Review and Assessment of the Rogue River in the Vicinity of the City of Medford Regional Water Reclamation Facility

Expert Opinion Report Prepared by Noah Hume, Stillwater Sciences, Portland, Oregon
for Stoel Rives LLP, Portland Oregon.

February 1, 2019

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Cover photos: Stillwater Sciences Rogue River sampling reaches.

Table of Contents

Tables

Figures

Appendices

1 INTRODUCTION

1.1 Request for Expert Opinion

Stoel Rives LLP has requested an expert opinion regarding water quality and ecological conditions of the Rogue River in the vicinity of the City of Medford's Regional Water Reclamation Facility (RWRF) wastewater outfall. Specifically, Stoel Rives LLP requested that Stillwater Sciences:

1. Conduct a detailed assessment of the existing data available (the previous studies identified *infra* in Section 1.5) and conduct additional sampling in riffle habitats in the Rogue River both upstream and downstream of the RWRF with the purpose of examining changes in ecological conditions; and

2. Based on the above information (as well as other available data and literature), evaluate the RWRF's potential contributions to those conditions, as relevant to several Oregon narrative water quality standards. These standards are the biocriterion standard at Oregon Administrative Rule (OAR) 340-041-0011 and other narrative standards at OAR 340-041-0007(9) (deleterious fungi and other growths); OAR 340-041-0007(10) (deleterious conditions); OAR 340-041-0007(11) (deleterious deposits); OAR 340-041-0007(12) (objectionable discoloration and other specified conditions); and OAR 340-041-0007(13) (offensive aesthetic conditions).

Stillwater Sciences was not asked to form an opinion on whether the discharges from the RWRF comply with the National Pollutant Discharge Elimination System (NPDES) Permit 100985, issued by the Oregon Department of Environmental Quality (DEQ).

1.1.1 Professional Background and Qualifications

My qualifications to render the opinions contained in this report are set forth in my resume attached hereto as Appendix A and incorporated herein by reference. As noted in my resume, in summary, my qualifications are as follows:

I received a B.S. in Mechanical and Ocean Engineering from the University of Rhode Island in 1985, an M.S. in Civil and Environmental Engineering from the University of California at Berkeley in 1989, and a Ph.D. from U.C. Berkeley in Ecological Engineering in 2000. Since joining Stillwater Sciences in 2000, I estimate that I have over three or four thousand hours devoted to studies related to the interaction of physical habitat and water quality conditions upon aquatic beneficial uses of water in rivers, lakes, wetlands, and estuaries. Specifically related to this expert opinion, I have prior experience on the Mackenzie River Oregon, and Tuolumne River, California in examining benthic macroinvertebrate community responses to changes in flow regime, temperature, sediment supply and transport. I have conducted a multi-year assessment of the interactions of treated wastewater discharges with riverine and estuarine portions of the lower Santa Clara River in Ventura, California, including BMI community and fishery responses to varying levels of treated wastewater discharge.

In the past ten (10) years, I have not submitted peer reviewed articles for journal publication.

1.1.2 Statement of Fees

Attached as Appendix B is a statement of fees charged by Stillwater Sciences through January 31, 2019, as well as a fee schedule showing the hourly rates that will be charged for further study and testimony.

1.1.3 Information Considered

My opinion is based on my familiarity with the general literature on aquatic ecology and bioassessment, prior field studies and data analysis of water quality, algae, and benthic macroinvertebrate assemblages in riverine settings. Specific information considered in this report include the review, in total or in part, of the following:

1. Pertinent reports regarding RWRF and other influences on water quality conditions in the Rogue River listed in Section 1.4.
2. Literature and information sources listed in the "References" section of this report,
3. Data collected in October 2018 by Stillwater Sciences (raw data included as Appendices C, D, and E)
4. Selected materials from ODEQ, available upon request.

1.1.4 Prior Expert Testimony

In the past four (4) years, I have not provided testimony at a trial or by deposition in any legal proceedings.

1.2 Background

The RWRF discharges secondary-treated municipal wastewater to the Rogue River along its south (left) bank in Jackson County, Oregon at river mile (RM) 130.5. The RWRF has a design average dry weather outflow of 31 cubic feet per second (cfs) and hydraulic capacity of 149 cfs during wet weather events. The RWRF discharges into the Rogue River within the Middle Rogue River Sub-basin (HUC 17100308). The middle and upper portions of the Rogue River are located northeast of the Siskiyou Mountains and along the western edge of the Cascade Mountains, with its headwaters near Crater Lake. The RWRF's discharges are authorized by NPDES Permit 100985, issued by the Oregon DEQ.

Designated beneficial uses of water in this portion of the Rogue River include public and private domestic water supply, industrial water supply, irrigation, livestock watering, fish and aquatic life (including rearing/migration and spawning), wildlife and hunting, fishing, boating, water contact recreation, aesthetic quality, and commercial navigation & transportation (OAR 340-041-0271, Table 271A). Several total maximum daily load (TMDL) assessments have been implemented to address historical Clean Water Act (CWA) Section 303(d) listings for the river and its tributaries. TMDLs were established in 1992 for Bear Creek to address non-attainment of standards for pH, aquatic weeds and algae, and dissolved oxygen (DO). Additional parameters were addressed in a 2007 TMDL for the Bear Creek watershed, including phosphorus, DO, chlorophyll a, pH, ammonia, temperature and fecal coliform. Completed in 2008, the Rogue Basin TMDL addressed high levels of bacteria as well as temperature standards for migration and rearing of salmon and trout.

On December 20, 2018, EPA approved Oregon's 2012 CWA Section 303(d) List which included listing water quality limited segments for biocriteria (OAR 340-041-0011) in portions of the Middle Rogue River from RM 132.2, upstream of the City of Medford RWRF, downstream to RM 110.7 near the confluence of Evans Creek at the City of Rogue River, Oregon. The section below summarizes data submitted in support of the recent 303(d) listing, as well as other information related to the biocriteria standard and the potential influence of the Medford RWRF on water quality conditions in the Rogue River relevant to the standard.

1.3 Previous Studies

Three previous studies of water quality, algal growth and/or the benthic macro-invertebrate (BMI) community data were conducted in 2012 and 2013 upstream and downstream of the City's wastewater outfall to assess the biological integrity of the Rogue River outside the City's regulatory mixing zone in the river[1]:

- *Medford Regional Water Reclamation Facility Outfall Assessment Study* (Hafele 2013), conducted in October 2012.
- *Rogue River Algae Reconnaissance: A Response to the Algae Concerns Related to the Medford RWRF* (ODEQ 2014), conducted in October 2013.
- *Medford Regional Water Reclamation Facility: Mixing Zone and Biological Assessment Study*. (Brown & Caldwell 2014), conducted in October 2013.

1.4 Review of Biological Community Assessment Methods and Metrics

In ODEQ's (2018) Draft Assessment methodology assessing water quality limited waters pursuant to CWA Sections 303(d) and 305(b) and OAR 340-041-0046), biological community assessments are used to indicate aquatic life beneficial use support. Assessment of biocriteria in Oregon and other states relies upon the use of reference conditions (e.g., Hughes et al 1986, Reynoldson et al. 1997) as the basis of comparison, sometimes using results from a wide range of sites rather than relying on information from one or a few control sites. However, some indicator metrics react to multiple factors or may have naturally different values within different regions. At present, listing decisions related to biocriteria may be determined by several approaches, with the preferred approach based upon application of regional scoring thresholds derived from ratios of observed and modeled (i.e., expected) species richness of the BMI assemblage at a range of reference sites using results from ODEQ's Predictive Assessment Tool for Oregon, or PREDATOR model (Hubler 2008).

Conducting bioassessments in environmentally diverse regions within Oregon is complicated by the inability of some component metrics to provide consistent meaning in different environmental settings. As part of its Integrated Report improvement efforts, DEQ convened a technical review panel in the fall of 2017 to solicit independent scientific and technical input regarding the biocriteria impairment thresholds. In addition to questions regarding data availability, peer review comments recognized that the PREDATOR model may not be readily applied to all locations because the model results are based on similarity of taxonomic composition of the BMI assemblage between test and reference sites which may differ from the smaller rivers and streams used to calibrate the model to reference conditions. For example, because gravel transport and fluvial processes in the Rogue River are interrupted by the William Jess Dam at RM 158 (upstream of the City's discharge), and because historical as well as present day discharges have been associated with excess nutrients, algae, and other water quality issues along the upper Rogue River (ODEQ 2014), the benthic community composition of the Rogue River would be expected

[1] Schedule A, Section 1.e., of the NPDES permit establishes the Regulatory Mixing Zone (RMZ) for the City's effluent discharge as that portion of the Rogue River contained within a band up to 100 feet from the south bank of the river and extending from a point 10 feet upstream of the outfall to a point 300 feet downstream of the outfall.

to differ from regional reference conditions assessed by the PREDATOR model. Recognizing such limitations, ODEQ allows that other approaches may be appropriate for specific cases and data sets. For example, "… study designs may look at upstream-downstream changes in macroinvertebrate community composition and function and provide valid information using multi-metric indices (MMIs) or simple metrics such as total richness, dominance, non-insect taxa, tolerance, etc." Additionally, "other aquatic communities such as fish and algae are considered equally valid for assessing the biological integrity of freshwater systems."

Water quality, habitat conditions, and biological communities vary widely within river systems both spatially and temporally. Pollutants are often dispersed or altered very quickly after they are discharged such that they will not be detected at locations far from the discharge point, or perhaps intermittent discharges might not be detected by infrequent measurements. Because of their ability to integrate pollutant exposures temporally, stream insects and other biological indicators have been developed as surrogate measures of water quality and habitat conditions as well as to represent unmeasured biota (Karr and Chu 1999; Rosenberg and Resh 1996). The sections below examine the rationale for quantitative biocriteria applied by the three studies, potential use of alternative criteria, and select measures that may be used to indicate aquatic life beneficial use support.

1.4.1 BMI Metrics

Biological impairment may be caused by a number of factors, including organic enrichment from point source discharges, scour and sediment effects, habitat alterations, changes to the riparian zone, or toxicological effects. A number of approaches have been used to detect or quantify changes in aquatic communities as a measure of such disturbances, including presence/absence of indicator taxa; changes in community statistics such as species richness, diversity, and evenness measures; by multivariate statistics; as well as by use of multimetric indices (Rosenberg and Resh 1996, Barbour and Yoder 2000). Various BMI metrics have been used to indicate impairment including: (1) absence of pollution-sensitive taxa, especially from the orders Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies) (also known as the EPT group); (2) excessive dominance of pollution-tolerant taxa, such as non-insect macroinvertebrates (e.g., worms and snails); (3) low overall numbers of taxa, or (4) other perceptible differences in assemblage structure relative to a reference site, such as changes within functional feeding group (FFG) dominance. Table 1-1 presents metrics used by Hafele (2013), Brown and Caldwell (2014), Oregon Water Quality Interagency Workgroup (WQIW 1999), the California Stream Condition Index (Rehn et al. 2015), and California (CA) North Coast B-IBI (Rehn et al. 2005). Selection of appropriate biocriteria metrics in assessing anthropogenic influences is complicated by the subjectivity in some component metrics, substitution of individual taxa in the metrics, insensitivity to changes in water quality, natural variations in conditions and communities, as well as applicability to particular river systems (Capmourteres et al. 2018, Mazor et al. 2016). While Table 1-1 does not show uniformity among studies and region-specific index metrics, it does suggest common inferences related to disturbances as indicated by various selected metrics. These studies and indices present richness and sensitivity (tolerance or intolerance) to pollution metrics as unifying indicators of biotic integrity and disturbance.

Table 1-1. Selected benthic macroinvertebrate indicators from review of 2012-2013 studies and relevant biocriteria sources

Metric	Hafele (2013)	Brown and Caldwell (2014)	Oregon WQIW (1999)	North Coastal CA IBI (Rehn et al. 2005)	CSCI (Rehn et al. 2015)	Stillwater Sciences (2018)
Abundance and Diversity Metrics						
Total Abundance	X	X				X
EPT Abundance	X	X				X
Shannon Diversity Index						
Bray-Curtis percent similarity						X
Richness Metrics						
Taxa Richness	X	X	X		X	X
Shredder Richness					X	
EPT Richness	X	X		X		X
Coleoptera Richness				X		
Diptera Richness				X		
Collector Richness						
Predator Richness						
Mayfly Richness			X			
Stonefly Richness			X			
Caddisfly Richness			X			
Composition Metrics						
Percent Coleoptera Taxa					X	
Percent Oligochaeta	X	X				
Percent EPT Taxa					X	
Percent Predator Individuals				X		
Percent Non-Insect Taxa	X	X		X		X
Sensitivity Metrics						
Percent Intolerant Individuals	X	X		X	X	X
Percent Tolerant Taxa			X			X
Percent Dominant Taxa		X	X			X
Percent Sediment Tolerant Taxa			X			
Number Sensitive Taxa			X			
Percent Sensitive EPT	X					
Number Sediment Sensitive Taxa			X			
Percent Clinger Taxa		X			X	
Modified Hilsenoff Biotic Index			X			

Metric	Hafele (2013)	Brown and Caldwell (2014)	Oregon WQIW (1999)	North Coastal CA IBI (Rehn et al. 2005)	CSCI (Rehn et al. 2015)	Stillwater Sciences (2018)
Functional Feeding Group (FFG) Metrics						
Percent Shredder Taxa		X		X		
Percent Non-Gastropod Scraper Individuals				X		

The metrics selected for this study included several types: abundance, richness, composition, sensitivity, and FFG measures. Metrics that measure abundance, composition, and FFGs were selected largely for the purpose of comparison to the Hafele (2013) and Brown and Caldwell (2014) studies. Metrics that measure richness and sensitivity were selected based on their use in reference indices or for comparison with the Hafele (2013) and Brown and Caldwell (2014) studies. The description, type of disturbance, typical response, and rationale for selecting or not selecting the metric are discussed below:

> *Bray-Curtis percent similarity:* This measure describes the overlap in BMI community composition in relation to another sample, and represents similarity in terms of both the number and abundance of each taxon (Bray and Curtis 1957). This metric was selected to quantify the similarity or dissimilarity in terms of taxonomic composition within and among sites, as well as the natural variance within and among sites. The metric is strictly comparative in nature and does not provide insight on stressors or overall ecosystem health.

> *Total abundance*: This is the total number of BMI individuals counted, or calculated, in a sample. Despite some uncertainty due to patchiness,[2] as well as uncertainties regarding representation of the BMI community due to the capture efficiency of differing equipment for particular taxa[3], this metric was selected for its value as a general indicator of environmental change and its use by Hafele (2013) and Brown and Caldwell (2014). For example, total abundance is generally thought to be increased in nutrient-enriched environments, such as an effluent plume from a wastewater treatment plant (Marcogliese et al. 2015), and more likely to decrease with increased scour disturbance (Matthaei et al. 2010; Declan and Gottelli 2000).

> *Total taxa richness:* This is the number of distinct taxa, which is used as a proxy for diversity within a sample (Resh et al. 1995). This metric was selected because it was used by Hafele (2013) and Brown and Caldwell (2014), and for its biotic integrity characterization value as described by other sources (Rehn et al. 2015; Rehn et al. 2005; and Barbour et al. 1999). While non-specific to particular stressors, increased disturbance is generally expected to decrease taxa richness (Barbour et al. 1999). In reviews of multiple studies in riverine settings, however, it has been suggested that richness may be maximized at intermediate levels of disturbance (Stoddard et al 2006).

> *EPT abundance:* This is the total number of individuals from the EPT group counted in or calculated for the sample. This metric was selected for its value as general indicator of environmental change and use by Hafele (2013) and Brown

[2] Due to the natural patchiness of benthic macroinvertebrate communities in riffle habitats, large numbers of sampling replicates are typically required to produce useful estimates at a 95% confidence level (Rosenberg et al. 1998). For this reason, BMI abundance estimates for the Rogue River referenced in this report should be considered indicators of relative abundance.

[3] Storey et al. (1991) suggested that Kick-net sampling appears to be biased toward collecting more abundant taxa and under-represent low-occurrence taxa. Moreover, Hornig and Pollard (1978) hypothesized that the Kick-net sampling technique will represent more easily dislodged and mobile taxa, whereas other gear (e.g., Surber, Hess) utilizing mechanical abrasion will represent more cryptic or closely adherent taxa.

and Caldwell (2014). For example, EPT abundance decreases with low water flow and increased fine sediment (Beermann 2017) as well as increased nutrient loading (Wang 2007, Weber 1973).

EPT taxa richness: This is the number of taxa present from the three EPT orders. This metric was selected because it was used by Hafele (2013) and Brown and Caldwell (2014), and for its biotic integrity characterization value as described by Rehn et al. 2005 and Barbour et al. (1999). For example, EPT taxa richness is particularly susceptible to nutrient enrichment (Wang 2007, Weber 1973).

Percent tolerant individuals: This is the percent of the invertebrate community made up of individuals that are considered tolerant to organic enrichment. Tolerance values are based on correlations of species (or taxa) persistence and level of organic enrichment (Hilsenhoff 1987, Chang et al. 2013). This metric was selected to contrast with percent intolerant individuals, and for its biotic integrity characterization value as described by WQIW (1999) and Barbour et al. (1999).

Percent intolerant individuals: This is the percent of the invertebrate community made up of individuals that are considered intolerant to organic enrichment. Tolerance values are based on the correlation between species persistence and level of organic enrichment (Hilsenhoff 1987, Chang et al. 2013). While there is little evidence of high organic loadings of BOD from the RWRF or other point sources to the Rogue River, this metric was selected because it was used by Hafele (2013) and Brown and Caldwell (2014), and for its biotic integrity characterization value as described by other sources (Rehn et al. 2015, Rehn et al. 2005, and Barbour et al. 1999).

Percent non-insect individuals: This is the percentage of the BMI organisms that are not insects. This metric was selected because it was used by Hafele (2013) and Brown and Caldwell (2014), and for its biotic integrity characterization value as described by Rehn et al. 2005 and Barbour et al. (1999). For example, non-insect taxa are generally tolerant of a wider range of environmental conditions (e.g. water flow and water temperatures) than insect taxa (DeShon 1995, Barbour et al. 1999).

Percent dominant taxon: This measures the dominance of a given number of the most abundant taxon or taxa (i.e., top 3 taxa). This metric was selected because it was used by Brown and Caldwell (2014), and for its biotic integrity characterization value as described by WQIW (1999) and Barbour et al. (1999). Community complexity is expected to decrease with Increasing diversity correlates with decreased health of the assemblage and suggests that niche space, habitat, and food sources are not adequate to support survival and propagation of many species, leading to fewer taxa being present and thus a few taxa being more dominant (Barbour et al. 1999).

Metrics used by Hafele (2013) and Brown and Caldwell (2014) and not selected for the 2018 study:

Percent shredders: This is the percent of individuals in the sample which have morphological adaptations to tear coarse particulate organic matter (CPOM) such as leaves and wood. Shredders are particularly sensitive to organic enrichment due to the effects nutrients have on the microbial and fungal community and, in turn, on CPOM decomposition. As such, shredders are often used as indicators of organic enrichment in low order streams. This metric was included in Brown and Caldwell (2014) and showed a decrease downstream of the RWRF outfall. However, the amount of CPOM naturally decreases from low to higher order streams (Graça et al. 2001); thus, the relative abundance of shredders is also expected to decrease. This metric may not be appropriate for higher order streams, such as the Rogue River, because shredders are expected to make up a smaller portion of the BMI community and be more irregularly concentrated. For this reason, this metric was not considered appropriate for this study.

Percent clingers: This is the percent of insects with fixed retreats or adaptations for attachment to surfaces in flowing water. This metric is often used as a measure of sediment deposition and scour (Barbour et al. 1999; Rabeni et al. 2005). While this metric was included in Brown and Caldwell (2014) and showed a decrease downstream of the RWRF outfall, due to the lack of any expected or known linkage between the RWRF discharge and alterations in sediment deposition and scour, and because no comparative habitat data were collected at the 2013 sampling sites, this metric was not selected for this study.

Percent Oligochaeta: This is the percent of Oligochaeta (segmented worms) individuals in the total sample (i.e. the percentage of total abundance comprised of oligochaetes). While there is little evidence of high organic loadings of BOD from the RWRF or other point sources to the Rogue River, Oligochaeta are generally associated with poor stream conditions in terms of fine sediment, low dissolved oxygen availability, high water temperature, pH variability, and nutrient enrichment due to the subclass's persistence in a wide range of environmental conditions. However, this metric was not selected due to its variability as an indicator (Barbour et al. 1999) and its redundancy with other metrics such as total abundance, percent non-insect individuals, percent tolerant individuals.

Percent Sensitive EPT: This is the number of EPT taxa particularly sensitive to organic enrichment. This metric is expected to decrease with organic enrichment. This metric was not selected due to its redundancy with percent sensitive individuals and inclusion of other EPT metrics in this study.

Common BMI metrics used in other aquatic bioassessments and not selected for the 2018 study:

Coleoptera Richness: This is the number of Coleoptera (beetle) taxa in the sample. While Coleoptera can be expected to decrease with sediment enrichment, they can have variable results as indicators (Erye et al. 1990, Ode et al. 2005). This metric is not commonly used without rigorous testing due to its variability as an indicator. As a result, this metric was not selected.

Shredder Richness: This is the number of taxa with physical adaptions that allows tearing of course particulate organic matter. This metric is expected to decrease with increased physical disturbance and nutrient enrichment. This metric was not selected due to the redundancy with other metrics and lack of comparable results in previous studies by Hafele (2013) and Brown and Caldwell (2014).

Diptera Richness: This is the number of Dipteran (fly) taxa. This metric is expected to decrease with increased physical disturbance and nutrient enrichment. This metric was not selected due to the redundancy with other metrics and lack of comparable results in previous studies by Hafele (2013) and Brown and Caldwell (2014).

Collector Richness: This is the number of taxa with physical adaptions for collecting fine particulate organic matter. This metric is expected to decrease with increased physical disturbance and nutrient enrichment. This metric was not selected due to the redundancy with other metrics and lack of comparable results in previous studies by Hafele (2013) and Brown and Caldwell (2014).

Predator Richness: This is the number of taxa with exclusively predatory behavior (i.e. obligate predators). This metric is expected to decrease with increased physical disturbance and nutrient enrichment. However, many predatory taxa can persist in a wide range of environmental conditions. As a result, the metric can have variability as an indicator metric. This metric was not selected due to its lack of reliability as an indicator, redundancy with other metrics, and lack of comparable results in previous studies by Hafele (2013) and Brown and Caldwell (2014).

Mayfly Richness: This is the number of Ephemeroptera taxa. This metric is expected to decrease with increased physical disturbance and nutrient enrichment. This metric was not selected due to the inclusion of Ephemeroptera taxa as part of EPT richness.

Stonefly Richness: This is the number of Plecopteran taxa. This metric is expected to decrease with increased physical disturbance and nutrient enrichment. This metric was not selected due to the inclusion of Plecopteran taxa as part of EPT richness.

Caddisfly Richness: This is the number of Trichopteran taxa. As with other richness metrics discussed above, this metric is expected to decrease with increased physical disturbance and nutrient enrichment. This metric was not selected due to the inclusion of Trichopteran taxa as part of EPT richness.

Percent Coleoptera Taxa: This is the percent of total abundance comprised of Coleopteran individuals. This metric is not commonly used without rigorous site-specific testing due to its variability as an indicator. As a result, this metric was not included.

Percent EPT Taxa: This is the percent of EPT taxa from total abundance. See EPT abundance for more information.

Percent predator individuals: This is the percent of total abundance represented by the predator functional feeding group, which can be made restrictive to exclude omnivores. While this metric tends to increase with physical disturbance and organic enrichment, there is variability in its response to these stressors. This metric was not selected due to variability as an indicator and lack of comparable results in previous studies by Hafele (2013) and Brown and Caldwell (2014).

Percent Sediment Tolerant Taxa: This is the percent of taxa tolerant to sediment increases. This metric was not selected because the Medford RWRF would not be expected to be the source of sediment-related disturbances.

Number Sensitive Taxa: This is the number of taxa sensitive to organic enrichment. This metric is expected to decrease with organic enrichment. This metric was not selected due to its lack of comparability to previous studies and redundancy with other metrics such as EPT richness, total richness, percent EPT, and percent sensitive individuals.

Number Sediment Sensitive Taxa: This is the number of taxa tolerant to sediment increases. This metric was not selected because the Medford RWRF would not be expected to be the source of sediment-related disturbances.

Modified Hilsenhoff Biotic Index: This metric uses unique taxa tolerance values and their relative abundance to create an average value for a sample. Hence, it measures the overall organic enrichment tolerance value of a sample. While this can be a particularly useful metric for visualizing organic enrichment in any given area, there is some redundancy with percent sensitive and tolerant individuals. As a result, it was not selected.

Percent Non-Gastropod Scraper Individuals: This measures the percent of non-gastropod (snails/slugs) scrapers in the sample. This metric is expected to be particularly sensitive to physical disturbance and organic enrichment than percent scrapers. This metric was not selected as it can be biased to habitat type and percent scrapers is a component of a selected metric.

1.4.2 Periphyton Metrics

DEQ has not yet established metrics, indices or predictive models for periphyton. In the absence of prescribed metrics and predictive models, metrics of community composition and function may be used in certain study designs, especially in assessing point-source impacts (ODEQ 2018). For example, changes in community composition can be used to diagnose the environmental stressors affecting biotic integrity and ecological health (Stevenson 1998, Stevenson and Pan 1999). As with BMI indices, periphyton metrics prescribed for use within certain states or regions may not be recommended for other regions. Nevertheless, metrics established for other regions can provide valuable information for comparative metric selection and index of biotic integrity development. For this reason, the EPA (Barbour et al. 1999) investigated metrics used successfully in multiple regions.

In Barbour et al. (1999), various periphyton metrics were identified as potential indicators of biotic integrity and impairment that could be used as a starting point for generation of region-specific indices or for comparative analysis. Metrics were divided into two groups which could be helpful in developing an index of biotic integrity. Metrics in the first group (species and generic richness, Shannon diversity, etc.) characterize biotic integrity ("natural balance in flora and fauna…." as in Karr and Dudley [1981]) without specifically diagnosing ecological conditions and causes of impairment. Therefore, the first group renders itself useful for comparative purposes. The second group of metrics more specifically diagnose causes of impaired biotic integrity. However, the metrics from the second group would require rigorous calibration via a robust dataset for the intended region. An ideal index would include metrics from both groups. However, the purpose of this study in not to create an index, but rather to compare the biotic integrity prior to influence from the RWRF outfall and after. As such, comparative metrics which measure biotic integrity have been adopted from Barbour et al. (1999). Additionally, metrics reported by Hafele (2013) and Brown and Caldwell (2014) have also been selected for comparison purposes. The description, type of disturbance, typical response, and rationale for selection have been listed below:

Percent community similarity (PSc) of diatoms: As with the Bray-Curtis Similarity used to assess BMI community similarity (see Section 1.4.1), the PSc is used in algal bioassessment to show community similarities based on relative abundances of individual taxa, and in doing so, gives more weight to dominant taxa than rare ones (Barbour et al. 1999). PSc can be used to compare control and test sites, or average community composition of a group of control or reference sites with a test site. This metric was selected due to its value in biotic integrity characterization as described by Barbour et al. (1999). However, percent community similarity values ranging from 0 (no similarity) to 100% (complete similarity) do not inherently indicate good or poor ecological conditions.

Cell density: The number of algal cells per centimeter squared. Increases in the density and volume of algae growing on stream substrates can result from increases in light, temperature, and/or nutrients (Hynes 1972). This metric was selected due to its inclusion by Hafele (2013) and Brown and Caldwell (2014).

Biovolume: The volume of algae, usually measured as the cubic microns of algae per centimeter squared. Increases in the density and volume of algae growing on stream substrates can result from increases in light, temperature, and/or nutrients (Hynes 1972). This metric was selected due to its inclusion by Hafele (2013) and Brown and Caldwell (2014).

Dominant taxon and percent dominant taxon: The top three most abundant taxa Used as a as a comparative descriptor in Hafele (2013) and Brown and Caldwell (2014), this is the total number of the three most abundant organisms divided by the total number sorted from the sample. Community complexity is expected to decrease with increasing environmental perturbation, leading to fewer taxa being present and thus a few taxa being more dominant (Barbour et al. 1999). This metric was selected due to inclusion by Hafele (2013) and Brown and Caldwell (2014).

Species richness: This is an estimate of the number of diatom species in a sample. High species richness is assumed to indicate high biotic integrity because many species are adapted to the conditions present in the habitat. Species richness is predicted to decrease with increasing pollution because many species may become stressed. However, many habitats may be naturally stressed by low nutrients, low light, or other factors. Slight increases in nutrient enrichment can increase species richness in headwater and naturally unproductive, nutrient-poor streams (Barbour et al. 1999). This metric was selected due to its inclusion by Hafele (2013) and Brown and Caldwell (2014), and for its biotic integrity characterization value described by Barbour et al. (1999).

Shannon's diversity index of diatoms: The Shannon Index is a function of both the number of species in a sample (species richness) and the distribution of individuals among those species (evenness). Low species diversity has historically been successfully used as an indicator of organic (sewage) pollution (Wilhm and Dorris 1968, Weber 1973, Cooper and Wilhm 1975). Bahls et al. (1992) uses Shannon diversity because of its sensitivity to water quality changes (Barbour et al. 1999). Typical values are between 1.5 and 3.5 in most ecological studies, and the index is rarely greater than 4. The Shannon diversity index increases as both the richness and the evenness of the community increase. This metric was selected due to its value in biotic integrity characterization as described by Barbour et al. (1999).

Percent sensitive diatoms: The percent sensitive diatoms metric is the sum of the relative abundances of all intolerant species. Sensitive diatoms are those with the value of 3. This metric was selected due to its value in biotic integrity characterization as described by Barbour et al. (1999).

Percent tolerant diatoms: The percent tolerant diatoms metric is the sum of the relative abundances of all tolerant species. Tolerant diatoms are those with the value of 1. This metric was selected as a proxy for the abundance of tolerant diatoms used by Brown and Caldwell (2014), and for its value for biotic integrity characterization as described by Barbour et al. (1999).

Pollution Tolerance Index (PTI) of diatoms: The PTI for algae resembles the Hilsenhoff biotic index for macroinvertebrates (Hilsenhoff 1987). Lange-Bertalot (1979) distinguishes three categories of diatoms according to their tolerance to increased pollution, with species assigned a value of 1 for most tolerant taxa (e.g., *Nitzschia palea*) to 3 for relatively sensitive species. Thus, Lange-Bertalot's PTI varies from 1 for most polluted to 3 for least polluted. This metric was selected due to its value in biotic integrity characterization as described by Barbour et al. (1999).

Percent Achnanthes minutissima: This species is a cosmopolitan diatom that has adapted to a very broad range of ecological conditions. It is an attached diatom and often the first species to pioneer a recently scoured site, sometimes to the exclusion of all other algae. The percent abundance of *A. minutissima* has been found to be directly proportional to the time that has elapsed since the last scouring flow or toxicity event. For use in bioassessment, the quartiles of this metric from a population of sites has been used to establish judgment criteria, e.g., 0–25% = no disturbance, 25–50% = minor disturbance, 50–75% = moderate disturbance, and 75–100% = severe disturbance (Barbour et al. 1999). This metric was selected given its value for biotic integrity characterization as described by Barbour et al. (1999).

Descriptive diatom autecological attributes percentages: The percent of individuals with specific autecological attributes (i.e., N-fixers, indicators of high P or N, indicators of low P or N, and trophic state). While more complex metrics utilizing these attributes are suggested by Barbour et al. (1999), caution is advised when specifically diagnosing causes of impaired biotic integrity. Rigorous calibration via a robust dataset for the intended region would be required for use of metrics suggested by Barbour et al. (1999). For this reason, the simple autecological metrics selected for this study are descriptive and not diagnostic. These descriptive diatom autecology percentages were selected due to similar inclusions of autecological attributes in Hafele (2013) and Brown and Caldwell (2014).

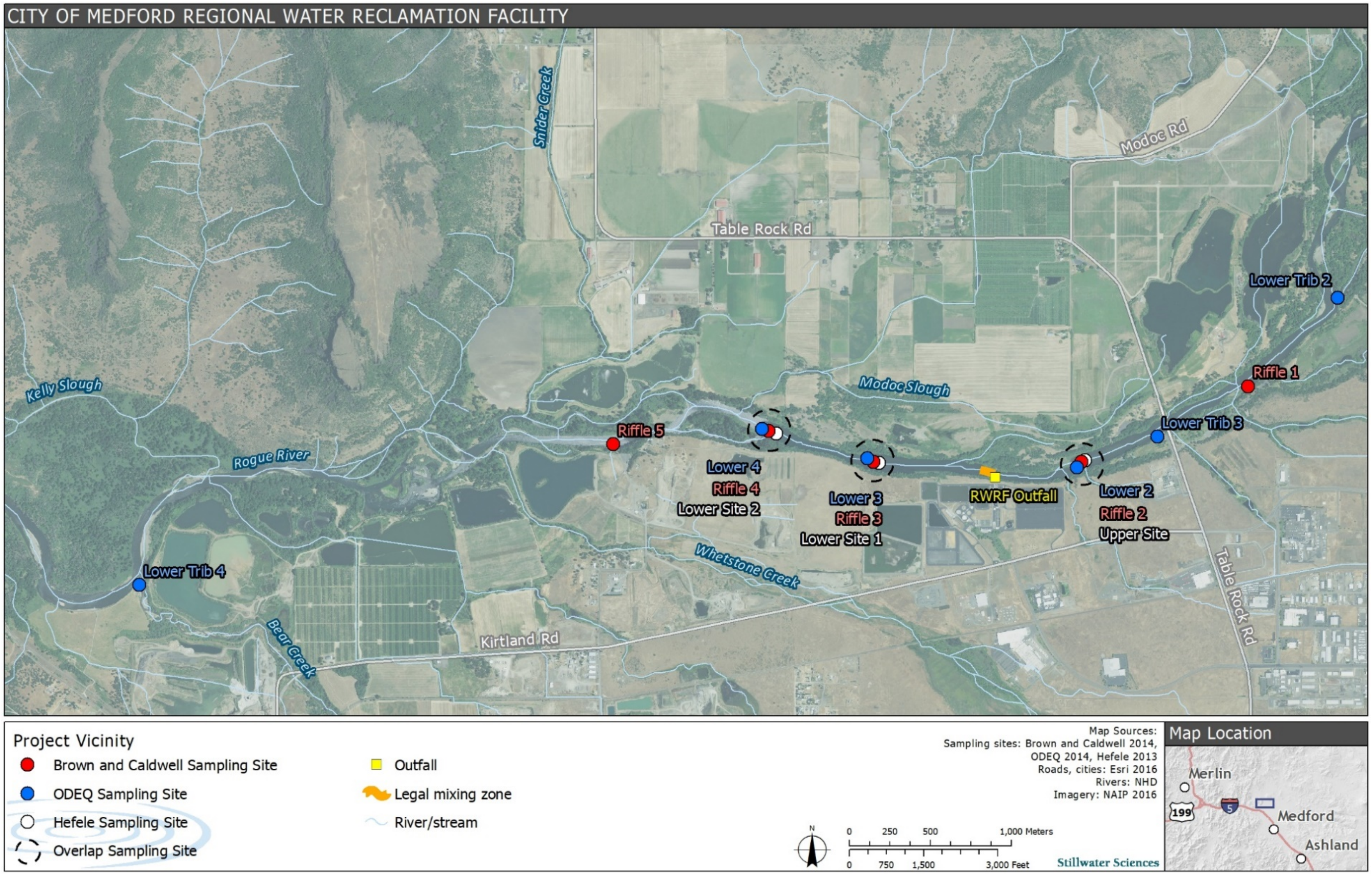
2 OVERVIEW OF 2012-2013 STREAM CONDITION ASSESSMENTS

The purpose of this section is to summarize and compare the results of the Hafele (2013), Brown and Caldwell (2014), and ODEQ (2014) studies that assessed conditions in the Rogue River during autumn at locations both upstream and downstream of the RWRF outfall. Each of the studies "sampled" at least three of the same sites around the same season: Hafele (2013) in mid-October of 2012, Brown and Caldwell (2014) in mid-October of 2013, ODEQ (2014) in late-September 2013. The current study by Stillwater Sciences sampled these same sites in early October of 2018 (see Section 3). The Hafele (2013), Brown and Caldwell (2014), and Stillwater Sciences studies quantitatively assess the conditions upstream and downstream of the RWRF outfall; however, the ODEQ (2014) simply sets out to qualitatively review areas of possible biocriteria concern throughout a larger portion of the Rogue River. Therefore, methods and results of the Hafele (2013) and Brown and Caldwell (2014) studies, but not ODEQ are detailed in this section.

Table 2-1. Summary of Sampling Design, Site Conditions and Sampling Methods

Description	Hafele (2013)	Brown and Caldwell (2014)	ODEQ (2014)
Sites Sampled			
Upper TouVelle Park		Riffle 1	
Lower TouVelle Park upstream of RWRF Outfall	Upper Site (US1)	Riffle 2	Lower 2
1st riffle downstream of RWRF Outfall	Lower Site 1 (LS1)	Riffle 3	Lower 3
2nd riffle downstream of RWRF Outfall	Lower Site 2 (LS2)	Riffle 4	Lower 4
3rd riffle downstream of RWRF Outfall		Riffle 5	
Sampling Design and Methods			
BMI	2 composites per site, composed of 8 kick net samples	2 composites per site, composed of 8 box type samples	Visual
Algae	USGS (Carpenter 2003)	USGS (Carpenter 2003)	Visual
Sampling Dates and Conditions			
Sampling Dates	Oct 10 - 11, 2012	Oct 14 - 17, 2013	Sep 25, 2013
Last Rain Event	8 weeks prior	2 weeks prior	~2 weeks prior
Avg. Stream Discharge (cfs)	1,413	1,504	1,706

Figure 2-1. Medford RWRF vicinity map for 2012–2013 sampling events



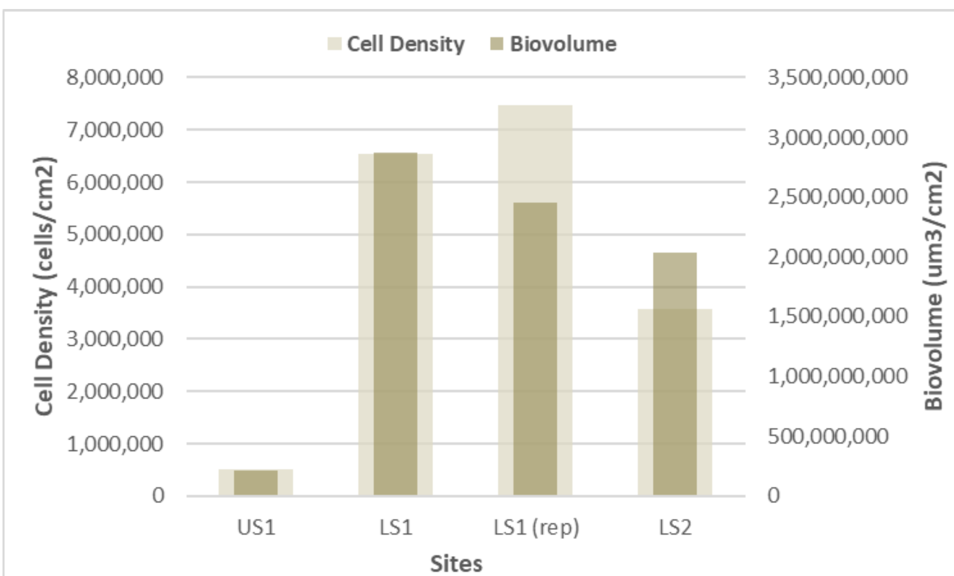
2.1 Summary of Hafele (2013) Results

Using an alternative sampling and assessment design consistent with ODEQ (2018), the Hafele (2013) study primarily focused on obtaining basic algae and BMI comparative data upstream and downstream of the RWRF.

2.1.1 Algae Summary

Hafele (2013) quantified attached algae (periphyton) by cell density per square centimeter (cells/cm^2) and biovolume by cubic micrometer (um^3/cm^2), and each taxon was processed to species. While there was a total of three algae samples with corresponding replicates, only three samples and one replicate were processed. No statistical analysis was performed between sites. However, the results of both the density and biovolume depicted dramatically higher algae measurements downstream of the RWRF. Cell density appeared to be approximately seven to 14 times (3,000,000 to 6,900,000 cells/cm^2) greater at Lower Site 2 and Lower Site 1 relative to the Upper Site. Similarly, algae biovolume appeared to be approximately 10 to 14 times (1,800,000,000 to 2,600,000,000 um^3/cm^2) greater at Lower Site 2 and Lower Site 1 relative to the Upper Site. Moreover, Hafele (2013) reported the identified algae species associated with low nutrient level concentrations (e.g., *Oscillatoria limnetica*) decreased from approximately 38 percent of biovolume upstream of RWRF to less than five percent at the downstream sites. Further illustrating a change in algal community assemblages, taxa associated with nutrient rich environments (e.g. *Nitzchia* spp.) increased from approximately 12 percent biovolume upstream to 25–38 percent downstream of the RWRF.

Figure 2-2. Hafele (2013) Algae Density and Biovolume



2.1.2 BMI Summary

BMI samples were identified and assessed by Hafele (2013) for common metrics used to assess impairment (Section 1.6.1), including total abundance, EPT (Ephemeroptera, Plecoptera, and Trichoptera) abundance, total taxa richness, EPT taxa richness, percent sensitive EPT taxa, percent intolerant taxa, percent Oligochaeta, and percent non-insect taxa. Instead of using a standard biotic index score system, the Hafele (2013) study applied the Tukey Comparison of Means to test the significance level of differences between the upstream and downstream sites. Similar to the algal community results, the BMI metrics used here showed a conspicuous difference between upstream and downstream condition (Table 2-2). Furthermore, all metrics were statistically significant between the upstream and downstream sites.

Table 2-2. Summary Table of Hafele (2013) Invertebrate Results

Metrics	US1	US1*	LS1	LS1*	LS2	LS2*
Total Abundance	21,550	22,153	4,852	4,440	9,297	5,289
EPT Abundance	7,871	9,080	242	294	1,743	1,141
Total Taxa Richness	46	42	32	32	37	38
EPT Taxa Richness	23	21	9	7	14	14
% Sensitive EPT Taxa	26	31.7	4.4	6.2	15.6	18.3
% Intolerant Taxa	29.6	35.3	3.3	5.5	16.5	18.5
% Oligochaeta	5.4	8.2	24.3	26.1	12.3	12.2
% Non-Insect Taxa	11.6	16.4	56.3	60.2	29	28.1

* replicate

2.2 Summary of Brown and Caldwell Results

As with Hafele (2013), Brown and Caldwell (2014) also used comparisons of algal and BMI community metrics near the facility, as well as assessing changes in analytical water chemistry in the Rogue River downstream of the RWRF outfall.

2.2.1 Water Quality Summary

Brown and Caldwell (2014) collected in situ water quality data and surface water grab samples for laboratory analysis of trace metals, nutrients (phosphorus [P] and nitrogen [N] in various chemical forms), as well as other compounds monitored as part of the City's NPDES permit requirements. Water samples were collected at four transects (three samples per transect) upstream of the RWRF outfall; at or near the zone of initial dilution (ZID) boundary, approximately 100 feet downstream of the regulatory mixing zone (RMZ) boundary (labeled and hereafter referred to as the RMZ samples); and downstream where the effluent was near fully mixed with the river. Samples were taken during dye injection to determine sample location within/outside of the most concentrated portions of the effluent plume. The dye does not contain

N or P that would skew the results. The upstream samples and most downstream samples were collected at each bank and midstream. The samples in the ZID and RMZ were collected in the apparent lateral center of the effluent plume, at the margin of the plume and at the far bank.

As part of the Brown and Caldwell (2014) study, multiparameter probes were deployed to measure in situ water quality (water temperature, dissolved oxygen, pH, turbidity, and conductivity) over portions of a 4-day period beginning mid-day on October 14 and ending mid-day on October 17, 2013. The probes were deployed at three riffle locations; Riffle 2 (upstream of the outfall) and Riffles 3 and 4 (downstream of the outfall), corresponding to the upstream and two downstream riffles sampled by Hafele (2013) (See Table 2-1). Ranges in in situ water quality parameters are shown in Table 2-3. Probes located at the Riffle 3 and 4 sites were moved from the north bank to the south bank on October 16 after the dye study indicated that the effluent plume did not influence water quality conditions across the channel to the north bank.

Table 2-3. Brown and Caldwell (2014) Summary of Continuous Probe Results

Parameter	Riffle 2	Riffle 3	Riffle 4
Water Temperature (°C)	6.1 – 9.3	7.0 – 10.2	6.4 – 9.5
DO (mg/L)	12.9 – 15.0	9.2 – 12.6	11.9 – 14.1*
DO (% saturation)	109.1 – 127.0	80.4 – 109.0	99.7 – 120.2
pH	7.5 – 8.5	7.2 – 7.9	7.51 – 8.4*

*Estimated from report graphics; data not available in Appendix H (Brown and Caldwell 2014)

Results of laboratory nutrient analyses as well as comparisons with independent sampling data collected by DEQ at other Rogue River locations are included in Table 2-4. Also included are 2013 results for samples taken in the Rogue River at Dodge Park (approximately 7.9 RMs upstream of the outfall) and north of Gold Hill, (approximately 9.75 RMs downstream of the outfall) (data were obtained from the Oregon Department of Environmental Quality [DEQ]), and Bear Creek, whose confluence with the Rogue River is approximately 3.6 RMs downstream of the outfall. All nutrients appeared to be elevated within the plume at the ZID and slightly elevated just downstream of the RMZ. However, these effects did not extend across the channel, but were observed only in the samples taken in the center of the effluent plume. There were detectable increases in nutrients where the effluent was near fully mixed with the river flow for nitrate and to a lesser extent, total N. Recognizing that typical background levels of nutrients are influenced by "ecoregional" differences in climate, geography, and geology as well as anthropogenic influences (USEPA 2000), DEQ water quality guidance indicating poor water quality occurs at nutrient levels > 0.08 mg-P/L total P and > 0.49 mg-N/L as nitrate + nitrite (Hicks, 2005). The three nitrate + nitrite results at the near complete mix conditions were below the DEQ cutoff for poor water quality. All values of nitrate at the near fully mixed sampling transect were higher than at the upstream site. At the near fully mixed location, orthophosphate was below detectable limits.

Table 2-4. Brown and Caldwell (2014) Nutrient Sampling Results

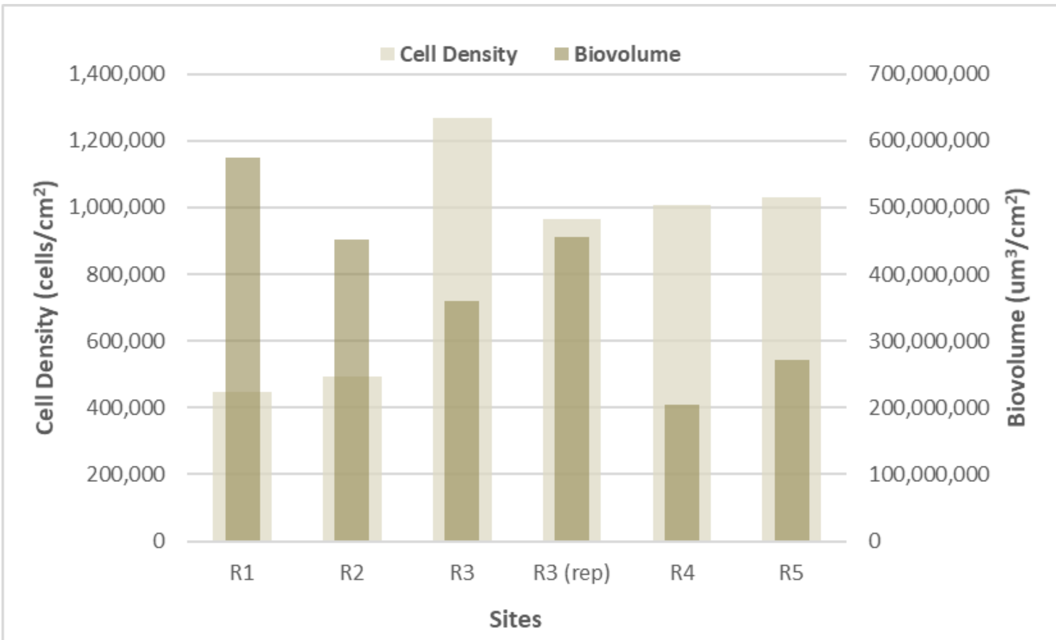
Site	Sample Site/Mo.	Total P (mg-P/L)	Orthophosphate (mg-P/L)	Total Kjeldahl N (mg-N/L)	Ammonia-N (mg-N/L)	Nitrate (mg-N/L)	Nitrite (mg-N/L)	Total N (mg-N/L)
Brown and Caldwell Mixing Zone Study Sampling								
Riffle 2 (Upstream)	*Left bank*	<0.07	<0.07	<0.30	<0.07	0.12	<0.05	0.12
	Center	<0.07	<0.07	0.3	<0.07	0.1	<0.05	0.4
	Right bank	<0.07	<0.08	<0.30	<0.07	0.18	<0.05	0.18
RWRF outfall (ZID)	*Center plume*	0.31	0.32	1	0.52	1.12	0.1	2.22
	Fringe	<0.07	<0.07	<0.30	<0.07	0.1	<0.05	0.1
	Out of plume	<0.07	<0.07	0.3	<0.07	0.14	<0.05	0.44
300 feet downstream of RWRF outfall (RMZ)	*Center plume*	0.22	0.18	0.7	0.18	0.65	0.06	1.41
	Fringe	<0.07	<0.07	<0.30	<0.07	0.14	<0.05	0.14
	Out of plume	<0.07	<0.07	0.3	<0.07	0.09	<0.05	0.39
Downstream of Riffle 5 (Full mix)	*Left bank*	<0.07	<0.07	<0.30	<0.07	0.41	<0.05	0.41
	Center	<0.07	<0.07	0.3	<0.07	0.29	<0.05	0.59
	Right bank	0.08	<0.07	<0.30	<0.07	0.45	<0.05	0.45
Oregon DEQ Monthly Sampling								
Dodge Park	*January*	0.04	0.036	Not analyzed	<0.01	0.0207*		Not analyzed
	March	0.04	0.0255		0.012	0.0059*		
	May	0.03	0.0255		0.01	<0.0005*		
	July	0.04	0.0265		<0.01	0.0074*		
north of Gold Hill	*January*	0.07	0.051	Not analyzed	0.122	0.249*		Not analyzed
	March	0.07	0.042		0.077	0.130*		
	May	0.08	0.057		0.136	0.108*		
	July	0.09	0.064		0.098	0.196*		
Bear Creek	*January*	0.07	0.045	Not analyzed	0.12	1.71*		Not analyzed
	March	0.06	0.029		0.12	0.656*		
	May	0.13	0.06		0.19	0.738*		
	July	0.11	0.063		0.035	0.736*		

*All DEQ Nitrate and Nitrite data reported as combined results

2.2.2 Algae Summary

Algal periphyton were also quantified by cell density per square centimeter and biovolume by cubic micrometer; each taxon was also processed to species. While there was a total of five algae samples with corresponding replicates, only five samples and one replicate were processed. No statistical analysis was performed between sites. Cell density appears to be greater downstream of the RWRF; whereas, biovolume was not. Comparing the same sites as Hafele (2013), cell density was between two and three times greater downstream of the RWRF compared to site R1 upstream. Algae biovolume was one to three times higher upstream of the RWRF (see Figure 2-3).

Figure 2-3. Brown and Caldwell Algae Density and Biovolume



Brown and Caldwell (2014) also performed an indicator species analysis on the periphyton assemblages to gauge the degree of nutrient and organic enrichment using species classifications, preferences, and tolerances published in Porter (2008). The assemblages examined included N fixers, taxa indicative of eutrophic (nutrient enriched) systems, taxa indicative of oligotrophic (nutrient poor) systems, tolerance to nutrient and organic enrichment (Bahls, 1993), and taxa indicative of N and P rich (eutrophic) and poor (oligotrophic) conditions. In general, density of eutrophic indicator taxa was higher downstream of the outfall, but biovolume was higher at the most upstream site. Oligotrophic taxa were found at higher densities downstream of the outfall and have higher biovolume at all downstream sites than the most upstream site. This may seem contradictory; however, the increase of oligotrophic algae downstream of the RWRF may simply be a result of greater algae abundance in the downstream region. Overall, algal data suggest that the composition of algae downstream responded to nutrient enrichment, leading to greater density (but not greater biovolume) downstream of the outfall. However, this enrichment does not appear to inhibit the growth of algae associated with low nutrient (oligotrophic) conditions.

2.2.3 BMI Summary

BMI samples were assessed for total abundance, EPT abundance, total taxa richness, EPT taxa richness, percent intolerant taxa, percent Oligochaeta, percent non-insect taxa, percent shredders, percent clingers, and percent dominant taxon to compare results with those of the Hafele (2013) study (see Table 2-5). Additional metrics were calculated and used to calculate scores based on the Index of Biotic Integrity (IBI) described in the Oregon Plan for Salmon and Watersheds (WQIW, 1999); final scores can be seen in Table 2-5 and calculations are available in the full Brown and Caldwell (2014) study. The Tukey's Comparison of Means test was also performed between sites and was adjusted with differences among samples and replicates.

All BMI metrics, except for dominant taxon shifted towards levels indicating general disturbance and nutrient enrichment at riffles downstream of the RWRF. The shift began at Riffle 3 for total abundance, EPT abundance, EPT taxa richness, percent intolerant taxa, percent Oligochaeta, percent shredders, percent clingers. Depressed total taxa richness and increased percent non-insect taxa were observed at Riffle 4. Most metrics showed levels similar to conditions upstream of the RWRF by Riffle 5, except for EPT taxa richness, percent intolerant taxa, and percent Oligochaeta. BMI metrics associated with high IBI scores decreased downstream of Riffle 2 and increased in Riffle 5. Similarly, invertebrate metrics associated with lower IBI scores increased starting in Riffle 2 and decreased in Riffle 5. Moreover, IBI scores decreased in Riffles 3 and 4, and increased in Riffle 5. Overall, the changes in metrics associated with nutrient and organic enrichment in the riffle habitats downstream of the RWRF outfall (Riffles 3–5) suggest that the RWRF facility may be causing or contributing to trophic level interactions which are resulting in changes of invertebrate community assemblages to those associated with less favorable conditions.

Table 2-5. Summary Table of Brown and Caldwell (2014) Invertebrate Results

Metrics	Riffle 1	Riffle 1 (Dup)	Riffle 2	Riffle 2 (Dup)	Riffle 3	Riffle 3 (Dup)	Riffle 4	Riffle 4 (Dup)	Riffle 5	Riffle 5 (Dup)
Total Abundance	12,598	6,900	5,448	8,940	2,812	3,746	11,310	8,139	14,051	5,767
EPT Abundance	5,978	3,000	2,336	3,615	1,280	1,665	915	1,264	5,026	1,614
Total Taxa Richness	47	45	45	41	40	42	34	33	10	42
EPT Taxa Richness	21	19	21	21	15	15	9	9	14	14
% Intolerant Taxa	2.0	4.5	5.2	7.2	2	1	0.1	0	0.3	0.2
% Oligochaeta	4.4	5.6	6.5	8.4	0.2	0.7	22.5	6.0	3.6	1.3
% Non-Insect Taxa	11.0	11.6	17.0	19.3	5	5.7	38.9	26.7	11.9	31.9
% shredders	13.8	25.7	10.8	13.9	8.3	7.5	6.2	9.5	13.5	10.1
% clingers	69.2	58.3	59.9	58.0	47.5	47.1	40.0	48.4	53.2	56.4
% Dominant taxon	12.8	17.0	10.3	10.7	17.5	15.8	16.4	10.4	12.8	20.5
IBI Scores from Oregon Plan for Salmon and Watersheds (WQIW 1999)*										
Total Score	38	38	38	36	34	34	26	24	36	28
Degree of impairment	Slight	Slight	Slight	Slight	Slight	Slight	Moderate	Moderate	Slight	Moderate

* Score calculations are available in Brown and Caldwell (2014)

2.3 Summary of ODEQ (2014) Qualitative Reconnaissance Results

The qualitative study conducted by the ODEQ (2014) covered approximately 31 miles of mainstem Rogue River, taking notes on areas of concerns at approximately nine reaches and seven tributary mouths. At all reaches and tributary sites, basic water parameters (i.e., water temperature, barometric pressure, dissolved oxygen, pH, and conductivity) were obtained. At all nine reaches, algae samples were taken for later taxonomic identification; invertebrate “density”, “diversity”, and “dominant taxa” were generalized and visually estimated onsite. There were two groups of observers. One group covered the upper 18 miles and eight sites. The other group covered lower 13 miles and other 8 sites. The three sites sampled by both Hafele (2013) and Brown and Caldwell (2014), were visually inspected by the group covering the lower 13 miles. Protocols for taxonomic ID or abundance estimation were not provided in the report.

2.3.1 Water Quality Summary

In situ water quality parameters were generally higher at site Lower 3 downstream of the RWRF outfall than results from adjacent sites. While temperatures were higher downstream of the outfall (Lower 3) compared to the next upstream (Lower 2) site by 1.9 °C, time-of-day effects may explain some of this increase and there was a similar increase from Lower 1 to Lower 2 of 1.2 °C. However, it should be noted the temperature was lower at Lower 4 by 0.9 °C than at Lower 3. Similarly, the difference in pH 0.7 units higher at Lower 2 than Lower 1, 0.1 units higher at Lower 2 that at Lower 3, and 0.2 units lower at Lower 4 than at Lower 3. Akin to pH and water temperature, DO was 0.6 mg/L higher at Lower 2 than at Lower 1, 1.8 mg/L higher at Lower 3, and 2.1 mg/L lower at Lower 4 than at Lower 3. Conductivity had notable difference in conductivity upstream of the RWRF, Lower 3 was 51 uS/cm higher than Lower 2 and conductivity was 23 uS/cm lower at Lower 4 than Lower 3. Overall, while water temperature, pH, and DO were higher at Lower 3 that at Lower 2 and Lower 4, it appears these differences are at least partially attributed to natural diurnal fluctuation. It should be noted that the differences described here were based on the summary tables and there were discrepancies in measurements and time of day references between the text and the tables provided in ODEQ (2014).

2.3.2 Algae Summary

Out of the nine reaches sampled for algal periphyton there were four areas with algal substrate coverage of 40 percent or more in the Rogue River: at the hatchery (90%), downstream of Trail Creek (75%), 0.3 miles downstream of the RWRF (90%), and 1 mile downstream of the RWRF (40–50%). Two of these were in the upper 18 miles and the other two were in the lower 13 miles. There was only one major apparent shift in composition of dominant algae taxa, stalked diatoms were not dominant in either of the reaches below the RWRF. Visually speaking, only two sites showed signs of nuisance algal growth and reduced macroinvertebrate conditions. The site below the Cole M. Rivers fish hatchery (Upper 1) and the site 0.3 miles below the Medford RWRF (Lower 3) both showed high algal growth and signs of reduced macroinvertebrate assemblage quality. Dominant algae taxa at seven sites upstream of the RWRF and the two nearest downstream sites are provided in Table 2-6.

Table 2-6. Dominant Algal Taxa from ODEQ (2014) Rock Scrapes

Site	Locations	Dominant Taxa
Upper 1	At Hatchery	*Cladophora* spp.
		Melosira spp.
		Cymbella spp.
Upper 2	Downstream of spillway	*Melosira* spp.
Upper 3	Downstream of Elk Island	*Cladophora* spp.
		Mougeotia spp.
		Epithemia spp.
Upper 4	Downstream of Trail Creek	*Melosira* spp.
Upper 5	At Countryview Mobile Home Estate outfall	*Melosira* spp.
Lower 1	Upstream of Hog Creek	*Oscillatoria* spp.
Lower 2	0.3 miles upstream of RWRF	*Melosira* spp.
		Oscillatoria spp.
Lower 3	0.3 miles downstream of RWRF	*Cladophora* spp.
		Melosira spp.
Lower 4	1.0 miles downstream of RWRF	*Cladophora* spp.
		Oedogonium spp.

2.3.3 BMI Summary

Based upon visual assessments by ODEQ (2014), most reaches surveyed along the Rogue River had moderate to high “density” and “diversity” of BMI; all reaches had at least one dominant taxa with in the EPT orders. Although there were no clear trends in invertebrate presence/absence along the surveyed reaches, the most noteworthy observation was the diversity level 0.3 mile downstream of the RWRF outfall (Lower 3) was low, which was unlike any other site.

3 OCTOBER 2018 SAMPLING METHODS AND RESULTS

3.1 Sampling Design

In order to provide comparability to previous studies as well as allowing statistical pooling of data across multiple surveys, the three riffles investigated during the Hafele (2013) study were sampled, along with four of the five riffles investigated by Brown and Caldwell (2014) (Table 3-1). In addition, samples were collected at riffles farther upstream and downstream than previously investigated (Table 3-1, Figure 3-1).

