



2019 Arsenic Accumulation in Fish Tissue

Preliminary Monitoring Results

Background

The United States Environmental Protection Agency (EPA) recommends two criteria for protecting human health under the Clean Water Act (CWA) §304(a). The two criteria are based on exposure through fish consumption only (fish only) and exposure through both drinking water and consumption of fish (fish+water). The fish-only criterion applies to waters designated for primary or secondary contact recreation; the fish+water criterion applies to waters designated for domestic water supply.

Both criteria are based on the human health criteria calculation and rely, in part, on a chemical-specific bioaccumulation factor (BAF) to calculate protective criteria. For more information on the human health criteria calculation, see the *Idaho Human Health Criteria: Technical Support Document* (DEQ 2015).

In 2018, Idaho initiated rulemaking to revise the arsenic human health criteria for fish only and fish+water. An issue identified in previous and current rulemaking processes was the uncertainty in what constitutes an appropriate BAF for inorganic arsenic in Idaho.

The Idaho Department of Environmental Quality (DEQ) initiated probabilistic monitoring to collect paired water column and fish tissue samples for both inorganic and total arsenic. This report summarizes the monitoring results from the 2019 field season. Monitoring will continue through 2021.

DEQ's monitoring effort supports Idaho's rulemaking by providing specific, defensible data on the rate of bioaccumulation of inorganic arsenic in Idaho fish.

Methods

Monitoring occurred from September 2019 through November 2019. Detailed monitoring and analytical methods are found in the *Arsenic Monitoring to Support Human Health Criteria Adoption Quality Assurance Project Plan* (DEQ 2019).

Site Selection

For 2019, 24 sites were monitored following a random probability design. Sites were represented by a latitude and longitude, known as the *x-site*.

Sites deemed nontarget or unsampleable were replaced systematically. If primary sites were eliminated as unsuitable, replacement sites were taken in the order given to maintain a statistically valid random sample.

A river sample reach was centered on the x-site and defined as 40 times the general wetted width with a minimum reach length of 150 meters and maximum reach length of 4,000 meters.

Sites were electrofished throughout the sample reach. If electrofishing within the predetermined reach did not yield five fish per species (up to two species), electrofishing continued downstream until the takeout or until the target of five fish per species was captured.

Sampled site locations are presented in Appendix A.

Water Samples

Water samples were collected and composited from three transects within the reach. The three transects were located at the top of the reach, midreach (x-site location), and bottom of the reach. Each transect was sampled at one-quarter, one-half, and three-quarters of the stream width giving three subsamples per transect and nine total subsamples per composite. The nine subsamples were composited in a nonreactive vessel. Samples were analyzed for total and inorganic arsenic. Compositing the samples could introduce sample oxidation but will not change the total inorganic arsenic value.

A composite subsample was transferred into a 60 milliliter (mL) sample bottle and two 10 mL vacuettes. The water samples were placed in a cooler on wet ice and maintained at $< 4^{\circ}\text{C}$ until delivered to the contract laboratory.

Fish Tissue Samples

The target fish sample was five game fish from each of two different game fish species. Sampled fish were identified to species, where possible, length was measured, and individual fish were labelled, placed in a zip-top bag, and frozen on dry ice in the field. Fish tissue samples were maintained frozen and shipped on dry ice to ensure they remained frozen until delivered to the contract laboratory.

Individual fish tissue samples were composited and analyzed at the contract laboratory. Fish tissue elements were expressed as a single composite of tissue from a target of five individuals of the same species where the smallest individual was no less than 75% of the total length (size) of the largest individual. For example, if the largest fish was 10 inches, the smallest fish must not be less than 7.5 inches.

Data Handling

All water and fish tissue samples were analyzed for both inorganic arsenic (iAs) and total arsenic (tAs). Analytical methods are detailed in the arsenic monitoring QAPP (DEQ 2019).

Sample results reported as less than the method detection limit (MDL) were assigned the MDL concentration for analyses. Sample results reported between the MDL and method reporting limit (MRL) were left unchanged for analyses.

Relative percent difference (RPD) for duplicate water and fish tissue samples were calculated using the following equation:

$$RPD = 100 \times \left[\frac{|C_1 - C_2|}{(C_1 + C_2)/2} \right]$$

Duplicate water samples were collected at two sites, and duplicate fish tissue samples were collected at three sites.

BAFs were calculated for each sample for both iAs and tAs using the following formula:

$$BAF = \left[\frac{C_{fish}}{C_{water}} \right]$$

where:

BAF is expressed in liters per kilogram (L/kg).

