

Interagency Burned Area Emergency Stabilization and Rehabilitation Plan

**French Fire Contaminants Assessment:
Preliminary Report, September 2005**



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I. OBJECTIVES

1. *To determine the effects the French Fire had on:*
 - *release and transport of sediments and metals from mining wastes in the Upper Clear Creek watershed to downstream areas including Whiskeytown Lake, and .*
 - *the aquatic habitat, resident biota, and water quality in the Upper Clear Creek watershed.*
2. *Provide management recommendations for the remediation of point sources of contamination as well as the downstream areas of deposition.*

II. BACKGROUND

During 2002-2003, a cooperative study conducted by the USGS, University of Montana, and the National Park Service (PMIS #77003) found that trace elements and metals in water and sediments had bioaccumulated in fish, amphibians, and aquatic macroinvertebrates in tributaries leading to Whiskeytown Lake (Fig. 1). In some areas, metals in sediments were at concentrations toxic to aquatic life (Moore and Hughes, 2003). Concentrations of metals and trace elements in the fine-grained sediment in the Clear Creek basin demonstrated that tributaries flowing into Whiskeytown Lake were highly elevated in several metals, especially arsenic, cadmium, copper, mercury, and zinc (Moore and Hughes, 2003). Specifically, these results indicate that streams within the burned area (French Gulch, Scorpion Gulch, and Cline Gulch) have elevated levels of arsenic and mercury in fine sediments. Such contaminated sediments can stress ecosystems by direct toxic effects and long-term disruption of productivity/reproduction. Several taxa of invertebrates and fish collected from these sites contained elevated concentrations of arsenic, nickel, lead, and/or mercury.

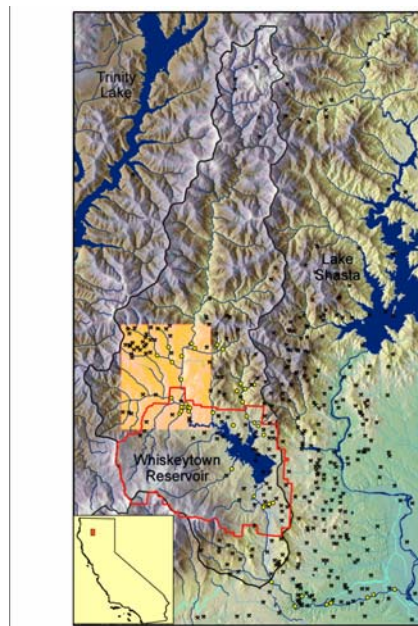


Fig. 1. Location map, showing known production and prospect mines in the area. The red line indicates Whiskeytown National Recreation Area boundary. Circles indicate previous metals reconnaissance sampling sites. Highlighted area upstream of Whiskey Reservoir is the area of focus for the study.

Areas with some of the highest concentrations of metals and trace elements also had the highest concentrations of mines and mill sites within the Upper Clear Creek watershed. Coincidentally, these were some of the areas with the highest burn severity in the French Fire area (Fig. 2). Among these highly contaminated streams, those of most concern are Scorpion Gulch, French Gulch, and Cline Gulch, which are all within the burned area. Scorpion Gulch and French Gulch are located in an extremely steep drainage (slopes in excess of 35%) where the burn severity was high. Based on the predictions from the BAER Team, a significant post-fire effect will be an increase in sediment loads from the watershed into the streams. The primary mode of metals transport and contamination is from metal-contaminated sediment. It is well established that fire can mobilize metals in the watershed by releasing more of this sediment and/or by making metals more soluble during precipitation events.

The French Fire, which started on August 14, 2004, within the Clear Creek Canyon and adjacent to the community of French Gulch, burned rapidly north and west from the origin, which was about one mile north of Highway 299, within Whiskeytown National Recreation Area. The final fire perimeter was in excess of 22 miles, with 13,323 acres burned. Many of the drainages along Trinity Mountain Road were subjected to moderate-to-high fire severity and, in some cases, the riparian vegetation was completely destroyed (Fig. 3).

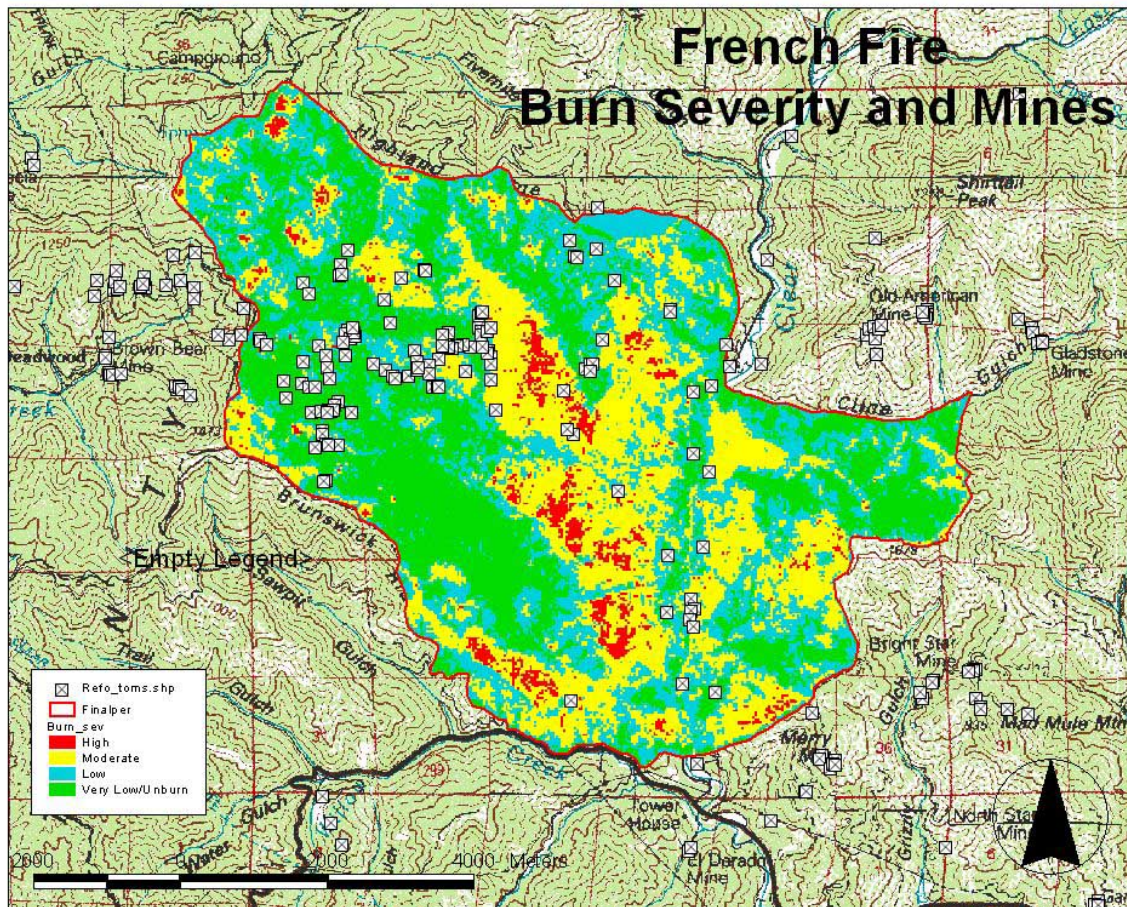


Fig. 2. Burn severity of the French Fire in relation to mine and mill site locations, Upper Clear Creek Watershed.



Spring (May 2002)



Spring (May 2003)



Fall (September 2004)



Fall (September 2004)

Fig. 3. Photographs of the same sampling reaches of French Gulch, before and after the French Fire.

There was concern that the effects of the French Fire could accelerate metals contamination of Whiskeytown Lake, which could then pose a serious long-term threat to the aquatic ecosystem, including fish-eating birds and mammals, and to human health (through fish consumption).

The interagency BAER Team conducted an extensive review of the resource conditions after the fire and determined that the severity of the burn was moderate or high in 65% of the watershed (Fig. 2). Areas of high burn severity included the steep slopes on the west side of Upper Clear Creek and the French Gulch Creek drainage, areas that were also at highest risk for debris flows and erosion (Fig. 4-5). Post-fire erosion potential in areas of high soil burn severity ranged between 2 and 50 tons per acre. Based on the average annual precipitation in the Clear Creek watershed of from 45 to 85 inches per year, the BAER Team predicted a watershed response that would impair water quality within the Upper Clear Creek drainage by potentially transporting metal contaminants into Whiskeytown Lake.

Park staff requested the expertise of the USGS and University of Montana to continue sampling these sites to determine the effects of the French Fire on resident stream communities and the upper reaches of Whiskeytown Lake. This information is critical for determining the downstream impact to park lands, which may have long-term and significant negative ramifications.



Fig.4. Hillside near French gulch sampling site about two months after the French Fire, October 2004.



Fig. 5. A view of the French Fire area in Upper Clear Creek, California.

III. METHODS

The USGS, in cooperation with the National Park Service and the University of Montana, is conducting a study to determine the abiotic and biotic effects of the French Fire on resident stream communities and the upper reaches of Whiskeytown Lake.

To evaluate stream contamination shortly after the fire but before the first major rains, water and sediment samples were collected at eight study sites and one reference site in October of 2004 (Fig. 6). In addition, invertebrates were collected for chemical analyses at four of the sites likely to be impacted by the fire. The allocation of funds for the current project did not occur until after the first heavy rains, so the opportunity to collect samples during the first flush was missed.

In addition to the October 2004 collections, collections were scheduled for June and September 2005 to evaluate post-fire effects on the Upper Clear Creek Watershed. The first set of collections was completed at eight study sites in and downstream from the fire area and from one regional reference site (Brandy Creek near south shore drive) in June 2005 (Fig. 6). Samples were processed and submitted to the appropriate laboratories for chemical analyses or community assessment. Data on habitat conditions were collected and tabulated. A second set of collections is in progress during the month of September to assist in the evaluation of seasonal changes in habitat, community composition, metals concentrations in water and sediments, and bioaccumulation in fish and invertebrates.

Specifically, this study includes:

1. *Water collection for quality and metals concentrations:* Water samples were collected by a mid-stream grab method. Water samples were analyzed for nutrients, major ions, and selected trace metals. Samples analyzed for nutrients were analyzed at the U. S. Geological Survey's National Water Quality Lab in Denver, CO. Samples that were processed for major ions and trace metals were analyzed at the Murdock Environmental Geochemistry Laboratory at the University of Montana.
2. *Collection of sediments for chemical analyses for metals and trace elements:* Sediment samples for metals analysis were collected using methods described by Moore and Hughes (2003). Briefly, samples of fine grain sediments were collected in triplicate using a plastic spoon and were sieved with a 63-mm mesh nylon-sieve cloth directly into the sample jar. A composite sample consisted of sediment from 5-10 locations within the study reach (usually 150 meters or more). Samples were placed on ice and held frozen until they were analyzed for metals at the Murdock Environmental Geochemistry Laboratory at the University of Montana.

