

Aquatic Invertebrate Report for samples collected by South Yuba River Citizen's League

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**Sampling Locations**

Table 1. Sampling site locations

Station	Location	Latitude	Longitude	Elevation (meters)
MYUBAORCK-1	Middle Yuba River , Above Oregon Creek, Nevada County, California	39.395	121.083	
MYUBAOURHS-1	Middle Yuba River, Our House, Sierra County, California	39.413	120.995	
SYUBABRGPT-1	South Yuba River, Bridgeport, Nevada County, California	39.293	121.198	
SYUBALANGCR-	South Yuba River, Lang's Crossing, Placer County, California	39.321	120.656	
SYUBAPLAV-1	South Yuba River, Plavada, Placer County, California	39.316	120.444	

## Methods

### Field sampling

Samples were collected between September 2, 2008 and September 9, 2008 (Table 2). Aquatic invertebrates were collected quantitatively from riffle habitats with a Surber net with a 500 micron mesh net.

### Laboratory methods

General procedures for processing invertebrate samples were similar to those recommended by the United States Geological Survey (Cuffney et al. 1993) and are described in greater detail and rationalized in Vinson and Hawkins (1996). Samples were sub-sampled if the sample appeared to contain more than 600 organisms. Sub-samples were obtained by pouring the sample into an appropriate diameter 500 micron sieve, floating this material by placing the sieve within an enamel pan partially filled with water and leveling the material within the sieve. The sieve was then removed from the water pan and the material within the sieve was divided into two equal parts. One half of the sieve was then randomly chosen to be processed and the other half set aside. The sieve was then placed back in the enamel pan and the material in the sieve again leveled and split in half. This process was repeated until approximately 600 organisms remained in one-half of the sieve. This material was placed into a Petri dish and all organisms were removed under a dissecting microscope at 10-30 power. Additional sub-samples were taken until at least 600 organisms were removed. All organisms within a sub-sample were removed, and separated into taxonomic Orders. When the sorting of the sub-samples was completed, the entire sample was spread throughout a large white enamel pan and searched for 10 minutes to remove any taxa that might not have been picked up during the initial sample sorting process. The objective of this "big/rare" search was to provide a more complete taxa list by finding rarer taxa that may have been excluded during the sub-sampling process. These rarer bugs were placed into a separate vial and the data entered separately from the bugs removed during the sub-sampling process. All the organisms removed during the sorting process were then identified using appropriate identification keys (see literature cited list for list of taxonomic resources used). Once the data had been entered into a computer and checked, the unsorted portion of the sample was discarded. The identified portion of the sample was placed in a 20 ml glass scintillation vial with polypropylene lids in 70% ethanol, given a catalog number, and retained. In this report, metrics were calculated using data from the sub-sampled and big/rare portions of the sample. Abundance data are presented as the estimated number of individuals per square meter for quantitative samples and the estimated number per sample for qualitative samples.

Table 2. Field comments and laboratory processing information.

Sample	Station	Sampling Date	Habitat Sampled	Sampling Method	Sampling Area Sqmts	% of sample processed	Number of individuals identified	Field Comments
139943	MYUBAORCK-	09/02/2008	Riffle	Surber net	0.74	63	624	
139944	SYUBAPLAV-1	09/09/2008	Riffle	Surber net	0.74	19	621	
139945	SYUBABRGPT-	09/03/2008	Riffle	Surber net	0.74	100	622	
139946	SYUBALANGC	09/07/2008	Riffle	Surber net	0.74	13	634	
139947	MYUBAOURHS	09/06/2008	Riffle	Surber net	0.74	22	617	

## Data summarization

A number of metrics or ecological summaries can be calculated from an aquatic invertebrate sample. A summary and description of commonly used metrics is available in Barbour et al. (1999, <http://www.epa.gov/owow/monitoring/rbp/index.html#Table%20of%20Contents>) and Karr and Chu (1998). Both of these publications suggest use of the following metrics for assessing the health of aquatic invertebrate assemblages: Total taxa richness, EPT taxa richness, Ephemeroptera taxa richness, Plecoptera taxa richness, Trichoptera taxa richness, % EPT abundance, % Ephemeroptera abundance, % Chironomidae abundance, Intolerant taxa richness, % tolerant organisms, Hilsenhoff Biotic Index, % contribution of the dominant taxon, clinger taxa richness, % clinger abundance, % collector-filterer abundance, and the % scraper abundance. Assessments are best made by comparing samples to samples collected similarly at reference sites or from samples collected prior to impacts or management actions at a location. In this report, the following metrics were calculated for each sample.

**Taxa richness** - Richness is a component and estimate of community structure and stream health based on the number of distinct taxa. Taxa richness normally decreases with decreasing water quality. In some situations organic enrichment can cause an increase in the number of pollution tolerant taxa. Taxa richness was calculated for operational taxonomic units (OTUs) and the number of unique genera, and families. The values for operational taxonomic units may be overestimates of the true taxa richness at a site if individuals were the same taxon as those identified to lower taxonomic levels or they may be underestimates of the true taxa richness if multiple taxa were present within a larger taxonomic grouping but were not identified. All individuals within all samples were generally identified similarly, so that comparisons in operational taxonomic richness among samples within this dataset are appropriate, but comparisons to other data sets may not. Comparisons to other datasets should be made at the genera or family level.

**Abundance** - The abundance, density, or number of aquatic macroinvertebrates per unit area is an indicator of habitat availability and fish food abundance. Abundance may be reduced or increased depending on the type of impact or pollutant. Increased organic enrichment typically causes large increases in abundance of pollution tolerant taxa. High flows, increases in fine sediment, or the presence of toxic substances normally cause a decrease in invertebrate abundance. Invertebrate abundance is presented as the number of individuals per square meter for quantitative samples and the number of individuals collected in each sample for qualitative samples.

**EPT** - A summary of the taxonomic richness and abundance within the insect Orders Ephemeroptera, Plecoptera, and Trichoptera (EPT). These orders are commonly considered sensitive to pollution (Karr and Chu 1998).

