPA 1632A	Inorganic Arsenic

Metals

This group includes all metals for which Oregon has existing water quality criteria. These metals occur naturally and may be enriched by human activities. Because of this, detections of these metals are common in water. Water samples contained nine different metals in 2011 compared with 11 metals detected in 2015. Two monitoring locations, both on Bear Creek (#10434 and #11051), had the highest number of unique detections in the basin (11). Both locations were among the locations with the highest unique detections during the 2011 sampling effort as well. Possible sources include wastewater treatment plant discharges and urban runoff, as these locations are located in urban areas between Interstate 5 and Highway 99.

Inorganic arsenic, which is naturally occurring in the Rogue Basin, exceeded DEQ's human health freshwater criterion (2.1 µg/L) at two locations in 2015, Bear Creek at Kirtland Road (#11051) and Little Butte Creek (#26632). Although inorganic arsenic was not included in the 2011 analysis at the Bear Creek at Kirtland Road or Little Butte Creek (#10602) locations, the dissolved and total recoverable concentrations at both indicated potential for exceedance. Arsenic was also found at high concentrations in samples collected as part of groundwater well sampling conducted during 2011 and 2015 in the Rogue Basin (DEQ 2013; DEQ 2016). While concentrations between groundwater and surface water are not directly comparable, this is an indication that arsenic contamination is a concern in the basin. DEQ's arsenic criteria were derived based on the consumption of two liters of untreated water, and were established to protect all users including subsistence consumers. Concentrations below these criteria are not expected adversely affect human health.

Iron exceeded DEQ's freshwater aquatic life chronic criterion (1000 µg/L) at two locations in 2015. Both iron exceedances occurred in Bear Creek (#10434 and #11051) and while these locations were sampled in 2011, neither exceeded the criterion, at that time. The only aquatic life criterion exceedance in 2013 for iron was at the Rogue River at Lobster Creek bridge (#10414) location. These exceedances support the 303(d) category 5 listings for these waterbodies in the 2018/2020 Integrated Report.

Legacy Pesticides

Pesticides are a broad class of chemicals that includes insecticides, herbicides and fungicides. Legacy pesticides refer to chlorinated insecticides, such as DDT, banned in the United States. Despite the ban,

legacy pesticides and associated derivatives are frequently detected in water bodies across the state. Legacy pesticides are known to sequester in sediment where physical processes (e.g., photo-degradation by sunlight) or biological processes (e.g., bacterial metabolism) break parent pesticides down into different chemicals, and these degradates may be more water soluble than the parent pesticide.

Three such breakdown products of DDT (4,4'-DDD, 4,4'-DDE, and 4,4'-DDT) were detected at concentrations that exceeded DEQ human health criteria at the Bear Creek at Kirtland Road location (#11051) in 2015. The concentration of total DDT, measured as the sum of the degradates in one sample, exceeded the DEQ freshwater aquatic life chronic criterion. No other detections of DDT or its degradates occurred across the basin. These chemicals were detected by other DEQ programs sampling in the basin, however. DDT, or one of its breakdown products, was found in five wells included in DEQ's groundwater sampling of the Rogue Basin in 2015 (DEQ 2016). None of which exceeded the health based screening level. The Pesticide Stewardship Partnerships (PSP) Program conducted sampling in the Rogue Basin during 2014, however, the detection frequency of DDT was low (2%) in the 53 samples collected (K. Masterson, personal communication October 28th, 2020).

Three other legacy pesticides were detected at the Bear Creek at Kirtland Road location (dieldrin, endosulfan sulfate and endrin ketone). The detection of dieldrin exceeded the DEQ human health criterion. Gamma-BHC, also known as lindane, was detected at the Bear Creek at Valley View Road location (#10434) about 18 miles upstream of the Kirtland Road monitoring location. Figure 4 shows the impact ratio for each legacy pesticide detection. The impact ratio is determined by dividing the concentration by the criterion. Values greater than one indicate a concentration that exceeds the criterion. Legacy pesticides were included in the 2011 analysis; however, none were detected. The appearance of legacy pesticides in the 2015 samples is likely due to new analytical methods, which reduced the detection limits substantially and allowed for more detections. These data were not captured in the 2018/2020 Integrated Report because they were released after the call for data window closed.

Current Use Pesticides

Current use pesticides can enter surface waters from agricultural fields, forests, urban lawns, and roadside spraying. The use of new analytical methods likely influenced the number of current use pesticide detections, as the number of unique chemicals detected rose from four in 2011 to seven in 2015. Of the chemicals detected in 2015, three (2,4-D, 2,6-dichlorobenzamide and dichlobenil) were included in the 2011 analysis, but not detected. Glyphosate, or RoundUp, and its breakdown product aminomethylphosphonic acid were added to the 2015 analysis and detected at three monitoring locations. In fact, all of the current use pesticide detections in 2015 occurred at three monitoring locations, Bear Creek at Valley View Road (#10434; 4), Bear Creek at Kirtland Road (#11051; 6) and Rogue River at Lathrop County Park (#38107; 3). As in 2011, none of the current use pesticide detections in 2015 exceeded EPA screening benchmarks. In one case, the concentration of diuron at the Bear Creek at Kirtland Road monitoring location decreased between the two sampling efforts. This was not the case for diuron at the other Bear Creek location or sulfometuron-methyl at the Kirtland Road location.

The PSP sampling in the area detected 17 unique chemicals including diuron, glyphosate, and aminomethylphosphonic acid. These chemicals were the most commonly detected pesticides in the PSP sampling with diuron detections occurring in nearly 93% of the samples collected (K. Masterson, personal communication October 28th, 2020).

Consumer product constituents including pharmaceuticals

The laboratory analyzed water samples for 28 consumer product constituents including pharmaceuticals in 2015; five of which were detected. Sulfamethoxazole, a common antibiotic, was again the most

commonly detected chemical as it was in 2011. The Bear Creek at Valley View Road location (#10434) had the highest number of unique detections with five, which is down from six detected at the same location in 2011. This location is downstream of Ashland and its wastewater treatment plant, which may contribute to the detection of consumer products. Bis(2-ethylhexyl)phthalate, which is commonly used in manufacturing PVC, was detected at concentrations above the DEQ human health criterion at two locations in 2011 (Rogue River at Robertson Bridge (#10418) and Illinois River downstream of Kerby (#11482)), but was not detected in 2015 samples.

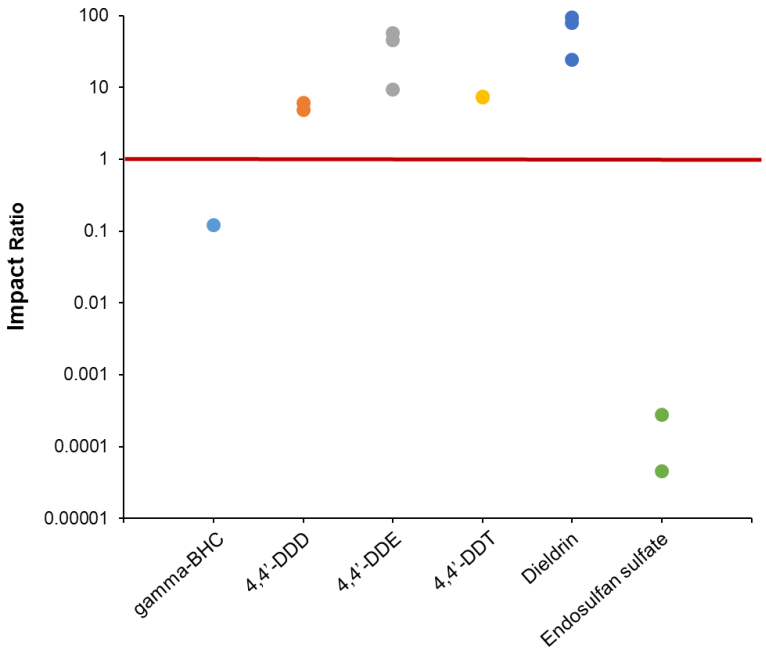

Figure 4. Impact ratio of legacy pesticide detections in 2015 from the Rogue River Basin.

Dioxins and Furans

Dioxins and furans share a similar chemical structure, persist in the environment, bioaccumulate in organisms, and are toxic to humans and wildlife. DEQ's analysis of this chemical group included 20 chemicals produced as by-products during the manufacture of pesticides, bleached paper manufacturing, and fossil fuel combustion as well as from sources such as wood stoves and forest fires (EPA 2015). Three dioxins and one furan were detected in 2015. OCDD and 1,2,3,4,6,7,8-HpCDD were the most commonly detected and were found at four locations in the basin. None of the chemicals in this group have an established criterion or benchmark. Three chemicals were detected in samples from both the Bear Creek at Kirtland Road (#11051) and Evans Creek at Palmerton Park (#11461) locations, while the Bear Creek at Valley View Road (#10461) and Rogue River at Lathrop County Park (#38107) locations had two distinct detections each. The analytical method for this chemical group was not included in the analysis of 2011 samples, so no comparison can be made between sampling efforts.

Flame Retardants

Flame retardants, or polybrominated diphenyl ethers (PBDEs), are a group of chemicals that are added to a variety of products such as laptops, automobiles, furniture, and textiles. When these chemicals are released from products, they can enter the aquatic environment through air deposition, landfill leachate, and wastewater discharges. PBDEs were detected at four locations in the Rogue Basin. The largest number of PBDEs (4) were detected at the Sucker Creek (#25814) location. PBDEs 100 and 209 were the

most commonly detected being found at two locations each. None of the chemicals in this group have an established criterion or benchmark. The analytical method for this chemical group was not included in the analysis of 2011 samples, so no comparison can be made between sampling efforts.

Industrial chemicals and ammonium

This group of analytes includes a selection of chemical intermediates used in the production of pesticides, pharmaceuticals, rubber, consumer products, etc. This chemical group included three analytes during the 2011 sampling effort. This number was increased to 20 analytes for the 2015 sampling effort, however, none of the analytes were detected during either sampling effort.

Ammonium is a naturally occurring compound that is also commonly found in waste products, such as treated sewage effluent and animal manure, and may be toxic to aquatic organisms. It is included as an industrial compound because of its use in fertilizers and dyes. Ammonium's toxicity is dependent on pH and temperature and increases as pH and temperature increase. Detectable levels of ammonium occurred in samples from 6 of the 10 locations sampled in 2015. Locations with ammonium detections included Bear Creek at Valley View Road (#10434), Bear Creek at Kirtland Road (#11051), Evans Creek at Palmerton Park (#11461), Little Butte Creek at Lake Creek (#26632), Rogue River downstream of Gold Ray Dam (#30195), and Rogue River at Lathrop County Park (#38107). None of these locations are located within 1.5 miles downstream of a wastewater treatment plant or commercial animal feeding operation, which are common sources of elevated ammonium concentrations. Ammonium was not included in the 2011 analysis. None of the 2015 samples exceeded the current aquatic life water quality criterion.

Plant and animal sterols

The laboratory measured four plant and animal sterols in the Rogue Basin. These sterols occur naturally in the environment but also may be enriched by humans and human activities. None of the sterols detected currently have a screening level or water quality criterion. Additional work is required to evaluate these data and their implications and relationship to other chemicals fully.

The predominant source of the two plant sterols analyzed, beta-sitosterol and stigmastanol, is terrestrial plants. Other sources of these sterols may be industrial processes (wood pulping, food oils) and modern pharmaceutical supplements. Beta-sitosterol and stigmastanol were detected at all locations. Levels varied with the lowest concentrations detected at the Sucker Creek location (#25814). The highest concentration of beta-sitosterol was detected at the Evans Creek (#11461) and the highest concentration of stigmastanol at the Little Butte Creek at Lakecreek (#26632) locations.

Measured levels of the animal sterols, cholesterol and coprostanol varied across the basin with the lowest concentration of cholesterol detected at the Rogue River at Hwy 234 (#10423) location and the lowest concentration of coprostanol at the Grave Creek (#10427) locations and the highest concentration of cholesterol detected at the Little Butte Creek location (#26632) and the highest concentration of coprostanol at the Rogue River at Lathrop County Park (#38107) location. While cholesterol is ubiquitous and found in a variety of different species, coprostanol is specific to fecal matter from humans and other mammals (e.g., cattle) as it is formed during digestion of cholesterol. The ratio of coprostanol to cholesterol may be used to evaluate contamination by human sewage. Ratios measured at all sites in this study were less than one, indicating that the source of coprostanol is likely biogenic (e.g., livestock), rather than an anthropogenic (e.g., human) source.

Sediment sample results

Metals

While the analysis of 2011 sediment samples did not include metals, they were included in the analysis and detected at each monitoring location during the 2015 sampling effort. The monitoring location with the highest number of unique metals detected was the Bear Creek at Valley View Road (#10434) location with 12 metals detected. This location is downstream of Ashland and below bridge that receives high traffic between Interstate 5 and Highway 99, which may influence metals concentrations. No fewer than 10 of the 16 metals included in the analysis were detected at any site in 2015.

Due to the difficulty in associating concentrations of metals in animals and fish with concentrations in sediment as well as the fact that metals are naturally occurring in the environment, background concentrations are used instead of screening levels (DEQ 2007). These background concentrations are intended for comparison use only as they are values representing the 90th or 95th percentile of regional soil samples. Four of the detected metals in the basin have DEQ background concentrations, rather than screening levels. Detections of cadmium, lead and mercury were below the background concentrations. One sample, collected from Little Butte Creek, was over the background concentration for arsenic. While this detection may indicate anthropogenic enrichment at this location, it does not indicate a potential health risk to humans or aquatic life, only that the concentration detected is higher than the regional default background concentration.

Legacy Pesticides

Legacy pesticides are known to accumulate and persist in sediment. The analysis of the 2011 samples consisted of 26 chemicals. The analysis of 2015 samples added four chemicals (endrin, cis-chlordane, trans-chlordane, and trans-nonachlor) to those included in 2011. DDT, or one of its degradates, was the most commonly detected chemical. Screening levels for the individual degradates of DDT do not exist, but there is a screening level of 0.00033 mg/kg (DEQ 2007) for the total concentration of all degradates in a sample. The highest concentration of total DDT in 2011 was detected at the Bear Creek at Kirtland Road (#11051) location, and was over 26 times greater than the screening level. In 2015, the highest concentration of total DDT occurred at the Bear Creek at Valley View Road (#10434) location, and was more than three times greater than the screening level. Two other locations in 2015 (Bear Creek at Kirtland Road and Rogue River at Lathrop County Park (#38107)) also exceeded the total DDT screening level. A comparison of the concentrations of total DDT found at the Bear Creek at Kirtland Road location shows a drop of nearly 90% from 2011 to 2015. This location may also be impacted by several irrigation districts, which withdraw flow upstream and use the creek channel to transfer agricultural runoff downstream (K. Jackson, personal communication, October 30th, 2020).