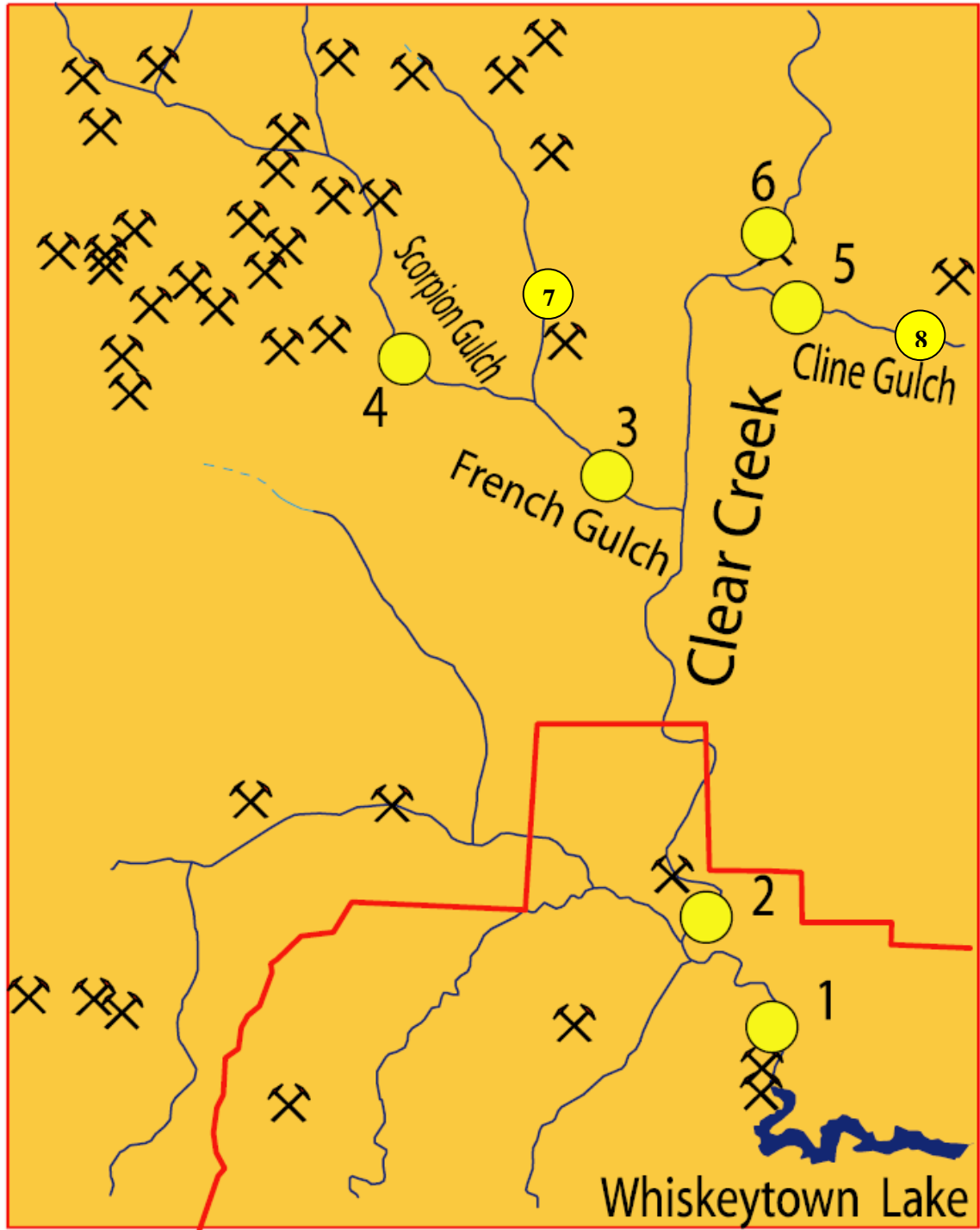


Fig. 6. Sites sampled as part of the French Fire Contaminants Study, 2005: 1=Clear Creek upstream of Carr Powerhouse(CCAR), 2=Clear Creek at Highway 299(H299), 3=French Gulch (FRGL), 4=Scorpion Gulch (SCRP), 5= Cline Gulch near Clear Creek (CLN1), 6=Clear Creek upstream Cline Gulch (CCCG), 7=Right Gulch(RTGL), 8= Cline Gulch upstream of American Mine Gulch (CLN2), and 9 (not pictured) Brandy Creek near South Shore Drive (BRAN), the reference site.

3. *Collection of aquatic biota to determine composition and distribution of aquatic assemblages (benthic algae, benthic macroinvertebrates, and fish):* Bioassessments integrate the effects of water and habitat quality over time. Biological communities reflect chronic or episodic effects of environmental quality that might not be captured by traditional water quality monitoring at fixed sites at regular time intervals. The temporal scale of this integration varies with the length of the life cycles of the assessed organisms, with fish communities considered to integrate conditions at the scale of a year or more, benthic macroinvertebrate communities from months to a year, and algae at the scale of several weeks. Since organisms from different trophic levels respond to contamination in different ways, an analysis of multiple trophic levels provides a more complete analysis of both short-term and long-term effects.
4. *Assessment of physical aquatic habitat:* Instream habitat measurements were taken at each site (Fig. 7) according to the National Water-Quality Assessment Program (NAWQA) stream habitat protocol (Fitzpatrick *et al.* 1998). Stream sampling reach length was determined as 20 times the wetted-channel width. Habitat variables were measured at eleven transects per sample site, placed at equally spaced intervals within a reach. Stream width (wetted channel) was measured directly from a transect tape, and open canopy was measured from midstream with a clinometer. A densiometer was used to calculate canopy cover. Percentage area of habitat features such as woody debris, and overhanging vegetation were visually estimated within a section of the transect 2-m upstream and downstream of the transect tape. Depth, velocity, and substrate were measured at a minimum of three points on each transect. Depth was measured with a wading rod and velocity with an electronic meter (Marsh-McBirney). The dominant substrate was classified at each transect point. Habitat variables were analyzed as the geometric mean of the 11 transects values or the geometric mean of the 33 or more point values.



Fig. 7. Sampling French Gulch, June 2005.

In addition, a more detailed characterization of sediment size classes included a pebble count; in which a minimum of 20 sediment measurements were collected per transect or 220 or more measurements for the entire sampling reach. The pebble count data will assess the potential increase or decrease of fine sediment associated with runoff events.

5. *Collection of biological resources (fish, invertebrates, and biofilm) for submission to the laboratory for determination of metal and trace element concentrations:* Samples of invertebrates were collected in October 2004 from four sites. In June 2005, samples of biofilm were collected by scrubbing rocks (Fig. 8), invertebrates were collected with nets, and fish were collected using a backpack electroshocker (Fig. 9-10). Fish were also collected using a boat-mounted electroshocker from Whiskeytown Lake, the ultimate recipient of sediments, metals, and trace elements. Samples were submitted to the Trace Element Research Laboratory (TERL) at Texas A&M University in College Station, Texas, under the direction of Dr. Robert Taylor.



Fig. 8. Collecting biofilm after the fire, June 2005.



Fig. 9. Collecting fish from Clear Creek using a backpack shocker.



Fig. 10. Measuring a fish collected as a part of the Whiskeytown French Fire Contaminants Study, June 2005.

IV. PRELIMINARY RESULTS

The post-fire sampling was completed in October 2004, and the spring sampling session was completed in June 2005, following the general plan shown in Table 1. The fall sampling session is underway in September 2005 following the plan used in spring 2005.

1. The results of the analyses of water (Table 2) collected in 2004 and spring 2005 have been received and tabulated, but a comprehensive evaluation of the water data will not be completed until the results of the fall 2005 sampling are received.
2. Results for the analyses of sediments collected in 2004 and June 2005 (Table 3) have been received, and bar graphs showing preliminary data have been created, including the appropriate ERL and ERM levels (See Fig. 11-14). Arsenic was high everywhere all years except at the Clear Creek mainstem sites and at the Brandy Creek reference site. Cadmium, chromium, and lead were all below the ERM at all sites all years. Copper was above the ERM only at Carr Powerhouse site on Clear Creek in 2004. The other high site for copper was on Clear Creek at Highway 299 in 2005. That concentration seemed unusually high, and the laboratory is rechecking the data. Mercury was above the ERM for French Gulch, Scorpion Gulch, and the two sites on Cline Gulch one or more years. Selenium was only analyzed in 2003 when it was above the "Apparent Effects threshold at all sites except Brandy and Right Gulch. Zinc was right at the ERM for Carr and Scorpion in 2003 and 2004, but it was in between ERL and ERM at the other affected sites, and was below the ERL at Brandy all years.
3. Fish and invertebrate community samples were collected in June 2005, and data are tabulated but not yet analyzed. Community samples were submitted to the contractor for evaluation.
4. In-stream habitat measurements were taken as described in the methods at each site in June 2005. These data were tabulated and will be assessed and compared with the data collected in September 2005
5. Samples of invertebrates (Table 4) collected shortly after the French fire in October 2004 were archived and submitted to TERL for chemical analyses after receipt of funding for the current study.

Fish collected from Whiskeytown Lake in early June 2005 (See Table 5) were submitted to TERL for chemical analyses. Fish fillets will be analyzed for total mercury, while the remainders of the fish carcasses will be analyzed for metals and trace elements. The analyses have not yet been completed.

Aquatic invertebrates (Table 6) and stream fishes (Table 7) were collected in June 2005 and were processed and submitted to TERL for metals and trace elements analyses. These analyses have not yet been completed.

Three replicates of biofilm were collected in June 2005 from each of the nine study sites and have been submitted to TERL for chemical analyses (Table 8). These analyses have not yet been completed.

V. PRELIMINARY CONCLUSIONS

There seems to be no general trend regarding most metals concentrations in the sediments over the three sampling periods. Mercury appeared to have increased in sediments in 2004, right after the fire, followed by a decline in June 2005, about 10 months after the fire. Arsenic, however, seemed to display an opposite trend, decreasing in concentrations at eight sites from values found in 2003 to those in 2004. However, the concentrations then increased at seven of the affected sites in 2005. The second session of sampling is underway, following the schedule shown in Table 1. Once the sampling is completed, samples will be processed and submitted to the appropriate laboratories for analyses. Further evaluation of the data will be completed after the results of the fall sampling are received, and a final report will be prepared.

An extension of this study for an additional year would provide critical information on post-BAER activities that would better document the short-term effects of the French Fire on contamination of the watershed as well as the effects of the efforts to control erosion and prevent contamination of the streams of the Upper Clear Creek Watershed and Whiskeytown Lake.

V. REFERENCES

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Long, E.R., and L.G. Morgan. 1990. The potential for biological effects of sediment-sorbed contaminants tested in the National Status and Trends Program. NOAA Technical Memorandum NOS OMA 52. National Oceanic and Atmospheric Administration. Seattle, WA.

Moore, J.N., and D. Hughes. 2003. Trace Metals in Sediments of a Mine Impacted River Basin: Clear Creek, California Project. Final Report. Department of Geology, University of Montana, Missoula, MT, December 30, 2003, 136 pp.

Table 1. Sampling schedule per sampling period (Spring and Fall 2005) for Whiskeytown French Fire Metals Contamination Project.

Site/Analyses	BRAN	CCAR	H299	CCCG	CLN1	CLN2	FRGL	RTGL	SCRP	count
Sediment-metals	3	3	3	3	3	3	3	3	3	27
Water-nutrients	1	1	1	1	1	1	1	1	1	9
Water-major ions	1	1	1	1	1	1	1	1	1	9
Water-metals	1	1	1	1	1	1	1	1	1	9
Biofilm-metals	3	3	3	3	3	3	3	3	3	27
Invertebrates-metals	3	3	3	3	3	3	3	3	3	27
Fish-metals	3	3	3	3	3	3	3	3	3	27
Periphyton-community	1	1	1	1	1	1	1	1	1	9
Invertebrates-riffle	1	1	1	1	1	1	1	1	1	9
Invertebrates-EMAP multihabitat	1	1	1	1	1	1	1	1	1	9
Fish-community-1 pass	--	1	1	1	--	1	--	1	1	6
Fish-community-3 pass	1	--	--	--	1	--	1	--	--	3
Stream habitat	x	x	x	x	x	x	x	x	x	9
General water parameters	x	x	x	x	x	x	x	x	x	9
Reach length (m)	150	400	400	400	150	150	150	150	100	

BRAN Brandy Creek near South Shore Drive
 CCAR Clear Creek upstream Carr Power House
 H299 Clear Creek near HWY 299
 CCCG Clear Creek upstream of Cline Gulch
 CLN1 Cline Gulch near confluence with Clear Creek
 CLN2 Cline Gulch upstream of American Gulch
 FRGL French Gulch near Queens Draw
 RTGL Right Fork French Gulch upstream of confluence
 SCRП Scorpion Gulch near confluence

Table 2. Water data for Whiskeytown French Fire Metals Contamination Project, 2003-2005.