**Percent contribution of the dominant family or taxon** - An assemblage largely dominated (>50%) by a single taxon or several taxa from the same family suggests environmental stress. Habitat conditions likely limit the number of taxa that can occur at the site.

**Shannon diversity index** - Ecological diversity is a measure of community structure defined by the relationship between the number of distinct taxa and their relative abundances. The Shannon diversity index was calculated for each sampling location for which there were a sufficient number of individuals and taxa collected to perform the calculations. The calculations were made following Ludwig and Reynolds (1988, equation 8.9, page 92).

**Evenness** - Evenness is a measure of the distribution of taxa within a community. The evenness index used in this report was calculated following Ludwig and Reynolds (1988, equation 8.15, page 94). Value ranges from 0-1 and approach zero as a single taxa becomes more dominant.

**Clinger taxa** - The number of clinger taxa have been found by Karr and Chu (1998) to respond negatively to human disturbance. Clinger taxa were determined using information in Merritt et al. (2008). These taxa typically cling to the tops of rocks and are thought to be reduced by sedimentation or abundant algal growths.

**Long-live taxa** - The number of long-lived taxa was calculated the number of taxa collected that typically have 2-3 year life cycles. Disturbances and water quality and habitat impairment typically reduces the number of long-lived taxa Karr and Chu (1998). Life-cycle length determinations were based on information in Merritt et al. (2008).

**Biotic indices** - Biotic indices use the indicator taxa concept. Taxa are assigned water quality tolerance values based on their tolerance to pollution. Scores are typically weighted by taxa relative abundance. In the United States the most commonly used biotic index is the Hilsenhoff Biotic Index (Hilsenhoff 1987, Hilsenhoff 1988). The USFS and BLM

throughout the western United States have also frequently used the USFS Community Tolerance Quotient.

**Hilsenhoff biotic index** - The Hilsenhoff Biotic Index (HBI) summarizes the overall pollution tolerances of the taxa collected. This index has been used to detect nutrient enrichment, high sediment loads, low dissolved oxygen, and thermal impacts. It is best at detecting organic pollution. Families were assigned an index value from 0- taxa normally found only in high quality unpolluted water, to 10- taxa found only in severely polluted waters. Family level values were taken from Hilsenhoff (1987, 1988) and a family level HBI was calculated for each sampling location for which there were a sufficient number of individuals and taxa collected to perform the calculations. Sampling locations with HBI values of 0-2 are considered clean, 2-4 slightly enriched, 4-7 enriched, and 7-10 polluted. Rather than using mean HBI values for a sample, taxon HBI values can also be used to determine the number of pollution intolerant and tolerant taxa occurring at a site. In this report, taxa with HBI values  $\leq 1$  were considered intolerant clean water taxa and taxa with HBI values  $\geq 9$  were considered pollution tolerant taxa. The number of tolerant and intolerant taxa and the abundances of tolerant and intolerant taxa were calculated for each sampling location.

**USFS community tolerant quotient** - Taxa are assigned a tolerant quotient (TQ) from 2 - taxa found only in high quality unpolluted water, to 108 - taxa found in severely polluted waters. TQ values were developed by Winget and Mangum (1979). The dominance weighted community tolerance quotient (CTQd) was calculated. Values can vary from about 20 to 100, in general the lower the value the better the water quality.

**Functional feeding group measures** - A common classification scheme for aquatic macroinvertebrates is to categorize them by feeding acquisition mechanisms. Categories are based on food particle size and food location, e.g., suspended in the water column, deposited in sediments, leaf litter, or live prey. This classification system reflects the major source of the resource, either within the stream itself or from riparian or upland areas and the primary location, either erosional or depositional habitats. The number of taxa and individuals of the following feeding groups were calculated for each sampling location. Functional feeding group designations were from Merritt et al. (2008).

**Shredders** - Shredders use both living vascular hydrophytes and decomposing vascular plant tissue - coarse particulate organic matter. Shredders are sensitive to changes in riparian vegetation. Shredders can be good indicators of toxicants that adhere to organic matter.

**Scrapers** - Scrapers feed on periphyton - attached algae and associated material. Scraper populations increase with increasing abundance of diatoms and can decrease as filamentous algae, mosses, and vascular plants increase, often in response to increases in nitrogen and phosphorus. Scrapers decrease in relative abundance in response to sedimentation and higher levels of organic pollution or nutrient enrichment.

**Collector-filterers** - Collector-filterers feed on suspended fine particulate organic matter. Collector-filterers are sensitive to toxicants in the water column and to pollutants that adhere to organic matter.

**Collector-gatherers** - Collector-gatherers feed on deposited fine particulate organic matter. Collector-gatherers are sensitive to deposited toxicants.

**Predators** - Predators feed on living animal tissue. Predators typically make up about 25% of the assemblage in stream environments and 50% of the assemblage in still-water environments.

**Unknown feeding group** - This category includes taxa that are highly variable, parasites, and those that for which the primary feeding mode is currently unknown.

## Results

Abundance data and taxa richness are reported as the estimated number of individuals per square meter for quantitative samples and the number per sample for qualitative samples. NC = Not calculated. \* = unable to calculate. EPT = totals for the insect orders, Ephemeroptera, Plecoptera, Trichoptera. QL = qualitative sample.