C_{fish} is the concentration of the target analyte in fish tissue (milligram per kilogram (mg/kg)).

C_{water} is the concentration of the target analyte in the water column (mg/L).

Results

Twenty-four sites were sampled, resulting in 45 fish tissue samples. Of the 24 sites, 20 had at least 2 species collected, and 1 site had 3 species collected. Eighteen samples were comprised of the target number of individual fish (five). The results are provided in Appendix A.

Quality Control

Results from duplicate water samples are presented in Table 1. Results from duplicate fish tissue samples are presented in Table 2.

Table 1. Duplicate water sample results.

Site ID	Analyte	Sample Result (µg/L)	Duplicate Result (µg/L)	Relative Percent Difference
ASP007	iAs	0.381	0.355	7.1
	tAs	0.449	0.467	3.9
ASP090	iAs	1.04	1.04	0.0
	tAs	1.56	1.51	3.3

Notes: microgram (µg)

Table 2. Duplicate fish tissue results.

Site ID	Fish Species	Analyte	Sample Result (µg/L)	Duplicate Result (µg/L)	Relative Percent Difference
ASP090	Mountain Whitefish	iAs	0.4 ^a	0.2 ^b	60
		tAs	38	25	41
ASP090	Bridgelip Sucker	iAs	10.0	4.4	48
		tAs	108	87	22
ASP126	Brown Trout	iAs	0.2 ^b	0.2 ^b	0
		tAs	24	17	34

a. Result is less than MRL

b. Result was below MDL; value reported is MDL.

Notes: microgram (µg)

Although all duplicate water samples were within the data quality objective range of RPD < 20, fish tissue samples were highly variable, and RPDs ranged from 0–60.

Analytical Results

Summary statistics of analytical results are presented in Table 3.

Table 3. Summary statistics for inorganic arsenic (iAs) and total arsenic (tAs) in fish tissue and water; calculated BAF; and iAs:tAs in water and fish tissue.

	Fish iAs (µg/kg)	Fish tAs (mg/kg)	Water iAs (µg/L)	Water tAs (µg/L)	BAF iAs (L/kg)	BAF tAs (L/kg)	Water iAs:tAs	Fish iAs:tAs
Minimum	0.20	0.00	0.04	0.07	0.02	0.53	0.46	0.00
10th percentile	0.20	0.01	0.13	0.20	0.17	7.42	0.57	0.00
25th percentile	0.30	0.02	0.26	0.34	0.31	18.92	0.63	0.01
Median	0.60	0.05	0.97	1.11	1.31	42.32	0.80	0.02
Average	1.85	0.08	1.42	1.69	5.35	118.50	0.79	0.04
75th percentile	2.00	0.11	1.61	2.54	3.45	157.14	0.95	0.04
90th percentile	5.80	0.16	4.15	4.52	9.24	270.91	1.03	0.08
Maximum	10.00	0.58	8.12	7.25	97.37	921.01	1.12	0.22

Relationship of Fish Tissue to Water Column Concentration

Based on the results presented, little relationship exists between the water column iAs concentrations and fish tissue concentrations (Figure 1).

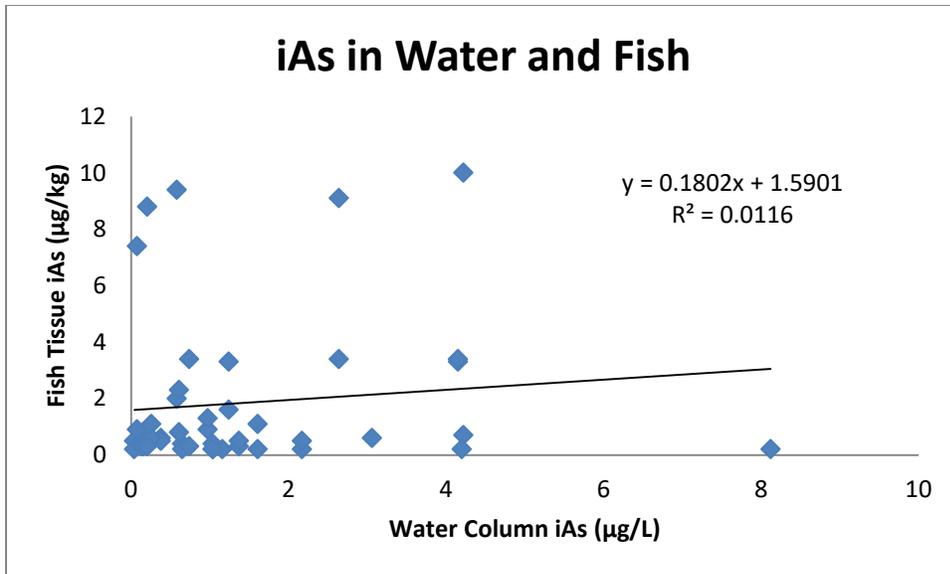


Figure 1. Inorganic arsenic (iAs) in water versus fish tissue.