Site	PQL ¹	UMT-2003	USGS-2004	UMT-2005	UMT-2003	USGS-2004	UMT-2005	UMT-2003	USGS-2004	UMT-2005	UMT-2003	USGS-2004	UMT-2005	UMT-2003	USGS-2004	UMT-2005
		As	As	As	Cd	Cd	Cd	Cr	Cr	Cr	Cu	Cu	Cu	Hg	Hg	Hg
BRAN		<0.005	0.063	<0.1	<0.001	<0.02	<0.1	<0.005	<0.4	<5	<0.003	0.523	<0.1	4.8	NC	NC
CCAR		<0.005	NC	1.69	<0.001	NC	<0.1	<0.005	NC	<5	0.005	NC	1.13	4.6	NC	NC
CCCG		<0.005	0.679	0.347	<0.001	<0.02	<0.1	<0.005	<0.4	<5	<0.003	0.483	<0.1	3.0	NC	NC
CLN1		0.008	7.845	8.50	<0.001	<0.02	<0.1	<0.005	<0.4	<5	<0.003	0.552	<0.1	<2.5	NC	NC
CLN2		0.008	NC	9.72	<0.001	NC	<0.1	<0.005	NC	<5	<0.003	NC	0.712	3.0	NC	NC
FRGL		0.010	21.992	11.5	<0.001	<0.02	<0.1	<0.005	<0.4	<5	<0.003	0.636	0.202	7.4	NC	NC
FRGL-replicate		NC	22.18	11.5	NC	<0.02	<0.1	NC	<0.4	<5	NC	0.681	0.160	NC	NC	NC
H299		<0.005	3.348	1.83	<0.001	<0.02	<0.1	<0.005	<0.4	<5	<0.003	0.717	0.265	6.8	NC	NC
RTGL		<0.005	NC	6.34	<0.001	NC	<0.1	<0.005	NC	<5	<0.003	NC	0.194	4.8	NC	NC
SCRIP		0.022	NC	22.6	<0.001	NC	<0.1	<0.005	NC	<5	<0.003	NC	0.527	9.2	NC	NC

Site	PQL ¹	UMT-2003	USGS-2004	UMT-2005	UMT-2003	USGS-2004	UMT-2005	UMT-2003	USGS-2004	UMT-2005	UMT-2003	USGS-2004	UMT-2005
		Ni	Ni	Ni	Pb	Pb	Pb	Se	Se	Se	Zn	Zn	Zn
BRAN		<0.002	0.115	<1	<0.01	<0.04	<0.1	<0.003	0.015	<0.01	<0.001	0.842	<0.1
CCAR		<0.002	NC	0.520	<0.01	<0.04	<0.1	<0.003	NC	0.215	0.006	NC	3.50
CCCG		<0.002	0.326	0.584	<0.01	<0.04	<0.1	<0.003	0.277	0.195	0.002	1.31	1.70
CLN1		<0.002	0.272	0.527	<0.01	<0.04	<0.1	<0.003	0.335	0.178	<0.001	0.787	0.943
CLN2		<0.002	NC	0.722	<0.01	<0.04	<0.1	<0.003	NC	0.170	<0.001	NC	2.38
FRGL		<0.002	0.45	0.685	<0.01	<0.04	<0.1	<0.003	0.486	0.646	0.003	1.02	2.55
FRGL-replicate		NC	0.588	0.697	NC	<0.04	<0.1	NC	0.697	0.651	NC	2.017	2.46
H299		<0.002	0.359	0.597	<0.01	<0.04	<0.1	<0.003	0.183	0.226	0.006	0.679	2.41
RTGL		<0.002	NC	0.358	<0.01	<0.04	<0.1	<0.003	NC	0.257	<0.001	NC	1.13
SCRIP		<0.002	NC	1.20	<0.01	<0.04	<0.1	<0.003	NC	0.975	0.006	NC	4.30

¹ PQL = Practical Quantification Limit.

Table 3. Sediment data for Whiskeytown French Fire Metals Contamination Project, 2003-2005.

Site	2003	2004	2005	2003	2004	2005	2003	2004	2005	2003	2004	2005
	AS	AS	AS	CD	CD	CD	CR	CR	CR	CU	CU	CU
PQL ¹	0.025	2.500	2.500	0.004	0.004	0.004	0.01	1.00	1.00	0.01	1.00	1.00
BRAN	<0.025	< 2.5	3.15	<0.004	<0.004	<0.004	102.56	47.7	70.34	32.92	16.9	26.40
H299	43.663	14.7	40.28	<0.004	3.8	0.60	64.01	36.8	40.39	58.14	46.3	193.31
CCAR	35.800	29.3	45.22	<0.004	2.3	1.85	57.78	36.1	45.60	187.82	275	52.44
CCCG	14.780	8.4	12.32	<0.004	1.7	1.38	77.62	46.3	54.33	59.96	43.8	47.07
CLN1	101.600	58.0	142.25	<0.004	0.5	0.94	36.08	29.3	31.49	47.70	43.6	50.94
CLN2	126.570	96.7	105.08	<0.004	1.9	0.68	40.74	28.4	31.46	59.99	55.0	44.09
FRGL	323.600	141.8	197.67	<0.004	3.0	1.08	44.36	28.9	32.02	57.78	54.7	46.64
RTGL	170.060	130	108.45	<0.004	0.7	0.40	57.18	40.4	30.69	49.72	49.1	40.47
SCRIP	714.800	262	429.54	1.76	4.9	0.62	30.14	25.1	32.50	67.90	60.6	43.32

Site	2003	2004	2005	2003	2004	2005	2003	2004	2005	2003	2004	2005	2003	2004	2005
	HG	HG	HG	NI	NI	NI	PB	PB	PB	SE	SE	SE	ZN	ZN	ZN
PQL ¹	0.01			NA	NA	1.00	0.09		8.00	0.00	NA	8.00	0.00		0.40
BRAN	0.01	0.03	0.03	NA	NA	25.82	29.18	15.5	17.38	0.34	NA	< 8.0	77.06	38.7	56.32
H299	0.19	0.21	0.24	NA	NA	43.08	39.33	24.8	27.47	1.39	NA	< 8.0	290.88	283	242.79
CCAR	0.11	0.20	0.33	NA	NA	64.12	35.92	27.0	33.50	1.37	NA	< 8.0	295.60	407	279.33
CCCG	0.07	0.12	0.12	NA	NA	61.01	37.72	23.7	24.97	1.10	NA	< 8.0	307.60	197	251.63
CLN1	0.03	0.45	1.05	NA	NA	61.14	40.70	26.5	52.91	1.12	NA	< 8.0	207.00	169	217.00
CLN2	1.13	1.02	0.75	NA	NA	56.89	57.59	41.5	33.15	1.62	NA	< 8.0	255.60	220	196.29
FRGL	0.65	1.3	0.67	NA	NA	49.98	73.14	52.5	50.57	1.30	NA	< 8.0	281.80	270.8	227.74
RTGL	0.31	0.62	0.35	NA	NA	35.13	60.08	50.3	43.79	0.75	NA	< 8.0	188.00	172	134.99
SCRIP	0.52	1.39	0.56	NA	NA	46.44	84.40	81.0	55.58	1.26	NA	< 8.0	375.00	422	197.57

¹ PQL = Practical Quantification Limit.

Table 4. Aquatic invertebrates collected for chemical analysis from the French Fire area, October 2004.

Site		LAT / LONG	Season	Year	Unique Sample Code	Date collected	Order	Family	#	Total Wt (g)	Ave Wt(g)	Analyses requested
CCAR	Clear Creek US Carr Power House	40 39 37/122 37 41	Fall	2004	WH04-CCAR-102004-001	10/20/2004	Plecoptera	Perlidae	15	1.94	0.129	Metals Scan
CCAR	Clear Creek US Carr Power House	40 39 37/122 37 41	Fall	2004	WH04-CCAR-102004-004	10/20/2004	Odonata	Gomphidae	7	2.91	0.416	Metals Scan
CCAR	Clear Creek US Carr Power House	40 39 37/122 37 41	Fall	2004	WH04-CCAR-102004-005	10/20/2004	Odonata	Gomphidae	7	2.53	0.361	Metals Scan
FRGL	French Gulch	40 42 11/122 38 55	Fall	2004	WH04-FRGL-102004-001	10/20/2004	Odonata	Gomphidae	10	2.69	0.269	Metals Scan
FRGL	French Gulch	40 42 11/122 38 55	Fall	2004	WH04-FRGL-102004-002	10/20/2004	Odonata	Gomphidae	10	1.91	0.191	Metals Scan
FRGL	French Gulch	40 42 11/122 38 55	Fall	2004	WH04-FRGL-102004-003	10/20/2004	Odonata	Gomphidae	20	1.40	0.070	Metals Scan
FRGL	French Gulch	40 42 11/122 38 55	Fall	2004	WH04-FRGL-102004-004	10/20/2004	Hemiptera	Gerridae	25	1.26	0.050	Metals Scan
FRGL	French Gulch	40 42 11/122 38 55	Fall	2004	WH04-FRGL-102004-005	10/20/2004	Plecoptera	Perlidae	5	1.10	0.220	Metals Scan
FRGL	French Gulch	40 42 11/122 38 55	Fall	2004	WH04-FRGL-102004-006	10/20/2004	Plecoptera	Perlidae	10	1.04	0.104	Metals Scan
H299	Clear Creek at HWY 299	40 39 59/122 37 53	Fall	2004	WH04-H299-102004-001	10/20/2004	Odonata	Gomphidae	5	1.59	0.318	Metals Scan
H299	Clear Creek at HWY 299	40 39 59/122 37 53	Fall	2004	WH04-H299-102004-003	10/20/2004	Odonata	Gomphidae	6	2.47	0.412	Metals Scan
H299	Clear Creek at HWY 299	40 39 59/122 37 53	Fall	2004	WH04-H299-102004-004	10/20/2004	Plecoptera	Perlidae	15	2.38	0.159	Metals Scan
H299	Clear Creek at HWY 299	40 39 59/122 37 53	Fall	2004	WH04-H299-102004-005	10/20/2004	Plecoptera	Perlidae	15	1.68	0.112	Metals Scan
SCRP	Scorpion Gulch	40 42 50/122 40 19	Fall	2004	WH04-SCRP-102004-004	10/20/2004	Plecoptera	Perlidae	10	2.16	0.216	Metals Scan
SCRP	Scorpion Gulch	40 42 50/122 40 19	Fall	2004	WH04-SCRP-102004-005	10/20/2004	Odonata	Gomphidae	6	1.42	0.237	Metals Scan
SCRP	Scorpion Gulch	40 42 50/122 40 19	Fall	2004	WH04-SCRP-102004-006	10/20/2004	Odonata	Gomphidae	11	1.24	0.113	Metals Scan
SCRP	Scorpion Gulch	40 42 50/122 40 19	Fall	2004	WH04-SCRP-102004-007	10/20/2004	Hemiptera	Gerridae	20	1.04	0.052	Metals Scan

Table 5. Fish collected for metals and trace elements analyses from Whiskeytown Lake, June 2005.