Sample	Sampling date	Station	Total abundance	EPT abundance	Dominant family	% contribution dominant family
139943	09/02/2008	MYUBAORCK-1	1326	686	Elmidae	18.03
139944	09/09/2008	SYUBAPLAV-1	4329	3168	Hydropsychidae	52.36
139945	09/03/2008	SYUBABRGPT-	836	270	Simuliidae	31.70
139946	09/07/2008	SYUBALANGCR	6582	1665	Chironomidae	57.46
139947	09/06/2008	MYUBAOURHS-	3729	2723	Hydropsychidae	26.31
Mean			3360.4	1702.4		37.17

## Diversity indices

Sample	Sampling Date	Station	Total taxa richness	Total genera richness	Total family richness	EPT taxa richness	Shannon diversity index	Evenness
139943	09/02/2008	MYUBAORCK-1	37	19	22	17	3.080	0.850
139944	09/09/2008	SYUBAPLAV-1	41	20	22	20	2.650	0.710
139945	09/03/2008	SYUBABRGPT-	41	25	25	15	2.900	0.780
139946	09/07/2008	SYUBALANGCR	42	25	23	18	2.490	0.670
139947	09/06/2008	MYUBAOURHS-	34	20	19	17	2.780	0.790
Mean			39.0	21.8	22.2	17.4	2.780	0.760

### Genera richness by major taxonomic group.

Sample	Sampling Date	Station	Coleoptera	Diptera	Ephemeroptera	Heteroptera	Megaloptera	Odonata	Plecoptera	Trichoptera	Annelida	Crustacea	Mollusca
139943	09/02/2008	MYUBAORCK-	6	9	7	0	1	1	3	7	1	0	2
139944	09/09/2008	SYUBAPLAV-1	6	10	5	0	0	0	5	10	1	0	0
139945	09/03/2008	SYUBABRGPT-	6	10	7	0	0	2	2	6	0	0	3
139946	09/07/2008	SYUBALANGC	3	16	3	0	1	0	6	9	1	0	1
139947	09/06/2008	MYUBAOURHS	7	6	4	0	0	2	5	8	0	0	1
Mean			5.6	10.2	5.2	0.0	0.4	1.0	4.2	8.0	0.6	0.0	1.4

### Total abundance by major taxonomic group.

Sample	Sampling Date	Station	Coleoptera	Diptera	Ephemeroptera	Heteroptera	Megaloptera	Odonata	Plecoptera	Trichoptera	Annelida	Crustacea	Mollusca
139943	09/02/2008	MYUBAORCK-1	313	295	188	0	6	17	180	318	8	0	0
139944	09/09/2008	SYUBAPLAV-1	295	793	237	0	0	0	461	2471	16	0	0
139945	09/03/2008	SYUBABRGPT-1	70	386	124	0	0	36	5	141	0	0	44
139946	09/07/2008	SYUBALANGCR-1	54	4742	570	0	0	0	427	668	0	0	24
139947	09/06/2008	MYUBAOURHS-1	397	547	1322	0	0	25	297	1104	0	0	0
Mean			225.8	1352.6	488.2	0.0	1.2	15.6	274.0	940.4	4.8	0.0	13.6

## Biotic Indices

Sample	Sampling date	Station	Hilsenhoff Biotic Index		USFS Community CTQd
			Index	Indication	
139943	09/02/2008	MYUBAORCK-1	4.05	Possible slight organic pollution	82
139944	09/09/2008	SYUBAPLAV-1	4.10	Possible slight organic pollution	79
139945	09/03/2008	SYUBABRGPT-	5.70	Fairly significant organic pollution	91
139946	09/07/2008	SYUBALANGCR	5.30	Some organic pollution	79
139947	09/06/2008	MYUBAOURHS-	4.20	Possible slight organic pollution	79
Mean			4.67		82.0

Taxa richness and relative abundance values with respect to tolerance or intolerance to pollution were based on the Hilsenhoff Biotic Index (HBI). Intolerant taxa have HBI score  $\leq 1$ . Tolerant taxa have a HBI score  $\geq 9$ . Data are presented as estimated count per square meter for quantitative samples and total number per sample for qualitative samples.

Sample	Sampling date	Station	Intolerant taxa				Tolerant Taxa			
			Richness		Abundance		Richness		Abundance	
139943	09/02/2008	MYUBAORCK-	8	(22)	206	(16)	2	(5)	26	(2)
139944	09/09/2008	SYUBAPLAV-1	8	(20)	404	(9)	0	(0)	0	(0)
139945	09/03/2008	SYUBABRGPT	5	(12)	15	(2)	2	(5)	32	(4)
139946	09/07/2008	SYUBALANGC	7	(17)	231	(4)	1	(2)	22	(0)
139947	09/06/2008	MYUBAOURH	5	(15)	278	(7)	1	(3)	6	(0)
Mean			6.6	(17)	226.8	(8)	1.2	(3)	17.2	(1)

## Functional feeding groups

Taxa richness by functional feeding group. The percent of the total is shown in parentheses.

Sample	Sampling date	Station	Shredders		Scrapers		Collector-filterers		Collector-gatherers		Predators		Unknown	
139943	09/02/2008	MYUBAORCK-	1	(3)	6	(16)	5	(14)	14	(38)	7	(19)	3	(8)
139944	09/09/2008	SYUBAPLAV-1	2	(5)	4	(10)	7	(17)	12	(29)	9	(22)	6	(15)
139945	09/03/2008	SYUBABRGPT-	1	(2)	6	(15)	6	(15)	11	(27)	11	(27)	5	(12)
139946	09/07/2008	SYUBALANGC	2	(5)	3	(7)	6	(14)	7	(17)	17	(40)	5	(12)
139947	09/06/2008	MYUBAOURHS	1	(3)	3	(9)	7	(21)	9	(26)	8	(24)	5	(15)
Mean			1.4	(4)	4.4	(11)	6.2	(16)	10.6	(27)	10.4	(26)	4.8	(12)

Invertebrate abundance by functional feed group. The percent of the total is shown in parentheses.

Sample	Sampling date	Station	Shredders	Scrapers	Collector-filterers	Collector-gatherers	Predators	Unknown
139943	09/02/2008	MYUBAORCK-	4 (0)	193 (15)	388 (29)	276 (21)	217 (16)	181 (14)
139944	09/09/2008	SYUBAPLAV-1	165 (4)	188 (4)	2557 (59)	734 (17)	376 (9)	288 (7)
139945	09/03/2008	SYUBABRGPT-	1 (0)	27 (3)	320 (38)	259 (31)	99 (12)	47 (6)
139946	09/07/2008	SYUBALANGC	75 (1)	78 (1)	816 (12)	3892 (59)	1073 (16)	293 (4)
139947	09/06/2008	MYUBAOURHS	0 (0)	625 (17)	1122 (30)	1482 (40)	334 (9)	141 (4)
Mean			49.0 (1)	222.2 (8)	1040.6 (34)	1328.6 (34)	419.8 (12)	190.0 (7)

The 10 metrics thought to be most responsive to human induced disturbance (Karr and Chu 1998).