This limited relationship is not affected by removing the sample results below the MRL (Figure 2).

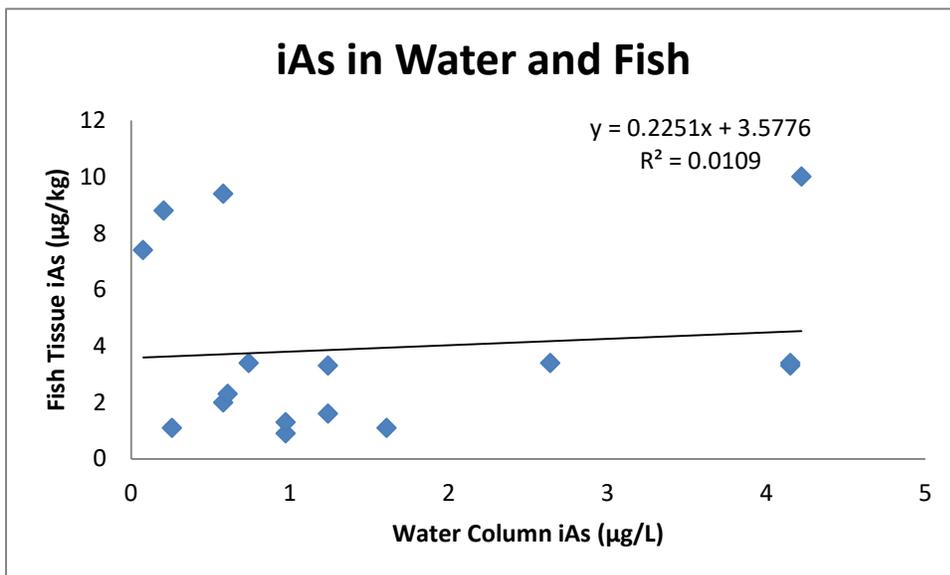


Figure 2. Inorganic arsenic (iAs) in water versus fish tissue for samples with results greater than the method reporting limit (MRL).

Summary

The results presented provide Idaho with a robust data set for calculating an appropriate BAF for iAs to support criteria development.

The relationship of iAs in water to iAs in fish tissue is absent or very weak. Additional monitoring in summer 2020 should focus on a better understanding this relationship, if one exists.

Future monitoring options include the following:

- Continue probabilistic monitoring design.
- Target sites/reaches with more robust iAs water column results, such as sites sampled through DEQ's targeted monthly arsenic monitoring (DEQ 2019).
- Target sites/reaches with relatively high or low ambient iAs concentrations.
- Analyze individual fish rather than composites to better understand the relative variability of iAs in fish tissue.

References Cited

DEQ (Idaho Department of Environmental Quality). 2015. *Idaho Human Health Criteria: Technical Support Document*. Boise, ID: DEQ.

DEQ (Idaho Department of Environmental Quality). 2019. *Arsenic Monitoring to Support Human Health Criteria Adoption Quality Assurance Project Plan*. Boise, ID: DEQ.

US Congress. 1972. Clean Water Act (Federal Water Pollution Control Act). 33 USC §1251–1387.

Appendix A. Analytical Results

Table A1. Sample locations and stream names.

Site ID	Water Body Name	Latitude	Longitude
ASP004	Bear River	42.058	-111.919
ASP005	Bear River	42.438	-111.381
ASP007	Whiskey Creek	42.465	-111.709
ASP008	Maple Creek	42.035	-111.759
ASP026	Warm Springs Creek	46.466	-114.876
ASP027	Red River	45.792	-115.456
ASP031	Cranberry Creek	46.635	-116.14
ASP035	Potlatch River	46.612	-116.655
ASP051	Saint Joe River	47.219	-115.575
ASP052	Hayden Creek	47.823	-116.654
ASP056	North Fork Coeur d'Alene River	48.026	-116.252
ASP062	Rock Creek	47.259	-115.891
ASP076	Salmon River	45.331	-114.366
ASP088	South Fork Salmon River	45.215	-115.545
ASP090	Salmon River	44.595	-114.189
ASP091	Seafoam Creek	44.542	-115.078
ASP100	Granite Creek	43.813	-115.404
ASP102	Marys Creek	42.227	-115.949
ASP104	Mores Creek	43.651	-115.981
ASP105	Weiser River	44.255	-116.773
ASP122	Snake River	43.661	-111.723
ASP123	Rock Creek	42.551	-114.479
ASP126	Henrys Fork	43.962	-111.694
ASP127	Salmon Falls Creek	42.049	-114.741

Table A2. Analytical results, including fish and water.