Sample code	Tissue	Analysis Requested	Location	Date	Species code	Genus: species	Total Length (mm)	Total Carcass Wgt (g)	Sex	Fillet Wt (g)	Sample Carcass wt (g)
WHIS-LKBB-060705-001F	Fillet	TOTAL HG	Brandy/Boulder Creek Area	6/7/2005	LMB	<i>Micropterus salmoides</i>	360	767.0	M	63.73	644.14
WHIS-LKBB-060705-002F	Fillet	TOTAL HG	Brandy/Boulder Creek Area	6/7/2005	LMB	<i>Micropterus salmoides</i>	382	817.5	M	76.74	684.03
WHIS-LKBB-060705-003F	Fillet	TOTAL HG	Brandy/Boulder Creek Area	6/7/2005	LMB	<i>Micropterus salmoides</i>	403	1027.0	M	114.50	878.62
WHIS-LKBB-060705-005F	Fillet	TOTAL HG	Brandy/Boulder Creek Area	6/7/2005	SPB	<i>Micropterus punctulatus</i>	385	809.0	F	76.07	708.61
WHIS-LKBB-060705-006F	Fillet	TOTAL HG	Brandy/Boulder Creek Area	6/7/2005	LMB	<i>Micropterus salmoides</i>	345	548.5	F	47.04	474.27
WHIS-LKBB-060705-007F	Fillet	TOTAL HG	Brandy/Boulder Creek Area	6/7/2005	LMB	<i>Micropterus salmoides</i>	325	490.4	F	62.25	405.44
WHIS-LKBB-060705-008F	Fillet	TOTAL HG	Brandy/Boulder Creek Area	6/7/2005	LMB	<i>Micropterus salmoides</i>	330	515.8	M	53.46	432.09
WHIS-LKBB-060705-009F	Fillet	TOTAL HG	Brandy/Boulder Creek Area	6/7/2005	LMB	<i>Micropterus salmoides</i>	315	380.4	F	43.73	279.56
WHIS-LKBB-060705-011F	Fillet	TOTAL HG	Brandy/Boulder Creek Area	6/7/2005	LMB	<i>Micropterus salmoides</i>	318	440.0	M	34.79	390.16
WHIS-LKBB-060705-012F	Fillet	TOTAL HG	Brandy/Boulder Creek Area	6/7/2005	SPB	<i>Micropterus punctulatus</i>	327	385.0	F	28.45	334.10
WHIS-LKBB-060705-013F	Fillet	TOTAL HG	Brandy/Boulder Creek Area	6/7/2005	SPB	<i>Micropterus punctulatus</i>	293	292.9	F	15.73	261.16
WHIS-LKBB-060705-014F	Fillet	TOTAL HG	Brandy/Boulder Creek Area	6/7/2005	SPB	<i>Micropterus punctulatus</i>	311	375.3	F	28.05	337.65
WHIS-LKBB-060705-017F	Fillet	TOTAL HG	Brandy/Boulder Creek Area	6/7/2005	SPB	<i>Micropterus punctulatus</i>	249	183.0	F	23.66	152.15
WHIS-LKBB-060705-018F	Fillet	TOTAL HG	Brandy/Boulder Creek Area	6/7/2005	SPB	<i>Micropterus punctulatus</i>	238	176.0	M	18.58	148.44
WHIS-LKBB-060705-019F	Fillet	TOTAL HG	Brandy/Boulder Creek Area	6/7/2005	SPB	<i>Micropterus punctulatus</i>	235	130.0	F	12.72	98.26
WHIS-LKBB-060705-020F	Fillet	TOTAL HG	Brandy/Boulder Creek Area	6/7/2005	SPB	<i>Micropterus punctulatus</i>	212	107.0	F	12.96	82.60
WHIS-LKBB-060705-022F	Fillet	TOTAL HG	Brandy/Boulder Creek Area	6/7/2005	LMB	<i>Micropterus salmoides</i>	210	125.0	F	7.76	109.78
WHIS-LKBB-060705-023F	Fillet	TOTAL HG	Brandy/Boulder Creek Area	6/7/2005	LMB	<i>Micropterus salmoides</i>	180	86.0	F	10.84	62.04
WHIS-LKBB-060705-025F	Fillet	TOTAL HG	Brandy/Boulder Creek Area	6/7/2005	LMB	<i>Micropterus salmoides</i>	176	58.0	M	4.76	48.21
WHIS-LKBB-060705-026F	Fillet	TOTAL HG	Brandy/Boulder Creek Area	6/7/2005	SPB	<i>Micropterus punctulatus</i>	173	54.0	F	6.07	44.81
WHIS-LKBB-060705-027F	Fillet	TOTAL HG	Brandy/Boulder Creek Area	6/7/2005	SPB	<i>Micropterus punctulatus</i>	145	33.0	M	3.27	26.86
WHIS-LKCC-060805-001F	Fillet	TOTAL HG	Clear Creek Arm	6/8/2005	LMB	<i>Micropterus salmoides</i>	443	1166.0	F	93.28	1056.10

Table 5. Fish collected for metals and trace elements analyses from Whiskeytown Lake, June 2005 (continued).

Sample code	Tissue	Analysis Requested	Location in Whiskeytown Lake	Collection Date	Species code	Genus: species	Total Length (mm)	Total Carcass Wgt (g)	Sex	Fillet Wt (g)	Sample Carcass wt (g)
WHIS-LKCC-060805-002F	Fillet	TOTAL HG	Clear Creek Arm	6/8/2005	LMB	<i>Micropterus salmoides</i>	385	769.0	F	73.30	660.05
WHIS-LKCC-060805-003F	Fillet	TOTAL HG	Clear Creek Arm	6/8/2005	LMB	<i>Micropterus salmoides</i>	370	819.0	F	77.53	699.50
WHIS-LKCC-060805-004F	Fillet	TOTAL HG	Clear Creek Arm	6/8/2005	LMB	<i>Micropterus salmoides</i>	370	772.0	F	68.41	653.16
WHIS-LKCC-060805-005F	Fillet	TOTAL HG	Clear Creek Arm	6/8/2005	LMB	<i>Micropterus salmoides</i>	335	591.0	F	53.85	500.63
WHIS-LKCC-060805-006F	Fillet	TOTAL HG	Clear Creek Arm	6/8/2005	LMB	<i>Micropterus salmoides</i>	345	547.0	M	30.49	487.82
WHIS-LKCC-060805-008F	Fillet	TOTAL HG	Clear Creek Arm	6/8/2005	LMB	<i>Micropterus salmoides</i>	283	325.0	M	22.60	273.48
WHIS-LKCC-060805-010F	Fillet	TOTAL HG	Clear Creek Arm	6/8/2005	SPB	<i>Micropterus punctulatus</i>	288	272.0	M	14.08	247.25
WHIS-LKCC-060805-011F	Fillet	TOTAL HG	Clear Creek Arm	6/8/2005	LMB	<i>Micropterus salmoides</i>	273	311.0	M	19.56	267.06
WHIS-LKCC-060805-012F	Fillet	TOTAL HG	Clear Creek Arm	6/8/2005	LMB	<i>Micropterus salmoides</i>	223	151.0	M	15.04	125.81
WHIS-LKCC-060805-013F	Fillet	TOTAL HG	Clear Creek Arm	6/8/2005	LMB	<i>Micropterus salmoides</i>	248	197.0	M	15.17	174.92
WHIS-LKCC-060805-014F	Fillet	TOTAL HG	Clear Creek Arm	6/8/2005	LMB	<i>Micropterus salmoides</i>	260	234.0	M	11.82	213.32
WHIS-LKCC-060805-015F	Fillet	TOTAL HG	Clear Creek Arm	6/8/2005	LMB	<i>Micropterus salmoides</i>	200	116.0	M	11.69	96.12
WHIS-LKCC-060805-016F	Fillet	TOTAL HG	Clear Creek Arm	6/8/2005	LMB	<i>Micropterus salmoides</i>	195	89.0	U	9.98	68.72
WHIS-LKCC-060805-017F	Fillet	TOTAL HG	Clear Creek Arm	6/8/2005	SPB	<i>Micropterus punctulatus</i>	174	53.0	U	6.77	41.92
WHIS-LKCC-060905-021F	Fillet	TOTAL HG	Clear Creek Arm	6/9/2005	LMB	<i>Micropterus salmoides</i>	350	602.0	M	48.49	521.63
WHIS-LKCC-060905-022F	Fillet	TOTAL HG	Clear Creek Arm	6/9/2005	LMB	<i>Micropterus salmoides</i>	300	404.0	M	40.40	329.50
WHIS-LKCC-060905-023F	Fillet	TOTAL HG	Clear Creek Arm	6/9/2005	LMB	<i>Micropterus salmoides</i>	275	349.0	F	31.86	292.72
WHIS-LKCC-060905-025F	Fillet	TOTAL HG	Clear Creek Arm	6/9/2005	LMB	<i>Micropterus salmoides</i>	202	115.0	F	14.25	84.27
WHIS-LKCC-060905-026F	Fillet	TOTAL HG	Clear Creek Arm	6/9/2005	SPB	<i>Micropterus punctulatus</i>	275	278.0	M	29.57	230.33
WHIS-LKCC-060905-027F	Fillet	TOTAL HG	Clear Creek Arm	6/9/2005	SPB	<i>Micropterus punctulatus</i>	290	302.0	M	30.61	250.76
WHIS-LKWC-060905-001F	Fillet	TOTAL HG	Whiskey Creek Arm	6/9/2005	LMB	<i>Micropterus salmoides</i>	450	1383.0	F	93.56	1269.70
WHIS-LKWC-060905-002F	Fillet	TOTAL HG	Whiskey Creek Arm	6/9/2005	LMB	<i>Micropterus salmoides</i>	415	1031.0	M	79.05	861.25

Table 5. Fish collected for metals and trace elements analyses from Whiskeytown Lake, June 2005 (continued).

Sample code	Tissue	Analysis Requested	Location in Whiskeytown Lake	Collection Date	Species code	Genus: species	Total Length (mm)	Total Carcass Wgt (g)	Sex	Fillet Wt (g)	Sample Carcass wt (g)
WHIS-LKWC-060905-003F	Fillet	TOTAL HG	Whiskey Creek Arm	6/9/2005	LMB	<i>Micropterus salmoides</i>	342	560.0	M	36.18	511.48
WHIS-LKWC-060905-004F	Fillet	TOTAL HG	Whiskey Creek Arm	6/9/2005	LMB	<i>Micropterus salmoides</i>	330	499.0	M	31.73	445.20
WHIS-LKWC-060905-005F	Fillet	TOTAL HG	Whiskey Creek Arm	6/9/2005	LMB	<i>Micropterus salmoides</i>	286	348.0	M	36.98	289.92
WHIS-LKWC-060905-006F	Fillet	TOTAL HG	Whiskey Creek Arm	6/9/2005	LMB	<i>Micropterus salmoides</i>	304	387.0	F	41.04	322.42
WHIS-LKWC-060905-007F	Fillet	TOTAL HG	Whiskey Creek Arm	6/9/2005	LMB	<i>Micropterus salmoides</i>	195	194.0	M	10.22	73.42
WHIS-LKWC-060905-008F	Fillet	TOTAL HG	Whiskey Creek Arm	6/9/2005	LMB	<i>Micropterus salmoides</i>	165	57.0	M	6.22	45.79
WHIS-LKWC-060905-009F	Fillet	TOTAL HG	Whiskey Creek Arm	6/9/2005	SPB	<i>Micropterus punctulatus</i>	363	695.0	F	30.88	609.04
WHIS-LKWC-060905-010F	Fillet	TOTAL HG	Whiskey Creek Arm	6/9/2005	SPB	<i>Micropterus punctulatus</i>	214	108.0	F	11.10	90.44
WHIS-LKWC-060905-012F	Fillet	TOTAL HG	Whiskey Creek Arm	6/9/2005	LMB	<i>Micropterus salmoides</i>	470	1453.0	M	64.94	1369.30
WHIS-LKWC-060905-013F	Fillet	TOTAL HG	Whiskey Creek Arm	6/9/2005	LMB	<i>Micropterus salmoides</i>	358	722.0	M	59.83	634.51
WHIS-LKWC-060905-014F	Fillet	TOTAL HG	Whiskey Creek Arm	6/9/2005	LMB	<i>Micropterus salmoides</i>	320	487.0	F	26.19	439.44
WHIS-LKWC-060905-015F	Fillet	TOTAL HG	Whiskey Creek Arm	6/9/2005	LMB	<i>Micropterus salmoides</i>	337	527.0	M	27.51	483.82
WHIS-LKWC-060905-017F	Fillet	TOTAL HG	Whiskey Creek Arm	6/9/2005	LMB	<i>Micropterus salmoides</i>	336	563.0	F	29.99	490.24
WHIS-LKWC-060905-019F	Fillet	TOTAL HG	Whiskey Creek Arm	6/9/2005	LMB	<i>Micropterus salmoides</i>	306	378.0	M	19.60	346.19
WHIS-LKWC-060905-020F	Fillet	TOTAL HG	Whiskey Creek Arm	6/9/2005	LMB	<i>Micropterus salmoides</i>	282	283.0	F	14.27	254.61
WHIS-LKWC-060905-021F	Fillet	TOTAL HG	Whiskey Creek Arm	6/9/2005	LMB	<i>Micropterus salmoides</i>	188	77.0	F	3.96	67.21
WHIS-LKWC-060905-022F	Fillet	TOTAL HG	Whiskey Creek Arm	6/9/2005	SPB	<i>Micropterus punctulatus</i>	388	679.0	F	34.80	627.88
WHIS-LKWC-060905-023F	Fillet	TOTAL HG	Whiskey Creek Arm	6/9/2005	SPB	<i>Micropterus punctulatus</i>	275	239.0	M	13.77	210.89
WHIS-LKWC-060905-024F	Fillet	TOTAL HG	Whiskey Creek Arm	6/9/2005	SPB	<i>Micropterus punctulatus</i>	243	154.0	F	12.19	138.09
WHIS-LKBB-060705-001W	Carcass	Metals Scan	Brandy/Boulder Creek Area	6/7/2005	LMB	<i>Micropterus salmoides</i>	360	767.0	M	63.73	644.14
WHIS-LKBB-060705-002W	Carcass	Metals Scan	Brandy/Boulder Creek Area	6/7/2005	LMB	<i>Micropterus salmoides</i>	382	817.5	M	76.74	684.03
WHIS-LKBB-060705-003W	Carcass	Metals Scan	Brandy/Boulder Creek Area	6/7/2005	LMB	<i>Micropterus salmoides</i>	403	1027.0	M	114.50	878.62

Table 5. Fish collected for metals and trace elements analyses from Whiskeytown Lake, June 2005 (continued).

