Lower Salmon River Mercury Fish Tissue Sampling Project Report

Assessment Unit ID17060209SL008_07—
Slate Creek to Rice Creek

State of Idaho
Department of Environmental Quality

Lewiston Regional Office

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Acknowledgements

Daniel Stewart, Jason Pappani, Mark Sellet, Hawk Stone, and Ian Yoder performed field work. Hawk Stone was the project quality assurance officer. Cindy Barrett, Sujata Connell, and John Cardwell were involved with project management. Jason Williams wrote the report. The Idaho Bureau of Laboratories performed laboratory analyses.

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Executive Summary

In October 2016, the Idaho Department of Environmental Quality (DEQ) sampled Smallmouth Bass within a 27-mile segment of the lower Salmon River to evaluate if mercury concentrations in fish pose a human health risk. DEQ sampled a segment of the lower Salmon River between Slate Creek and Rice Creek (assessment unit ID17060209SL008_07) because a previous statewide assessment of mercury in Idaho rivers found fish with elevated mercury concentrations in this river segment.

Total mercury concentrations were measured in 22 Smallmouth Bass approximately 10 inches and longer (the size typically kept by anglers). The average total mercury concentration in Smallmouth Bass fish tissue was 0.579 milligrams total mercury per kilogram of wet weight fish tissue (mg/kg). Idaho's water quality standard for protecting recreational (i.e., fishing) use of a water body is 0.3 mg/kg methylmercury in fish tissue; tissue concentrations exceeding this value are considered to pose an unacceptable human health risk. Considering a large percentage (often >90%) of total mercury in fish tissue is in the form of methylmercury, especially for predatory and high trophic level game fish such as Smallmouth Bass, the observed concentration of 0.579 mg/kg is considered to exceed Idaho's water quality standard. Based on results, the associated assessment unit does not support the secondary contact recreation beneficial use and will remain on Idaho's list of impaired waters (§303(d) list) under the Clean Water Act in Idaho's next Integrated Report.

This report will be provided to the Idaho Department of Health and Welfare Fish Advisory Program. Smallmouth Bass within the sampled segment are already covered by an existing statewide fish consumption advisory due to mercury.

Further investigation would be needed to identify sources of mercury and their relative contributions to elevated fish tissue concentrations within the sampled stream segment. Potential anthropogenic sources of mercury to Idaho water bodies may include mercury associated with current or historic mining activities within the watershed and air emissions from coal-fired power plants and other industries in the Pacific Northwest and beyond. Definitively identifying mercury sources and delineating their relative importance is beyond the scope of this report and would require further investigation.

1 Background

Mercury is a toxic metal present in air, soil, and water that can pose health risks to wildlife and humans (Driscoll et al. 2013). Humans are exposed to mercury primarily by consuming mercury-contaminated fish or shellfish (ATSDR 1999; EPA 2001). Methylmercury, an organic form of mercury that can enter aquatic food webs and reach elevated concentrations in fish tissue, is a potent neurotoxin. It can cause damage to the central nervous system, personality changes, changes in vision or hearing, memory impairment, interference with brain development of young children, and brain damage in a developing fetus (ATSDR 1999).

In Idaho, mercury in the environment may derive from natural or anthropogenic sources. Natural sources of mercury include ore deposits and geothermal features within Idaho and distant natural sources such as emissions from volcanoes and mercury volatilization from the oceans (DEQ 2005; Driscoll et al. 2013). Anthropogenic sources of mercury may include use of mercury in gold mining processes and air emissions from coal-fired power plants and other industries in the Pacific Northwest and beyond (DEQ 2005, 2013; Driscoll et al. 2013; UNEP 2013).

Mercury inputs to Idaho water bodies combined with particular physical, chemical, and ecological conditions within water bodies can cause elevated methylmercury concentrations in fish consumed by humans (Driscoll et al. 2013; Eagles-Smith et al. 2016a). Mercury cycling in the environment is complex and occurs at global and local scales. Inorganic mercury present in a watershed from atmospheric or local input sources interacts with the landscape, which determines the amount of mercury transported to a water body. Once in a water body, inorganic mercury is converted to methylmercury by anaerobic bacteria, typically in aquatic sediments. The rate of methylation depends on multiple chemical and biological factors (Driscoll et al. 2013).