Site ID	Sample_Tag	Species	Count	Note	Sample_Date	Matrix	Analyte	Result	MDL	MRL	Units	Qualifiers
ASP004	ASP004				10/15/2019	Water	As	2.54	0.012	0.041	µg/L	
ASP004	ASP004				10/15/2019	Water	As(Inorg)	1.61	0.040	0.200	µg/L	
ASP004	ASP004A	Catfish sp.	4		10/15/2019	Fish	As 91 [O2]	0.011	0.009	0.021	mg/kg	J
ASP004	ASP004A	Catfish sp.	4		10/15/2019	Fish	InorgAs	0.2	0.2	1.0	µg/kg	U
ASP004	ASP004B	Largemouth Bass	3		10/15/2019	Fish	As 91 [O2]	0.128	0.008	0.019	mg/kg	
ASP004	ASP004B	Largemouth Bass	3		10/15/2019	Fish	InorgAs	1.1	0.2	0.8	µg/kg	
ASP005	ASP005				10/16/2019	Water	As	1.11	0.012	0.041	µg/L	
ASP005	ASP005				10/16/2019	Water	As(Inorg)	0.649	0.040	0.200	µg/L	
ASP005	ASP005A	Brown Trout	2		10/16/2019	Fish	As 91 [O2]	0.021	0.010	0.022	mg/kg	J
ASP005	ASP005A	Brown Trout	2		10/16/2019	Fish	InorgAs	0.4	0.2	1.0	µg/kg	J
ASP005	ASP005B	Common Carp	1		10/16/2019	Fish	As 91 [O2]	0.009	0.007	0.016	mg/kg	J
ASP005	ASP005B	Common Carp	1		10/16/2019	Fish	InorgAs	0.2	0.2	0.8	µg/kg	U
ASP007	ASP007				08/20/2019	Water	As	0.449	0.012	0.041	µg/L	
ASP007	ASP007				08/20/2019	Water	As(Inorg)	0.381	0.040	0.200	µg/L	
ASP007	ASP007D			Water duplicate	08/20/2019	Water	As	0.467	0.012	0.041	µg/L	
ASP007	ASP007D			Water duplicate	08/20/2019	Water	As(Inorg)	0.355	0.040	0.200	µg/L	
ASP007	ASP007A	Rainbow Trout	5		08/20/2019	Fish	As 91 [O2]	0.019	0.009	0.022	mg/kg	J
ASP007	ASP007A	Rainbow Trout	5		08/20/2019	Fish	InorgAs	0.6	0.3	0.8	µg/kg	J
ASP007	ASP007B	Cutthroat Trout	2		08/20/2019	Fish	As 91 [O2]	0.248	0.009	0.022	mg/kg	
ASP007	ASP007B	Cutthroat Trout	2		08/20/2019	Fish	InorgAs	0.5	0.3	0.8	µg/kg	J
ASP008	ASP008				08/20/2019	Water	As	0.989	0.012	0.041	µg/L	
ASP008	ASP008				08/20/2019	Water	As(Inorg)	0.973	0.040	0.200	µg/L	
ASP008	ASP008A	Brown Trout	5		08/20/2019	Fish	As 91 [O2]	0.100	0.009	0.021	mg/kg	