Table 3-1. October 2018 sampling locations

Site	Latitude (WGS84)	Longitude (WGS84)	Previous Study Site No.			Location Relative to RWRF Outfall	
			Hafele (2013)	Brown & Caldwell (2014)	ODEQ (2014)	Reach	RM
1	42.451672	-122.88003				Upstream	1.8
2	42.443384	-122.885543		Riffle 1			1.1
3	42.438851	-122.897916	US1	Riffle 2	Lower 2		0.4
4	42.438716	-122.913395	LS1	Riffle 3	Lower 3	Downstream	0.4
5	42.440351	-122.921109	LS2	Riffle 4	Lower 4		0.9
6	42.440134	-122.932468		Riffle 5			1.5
7	42.430937	-122.973356					4.1

1. Sampling of "full mixing zone" about 0.2 RM upstream of Riffle 5

Site 1 was adjacent to Modoc Pond, approximately 1.8 RM upstream of the RWRF outfall, and 1 RM downstream of Ash Creek. Canopy cover was less than 10 percent and confined to the river margin. Average water depth across the stream varied with average water depths less than three feet, however the deepest areas were between three to four feet.

Site 2 was adjacent to the eastern end of the TouVelle State Recreation Site, approximately 1.1 RM upstream of the RWRF outfall and 0.4 RM downstream of Little Butte Creek. Canopy cover was less than 10 percent and confined to the river margin. Average water depth across the stream varied with average water depths less than three feet, however the deepest areas were between three to four feet.

Site 3 was adjacent to pasture and agricultural fields, approximately 0.4 RM upstream of the RWRF outfall and 1.1 RM downstream of Little Butte Creek. Smaller tributaries channels also located upstream of Site 3 include the Modoc Pond drainage channel (0.6 RM), an unnamed drainage ditch which originates from Ken Denmark Wildlife Area and the Jackson County Fire District No. 3 (0.5 RM), and another unnamed drainage channel with multiple origin points (0.3 RM). Canopy cover was less than 10 percent and confined to the river margin. Average water depth across the stream varied with average water depths less than three feet, however the deepest areas were between three to four feet.

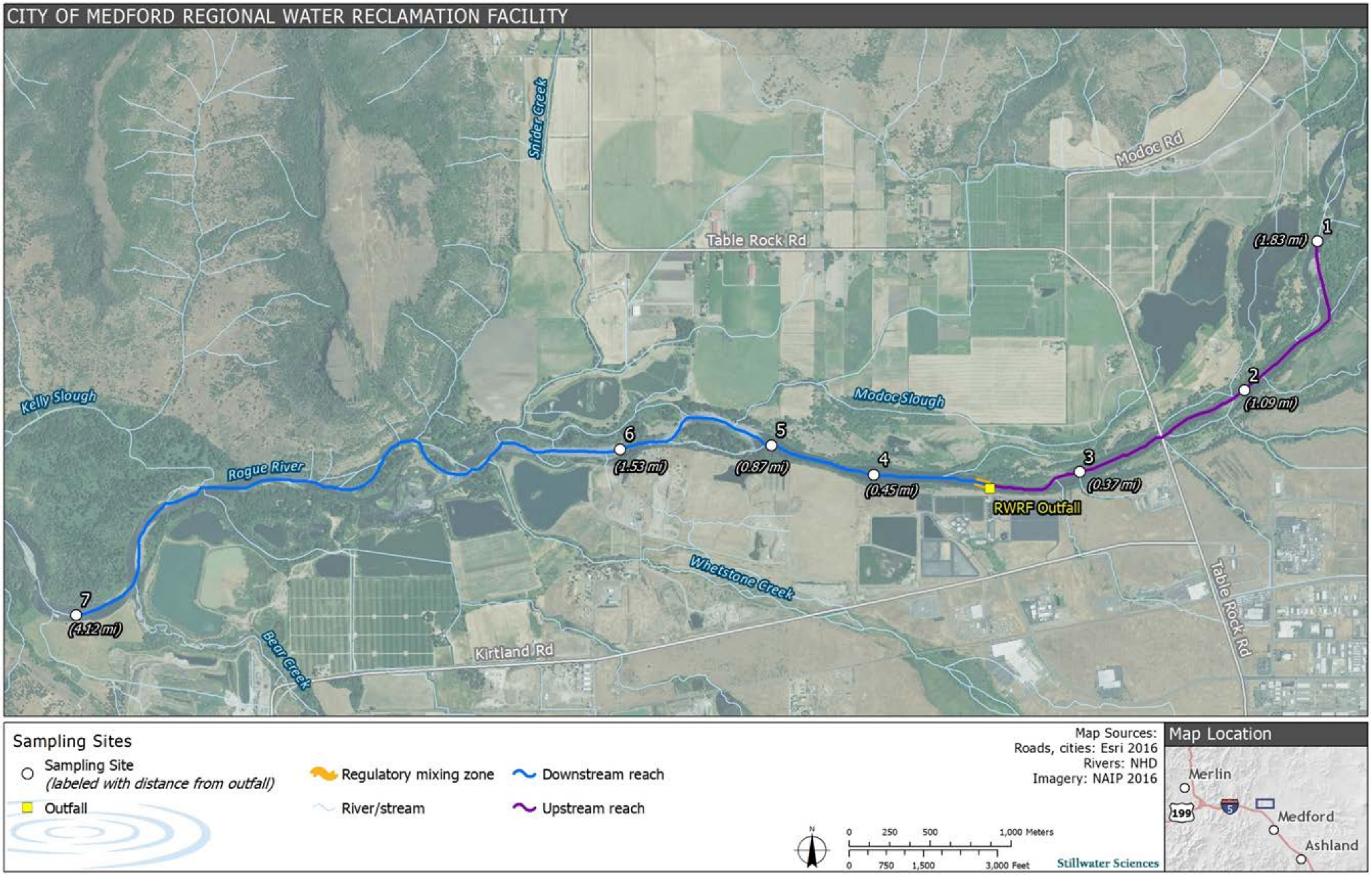
Site 4 was adjacent to pasture and agricultural fields, approximately 0.4 RM downstream of the RWRF outfall. Canopy cover was less than 10 percent and confined to the river margin. Average water depth across the stream varied with average water depths less than three feet, however the deepest areas were between three to four feet.

Site 5 was adjacent to pasture and agricultural fields, and approximately 0.9 RM downstream of the RWRF outfall. Canopy cover was less than 10 percent and confined to the river margin. Average water depth across the stream varied with average water depths less than three feet, however the deepest areas were between three to four feet.

Site 6 was adjacent to pasture and agricultural fields, and approximately 1.5 RM downstream of the RWRF outfall. Canopy cover was less than 10 percent and confined to the river margin. Average water depth across the stream varied with average water depths less than three feet, however the deepest areas were between three to four feet.

Site 7 was adjacent to pasture fields and forested land, and approximately 4.12 RM downstream of the RWRF outfall. Nearby tributaries upstream of Site 7 include Bear Creek (0.2 RM) and Upton Slough (0.8 RM). Additional tributaries downstream of Site 6 and more than 1 RM upstream of Site 7 include Snider Creek, Whetstone Creek, and multiple unnamed drainage ditches. Canopy cover was less than 10 percent and the average water depth across the stream varied with average water depths less than three feet, however the deepest areas were between three to four feet.

Figure 3-1. Medford RWRF vicinity map for October 2018 sampling event



3.2 Quality Assurance

The objective of data collection for this sampling plan was to produce data that represent, as closely as possible, in situ conditions of the Rogue River in the vicinity of the Medford RWRF with respect to water chemistry affecting algae and BMI assemblages. Sampling and laboratory quality assurance/quality control (QA/QC) and data reporting were performed in accordance with ODEQ requirements for minimum data acceptance (Data Quality Level A). Quality assurance guidelines include adherence to standard sampling and handling methods, and sampling control through standard chain of custody forms maintained at each laboratory. All collected samples were described by field notes, labeled with the Project name, site identification, sample type, date and time sampled, preservatives used, constituent analyses required, and the sampler's name. For laboratory analyses of collected water samples, precision was measured through a duplicate and a blank sample. Laboratory precision was evaluated against quantitative relative percent difference (RPD) performance criteria.

3.3 Water Quality

3.3.1 Methods

Seven sites were selected, including three locations upstream of the RWRF outfall, as well as four locations downstream of the outfall (see Table 3-1 and Figure 3-1 for site locations). Sites sampled during this study were selected for comparison to previous studies, proximity to the RWRF outfall, and river accessibility. Basic water quality and nutrient samples were collected at each site (see Table 3-2 for parameters). To provide comparability with existing data, sample collection and analysis generally conform with ODEQ (2009) standard operation procedures for sampling of surface water quality, with minor modifications described below.

Using a modification of the bucket grab method in ODEQ (2009), surface water grab samples were collected using a 1 Liter HDPE bottle at four (4) equally spaced locations along a transect located at the upstream end of the riffles selected for BMI and periphyton sampling. A bottle rinsed with in situ water was filled in the stream at each sampling location. Contents were then transferred to another food-grade container rinsed with in-situ water quality measurement and collection of analytical water quality samples. Temperature, dissolved oxygen (DO), conductivity, and pH were collected using a pre-calibrated multi-probe (YSI Pro Plus), while turbidity was measured using grab samples and a portable turbidimeter (Hach 2100Q). Following recording of in situ measurements, composited water samples were placed in laboratory supplied sample containers. The samples were preserved, stored on ice, and delivered to Neilson Research Corporation in Medford for analysis. Samples were analyzed within EPA specified holding times and were accomplished with appropriate quality control measures. Constituents used for analysis and reporting limits are included on Table 3-2.

Table 3-2: In situ and analytical water quality methods

Parameter/Constituent	Method	Resolution/ Method Reporting Limit
In Situ Water Quality		
Temperature	EPA 170.1	+ 0.15 °C
Dissolved oxygen	SM 4500-O	+ 0.2 mg/L or 2% of reading (0-20 mg/L)
pH	SM 4500-H	0.0625 s.u.
Specific conductance	SM 2510A	+ 0.5% of reading (0 -100 uS/cm)
Turbidity	SM 2130 B	0.01 NTU or ±2% of reading (0–1000 NTU)
Analytical Chemistry		
Total Phosphorus	SM4500PE	0.025 mg P/L
Orthophosphate	SM4500PE	0.025 mg P/L
Total Kjeldahl Nitrogen	EPA 351.2 Cu	0.0625 mg N/L
Ammonia	EPA 350.1	0.15 mg N/L
Nitrate	EPA 353.2	0.05 mg N/L
Nitrite	EPA 353.2	0.01 mg N/L

3.3.2 Results

Based upon four spot measurements taken at each sampling sites, Table 3-3 shows average in-situ water quality (i.e., water temperature, dissolved oxygen, conductivity, pH, and turbidity) during sampling. Water temperature ranged from 10.2–10.6°C with an average of 10.4°C for samples collected during morning hours in the reach upstream of the RWRF, whereas samples collected later in the day ranged from 11.3–13.1°C with an average of 12.3°C in the reach downstream of the RWRF. Although these results were only representative of the time of sampling, results at different locations were within the range of diel variability at three locations documented in continuous monitoring by Brown and Caldwell (2014).

Dissolved oxygen (DO) ranged from 10.8–11.6 mg/L with an average of 11.3 mg/L for samples collected during morning hours in the reach upstream of the RWRF, whereas samples collected later in the day ranged from 11.5–12.4 mg/L with an average of 12.1 mg/L in the reach downstream of the RWRF. Corresponding DO saturation ranged from 102–109 percent with an average of 106 percent in the reach upstream of the RWRF and 110–123 percent with an average of 118 percent in the reach downstream of the RWRF. pH ranged from 7.6–8.1 with an average of 7.9 for samples collected during morning hours in the reach upstream of the RWRF, whereas samples collected later in the day ranged from 8.1–8.8 with an average of 8.5 at the four sites in the reach downstream of the RWRF. These results are consistent with photosynthetic DO production by periphyton during daylight hours at locations both upstream and downstream of the RWRF.

Conductivity ranged from 53–66 uS/cm with an average of 58 uS/cm in the reach upstream of the RWRF and 66–83 uS/cm with an average of 72 uS/cm in the reach downstream of the RWRF. Turbidity ranged from 1.9–2.6 NTU with an average of 2.4 NTU in Upstream Reach, and 3.7–5.3 NTU with an average of 4.2 NTU in the reach downstream of the RWRF.

Table 3-3. In situ water quality, substrate, and cover estimates at October 2018 study sites

Site	Date	Time	H_2O Temp (°C)	DO (mg/L)	DO (%)	pH	Cond. (uS/cm)	Turbidity (NTU)	Median Substrate (mm)	Substrate Algae Cover	Macrophyte Cover
1	4-Oct	10:46	10.2	11.5	108	8.0	53.3	1.9	65	10%	20%
2	3-Oct	9:00	10.3	10.8	102	7.6	65.9	2.5	90	60-90%	20%
3	4-Oct	11:00	10.6	11.6	109	8.1	55.6	2.6	90	10%	20%
4	4-Oct	11:41	11.3	11.7	111	8.1	66.1	3.7	60	100%	5-30%
4 (Dup.)	4-Oct	11:51	11.5	11.5	110	8.2	69.8	5.3	60	100%	5-30%
5	4-Oct	15:13	12.8	12.4	122	8.7	67.2	4.4	110	-	80%
6	4-Oct	15:58	13.0	12.4	122	8.8	71.5	4.1	95	90%	20-30%
7	4-Oct	15:36	13.1	12.4	123	8.7	83.2	3.7	70	0%	<5%

Qualitative data included median substrate size, algae cover (i.e., substrate algae cover and macrophyte cover), which are shown in Table 3-3. Median substrate size was visually estimated, and a median size rock was selected and measured along the a-axis and b-axis. The b-axis was displayed in Table 3-3. The median substrate size ranged from 65–90 mm in the reach upstream of the RWRF and 60-110 in the Reach downstream of the RWRF. Visually estimated substrate algae cover ranged from 10–90 percent in the reach upstream of the RWRF and 0–100 percent in the Reach downstream of the RWRF. Visually estimated macrophyte cover was consistently 20 percent in the reach upstream of the RWRF and ranged from <5–80 percent in the downstream reach. As found in previous studies, white bubble-like foam was observed at Site 4 only, with odor typically associated with wastewater treatment (e.g., volatile fatty acids such as butyric, propanoic, and valeric acids) initially detectable at Site 4 but no longer detectable downstream of Site 5.

Laboratory reports for analytical water chemistry are included in Appendix C. Nutrient results for total phosphorus (Total P), orthophosphate, total Kjeldahl nitrogen (TKN), ammonia as nitrogen (Ammonia-N), nitrate, and nitrite are displayed in Table 3-4. Total P ranged from 0.062–0.082 mg/L with an average of 0.073 mg/L in the reach upstream of the RWRF and 0.087–0.254 mg/L with an average of 0.14 mg/L in the reach downstream of the RWRF. Orthophosphate ranged from 0.027–0.037 mg/L with an average of 0.31 mg/L in the reach upstream of the RWRF and 0.060–0.102 mg/L with an average of 0.08 mg/L in the reach downstream of the RWRF. Total Kjeldahl nitrogen ranged from 0.24–0.34 mg/L with an average of 0.29 mg/L in the upstream of the RWRF, and 0.41–0.70 mg/L with an average of 0.49 mg/L in the reach downstream of the RWRF. Ammonia-N ranged from 0.110–0.155 mg/L with an average of 0.13 mg/L in the reach upstream of the RWRF and 0.060–0.102 mg/L with an average of 0.085 mg/L in the reach downstream of the RWRF. Nitrate concentrations in the reach upstream of the RWRF were less than 0.05 mg/L and as such were not detectable by laboratory instruments. Nitrate-N concentrations ranged from and 0.076–0.280 mg/L with an average of 0.21 mg/L in the reach downstream of the RWRF. Nitrite-N concentrations ranged from and 0.015–0.043 mg/L in the reach downstream of the RWRF and were less than 0.01 mg/L in the reach upstream of the RWRF.

Table 3-4: Analytical results for nutrients at October 2018 study sites

Site	TP (mg-P/L)	Orthophosphate (mg-P/L)	TKN (mg-N/L)	Ammonia-N (mg-N/L)	Nitrate (mg-N/L)	Nitrite (mg-N/L)	TIN:PO4 (mg-N/ mg-P)
1	0.074	0.027	0.34	0.155	<0.05	<0.01	8.0
2	0.082	0.037	0.24	0.110	<0.05	<0.01	4.6
3	0.062	0.028	0.30	0.140	<0.05	<0.01	7.1
4	0.131	0.090	0.46	0.231	0.249	0.043	5.8
4 (Dup.)	0.254	0.102	0.70	0.205	0.244	0.035	4.7
5	0.087	0.060	0.42	0.184	0.076	0.015	4.6
6	0.114	0.085	0.44	0.313	0.180	0.032	6.2
7	0.122	0.087	0.41	0.217	0.280	0.032	6.1

While the results above suggest total phosphorus levels were above DEQ guidelines (> 0.08 mg/L total P) (Hicks 2005), total phosphorus generally decreased with distance downstream of the RWRF outfall. In addition to various guidelines regarding nutrient thresholds, the ratio of nutrients can be used to indicate the nutrient balance in aquatic ecosystems and assist in indicating an over- or under-abundance (i.e., nutrient limitation) of one nutrient or another (Carpenter 2003). The ratio of total inorganic nitrogen (TIN)[4] to phosphate at a balanced state was often considered to be a 16:1 (molar) ratio for dissolved inorganic nitrogen and phosphorus (N:P) (Redfield 1958). The molar N:P ratio of 16:1 corresponds to a mass ratio of approximately 7.2:1 and indicates a balance of algal nutrients in aquatic ecosystems on a theoretical basis. Nitrogen limitation is strongly indicated at nitrogen to phosphorus TIN:PO4 mass ratios below 4.5:1 (10:1 molar ratio) and phosphorus limitation at mass ratios above 9.1 (20:1 molar ratio), respectively. Overall, the October 2018 results suggest relatively balanced nutrient conditions at two sites upstream of the RWRF, and nitrogen limitation at Site 2 at the eastern end of TouVelle State Recreation Site as well as all sites downstream of the RWRF.

3.4 Benthic Macroinvertebrates

3.4.1 Methods

Seven sites were selected, including three locations upstream of the RWRF outfall, as well as four locations downstream of the outfall (Table 3-1 and Figure 3-1). Sites sampled during this study were selected based on previous studies, proximity to the RWRF outfall, as well as river accessibility. A replicated BMI sample was collected in each riffle and then sent to a laboratory for identification and enumeration, allowing for comparisons of within-site variability. To provide comparability with existing data, sample collection and analysis generally followed sampling and quality control procedures from previous studies for BMI with the substitution of Surber sampling in lieu of Kick-net methods.

BMI sampling followed DEQ guidelines for a Level 3 BMI Survey (ODEQ 2009). Two composite samples, each consisting of eight randomly selected sub-samples, were collected from each of the seven selected riffle sample locations. One square foot of substrate was sampled at each of the eight sub-sample locations using a Surber sampler with a 0.500-millimeter mesh netting. The sampler was placed on the substrate and, working from the upstream edge of the sampling plot backward, larger stones were scrubbed with gloved hands and a stiff brush directly in front of the net to remove attached animals. Each stone was inspected for additional attached organisms before being set aside. If a rock was lodged in the stream bottom, it was rubbed a few times concentrating on any cracks or indentations. After removing all large stones, small substrates (i.e., sand or gravel) were disturbed to a depth of about 10 cm by raking and stirring with the hands. The process continued until no additional animals or organic matter washed into the net. After completing the collection, the net contents were transferred into a clean jar with a squirt bottler. The net was rinsed until it was free of debris and BMI. The composite samples were labeled, preserved in ethanol, and sent to Aquatic Biological Associates in Corvallis, Oregon for later identification and enumeration.

3.4.2 Results

As discussed in Section 1.4.1, there are multiple ways to describe BMI communities. The metrics selected for calculation include those used by Hafele (2013), Brown and Caldwell (2014), plus additional ones identified by the EPA's rapid bioassessment of wadeable streams (Barbour et al. 1999) for greater completeness in identifying environmental perturbation. Table 3-5 summarizes results for metrics discussed above and in Section 1.4.1.

[4] Sum of inorganic nitrogen concentrations from NH_3, NO_3, and NO_2, expressed as mg-N/L

Table 3-5: Summary of BMI results at October 2018 study sites

Site	Total taxa richness	Total abundance	EPT taxa richness	EPT abundance	% Total tolerant individuals	% Total sensitive individuals	% Total non-insect individuals	% Total dominant taxon
1	45	10,539	21	4,324	31.8	3.3	14.8	35.8
1(Dup.)	43	20,447	21	10,080	23.2	2.3	15.6	37.0
2	50	30,941	24	12,416	21.9	7.7	23.1	37.0
2(Dup.)	59	41,577	26	11,714	24.5	18.6	16.9	41.5
3	57	12,295	22	2,750	30.0	20.4	27.9	47.1
3(Dup.)	48	13,993	18	3,314	31.1	11.3	33.3	40.4
4	47	11,927	11	3,023	19.7	0.4	19.0	41.4
4(Dup.)	47	12,861	13	3,577	16.6	0.2	20.8	37.8
5	33	18,162	5	284	40.9	0.0	82.9	66.4
5(Dup.)	33	26,796	6	538	53.6	0.0	84.5	56.0
6	45	7,944	15	1,077	22.9	0.0	43.6	46.4
6(Dup.)	42	11,529	11	1,660	39.8	0.0	54.2	39.8
7	44	10,738	13	4,541	17.3	0.0	29.9	55.2
7(Dup.)	41	15,151	13	5,408	20.1	0.0	32.3	49.5

The Bray-Curtis Similarity was calculated across all sites and site replicates (see Appendix D, Table 1). Similarity within sites was low to moderate ranging from 66–83 percent, with a median of 72 percent. Similarity among sites ranged from 33–64 percent in the reach upstream of the RWRF sites and 24–60 percent in the reach downstream of the RWRF. Similarity values between sites in the reaches upstream and downstream of the RWRF were relatively low ranging from 15–51 percent, suggesting some change in the BMI community upstream and downstream of the RWRF outfall. The lowest similarity among reaches was between Site 1 and Site 5, and highest between Site 3 and Site 6.

Variation in total taxa richness and total abundance for each site are shown in Table 3-5 (also see Appendix D, Figure 1). Taxa richness ranged from 43–59 with an average of 50 in the reach upstream of the RWRF and 33–47 with an average of 42 in the reach downstream of the RWRF. Total abundance ranged from 10,500–41,600 with an average of 21,600 in the reach upstream of the RWRF and 7,900–26,800 with an average of 14,400 in the reach downstream of the RWRF. While both taxa richness and macroinvertebrate abundance show a lower average in the reach downstream of the RWRF, the individual sites appear to be within the overall range of the reach upstream of the RWRF (excluding total taxa richness at Site 5 and total abundance in one of the downstream Site samples). Lowest taxa richness was at Site 5. Taxa richness is higher at Site 6 and Site 7, which have similar values to site 4. The lowest abundance was at Site 6; however, the Site 6 replicate and both Site 7 values were with the range of values in the reach upstream of the RWRF.

While EPT abundance and EPT taxa richness also have lower values downstream of the RWRF outfall, decreases appear to begin upstream of the facility (see Table 3-5 and Appendix D, Figure 2). EPT taxa richness ranged from 24–36 with an average of 28 in the reach upstream of the RWRF and 16–24 with an average of 20 in the reach downstream of the RWRF. EPT abundance ranged from 7,200–12,400 with an average of 7,400 in the reach upstream of the RWRF and 300–5,500 with an average of 2,500 in the reach downstream of the RWRF. The EPT values in the reach downstream of the RWRF were notably lower than in the reach upstream. The lowest EPT abundance and richness values were recorded at site 5. EPT richness at Sites 4, 6, and 7 were all similarly low in comparison to Sites 1,2, and 3. EPT Abundance at Site 6 was also below the range found at the sites upstream of the RWRF.

There were lower percentages of sensitive BMI individuals at all sites in the reach downstream of the RWRF; however, there were only three samples with notably higher relative abundance of tolerant individuals in the reach downstream of the RWRF (see Table 3-5 and Appendix D, Figure 3). The percent of intolerant individuals ranged from 2.3–20.4 with an average of 11 in the reach upstream of the RWRF and 0–0.4 percent with an average of 0.1 in the reach downstream of the RWRF. The percent of tolerant individuals ranged from 21.9–31.8 with an average of 27 in the reach upstream of the RWRF and 16.6–53.6 with an average of 29 in the reach downstream of the RWRF. The results depict a decrease of intolerant individuals between Site 4 and Site 7 as well as a lower overall average than the reach upstream of the RWRF.

The percent dominant taxon and non-insect individuals in the reach downstream of the RWRF were notably higher than those in the upstream reach (see Table 3-5 and Appendix D, Figure 4). The percent of dominant taxon ranged from 35.8–47.1 with an average of 40 in the reach upstream of the RWRF and 37.8–66.4 with an average of 49 in the reach downstream of the RWRF. The percent of non-insect individuals ranged from 14.8–33.3 with an average of 22 in the reach upstream of the RWRF and 19.0–84.5 with an average of 46 in the reach downstream of the RWRF. As found for the percent of tolerant individuals, there was a notable increase in the percent of dominant taxon and non-insect individuals at Site 5 relative to results at upstream sites. The relative abundance of dominant taxon is lower at Site 7 than Site 5, but still outside the range found at the sites in the reach upstream of the RWRF. While the percent of total non-insect individuals at Site 6 is lower than Site 5, it is still outside the range found at sites upstream of the RWRF. Interestingly, the percent of dominant taxon and non-insect individuals at Site 4 were both within the range found at sites upstream of the RWRF.

3.5 Periphyton

3.5.1 Methods

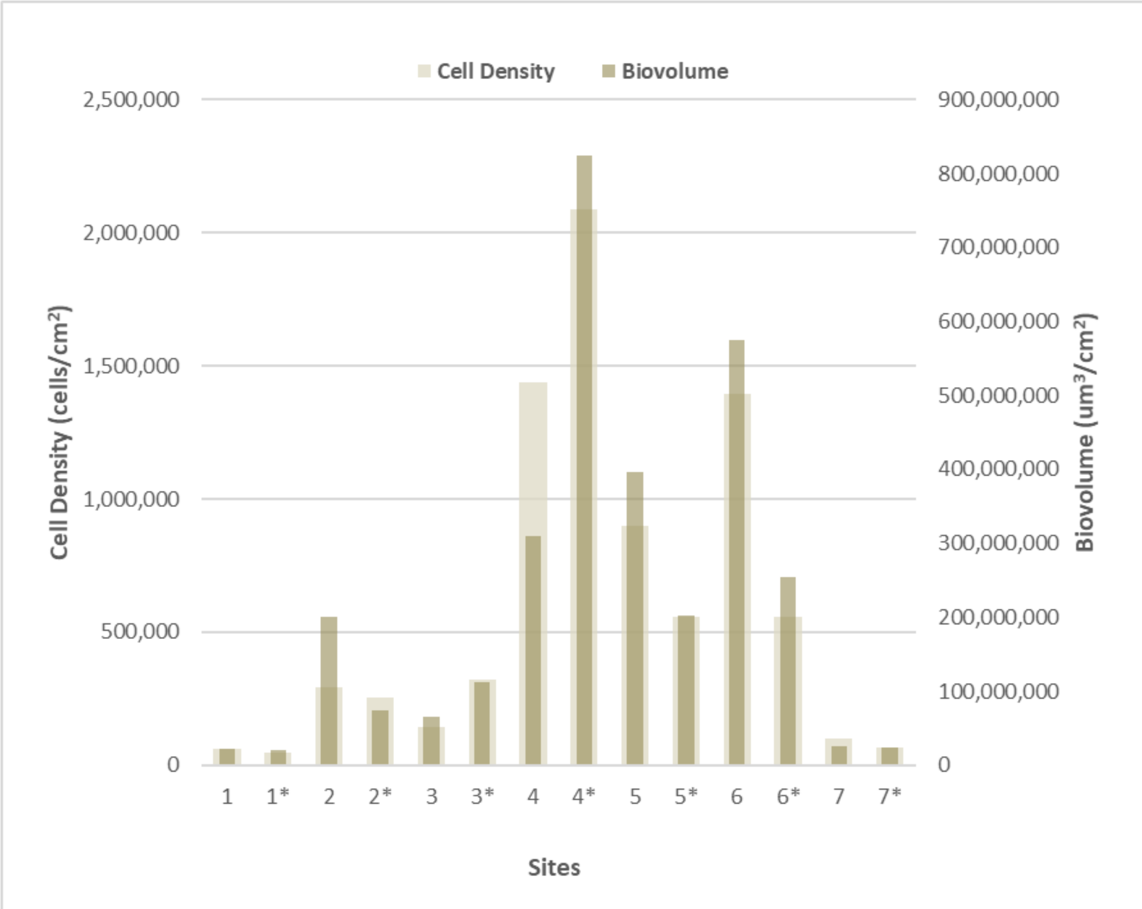
For comparability to previous studies, periphyton was collected using procedures described by USGS (Carpenter 2003). Seven sites were selected, including three locations upstream of the RWRF outfall, as well as four locations downstream of the outfall (Table 3-1 and Figure 3-1). Riffles sampled during this study were selected based on previous studies, proximity to the RWRF outfall, as well as river accessibility. Replicate periphyton samples were collected in each riffle, allowing for comparisons of within-site variability. Basic water quality and nutrient samples were collected at each site (see Table 3-2 for parameters).

Composite algae samples were comprised from attached algae from 16 randomly selected rocks at each of the seven selected riffle sample sites. Rocks selected were the nearest two rocks behind the rebar marker placed to delineate BMI sampling location. Rocks selected were large and flat enough to accommodate sampling a round ABS pipe fitting (scribe) with an outside diameter of 5.6 cm. The pipe was placed on each rock, and the algae located outside the scribe was removed with a plastic-bristle brush and/or scraped off with a knife and discarded. The circular patch of algae remaining on the rock was then scraped into a basin, and then transferred to a 125 ml sample jar. Algae samples were labeled, preserved in ethanol, and sent to Aquatic Analysts (Friday Harbor, Washington) for identification and enumeration (i.e., species density and biovolume).

3.5.2 Results

As discussed in Section 1.4, the metrics selected for calculation include those used by Hafele (2013) and Brown and Caldwell (2014) with additional metrics identified by EPA's rapid bioassessment of wadeable streams (Barbour et al. 1999). Figure 3-2 (cell density and biovolume) and Appendix E Table 3 (dominant taxon) summarize metrics also discussed in previous studies. The cell density and biovolume for all sites are shown in Table 3-2. Cell density ranged from 61,000 - 324,000 cells/cm^2 in the reach upstream of the RWRF and 67,000 - 2,088,000 cells/cm^2 in the reach downstream of the RWRF. Biovolume ranged from 20,168,000 - 201,041,000 um^3/cm^2 in the reach upstream of the RWRF and 23,961,000 - 823,906,000 um^3/cm^2 in the reach downstream of the RWRF. Cell density and biovolume in the reach downstream of the RWRF show notable increases relative to sites in the reach upstream of the RWRF from sites 4 through 6. Cell densities and biovolumes at Site 7 were comparable to Site 1.

Figure 3-2. Diatom Cell Density and Biovolume estimates at October 2018 study sites



In addition to differences in algal cover, density and biomass, algal community composition was examined at sites upstream and downstream of the RWRF. Using the Percent Community Similarity (PSc), community similarity within sites was low to moderate ranging from 69–81 percent, with a median and average of 74 percent (See Appendix E, Table 1). PSc ranged from 63–84 percent within the reach upstream of the RWRF and 39–74 percent within the reach downstream of the RWRF. Similarity among the sites upstream and downstream of the RWRF was relatively low to moderate, ranging from 50–74 percent. Across all sites, the greatest PSc was between Sites 3 and 6. The lowest similarity across all sites was between Site 2 and 5 replicates. These results suggest changes in composition between sites may not be readily attributed to the RWRF discharge.

Other measures of periphyton community composition were similar at sites upstream and downstream of the RWRF (Table 3-6). The percent dominant taxon ranged from 45.6–62.6 with an average of 58 in the reach upstream of the RWRF and 45.8–74.5 with an average of 56 in the reach downstream of the RWRF. Except for Site 4, the reach downstream of the RWRF had relatively lower percentages of dominant taxon than the reach upstream of the RWRF. Overall, taxon among the two reaches also seem to be similar (see Appendix E, Table 3). Species richness ranged from 18–29 with an average of 24 in the reach upstream of the RWRF and 19–29 with an average of 25 in the reach downstream of the RWRF. Shannon's diversity ranged from 1.96–2.71 with an average of 2.26 in the reach upstream of the RWRF and 1.8–2.72 with an average of 2.38

in the reach downstream of the RWRF. Overall, species richness and Shannon's diversity seem to be similar in the reach downstream of the RWRF than in the reach upstream of the RWRF (also see Appendix E, Figure 1).

Table 3-6: Summary of EPA (Barbour et al. 1999) diatom biotic integrity metrics results at October 2018 study sites

Site	Species Richness	Shannon Diversity	Percent Sensitive	Percent Tolerant	PTI	Percent *A. minutissima*
1	18	2.2	49.4	0.0	2.5	12.9
1 (Dup.)	19	2.0	40.0	1.2	2.4	8.2
2	29	2.7	37.5	7.5	2.3	9.2
2 (Dup.)	25	2.3	46.3	4.1	2.4	23.1
3	24	2.2	37.1	5.7	2.3	6.7
3 (Dup.)	27	2.2	32.3	2.5	2.3	7.0
4	24	1.8	18.9	11.5	2.1	8.9
4 (Dup.)	25	2.1	21.6	23.0	2.0	5.4
5	28	2.7	47.2	4.8	2.4	1.6
5 (Dup.)	19	2.5	45.8	9.3	2.4	0.0
6	27	2.4	31.2	11.0	2.2	3.3
6 (Dup.)	23	2.4	35.2	8.5	2.3	4.2
7	23	2.6	50.5	11.9	2.4	6.4
7 (Dup.)	29	2.5	34.5	14.4	2.2	2.2

As expected, percent sensitive diatoms and tolerant diatoms generally exhibited an inverse pattern (Table 3-6). The percent sensitive diatoms ranged from 32.2–49.4 with an average of 40 in the reach upstream of the RWRF and 18.8–50.5 with an average of 36 in the reach downstream of the RWRF. The percent tolerant diatoms ranged from 0–7.5 with an average of 3.5 in the reach upstream of the RWRF and 4.8–23.0 with an average of 12 in the reach downstream of the RWRF. There was a notable depression in the percent of sensitive diatoms at Site 4, which returned to levels similar to Site 1 at Site 5. Tolerant taxa had opposite fluctuations at Sites 4 and 5. Overall, there was a notable increase in the percent of tolerant diatoms and more dynamic fluctuations in the percent of sensitive diatoms in the reach downstream of the RWRF (see Table 3-6 and Appendix E, Figure 2). Although the percent tolerant individuals (PTI) were similar at the reach scale upstream and downstream of the RWRF, the PTI was noticeably lower at Site 4 than any other site (see also Appendix E, Figure 3).

As anticipated, the percent of *A. minutissima* appeared to follow an inverse pattern to substrate size (see Table 3-3, Table 3-6, and Appendix E, Figure 4). The percent of *A. minutissima* ranged from 6.7–23.1 with an average of 11.2 in the reach upstream of the RWRF and 0–8.9 with an average of 4.0 in the in the reach downstream of the RWRF. Overall, the relative abundance of *A. minutissima* was considerably lower at Sites 5 through 7 than at Site 4 or the sites in the reach upstream of the RWRF. As described in Section 3.3, the median substrate size was larger at Sites 5 through 7 compared to both Site 4 and the reach upstream of the RWRF.

There were also no observable patterns in the percentage of other diatoms associated with trophic states, except for the percent of diatoms indifferent to trophic state, which followed patterns similar to that shown by *A. minutissima* (see Appendix E, Table 2). The percent of diatoms indifferent to trophic state ranged from 15.8–33.1 with an average of 19.9 in the reach upstream of the RWRF and 5.6–26.5 with an average of 13.7 in the in the reach downstream of the RWRF. Overall, the percent of diatoms indifferent to trophic state was notably lower in the reach downstream of the RWRF than in the reach upstream of the RWRF. The percent of diatoms considered N-fixers also had a similar trend to *A. minutissima* (see Appendix E, Table 2). The percent of N-fixing diatoms ranged from 0–3.3 with an average of 1.7 in the reach upstream of the RWRF and 0–1.6 with an average of 0.4 in the in the reach downstream of the RWRF. The percent of N-fixing diatoms was considerably lower in the reach downstream of the RWRF than in the reach upstream of the RWRF.

Lastly, the percent of diatoms indicative of low N and P had similar patterns to the percent of N-fixers; whereas, the percent of diatoms indicative of high N and P had nearly opposite patterns (see Appendix E, Table 2). The percent of diatoms indicative of low N ranged from 0–11.7 with an average of 5.4 in the reach upstream of the RWRF and 1.8–4.8 with an average of 2.9 in the in the reach downstream of the RWRF. The percent of diatoms indicative of low P ranged from 3.5–11.7 with an average of 6.5 in the reach upstream of the RWRF and 1.4–7.2 with an average of 4.1 in the in the reach downstream of the RWRF. The percent of diatoms indicative of high N ranged from 52.9–70.5 with an average of 61.6 in the reach upstream of the RWRF and 50.4–75.9 with an average of 63.4 in the in the reach downstream of the RWRF. The percent of diatoms indicative of high P ranged from 52.9–69.5 with an average of 61.2 in the reach upstream of the RWRF and 48.0–75.9 with an average of 61.0 in the in the reach downstream of the RWRF. The lowest relative abundance of diatoms indicative of low N and P were observed at Site 4, with generally lower percentages downstream of the RWRF. In contrast, the highest relative abundance of diatoms indicative of high N and P were observed at Site 4. However, by Site 5 these decrease to similar percentages as those observed upstream of the RWRF.

4 ANALYSIS AND ASSESSMENT

4.1 Comparisons of 2012–2013 and 2018 Assessments

4.1.1 Water Quality

In situ water quality measurements (water temperature, dissolved oxygen, pH, conductivity, turbidity) are routinely measured in aquatic assessments to establish general conditions, including the influences of local environmental conditions, seasonal and annual variability, and the ability to support aquatic life. Although Hafele (2013) recorded no in situ water quality data, both the ODEQ (2014) and Brown and Caldwell (2014) studies included measurements of in situ water quality parameters, including water temperature, dissolved oxygen, pH, and conductivity across sites sampled at differing times of day both upstream and downstream of the outfall. In general, these data and data collected in 2018 show similar in situ water quality upstream and downstream of the RWRF, with dissolved oxygen consistently at or near saturation and reflecting the range of conditions and variability found throughout the Rogue River as presented in ODEQ (2014). Variability in dissolved oxygen and pH might be expected during periods of higher solar insolation and photosynthetic activity (daytime) followed by lower dissolved oxygen concentrations during low light levels (night) when bacterial and phytoplankton respiration were expected to exceed re-aeration at the surface of the Rogue River. Continuous data collected by Brown and Caldwell (2014) showed similar variability in DO and pH at locations upstream and downstream of the RWRF outfall, indicating that algae and aquatic vascular plants were not differentially influencing in situ water quality parameters, such as dissolved oxygen, that might be expected to influence suitability for BMI and fish.

Although Hafele (2013) and ODEQ (2014) did not collect nutrient data that might be used to indicate the potential for biostimulatory growth of algae and macrophytes, both Brown and Caldwell (2014) and the current study can be used to compare conditions upstream and downstream of the RWRF outfall. A comparison of the nutrient levels by Brown and Caldwell (See Table 2-4) and samples collected in 2018 (Table 3-4) show elevated N and P concentrations at sites downstream of the RWRF outfall, including sites below the Bear Creek confluence sampled in 2018. Excluding the samples collected downstream of Bear Creek, statistical comparisons of the three sites downstream of the RWRF (Sites 4-6) and the three upstream sites (Sites 1–3) and using a two-tailed t-test with equal variance were performed. The results in Table 3-4 show that TIN and soluble Phosphorus (PO_4) concentrations were greater in the downstream group, and the t-tests confirmed these differences were statistically significant.

As discussed in Section 3.3.2, the ratio of TIN:PO_4 can be used to indicate the nutrient balance in aquatic systems and assist with indicating an over- or under-abundance (i.e., nutrient limitation) of one nutrient or another. Consistent with slightly elevated background phosphorus levels in the Rogue River basin soils resulting from the eruption and ash fall of Mt. Mazama (Dingus 1974), Brown and Caldwell (2014) found nitrogen limitation in samples both upstream and downstream of the RWRF. The 2018 results show a similar pattern of excess phosphorus and overall nitrogen limitation at one site upstream and all sites downstream of the RWRF (Table 3-4). These results suggest that nitrogen reductions from the RWRF as well as other upstream sources may reduce the potential for biostimulatory growth of algae in the Middle Rogue River both upstream and downstream of the RWRF.

4.1.2 Selected BMI Metrics

The Hafele (2013), Brown and Caldwell (2014), and the 2018 studies used similar analytical assessment methodology, while the ODEQ (2014) study provided a qualitative summary of "density," "dominant taxon," and "diversity." All four of the studies depict lower abundance and richness at least in one sampling location downstream of the RWRF, potentially indicating a localized response to the RWRF discharge. Hafele (2013) showed all of the selected BMI metrics in that study were consistently lower, and non-insect taxa increased, downstream of the RWRF. While not all BMI metrics in Brown and Caldwell (2014) and the 2018 studies showed consistently differing conditions downstream of the outfall, most metrics showed at least one sampling location per metric which depicted conditions outside the range of those upstream of the RWRF outfall. Brown and Caldwell (2014) and the 2018 studies did show that both EPT richness and percent sensitive individuals were consistently lower downstream of the RWRF outfall.

In all studies, there were decreases in relative abundance of intolerant and an increase of non-insect BMI downstream of the RWRF outfall. Both Hafele (2013) and ODEQ (2014) note there was a decrease in the relative abundance of intolerant individuals at the site directly below the outfall, which subsequently increased at the next site downstream. The Brown and Caldwell (2014) and the 2018 studies, however, showed depressed relative abundances of intolerant individuals at the second site downstream of the outfall. Where the Brown and Caldwell (2014) data show recovery in relative abundance of intolerant individuals further downstream, the 2018 study did not show statistically significant differences in BMI abundances. However, excluding samples collected below the Bear Creek confluence (Site 7), 2018 BMI results (Table 3-5) from the three sites downstream of the RWRF (Sites 4–6) and the three upstream sites (Sites 1–3) showed species richness (total and EPT) as well as EPT abundance and total sensitive individuals were lower in the downstream sites to a statistically significant degree using a two-tailed t-test with equal variance.

The 2018 study also showed a corresponding increase in the relative abundance of tolerant individuals downstream of the RWRF outfall, and these data did show a slow recovery (i.e., a reduction in relative abundance of tolerant individuals with increased distance downstream). The patterns observed in relative abundance of tolerant individuals closely matched those of the non-insect taxa in all four studies and the 2018 study showed statistically significant increases in percent non-insect individuals at the three sites (Sites 4–6) downstream of the RWRF in comparison to upstream sites (Sites 1–3).

Despite the minor differences in BMI results among the studies, there were some consistent trends in EPT abundance, richness and percent sensitive individuals. These trends suggest both general perturbation and nutrient enrichment immediately downstream of the RWRF with some recovery apparent at either the second or third site downstream of the outfall depending on the study and metric.

4.1.3 Selected Periphyton Metrics

Periphyton algae conditions were assessed in each of the previous studies as well as the 2018 study. Based upon photographs and periphyton sampling presented in Hafele (2013), as well as qualitative observations reported in ODEQ (2014), the riffles downstream of the RWRF outfall showed accumulations of attached algae somewhat greater than riffles at locations upstream of the outfall. The ODEQ (2014) study reported "light" to "moderate" cover throughout the upper and lower reaches of the main stem Rogue River, with an estimate of "heavy" in the reach below the outfall. That study also reported nuisance algal growth at several points in both the upper and lower survey reaches. As discussed in Section 2.3.2, ODEQ (2014) found several sites with high algae cover both upstream and downstream of the RWRF, and suggested that conditions below the Cole M. Rivers fish hatchery and downstream of the Medford RWRF showed high algae cover and signs of altered macroinvertebrate assemblages. ODEQ (2014) reported that macrophyte density in the main channel below the RWRF was higher than observed at any other site surveyed in 2013. The 2018 data showed highly variable algae and macrophyte cover both upstream and downstream of the RWRF outfall (Table 3-3), with the highest apparent algae cover at Site 4 immediately downstream of the outfall. Macrophyte cover was highest at Site 5, approximately one mile downstream of the outfall.

In addition to apparent patterns of algae and macrophyte cover, Hafele (2013), Brown and Caldwell (2014), and the 2018 study analyzed metrics commonly used to assess algal samples (Section 1.4.2), including; identification of taxa, total abundance expressed as cell density (number of cells per cm^2), and total biovolume (cubic microns per cm^2). The ODEQ (2014) study provided taxa identification along with a qualitative assessment of overall abundance and dominant taxa. Results from the Hafele (2013) study show large increases in both algae cell density and biovolume below the RWRF outfall. Brown and Caldwell (2014) show elevated algae cell densities downstream of the outfall, with decreased algae biovolume, with overall lower values than were reported by Hafele (2013). The Brown and Caldwell (2014) results may have been affected by a rainfall event prior to sampling that increased streamflow and could have scoured the algae. The 2018 study results showed a pattern and magnitude more similar to Hafele (2013), with large increases in both algal cell density and biovolume below the outfall. Figure 3-2 shows cell density and biovolume indicators of biomass that were greater in the three sites downstream of the RWRF (Sites 3–6) than the three upstream sites (Sites 1–3) to a statistically significant degree using a two-tailed t-test with equal variance.

In comparison to Hafele (2013) and Brown and Caldwell (2014), the 2018 study showed that the proportions of diatoms indicative of low nutrient (N and P) conditions decreased in samples collected downstream relative to samples collected upstream of the RWRF; whereas, the proportions of diatoms indicative of high nutrient (N and P) conditions increased. The proportions of sensitive and tolerant diatoms also varied moving from upstream to downstream, with greater proportions of tolerant diatoms at the three sites downstream of the RWRF (Sites 4–6) in comparison to the upstream sites (Sites 1–3) to a statistically significant degree. Acknowledging some changes in percentages of various indicator taxa in 2018 such as *A. minutissima*, species richness, Shannon's diversity as well as dominant taxon and individual species were equally represented in the reaches upstream and downstream of the RWRF.

4.2 Discussion

This section evaluates Rogue River conditions downstream of the RWRF's 300-foot regulatory mixing zone, as well as the extent to which discharges from the RWRF may be contributing to those conditions, as they relate to the biocriteria standard set forth in OAR 340-041-0011 and the other narrative water quality standards set forth in OAR 340-041-0007(9)-(13). The evaluation is based on review and analysis of the 2012–2013 and 2018 studies described above.

4.2.1 Statewide narrative criteria—OAR 340-041-0007(9)-(13)

Based upon visual observations and individual aesthetic judgments made during the 2012–13 and 2018 studies described above, this section considers whether the RWRF discharge results in "objectionable discoloration," "floating solids," and the presence of "aesthetic conditions offensive to the human senses of sight, taste, smell, or touch" in the Rogue River downstream of the RWRF's 300-foot regulatory mixing zone as relevant to Oregon's statewide narrative criteria contained in OAR 340-041-0007 (9) through (13).

OAR 340-041-0007 (9) – "the development of fungi or other growths having a deleterious effect on stream bottoms, fish or other aquatic life, or that are injurious to health, recreation, or industry may not be allowed;"

Photographs as well as periphyton sampling presented in Hafele (2013), as well as qualitative observations reported in ODEQ (2014), suggest that the riffles downstream of the RWRF outfall had accumulations of attached algae in greater amounts than upstream of the outfall. Although ODEQ (2014) identified several locations exhibiting localized growths on the stream bottom upstream of the RWRF, the 2018 study partially corroborated higher algae cover estimates and documented increased algal cell density and biovolume at locations downstream of the RWRF. While increases in algal cover and density appear to result in changes to the BMI community with some potential for consequences to the aquatic food web (See Section 4.2.2), similar algae cover conditions were documented by ODEQ (2014) at the Cole. M. River hatchery upstream of the RWRF and at several tributary locations, including Bear Creek downstream of the RWRF. For this reason, it is uncertain whether the patterns in algal cover were solely attributable to the RWRF discharge vs. other nutrient sources, whether such conditions were persistent at all times of year, and whether such conditions might be partially explained by natural spatial variations in algae growth within riffle habitats of the Rogue River.

OAR 340-041-0007 (10) – "the creation of tastes or odors or toxic or other conditions that are deleterious to fish or other aquatic life or affect the potability of drinking water or the palatability of fish or shellfish may not be allowed;"

Odors were observed during the studies, but there are no references in the studies to variations in taste and odors related to the potability of drinking water, the palatability of fish or shellfish, or potential toxicity agents associated with the RWRF outfall. In addition, few blue-green algae species were identified by Hafele (2013), ODEQ (2014), or Brown and Caldwell (2014), and none that were associated with algal toxins. Accordingly, there is no basis in the 2012–2013, or 2018 studies for concluding that "tastes or odors or toxic or other conditions" in the river have an effect on the uses described in this standard due to discharges from the RWRF. The aesthetic aspects of odors observed during the studies are addressed further below under OAR 340-041-0007(13).

OAR 340-041-0007 (11) – "the formation of appreciable bottom or sludge deposits or the formation of any organic or inorganic deposits deleterious to fish or other aquatic life or injurious to public health, recreation, or industry may not be allowed;"

We were unaware of sufficient suspended sediments or residual organic matter in the RWRF discharge that would result in identifiable deposits. As such, there is no basis for concluding that discharges from the RWRF are creating river deposits relevant to this standard.

OAR 340-041-0007 (12) – "objectionable discoloration, scum, oily sheens, or floating solids, or coating of aquatic life with oil films may not be allowed;

The 2012–13 studies observed a visual plume from the RWRF outfall that extended downstream beyond the regulatory mixing zone. Observations of surface bubbles were apparent at Site 4 in October 2018, approximately 0.4 RM downstream of the RWRF outfall, but these bubbles were not found at sites farther downstream. Recognizing that the RWRF outfall design is associated with air entrainment that routinely results in foam downstream (ODEQ 2011), it is plausible that accumulation of floating materials in the river may be attributed to the dissolved air in the discharge. Other than NPDES-permitted discharges of TSS from the RWRF, there is no indication that this discharge contained floating solids or other pollutants associated with OAR 340-041-0007 (12).

OAR 340-041-0007 (13) – "aesthetic conditions offensive to the human senses of sight, taste, smell, or touch may not be allowed."

The previous studies refer to odors attributed to discharges from the RWRF. These observations were presumably based upon observable differences of aesthetic conditions upstream and downstream of the RWRF outfall. Stillwater staff noted odors related to treatment processes were apparent at Site 4 in October 2018, approximately 0.4 miles downstream of the RWRF outfall, but were not noticed at sites farther downstream. Whether these odors were "offensive" within the meaning of the narrative standard is a subjective determination that cannot be assessed objectively.

4.2.2 Biocriteria—OAR 340-041-0011

OAR 340-041-0011 states that "Waters of the State must be of sufficient quality to support aquatic species without detrimental changes in the resident biological communities." OAR 340-041-0002(75) defines "without detrimental changes in the resident biological community" as "no loss of ecological integrity when compared to natural conditions at an appropriate reference site or region." "Ecological integrity" is defined, in turn, by OAR 340-041-0002(19) as "the summation of chemical, physical and biological integrity capable of supporting and maintaining a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of the natural habitat for the region." As noted in Section 1.4, the ongoing presence of the upstream William Jess Dam at RM 158, legacy effects of historical and present day land uses, as well as the influences of ongoing point and non-point discharges prevent the direct assessment of local conditions downstream of the RWRF in comparison to "natural habitat" for this region. OAR 340-041-0002(5) defines an "appropriate reference site or region" as "a site on the same water body or within the same basin or ecoregion that has similar habitat conditions, and represents the water quality and biological community attainable within the areas of concern." Lacking an appropriate reference site, this study relies upon comparisons of sampling results from sites upstream and downstream of the RWRF as an accepted basis of comparison by ODEQ (2018). The paragraphs below discuss differences in water quality conditions upstream and downstream of the RWRF as well as periphyton and BMI metrics used to indicate suitable conditions for the resident biological community.

Water Quality Conditions

While DO, pH and other in situ water quality parameters show similar variability upstream and downstream of the RWRF (Section 4.1.1), a comparison of the nutrient levels by Brown and Caldwell (2014) and samples collected in 2018 show elevated N and P concentrations at sites downstream of the RWRF outfall, with further increases at the site downstream of the Bear Creek confluence that was sampled in 2018. As suggested by ODEQ (2014), there are likely multiple nutrient sources to the Middle Rogue River upstream as well as downstream of the RWRF. Nevertheless, the consistent patterns in periphyton and BMI metrics discussed below suggest the potential for discharges from the RWRF to contribute to the observed changes in the resident biological community, changes which represent a shift away from the biological communities that would be otherwise attainable.

Periphyton and BMI Indicator Metrics

Using selected indicators of biotic integrity and impairment (Section 1.4), periphyton and BMI metrics from Hafele (2013), Brown and Caldwell (2014), and other sources (see Section 1.4) were compared with the 2018 study at locations downstream of the RWRF outfall. As noted in Section 4.1.3, periphyton biomass indicators were greater in the three sites downstream of the RWRF (Sites 3–6) than the three upstream sites (Sites 1–3) in 2018 to a statistically significant degree. While the taxa represented as well as richness and diversity measures were similar at sites upstream and downstream of the RWRF, the proportions of sensitive and tolerant diatoms varied between upstream and downstream locations, with significantly greater proportions of tolerant diatoms at the three downstream sites (Sites 4–6).

BMI metrics from the three studies as well as data collected in October 2018 depict lower BMI abundance (total and EPT) at Site 4 approximately 0.4 miles downstream of the RWRF, with gradual recovery of EPT taxa at sites farther downstream. Similar to other studies that indicate a reduction in taxa richness downstream of point sources (Ortiz & Puig 2007), EPT taxa richness and the percentage of other sensitive taxa generally decrease immediately downstream of the RWRF, concurrent with an increase of tolerant, generally non-insect taxa at these locations. While the taxa represented were generally similar at sites upstream and downstream of the RWRF, BMI species richness (total and EPT) as well as EPT abundance and total sensitive individuals were lower in the downstream group to a statistically significant degree, excluding samples collected below the Bear Creek confluence (Site 7).

Other Potential Linkages to Resident Biological Community

Although this report does not directly estimate fish abundance or habitat use in the vicinity of the RWRF, the Middle Rogue River currently supports spawning and rearing of a variety of Pacific salmonids and other native and introduced fish species. Based upon documented spawning use of the riffles immediately downstream of the RWRF by Brown and Caldwell (2014) and during October 2018, as well as reports of regular use of the pool immediately downstream of the outfall by recreational fisherman (Freeman 2014), ongoing discharges do not appear to be substantially affecting these fishes' habitat use downstream of the RWRF. Recognizing, however, that the 2012–13 studies (Hafele 2013, Brown and Caldwell 2014, ODEQ 2014), and the 2018 study show changes in nutrient, periphyton and BMI metrics when comparing sites located outside the 300-ft RMZ downstream of the RWRF to sites located farther upstream, we discuss potential ecological linkages to the broader aquatic food web downstream of the RWRF outfall in the paragraphs below using BMI functional feeding group data presented in Appendix D.

The functional composition of the BMI community, which is quantified as the proportions of different FFGs, has implications for ecosystem functioning (Minshall et al. 1983). Based on feeding behavior, five different FFGs are commonly used in stream bioassessments, including shredders, collector-gatherers, collector-filterers, scraper-grazers, and predators (Cummins and Klug, 1979; Vannote et al. 1980). FFGs may respond to changes in habitat conditions differently in multiple ways especially with groups such as collectors (filterers and gatherers) and predators (Allan and Castillo 2007). For example, relative abundance of scrapers would be expected to increase with increasing periphyton abundance. However, scraper abundance was somewhat lower downstream of the RWRF outfall in the 2018 study, with some increases at Site 5 (see Appendix D, Figure 5). The decreases in scraper abundance in the reach downstream of the RWRF may be in part due to variations in algal abundance, and/or other abiotic and biotic stressors (e.g., flow, sediment, macrophytes). Despite some differences at Site 5, collectors increased downstream of the outfall, which has been shown to occur in other studies comparing habitats upstream and downstream of wastewater treatment facilities' outfalls (Bo and Fenoglio 2011, Quinn and Hickey 1993, Marcogliese 2015).

In drawing linkages of BMI taxa to the broader aquatic food web, longer life cycles and invertebrate size are positively correlated (Zeuss et al. 2017) and size is often positively associated with higher caloric content of BMI consumed as prey items (Ojala 2008, Allan and Castillo 2007). The increase of collector FFGs discussed above is consistent with a relative increase of BMI species with multiple broods per year (i.e., multivoltinism) that is seen in the BMI data (Appendix D, Figure 6). When the relative abundance of taxa in different voltine classifications was compared among sites, there was a higher abundance of multivoltine (< 1-year life cycles) and depressed abundance of semivoltine (> 1-year life cycles) BMI downstream of the outfall. This is particularly clear at Sites 6 and 7, and arguably noticeable at Site 4 (See Appendix D, Figure 5 [BMI FFGs] and Figure 6 [BMI life cycles]). Conceptually, the loss of longer lived and larger BMI individuals may affect food supply for stream fishes. For example, Ringler (1979) found that while brown trout prefer large prey with higher caloric values (mealworms) over smaller lower caloric value items (brine shrimp), their non-preferred prey were never excluded from their diet (Allan and Castillo 2007). Thus, reduction in the abundance of larger preferred prey may result in insectivorous fish switching to feeding on smaller, lower quality (lower caloric content) prey items, which in turn may result in increased bioenergetics foraging demands if the fish need to expend more energy to catch larger number of small prey items. Reductions in bioenergetics efficiency of foraging may lead to reduced fish growth rates and increased exposure to predation if the change in food supply requires them to spend more time foraging away from protected sites.

While the balance in relative abundance of BMI FFGs and voltine groups appears to change downstream of the outfall, the food web implications of these patterns discussed above are only speculative. While it is possible that the observed localized periphyton accumulations may result in locally lower caloric content in BMI food resources used by fish and wildlife, no sampling was conducted nor existing data identified to examine the carrying capacity, diet, and foraging behavior of higher trophic level species upstream and downstream of the RWRF. Longer-term BMI and food web studies would be required to indicate whether food resources are limiting at one or more trophic levels, and whether these effects are partially or solely attributable to the RWRF.

Summary

Overall, review of Hafele (2013), Brown and Caldwell (2014), and ODEQ (2014) and comparison with the 2018 data indicate locally high periphyton and macrophyte cover and shifts in algae and BMI community metrics downstream of the RWRF outfall. Comparison of water quality, periphyton, and BMI data suggest that the resident biological communities downstream of the RWRF outfall were likely responding to nutrient enrichment, leading to locally high algae accumulation (increased cover, cell density, and biovolume) at sites located downstream of the RWRF outfall and 300 ft RMZ. While the taxa represented as well as broad species richness and diversity measures were similar at sites upstream and downstream of the RWRF, significantly greater proportions of tolerant diatoms were documented at the three downstream sites (Sites 4–6) relative to sites upstream of the RWRF outfall. In addition, BMI abundance (2012–2013 studies only), species richness (total and EPT), EPT abundance, as well as total sensitive individuals were significantly lower at sites located downstream of the RWRF outfall relative to upstream sites. While data related to fish and wildlife food resources were not directly examined, BMI data collected as part of this study may indicate a reduction in the average caloric content of BMI available as prey for insectivorous fish at the surveyed locations downstream of the RWRF. Although the taxa identified in the 2012–2013 and 2018 studies are represented at locations both upstream and downstream of the RWRF, based upon an assumption that data collected at upstream sites are representative of "water quality and biological community attainable within the areas of concern", the periphyton and BMI metrics examined in this study suggest the RWRF discharges potentially contribute to local effects to the resident biological community that represent a shift away from the biological communities that would be otherwise attainable.

5 CONCLUSIONS AND RECOMMENDATIONS

After review of three previous studies of the Rogue River (Hafele 2013, Brown and Caldwell 2014, ODEQ 2014) in relation to Oregon's biocriteria (OAR 340-041-0011) and other narrative water quality standards set forth in OAR 340-041-0007(9)-(13), Stillwater Sciences conducted follow-up sampling in October 2018 at previous study sites plus some additional sites along the Rogue River upstream and downstream of the RWRF in order to assess the findings of the previous studies and provide estimates of temporal as well as site-to-site variability in the reported indices. Consistent with ODEQ (2018) policy regarding biocriteria comparisons using appropriate reference sites, comparisons of metrics describing algal and BMI community composition were conducted along with comparisons of physical and water quality conditions upstream and downstream of the RWRF discharge location. Based on analysis and assessment of the previous 2012–2013 studies and additional information collected in 2018, this report makes the following findings.