Dieldrin exceeded the DEQ sediment screening level at two locations in 2011 (Rogue River at Robertson Bridge (#10418) and Bear Creek at Kirtland Road). All other legacy pesticide detections in the basin were below existing screening levels. The sediment bioaccumulation screening level represents the concentration at or below which chemicals would not be expected to affect the human population consuming more than 17 grams, about a tablespoon, of fish or shellfish per day from these waterways (DEQ 2007).

Current Use Pesticides

No current use pesticides were included in the 2011 sediment analysis. In 2015, DEQ monitored for a short list of current use pesticides, most of which are pyrethroid pesticides. The non-pyrethroid pesticides analyzed for this study, trifluralin, chlorpyrifos, and oxyfluorfen, have a similar affinity to partition to

sediments as pyrethroids. These pesticides are usually sold as wettable powders or granules under names like Talstar, Baygon or Temprid. None of the current use pesticides included in the analysis were detected in the 2015 sediment samples.

Dioxins and Furans

Thirteen of the 20 chemicals in this group were detected during the 2011 or 2015 sampling efforts. Detections occurred at three locations in 2011 (Rogue River at Robertson Bridge (#10418), Little Butte Creek at Agate Road (#10602) and Bear Creek at Kirtland Road (#11051)) and at all locations in 2015 except the Grave Creek (#10427) location. While screening values exist for these compounds, none of the detections in 2011 exceeded the applicable concentration. In the 2015 samples, four chemicals exceeded DEQ sediment screening level. One chemical, 2,3,4,7,8-PeCDF, was detected above its screening level at the Bear Creek at Valley View Road (#10434) location. Three chemicals were detected above their screening levels at the Little Butte Creek location in Lake Creek (#26632). As with the screening levels for legacy pesticides, these screening levels represent the concentration at or below which chemicals are not expected to affect human health (DEQ 2007).

A number of forest fires occurred in the Rogue Basin within a year of each sampling effort, which could influence the dioxin and furan concentrations at monitoring locations within the basin. OCDD, which was detected in eight of the fourteen sediment samples collected, tends to be associated with forest fires. The full effect of these fires and a direct causal link, however, is unknown. Three dioxin or furan congeners were detected in 2011 and 2015 samples collected at the Bear Creek at Kirtland Road location and in all three cases the concentrations detected in 2015 were substantially lower (Figure 5).

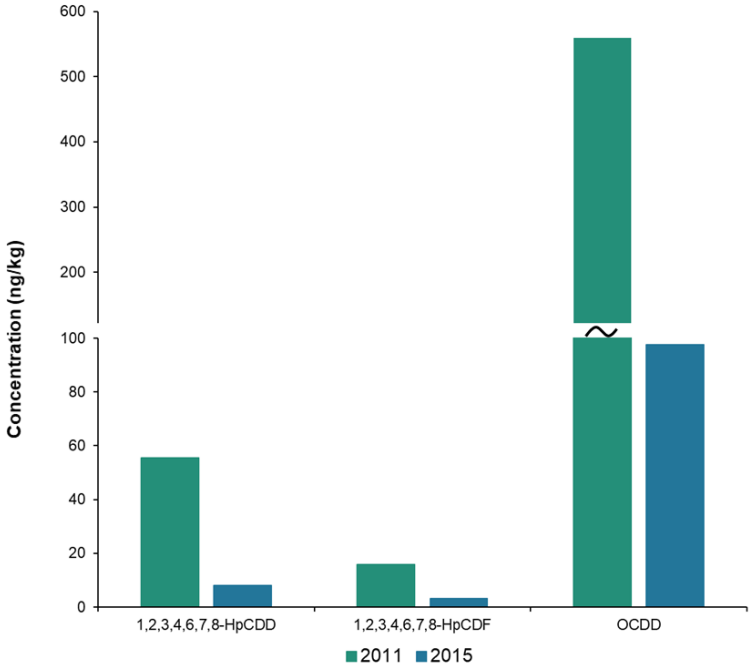

Figure 5. Comparison of dioxin and furan concentrations found in sediment samples from the Bear Creek at Kirtland Road location (#11051) in 2011 and 2015.

Flame retardants

Fifteen PBDEs were detected in samples collected in 2011 or 2015. Detections occurred at 10 of the 14 sediment sampling locations over the two sampling efforts. The highest number of PBDEs occurred at the

Bear Creek at Kirtland Road (#11051) location in 2011 and at the Rogue River downstream of Gold Ray Dam (#10422) location in 2015. Like dioxins and furans, these chemicals persist in the environment and bioaccumulate in organisms. None of the detected flame retardants have established bioaccumulation screening levels.

Polychlorinated biphenyls (PCBs)

PCBs are a class of 209 industrial chemicals historically used as electrical insulating fluid in transformers and capacitors. The manufacture and use of PCBs were banned or limited in 1979 due to their ability to persist in the environment and toxicity to humans and wildlife. However, low levels (below 50ppm) in products are not regulated and PCBs can be inadvertent by-products of some manufacturing processes, such as those associated with colorants.

PCBs were detected at two monitoring locations in 2011 and three locations in 2015. Twenty-three PCBs were detected at the Bear Creek at Kirtland Road (#11051) location in 2011 and at the Rogue River downstream of Gold Ray Dam (#10422) location in 2015. The screening level for total PCB, the sum of all congener concentrations detected in one sample, was exceeded at two locations in 2011 (Rogue River at Robertson Bridge (#10418) and Bear Creek at Kirtland Road) and three locations in 2015 (Sucker Creek (#25814), Little Butte Creek at Lakecreek (#26632) and Rogue River downstream of Gold Ray Dam). The Rogue River location downstream of Gold Ray Dam had the highest concentration of PCBs in either sampling effort (Figure 6). This location is downstream of not only the former Gold Ray dam, which had power generation capabilities, but also White City, which is a major industrial area for metals recycling and historic timber processing (K. Jackson, personal communication, October 30th, 2020).

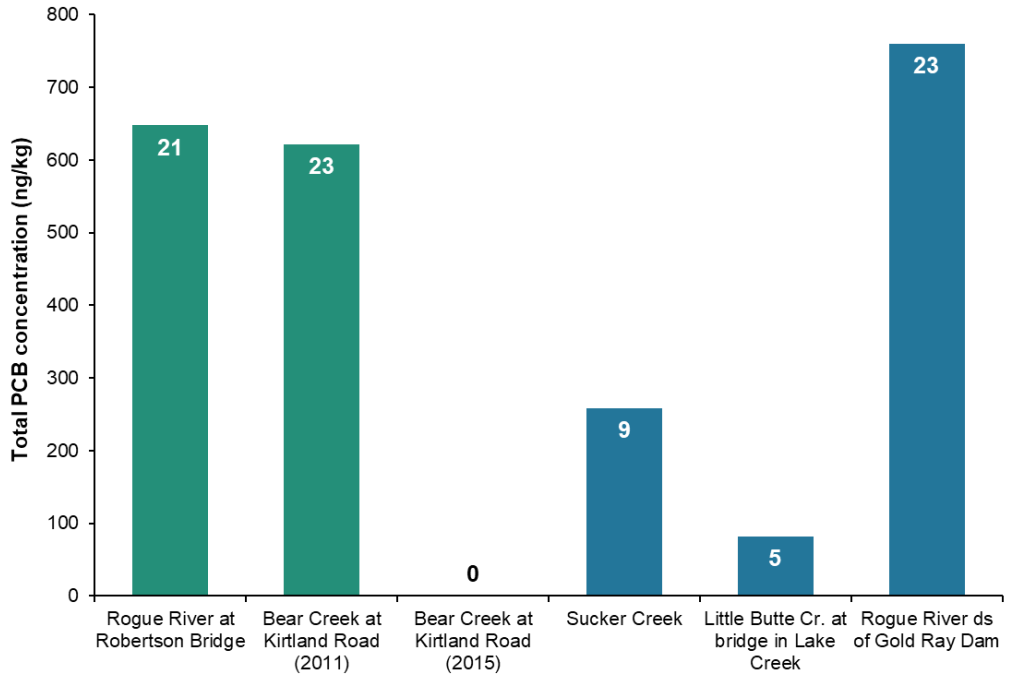

Figure 6. Total PCB concentration in sediment samples from the Rogue River Basin. Green bars indicate locations sampled in 2011. Blue bars indicate locations sampled in 2015. The red line indicates the total PCB bioaccumulation screening level value of 48 ng/kg. The numbers in the bars are the number of types of PCB detected.

In addition to the total concentration of PCBs in a sample, only three of the PCB congeners detected in either sampling effort have an established screening level. Screening levels for PCB-105 and PCB-118

were exceeded three times over the two sampling efforts. These exceedances occurred at the Rogue River at Robertson Bridge (#10418) location in 2011, Bear Creek at Kirtland Road location in 2011, and Rogue River downstream of Gold Ray Dam location in 2015.

PCBs sequester to sediments and can bioaccumulate in organisms meaning that once these chemicals enter the environment, they are likely to remain for an extended period of time. Among other potential health risks, the EPA identifies PCBs as a potential carcinogen (EPA 2020). The sediment bioaccumulation screening level values used in this report assume a regular daily consumption of 17 g of fish or shellfish from the waterbody for the potential for adverse health effects in humans.

Tissue sample results

Tissue sample collection occurred at four locations in 2010 and one location in 2014. The sample dates were altered to accommodate the removal of the Gold Ray Dam in 2010 and to collect samples in conjunction with Oregon Department of Fish and Wildlife sampling occurring in the basin in 2014. Sampling included four different fish species: Largemouth Bass (Micropterus salmoides), Smallmouth Bass (Micropterus dolomeiu), Rainbow Trout (Oncorhynchus mykiss), and Northern Pikeminnow (Ptychocheilus oregonensis). All samples were processed as skinless fillets in accordance with the OHA fish consumption guidelines. Samples contained 126 different PCB congeners, 19 legacy pesticides, and 16 flame retardants. The fish collected at the Rogue River upstream of Gold Ray Dam (#10422) location in 2010 contained the highest number of unique detections in each of these chemical groups. None of the detections in either sampling effort, however, exceeded OHA screening levels.

Total arsenic was detected in three fish collected from Applegate Reservoir (#36283) in 2010. The detected concentrations were below the OHA screening level for inorganic arsenic. While total arsenic levels are not indicative of inorganic arsenic levels, they do provide some insight into where arsenic levels are elevated. Mercury concentrations exceeded the DEQ human health criterion at each monitoring location sampled in the basin. The highest concentration of mercury was detected in a largemouth bass collected from Emigrant Lake (#18390) in 2010. The concentration was 2.48 mg/kg, which is more than 60 times the criterion of 0.04 mg/kg. DEQ's human health criteria were established to protect all consumers, including subsistence consumers. Thus, the mercury criterion assumes a fish or shellfish consumption rate of 175 grams per day. Figure 7 shows the impact ratio for each mercury detection. The impact ratio is determined by dividing the concentration by the criterion. Values greater than one indicate at concentration that exceeds the criterion. OHA has consumption guidelines in place for both the Applegate Reservoir and Emigrant Lake due to high mercury concentrations. The guidelines recommend limiting consumption of certain fish species based on location (OHA 2020). In addition, a statewide fish advisory is in place for bass due to high mercury concentrations. Arsenic and mercury are known to naturally occur in the basin, which may contribute to these detections (K. Jackson, personal communication, October 30th, 2020). For a full summary of the tissue sampling results view the Statewide Aquatic Tissue Toxics Report released in 2017.

Replicate sampling

Replicate samples were included to help identify trends within the basin. One monitoring location, Bear Creek at Kirtland Road (#11051), was selected for replicate water and sediment samples and an additional two monitoring locations, Bear Creek at Valley View Road (#10434) and Rogue River at Hwy 234 (#10423), were used for replicate water samples only (Figure 8). Two species of fish, Largemouth Bass and Smallmouth Bass, were collected at one location, Emigrant Lake; however, this did not constitute a replicate sample as both tissue samples were collected in 2010.

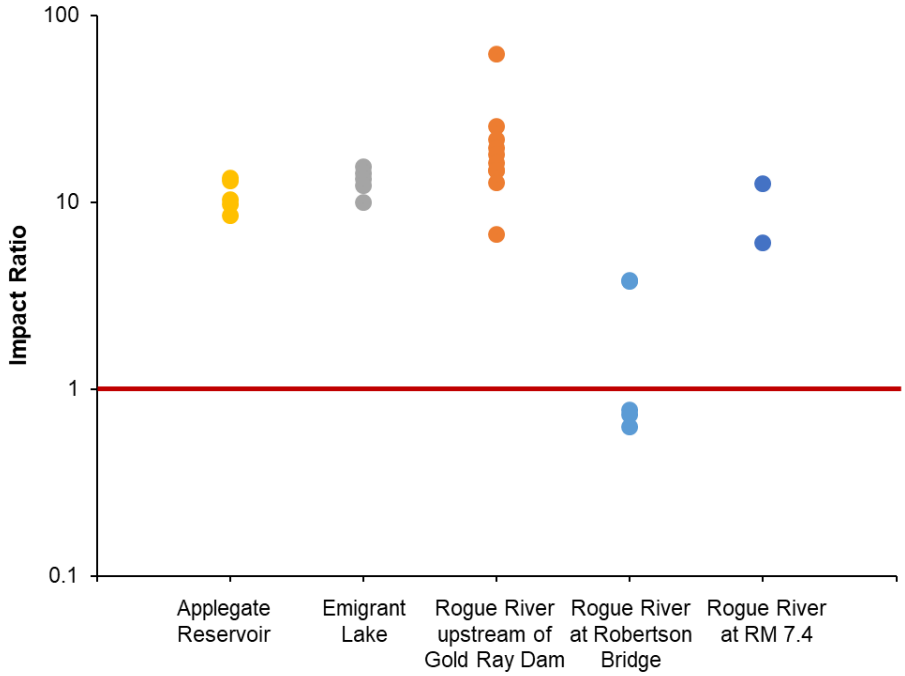

Figure 7. Impact ratios of mercury detections in tissue samples collected in the Rogue Basin.

In 2015, the water samples from the Bear Creek at Kirtland Road (#11051) location contained more unique chemicals (30) and had a higher number of exceedances (7) than any other monitoring location across the basin. This is compared to 13 unique chemicals detected and zero exceedances at the same location in 2011. Overall, the number of metals detected at the three replicate water locations increased by three or four metals between sampling efforts. Two metals, aluminum and potassium, are commonly found in the earth's crust and were added to the analysis of the 2015 samples. The inorganic form of arsenic, for which DEQ's human health criterion was established in 2011, was also added to the analysis of the 2015 samples. Iron concentrations at the two Bear Creek locations increased from 2011 to 2015 and both exceeded DEQ's aquatic life criteria in 2015. Nickel and chromium concentrations also increased between the two sampling efforts, and while the detections were below applicable criteria, the detections are notable as they may indicate the presence of stormwater runoff or the discharge of wastewater in the area.