Site ID	Sample_Tag	Species	Count	Note	Sample_Date	Matrix	Analyte	Result	MDL	MRL	Units	Qualifiers
ASP008	ASP008A	Brown Trout	5		08/20/2019	Fish	InorgAs	0.9	0.3	0.8	µg/kg	
ASP008	ASP008B	Cutthroat Trout	3		08/20/2019	Fish	As 91 [O2]	0.034	0.009	0.020	mg/kg	
ASP008	ASP008B	Cutthroat Trout	3		08/20/2019	Fish	InorgAs	1.3	0.3	0.8	µg/kg	
ASP026	ASP026				10/02/2019	Water	As(Inorg)	0.040	0.040	0.200	µg/L	U
ASP026	ASP026				10/02/2019	Water	As	0.070	0.012	0.041	µg/L	
ASP026	ASP026A	Cutthroat Trout	2		10/02/2019	Fish	As 91 [O2]	0.016	0.007	0.017	mg/kg	J
ASP026	ASP026A	Cutthroat Trout	2		10/02/2019	Fish	InorgAs	0.5	0.2	0.9	µg/kg	J
ASP026	ASP026B	Sculpin sp.	4		10/02/2019	Fish	As 91 [O2]	0.011	0.008	0.019	mg/kg	J
ASP026	ASP026B	Sculpin sp.	4		10/02/2019	Fish	InorgAs	0.2	0.2	0.9	µg/kg	U
ASP027	ASP027				10/02/2019	Water	As(Inorg)	0.131	0.040	0.200	µg/L	J
ASP027	ASP027				10/02/2019	Water	As	0.218	0.012	0.041	µg/L	
ASP027	ASP027A	Cutthroat Trout	1		10/02/2019	Fish	As 91 [O2]	0.038	0.009	0.021	mg/kg	
ASP027	ASP027A	Cutthroat Trout	1		10/02/2019	Fish	InorgAs	0.7	0.2	0.8	µg/kg	J
ASP027	ASP027B	Dace sp.	3		10/02/2019	Fish	As 91 [O2]	0.031	0.009	0.020	mg/kg	
ASP027	ASP027B	Dace sp.	3		10/02/2019	Fish	InorgAs	0.3	0.2	1.0	µg/kg	J
ASP031	ASP031				10/01/2019	Water	As(Inorg)	0.076	0.040	0.200	µg/L	J
ASP031	ASP031				10/01/2019	Water	As	0.152	0.012	0.041	µg/L	
ASP031	ASP031A	Rainbow Trout	5		10/01/2019	Fish	As 91 [O2]	0.053	0.007	0.015	mg/kg	
ASP031	ASP031A	Rainbow Trout	5		10/01/2019	Fish	InorgAs	7.4	0.2	0.9	µg/kg	
ASP031	ASP031B	Sculpin sp.	5		10/01/2019	Fish	As 91 [O2]	0.014	0.008	0.018	mg/kg	J
ASP031	ASP031B	Sculpin sp.	5		10/01/2019	Fish	InorgAs	0.9	0.2	1.0	µg/kg	J
ASP035	ASP035				09/10/2019	Water	As	0.338	0.012	0.041	µg/L	
ASP035	ASP035				09/10/2019	Water	As(Inorg)	0.154	0.040	0.200	µg/L	J
ASP035	ASP035A	Redside Shiner	4		09/10/2019	Fish	As 91 [O2]	0.022	0.009	0.020	mg/kg	

Site ID	Sample_Tag	Species	Count	Note	Sample_Date	Matrix	Analyte	Result	MDL	MRL	Units	Qualifiers
ASP035	ASP035A	Redside Shiner	4		09/10/2019	Fish	InorgAs	0.3	0.3	0.9	µg/kg	U
ASP035	ASP035B	Northern Pikeminnow	2		09/10/2019	Fish	As 91 [O2]	0.008	0.008	0.020	mg/kg	U
ASP035	ASP035B	Northern Pikeminnow	2		09/10/2019	Fish	InorgAs	0.3	0.3	0.9	µg/kg	U
ASP051	ASP051				09/10/2019	Water	As	0.283	0.012	0.041	µg/L	
ASP051	ASP051				09/10/2019	Water	As(Inorg)	0.258	0.040	0.200	µg/L	
ASP051	ASP051A	Cutthroat Trout	3		09/03/2019	Fish	As 91 [O2]	0.050	0.009	0.020	mg/kg	
ASP051	ASP051A	Cutthroat Trout	3		09/03/2019	Fish	InorgAs	0.6	0.3	1.0	µg/kg	J
ASP051	ASP051B	Sculpin sp.	5		09/10/2019	Fish	As 91 [O2]	0.053	0.010	0.022	mg/kg	
ASP051	ASP051B	Sculpin sp.	5		09/10/2019	Fish	InorgAs	1.1	0.3	0.9	µg/kg	
ASP052	ASP052				09/09/2019	Water	As	0.633	0.012	0.041	µg/L	
ASP052	ASP052				09/09/2019	Water	As(Inorg)	0.580	0.040	0.200	µg/L	
ASP052	ASP052A	Rainbow Trout	4		09/09/2019	Fish	As 91 [O2]	0.173	0.009	0.022	mg/kg	
ASP052	ASP052A	Rainbow Trout	4		09/09/2019	Fish	InorgAs	9.4	0.3	0.9	µg/kg	
ASP052	ASP052B	Brook Trout	3		09/10/2019	Fish	As 91 [O2]	0.583	0.009	0.021	mg/kg	
ASP052	ASP052B	Brook Trout	3		09/10/2019	Fish	InorgAs	2.0	0.3	0.9	µg/kg	
ASP056	ASP056				09/09/2019	Water	As	0.783	0.012	0.041	µg/L	
ASP056	ASP056				09/09/2019	Water	As(Inorg)	0.741	0.040	0.200	µg/L	
ASP056	ASP056A	Cutthroat Trout	2		09/10/2019	Fish	As 91 [O2]	0.152	0.009	0.021	mg/kg	
ASP056	ASP056A	Cutthroat Trout	2		09/10/2019	Fish	InorgAs	0.3	0.3	0.9	µg/kg	U
ASP056	ASP056B	Sculpin sp.	5		09/10/2019	Fish	As 91 [O2]	0.062	0.009	0.021	mg/kg	
ASP056	ASP056B	Sculpin sp.	5		09/10/2019	Fish	InorgAs	3.4	0.3	0.9	µg/kg	
ASP062	ASP062				09/10/2019	Water	As	0.202	0.012	0.041	µg/L	
ASP062	ASP062				09/10/2019	Water	As(Inorg)	0.206	0.040	0.200	µg/L	
ASP062	ASP062A	Rainbow Trout	1		09/10/2019	Fish	As 91 [O2]	0.100	0.008	0.020	mg/kg	