- In situ measurements of dissolved oxygen (DO) and pH were similar upstream and downstream of the RWRF. Continuous measurements of these parameters collected by Brown and Caldwell (2014) also show similar variation upstream and downstream of the RWRF and no evidence of DO depletion nor DO and pH variation indicative of nuisance levels of algae in the Rogue River.

- ODEQ (2014) noted multiple sources of nutrients to reaches of the Rogue River upstream and downstream of the RWRF and a comparison of the nutrient levels by Brown and Caldwell (2014) and samples collected in 2018 show statistically significant elevated N and P concentrations at sites downstream of the RWRF outfall relative to upstream locations.

- Comparisons of visual estimates of periphyton and macrophyte cover were variable at tributary confluences and other sites upstream and downstream of the RWRF (ODEQ 2014). In 2018, the highest cover was at sites downstream of the RWRF outfall as well as at other tributary locations.

- Periphyton biomass (cell density and biovolume) was greater in the three sites downstream of the RWRF (Sites 3–6) compared to the three upstream sites (Sites 1–3) in 2018 to a statistically significant degree. Additionally, relative abundance of diatoms indicative of higher nutrient (N and P) conditions was also higher in most samples collected downstream of the RWRF relative to samples collected upstream. Despite these community shifts, richness measures and the dominant algal taxa were generally similar in reaches upstream and downstream of the RWRF.

- BMI sampling in all studies showed changes in community composition consistent with the effects of excess nutrient loading. All studies showed reduced EPT richness and percent sensitive individuals in the riffle immediately downstream of the RWRF. While not definitively attributable to the RWRF, sampling at other sites farther downstream found other BMI metrics selected for this assessment at levels below the ranges found in all sites sampled upstream of the RWRF. Species richness (total and EPT) as well as EPT abundance and total sensitive individuals were lower at sites downstream of the RWRF to a statistically significant degree.

With respect to Oregon's statewide narrative criteria contained in OAR 340-041-0007 (9) through (13), this report makes the following findings.

- OAR 340-041-0007 (9) (*Development of fungi and other growths)*. Semi-quantitative algae cover data collected by ODEQ (2014) as well as periphyton metrics collected by Hafele (2013), Brown and Caldwell (2014), and by this study in 2018 suggest that the riffle habitats downstream of the RWRF have accumulations of attached algae in greater amounts than upstream of the outfall. While the potential for effects on aquatic food resources for fish are discussed below, it is uncertain whether the patterns in algal cover were solely attributable to the RWRF discharge vs. other nutrient sources, whether such conditions were persistent at all times of year, and whether such conditions might be partially explained by natural spatial variations in algae growth within riffle habitats of the Rogue River.

- OAR 340-041-0007 (10) (*Taste and Odor, Toxicity*). None of the studies contains references to or found variations in taste and odors related to the potability of drinking water, the palatability of fish or shellfish, or potential toxicity agents associated with the RWRF outfall. Accordingly, there is no basis for concluding that the conditions described in the standard exist in the river.

- OAR 340-041-0007 (11) (*Formation of Bottom Deposits*). None of studies found accumulations of bottom deposits, and no RWRF discharge data suggests that there are sufficient suspended sediments or residual organic matter in the discharge to result in identifiable deposits. Accordingly, there is no basis for concluding that the conditions described in the standard exist in the river.

- OAR 340-041-0007 (12) (*Objectionable discoloration, scum, oily sheens, floating solids*). Recognizing that the RWRF outfall design is associated with air entrainment that routinely results in foam downstream (ODEQ 2011), there is no indication that this discharge contained floating solids other than NPDES-permitted discharges of residual TSS from the RWRF. Accordingly, there is no basis for concluding that the conditions described in the standard exist in the river.

- OAR 340-041-0007 (13) (*Offensive aesthetic conditions*). The studies include several observations of odor associated with the discharge from the RWRF. Observations of odor related to RWRF treatment processes were apparent at Site 4 in October 2018, approximately 0.4 miles downstream of the RWRF outfall, but were not found at sites farther downstream. Whether these odors were "offensive" within the meaning of the narrative standard is a subjective determination that cannot be assessed objectively.

With respect to Oregon's biocriteria standard contained in OAR 340-041-0011, this report makes the following findings.

- Review of Hafele (2013), Brown and Caldwell (2014), and ODEQ (2014) in comparison to the 2018 data indicates locally high periphyton and macrophyte cover, increases in periphyton biomass, and shifts in algae and BMI community metrics at locations downstream of the 300-ft RMZ below the RWRF outfall.

- Comparison of nutrients in water samples, periphyton and BMI indicators data suggest that the resident biological community downstream of the RWRF outfall was likely responding to nutrient enrichment downstream of the RWRF outfall. In addition to increases in apparent algae and macrophyte cover, statistically significant differences in periphyton biomass (cell density, and biovolume) and reductions in BMI indicators (total richness, EPT richness, EPT abundance and total sensitive individuals) were found at sites downstream of the RWRF. Additionally, and while data related to fish and wildlife food resources were not examined, BMI data collected as part of this study may indicate a reduction in the average caloric content of BMI used as prey items by fish at locations downstream of the RWRF.

- Although the taxa identified in the 2012–2013 and 2018 studies are represented at locations both upstream and downstream of the RWRF, based upon an assumption that data collected at upstream sites are representative of "water quality and biological community attainable within the areas of concern," the periphyton and BMI data examined in this study suggest the RWRF discharges contribute to local effects on the resident biological community that represent a shift away from the biological community that would be otherwise attainable.

As noted in ODEQ (2018), identified differences in biological communities relative to reference sites do not by themselves indicate if changes are related to pollutants, or identify which pollutant should be addressed by point source or other controls through a Total Maximum Daily Load (ODEQ 2018). Given the relatively high background phosphorus levels in the headwaters of the Rogue River basin and identified excess of phosphorus both upstream and downstream of the RWRF, the Rogue River is likely somewhat nitrogen limited and responding to incremental nitrogen loads from multiple sources to the Middle Rogue River. As evidenced by local algae accumulation observed by ODEQ (2014) and the current study downstream of tributary junctions and known nitrogen sources such as the Cole M. River hatchery, it should be noted that local algae accumulation in these and other locations will likely occur in the future regardless of any nutrient control contemplated by the City. Nevertheless, even incremental reductions in nitrogen discharges may be expected to reduce algae growth in the reach immediately downstream of the RWRF. Additional receiving water sampling to confirm limiting nutrients, as well as sampling within the RWRF process train, would be needed to inform approaches to be taken and the design basis to reduce nitrogen discharges.

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Appendix A

Professional Background and Qualifications

Noah Hume, P.E., Ph.D.

Aquatic Ecologist/Senior Scientist

Dr. Noah Hume (*Ph.D., Civil and Environmental Engineering*) has over 25 years experience in aquatic sciences and engineering spanning ecology, water quality, water supply and treatment. Dr. Hume's areas of expertise include engineering, water quality management, wetlands ecology, limnology, and fisheries biology. Dr. Hume brings his technical expertise to a wide variety of interdisciplinary projects that emphasize physical and water quality impacts to aquatic species, including habitat assessments, created wetland projects, river restoration and fisheries programs, and a number of engineering design projects. Dr. Hume has also participated in the design and implementation of several constructed wetlands projects and has provided expertise for water quality and wildlife management of wetland projects ranging from Oregon to Newport Bay, CA.

AREAS OF EXPERTISE

- Wetlands and Aquatic Ecology
- Water Quality
- Fisheries Biology
- Civil and Environmental Engineering
- Mechanical Engineering
- Restoration Ecology

YEARS OF EXPERIENCE

At Stillwater: 15 years
In Total: 25 years

EDUCATION & LICENSURE

Ph.D., *Civil and Environmental Engineering,* UC Berkeley, 2000
M.S., *Civil and Environmental Engineering,* UC Berkeley, 1989
B.S., *Mechanical and Ocean Engineering,* University of Rhode Island, 1985

Professional Engineer (Civil/ Mechanical), State of California (Licenses C45808, M28919)

PROFESSIONAL HISTORY

- **Senior Scientist** (since 2000), Stillwater Sciences.
- **Lecturer** (1994-2002), University Extension, UC Berkeley.
- **Engineer** (1989-1994), Kennedy/Jenks Consultants, San Francisco, CA.
- **Environmental Scientist** (1987-1988), Alameda County Public Works Agency, Hayward, CA.

SELECTED PROJECT EXPERIENCE

Clean Water Act, Section 401 Certification, Carmen-Smith Hydroelectric Project, McKenzie River, OR *(Client: Eugene Water and Electric Board):* Dr. Hume served as Project Manager and lead author in the preparation of a Section 401 Application to the Oregon Dept. of Environmental Quality to ensure that the continued operations of the Carmen-Smith Project will comply with the State of Oregon's water quality standards. The Certification process ensures that the Project will remain in compliance with all applicable state and federal water quality standards, including control measures for temperature, turbidity, and hazardous materials, as well as the adoption of a Project-wide Water Quality Management Plan.

Benthic Macroinvertebrate Studies, Tuolumne River, CA *(Client: Turlock and Modesto Irrigation Districts):* Dr. Hume served as lead scientist in the analysis of long-term BMI data collection efforts collected to assess water quality conditions and food resources to rearing salmonids in the Tuolumne River downstream of the Don Pedro Hydroelectric Project. Dr. Hume analyzed spatial and multi-year trends in BMI data on the basis of traditional indices, multi-metric approaches included in the CSBP and SWAMP protocols, as well as multi-metrics used to assess impacts downstream of hydroelectric projects.

Water Quality Assessments for Hydroelectric Project Relicensing, CA and OR

- **Bucks Creek, CA** *(Client: Pacific Gas & Electric Company)*
- **Eel River & East Fork Russian River** *(Client: Pacific Gas & Electric Company)*
- **Feather River, CA** *(Client: South Fork Water and Power Agency)*
- **West Branch Feather River & Butte Creek, CA** *(Client: Pacific Gas & Electric Company)*
- **McCloud River & Pit River, CA** *(Client: Pacific Gas & Electric Company)*
- **McKenzie River, OR** *(Client: Eugene Water and Electric Board)*
- **Mokelumne River & Bear Creek, CA** *(Client: Pacific Gas & Electric Company)*

- Mechanical Engineer (1986-1987), Gibbs & Cox, Inc., Marine Engineers, New York, New York.

SELECTED PUBLICATIONS

Hume, N., D. Riordan, D. McEwan, L. Chu, and S. Andrews. **2016. Restoration approaches and planning for the Prospect Island Tidal Habitat Restoration Project.** Bay-Delta Science Conference 2016.

Orr, B, M. Keever, A. Merrill, **N. Hume**, J. Long, H. Green, and G. Darren**. 2016. Restoration Design in the Sacramento-San Joaquin Delta – Lessons from Case Studies.** Bay-Delta Science Conference 2016**.**

Hume., N., G. Leverich, S. Dusterhoff, D. Pfeifer, C. McCalvin, and L. Holmes. **2014. Balancing Habitat Needs for Rearing and Migratory Steelhead with Other Beneficial Water Uses in the Santa Clara River Estuary**. 32nd Annual Salmonid Restoration Conference, Santa Barbara, CA.

Singer, M., **N. Hume**, D. Slotton, N. Bloom, J. Wood, and P. Downs. **In prep**. **Mercury bioaccumulation potential versus avian habitat benefits in restoration design of a dredged and regulated river-floodplain in the Central Valley of California**.

Hume, N., M. Fleming, and A. Horne **2002. Denitrification potential and carbon quality of four aquatic plants in wetland microcosms.** Soil Science Society of America Journal 66: 1706–1712.

Hume, N., M. Fleming, and A. Horne **2002. Plant carbohydrate limitation on nitrate reduction in wetland microcosms.** Water Research 36: 577–584

Dr. Hume served as Project Manager and lead scientist for numerous water quality and water temperature studies for FERC hydroelectric project relicensing. These studies led to mitigation, restoration and management strategies related to flow and temperature impacts of hydroelectric Project operations upon sensitive aquatic species.

Algae Monitoring and Mitigation Plan, San Francisco Regional Water Supply System *(Client: San Francisco Public Utilities Commission)*
Dr. Hume served as Project Manager and lead scientist in the review and update of an existing Algae Monitoring and Mitigation Plan (AMMP) for SFPUC. Extensive review of water quality data and operating procedures was undertaken in order to develop appropriate responses to altered water quality conditions and algae community composition in their water supply reservoirs. In addition to limnological analyses of seasonal water quality and algal species data, Stillwater reviewed recent in situ and remote sensing techniques for detecting algal blooms in their early stages. Stillwater reviewed current data at two of SFPUCs reservoirs that have been using hypolimnetic oxygenation to limit internal nutrient cycling. Based upon interviews with operations staff as well as other water utilities in the Western U.S., updated prevention and mitigation response recommendations were developed in collaboration with SFPUC, including modified HOS operations, selective withdrawal options, targeted use of algaecides, as well as potential reservoir amendments designed to limit nutrient supply to algae.

Don Pedro Reservoir Mercury Bioaccumulation Study, Tuolumne River, CA *(Client: Turlock and Modesto Irrigation Districts)***:** Dr. Hume served as lead scientist in a mercury bioaccumulation study of the Tuolumne River, CA. In response to State 303(d) listing of Don Pedro reservoir for mercury impairment, the study compared water quality and fish tissue concentrations in regional waterbodies to conditions upstream, within and downstream of the reservoir.

Mercury Methylation Investigations, Merced River Ranch Restoration Planning, CA *(Client: CALFED):* Dr. Hume served as project manager of a study related to methylation potential and bioaccumulation of residual mercury in mine tailings to evaluate suitability for salmon spawning gravel replenishment as well as gravel processing planning.

Soulajule Reservoir Mercury Bioaccumulation Study, Walker Creek, Marin County, CA *(Client: Marin Municipal Water District)***:** Dr. Hume is currently serving as project director of ongoing water quality and limnology studies for investigations intended to control methyl mercury bioaccumulation and production in Soulajule Reservoir and downstream locations in Walker Creek. The study is being carried out as part of the implementation plan for the Walker Creek watershed Mercury Total Maximum Daily Load (TMDL) and is focused on the protection of both wildlife and human consumptive resources.

EIS/EIR and Secretarial Determination Overview Report for Klamath River Dam Removal *(Client: US Bureau of Reclamation):* Dr. Hume provided technical support to a State and Federal water quality subteam for the Secretarial Determination process in evaluating the feasibility and potential impacts of the removal of four dams on the Klamath River. Primary technical analyses included evaluation of potential short-term sediment related impacts upon dissolved oxygen following dam removal, as well as longer term impacts in relation to the KHSA and KBRA implementation measures over a 50-year period.

Estuary Special Studies, Santa Clara River Estuary, CA *(Client: City of Ventura):* Dr. Hume has served as lead scientist on multiple phases of work in the assessment of ecological impacts of ongoing wastewater discharge into the Santa Clara River Estuary. Using an ecological functions and focal species approach, Dr. Hume used physical habitat and water quality data in conjunction with existing survey data documenting threatened and endangered species use of estuary habitats to examine current ecological functioning as well as in relation to future flows and likely climate change impacts.

Receiving Waters Monitoring Plan, Humboldt Bay CA *(Client: City of Arcata):* Dr. Hume served as technical reviewer for the development of a monitoring plan to address point source discharges from the City of Arcata wastewater treatment plant, as regulated under the National Pollutant Discharge Elimination System (NPDES). In addition to basic physical, chemical, and biological water quality constituents, the plan was developed to include specific consideration of the fate of copper, zinc, cyanide, and dioxin [2,3,7,8-TCDD] in Humboldt Bay.

Stormwater Treatment Wetland, Port of Sacramento, CA *(Client: Port of Sacramento):* Dr. Hume worked with Kennedy Jenks Consultants in the design and implementation of a stormwater treatment wetland for the Port of Sacramento. Dr. Hume reviewed historical monitoring data and projected stormwater flows to develop preliminary design sizing and design details. Following implementation, Dr. Hume has provided assistance to the Port in assessing wetland performance and ongoing operations.

The Trust for Public Land, Urban Orchard Project, City of South Gate, CA *(Client: City of South Gate):* Dr. Hume is part of a team designing a 30-acre multi-benefit park and green infrastructure project along the Los Angeles River. The project objective is to restore former industrial land to a community park featuring an urban orchard, a treatment wetland, native habitat restoration, groundwater infiltration, and a study on naturalization of a flood control channel. Dr. Hume provided engineering review of design concepts as well as water quality assessment for the Urban Orchard project.

Wetlands Treatment Studies, Santa Clara River, CA *(Client: City of Ventura):* Dr. Hume provided design review and performance evaluation estimates of several opportunities for the development of on-site and off-site treatment wetlands as part of a long-term water management approach for treated effluent discharge to the Santa Clara River estuary.

John Muir Treatment Wetlands Design Assistance *(Client: San Francisco Public Utilities Commission, as subcontractor to Kennedy-Jenks Consultants):* Building upon preliminary removal estimates of bacteria, nutrients and metals from stormwater, Dr. Hume provided design assistance for the John Muir Wetland through refinement of previous pollutant removal estimates for stormwater and dry weather flows, and served as a liaison with the prime contractor and other Stillwater scientists. The project aimed to provide additional water supply to Lake Merced through the use of a stormwater treatment wetland. Pollutants considered include nitrogen, phosphorus, total suspended solids, metals (chromium, copper, nickel, lead, and zinc), and bacteria (total coliform, *Escherichia coli*).

Appendix B

Statement of Fees

For work in reviewing existing information, conducting field work, assessment and report preparation, the following statement of fees is provided in Table B-1 below.

Table B-1 Statement of Fees

Description	Charge
Information Review	$26,329
Field Work	$16,363
Expenses and Lab	$16,246
Assessment	$52,142
Total	**$108,311**

In the event that my deposition is taken in this matter and/or I testify at trial, I will be compensated for that time as a Senior Scientist at the rate of $325 per hour, plus expenses. Additional fees for support services are provided in Table B-2 below.

Table B-2. 2019 Stillwater Sciences Expert Witness Billing Rates

Billing Classification	Hourly Rate
Administrative Support	$90
Technical Support	$150
Senior Scientist	$325

Rates listed above are for calendar year 2019. These are applied for labor-hour level-of-effort contracts with reimbursement for expenses (including travel expenses) at cost plus 10%.

Appendix C

October 2018 Analytical Water Quality Data Reports

Client ID	Analysis	Analyte	Prepared	Analyzed	Results	DL	QL	Units	Dilution	CAS	Qual
R1	EPA 350.1	Nitrogen, Ammonia (As N)	10/12/2018	10/15/2018	0.155	0	0.2	mg/L	1.0	7727-37-9	
R1	EPA 353.2	Nitrate Nitrogen		10/10/2018	ND	0	0.1	mg/L	1.0	7727-37-9	
R1	SM 4500-P E	Phosphorus, Total (As P)	10/10/2018	10/10/2018	0.0738	0	0.0	mg/L	1.0	7723-14-0	
R1	EPA 351.2	Nitrogen, Kjeldahl, Total	10/23/2018	10/24/2018	0.34	0	0.6	mg/L	1.0	7727-37-9	J
R1	SM 4500-NO2-B	Nitrite Nitrogen		10/5/2018	ND	0	0.0	mg/L	1.0	7727-37-9	
R1	SM 4500-P E	Orthophosphate (As P)		10/5/2018	0.0267	0	0.0	mg/L	1.0	7723-14-0	
R3	EPA 350.1	Nitrogen, Ammonia (As N)	10/12/2018	10/15/2018	0.14	0	0.2	mg/L	1.0	7727-37-9	J
R3	EPA 353.2	Nitrate Nitrogen		10/10/2018	ND	0	0.1	mg/L	1.0	7727-37-9	
R3	SM 4500-P E	Phosphorus, Total (As P)	10/10/2018	10/10/2018	0.0623	0	0.0	mg/L	1.0	7723-14-0	
R3	EPA 351.2	Nitrogen, Kjeldahl, Total	10/23/2018	10/24/2018	0.30	0	0.6	mg/L	1.0	7727-37-9	J
R3	SM 4500-NO2-B	Nitrite Nitrogen		10/5/2018	ND	0	0.0	mg/L	1.0	7727-37-9	
R3	SM 4500-P E	Orthophosphate (As P)		10/5/2018	0.0283	0	0.0	mg/L	1.0	7723-14-0	
R4	EPA 350.1	Nitrogen, Ammonia (As N)	11/8/2018	11/9/2018	0.231	0	0.2	mg/L	1.0	7727-37-9	HP N
R4	EPA 353.2	Nitrate Nitrogen		10/10/2018	0.249	0	0.1	mg/L	1.0	7727-37-9	
R4	SM 4500-P E	Phosphorus, Total (As P)	10/10/2018	10/10/2018	0.131	0	0.0	mg/L	1.0	7723-14-0	
R4	EPA 351.2	Nitrogen, Kjeldahl, Total	11/13/2018	11/14/2018	0.46	0	0.6	mg/L	1.0	7727-37-9	HP N J
R4	SM 4500-NO2-B	Nitrite Nitrogen		10/5/2018	0.0434	0	0.0	mg/L	1.0	7727-37-9	
R4	SM 4500-P E	Orthophosphate (As P)		10/5/2018	0.0899	0	0.0	mg/L	1.0	7723-14-0	
R5	EPA 350.1	Nitrogen, Ammonia (As N)	10/12/2018	10/15/2018	0.184	0	0.2	mg/L	1.0	7727-37-9	
R5	EPA 353.2	Nitrate Nitrogen		10/10/2018	0.0757	0	0.1	mg/L	1.0	7727-37-9	
R5	SM 4500-P E	Phosphorus, Total (As P)	10/10/2018	10/10/2018	0.0886	0	0.0	mg/L	1.0	7723-14-0	
R5	EPA 351.2	Nitrogen, Kjeldahl, Total	10/23/2018	10/24/2018	0.42	0	0.6	mg/L	1.0	7727-37-9	J
R5	SM 4500-NO2-B	Nitrite Nitrogen		10/5/2018	0.0147	0	0.0	mg/L	1.0	7727-37-9	
R5	SM 4500-P E	Orthophosphate (As P)		10/5/2018	0.0599	0	0.0	mg/L	1.0	7723-14-0	
R6	EPA 350.1	Nitrogen, Ammonia (As N)	10/12/2018	10/15/2018	0.313	0	0.2	mg/L	1.0	7727-37-9	
R6	EPA 353.2	Nitrate Nitrogen		10/10/2018	0.180	0	0.1	mg/L	1.0	7727-37-9	
R6	SM 4500-P E	Phosphorus, Total (As P)	10/11/2018	10/11/2018	0.114	0	0.0	mg/L	1.0	7723-14-0	
R6	EPA 351.2	Nitrogen, Kjeldahl, Total	10/23/2018	10/24/2018	0.44	0	0.6	mg/L	1.0	7727-37-9	J
R6	SM 4500-NO2-B	Nitrite Nitrogen		10/5/2018	0.0317	0	0.0	mg/L	1.0	7727-37-9	
R6	SM 4500-P E	Orthophosphate (As P)		10/5/2018	0.0849	0	0.0	mg/L	1.0	7723-14-0	
R7	EPA 350.1	Nitrogen, Ammonia (As N)	10/12/2018	10/15/2018	0.217	0	0.2	mg/L	1.0	7727-37-9	
R7	EPA 353.2	Nitrate Nitrogen		10/10/2018	0.280	0	0.1	mg/L	1.0	7727-37-9	
R7	SM 4500-P E	Phosphorus, Total (As P)	10/11/2018	10/11/2018	0.122	0	0.0	mg/L	1.0	7723-14-0	
R7	EPA 351.2	Nitrogen, Kjeldahl, Total	10/23/2018	10/24/2018	0.41	0	0.6	mg/L	1.0	7727-37-9	J
R7	SM 4500-NO2-B	Nitrite Nitrogen		10/5/2018	0.0324	0	0.0	mg/L	1.0	7727-37-9	
R7	SM 4500-P E	Orthophosphate (As P)		10/5/2018	0.0865	0	0.0	mg/L	1.0	7723-14-0	
EB	EPA 350.1	Nitrogen, Ammonia (As N)	11/8/2018	11/9/2018	ND	0	0.2	mg/L	1.0	7727-37-9	HP N
EB	EPA 353.2	Nitrate Nitrogen		10/10/2018	ND	0	0.1	mg/L	1.0	7727-37-9	
EB	SM 4500-P E	Phosphorus, Total (As P)	10/11/2018	10/11/2018	ND	0	0.0	mg/L	1.0	7723-14-0	
EB	EPA 351.2	Nitrogen, Kjeldahl, Total	11/13/2018	11/14/2018	ND	0	0.6	mg/L	1.0	7727-37-9	HP N

Client ID	Analysis	Analyte	Prepared	Analyzed	Results	DL	QL	Units	Dilution	CAS	Qual
EB	SM 4500-NO2-B	Nitrite Nitrogen		10/5/2018	ND	0	0.0	mg/L	1.0	7727-37-9	
EB	SM 4500-P E	Orthophosphate (As P)		10/5/2018	ND	0	0.0	mg/L	1.0	7723-14-0	
R4B	EPA 350.1	Nitrogen, Ammonia (As N)	11/8/2018	11/9/2018	0.205	0	0.2	mg/L	1.0	7727-37-9	HP N
R4B	EPA 353.2	Nitrate Nitrogen		10/10/2018	0.244	0	0.1	mg/L	1.0	7727-37-9	
R4B	SM 4500-P E	Phosphorus, Total (As P)	10/11/2018	10/11/2018	0.254	0	0.0	mg/L	1.0	7723-14-0	
R4B	EPA 351.2	Nitrogen, Kjeldahl, Total	11/13/2018	11/14/2018	0.700	0	0.6	mg/L	1.0	7727-37-9	HP N
R4B	SM 4500-NO2-B	Nitrite Nitrogen		10/5/2018	0.0351	0	0.0	mg/L	1.0	7727-37-9	
R4B	SM 4500-P E	Orthophosphate (As P)		10/5/2018	0.102	0	0.0	mg/L	1.0	7723-14-0	
R2	EPA 350.1	Nitrogen, Ammonia (As N)	10/10/2018	10/11/2018	0.11	0	0.2	mg/L	1.0	7727-37-9	J
R2	EPA 353.2	Nitrate Nitrogen		10/8/2018	ND	0	0.1	mg/L	1.0	7727-37-9	
R2	SM 4500-P E	Phosphorus, Total (As P)	10/8/2018	10/8/2018	0.0820	0	0.0	mg/L	1.0	7723-14-0	
R2	EPA 351.2	Nitrogen, Kjeldahl, Total	10/23/2018	10/24/2018	0.24	0	0.6	mg/L	1.0	7727-37-9	J
R2	SM 4500-NO2-B	Nitrite Nitrogen		10/4/2018	ND	0	0.0	mg/L	1.0	7727-37-9	
R2	SM 4500-P E	Orthophosphate (As P)		10/4/2018	0.0367	0	0.0	mg/L	1.0	7723-14-0	

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Analysis Report

ORELAP 100016
EPA OR00028

Stillwater Sciences
2855 Telegraph Ave., Suite 400
Berkeley, CA 94704
Client Sample ID: **R1**
Sample Location: **Grab**
Project: **Medford WWTP 821-AMENDED**

Lab Order: **1810273**
NRC Sample ID **1810273-01A**
Collection Date: **10/4/2018 10:54:00 AM**
Received Date: **10/5/2018 8:44:00 AM**
Reported Date: **11/16/2018 9:56:14 AM**
Matrix: **Aqueous**

ANALYTICAL RESULTS

Analyses	Result	Qual	MDL	MRL	Units	DF	NELAP	Date Analyzed
AMMONIA NITROGEN AS N			**EPA 350.1**					Analyst: **SJK**
Nitrogen, Ammonia (As N)	0.155		0.105	0.15	mg/L	1	A	10/15/2018
NITRATE NITROGEN AS N			**EPA 353.2**					Analyst: **SJK**
Nitrate Nitrogen	ND		0.0118	0.05	mg/L	1	A	10/10/2018
TOTAL PHOSPHORUS AS P			**SM 4500-P E**					Analyst: **SCM**
Phosphorus, Total (As P)	0.0738		0.00600	0.025	mg/L	1	A	10/10/2018
TOTAL KJELDAHL NITROGEN			**EPA 351.2**					Analyst: **SJK**
Nitrogen, Kjeldahl, Total	0.34	J	0.238	0.625	mg/L	1	A	10/24/2018

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Minimum Reporting Limit
S	Spike Recovery outside accepted recovery limits		

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Analysis Report

ORELAP 100016
EPA OR00028

Stillwater Sciences		Lab Order:	**1810273**
2855 Telegraph Ave., Suite 400		NRC Sample ID	**1810273-01B**
Berkeley, CA 94704		Collection Date:	**10/4/2018 10:54:00 AM**
Client Sample ID:	**R1**	Received Date:	**10/5/2018 8:44:00 AM**
Sample Location:	**Grab**	Reported Date:	**11/16/2018 9:56:14 AM**
Project:	**Medford WWTP 821-AMENDED**	Matrix:	**Aqueous**

ANALYTICAL RESULTS

Analyses	Result	Qual	MDL	MRL	Units	DF	NELAP	Date Analyzed
NITRITE NITROGEN AS N		**SM 4500-NO2-B**						Analyst: **SCM**
Nitrite Nitrogen	ND		0.00116	0.01	mg/L	1	A	10/5/2018 11:0(
ORTHOPHOSPHATE AS P		**SM 4500-P E**						Analyst: **SCM**
Orthophosphate (As P)	0.0267		0.00290	0.025	mg/L	1	A	10/5/2018 12:2(

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Minimum Reporting Limit
S	Spike Recovery outside accepted recovery limits		

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Analysis Report

ORELAP 100016
EPA OR00028

Stillwater Sciences
2855 Telegraph Ave., Suite 400
Berkeley, CA 94704
Client Sample ID: **R3**
Sample Location: **Grab**
Project: **Medford WWTP 821-AMENDED**

Lab Order: **1810273**
NRC Sample ID **1810273-02A**
Collection Date: **10/4/2018 11:00:00 AM**
Received Date: **10/5/2018 8:44:00 AM**
Reported Date: **11/16/2018 9:56:14 AM**
Matrix: **Aqueous**

ANALYTICAL RESULTS

Analyses	Result	Qual	MDL	MRL	Units	DF	NELAP	Date Analyzed
AMMONIA NITROGEN AS N			**EPA 350.1**					Analyst: **SJK**
Nitrogen, Ammonia (As N)	0.14	J	0.105	0.15	mg/L	1	A	10/15/2018
NITRATE NITROGEN AS N			**EPA 353.2**					Analyst: **SJK**
Nitrate Nitrogen	ND		0.0118	0.05	mg/L	1	A	10/10/2018
TOTAL PHOSPHORUS AS P			**SM 4500-P E**					Analyst: **SCM**
Phosphorus, Total (As P)	0.0623		0.00600	0.025	mg/L	1	A	10/10/2018
TOTAL KJELDAHL NITROGEN			**EPA 351.2**					Analyst: **SJK**
Nitrogen, Kjeldahl, Total	0.30	J	0.238	0.625	mg/L	1	A	10/24/2018

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Minimum Reporting Limit
S	Spike Recovery outside accepted recovery limits		

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Analysis Report

ORELAP 100016
EPA OR00028

Stillwater Sciences
2855 Telegraph Ave., Suite 400
Berkeley, CA 94704
Client Sample ID: **R3**
Sample Location: **Grab**
Project: **Medford WWTP 821-AMENDED**

Lab Order: **1810273**
NRC Sample ID **1810273-02B**
Collection Date: **10/4/2018 11:00:00 AM**
Received Date: **10/5/2018 8:44:00 AM**
Reported Date: **11/16/2018 9:56:14 AM**
Matrix: **Aqueous**

ANALYTICAL RESULTS

Analyses	Result	Qual	MDL	MRL	Units	DF	NELAP	Date Analyzed
NITRITE NITROGEN AS N			**SM 4500-NO2-B**					Analyst: **SCM**
Nitrite Nitrogen	ND		0.00116	0.01	mg/L	1	A	10/5/2018 11:0(
ORTHOPHOSPHATE AS P			**SM 4500-P E**					Analyst: **SCM**
Orthophosphate (As P)	0.0283		0.00290	0.025	mg/L	1	A	10/5/2018 12:2ﬁ

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Minimum Reporting Limit
S	Spike Recovery outside accepted recovery limits		

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Analysis Report

ORELAP 100016
EPA OR00028

Stillwater Sciences	Lab Order: **1810273**
2855 Telegraph Ave., Suite 400	NRC Sample ID **1810273-03A**
Berkeley, CA 94704	Collection Date: **10/4/2018 11:41:00 AM**
Client Sample ID: **R4**	Received Date: **10/5/2018 8:44:00 AM**
Sample Location: **Grab**	Reported Date: **11/16/2018 9:56:14 AM**
Project: **Medford WWTP 821-AMENDED**	Matrix: **Aqueous**

ANALYTICAL RESULTS

Analyses	Result	Qual	MDL	MRL	Units	DF	NELAP	Date Analyzed
AMMONIA NITROGEN AS N			**EPA 350.1**					Analyst: **SJK**
Nitrogen, Ammonia (As N)	0.231	HP N	0.105	0.15	mg/L	1	A	11/9/2018
NITRATE NITROGEN AS N			**EPA 353.2**					Analyst: **SJK**
Nitrate Nitrogen	0.249		0.0118	0.05	mg/L	1	A	10/10/2018
TOTAL PHOSPHORUS AS P			**SM 4500-P E**					Analyst: **SCM**
Phosphorus, Total (As P)	0.131		0.00600	0.025	mg/L	1	A	10/10/2018
TOTAL KJELDAHL NITROGEN			**EPA 351.2**					Analyst: **SJK**
Nitrogen, Kjeldahl, Total	0.46	HP N J	0.238	0.625	mg/L	1	A	11/14/2018

Qualifiers:	*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
	J	Analyte detected below quantitation limits	ND	Not Detected at the Minimum Reporting Limit
	S	Spike Recovery outside accepted recovery limits		

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Analysis Report

ORELAP 100016
EPA OR00028

Stillwater Sciences
2855 Telegraph Ave., Suite 400
Berkeley, CA 94704
Client Sample ID: **R4**
Sample Location: **Grab**
Project: **Medford WWTP 821-AMENDED**

Lab Order: **1810273**
NRC Sample ID **1810273-03B**
Collection Date: **10/4/2018 11:41:00 AM**
Received Date: **10/5/2018 8:44:00 AM**
Reported Date: **11/16/2018 9:56:14 AM**
Matrix: **Aqueous**

ANALYTICAL RESULTS

Analyses	Result	Qual	MDL	MRL	Units	DF	NELAP	Date Analyzed
NITRITE NITROGEN AS N		**SM 4500-NO2-B**						Analyst: **SCM**
Nitrite Nitrogen	0.0434		0.00116	0.01	mg/L	1	A	10/5/2018 11:0(
ORTHOPHOSPHATE AS P		**SM 4500-P E**						Analyst: **SCM**
Orthophosphate (As P)	0.0899		0.00290	0.025	mg/L	1	A	10/5/2018 12:2ł

Qualifiers:

* Value exceeds Maximum Contaminant Level	B Analyte detected in the associated Method Blank
E Value above quantitation range	H Holding times for preparation or analysis exceeded
J Analyte detected below quantitation limits	ND Not Detected at the Minimum Reporting Limit
S Spike Recovery outside accepted recovery limits	

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Analysis Report

ORELAP 100016
EPA OR00028

Stillwater Sciences	Lab Order: **1810273**
2855 Telegraph Ave., Suite 400	NRC Sample ID **1810273-04A**
Berkeley, CA 94704	Collection Date: **10/4/2018 3:15:00 PM**
Client Sample ID: **R5**	Received Date: **10/5/2018 8:44:00 AM**
Sample Location: **Grab**	Reported Date: **11/16/2018 9:56:14 AM**
Project: **Medford WWTP 821-AMENDED**	Matrix: **Aqueous**

ANALYTICAL RESULTS

Analyses	Result	Qual	MDL	MRL	Units	DF	NELAP	Date Analyzed
AMMONIA NITROGEN AS N			**EPA 350.1**					Analyst: **SJK**
Nitrogen, Ammonia (As N)	0.184		0.105	0.15	mg/L	1	A	10/15/2018
NITRATE NITROGEN AS N			**EPA 353.2**					Analyst: **SJK**
Nitrate Nitrogen	0.0757		0.0118	0.05	mg/L	1	A	10/10/2018
TOTAL PHOSPHORUS AS P			**SM 4500-P E**					Analyst: **SCM**
Phosphorus, Total (As P)	0.0886		0.00600	0.025	mg/L	1	A	10/10/2018
TOTAL KJELDAHL NITROGEN			**EPA 351.2**					Analyst: **SJK**
Nitrogen, Kjeldahl, Total	0.42	J	0.238	0.625	mg/L	1	A	10/24/2018

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Minimum Reporting Limit
S	Spike Recovery outside accepted recovery limits		

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Analysis Report

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EPA OR00028

Stillwater Sciences
2855 Telegraph Ave., Suite 400
Berkeley, CA 94704
Client Sample ID: **R5**
Sample Location: **Grab**
Project: **Medford WWTP 821-AMENDED**

Lab Order: **1810273**
NRC Sample ID **1810273-04B**
Collection Date: **10/4/2018 3:15:00 PM**
Received Date: **10/5/2018 8:44:00 AM**
Reported Date: **11/16/2018 9:56:14 AM**
Matrix: **Aqueous**

ANALYTICAL RESULTS

Analyses	Result	Qual	MDL	MRL	Units	DF	NELAP	Date Analyzed
NITRITE NITROGEN AS N		**SM 4500-NO2-B**						Analyst: **SCM**
Nitrite Nitrogen	0.0147		0.00116	0.01	mg/L	1	A	10/5/2018 11:0(
ORTHOPHOSPHATE AS P		**SM 4500-P E**						Analyst: **SCM**
Orthophosphate (As P)	0.0599		0.00290	0.025	mg/L	1	A	10/5/2018 12:2ł

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Minimum Reporting Limit
S	Spike Recovery outside accepted recovery limits		

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Analysis Report

ORELAP 100016
EPA OR00028

Stillwater Sciences	Lab Order: **1810273**
2855 Telegraph Ave., Suite 400	NRC Sample ID **1810273-05A**
Berkeley, CA 94704	Collection Date: **10/4/2018 4:00:00 PM**
Client Sample ID: **R6**	Received Date: **10/5/2018 8:44:00 AM**
Sample Location: **Grab**	Reported Date: **11/16/2018 9:56:14 AM**
Project: **Medford WWTP 821-AMENDED**	Matrix: **Aqueous**

ANALYTICAL RESULTS

Analyses	Result	Qual	MDL	MRL	Units	DF	NELAP	Date Analyzed
AMMONIA NITROGEN AS N			**EPA 350.1**					Analyst: **SJK**
Nitrogen, Ammonia (As N)	0.313		0.105	0.15	mg/L	1	A	10/15/2018
NITRATE NITROGEN AS N			**EPA 353.2**					Analyst: **SJK**
Nitrate Nitrogen	0.180		0.0118	0.05	mg/L	1	A	10/10/2018
TOTAL PHOSPHORUS AS P			**SM 4500-P E**					Analyst: **EAT**
Phosphorus, Total (As P)	0.114		0.00600	0.025	mg/L	1	A	10/11/2018
TOTAL KJELDAHL NITROGEN			**EPA 351.2**					Analyst: **SJK**
Nitrogen, Kjeldahl, Total	0.44	J	0.238	0.625	mg/L	1	A	10/24/2018

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Minimum Reporting Limit
S	Spike Recovery outside accepted recovery limits		

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Analysis Report

ORELAP 100016
EPA OR00028

Stillwater Sciences
2855 Telegraph Ave., Suite 400
Berkeley, CA 94704
Client Sample ID: **R6**
Sample Location: **Grab**
Project: **Medford WWTP 821-AMENDED**

Lab Order: **1810273**
NRC Sample ID **1810273-05B**
Collection Date: **10/4/2018 4:00:00 PM**
Received Date: **10/5/2018 8:44:00 AM**
Reported Date: **11/16/2018 9:56:14 AM**
Matrix: **Aqueous**

ANALYTICAL RESULTS

Analyses	Result	Qual	MDL	MRL	Units	DF	NELAP	Date Analyzed
NITRITE NITROGEN AS N			**SM 4500-NO2-B**					Analyst: **SCM**
Nitrite Nitrogen	0.0317		0.00116	0.01	mg/L	1	A	10/5/2018 11:0(
ORTHOPHOSPHATE AS P			**SM 4500-P E**					Analyst: **SCM**
Orthophosphate (As P)	0.0849		0.00290	0.025	mg/L	1	A	10/5/2018 12:2(

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Minimum Reporting Limit
S	Spike Recovery outside accepted recovery limits		

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245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

Analysis Report ORELAP 100016 EPA OR00028

Stillwater Sciences
2855 Telegraph Ave., Suite 400
Berkeley, CA 94704
Client Sample ID: **R7**
Sample Location: **Grab**
Project: **Medford WWTP 821-AMENDED**

Lab Order: **1810273**
NRC Sample ID **1810273-06A**
Collection Date: **10/4/2018 3:30:00 PM**
Received Date: **10/5/2018 8:44:00 AM**
Reported Date: **11/16/2018 9:56:14 AM**
Matrix: **Aqueous**

ANALYTICAL RESULTS

Analyses	Result	Qual	MDL	MRL	Units	DF	NELAP	Date Analyzed
AMMONIA NITROGEN AS N			**EPA 350.1**					Analyst: **SJK**
Nitrogen, Ammonia (As N)	0.217		0.105	0.15	mg/L	1	A	10/15/2018
NITRATE NITROGEN AS N			**EPA 353.2**					Analyst: **SJK**
Nitrate Nitrogen	0.280		0.0118	0.05	mg/L	1	A	10/10/2018
TOTAL PHOSPHORUS AS P			**SM 4500-P E**					Analyst: **EAT**
Phosphorus, Total (As P)	0.122		0.00600	0.025	mg/L	1	A	10/11/2018
TOTAL KJELDAHL NITROGEN			**EPA 351.2**					Analyst: **SJK**
Nitrogen, Kjeldahl, Total	0.41	J	0.238	0.625	mg/L	1	A	10/24/2018

Qualifiers:

* Value exceeds Maximum Contaminant Level	B Analyte detected in the associated Method Blank
E Value above quantitation range	H Holding times for preparation or analysis exceeded
J Analyte detected below quantitation limits	ND Not Detected at the Minimum Reporting Limit
S Spike Recovery outside accepted recovery limits	

Neilson Research Corporation

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Analysis Report

ORELAP 100016
EPA OR00028

Stillwater Sciences
2855 Telegraph Ave., Suite 400
Berkeley, CA 94704
Client Sample ID: **R7**
Sample Location: **Grab**
Project: **Medford WWTP 821-AMENDED**

Lab Order: **1810273**
NRC Sample ID **1810273-06B**
Collection Date: **10/4/2018 3:30:00 PM**
Received Date: **10/5/2018 8:44:00 AM**
Reported Date: **11/16/2018 9:56:14 AM**
Matrix: **Aqueous**

ANALYTICAL RESULTS

Analyses	Result	Qual	MDL	MRL	Units	DF	NELAP	Date Analyzed
NITRITE NITROGEN AS N			**SM 4500-NO2-B**					Analyst: **SCM**
Nitrite Nitrogen	0.0324		0.00116	0.01	mg/L	1	A	10/5/2018 11:0(
ORTHOPHOSPHATE AS P			**SM 4500-P E**					Analyst: **SCM**
Orthophosphate (As P)	0.0865		0.00290	0.025	mg/L	1	A	10/5/2018 12:2ε

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Minimum Reporting Limit
S	Spike Recovery outside accepted recovery limits		

Neilson Research Corporation

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Analysis Report

ORELAP 100016
EPA OR00028

Stillwater Sciences
2855 Telegraph Ave., Suite 400
Berkeley, CA 94704
Client Sample ID: **EB**
Sample Location: **Grab**
Project: **Medford WWTP 821-AMENDED**

Lab Order: **1810273**
NRC Sample ID **1810273-07A**
Collection Date: **10/4/2018 4:05:00 PM**
Received Date: **10/5/2018 8:44:00 AM**
Reported Date: **11/16/2018 9:56:14 AM**
Matrix: **Aqueous**

ANALYTICAL RESULTS

Analyses	Result	Qual	MDL	MRL	Units	DF	NELAP	Date Analyzed
AMMONIA NITROGEN AS N			**EPA 350.1**					Analyst: **SJK**
Nitrogen, Ammonia (As N)	ND	HP N	0.105	0.15	mg/L	1	A	11/9/2018
NITRATE NITROGEN AS N			**EPA 353.2**					Analyst: **SJK**
Nitrate Nitrogen	ND		0.0118	0.05	mg/L	1	A	10/10/2018
TOTAL PHOSPHORUS AS P			**SM 4500-P E**					Analyst: **EAT**
Phosphorus, Total (As P)	ND		0.00600	0.025	mg/L	1	A	10/11/2018
TOTAL KJELDAHL NITROGEN			**EPA 351.2**					Analyst: **SJK**
Nitrogen, Kjeldahl, Total	ND	HP N	0.238	0.625	mg/L	1	A	11/14/2018

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Minimum Reporting Limit
S	Spike Recovery outside accepted recovery limits		

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Analysis Report

ORELAP 100016
EPA OR00028

Stillwater Sciences
2855 Telegraph Ave., Suite 400
Berkeley, CA 94704
Client Sample ID: **EB**
Sample Location: **Grab**
Project: **Medford WWTP 821-AMENDED**

Lab Order: **1810273**
NRC Sample ID **1810273-07B**
Collection Date: **10/4/2018 4:05:00 PM**
Received Date: **10/5/2018 8:44:00 AM**
Reported Date: **11/16/2018 9:56:14 AM**
Matrix: **Aqueous**

ANALYTICAL RESULTS

Analyses	Result	Qual	MDL	MRL	Units	DF	NELAP	Date Analyzed
NITRITE NITROGEN AS N			**SM 4500-NO2-B**					Analyst: **SCM**
Nitrite Nitrogen	ND		0.00116	0.01	mg/L	1	A	10/5/2018 11:0(
ORTHOPHOSPHATE AS P			**SM 4500-P E**					Analyst: **SCM**
Orthophosphate (As P)	ND		0.00290	0.025	mg/L	1	A	10/5/2018 12:2ł

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Minimum Reporting Limit
S	Spike Recovery outside accepted recovery limits		

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Analysis Report

ORELAP 100016
EPA OR00028

Stillwater Sciences
2855 Telegraph Ave., Suite 400
Berkeley, CA 94704
Client Sample ID: **R4B**
Sample Location: **Grab**
Project: **Medford WWTP 821-AMENDED**

Lab Order: **1810273**
NRC Sample ID **1810273-08A**
Collection Date: **10/4/2018 11:51:00 AM**
Received Date: **10/5/2018 8:44:00 AM**
Reported Date: **11/16/2018 9:56:14 AM**
Matrix: **Aqueous**

ANALYTICAL RESULTS

Analyses	Result	Qual	MDL	MRL	Units	DF	NELAP	Date Analyzed
AMMONIA NITROGEN AS N			**EPA 350.1**					Analyst: **SJK**
Nitrogen, Ammonia (As N)	0.205	HP N	0.105	0.15	mg/L	1	A	11/9/2018
NITRATE NITROGEN AS N			**EPA 353.2**					Analyst: **SJK**
Nitrate Nitrogen	0.244		0.0118	0.05	mg/L	1	A	10/10/2018
TOTAL PHOSPHORUS AS P			**SM 4500-P E**					Analyst: **EAT**
Phosphorus, Total (As P)	0.254		0.00600	0.025	mg/L	1	A	10/11/2018
TOTAL KJELDAHL NITROGEN			**EPA 351.2**					Analyst: **SJK**
Nitrogen, Kjeldahl, Total	0.700	HP N	0.238	0.625	mg/L	1	A	11/14/2018

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Minimum Reporting Limit
S	Spike Recovery outside accepted recovery limits		

Neilson Research Corporation

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Analysis Report

ORELAP 100016
EPA OR00028

Stillwater Sciences
2855 Telegraph Ave., Suite 400
Berkeley, CA 94704
Client Sample ID: **R4B**
Sample Location: **Grab**
Project: **Medford WWTP 821-AMENDED**

Lab Order: **1810273**
NRC Sample ID **1810273-08B**
Collection Date: **10/4/2018 11:51:00 AM**
Received Date: **10/5/2018 8:44:00 AM**
Reported Date: **11/16/2018 9:56:14 AM**
Matrix: **Aqueous**

ANALYTICAL RESULTS

Analyses	Result	Qual	MDL	MRL	Units	DF	NELAP	Date Analyzed
NITRITE NITROGEN AS N			**SM 4500-NO2-B**					Analyst: **SCM**
Nitrite Nitrogen	0.0351		0.00116	0.01	mg/L	1	A	10/5/2018 11:0(
ORTHOPHOSPHATE AS P			**SM 4500-P E**					Analyst: **SCM**
Orthophosphate (As P)	0.102		0.00290	0.025	mg/L	1	A	10/5/2018 12:2ε

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Minimum Reporting Limit
S	Spike Recovery outside accepted recovery limits		

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DATA FLAGS

B	Analyte detected in the associated method blank.
BA	BOD Alternative Calculation: The initial results performed by Standard Methods did not fall within parameters of the Standard Methods calculation. An alternate approved calculation was performed using the HACH method and the value reported is an estimated concentration.
C	Sample(s) does not meet NELAP/ORELAP sample acceptance criteria. See Case Narrative.
C1	Sample(s) does not meet NELAP/ORELAP sample acceptance criteria for temperature.
CF	Results confirmed by re-analysis.
CU	Cleanup performed as specified by method.
D1	The diesel elution pattern for the sample is not typical.
D2	The sample appears to be a heavier hydrocarbon range than diesel.
D3	The sample appears to be a lighter hydrocarbon range than diesel.
D4	Detected hydrocarbons do not have pattern and range consistent with typical petroleum products and may be due to biogenic interference.
D5	Detected hydrocarbons in the diesel range appear to be weathered diesel.
E	Estimated value.
ER	Elevated reporting limit due to matrix. Report limits (MDLs, MRLs & PQLs) are adjusted based on variations in sample preparation amounts, analytical dilutions, and percent solids, where applicable.
FC	Fecal Coliforms: Sample(s) received past 40 CFR Part 136 specified holding time. Results reported as estimated values.
G1	The gasoline elution pattern for the sample is not typical.
G2	The sample appears to be a heavier hydrocarbon range than gasoline.
G3	The sample appears to be a lighter hydrocarbon range than gasoline.
G4	Detected hydrocarbons in the gasoline range appear to be weathered gasoline.
HP	Sample re-analysis performed outside of method specified holding time.
HR	Sample received outside of method specified holding time.
HS	Sample analyzed for volatile organics contained headspace.
HT	At the client's request, the sample was analyzed outside of method specified holding time.
H	Analysis performed outside of method specified holding time.
J	Analyte detected below the Minimum Reporting Limit (MRL) and above the Method Detection Limit (MDL). The J flag result is an estimated value and the user should be aware that this data is of limited reliability.
L	Dissolved metals were not filtered within 15 minutes of collection per 40 CFR Part 136.
MI	Surrogate or Matrix Spike recovery is out of control limits due to matrix interference. Sample results may be biased.
N	See Case Narrative on page 2 of report.
NLR	No Legionella Recovered.
PLR	Presence of Legionella Recovered.
Q	Closing continuing calibration verification (CCV) or laboratory control sample (LCS) exceeded high recovery limits, but associated samples are non-detect and the sample results are not affected. Data meets EPA/NELAP requirements.
R	Relative percent difference (RPD) is outside of the accepted recovery limits.
R1	Relative percent difference (RPD) is outside of the accepted recovery limits. However, analyses are not controlled on RPD values for sample concentrations that are less than the reporting limit.
R3	The relative percent difference (RPD) and/or percent recovery for the duplicate (DUP) or matrix spike (MS)/matrix spike duplicate (MSD) cannot be accurately calculated due to the concentration of analyte already present in the sample.
R4	Duplicate analysis failed due to result being at or near method reporting limit.
S	Surrogate and/or matrix spike recovery is outside of the accepted recovery limits. Sample results may be biased.
S1	Surrogate or matrix spike recovery is outside of control limits due to dilution necessary for analysis.
SC	Sub-contracted to another laboratory for analysis.
SP	Sample(s) were not collected per EPA Method 5035A protocols. The results are considered minimum values.
T	Toxicity Characteristic Leaching Procedure – Sample submitted contained < 0.5% solids. If the waste contains <0.5% dry solids, the liquid portion of the waste, after filtration, is defined as the TCLP extract.
#	Value exceeds regulatory level for TCLP contaminant.
X1	The motor oil elution pattern for the sample is not typical.
X2	The sample appears to be a heavier hydrocarbon range than motor oil.
X3	The sample appears to be a lighter hydrocarbon range than motor oil.
*	Value exceeds Maximum Contaminant Level or is outside the acceptable range.