Sample code	Tissue	Analysis Requested	Location in Whiskeytown Lake	Collection Date	Species code	Genus: species	Total Length (mm)	Total Carcass Wgt (g)	Sex	Fillet Wt (g)	Sample Carcass wt (g)
WHIS-LKBB-060705-005W	Carcass	Metals Scan	Brandy/Boulder Creek Area	6/7/2005	SPB	<i>Micropterus punctulatus</i>	385	809.0	F	76.07	708.61
WHIS-LKBB-060705-006W	Carcass	Metals Scan	Brandy/Boulder Creek Area	6/7/2005	LMB	<i>Micropterus salmoides</i>	345	548.5	F	47.04	474.27
WHIS-LKBB-060705-007W	Carcass	Metals Scan	Brandy/Boulder Creek Area	6/7/2005	LMB	<i>Micropterus salmoides</i>	325	490.4	F	62.25	405.44
WHIS-LKBB-060705-008W	Carcass	Metals Scan	Brandy/Boulder Creek Area	6/7/2005	LMB	<i>Micropterus salmoides</i>	330	515.8	M	53.46	432.09
WHIS-LKBB-060705-009W	Carcass	Metals Scan	Brandy/Boulder Creek Area	6/7/2005	LMB	<i>Micropterus salmoides</i>	315	380.4	F	43.73	279.56
WHIS-LKBB-060705-011W	Carcass	Metals Scan	Brandy/Boulder Creek Area	6/7/2005	LMB	<i>Micropterus salmoides</i>	318	440.0	M	34.79	390.16
WHIS-LKBB-060705-012W	Carcass	Metals Scan	Brandy/Boulder Creek Area	6/7/2005	SPB	<i>Micropterus punctulatus</i>	327	385.0	F	28.45	334.10
WHIS-LKBB-060705-013W	Carcass	Metals Scan	Brandy/Boulder Creek Area	6/7/2005	SPB	<i>Micropterus punctulatus</i>	293	292.9	F	15.73	261.16
WHIS-LKBB-060705-014W	Carcass	Metals Scan	Brandy/Boulder Creek Area	6/7/2005	SPB	<i>Micropterus punctulatus</i>	311	375.3	F	28.05	337.65
WHIS-LKBB-060705-017W	Carcass	Metals Scan	Brandy/Boulder Creek Area	6/7/2005	SPB	<i>Micropterus punctulatus</i>	249	183.0	F	23.66	152.15
WHIS-LKBB-060705-018W	Carcass	Metals Scan	Brandy/Boulder Creek Area	6/7/2005	SPB	<i>Micropterus punctulatus</i>	238	176.0	M	18.58	148.44
WHIS-LKBB-060705-019W	Carcass	Metals Scan	Brandy/Boulder Creek Area	6/7/2005	SPB	<i>Micropterus punctulatus</i>	235	130.0	F	12.72	98.26
WHIS-LKBB-060705-020W	Carcass	Metals Scan	Brandy/Boulder Creek Area	6/7/2005	SPB	<i>Micropterus punctulatus</i>	212	107.0	F	12.96	82.60
WHIS-LKBB-060705-022W	Carcass	Metals Scan	Brandy/Boulder Creek Area	6/7/2005	LMB	<i>Micropterus salmoides</i>	210	125.0	F	7.76	109.78
WHIS-LKBB-060705-023W	Carcass	Metals Scan	Brandy/Boulder Creek Area	6/7/2005	LMB	<i>Micropterus salmoides</i>	180	86.0	F	10.84	62.04
WHIS-LKBB-060705-025W	Carcass	Metals Scan	Brandy/Boulder Creek Area	6/7/2005	LMB	<i>Micropterus salmoides</i>	176	58.0	M	4.76	48.21
WHIS-LKBB-060705-026W	Carcass	Metals Scan	Brandy/Boulder Creek Area	6/7/2005	SPB	<i>Micropterus punctulatus</i>	173	54.0	F	6.07	44.81
WHIS-LKBB-060705-027W	Carcass	Metals Scan	Brandy/Boulder Creek Area	6/7/2005	SPB	<i>Micropterus punctulatus</i>	145	33.0	M	3.27	26.86
WHIS-LKCC-060805-001W	Carcass	Metals Scan	Clear Creek Arm	6/8/2005	LMB	<i>Micropterus salmoides</i>	443	1166.0	F	93.28	1056.10
WHIS-LKCC-060805-002W	Carcass	Metals Scan	Clear Creek Arm	6/8/2005	LMB	<i>Micropterus salmoides</i>	385	769.0	F	73.30	660.05
WHIS-LKCC-060805-003W	Carcass	Metals Scan	Clear Creek Arm	6/8/2005	LMB	<i>Micropterus salmoides</i>	370	819.0	F	77.53	699.50
WHIS-LKCC-060805-004W	Carcass	Metals Scan	Clear Creek Arm	6/8/2005	LMB	<i>Micropterus salmoides</i>	370	772.0	F	68.41	653.16

Table 5. Fish collected for metals and trace elements analyses from Whiskeytown Lake, June 2005 (continued).

Sample code	Tissue	Analysis Requested	Location in Whiskeytown Lake	Collection Date	Species code	Genus: species	Total Length (mm)	Total Carcass Wgt (g)	Sex	Fillet Wt (g)	Sample Carcass wt (g)
WHIS-LKCC-060805-005W	Carcass	Metals Scan	Clear Creek Arm	6/8/2005	LMB	<i>Micropterus salmoides</i>	335	591.0	F	53.85	500.63
WHIS-LKCC-060805-006W	Carcass	Metals Scan	Clear Creek Arm	6/8/2005	LMB	<i>Micropterus salmoides</i>	345	547.0	M	30.49	487.82
WHIS-LKCC-060805-008W	Carcass	Metals Scan	Clear Creek Arm	6/8/2005	LMB	<i>Micropterus salmoides</i>	283	325.0	M	22.60	273.48
WHIS-LKCC-060805-010W	Carcass	Metals Scan	Clear Creek Arm	6/8/2005	SPB	<i>Micropterus punctulatus</i>	288	272.0	M	14.08	247.25
WHIS-LKCC-060805-011W	Carcass	Metals Scan	Clear Creek Arm	6/8/2005	LMB	<i>Micropterus salmoides</i>	273	311.0	M	19.56	267.06
WHIS-LKCC-060805-012W	Carcass	Metals Scan	Clear Creek Arm	6/8/2005	LMB	<i>Micropterus salmoides</i>	223	151.0	M	15.04	125.81
WHIS-LKCC-060805-013W	Carcass	Metals Scan	Clear Creek Arm	6/8/2005	LMB	<i>Micropterus salmoides</i>	248	197.0	M	15.17	174.92
WHIS-LKCC-060805-014W	Carcass	Metals Scan	Clear Creek Arm	6/8/2005	LMB	<i>Micropterus salmoides</i>	260	234.0	M	11.82	213.32
WHIS-LKCC-060805-015W	Carcass	Metals Scan	Clear Creek Arm	6/8/2005	LMB	<i>Micropterus salmoides</i>	200	116.0	M	11.69	96.12
WHIS-LKCC-060805-016W	Carcass	Metals Scan	Clear Creek Arm	6/8/2005	LMB	<i>Micropterus salmoides</i>	195	89.0	U	9.98	68.72
WHIS-LKCC-060805-017W	Carcass	Metals Scan	Clear Creek Arm	6/8/2005	SPB	<i>Micropterus punctulatus</i>	174	53.0	U	6.77	41.92
WHIS-LKCC-060905-021W	Carcass	Metals Scan	Clear Creek Arm	6/9/2005	LMB	<i>Micropterus salmoides</i>	350	602.0	M	48.49	521.63
WHIS-LKCC-060905-022W	Carcass	Metals Scan	Clear Creek Arm	6/9/2005	LMB	<i>Micropterus salmoides</i>	300	404.0	M	40.40	329.50
WHIS-LKCC-060905-023W	Carcass	Metals Scan	Clear Creek Arm	6/9/2005	LMB	<i>Micropterus salmoides</i>	275	349.0	F	31.86	292.72
WHIS-LKCC-060905-025W	Carcass	Metals Scan	Clear Creek Arm	6/9/2005	LMB	<i>Micropterus salmoides</i>	202	115.0	F	14.25	84.27
WHIS-LKCC-060905-026W	Carcass	Metals Scan	Clear Creek Arm	6/9/2005	SPB	<i>Micropterus punctulatus</i>	275	278.0	M	29.57	230.33
WHIS-LKCC-060905-027W	Carcass	Metals Scan	Clear Creek Arm	6/9/2005	SPB	<i>Micropterus punctulatus</i>	290	302.0	M	30.61	250.76
WHIS-LKWC-060905-001W	Carcass	Metals Scan	Whiskey Creek Arm	6/9/2005	LMB	<i>Micropterus salmoides</i>	450	1383.0	F	93.56	1269.70
WHIS-LKWC-060905-002W	Carcass	Metals Scan	Whiskey Creek Arm	6/9/2005	LMB	<i>Micropterus salmoides</i>	415	1031.0	M	79.05	861.25
WHIS-LKWC-060905-003W	Carcass	Metals Scan	Whiskey Creek Arm	6/9/2005	LMB	<i>Micropterus salmoides</i>	342	560.0	M	36.18	511.48
WHIS-LKWC-060905-004W	Carcass	Metals Scan	Whiskey Creek Arm	6/9/2005	LMB	<i>Micropterus salmoides</i>	330	499.0	M	31.73	445.20
WHIS-LKWC-060905-005W	Carcass	Metals Scan	Whiskey Creek Arm	6/9/2005	LMB	<i>Micropterus salmoides</i>	286	348.0	M	36.98	289.92

Table 5. Fish collected for metals and trace elements analyses from Whiskeytown Lake, June 2005 (continued).