Site ID	Sample_Tag	Species	Count	Note	Sample_Date	Matrix	Analyte	Result	MDL	MRL	Units	Qualifiers
ASP062	ASP062A	Rainbow Trout	1		09/10/2019	Fish	InorgAs	0.3	0.3	0.9	µg/kg	U
ASP062	ASP062B	Cutthroat Trout	2		09/10/2019	Fish	As 91 [O2]	0.054	0.008	0.019	mg/kg	
ASP062	ASP062B	Cutthroat Trout	2		09/10/2019	Fish	InorgAs	8.8	0.3	1.0	µg/kg	
ASP076	ASP076				10/13/2019	Water	As	1.71	0.012	0.041	µg/L	
ASP076	ASP076				10/13/2019	Water	As(Inorg)	1.16	0.040	0.200	µg/L	
ASP076	ASP076A	Northern Pikeminnow	1		10/13/2019	Fish	As 91 [O2]	0.0009	0.0009	0.002	mg/kg	U
ASP076	ASP076A	Northern Pikeminnow	1		10/13/2019	Fish	InorgAs	0.2	0.2	0.9	µg/kg	J
ASP088	ASP088				10/08/2019	Water	As	5.20	0.012	0.041	µg/L	
ASP088	ASP088				10/08/2019	Water	As(Inorg)	4.15	0.040	0.200	µg/L	
ASP088	ASP088A	Sculpin sp.	4		10/08/2019	Fish	As 91 [O2]	0.041	0.009	0.022	mg/kg	
ASP088	ASP088A	Sculpin sp.	4		10/08/2019	Fish	InorgAs	3.3	0.2	0.9	µg/kg	
ASP088	ASP088B	Dace sp.	2		10/08/2019	Fish	As 91 [O2]	0.068	0.010	0.023	mg/kg	
ASP088	ASP088B	Dace sp.	2		10/08/2019	Fish	InorgAs	3.4	0.2	0.9	µg/kg	
ASP090	ASP090				10/14/2019	Water	As	1.56	0.012	0.041	µg/L	
ASP090	ASP090				10/14/2019	Water	As(Inorg)	1.04	0.040	0.200	µg/L	
ASP090	ASP090B				10/14/2019	Water	As	0.012	0.012	0.041	µg/L	U
ASP090	ASP090B				10/14/2019	Water	As(Inorg)	0.040	0.040	0.200	µg/L	U
ASP090	ASP090D			Water duplicate	10/14/2019	Water	As	1.51	0.012	0.041	µg/L	
ASP090	ASP090D			Water duplicate	10/14/2019	Water	As(Inorg)	1.04	0.040	0.200	µg/L	
ASP090	ASP090A	Mountain Whitefish	5		10/14/2019	Fish	As 91 [O2]	0.038	0.008	0.019	mg/kg	
ASP090	ASP090A	Mountain Whitefish	5		10/14/2019	Fish	InorgAs	0.4	0.2	1.0	µg/kg	J
ASP090	ASP090Ad	Mountain Whitefish	5	Fish duplicate	10/14/2019	Fish	As 91 [O2]	0.025	0.008	0.018	mg/kg	
ASP090	ASP090Ad	Mountain	5	Fish	10/14/2019	Fish	InorgAs	0.2	0.2	0.9	µg/kg	U