Sample	Sampling Date	Station	Total taxa	Ephemeroptera taxa	Plecoptera taxa	Trichoptera taxa	Long-lived taxa	Intolerant taxa	Clinger taxa	% tolerant individuals	% contribution dominant taxon	% predators
139943	09/02/2008	MYUBAORCK-1	37	4	1	5	10	8	23	1.96	10.56	16.37
139944	09/09/2008	SYUBAPLAV-1	41	2	3	7	8	8	20	0.00	30.86	8.69
139945	09/03/2008	SYUBABRGPT-1	41	4	2	4	10	5	21	3.83	22.73	11.84
139946	09/07/2008	SYUBALANGCR-	42	1	4	7	6	7	16	0.33	36.37	16.30
139947	09/06/2008	MYUBAOURHS-	34	3	4	5	11	5	17	0.16	14.54	8.96
Mean			39.0	2.8	2.8	5.6	9.0	6.6	19.4	1.26	23.01	12.43



Taxonomic list and counts for 5 samples collected between September 2, 2008 and September 9, 2008. Count is the total number of individuals identified and retained. Samples heading refers to the number of samples contain that taxon.

Order/SubOrder	Family	Subfamily/Genus/Species	Samples	Count
Phylum: Annelida				
Class: Clitellata	SubClass: Oligochaeta		3	8
Phylum: Arthropoda				
Class: Arachnida	SubClass: Acari			
Trombidiformes			1	2
Trombidiformes Prostigmata	Lebertiidae	Lebertia	1	3
Trombidiformes Prostigmata	Mideopsidae	Mideopsis	1	1
Trombidiformes Prostigmata	Sperchonidae	Sperchon	2	12
Trombidiformes Prostigmata	Torrenticolidae	Torrenticola	3	22
Class: Entognatha				
Collembola			1	1
Class: Insecta	SubClass: Pterygota			
Coleoptera Polyphaga	Elmidae		4	28
Coleoptera Polyphaga	Elmidae	Ampumixis dispar	1	1
Coleoptera Polyphaga	Elmidae	Microcylloepus pusillus	1	8
Coleoptera Polyphaga	Elmidae	Optioservus	3	45
Coleoptera Polyphaga	Elmidae	Optioservus quadrimaculatus	4	11
Coleoptera Polyphaga	Elmidae	Ordobrevia nubifera	4	39
Coleoptera Polyphaga	Elmidae	Zaitzevia	5	110
Coleoptera Polyphaga	Hydraenidae	Hydraena	1	2
Coleoptera Polyphaga	Psephenidae		3	64
Coleoptera Polyphaga	Psephenidae	Eubrianacinae Eubrianax edwardsii	1	4
Coleoptera Polyphaga	Ptilodactylidae	Stenocolus scutellaris	1	
Diptera			3	8
Diptera Nematocera	Blephariceridae		2	3
Diptera	Ceratopogonidae	Ceratopogoninae Sphaeromiini Probezia	1	1
Diptera	Ceratopogonidae	Forcipomyiinae Atrichopogon	1	1
Diptera Nematocera	Chironomidae		4	27
Diptera Nematocera	Chironomidae	Chironominae	5	119
Diptera Nematocera	Chironomidae	Orthocladiinae	5	397
Diptera Nematocera	Chironomidae	Tanypodinae	4	80
Diptera Brachycera	Empididae	Clinocera	1	2
Diptera Brachycera	Empididae	Hemerodromiinae Hemerodromiini	1	1
Diptera Brachycera	Empididae	Neoplasta	1	4
Diptera	Muscidae		1	7
Diptera Nematocera	Psychodidae	Maruina	3	8
Diptera Nematocera	Simuliidae		5	126
Diptera Nematocera	Simuliidae	Simuliinae Simuliini Simulium	5	268
Diptera Nematocera	Simuliidae	Simuliinae Simuliini Simulium bivittatum group	1	2
Diptera Nematocera	Simuliidae	Simuliinae Simuliini Simulium tuberosum	2	2
Diptera Nematocera	Tipulidae	Antocha monticola	4	25
Diptera Nematocera	Tipulidae	Dicranota	1	1
Diptera Nematocera	Tipulidae	Hexatoma	1	
Ephemeroptera Pisciforma	Baetidae		3	31
Ephemeroptera Pisciforma	Baetidae	Baetis	5	237
Ephemeroptera Pisciforma	Baetidae	Centroptilum	1	