The use of an improved analytical method with a lower minimum detection level was most likely the reason for the increased number of legacy pesticides found at the Bear Creek at Valley View Road (1) and Bear Creek at Kirtland Road (7) locations. Current use pesticide detections also increased at these locations from two to four at the Bear Creek at Valley View Road location, and from three to seven at the Bear Creek at Kirtland Road location. The diuron concentration increased from 2011 to 2015 at the Valley View Road location. At the Kirtland Road location, the concentration of diuron decreased, and the concentration of sulfometuron-methyl increased. The only current use pesticide detected at the Rogue River at Highway 234 location in 2011, was not found in samples collected in 2015.

Although not a replicate sample, the Rogue River at RM 120.76, 200 yards upstream of Gold Hill PWS intake (#34860) location was also sampled during a 2008 DEQ Drinking Water Source Monitoring Project. Samples from the drinking water monitoring were analyzed for 272 compounds (DEQ 2012) including many that were included in the analysis of the toxics monitoring reported here. The 2011 toxics monitoring confirmed detections of a number of compounds, most notably atrazine and diuron, both current use pesticides, and sulfamethoxazole, a consumer use product.

The replicate sediment sample collected at Bear Creek at Kirtland Road (#11051) in 2015 contained 22 unique chemicals, a substantially lower number than the sample collected in 2011 (53; Appendix B). Among the notable reductions were PCBs, from 23 in the 2011 sample to zero in the 2015 sample, flame retardants, from 14 to 1, and legacy pesticides, from 13 to 5. The number of exceedances declined from six in 2011 to one in 2015. The lone exceedance in 2015 was total DDT and the concentration dropped from 8785 mg/kg in the 2011 sample to 881 mg/kg in the 2015, a decrease of nearly 90% since the 2011 sampling effort. The 2015 concentration was still well above the DEQ bioaccumulation screening level. During this time period, a bridge improvement project occurred on the Kirtland Road bridge, which included stream restoration work. By altering the path of the stream channel, this project may have moved the stream channel away from potential contaminant sources reflected in the 2011 results (H. Tugaw, personal communication, Nov. 20, 2020).

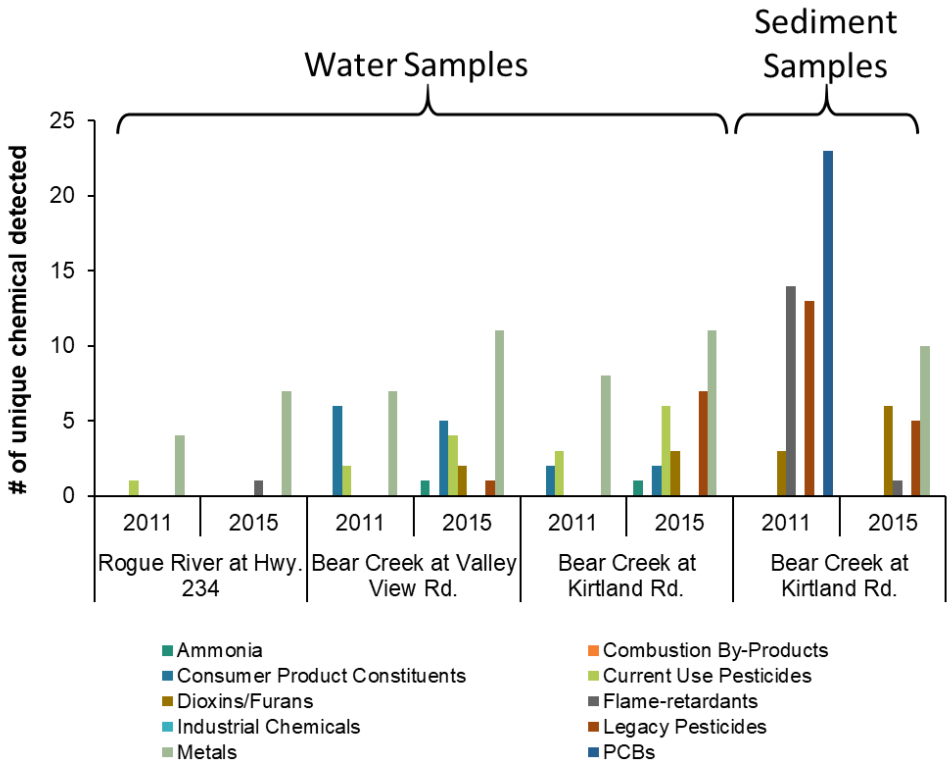

Figure 8 – Number of unique chemicals detected during 2011 and 2015 at sites selected as replicate monitoring locations.

Summary and Recommendations

Across all media, 152 of the nearly 500 chemicals included in the analysis of the 2015 samples were detected. Among the most commonly detected chemicals were arsenic, diuron, and sulfamethoxazole in water samples, DDT and PCBs in sediment samples, and PCBs and mercury in fish tissue samples. Levels of some of these chemicals exceeded applicable criteria and benchmarks, however, most detected chemicals were within levels considered safe for aquatic life, wildlife and human health.

Fewer unique detections occurred in 2015 than in 2011. In both years, the detection of PCB congeners in sediment and tissue samples made up a majority of the detections. The reduction in detections is unexpected given the inclusion of improved analytical methods for PCBs, current use pesticides, and legacy pesticides the 2015 analysis of water samples. The improved analytical methods reduced the

minimum detection limit for a number of chemicals and allowed for more potential detections at lower concentrations. Analysis of flame retardants and dioxins and furans were also added to the analysis in 2015.

The water samples analyzed as a part of this study show few toxics detections and little cause for concern about human health or risk to aquatic life from the constituents monitored. The exception being the location on Bear Creek at Kirtland Road (#11051). This location is situated near the mouth of Bear Creek, which flows through the communities of Ashland, Talent, Phoenix, Medford and Central Point before joining the Rogue River, and is the most urban watershed in the Rogue Basin. In addition, several public water systems, including the cities of Gold Hill, Rogue River, and Grants Pass, rely on the Rogue River as a source of drinking water downstream of the Bear Creek confluence. Seven chemicals were detected at concentrations above criteria that protect both human health and aquatic life at this location. DEQ human health criteria for water quality are designed to protect people who use the water as a primary drinking water source and who consume fish or shellfish collected from waterbodies. DEQ human health criteria are generally lower than health standards set specifically for drinking water by EPA and others (i.e. Maximum Contaminant Levels or Health Based Screening Levels). The levels detected for each parameter at the Kirtland Road location are less than EPA Maximum Contaminant Levels or Health Based Screening Levels where available.DEQ aquatic life criteria are set at levels designed to protect fish and aquatic life.

Many of the watersheds, streams, and waterbodies in the Rogue Basin appear on the 2018/2020 Integrated Report 303(d) list of impaired waters for parameters not addressed in this report (i.e., temperature, sedimentation, dissolved oxygen, pH, E. coli, and hazardous algal blooms). The Toxics Monitoring Program's sampling does not have any bearing on these parameters. The results of this sampling does support the 303(d) Category 5 listings for iron in the Rogue River and Bear Creek, as well as the Category 5 listings for methylmercury in Applegate Reservoir, Emigrant Lake, and both locations in the Rogue River. Similar to the TMDL program, the Integrated Report identifies if pollutants exceed a waterbody's assimilative capacity rather than specific instances of high concentrations as reported in this Toxics summary. Visit the 2018/2020 Integrated Report webpage for more information.

In the sediment samples collected in 2015, a majority of chemicals were not detected or were found at concentrations below applicable bioaccumulation screening levels. However, the total DDT screening level was exceeded at five locations (the Bear Creek at Valley View Road (#10434), Bear Creek at Kirtland Road, Little Butte Creek (#26632), Rogue River downstream of Gold Ray Dam (#30195), and Rogue River at Lathrop Park (#38107)), and the total PCB screening level was exceeded at three locations (Sucker Creek (#25814), Little Butte Creek, and Rogue River downstream of Gold Ray Dam). The total chlordane screening level was exceeded at the Bear Creek at Valley View road location. The screening levels represent the concentration at or below which chemicals would not be expected to affect the human population consuming more than 17 grams, or about a tablespoon, of fish or shellfish from these waterways per day (DEQ 2007). Besides the decrease in the number of detected chemicals at the Bear Creek at Kirtland Road location, none of these results were unexpected.

Tissue samples across all monitoring locations exceeded DEQ's human health criterion for mercury. The criterion was based on consuming 175 grams per day of fish or shellfish. Thus, anglers in the Rogue Basin should be cognizant of their fish intake. Oregon Health Authority also has a statewide fish consumption guideline in place based on mercury concentrations in bass. Additionally, two of the monitoring locations have individual consumption guidelines that recommend further restriction of fish consumption. The guideline for Emigrant Lake recommends limiting consumption of all resident fish except rainbow trout to 1-3 meals per month. The guideline in place on Applegate Reservoir recommends limiting panfish consumption to 5-13 meals per month and bass or perch consumption to 2-5 meals per month.

Two unexpected results from this study were the lack of PCBs and legacy pesticides found in water samples. Given that the total PCB concentrations and number of PCBs detected in sediment samples collected from the Sucker Creek (9 PCBs), Little Butte Creek (5 PCBs), and Rogue River downstream of Gold Ray Dam (23 PCBs) locations, it was surprising that not one PCB was detected in water samples collected from any of these locations. Similarly, legacy pesticides, specifically total DDT, was found at concentrations over the sediment bioaccumulation screening level at eight locations, but was only detected in water samples collected from one of these locations. This held true for detections of other legacy pesticides, such as chlordanes, and dieldrin. Typically, water detections are linked to detections in sediment, however, that was not the case in 2015.

After the 2011 sampling effort, no individual chemicals or groups of chemicals were identified as chemicals of interest in the surface water samples. The two monitoring locations on Bear Creek were; however, identified as locations that warranted further monitoring based on the number of detections, point source inputs and urban run-off present at each location. Given previous concerns and increases in unique detections and exceedances at both locations, both Bear Creek locations have been included in the Toxics Monitoring Network. The locations on the Rogue River at Robertson Bridge and at RM 7.4 were also included in the Toxics Monitoring Network. The Robertson Bridge location was included based on the number of detections and exceedances found in tissue and sediment samples collected in 2011. The location at RM 7.4 was included based on the detections found in the tissue sample collected in 2015. Appendices A-C provide the detection data from this basin.

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Appendices

Screening Value Reference Key

nsv : No screening value has been assigned

1. Human Health Criteria: Water + Organism 2. Freshwater Chronic Criteria (CCC) 3. Saltwater Chronic Criteria (CCC 4. Saltwater Acute Criteria (CMC)	https://www.oregon.gov/deq/Rulemaking%20Docs/tables303140.pdf
5. Freshwater Fish Acute Criteria 6. Freshwater Fish Chronic Criteria 7. Freshwater Invertebrates Acute Criteria 8. Freshwater Invertebrates Chronic Criteria 9. Freshwater Nonvascular Plants Acute Criteria 10. Freshwater Vascular Plants Acute Criteria	https://www.epa.gov/pesticide-science-and-assessing-pesticide-risks/aquatic-life-benchmarks-and-ecological-risk
11. Sediment Bioaccumulation Screening Level Value	https://www.oregon.gov/deq/FilterDocs/GuidanceAssessingBioaccumulative.pdf
12. OHA Fish Advisory Program Screening Level	https://www.oregon.gov/oha/PH/HEALTHYENVIRONMENTS/RECREATION/FISHCONSUMPTION/Documents/fishscreeninglevels.pdf
13. Human Health Criteria: Organism Only	https://www.oregon.gov/deq/Rulemaking%20Docs/tables303140.pdf
14. Acceptable Tissue Levels for Chemicals in Fish/Shellfish Consumed by Wildlife	https://www.oregon.gov/deq/FilterDocs/GuidanceAssessingBioaccumulative.pdf

* Hardness dependent criteria

‡ pH and temperature dependent criteria

This criteria applies to the total recoverable metal

§ This criteria applies to the dissolved concentration, and is therefore a conservative comparison

† This criteria applies to freshwater organisms

Indicates sites at which at least one sample exceeded the screening value

State of Oregon Department of Environmental Quality

Appendix A
Water Sample Results

ROGUE BASIN
Station ID and Description

Samples in 2011, 2013 or 2015	Percent Detection	Number of samples over screening value	Rogue River at Lobster Creek Bridge - 2013	Rogue River at Robertson Bridge - 2011	Rogue River at Hwy 234 - 2011	Rogue River at Hwy 234 - 2015	Screening Value	S.V. Reference
			10414	10418	10423	10423		
			Maximum Values (µg/L)					
Ammonia								
Ammonia as N	33	0	—	—	—	—	‡	2
Consumer Product Constituents								
bis(2-ethylhexyl)phthalate	4	2	—	0.445	—	—	0.2	1
Carbamazepine	11		—	—	—	—	*nsv*	
Cotinine	2		—	—	—	—	*nsv*	
DEET	3		—	—	—	—	*nsv*	
Diphenhydramine	2		—	—	—	—	*nsv*	
Estriol	3		—	—	—	—	*nsv*	
Sulfamethoxazole	37		0.0267	0.0261	—	—	*nsv*	
Venlafaxine	11		—	—	—	—	*nsv*	
Current Use Pesticides								
2,4-D	2	0	—	—	—	—	100	1
2,6-Dichlorobenazamide	6		—	—	—	—	*nsv*	
Aminomethylphosphonic acid (AMPA)	17	0	—	—	—	—	249500	5
Atrazine	10	0	—	0.007	0.0091	—	1.0	9
Deisopropylatrazine	2	0	—	—	—	—	2500	9
Dichlobenil	3	0	—	—	—	—	30	10
Diuron	33	0	0.00575	0.008	—	—	2.4	9
Glyphosate	10	0	—	—	—	—	11900	10
Sulfometuron-methyl	8	0	—	—	—	—	0.45	10
Dioxins and Furans								
1,2,3,4,6,7,8-HpCDD	18		—	—	—	—	*nsv*	
1,2,3,7,8,9-HxCDD	3		—	—	—	—	*nsv*	
OCDD	27		—	—	—	—	*nsv*	
OCDF	3		—	—	—	—	*nsv*	
Flame-retardants								
PBDE-28	3		—	—	—	—	*nsv*	
PBDE-47	3		—	—	—	—	*nsv*	
PBDE-99	3		—	—	—	—	*nsv*	
PBDE-100	6		—	—	—	—	*nsv*	
PBDE-153	3		—	—	—	—	*nsv*	
PBDE-154	3		—	—	—	—	*nsv*	
PBDE-209	6		—	—	—	0.00143	*nsv*	
Legacy Pesticides								
BHC-technical (HCH)	1	0	—	—	—	—	0.0014	1
gamma-BHC (Lindane)	1	0	—	—	—	—	0.17	1