Sample code	Tissue	Analysis Requested	Location in Whiskeytown Lake	Collection Date	Species code	Genus: species	Total Length (mm)	Total Carcass Wgt (g)	Sex	Fillet Wgt (g)	Sample Carcass Wgt (g)
WHIS-LKWC-060905-006W	Carcass	Metals Scan	Whiskey Creek Arm	6/9/2005	LMB	<i>Micropterus salmoides</i>	304	387.0	F	41.04	322.42
WHIS-LKWC-060905-007W	Carcass	Metals Scan	Whiskey Creek Arm	6/9/2005	LMB	<i>Micropterus salmoides</i>	195	194.0	M	10.22	73.42
WHIS-LKWC-060905-008W	Carcass	Metals Scan	Whiskey Creek Arm	6/9/2005	LMB	<i>Micropterus salmoides</i>	165	57.0	M	6.22	45.79
WHIS-LKWC-060905-009W	Carcass	Metals Scan	Whiskey Creek Arm	6/9/2005	SPB	<i>Micropterus punctulatus</i>	363	695.0	F	30.88	609.04
WHIS-LKWC-060905-010W	Carcass	Metals Scan	Whiskey Creek Arm	6/9/2005	SPB	<i>Micropterus punctulatus</i>	214	108.0	F	11.10	90.44
WHIS-LKWC-060905-012W	Carcass	Metals Scan	Whiskey Creek Arm	6/9/2005	LMB	<i>Micropterus salmoides</i>	470	1453.0	M	64.94	1369.30
WHIS-LKWC-060905-013W	Carcass	Metals Scan	Whiskey Creek Arm	6/9/2005	LMB	<i>Micropterus salmoides</i>	358	722.0	M	59.83	634.51
WHIS-LKWC-060905-014W	Carcass	Metals Scan	Whiskey Creek Arm	6/9/2005	LMB	<i>Micropterus salmoides</i>	320	487.0	F	26.19	439.44
WHIS-LKWC-060905-015W	Carcass	Metals Scan	Whiskey Creek Arm	6/9/2005	LMB	<i>Micropterus salmoides</i>	337	527.0	M	27.51	483.82
WHIS-LKWC-060905-017W	Carcass	Metals Scan	Whiskey Creek Arm	6/9/2005	LMB	<i>Micropterus salmoides</i>	336	563.0	F	29.99	490.24
WHIS-LKWC-060905-019W	Carcass	Metals Scan	Whiskey Creek Arm	6/9/2005	LMB	<i>Micropterus salmoides</i>	306	378.0	M	19.60	346.19
WHIS-LKWC-060905-020W	Carcass	Metals Scan	Whiskey Creek Arm	6/9/2005	LMB	<i>Micropterus salmoides</i>	282	283.0	F	14.27	254.61
WHIS-LKWC-060905-021W	Carcass	Metals Scan	Whiskey Creek Arm	6/9/2005	LMB	<i>Micropterus salmoides</i>	188	77.0	F	3.96	67.21
WHIS-LKWC-060905-022W	Carcass	Metals Scan	Whiskey Creek Arm	6/9/2005	SPB	<i>Micropterus punctulatus</i>	388	679.0	F	34.80	627.88
WHIS-LKWC-060905-023W	Carcass	Metals Scan	Whiskey Creek Arm	6/9/2005	SPB	<i>Micropterus punctulatus</i>	275	239.0	M	13.77	210.89
WHIS-LKWC-060905-024W	Carcass	Metals Scan	Whiskey Creek Arm	6/9/2005	SPB	<i>Micropterus punctulatus</i>	243	154.0	F	12.19	138.09

Table 6. Aquatic invertebrates collected for chemical analyses from the French fire area, June 2005.

Site Code	Site	Sample Code	Date Collected	Order	Family	No.	Wgt (g)	Ave. Wgt (g)	Analyses Requested
BRAN	Brandy Creek	WHIS-BRAN-062205-001	6/22/2005	Odonata	Gomphidae	3	0.36	0.12	Metals
BRAN	Brandy Creek	WHIS-BRAN-062205-003	6/22/2005	Plecoptera	Perlidae	3	0.94	0.31	Metals
BRAN	Brandy Creek	WHIS-BRAN-062205-005	6/22/2005	Trichoptera	Hydropsychidae	60	1.47	0.02	Metals
BRAN	Brandy Creek	WHIS-BRAN-062205-007	6/22/2005	Hemiptera	Gerridae	25	1.6	0.06	Metals
CARR	Clear Creek US Carr PH	WHIS-CARR-063005-001	6/23/2005	Odonata	Gomphidae	5	1.04	0.21	Metals
CARR	Clear Creek US Carr PH	WHIS-CARR-063005-002	6/23/2005	Odonata	Gomphidae	10	1.29	0.13	Metals
CARR	Clear Creek US Carr PH	WHIS-CARR-063005-003	6/23/2005	Hemiptera	Gerridae	25	1.76	0.07	Metals
CARR	Clear Creek US Carr PH	WHIS-CARR-063005-004	6/23/2005	Trichoptera	Hydropsychidae	60	1.48	0.02	Metals
H299	Clear Creek at HWY 299	WHIS-H299-062305-001	6/23/2005	Odonata	Gomphidae	7	1.22	0.17	Metals
H299	Clear Creek at HWY 299	WHIS-H299-062305-002	6/23/2005	Trichoptera	Hydropsychidae	60	1.71	0.03	Metals
H299	Clear Creek at HWY 299	WHIS-H299-062305-003	6/23/2005	Hemiptera	Gerridae	25	1.89	0.08	Metals
CCCG	Clear Creek US Cline Creek	WHIS-CCCG-062305-001	6/23/2005	Odonata	Gomphidae	15	1.71	0.11	Metals
CCCG	Clear Creek US Cline Creek	WHIS-CCCG-062305-002	6/23/2005	Plecoptera	Perlidae	7	1.18	0.17	Metals
CCCG	Clear Creek US Cline Creek	WHIS-CCCG-062305-004	6/23/2005	Hemiptera	Gerridae	25	1.61	0.06	Metals
CCCG	Clear Creek US Cline Creek	WHIS-CCCG-062305-005	6/23/2005	Trichoptera	Hydropsychidae	60	1.42	0.02	Metals
CCCG	Clear Creek US Cline Creek	WHIS-CCCG-062305-006	6/23/2005	Trichoptera	Hydropsychidae	60	1.7	0.03	Metals
CLN1	Cline Gulch nr Clear Creek	WHIS-CLN1-062205-001	6/22/2005	Odonata	Gomphidae	12	1.66	0.14	Metals
CLN1	Cline Gulch nr Clear Creek	WHIS-CLN1-062205-002	6/22/2005	Plecoptera	Perlidae	7	1.14	0.16	Metals

Table 6. Aquatic invertebrates collected for chemical analyses from the French fire area, June 2005 (continued).

Site Code	Site	Sample Code	Date Collected	Order	Family	No.	Wgt (g)	Ave Wgt (g)	Analyses Requested
CLN1	Cline Gulch nr Clear Creek	WHIS-CLN1-062205-003	6/22/2005	Plecoptera	Perlidae	7	1.37	0.20	Metals
CLN1	Cline Gulch nr Clear Creek	WHIS-CLN1-062205-004	6/22/2005	Hemiptera	Gerridae	25	1.62	0.06	Metals
CLN2	Cline Gulch US American Gulch	WHIS-CLN2-062205-001	6/22/2005	Odonata	Gomphidae	9	1.05	0.12	Metals
CLN2	Cline Gulch US American Gulch	WHIS-CLN2-062205-002	6/22/2005	Odonata	Gomphidae	9	1.16	0.13	Metals
CLN2	Cline Gulch US American Gulch	WHIS-CLN2-062205-004	6/22/2005	Plecoptera	Perlidae	9	1.86	0.21	Metals
CLN2	Cline Gulch US American Gulch	WHIS-CLN2-062205-005	6/22/2005	Plecoptera	Perlidae	9	1.3	0.14	Metals
CLN2	Cline Gulch US American Gulch	WHIS-CLN2-062205-007	6/22/2005	Hemiptera	Gerridae	25	1.72	0.07	Metals
FRGL	French Gulch	WHIS-FRGL-062305-001	6/23/2005	Odonata	Gomphidae	7	1.04	0.15	Metals
FRGL	French Gulch	WHIS-FRGL-062305-002	6/23/2005	Plecoptera	Perlidae	6	1.39	0.23	Metals
FRGL	French Gulch	WHIS-FRGL-062305-003	6/23/2005	Plecoptera	Perlidae	6	1.4	0.23	Metals
FRGL	French Gulch	WHIS-FRGL-062305-004	6/23/2005	Plecoptera	Perlidae	10	1.24	0.12	Metals
FRGL	French Gulch	WHIS-FRGL-062305-005	6/23/2005	Hemiptera	Gerridae	25	1.78	0.07	Metals
FRGL	French Gulch	WHIS-FRGL-062305-006	6/23/2005	Hemiptera	Gerridae	25	1.74	0.07	Metals
FRGL	French Gulch	WHIS-FRGL-062405-007	6/24/2005	Trichoptera	Hydropsychidae	60	1.53	0.03	Metals
RTGL	RF French Gulch	WHIS-RTGL-062405-001	6/24/2005	Odonata	Gomphidae	8	1	0.13	Metals
RTGL	RF French Gulch	WHIS-RTGL-062405-003	6/24/2005	Plecoptera	Perlidae	9	1.27	0.14	Metals
RTGL	RF French Gulch	WHIS-RTGL-062405-004	6/24/2005	Hemiptera	Gerridae	25	1.74	0.07	Metals
RTGL	RF French Gulch	WHIS-RTGL-062405-005	6/24/2005	Trichoptera	Hydropsychidae	60	1.64	0.03	Metals
SCRP	Scorpion Gulch	WHIS-SCRP-062205-001	6/22/2005	Odonata	Gomphidae	6	0.77	0.13	Metals
SCRP	Scorpion Gulch	WHIS-SCRP-062205-004	6/22/2005	Plecoptera	Perlidae	5	1.51	0.30	Metals
SCRP	Scorpion Gulch	WHIS-SCRP-062205-005	6/22/2005	Plecoptera	Perlidae	12	1.27	0.11	Metals
SCRP	Scorpion Gulch	WHIS-SCRP-062205-006	6/22/2005	Hemiptera	Gerridae	25	1.81	0.07	Metals
SCRP	Scorpion Gulch	WHIS-SCRP-062205-007	6/22/2005	Trichoptera	Hydropsychidae	60	1.56	0.03	Metals

Table 7. Stream fish collected from sites in the French Fire for chemical analyses, June 2005.