NRC SOP QA-1104/AD-3100
Revision 5
Effective Date: 3/12/18

CLIENT: Stillwater Sciences
Work Order: 1810273
Project: Medford WWTP 821-AMENDED

ANALYTICAL QC SUMMARY REPORT

TestCode: AMMONIA_AUTO_W

Sample ID **MB-42657** SampType: **MBLK** TestCode: **AMMONIA_A** Units: **mg/L** Prep Date: **10/12/2018** RunNo: **107323**
Client ID: **ZZZZZ** Batch ID: **42657** TestNo: **EPA 350.1** **(EPA 350.1)** Analysis Date: **10/15/2018** SeqNo: **1634560**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Ammonia (As N)	0.1460	0.150									J

Sample ID **MB-42876** SampType: **MBLK** TestCode: **AMMONIA_A** Units: **mg/L** Prep Date: **11/8/2018** RunNo: **107936**
Client ID: **ZZZZZ** Batch ID: **42876** TestNo: **EPA 350.1** **(EPA 350.1)** Analysis Date: **11/9/2018** SeqNo: **1644857**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Ammonia (As N)	0.1490	0.150									J

Sample ID **LCS-42657** SampType: **LCS** TestCode: **AMMONIA_A** Units: **mg/L** Prep Date: **10/12/2018** RunNo: **107323**
Client ID: **ZZZZZ** Batch ID: **42657** TestNo: **EPA 350.1** **(EPA 350.1)** Analysis Date: **10/15/2018** SeqNo: **1634559**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Ammonia (As N)	1.692	0.150	1.645	0	103	90	110				

Sample ID **LCS-42876** SampType: **LCS** TestCode: **AMMONIA_A** Units: **mg/L** Prep Date: **11/8/2018** RunNo: **107936**
Client ID: **ZZZZZ** Batch ID: **42876** TestNo: **EPA 350.1** **(EPA 350.1)** Analysis Date: **11/9/2018** SeqNo: **1644856**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Ammonia (As N)	1.569	0.150	1.645	0	95.4	90	110				

Sample ID **1810273-01AMS** SampType: **MS** TestCode: **AMMONIA_A** Units: **mg/L** Prep Date: **10/12/2018** RunNo: **107323**
Client ID: **R1** Batch ID: **42657** TestNo: **EPA 350.1** **(EPA 350.1)** Analysis Date: **10/15/2018** SeqNo: **1634548**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Ammonia (As N)	1.834	0.150	1.645	0.155	102	80	120				

Qualifiers:
E Value above quantitation range
ND Not Detected at the Minimum Reporting Limit
H Holding times for preparation or analysis exceeded
R RPD outside accepted recovery limits
J Analyte detected below quantitation limits
S Spike Recovery outside accepted recovery limits

CLIENT: Stillwater Sciences
Work Order: 1810273
Project: Medford WWTP 821-AMENDED

ANALYTICAL QC SUMMARY REPORT

TestCode: AMMONIA_AUTO_W

Sample ID **1810B22-02BMS** SampType: **MS** TestCode: **AMMONIA_A** Units: **mg/L** Prep Date: **11/8/2018** RunNo: **107936**
Client ID: **ZZZZZ** Batch ID: **42876** TestNo: **EPA 350.1** **(EPA 350.1)** Analysis Date: **11/9/2018** SeqNo: **1644852**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Ammonia (As N)	2.461	0.150	1.645	1.133	80.7	80	120				

Sample ID **1810273-01AMSD** SampType: **MSD** TestCode: **AMMONIA_A** Units: **mg/L** Prep Date: **10/12/2018** RunNo: **107323**
Client ID: **R1** Batch ID: **42657** TestNo: **EPA 350.1** **(EPA 350.1)** Analysis Date: **10/15/2018** SeqNo: **1634549**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Ammonia (As N)	1.756	0.150	1.645	0.155	97.3	80	120	1.834	4.35	20	

Sample ID **1810B22-02BMSD** SampType: **MSD** TestCode: **AMMONIA_A** Units: **mg/L** Prep Date: **11/8/2018** RunNo: **107936**
Client ID: **ZZZZZ** Batch ID: **42876** TestNo: **EPA 350.1** **(EPA 350.1)** Analysis Date: **11/9/2018** SeqNo: **1644853**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Ammonia (As N)	2.466	0.150	1.645	1.133	81.0	80	120	2.461	0.203	20	

Qualifiers:
E Value above quantitation range
ND Not Detected at the Minimum Reporting Limit
H Holding times for preparation or analysis exceeded
R RPD outside accepted recovery limits
J Analyte detected below quantitation limits
S Spike Recovery outside accepted recovery limits

CLIENT: Stillwater Sciences
Work Order: 1810273
Project: Medford WWTP 821-AMENDED

ANALYTICAL QC SUMMARY REPORT

TestCode: NO2-COLOR_W

Sample ID **MB-R107143** SampType: **MBLK** TestCode: **NO2-COLOR** Units: **mg/L** Prep Date: RunNo: **107143**
Client ID: **ZZZZZ** Batch ID: **R107143** TestNo: **SM 4500-NO2** Analysis Date: **10/5/2018** SeqNo: **1631897**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrite Nitrogen	ND	0.0100									

Sample ID **LCS-R107143** SampType: **LCS** TestCode: **NO2-COLOR** Units: **mg/L** Prep Date: RunNo: **107143**
Client ID: **ZZZZZ** Batch ID: **R107143** TestNo: **SM 4500-NO2** Analysis Date: **10/5/2018** SeqNo: **1631898**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrite Nitrogen	9.144	1.00	10	0	91.4	80	120				

Sample ID **1810273-01BMS** SampType: **MS** TestCode: **NO2-COLOR** Units: **mg/L** Prep Date: RunNo: **107143**
Client ID: **R1** Batch ID: **R107143** TestNo: **SM 4500-NO2** Analysis Date: **10/5/2018** SeqNo: **1631900**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrite Nitrogen	0.03892	0.0100	0.0385	0	101	80	120				

Sample ID **1810273-01BMSD** SampType: **MSD** TestCode: **NO2-COLOR** Units: **mg/L** Prep Date: RunNo: **107143**
Client ID: **R1** Batch ID: **R107143** TestNo: **SM 4500-NO2** Analysis Date: **10/5/2018** SeqNo: **1631901**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrite Nitrogen	0.03961	0.0100	0.0385	0	103	80	120	0.03892	1.76	15	

Qualifiers:

E	Value above quantitation range	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Minimum Reporting Limit	R	RPD outside accepted recovery limits	S	Spike Recovery outside accepted recovery limits

CLIENT: Stillwater Sciences
Work Order: 1810273
Project: Medford WWTP 821-AMENDED

ANALYTICAL QC SUMMARY REPORT

TestCode: **NO2NO3_AUTO_W**

Sample ID **MBLK**	SampType: **MBLK**	TestCode: **NO2NO3_AU** Units: **mg/L**	Prep Date:	RunNo: **107217**
Client ID: **ZZZZZ**	Batch ID: **R107217**	TestNo: **EPA 353.2**	Analysis Date: **10/10/2018**	SeqNo: **1633080**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrate Nitrogen	ND	0.0500									

Sample ID **LCS**	SampType: **LCS**	TestCode: **NO2NO3_AU** Units: **mg/L**	Prep Date:	RunNo: **107217**
Client ID: **ZZZZZ**	Batch ID: **R107217**	TestNo: **EPA 353.2**	Analysis Date: **10/10/2018**	SeqNo: **1633079**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrate Nitrogen	30.57	1.00	30	0	102	90	110				

Sample ID **1810233-08AMS**	SampType: **MS**	TestCode: **NO2NO3_AU** Units: **mg/L**	Prep Date:	RunNo: **107217**
Client ID: **ZZZZZ**	Batch ID: **R107217**	TestNo: **EPA 353.2**	Analysis Date: **10/10/2018**	SeqNo: **1633058**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrate Nitrogen	1.159	0.100	1	0.0394	112	80	120				

Sample ID **1810233-08AMSD**	SampType: **MSD**	TestCode: **NO2NO3_AU** Units: **mg/L**	Prep Date:	RunNo: **107217**
Client ID: **ZZZZZ**	Batch ID: **R107217**	TestNo: **EPA 353.2**	Analysis Date: **10/10/2018**	SeqNo: **1633059**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrate Nitrogen	1.101	0.100	1	0.0394	106	80	120	1.159	5.10	20	

Qualifiers:			
E Value above quantitation range	H Holding times for preparation or analysis exceeded	J Analyte detected below quantitation limits
ND Not Detected at the Minimum Reporting Limit	R RPD outside accepted recovery limits	S Spike Recovery outside accepted recovery limits

CLIENT: Stillwater Sciences
Work Order: 1810273
Project: Medford WWTP 821-AMENDED

ANALYTICAL QC SUMMARY REPORT

TestCode: PHOS-O_W

Sample ID **MB-R107122** SampType: **MBLK** TestCode: **PHOS-O_W** Units: **mg/L** Prep Date: RunNo: **107122**
Client ID: **ZZZZZ** Batch ID: **R107122** TestNo: **SM 4500-P E** Analysis Date: **10/5/2018** SeqNo: **1631715**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Orthophosphate (As P)	ND	0.0250									

Sample ID **LCS-R107122** SampType: **LCS** TestCode: **PHOS-O_W** Units: **mg/L** Prep Date: RunNo: **107122**
Client ID: **ZZZZZ** Batch ID: **R107122** TestNo: **SM 4500-P E** Analysis Date: **10/5/2018** SeqNo: **1631716**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Orthophosphate (As P)	0.4956	0.0250	0.5	0	99.1	85	115				

Sample ID **1810273-08BMS** SampType: **MS** TestCode: **PHOS-O_W** Units: **mg/L** Prep Date: RunNo: **107122**
Client ID: **R4B** Batch ID: **R107122** TestNo: **SM 4500-P E** Analysis Date: **10/5/2018** SeqNo: **1631725**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Orthophosphate (As P)	0.2961	0.0250	0.2	0.1015	97.3	80	120				

Sample ID **1810273-08BMSD** SampType: **MSD** TestCode: **PHOS-O_W** Units: **mg/L** Prep Date: RunNo: **107122**
Client ID: **R4B** Batch ID: **R107122** TestNo: **SM 4500-P E** Analysis Date: **10/5/2018** SeqNo: **1631726**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Orthophosphate (As P)	0.2911	0.0250	0.2	0.1015	94.8	80	120	0.2961	1.70	20	

Qualifiers:
E Value above quantitation range
ND Not Detected at the Minimum Reporting Limit
H Holding times for preparation or analysis exceeded
R RPD outside accepted recovery limits
J Analyte detected below quantitation limits
S Spike Recovery outside accepted recovery limits

Neilson Research Corporation

Date: 16-Nov-18

CLIENT: Stillwater Sciences
Work Order: 1810273
Project: Medford WWTP 821-AMENDED

ANALYTICAL QC SUMMARY REPORT

TestCode: PHOS-T_W

Sample ID **MB-42630** SampType: **MBLK** TestCode: **PHOS-T_W** Units: **mg/L** Prep Date: **10/10/2018** RunNo: **107220**
Client ID: **ZZZZZ** Batch ID: **42630** TestNo: **SM 4500-P E (SM 4500 P-E** Analysis Date: **10/10/2018** SeqNo: **1633121**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Phosphorus, Total (As P)	ND	0.0250									

Sample ID **MB-42639** SampType: **MBLK** TestCode: **PHOS-T_W** Units: **mg/L** Prep Date: **10/11/2018** RunNo: **107250**
Client ID: **ZZZZZ** Batch ID: **42639** TestNo: **SM 4500-P E (SM 4500 P-E** Analysis Date: **10/11/2018** SeqNo: **1633447**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Phosphorus, Total (As P)	ND	0.0250									

Sample ID **LCS-42630** SampType: **LCS** TestCode: **PHOS-T_W** Units: **mg/L** Prep Date: **10/10/2018** RunNo: **107220**
Client ID: **ZZZZZ** Batch ID: **42630** TestNo: **SM 4500-P E (SM 4500 P-E** Analysis Date: **10/10/2018** SeqNo: **1633122**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Phosphorus, Total (As P)	0.4804	0.0250	0.5	0	96.1	85	115				

Sample ID **LCS-42639** SampType: **LCS** TestCode: **PHOS-T_W** Units: **mg/L** Prep Date: **10/11/2018** RunNo: **107250**
Client ID: **ZZZZZ** Batch ID: **42639** TestNo: **SM 4500-P E (SM 4500 P-E** Analysis Date: **10/11/2018** SeqNo: **1633448**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Phosphorus, Total (As P)	0.5051	0.0250	0.5	0	101	85	115				

Sample ID **1810217-01AMS** SampType: **MS** TestCode: **PHOS-T_W** Units: **mg/L** Prep Date: **10/10/2018** RunNo: **107220**
Client ID: **ZZZZZ** Batch ID: **42630** TestNo: **SM 4500-P E (SM 4500 P-E** Analysis Date: **10/10/2018** SeqNo: **1633126**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Phosphorus, Total (As P)	9.706	0.625	5	4.438	105	80	120				

Qualifiers:
E Value above quantitation range
ND Not Detected at the Minimum Reporting Limit
H Holding times for preparation or analysis exceeded
R RPD outside accepted recovery limits
J Analyte detected below quantitation limits
S Spike Recovery outside accepted recovery limits

CLIENT: Stillwater Sciences
Work Order: 1810273
Project: Medford WWTP 821-AMENDED

ANALYTICAL QC SUMMARY REPORT

TestCode: PHOS-T_W

Sample ID **1810301-03AMS** SampType: **MS** TestCode: **PHOS-T_W** Units: **mg/L** Prep Date: **10/11/2018** RunNo: **107250**
Client ID: **ZZZZZ** Batch ID: **42639** TestNo: **SM 4500-P E** **(SM 4500 P-E** Analysis Date: **10/11/2018** SeqNo: **1633454**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Phosphorus, Total (As P)	9.376	0.500	4	5.22	104	80	120				

Sample ID **1810217-01AMSD** SampType: **MSD** TestCode: **PHOS-T_W** Units: **mg/L** Prep Date: **10/10/2018** RunNo: **107220**
Client ID: **ZZZZZ** Batch ID: **42630** TestNo: **SM 4500-P E** **(SM 4500 P-E** Analysis Date: **10/10/2018** SeqNo: **1633127**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Phosphorus, Total (As P)	9.376	0.625	5	4.438	98.8	80	120	9.706	3.45	15	

Sample ID **1810301-03AMSD** SampType: **MSD** TestCode: **PHOS-T_W** Units: **mg/L** Prep Date: **10/11/2018** RunNo: **107250**
Client ID: **ZZZZZ** Batch ID: **42639** TestNo: **SM 4500-P E** **(SM 4500 P-E** Analysis Date: **10/11/2018** SeqNo: **1633455**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Phosphorus, Total (As P)	9.376	0.500	4	5.22	104	80	120	9.376	0	15	

Qualifiers:

- E Value above quantitation range
- ND Not Detected at the Minimum Reporting Limit
- H Holding times for preparation or analysis exceeded
- R RPD outside accepted recovery limits
- J Analyte detected below quantitation limits
- S Spike Recovery outside accepted recovery limits

CLIENT: Stillwater Sciences
Work Order: 1810273
Project: Medford WWTP 821-AMENDED

ANALYTICAL QC SUMMARY REPORT

TestCode: TKN_AUTO_W

Sample ID **MB-42621**	SampType: **MBLK**	TestCode: **TKN_AUTO_**	Units: **mg/L**	Prep Date: **10/23/2018**	RunNo: **107536**					
Client ID: **ZZZZZ**	Batch ID: **42621**	TestNo: **EPA 351.2**	**(EPA 351.1)**	Analysis Date: **10/24/2018**	SeqNo: **1637622**					
Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Kjeldahl, Total	ND	0.625									

Sample ID **MB-42847**	SampType: **MBLK**	TestCode: **TKN_AUTO_**	Units: **mg/L**	Prep Date: **11/1/2018**	RunNo: **107798**						
Client ID: **ZZZZZ**	Batch ID: **42847**	TestNo: **EPA 351.2**	**(EPA 351.1)**	Analysis Date: **11/5/2018**	SeqNo: **1641665**						
Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Kjeldahl, Total	ND	0.625									

Sample ID **MB-42956**	SampType: **MBLK**	TestCode: **TKN_AUTO_**	Units: **mg/L**	Prep Date: **11/13/2018**	RunNo: **107536**						
Client ID: **ZZZZZ**	Batch ID: **42956**	TestNo: **EPA 351.2**	**(EPA 351.1)**	Analysis Date: **11/14/2018**	SeqNo: **1648378**						
Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Kjeldahl, Total	ND	0.625									

Sample ID **LCS-42621**	SampType: **LCS**	TestCode: **TKN_AUTO_**	Units: **mg/L**	Prep Date: **10/23/2018**	RunNo: **107536**						
Client ID: **ZZZZZ**	Batch ID: **42621**	TestNo: **EPA 351.2**	**(EPA 351.1)**	Analysis Date: **10/24/2018**	SeqNo: **1637621**						
Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Kjeldahl, Total	3.768	0.625	4.112	0	91.6	90	110				

Sample ID **LCS-42847**	SampType: **LCS**	TestCode: **TKN_AUTO_**	Units: **mg/L**	Prep Date: **11/1/2018**	RunNo: **107798**						
Client ID: **ZZZZZ**	Batch ID: **42847**	TestNo: **EPA 351.2**	**(EPA 351.1)**	Analysis Date: **11/5/2018**	SeqNo: **1641664**						
Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Kjeldahl, Total	4.092	0.625	4.112	0	99.5	90	110				

Qualifiers:

E	Value above quantitation range	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Minimum Reporting Limit	R	RPD outside accepted recovery limits	S	Spike Recovery outside accepted recovery limits

CLIENT: Stillwater Sciences
Work Order: 1810273
Project: Medford WWTP 821-AMENDED

ANALYTICAL QC SUMMARY REPORT

TestCode: TKN_AUTO_W

Sample ID **LCS-42956** SampType: **LCS** TestCode: **TKN_AUTO_** Units: **mg/L** Prep Date: **11/13/2018** RunNo: **107536**
Client ID: **ZZZZZ** Batch ID: **42956** TestNo: **EPA 351.2** **(EPA 351.1)** Analysis Date: **11/14/2018** SeqNo: **1648377**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Kjeldahl, Total	5.370	0.625	5	0	107	90	110				

Sample ID **1810185-02BMS** SampType: **MS** TestCode: **TKN_AUTO_** Units: **mg/L** Prep Date: **10/23/2018** RunNo: **107536**
Client ID: **ZZZZZ** Batch ID: **42621** TestNo: **EPA 351.2** **(EPA 351.1)** Analysis Date: **10/24/2018** SeqNo: **1637600**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Kjeldahl, Total	ND	0.625	4.112	0	0	80	120				MI

Sample ID **1810B22-02BMS** SampType: **MS** TestCode: **TKN_AUTO_** Units: **mg/L** Prep Date: **11/1/2018** RunNo: **107798**
Client ID: **ZZZZZ** Batch ID: **42847** TestNo: **EPA 351.2** **(EPA 351.1)** Analysis Date: **11/5/2018** SeqNo: **1641651**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Kjeldahl, Total	2.118	0.625	4.112	0.355	42.9	80	120				MI

Sample ID **1810185-02BMSD** SampType: **MSD** TestCode: **TKN_AUTO_** Units: **mg/L** Prep Date: **10/23/2018** RunNo: **107536**
Client ID: **ZZZZZ** Batch ID: **42621** TestNo: **EPA 351.2** **(EPA 351.1)** Analysis Date: **10/24/2018** SeqNo: **1637601**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Kjeldahl, Total	ND	0.625	4.112	0	0	80	120	0	0	20	MI

Sample ID **1810B22-02BMSD** SampType: **MSD** TestCode: **TKN_AUTO_** Units: **mg/L** Prep Date: **11/1/2018** RunNo: **107798**
Client ID: **ZZZZZ** Batch ID: **42847** TestNo: **EPA 351.2** **(EPA 351.1)** Analysis Date: **11/5/2018** SeqNo: **1641652**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Kjeldahl, Total	3.150	0.625	4.112	0.355	68.0	80	120	2.118	39.2	20	MI

Qualifiers:

E	Value above quantitation range	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Minimum Reporting Limit	R	RPD outside accepted recovery limits	S	Spike Recovery outside accepted recovery limits

NEILSON RESEARCH CORPORATION
Environmental Testing Laboratory
245 South Grape Street * Medford, OR 97501
(541) 770-5678 fax (541) 770-2901

Chain of Custody Record

This Chain of Custody is a LEGAL DOCUMENT and must be filled out accurately.

Section A
Required Client Information

Company:	Stillwater
Address:	2855 Telegraph Ave, Berkeley, CA 94705
Email:	Noah@Stillwatersci.com
Phone:	510-990-6214 Fax:
Collected By (Print):	DAVID DeKrey
Collected By (Sign):	[signature]
Email Report X Yes __ No	Mail Report __ Yes __ No
Fax Report __ Yes __ No	

Section B
Required Project Information

Project Name:	Medford WWTP
Project Number:	821
Report To:	Noah@Stillwatersci.com
Copy To:	ddekrey@Stillwatersci.com

Section C
Invoice Information

Attention:	
Company Name:	
Address:	
P.O. #	

Section D
Rush Status (Subject to Scheduling)

X Standard 10-14 Days
__ 5 Business Days (50% surcharge)
__ 3 Business Days (75% surcharge)
__ 24 - 48 hours (100% surcharge)
__ Other ______
Authorized __ Yes __ No

Section E
Sample Information

NRC Workorder # (Lab Use Only): 1810273

Sample ID	Comp/Grab	Matrix*	Date Collected	Time Collected	No. of Containers	T. Phos	Ortho phos	Total Kj N	Ammonia	Nitrate	Nitrite					Remarks/Field Data	NRC Sample # (Lab Use Only)
R1	Grab	W	10/04/18	10:54	2	✓	✓	✓	✓	✓	✓					2 Bottles, 1 preserved	01A-B
R3	↓	↓	↓	11:00	↓	↓	↓	↓	↓	↓	↓					↓	02A-B
R4	↓	↓	↓	11:05 / 11:41	↓	↓	↓	↓	↓	↓	↓					↓	03A-B
R5	↓	↓	↓	15:15	↓	↓	↓	↓	↓	↓	↓					↓	04A-B
R6	↓	↓	↓	16:00	↓	↓	↓	↓	↓	↓	↓					↓	05A-B
R7	↓	↓	↓	15:30	↓	↓	↓	↓	↓	↓	↓					↓	06A-B
EB	↓	↓	↓	16:05	↓	↓	↓	↓	↓	↓	↓					↓	07A-B
R4B	X	X	X	~~12:00~~ 11:51	X	X	X	X	X	X	X					X	08A-B

*Matrix: DW - Drinking Water WW - Wastewater W - Water S - Soil/Solid SL - Sludge O - Oil WP - Wipe OT - Other

Section F
Relinquish/Receive

	Sign	Print	Date	Time
Relinquished By:	[signature]	DAVID DeKrey	10-5-18	844
Received By:				
Relinquished By:				
Received By:				
Relinquished By:				
Received By Laboratory:	[signature]	Jordan Merrill	10-5-18	844

Section G
Lab Use Only

Temp: 1.8°C
4°C +/- 2°C: __ Yes __ No
Received on Ice: X Yes __ No
Number of Bottles Received: 16
pH Checked:
COC Seals Intact: __ Yes __ No __ NA
Field Blank Included: __ Yes __ No
Received Via __ UPS __ FedEX __ Other X Hand
Payment: __ Invoice __ Cash __ VISA, M/C __ Check # ____ Amount ____

Appendix D

Supplemental October 2018 BMI Results and Laboratory Identification

Table 1:Bray-Curtis Similarity Matrix in BMI composition between samples at October 2018 sampling sites

Site	1	1*	2	2*	3	3*	4	4*	5	5*	6	6*	7	7*
1	100%													
1*	63%	100%												
2	44%	64%	100%											
2*	33%	52%	72%	100%										
3	48%	47%	46%	37%	100%									
3*	55%	53%	51%	41%	76%	100%								
4	45%	41%	36%	35%	40%	45%	100%							
4*	41%	41%	35%	35%	43%	48%	83%	100%						
5	16%	20%	31%	26%	25%	31%	28%	24%	100%					
5*	15%	19%	29%	25%	23%	28%	25%	24%	72%	100%				
6	34%	33%	29%	26%	43%	46%	60%	53%	42%	35%	100%			
6*	32%	34%	29%	25%	51%	51%	50%	52%	45%	45%	67%	100%		
7	43%	37%	35%	24%	43%	41%	45%	42%	32%	27%	59%	49%	100%	
7*	40%	39%	38%	29%	38%	40%	43%	42%	40%	35%	54%	49%	78%	100%

*Replicate

Figure 1: Total BMI taxa richness and abundance at October 2018 sampling sites

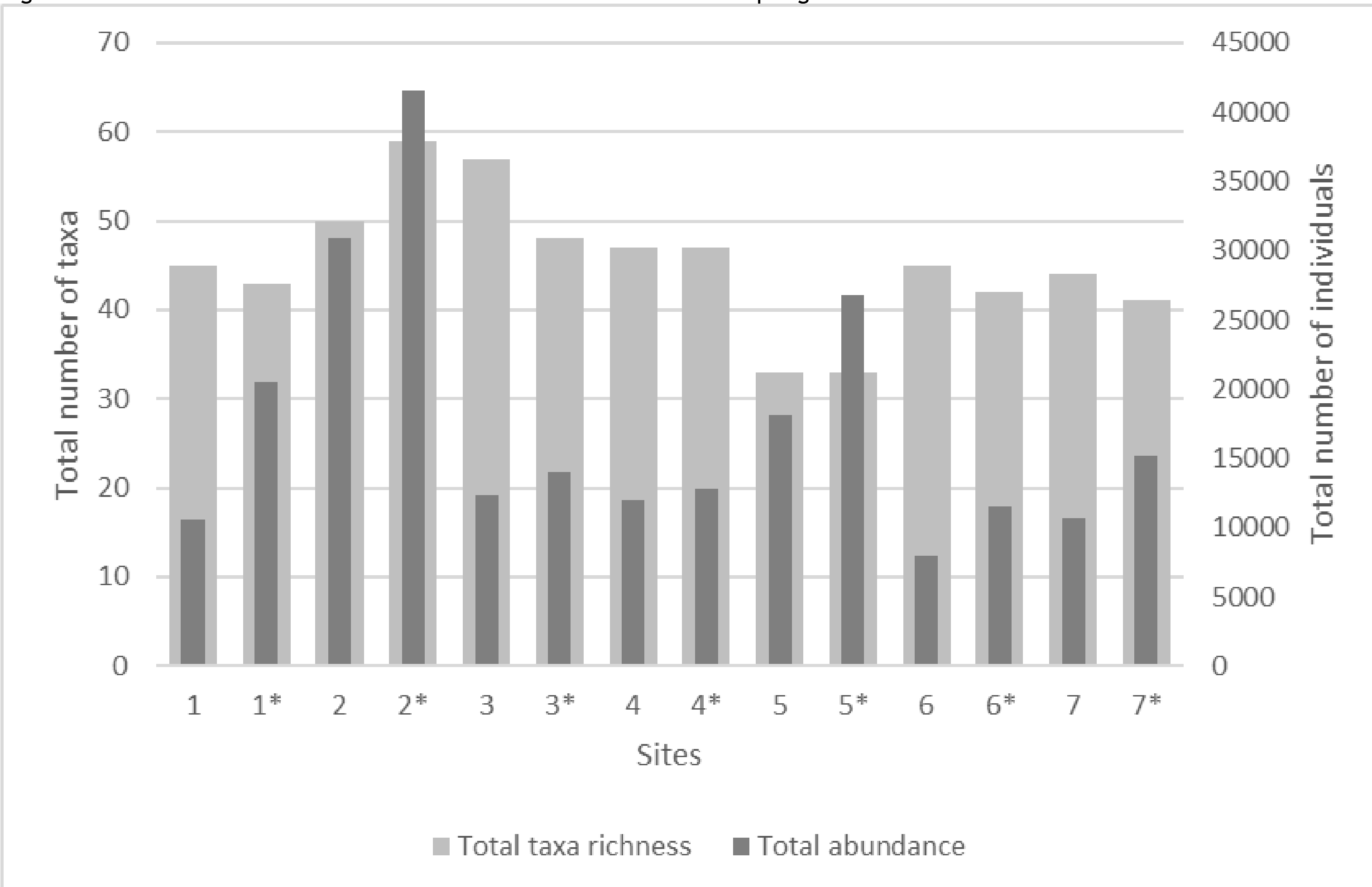


Figure 2: EPT taxa richness and abundance at October 2018 sampling sites

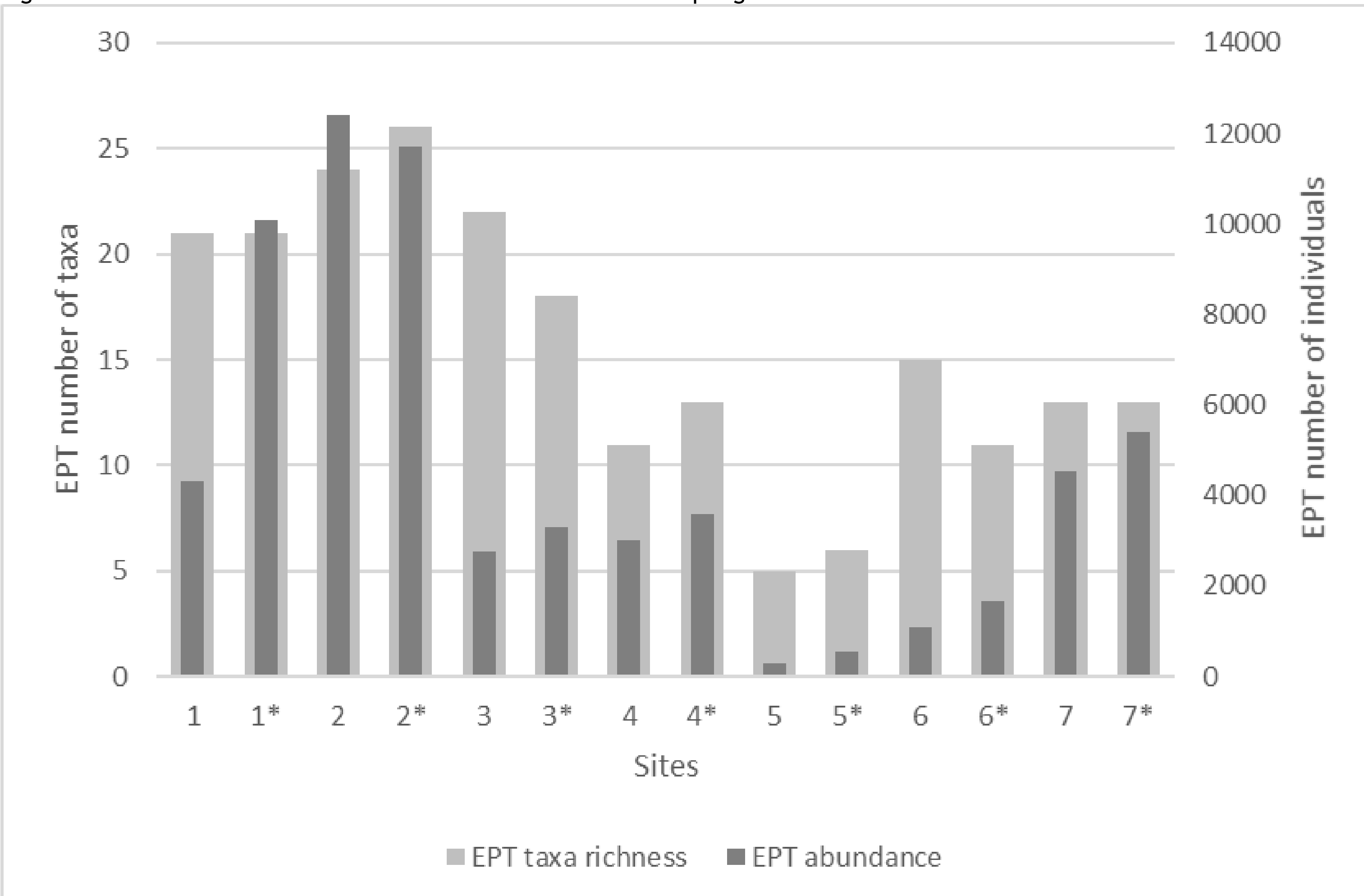


Figure 3: Percent of tolerant and intolerant BMI individuals at October 2018 sampling sites

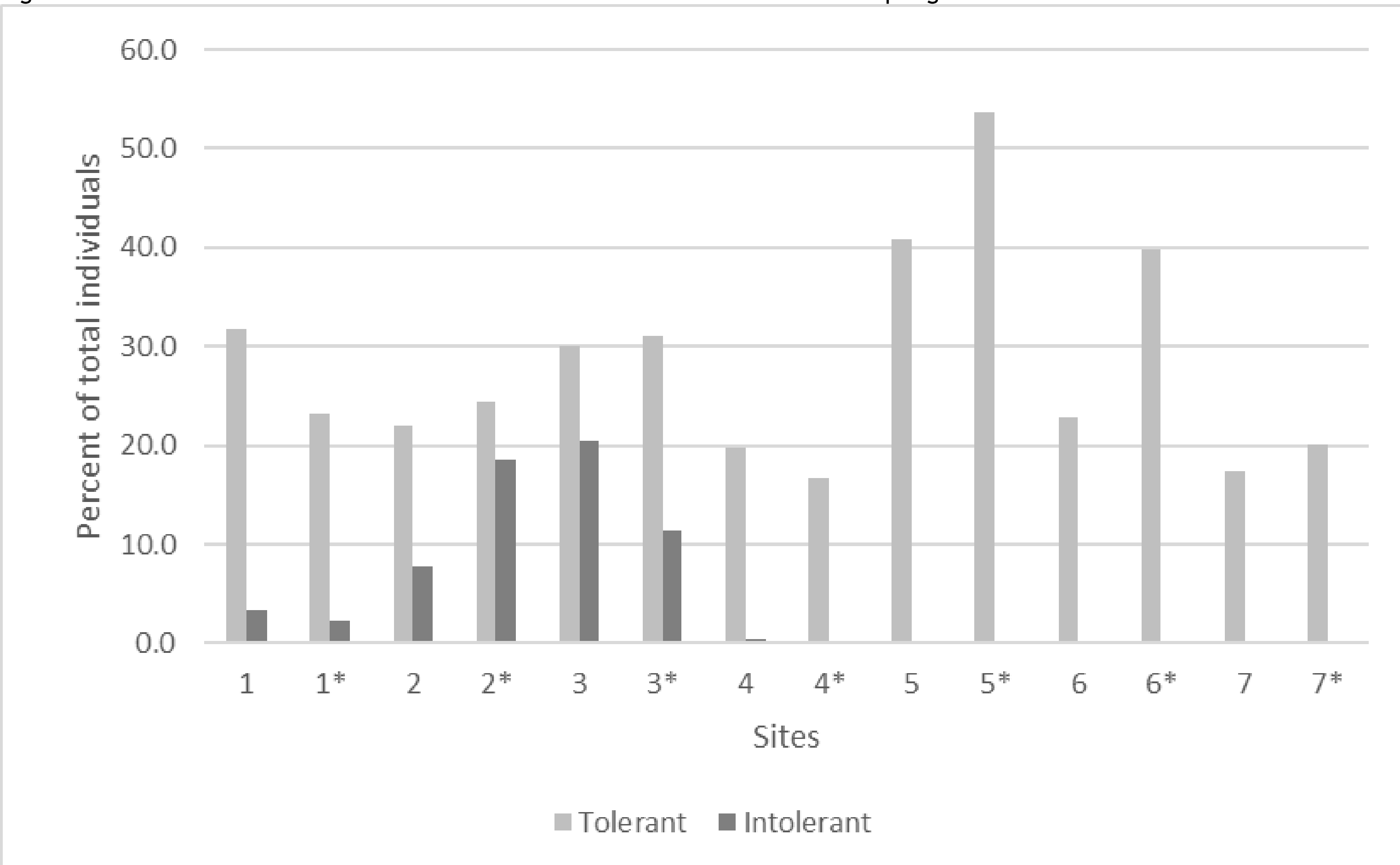


Figure 4: Percent of dominant taxon and non-insect individuals at October 2018 sampling sites

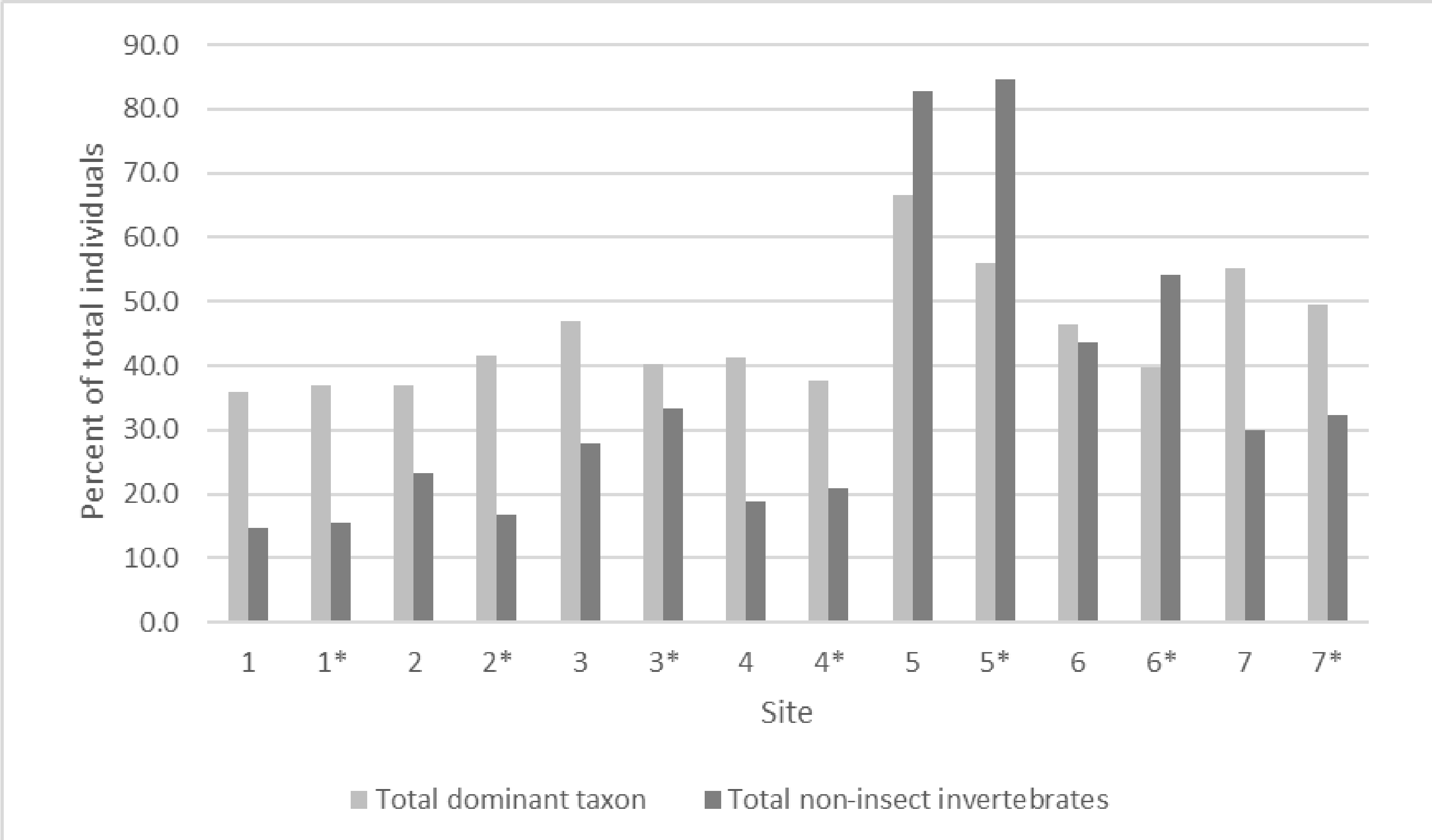


Figure 5: Relative abundance of BMI functional feeding groups at at October 2018 sampling sites

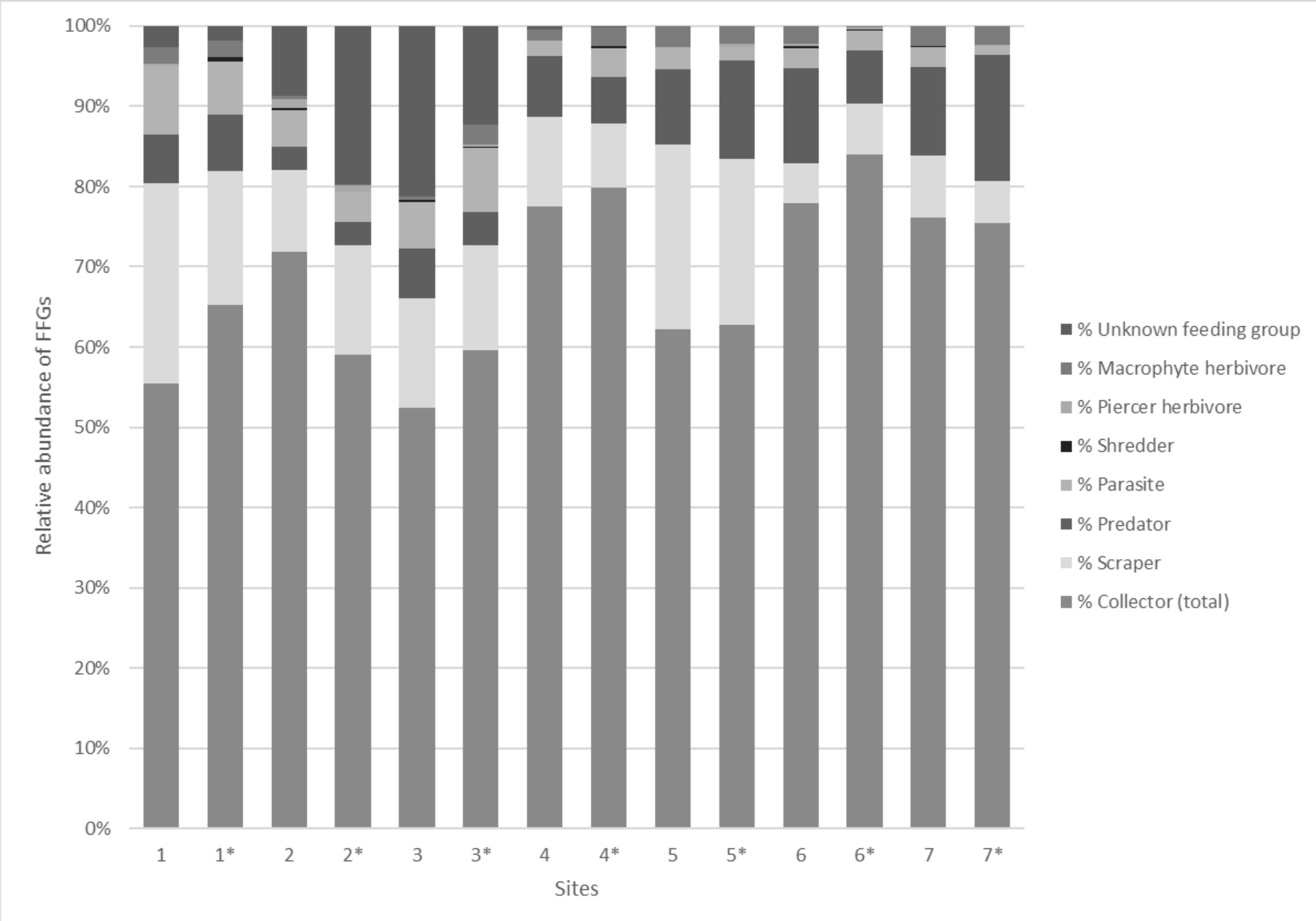
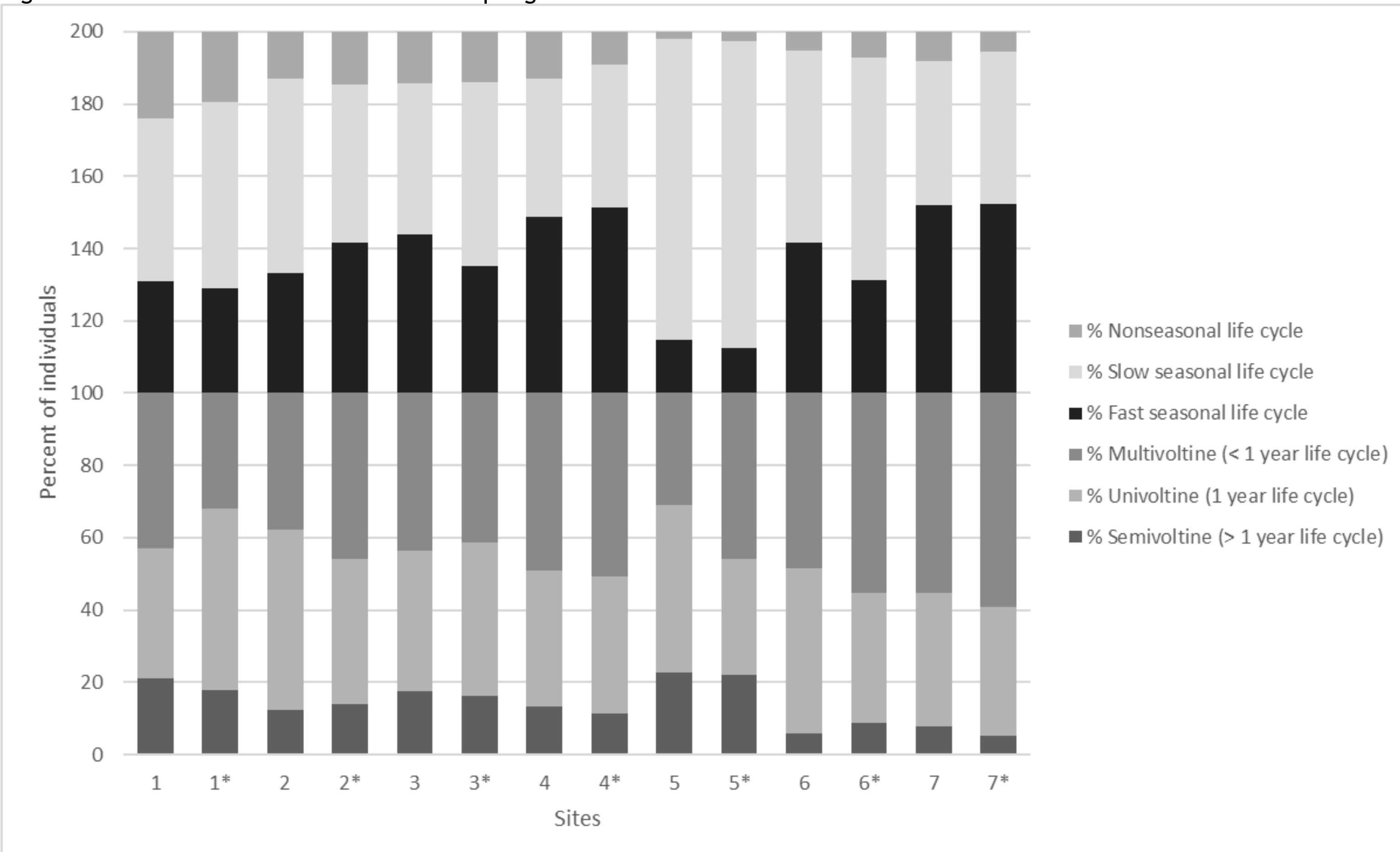


Figure 6: BMI voltinism at October 2018 sampling sites



BMI Identification Data

Aquatic Biology Associates, Inc
3490 NW Deer Run Street
Corvallis, OR 97330
aquaticbio.com

Robert Wisseman, Senior Scientist
541-740-1568
bob@aquaticbio.com

Client

Stillwater Sciences

Client contact: Noah Hume, noah@stillwatersci.com

Project	Rogue River @ Medford WWTP
Project location	Rogue River above and below the Medford WWTP
Project objectives	Impacts to BMI community from WWTP outfall

The WWTP is OR: Jackson County, 42.43834 N, -122.90723 W, 366 m elevation

Note that a large/rare search was condcuted on each sample. This information was incorporated in the quantitative subsample data by listing any taxa encountered in the large/reare search that was not found in the quantitative subsample as an abundance of 1, and with the subsampling correction factor set to 1 (or full sample basis). If desired, we can rerun the data with all the large/rare specimens removed.

Laboratory

Contact

Robert Wisseman	James DiGiulio	Jon Lee
General taxonomy	Chironomidae taxonomy	Mite taxonomy
bobwisseman@mac.com	digiulio@peak.org	jlee@humboldt1.com

Sampling protocol

Sampling gear	Surber sampler
Mesh size	500 micron
Square area sampled	8 square foot composite
Habitat sampled	erosional

Laboratory protocol

Mesh size	500 micron
Subsampling target count	500 organism minimum
Subsampling device	Caton tray
Sorting efficacy	95+%
Taxa abundances	converted to a full sample and 1 square meter basis

Identification protocol

Standard taxonomic effort	PNAMP level 2
Chironomidae (midges)	genus/species group
Oligochaeta (segmented worms)	class Oligochaeta
Acari (mites)	genus

Life stages:

U	unknown (for non-insects)
L	larvae
LE	Larval exuvia
P	pupae
PE	pupal exuvia
A	adult
E	egg

Biomass determination

Published length weight regressions used to calculate biomass.
Length of all macroinvertebrates measured to nearest 0.5 mm if individual <5 mm, or nearest 1 mm if > 5 mm.
Reported as the biomass corresponding to the taxa abundances (see laboratory protocol above).

Data analysis

Standard taxonomic effort (STE)	Version 2 ABA
Taxa traits (e.g. feeding group, etc.)	Version 2 ABA (see "Traits" tab in this output for documentation)

Programmed in R by Adam and Robert Wisseman
Version 2 of ABA STE and taxa traits is a draft version still under development.
Abundances converted to a standard full sample (if subsampled) and one square meter basis.

Date run:
'2018-11-18
Analysis program in developmental phase.

Explanation of metrics	All abundances and biomass converted to a full sample and 1 square meter basis.
Subsample count (raw)	Total count of subsample prior to correction factors being applied for subsampling and conversion to a 1 square meter basis.
Subsample correction factor to full sample	Multiplier to convert subsample abundances to a full sample basis, e.g. if 1/2 the sample was sorted, then the subsample correction is X2.
Area correction factor to square meter	Converts abundances of full sample to a 1 square meter basis, e.g. if 8 square feet was sampled, then the conversion to 1 square meter is X1.345
SUMMARY METRICS	
Total taxa richness	Total count of unique taxa in sample.
Total abundance	Total abundance in sample converted to a full sample and 1 square meter basis.
Total biomass (mg)	Total biomass in full sample adjusted to a 1 square meter basis as calculated by length/mass regressions.
Large/rare biomass (mg)	Biomass from taxa marked as "large/rare" in the "Incidental" column. These taxa may dominate the sample biomass.
Total biomass without large/rare (mg)	Total biomass - large/rare biomass
EPT taxa	Taxa in the insect orders Ephemeroptera+Plecoptera+Trichoptera, or mayflies+stoneflies+caddisflies.
Hilsenhoff Biotic Index (WY DEQ version)	
$HBI = \sum_{i=1}^{S} \frac{n_i \cdot a_i}{N}$	S is the number of taxa present. N is the total sample abundance. n_i is the abundance of the i-th taxa. a_i is the WY HBI index value (can be found on the Traits sheet). An index of 11 indicates a taxa that is discarded from the calculation.
DOMINANCE AND DIVERSITY	Metrics that examine how dominated the community is by a single or few taxa.
Dominant taxa	The most numerous taxon.
Subdominant taxa	The second most numerous taxon.
Shannon-Weaver Diversity (loge)	Information theory index that examines how evenly abundance is allocated among the taxa present in the community.
$H' = -\sum_{i=1}^{S} \frac{n_i}{N} \ln\left(\frac{n_i}{N}\right)$	S is the number of taxa present. N is the total sample abundance. n_i is the abundance of the i-th taxa.
Shannon-Weaver Diversity (log2)	
Shannon Evenness Index	
$E = H'/\ln(S)$	Where H' and S are defined above.
TOLERANT AND INTOLERANT TAXA	Based on habitat association and best professional judgement (Wisseman unpublished). Water temperature and dissolved oxygen are the dominant environmental factors.
Total tolerant taxa	Sum of the moderately and highly tolerant taxa. Taxa found frequently in habitats with warm water temperature and low dissolved oxygen. Eurythermal.
Highly tolerant taxa	Taxa highly tolerant of warm water and very low dissolved oxygen. Found often in stagnant and highly eutrophic habitat.
Moderately tolerant taxa	Taxa moderately tolerant of warm water and low dissolved oxygen.
Total intolerant taxa	Sum of moderately intolerant and highly intolerant taxa. Cool and cold water biota found in habitats with high dissolved oxygen.
Highly intolerant taxa	Taxa generally found in habitats with year-round cold water temperatures and very high dissolved oxygen. Indicative of bull trout zone. Cold water biota, cold stenotherms.
Moderately Intolerant taxa	Taxa generally found in cool water habitats, cold to cool water eurythermal. Indicative of general salmonid zone.
VOLTINISM (length of life cycle)	Modified from Poff et al. 2006
Semivoltine (> 1 year life cycle)	Taxa where a significant proportion of individuals require more than one year to complete their life cycle.
Univoltine (1 year life cycle)	Taxa where most individuals exhibit a one year life cycle.
Multivoltine (< 1 year life cycle)	Taxa where a significant proportion of the population has more than one generation a year.
GROWTH AND DEVELOPMENT	Modified from Poff et al. 2006
Fast seasonal life cycle	Taxa that grow and mature over a few months or a single season.
Slow seasonal life cycle	Taxa where growth and maturation extends over several seasons.
Nonseasonal life cycle	Taxa that exhibit asynchronous seasonal development, with multiple life stages present during most of the year.
OCCURRENCE IN DRIFT	Modified from Poff et al. 2006
Rare in drift	Found rarely in stream drift. Drift occurs during catastrophic events (e.g. floods).
Common in drift	Found commonly in stream drift.
Abundant in drift	Dominant in stream drift, behavioral drifters.
SIZE AT MATURITY	Modified from Poff et al. 2006
Small size at maturity	<9 mm long at maturity
Medium size at maturity	9-16 mm long at maturity
Large size at maturity	> 16 mm long at maturity
RHEOPHILY AND HABITAT AFFINITY	Modified from Poff et al. 2006
Depositional only	Occurs primarily in lentic habitats, stream pools and alcoves, or low gradient slowly flowing streams.
Depositional and erosional	Stream taxa found in both pools and riffles, though usually in protected pockets in riffles.
Erosional	Stream taxa associated with moderate to fast water current.
THERMAL PREFERENCE	Modified from Poff et al. 2006
Cold stenothermal and cool eurythermal	
Cool/warm eurythermal	
Warm eurythermal	
NON-INSECT AND INSECT ORDERS	
Non-insect invertebrates	Hydroids, vermiform taxa, mollusks, crustaceans and mites.
Ephemeroptera (mayflies)	
Odonata (damsel- and dragonflies)	
Plecoptera (stoneflies)	
Hemiptera (true bugs)	
Megaloptera (alderflies and hellgramites)	
Trichoptera (caddisflies)	
Lepidoptera (moths)	
Coleoptera (beetles)	
Diptera (total)(true flies)	Inclusive of the Chironomidae.
Chironomidae (true flies- midges)	Dominant and ubiquitous aquatic dipteran family.
INDICATOR TAXA	
Mollusca (snails and bivalves) taxa	
Crustacea taxa	Benthic taxa include Ostracoda, Amphipoda, Isopoda, Decapoda, and the Chydoridae (Cladocera), but not water column associated microcrustaceans (e.g. Daphnidae and Copepoda)
Baetidae (mayfly) taxa	Common, ubiquitous and diverse family of minnow-like mayfles.
Ephemerellidae (mayfly) taxa	Common, ubiquitous and diverse family of mayflies with most taxa associated with cool-cold montane rivers. Many taxa intolerant.
Heptageniidae (mayfly) taxa	Common, ubiquitous and diverse family of mayflies. Rheophilic, scraper mayflies found over a broad longitudinal range in montane and foothill rivers and streams.
Nemouridae (stonefly) taxa	Common, ubiquitous, and diverse family of stoneflies. Broadly distributed along river systems with peak diversity in small, forested streams.
Rhyacophilidae (caddisfly) taxa	Common, ubiquitous and very diverse family of caddisflies. Primarily predators. Broadly distributed along river systems with peak diversity in small to mid-size, cool/cold montane streams.
Hydropsychidae (caddisfly) taxa	Common, ubiquitous, and diverse family of net spinning caddisflies.
Elmidae (riffle beetle) taxa	Common, ubiquitous, and diverse family of aquatic beetles.
FEEDING GROUPS	Functional feeding groups based on the mechanism by which taxa feed. Modified from Merritt et al. 2008.
Predator taxa	Taxa that are primarily predators, consuming living animal tissue by engulfing prey or piercing prey tissues and sucking fluids. Excluding parasites.
Parasite taxa	External parasites of invertebrates (e.g. Acari or mites), or internal parasites (e.g. Nemata or roundworms).
Collector-gatherer taxa	Utilize mouthparts and other structures to "gather" fine particulate organic matter (FPOM) that is mostly detritus but may include algae, bacteria, small animals, etc.
Collector-filterer taxa	Utilize nets, mothparts or other structures to capture and consume FPOM suspended in the water column. FPOM may include algae, bacteria, small animals, etc.
Collector (total) taxa	Sum of the collector-gatherer and collector-filterer.
Piercer herbivore taxa	Also called Macrophyte piercers. Pierce living tissue of aquatic macrophytes and suck fluids, e.g. some Hydroptilidae.
Macrophyte herbivore taxa	Chewers and miners of living macrophytes. Considered a subclass of shredders in Merritt et al. 2008.
Shredder taxa	Consume (chew) coarse particulate organic matter (CPOM) such as decaying leaves and wood.
Scraper taxa	"Scrape" periphyton (attached algae) and associated material from hard surfaces.
Omnivore taxa	Taxa exhibiting multiple feeding mechanisms (above), with no one mechanism clearly dominant.
Unknown taxa	No information available on how and what taxon feeds on.
HABIT	Mode of existence.
Skater taxa	Adapted for "skating" on the wayter surface. Generally excluded from benthic data sets.
Planktonic taxa	Inhabit the water column in lentic water or slow moving streams. Generally excluded from benthic data sets.
Diver taxa	Swim in the water column and along the benthos, but return to the water surface to obtain oxygen. Gnerally excluded from benthic data sets.
Swimmer taxa	Exhibit fishlike swimming in lotic or lentic waters, but return to the benthos between bursts of swimming. Included in benthic data sets.
Clinger taxa	Taxa that have behavioral (e.g. net spinners) or morphological adaptations (e.g. claws) to attach to hard substrates in faster water current.
Sprawler taxa	Found on the surface of fine sediments or floating leaves of macrophytes.
Climber taxa	Found on leaves and stems of aquatic macrophytes or submerged branches and roots.
Burrower taxa	Burrow into fine sediments or tunnel into plant stems, leaves or roots (miners)
Unknowns taxa	Not able to classify as above.
STATE OF CALIFORNIA DESIGNATIONS	Traits coding according to CAMLnet January 27, 2003. List of California macroinvertebrate taxa and standard taxonomic effort.
CA % Sensitive EPT	Ephemeroptera, Plecoptera and Trichoptera with California Tolerance Value (CTV) of 0-2 on a 0-10 scaling.
CA % Intolerant individuals	All invertebrates with a CTV of 0-2 on a 0-10 scaling.
CA % Tolerant individuals	All invertebrates with a CTV of 8-10 on a 0-10 scaling.
CA weighted tolerance value	Calculates the Hilsenhoff Biotic Index using the California Toilerance Values (CTV)
CA % Predators	Primary designation of predator as classed by CA.
CA % Collector-gatherers	Primary designation of gatherer as classed by collector-gatherer by CA.
CA % Filterers	Primary designation of fileter as classed by collector-filterer by CA.
CA % Scrapers	Primary designation of scraper as classed by CA.
CA % Shredders	Primary designation of shredder as classed by CA.
BIOTIC CONDITION INDEX	
CTQa- Community Tolerance Quotient actual	
$CTQa = \sum_{i=1}^{S} \frac{TQ_i}{S}$	S is the number of taxa. TQ_i is the BCI TV (tolerance value) from the Traits sheet. A BCI TV of 110 indicates a taxa that is exluded from the calculation.

CTQd-Community Tolerance Quotient dominance
$$CTQd = \sum_{i=1}^{S} (TQ_i \cdot \log(n_i)) \Big/ \sum_{i=1}^{S} \log(n_i)$$
SIZE CLASS
0-2.75 mm abundance
3-4.75 mm abundance
5-6.75 mm abundance
7-8.75 mm abundance
9-10.75 mm abundance
11-15 mm abundance
16-20 mm abundance
>20 mm abundance
0-2.75 mm biomass (mg)
3-4.75 mm biomass (mg)
5-6.75 mm biomass (mg)
7-8.75 mm biomass (mg)
9-10.75 mm biomass (mg)
11-15 mm biomass (mg)
16-20 mm biomass (mg)
>20 mm biomass (mg)

TQ_i and S as above.
n_i is the abundance of taxa i.