Appendix A Water Sample Results			ROGUE BASIN Station ID and Description					
Samples in 2011, 2013 or 2015	Percent Detection	Number of samples over screening value	Rogue River at Lobster Creek Bridge - 2013	Rogue River at Robertson Bridge - 2011	Rogue River at Hwy 234 - 2011	Rogue River at Hwy 234 - 2015	Screening Value	S.V. Reference
			10414	10418	10423	10423		
			Maximum Values (µg/L)					
Legacy Pesticides, continued								
Dieldrin	3	3	—	—	—	—	5E-06	1
Endosulfan sulfate	2	0	—	—	—	—	8.5	1
Endrin ketone	3		—	—	—	—	*nsv*	
Total DDT	3	2	—	—	—	—	0.001	2
2,4'-DDD	6		—	—	—	—	*nsv*	
4,4'-DDD	2	2	—	—	—	—	3E-05	1
4,4'-DDE	3	3	—	—	—	—	2E-05	1
4,4'-DDT	2	2	—	—	—	—	2E-05	1
Plant or animal sterols								
beta-Sitosterol	100		0.368	0.33	0.259	0.434	*nsv*	
Cholesterol	100		1	0.71	0.503	0.58	*nsv*	
Coprostanol	78		0.0406	0.1	—	0.00972	*nsv*	
Stigmastanol	100		0.0267	0.0439	0.027	0.0379	*nsv*	
Priority Metals								
Dissolved								
Aluminum	40		—	—	—	31	*nsv*	
Arsenic	85		0.49	0.43	0.28	0.36	*nsv*	
Barium	100		8.78	8.3	4.3	3.96	*nsv*	
Chromium	5	0	—	—	—	—	11	2
Copper	13	0	—	—	—	—	*	2
Iron	22	0	—	—	—	59.6	1000[#]	2
Manganese	83		—	—	—	4.76	*nsv*	
Nickel	33	0	1.52	—	—	—	*	2
Potassium	100		—	—	—	1.38	*nsv*	
Zinc	100	0	—	7.8	6.4	7.43	*	2
Total Inorganic								
Arsenic	100	2	0.391	—	—	—	2.1	1
Total Recoverable								
Aluminum	78		—	—	—	138	*nsv*	
Arsenic	88		—	0.47	0.31	0.4	*nsv*	
Barium	100	0	13.5	9.5	5.1	4.61	1000	1
Chromium	12	0	3.33	—	—	—	11[§]	2
Copper	18	0	1.64	—	—	—	*[§]	2
Iron	64	3	1020	250	—	160.0	1000	2
Lead	14	0	0.25	—	—	—	*[§]	2
Manganese	100		31.1	12.4	14.5	18	*nsv*	

Appendix A Water Sample Results			ROGUE BASIN Station ID and Description					
Samples in 2011, 2013 or 2015	Percent Detection	Number of samples over screening value	Rogue River at Lobster Creek Bridge - 2013	Rogue River at Robertson Bridge - 2011	Rogue River at Hwy 234 - 2011	Rogue River at Hwy 234 - 2015	Screening Value	S.V. Reference
			10414	10418	10423	10423		
			Average Values					
Priority Metals, continued								
Total Recoverable								
Nickel	43	0	6.33	1.1	—	—	*§	2
Potassium	100		—	—	—	1.46	*nsv*	
Zinc	100	0	—	8.0	6.1	—	*§	2
Standard Parameters (mg/L)								
Dissolved Organic Carbon	93		1.7	5.3	3.8	1.1		
Sulfate	100		2.5	2.1	0.7	1.2		
Total Organic Carbon	98		1.3	4.7	3.7	1.0		
Total Solids	100		82.7	91.3	66.0	61.3		
Total Suspended Solids	68		6.5	2.0	1.5	1.7		
Field Parameters								
Conductivity (µmhos/cm @ 25° C)	100		103	97	63	89		
Dissolved Oxygen (mg/L)	100		11.2	11.0	11.4	11.0		
pH (SU)	100		8.5	8.2	8.0	8.1		
Temperature (°C)	100		15.6	13.8	9.8	12.5		
Turbidity (NTU)	90		3	4	2	4		

Appendix A Water Sample Results	ROGUE BASIN Station ID and Description						
Samples in 2011, 2013 or 2015	Grave Creek at mouth - 2015	Applegate River at Hwy 199 - 2011	Bear Creek at Valley View Road - 2011	Bear Creek at Valley View Road - 2015	Little Butte Creek at Agate Road - 2011	Screening Value	S.V. Reference
	10427	10428	10434	10434	10602		
	Maximum Values (µg/L)						
Ammonia							
Ammonia as N	—	—	—	10	—	‡	2
Consumer Product Constituents							
bis(2-ethylhexyl)phthalate	—	—	—	—	—	0.2	1
Carbamazepine	—	—	0.0424	0.077	—	*nsv*	
Cotinine	—	—	—	0.0169	—	*nsv*	
DEET	—	—	0.032	0.0359	—	*nsv*	
Diphenhydramine	—	—	0.0191	—	—	*nsv*	
Estriol	—	—	0.0004	—	—	*nsv*	
Sulfamethoxazole	—	—	0.175	0.123	—	*nsv*	
Venlafaxine	—	—	0.0309	0.0732	—	*nsv*	
Current Use Pesticides							
2,4-D	—	—	—	—	—	100	1
2,6-Dichlorobenazamide	—	—	—	—	—	*nsv*	
Aminomethylphosphonic acid (AMPA)	—	—	—	0.0887	—	249500	5
Atrazine	—	—	—	—	—	1.0	9
Deisopropylatrazine	—	—	—	—	—	2500	9
Dichlobenil	—	—	—	0.0489	—	30	10
Diuron	—	0.015	0.0064	0.0081	0.008	2.4	9
Glyphosate	—	—	—	0.122	—	11900	10
Sulfometuron-methyl	—	—	0.0041	—	—	0.45	10
Dioxins and Furans							
1,2,3,4,6,7,8-HpCDD	—	—	—	4.9E-06	—	*nsv*	
1,2,3,7,8,9-HxCDD	—	—	—		—	*nsv*	
OCDD	—	—	—	8.4E-06	—	*nsv*	
OCDF	—	—	—	—	—	*nsv*	
Flame-retardants							
PBDE-28	—	—	—	—	—	*nsv*	
PBDE-47	—	—	—	—	—	*nsv*	
PBDE-99	—	—	—	—	—	*nsv*	
PBDE-100	—	—	—	—	—	*nsv*	
PBDE-153	—	—	—	—	—	*nsv*	
PBDE-154	—	—	—	—	—	*nsv*	
PBDE-209	—	—	—	—	—	*nsv*	
Legacy Pesticides							
BHC-technical (HCH)	—	—	—	0.00017	—	0.0014	1
gamma-BHC (Lindane)	—	—	—	0.00017	—	0.17	1

Appendix A Water Sample Results	ROGUE BASIN Station ID and Description						
Samples in 2011, 2013 or 2015	Grave Creek at mouth - 2015	Applegate River at Hwy 199 - 2011	Bear Creek at Valley View Road - 2011	Bear Creek at Valley View Road - 2015	Little Butte Creek at Agate Road - 2011	Screening Value	S.V. Reference
	10427	10428	10434	10434	10602		
	Maximum Values (µg/L)						
Legacy Pesticides, continued							
Dieldrin	—	—	—	—	—	5E-06	1
Endosulfan sulfate	—	—	—	—	—	8.5	1
Endrin ketone	—	—	—	—	—	*nsv*	
Total DDT	—	—	—	—	—	0.001	2
2,4'-DDD	—	—	—	—	—	*nsv*	
4,4'-DDD	—	—	—	—	—	3E-05	1
4,4'-DDE	—	—	—	—	—	2E-05	1
4,4'-DDT	—	—	—	—	—	2E-05	1
Plant or animal sterols							
beta-Sitosterol	0.491	0.29	0.774	0.644	0.722	*nsv*	
Cholesterol	0.967	0.694	0.87	0.758	1.5	*nsv*	
Coprostanol	0.00732	0.0114	0.037	0.031	0.046	*nsv*	
Stigmastanol	0.0326	0.027	0.066	0.0652	0.169	*nsv*	
Priority Metals							
Dissolved							
Aluminum	—	—	—	21.5	—	*nsv*	
Arsenic	0.59	0.66	0.65	0.98	2.05	*nsv*	
Barium	12.5	12.5	25.4	31.9	16.2	*nsv*	
Chromium	—	—	—	—	—	11	2
Copper	—	—	2.5	1.68	1.5	*	2
Iron	—	—	—	76	—	1000[#]	2
Manganese	5.08	—	—	15.3	—	*nsv*	
Nickel	1.07	2.6	—	—	—	*	2
Potassium	0.54	—	—	4.22	—	*nsv*	
Zinc	—	18.5	11.6	8.88	5.3	*	2
Total Inorganic							
Arsenic	—	—	—	0.70	—	2.1	1
Total Recoverable							
Aluminum	33.9	—	—	2740	—	*nsv*	
Arsenic	0.63	0.61	0.74	1.09	2.22	*nsv*	
Barium	12.6	11.9	25.8	32.9	18.9	1000	1
Chromium	—	—	—	1.68	—	11[§]	2
Copper	—	1.6	1.8	3.55	2	*[§]	2
Iron	60.8	—	570	2440	600	1000	2
Lead	—	—	0.21	0.39	—	*[§]	2
Manganese	13.30	7.1	41.2	59.9	43.8	*nsv*	

Appendix A Water Sample Results	ROGUE BASIN Station ID and Description						
Samples in 2011, 2013 or 2015	Grave Creek at mouth - 2015	Applegate River at Hwy 199 - 2011	Bear Creek at Valley View Road - 2011	Bear Creek at Valley View Road - 2015	Little Butte Creek at Agate Road - 2011	Screening Value	S.V. Reference
	10427	10428	10434	10434	10602		
	Average Values						
Priority Metals, continued							
Total Recoverable							
Nickel	1.1	3.1	—	1.55	1.1	*§	2
Potassium	0.56	—	—	4.23	—	*nsv*	
Zinc	—	12.4	8.2	9.02	—	*§	2
Standard Parameters (mg/L)							
Dissolved Organic Carbon	2.1	5.3	7.9	4.3	5.3		
Sulfate	6.8	3.6	7.7	12.8	1.0		
Total Organic Carbon	1.9	6.2	9.8	4.5	7.8		
Total Solids	104.0	96.0	137.0	155.0	106.3		
Total Suspended Solids	1.0	1.0	5.0	7.0	5.3		
Field Parameters							
Conductivity (µmhos/cm @ 25° C)	163	136	179	217	106		
Dissolved Oxygen (mg/L)	9.9	10.6	10.0	9.5	10.5		
pH (SU)	8.3	8.2	8.3	8.2	8.0		
Temperature (°C)	18.0	13.8	14.2	16.8	13.2		
Turbidity (NTU)	1	1	6	16	6		

Appendix A Water Sample Results	ROGUE BASIN Station ID and Description						
Samples in 2011, 2013 or 2015	Bear Creek at Kirtland Road - 2011	Bear Creek at Kirtland Road - 2015	Rogue River at Casey State Park - 2011	Evans Creek at Palmerton Park - 2015	Illinois River downstream of Kerby - 2011	Screening Value	S.V. Reference
	11051	11051	11375	11461	11482		
	Maximum Values (µg/L)						
Ammonia							
Ammonia as N	—	27	—	10	—	‡	2
Consumer Product Constituents							
bis(2-ethylhexyl)phthalate	—	—	—	—	0.772	0.2	1
Carbamazepine	—	0.0209	—	—	—	*nsv*	
Cotinine	—	—	—	—	—	*nsv*	
DEET	—	—	—	—	—	*nsv*	
Diphenhydramine	—	—	—	—	—	*nsv*	
Estriol	0.0019	—	—	—	—	*nsv*	
Sulfamethoxazole	0.042	0.0527	—	0.0157	—	*nsv*	
Venlafaxine	—	—	—	—	—	*nsv*	
Current Use Pesticides							
2,4-D	—	0.1	—	—	—	100	1
2,6-Dichlorobenazamide	—	0.0241	—	—	—	*nsv*	
Aminomethylphosphonic acid (AMPA)	—	0.27	—	—	—	249500	5
Atrazine	—	—	0.0107	—	—	1.0	9
Deisopropylatrazine	0.0053	—	—	—	—	2500	9
Dichlobenil	—	—	—	—	—	30	10
Diuron	0.0815	0.0209	—	—	—	2.4	9
Glyphosate	—	0.125	—	—	—	11900	10
Sulfometuron-methyl	0.0051	0.00849	—	—	—	0.45	10
Dioxins and Furans							
1,2,3,4,6,7,8-HpCDD	—	3.9E-06	—	1.4E-06	—	*nsv*	
1,2,3,7,8,9-HxCDD	—		—	7.3E-07	—	*nsv*	
OCDD	—	2.8E-05	—	4.7E-06	—	*nsv*	
OCDF	—	2.6E-06	—	—	—	*nsv*	
Flame-retardants							
PBDE-28	—	—	—	6.7E-05	—	*nsv*	
PBDE-47	—	—	—	0.00269	—	*nsv*	
PBDE-99	—	—	—	—	—	*nsv*	
PBDE-100	—	—	—	0.00033	—	*nsv*	
PBDE-153	—	—	—	—	—	*nsv*	
PBDE-154	—	—	—	—	—	*nsv*	
PBDE-209	—	—	—	—	—	*nsv*	
Legacy Pesticides							
BHC-technical (HCH)	—	—	—	—	—	0.0014	1
gamma-BHC (Lindane)	—	—	—	—	—	0.17	1

Appendix A Water Sample Results	ROGUE BASIN Station ID and Description						
Samples in 2011, 2013 or 2015	Bear Creek at Kirtland Road - 2011	Bear Creek at Kirtland Road - 2015	Rogue River at Casey State Park - 2011	Evans Creek at Palmerton Park - 2015	Illinois River downstream of Kerby - 2011	Screening Value	S.V. Reference
	11051	11051	11375	11461	11482		
	Maximum Values (µg/L)						
Legacy Pesticides, continued							
Dieldrin	—	0.00047	—	—	—	5E-06	1
Endosulfan sulfate	—	0.00235	—	—	—	8.5	1
Endrin ketone	—	0.00082	—	—	—	*nsv*	
Total DDT	—	0.00162	—	—	—	0.001	2
2,4'-DDD	—	6.4E-05	—	—	—	*nsv*	
4,4'-DDD	—	0.00019	—	—	—	3E-05	1
4,4'-DDE	—	0.00124	—	—	—	2E-05	1
4,4'-DDT	—	0.00017	—	—	—	2E-05	1
Plant or animal sterols							
beta-Sitosterol	0.731	0.828	0.32	1.87	0.244	*nsv*	
Cholesterol	1.36	1.3	0.436	1.69	0.708	*nsv*	
Coprostanol	0.0674	0.0801	—	0.0587	0.0082	*nsv*	
Stigmastanol	0.123	0.127	0.0248	0.093	0.015	*nsv*	
Priority Metals							
Dissolved							
Aluminum	—	—	—	—	—	*nsv*	
Arsenic	2.3	2.3	0.26	0.54	—	*nsv*	
Barium	35.9	41.8	3.5	14.1	6.8	*nsv*	
Chromium	—	—	—	—	1.7	11	2
Copper	1.9	2.39	—	1.72	—	*	2
Iron	—	54.6	—	136.0	—	1000[#]	2
Manganese	—	44.6	—	32	—	*nsv*	
Nickel	1.1	1.28	—	1.58	6.3	*	2
Potassium	—	2.3	—	1.28	—	*nsv*	
Zinc	7.1	—	11.3	21	5.1	*	2
Total Inorganic							
Arsenic	—	2.23	—	—	—	2.1	1
Total Recoverable							
Aluminum	—	1250	—	126	—	*nsv*	
Arsenic	2.59	2.64	0.31	0.52	—	*nsv*	
Barium	39.5	44.7	4.3	14.3	7.0	1000	1
Chromium	—	1.66	—	—	—	11[§]	2
Copper	2.9	3.74	—	2.08	—	*[§]	2
Iron	770	1280	—	263	—	1000	2
Lead	0.43	0.63	—	—	0.23	*[§]	2
Manganese	47	75.9	24.2	43.9	4	*nsv*	