Ephemeroptera Pisciforma	Baetidae	Dipheter hageni	1	5
Ephemeroptera Pisciforma	Baetidae	Fallceon quilleri	1	20
Ephemeroptera Furcatergalia	Ephemerellidae		3	25
Ephemeroptera Furcatergalia	Ephemerellidae	Ephemerella inermis/dorothea	1	1
Ephemeroptera Setisura	Heptageniidae		5	82
Ephemeroptera Setisura	Heptageniidae	Epeorus	3	61
Ephemeroptera Furcatergalia	Leptohyphidae	Tricorythodes	2	14
Ephemeroptera Furcatergalia	Leptophlebiidae		1	6
Hemiptera Heteroptera	Veliidae	Rhagoveliinae Rhagovelia	1	1
Lepidoptera	Pyralidae	Nymphulinae Argyractini Petrophila	1	2
Megaloptera	Corydalidae		1	3
Megaloptera	Sialidae	Sialis	1	
Odonata			1	5
Odonata Zygoptera	Coenagrionidae		1	1
Odonata Zygoptera	Coenagrionidae	Argia	2	30
Odonata Anisoptera	Gomphidae		1	3
Plecoptera			1	6
Plecoptera Systellognatha	Chloroperlidae		1	1
Plecoptera Systellognatha	Chloroperlidae	Sweltsa	3	23
Plecoptera Euholognatha	Nemouridae		1	21
Plecoptera Euholognatha	Nemouridae	Malenka	1	22
Plecoptera Systellognatha	Perlidae		3	33
Plecoptera Systellognatha	Perlidae	Calineuria californica	5	103
Plecoptera Systellognatha	Perlidae	Hesperoperla pacifica	1	10
Plecoptera Systellognatha	Perlodidae		1	8
Plecoptera Systellognatha	Perlodidae	Perlodinae Arcynopterygini Skwala americana	3	30
Plecoptera Systellognatha	Pteronarcyidae	Pteronarcyinae Pteronarcyini Pteronarcys	1	1
Trichoptera			2	4
Trichoptera	Brachycentridae	Micrasema	2	8
Trichoptera	Glossosomatidae	Glossosomatinae Glossosomatini Glossosoma	1	16
Trichoptera	Hydropsychidae		5	143
Trichoptera	Hydropsychidae	Arctopsychinae Arctopsyche californica	1	2
Trichoptera	Hydropsychidae	Hydropsychinae Cheumatopsyche	2	84
Trichoptera	Hydropsychidae	Hydropsychinae Hydropsyche	5	376
Trichoptera	Hydroptilidae		5	116
Trichoptera	Hydroptilidae	Hydroptilinae Hydroptilini Hydroptila	1	16
Trichoptera	Hydroptilidae	Hydroptilinae Leucotrichiini Leucotrichia	1	21
Trichoptera	Lepidostomatidae	Lepidostomatinae Lepidostoma	1	1
Trichoptera	Philopotamidae	Chimarrinae Chimarra	2	25
Trichoptera	Philopotamidae	Philopotaminae Dolophilodes	1	13
Trichoptera	Philopotamidae	Philopotaminae Wormaldia	2	11
Trichoptera	Polycentropodidae	Polycentropodinae Polycentropus	1	2
Trichoptera	Rhyacophilidae	Rhyacophila	2	3
Trichoptera	Rhyacophilidae	Rhyacophila betteni group	4	7
Trichoptera	Rhyacophilidae	Rhyacophila brunnea/vemna group	1	2
Trichoptera	Sericostomatidae	Gumaga	1	2
Class: Malacostraca	SubClass: Eumalacostraca			
Amphipoda			1	1
Phylum: Mollusca				
Class: Gastropoda				
			1	1
Basommatophora	Lymnaeidae	Lymnaeinae Lymnaea	2	18
Basommatophora	Physidae	Physinae Physa	3	14
Neotaenioglossa	Pleuroceridae	Juga	1	4

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Total: OTU Taxa : **92**                      Genera : **61**                      Families : **44**                      Individuals : **3118**

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## Literature Cited

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# Taxa Lists for Individual Samples

Taxonomic list and densities of aquatic invertebrates identified and retained from a sample collected September 2, 2008 at station MYUBAORCK-1, Middle Yuba River, Above Oregon Creek, Nevada county, California. The sample was collected from riffle habitat using a surber net. The total area sampled was 0.744 square meters. The percentage of the sample that was identified and retained was 63% of the collected sample. A total of 624 individuals were removed, identified and retained. The sample identification number is 139943. OTU=operational taxonomic unit. Notes - identification to genus or species was not supported because: I - immature organisms, D- damaged organisms, M - poor slide mount, G - gender, U - indistinct characters or distribution, R - retained in our reference collection.

Order	Family	Subfamily/Genus/Species	Life Stage	Density	Notes
Phylum: Annelida					
Class: Clitellata		SubClass: Oligochaeta	adult	8.33	
Phylum: Arthropoda					
Class: Insecta		SubClass: Pterygota			
Coleoptera Polyphaga	Elmidae		larvae	6.45	I
Coleoptera Polyphaga	Elmidae	Optioservus	larvae	51.61	U
Coleoptera Polyphaga	Elmidae	Optioservus quadrimaculatus	adult	12.90	
Coleoptera Polyphaga	Elmidae	Ordobrevia nubifera	adult	13.98	
Coleoptera Polyphaga	Elmidae	Zaitzevia	adult	69.89	U
Coleoptera Polyphaga	Psephenidae		larvae	74.46	
Diptera Nematocera	Blephariceridae		larvae	2.15	I
Diptera Nematocera	Chironomidae		pupae	4.30	U
Diptera Nematocera	Chironomidae	Chironominae	larvae	15.05	
Diptera Nematocera	Chironomidae	Orthocladiinae	larvae	58.06	
Diptera Nematocera	Chironomidae	Tanypodinae	larvae	10.75	
Diptera Nematocera	Psychodidae	Maruina	larvae	8.60	
Diptera Nematocera	Simuliidae		larvae	81.72	I
Diptera Nematocera	Simuliidae	Simuliinae Simuliini Simulium	larvae	108.06	
Diptera Nematocera	Tipulidae	Antocha monticola	larvae	6.45	
Ephemeroptera Pisciforma	Baetidae		larvae	58.06	I
Ephemeroptera Pisciforma	Baetidae	Baetis	larvae	94.62	
Ephemeroptera Furcatergalia	Ephemerellidae		larvae	12.90	I
Ephemeroptera Furcatergalia	Ephemerellidae	Ephemerella inermis/dorothea	larvae	2.15	
Ephemeroptera Setisura	Heptageniidae		larvae	10.75	I,D
Ephemeroptera Setisura	Heptageniidae	Epeorus	larvae	5.65	
Ephemeroptera Furcatergalia	Leptohyphidae	Tricorythodes	larvae	4.30	
Megaloptera	Corydalidae		larvae	5.65	I
Odonata Zygoptera	Coenagrionidae	Argia	larvae	17.20	
Plecoptera Systellognatha	Chloroperlidae		larvae	2.15	U
Plecoptera Systellognatha	Perlidae		larvae	64.52	I
Plecoptera Systellognatha	Perlidae	Calineuria californica	larvae	113.44	
Trichoptera	Hydropsychidae		larvae	25.81	I
Trichoptera	Hydropsychidae	Hydropsychinae Hydropsyche	larvae	129.30	
Trichoptera	Hydroptilidae		larvae	66.67	U