Site ID	Sample_Tag	Species	Count	Note	Sample_Date	Matrix	Analyte	Result	MDL	MRL	Units	Qualifiers
		Whitefish		duplicate								
ASP090	ASP090B	Northern Pikeminnow	5		10/14/2019	Fish	As 91 [O2]	0.061	0.006	0.015	mg/kg	
ASP090	ASP090B	Northern Pikeminnow	5		10/14/2019	Fish	InorgAs	0.2	0.2	1.0	µg/kg	U
ASP090	ASP090c	Cutthroat Trout	2		10/14/2019	Fish	As 91 [O2]	0.033	0.008	0.019	mg/kg	
ASP090	ASP090c	Cutthroat Trout	2		10/14/2019	Fish	InorgAs	0.2	0.2	0.8	µg/kg	U
ASP091	ASP091				09/20/2019	Water	As	2.54	0.012	0.041	µg/L	
ASP091	ASP091				09/20/2019	Water	As(Inorg)	2.64	0.040	0.200	µg/L	
ASP091	ASP091B			Water blank	09/20/2019	Water	As	0.012	0.012	0.041	µg/L	U
ASP091	ASP091B			Water blank	09/20/2019	Water	As(Inorg)	0.040	0.040	0.200	µg/L	U
ASP091	ASP091A	Cutthroat Trout	5		09/20/2019	Fish	As 91 [O2]	0.278	0.009	0.020	mg/kg	
ASP091	ASP091A	Cutthroat Trout	5		09/20/2019	Fish	InorgAs	3.4	0.2	0.9	µg/kg	
ASP091	ASP091B	Sculpin sp.	4		09/20/2019	Fish	As 91 [O2]	0.145	0.010	0.023	mg/kg	
ASP091	ASP091B	Sculpin sp.	4		09/20/2019	Fish	InorgAs	9.1	0.2	0.9	µg/kg	
ASP100	ASP100				08/16/2019	Water	As(Inorg)	1.24	0.040	0.200	µg/L	
ASP100	ASP100				08/16/2019	Water	As	1.20	0.012	0.041	µg/L	
ASP100	ASP100A	Rainbow Trout	5		08/16/2019	Fish	As 91 [O2]	0.114	0.009	0.021	mg/kg	
ASP100	ASP100A	Rainbow Trout	5		08/16/2019	Fish	InorgAs	3.3	0.3	0.8	µg/kg	
ASP100	ASP100B	Sculpin sp.	5		08/16/2019	Fish	As 91 [O2]	0.117	0.009	0.020	mg/kg	
ASP100	ASP100B	Sculpin sp.	5		08/16/2019	Fish	InorgAs	1.6	0.3	0.8	µg/kg	
ASP102	ASP102				08/21/2019	Water	As	0.759	0.012	0.041	µg/L	
ASP102	ASP102				08/21/2019	Water	As(Inorg)	0.608	0.040	0.200	µg/L	
ASP102	ASP102A	Northern Pikeminnow	2		08/21/2019	Fish	As 91 [O2]	0.022	0.009	0.020	mg/kg	
ASP102	ASP102A	Northern	2		08/21/2019	Fish	InorgAs	0.8	0.4	0.9	µg/kg	J