Composite Sample No.	Site code	Collection Date	Analysis Requested	Common Name	Genus/species	Composite Wgt (g)	Sex		
							Male	Female	Unk.
WHIS1-05-F-BRAN-001	BRAN	6/30/2005	Metals Scan	riffle sculpin	<i>Cottus gulosus</i>	89.30	2	0	3
WHIS1-05-F-BRAN-002	BRAN	6/30/2005	Metals Scan	riffle sculpin	<i>Cottus gulosus</i>	65.47	2	0	3
WHIS1-05-F-H299-003	H299	6/29/2005	Metals Scan	riffle sculpin	<i>Cottus gulosus</i>	71.92	3	2	0
WHIS1-05-F-H299-004	H299	6/29/2005	Metals Scan	riffle sculpin	<i>Cottus gulosus</i>	52.14	1	3	1
WHIS1-05-F-H299-005	H299	6/29/2005	Metals Scan	riffle sculpin	<i>Cottus gulosus</i>	38.38	1	3	1
WHIS1-05-F-CARR-006	CARR	6/30/2005	Metals Scan	riffle sculpin	<i>Cottus gulosus</i>	81.14	1	1	1
WHIS1-05-F-CARR-007	CARR	6/30/2005	Metals Scan	riffle sculpin	<i>Cottus gulosus</i>	67.36	2	2	1
WHIS1-05-F-CARR-008	CARR	6/30/2005	Metals Scan	riffle sculpin	<i>Cottus gulosus</i>	41.83	0	5	0
WHIS1-05-F-CCCG-009	CCCG	6/29/2005	Metals Scan	riffle sculpin	<i>Cottus gulosus</i>	70.00	1	1	3
WHIS1-05-F-CCCG-010	CCCG	6/29/2005	Metals Scan	riffle sculpin	<i>Cottus gulosus</i>	53.15	2	3	0
WHIS1-05-F-CCCG-011	CCCG	6/29/2005	Metals Scan	riffle sculpin	<i>Cottus gulosus</i>	38.99	0	4	1
WHIS1-05-F-CLN1-012	CLN1	6/28/2005	Metals Scan	riffle sculpin	<i>Cottus gulosus</i>	101.13	3	0	2
WHIS1-05-F-CLN1-013	CLN1	6/28/2005	Metals Scan	riffle sculpin	<i>Cottus gulosus</i>	76.78	3	2	0
WHIS1-05-F-CLN1-014	CLN1	6/28/2005	Metals Scan	riffle sculpin	<i>Cottus gulosus</i>	38.45	1	2	2
WHIS1-05-F-CLN2-015	CLN2	6/27/2005	Metals Scan	riffle sculpin	<i>Cottus gulosus</i>	116.88	3	1	1
WHIS1-05-F-CLN2-016	CLN2	6/27/2005	Metals Scan	riffle sculpin	<i>Cottus gulosus</i>	73.15	4	0	1
WHIS1-05-F-CLN2-017	CLN2	6/27/2005	Metals Scan	riffle sculpin	<i>Cottus gulosus</i>	65.83	4	1	0
WHIS1-05-F-FRGL-018	FRGL	6/28/2005	Metals Scan	riffle sculpin	<i>Cottus gulosus</i>	130.15	3	0	2
WHIS1-05-F-FRGL-019	FRGL	6/28/2005	Metals Scan	riffle sculpin	<i>Cottus gulosus</i>	101.06	3	0	2
WHIS1-05-F-RTGL-020	RTGL	6/27/2005	Metals Scan	riffle sculpin	<i>Cottus gulosus</i>	78.44	4	1	0
WHIS1-05-F-RTGL-021	RTGL	6/27/2005	Metals Scan	riffle sculpin	<i>Cottus gulosus</i>	61.57	3	2	0
WHIS1-05-F-RTGL-022	RTGL	6/27/2005	Metals Scan	riffle sculpin	<i>Cottus gulosus</i>	49.46	1	2	2
WHIS1-05-F-BRAN-023	BRAN	6/30/2005	Metals Scan	rainbow trout	<i>Oncorhynchus mykiss</i>	289.17	3	1	1

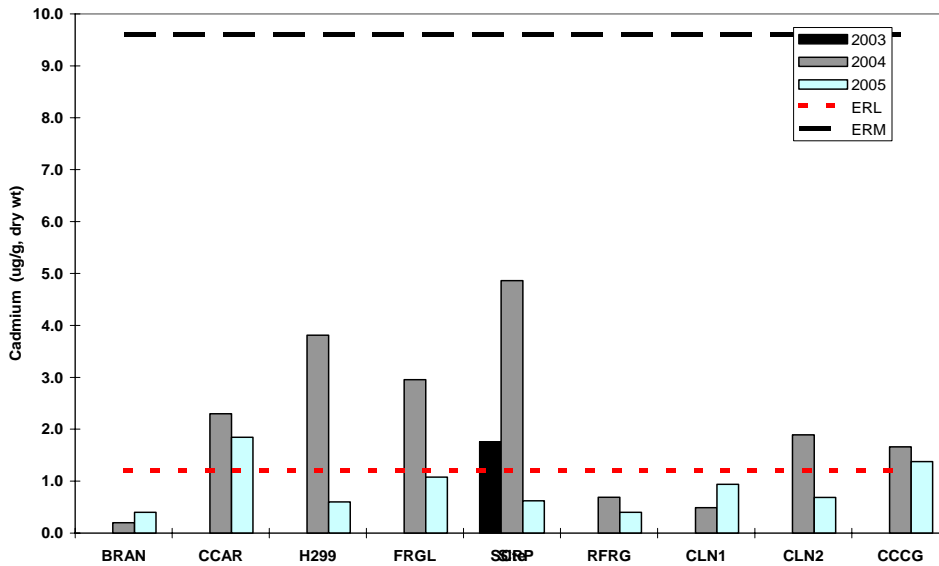
Table 7. Stream fish collected from sites in the French Fire for chemical analyses, June 2005 (continued).

Composite Sample No.	Site code	Collection Date	Analysis Requested	Common Name	Genus/species	Composite Wgt (g)	Sex		
							Male	Female	Unk.
WHIS1-05-F-FRGL-024	FRGL	6/28/2005	Metals Scan	rainbow trout	<i>Oncorhynchus mykiss</i>	204.43	4	0	1
WHIS1-05-F-SCRP-025	SCRP	6/28/2005	Metals Scan	rainbow trout	<i>Oncorhynchus mykiss</i>	171.04	3	0	2
WHIS1-05-F-SCRP-026	SCRP	6/28/2005	Metals Scan	rainbow trout	<i>Oncorhynchus mykiss</i>	115.69	2	0	3
WHIS1-05-F-SCRP-027	SCRP	6/28/2005	Metals Scan	rainbow trout	<i>Oncorhynchus mykiss</i>	69.90	2	0	3
WHIS1-05-F-BRAN-028	BRAN	6/30/2005	Metals Scan	riffle sculpin	<i>Cottus gulosus</i>	44.15	1	0	4
WHIS1-05-F-FRGL-029	FRGL	6/28/2005	Metals Scan	riffle sculpin	<i>Cottus gulosus</i>	46.73	3	0	1

Table 8. Biofilm collected from the French Fire area for metals analyses, June 2005.

Site Code	Locality	Unique Sample Code	Date Collected	Latitude	Longitude	Analyses Requested
BRAN	Brandy Creek	WHIS-BRAN-062205-001a	6/22/2005	40° 36.450'	122° 34.667'	Metals Scan
BRAN	Brandy Creek	WHIS-BRAN-062205-001b	6/22/2005	40° 36.450'	122° 34.667'	Metals Scan
BRAN	Brandy Creek	WHIS-BRAN-062205-001c	6/22/2005	40° 36.450'	122° 34.667'	Metals Scan
CCAR	Clear Creek US Carr Power House	WHIS-CARR-063005-001a	6/23/2005	40° 39.617'	122° 37.600'	Metals Scan
CCAR	Clear Creek US Carr Power House	WHIS-CARR-063005-001b	6/23/2005	40° 39.617'	122° 37.600'	Metals Scan
CCAR	Clear Creek US Carr Power House	WHIS-CARR-063005-001c	6/23/2005	40° 39.617'	122° 37.600'	Metals Scan
H299	Clear Creek at HWY 299	WHIS-H299-062305-001a	6/23/2005	40° 39.867'	122° 38.100'	Metals Scan
H299	Clear Creek at HWY 299	WHIS-H299-062305-001b	6/23/2005	40° 39.867'	122° 38.100'	Metals Scan
H299	Clear Creek at HWY 299	WHIS-H299-062305-001c	6/23/2005	40° 39.867'	122° 38.100'	Metals Scan
CCCG	Clear Creek us Cline Gulch	WHIS-CCCG-062305-001a	6/23/2005	40° 42.967	122° 37.933'	Metals Scan
CCCG	Clear Creek us Cline Gulch	WHIS-CCCG-062305-001b	6/23/2005	40° 42.967	122° 37.933'	Metals Scan
CCCG	Clear Creek us Cline Gulch	WHIS-CCCG-062305-001c	6/23/2005	40° 42.967	122° 37.933'	Metals Scan
CLN1	Cline Gulch nr Clear Creek	WHIS-CLN1-062005-001a	6/20/2005	40° 42.917'	122° 37.800'	Metals Scan
CLN1	Cline Gulch nr Clear Creek	WHIS-CLN1-062005-001b	6/20/2005	40° 42.917'	122° 37.800'	Metals Scan
CLN1	Cline Gulch nr Clear Creek	WHIS-CLN1-062005-001c	6/20/2005	40° 42.917'	122° 37.800'	Metals Scan
CLN2	Cline Gulch us American Gulch	WHIS-CLN2-062005-001a	6/20/2005	40° 42.683'	122° 36.533'	Metals Scan
CLN2	Cline Gulch us American Gulch	WHIS-CLN2-062005-001b	6/20/2005	40° 42.683'	122° 36.533'	Metals Scan
CLN2	Cline Gulch us American Gulch	WHIS-CLN2-062005-001c	6/20/2005	40° 42.683'	122° 36.533'	Metals Scan
FRGL	French Gulch	WHIS-FRGL-062005-001a	6/20/2005	40° 42.250'	122° 39.000'	Metals Scan
FRGL	French Gulch	WHIS-FRGL-062005-001b	6/20/2005	40° 42.250'	122° 39.000'	Metals Scan
FRGL	French Gulch	WHIS-FRGL-062005-001c	6/20/2005	40° 42.250'	122° 39.000'	Metals Scan
RTGL	Right Fork of French Gulch	WHIS-RTGL-062105-001a	6/21/2005	40° 42.922'	122° 40.217'	Metals Scan
RTGL	Right Fork of French Gulch	WHIS-RTGL-062105-001b	6/21/2005	40° 42.922'	122° 40.217'	Metals Scan
RTGL	Right Fork of French Gulch	WHIS-RTGL-062105-001c	6/21/2005	40° 42.922'	122° 40.217'	Metals Scan
SCRP	Scorpion Gulch	WHIS-SCRP-062105-001a	6/21/2005	40° 42.840'	122° 40.313'	Metals Scan
SCRP	Scorpion Gulch	WHIS-SCRP-062105-001b	6/21/2005	40° 42.840'	122° 40.313'	Metals Scan
SCRP	Scorpion Gulch	WHIS-SCRP-062105-001c	6/21/2005	40° 42.840'	122° 40.313'	Metals Scan

Cadmium in Upper Clear Creek, 2003-2005



Copper in Upper Clear Creek, 2003-2005

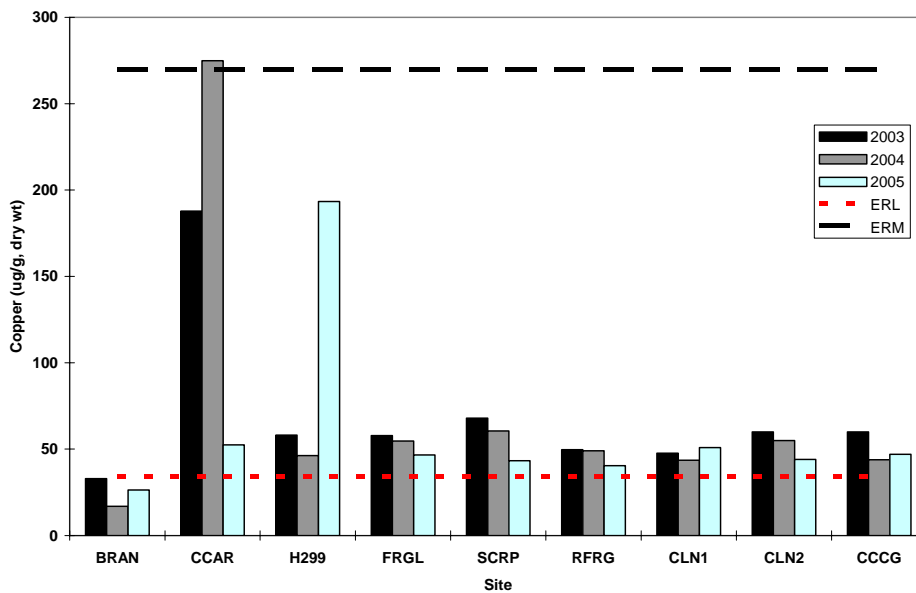
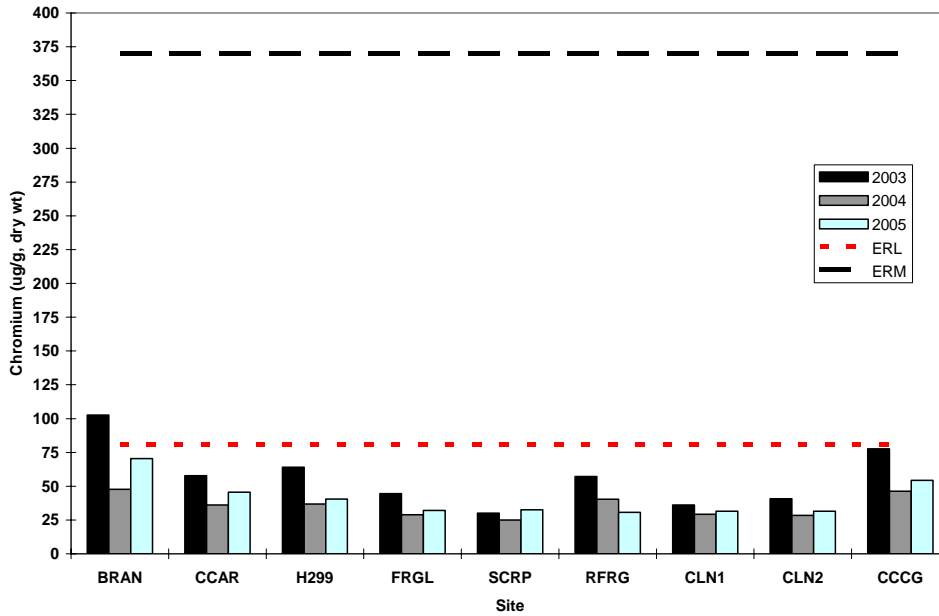


Fig. 11. Concentrations of cadmium and copper in sediments collected from sites from the French Fire Study and one reference site (BRAN). The dotted line represents the ERL, the effects range-low, the value below which biological effects are not expected. The dashed line represents the ERM, the effects range median, the value above which biological effects are expected at least half the time. ERL and ERM values are from Long et al. (1995).