Trichoptera	Hydroptilidae	Hydroptilinae Leucotrichiini Leucotrichia pictipes	larvae	45.16
Trichoptera	Philopotamidae	Chimarrinae Chimarra	larvae	43.01
Trichoptera	Rhyacophilidae	Rhyacophila betteni group	larvae	3.49
Trichoptera	Sericostomatidae	Gumaga	larvae	4.30
Phylum: Mollusca				
Class: Gastropoda				
Basommatophora	Lymnaeidae	Lymnaeinae Lymnaea	adult	
Basommatophora	Physidae	Physinae Physa	adult	

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Total: OTU Taxa : **37**      Genera : **20**      Families : **22**      1325.81

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Taxonomic list and densities of aquatic invertebrates identified and retained from a sample collected September 9, 2008 at station SYUBAPLAV-1, South Yuba River, Plavada, Placer county, California. The sample was collected from riffle habitat using a surber net. The total area sampled was 0.744 square meters. The percentage of the sample that was identified and retained was 19% of the collected sample. A total of 621 individuals were removed, identified and retained. The sample identification number is 139944. OTU=operational taxonomic unit. Notes - identification to genus or species was not supported because: I - immature organisms, D- damaged organisms, M - poor slide mount, G - gender, U - indistinct characters or distribution, R - retained in our reference collection.

Order	Family	Subfamily/Genus/Species	Life Stage	Density	Notes
Phylum: Annelida					
Class: Clitellata		SubClass: Oligochaeta			
			adult	15.68	
Phylum: Arthropoda					
Class: Arachnida		SubClass: Acari			
Trombidiformes	Mideopsidae	Mideopsis	adult	7.17	
Prostigmata					
Trombidiformes	Sperchonidae	Sperchon	adult	35.84	
Prostigmata					
Class: Entognatha					
Collembola			adult	7.17	
Class: Insecta		SubClass: Pterygota			
Coleoptera Polyphaga	Elmidae		larvae	21.51	I
Coleoptera Polyphaga	Elmidae	Ordobrevia nubifera	adult	75.27	
Coleoptera Polyphaga	Elmidae	Zaitzevia	larvae	64.52	U
Coleoptera Polyphaga	Hydraenidae	Hydraena	adult	14.34	
Coleoptera Polyphaga	Psephenidae		larvae	21.51	I
Coleoptera Polyphaga	Psephenidae	Eubrianacinae Eubrianax edwardsii	larvae	22.85	
Diptera			pupae	15.01	U
Diptera	Ceratopogonidae	Forcipomyiinae Atrichopogon	larvae	7.17	
Diptera Nematocera	Chironomidae		pupae	64.52	U
Diptera Nematocera	Chironomidae	Chironominae	larvae	166.22	
Diptera Nematocera	Chironomidae	Orthoclaadiinae	larvae	207.89	
Diptera Nematocera	Chironomidae	Tanypodinae	larvae	7.17	
Diptera Nematocera	Simuliidae		larvae	71.68	I
Diptera Nematocera	Simuliidae	Simuliinae Simuliini Simulium	larvae	194.89	
Diptera Nematocera	Simuliidae	Simuliinae Simuliini Simulium tuberosum group	larvae	7.17	
Diptera Nematocera	Tipulidae	Antocha monticola	larvae	35.84	
Ephemeroptera	Baetidae		larvae	7.17	I
Pisciforma					
Ephemeroptera	Baetidae	Baetis	larvae	93.19	
Pisciforma					
Ephemeroptera	Baetidae	Centroptilum	larvae		
Pisciforma					
Ephemeroptera	Ephemerellidae		larvae	107.53	I,D
Furcatergalia					
Ephemeroptera	Heptageniidae		larvae	28.67	D
Setisura					
Plecoptera	Chloroperlidae	Sweltsa	larvae	130.38	
Systellognatha					
Plecoptera	Nemouridae		larvae	150.54	I,D
Euholognatha					
Plecoptera	Perlidae		larvae	14.34	I
Systellognatha					
Plecoptera	Perlidae	Calineuria californica	larvae	7.17	
Systellognatha					



Plecoptera	Perlodidae	Perlodinae Arcynopterygini Skwala	larvae	158.60	
Systellognatha		americana			
Trichoptera			larvae	21.51	
Trichoptera	Brachycentridae	Micrasema	larvae	14.34	
Trichoptera	Glossosomatidae	Glossosomatinae Glossosomatini	larvae	114.70	
		Glossosoma			
Trichoptera	Hydropsychidae		larvae	738.35	
Trichoptera	Hydropsychidae	Hydropsychinae Cheumatopsyche	larvae	193.55	
Trichoptera	Hydropsychidae	Hydropsychinae Hydropsyche	larvae	1335.57	
Trichoptera	Hydroptilidae		larvae	21.51	
Trichoptera	Philopotamidae	Philopotaminae Wormaldia	larvae	15.68	
Trichoptera	Rhyacophilidae	Rhyacophila	larvae	7.17	
Trichoptera	Rhyacophilidae	Rhyacophila betteni group	larvae	8.51	
Class: Malacostraca		SubClass: Eumalacostraca			
Amphipoda			adult	7.17	

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Total: OTU Taxa : **41**      Genera : **22**      Families : **22**      4329.30

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Taxonomic list and densities of aquatic invertebrates identified and retained from a sample collected September 3, 2008 at station SYUBABRGPT-1, South Yuba River, Bridgeport, Nevada county, California. The sample was collected from riffle habitat using a surber net. The total area sampled was 0.744 square meters. The percentage of the sample that was identified and retained was 100% of the collected sample. A total of 622 individuals were removed, identified and retained. The sample identification number is 139945. OTU=operational taxonomic unit. Notes - identification to genus or species was not supported because: I - immature organisms, D- damaged organisms, M - poor slide mount, G - gender, U - indistinct characters or distribution, R - retained in our reference collection.