Waterbody	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River
Station	1	1	2	2	3	3	4	4	5	5	6	6	7	7
Date	2018-10-04	2018-10-04	2018-10-03	2018-10-03	2018-10-05	2018-10-05	2018-10-04	2018-10-04	2018-10-05	2018-10-05	2018-10-04	2018-10-04	2018-10-05	2018-10-05
Replicate	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Subsample count	528	570	513	527	539	524	523	532	453	501	545	502	536	506
Subsample correction factor to full sample	15	26.67	45.45	60	17.14	20	17.14	18.07	30	40	10.91	17.14	15	22.56
Area correction factor to square meter	1.345	1.345	1.345	1.345	1.345	1.345	1.345	1.345	1.345	1.345	1.345	1.345	1.345	1.345
Bray Curtis similarity (%)	63.26	63.26	72.48	72.48	76.45	76.45	82.53	82.53	72.23	72.23	66.87	66.87	78.30	78.30
SUMMARY METRICS														
Total taxa richness	45	43	50	59	57	48	47	47	33	33	45	42	44	41
Total abundance	10539.42	20446.56	30941.32	41576.64	12295.48	13993.38	11926.63	12860.93	18161.53	26796.43	7943.99	11529.34	10738.48	15150.67
EPT taxa richness	21	21	24	26	22	18	11	13	5	6	15	11	13	13
EPT abundance	4324.18	10079.79	12416.17	11713.6	2750.07	3314.08	3022.67	3576.75	283.8	538	1076.58	1659.84	4540.72	5407.81
Hilsenhoff Biotic Index (WY DEQ version)	4.06	3.92	4.27	4.21	4.08	4.24	4.71	4.67	5.95	6.39	5.17	5.5	5.19	5.25
DOMINANCE AND DIVERSITY														
% Dominant taxa	17.99	16.14	16.79	18.63	20.06	18.07	19.33	19.84	36.21	19.07	22.72	17	30.44	24.03
% Subdominant taxa	9.19	11.05	10.27	12.03	16.31	11.34	11.02	10.02	20.88	18.67	12.56	14	16.35	13.82
% Top 3 taxa	35.8	37.02	36.95	41.54	47.06	40.37	41.36	37.8	66.43	56.02	46.36	39.79	55.24	49.47
% Top 5 taxa	49	50.35	52.55	59.01	59.44	53.06	57.02	51.97	79.32	77.9	59.66	54.59	68.76	61.08
% Top 10 taxa	72.36	69.65	75.27	78.42	74.81	69.78	80.8	75.4	90.87	89.75	77.03	78.78	80.6	78.71
Shannon-Weaver Diversity (loge)	3	3.07	2.97	2.89	2.93	3.03	2.83	2.95	2.17	2.39	2.82	2.86	2.59	2.71
Shannon-Weaver Diversity (log2)	4.33	4.44	4.28	4.17	4.23	4.37	4.09	4.25	3.13	3.44	4.07	4.13	3.74	3.91
Shannon Evenness Index	0.79	0.82	0.76	0.71	0.73	0.78	0.74	0.77	0.62	0.68	0.74	0.77	0.69	0.73
TOLERANT AND INTOLERANT TAXA														
Total tolerant taxa richness	10	7	12	15	15	14	14	11	11	12	14	14	16	14
Total tolerant abundance	3350.39	4734.99	6786.8	10169.55	3688.53	4357.8	2354.13	2138.77	7425.74	14367.29	1819.57	4587.61	1858.79	3037.01
% Total tolerant by abundance	31.79	23.16	21.93	24.46	30	31.14	19.74	16.63	40.89	53.62	22.9	39.79	17.31	20.05
Highly tolerant taxa richness	0	0	0	0	1	1	1	0	2	2	1	1	1	1
Highly tolerant abundance	0	0	0	0	161.37	349.7	46.11	0	1210.5	4897.15	264.13	1613.73	161.4	303.43
% Highly tolerant by abundance	0	0	0	0	1.312	2.499	0.3866	0	6.665	18.28	3.325	14	1.503	2.003
Moderately tolerant taxa richness	10	7	12	15	14	13	13	11	9	10	13	13	15	13
Moderately tolerant abundance	3350.39	4734.99	6786.8	10169.55	3527.15	4008.1	2308.02	2138.77	6215.24	9470.14	1555.44	2973.88	1697.39	2733.58
% Moderately tolerant by abundance	31.79	23.16	21.93	24.46	28.69	28.64	19.35	16.63	34.22	35.34	19.58	25.79	15.81	18.04
Total intolerant taxa richness	2	3	1	1	2	1	1	1	0	0	0	0	0	0
Total intolerant abundance	342.97	466.32	2384.08	7747.2	2512.81	1587.1	46.11	24.3	0	0	0	0	0	0
% Total intolerant by abundance	3.254	2.281	7.705	18.63	20.44	11.34	0.3866	0.189	0	0	0	0	0	0
Highly intolerant taxa richness	1	1	0	0	1	0	0	0	0	0	0	0	0	0
Highly intolerant abundance	80.7	35.87	0	0	46.11	0	0	0	0	0	0	0	0	0
% Highly intolerant by abundance	0.7657	0.1754	0	0	0.375	0	0	0	0	0	0	0	0	0
Moderately intolerant taxa richness	1	2	1	1	1	1	1	1	0	0	0	0	0	0
Moderately intolerant abundance	262.27	430.45	2384.08	7747.2	2466.7	1587.1	46.11	24.3	0	0	0	0	0	0
% Moderately intolerant by abundance	2.489	2.105	7.705	18.63	20.06	11.34	0.3866	0.189	0	0	0	0	0	0
VOLTINISM (length of life cycle)														
TAXA RICHNESS														
Semivoltine (> 1 year life cycle) taxa richness	9	8	8	9	7	5	10	9	4	4	6	5	7	7
Univoltine (1 year life cycle) taxa richness	15	16	19	21	22	18	11	11	7	8	16	11	12	9
Multivoltine (< 1 year life cycle) taxa richness	21	19	23	29	28	25	26	27	22	21	23	26	25	25
ABUNDANCE														
Semivoltine (> 1 year life cycle) abundance	2224.63	3622.99	3795.46	5818.47	2169.7	2287.84	1573	1460.94	4117.05	5864.2	456.24	1015.69	850.04	763.96
Univoltine (1 year life cycle) abundance	3795.59	10295.02	15469.99	16712.97	4777.41	5922.03	4498.08	4886.48	8435.84	8612.03	3628.5	4150.94	3956.99	5434.12
Multivoltine (< 1 year life cycle) abundance	4519.2	6528.55	11675.88	19045.2	5348.37	5783.5	5855.54	6513.51	5608.65	12320.2	3859.25	6362.71	5931.45	8952.59
PERCENTAGE BY ABUNDANCE														
% Semivoltine (> 1 year life cycle) by abundance	21.11	17.72	12.27	13.99	17.65	16.35	13.19	11.36	22.67	21.88	5.743	8.81	7.916	5.042
% Univoltine (1 year life cycle) by abundance	36.01	50.35	50	40.2	38.86	42.32	37.71	37.99	46.45	32.14	45.68	36	36.85	35.87
% Multivoltine (< 1 year life cycle) by abundance	42.88	31.93	37.74	45.81	43.5	41.33	49.1	50.65	30.88	45.98	48.58	55.19	55.24	59.09
GROWTH AND DEVELOPMENT														
% Fast seasonal life cycle by abundance	30.82	29.12	33.19	41.73	43.88	35.18	48.9	51.4	14.66	12.45	41.56	31.39	51.85	52.27
% Slow seasonal life cycle by abundance	45.04	51.4	53.96	43.51	41.85	50.97	38.14	39.52	83.34	84.94	53.08	61.4	39.88	42.11
% Nonseasonal life cycle by abundance	24.14	19.47	12.85	14.76	14.26	13.85	12.96	9.081	2	2.61	5.357	7.21	8.267	5.617
OCCURRENCE IN DRIFT														
% Rare in drift by abundance	23.79	27.72	33.81	23.52	40.92	42.52	29.05	32.71	74.89	64.86	43.46	47.41	29.92	31.5
% Common in drift by abundance	48.46	49.3	35.97	36.5	26.46	30.37	25.72	23.25	10.67	22.89	17.75	27.39	19.54	17.63
% Abundant in drift by abundance	27.76	22.98	30.23	39.98	32.62	27.1	45.23	44.03	14.44	12.25	38.79	25.19	50.54	50.87
SIZE AT MATURITY														
TAXA RICHNESS														
Small size at maturity taxa richness	21	18	23	28	28	25	28	30	23	22	24	26	26	22
Medium size at maturity taxa richness	16	18	19	22	24	18	14	12	9	10	17	15	13	14
Large size at maturity taxa richness	8	7	8	9	5	5	5	5	1	1	4	1	5	5
ABUNDANCE														
Small size at maturity abundance	5749.88	8429.72	14549	24129.3	6270.5	6940.2	7284.84	7582.89	7384.05	10491	3859.25	5002.57	6497.69	8708.5
Medium size at maturity abundance	4560.89	11227.67	15836.77	17195.83	5536.83	6671.2	4568.59	4959.39	10776.14	16144.03	4038.03	6319.29	4158.74	6406.45
Large size at maturity abundance	228.65	789.17	555.55	251.52	488.15	381.98	73.19	318.64	1.34	161.4	46.71	207.48	82.05	35.72
PERCENTAGE BY ABUNDANCE														
% Small size at maturity by abundance	54.56	41.23	47.02	58.04	51	49.6	61.08	58.96	40.66	39.15	48.58	43.39	60.51	57.48
% Medium size at maturity by abundance	43.27	54.91	51.18	41.36	45.03	47.67	38.31	38.56	59.33	60.25	50.83	54.81	38.73	42.28
% Large size at maturity by abundance	2.169	3.86	1.796	0.6049	3.97	2.73	0.6137	2.478	0.007406	0.6023	0.588	1.8	0.764	0.2358
RHEOPHILY AND HABITAT AFFINITY														
% Depositional only by abundance	0.1914	0	0.3951	0.1941	0.5625	0.5767	1.171	0.378	0.4443	0	0.5542	0.3999	1.691	0.8011
% Depositional and erosional by abundance	75.47	70.7	75.88	82.91	93.24	92.1	94.76	97.15	98.22	99	92.21	97	88.35	87.96

Waterbody	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River
Station	1	1	2	2	3	3	4	4	5	5	6	6	7	7
Date	2018-10-04	2018-10-04	2018-10-03	2018-10-03	2018-10-05	2018-10-05	2018-10-04	2018-10-04	2018-10-05	2018-10-05	2018-10-04	2018-10-04	2018-10-05	2018-10-05
Replicate	A	B	A	B	A	B	A	B	A	B	A	B	A	B
% Erosional by abundance	24.34	29.3	23.73	16.9	6.198	7.324	4.07	2.467	1.333	1.004	7.238	2.599	9.957	11.24
THERMAL PREFERENCE														
% Cold stenothermal and cool eurythermal by abundance	3.446	3.158	8.693	18.63	22.12	12.5	0.3866	0.378	0	0	0.3694	0.2	0	0
% Cool/warm eurythermal by abundance	96.55	96.84	91.31	81.37	76.56	85.01	99.22	99.62	93.33	81.72	96.31	85.8	98.5	98
% Warm eurythermal by abundance	0	0	0	0	1.312	2.499	0.3979	0	6.673	18.28	3.325	14	1.503	2.003
NON-INSECT AND INSECT ORDERS														
TAXA RICHNESS														
Non-insect invertebrates taxa richness	8	6	8	12	13	12	14	12	15	14	12	14	12	9
Ephemeroptera (mayflies) taxa richness	7	6	7	10	9	6	3	4	2	3	6	3	5	4
Odonata (damsel- and dragonflies) taxa richness	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plecoptera (stoneflies) taxa richness	8	8	5	5	5	3	3	4	1	0	2	0	3	4
Hemiptera (true bugs taxa richness	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Megaloptera (alderflies and hellgramites) taxa richness	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Trichoptera (caddisflies) taxa richness	6	7	12	11	8	9	5	5	2	3	7	8	5	5
Lepidoptera (moths) taxa richness	0	0	1	1	1	1	1	0	0	0	0	1	0	0
Coleoptera (beetles) taxa richness	3	3	3	3	3	3	3	3	1	1	4	3	2	2
Diptera (total)(true flies) taxa richness	13	13	14	17	18	14	18	19	12	12	13	14	17	17
Chironomidae (midges) taxa richness	11	13	12	15	16	13	14	17	10	11	11	12	15	15
Chironomidae (midges -Nostoc midge) taxa richness	10	12	11	14	15	12	13	16	10	11	11	12	15	15
ABUNDANCE														
Non-insect invertebrates abundance	1554.82	3192.53	7152.24	7024.93	3434.94	4653.7	2261.91	2673.46	15053.24	22653.83	3463.05	6248.79	3211.86	4887.95
Ephemeroptera (mayflies) abundance	1736.39	3084.92	4465.2	4602.59	1063.14	1156.7	1705.94	1725.59	161.4	322.8	442.91	438.01	3591.15	4128.02
Odonata (damsel- and dragonflies) abundance	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plecoptera (stoneflies) abundance	328.18	1255.49	186.08	86.08	71.85	4.04	25.74	28.34	1.34	0	16.02	0	60.53	34.38
Hemiptera (true bugs abundance	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Megaloptera (alderflies and hellgramites) abundance	0	0	0	0	0	0	1.34	0	0	0	0	0	0	0
Trichoptera (caddisflies) abundance	2259.6	5739.38	7764.89	7024.93	1615.08	2153.34	1290.98	1822.81	121.05	215.2	617.65	1221.82	889.04	1245.42
Lepidoptera (moths) abundance	0	0	1.34	564.9	23.05	26.9	0	0	0	0	14.67	0	0	0
Coleoptera (beetles) abundance	2017.5	2833.82	3424.64	5810.4	1661.18	1909.9	1452.36	1069.38	282.45	430.4	425.54	785.16	786.83	728.24
Diptera (total)(true flies) abundance	2642.93	4340.41	7946.93	16462.8	4426.23	4088.8	5188.34	5541.35	2542.05	3174.2	2964.14	2835.56	2199.07	4126.68
Chironomidae (midges) abundance	2400.82	4340.41	7763.54	16059.3	3872.95	3712.2	4772.03	5395.52	2380.65	3012.8	2758.7	2766.4	1936.8	3519.81
Chironomidae (midges -Nostoc midge) abundance	2138.55	3981.7	5379.46	8312.1	1406.25	2125.1	4725.93	5371.22	2380.65	3012.8	2758.7	2766.4	1936.8	3519.81
PERCENTAGE BY ABUNDANCE														
% Non-insect invertebrates by abundance	14.75	15.61	23.12	16.9	27.94	33.26	18.97	20.79	82.89	84.54	43.59	54.2	29.91	32.26
% Ephemeroptera (mayflies) by abundance	16.48	15.09	14.43	11.07	8.647	8.266	14.3	13.42	0.8887	1.205	5.575	3.799	33.44	27.25
% Odonata (damsel- and dragonflies) by abundance	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Plecoptera (stoneflies) by abundance	3.114	6.14	0.6014	0.207	0.5844	0.02884	0.2158	0.2204	0.007406	0	0.2016	0	0.5636	0.2269
% Hemiptera (true bugs by abundance	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Megaloptera (alderflies and hellgramites) by abundance	0	0	0	0	0	0	0.01128	0	0	0	0	0	0	0
% Trichoptera (caddisflies) by abundance	21.44	28.07	25.1	16.9	13.14	15.39	10.82	14.17	0.6665	0.8031	7.775	10.6	8.279	8.22
% Lepidoptera (moths) by abundance	0	0	0.004347	1.359	0.1875	0.1922	0	0	0	0	0.1847	0	0	0
% Coleoptera (beetles) by abundance	19.14	13.86	11.07	13.98	13.51	13.65	12.18	8.315	1.555	1.606	5.357	6.81	7.327	4.807
% Diptera (total)(true flies) by abundance	25.08	21.23	25.68	39.6	36	29.22	43.5	43.09	14	11.85	37.31	24.59	20.48	27.24
% Chironomidae (midges) by abundance	22.78	21.23	25.09	38.63	31.5	26.53	40.01	41.95	13.11	11.24	34.73	23.99	18.04	23.23
% Chironomidae (midges -Nostoc midge) by abundance	20.29	19.47	17.39	19.99	11.44	15.19	39.63	41.76	13.11	11.24	34.73	23.99	18.04	23.23
FAMILIES AND GROUPS														
TAXA RICHNESS														
Oligochaeta (segmented worms) taxa richness	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Mollusca (snails and bivalves) taxa richness	1	1	1	2	2	2	4	3	6	7	2	4	4	3
Crustacea taxa richness	0	0	0	2	1	2	1	1	2	2	2	2	2	2
Acari (mites) taxa richness	4	2	3	4	6	4	5	4	4	2	4	5	2	1
Baetidae (mayfly) taxa richness	2	2	2	3	2	2	2	2	1	2	2	2	2	2
Baetis tricaudatus complex (mayfly) taxa richness	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Ephemerellidae (mayfly) taxa richness	3	2	3	3	3	1	1	2	1	1	3	1	2	2
Heptageniidae (mayfly) taxa richness	2	2	2	3	3	2	0	0	0	0	1	0	0	0
Leptohyphidae (mayfly) taxa richness	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leptophlebiidae (mayfly) taxa richness	0	0	0	1	1	1	0	0	0	0	0	0	1	0
Chloroperlidae (mayfly) taxa richness	1	1	0	0	1	0	0	1	0	0	0	0	0	1
Nemouridae (stonefly) taxa richness	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Perlidae (stonefly) taxa richness	3	2	2	2	1	1	2	2	0	0	1	0	2	3
Perlodidae (stonefly) taxa richness	3	3	2	2	2	2	0	0	0	0	0	0	0	0
Peltoperlidae (stonefly) taxa richness	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pteronarcyidae (stonefly) taxa richness	1	1	1	1	1	0	1	1	1	0	1	0	1	0
Brachycentridae (caddisfly) taxa richness	1	2	1	2	2	2	1	0	1	1	2	2	1	1
Glossosomatidae (caddisfly) taxa richness	1	1	1	1	1	1	1	1	1	0	0	1	1	1
Hydropsychidae (caddisfly) taxa richness	1	2	2	2	1	1	1	1	0	1	1	1	1	1
Lepidostomatidae (caddisfly) taxa richness	1	1	2	1	2	2	1	2	0	0	2	2	1	1
Limnephilidae (caddisfly) taxa richness	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Philopotamidae (caddisfly) taxa richness	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhyacophilidae (caddisfly) taxa richness	0	0	2	3	0	1	0	0	0	0	0	0	0	0
Uenoidae (caddisfly) taxa richness	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elmidae (riffle beetle) taxa richness	3	3	3	3	3	3	3	3	1	1	3	3	2	2
Empididae (dance fly) taxa richness	1	0	1	1	2	1	1	1	0	0	1	1	1	1
Athericidae (higher flies) taxa richness	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Simuliidae (black fly) taxa richness	1	0	1	1	0	0	1	1	1	1	1	1	1	1
Tipulidae (crane fly) taxa richness	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Waterbody	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River
Station	1	1	2	2	3	3	4	4	5	5	6	6	7	7
Date	2018-10-04	2018-10-04	2018-10-03	2018-10-03	2018-10-05	2018-10-05	2018-10-04	2018-10-04	2018-10-05	2018-10-05	2018-10-04	2018-10-04	2018-10-05	2018-10-05
Replicate	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Chironomidae: Chironominae taxa richness	2	2	2	4	3	3	5	2	2	1	1	4	4	3
Tanytarsini taxa richness	1	1	1	3	1	2	2	1	0	0	0	2	1	1
Chironomidae: Diamesinae taxa richness	1	2	1	1	2	1	1	2	0	0	1	0	0	0
Chironomidae: Orthocladiinae taxa richness	7	8	8	9	10	8	7	11	7	8	8	7	10	11
Chironomidae: Prodiamesinae taxa richness	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chironomidae: Tanypodinae taxa richness	0	0	0	0	0	0	0	1	0	1	0	0	0	0
Cricotopus (Nostococladius) taxa richness	1	1	1	1	1	1	1	1	0	0	0	0	0	0
ABUNDANCE														
Oligochaeta (segmented worms) abundance	685.95	1721.82	5196.07	5003.4	2005.64	2528.6	1014.35	1020.77	6577.05	5111	1804.9	1959.53	1755.22	2093.68
Mollusca (snails and bivalves) abundance	1.34	71.74	305.65	2.69	622.44	726.3	94.9	364.56	5046.44	10386.09	293.48	1845.61	165.44	306.12
Crustacea abundance	0	0	0	82.05	46.11	215.2	92.21	267.35	1250.85	3497	264.13	1498.46	60.53	546.18
Acari (mites) abundance	827.17	932.65	1222.61	1210.5	507.17	968.4	161.37	267.35	443.85	430.4	161.41	230.53	141.23	151.72
Baetidae (mayfly) abundance	504.38	430.45	1650.52	564.9	161.37	107.6	391.91	413.17	121.05	161.4	190.76	138.32	3288.53	3732.21
Baetis tricaudatus complex (mayfly) abundance	464.02	358.71	1528.26	403.5	138.32	80.7	299.69	194.43	121.05	107.6	132.07	115.27	3268.35	3641.18
Ephemerellidae (mayfly) abundance	1030.27	2116.4	2447.9	3713.55	532.92	860.8	1314.04	1312.42	40.35	161.4	237.47	299.69	282.45	395.81
Heptageniidae (mayfly) abundance	201.75	538.07	366.78	243.45	322.75	161.4	0	0	0	0	14.67	0	0	0
Leptohyphidae (mayfly) abundance	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leptophlebiidae (mayfly) abundance	0	0	0	80.7	46.11	26.9	0	0	0	0	0	0	20.18	0
Chloroperlidae (mayfly) abundance	100.88	358.71	0	0	23.05	0	0	1.34	0	0	0	0	0	1.34
Nemouridae (stonefly) abundance	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Perlidae (stonefly) abundance	103.56	322.84	62.48	2.69	23.05	1.34	24.4	25.65	0	0	1.34	0	40.35	33.03
Perlodidae (stonefly) abundance	122.4	466.32	122.26	82.05	24.4	2.69	0	0	0	0	0	0	0	0
Peltoperlidae (stonefly) abundance	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pteronarcyidae (stonefly) abundance	1.34	35.87	1.34	1.34	1.34	0	1.34	1.34	1.34	0	14.67	0	20.18	0
Brachycentridae (caddisfly) abundance	706.12	1004.39	3056.51	2259.6	322.75	995.3	23.05	0	80.7	53.8	74.71	115.27	20.18	30.34
Glossosomatidae (caddisfly) abundance	524.55	789.17	183.39	161.4	69.16	26.9	23.05	24.3	40.35	0	0	23.05	80.7	91.03
Hydropsychidae (caddisfly) abundance	907.88	3336.02	3484.42	3792.9	138.32	107.6	92.21	170.13	0	53.8	278.81	184.43	685.95	1001.33
Lepidostomatidae (caddisfly) abundance	80.7	573.94	427.91	322.8	1014.35	941.5	299.69	753.43	0	0	161.41	714.65	100.88	121.37
Limnephilidae (caddisfly) abundance	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Philopotamidae (caddisfly) abundance	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhyacophilidae (caddisfly) abundance	0	0	123.61	164.09	0	1.34	0	0	0	0	0	0	0	0
Uenoidae (caddisfly) abundance	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elmidae (riffle beetle) abundance	2017.5	2833.82	3424.64	5810.4	1661.18	1909.9	1452.36	1069.38	282.45	430.4	410.87	785.16	786.83	728.24
Empididae (dance fly) abundance	181.58	0	122.26	322.8	553.28	376.6	46.11	72.91	0	0	14.67	46.11	40.35	60.69
Athericidae (higher flies) abundance	0	0	0	0	0	0	1.34	0	0	0	0	0	0	0
Simuliidae (black fly) abundance	60.53	0	61.13	80.7	0	0	322.75	72.91	121.05	161.4	190.76	23.05	221.93	546.18
Tipulidae (crane fly) abundance	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chironomidae: Chironominae abundance	887.7	1398.97	550.17	484.2	92.21	538	368.85	413.17	524.55	591.8	176.09	92.21	443.85	546.18
Tanytarsini abundance	685.95	1004.39	427.91	403.5	23.05	215.2	161.37	121.52	0	0	0	46.11	60.53	60.69
Chironomidae: Diamesinae abundance	80.7	71.74	122.26	80.7	69.16	26.9	115.27	291.65	0	0	14.67	0	0	0
Chironomidae: Orthocladiinae abundance	1311.38	2403.37	6602.07	14364.6	3573.26	2878.3	3757.69	3791.45	1694.7	2259.6	2318.48	2466.7	1291.2	2215.05
Chironomidae: Prodiamesinae abundance	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chironomidae: Tanypodinae abundance	0	0	0	0	0	0	0	24.3	0	53.8	0	0	0	0
Cricotopus (Nostococladius) abundance	262.27	358.71	2384.08	7747.2	2466.7	1587.1	46.11	24.3	0	0	0	0	0	0
PERCENTAGE BY ABUNDANCE														
% Oligochaeta (segmented worms) by abundance	6.508	8.421	16.79	12.03	16.31	18.07	8.505	7.937	36.21	19.07	22.72	17	16.35	13.82
% Mollusca (snails and bivalves) by abundance	0.01276	0.3509	0.9878	0.00647	5.062	5.19	0.7957	2.835	27.79	38.76	3.694	16.01	1.541	2.021
% Crustacea by abundance	0	0	0	0.1973	0.375	1.538	0.7732	2.079	6.887	13.05	3.325	13	0.5636	3.605
% Acari (mites) by abundance	7.848	4.561	3.951	2.911	4.125	6.92	1.353	2.079	2.444	1.606	2.032	2	1.315	1.001
% Baetidae (mayfly) by abundance	4.786	2.105	5.334	1.359	1.312	0.7689	3.286	3.213	0.6665	0.6023	2.401	1.2	30.62	24.63
% Baetis tricaudatus complex (mayfly) by abundance	4.403	1.754	4.939	0.9705	1.125	0.5767	2.513	1.512	0.6665	0.4015	1.662	0.9998	30.44	24.03
% Ephemerellidae (mayfly) by abundance	9.775	10.35	7.911	8.932	4.334	6.151	11.02	10.2	0.2222	0.6023	2.989	2.599	2.63	2.612
% Heptageniidae (mayfly) by abundance	1.914	2.632	1.185	0.5855	2.625	1.153	0	0	0	0	0.1847	0	0	0
% Leptohyphidae (mayfly) by abundance	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Leptophlebiidae (mayfly) by abundance	0	0	0	0.1941	0.375	0.1922	0	0	0	0	0	0	0.1879	0
% Chloroperlidae (mayfly) by abundance	0.9571	1.754	0	0	0.1875	0	0	0.01046	0	0	0	0	0	0.008877
% Nemouridae (stonefly) by abundance	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Perlidae (stonefly) by abundance	0.9826	1.579	0.2019	0.00647	0.1875	0.009612	0.2046	0.1994	0	0	0.01693	0	0.3758	0.218
% Perlodidae (stonefly) by abundance	1.161	2.281	0.3951	0.1973	0.1984	0.01922	0	0	0	0	0	0	0	0
% Peltoperlidae (stonefly) by abundance	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Pteronarcyidae (stonefly) by abundance	0.01276	0.1754	0.004347	0.003235	0.01094	0	0.01128	0.01046	0.007406	0	0.1847	0	0.1879	0
% Brachycentridae (caddisfly) by abundance	6.7	4.912	9.878	5.435	2.625	7.113	0.1933	0	0.4443	0.2008	0.9405	0.9998	0.1879	0.2003
% Glossosomatidae (caddisfly) by abundance	4.977	3.86	0.5927	0.3882	0.5625	0.1922	0.1933	0.189	0.2222	0	0	0.2	0.7515	0.6008
% Hydropsychidae (caddisfly) by abundance	8.614	16.32	11.26	9.123	1.125	0.7689	0.7732	1.323	0	0.2008	3.51	1.6	6.388	6.609
% Lepidostomatidae (caddisfly) by abundance	0.7657	2.807	1.383	0.7764	8.25	6.728	2.513	5.858	0	0	2.032	6.199	0.9394	0.8011
% Limnephilidae (caddisfly) by abundance	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Philopotamidae (caddisfly) by abundance	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Rhyacophilidae (caddisfly) by abundance	0	0	0.3995	0.3947	0	0.009612	0	0	0	0	0	0	0	0
% Uenoidae (caddisfly) by abundance	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Elmidae (riffle beetle) by abundance	19.14	13.86	11.07	13.98	13.51	13.65	12.18	8.315	1.555	1.606	5.172	6.81	7.327	4.807
% Empididae (dance fly) by abundance	1.723	0	0.3951	0.7764	4.5	2.691	0.3866	0.5669	0	0	0.1847	0.3999	0.3758	0.4006
% Athericidae (higher flies) by abundance	0	0	0	0	0	0	0.01128	0	0	0	0	0	0	0
% Simuliidae (black fly) by abundance	0.5743	0	0.1976	0.1941	0	0	2.706	0.5669	0.6665	0.6023	2.401	0.2	2.067	3.605
% Tipulidae (crane fly) by abundance	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Chironomidae: Chironominae by abundance	8.423	6.842	1.778	1.165	0.75	3.845	3.093	3.213	2.888	2.209	2.217	0.7998	4.133	3.605
% Tanytarsini by abundance	6.508	4.912	1.383	0.9705	0.1875	1.538	1.353	0.9449	0	0	0	0.3999	0.5636	0.4006

Waterbody	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River
Station	1	1	2	2	3	3	4	4	5	5	6	6	7	7
Date	2018-10-04	2018-10-04	2018-10-03	2018-10-03	2018-10-05	2018-10-05	2018-10-04	2018-10-04	2018-10-05	2018-10-05	2018-10-04	2018-10-04	2018-10-05	2018-10-05
Replicate	A	B	A	B	A	B	A	B	A	B	A	B	A	B
% Chironomidae: Diamesinae by abundance	0.7657	0.3509	0.3951	0.1941	0.5625	0.1922	0.9665	2.268	0	0	0.1847	0	0	0
% Chironomidae: Orthocladiinae by abundance	12.44	11.75	21.34	34.55	29.06	20.57	31.51	29.48	9.331	8.432	29.19	21.4	12.02	14.62
% Chironomidae: Prodiamesinae by abundance	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Chironomidae: Tanypodinae by abundance	0	0	0	0	0	0	0	0.189	0	0.2008	0	0	0	0
% Cricotopus (Nostococladius) by abundance	2.489	1.754	7.705	18.63	20.06	11.34	0.3866	0.189	0	0	0	0	0	0
FEEDING GROUPS														
TAXA RICHNESS														
Predator taxa richness	10	8	10	11	9	7	7	9	1	3	5	3	7	8
Parasite taxa richness	5	3	4	5	7	5	6	5	5	2	5	6	3	2
Collector-gatherer taxa richness	19	21	20	25	28	24	20	23	16	16	23	22	24	21
Collector-filterer taxa richness	2	2	3	5	1	2	5	3	2	3	2	4	3	4
Collector (total) taxa richness	21	23	23	30	29	26	25	26	18	19	25	26	27	25
Piercer herbivore taxa richness	1	0	1	1	0	1	0	0	0	1	1	1	0	0
Macrophyte herbivore taxa richness	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Shredder taxa richness	1	2	2	1	2	1	1	2	1	0	2	1	1	0
Caddisfly shredder taxa richness	0	0	1	0	1	1	0	1	0	0	1	1	0	0
Stonefly shredder taxa richness	1	2	1	1	1	0	1	1	1	0	1	0	1	0
Wood-eating taxa richness	0	0	0	1	1	0	0	0	0	0	0	0	0	0
Scraper taxa richness	4	4	7	7	7	5	5	3	7	5	4	3	4	3
Omnivore taxa richness	2	2	2	3	2	2	2	1	1	2	2	2	2	2
Unknown feeding group taxa richness	1	1	1	1	1	1	1	1	0	0	0	0	0	0
ABUNDANCE														
Predator abundance	589.11	1363.1	798.73	1136.53	717.34	543.38	903.11	731.81	1694.7	3283.14	927.15	737.71	1190.33	2372.15
Parasite abundance	847.35	1291.36	1283.74	1452.6	668.55	1022.2	230.53	461.78	484.2	430.4	190.76	276.64	262.28	182.06
Collector-gatherer abundance	4480.19	9362.37	16263.34	19209.29	5927.39	7532	8691.09	9770.27	11096.25	16193.8	5637.49	9199.61	7143.3	9680.83
Collector-filterer abundance	968.4	3336.02	3545.55	4035	138.32	161.4	507.17	291.65	161.4	484.2	469.57	253.59	1008.75	1729.56
Collector (total) abundance	5448.6	12698.39	19808.89	23244.29	6065.71	7693.4	9198.27	10061.92	11257.65	16678	6107.05	9453.2	8152.05	11410.39
Piercer herbivore abundance	20.18	0	305.65	322.8	0	26.9	0	0	0	107.6	14.67	23.05	0	0
Macrophyte herbivore abundance	201.75	394.58	122.26	80.7	46.11	322.8	161.37	291.65	484.2	591.8	176.09	23.05	262.27	364.12
Shredder abundance	1.34	107.61	62.48	1.34	24.4	26.9	1.34	25.65	1.34	0	29.35	23.05	20.18	0
Caddisfly shredder abundance	0	0	61.13	0	23.05	26.9	0	24.3	0	0	14.67	23.05	0	0
Stonefly shredder abundance	1.34	107.61	1.34	1.34	1.34	0	1.34	1.34	1.34	0	14.67	0	20.18	0
Wood-eating taxa abundance	0	0	0	161.4	69.16	0	0	0	0	0	0	0	0	0
Scraper abundance	2461.35	3264.27	2813.34	5409.59	1592.02	1694.7	1316.73	996.47	4158.74	5490.29	396.2	716	829.87	790.27
Omnivore abundance	707.47	968.52	3362.16	2181.59	714.65	1076	69.16	267.35	80.7	215.2	102.72	276.64	21.52	31.69
Unknown feeding group abundance	262.27	358.71	2384.08	7747.2	2466.7	1587.1	46.11	24.3	0	0	0	0	0	0
PERCENTAGE BY ABUNDANCE														
% Predator by abundance	5.59	6.667	2.581	2.734	5.834	3.883	7.572	5.69	9.331	12.25	11.67	6.399	11.08	15.66
% Parasite by abundance	8.04	6.316	4.149	3.494	5.437	7.305	1.933	3.591	2.666	1.606	2.401	2.399	2.442	1.202
% Collector-gatherer by abundance	42.51	45.79	52.56	46.2	48.21	53.83	72.87	75.97	61.1	60.43	70.97	79.79	66.52	63.9
% Collector-filterer by abundance	9.188	16.32	11.46	9.705	1.125	1.153	4.252	2.268	0.8887	1.807	5.911	2.199	9.394	11.42
% Collector (total) by abundance	51.7	62.11	64.02	55.91	49.33	54.98	77.12	78.24	61.99	62.24	76.88	81.99	75.91	75.31
% Piercer herbivore by abundance	0.1914	0	0.9878	0.7764	0	0.1922	0	0	0	0.4015	0.1847	0.2	0	0
% Macrophyte herbivore by abundance	1.914	1.93	0.3951	0.1941	0.375	2.307	1.353	2.268	2.666	2.209	2.217	0.2	2.442	2.403
% Shredder by abundance	0.01276	0.5263	0.2019	0.003235	0.1984	0.1922	0.01128	0.1994	0.007406	0	0.3694	0.2	0.1879	0
% Caddisfly shredder by abundance	0	0	0.1976	0	0.1875	0.1922	0	0.189	0	0	0.1847	0.2	0	0
% Stonefly shredder by abundance	0.01276	0.5263	0.004347	0.003235	0.01094	0	0.01128	0.01046	0.007406	0	0.1847	0	0.1879	0
% Wood-eating taxa by abundance	0	0	0	0.3882	0.5625	0	0	0	0	0	0	0	0	0
% Scraper by abundance	23.35	15.96	9.092	13.01	12.95	12.11	11.04	7.748	22.9	20.49	4.987	6.21	7.728	5.216
% Omnivore by abundance	6.713	4.737	10.87	5.247	5.812	7.689	0.5799	2.079	0.4443	0.8031	1.293	2.399	0.2004	0.2092
% Unknown feeding group by abundance	2.489	1.754	7.705	18.63	20.06	11.34	0.3866	0.189	0	0	0	0	0	0
HABIT														
TAXA RICHNESS														
Skater taxa richness	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Planktonic taxa richness	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Diver taxa richness	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Swimmer taxa richness	4	2	3	5	7	6	6	5	6	4	6	7	4	3
Clinger taxa richness	25	24	31	36	28	25	23	19	16	19	24	21	23	22
Sprawler taxa richness	9	10	9	12	13	13	10	10	13	6	7	9	7	10	9
Climber taxa richness	2	2	3	2	3	3	2	3	0	0	3	3	2	2
Burrower taxa richness	5	5	4	4	6	4	6	7	5	3	3	4	5	5
Unknown habit taxa richness	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ABUNDANCE														
Skater abundance	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Planktonic abundance	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Diver abundance	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Swimmer abundance	827.17	932.65	1222.61	1291.2	553.28	1183.6	253.59	534.69	1694.7	3927.4	425.54	1729	201.75	697.89
Clinger abundance	7370.6	13810.39	17796.97	19783.6	4248.53	5735.08	6044	5226.74	8637.59	15821.24	3879.3	5466.32	7307.39	9716.55
Sprawler abundance	1050.45	1829.43	3302.38	6055.19	1592.02	1640.9	2724.32	3282.41	969.75	1560.2	1305.98	1221.82	907.88	1213.73
Climber abundance	100.88	609.81	489.04	324.15	1083.51	995.3	1152.66	1628.38	0	0	249.46	876.03	102.22	122.72
Burrower abundance	1190.32	3264.27	8130.32	14122.5	4818.14	4438.5	1752.05	2188.72	6859.5	5487.6	2083.7	2236.17	2219.25	3399.78
Unknown habit abundance	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PERCENTAGE BY ABUNDANCE														
% Skater by abundance	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Planktonic by abundance	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Diver by abundance	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Waterbody	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River
Station	1	1	2	2	3	3	4	4	5	5	6	6	7	7
Date	2018-10-04	2018-10-04	2018-10-03	2018-10-03	2018-10-05	2018-10-05	2018-10-04	2018-10-04	2018-10-05	2018-10-05	2018-10-04	2018-10-04	2018-10-05	2018-10-05
Replicate	A	B	A	B	A	B	A	B	A	B	A	B	A	B
% Swimmer by abundance	7.848	4.561	3.951	3.106	4.5	8.458	2.126	4.157	9.331	14.66	5.357	15	1.879	4.606
% Clinger by abundance	69.93	67.54	57.52	47.58	34.55	40.98	50.68	40.64	47.56	59.04	48.83	47.41	68.05	64.13
% Sprawler by abundance	9.967	8.947	10.67	14.56	12.95	11.73	22.84	25.52	5.34	5.822	16.44	10.6	8.454	8.011
% Climber by abundance	0.9571	2.982	1.581	0.7796	8.812	7.113	9.665	12.66	0	0	3.14	7.598	0.9519	0.81
% Burrower by abundance	11.29	15.96	26.28	33.97	39.19	31.72	14.69	17.02	37.77	20.48	26.23	19.4	20.67	22.44
% Unknown habit by abundance	0	0	0	0	0	0	0	0	0	0	0	0	0	0
STATE OF CALIFORNIA DESIGNATIONS														
CA % Sensitive EPT	27.25	30.7	22.15	16.72	19.37	21.57	14.13	16.47	0.8961	0.8031	6.348	9.998	5.261	4.442
CA % Intolerant individuals	30.49	31.05	30.05	35.35	40.74	31.94	16.45	19.5	1.563	1.205	7.255	11	6.388	4.442
CA % Tolerant individuals	12.83	10.7	11.26	10.87	9.187	12.69	3.093	3.213	10.22	22.49	7.573	18.4	6.576	7.019
CA weighted tolerance value	4.19	3.96	4.14	3.85	3.7	4.14	4.75	4.67	5.45	5.75	5.23	5.36	5.23	5.23
CA % Predators	13.06	12.46	6.726	6.033	11.26	11.19	9.505	9.092	12	13.86	14.06	8.798	13.34	16.85
CA % Collector-gatherers	37.34	34.91	47.82	53.19	50.47	50.17	61.66	62.17	51.54	39.35	62.12	54.6	60.87	56.89
CA % Filterers	9.188	16.32	11.46	9.705	1.125	1.153	4.252	2.268	0.8887	1.807	5.911	2.199	9.394	11.42
CA % Scrapers	25.86	20.35	14.03	16.12	21.95	19.99	12.59	10.77	29.56	39.36	9.051	22.81	9.619	7.428
CA % Shredders	0.7657	3.158	1.383	0.7764	8.25	6.728	2.513	5.858	0	0	2.032	6.199	0.9394	0.8011
BIOTIC CONDITION INDEX														
CTQa- Community Tolerance Quotient actual	74.3	73.44	76.14	77.52	78.84	80.28	86.72	87.11	95.21	101.33	83.64	92.02	86.3	84.95
CTQd-Community Tolerance Quotient dominance	80.58	74.73	83.59	87.2	83.21	86.64	91.01	91.54	99.14	102.23	90.98	92.09	90	94.06
BIOLOGICAL CONDITION GRADIENT (BCG) ATTRIBUTES														
TAXA RICHNESS														
Attribute 1 taxa richness	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Attribute 2 taxa richness	2	1	1	3	2	0	0	1	0	0	2	0	2	2
Attribute 3 taxa richness	19	20	18	17	21	18	11	13	4	4	11	9	10	10
Attribute 4 taxa richness	23	21	29	35	32	27	33	32	25	25	29	29	28	27
Attribute 5 taxa richness	1	1	2	3	2	3	2	1	3	3	3	3	3	2
Attribute 6 taxa richness	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown attribute taxa richness	0	0	0	1	0	0	1	0	1	1	0	1	1	0
% TAXA RICHNESS BY ATTRIBUTE OF TOTAL RICHNESS														
Attribute 1 % of total taxa richness	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Attribute 2 % of total taxa richness	4.444	2.326	2	5.085	3.509	0	0	2.128	0	0	4.444	0	4.545	4.878
Attribute 3 % of total taxa richness	42.22	46.51	36	28.81	36.84	37.5	23.4	27.66	12.12	12.12	24.44	21.43	22.73	24.39
Attribute 4 % of total taxa richness	51.11	48.84	58	59.32	56.14	56.25	70.21	68.09	75.76	75.76	64.44	69.05	63.64	65.85
Attribute 5 % of total taxa richness	2.222	2.326	4	5.085	3.509	6.25	4.255	2.128	9.091	9.091	6.667	7.143	6.818	4.878
Attribute 6 % of total taxa richness	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown attribute % of total taxa richness	0	0	0	1.695	0	0	2.128	0	3.03	3.03	0	2.381	2.273	0
ABUNDANCE														
Attribute 1 abundance	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Attribute 2 abundance	161.4	107.61	1.34	83.39	2.69	0	0	24.3	0	0	2.69	0	40.35	2.69
Attribute 3 abundance	2488.25	5488.29	8624.75	14130.57	5075.76	4874.28	3022.67	3819.79	525.89	807	1411.39	1729	625.43	821.96
Attribute 4 abundance	7869.6	14814.78	21948.45	27038.53	7032.6	8688.7	8810.4	8992.54	15253.64	18454.74	6089.69	7655.04	9829.26	13506.76
Attribute 5 abundance	20.18	35.87	366.78	322.8	184.43	430.4	92.21	24.3	2380.65	7533.35	440.22	2143.96	242.1	819.27
Attribute 6 abundance	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown attribute abundance	0	0	0	1.34	0	0	1.34	0	1.34	1.34	0	1.34	1.34	0
PERCENTAGE BY ABUNDANCE														
% Attribute 1 by abundance	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Attribute 2 by abundance	1.531	0.5263	0.004347	0.2006	0.02188	0	0	0.189	0	0	0.03386	0	0.3758	0.01775
% Attribute 3 by abundance	23.61	26.84	27.87	33.99	41.28	34.83	25.34	29.7	2.896	3.012	17.77	15	5.824	5.425
% Attribute 4 by abundance	74.67	72.46	70.94	65.03	57.2	62.09	73.87	69.92	83.99	68.87	76.66	66.4	91.53	89.15
% Attribute 5 by abundance	0.1914	0.1754	1.185	0.7764	1.5	3.076	0.7732	0.189	13.11	28.11	5.542	18.6	2.255	5.407
% Attribute 6 by abundance	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Unknown attribute by abundance	0	0	0	0.003235	0	0	0.01128	0	0.007406	0.005019	0	0.01167	0.01253	0

							Waterbody	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River
							Station	1	1	2	2	3	3	4	4	5	5	6	6	7	7
							Date	2018-10-04	2018-10-04	2018-10-03	2018-10-03	2018-10-05	2018-10-05	2018-10-04	2018-10-04	2018-10-05	2018-10-05	2018-10-04	2018-10-04	2018-10-05	2018-10-05
							Replicate	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Taxon	Stage	Insect?	Origin	Higher classification	Order	Family	Common name	Abundance	Abundance	Abundance	Abundance	Abundance	Abundance	Abundance	Abundance	Abundance	Abundance	Abundance	Abundance	Abundance	Abundance
Trepaxonemata	U	non-insect	Aquatic	Turbellaria	miscellaneous non-insect	x	flat worms		107.613	305.651	403.5	69.16	107.6	783.812	534.691	1694.7	3228	880.437	668.546	907.875	1759.906
Nemata	U	non-insect	Aquatic	Nemata	miscellaneous non-insect	x	round worms	20.175	358.712	61.13	242.1	161.373	53.8	69.16	194.433	40.35		29.348	46.107	121.05	30.343
Prostoma	U	non-insect	Aquatic	Annelida: Nemertea	miscellaneous non-insect	Tetrastemmatidae	nemerteans	20.175		61.13	80.7	23.053	53.8	46.107	24.304			29.348		60.525	
Oligochaeta	U	non-insect	Aquatic	Annelida: Oligochaeta	miscellaneous non-insect	x	segmented worms	685.95	1721.815	5196.071	5003.4	2005.637	2528.6	1014.345	1020.774	6577.05	5111	1804.896	1959.531	1755.225	2093.681
Helobdella	U	non-insect	Aquatic	Annelida: Hirudinea	miscellaneous non-insect	Glossiphoniidae	leeches										1.345				
Fluminicola	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Hydrobiidae	snails								48.608	3792.9	5003.4			1.345	
Galba	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Lymnaeidae	snails														1.345
Lanx	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Lymnaeidae	snails				1.345			1.345		1.345	1.345		1.345	1.345	
Physella	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Physidae	snails					161.373	349.7			1170.15	4895.8	264.131	1613.731	161.4	303.432
Helisoma	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Planorbidae	snails							1.345		1.345	1.345				
Menetus	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Planorbidae	snails									40.35	53.8				
Juga	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Pleuroceridae	snails	1.345	71.742	305.651	1.345	461.066	376.6	46.107	267.346		161.4	29.348	207.48	1.345	1.345
Sphaeriidae	U	non-insect	Aquatic	Mollusca: Bivalvia	x	Sphaeriidae	pea clams							46.107	48.608	40.35	269		23.053		
Ostracoda	U	non-insect	Aquatic	Crustacea: Ostracoda	x	x	seed shrimp					46.107	188.3	92.213	267.346	80.7	860.8	117.392	991.292	40.35	30.343
Crangonyx	U	non-insect	Aquatic	Crustacea: Amphipoda	x	Crangonyctidae	scuds				80.7		26.9			1170.15	2636.2	146.739	507.173	20.175	515.834
Pacifastacus	U	non-insect	Aquatic	Crustacea: Decapoda	x	Astacidae	crayfish				1.345										
Trombidiformes	U	non-insect	Aquatic	Arachnida: Acari	Trombidiformes	x	mites				80.7										
Atractides	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	20.175				46.107		23.053							
Lebertia	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	322.8	179.356	489.042	242.1	253.586	376.6	46.107	24.304			14.674	46.107	20.175	
Oribatida	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites							23.053		322.8	322.8				
Protzia	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	20.175				23.053	134.5						23.053		
Sperchon	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	464.025	753.294	672.433	645.6	115.266	376.6	46.107	194.433	40.35	107.6	58.696	23.053	121.05	151.716
Sperchonopsis	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites			61.13	242.1	23.053	80.7	23.053	24.304	40.35		58.696	23.053		
Testudacarus	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites									40.35					
Torrenticola	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites					46.107			24.304			29.348	115.266		
Acentrella insignificans	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	40.35	71.742	122.261	80.7	23.053	26.9	92.213	218.737		53.8	58.696	23.053	20.175	91.03
Baetis flavistriga complex	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies				80.7										
Baetis tricaudatus complex	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	464.025	358.712	1528.256	403.5	138.32	80.7	299.693	194.433	121.05	107.6	132.066	115.266	3268.35	3641.184
Drunella grandis	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Ephemerellidae	mayflies	60.525	107.613	1.345	80.7	1.345			24.304			1.345		20.175	1.345
Ephemerella excrucians group	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Ephemerellidae	mayflies	968.4	2008.784	2445.21	3631.5	530.226	860.8	1314.038	1288.12	40.35	161.4	234.783	299.693	262.275	394.462
Ephemerella tibialis	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Ephemerellidae	mayflies	1.345		1.345	1.345	1.345						1.345			
Cinygma	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Heptageniidae	mayflies				161.4	69.16									
Epeorus	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Heptageniidae	mayflies	20.175	179.356	305.651		184.426	134.5					14.674			
Heptagenia	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Heptageniidae	mayflies				80.7										
Rhithrogena	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Heptageniidae	mayflies	181.575	358.712	61.13	1.345	69.16	26.9								
Leptophlebiidae	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Leptophlebiidae	mayflies				80.7	46.107	26.9							20.175	
Capniidae	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Capniidae	stoneflies		71.742												
Chloroperlidae	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Chloroperlidae	stoneflies								1.345						
Sweltsa	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Chloroperlidae	stoneflies	100.875	358.712			23.053									1.345
Calineuria californica	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlidae	stoneflies	100.875			1.345							1.345		20.175	1.345
Claassenia sabulosa	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlidae	stoneflies	1.345	286.969	61.13		23.053	1.345	1.345	24.304					20.175	30.343
Hesperoperla pacifica	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlidae	stoneflies	1.345	35.871	1.345	1.345			23.053	1.345						1.345
Perlodidae	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlodidae	stoneflies	60.525	215.227				1.345								
Isoperla	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlodidae	stoneflies	60.525	215.227	61.13	80.7	23.053									
Skwala	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlodidae	stoneflies	1.345	35.871	61.13	1.345	1.345	1.345								
Pteronarcys californica	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Pteronarcyidae	stoneflies	1.345	35.871	1.345	1.345	1.345		1.345	1.345	1.345		14.674		20.175	
Sialis	L	insect	Aquatic	Arthropoda: Insecta	Megaloptera	Sialidae	alderflies							1.345							
Amiocentrus aspilus	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Brachycentridae	caddisflies		107.613		80.7	69.16	295.9					1.345	46.107		
Brachycentrus occidentalis	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Brachycentridae	caddisflies	706.125	896.779	3056.513	2178.9	253.586	699.4	23.053		80.7	53.8	73.37	69.16	20.175	30.343
Glossosoma	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Glossosomatidae	caddisflies	504.375	753.294	122.261	80.7	23.053		23.053						80.7	91.03
Glossosoma	P	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Glossosomatidae	caddisflies	20.175	35.871	61.13	80.7	46.107	26.9		24.304						
Protoptila	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Glossosomatidae	caddisflies									40.35			23.053		
Goera archaon	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Goeridae	caddisflies					1.345									
Cheumatopsyche	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydropsychidae	caddisflies		35.871	305.651	161.4										
Hydropsyche	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydropsychidae	caddisflies	907.875	3300.146	3178.773	3631.5	138.32	107.6	92.213	170.129		53.8	278.805	184.426	685.95	1001.326
Hydroptila	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydroptilidae	caddisflies	20.175		305.651	322.8		26.9					14.674	23.053		
Hydroptila	P	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydroptilidae	caddisflies										107.6				
Leucotrichia	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydroptilidae	caddisflies			61.13											
Lepidostoma (Neodinarthrum)	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies	80.7	573.938	366.782	322.8	991.292	914.6	299.693	729.125			146.739	691.599	100.875	121.373
Lepidostoma-panel case larvae	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies			61.13											
Lepidostoma unicolor group	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies					23.053	26.9		24.304			14.674	23.053		
Ceraclea	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Leptoceridae	caddisflies	20.175	35.871	61.13	1.345	69.16	53.8	852.972	874.949			88.044	161.373	1.345	1.345
Psychomyia	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Psychomyiidae	caddisflies			61.13											
Rhyacophila arnaudi	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Rhyacophilidae	caddisflies				1.345										
Rhyacophila brunnea/vemna group	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Rhyacophilidae	caddisflies			1.345	1.345										
Rhyacophila coloradensis group	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Rhyacophilidae	caddisflies						1.345								
Rhyacophila malkini	P	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Rhyacophilidae	caddisflies			122.261	161.4										
Petrophila	L	insect	Aquatic	Arthropoda: Insecta	Lepidoptera	Pyralidae	aquatic moths			1.345	564.9	23.053	26.9					14.674			
Narpus concolor	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	20.175	71.742	1.345	80.7	1.345	53.8	46.107	24.304			29.348	1.345		
Optioservus	A	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	161.4	322.84	244.521	80.7	138.32	53.8	46.107	24.304	40.35			23.053	20.175	
Optioservus	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	1735.05	1937.042	2139.559	4438.5	1175.718	1479.5	1267.931	923.558	242.1	430.4	352.175	691.599	746.475	697.894
Zaitzevia	A	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles				80.7		26.9								
Zaitzevia	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	100.875	502.196	1039.214	1129.8	345.8	295.9	92.213	97.217			29.348	69.16	20.175	30.343
Hydraena	A	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Hydraenidae	moss beetles											14.674			
Atherix	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Athericidae	higher flies							1.345							
Chelifera/Metachela	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Empididae	dance flies					23.053									
Hemerodromia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Empididae	dance flies	181.575		122.261	322.8	530.226	376.6	46.107	72.912			14.674	46.107	40.35	60.686
Psychoda	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Psychodidae	moth flies							46.107		40.35					
Simulium	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies	60.525		61.13	80.7			299.693	72.912	121.05	161.4	190.761	23.053	221.925	515.834
Simulium	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies							23.053							30.343
Chironomidae	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae	midges	121.05	466.325	489.042	1129.8	138.32	269	530.226	874.949	161.4	107.6	249.457	207.48	201.75	758.58
Cardiocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges								24.304					121.05	515.834
Corynoneura	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges						26.9								
Cricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	282.45	394.583	1100.345	645.6	161.373	134.5	599.386	510.387	40.35	53.8	381.523	299.693	242.1	364.118
Cricotopus (Isocladius) type 1	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges											29.348			
Cricotopus bicinctus group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges					23.053								20.175	
Cricotopus (Nostococladius)	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	262.275	358.712	2384.08	7747.2	2466.703	1587.1	46.107	24.304						
Cricotopus trifascia group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges			122.261	484.2	23.053		599.386	364.562	685.95	699.4	675.002	1014.345	141.225	182.059
Cryptochironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges												23.053		
Diamesa	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Diamesinae	midges	80.7	35.871			46.107									
Eukiefferiella brehmi group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	80.7	107.613	427.912	645.6	92.213	80.7			80.7	269				91.03
Eukiefferiella claripennis group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	322.8	932.65	978.084	1210.5	299.693	322.8	46.107	72.912	161.4	269	132.066	253.586	282.45	364.118
Eukiefferiella devonica group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	100.875	215.227	794.693	1452.6	92.213		46.107	24.304	282.45	215.2	29.348	92.213	40.35	121.373
Eukiefferiella pseudomontana group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges											14.674			30.343
Micropsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	685.95	1004.392	427.912	242.1	23.053	161.4	138.32	121.521				23.053	60.525	
Microtendipes pedellus group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges							23.053						100.875	121.373
Nanocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	20.175							48.608				23.053		
Nilotanypus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges										53.8				
Orthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	242.1	322.84	733.563	2017.5	207.48	511.1	2305.33	2551.936	322.8	591.8	997.829	622.439	181.575	394.462
Paratanytarsus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges				80.7										
Paratendipes	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges													20.175	
Phaenopsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges							23.053		40.35					
Polypedilum	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	201.75	394.583	122.261	80.7	46.107	322.8	161.373	291.65	484.2	591.8	176.087	23.053	262.275	364.118
Potthastia gaedii group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Diamesinae	midges		35.871	122.261	80.7	23.053	26.9	115.266	267.346			14.674			
Potthastia longimana group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Diamesinae	midges								24.304						

							Waterbody	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River
							Station	1	1	2	2	3	3	4	4	5	5	6	6	7	7
							Date	2018-10-04	2018-10-04	2018-10-03	2018-10-03	2018-10-05	2018-10-05	2018-10-04	2018-10-04	2018-10-05	2018-10-05	2018-10-04	2018-10-04	2018-10-05	2018-10-05
							Replicate	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Taxon	Stage	Insect?	Origin	Higher classification	Order	Family	Common name	Abundance	Abundance	Abundance	Abundance	Abundance	Abundance	Abundance	Abundance	Abundance	Abundance	Abundance	Abundance	Abundance	Abundance
Rheocricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges								48.608						60.686
Rheotanytarsus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges				80.7		53.8	23.053					23.053		
Stenochironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges					23.053									
Synorthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges		35.871			184.426	134.5	115.266	97.217	121.05	107.6	58.696	161.373	141.225	30.343
Tanytarsus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges														60.686
Thienemanniella	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges			61.13	80.7	23.053	80.7				53.8			20.175	
Thienemannimyia complex	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges								24.304						
Tvetenia bavarica group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges		35.871												
Tvetenia vitracies group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges				80.7				24.304					100.875	60.686

							Waterbody	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River
							Station	1	1	2	2	3	3	4	4	5	5	6	6	7	7
							Date	2018-10-04	2018-10-04	2018-10-03	2018-10-03	2018-10-05	2018-10-05	2018-10-04	2018-10-04	2018-10-05	2018-10-05	2018-10-04	2018-10-04	2018-10-05	2018-10-05
							Replicate	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Taxon	Stage	Insect?	Origin	Higher classification	Order	Family	Common name	% abundance	% abundance	% abundance	% abundance	% abundance	% abundance	% abundance	% abundance	% abundance	% abundance	% abundance	% abundance	% abundance	% abundance
Trepaxonemata	U	non-insect	Aquatic	Turbellaria	miscellaneous non-insect	x	flat worms		0.5263	0.9878	0.9705	0.5625	0.7689	6.572	4.157	9.331	12.05	11.08	5.799	8.454	11.62
Nemata	U	non-insect	Aquatic	Nemata	miscellaneous non-insect	x	round worms	0.1914	1.754	0.1976	0.5823	1.312	0.3845	0.5799	1.512	0.2222		0.3694	0.3999	1.127	0.2003
Prostoma	U	non-insect	Aquatic	Annelida: Nemertea	miscellaneous non-insect	Tetrastemmatidae	nemerteans	0.1914		0.1976	0.1941	0.1875	0.3845	0.3866	0.189			0.3694		0.5636	
Oligochaeta	U	non-insect	Aquatic	Annelida: Oligochaeta	miscellaneous non-insect	x	segmented worms	6.508	8.421	16.79	12.03	16.31	18.07	8.505	7.937	36.21	19.07	22.72	17	16.35	13.82
Helobdella	U	non-insect	Aquatic	Annelida: Hirudinea	miscellaneous non-insect	Glossiphoniidae	leeches										0.005019				
Fluminicola	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Hydrobiidae	snails								0.378	20.88	18.67			0.01253	
Galba	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Lymnaeidae	snails														0.008877
Lanx	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Lymnaeidae	snails				0.003235			0.01128		0.007406	0.005019		0.01167	0.01253	
Physella	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Physidae	snails					1.312	2.499			6.443	18.27	3.325	14	1.503	2.003
Helisoma	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Planorbidae	snails							0.01128		0.007406	0.005019				
Menetus	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Planorbidae	snails									0.2222	0.2008				
Juga	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Pleuroceridae	snails	0.01276	0.3509	0.9878	0.003235	3.75	2.691	0.3866	2.079		0.6023	0.3694	1.8	0.01253	0.008877
Sphaeriidae	U	non-insect	Aquatic	Mollusca: Bivalvia	x	Sphaeriidae	pea clams							0.3866	0.378	0.2222	1.004		0.2		
Ostracoda	U	non-insect	Aquatic	Crustacea: Ostracoda	x	x	seed shrimp					0.375	1.346	0.7732	2.079	0.4443	3.212	1.478	8.598	0.3758	0.2003
Crangonyx	U	non-insect	Aquatic	Crustacea: Amphipoda	x	Crangonyctidae	scuds				0.1941		0.1922			6.443	9.838	1.847	4.399	0.1879	3.405
Pacifastacus	U	non-insect	Aquatic	Crustacea: Decapoda	x	Astacidae	crayfish				0.003235										
Trombidiformes	U	non-insect	Aquatic	Arachnida: Acari	Trombidiformes	x	mites				0.1941										
Atractides	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	0.1914				0.375		0.1933							
Lebertia	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	3.063	0.8772	1.581	0.5823	2.062	2.691	0.3866	0.189			0.1847	0.3999	0.1879	
Oribatida	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites							0.1933		1.777	1.205				
Protzia	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	0.1914				0.1875	0.9612						0.2		
Sperchon	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	4.403	3.684	2.173	1.553	0.9375	2.691	0.3866	1.512	0.2222	0.4015	0.7389	0.2	1.127	1.001
Sperchonopsis	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites			0.1976	0.5823	0.1875	0.5767	0.1933	0.189	0.2222		0.7389	0.2		
Testudacarus	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites									0.2222					
Torrenticola	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites					0.375			0.189			0.3694	0.9998		
Acentrella insignificans	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	0.3828	0.3509	0.3951	0.1941	0.1875	0.1922	0.7732	1.701		0.2008	0.7389	0.2	0.1879	0.6008
Baetis flavistriga complex	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies				0.1941										
Baetis tricaudatus complex	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	4.403	1.754	4.939	0.9705	1.125	0.5767	2.513	1.512	0.6665	0.4015	1.662	0.9998	30.44	24.03
Drunella grandis	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Ephemerellidae	mayflies	0.5743	0.5263	0.004347	0.1941	0.01094			0.189			0.01693		0.1879	0.008877
Ephemerella excrucians group	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Ephemerellidae	mayflies	9.188	9.825	7.903	8.734	4.312	6.151	11.02	10.02	0.2222	0.6023	2.955	2.599	2.442	2.604
Ephemerella tibialis	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Ephemerellidae	mayflies	0.01276		0.004347	0.003235	0.01094						0.01693			
Cinygma	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Heptageniidae	mayflies				0.3882	0.5625									
Epeorus	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Heptageniidae	mayflies	0.1914	0.8772	0.9878		1.5	0.9612					0.1847			
Heptagenia	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Heptageniidae	mayflies				0.1941										
Rhithrogena	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Heptageniidae	mayflies	1.723	1.754	0.1976	0.003235	0.5625	0.1922								
Leptophlebiidae	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Leptophlebiidae	mayflies				0.1941	0.375	0.1922							0.1879	
Capniidae	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Capniidae	stoneflies		0.3509												
Chloroperlidae	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Chloroperlidae	stoneflies								0.01046						
Sweltsa	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Chloroperlidae	stoneflies	0.9571	1.754			0.1875									0.008877
Calineuria californica	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlidae	stoneflies	0.9571			0.003235							0.01693		0.1879	0.008877
Claassenia sabulosa	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlidae	stoneflies	0.01276	1.404	0.1976		0.1875	0.009612	0.01128	0.189					0.1879	0.2003
Hesperoperla pacifica	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlidae	stoneflies	0.01276	0.1754	0.004347	0.003235			0.1933	0.01046						0.008877
Perlodidae	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlodidae	stoneflies	0.5743	1.053				0.009612								
Isoperla	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlodidae	stoneflies	0.5743	1.053	0.1976	0.1941	0.1875									
Skwala	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlodidae	stoneflies	0.01276	0.1754	0.1976	0.003235	0.01094	0.009612								
Pteronarcys californica	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Pteronarcyidae	stoneflies	0.01276	0.1754	0.004347	0.003235	0.01094		0.01128	0.01046	0.007406		0.1847		0.1879	
Sialis	L	insect	Aquatic	Arthropoda: Insecta	Megaloptera	Sialidae	alderflies							0.01128							
Amiocentrus aspilus	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Brachycentridae	caddisflies		0.5263		0.1941	0.5625	2.115					0.01693	0.3999		
Brachycentrus occidentalis	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Brachycentridae	caddisflies	6.7	4.386	9.878	5.241	2.062	4.998	0.1933		0.4443	0.2008	0.9236	0.5999	0.1879	0.2003
Glossosoma	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Glossosomatidae	caddisflies	4.786	3.684	0.3951	0.1941	0.1875		0.1933						0.7515	0.6008
Glossosoma	P	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Glossosomatidae	caddisflies	0.1914	0.1754	0.1976	0.1941	0.375	0.1922		0.189						
Protoptila	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Glossosomatidae	caddisflies									0.2222			0.2		
Goera archaon	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Goeridae	caddisflies					0.01094									
Cheumatopsyche	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydropsychidae	caddisflies		0.1754	0.9878	0.3882										
Hydropsyche	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydropsychidae	caddisflies	8.614	16.14	10.27	8.734	1.125	0.7689	0.7732	1.323		0.2008	3.51	1.6	6.388	6.609
Hydroptila	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydroptilidae	caddisflies	0.1914		0.9878	0.7764		0.1922					0.1847	0.2		
Hydroptila	P	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydroptilidae	caddisflies										0.4015				
Leucotrichia	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydroptilidae	caddisflies			0.1976											
Lepidostoma (Neodinarthrum)	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies	0.7657	2.807	1.185	0.7764	8.062	6.536	2.513	5.669			1.847	5.999	0.9394	0.8011
Lepidostoma-panel case larvae	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies			0.1976											
Lepidostoma unicolor group	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies					0.1875	0.1922		0.189			0.1847	0.2		
Ceraclea	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Leptoceridae	caddisflies	0.1914	0.1754	0.1976	0.003235	0.5625	0.3845	7.152	6.803			1.108	1.4	0.01253	0.008877
Psychomyia	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Psychomyiidae	caddisflies			0.1976											
Rhyacophila arnaudi	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Rhyacophilidae	caddisflies				0.003235										
Rhyacophila brunnea/vemna group	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Rhyacophilidae	caddisflies			0.004347	0.003235										
Rhyacophila coloradensis group	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Rhyacophilidae	caddisflies						0.009612								
Rhyacophila malkini	P	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Rhyacophilidae	caddisflies			0.3951	0.3882										
Petrophila	L	insect	Aquatic	Arthropoda: Insecta	Lepidoptera	Pyralidae	aquatic moths			0.004347	1.359	0.1875	0.1922					0.1847			
Narpus concolor	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	0.1914	0.3509	0.004347	0.1941	0.01094	0.3845	0.3866	0.189			0.3694	0.01167		
Optioservus	A	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	1.531	1.579	0.7903	0.1941	1.125	0.3845	0.3866	0.189	0.2222			0.2	0.1879	
Optioservus	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	16.46	9.474	6.915	10.68	9.562	10.57	10.63	7.181	1.333	1.606	4.433	5.999	6.951	4.606
Zaitzevia	A	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles				0.1941		0.1922								
Zaitzevia	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	0.9571	2.456	3.359	2.717	2.812	2.115	0.7732	0.7559			0.3694	0.5999	0.1879	0.2003
Hydraena	A	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Hydraenidae	moss beetles											0.1847			
Atherix	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Athericidae	higher flies							0.01128							
Chelifera/Metachela	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Empididae	dance flies					0.1875									
Hemerodromia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Empididae	dance flies	1.723		0.3951	0.7764	4.312	2.691	0.3866	0.5669			0.1847	0.3999	0.3758	0.4006
Psychoda	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Psychodidae	moth flies							0.3866		0.2222					
Simulium	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies	0.5743		0.1976	0.1941			2.513	0.5669	0.6665	0.6023	2.401	0.2	2.067	3.405
Simulium	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies							0.1933							0.2003
Chironomidae	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae	midges	1.149	2.281	1.581	2.717	1.125	1.922	4.446	6.803	0.8887	0.4015	3.14	1.8	1.879	5.007
Cardiocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges								0.189					1.127	3.405
Corynoneura	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges						0.1922								
Cricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	2.68	1.93	3.556	1.553	1.312	0.9612	5.026	3.969	0.2222	0.2008	4.803	2.599	2.255	2.403
Cricotopus (Isocladius) type 1	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges											0.3694			
Cricotopus bicinctus group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges					0.1875								0.1879	
Cricotopus (Nostococladius)	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	2.489	1.754	7.705	18.63	20.06	11.34	0.3866	0.189						
Cricotopus trifascia group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges			0.3951	1.165	0.1875		5.026	2.835	3.777	2.61	8.497	8.798	1.315	1.202
Cryptochironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges												0.2		
Diamesa	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Diamesinae	midges	0.7657	0.1754			0.375									
Eukiefferiella brehmi group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0.7657	0.5263	1.383	1.553	0.75	0.5767			0.4443	1.004				0.6008
Eukiefferiella claripennis group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	3.063	4.561	3.161	2.911	2.437	2.307	0.3866	0.5669	0.8887	1.004	1.662	2.199	2.63	2.403
Eukiefferiella devonica group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0.9571	1.053	2.568	3.494	0.75		0.3866	0.189	1.555	0.8031	0.3694	0.7998	0.3758	0.8011
Eukiefferiella pseudomontana group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges											0.1847			0.2003
Micropsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	6.508	4.912	1.383	0.5823	0.1875	1.153	1.16	0.9449				0.2	0.5636	
Microtendipes pedellus group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges							0.1933						0.9394	0.8011
Nanocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0.1914							0.378				0.2		
Nilotanypus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges										0.2008				
Orthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	2.297	1.579	2.371	4.852	1.687	3.652	19.33	19.84	1.777	2.209	12.56	5.399	1.691	2.604
Paratanytarsus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges				0.1941										
Paratendipes	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges													0.1879	
Phaenopsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges							0.1933		0.2222					
Polypedilum	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	1.914	1.93	0.3951	0.1941	0.375	2.307	1.353	2.268	2.666	2.209	2.217	0.2	2.442	2.403
Potthastia gaedii group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Diamesinae	midges		0.1754	0.3951	0.1941	0.1875	0.1922	0.9665	2.079			0.1847			
Potthastia longimana group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Diamesinae	midges								0.189						
Rheocricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges								0.378						0.4006
Rheotanytarsus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges				0.1941		0.3845	0.1933					0.2		
Stenochironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges					0.1875									