Appendix A Water Sample Results	ROGUE BASIN Station ID and Description						
Samples in 2011, 2013 or 2015	Bear Creek at Kirtland Road - 2011	Bear Creek at Kirtland Road - 2015	Rogue River at Casey State Park - 2011	Evans Creek at Palmerton Park - 2015	Illinois River downstream of Kerby - 2011	Screening Value	S.V. Reference
	11051	11051	11375	11461	11482		
	Average Values						
Priority Metals, continued							
Total Recoverable							
Nickel	1.6	2.17	—	1.96	7.3	*§	2
Potassium	—	2.36	—	1.31	—	*nsv*	
Zinc	—	5.28	8.8	25.2	7.0	*§	2
Standard Parameters (mg/L)							
Dissolved Organic Carbon	7.9	5.4	3.0	2.4	3.3		
Sulfate	12.3	15.9	0.6	4.5	1.4		
Total Organic Carbon	13.1	5.3	3.7	2.3	3.0		
Total Solids	195.3	227.7	68.7	123.0	90.7		
Total Suspended Solids	7.7	9.3	1.0	2.5	—		
Field Parameters							
Conductivity (µmhos/cm @ 25° C)	283	332	60	175	131		
Dissolved Oxygen (mg/L)	10.9	9.8	11.2	9.1	10.3		
pH (SU)	8.3	8.1	7.7	7.6	8.0		
Temperature (°C)	14.6	16.2	9.6	15.6	13.4		
Turbidity (NTU)	9	14	2	2	1		

Appendix A Water Sample Results	ROGUE BASIN Station ID and Description							
Samples in 2011, 2013 or 2015	Applegate R at Fish Hatchery Road - 2015	Sucker Creek - 2015	Little Butte Cr. At bridge in town of Lake Creek - 2015	Rogue River downstream of Gold Ray Dam -	Rogue River at RM 120.76 - 2011	Rogue River at Lathrop County Park - 2015	Screening Value	S.V. Reference
	11840	25814	26632	30195	34860	38107		
	Maximum Values (µg/L)							
Ammonia								
Ammonia as N	—	—	11	121	—	76	‡	2
Consumer Product Constituents								
bis(2-ethylhexyl)phthalate	—	—	—	—	—	—	0.2	1
Carbamazepine	—	—	—	—	—	—	*nsv*	
Cotinine	—	—	—	—	—	—	*nsv*	
DEET	—	—	—	—	—	—	*nsv*	
Diphenhydramine	—	—	—	—	—	—	*nsv*	
Estriol	—	—	—	—	—	—	*nsv*	
Sulfamethoxazole	—	—	—	0.0235	0.0194	0.044	*nsv*	
Venlafaxine	—	—	—	—	—	0.0131	*nsv*	
Current Use Pesticides								
2,4-D	—	—	—	—	—	—	100	1
2,6-Dichlorobenazamide	—	—	—	—	—	—	*nsv*	
Aminomethylphosphonic acid (AMPA)	—	—	—	—	—	0.0578	249500	5
Atrazine	—	—	—	—	0.0087	—	1.0	9
Deisopropylatrazine	—	—	—	—	—	—	2500	9
Dichlobenil	—	—	—	—	—	—	30	10
Diuron	—	—	—	—	0.0074	0.0092	2.4	9
Glyphosate	—	—	—	—	—	0.0743	11900	10
Sulfometuron-methyl	—	—	—	—	—	—	0.45	10
Dioxins and Furans								
1,2,3,4,6,7,8-HpCDD	—	—	—	—	—	3E-06	*nsv*	
1,2,3,7,8,9-HxCDD	—	—	—	—	—	—	*nsv*	
OCDD	—	—	—	—	—	1E-05	*nsv*	
OCDF	—	—	—	—	—	—	*nsv*	
Flame-retardants								
PBDE-28	—	—	—	—	—	—	*nsv*	
PBDE-47	—	—	—	—	—	—	*nsv*	
PBDE-99	—	0.0041	—	—	—	—	*nsv*	
PBDE-100	—	0.0007	—	—	—	—	*nsv*	
PBDE-153	—	0.0005	—	—	—	—	*nsv*	
PBDE-154	—	0.0004	—	—	—	—	*nsv*	
PBDE-209	—	—	—	0.0012	—	—	*nsv*	
Legacy Pesticides								
BHC-technical (HCH)	—	—	—	—	—	—	0.0014	1
gamma-BHC (Lindane)	—	—	—	—	—	—	0.17	1

Appendix A Water Sample Results	ROGUE BASIN Station ID and Description							
Samples in 2011, 2013 or 2015	Applegate R at Fish Hatchery Road - 2015	Sucker Creek - 2015	Little Butte Cr. At bridge in town of Lake Creek - 2015	Rogue River downstream of Gold Ray Dam -	Rogue River at RM 120.76 - 2011	Rogue River at Lathrop County Park - 2015	Screening Value	S.V. Reference
	11840	25814	26632	30195	34860	38107		
	Maximum Values (µg/L)							
Legacy Pesticides, continued								
Dieldrin	—	—	—	—	—	—	5E-06	1
Endosulfan sulfate	—	—	—	—	—	—	8.5	1
Endrin ketone	—	—	—	—	—	—	*nsv*	
Total DDT	—	—	—	—	—	—	0.001	2
2,4'-DDD	—	—	—	—	—	—	*nsv*	
4,4'-DDD	—	—	—	—	—	—	3E-05	1
4,4'-DDE	—	—	—	—	—	—	2E-05	1
4,4'-DDT	—	—	—	—	—	—	2E-05	1
Plant or animal sterols								
beta-Sitosterol	0.531	0.233	0.901	0.554	0.481	0.489	*nsv*	
Cholesterol	0.762	0.124	1.26	1.12	0.674	1.23	*nsv*	
Coprostanol	0.0325	—	0.0878	0.27	0.136	0.312	*nsv*	
Stigmastanol	0.054	0.0175	0.189	0.0696	0.0526	0.0535	*nsv*	
Priority Metals								
Dissolved								
Aluminum	—	—	60.6	31.3	—	29	*nsv*	
Arsenic	0.66	—	2.9	0.46	0.45	0.51	*nsv*	
Barium	12.2	7.91	11.3	6.51	6.9	6.39	*nsv*	
Chromium	—	—	—	—	—	—	11	2
Copper	—	—	—	—	—	—	*	2
Iron	55.0	—	111.0	71.5	—	69.0	1000[#]	2
Manganese	7.2	3.54	7.6	7.5	—	3.90	*nsv*	
Nickel	1.49	2.09	—	—	—	—	*	2
Potassium	0.98	0.64	1.5	1.52	—	1.61	*nsv*	
Zinc	—	—	—	—	5.7	—	*	2
Total Inorganic								
Arsenic	—	—	2.86	—	—	—	2.1	1
Total Recoverable								
Aluminum	21.7	—	329	184	—	155	*nsv*	
Arsenic	0.64	—	2.94	0.49	0.51	0.55	*nsv*	
Barium	12.4	7.87	12.0	7.4	8.7	7.13	1000	1
Chromium	—	—	—	—	—	—	11[§]	2
Copper	—	—	—	—	—	—	*[§]	2
Iron	87.5	—	407	228	310	180	1000	2
Lead	—	—	—	—	—	—	*[§]	2
Manganese	11.7	3.94	26.5	16.2	14.5	10.8	*nsv*	

Appendix A Water Sample Results	ROGUE BASIN Station ID and Description							
Samples in 2011, 2013 or 2015	Applegate R at Fish Hatchery Road - 2015	Sucker Creek - 2015	Little Butte Cr. At bridge in town of Lake Creek - 2015	Rogue River downstream of Gold Ray Dam -	Rogue River at RM 120.76 - 2011	Rogue River at Lathrop County Park - 2015	Screening Value	S.V. Reference
	11840	25814	26632	30195	34860	38107		
	Average Values							
Priority Metals, continued								
Total Recoverable								
Nickel	1.68	2.11	—	—	—	—	*§	2
Potassium	0.98	0.67	1.56	3.28	—	1.61	*nsv*	
Zinc	—	—	—	—	—	—	*§	2
Standard Parameters (mg/L)								
Dissolved Organic Carbon	1.9	1.1	2.9	1.6	3.2	1.9		
Sulfate	5.2	3.9	1.4	2.0	1.5	2.4		
Total Organic Carbon	1.7	0.9	2.9	1.4	3.8	1.6		
Total Solids	102.6	81.3	91.0	80.0	80.0	79.0		
Total Suspended Solids	2.0		4.7	2.3	1.7	2.0		
Field Parameters								
Conductivity (µmhos/cm @ 25° C)	163	126	107	87	82	95		
Dissolved Oxygen (mg/L)	11.2	8.8	10.6	10.5	10.8	10.4		
pH (SU)	8.6	7.4	8.1	7.7	8.2	7.8		
Temperature (°C)	20.0	17.0	15.5	11.7	12.1	15.1		
Turbidity (NTU)	2		5	7	3	2		

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Appendix B
Sediment Sample Results

Samples collected in 2011 or 2015	Percent Detection	Number of samples over screening value	ROGUE BASIN Station ID and Description: Rogue River at Robertson Bridge - 2011 (10418)	Rogue River at Hwy 234 - 2015 (10423)	Grave Creek at mouth - 2015 (10427)	R05 - Bear Creek at Valley View Road - 2015 (10434)	Screening Value	S.V. Reference
			Maximum Values (ng/kg)					
Dioxins & Furans								
1,2,3,4,6,7,8-HpCDD	61		—	4.31	—	0.452	85	11
1,2,3,4,6,7,8-HpCDF	46		—	4.74	—	0.251	85	11
1,2,3,4,7,8-HxCDD	15		—	—	—	—	0.34	11
1,2,3,4,7,8-HxCDF	21		—	0.126	—	—	0.34	11
1,2,3,6,7,8-HxCDD	31	1	—	0.197	—	0.167	0.34	11
1,2,3,7,8,9-HxCDD	23	1	—	0.0704	—	—	0.34	11
1,2,3,7,8,9-HxCDF	7		—	—	—	—	0.34	11
1,2,3,7,8-PeCDD	7	1	—	—	—	—	0.034	11
2,3,4,6,7,8-HxCDF	8		—	—	—	0.154	0.34	11
2,3,4,7,8-PeCDF	7	1	—	—	—	0.17	0.0037	11
2,3,7,8-TCDF	7		—	—	—	—	0.094	11
OCDD	7		52.8	42.1	—	1.81	2800	11
OCDF	37		NA	6.16	—	—	2800	11
Flame-retardants								
PBDE-17	25		9.27	—	—	—	*nsv*	
PBDE-47	40		464	—	—	—	*nsv*	
PBDE-49	13		26.1	—	—	—	*nsv*	
PBDE-66	13		13.7	—	—	—	*nsv*	
PBDE-85	20		16.7	—	—	—	*nsv*	
PBDE-99	33		418	—	—	—	*nsv*	
PBDE-100	33		94.9	—	—	—	*nsv*	
PBDE-138	7		—	—	—	—	*nsv*	
PBDE-139	7		—	—	—	—	*nsv*	
PBDE-153	20		39.2	—	—	—	*nsv*	
PBDE-154	13		37.6	—	—	—	*nsv*	
PBDE-206	7		—	—	—	—	*nsv*	
PBDE-207	7		—	—	—	—	*nsv*	
PBDE-208	7		—	—	—	—	*nsv*	
PBDE-209	62		1460	280	—	—	*nsv*	
Legacy Pesticides								
Total Chlordane	12	3	187	—	—	228	46	11
alpha-Chlordane	12		51.4	—	—	62.9	*nsv*	
cis-Nonachlor	12		23.9	—	—	25.2	*nsv*	
gamma-Chlordane+trans-Nonachlor	20		112	—	—	140	*nsv*	
Oxychlordane	4		—	—	—	—	*nsv*	

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Appendix B
Sediment Sample Results

Samples collected in 2011 or 2015	Percent Detection	Number of samples over screening value	ROGUE BASIN Station ID and Description: Rogue River at Robertson Bridge - 2011	Rogue River at Hwy 234 - 2015	Grave Creek at mouth - 2015	R05 - Bear Creek at Valley View Road - 2015	Screening Value	S.V. Reference
			10418	10423	10427	10434		
			Maximum Values (ng/kg)					
Legacy Pesticides, continued								
Dieldrin	8	2	22.8	—	—	—	8.1	11
Endosulfan II	4		—	—	—	324	*nsv*	
Endosulfan sulfate	4		—	—	—	—	*nsv*	
Endrin+cis-Nonachlor	20		43.9	—	—	48	*nsv*	
Hexachlorobenzene	14	0	183	—	—	—	19000	11
Methoxychlor	4		—	—	—	—	*nsv*	
Total DDT	31	8	1289	—	—	1090	40	11
2,4´-DDD	15		62.8	—	—	—	*nsv*	
2,4´-DDE	8		16.7	—	—	—	*nsv*	
2,4´-DDT	12		15.3	—	—	28.6	*nsv*	
4,4´-DDD	27		170	—	—	75.8	*nsv*	
4,4´-DDE	38		945	—	—	539	*nsv*	
4,4´-DDT	31		78.9	—	—	447	*nsv*	
PCBs								
Total PCBs	33	5	647.6	—	—	—	48	11
PCB-101+113	27		59.1	—	—	—	*nsv*	
PCB-105	20	3	34.0	—	—	—	21	11
PCB-110	33		75.8	—	—	—	*nsv*	
PCB-118	33	3	77.8	—	—	—	26	11
PCB-128	20		12.8	—	—	—	*nsv*	
PCB-132+153	33		68.5	—	—	—	*nsv*	
PCB-138+163	27		56.5	—	—	—	*nsv*	
PCB-141	7		—	—	—	—	*nsv*	
PCB-149	33		31.6	—	—	—	*nsv*	
PCB-151	13		—	—	—	—	*nsv*	
PCB-156	13	0	10.4	—	—	—	26	11
PCB-170	7		—	—	—	—	*nsv*	
PCB-174	7		—	—	—	—	*nsv*	
PCB-175+182	7		—	—	—	—	*nsv*	
PCB-177	7		—	—	—	—	*nsv*	
PCB-180+193	7		—	—	—	—	*nsv*	
PCB-187	7		—	—	—	—	*nsv*	
PCB-199	13		—	—	—	—	*nsv*	
PCB-206	7		—	—	—	—	*nsv*	
PCB-209	7		—	—	—	—	*nsv*	