Order	Family	Subfamily/Genus/Species	Life Stage	Density	Notes
Phylum: Arthropoda					
Class: Arachnida		SubClass: Acari			
Trombidiformes Prostigmata	Lebertiidae	Lebertia	adult	4.03	
Trombidiformes Prostigmata	Sperchonidae	Sperchon	adult	9.41	
Trombidiformes Prostigmata	Torrenticolidae	Torrenticola	adult	12.10	
Class: Insecta		SubClass: Pterygota			
Coleoptera Polyphaga	Elmidae		larvae	9.41	I
Coleoptera Polyphaga	Elmidae	Microcylloepus pusillus	larvae	5.38	
Coleoptera Polyphaga	Elmidae	Optioservus	larvae	14.78	U
Coleoptera Polyphaga	Elmidae	Optioservus quadrimaculatus	adult	1.34	
Coleoptera Polyphaga	Elmidae	Ordobrevia nubifera	adult	2.69	
Coleoptera Polyphaga	Elmidae	Zaitzevia	larvae	28.23	U
Diptera			pupae	1.34	U
Diptera Nematocera	Blephariceridae		larvae	2.69	
Diptera Nematocera	Chironomidae	Chironominae	larvae	14.78	
Diptera Nematocera	Chironomidae	Orthoclaadiinae	larvae	71.24	
Diptera Nematocera	Chironomidae	Tanypodinae	larvae	26.88	
Diptera Brachycera	Empididae	Hemerodromiinae Hemerodromiini Hemerodromia	larvae	1.34	
Diptera Nematocera	Psychodidae	Maruina	larvae	2.69	
Diptera Nematocera	Simuliidae		larvae	72.58	I
Diptera Nematocera	Simuliidae	Simuliinae Simuliini Simulium	larvae	189.52	
Diptera Nematocera	Simuliidae	Simuliinae Simuliini Simulium bivittatum group	larvae	2.69	
Ephemeroptera Pisciforma	Baetidae		larvae	4.03	
Ephemeroptera Pisciforma	Baetidae	Baetis	larvae	64.52	
Ephemeroptera Pisciforma	Baetidae	Fallceon quilleri	larvae	26.88	
Ephemeroptera Furcatergalia	Ephemerellidae		larvae	5.38	D
Ephemeroptera Setisura	Heptageniidae		larvae	2.69	D
Ephemeroptera Setisura	Heptageniidae	Epeorus	larvae	4.03	
Ephemeroptera Furcatergalia	Leptohyphidae	Tricorythodes	larvae	16.13	
Hemiptera Heteroptera	Veliidae	Rhagoveliinae Rhagovelia	adult	1.34	
Lepidoptera	Pyralidae	Nymphulinae Argyractini Petrophila	larvae	2.69	
Odonata			larvae	6.72	I
Odonata Zygoptera	Coenagrionidae	Argia	larvae	29.57	

Plecoptera	Perlidae	Calineuria californica	larvae	4.03	
Systellognatha					
Plecoptera	Pteronarcyidae	Pteronarcyinae Pteronarcyini Pteronarcys	larvae	1.34	U
Systellognatha					
Trichoptera	Hydropsychidae		larvae	4.03	I
Trichoptera	Hydropsychidae	Hydropsychinae Hydropsyche	larvae	33.60	
Trichoptera	Hydroptilidae		larvae	81.99	I
Trichoptera	Philopotamidae	Philopotaminae Dolophilodes	larvae	17.47	
Trichoptera	Polycentropodidae	Polycentropodinae Polycentropus	larvae	2.69	
Trichoptera	Rhyacophilidae	Rhyacophila betteni group	larvae	1.34	
Phylum:	Mollusca				
Class:	Gastropoda				
			adult	1.34	I
Basommatophora	Lymnaeidae	Lymnaeinae Lymnaea	adult	24.19	
Basommatophora	Physidae	Physinae Physa	adult	18.82	

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Total: OTU Taxa : **41**      Genera : **27**      Families : **25**      836.02

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Taxonomic list and densities of aquatic invertebrates identified and retained from a sample collected September 7, 2008 at station SYUBALANGCR-1, South Yuba River, Lang's Crossing, Placer county, California. The sample was collected from riffle habitat using a surber net. The total area sampled was 0.744 square meters. The percentage of the sample that was identified and retained was 13% of the collected sample. A total of 634 individuals were removed, identified and retained. The sample identification number is 139946. OTU=operational taxonomic unit. Notes - identification to genus or species was not supported because: I - immature organisms, D- damaged organisms, M - poor slide mount, G - gender, U - indistinct characters or distribution, R - retained in our reference collection.

Order	Family	Subfamily/Genus/Species	Life Stage	Density	Notes
Phylum: Annelida					
Class: Clitellata		SubClass: Oligochaeta			
			adult		
Phylum: Arthropoda					
Class: Arachnida		SubClass: Acari			
Trombidiformes			adult	21.51	U
Trombidiformes			adult	75.27	
Prostigmata					
Class: Insecta		SubClass: Pterygota			
Coleoptera Polyphaga	Elmidae	Ampumixis dispar	larvae	10.75	
Coleoptera Polyphaga	Elmidae	Optioservus quadrimaculatus	adult	21.51	
Coleoptera Polyphaga	Elmidae	Zaitzevia	adult	21.51	
Diptera			pupae	21.51	U
Diptera	Ceratopogonidae	Ceratopogoninae Sphaeromiini Probezia	larvae	10.75	
Diptera Nematocera	Chironomidae		pupae	87.37	U
Diptera Nematocera	Chironomidae	Chironominae	larvae	720.43	
Diptera Nematocera	Chironomidae	Orthoclaadiinae	larvae	2393.82	
Diptera Nematocera	Chironomidae	Tanypodinae	larvae	580.65	
Diptera Brachycera	Empididae	Clinocera	larvae	21.51	
Diptera Brachycera	Empididae	Neoplasta	larvae	43.01	
Diptera	Muscidae		larvae	56.45	U
Diptera Nematocera	Psychodidae	Maruina	larvae	21.51	
Diptera Nematocera	Simuliidae		larvae	225.81	I
Diptera Nematocera	Simuliidae	Simuliinae Simuliini Simulium	larvae	384.41	
Diptera Nematocera	Simuliidae	Simuliinae Simuliini Simulium tuberosum group	pupae	10.75	
Diptera Nematocera	Tipulidae	Antocha monticola	larvae	153.23	
Diptera Nematocera	Tipulidae	Dicranota	larvae	10.75	
Diptera Nematocera	Tipulidae	Hexatoma	larvae		
Ephemeroptera	Baetidae	Baetis	larvae	473.12	
Pisciforma					
Ephemeroptera	Heptageniidae		larvae	32.26	D
Setisura					
Ephemeroptera	Leptophlebiidae		larvae	64.52	D
Furcatergalia					
Megaloptera	Sialidae	Sialis	larvae		
Plecoptera	Chloroperlidae	Sweltsa	larvae	32.26	
Systellognatha					
Plecoptera	Nemouridae	Malenka	larvae	217.74	
Euholognatha					
Plecoptera	Perlidae		larvae	10.75	D
Systellognatha					
Plecoptera	Perlidae	Calineuria californica	larvae	69.89	
Systellognatha					
Plecoptera	Perlodidae		larvae	86.02	D,I
Systellognatha					
Plecoptera	Perlodidae	Perlodinae Arcynopterygini Skwala americana	larvae	10.75	
Systellognatha					