							Waterbody	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River	Rogue River
							Station	1	1	2	2	3	3	4	4	5	5	6	6	7	7
							Date	2018-10-04	2018-10-04	2018-10-03	2018-10-03	2018-10-05	2018-10-05	2018-10-04	2018-10-04	2018-10-05	2018-10-05	2018-10-04	2018-10-04	2018-10-05	2018-10-05
							Replicate	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Taxon	Stage	Insect?	Origin	Higher classification	Order	Family	Common name	% abundance	% abundance	% abundance	% abundance	% abundance	% abundance	% abundance	% abundance	% abundance	% abundance	% abundance	% abundance	% abundance	% abundance
Synorthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges		0.1754			1.5	0.9612	0.9665	0.7559	0.6665	0.4015	0.7389	1.4	1.315	0.2003
Tanytarsus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges														0.4006
Thienemanniella	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges			0.1976	0.1941	0.1875	0.5767				0.2008			0.1879	
Thienemannimyia complex	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges								0.189						
Tvetenia bavarica group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges		0.1754												
Tvetenia vitracies group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges				0.1941				0.189					0.9394	0.4006

Waterbody	Station	Date	Replicate	Taxon	Stage	Insect	Origin	Higher.classification	Order	Family	Common.name	Abundance
Rogue River	2	2018-10-03	A	Petrophila	L	insect	Aquatic	Arthropoda: Insecta	Lepidoptera	Pyralidae	aquatic moths	1.345
Rogue River	2	2018-10-03	A	Simulium	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies	61.13025
Rogue River	2	2018-10-03	A	Brachycentrus occidentalis	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Brachycentridae	caddisflies	3056.5125
Rogue River	2	2018-10-03	A	Glossosoma	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Glossosomatidae	caddisflies	122.2605
Rogue River	2	2018-10-03	A	Glossosoma	P	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Glossosomatidae	caddisflies	61.13025
Rogue River	2	2018-10-03	A	Cheumatopsyche	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydropsychidae	caddisflies	305.65125
Rogue River	2	2018-10-03	A	Hydropsyche	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydropsychidae	caddisflies	3178.773
Rogue River	2	2018-10-03	A	Hydroptila	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydroptilidae	caddisflies	305.65125
Rogue River	2	2018-10-03	A	Leucotrichia	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydroptilidae	caddisflies	61.13025
Rogue River	2	2018-10-03	A	Lepidostoma (Neodinarthrum)	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies	366.7815
Rogue River	2	2018-10-03	A	Lepidostoma-panel case larvae	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies	61.13025
Rogue River	2	2018-10-03	A	Ceraclea	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Leptoceridae	caddisflies	61.13025
Rogue River	2	2018-10-03	A	Psychomyia	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Psychomyiidae	caddisflies	61.13025
Rogue River	2	2018-10-03	A	Rhyacophila brunnea/vemna group	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Rhyacophilidae	caddisflies	1.345
Rogue River	2	2018-10-03	A	Rhyacophila malkini	P	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Rhyacophilidae	caddisflies	122.2605
Rogue River	2	2018-10-03	A	Hemerodromia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Empididae	dance flies	122.2605
Rogue River	2	2018-10-03	A	Trepaxonemata	U	non-insect	Aquatic	Turbellaria	miscellaneous non-insect	x	flat worms	305.65125
Rogue River	2	2018-10-03	A	Acentrella insignificans	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	122.2605
Rogue River	2	2018-10-03	A	Baetis tricaudatus complex	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	1528.25625
Rogue River	2	2018-10-03	A	Drunella grandis	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Ephemerellidae	mayflies	1.345
Rogue River	2	2018-10-03	A	Ephemerella excrucians group	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Ephemerellidae	mayflies	2445.21
Rogue River	2	2018-10-03	A	Ephemerella tibialis	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Ephemerellidae	mayflies	1.345
Rogue River	2	2018-10-03	A	Epeorus	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Heptageniidae	mayflies	305.65125
Rogue River	2	2018-10-03	A	Rhithrogena	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Heptageniidae	mayflies	61.13025
Rogue River	2	2018-10-03	A	Chironomidae	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae	midges	489.042
Rogue River	2	2018-10-03	A	Polypedilum	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	122.2605
Rogue River	2	2018-10-03	A	Micropsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	427.91175
Rogue River	2	2018-10-03	A	Potthastia gaedii group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Diamesinae	midges	122.2605
Rogue River	2	2018-10-03	A	Cricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	1100.3445
Rogue River	2	2018-10-03	A	Cricotopus (Nostococladius)	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	2384.07975
Rogue River	2	2018-10-03	A	Cricotopus trifascia group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	122.2605
Rogue River	2	2018-10-03	A	Eukiefferiella brehmi group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	427.91175
Rogue River	2	2018-10-03	A	Eukiefferiella claripennis group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	978.084
Rogue River	2	2018-10-03	A	Eukiefferiella devonica group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	794.69325
Rogue River	2	2018-10-03	A	Orthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	733.563
Rogue River	2	2018-10-03	A	Thienemanniella	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	61.13025
Rogue River	2	2018-10-03	A	Lebertia	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	489.042
Rogue River	2	2018-10-03	A	Sperchon	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	672.43275
Rogue River	2	2018-10-03	A	Sperchonopsis	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	61.13025
Rogue River	2	2018-10-03	A	Prostoma	U	non-insect	Aquatic	Annelida: Nemertea	miscellaneous non-insect	Tetrastemmatidae	nemerteans	61.13025
Rogue River	2	2018-10-03	A	Optioservus	A	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	244.521
Rogue River	2	2018-10-03	A	Narpus concolor	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	1.345
Rogue River	2	2018-10-03	A	Optioservus	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	2139.55875
Rogue River	2	2018-10-03	A	Zaitzevia	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	1039.21425
Rogue River	2	2018-10-03	A	Nemata	U	non-insect	Aquatic	Nemata	miscellaneous non-insect	x	round worms	61.13025
Rogue River	2	2018-10-03	A	Oligochaeta	U	non-insect	Aquatic	Annelida: Oligochaeta	miscellaneous non-insect	x	segmented worms	5196.07125
Rogue River	2	2018-10-03	A	Juga	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Pleuroceridae	snails	305.65125
Rogue River	2	2018-10-03	A	Claassenia sabulosa	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlidae	stoneflies	61.13025
Rogue River	2	2018-10-03	A	Hesperoperla pacifica	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlidae	stoneflies	1.345
Rogue River	2	2018-10-03	A	Isoperla	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlodidae	stoneflies	61.13025
Rogue River	2	2018-10-03	A	Skwala	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlodidae	stoneflies	61.13025
Rogue River	2	2018-10-03	A	Pteronarcys californica	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Pteronarcyidae	stoneflies	1.345
Rogue River	1	2018-10-04	A	Simulium	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies	60.525
Rogue River	1	2018-10-04	A	Brachycentrus occidentalis	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Brachycentridae	caddisflies	706.125
Rogue River	1	2018-10-04	A	Glossosoma	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Glossosomatidae	caddisflies	504.375
Rogue River	1	2018-10-04	A	Glossosoma	P	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Glossosomatidae	caddisflies	20.175
Rogue River	1	2018-10-04	A	Hydropsyche	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydropsychidae	caddisflies	907.875
Rogue River	1	2018-10-04	A	Hydroptila	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydroptilidae	caddisflies	20.175
Rogue River	1	2018-10-04	A	Lepidostoma (Neodinarthrum)	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies	80.7
Rogue River	1	2018-10-04	A	Ceraclea	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Leptoceridae	caddisflies	20.175
Rogue River	1	2018-10-04	A	Hemerodromia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Empididae	dance flies	181.575
Rogue River	1	2018-10-04	A	Acentrella insignificans	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	40.35
Rogue River	1	2018-10-04	A	Baetis tricaudatus complex	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	464.025
Rogue River	1	2018-10-04	A	Drunella grandis	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Ephemerellidae	mayflies	60.525
Rogue River	1	2018-10-04	A	Ephemerella excrucians group	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Ephemerellidae	mayflies	968.4
Rogue River	1	2018-10-04	A	Ephemerella tibialis	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Ephemerellidae	mayflies	1.345
Rogue River	1	2018-10-04	A	Epeorus	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Heptageniidae	mayflies	20.175
Rogue River	1	2018-10-04	A	Rhithrogena	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Heptageniidae	mayflies	181.575

Waterbody	Station	Date	Replicate	Taxon	Stage	Insect	Origin	Higher.classification	Order	Family	Common.name	Abundance
Rogue River	1	2018-10-04	A	Chironomidae	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae	midges	121.05
Rogue River	1	2018-10-04	A	Polypedilum	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	201.75
Rogue River	1	2018-10-04	A	Micropsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	685.95
Rogue River	1	2018-10-04	A	Diamesa	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Diamesinae	midges	80.7
Rogue River	1	2018-10-04	A	Cricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	282.45
Rogue River	1	2018-10-04	A	Cricotopus (Nostococladius)	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	262.275
Rogue River	1	2018-10-04	A	Eukiefferiella brehmi group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	80.7
Rogue River	1	2018-10-04	A	Eukiefferiella claripennis group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	322.8
Rogue River	1	2018-10-04	A	Eukiefferiella devonica group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	100.875
Rogue River	1	2018-10-04	A	Nanocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	20.175
Rogue River	1	2018-10-04	A	Orthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	242.1
Rogue River	1	2018-10-04	A	Atractides	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	20.175
Rogue River	1	2018-10-04	A	Lebertia	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	322.8
Rogue River	1	2018-10-04	A	Protzia	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	20.175
Rogue River	1	2018-10-04	A	Sperchon	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	464.025
Rogue River	1	2018-10-04	A	Prostoma	U	non-insect	Aquatic	Annelida: Nemertea	miscellaneous non-insect	Tetrastemmatidae	nemerteans	20.175
Rogue River	1	2018-10-04	A	Optioservus	A	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	161.4
Rogue River	1	2018-10-04	A	Narpus concolor	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	20.175
Rogue River	1	2018-10-04	A	Optioservus	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	1735.05
Rogue River	1	2018-10-04	A	Zaitzevia	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	100.875
Rogue River	1	2018-10-04	A	Nemata	U	non-insect	Aquatic	Nemata	miscellaneous non-insect	x	round worms	20.175
Rogue River	1	2018-10-04	A	Oligochaeta	U	non-insect	Aquatic	Annelida: Oligochaeta	miscellaneous non-insect	x	segmented worms	685.95
Rogue River	1	2018-10-04	A	Juga	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Pleuroceridae	snails	1.345
Rogue River	1	2018-10-04	A	Sweltsa	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Chloroperlidae	stoneflies	100.875
Rogue River	1	2018-10-04	A	Calineuria californica	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlidae	stoneflies	100.875
Rogue River	1	2018-10-04	A	Claassenia sabulosa	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlidae	stoneflies	1.345
Rogue River	1	2018-10-04	A	Hesperoperla pacifica	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlidae	stoneflies	1.345
Rogue River	1	2018-10-04	A	Isoperla	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlodidae	stoneflies	60.525
Rogue River	1	2018-10-04	A	Perlodidae	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlodidae	stoneflies	60.525
Rogue River	1	2018-10-04	A	Skwala	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlodidae	stoneflies	1.345
Rogue River	1	2018-10-04	A	Pteronarcys californica	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Pteronarcyidae	stoneflies	1.345
Rogue River	4	2018-10-04	A	Sialis	L	insect	Aquatic	Arthropoda: Insecta	Megaloptera	Sialidae	alderflies	1.345
Rogue River	4	2018-10-04	A	Simulium	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies	299.6929
Rogue River	4	2018-10-04	A	Simulium	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies	23.0533
Rogue River	4	2018-10-04	A	Brachycentrus occidentalis	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Brachycentridae	caddisflies	23.0533
Rogue River	4	2018-10-04	A	Glossosoma	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Glossosomatidae	caddisflies	23.0533
Rogue River	4	2018-10-04	A	Hydropsyche	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydropsychidae	caddisflies	92.2132
Rogue River	4	2018-10-04	A	Lepidostoma (Neodinarthrum)	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies	299.6929
Rogue River	4	2018-10-04	A	Ceraclea	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Leptoceridae	caddisflies	852.9721
Rogue River	4	2018-10-04	A	Hemerodromia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Empididae	dance flies	46.1066
Rogue River	4	2018-10-04	A	Trepaxonemata	U	non-insect	Aquatic	Turbellaria	miscellaneous non-insect	x	flat worms	783.8122
Rogue River	4	2018-10-04	A	Atherix	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Athericidae	higher flies	1.345
Rogue River	4	2018-10-04	A	Acentrella insignificans	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	92.2132
Rogue River	4	2018-10-04	A	Baetis tricaudatus complex	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	299.6929
Rogue River	4	2018-10-04	A	Ephemerella excrucians group	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Ephemerellidae	mayflies	1314.0381
Rogue River	4	2018-10-04	A	Chironomidae	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae	midges	530.2259
Rogue River	4	2018-10-04	A	Microtendipes pedellus group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	23.0533
Rogue River	4	2018-10-04	A	Phaenopsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	23.0533
Rogue River	4	2018-10-04	A	Polypedilum	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	161.3731
Rogue River	4	2018-10-04	A	Micropsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	138.3198
Rogue River	4	2018-10-04	A	Rheotanytarsus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	23.0533
Rogue River	4	2018-10-04	A	Potthastia gaedii group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Diamesinae	midges	115.2665
Rogue River	4	2018-10-04	A	Cricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	599.3858
Rogue River	4	2018-10-04	A	Cricotopus (Nostococladius)	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	46.1066
Rogue River	4	2018-10-04	A	Cricotopus trifascia group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	599.3858
Rogue River	4	2018-10-04	A	Eukiefferiella claripennis group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	46.1066
Rogue River	4	2018-10-04	A	Eukiefferiella devonica group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	46.1066
Rogue River	4	2018-10-04	A	Orthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	2305.33
Rogue River	4	2018-10-04	A	Synorthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	115.2665
Rogue River	4	2018-10-04	A	Atractides	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	23.0533
Rogue River	4	2018-10-04	A	Lebertia	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	46.1066
Rogue River	4	2018-10-04	A	Oribatida	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	23.0533
Rogue River	4	2018-10-04	A	Sperchon	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	46.1066
Rogue River	4	2018-10-04	A	Sperchonopsis	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	23.0533
Rogue River	4	2018-10-04	A	Psychoda	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Psychodidae	moth flies	46.1066
Rogue River	4	2018-10-04	A	Prostoma	U	non-insect	Aquatic	Annelida: Nemertea	miscellaneous non-insect	Tetrastemmatidae	nemerteans	46.1066
Rogue River	4	2018-10-04	A	Sphaeriidae	U	non-insect	Aquatic	Mollusca: Bivalvia	x	Sphaeriidae	pea clams	46.1066
Rogue River	4	2018-10-04	A	Optioservus	A	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	46.1066

Waterbody	Station	Date	Replicate	Taxon	Stage	Insect	Origin	Higher.classification	Order	Family	Common.name	Abundance
Rogue River	4	2018-10-04	A	Narpus concolor	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	46.1066
Rogue River	4	2018-10-04	A	Optioservus	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	1267.9315
Rogue River	4	2018-10-04	A	Zaitzevia	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	92.2132
Rogue River	4	2018-10-04	A	Nemata	U	non-insect	Aquatic	Nemata	miscellaneous non-insect	x	round worms	69.1599
Rogue River	4	2018-10-04	A	Ostracoda	U	non-insect	Aquatic	Crustacea: Ostracoda	x	x	seed shrimp	92.2132
Rogue River	4	2018-10-04	A	Oligochaeta	U	non-insect	Aquatic	Annelida: Oligochaeta	miscellaneous non-insect	x	segmented worms	1014.3452
Rogue River	4	2018-10-04	A	Lanx	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Lymnaeidae	snails	1.345
Rogue River	4	2018-10-04	A	Helisoma	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Planorbidae	snails	1.345
Rogue River	4	2018-10-04	A	Juga	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Pleuroceridae	snails	46.1066
Rogue River	4	2018-10-04	A	Claassenia sabulosa	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlidae	stoneflies	1.345
Rogue River	4	2018-10-04	A	Hesperoperla pacifica	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlidae	stoneflies	23.0533
Rogue River	4	2018-10-04	A	Pteronarcys californica	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Pteronarcyidae	stoneflies	1.345
Rogue River	6	2018-10-04	A	Petrophila	L	insect	Aquatic	Arthropoda: Insecta	Lepidoptera	Pyralidae	aquatic moths	14.67395
Rogue River	6	2018-10-04	A	Simulium	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies	190.76135
Rogue River	6	2018-10-04	A	Amiocentrus aspilus	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Brachycentridae	caddisflies	1.345
Rogue River	6	2018-10-04	A	Brachycentrus occidentalis	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Brachycentridae	caddisflies	73.36975
Rogue River	6	2018-10-04	A	Hydropsyche	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydropsychidae	caddisflies	278.80505
Rogue River	6	2018-10-04	A	Hydroptila	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydroptilidae	caddisflies	14.67395
Rogue River	6	2018-10-04	A	Lepidostoma (Neodinarthrum)	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies	146.7395
Rogue River	6	2018-10-04	A	Lepidostoma unicolor group	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies	14.67395
Rogue River	6	2018-10-04	A	Ceraclea	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Leptoceridae	caddisflies	88.0437
Rogue River	6	2018-10-04	A	Hemerodromia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Empididae	dance flies	14.67395
Rogue River	6	2018-10-04	A	Trepaxonemata	U	non-insect	Aquatic	Turbellaria	miscellaneous non-insect	x	flat worms	880.437
Rogue River	6	2018-10-04	A	Acentrella insignificans	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	58.6958
Rogue River	6	2018-10-04	A	Baetis tricaudatus complex	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	132.06555
Rogue River	6	2018-10-04	A	Drunella grandis	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Ephemerellidae	mayflies	1.345
Rogue River	6	2018-10-04	A	Ephemerella excrucians group	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Ephemerellidae	mayflies	234.7832
Rogue River	6	2018-10-04	A	Ephemerella tibialis	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Ephemerellidae	mayflies	1.345
Rogue River	6	2018-10-04	A	Epeorus	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Heptageniidae	mayflies	14.67395
Rogue River	6	2018-10-04	A	Chironomidae	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae	midges	249.45715
Rogue River	6	2018-10-04	A	Polypedilum	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	176.0874
Rogue River	6	2018-10-04	A	Potthastia gaedii group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Diamesinae	midges	14.67395
Rogue River	6	2018-10-04	A	Cricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	381.5227
Rogue River	6	2018-10-04	A	Cricotopus (Isocladius) type 1	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	29.3479
Rogue River	6	2018-10-04	A	Cricotopus trifascia group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	675.0017
Rogue River	6	2018-10-04	A	Eukiefferiella claripennis group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	132.06555
Rogue River	6	2018-10-04	A	Eukiefferiella devonica group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	29.3479
Rogue River	6	2018-10-04	A	Eukiefferiella pseudomontana group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	14.67395
Rogue River	6	2018-10-04	A	Orthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	997.8286
Rogue River	6	2018-10-04	A	Synorthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	58.6958
Rogue River	6	2018-10-04	A	Lebertia	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	14.67395
Rogue River	6	2018-10-04	A	Sperchon	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	58.6958
Rogue River	6	2018-10-04	A	Sperchonopsis	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	58.6958
Rogue River	6	2018-10-04	A	Torrenticola	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	29.3479
Rogue River	6	2018-10-04	A	Hydraena	A	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Hydraenidae	moss beetles	14.67395
Rogue River	6	2018-10-04	A	Prostoma	U	non-insect	Aquatic	Annelida: Nemertea	miscellaneous non-insect	Tetrastemmatidae	nemerteans	29.3479
Rogue River	6	2018-10-04	A	Narpus concolor	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	29.3479
Rogue River	6	2018-10-04	A	Optioservus	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	352.1748
Rogue River	6	2018-10-04	A	Zaitzevia	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	29.3479
Rogue River	6	2018-10-04	A	Nemata	U	non-insect	Aquatic	Nemata	miscellaneous non-insect	x	round worms	29.3479
Rogue River	6	2018-10-04	A	Crangonyx	U	non-insect	Aquatic	Crustacea: Amphipoda	x	Crangonyctidae	scuds	146.7395
Rogue River	6	2018-10-04	A	Ostracoda	U	non-insect	Aquatic	Crustacea: Ostracoda	x	x	seed shrimp	117.3916
Rogue River	6	2018-10-04	A	Oligochaeta	U	non-insect	Aquatic	Annelida: Oligochaeta	miscellaneous non-insect	x	segmented worms	1804.89585
Rogue River	6	2018-10-04	A	Physella	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Physidae	snails	264.1311
Rogue River	6	2018-10-04	A	Juga	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Pleuroceridae	snails	29.3479
Rogue River	6	2018-10-04	A	Calineuria californica	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlidae	stoneflies	1.345
Rogue River	6	2018-10-04	A	Pteronarcys californica	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Pteronarcyidae	stoneflies	14.67395
Rogue River	3	2018-10-05	A	Petrophila	L	insect	Aquatic	Arthropoda: Insecta	Lepidoptera	Pyralidae	aquatic moths	23.0533
Rogue River	3	2018-10-05	A	Amiocentrus aspilus	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Brachycentridae	caddisflies	69.1599
Rogue River	3	2018-10-05	A	Brachycentrus occidentalis	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Brachycentridae	caddisflies	253.5863
Rogue River	3	2018-10-05	A	Glossosoma	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Glossosomatidae	caddisflies	23.0533
Rogue River	3	2018-10-05	A	Glossosoma	P	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Glossosomatidae	caddisflies	46.1066
Rogue River	3	2018-10-05	A	Goera archaon	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Goeridae	caddisflies	1.345
Rogue River	3	2018-10-05	A	Hydropsyche	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydropsychidae	caddisflies	138.3198
Rogue River	3	2018-10-05	A	Lepidostoma (Neodinarthrum)	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies	991.2919
Rogue River	3	2018-10-05	A	Lepidostoma unicolor group	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies	23.0533
Rogue River	3	2018-10-05	A	Ceraclea	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Leptoceridae	caddisflies	69.1599
Rogue River	3	2018-10-05	A	Chelifera/Metachela	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Empididae	dance flies	23.0533

Waterbody	Station	Date	Replicate	Taxon	Stage	Insect	Origin	Higher.classification	Order	Family	Common.name	Abundance
Rogue River	3	2018-10-05	A	Hemerodromia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Empididae	dance flies	530.2259
Rogue River	3	2018-10-05	A	Trepaxonemata	U	non-insect	Aquatic	Turbellaria	miscellaneous non-insect	x	flat worms	69.1599
Rogue River	3	2018-10-05	A	Acentrella insignificans	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	23.0533
Rogue River	3	2018-10-05	A	Baetis tricaudatus complex	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	138.3198
Rogue River	3	2018-10-05	A	Drunella grandis	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Ephemerellidae	mayflies	1.345
Rogue River	3	2018-10-05	A	Ephemerella excrucians group	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Ephemerellidae	mayflies	530.2259
Rogue River	3	2018-10-05	A	Ephemerella tibialis	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Ephemerellidae	mayflies	1.345
Rogue River	3	2018-10-05	A	Cinygma	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Heptageniidae	mayflies	69.1599
Rogue River	3	2018-10-05	A	Epeorus	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Heptageniidae	mayflies	184.4264
Rogue River	3	2018-10-05	A	Rhithrogena	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Heptageniidae	mayflies	69.1599
Rogue River	3	2018-10-05	A	Leptophlebiidae	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Leptophlebiidae	mayflies	46.1066
Rogue River	3	2018-10-05	A	Chironomidae	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae	midges	138.3198
Rogue River	3	2018-10-05	A	Polypedilum	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	46.1066
Rogue River	3	2018-10-05	A	Stenochironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	23.0533
Rogue River	3	2018-10-05	A	Micropsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	23.0533
Rogue River	3	2018-10-05	A	Diamesa	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Diamesinae	midges	46.1066
Rogue River	3	2018-10-05	A	Potthastia gaedii group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Diamesinae	midges	23.0533
Rogue River	3	2018-10-05	A	Cricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	161.3731
Rogue River	3	2018-10-05	A	Cricotopus (Nostococladius)	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	2466.7031
Rogue River	3	2018-10-05	A	Cricotopus bicinctus group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	23.0533
Rogue River	3	2018-10-05	A	Cricotopus trifascia group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	23.0533
Rogue River	3	2018-10-05	A	Eukiefferiella brehmi group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	92.2132
Rogue River	3	2018-10-05	A	Eukiefferiella claripennis group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	299.6929
Rogue River	3	2018-10-05	A	Eukiefferiella devonica group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	92.2132
Rogue River	3	2018-10-05	A	Orthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	207.4797
Rogue River	3	2018-10-05	A	Synorthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	184.4264
Rogue River	3	2018-10-05	A	Thienemanniella	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	23.0533
Rogue River	3	2018-10-05	A	Atractides	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	46.1066
Rogue River	3	2018-10-05	A	Lebertia	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	253.5863
Rogue River	3	2018-10-05	A	Protzia	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	23.0533
Rogue River	3	2018-10-05	A	Sperchon	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	115.2665
Rogue River	3	2018-10-05	A	Sperchonopsis	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	23.0533
Rogue River	3	2018-10-05	A	Torrenticola	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	46.1066
Rogue River	3	2018-10-05	A	Prostoma	U	non-insect	Aquatic	Annelida: Nemertea	miscellaneous non-insect	Tetrastemmatidae	nemerteans	23.0533
Rogue River	3	2018-10-05	A	Optioservus	A	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	138.3198
Rogue River	3	2018-10-05	A	Narpus concolor	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	1.345
Rogue River	3	2018-10-05	A	Optioservus	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	1175.7183
Rogue River	3	2018-10-05	A	Zaitzevia	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	345.7995
Rogue River	3	2018-10-05	A	Nemata	U	non-insect	Aquatic	Nemata	miscellaneous non-insect	x	round worms	161.3731
Rogue River	3	2018-10-05	A	Ostracoda	U	non-insect	Aquatic	Crustacea: Ostracoda	x	x	seed shrimp	46.1066
Rogue River	3	2018-10-05	A	Oligochaeta	U	non-insect	Aquatic	Annelida: Oligochaeta	miscellaneous non-insect	x	segmented worms	2005.6371
Rogue River	3	2018-10-05	A	Physella	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Physidae	snails	161.3731
Rogue River	3	2018-10-05	A	Juga	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Pleuroceridae	snails	461.066
Rogue River	3	2018-10-05	A	Sweltsa	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Chloroperlidae	stoneflies	23.0533
Rogue River	3	2018-10-05	A	Claassenia sabulosa	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlidae	stoneflies	23.0533
Rogue River	3	2018-10-05	A	Isoperla	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlodidae	stoneflies	23.0533
Rogue River	3	2018-10-05	A	Skwala	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlodidae	stoneflies	1.345
Rogue River	3	2018-10-05	A	Pteronarcys californica	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Pteronarcyidae	stoneflies	1.345
Rogue River	5	2018-10-05	A	Simulium	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies	121.05
Rogue River	5	2018-10-05	A	Brachycentrus occidentalis	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Brachycentridae	caddisflies	80.7
Rogue River	5	2018-10-05	A	Protoptila	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Glossosomatidae	caddisflies	40.35
Rogue River	5	2018-10-05	A	Trepaxonemata	U	non-insect	Aquatic	Turbellaria	miscellaneous non-insect	x	flat worms	1694.7
Rogue River	5	2018-10-05	A	Baetis tricaudatus complex	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	121.05
Rogue River	5	2018-10-05	A	Ephemerella excrucians group	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Ephemerellidae	mayflies	40.35
Rogue River	5	2018-10-05	A	Chironomidae	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae	midges	161.4
Rogue River	5	2018-10-05	A	Phaenopsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	40.35
Rogue River	5	2018-10-05	A	Polypedilum	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	484.2
Rogue River	5	2018-10-05	A	Cricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	40.35
Rogue River	5	2018-10-05	A	Cricotopus trifascia group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	685.95
Rogue River	5	2018-10-05	A	Eukiefferiella brehmi group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	80.7
Rogue River	5	2018-10-05	A	Eukiefferiella claripennis group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	161.4
Rogue River	5	2018-10-05	A	Eukiefferiella devonica group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	282.45
Rogue River	5	2018-10-05	A	Orthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	322.8
Rogue River	5	2018-10-05	A	Synorthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	121.05
Rogue River	5	2018-10-05	A	Oribatida	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	322.8
Rogue River	5	2018-10-05	A	Sperchon	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	40.35
Rogue River	5	2018-10-05	A	Sperchonopsis	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	40.35
Rogue River	5	2018-10-05	A	Testudacarus	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	40.35

Waterbody	Station	Date	Replicate	Taxon	Stage	Insect	Origin	Higher.classification	Order	Family	Common.name	Abundance
Rogue River	5	2018-10-05	A	Psychoda	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Psychodidae	moth flies	40.35
Rogue River	5	2018-10-05	A	Sphaeriidae	U	non-insect	Aquatic	Mollusca: Bivalvia	x	Sphaeriidae	pea clams	40.35
Rogue River	5	2018-10-05	A	Optioservus	A	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	40.35
Rogue River	5	2018-10-05	A	Optioservus	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	242.1
Rogue River	5	2018-10-05	A	Nemata	U	non-insect	Aquatic	Nemata	miscellaneous non-insect	x	round worms	40.35
Rogue River	5	2018-10-05	A	Crangonyx	U	non-insect	Aquatic	Crustacea: Amphipoda	x	Crangonyctidae	scuds	1170.15
Rogue River	5	2018-10-05	A	Ostracoda	U	non-insect	Aquatic	Crustacea: Ostracoda	x	x	seed shrimp	80.7
Rogue River	5	2018-10-05	A	Oligochaeta	U	non-insect	Aquatic	Annelida: Oligochaeta	miscellaneous non-insect	x	segmented worms	6577.05
Rogue River	5	2018-10-05	A	Fluminicola	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Hydrobiidae	snails	3792.9
Rogue River	5	2018-10-05	A	Lanx	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Lymnaeidae	snails	1.345
Rogue River	5	2018-10-05	A	Physella	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Physidae	snails	1170.15
Rogue River	5	2018-10-05	A	Helisoma	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Planorbidae	snails	1.345
Rogue River	5	2018-10-05	A	Menetus	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Planorbidae	snails	40.35
Rogue River	5	2018-10-05	A	Pteronarcys californica	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Pteronarcyidae	stoneflies	1.345
Rogue River	7	2018-10-05	A	Simulium	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies	221.925
Rogue River	7	2018-10-05	A	Brachycentrus occidentalis	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Brachycentridae	caddisflies	20.175
Rogue River	7	2018-10-05	A	Glossosoma	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Glossosomatidae	caddisflies	80.7
Rogue River	7	2018-10-05	A	Hydropsyche	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydropsychidae	caddisflies	685.95
Rogue River	7	2018-10-05	A	Lepidostoma (Neodinarthrum)	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies	100.875
Rogue River	7	2018-10-05	A	Ceraclea	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Leptoceridae	caddisflies	1.345
Rogue River	7	2018-10-05	A	Hemerodromia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Empididae	dance flies	40.35
Rogue River	7	2018-10-05	A	Trepaxonemata	U	non-insect	Aquatic	Turbellaria	miscellaneous non-insect	x	flat worms	907.875
Rogue River	7	2018-10-05	A	Acentrella insignificans	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	20.175
Rogue River	7	2018-10-05	A	Baetis tricaudatus complex	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	3268.35
Rogue River	7	2018-10-05	A	Drunella grandis	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Ephemerellidae	mayflies	20.175
Rogue River	7	2018-10-05	A	Ephemerella excrucians group	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Ephemerellidae	mayflies	262.275
Rogue River	7	2018-10-05	A	Leptophlebiidae	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Leptophlebiidae	mayflies	20.175
Rogue River	7	2018-10-05	A	Chironomidae	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae	midges	201.75
Rogue River	7	2018-10-05	A	Microtendipes pedellus group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	100.875
Rogue River	7	2018-10-05	A	Paratendipes	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	20.175
Rogue River	7	2018-10-05	A	Polypedilum	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	262.275
Rogue River	7	2018-10-05	A	Micropsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	60.525
Rogue River	7	2018-10-05	A	Cardiocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	121.05
Rogue River	7	2018-10-05	A	Cricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	242.1
Rogue River	7	2018-10-05	A	Cricotopus bicinctus group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	20.175
Rogue River	7	2018-10-05	A	Cricotopus trifascia group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	141.225
Rogue River	7	2018-10-05	A	Eukiefferiella claripennis group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	282.45
Rogue River	7	2018-10-05	A	Eukiefferiella devonica group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	40.35
Rogue River	7	2018-10-05	A	Orthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	181.575
Rogue River	7	2018-10-05	A	Synorthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	141.225
Rogue River	7	2018-10-05	A	Thienemanniella	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	20.175
Rogue River	7	2018-10-05	A	Tvetenia vitracies group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	100.875
Rogue River	7	2018-10-05	A	Lebertia	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	20.175
Rogue River	7	2018-10-05	A	Sperchon	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	121.05
Rogue River	7	2018-10-05	A	Prostoma	U	non-insect	Aquatic	Annelida: Nemertea	miscellaneous non-insect	Tetrastemmatidae	nemerteans	60.525
Rogue River	7	2018-10-05	A	Optioservus	A	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	20.175
Rogue River	7	2018-10-05	A	Optioservus	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	746.475
Rogue River	7	2018-10-05	A	Zaitzevia	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	20.175
Rogue River	7	2018-10-05	A	Nemata	U	non-insect	Aquatic	Nemata	miscellaneous non-insect	x	round worms	121.05
Rogue River	7	2018-10-05	A	Crangonyx	U	non-insect	Aquatic	Crustacea: Amphipoda	x	Crangonyctidae	scuds	20.175
Rogue River	7	2018-10-05	A	Ostracoda	U	non-insect	Aquatic	Crustacea: Ostracoda	x	x	seed shrimp	40.35
Rogue River	7	2018-10-05	A	Oligochaeta	U	non-insect	Aquatic	Annelida: Oligochaeta	miscellaneous non-insect	x	segmented worms	1755.225
Rogue River	7	2018-10-05	A	Fluminicola	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Hydrobiidae	snails	1.345
Rogue River	7	2018-10-05	A	Lanx	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Lymnaeidae	snails	1.345
Rogue River	7	2018-10-05	A	Physella	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Physidae	snails	161.4
Rogue River	7	2018-10-05	A	Juga	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Pleuroceridae	snails	1.345
Rogue River	7	2018-10-05	A	Calineuria californica	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlidae	stoneflies	20.175
Rogue River	7	2018-10-05	A	Claassenia sabulosa	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlidae	stoneflies	20.175
Rogue River	7	2018-10-05	A	Pteronarcys californica	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Pteronarcyidae	stoneflies	20.175
Rogue River	2	2018-10-03	B	Petrophila	L	insect	Aquatic	Arthropoda: Insecta	Lepidoptera	Pyralidae	aquatic moths	564.9
Rogue River	2	2018-10-03	B	Simulium	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies	80.7
Rogue River	2	2018-10-03	B	Amiocentrus aspilus	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Brachycentridae	caddisflies	80.7
Rogue River	2	2018-10-03	B	Brachycentrus occidentalis	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Brachycentridae	caddisflies	2178.9
Rogue River	2	2018-10-03	B	Glossosoma	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Glossosomatidae	caddisflies	80.7
Rogue River	2	2018-10-03	B	Glossosoma	P	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Glossosomatidae	caddisflies	80.7
Rogue River	2	2018-10-03	B	Cheumatopsyche	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydropsychidae	caddisflies	161.4
Rogue River	2	2018-10-03	B	Hydropsyche	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydropsychidae	caddisflies	3631.5
Rogue River	2	2018-10-03	B	Hydroptila	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydroptilidae	caddisflies	322.8

Waterbody	Station	Date	Replicate	Taxon	Stage	Insect	Origin	Higher.classification	Order	Family	Common.name	Abundance
Rogue River	2	2018-10-03	B	Lepidostoma (Neodinarthrum)	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies	322.8
Rogue River	2	2018-10-03	B	Ceraclea	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Leptoceridae	caddisflies	1.345
Rogue River	2	2018-10-03	B	Rhyacophila arnaudi	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Rhyacophilidae	caddisflies	1.345
Rogue River	2	2018-10-03	B	Rhyacophila brunnea/vemna group	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Rhyacophilidae	caddisflies	1.345
Rogue River	2	2018-10-03	B	Rhyacophila malkini	P	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Rhyacophilidae	caddisflies	161.4
Rogue River	2	2018-10-03	B	Pacifastacus	U	non-insect	Aquatic	Crustacea: Decapoda	x	Astacidae	crayfish	1.345
Rogue River	2	2018-10-03	B	Hemerodromia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Empididae	dance flies	322.8
Rogue River	2	2018-10-03	B	Trepaxonemata	U	non-insect	Aquatic	Turbellaria	miscellaneous non-insect	x	flat worms	403.5
Rogue River	2	2018-10-03	B	Acentrella insignificans	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	80.7
Rogue River	2	2018-10-03	B	Baetis flavistriga complex	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	80.7
Rogue River	2	2018-10-03	B	Baetis tricaudatus complex	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	403.5
Rogue River	2	2018-10-03	B	Drunella grandis	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Ephemerellidae	mayflies	80.7
Rogue River	2	2018-10-03	B	Ephemerella excrucians group	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Ephemerellidae	mayflies	3631.5
Rogue River	2	2018-10-03	B	Ephemerella tibialis	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Ephemerellidae	mayflies	1.345
Rogue River	2	2018-10-03	B	Cinygma	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Heptageniidae	mayflies	161.4
Rogue River	2	2018-10-03	B	Heptagenia	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Heptageniidae	mayflies	80.7
Rogue River	2	2018-10-03	B	Rhithrogena	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Heptageniidae	mayflies	1.345
Rogue River	2	2018-10-03	B	Leptophlebiidae	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Leptophlebiidae	mayflies	80.7
Rogue River	2	2018-10-03	B	Chironomidae	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae	midges	1129.8
Rogue River	2	2018-10-03	B	Polypedilum	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	80.7
Rogue River	2	2018-10-03	B	Micropsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	242.1
Rogue River	2	2018-10-03	B	Paratanytarsus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	80.7
Rogue River	2	2018-10-03	B	Rheotanytarsus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	80.7
Rogue River	2	2018-10-03	B	Potthastia gaedii group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Diamesinae	midges	80.7
Rogue River	2	2018-10-03	B	Cricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	645.6
Rogue River	2	2018-10-03	B	Cricotopus (Nostococladius)	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	7747.2
Rogue River	2	2018-10-03	B	Cricotopus trifascia group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	484.2
Rogue River	2	2018-10-03	B	Eukiefferiella brehmi group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	645.6
Rogue River	2	2018-10-03	B	Eukiefferiella claripennis group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	1210.5
Rogue River	2	2018-10-03	B	Eukiefferiella devonica group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	1452.6
Rogue River	2	2018-10-03	B	Orthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	2017.5
Rogue River	2	2018-10-03	B	Thienemanniella	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	80.7
Rogue River	2	2018-10-03	B	Tvetenia vitracies group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	80.7
Rogue River	2	2018-10-03	B	Trombidiformes	U	non-insect	Aquatic	Arachnida: Acari	Trombidiformes	x	mites	80.7
Rogue River	2	2018-10-03	B	Lebertia	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	242.1
Rogue River	2	2018-10-03	B	Sperchon	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	645.6
Rogue River	2	2018-10-03	B	Sperchonopsis	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	242.1
Rogue River	2	2018-10-03	B	Prostoma	U	non-insect	Aquatic	Annelida: Nemertea	miscellaneous non-insect	Tetrastemmatidae	nemerteans	80.7
Rogue River	2	2018-10-03	B	Optioservus	A	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	80.7
Rogue River	2	2018-10-03	B	Zaitzevia	A	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	80.7
Rogue River	2	2018-10-03	B	Narpus concolor	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	80.7
Rogue River	2	2018-10-03	B	Optioservus	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	4438.5
Rogue River	2	2018-10-03	B	Zaitzevia	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	1129.8
Rogue River	2	2018-10-03	B	Nemata	U	non-insect	Aquatic	Nemata	miscellaneous non-insect	x	round worms	242.1
Rogue River	2	2018-10-03	B	Crangonyx	U	non-insect	Aquatic	Crustacea: Amphipoda	x	Crangonyctidae	scuds	80.7
Rogue River	2	2018-10-03	B	Oligochaeta	U	non-insect	Aquatic	Annelida: Oligochaeta	miscellaneous non-insect	x	segmented worms	5003.4
Rogue River	2	2018-10-03	B	Lanx	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Lymnaeidae	snails	1.345
Rogue River	2	2018-10-03	B	Juga	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Pleuroceridae	snails	1.345
Rogue River	2	2018-10-03	B	Calineuria californica	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlidae	stoneflies	1.345
Rogue River	2	2018-10-03	B	Hesperoperla pacifica	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlidae	stoneflies	1.345
Rogue River	2	2018-10-03	B	Isoperla	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlodidae	stoneflies	80.7
Rogue River	2	2018-10-03	B	Skwala	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlodidae	stoneflies	1.345
Rogue River	2	2018-10-03	B	Pteronarcys californica	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Pteronarcyidae	stoneflies	1.345
Rogue River	1	2018-10-04	B	Amiocentrus aspilus	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Brachycentridae	caddisflies	107.61345
Rogue River	1	2018-10-04	B	Brachycentrus occidentalis	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Brachycentridae	caddisflies	896.77875
Rogue River	1	2018-10-04	B	Glossosoma	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Glossosomatidae	caddisflies	753.29415
Rogue River	1	2018-10-04	B	Glossosoma	P	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Glossosomatidae	caddisflies	35.87115
Rogue River	1	2018-10-04	B	Cheumatopsyche	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydropsychidae	caddisflies	35.87115
Rogue River	1	2018-10-04	B	Hydropsyche	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydropsychidae	caddisflies	3300.1458
Rogue River	1	2018-10-04	B	Lepidostoma (Neodinarthrum)	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies	573.9384
Rogue River	1	2018-10-04	B	Ceraclea	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Leptoceridae	caddisflies	35.87115
Rogue River	1	2018-10-04	B	Trepaxonemata	U	non-insect	Aquatic	Turbellaria	miscellaneous non-insect	x	flat worms	107.61345
Rogue River	1	2018-10-04	B	Acentrella insignificans	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	71.7423
Rogue River	1	2018-10-04	B	Baetis tricaudatus complex	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	358.7115
Rogue River	1	2018-10-04	B	Drunella grandis	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Ephemerellidae	mayflies	107.61345
Rogue River	1	2018-10-04	B	Ephemerella excrucians group	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Ephemerellidae	mayflies	2008.7844
Rogue River	1	2018-10-04	B	Epeorus	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Heptageniidae	mayflies	179.35575
Rogue River	1	2018-10-04	B	Rhithrogena	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Heptageniidae	mayflies	358.7115

Waterbody	Station	Date	Replicate	Taxon	Stage	Insect	Origin	Higher.classification	Order	Family	Common.name	Abundance
Rogue River	1	2018-10-04	B	Chironomidae	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae	midges	466.32495
Rogue River	1	2018-10-04	B	Polypedilum	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	394.58265
Rogue River	1	2018-10-04	B	Micropsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	1004.3922
Rogue River	1	2018-10-04	B	Diamesa	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Diamesinae	midges	35.87115
Rogue River	1	2018-10-04	B	Potthastia gaedii group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Diamesinae	midges	35.87115
Rogue River	1	2018-10-04	B	Cricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	394.58265
Rogue River	1	2018-10-04	B	Cricotopus (Nostococladius)	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	358.7115
Rogue River	1	2018-10-04	B	Eukiefferiella brehmi group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	107.61345
Rogue River	1	2018-10-04	B	Eukiefferiella claripennis group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	932.6499
Rogue River	1	2018-10-04	B	Eukiefferiella devonica group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	215.2269
Rogue River	1	2018-10-04	B	Orthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	322.84035
Rogue River	1	2018-10-04	B	Synorthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	35.87115
Rogue River	1	2018-10-04	B	Tvetenia bavarica group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	35.87115
Rogue River	1	2018-10-04	B	Lebertia	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	179.35575
Rogue River	1	2018-10-04	B	Sperchon	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	753.29415
Rogue River	1	2018-10-04	B	Optioservus	A	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	322.84035
Rogue River	1	2018-10-04	B	Narpus concolor	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	71.7423
Rogue River	1	2018-10-04	B	Optioservus	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	1937.0421
Rogue River	1	2018-10-04	B	Zaitzevia	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	502.1961
Rogue River	1	2018-10-04	B	Nemata	U	non-insect	Aquatic	Nemata	miscellaneous non-insect	x	round worms	358.7115
Rogue River	1	2018-10-04	B	Oligochaeta	U	non-insect	Aquatic	Annelida: Oligochaeta	miscellaneous non-insect	x	segmented worms	1721.8152
Rogue River	1	2018-10-04	B	Juga	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Pleuroceridae	snails	71.7423
Rogue River	1	2018-10-04	B	Capniidae	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Capniidae	stoneflies	71.7423
Rogue River	1	2018-10-04	B	Sweltsa	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Chloroperlidae	stoneflies	358.7115
Rogue River	1	2018-10-04	B	Claassenia sabulosa	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlidae	stoneflies	286.9692
Rogue River	1	2018-10-04	B	Hesperoperla pacifica	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlidae	stoneflies	35.87115
Rogue River	1	2018-10-04	B	Isoperla	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlodidae	stoneflies	215.2269
Rogue River	1	2018-10-04	B	Perlodidae	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlodidae	stoneflies	215.2269
Rogue River	1	2018-10-04	B	Skwala	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlodidae	stoneflies	35.87115
Rogue River	1	2018-10-04	B	Pteronarcys californica	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Pteronarcyidae	stoneflies	35.87115
Rogue River	4	2018-10-04	B	Simulium	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies	72.91245
Rogue River	4	2018-10-04	B	Glossosoma	P	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Glossosomatidae	caddisflies	24.30415
Rogue River	4	2018-10-04	B	Hydropsyche	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydropsychidae	caddisflies	170.12905
Rogue River	4	2018-10-04	B	Lepidostoma (Neodinarthrum)	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies	729.1245
Rogue River	4	2018-10-04	B	Lepidostoma unicolor group	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies	24.30415
Rogue River	4	2018-10-04	B	Ceraclea	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Leptoceridae	caddisflies	874.9494
Rogue River	4	2018-10-04	B	Hemerodromia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Empididae	dance flies	72.91245
Rogue River	4	2018-10-04	B	Trepaxonemata	U	non-insect	Aquatic	Turbellaria	miscellaneous non-insect	x	flat worms	534.6913
Rogue River	4	2018-10-04	B	Acentrella insignificans	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	218.73735
Rogue River	4	2018-10-04	B	Baetis tricaudatus complex	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	194.4332
Rogue River	4	2018-10-04	B	Drunella grandis	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Ephemerellidae	mayflies	24.30415
Rogue River	4	2018-10-04	B	Ephemerella excrucians group	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Ephemerellidae	mayflies	1288.11995
Rogue River	4	2018-10-04	B	Chironomidae	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae	midges	874.9494
Rogue River	4	2018-10-04	B	Polypedilum	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	291.6498
Rogue River	4	2018-10-04	B	Micropsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	121.52075
Rogue River	4	2018-10-04	B	Potthastia gaedii group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Diamesinae	midges	267.34565
Rogue River	4	2018-10-04	B	Potthastia longimana group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Diamesinae	midges	24.30415
Rogue River	4	2018-10-04	B	Cardiocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	24.30415
Rogue River	4	2018-10-04	B	Cricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	510.38715
Rogue River	4	2018-10-04	B	Cricotopus (Nostococladius)	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	24.30415
Rogue River	4	2018-10-04	B	Cricotopus trifascia group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	364.56225
Rogue River	4	2018-10-04	B	Eukiefferiella claripennis group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	72.91245
Rogue River	4	2018-10-04	B	Eukiefferiella devonica group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	24.30415
Rogue River	4	2018-10-04	B	Nanocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	48.6083
Rogue River	4	2018-10-04	B	Orthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	2551.93575
Rogue River	4	2018-10-04	B	Rheocricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	48.6083
Rogue River	4	2018-10-04	B	Synorthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	97.2166
Rogue River	4	2018-10-04	B	Tvetenia vitracies group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	24.30415
Rogue River	4	2018-10-04	B	Thienemannimyia complex	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	24.30415
Rogue River	4	2018-10-04	B	Lebertia	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	24.30415
Rogue River	4	2018-10-04	B	Sperchon	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	194.4332
Rogue River	4	2018-10-04	B	Sperchonopsis	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	24.30415
Rogue River	4	2018-10-04	B	Torrenticola	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	24.30415
Rogue River	4	2018-10-04	B	Prostoma	U	non-insect	Aquatic	Annelida: Nemertea	miscellaneous non-insect	Tetrastemmatidae	nemerteans	24.30415
Rogue River	4	2018-10-04	B	Sphaeriidae	U	non-insect	Aquatic	Mollusca: Bivalvia	x	Sphaeriidae	pea clams	48.6083
Rogue River	4	2018-10-04	B	Optioservus	A	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	24.30415
Rogue River	4	2018-10-04	B	Narpus concolor	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	24.30415
Rogue River	4	2018-10-04	B	Optioservus	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	923.5577

Waterbody	Station	Date	Replicate	Taxon	Stage	Insect	Origin	Higher.classification	Order	Family	Common.name	Abundance
Rogue River	4	2018-10-04	B	Zaitzevia	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	97.2166
Rogue River	4	2018-10-04	B	Nemata	U	non-insect	Aquatic	Nemata	miscellaneous non-insect	x	round worms	194.4332
Rogue River	4	2018-10-04	B	Ostracoda	U	non-insect	Aquatic	Crustacea: Ostracoda	x	x	seed shrimp	267.34565
Rogue River	4	2018-10-04	B	Oligochaeta	U	non-insect	Aquatic	Annelida: Oligochaeta	miscellaneous non-insect	x	segmented worms	1020.7743
Rogue River	4	2018-10-04	B	Fluminicola	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Hydrobiidae	snails	48.6083
Rogue River	4	2018-10-04	B	Juga	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Pleuroceridae	snails	267.34565
Rogue River	4	2018-10-04	B	Chloroperlidae	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Chloroperlidae	stoneflies	1.345
Rogue River	4	2018-10-04	B	Claassenia sabulosa	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlidae	stoneflies	24.30415
Rogue River	4	2018-10-04	B	Hesperoperla pacifica	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlidae	stoneflies	1.345
Rogue River	4	2018-10-04	B	Pteronarcys californica	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Pteronarcyidae	stoneflies	1.345
Rogue River	6	2018-10-04	B	Simulium	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies	23.0533
Rogue River	6	2018-10-04	B	Amiocentrus aspilus	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Brachycentridae	caddisflies	46.1066
Rogue River	6	2018-10-04	B	Brachycentrus occidentalis	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Brachycentridae	caddisflies	69.1599
Rogue River	6	2018-10-04	B	Protoptila	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Glossosomatidae	caddisflies	23.0533
Rogue River	6	2018-10-04	B	Hydropsyche	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydropsychidae	caddisflies	184.4264
Rogue River	6	2018-10-04	B	Hydroptila	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydroptilidae	caddisflies	23.0533
Rogue River	6	2018-10-04	B	Lepidostoma (Neodinarthrum)	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies	691.599
Rogue River	6	2018-10-04	B	Lepidostoma unicolor group	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies	23.0533
Rogue River	6	2018-10-04	B	Ceraclea	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Leptoceridae	caddisflies	161.3731
Rogue River	6	2018-10-04	B	Hemerodromia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Empididae	dance flies	46.1066
Rogue River	6	2018-10-04	B	Trepaxonemata	U	non-insect	Aquatic	Turbellaria	miscellaneous non-insect	x	flat worms	668.5457
Rogue River	6	2018-10-04	B	Acentrella insignificans	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	23.0533
Rogue River	6	2018-10-04	B	Baetis tricaudatus complex	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	115.2665
Rogue River	6	2018-10-04	B	Ephemerella excrucians group	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Ephemerellidae	mayflies	299.6929
Rogue River	6	2018-10-04	B	Chironomidae	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae	midges	207.4797
Rogue River	6	2018-10-04	B	Cryptochironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	23.0533
Rogue River	6	2018-10-04	B	Polypedilum	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	23.0533
Rogue River	6	2018-10-04	B	Micropsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	23.0533
Rogue River	6	2018-10-04	B	Rheotanytarsus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	23.0533
Rogue River	6	2018-10-04	B	Cricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	299.6929
Rogue River	6	2018-10-04	B	Cricotopus trifascia group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	1014.3452
Rogue River	6	2018-10-04	B	Eukiefferiella claripennis group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	253.5863
Rogue River	6	2018-10-04	B	Eukiefferiella devonica group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	92.2132
Rogue River	6	2018-10-04	B	Nanocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	23.0533
Rogue River	6	2018-10-04	B	Orthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	622.4391
Rogue River	6	2018-10-04	B	Synorthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	161.3731
Rogue River	6	2018-10-04	B	Lebertia	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	46.1066
Rogue River	6	2018-10-04	B	Protzia	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	23.0533
Rogue River	6	2018-10-04	B	Sperchon	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	23.0533
Rogue River	6	2018-10-04	B	Sperchonopsis	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	23.0533
Rogue River	6	2018-10-04	B	Torrenticola	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	115.2665
Rogue River	6	2018-10-04	B	Sphaeriidae	U	non-insect	Aquatic	Mollusca: Bivalvia	x	Sphaeriidae	pea clams	23.0533
Rogue River	6	2018-10-04	B	Optioservus	A	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	23.0533
Rogue River	6	2018-10-04	B	Narpus concolor	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	1.345
Rogue River	6	2018-10-04	B	Optioservus	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	691.599
Rogue River	6	2018-10-04	B	Zaitzevia	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	69.1599
Rogue River	6	2018-10-04	B	Nemata	U	non-insect	Aquatic	Nemata	miscellaneous non-insect	x	round worms	46.1066
Rogue River	6	2018-10-04	B	Crangonyx	U	non-insect	Aquatic	Crustacea: Amphipoda	x	Crangonyctidae	scuds	507.1726
Rogue River	6	2018-10-04	B	Ostracoda	U	non-insect	Aquatic	Crustacea: Ostracoda	x	x	seed shrimp	991.2919
Rogue River	6	2018-10-04	B	Oligochaeta	U	non-insect	Aquatic	Annelida: Oligochaeta	miscellaneous non-insect	x	segmented worms	1959.5305
Rogue River	6	2018-10-04	B	Lanx	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Lymnaeidae	snails	1.345
Rogue River	6	2018-10-04	B	Physella	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Physidae	snails	1613.731
Rogue River	6	2018-10-04	B	Juga	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Pleuroceridae	snails	207.4797
Rogue River	3	2018-10-05	B	Petrophila	L	insect	Aquatic	Arthropoda: Insecta	Lepidoptera	Pyralidae	aquatic moths	26.9
Rogue River	3	2018-10-05	B	Amiocentrus aspilus	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Brachycentridae	caddisflies	295.9
Rogue River	3	2018-10-05	B	Brachycentrus occidentalis	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Brachycentridae	caddisflies	699.4
Rogue River	3	2018-10-05	B	Glossosoma	P	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Glossosomatidae	caddisflies	26.9
Rogue River	3	2018-10-05	B	Hydropsyche	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydropsychidae	caddisflies	107.6
Rogue River	3	2018-10-05	B	Hydroptila	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydroptilidae	caddisflies	26.9
Rogue River	3	2018-10-05	B	Lepidostoma (Neodinarthrum)	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies	914.6
Rogue River	3	2018-10-05	B	Lepidostoma unicolor group	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies	26.9
Rogue River	3	2018-10-05	B	Ceraclea	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Leptoceridae	caddisflies	53.8
Rogue River	3	2018-10-05	B	Rhyacophila coloradensis group	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Rhyacophilidae	caddisflies	1.345
Rogue River	3	2018-10-05	B	Hemerodromia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Empididae	dance flies	376.6
Rogue River	3	2018-10-05	B	Trepaxonemata	U	non-insect	Aquatic	Turbellaria	miscellaneous non-insect	x	flat worms	107.6
Rogue River	3	2018-10-05	B	Acentrella insignificans	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	26.9
Rogue River	3	2018-10-05	B	Baetis tricaudatus complex	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	80.7
Rogue River	3	2018-10-05	B	Ephemerella excrucians group	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Ephemerellidae	mayflies	860.8