Site ID	Sample_Tag	Species	Count	Note	Sample_Date	Matrix	Analyte	Result	MDL	MRL	Units	Qualifiers
		Pikeminnow										
ASP102	ASP102B	Bridgelip Sucker	5		08/21/2019	Fish	As 91 [O2]	0.031	0.009	0.022	mg/kg	
ASP102	ASP102B	Bridgelip Sucker	5		08/21/2019	Fish	InorgAs	2.3	0.4	0.9	µg/kg	
ASP104	ASP104				08/14/2019	Water	As(Inorg)	4.22	0.040	0.200	µg/L	
ASP104	ASP104				08/14/2019	Water	As	4.52	0.012	0.041	µg/L	
ASP104	ASP104A	Rainbow Trout	3		08/14/2019	Fish	As 91 [O2]	0.169	0.009	0.021	mg/kg	
ASP104	ASP104A	Rainbow Trout	3		08/14/2019	Fish	InorgAs	0.7	0.3	0.9	µg/kg	J
ASP104	ASP104B	Bridgelip Sucker	5		08/14/2019	Fish	As 91 [O2]	0.108	0.009	0.021	mg/kg	
ASP104	ASP104B	Bridgelip Sucker	5		08/14/2019	Fish	InorgAs	10.0	0.3	0.8	µg/kg	
ASP104	ASP104BD	Bridgelip Sucker	5	Fish Duplicate	08/22/2019	Fish	As 91 [O2]	0.087	0.009	0.021	mg/kg	
ASP104	ASP104BD	Bridgelip Sucker	5	Fish Duplicate	08/22/2019	Fish	InorgAs	4.4	0.3	0.9	µg/kg	
ASP105	ASP105				09/03/2019	Water	As	1.83	0.012	0.041	µg/L	
ASP105	ASP105				09/03/2019	Water	As(Inorg)	1.37	0.040	0.200	µg/L	
ASP105	ASP105A	Smallmouth Bass	5		09/03/2019	Fish	As 91 [O2]	0.069	0.010	0.023	mg/kg	
ASP105	ASP105A	Smallmouth Bass	5		09/03/2019	Fish	InorgAs	0.3	0.3	0.9	µg/kg	U
ASP105	ASP105B	Redside Shiner	5		09/03/2019	Fish	As 91 [O2]	0.013	0.009	0.021	mg/kg	J
ASP105	ASP105B	Redside Shiner	5		09/03/2019	Fish	InorgAs	0.5	0.3	0.9	µg/kg	J
ASP122	ASP122				10/17/2019	Water	As	3.00	0.012	0.041	µg/L	
ASP122	ASP122				10/17/2019	Water	As(Inorg)	2.17	0.040	0.200	µg/L	
ASP122	ASP122A	Brown Trout	5		10/17/2019	Fish	As 91 [O2]	0.037	0.010	0.023	mg/kg	
ASP122	ASP122A	Brown Trout	5		10/17/2019	Fish	InorgAs	0.2	0.2	0.9	µg/kg	U
ASP122	ASP122B	Mountain Whitefish	5		10/17/2019	Fish	As 91 [O2]	0.046	0.007	0.016	mg/kg	

Site ID	Sample_Tag	Species	Count	Note	Sample_Date	Matrix	Analyte	Result	MDL	MRL	Units	Qualifiers
ASP122	ASP122B	Mountain Whitefish	5		10/17/2019	Fish	InorgAs	0.5	0.2	0.8	µg/kg	J
ASP123	ASP123				09/18/2019	Water	As	7.25	0.012	0.041	µg/L	
ASP123	ASP123				09/18/2019	Water	As(Inorg)	8.12	0.040	0.200	µg/L	
ASP123	ASP123A	Brown Trout	1		09/18/2019	Fish	As 91 [O2]	0.122	0.008	0.018	mg/kg	
ASP123	ASP123A	Brown Trout	1		09/18/2019	Fish	InorgAs	0.2	0.2	0.9	µg/kg	J
ASP126	ASP126				10/16/2019	Water	As	5.62	0.012	0.041	µg/L	
ASP126	ASP126				10/16/2019	Water	As(Inorg)	4.20	0.040	0.200	µg/L	
ASP126	ASP126A	Brown Trout	5		10/16/2019	Fish	As 91 [O2]	0.024	0.010	0.023	mg/kg	
ASP126	ASP126A	Brown Trout	5		10/16/2019	Fish	InorgAs	0.2	0.2	1.0	µg/kg	U
ASP126	ASP126AD	Brown Trout	5	Fish Duplicate	10/16/2019	Fish	As 91 [O2]	0.017	0.006	0.014	mg/kg	
ASP126	ASP126AD	Brown Trout	5	Fish Duplicate	10/16/2019	Fish	InorgAs	0.2	0.2	0.9	µg/kg	J
ASP127	ASP127				08/21/2019	Water	As	3.18	0.012	0.041	µg/L	
ASP127	ASP127				08/21/2019	Water	As(Inorg)	3.06	0.040	0.200	µg/L	
ASP127	ASP127A	Northern Pikeminnow	2		08/21/2019	Fish	As 91 [O2]	0.016	0.009	0.020	mg/kg	J
ASP127	ASP127A	Northern Pikeminnow	2		08/21/2019	Fish	InorgAs	0.6	0.3	0.8	µg/kg	J

Qualifiers: U indicates analytical results were <MDL; J indicates analytical result was >MDL but <MRL.