State of Oregon Department of Environmental Quality

Appendix B
Sediment Sample Results

ROGUE BASIN
Station ID and Description

Samples collected in 2011 or 2015	Percent Detection	Number of samples over screening value	Rogue River at Robertson Bridge - 2011	Rogue River at Hwy 234 - 2015	Grave Creek at mouth - 2015	R05 - Bear Creek at Valley View Road - 2015	Screening Value	S.V. Reference
			10418	10423	10427	10434		
			Maximum Values (mg/kg)					
PCBs								
PCB-28	7		—	—	—	—	*nsv*	
PCB-31	20		5.66	—	—	—	*nsv*	
PCB-43+52	13		38.2	—	—	—	*nsv*	
PCB-44	13		14.7	—	—	—	*nsv*	
PCB-49	13		12.2	—	—	—	*nsv*	
PCB-66	20		11.4	—	—	—	*nsv*	
PCB-70	27		24.4	—	—	—	*nsv*	
PCB-84	13		13.1	—	—	—	*nsv*	
PCB-85	13		11.1	—	—	—	*nsv*	
PCB-89	13		12.4	—	—	—	*nsv*	
PCB-95+121	20		37.0	—	—	—	*nsv*	
PCB-97	20		16.8	—	—	—	*nsv*	
PCB-99	20		24.1	—	—	—	*nsv*	
Priority Metals (Total)								
Aluminum	100		—	20500	29400	14000	*nsv*	
Antimony	9		—	—	—	0.36	*nsv*	
Arsenic	100	1	—	3.06	2.94	2.38	7	11
Barium	100		—	98.3	83.8	99.7	*nsv*	
Cadmium	55	0	—	—	0.15	0.10	1	11
Chromium	100		—	35.3	298	19.6	*nsv*	
Cobalt	100		—	16.0	16.9	5.54	*nsv*	
Copper	100		—	16.0	32.2	12.0	*nsv*	
Lead	100	0	—	2.68	4.16	5.20	17	11
Manganese	100		—	390	537	328	*nsv*	
Mercury	9	0	—	—	—	—	0.07	11
Nickel	100		—	27.9	103	8.29	*nsv*	
Thallium	9		—	—	—	0.10	*nsv*	
Zinc	100		—	74.9	73.1	37.8	*nsv*	

Appendix B Sediment Sample Results	ROGUE BASIN Station ID and Description						
Samples collected in 2011 or 2015	Little Butte Creek at Agate Road - 2011	Bear Creek at Kirtland Road - 2011	Bear Creek at Kirtland Road - 2015	Evans Creek at Palmerton Park - 2015	Illinois River downstream of Kerby - 2011	Screening Value	S.V. Reference
	10602	11051	11051	11461	11482		
	Maximum Values (ng/kg)						
Dioxins & Furans							
1,2,3,4,6,7,8-HpCDD	—	55.4	7.96	0.412	—	85	11
1,2,3,4,6,7,8-HpCDF	—	15.7	3.22	—	—	85	11
1,2,3,4,7,8-HxCDD	—	—	—	—	—	0.34	11
1,2,3,4,7,8-HxCDF	—	—	—	—	—	0.34	11
1,2,3,6,7,8-HxCDD	—	—	0.335	—	—	0.34	11
1,2,3,7,8,9-HxCDD	—	—	0.305	—	—	0.34	11
1,2,3,7,8,9-HxCDF	—	—	—	—	—	0.34	11
1,2,3,7,8-PeCDD	—	—	—	—	—	0.034	11
2,3,4,6,7,8-HxCDF	—	—	—	—	—	0.34	11
2,3,4,7,8-PeCDF	—	—	—	—	—	0.0037	11
2,3,7,8-TCDF	—	—	—	—	—	0.094	11
OCDD	18.8	560	97.5	2.93	—	2800	11
OCDF	NA	NA	12.6	—	—	2800	11
Flame-retardants							
PBDE-17	—	—	—	—	—	*nsv*	
PBDE-47	—	415	—	—	149	*nsv*	
PBDE-49	—	34.7	—	—	—	*nsv*	
PBDE-66	—	21	—	—	—	*nsv*	
PBDE-85	—	44.6	—	—	—	*nsv*	
PBDE-99	—	831	—	—	176	*nsv*	
PBDE-100	—	180	—	—	36.9	*nsv*	
PBDE-138	—	18.3	—	—	—	*nsv*	
PBDE-139	—	19.9	—	—	—	*nsv*	
PBDE-153	—	128	—	—	30.4	*nsv*	
PBDE-154	—	115	—	—	—	*nsv*	
PBDE-206	—	164	—	—	—	*nsv*	
PBDE-207	—	98.1	—	—	—	*nsv*	
PBDE-208	—	53.8	—	—	—	*nsv*	
PBDE-209	491	5320	385	—	537	*nsv*	
Legacy Pesticides							
Total Chlordane	—	616	—	—	—	46	11
alpha-Chlordane	—	159	—	—	—	*nsv*	
cis-Nonachlor	—	87.8	—	—	—	*nsv*	
gamma-Chlordane+trans-Nonachlor	—	355	—	—	—	*nsv*	
Oxychlordane	—	14.1	—	—	—	*nsv*	

Appendix B Sediment Sample Results	ROGUE BASIN Station ID and Description						
Samples collected in 2011 or 2015	Little Butte Creek at Agate Road - 2011	Bear Creek at Kirtland Road - 2011	Bear Creek at Kirtland Road - 2015	Evans Creek at Palmerton Park - 2015	Illinois River downstream of Kerby - 2011	Screening Value	S.V. Reference
	10602	11051	11051	11461	11482		
	Maximum Values (ng/kg)						
Legacy Pesticides, continued							
Dieldrin	—	204	—	—	—	8.1	11
Endosulfan II	—	—	—	—	—	*nsv*	
Endosulfan sulfate	—	71.1	—	—	—	*nsv*	
Endrin+cis-Nonachlor	—	86.4	—	—	—	*nsv*	
Hexachlorobenzene	—	—	—	—	799	19000	11
Methoxychlor	—	—	1410	—	—	*nsv*	
Total DDT	210	8785	881	—	—	40	11
2,4´-DDD	—	304	24.3	—	—	*nsv*	
2,4´-DDE	—	104	—	—	—	*nsv*	
2,4´-DDT	—	131	—	—	—	*nsv*	
4,4´-DDD	25.5	953	83.9	—	—	*nsv*	
4,4´-DDE	141	6510	651	—	—	*nsv*	
4,4´-DDT	43.5	783	122	—	—	*nsv*	
PCBs							
Total PCBs	—	621.7	—	—	—	48	11
PCB-101+113	—	35.6	—	—	—	*nsv*	
PCB-105	—	26.0	—	—	—	21	11
PCB-110	—	51.5	—	—	—	*nsv*	
PCB-118	—	55.1	—	—	—	26	11
PCB-128	—	16.1	—	—	—	*nsv*	
PCB-132+153	—	80.3	—	—	—	*nsv*	
PCB-138+163	—	70.0	—	—	—	*nsv*	
PCB-141	—	—	—	—	—	*nsv*	
PCB-149	—	39.2	—	—	—	*nsv*	
PCB-151	—	11.4	—	—	—	*nsv*	
PCB-156	—	—	—	—	—	26	11
PCB-170	—	12.5	—	—	—	*nsv*	
PCB-174	—	15.4	—	—	—	*nsv*	
PCB-175+182	—	23.9	—	—	—	*nsv*	
PCB-177	—	10.6	—	—	—	*nsv*	
PCB-180+193	—	33.7	—	—	—	*nsv*	
PCB-187	—	—	—	—	—	*nsv*	
PCB-199	—	15.5	—	—	—	*nsv*	
PCB-206	—	23.2	—	—	—	*nsv*	
PCB-209	—	16.2	—	—	—	*nsv*	

Appendix B Sediment Sample Results	ROGUE BASIN Station ID and Description						
Samples collected in 2011 or 2015	Little Butte Creek at Agate Road - 2011	Bear Creek at Kirtland Road - 2011	Bear Creek at Kirtland Road - 2015	Evans Creek at Palmerton Park - 2015	Illinois River downstream of Kerby - 2011	Screening Value	S.V. Reference
	10602	11051	11051	11461	11482		
	Maximum Values (mg/kg)						
PCBs							
PCB-28	—	—	—	—	—	*nsv*	
PCB-31	—	6.42	—	—	—	*nsv*	
PCB-43+52	—	—	—	—	—	*nsv*	
PCB-44	—	—	—	—	—	*nsv*	
PCB-49	—	—	—	—	—	*nsv*	
PCB-66	—	11.7	—	—	—	*nsv*	
PCB-70	—	17.1	—	—	—	*nsv*	
PCB-84	—	—	—	—	—	*nsv*	
PCB-85	—	—	—	—	—	*nsv*	
PCB-89	—	—	—	—	—	*nsv*	
PCB-95+121	—	24.2	—	—	—	*nsv*	
PCB-97	—	10.4	—	—	—	*nsv*	
PCB-99	—	15.7	—	—	—	*nsv*	
Priority Metals (Total)							
Aluminum	—	—	12000	18600	—	*nsv*	
Antimony	—	—	—	—	—	*nsv*	
Arsenic	—	—	2.43	2.23	—	7	11
Barium	—	—	66.2	83.0	—	*nsv*	
Cadmium	—	—	—	—	—	1	11
Chromium	—	—	14.6	21.2	—	*nsv*	
Cobalt	—	—	5.5	7.19	—	*nsv*	
Copper	—	—	10.6	11.5	—	*nsv*	
Lead	—	—	3.10	2.78	—	17	11
Manganese	—	—	320	277	—	*nsv*	
Mercury	—	—	—	—	—	0.07	11
Nickel	—	—	7.73	11.8	—	*nsv*	
Thallium	—	—	—	—	—	*nsv*	
Zinc	—	—	25.2	34.9	—	*nsv*	

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Appendix B
Sediment Sample Results

ROGUE BASIN
Station ID and Description

Samples collected in 2011 or 2015	Applegate R at Fish Hatchery Road - 2015	Sucker Creek - 2015	Little Butte Cr. at bridge in Lake Creek - 2015	Rogue River ds of Gold Ray Dam - 2015	Rogue River at Lathrop County Park - 2015	Screening Value	S.V. Reference
	11840	25814	26632	30195	38107		
	Maximum Values (ng/kg)						
Dioxins & Furans							
1,2,3,4,6,7,8-HpCDD	0.657	—	9.2	4.04	—	85	11
1,2,3,4,6,7,8-HpCDF	—	0.554	1.59	—	—	85	11
1,2,3,4,7,8-HxCDD	—	0.131	0.205	—	—	0.34	11
1,2,3,4,7,8-HxCDF	—	—	0.144	—	0.0497	0.34	11
1,2,3,6,7,8-HxCDD	—	—	0.447	—	—	0.34	11
1,2,3,7,8,9-HxCDD	—	—	0.465	—	—	0.34	11
1,2,3,7,8,9-HxCDF	—	0.189	—	—	—	0.34	11
1,2,3,7,8-PeCDD	—	—	0.246	—	—	0.034	11
2,3,4,6,7,8-HxCDF	—	—	—	—	—	0.34	11
2,3,4,7,8-PeCDF	—	—	—	—	—	0.0037	11
2,3,7,8-TCDF	—	—	0.0932	—	—	0.094	11
OCDD	—	—	66.3	—	—	2800	11
OCDF	—	—	6.04	—	—	2800	11
Flame-retardants							
PBDE-17	—	—	—	—	—	*nsv*	
PBDE-47	—	277	—	178	245	*nsv*	
PBDE-49	—	—	—	—	—	*nsv*	
PBDE-66	—	—	—	—	—	*nsv*	
PBDE-85	—	—	—	11.3	—	*nsv*	
PBDE-99	—	—	—	178	208	*nsv*	
PBDE-100	—	—	—	37.4	47.6	*nsv*	
PBDE-138	—	—	—	—	—	*nsv*	
PBDE-139	—	—	—	—	—	*nsv*	
PBDE-153	—	—	—	—	—	*nsv*	
PBDE-154	—	—	—	—	—	*nsv*	
PBDE-206	—	—	—	—	—	*nsv*	
PBDE-207	—	—	—	—	—	*nsv*	
PBDE-208	—	—	—	—	—	*nsv*	
PBDE-209	—	—	191	251	—	*nsv*	
Legacy Pesticides							
Total Chlordane	—	—	—	—	—	46	11
alpha-Chlordane	—	—	—	—	—	*nsv*	
cis-Nonachlor	—	—	—	—	—	*nsv*	
gamma-Chlordane+trans-Nonachlor	—	—	—	—	—	*nsv*	
Oxychlordane	—	—	—	—	—	*nsv*	

Appendix B Sediment Sample Results	ROGUE BASIN Station ID and Description						
Samples collected in 2011 or 2015	Applegate R at Fish Hatchery Road - 2015	Sucker Creek - 2015	Little Butte Cr. at bridge in Lake Creek - 2015	Rogue River ds of Gold Ray Dam - 2015	Rogue River at Lathrop County Park - 2015	Screening Value	S.V. Reference
	11840	25814	26632	30195	38107		
	Maximum Values (ng/kg)						
Legacy Pesticides, continued							
Dieldrin	—	—	—	—	—	8.1	11
Endosulfan II	—	—	—	—	—	*nsv*	
Endosulfan sulfate	—	—	—	—	—	*nsv*	
Endrin+cis-Nonachlor	—	—	—	—	—	*nsv*	
Hexachlorobenzene	—	—	—	—	—	19000	11
Methoxychlor	—	—	—	—	—	*nsv*	
Total DDT	—	—	144	282	463	40	11
2,4´-DDD	—	—	—	—	46.8	*nsv*	
2,4´-DDE	—	—	—	—	—	*nsv*	
2,4´-DDT	—	—	—	—	—	*nsv*	
4,4´-DDD	—	—	—	46.2	168	*nsv*	
4,4´-DDE	—	—	102	192	187	*nsv*	
4,4´-DDT	—	—	42.1	44.0	61.6	*nsv*	
PCBs							
Total PCBs	—	258.5	82.1	760.2	—	48	11
PCB-101+113	—	34.7	—	61.7	—	*nsv*	
PCB-105	—	—	—	40.9	—	21	11
PCB-110	—	33.1	15.2	83.7	—	*nsv*	
PCB-118	—	24.8	18.8	87.5	—	26	11
PCB-128	—	—	—	22.1	—	*nsv*	
PCB-132+153	—	49.2	22.6	83.0	—	*nsv*	
PCB-138+163	—	27.8	—	85.0	—	*nsv*	
PCB-141	—	—	—	11.0	—	*nsv*	
PCB-149	—	39.4	11.6	42.8	—	*nsv*	
PCB-151	—	—	13.9	—	—	*nsv*	
PCB-156	—	—	—	15.8	—	26	11
PCB-170	—	—	—	—	—	*nsv*	
PCB-174	—	—	—	—	—	*nsv*	
PCB-175+182	—	—	—	—	—	*nsv*	
PCB-177	—	—	—	—	—	*nsv*	
PCB-180+193	—	—	—	—	—	*nsv*	
PCB-187	—	17.8	—	—	—	*nsv*	
PCB-199	—	18.4	—	—	—	*nsv*	
PCB-206	—	—	—	—	—	*nsv*	
PCB-209	—	—	—	—	—	*nsv*	