Waterbody	Station	Date	Replicate	Taxon	Stage	Insect	Origin	Higher.classification	Order	Family	Common.name	Abundance
Rogue River	3	2018-10-05	B	Epeorus	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Heptageniidae	mayflies	134.5
Rogue River	3	2018-10-05	B	Rhithrogena	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Heptageniidae	mayflies	26.9
Rogue River	3	2018-10-05	B	Leptophlebiidae	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Leptophlebiidae	mayflies	26.9
Rogue River	3	2018-10-05	B	Chironomidae	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae	midges	269
Rogue River	3	2018-10-05	B	Polypedilum	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	322.8
Rogue River	3	2018-10-05	B	Micropsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	161.4
Rogue River	3	2018-10-05	B	Rheotanytarsus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	53.8
Rogue River	3	2018-10-05	B	Potthastia gaedii group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Diamesinae	midges	26.9
Rogue River	3	2018-10-05	B	Corynoneura	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	26.9
Rogue River	3	2018-10-05	B	Cricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	134.5
Rogue River	3	2018-10-05	B	Cricotopus (Nostococladius)	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	1587.1
Rogue River	3	2018-10-05	B	Eukiefferiella brehmi group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	80.7
Rogue River	3	2018-10-05	B	Eukiefferiella claripennis group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	322.8
Rogue River	3	2018-10-05	B	Orthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	511.1
Rogue River	3	2018-10-05	B	Synorthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	134.5
Rogue River	3	2018-10-05	B	Thienemanniella	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	80.7
Rogue River	3	2018-10-05	B	Lebertia	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	376.6
Rogue River	3	2018-10-05	B	Protzia	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	134.5
Rogue River	3	2018-10-05	B	Sperchon	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	376.6
Rogue River	3	2018-10-05	B	Sperchonopsis	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	80.7
Rogue River	3	2018-10-05	B	Prostoma	U	non-insect	Aquatic	Annelida: Nemertea	miscellaneous non-insect	Tetrastemmatidae	nemerteans	53.8
Rogue River	3	2018-10-05	B	Optioservus	A	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	53.8
Rogue River	3	2018-10-05	B	Zaitzevia	A	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	26.9
Rogue River	3	2018-10-05	B	Narpus concolor	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	53.8
Rogue River	3	2018-10-05	B	Optioservus	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	1479.5
Rogue River	3	2018-10-05	B	Zaitzevia	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	295.9
Rogue River	3	2018-10-05	B	Nemata	U	non-insect	Aquatic	Nemata	miscellaneous non-insect	x	round worms	53.8
Rogue River	3	2018-10-05	B	Crangonyx	U	non-insect	Aquatic	Crustacea: Amphipoda	x	Crangonyctidae	scuds	26.9
Rogue River	3	2018-10-05	B	Ostracoda	U	non-insect	Aquatic	Crustacea: Ostracoda	x	x	seed shrimp	188.3
Rogue River	3	2018-10-05	B	Oligochaeta	U	non-insect	Aquatic	Annelida: Oligochaeta	miscellaneous non-insect	x	segmented worms	2528.6
Rogue River	3	2018-10-05	B	Physella	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Physidae	snails	349.7
Rogue River	3	2018-10-05	B	Juga	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Pleuroceridae	snails	376.6
Rogue River	3	2018-10-05	B	Claassenia sabulosa	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlidae	stoneflies	1.345
Rogue River	3	2018-10-05	B	Perlodidae	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlodidae	stoneflies	1.345
Rogue River	3	2018-10-05	B	Skwala	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlodidae	stoneflies	1.345
Rogue River	5	2018-10-05	B	Simulium	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies	161.4
Rogue River	5	2018-10-05	B	Brachycentrus occidentalis	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Brachycentridae	caddisflies	53.8
Rogue River	5	2018-10-05	B	Hydropsyche	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydropsychidae	caddisflies	53.8
Rogue River	5	2018-10-05	B	Hydroptila	P	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydroptilidae	caddisflies	107.6
Rogue River	5	2018-10-05	B	Trepaxonemata	U	non-insect	Aquatic	Turbellaria	miscellaneous non-insect	x	flat worms	3228
Rogue River	5	2018-10-05	B	Helobdella	U	non-insect	Aquatic	Annelida: Hirudinea	miscellaneous non-insect	Glossiphoniidae	leeches	1.345
Rogue River	5	2018-10-05	B	Acentrella insignificans	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	53.8
Rogue River	5	2018-10-05	B	Baetis tricaudatus complex	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	107.6
Rogue River	5	2018-10-05	B	Ephemerella excrucians group	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Ephemerellidae	mayflies	161.4
Rogue River	5	2018-10-05	B	Chironomidae	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae	midges	107.6
Rogue River	5	2018-10-05	B	Polypedilum	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	591.8
Rogue River	5	2018-10-05	B	Cricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	53.8
Rogue River	5	2018-10-05	B	Cricotopus trifascia group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	699.4
Rogue River	5	2018-10-05	B	Eukiefferiella brehmi group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	269
Rogue River	5	2018-10-05	B	Eukiefferiella claripennis group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	269
Rogue River	5	2018-10-05	B	Eukiefferiella devonica group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	215.2
Rogue River	5	2018-10-05	B	Orthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	591.8
Rogue River	5	2018-10-05	B	Synorthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	107.6
Rogue River	5	2018-10-05	B	Thienemanniella	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	53.8
Rogue River	5	2018-10-05	B	Nilotanypus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	53.8
Rogue River	5	2018-10-05	B	Oribatida	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	322.8
Rogue River	5	2018-10-05	B	Sperchon	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	107.6
Rogue River	5	2018-10-05	B	Sphaeriidae	U	non-insect	Aquatic	Mollusca: Bivalvia	x	Sphaeriidae	pea clams	269
Rogue River	5	2018-10-05	B	Optioservus	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	430.4
Rogue River	5	2018-10-05	B	Crangonyx	U	non-insect	Aquatic	Crustacea: Amphipoda	x	Crangonyctidae	scuds	2636.2
Rogue River	5	2018-10-05	B	Ostracoda	U	non-insect	Aquatic	Crustacea: Ostracoda	x	x	seed shrimp	860.8
Rogue River	5	2018-10-05	B	Oligochaeta	U	non-insect	Aquatic	Annelida: Oligochaeta	miscellaneous non-insect	x	segmented worms	5111
Rogue River	5	2018-10-05	B	Fluminicola	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Hydrobiidae	snails	5003.4
Rogue River	5	2018-10-05	B	Lanx	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Lymnaeidae	snails	1.345
Rogue River	5	2018-10-05	B	Physella	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Physidae	snails	4895.8
Rogue River	5	2018-10-05	B	Helisoma	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Planorbidae	snails	1.345
Rogue River	5	2018-10-05	B	Menetus	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Planorbidae	snails	53.8
Rogue River	5	2018-10-05	B	Juga	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Pleuroceridae	snails	161.4

Waterbody	Station	Date	Replicate	Taxon	Stage	Insect	Origin	Higher.classification	Order	Family	Common.name	Abundance
Rogue River	7	2018-10-05	B	Simulium	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies	515.8344
Rogue River	7	2018-10-05	B	Simulium	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies	30.3432
Rogue River	7	2018-10-05	B	Brachycentrus occidentalis	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Brachycentridae	caddisflies	30.3432
Rogue River	7	2018-10-05	B	Glossosoma	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Glossosomatidae	caddisflies	91.0296
Rogue River	7	2018-10-05	B	Hydropsyche	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydropsychidae	caddisflies	1001.3256
Rogue River	7	2018-10-05	B	Lepidostoma (Neodinarthrum)	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies	121.3728
Rogue River	7	2018-10-05	B	Ceraclea	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Leptoceridae	caddisflies	1.345
Rogue River	7	2018-10-05	B	Hemerodromia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Empididae	dance flies	60.6864
Rogue River	7	2018-10-05	B	Trepaxonemata	U	non-insect	Aquatic	Turbellaria	miscellaneous non-insect	x	flat worms	1759.9056
Rogue River	7	2018-10-05	B	Acentrella insignificans	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	91.0296
Rogue River	7	2018-10-05	B	Baetis tricaudatus complex	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	3641.184
Rogue River	7	2018-10-05	B	Drunella grandis	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Ephemerellidae	mayflies	1.345
Rogue River	7	2018-10-05	B	Ephemerella excrucians group	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Ephemerellidae	mayflies	394.4616
Rogue River	7	2018-10-05	B	Chironomidae	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae	midges	758.58
Rogue River	7	2018-10-05	B	Microtendipes pedellus group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	121.3728
Rogue River	7	2018-10-05	B	Polypedilum	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	364.1184
Rogue River	7	2018-10-05	B	Tanytarsus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	60.6864
Rogue River	7	2018-10-05	B	Cardiocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	515.8344
Rogue River	7	2018-10-05	B	Cricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	364.1184
Rogue River	7	2018-10-05	B	Cricotopus trifascia group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	182.0592
Rogue River	7	2018-10-05	B	Eukiefferiella brehmi group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	91.0296
Rogue River	7	2018-10-05	B	Eukiefferiella claripennis group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	364.1184
Rogue River	7	2018-10-05	B	Eukiefferiella devonica group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	121.3728
Rogue River	7	2018-10-05	B	Eukiefferiella pseudomontana group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	30.3432
Rogue River	7	2018-10-05	B	Orthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	394.4616
Rogue River	7	2018-10-05	B	Rheocricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	60.6864
Rogue River	7	2018-10-05	B	Synorthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	30.3432
Rogue River	7	2018-10-05	B	Tvetenia vitracies group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	60.6864
Rogue River	7	2018-10-05	B	Sperchon	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	151.716
Rogue River	7	2018-10-05	B	Optioservus	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	697.8936
Rogue River	7	2018-10-05	B	Zaitzevia	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	30.3432
Rogue River	7	2018-10-05	B	Nemata	U	non-insect	Aquatic	Nemata	miscellaneous non-insect	x	round worms	30.3432
Rogue River	7	2018-10-05	B	Crangonyx	U	non-insect	Aquatic	Crustacea: Amphipoda	x	Crangonyctidae	scuds	515.8344
Rogue River	7	2018-10-05	B	Ostracoda	U	non-insect	Aquatic	Crustacea: Ostracoda	x	x	seed shrimp	30.3432
Rogue River	7	2018-10-05	B	Oligochaeta	U	non-insect	Aquatic	Annelida: Oligochaeta	miscellaneous non-insect	x	segmented worms	2093.6808
Rogue River	7	2018-10-05	B	Galba	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Lymnaeidae	snails	1.345
Rogue River	7	2018-10-05	B	Physella	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Physidae	snails	303.432
Rogue River	7	2018-10-05	B	Juga	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Pleuroceridae	snails	1.345
Rogue River	7	2018-10-05	B	Sweltsa	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Chloroperlidae	stoneflies	1.345
Rogue River	7	2018-10-05	B	Calineuria californica	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlidae	stoneflies	1.345
Rogue River	7	2018-10-05	B	Claassenia sabulosa	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlidae	stoneflies	30.3432
Rogue River	7	2018-10-05	B	Hesperoperla pacifica	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlidae	stoneflies	1.345

Taxon	Stage	Insect.	Origin	Higher.classification	Order	Family	Common.name	BCG.Attribute	Feeding.Group	CA.feeding.group	Habit	Tolerance	WY.HBI	PSSB.tolerance	CA.tolerance	HDG.tolerance	BCI.TV	PSSB.long.lived	Voltinism	Development	Occurrence.in.drift	Size.at.maturity	Rheophily	Thermal.preference	a	b
Nemata	U	non-insect	Aquatic	Nemata	miscellaneous non-insect	x	round worms	4	PA	PR	BU	0	5	0	6	0	108	0	2	2	1	2	2	2	0.0758	0.74
Oligochaeta	U	non-insect	Aquatic	Annelida: Oligochaeta	miscellaneous non-insect	x	segmented worms	4	CG	CG	BU	0	5	0	5	0	108	0	2	2	1	2	2	2	0.0758	0.74
Prostoma	U	non-insect	Aquatic	Annelida: Nemertea	miscellaneous non-insect	Tetrastemmatidae	nemerteans	5	PR	PR	SP	0	8	0	8	0	110	0	2	2	1	1	1	2	0.0758	0.74
Protzia	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	3	PA	PR	SW	MT	5	0	8	0	108	0	3	2	2	1	2	2	0.053	2.494
Lebertia	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	4	PA	PR	SW	MT	5	0	8	0	108	0	3	2	2	1	2	2	0.053	2.494
Sperchon	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	4	PA	PR	SW	MT	5	0	8	0	108	0	3	2	2	1	2	2	0.053	2.494
Atractides	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	4	PA	PR	SW	MT	5	0	8	0	108	0	3	2	2	1	2	2	0.053	2.494
Acentrella insignificans	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	3	CG	CG	CL	0	6	0	4	0	72	0	3	1	2	1	2	2	0.00962	2.75
Baetis tricaudatus complex	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	4	CG	CG	CL	0	6	0	6	0	72	0	3	1	3	1	2	2	0.0053	2.875
Drunella grandis	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Ephemerellidae	mayflies	2	PR	CG	CL	0	1	0	0	0	24	0	2	2	1	3	3	2	0.0019	3.46
Ephemerella excrucians group	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Ephemerellidae	mayflies	4	CG	CG	CL	0	1	0	1	0	48	0	2	2	2	2	2	2	0.0097	2.663
Epeorus	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Heptageniidae	mayflies	3	SC	SC	CL	0	0	0	0	0	21	0	2	1	1	2	3	1	0.0108	2.754
Rhithrogena	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Heptageniidae	mayflies	3	SC	SC	CL	0	0	0	0	0	21	0	2	1	2	2	3	2	0.0108	2.754
Sweltsa	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Chloroperlidae	stoneflies	3	PR	PR	BU	0	1	0	1	0	24	0	1	2	2	2	2	2	0.0065	2.724
Calineuria californica	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlidae	stoneflies	2	PR	PR	CL	0	2	0	2	0	24	0	1	2	1	3	3	2	0.0099	2.879
Perlodidae	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlodidae	stoneflies	3	PR	PR	CL	0	2	0	2	0	48	0	2	2	1	3	2	2	0.0196	2.742
Isoperla	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlodidae	stoneflies	3	PR	PR	CL	0	2	0	2	0	48	0	2	2	2	2	2	2	0.0196	2.742
Brachycentrus occidentalis	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Brachycentridae	caddisflies	3	OM	OM	CL	0	1	0	1	0	24	0	2	2	1	2	3	2	0.0025	3.443
Glossosoma	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Glossosomatidae	caddisflies	3	SC	SC	CL	0	1	0	1	0	24	0	3	3	1	2	3	2	0.0082	2.958
Glossosoma	P	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Glossosomatidae	caddisflies	3	SC	SC	CL	0	1	0	1	0	24	0	3	3	1	2	3	2	0.0082	2.958
Hydropsyche	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydropsychidae	caddisflies	4	CF	CF	CL	0	4	0	4	0	108	0	2	2	2	2	3	2	0.0046	2.926
Ceraclea	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Leptoceridae	caddisflies	4	CG	OM	CM	0	4	0	4	0	18	0	2	2	1	2	2	2	0.0034	3.212
Hydroptila	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydroptilidae	caddisflies	4	PH	PH	CL	MT	6	0	6	0	108	0	3	2	2	1	2	2	0.0056	2.839
Lepidostoma (Neodinarthrum)	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies	3	CG	SH	CM	0	1	0	1	0	18	0	2	1	1	2	2	2	0.0079	2.649
Narpus concolor	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	4	CG	CG	CL	0	4	0	4	0	104	0	1	3	1	2	2	2	0.0074	2.879
Optioservus	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	4	SC	SC	CL	MT	4	0	4	0	104	0	1	3	2	1	2	2	0.0074	2.879
Optioservus	A	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	4	CG	SC	CL	MT	4	0	4	0	104	0	1	3	2	1	2	2	0.00093	6.18
Zaitzevia	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	3	CG	SC	CL	MT	6	0	4	0	104	0	1	3	2	1	2	2	0.0074	2.879
Hemerodromia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Empididae	dance flies	4	PR	PR	SP	MT	6	0	6	0	95	0	3	2	1	2	2	2	0.0054	2.546
Simulium	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies	4	CF	CF	CL	0	6	0	6	0	108	0	3	1	3	1	3	2	0.002	3.011
Chironomidae	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae	midges	4	CG	CG	BU	0	6	0	6	0	108	0	3	1	3	1	2	2	0.0018	2.617
Cricotopus (Nostococladius)	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	3	UN	CG	BU	MI	3	0	1	0	108	0	3	1	3	1	2	1	0.0018	2.617
Cricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	4	CG	CG	CL	0	7	0	7	0	108	0	3	1	3	1	2	2	0.0018	2.617
Diamesa	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Diamesinae	midges	3	CG	CG	SP	HI	5	0	2	0	108	0	3	1	3	2	2	1	0.0018	2.617
Eukiefferiella brehmi group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	4	CG	OM	SP	0	8	0	8	0	108	0	3	1	3	1	2	2	0.0018	2.617
Eukiefferiella claripennis group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	4	CG	OM	SP	MT	8	0	8	0	108	0	3	1	3	1	2	2	0.0018	2.617
Eukiefferiella devonica group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	4	CG	OM	SP	0	8	0	8	0	108	0	3	1	3	1	2	2	0.0018	2.617
Micropsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	4	CG	CG	CL	0	7	0	7	0	108	0	3	1	3	1	2	2	0.0018	2.617
Nanocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	4	CG	CG	SP	0	3	0	3	0	108	0	3	1	3	1	2	2	0.0018	2.617
Orthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	3	CG	CG	SP	0	6	0	6	0	108	0	3	1	3	1	2	2	0.0018	2.617
Polypedilum	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	4	MH	MH	CL	0	6	0	6	0	108	0	3	1	3	1	2	2	0.0018	2.617
Juga	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Pleuroceridae	snails	4	OM	SC	CL	MT	7	0	7	0	108	0	1	2	1	3	2	2	0.0208	3.03
Ephemerella tibialis	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Ephemerellidae	mayflies	3	CG	CG	CL	0	2	0	2	0	48	0	2	2	2	2	2	2	0.0104	2.83
Hesperoperla pacifica	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlidae	stoneflies	3	PR	PR	CL	0	2	0	2	0	18	0	1	3	1	3	3	2	0.0099	2.879
Claassenia sabulosa	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlidae	stoneflies	3	PR	PR	CL	0	3	0	3	0	6	0	1	3	1	3	3	2	0.0099	2.879
Skwala	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Perlodidae	stoneflies	3	PR	PR	CL	0	2	0	2	0	18	0	2	2	1	3	2	2	0.0196	2.742
Pteronarcys californica	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Pteronarcyidae	stoneflies	3	SH	OM	SP	0	1	0	1	0	18	0	1	2	2	3	2	2	0.0324	2.573
Trepaxonemata	U	non-insect	Aquatic	Turbellaria	miscellaneous non-insect	x	flat worms	4	PR	PR	CL	0	4	0	4	0	108	0	2	2	1	2	2	2	0.0082	2.168
Capniidae	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Capniidae	stoneflies	3	SH	SH	SP	MI	1	0	1	0	32	0	2	1	1	2	2	1	0.0049	2.562
Amiocentrus aspilus	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Brachycentridae	caddisflies	3	CG	CG	CL	0	3	0	3	0	24	0	2	2	1	2	2	2	0.0083	2.818
Cheumatopsyche	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydropsychidae	caddisflies	5	CF	CF	CL	MT	8	0	5	0	108	0	3	3	2	2	3	2	0.0046	2.926
Potthastia gaedii group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Diamesinae	midges	4	CG	CG	SP	0	2	0	2	0	108	0	3	1	3	1	2	2	0.0018	2.617
Synorthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	3	CG	CG	SP	0	2	0	2	0	108	0	3	1	3	1	2	2	0.0018	2.617
Tvetenia bavarica group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	4	CG	CG	SP	0	5	0	5	0	108	0	3	1	3	1	2	2	0.0018	2.617
Sperchonopsis	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	4	PA	PR	SW	MT	5	0	8	0	108	0	3	2	2	1	2	2	0.053	2.494
Leucotrichia	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydroptilidae	caddisflies	4	SC	SC	CL	0	6	0	6	0	108	0	3	2	1	1	2	2	0.0056	2.839
Lepidostoma-panel case larvae	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies	4	SH	SH	CM	0	1	0	1	0	18	0	2	1	1	2	1	2	0.0079	2.649
Psychomyia	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Psychomyiidae	caddisflies	3	SC	CG	CL	0	2	0	2	0	108	0	2	2	1	2	2	2	0.0039	2.873
Rhyacophila malkini	P	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Rhyacophilidae	caddisflies	3	PR	PR	CL	0	0	0	1	0	18	0	2	2	1	3	3	2	0.0099	2.48
Cricotopus trifascia group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	4	CG	CG	CL	MT	6	0	7	0	108	0	3	1	3	1	2	2	0.0018	2.617
Thienemanniella	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	4	CG	CG	SP	0	6	0	6	0	108	0	3	1	3	1	2	2	0.0018	2.617
Rhyacophila brunnea/vemna group	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Rhyacophilidae	caddisflies	3	PR	PR	CL	0	1	0	1	0	18	0	1	2	1	3	3	2	0.0099	2.48
Petrophila	L	insect	Aquatic	Arthropoda: Insecta	Lepidoptera	Pyralidae	aquatic moths	4	SC	SC	CL	MT	5	0	5	0	72	0	2	2	1	2	3	2	0.0033	2.918
Crangonyx	U	non-insect	Aquatic	Crustacea: Amphipoda	x	Crangonyctidae	scuds	5	CG	CG	SW	MT	11	0	4	0	108	0	3	2	1	1	2	2	0.0058	3.015
Trombidiformes	U	non-insect	Aquatic	Arachnida: Acari	Trombidiformes	x	mites	4	PA	PR	SW	0	5	0	5	0	108	0	3	2	2	1	2	2	0.053	2.494
Baetis flavistriga complex	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	4	CG	CG	CL	0	4	0	4	0	72	0	3	1	3	1	2	2	0.0053	2.875
Heptagenia	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Heptageniidae	mayflies	4	SC	SC	CL	MT	4	0	4	0	48	0	3	1	2	2	2	2	0.0108	2.754
Cinygma	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Heptageniidae	mayflies	4	SC	SC	CL	0	2	0	2	0	48	0	2	1	2	2	2	2	0.0108	2.754
Leptophlebiidae	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Leptophlebiidae	mayflies	3	CG	CG	SP	MT	6	0	2	0	36	0	2	1	2	1	2	2	0.0047	2.686
Zaitzevia	A	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	3	CG	SC	CL	MT	6	0	4	0	104	0	1	3	2	1	2	2	0.00093	6.18
Paratanytarsus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	4	CF	CF	CL	0	6	0	6	0	108	0	3	1	3	1	2	2	0.0018	2.617
Rheotanytarsus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	4	CF	CF	CL	0	6	0	6	0	108	0	3	1	3	1	2	2	0.0018	2.617
Tvetenia vitracies group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	4	CG	CG	SP	0	5	0	5	0	108	0	3	1	3	1	2	2	0.0018	2.617
Lanx	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Lymnaeidae	snails	0	SC	SC	CL	0	8	0	6	0	108	0	2	2	1	2	2	2	0.0208	3.03
Pacifastacus	U	non-insect	Aquatic	Crustacea: Decapoda	x	Astacidae	crayfish	4	OM	OM	SP	0	6	0	6	0	108	0	1	3	1	3	2	2	0.0147	3.626
Rhyacophila arnaudi	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Rhyacophilidae	caddisflies	2	PR	PR	CL	0	0	0	0	0	18	0	2	2	1	2	2	2	0.0099	2.48
Physella	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Physidae	snails	5	CG	SC	CL	HT	8	0	8	0	108	0	3	2	2	2	2	3	0.0208	3.03
Ostracoda	U	non-insect	Aquatic	Crustacea: Ostracoda	x	x	seed shrimp	4	CG	CG	SW	0	8	0	6	0	108	0	3	2	1	1	2	2	0.006753	2.27
Torrenticola	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	4	PA	PR	SW	0	5	0	5	0	108	0	3	2	2	1	2	2	0.053	2.494
Lepidostoma unicolor group	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies	3	SH	SH	CM	0	1	0	1	0	18	0	2	2	1	2	1	1	0.0079	2.649
Chelifera/Metachela	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Empididae	dance flies	4	PR	PR	SP	0	6	0	6	0	95	0	2	2	1	2	2	2	0.0054	2.546
Cricotopus bicinctus group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	4	CG	CG	CL	MT	7	0	7	0	108	0	3	1	3	1	2	2	0.0018	2.617
Stenochironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	4	CG	CG	BU	0	9	0	5	0	108	0	3	1	3	1	1	2	0.0018	2.617
Goera archaon	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Goeridae	caddisflies	2	SC	SC	CL	0	3	0	1	0	110	0	2	1	1	2	2	2	0.0056	2.839
Corynoneura	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	4	CG	CG	SP	0	7	0	7	0	108	0	3	1	3	1	2	2	0.0018	2.617
Rhyacophila coloradensis group	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Rhyacophilidae	caddisflies	3	PR	PR	CL	0	2	0	2	0	18	0	2	2	1	3	3	2	0.0099	2.48
Sphaeriidae	U	non-insect	Aquatic	Mollusca: Bivalvia	x	Sphaeriidae	pea clams	4	CF	CF	BU	0	8	0	8	0	108	0	1	3	1	1	2	2	0.0163	2.477
Oribatida	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	4	PA	PR	SW	0	5	0	5	0	108	0	3	2	2	1	2	2	0.053	2.494
Psychoda	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Psychodidae	moth flies	5	CG	CG	BU	HT	10	0	10	0	36	0	3	1	1	1	1	3	0.0025	2.692
Simulium	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies	4	CF	CF	CL	0	6	0	6	0	108	0	3	1	3	1	3	2	0.002	3.011
Microtendipes pedellus group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	4	CF	CF	CL	MT	6	0	6	0	108	0	3	1	3	1	1	2	0.0018	2.617
Phaenopsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	4	SC	SC	CL	0	7	0	7	0	108	0	3	1	3	1	1	2	0.0018	2.617
Helisoma	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Planorbidae	snails	4	SC	SC	CL	MT	11	0	6	0	108	0	2	2	1	2	2	3	0.0208	3.03
Sialis	L	insect	Aquatic	Arthropoda: Insecta	Megaloptera	Sialidae	alderflies	4	PR	PR	SP	MT	4	0	4	0	72	0	1	2	1	3	1	2	0.0037	2.753
Atherix	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Athericidae	higher flies	4	PR	PR	SP	0	4	0	2	0	24	0	1	2	1	2	2	2	0.0038	2.586
Fluminicola	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Hydrobiidae	snails	4	SC	SC	CL	MT	8	0	6	0	108	0	1	2	1	1	2	2	0.0208	3.03
Cardiocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	4	PR	PR	BU	MT	5	0	5	0	108	0	3	1	3	1	2	2	0.0018	2.617
Potthastia longimana group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Diamesinae	midges	3	CG	CG	SP	0	2	0	2	0	108	0	3	1	3	1	2	2	0.0018	2.617
Rheocricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	4	CG	CG	SP	0	6	0	6	0	108	0	3	1	3	1	2	2	0.0018	2.617
Thienemannimyia complex	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	4	PR	PR	SP	0	6	0	6	0	108	0	3	1	3	1	2	2	0.0018	2.617
Chloroperlidae	L	insect	Aquatic	Arthropoda: Insecta	Plecoptera	Chloroperlidae	stoneflies	3	PR	PR	BU	0	1	0	1	0	24	0	2	2	1	2	2	2	0.0065	2.724
Menetus	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Planorbidae	snails	4	SC	SC	CL	MT	8	0	6	0	108	0	3	2	1	1	2	2	0.0208	3.03
Testudacarus	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	4	PA	PR	SW	0	5	0	5	0	108	0	3	2	2	1	2	2	0.053	2.494
Protoptila	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Glossosomatidae	caddisflies	4	SC	SC	CL	0	1	0	1	0	32	0	3	3	1	1	3	2	0.0082	2.958
Hydroptila	P	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydroptilidae	caddisflies	4	PH	PH	CL	MT	6	0	6	0	108	0	3	2	2	1	2	2	0.0056	2.839
Nilotanypus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	4	PR	PR	SP	0	6	0	6	0	108	0	3	1	3	1	2	2	0.0018	2.617
Helobdella	U	non-insect	Aquatic	Annelida: Hirudinea	miscellaneous non-insect	Glossiphoniidae	leeches	5	PR	PR	CL	HT	6	0	6	0	108	0	2	2	1	2	2	2	0.000102	3.25
Hydraena	A	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Hydraenidae	moss beetles	4	SC	SC	CL	0	4	0	5	0	72	0	2	3	1	1	2	2	0.04	2.64
Cricotopus (Isocladius) type 1	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	4	CG	CG	CL	0	7	0	7	0	108	0	3	1	3	1	2	2	0.0018	2.617
Eukiefferiella pseudomontana group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	4	CG	OM	SP	MT	8	0	8	0	108	0	3	1	3	1	2	2	0.0018	2.617
Cryptochironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	5	PR	PR	SP	MT	8	0	8	0	108	0	3	1	3	1	1	2	0.0018	2.617
Paratendipes	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	4	CG	CG	BU	MT	8	0	8	0	108	0	3	1	3	1	1	2	0.0018	2.617
Tanytarsus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	4	CF	CF	CL	MT	6	0	6	0	108	0	3	1	3	1	2	2	0.0018	2.617
Galba	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Lymnaeidae	snails	4	SC	SC	CL	MT	8	0	8	0	108	0	3	2	1	2	2	2	0.0208	3.03

Appendix E

Supplemental October 2018 Periphyton Results

Table 1: Diatom percent community similarity (PSc) matrix between samples at October 2018 sampling sites

Site	1	1*	2	2*	3	3*	4	4*	5	5*	6	6*	7	7*
1	100%													
1*	75%	100%												
2	65%	67%	100%											
2*	67%	66%	77%	100%										
3	68%	79%	64%	63%	100%									
3*	74%	84%	68%	69%	81%	100%								
4	59%	67%	57%	55%	68%	70%	100%							
4*	60%	70%	61%	56%	73%	71%	74%	100%						
5	61%	59%	57%	53%	51%	56%	42%	49%	100%					
5*	56%	52%	53%	50%	57%	54%	39%	46%	72%	100%				
6	68%	69%	62%	59%	74%	72%	67%	74%	62%	56%	100%			
6*	64%	62%	64%	62%	65%	64%	55%	62%	60%	66%	69%	100%		
7	64%	64%	59%	54%	56%	59%	46%	52%	69%	66%	62%	62%	100%	
7*	67%	71%	65%	63%	62%	65%	51%	62%	68%	62%	70%	68%	71%	100%

*Replicate

Table 2: Summary table of descriptive diatom autecological attributes at October 2018 sampling sites

Site	Percent indifferent	Percent eutrophic	Percent eutrophic-mesotrophic	Percent mesotrophic	Percent mesotrophic-oligotrophic	Percent oligotrophic	Percent N fixers	Percent Indicative high N	Percent indicative low N	Percent indicative high P	Percent indicative low P	Percent unknown autecological attributes
1	17.65	69.41	1.18	0.00	3.53	1.18	0.00	57.65	0.00	56.47	3.53	7.06
1*	16.47	74.12	1.18	0.00	2.35	1.18	1.18	69.41	4.71	69.41	5.88	4.71
2	19.17	63.33	6.67	0.00	1.67	0.00	3.33	53.33	11.67	53.33	11.67	9.17
2*	33.06	54.55	4.96	0.00	0.00	0.83	2.48	52.89	4.96	52.89	4.96	6.61
3	17.14	68.57	2.86	0.00	3.81	0.95	0.95	70.48	4.76	69.52	5.71	6.67
3*	15.82	71.52	1.90	0.00	1.90	0.63	2.53	65.82	6.33	65.82	6.96	8.23
4	18.32	73.82	2.62	0.00	0.00	0.52	0.00	75.92	2.09	75.92	1.57	4.71
4*	26.47	61.76	4.41	0.00	2.94	0.00	0.00	75.00	2.45	75.00	4.90	4.41
5	5.60	73.60	4.00	0.00	2.40	4.00	1.60	50.40	4.80	48.00	7.20	10.40
5*	12.71	68.64	5.08	0.00	2.54	0.00	0.00	54.24	3.39	50.85	2.54	11.02
6	11.69	72.73	3.90	0.00	2.60	1.30	0.65	61.69	3.25	60.39	4.55	7.79
6*	14.79	69.72	5.63	0.00	0.70	0.00	0.00	64.79	2.11	54.23	1.41	9.15
7	13.76	65.14	8.26	0.00	2.75	1.83	0.00	60.55	1.83	58.72	4.59	8.26
7*	6.47	69.06	13.67	0.00	3.60	1.44	0.72	64.75	3.60	64.75	5.76	5.76

*Replicate

Table 3: Dominant taxon by cell density at October 2018 sampling sites

Site	Dominant taxon by cell density	Percent	Replicate dominant taxon by cell density	Replicate Percent
1	*Nitzschia frustulum*	35.5	*Nitzschia frustulum*	40.4
	Achnanthes minutissima	11.8	*Cocconeis placentula*	12.1
	Cocconeis placentula	10.8	*Oscillatoria sp.*	10.1
2	*Nitzschia frustulum*	30.4	*Nitzschia frustulum*	31.0
	Achnanthes minutissima	8.8	*Achnanthes minutissima*	22.2
	Navicula cryptocephala	6.4	*Navicula cryptocephala*	7.9
3	*Nitzschia frustulum*	41.2	*Nitzschia frustulum*	42.7
	Oscillatoria limosa	10.9	*Cocconeis placentula*	9.4
	Navicula cryptocephala	8.4	*Navicula cryptocephala*	6.4
4	*Nitzschia frustulum*	58.3	*Nitzschia frustulum*	45.0
	Achnanthes minutissima	8.9	*Nitzschia palea*	16.3
	Nitzschia palea	7.3	*Achnanthes minutissima*	5.3
5	*Nitzschia frustulum*	23.2	*Nitzschia frustulum*	20.3
	Cocconeis placentula	13.6	*Rhoicosphenia curvata*	13.6
	Navicula cryptocephala veneta	10.4	*Cocconeis placentula*	11.9
6	*Nitzschia frustulum*	40.6	*Nitzschia frustulum*	35.0
	Fragilaria construens	6.5	*Navicula cryptocephala*	9.1
	Cocconeis placentula	5.8	*Melosira varians*	8.4
7	*Cocconeis placentula*	20.9	*Nitzschia frustulum*	32.9
	Nitzschia frustulum	20.0	*Nitzschia dissipata*	12.9
	Nitzschia dissipata	8.2	*Cocconeis placentula*	12.9

Figure 1: Shannon's diversity and species richness of diatoms at October 2018 sampling sites

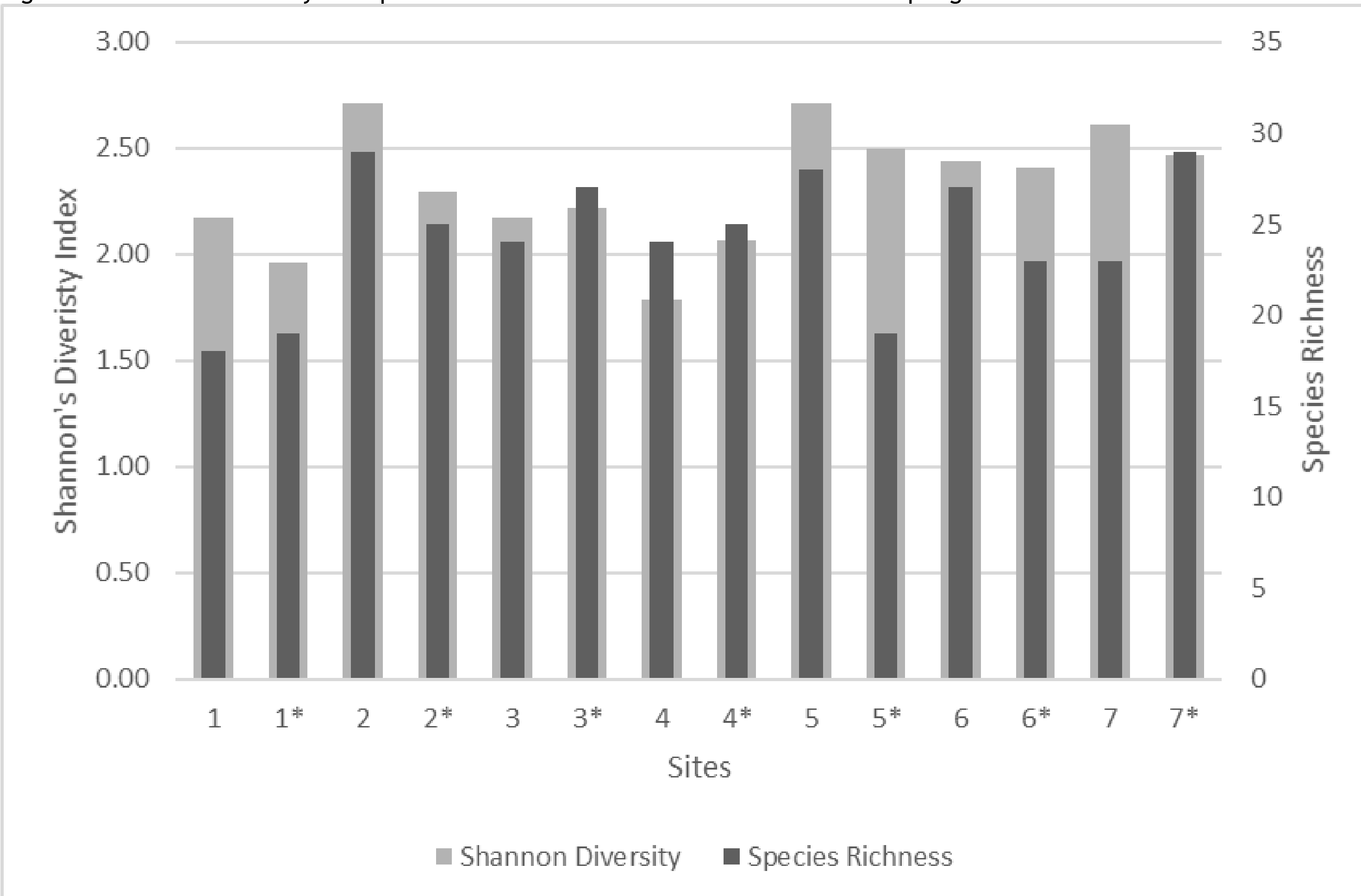


Figure 2: Percent sensitive and percent tolerant diatoms at October 2018 sampling sites

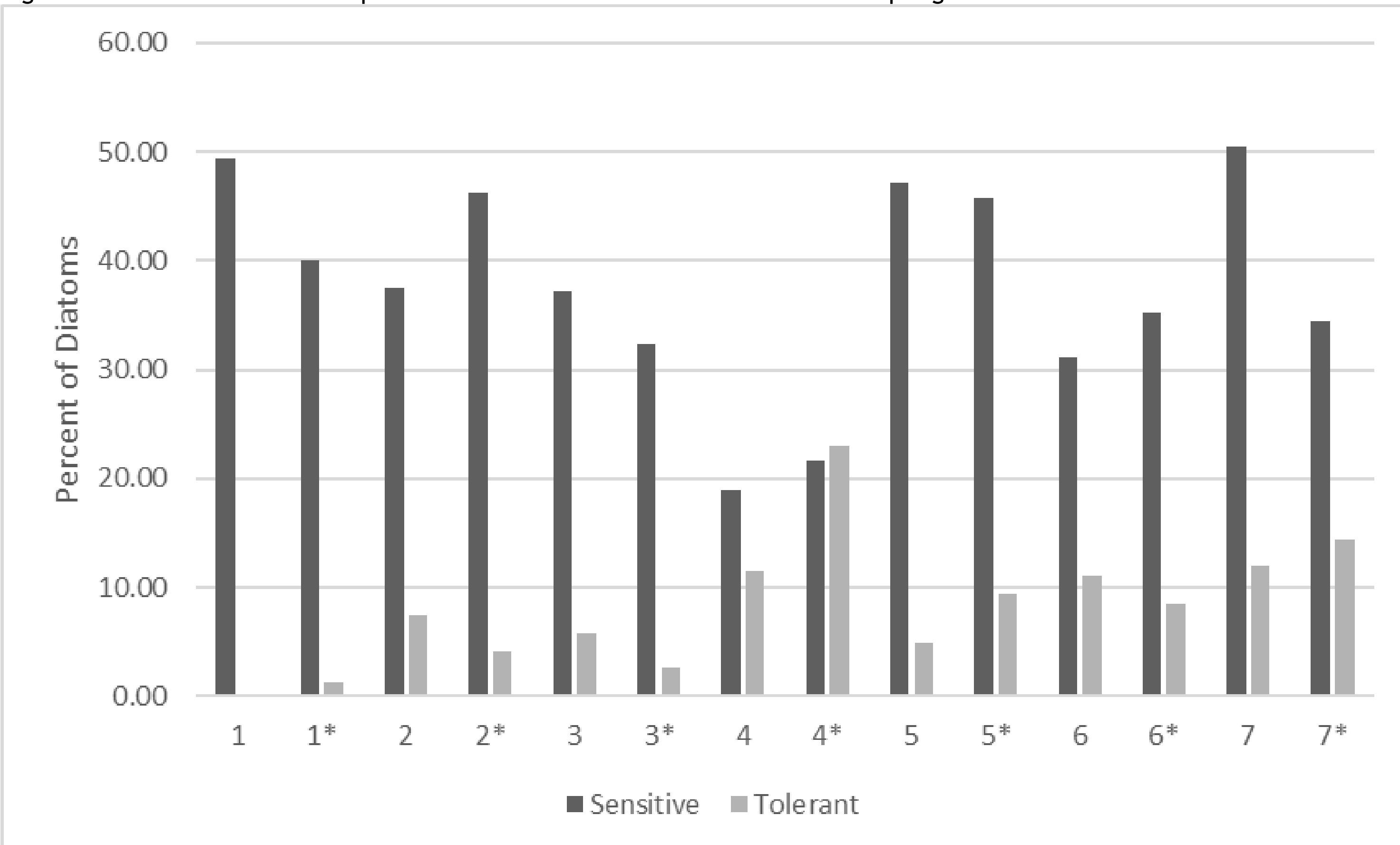


Figure 3: Periphyton Pollution Tolerance Index at October 2018 sampling sites

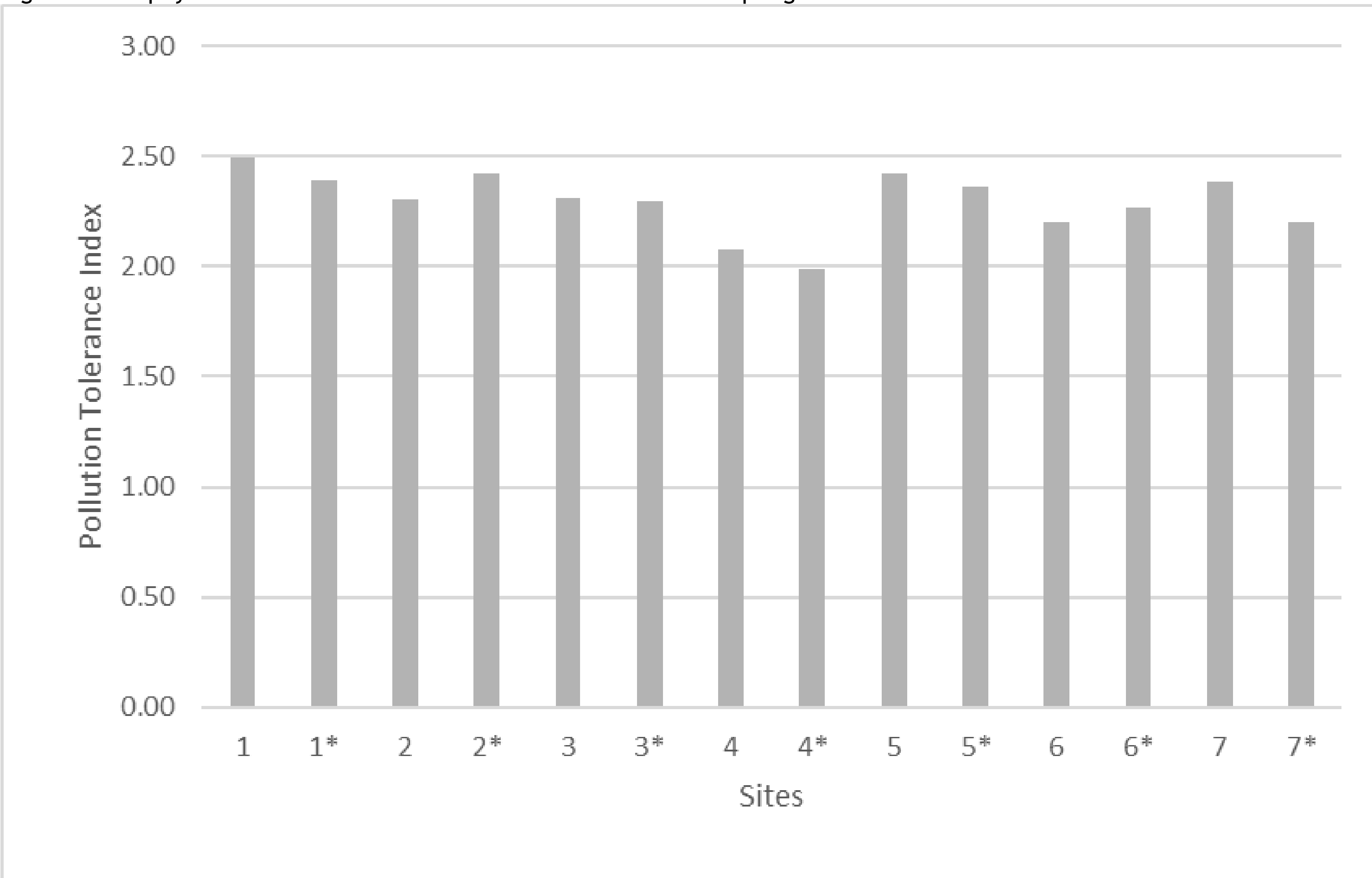
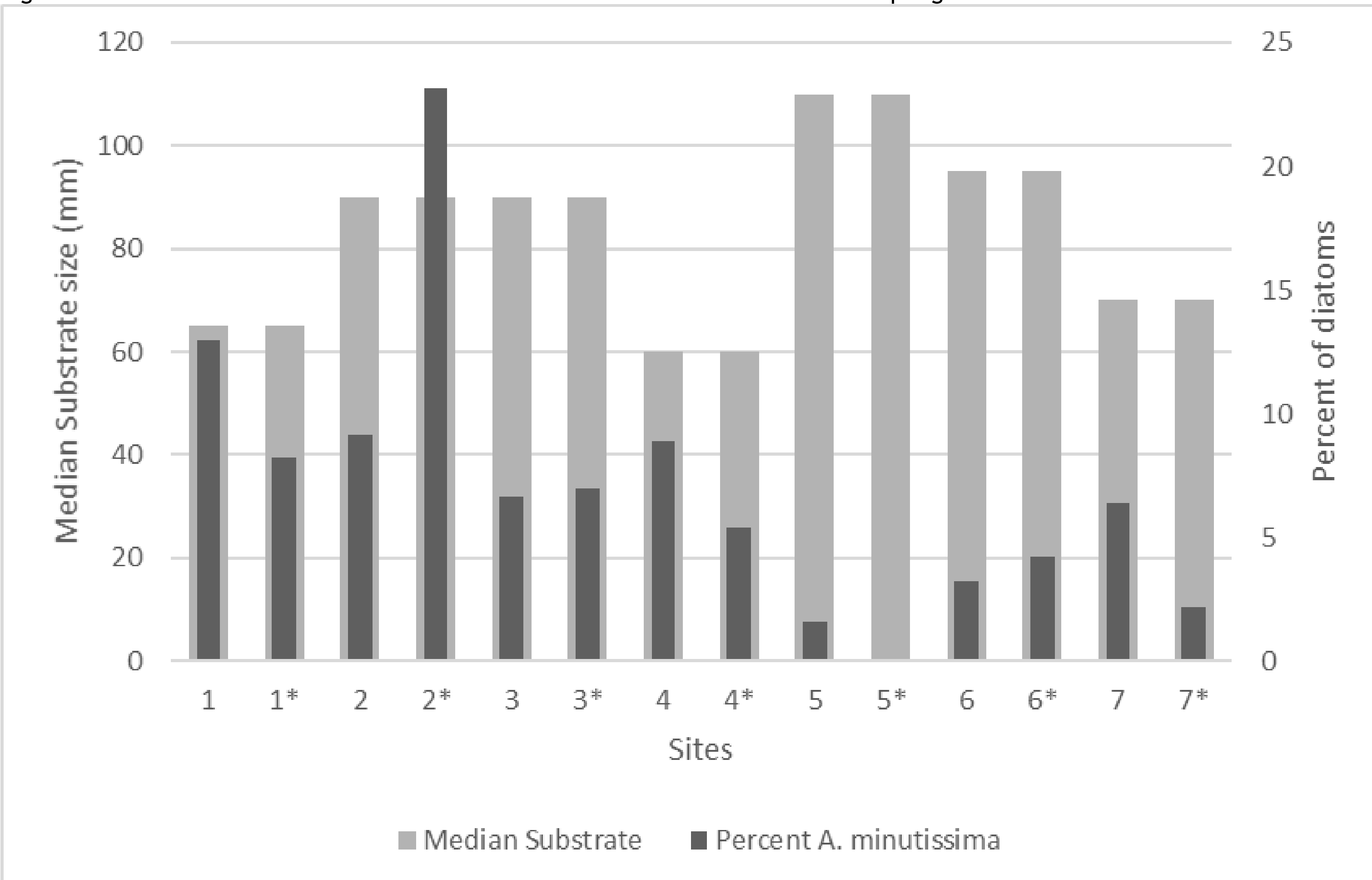


Figure 4: Median Substrate size and Percent *A. minustissima* at October 2018 sampling sites



Algae Identification Data

Slide	Lake/River	Sample Date	Site	Date Analyzed	Species Name	Species Code	Count per taxa	Density	% Density	Biovolume	% Biovolume	Group	Total Density	Total Biovolume	TSI	Depth Units	Count Units	Type
VR87	Rogue River	10/4/2018	R1	10/27/2018	Nitzschia frustulum	NZFR	33	21501	35.5	3096110	13.9	diatom	60593	22261759	72.2	m	NU	PERI
VR87	Rogue River	10/4/2018	R1	10/27/2018	Achnanthes minutissima	ACMN	11	7167	11.8	394181	1.8	diatom	60593	22261759	72.2	m	NU	PERI
VR87	Rogue River	10/4/2018	R1	10/27/2018	Cocconeis placentula	COPC	10	6515	10.8	2997076	13.5	diatom	60593	22261759	72.2	m	NU	PERI
VR87	Rogue River	10/4/2018	R1	10/27/2018	Oscillatoria sp.	OSXX	8	5212	8.6	5816934	26.1	bluegreen	60593	22261759	72.2	m	NU	PERI
VR87	Rogue River	10/4/2018	R1	10/27/2018	Rhoicosphenia curvata	RHCU	5	3258	5.4	381150	1.7	diatom	60593	22261759	72.2	m	NU	PERI
VR87	Rogue River	10/4/2018	R1	10/27/2018	Navicula cryptocephala veneta	NVCV	4	2606	4.3	247585	1.1	diatom	60593	22261759	72.2	m	NU	PERI
VR87	Rogue River	10/4/2018	R1	10/27/2018	Navicula cryptocephala	NVCR	4	2606	4.3	482138	2.2	diatom	60593	22261759	72.2	m	NU	PERI
VR87	Rogue River	10/4/2018	R1	10/27/2018	Achnanthes linearis	ACLN	3	1955	3.2	258009	1.2	diatom	60593	22261759	72.2	m	NU	PERI
VR87	Rogue River	10/4/2018	R1	10/27/2018	Cymbella minuta	CMMN	2	1303	2.2	482138	2.2	diatom	60593	22261759	72.2	m	NU	PERI
VR87	Rogue River	10/4/2018	R1	10/27/2018	Nitzschia paleacea	NZPC	2	1303	2.2	127702	0.6	diatom	60593	22261759	72.2	m	NU	PERI
VR87	Rogue River	10/4/2018	R1	10/27/2018	Gomphonema subclavatum	GFSB	2	1303	2.2	781846	3.5	diatom	60593	22261759	72.2	m	NU	PERI
VR87	Rogue River	10/4/2018	R1	10/27/2018	Navicula minuscula	NVML	2	1303	2.2	58638	0.3	diatom	60593	22261759	72.2	m	NU	PERI
VR87	Rogue River	10/4/2018	R1	10/27/2018	Fragilaria construens venter	FRCV	1	652	1.1	31274	0.1	diatom	60593	22261759	72.2	m	NU	PERI
VR87	Rogue River	10/4/2018	R1	10/27/2018	Gomphonema angustatum	GFAN	1	652	1.1	117277	0.5	diatom	60593	22261759	72.2	m	NU	PERI
VR87	Rogue River	10/4/2018	R1	10/27/2018	Nitzschia amphibia	NZAM	1	652	1.1	62548	0.3	diatom	60593	22261759	72.2	m	NU	PERI
VR87	Rogue River	10/4/2018	R1	10/27/2018	Synedra rumpens	SNRM	1	652	1.1	91215	0.4	diatom	60593	22261759	72.2	m	NU	PERI
VR87	Rogue River	10/4/2018	R1	10/27/2018	Asterionella formosa	ASFO	1	652	1.1	143338	0.6	diatom	60593	22261759	72.2	m	NU	PERI
VR87	Rogue River	10/4/2018	R1	10/27/2018	Cymbella cymbiformes	CMCM	1	652	1.1	6269101	28.2	diatom	60593	22261759	72.2	m	NU	PERI
VR87	Rogue River	10/4/2018	R1	10/27/2018	Melosira varians	MLVR	1	652	1.1	423500	1.9	diatom	60593	22261759	72.2	m	NU	PERI
VR88	Rogue River	10/4/2018	R1B	10/27/2018	Nitzschia frustulum	NZFR	40	18863	40.4	2263526	11.2	diatom	46685	20168488	71.5	m	NU	PERI
VR88	Rogue River	10/4/2018	R1B	10/27/2018	Cocconeis placentula	COPC	12	5659	12.1	2603055	12.9	diatom	46685	20168488	71.5	m	NU	PERI
VR88	Rogue River	10/4/2018	R1B	10/27/2018	Oscillatoria sp.	OSXX	10	4716	10.1	4970326	24.6	bluegreen	46685	20168488	71.5	m	NU	PERI
VR88	Rogue River	10/4/2018	R1B	10/27/2018	Achnanthes minutissima	ACMN	7	3301	7.1	181554	0.9	diatom	46685	20168488	71.5	m	NU	PERI
VR88	Rogue River	10/4/2018	R1B	10/27/2018	Navicula cryptocephala	NVCR	6	2829	6.1	523440	2.6	diatom	46685	20168488	71.5	m	NU	PERI
VR88	Rogue River	10/4/2018	R1B	10/27/2018	Navicula cryptocephala veneta	NVCV	5	2358	5.1	223995	1.1	diatom	46685	20168488	71.5	m	NU	PERI
VR88	Rogue River	10/4/2018	R1B	10/27/2018	Cladophora sp.	CFXX	3	1415	3.0	2404996	11.9	green	46685	20168488	71.5	m	NU	PERI
VR88	Rogue River	10/4/2018	R1B	10/27/2018	Gomphonema subclavatum	GFSB	2	943	2.0	848822	4.2	diatom	46685	20168488	71.5	m	NU	PERI
VR88	Rogue River	10/4/2018	R1B	10/27/2018	Nitzschia amphibia	NZAM	1	472	1.0	45271	0.2	diatom	46685	20168488	71.5	m	NU	PERI
VR88	Rogue River	10/4/2018	R1B	10/27/2018	Cymbella sinuata	CMSN	1	472	1.0	66020	0.3	diatom	46685	20168488	71.5	m	NU	PERI
VR88	Rogue River	10/4/2018	R1B	10/27/2018	Scenedesmus abundans	SCAB	1	472	1.0	94314	0.5	green	46685	20168488	71.5	m	NU	PERI
VR88	Rogue River	10/4/2018	R1B	10/27/2018	Synedra mazamaensis	SNMZ	1	472	1.0	120721	0.6	diatom	46685	20168488	71.5	m	NU	PERI
VR88	Rogue River	10/4/2018	R1B	10/27/2018	Navicula minuscula	NVML	1	472	1.0	21221	0.1	diatom	46685	20168488	71.5	m	NU	PERI
VR88	Rogue River	10/4/2018	R1B	10/27/2018	Fragilaria construens	FRCN	1	472	1.0	316894	1.6	diatom	46685	20168488	71.5	m	NU	PERI
VR88	Rogue River	10/4/2018	R1B	10/27/2018	Synedra ulna	SNUL	1	472	1.0	938420	4.7	diatom	46685	20168488	71.5	m	NU	PERI
VR88	Rogue River	10/4/2018	R1B	10/27/2018	Achnanthes lanceolata	ACLC	1	472	1.0	84882	0.4	diatom	46685	20168488	71.5	m	NU	PERI
VR88	Rogue River	10/4/2018	R1B	10/27/2018	Rhoicosphenia curvata	RHCU	1	472	1.0	55173	0.3	diatom	46685	20168488	71.5	m	NU	PERI
VR88	Rogue River	10/4/2018	R1B	10/27/2018	Epithemia turgida	EPTR	1	472	1.0	4008327	19.9	diatom	46685	20168488	71.5	m	NU	PERI
VR88	Rogue River	10/4/2018	R1B	10/27/2018	Navicula sp.	NVXX	1	472	1.0	70735	0.4	diatom	46685	20168488	71.5	m	NU	PERI
VR88	Rogue River	10/4/2018	R1B	10/27/2018	Gomphonema angustatum	GFAN	1	472	1.0	169764	0.8	diatom	46685	20168488	71.5	m	NU	PERI
VR88	Rogue River	10/4/2018	R1B	10/27/2018	Nitzschia communis	NZCM	1	472	1.0	21221	0.1	diatom	46685	20168488	71.5	m	NU	PERI
VR88	Rogue River	10/4/2018	R1B	10/27/2018	Fragilaria vaucheria	FRVA	1	472	1.0	135812	0.7	diatom	46685	20168488	71.5	m	NU	PERI
VR89	Rogue River	10/3/2018	R2	10/29/2018	Nitzschia frustulum	NZFR	38	89130	30.4	11765217	5.9	diatom	293192	201040732	88.1	m	NU	PERI
VR89	Rogue River	10/3/2018	R2	10/29/2018	Achnanthes minutissima	ACMN	11	25801	8.8	1419050	0.7	diatom	293192	201040732	88.1	m	NU	PERI
VR89	Rogue River	10/3/2018	R2	10/29/2018	Navicula cryptocephala	NVCR	8	18764	6.4	3471396	1.7	diatom	293192	201040732	88.1	m	NU	PERI
VR89	Rogue River	10/3/2018	R2	10/29/2018	Cocconeis placentula	COPC	7	16419	5.6	7552632	3.8	diatom	293192	201040732	88.1	m	NU	PERI
VR89	Rogue River	10/3/2018	R2	10/29/2018	Navicula cryptocephala veneta	NVCV	6	14073	4.8	1336957	0.7	diatom	293192	201040732	88.1	m	NU	PERI
VR89	Rogue River	10/3/2018	R2	10/29/2018	Nitzschia dissipata	NZDS	6	14073	4.8	3785698	1.9	diatom	293192	201040732	88.1	m	NU	PERI
VR89	Rogue River	10/3/2018	R2	10/29/2018	Epithemia sorex	EPSX	4	9382	3.2	16043478	8.0	diatom	293192	201040732	88.1	m	NU	PERI
VR89	Rogue River	10/3/2018	R2	10/29/2018	Rhoicosphenia curvata	RHCU	3	7037	2.4	823284	0.4	diatom	293192	201040732	88.1	m	NU	PERI
VR89	Rogue River	10/3/2018	R2	10/29/2018	Synedra ulna	SNUL	3	7037	2.4	18203719	9.1	diatom	293192	201040732	88.1	m	NU	PERI
VR89	Rogue River	10/3/2018	R2	10/29/2018	Cymbella affinis	CMAF	3	7037	2.4	12665904	6.3	diatom	293192	201040732	88.1	m	NU	PERI
VR89	Rogue River	10/3/2018	R2	10/29/2018	Achnanthes lanceolata	ACLC	3	7037	2.4	1266590	0.6	diatom	293192	201040732	88.1	m	NU	PERI
VR89	Rogue River	10/3/2018	R2	10/29/2018	Nitzschia paleacea	NZPC	2	4691	1.6	459725	0.2	diatom	293192	201040732	88.1	m	NU	PERI
VR89	Rogue River	10/3/2018	R2	10/29/2018	Navicula tripunctata	NVTP	2	4691	1.6	5254005	2.6	diatom	293192	201040732	88.1	m	NU	PERI
VR89	Rogue River	10/3/2018	R2	10/29/2018	Navicula minima	NVMN	2	4691	1.6	206407	0.1	diatom	293192	201040732	88.1	m	NU	PERI
VR89	Rogue River	10/3/2018	R2	10/29/2018	Gomphoneis herculeana	GSHR	2	4691	1.6	25331808	12.6	diatom	293192	201040732	88.1	m	NU	PERI
VR89	Rogue River	10/3/2018	R2	10/29/2018	Nitzschia communis	NZCM	2	4691	1.6	211098	0.1	diatom	293192	201040732	88.1	m	NU	PERI
VR89	Rogue River	10/3/2018	R2	10/29/2018	Oscillatoria sp.	OSXX	2	4691	1.6	4362700	2.2	bluegreen	293192	201040732	88.1	m	NU	PERI
VR89	Rogue River	10/3/2018	R2	10/29/2018	Fragilaria construens venter	FRCV	2	4691	1.6	450343	0.2	diatom	293192	201040732	88.1	m	NU	PERI
VR89	Rogue River	10/3/2018	R2	10/29/2018	Navicula graciloides	NVGC	2	4691	1.6	2040618	1.0	diatom	293192	201040732	88.1	m	NU	PERI
VR89	Rogue River	10/3/2018	R2	10/29/2018	Navicula minuscula	NVML	2	4691	1.6	211098	0.1	diatom	293192	201040732	88.1	m	NU	PERI
VR89	Rogue River	10/3/2018	R2	10/29/2018	Cymbella tumida	CMTM	2	4691	1.6	11727689	5.8	diatom	293192	201040732	88.1	m	NU	PERI
VR89	Rogue River	10/3/2018	R2	10/29/2018	Gomphonema subclavatum	GFSB	2	4691	1.6	2814645	1.4	diatom	293192	201040732	88.1	m	NU	PERI
VR89	Rogue River	10/3/2018	R2	10/29/2018	Ankistrodesmus falcatus	AKFL	1	2346	0.8	175915	0.1	green	293192	201040732	88.1	m	NU	PERI
VR89	Rogue River	10/3/2018	R2	10/29/2018	Cyclotella meneghiniana	CCMG	1	2346	0.8	891304	0.4	diatom	293192	201040732	88.1	m	NU	PERI
VR89	Rogue River	10/3/2018	R2	10/29/2018	Anabaena sp.	ABXX	1	2346	0.8	3189931	1.6	bluegreen	293192	201040732	88.1	m	NU	PERI
VR89	Rogue River	10/3/2018	R2	10/29/2018	Calothrix sp.	KXXX	1	2346	0.8	1876430	0.9	bluegreen	293192	201040732	88.1	m	NU	PERI
VR89	Rogue River	10/3/2018	R2	10/29/2018	Rhopalodia gibba	RPGB	1	2346	0.8	60045767	29.9	diatom	293192	201040732	88.1	m	NU	PERI