Chromium in Upper Clear Creek, 2003-2005



Lead in Upper Clear Creek, 2003-2005

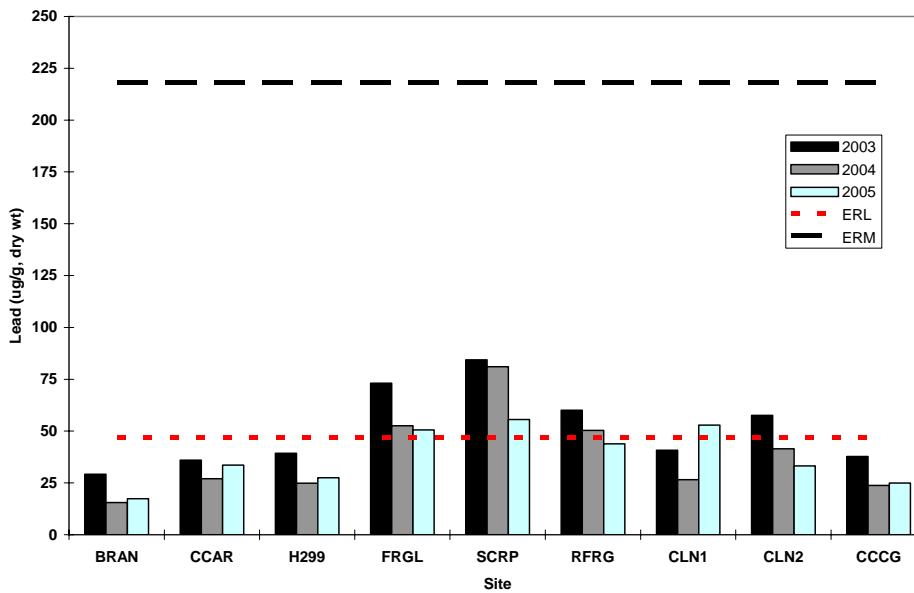
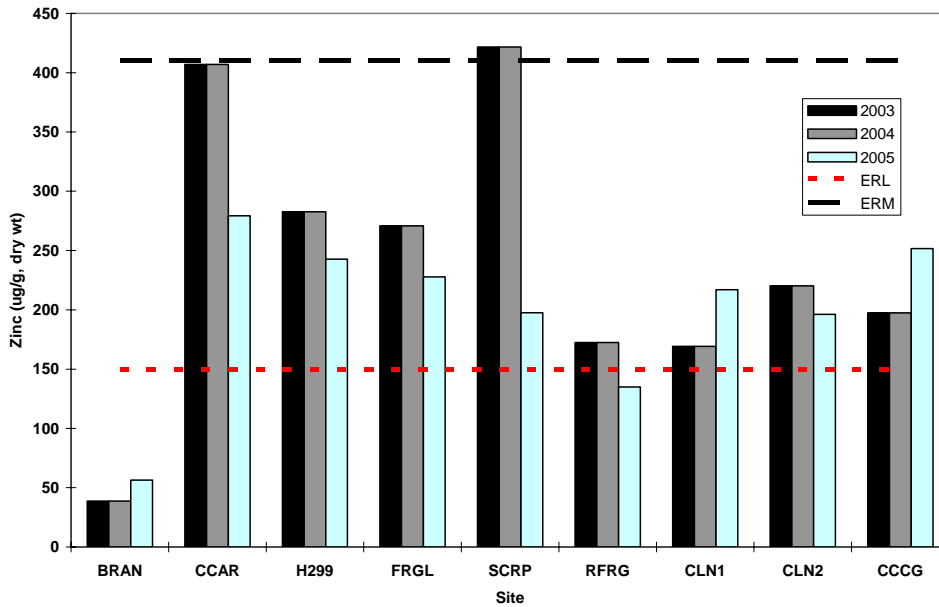


Fig. 12. Concentrations of chromium and lead in sediments collected from sites from the French Fire Study and one reference site (BRAN). The dotted line represents the ERL, the effects range-low, the value below which biological effects are not expected. The dashed line represents the ERM, the effects range median, the value above which biological effects are expected at least half the time. ERL and ERM values are from Long et al. (1995).

Zinc in Upper Clear Creek, 2003-2005



Selenium in Upper Clear Creek, 2003-2005

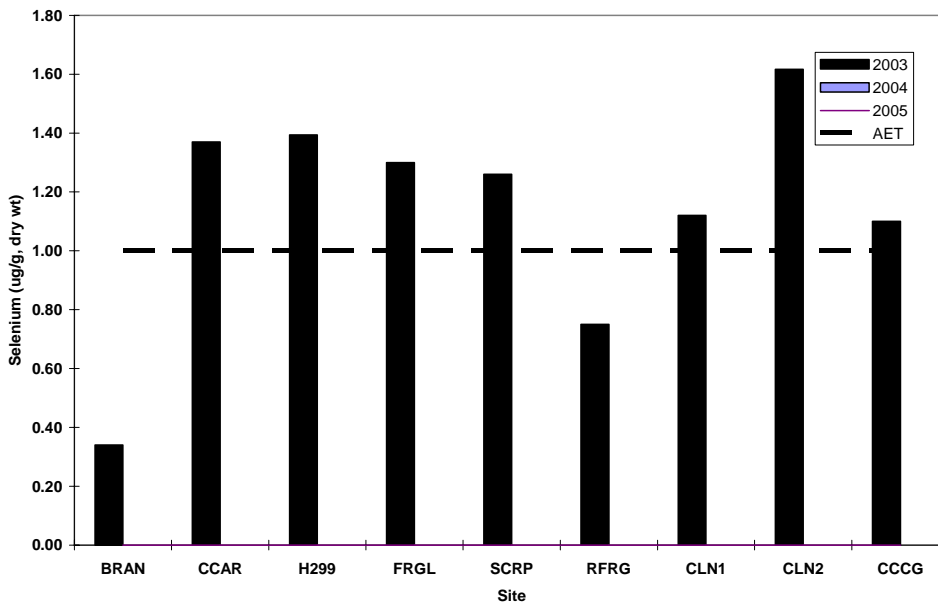
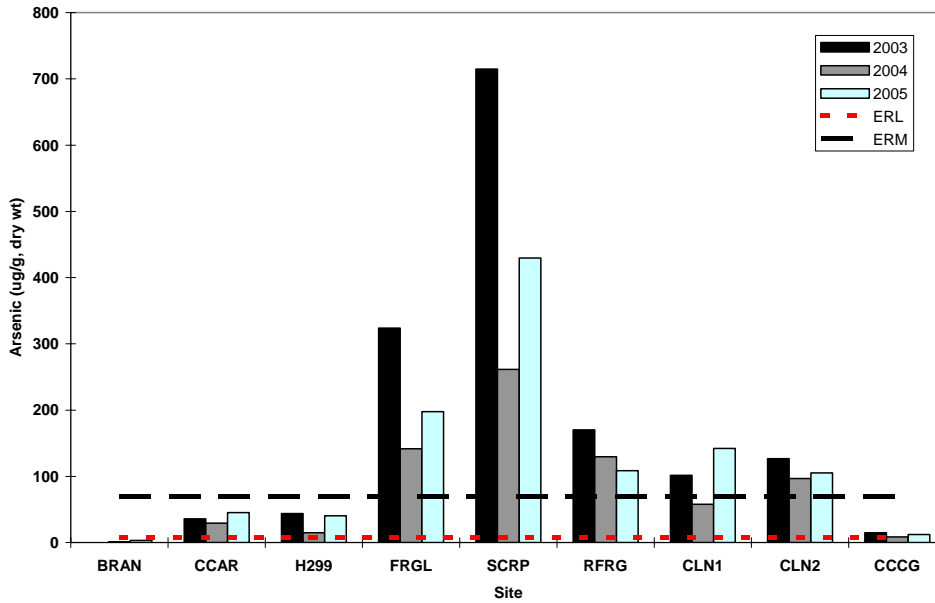


Fig. 13. Concentrations of selenium (2003 only) and zinc in sediments collected from sites from the French Fire Study and one reference site (BRAN). The dotted line represents the ERL, the effects range-low, the value below which biological effects are not expected. The dashed line represents the ERM, the effects range median, the value above which biological effects are expected at least half the time. ERL and ERM values are from Long et al. (1995). For selenium, the AET is the apparent effects threshold, a value known to have toxic effects on amphipods.

Arsenic in Upper Clear Creek, 2003-2005



Mercury in Upper Clear Creek, 2003-2005

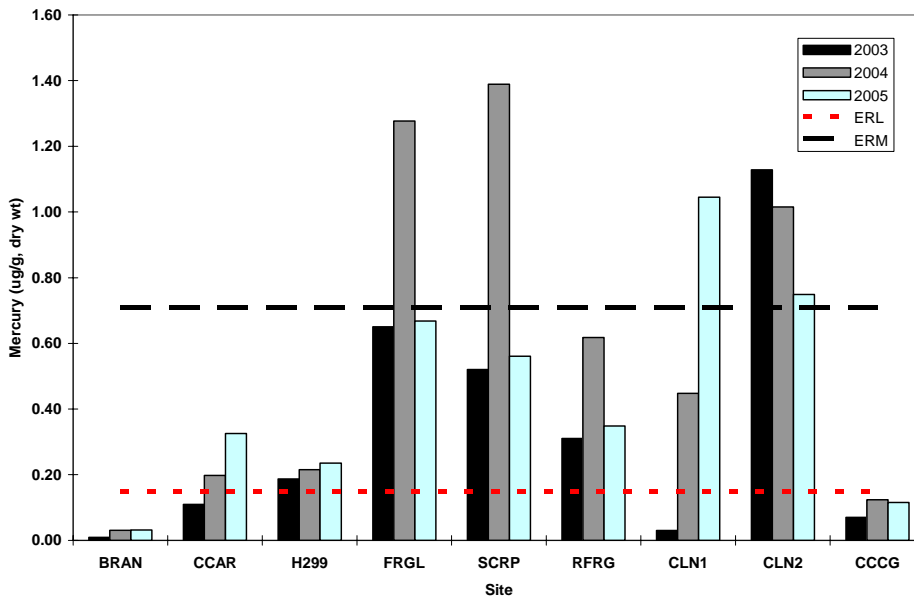


Fig. 14. Concentrations of arsenic and mercury in sediments collected from sites from the French Fire Study and one reference site (BRAN). The dotted line represents the ERL, the effects range-low, the value below which biological effects are not expected. The dashed line represents the ERM, the effects range median, the value above which biological effects are expected at least half the time. ERL and ERM values are from Long et al. (1995).