Appendix B Sediment Sample Results	ROGUE BASIN Station ID and Description						
Samples collected in 2011 or 2015	Applegate R at Fish Hatchery Road - 2015	Sucker Creek - 2015	Little Butte Cr. at bridge in Lake Creek - 2015	Rogue River ds of Gold Ray Dam - 2015	Rogue River at Lathrop County Park - 2015	Screening Value	S.V. Reference
	11840	25814	26632	30195	38107		
	Maximum Values (mg/kg)						
PCBs							
PCB-28	—	—	—	6.95	—	*nsv*	
PCB-31	—	—	—	5.81	—	*nsv*	
PCB-43+52	—	—	—	30.0	—	*nsv*	
PCB-44	—	—	—	11.3	—	*nsv*	
PCB-49	—	—	—	10.8	—	*nsv*	
PCB-66	—	—	—	13.6	—	*nsv*	
PCB-70	—	13.3	—	28.5	—	*nsv*	
PCB-84	—	—	—	11.5	—	*nsv*	
PCB-85	—	—	—	10.9	—	*nsv*	
PCB-89	—	—	—	10.7	—	*nsv*	
PCB-95+121	—	—	—	34.5	—	*nsv*	
PCB-97	—	—	—	21.5	—	*nsv*	
PCB-99	—	—	—	30.6	—	*nsv*	
Priority Metals (Total)							
Aluminum	19100	21100	31800	11300	20100	*nsv*	
Antimony	—	—	—	—	—	*nsv*	
Arsenic	2.13	1.70	9.21	0.89	2.39	7	11
Barium	49.3	53.7	123.0	37.3	94.0	*nsv*	
Cadmium	0.13	0.13	0.17	—	0.10	1	11
Chromium	92.1	185	39.7	67.6	32.5	*nsv*	
Cobalt	10.1	16.1	13.7	4.8	9.1	*nsv*	
Copper	26.2	31.0	26.3	12.8	16.0	*nsv*	
Lead	2.01	2.32	3.68	1.57	3.16	17	11
Manganese	334	389	614	129	289	*nsv*	
Mercury	—	—	—	—	0.043	0.07	11
Nickel	60.1	147.0	21.1	21.8	18.7	*nsv*	
Thallium	—	—	—	—	—	*nsv*	
Zinc	36.3	39.9	62.1	15.8	42.9	*nsv*	

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Appendix C
Tissue Sample Results

Samples collected in 2010 or 2014	Percent Detection	Number of samples over screening value	ROGUE BASIN Station ID and Description: Rogue River at Robertson Bridge (NPM, 2010) 10418	Rogue River us Gold Ray Dam (NPM, 2010) 10422	Ashland Emigrant Lake (LMB, 2010) 18390	Screening Value	S.V. Reference
			Maximum Values (mg/kg)				
Flame-retardants							
PBDE-100	80		0.00013	0.00182	—	*nsv*	
PBDE-119	40		2.1E-06	5.9E-06	—	*nsv*	
PBDE-140	20		—	1E-05	—	*nsv*	
PBDE-15	60		1.9E-06	4E-06	—	*nsv*	
PBDE-153	80	0	2.5E-05	0.00043	—	0.2	12
PBDE-154	80		3.2E-05	0.00047	—	*nsv*	
PBDE-17	80		1.2E-05	2.1E-05	—	*nsv*	
PBDE-183	20		—	6.6E-06	—	*nsv*	
PBDE-184	20		—	3.3E-06	—	*nsv*	
PBDE-209	25	0	9.5E-05	—	—	16.3	12
PBDE-28	80		5.3E-05	0.00015	—	*nsv*	
PBDE-47	80	0	0.00092	0.0108	—	0.2	12
PBDE-49	80		6.5E-05	0.00034	—	*nsv*	
PBDE-66	60		3.1E-05	0.00026	—	*nsv*	
PBDE-85	40		4.1E-06	—	—	*nsv*	
PBDE-99	80		0.00039	0.00628	—	0.2	12
Legacy Pesticides							
Total Chlordane	100	0	0.00154	0.00149	7.1E-05	1.2	12
alpha-Chlordane	100		0.00021	0.00021	9.6E-06	*nsv*	
cis-Nonachlor	83		0.0003	0.00028	1.6E-05	*nsv*	
gamma-Chlordane	100		0.00095	0.00086	4.6E-05	*nsv*	
gamma-Chlordane+trans-Nonachlor	100		—	—	—	*nsv*	
Oxychlordane	33		8.3E-05	0.00014	—	*nsv*	
Dieldrin	83	0	0.00016	0.00038	1.3E-05	0.1	12
Endrin	100	0	0.00024	0.00023	1.5E-05	0.7	12
Endrin+cis-Nonachlor	50		—	—	—	*nsv*	
Heptachlor	17		—	1.4E-06	—	*nsv*	
Heptachlor epoxide	33	0	1.4E-05	1.8E-05	—	0.03	12
Hexachlorobenzene	100	0	0.00017	0.00016	5E-05	1.9	12
Methoxychlor	67	0	6.5E-05	4.7E-05	0.00068	11.7	12
Mirex	83	0	1.5E-05	1.3E-05	4.5E-06	0.5	12
Total DDT	100	0	0.01193	0.03535	0.00118	1.2	12
2,4´-DDD	83		7.2E-05	0.00042	7.4E-06	*nsv*	
2,4´-DDE	50		5.3E-05	0.00016	—	*nsv*	
2,4´-DDT	100		3.1E-05	0.00015	8.9E-06	*nsv*	

Appendix C Tissue Sample Results			ROGUE BASIN Station ID and Description				
Samples collected in 2010 or 2014	Percent Detection	Number of samples over screening value	Rogue River at Robertson Bridge (NPM, 2010)	Rogue River us Gold Ray Dam (NPM, 2010)	Ashland Emigrant Lake (LMB, 2010)	Screening Value	S.V. Reference
			10418	10422	18390		
			Maximum Values (mg/kg)				
Legacy Pesticides, continued							
4,4´-DDD	100		0.00057	0.00209	4.1E-05	*nsv*	
4,4´-DDE	100		0.0112	0.0317	0.00107	*nsv*	
4,4´-DDT	80		8E-06	0.00083	5.2E-05	*nsv*	
PCBs							
Total PCB	100	0	0.00053	0.03948	0.00045	0.05	12
PCB-101	100		2.9E-05	0.00334	2.2E-05	*nsv*	
PCB-101+113	100		—	—	—	*nsv*	
PCB-102	17		—	3.3E-05	—	*nsv*	
PCB-103	17		—	9.4E-06	—	*nsv*	
PCB-105	83		1.2E-05	0.00152	8.8E-06	*nsv*	
PCB-107	100		2.7E-06	0.00028	6.6E-06	*nsv*	
PCB-107+123	50		—	—	—	*nsv*	
PCB-110	100		2.7E-05	0.00333	1.5E-05	*nsv*	
PCB-112	25		—	0.00011	—	*nsv*	
PCB-114	33		—	0.00012	4.5E-06	*nsv*	
PCB-115	17		—	7.7E-05	—	*nsv*	
PCB-118	100		3.3E-05	0.00406	2.3E-05	*nsv*	
PCB-124	17		—	0.00014	—	*nsv*	
PCB-125	17		—	4.6E-06	—	*nsv*	
PCB-126	17		—	—	4.6E-06	*nsv*	
PCB-128	83		6.2E-06	0.00072	4.4E-06	*nsv*	
PCB-129	50		1.2E-06	0.00019	1E-06	*nsv*	
PCB-130	83		2.4E-06	0.00024	1.8E-06	*nsv*	
PCB-131	25		—	4.6E-05	—	*nsv*	
PCB-132	100		6.1E-05	0.00369	5E-05	*nsv*	
PCB-132+153	100		—	—	—	*nsv*	
PCB-134	33		—	0.00015	—	*nsv*	
PCB-135	83		3.2E-06	0.0002	1.7E-06	*nsv*	
PCB-137	83		2.3E-06	0.00024	1.7E-06	*nsv*	
PCB-138	100		4.4E-05	0.00328	3.6E-05	*nsv*	
PCB-138+163	100		—	—	—	*nsv*	
PCB-139	17		—	—	—	*nsv*	
PCB-140	17		—	1.8E-05	—	*nsv*	
PCB-141	83		6.4E-06	0.00049	4.8E-06	*nsv*	
PCB-142	17		—	4.3E-05	—	*nsv*	

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Appendix C
Tissue Sample Results

Samples collected in 2010 or 2014	Percent Detection	Number of samples over screening value	ROGUE BASIN Station ID and Description: Rogue River at Robertson Bridge (NPM, 2010) 10418	Rogue River us Gold Ray Dam (NPM, 2010) 10422	Ashland Emigrant Lake (LMB, 2010) 18390	Screening Value	S.V. Reference
			Maximum Values (mg/kg)				
PCBs, continued							
PCB-144	67		1.9E-06	0.00012	1E-06	*nsv*	
PCB-146	100		6.1E-06	0.00032	6.9E-06	*nsv*	
PCB-147	33		—	7.5E-05	5E-07	*nsv*	
PCB-148	67		2.3E-06	0.00019	1.8E-06	*nsv*	
PCB-149	100		2.5E-05	0.0017	1.5E-05	*nsv*	
PCB-150	17		—	2E-06	—	*nsv*	
PCB-151	83		8.4E-06	0.00037	5E-06	*nsv*	
PCB-154	17		—	2.2E-05	—	*nsv*	
PCB-156	83		3.7E-06	0.00055	9.9E-06	*nsv*	
PCB-157	50		—	0.00012	4.8E-06	*nsv*	
PCB-158	100		3.8E-06	0.00042	3.1E-06	*nsv*	
PCB-158+160	50		—	—	—	*nsv*	
PCB-162	17		—	—	5.4E-07	*nsv*	
PCB-164	83		2.1E-06	0.00019	1.5E-06	*nsv*	
PCB-166	17		—	2.3E-05	—	*nsv*	
PCB-167	83		2.6E-06	0.00019	7.4E-06	*nsv*	
PCB-169	17		—	—	3.9E-06	*nsv*	
PCB-170	83		6.7E-06	0.00028	5E-06	*nsv*	
PCB-171	83		2.4E-06	8.6E-05	1.7E-06	*nsv*	
PCB-172	50		2E-06	4.8E-05	1.6E-06	*nsv*	
PCB-173	17		—	6.3E-06	—	*nsv*	
PCB-174	83		6.6E-06	0.00016	3.4E-06	*nsv*	
PCB-175	25		—	1E-05	—	*nsv*	
PCB-176	50		1.4E-06	2.1E-05	5.8E-07	*nsv*	
PCB-177	83		5.4E-06	0.00013	3.4E-06	*nsv*	
PCB-178	83		2.5E-06	3.6E-05	2E-06	*nsv*	
PCB-179	67		3.6E-06	4.6E-05	1.9E-06	*nsv*	
PCB-18	17		—	6.4E-06	—	*nsv*	
PCB-180	100		2.1E-05	0.00047	1.9E-05	*nsv*	
PCB-180+193	50		—	—	—	*nsv*	
PCB-181	17		—	6.8E-06	—	*nsv*	
PCB-183	83		7.5E-06	0.00014	5.3E-06	*nsv*	
PCB-185	33		1.2E-06	1.6E-05	—	*nsv*	
PCB-187	100		1.7E-05	0.00023	1.3E-05	*nsv*	
PCB-189	33		—	1.4E-05	2.1E-06	*nsv*	

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Appendix C
Tissue Sample Results

Samples collected in 2010 or 2014	Percent Detection	Number of samples over screening value	ROGUE BASIN Station ID and Description: Rogue River at Robertson Bridge (NPM, 2010) 10418	Rogue River us Gold Ray Dam (NPM, 2010) 10422	Ashland Emigrant Lake (LMB, 2010) 18390	Screening Value	S.V. Reference
			Maximum Values (mg/kg)				
PCBs, continued							
PCB-190	67		1.3E-06	5.7E-05	1.6E-06	*nsv*	
PCB-191	17		—	1.1E-05	—	*nsv*	
PCB-194	67		3.6E-06	3.8E-05	4.4E-06	*nsv*	
PCB-195	67		1.1E-06	1.7E-05	1.6E-06	*nsv*	
PCB-196	67		2.3E-06	2.2E-05	2.3E-06	*nsv*	
PCB-197	33		—	1.9E-06	5E-07	*nsv*	
PCB-199	83		7.9E-06	5.1E-05	5.4E-06	*nsv*	
PCB-20	100		4.9E-06	7.8E-06	3E-06	*nsv*	
PCB-200	33		—	3.2E-06	4.2E-07	*nsv*	
PCB-201	67		1E-06	5.4E-06	1.2E-06	*nsv*	
PCB-202	67		2.5E-06	1.2E-05	2.4E-06	*nsv*	
PCB-203	83		4.4E-06	3E-05	3E-06	*nsv*	
PCB-205	17		—	2.6E-06	—	*nsv*	
PCB-206	67		2.5E-06	1.5E-05	2.6E-06	*nsv*	
PCB-207	17		—	1.8E-06	—	*nsv*	
PCB-208	50		—	5.5E-06	1.6E-06	*nsv*	
PCB-209	67		1.3E-06	4.6E-06	1.9E-06	*nsv*	
PCB-22	33		—	4.4E-06	1.6E-06	*nsv*	
PCB-26	17		—	3.7E-06	—	*nsv*	
PCB-28	83		7.1E-06	2.3E-05	7.4E-06	*nsv*	
PCB-31	83		7.1E-06	2.3E-05	4.4E-06	*nsv*	
PCB-37	17		—	—	1.9E-06	*nsv*	
PCB-39	17		—	8.1E-06	—	*nsv*	
PCB-40	17		—	1.2E-05	—	*nsv*	
PCB-42	17		—	2.3E-05	—	*nsv*	
PCB-43	100		1.5E-05	0.0011	1.3E-05	*nsv*	
PCB-43+52	50		—	—	—	*nsv*	
PCB-44	83		6.9E-06	0.0003	4.6E-06	*nsv*	
PCB-48	17		—	6.4E-06	—	*nsv*	
PCB-49	83		5.7E-06	0.00026	3.2E-06	*nsv*	
PCB-53	17		—	6.8E-06	—	*nsv*	
PCB-56	67		2.8E-06	6.8E-05	1.7E-06	*nsv*	
PCB-59	17		—	2.6E-06	—	*nsv*	
PCB-60	83		2.6E-06	0.00015	2.2E-06	*nsv*	
PCB-63	17		—	1.6E-05	—	*nsv*	