Slide	Lake/River	Sample Date	Site	Date Analyzed	Species Name	Species Code	Count per taxa	Density	% Density	Biovolume	% Biovolume	Group	Total Density	Total Biovolume	TSI	Depth Units	Count Units	Type
VR89	Rogue River	10/3/2018	R2	10/29/2018	Navicula sp.	NVXX	1	2346	0.8	351831	0.2	diatom	293192	201040732	88.1	m	NU	PERI
VR89	Rogue River	10/3/2018	R2	10/29/2018	Fragilaria vaucheria	FRVA	1	2346	0.8	675515	0.3	diatom	293192	201040732	88.1	m	NU	PERI
VR89	Rogue River	10/3/2018	R2	10/29/2018	Nitzschia capitellata	NZCP	1	2346	0.8	844394	0.4	diatom	293192	201040732	88.1	m	NU	PERI
VR89	Rogue River	10/3/2018	R2	10/29/2018	Amphora perpusilla	AFPR	1	2346	0.8	389359	0.2	diatom	293192	201040732	88.1	m	NU	PERI
VR89	Rogue River	10/3/2018	R2	10/29/2018	Fragilaria pinnata	FRPN	1	2346	0.8	140732	0.1	diatom	293192	201040732	88.1	m	NU	PERI
VR89	Rogue River	10/3/2018	R2	10/29/2018	Navicula viridula	NVVR	1	2346	0.8	1055492	0.5	diatom	293192	201040732	88.1	m	NU	PERI
VR90	Rogue River	10/3/2018	R2B	10/29/2018	Nitzschia frustulum	NZFR	39	78505	31.0	11304792	15.3	diatom	253633	73968284	80.9	m	NU	PERI
VR90	Rogue River	10/3/2018	R2B	10/29/2018	Achnanthes minutissima	ACMN	28	56363	22.2	3099961	4.2	diatom	253633	73968284	80.9	m	NU	PERI
VR90	Rogue River	10/3/2018	R2B	10/29/2018	Navicula cryptocephala	NVCR	10	20130	7.9	3723979	5.0	diatom	253633	73968284	80.9	m	NU	PERI
VR90	Rogue River	10/3/2018	R2B	10/29/2018	Cocconeis placentula	COPC	8	16104	6.3	7407698	10.0	diatom	253633	73968284	80.9	m	NU	PERI
VR90	Rogue River	10/3/2018	R2B	10/29/2018	Navicula cryptocephala veneta	NVCV	6	12078	4.8	1147388	1.6	diatom	253633	73968284	80.9	m	NU	PERI
VR90	Rogue River	10/3/2018	R2B	10/29/2018	Nitzschia dissipata	NZDS	5	10065	4.0	2707433	3.7	diatom	253633	73968284	80.9	m	NU	PERI
VR90	Rogue River	10/3/2018	R2B	10/29/2018	Calothrix sp.	KXXX	3	6039	2.4	4106441	5.6	bluegreen	253633	73968284	80.9	m	NU	PERI
VR90	Rogue River	10/3/2018	R2B	10/29/2018	Nitzschia paleacea	NZPC	2	4026	1.6	394540	0.5	diatom	253633	73968284	80.9	m	NU	PERI
VR90	Rogue River	10/3/2018	R2B	10/29/2018	Nitzschia volcanica	NZVL	2	4026	1.6	644148	0.9	diatom	253633	73968284	80.9	m	NU	PERI
VR90	Rogue River	10/3/2018	R2B	10/29/2018	Fragilaria construens venter	FRCV	2	4026	1.6	1062844	1.4	diatom	253633	73968284	80.9	m	NU	PERI
VR90	Rogue River	10/3/2018	R2B	10/29/2018	Cymbella affinis	CMAF	2	4026	1.6	7246661	9.8	diatom	253633	73968284	80.9	m	NU	PERI
VR90	Rogue River	10/3/2018	R2B	10/29/2018	Achnanthes lanceolata	ACLC	2	4026	1.6	724666	1.0	diatom	253633	73968284	80.9	m	NU	PERI
VR90	Rogue River	10/3/2018	R2B	10/29/2018	Epithemia sorex	EPSX	2	4026	1.6	6884328	9.3	diatom	253633	73968284	80.9	m	NU	PERI
VR90	Rogue River	10/3/2018	R2B	10/29/2018	Navicula sp.	NVXX	1	2013	0.8	301944	0.4	diatom	253633	73968284	80.9	m	NU	PERI
VR90	Rogue River	10/3/2018	R2B	10/29/2018	Oscillatoria sp.	OSXX	1	2013	0.8	1248036	1.7	bluegreen	253633	73968284	80.9	m	NU	PERI
VR90	Rogue River	10/3/2018	R2B	10/29/2018	Fragilaria construens	FRCN	1	2013	0.8	225452	0.3	diatom	253633	73968284	80.9	m	NU	PERI
VR90	Rogue River	10/3/2018	R2B	10/29/2018	Nitzschia capitellata	NZCP	1	2013	0.8	724666	1.0	diatom	253633	73968284	80.9	m	NU	PERI
VR90	Rogue River	10/3/2018	R2B	10/29/2018	Rhoicosphenia curvata	RHCU	1	2013	0.8	235516	0.3	diatom	253633	73968284	80.9	m	NU	PERI
VR90	Rogue River	10/3/2018	R2B	10/29/2018	Hannaea arcus	HNAR	1	2013	0.8	3522683	4.8	diatom	253633	73968284	80.9	m	NU	PERI
VR90	Rogue River	10/3/2018	R2B	10/29/2018	Nitzschia amphibia	NZAM	1	2013	0.8	193244	0.3	diatom	253633	73968284	80.9	m	NU	PERI
VR90	Rogue River	10/3/2018	R2B	10/29/2018	Ankistrodesmus falcatus	AKFL	1	2013	0.8	201296	0.3	green	253633	73968284	80.9	m	NU	PERI
VR90	Rogue River	10/3/2018	R2B	10/29/2018	Amphora perpusilla	AFPR	1	2013	0.8	334152	0.5	diatom	253633	73968284	80.9	m	NU	PERI
VR90	Rogue River	10/3/2018	R2B	10/29/2018	Navicula tripunctata	NVTP	1	2013	0.8	2254517	3.0	diatom	253633	73968284	80.9	m	NU	PERI
VR90	Rogue River	10/3/2018	R2B	10/29/2018	Synedra ulna	SNUL	1	2013	0.8	4005793	5.4	diatom	253633	73968284	80.9	m	NU	PERI
VR90	Rogue River	10/3/2018	R2B	10/29/2018	Epithemia turgida	EPTR	1	2013	0.8	8555086	11.6	diatom	253633	73968284	80.9	m	NU	PERI
VR90	Rogue River	10/3/2018	R2B	10/29/2018	Cymbella minuta	CMMN	1	2013	0.8	744796	1.0	diatom	253633	73968284	80.9	m	NU	PERI
VR90	Rogue River	10/3/2018	R2B	10/29/2018	Navicula graciloides	NVGC	1	2013	0.8	875638	1.2	diatom	253633	73968284	80.9	m	NU	PERI
VR90	Rogue River	10/3/2018	R2B	10/29/2018	Navicula minuscula	NVML	1	2013	0.8	90583	0.1	diatom	253633	73968284	80.9	m	NU	PERI
VR91	Rogue River	10/5/2018	R3	10/29/2018	Nitzschia frustulum	NZFR	49	58354	41.2	8402928	12.8	diatom	141716	65620722	80.0	m	NU	PERI
VR91	Rogue River	10/5/2018	R3	10/29/2018	Oscillatoria limosa	OSLS	13	15482	10.9	14397874	21.9	bluegreen	141716	65620722	80.0	m	NU	PERI
VR91	Rogue River	10/5/2018	R3	10/29/2018	Navicula cryptocephala	NVCR	10	11909	8.4	2203149	3.4	diatom	141716	65620722	80.0	m	NU	PERI
VR91	Rogue River	10/5/2018	R3	10/29/2018	Achnanthes minutissima	ACMN	7	8336	5.9	458493	0.7	diatom	141716	65620722	80.0	m	NU	PERI
VR91	Rogue River	10/5/2018	R3	10/29/2018	Cocconeis placentula	COPC	7	8336	5.9	3834669	5.8	diatom	141716	65620722	80.0	m	NU	PERI
VR91	Rogue River	10/5/2018	R3	10/29/2018	Navicula cryptocephala veneta	NVCV	3	3573	2.5	339404	0.5	diatom	141716	65620722	80.0	m	NU	PERI
VR91	Rogue River	10/5/2018	R3	10/29/2018	Navicula tripunctata	NVTP	3	3573	2.5	4001394	6.1	diatom	141716	65620722	80.0	m	NU	PERI
VR91	Rogue River	10/5/2018	R3	10/29/2018	Fragilaria vaucheria	FRVA	3	3573	2.5	1337609	2.0	diatom	141716	65620722	80.0	m	NU	PERI
VR91	Rogue River	10/5/2018	R3	10/29/2018	Nitzschia communis	NZCM	3	3573	2.5	160770	0.2	diatom	141716	65620722	80.0	m	NU	PERI
VR91	Rogue River	10/5/2018	R3	10/29/2018	Gomphonema subclavatum	GFSB	3	3573	2.5	2143604	3.3	diatom	141716	65620722	80.0	m	NU	PERI
VR91	Rogue River	10/5/2018	R3	10/29/2018	Rhoicosphenia curvata	RHCU	2	2382	1.7	278669	0.4	diatom	141716	65620722	80.0	m	NU	PERI
VR91	Rogue River	10/5/2018	R3	10/29/2018	Nitzschia dissipata	NZDS	2	2382	1.7	640699	1.0	diatom	141716	65620722	80.0	m	NU	PERI
VR91	Rogue River	10/5/2018	R3	10/29/2018	Diatoma vulgare	DTVL	1	1191	0.8	2334147	3.6	diatom	141716	65620722	80.0	m	NU	PERI
VR91	Rogue River	10/5/2018	R3	10/29/2018	Cymbella minuta	CMMN	1	1191	0.8	440630	0.7	diatom	141716	65620722	80.0	m	NU	PERI
VR91	Rogue River	10/5/2018	R3	10/29/2018	Gomphoneis herculeana	GSHR	1	1191	0.8	6430812	9.8	diatom	141716	65620722	80.0	m	NU	PERI
VR91	Rogue River	10/5/2018	R3	10/29/2018	Melosira varians	MLVR	1	1191	0.8	774079	1.2	diatom	141716	65620722	80.0	m	NU	PERI
VR91	Rogue River	10/5/2018	R3	10/29/2018	Nitzschia palea	NZPL	1	1191	0.8	214360	0.3	diatom	141716	65620722	80.0	m	NU	PERI
VR91	Rogue River	10/5/2018	R3	10/29/2018	Nitzschia sp.	NZXX	1	1191	0.8	142907	0.2	diatom	141716	65620722	80.0	m	NU	PERI
VR91	Rogue River	10/5/2018	R3	10/29/2018	Calothrix sp.	KXXX	1	1191	0.8	9527129	14.5	bluegreen	141716	65620722	80.0	m	NU	PERI
VR91	Rogue River	10/5/2018	R3	10/29/2018	Caloneis ventricosa minuta	CAVM	1	1191	0.8	333450	0.5	diatom	141716	65620722	80.0	m	NU	PERI
VR91	Rogue River	10/5/2018	R3	10/29/2018	Synedra mazamaensis	SNMZ	1	1191	0.8	304868	0.5	diatom	141716	65620722	80.0	m	NU	PERI
VR91	Rogue River	10/5/2018	R3	10/29/2018	Frustulia rhomboides	FSRH	1	1191	0.8	1286162	2.0	diatom	141716	65620722	80.0	m	NU	PERI
VR91	Rogue River	10/5/2018	R3	10/29/2018	Nitzschia volcanica	NZVL	1	1191	0.8	190543	0.3	diatom	141716	65620722	80.0	m	NU	PERI
VR91	Rogue River	10/5/2018	R3	10/29/2018	Epithemia turgida	EPTR	1	1191	0.8	5061287	7.7	diatom	141716	65620722	80.0	m	NU	PERI
VR91	Rogue River	10/5/2018	R3	10/29/2018	Gomphonema angustatum	GFAN	1	1191	0.8	214360	0.3	diatom	141716	65620722	80.0	m	NU	PERI
VR91	Rogue River	10/5/2018	R3	10/29/2018	Synedra rumpens	SNRM	1	1191	0.8	166725	0.3	diatom	141716	65620722	80.0	m	NU	PERI
VR92	Rogue River	10/5/2018	R3B	10/29/2018	Nitzschia frustulum	NZFR	73	138181	42.7	16581717	14.9	diatom	323684	111444663	83.8	m	NU	PERI
VR92	Rogue River	10/5/2018	R3B	10/29/2018	Cocconeis placentula	COPC	16	30286	9.4	13931671	12.5	diatom	323684	111444663	83.8	m	NU	PERI
VR92	Rogue River	10/5/2018	R3B	10/29/2018	Navicula cryptocephala	NVCR	11	20822	6.4	3852031	3.5	diatom	323684	111444663	83.8	m	NU	PERI
VR92	Rogue River	10/5/2018	R3B	10/29/2018	Achnanthes minutissima	ACMN	11	20822	6.4	1041090	0.9	diatom	323684	111444663	83.8	m	NU	PERI
VR92	Rogue River	10/5/2018	R3B	10/29/2018	Oscillatoria sp.	OSXX	11	20822	6.4	20655217	18.5	bluegreen	323684	111444663	83.8	m	NU	PERI
VR92	Rogue River	10/5/2018	R3B	10/29/2018	Navicula cryptocephala veneta	NVCV	4	7572	2.3	719298	0.6	diatom	323684	111444663	83.8	m	NU	PERI
VR92	Rogue River	10/5/2018	R3B	10/29/2018	Cymbella minuta	CMMN	4	7572	2.3	3361773	3.0	diatom	323684	111444663	83.8	m	NU	PERI
VR92	Rogue River	10/5/2018	R3B	10/29/2018	Epithemia sorex	EPSX	3	5679	1.8	6473684	5.8	diatom	323684	111444663	83.8	m	NU	PERI

Slide	Lake/River	Sample Date	Site	Date Analyzed	Species Name	Species Code	Count per taxa	Density	% Density	Biovolume	% Biovolume	Group	Total Density	Total Biovolume	TSI	Depth Units	Count Units	Type
VR92	Rogue River	10/5/2018	R3B	10/29/2018	Nitzschia volcanica	NZVL	3	5679	1.8	908587	0.8	diatom	323684	111444663	83.8	m	NU	PERI
VR92	Rogue River	10/5/2018	R3B	10/29/2018	Fragilaria construens venter	FRCV	3	5679	1.8	1090305	1.0	diatom	323684	111444663	83.8	m	NU	PERI
VR92	Rogue River	10/5/2018	R3B	10/29/2018	Nitzschia amphibia	NZAM	3	5679	1.8	708698	0.6	diatom	323684	111444663	83.8	m	NU	PERI
VR92	Rogue River	10/5/2018	R3B	10/29/2018	Gomphonema subclavatum	GFSB	3	5679	1.8	4429363	4.0	diatom	323684	111444663	83.8	m	NU	PERI
VR92	Rogue River	10/5/2018	R3B	10/29/2018	Nitzschia paleacea	NZPC	3	5679	1.8	556510	0.5	diatom	323684	111444663	83.8	m	NU	PERI
VR92	Rogue River	10/5/2018	R3B	10/29/2018	Synedra ulna	SNUL	2	3786	1.2	7533703	6.8	diatom	323684	111444663	83.8	m	NU	PERI
VR92	Rogue River	10/5/2018	R3B	10/29/2018	Nitzschia dissipata	NZDS	2	3786	1.2	1527562	1.4	diatom	323684	111444663	83.8	m	NU	PERI
VR92	Rogue River	10/5/2018	R3B	10/29/2018	Synedra mazamaensis	SNMZ	2	3786	1.2	969160	0.9	diatom	323684	111444663	83.8	m	NU	PERI
VR92	Rogue River	10/5/2018	R3B	10/29/2018	Gomphonema clevei	GFCL	2	3786	1.2	340720	0.3	diatom	323684	111444663	83.8	m	NU	PERI
VR92	Rogue River	10/5/2018	R3B	10/29/2018	Nitzschia communis	NZCM	2	3786	1.2	170360	0.2	diatom	323684	111444663	83.8	m	NU	PERI
VR92	Rogue River	10/5/2018	R3B	10/29/2018	Fragilaria vaucheria	FRVA	2	3786	1.2	2180609	2.0	diatom	323684	111444663	83.8	m	NU	PERI
VR92	Rogue River	10/5/2018	R3B	10/29/2018	Anabaena sp.	ABXX	2	3786	1.2	3861496	3.5	bluegreen	323684	111444663	83.8	m	NU	PERI
VR92	Rogue River	10/5/2018	R3B	10/29/2018	Nitzschia sp.	NZXX	1	1893	0.6	227147	0.2	diatom	323684	111444663	83.8	m	NU	PERI
VR92	Rogue River	10/5/2018	R3B	10/29/2018	Navicula menisculus upsaliensis	NVMU	1	1893	0.6	388042	0.3	diatom	323684	111444663	83.8	m	NU	PERI
VR92	Rogue River	10/5/2018	R3B	10/29/2018	Epithemia turgida	EPTR	1	1893	0.6	8044783	7.2	diatom	323684	111444663	83.8	m	NU	PERI
VR92	Rogue River	10/5/2018	R3B	10/29/2018	Nitzschia capitellata	NZCP	1	1893	0.6	681440	0.6	diatom	323684	111444663	83.8	m	NU	PERI
VR92	Rogue River	10/5/2018	R3B	10/29/2018	Navicula minuscula	NVML	1	1893	0.6	85180	0.1	diatom	323684	111444663	83.8	m	NU	PERI
VR92	Rogue River	10/5/2018	R3B	10/29/2018	Rhoicosphenia curvata	RHCU	1	1893	0.6	221468	0.2	diatom	323684	111444663	83.8	m	NU	PERI
VR92	Rogue River	10/5/2018	R3B	10/29/2018	Achnanthes lanceolata	ACLC	1	1893	0.6	340720	0.3	diatom	323684	111444663	83.8	m	NU	PERI
VR92	Rogue River	10/5/2018	R3B	10/29/2018	Gomphoneis herculeana	GSHR	1	1893	0.6	10221607	9.2	diatom	323684	111444663	83.8	m	NU	PERI
VR92	Rogue River	10/5/2018	R3B	10/29/2018	Gomphonema angustatum	GFAN	1	1893	0.6	340720	0.3	diatom	323684	111444663	83.8	m	NU	PERI
VR93	Rogue River	10/4/2018	R4	10/30/2018	Nitzschia frustulum	NZFR	112	839181	58.3	110771930	35.7	diatom	1438596	310264803	91.2	m	NU	PERI
VR93	Rogue River	10/4/2018	R4	10/30/2018	Achnanthes minutissima	ACMN	17	127376	8.9	8916301	2.9	diatom	1438596	310264803	91.2	m	NU	PERI
VR93	Rogue River	10/4/2018	R4	10/30/2018	Nitzschia palea	NZPL	14	104898	7.3	18881579	6.1	diatom	1438596	310264803	91.2	m	NU	PERI
VR93	Rogue River	10/4/2018	R4	10/30/2018	Cocconeis placentula	COPC	5	37463	2.6	17233187	5.6	diatom	1438596	310264803	91.2	m	NU	PERI
VR93	Rogue River	10/4/2018	R4	10/30/2018	Nitzschia paleacea	NZPC	5	37463	2.6	3671418	1.2	diatom	1438596	310264803	91.2	m	NU	PERI
VR93	Rogue River	10/4/2018	R4	10/30/2018	Nitzschia dissipata	NZDS	5	37463	2.6	10077668	3.2	diatom	1438596	310264803	91.2	m	NU	PERI
VR93	Rogue River	10/4/2018	R4	10/30/2018	Nitzschia microcephala	NZMC	4	29971	2.1	2997076	1.0	diatom	1438596	310264803	91.2	m	NU	PERI
VR93	Rogue River	10/4/2018	R4	10/30/2018	Nitzschia amphibia	NZAM	3	22478	1.6	2157895	0.7	diatom	1438596	310264803	91.2	m	NU	PERI
VR93	Rogue River	10/4/2018	R4	10/30/2018	Navicula minuscula	NVML	3	22478	1.6	1011513	0.3	diatom	1438596	310264803	91.2	m	NU	PERI
VR93	Rogue River	10/4/2018	R4	10/30/2018	Nitzschia communis	NZCM	3	22478	1.6	1011513	0.3	diatom	1438596	310264803	91.2	m	NU	PERI
VR93	Rogue River	10/4/2018	R4	10/30/2018	Navicula cryptocephala	NVCR	2	14985	1.0	2772295	0.9	diatom	1438596	310264803	91.2	m	NU	PERI
VR93	Rogue River	10/4/2018	R4	10/30/2018	Rhoicosphenia curvata	RHCU	2	14985	1.0	1753289	0.6	diatom	1438596	310264803	91.2	m	NU	PERI
VR93	Rogue River	10/4/2018	R4	10/30/2018	Gomphoneis herculeana	GSHR	2	14985	1.0	80921053	26.1	diatom	1438596	310264803	91.2	m	NU	PERI
VR93	Rogue River	10/4/2018	R4	10/30/2018	Nitzschia volcanica	NZVL	2	14985	1.0	2397661	0.8	diatom	1438596	310264803	91.2	m	NU	PERI
VR93	Rogue River	10/4/2018	R4	10/30/2018	Navicula cryptocephala veneta	NVCV	2	14985	1.0	1423611	0.5	diatom	1438596	310264803	91.2	m	NU	PERI
VR93	Rogue River	10/4/2018	R4	10/30/2018	Synedra mazamaensis	SNMZ	2	14985	1.0	3836257	1.2	diatom	1438596	310264803	91.2	m	NU	PERI
VR93	Rogue River	10/4/2018	R4	10/30/2018	Nitzschia innominata	NZIN	1	7493	0.5	359649	0.1	diatom	1438596	310264803	91.2	m	NU	PERI
VR93	Rogue River	10/4/2018	R4	10/30/2018	Fragilaria vaucheria	FRVA	1	7493	0.5	2157895	0.7	diatom	1438596	310264803	91.2	m	NU	PERI
VR93	Rogue River	10/4/2018	R4	10/30/2018	Gomphonema angustatum	GFAN	1	7493	0.5	1348684	0.4	diatom	1438596	310264803	91.2	m	NU	PERI
VR93	Rogue River	10/4/2018	R4	10/30/2018	Navicula menisculus upsaliensis	NVMU	1	7493	0.5	1536001	0.5	diatom	1438596	310264803	91.2	m	NU	PERI
VR93	Rogue River	10/4/2018	R4	10/30/2018	Nitzschia capitellata	NZCP	1	7493	0.5	5394737	1.7	diatom	1438596	310264803	91.2	m	NU	PERI
VR93	Rogue River	10/4/2018	R4	10/30/2018	Synedra ulna	SNUL	1	7493	0.5	14910453	4.8	diatom	1438596	310264803	91.2	m	NU	PERI
VR93	Rogue River	10/4/2018	R4	10/30/2018	Navicula tripunctata	NVTP	1	7493	0.5	8391813	2.7	diatom	1438596	310264803	91.2	m	NU	PERI
VR93	Rogue River	10/4/2018	R4	10/30/2018	Gomphonema olivaceum	GFOM	1	7493	0.5	1685855	0.5	diatom	1438596	310264803	91.2	m	NU	PERI
VR93	Rogue River	10/4/2018	R4	10/30/2018	Oscillatoria sp.	OSXX	1	7493	0.5	4645468	1.5	bluegreen	1438596	310264803	91.2	m	NU	PERI
VR94	Rogue River	10/4/2018	R4B	11/6/2018	Nitzschia frustulum	NZFR	94	939084	45.0	123959064	15.0	diatom	2087963	823906189	98.3	m	NU	PERI
VR94	Rogue River	10/4/2018	R4B	11/6/2018	Nitzschia palea	NZPL	34	339669	16.3	61140351	7.4	diatom	2087963	823906189	98.3	m	NU	PERI
VR94	Rogue River	10/4/2018	R4B	11/6/2018	Achnanthes minutissima	ACMN	11	109893	5.3	6044103	0.7	diatom	2087963	823906189	98.3	m	NU	PERI
VR94	Rogue River	10/4/2018	R4B	11/6/2018	Nitzschia dissipata	NZDS	9	89912	4.3	24186404	2.9	diatom	2087963	823906189	98.3	m	NU	PERI
VR94	Rogue River	10/4/2018	R4B	11/6/2018	Navicula cryptocephala veneta	NVCV	7	69932	3.3	6643519	0.8	diatom	2087963	823906189	98.3	m	NU	PERI
VR94	Rogue River	10/4/2018	R4B	11/6/2018	Cocconeis placentula	COPC	6	59942	2.9	27573099	3.3	diatom	2087963	823906189	98.3	m	NU	PERI
VR94	Rogue River	10/4/2018	R4B	11/6/2018	Gomphonema subclavatum	GFSB	6	59942	2.9	35964912	4.4	diatom	2087963	823906189	98.3	m	NU	PERI
VR94	Rogue River	10/4/2018	R4B	11/6/2018	Navicula cryptocephala	NVCR	6	59942	2.9	11089181	1.3	diatom	2087963	823906189	98.3	m	NU	PERI
VR94	Rogue River	10/4/2018	R4B	11/6/2018	Oscillatoria sp.	OSXX	5	49951	2.4	74327485	9.0	bluegreen	2087963	823906189	98.3	m	NU	PERI
VR94	Rogue River	10/4/2018	R4B	11/6/2018	Gomphoneis herculeana	GSHR	5	49951	2.4	269736842	32.7	diatom	2087963	823906189	98.3	m	NU	PERI
VR94	Rogue River	10/4/2018	R4B	11/6/2018	Nitzschia amphibia	NZAM	4	39961	1.9	3836257	0.5	diatom	2087963	823906189	98.3	m	NU	PERI
VR94	Rogue River	10/4/2018	R4B	11/6/2018	Nitzschia communis	NZCM	3	29971	1.4	2697368	0.3	diatom	2087963	823906189	98.3	m	NU	PERI
VR94	Rogue River	10/4/2018	R4B	11/6/2018	Rhoicosphenia curvata	RHCU	3	29971	1.4	3506579	0.4	diatom	2087963	823906189	98.3	m	NU	PERI
VR94	Rogue River	10/4/2018	R4B	11/6/2018	Synedra ulna	SNUL	3	29971	1.4	101391082	12.3	diatom	2087963	823906189	98.3	m	NU	PERI
VR94	Rogue River	10/4/2018	R4B	11/6/2018	Navicula tripunctata	NVTP	2	19981	1.0	22378168	2.7	diatom	2087963	823906189	98.3	m	NU	PERI
VR94	Rogue River	10/4/2018	R4B	11/6/2018	Nitzschia microcephala	NZMC	1	9990	0.5	999025	0.1	diatom	2087963	823906189	98.3	m	NU	PERI
VR94	Rogue River	10/4/2018	R4B	11/6/2018	Cocconeis klamathensis	COKL	1	9990	0.5	2797271	0.3	diatom	2087963	823906189	98.3	m	NU	PERI
VR94	Rogue River	10/4/2018	R4B	11/6/2018	Fragilaria construens	FRCN	1	9990	0.5	8951267	1.1	diatom	2087963	823906189	98.3	m	NU	PERI
VR94	Rogue River	10/4/2018	R4B	11/6/2018	Nitzschia paleacea	NZPC	1	9990	0.5	979045	0.1	diatom	2087963	823906189	98.3	m	NU	PERI
VR94	Rogue River	10/4/2018	R4B	11/6/2018	Achnanthes lanceolata	ACLC	1	9990	0.5	1798246	0.2	diatom	2087963	823906189	98.3	m	NU	PERI
VR94	Rogue River	10/4/2018	R4B	11/6/2018	Cymbella minuta	CMMN	1	9990	0.5	3696394	0.4	diatom	2087963	823906189	98.3	m	NU	PERI
VR94	Rogue River	10/4/2018	R4B	11/6/2018	Fragilaria vaucheria	FRVA	1	9990	0.5	2877193	0.3	diatom	2087963	823906189	98.3	m	NU	PERI

Slide	Lake/River	Sample Date	Site	Date Analyzed	Species Name	Species Code	Count per taxa	Density	% Density	Biovolume	% Biovolume	Group	Total Density	Total Biovolume	TSI	Depth Units	Count Units	Type
VR94	Rogue River	10/4/2018	R4B	11/6/2018	Synedra mazamaensis	SNMZ	1	9990	0.5	2557505	0.3	diatom	2087963	823906189	98.3	m	NU	PERI
VR94	Rogue River	10/4/2018	R4B	11/6/2018	Cymbella sinuata	CMSN	1	9990	0.5	1398635	0.2	diatom	2087963	823906189	98.3	m	NU	PERI
VR94	Rogue River	10/4/2018	R4B	11/6/2018	Cyclotella meneghiniana	CCMG	1	9990	0.5	3796296	0.5	diatom	2087963	823906189	98.3	m	NU	PERI
VR94	Rogue River	10/4/2018	R4B	11/6/2018	Diatoma vulgare	DTVL	1	9990	0.5	19580897	2.4	diatom	2087963	823906189	98.3	m	NU	PERI
VR95	Rogue River	10/5/2018	R5	11/6/2018	Nitzschia frustulum	NZFR	29	208596	23.2	27534737	7.0	diatom	899123	395593175	93.0	m	NU	PERI
VR95	Rogue River	10/5/2018	R5	11/6/2018	Cocconeis placentula	COPC	17	122281	13.6	56249123	14.2	diatom	899123	395593175	93.0	m	NU	PERI
VR95	Rogue River	10/5/2018	R5	11/6/2018	Navicula cryptocephala veneta	NVCV	13	93509	10.4	8883333	2.2	diatom	899123	395593175	93.0	m	NU	PERI
VR95	Rogue River	10/5/2018	R5	11/6/2018	Rhoicosphenia curvata	RHCU	13	93509	10.4	12034579	3.0	diatom	899123	395593175	93.0	m	NU	PERI
VR95	Rogue River	10/5/2018	R5	11/6/2018	Cymbella minuta	CMMN	6	43158	4.8	19162105	4.8	diatom	899123	395593175	93.0	m	NU	PERI
VR95	Rogue River	10/5/2018	R5	11/6/2018	Gomphonema angustatum	GFAN	5	35965	4.0	7768421	2.0	diatom	899123	395593175	93.0	m	NU	PERI
VR95	Rogue River	10/5/2018	R5	11/6/2018	Nitzschia amphibia	NZAM	5	35965	4.0	3452632	0.9	diatom	899123	395593175	93.0	m	NU	PERI
VR95	Rogue River	10/5/2018	R5	11/6/2018	Nitzschia dissipata	NZDS	3	21579	2.4	5804737	1.5	diatom	899123	395593175	93.0	m	NU	PERI
VR95	Rogue River	10/5/2018	R5	11/6/2018	Gomphonema subclavatum	GFSB	3	21579	2.4	12947368	3.3	diatom	899123	395593175	93.0	m	NU	PERI
VR95	Rogue River	10/5/2018	R5	11/6/2018	Nitzschia paleacea	NZPC	3	21579	2.4	2114737	0.5	diatom	899123	395593175	93.0	m	NU	PERI
VR95	Rogue River	10/5/2018	R5	11/6/2018	Navicula cryptocephala	NVCR	3	21579	2.4	3992105	1.0	diatom	899123	395593175	93.0	m	NU	PERI
VR95	Rogue River	10/5/2018	R5	11/6/2018	Melosira varians	MLVR	3	21579	2.4	23844737	6.0	diatom	899123	395593175	93.0	m	NU	PERI
VR95	Rogue River	10/5/2018	R5	11/6/2018	Nitzschia communis	NZCM	2	14386	1.6	647368	0.2	diatom	899123	395593175	93.0	m	NU	PERI
VR95	Rogue River	10/5/2018	R5	11/6/2018	Epithemia turgida	EPTR	2	14386	1.6	61140351	15.5	diatom	899123	395593175	93.0	m	NU	PERI
VR95	Rogue River	10/5/2018	R5	11/6/2018	Gomphoneis herculeana	GSHR	2	14386	1.6	77684211	19.6	diatom	899123	395593175	93.0	m	NU	PERI
VR95	Rogue River	10/5/2018	R5	11/6/2018	Fragilaria construens	FRCN	2	14386	1.6	6444912	1.6	diatom	899123	395593175	93.0	m	NU	PERI
VR95	Rogue River	10/5/2018	R5	11/6/2018	Cymbella affinis	CMAF	2	14386	1.6	25894737	6.5	diatom	899123	395593175	93.0	m	NU	PERI
VR95	Rogue River	10/5/2018	R5	11/6/2018	Achnanthes minutissima	ACMN	2	14386	1.6	719298	0.2	diatom	899123	395593175	93.0	m	NU	PERI
VR95	Rogue River	10/5/2018	R5	11/6/2018	Fragilaria construens venter	FRCV	1	7193	0.8	345263	0.1	diatom	899123	395593175	93.0	m	NU	PERI
VR95	Rogue River	10/5/2018	R5	11/6/2018	Nitzschia capitellata	NZCP	1	7193	0.8	2589474	0.7	diatom	899123	395593175	93.0	m	NU	PERI
VR95	Rogue River	10/5/2018	R5	11/6/2018	Navicula tripunctata	NVTP	1	7193	0.8	8056140	2.0	diatom	899123	395593175	93.0	m	NU	PERI
VR95	Rogue River	10/5/2018	R5	11/6/2018	Amphora perpusilla	AFPR	1	7193	0.8	1194035	0.3	diatom	899123	395593175	93.0	m	NU	PERI
VR95	Rogue River	10/5/2018	R5	11/6/2018	Navicula sp.	NVXX	1	7193	0.8	1078947	0.3	diatom	899123	395593175	93.0	m	NU	PERI
VR95	Rogue River	10/5/2018	R5	11/6/2018	Cymbella sinuata	CMSN	1	7193	0.8	1007018	0.3	diatom	899123	395593175	93.0	m	NU	PERI
VR95	Rogue River	10/5/2018	R5	11/6/2018	Cyclotella meneghiniana	CCMG	1	7193	0.8	2733333	0.7	diatom	899123	395593175	93.0	m	NU	PERI
VR95	Rogue River	10/5/2018	R5	11/6/2018	Synedra ulna	SNUL	1	7193	0.8	14314035	3.6	diatom	899123	395593175	93.0	m	NU	PERI
VR95	Rogue River	10/5/2018	R5	11/6/2018	Synedra mazamaensis	SNMZ	1	7193	0.8	1841404	0.5	diatom	899123	395593175	93.0	m	NU	PERI
VR95	Rogue River	10/5/2018	R5	11/6/2018	Gomphonema ventricosum	GFVT	1	7193	0.8	6114035	1.5	diatom	899123	395593175	93.0	m	NU	PERI
VR96	Rogue River	10/5/2018	R5B	11/6/2018	Nitzschia frustulum	NZFR	24	113573	20.3	16354571	8.1	diatom	558403	201954340	88.1	m	NU	PERI
VR96	Rogue River	10/5/2018	R5B	11/6/2018	Rhoicosphenia curvata	RHCU	16	75716	13.6	11516343	5.7	diatom	558403	201954340	88.1	m	NU	PERI
VR96	Rogue River	10/5/2018	R5B	11/6/2018	Cocconeis placentula	COPC	14	66251	11.9	30475531	15.1	diatom	558403	201954340	88.1	m	NU	PERI
VR96	Rogue River	10/5/2018	R5B	11/6/2018	Navicula cryptocephala	NVCR	13	61519	11.0	11381002	5.6	diatom	558403	201954340	88.1	m	NU	PERI
VR96	Rogue River	10/5/2018	R5B	11/6/2018	Navicula cryptocephala veneta	NVCV	11	52054	9.3	4945175	2.4	diatom	558403	201954340	88.1	m	NU	PERI
VR96	Rogue River	10/5/2018	R5B	11/6/2018	Cymbella minuta	CMMN	8	37858	6.8	15408126	7.6	diatom	558403	201954340	88.1	m	NU	PERI
VR96	Rogue River	10/5/2018	R5B	11/6/2018	Nitzschia dissipata	NZDS	6	28393	5.1	9165374	4.5	diatom	558403	201954340	88.1	m	NU	PERI
VR96	Rogue River	10/5/2018	R5B	11/6/2018	Fragilaria vaucheria	FRVA	4	18929	3.4	5451524	2.7	diatom	558403	201954340	88.1	m	NU	PERI
VR96	Rogue River	10/5/2018	R5B	11/6/2018	Melosira varians	MLVR	4	18929	3.4	12303786	6.1	diatom	558403	201954340	88.1	m	NU	PERI
VR96	Rogue River	10/5/2018	R5B	11/6/2018	Gomphonema subclavatum	GFSB	3	14197	2.5	8518006	4.2	diatom	558403	201954340	88.1	m	NU	PERI
VR96	Rogue River	10/5/2018	R5B	11/6/2018	Nitzschia communis	NZCM	3	14197	2.5	638850	0.3	diatom	558403	201954340	88.1	m	NU	PERI
VR96	Rogue River	10/5/2018	R5B	11/6/2018	Gomphoneis herculeana	GSHR	2	9464	1.7	51108033	25.3	diatom	558403	201954340	88.1	m	NU	PERI
VR96	Rogue River	10/5/2018	R5B	11/6/2018	Nitzschia volcanica	NZVL	2	9464	1.7	1514312	0.7	diatom	558403	201954340	88.1	m	NU	PERI
VR96	Rogue River	10/5/2018	R5B	11/6/2018	Nitzschia palea	NZPL	2	9464	1.7	1703601	0.8	diatom	558403	201954340	88.1	m	NU	PERI
VR96	Rogue River	10/5/2018	R5B	11/6/2018	Nitzschia paleacea	NZPC	2	9464	1.7	927516	0.5	diatom	558403	201954340	88.1	m	NU	PERI
VR96	Rogue River	10/5/2018	R5B	11/6/2018	Gomphonema olivaceum	GFOM	1	4732	0.8	1064751	0.5	diatom	558403	201954340	88.1	m	NU	PERI
VR96	Rogue River	10/5/2018	R5B	11/6/2018	Diatoma vulgare	DTVL	1	4732	0.8	18550323	9.2	diatom	558403	201954340	88.1	m	NU	PERI
VR96	Rogue River	10/5/2018	R5B	11/6/2018	Nitzschia microcephala	NZMC	1	4732	0.8	473223	0.2	diatom	558403	201954340	88.1	m	NU	PERI
VR96	Rogue River	10/5/2018	R5B	11/6/2018	Nitzschia amphibia	NZAM	1	4732	0.8	454294	0.2	diatom	558403	201954340	88.1	m	NU	PERI
VR97	Rogue River	10/4/2018	R6	11/6/2018	Nitzschia frustulum	NZFR	63	566447	40.6	81568421	14.2	diatom	1393640	574181623	95.7	m	NU	PERI
VR97	Rogue River	10/4/2018	R6	11/6/2018	Fragilaria construens	FRCN	10	89912	6.5	120842105	21.0	diatom	1393640	574181623	95.7	m	NU	PERI
VR97	Rogue River	10/4/2018	R6	11/6/2018	Cocconeis placentula	COPC	9	80921	5.8	37223684	6.5	diatom	1393640	574181623	95.7	m	NU	PERI
VR97	Rogue River	10/4/2018	R6	11/6/2018	Nitzschia palea	NZPL	8	71930	5.2	12947368	2.3	diatom	1393640	574181623	95.7	m	NU	PERI
VR97	Rogue River	10/4/2018	R6	11/6/2018	Navicula cryptocephala veneta	NVCV	6	53947	3.9	5125000	0.9	diatom	1393640	574181623	95.7	m	NU	PERI
VR97	Rogue River	10/4/2018	R6	11/6/2018	Nitzschia amphibia	NZAM	6	53947	3.9	5178947	0.9	diatom	1393640	574181623	95.7	m	NU	PERI
VR97	Rogue River	10/4/2018	R6	11/6/2018	Nitzschia dissipata	NZDS	5	44956	3.2	12093202	2.1	diatom	1393640	574181623	95.7	m	NU	PERI
VR97	Rogue River	10/4/2018	R6	11/6/2018	Rhoicosphenia curvata	RHCU	5	44956	3.2	5259868	0.9	diatom	1393640	574181623	95.7	m	NU	PERI
VR97	Rogue River	10/4/2018	R6	11/6/2018	Navicula cryptocephala	NVCR	5	44956	3.2	8316886	1.4	diatom	1393640	574181623	95.7	m	NU	PERI
VR97	Rogue River	10/4/2018	R6	11/6/2018	Achnanthes minutissima	ACMN	5	44956	3.2	2247807	0.4	diatom	1393640	574181623	95.7	m	NU	PERI
VR97	Rogue River	10/4/2018	R6	11/6/2018	Cymbella minuta	CMMN	4	35965	2.6	15968421	2.8	diatom	1393640	574181623	95.7	m	NU	PERI
VR97	Rogue River	10/4/2018	R6	11/6/2018	Nitzschia communis	NZCM	4	35965	2.6	1618421	0.3	diatom	1393640	574181623	95.7	m	NU	PERI
VR97	Rogue River	10/4/2018	R6	11/6/2018	Gomphonema subclavatum	GFSB	4	35965	2.6	21578947	3.8	diatom	1393640	574181623	95.7	m	NU	PERI
VR97	Rogue River	10/4/2018	R6	11/6/2018	Nitzschia paleacea	NZPC	3	26974	1.9	2643421	0.5	diatom	1393640	574181623	95.7	m	NU	PERI
VR97	Rogue River	10/4/2018	R6	11/6/2018	Fragilaria vaucheria	FRVA	3	26974	1.9	10098947	1.8	diatom	1393640	574181623	95.7	m	NU	PERI
VR97	Rogue River	10/4/2018	R6	11/6/2018	Melosira varians	MLVR	2	17982	1.3	11688596	2.0	diatom	1393640	574181623	95.7	m	NU	PERI
VR97	Rogue River	10/4/2018	R6	11/6/2018	Gomphonema angustatum	GFAN	2	17982	1.3	3236842	0.6	diatom	1393640	574181623	95.7	m	NU	PERI

Slide	Lake/River	Sample Date	Site	Date Analyzed	Species Name	Species Code	Count per taxa	Density	% Density	Biovolume	% Biovolume	Group	Total Density	Total Biovolume	TSI	Depth Units	Count Units	Type
VR97	Rogue River	10/4/2018	R6	11/6/2018	Achnanthes lanceolata	ACLC	1	8991	0.6	1618421	0.3	diatom	1393640	574181623	95.7	m	NU	PERI
VR97	Rogue River	10/4/2018	R6	11/6/2018	Epithemia turgida	EPTR	1	8991	0.6	38212719	6.7	diatom	1393640	574181623	95.7	m	NU	PERI
VR97	Rogue River	10/4/2018	R6	11/6/2018	Cymbella mexicana	CMMX	1	8991	0.6	49451754	8.6	diatom	1393640	574181623	95.7	m	NU	PERI
VR97	Rogue River	10/4/2018	R6	11/6/2018	Oscillatoria sp.	OSXX	1	8991	0.6	5574561	1.0	bluegreen	1393640	574181623	95.7	m	NU	PERI
VR97	Rogue River	10/4/2018	R6	11/6/2018	Gomphoneis herculeana	GSHR	1	8991	0.6	97105263	16.9	diatom	1393640	574181623	95.7	m	NU	PERI
VR97	Rogue River	10/4/2018	R6	11/6/2018	Navicula minima	NVMN	1	8991	0.6	395614	0.1	diatom	1393640	574181623	95.7	m	NU	PERI
VR97	Rogue River	10/4/2018	R6	11/6/2018	Nitzschia volcanica	NZVL	1	8991	0.6	1438596	0.3	diatom	1393640	574181623	95.7	m	NU	PERI
VR97	Rogue River	10/4/2018	R6	11/6/2018	Synedra mazamaensis	SNMZ	1	8991	0.6	4603509	0.8	diatom	1393640	574181623	95.7	m	NU	PERI
VR97	Rogue River	10/4/2018	R6	11/6/2018	Nitzschia innominata	NZIN	1	8991	0.6	431579	0.1	diatom	1393640	574181623	95.7	m	NU	PERI
VR97	Rogue River	10/4/2018	R6	11/6/2018	Navicula tripunctata	NVTP	1	8991	0.6	10070175	1.8	diatom	1393640	574181623	95.7	m	NU	PERI
VR97	Rogue River	10/4/2018	R6	11/6/2018	Gomphonema ventricosum	GFVT	1	8991	0.6	7642544	1.3	diatom	1393640	574181623	95.7	m	NU	PERI
VR98	Rogue River	10/4/2018	R6B	11/7/2018	Nitzschia frustulum	NZFR	50	195461	35.0	32837529	12.9	diatom	559020	254809058	89.8	m	NU	PERI
VR98	Rogue River	10/4/2018	R6B	11/7/2018	Navicula cryptocephala	NVCR	13	50820	9.1	9401697	3.7	diatom	559020	254809058	89.8	m	NU	PERI
VR98	Rogue River	10/4/2018	R6B	11/7/2018	Melosira varians	MLVR	12	46911	8.4	131115561	51.5	diatom	559020	254809058	89.8	m	NU	PERI
VR98	Rogue River	10/4/2018	R6B	11/7/2018	Navicula cryptocephala veneta	NVCV	10	39092	7.0	3713768	1.5	diatom	559020	254809058	89.8	m	NU	PERI
VR98	Rogue River	10/4/2018	R6B	11/7/2018	Cymbella minuta	CMMN	8	31274	5.6	11571320	4.5	diatom	559020	254809058	89.8	m	NU	PERI
VR98	Rogue River	10/4/2018	R6B	11/7/2018	Nitzschia dissipata	NZDS	8	31274	5.6	8412662	3.3	diatom	559020	254809058	89.8	m	NU	PERI
VR98	Rogue River	10/4/2018	R6B	11/7/2018	Rhoicosphenia curvata	RHCU	8	31274	5.6	3659039	1.4	diatom	559020	254809058	89.8	m	NU	PERI
VR98	Rogue River	10/4/2018	R6B	11/7/2018	Achnanthes minutissima	ACMN	6	23455	4.2	1407323	0.6	diatom	559020	254809058	89.8	m	NU	PERI
VR98	Rogue River	10/4/2018	R6B	11/7/2018	Cocconeis placentula	COPC	4	15637	2.8	7192982	2.8	diatom	559020	254809058	89.8	m	NU	PERI
VR98	Rogue River	10/4/2018	R6B	11/7/2018	Nitzschia amphibia	NZAM	3	11728	2.1	1463616	0.6	diatom	559020	254809058	89.8	m	NU	PERI
VR98	Rogue River	10/4/2018	R6B	11/7/2018	Navicula viridula	NVVR	3	11728	2.1	5277460	2.1	diatom	559020	254809058	89.8	m	NU	PERI
VR98	Rogue River	10/4/2018	R6B	11/7/2018	Fragilaria construens venter	FRCV	2	7818	1.4	1125858	0.4	diatom	559020	254809058	89.8	m	NU	PERI
VR98	Rogue River	10/4/2018	R6B	11/7/2018	Fragilaria construens	FRCN	2	7818	1.4	14010679	5.5	diatom	559020	254809058	89.8	m	NU	PERI
VR98	Rogue River	10/4/2018	R6B	11/7/2018	Nitzschia palea	NZPL	2	7818	1.4	1407323	0.6	diatom	559020	254809058	89.8	m	NU	PERI
VR98	Rogue River	10/4/2018	R6B	11/7/2018	Nitzschia communis	NZCM	2	7818	1.4	351831	0.1	diatom	559020	254809058	89.8	m	NU	PERI
VR98	Rogue River	10/4/2018	R6B	11/7/2018	Fragilaria vaucheria	FRVA	2	7818	1.4	2251716	0.9	diatom	559020	254809058	89.8	m	NU	PERI
VR98	Rogue River	10/4/2018	R6B	11/7/2018	Gomphonema subclavatum	GFSB	1	3909	0.7	2345538	0.9	diatom	559020	254809058	89.8	m	NU	PERI
VR98	Rogue River	10/4/2018	R6B	11/7/2018	Nitzschia innominata	NZIN	1	3909	0.7	187643	0.1	diatom	559020	254809058	89.8	m	NU	PERI
VR98	Rogue River	10/4/2018	R6B	11/7/2018	Calothrix sp.	KXXX	1	3909	0.7	12509535	4.9	bluegreen	559020	254809058	89.8	m	NU	PERI
VR98	Rogue River	10/4/2018	R6B	11/7/2018	Navicula menisculus upsaliensis	NVMU	1	3909	0.7	801392	0.3	diatom	559020	254809058	89.8	m	NU	PERI
VR98	Rogue River	10/4/2018	R6B	11/7/2018	Amphora perpusilla	AFPR	1	3909	0.7	648932	0.3	diatom	559020	254809058	89.8	m	NU	PERI
VR98	Rogue River	10/4/2018	R6B	11/7/2018	Synedra mazamaensis	SNMZ	1	3909	0.7	2001526	0.8	diatom	559020	254809058	89.8	m	NU	PERI
VR98	Rogue River	10/4/2018	R6B	11/7/2018	Navicula cascadensis	NVCS	1	3909	0.7	234554	0.1	diatom	559020	254809058	89.8	m	NU	PERI
VR98	Rogue River	10/4/2018	R6B	11/7/2018	Gomphonema olivaceum	GFOM	1	3909	0.7	879577	0.3	diatom	559020	254809058	89.8	m	NU	PERI
VR99	Rogue River	10/5/2018	R7	11/7/2018	Cocconeis placentula	COPC	23	20543	20.9	9449721	38.0	diatom	98249	24877954	73.0	m	NU	PERI
VR99	Rogue River	10/5/2018	R7	11/7/2018	Nitzschia frustulum	NZFR	22	19650	20.0	2357964	9.5	diatom	98249	24877954	73.0	m	NU	PERI
VR99	Rogue River	10/5/2018	R7	11/7/2018	Nitzschia dissipata	NZDS	9	8039	8.2	2162361	8.7	diatom	98249	24877954	73.0	m	NU	PERI
VR99	Rogue River	10/5/2018	R7	11/7/2018	Achnanthes minutissima	ACMN	7	6252	6.4	312609	1.3	diatom	98249	24877954	73.0	m	NU	PERI
VR99	Rogue River	10/5/2018	R7	11/7/2018	Navicula cryptocephala veneta	NVCV	7	6252	6.4	593957	2.4	diatom	98249	24877954	73.0	m	NU	PERI
VR99	Rogue River	10/5/2018	R7	11/7/2018	Navicula cryptocephala	NVCR	6	5359	5.5	991417	4.0	diatom	98249	24877954	73.0	m	NU	PERI
VR99	Rogue River	10/5/2018	R7	11/7/2018	Rhoicosphenia curvata	RHCU	4	3573	3.6	501603	2.0	diatom	98249	24877954	73.0	m	NU	PERI
VR99	Rogue River	10/5/2018	R7	11/7/2018	Nitzschia amphibia	NZAM	3	2680	2.7	257232	1.0	diatom	98249	24877954	73.0	m	NU	PERI
VR99	Rogue River	10/5/2018	R7	11/7/2018	Nitzschia paleacea	NZPC	3	2680	2.7	262591	1.1	diatom	98249	24877954	73.0	m	NU	PERI
VR99	Rogue River	10/5/2018	R7	11/7/2018	Cymbella minuta	CMMN	3	2680	2.7	991417	4.0	diatom	98249	24877954	73.0	m	NU	PERI
VR99	Rogue River	10/5/2018	R7	11/7/2018	Gomphonema subclavatum	GFSB	3	2680	2.7	1607703	6.5	diatom	98249	24877954	73.0	m	NU	PERI
VR99	Rogue River	10/5/2018	R7	11/7/2018	Navicula minuscula	NVML	2	1786	1.8	80385	0.3	diatom	98249	24877954	73.0	m	NU	PERI
VR99	Rogue River	10/5/2018	R7	11/7/2018	Nitzschia communis	NZCM	2	1786	1.8	80385	0.3	diatom	98249	24877954	73.0	m	NU	PERI
VR99	Rogue River	10/5/2018	R7	11/7/2018	Gomphonema angustatum	GFAN	2	1786	1.8	321541	1.3	diatom	98249	24877954	73.0	m	NU	PERI
VR99	Rogue River	10/5/2018	R7	11/7/2018	Synedra mazamaensis	SNMZ	2	1786	1.8	457302	1.8	diatom	98249	24877954	73.0	m	NU	PERI
VR99	Rogue River	10/5/2018	R7	11/7/2018	Cymbella sinuata	CMSN	2	1786	1.8	250087	1.0	diatom	98249	24877954	73.0	m	NU	PERI
VR99	Rogue River	10/5/2018	R7	11/7/2018	Nitzschia palea	NZPL	2	1786	1.8	321541	1.3	diatom	98249	24877954	73.0	m	NU	PERI
VR99	Rogue River	10/5/2018	R7	11/7/2018	Fragilaria construens	FRCN	2	1786	1.8	400139	1.6	diatom	98249	24877954	73.0	m	NU	PERI
VR99	Rogue River	10/5/2018	R7	11/7/2018	Nitzschia innominata	NZIN	1	893	0.9	42872	0.2	diatom	98249	24877954	73.0	m	NU	PERI
VR99	Rogue River	10/5/2018	R7	11/7/2018	Melosira varians	MLVR	1	893	0.9	580559	2.3	diatom	98249	24877954	73.0	m	NU	PERI
VR99	Rogue River	10/5/2018	R7	11/7/2018	Oscillatoria sp.	OSXX	1	893	0.9	553764	2.2	bluegreen	98249	24877954	73.0	m	NU	PERI
VR99	Rogue River	10/5/2018	R7	11/7/2018	Diatoma vulgare	DTVL	1	893	0.9	1750610	7.0	diatom	98249	24877954	73.0	m	NU	PERI
VR99	Rogue River	10/5/2018	R7	11/7/2018	Navicula viridula	NVVR	1	893	0.9	401926	1.6	diatom	98249	24877954	73.0	m	NU	PERI
VR99	Rogue River	10/5/2018	R7	11/7/2018	Amphora perpusilla	AFPR	1	893	0.9	148266	0.6	diatom	98249	24877954	73.0	m	NU	PERI
VR00	Rogue River	10/5/2018	R7B	11/7/2018	Nitzschia frustulum	NZFR	46	22000	32.9	3167973	13.2	diatom	66956	23961240	72.8	m	NU	PERI
VR00	Rogue River	10/5/2018	R7B	11/7/2018	Nitzschia dissipata	NZDS	18	8609	12.9	2315719	9.7	diatom	66956	23961240	72.8	m	NU	PERI
VR00	Rogue River	10/5/2018	R7B	11/7/2018	Cocconeis placentula	COPC	18	8609	12.9	3959966	16.5	diatom	66956	23961240	72.8	m	NU	PERI
VR00	Rogue River	10/5/2018	R7B	11/7/2018	Navicula cryptocephala veneta	NVCV	10	4783	7.1	454344	1.9	diatom	66956	23961240	72.8	m	NU	PERI
VR00	Rogue River	10/5/2018	R7B	11/7/2018	Rhoicosphenia curvata	RHCU	5	2391	3.6	279780	1.2	diatom	66956	23961240	72.8	m	NU	PERI
VR00	Rogue River	10/5/2018	R7B	11/7/2018	Navicula cryptocephala	NVCR	5	2391	3.6	442388	1.8	diatom	66956	23961240	72.8	m	NU	PERI
VR00	Rogue River	10/5/2018	R7B	11/7/2018	Gomphonema subclavatum	GFSB	4	1913	2.9	1147816	4.8	diatom	66956	23961240	72.8	m	NU	PERI
VR00	Rogue River	10/5/2018	R7B	11/7/2018	Fragilaria construens	FRCN	4	1913	2.9	3428145	14.3	diatom	66956	23961240	72.8	m	NU	PERI
VR00	Rogue River	10/5/2018	R7B	11/7/2018	Nitzschia innominata	NZIN	3	1435	2.1	89530	0.4	diatom	66956	23961240	72.8	m	NU	PERI

Slide	Lake/River	Sample Date	Site	Date Analyzed	Species Name	Species Code	Count per taxa	Density	% Density	Biovolume	% Biovolume	Group	Total Density	Total Biovolume	TSI	Depth Units	Count Units	Type
VR00	Rogue River	10/5/2018	R7B	11/7/2018	Achnanthes minutissima	ACMN	3	1435	2.1	71739	0.3	diatom	66956	23961240	72.8	m	NU	PERI
VR00	Rogue River	10/5/2018	R7B	11/7/2018	Nitzschia amphibia	NZAM	2	957	1.4	91825	0.4	diatom	66956	23961240	72.8	m	NU	PERI
VR00	Rogue River	10/5/2018	R7B	11/7/2018	Fragilaria vaucheria	FRVA	2	957	1.4	275476	1.1	diatom	66956	23961240	72.8	m	NU	PERI
VR00	Rogue River	10/5/2018	R7B	11/7/2018	Gomphonema angustatum	GFAN	2	957	1.4	172172	0.7	diatom	66956	23961240	72.8	m	NU	PERI
VR00	Rogue River	10/5/2018	R7B	11/7/2018	Nitzschia communis	NZCM	2	957	1.4	43043	0.2	diatom	66956	23961240	72.8	m	NU	PERI
VR00	Rogue River	10/5/2018	R7B	11/7/2018	Epithemia turgida	EPTR	1	478	0.7	2032591	8.5	diatom	66956	23961240	72.8	m	NU	PERI
VR00	Rogue River	10/5/2018	R7B	11/7/2018	Ankistrodesmus falcatus	AKFL	1	478	0.7	11956	0.0	green	66956	23961240	72.8	m	NU	PERI
VR00	Rogue River	10/5/2018	R7B	11/7/2018	Diatoma vulgare	DTVL	1	478	0.7	937383	3.9	diatom	66956	23961240	72.8	m	NU	PERI
VR00	Rogue River	10/5/2018	R7B	11/7/2018	Cymbella affinis	CMAF	1	478	0.7	860862	3.6	diatom	66956	23961240	72.8	m	NU	PERI
VR00	Rogue River	10/5/2018	R7B	11/7/2018	Navicula cascadensis	NVCS	1	478	0.7	28695	0.1	diatom	66956	23961240	72.8	m	NU	PERI
VR00	Rogue River	10/5/2018	R7B	11/7/2018	Navicula minuscula	NVML	1	478	0.7	21522	0.1	diatom	66956	23961240	72.8	m	NU	PERI
VR00	Rogue River	10/5/2018	R7B	11/7/2018	Fragilaria construens venter	FRCV	1	478	0.7	22956	0.1	diatom	66956	23961240	72.8	m	NU	PERI
VR00	Rogue River	10/5/2018	R7B	11/7/2018	Cymbella sinuata	CMSN	1	478	0.7	66956	0.3	diatom	66956	23961240	72.8	m	NU	PERI
VR00	Rogue River	10/5/2018	R7B	11/7/2018	Nitzschia microcephala	NZMC	1	478	0.7	47826	0.2	diatom	66956	23961240	72.8	m	NU	PERI
VR00	Rogue River	10/5/2018	R7B	11/7/2018	Achnanthes lanceolata	ACLC	1	478	0.7	86086	0.4	diatom	66956	23961240	72.8	m	NU	PERI
VR00	Rogue River	10/5/2018	R7B	11/7/2018	Cymbella minuta	CMMN	1	478	0.7	176955	0.7	diatom	66956	23961240	72.8	m	NU	PERI
VR00	Rogue River	10/5/2018	R7B	11/7/2018	Nitzschia paleacea	NZPC	1	478	0.7	46869	0.2	diatom	66956	23961240	72.8	m	NU	PERI
VR00	Rogue River	10/5/2018	R7B	11/7/2018	Synedra ulna	SNUL	1	478	0.7	951731	4.0	diatom	66956	23961240	72.8	m	NU	PERI
VR00	Rogue River	10/5/2018	R7B	11/7/2018	Gomphoneis herculeana	GSHR	1	478	0.7	2582587	10.8	diatom	66956	23961240	72.8	m	NU	PERI
VR00	Rogue River	10/5/2018	R7B	11/7/2018	Amphora perpusilla	AFPR	1	478	0.7	79391	0.3	diatom	66956	23961240	72.8	m	NU	PERI
VR00	Rogue River	10/5/2018	R7B	11/7/2018	Synedra rumpens	SNRM	1	478	0.7	66956	0.3	diatom	66956	23961240	72.8	m	NU	PERI