Trichoptera	Brachycentridae	Micrasema	larvae	64.52	
Trichoptera	Hydropsychidae		larvae	96.77	I
Trichoptera	Hydropsychidae	Arctopsychinae Arctopsyche californica	larvae	12.10	
Trichoptera	Hydropsychidae	Hydropsychinae Hydropsyche	larvae	86.02	
Trichoptera	Hydroptilidae		larvae	182.80	U
Trichoptera	Hydroptilidae	Hydroptilinae Hydroptilini Hydroptila	larvae	172.04	
Trichoptera	Lepidostomatidae	Lepidostomatinae Lepidostoma	larvae	10.75	
Trichoptera	Rhyacophilidae	Rhyacophila	larvae	21.51	I
Trichoptera	Rhyacophilidae	Rhyacophila brunnea/vemna group	larvae	21.51	
Phylum: Mollusca					
Class: Gastropoda					
Neotaenioglossa	Pleuroceridae	Juga	adult	24.19	

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Total: OTU Taxa : **42**      Genera : **27**      Families : **23**      6581.99

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Taxonomic list and densities of aquatic invertebrates identified and retained from a sample collected September 6, 2008 at station MYUBAOURHS-1, Middle Yuba River, Our House, Sierra county, California. The sample was collected from riffle habitat using a surber net. The total area sampled was 0.744 square meters. The percentage of the sample that was identified and retained was 22% of the collected sample. A total of 617 individuals were removed, identified and retained. The sample identification number is 139947. OTU=operational taxonomic unit. Notes - identification to genus or species was not supported because: I - immature organisms, D- damaged organisms, M - poor slide mount, G - gender, U - indistinct characters or distribution, R - retained in our reference collection.

Order	Family	Subfamily/Genus/Species	Life Stage	Density	Notes
Phylum: Arthropoda					
Class: Arachnida		SubClass: Acari			
Trombidiformes	Torrenticolidae	Torrenticola	adult	36.87	
Prostigmata					
Class: Insecta		SubClass: Pterygota			
Coleoptera Polyphaga	Elmidae		larvae	92.17	I
Coleoptera Polyphaga	Elmidae	Optioservus	larvae	61.44	U
Coleoptera Polyphaga	Elmidae	Optioservus quadrimaculatus	adult	12.29	
Coleoptera Polyphaga	Elmidae	Ordobrevia nubifera	larvae	6.14	
Coleoptera Polyphaga	Elmidae	Zaitzevia	adult	39.94	U
Coleoptera Polyphaga	Psephenidae		larvae	72.68	
Coleoptera Polyphaga	Ptilodactylidae	Stenocolus scutellaris	larvae		
Diptera Nematocera	Chironomidae		pupae	43.01	U
Diptera Nematocera	Chironomidae	Chironominae	larvae	61.44	
Diptera Nematocera	Chironomidae	Orthocladiinae	larvae	374.81	
Diptera Nematocera	Simuliidae		larvae	18.43	I
Diptera Nematocera	Simuliidae	Simuliinae Simuliini Simulium	larvae	43.01	
Diptera Nematocera	Tipulidae	Antocha monticola	larvae	6.14	
Ephemeroptera	Baetidae	Baetis	larvae	535.91	
Pisciforma					
Ephemeroptera	Baetidae	Dipheter hageni	larvae	30.72	
Pisciforma					
Ephemeroptera	Heptageniidae		larvae	417.82	D
Setisura					
Ephemeroptera	Heptageniidae	Epeorus	larvae	337.94	
Setisura					
Odonata Zygoptera	Coenagrionidae		larvae	6.14	I
Odonata Anisoptera	Gomphidae		larvae	18.43	I
Plecoptera			larvae	36.87	I
Plecoptera	Chloroperlidae	Sweltsa	larvae	6.14	
Systellognatha					
Plecoptera	Perlidae	Calineuria californica	larvae	194.51	
Systellognatha					
Plecoptera	Perlidae	Hesperoperla pacifica	larvae	47.04	
Systellognatha					
Plecoptera	Perlodidae	Perlodinae Arcynopterygini Skwala	larvae	12.29	
Systellognatha		americana			
Trichoptera			larvae	6.14	I
Trichoptera	Hydropsychidae		larvae	98.31	I
Trichoptera	Hydropsychidae	Hydropsychinae Cheumatopsyche	larvae	340.63	
Trichoptera	Hydropsychidae	Hydropsychinae Hydropsyche	larvae	542.05	
Trichoptera	Hydroptilidae		larvae	24.58	U
Trichoptera	Philopotamidae	Chimarrinae Chimarra	larvae	30.72	
Trichoptera	Philopotamidae	Philopotaminae Wormaldia	larvae	49.16	
Trichoptera	Rhyacophilidae	Rhyacophila betteni group	larvae	12.29	

Phylum: Mollusca

Class: Gastropoda

Basommatophora

Physidae

Physinae Physa

adult

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Total: OTU Taxa : **34**

Genera : **21**

Families : **19**

3728.69

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