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Appendix C
Tissue Sample Results

Samples collected in 2010 or 2014	Percent Detection	Number of samples over screening value	ROGUE BASIN Station ID and Description: Rogue River at Robertson Bridge (NPM, 2010) 10418	Rogue River us Gold Ray Dam (NPM, 2010) 10422	Ashland Emigrant Lake (LMB, 2010) 18390	Screening Value	S.V. Reference
			Maximum Values (mg/kg)				
PCBs, continued							
PCB-64	100		4.9E-06	0.00012	3.3E-06	*nsv*	
PCB-64+68	50		—	—	—	*nsv*	
PCB-65	100		4.9E-06	4.4E-05	4.4E-06	*nsv*	
PCB-65+75	50		—	—	—	*nsv*	
PCB-66	83		9.2E-06	0.00036	5.8E-06	*nsv*	
PCB-70	83		1.4E-05	0.00101	8.6E-06	*nsv*	
PCB-71	17		—	2.1E-05	—	*nsv*	
PCB-74	100		6E-06	0.00033	4.6E-06	*nsv*	
PCB-74+76	50		—	—	—	*nsv*	
PCB-77	33		—	2.3E-05	4.4E-06	*nsv*	
PCB-81	33		—	4.6E-05	4.8E-06	*nsv*	
PCB-82	17		—	0.00029	—	*nsv*	
PCB-83	17		—	4.8E-05	—	*nsv*	
PCB-84	33		—	7.5E-05	1E-05	*nsv*	
PCB-85	67		4.9E-06	0.00054	3.7E-06	*nsv*	
PCB-87	100		8.8E-06	0.00124	6.6E-06	*nsv*	
PCB-87+111+116+117	50		—	—	—	*nsv*	
PCB-89	67		5E-06	0.00056	3.4E-06	*nsv*	
PCB-90	17		—	2.2E-05	—	*nsv*	
PCB-91	33		—	0.00026	—	*nsv*	
PCB-94	17		—	4.9E-06	—	*nsv*	
PCB-95	100		1.1E-05	0.00139	7.8E-06	*nsv*	
PCB-95+121	50		—	—	—	*nsv*	
PCB-96	17		—	3.6E-06	—	*nsv*	
PCB-97	83		9.8E-06	0.00119	4.4E-06	*nsv*	
PCB-99	100		1.2E-05	0.00132	8.9E-06	*nsv*	
Priority Metals (Total)							
Arsenic	43	0	—	—	—	0.7°	12
Mercury	100	24	0.54	0.62	2.48	0.04	13

Appendix C Tissue Sample Results	ROGUE BASIN Station ID and Description				
Samples collected in 2010 or 2014	Ashland Emigrant Lake (SMB, 2010)	Applegate Reservoir (RBT, 2010)	Rogue River at RM 7.4 (NPM, 2014)	Screening Value	S.V. Reference
	18390	36283	37826		
	Maximum Values (mg/kg)				
Flame-retardants					
PBDE-100	0.00015	—	0.00114	*nsv*	
PBDE-119	—	—	—	*nsv*	
PBDE-140	—	—	—	*nsv*	
PBDE-15	2.3E-06	—	—	*nsv*	
PBDE-153	2.1E-05	—	8.2E-05	0.2	12
PBDE-154	3.3E-05	—	0.00028	*nsv*	
PBDE-17	2E-05	—	9.2E-06	*nsv*	
PBDE-183	—	—	—	*nsv*	
PBDE-184	—	—	—	*nsv*	
PBDE-209	—	—	—	16.3	12
PBDE-28	8.3E-05	—	0.00016	*nsv*	
PBDE-47	0.00146	—	0.00739	0.2	12
PBDE-49	7.5E-05	—	0.00014	*nsv*	
PBDE-66	4.4E-05	—	—	*nsv*	
PBDE-85	9.1E-06	—	—	*nsv*	
PBDE-99	0.0004	—	0.00017	0.2	12
Legacy Pesticides					
Total Chlordane	7.5E-05	4.8E-05	0.00033	1.2	12
alpha-Chlordane	9.8E-06	1E-05	5.6E-05	*nsv*	
cis-Nonachlor	1.4E-05	—	7.3E-05	*nsv*	
gamma-Chlordane	3.6E-05	—	—	*nsv*	
gamma-Chlordane+trans-Nonachlor	—	3.7E-05	0.0002	*nsv*	
Oxychlordane	—	—	—	*nsv*	
Dieldrin	2E-05	—	4.8E-05	0.1	12
Endrin	9.6E-06	—	—	0.7	12
Endrin+cis-Nonachlor	—	—	8.7E-05	*nsv*	
Heptachlor	—	—	—	*nsv*	
Heptachlor epoxide	—	—	—	0.03	12
Hexachlorobenzene	8.7E-05	—	—	1.9	12
Methoxychlor	5.7E-05	—	—	11.7	12
Mirex	5.1E-06	—	1.1E-05	0.5	12
Total DDT	0.00092	0.00057	0.00303	1.2	12
2,4´-DDD	8.4E-06	—	1.4E-05	*nsv*	
2,4´-DDE	—	—	1.3E-05	*nsv*	
2,4´-DDT	7.5E-06	1.1E-05	1.6E-05	*nsv*	

Appendix C Tissue Sample Results	ROGUE BASIN Station ID and Description				
Samples collected in 2010 or 2014	Ashland Emigrant Lake (SMB, 2010)	Applegate Reservoir (RBT, 2010)	Rogue River at RM 7.4 (NPM, 2014)	Screening Value	S.V. Reference
	18390	36283	37826		
	Maximum Values (mg/kg)				
Legacy Pesticides, continued					
4,4´-DDD	3.3E-05	2.4E-05	0.00011	*nsv*	
4,4´-DDE	0.00083	0.00054	0.00287	*nsv*	
4,4´-DDT	4E-05	—	—	*nsv*	
PCBs					
Total PCB	0.0005	0.00024	0.00348	0.05	12
PCB-101	2.5E-05	—	—	*nsv*	
PCB-101+113	—	2.5E-05	0.00017	*nsv*	
PCB-102	—	—	—	*nsv*	
PCB-103	—	—	—	*nsv*	
PCB-105	1.1E-05	—	0.00011	*nsv*	
PCB-107	2.9E-06	—	—	*nsv*	
PCB-107+123	—	—	2.4E-05	*nsv*	
PCB-110	2.3E-05	1.6E-05	0.00017	*nsv*	
PCB-112	—	—	—	*nsv*	
PCB-114	—	—	—	*nsv*	
PCB-115	—	—	—	*nsv*	
PCB-118	3.2E-05	2.6E-05	0.00042	*nsv*	
PCB-124	—	—	—	*nsv*	
PCB-125	—	—	—	*nsv*	
PCB-126	—	—	—	*nsv*	
PCB-128	6.9E-06	—	7.3E-05	*nsv*	
PCB-129	—	—	—	*nsv*	
PCB-130	2.1E-06	—	1.9E-05	*nsv*	
PCB-131	—	—	—	*nsv*	
PCB-132	6.6E-05	—	—	*nsv*	
PCB-132+153	—	7.4E-05	0.0006	*nsv*	
PCB-134	1.3E-06	—	—	*nsv*	
PCB-135	2.3E-06	—	1.2E-05	*nsv*	
PCB-137	2.5E-06	—	2.3E-05	*nsv*	
PCB-138	4.4E-05	—	—	*nsv*	
PCB-138+163	—	4E-05	0.00048	*nsv*	
PCB-139	—	—	0.0001	*nsv*	
PCB-140	—	—	—	*nsv*	
PCB-141	6.6E-06	—	3.3E-05	*nsv*	
PCB-142	—	—	—	*nsv*	

Appendix C Tissue Sample Results	ROGUE BASIN Station ID and Description				
Samples collected in 2010 or 2014	Ashland Emigrant Lake (SMB, 2010)	Applegate Reservoir (RBT, 2010)	Rogue River at RM 7.4 (NPM, 2014)	Screening Value	S.V. Reference
	18390	36283	37826		
	Maximum Values (mg/kg)				
PCBs, continued					
PCB-144	1.3E-06	—	—	*nsv*	
PCB-146	6.6E-06	1.3E-05	5.4E-05	*nsv*	
PCB-147	—	—	—	*nsv*	
PCB-148	2E-06	—	—	*nsv*	
PCB-149	2.3E-05	2.1E-05	0.0001	*nsv*	
PCB-150	—	—	—	*nsv*	
PCB-151	7.7E-06	—	2E-05	*nsv*	
PCB-154	—	—	—	*nsv*	
PCB-156	2.8E-06	—	5.1E-05	*nsv*	
PCB-157	—	—	1E-05	*nsv*	
PCB-158	4.1E-06	—	—	*nsv*	
PCB-158+160	—	—	4.1E-05	*nsv*	
PCB-162	—	—	—	*nsv*	
PCB-164	2E-06	—	1.3E-05	*nsv*	
PCB-166	—	—	—	*nsv*	
PCB-167	2.4E-06	—	3.1E-05	*nsv*	
PCB-169	—	—	—	*nsv*	
PCB-170	6.9E-06	—	2.8E-05	*nsv*	
PCB-171	2.6E-06	—	1E-05	*nsv*	
PCB-172	—	—	—	*nsv*	
PCB-173	—	—	—	*nsv*	
PCB-174	5.8E-06	—	1.5E-05	*nsv*	
PCB-175	—	—	—	*nsv*	
PCB-176	—	—	—	*nsv*	
PCB-177	4.7E-06	—	1.5E-05	*nsv*	
PCB-178	2.7E-06	—	9.3E-06	*nsv*	
PCB-179	3.2E-06	—	—	*nsv*	
PCB-18	—	—	—	*nsv*	
PCB-180	2.3E-05	—	—	*nsv*	
PCB-180+193	—	—	8.9E-05	*nsv*	
PCB-181	—	—	—	*nsv*	
PCB-183	8E-06	—	2.3E-05	*nsv*	
PCB-185	—	—	—	*nsv*	
PCB-187	1.9E-05	1.3E-05	5.8E-05	*nsv*	
PCB-189	—	—	—	*nsv*	

State of Oregon Department of Environmental Quality	Appendix C Tissue Sample Results	ROGUE BASIN Station ID and Description				
	Samples collected in 2010 or 2014	Ashland Emigrant Lake (SMB, 2010)	Applegate Reservoir (RBT, 2010)	Rogue River at RM 7.4 (NPM, 2014)	Screening Value	S.V. Reference
		18390	36283	37826		
		Maximum Values (mg/kg)				
PCBs, continued						
PCB-190		—	—	9.8E-06	*nsv*	
PCB-191		—	—	—	*nsv*	
PCB-194		4.4E-06	—	—	*nsv*	
PCB-195		1.3E-06	—	—	*nsv*	
PCB-196		3E-06	—	—	*nsv*	
PCB-197		—	—	—	*nsv*	
PCB-199		9.8E-06	—	1.8E-05	*nsv*	
PCB-20		3.2E-06	—	—	*nsv*	
PCB-200		—	—	—	*nsv*	
PCB-201		1.1E-06	—	—	*nsv*	
PCB-202		2.9E-06	—	—	*nsv*	
PCB-203		4.8E-06	—	2E-05	*nsv*	
PCB-205		—	—	—	*nsv*	
PCB-206		3.5E-06	—	—	*nsv*	
PCB-207		—	—	—	*nsv*	
PCB-208		1.5E-06	—	—	*nsv*	
PCB-209		1.7E-06	—	—	*nsv*	
PCB-22		—	—	—	*nsv*	
PCB-26		—	—	—	*nsv*	
PCB-28		4.7E-06	—	9.9E-06	*nsv*	
PCB-31		5.1E-06	—	7.8E-06	*nsv*	
PCB-37		—	—	—	*nsv*	
PCB-39		—	—	—	*nsv*	
PCB-40		—	—	—	*nsv*	
PCB-42		—	—	—	*nsv*	
PCB-43		1.1E-05	—	—	*nsv*	
PCB-43+52		—	—	4.6E-05	*nsv*	
PCB-44		5.5E-06	—	2.9E-05	*nsv*	
PCB-48		—	—	—	*nsv*	
PCB-49		4.4E-06	—	2E-05	*nsv*	
PCB-53		—	—	—	*nsv*	
PCB-56		2.5E-06	—	—	*nsv*	
PCB-59		—	—	—	*nsv*	
PCB-60		2.5E-06	—	1.1E-05	*nsv*	
PCB-63		—	—	—	*nsv*	

Appendix C Tissue Sample Results	ROGUE BASIN Station ID and Description				
Samples collected in 2010 or 2014	Ashland Emigrant Lake (SMB, 2010)	Applegate Reservoir (RBT, 2010)	Rogue River at RM 7.4 (NPM, 2014)	Screening Value	S.V. Reference
	18390	36283	37826		
	Maximum Values (mg/kg)				
PCBs, continued					
PCB-64	4.1E-06	—	—	*nsv*	
PCB-64+68	—	—	2E-05	*nsv*	
PCB-65	5.3E-06	—	—	*nsv*	
PCB-65+75	—	—	1.8E-05	*nsv*	
PCB-66	7.3E-06	—	3.8E-05	*nsv*	
PCB-70	1.1E-05	—	3.9E-05	*nsv*	
PCB-71	—	—	—	*nsv*	
PCB-74	4.8E-06	—	—	*nsv*	
PCB-74+76	—	—	2.8E-05	*nsv*	
PCB-77	—	—	—	*nsv*	
PCB-81	—	—	—	*nsv*	
PCB-82	—	—	—	*nsv*	
PCB-83	—	—	—	*nsv*	
PCB-84	—	—	1E-05	*nsv*	
PCB-85	—	—	3.7E-05	*nsv*	
PCB-87	8.1E-06	—	—	*nsv*	
PCB-87+111+116+117	—	—	5.4E-05	*nsv*	
PCB-89	—	—	2.7E-05	*nsv*	
PCB-90	—	—	—	*nsv*	
PCB-91	—	—	1.4E-05	*nsv*	
PCB-94	—	—	—	*nsv*	
PCB-95	0.00001	—	—	*nsv*	
PCB-95+121	—	—	5.1E-05	*nsv*	
PCB-96	—	—	—	*nsv*	
PCB-97	9.1E-06	—	5.8E-05	*nsv*	
PCB-99	1.2E-05	1.4E-05	0.00011	*nsv*	
Priority Metals (Total)					
Arsenic	—	0.14	—	0.7°	12
Mercury	0.86	0.152	0.504	0.04	13