Once methylmercury has been created, it can be taken up by aquatic organisms from water or food; this process is called bioaccumulation. The rate of methylmercury bioaccumulation depends on chemical conditions in water bodies and ecological variables including organism feeding habits (Eagles-Smith et al. 2016a). When methylmercury bioaccumulates in aquatic organisms, it then increases in concentration up the food chain through a process called biomagnification, causing predators to have greater tissue pollutant concentrations than their prey. The rate of biomagnification depends on food web structure, among other factors (Lavoie et al. 2013; Eagles-Smith et al. 2016a). Through these processes, methylmercury concentrations in fish consumed by anglers can have concentrations that pose human health risks.

1.1 Idaho Methylmercury Criterion

To address human health risks of methylmercury associated with fish consumption, the Idaho Department of Environmental Quality (DEQ) adopted the US Environmental Protection Agency (EPA) 2001 water quality criterion for methylmercury (EPA 2001) as the state’s methylmercury water quality standard (DEQ 2005). This criterion is expressed as a fish tissue residue value (wet-weight methylmercury in fish tissue). Fish tissue concentrations greater than 0.3 milligrams methylmercury per kilogram fish tissue wet weight (mg/kg) are considered to pose an unacceptable health risk to humans.

DEQ uses this methylmercury fish tissue criterion to evaluate if the recreational use of a water body (i.e., fishing) is impaired by mercury under the Clean Water Act. If methylmercury concentrations in fish from an Idaho water body exceed the criterion, the water body will be placed on Idaho's list of impaired waters (§303(d) list), which is published as part of Idaho's biennial Integrated Report. Placing a water body on the §303(d) list for mercury triggers a need by DEQ to develop a plan to reduce fish tissue concentrations to below the 0.3 mg/kg methylmercury concentration that poses an unacceptable human health risk.

If mercury causing the fish tissue criterion exceedance comes primarily from air pollution and atmospheric deposition of mercury to the watershed, a plan for regional air pollution control activities and land use best management practices may be needed to reduce the amount of mercury entering the water body (DEQ 2005). If the mercury comes from anthropogenic sources within the watershed, such as current or legacy mining activities, DEQ needs to develop a water quality improvement plan known as a total maximum daily load (DEQ 2005). The goal of a mercury total maximum daily load would be to reduce mercury inputs or address processes of mercury methylation and bioaccumulation and thereby reduce fish tissue concentrations to below the 0.3 mg/kg criterion.

When water bodies are found to have methylmercury levels above what is considered safe, the Idaho Department of Health and Welfare (IDHW) issues fish consumption advisories through the Idaho Fish Consumption Advisory Program. When DEQ monitoring identifies elevated mercury concentrations in fish tissue, DEQ provides that information to IDHW. Currently, there is a statewide fish consumption advisory for Largemouth and Smallmouth Bass due to mercury. IDHW has also issued fish consumption advisories for specific water bodies in Idaho; such advisories may be due to mercury or other pollutants. The process IDHW uses to determine if a fish consumption advisory is warranted is different from the process DEQ uses to determine if fish tissue concentrations exceed the methylmercury criterion (DEQ 2005). As a result, a fish consumption advisory does not necessarily mean the methylmercury criterion has been exceeded (DEQ 2005).

1.2 Statewide River Mercury Assessment, 2006–2008

In 2006–2008, DEQ conducted a statewide assessment of mercury in Idaho's major rivers (Essig 2010). The objective of the assessment was to determine the proportion of major rivers in Idaho with an average mercury concentration in fish that exceeds the 0.3 mg/kg methylmercury criterion. At each site sampled, the average total (organic plus inorganic) mercury (THg) concentration in muscle tissue was quantified for each fish species collected, based on a composite of muscle tissue samples from up to 10 individuals from the site (Essig 2010). THg was measured rather than methylmercury because THg measurements are less expensive and because a large percentage (often >90%) of THg in fish tissue is in the form of methylmercury, especially for predatory and high trophic level game fish (Essig 2010). Assuming all THg is in the form of methylmercury is protective because all THg may not actually be in the form of methylmercury.

For each sample site, a site trophic level weighted average fish tissue THg concentration was calculated and compared to the 0.3 mg/kg methylmercury criterion, following the DEQ *Implementation Guidance for the Idaho Mercury Water Quality Criteria* (DEQ 2005).

During the assessment, three sites on the lower Salmon River were sampled (Figure 1). At all three sites, composite fish samples from one species were greater than the 0.3 mg/kg criterion (Table 1). In addition, two sites had site trophic level weighted average concentrations that exceeded the 0.3 mg/kg methylmercury criterion value (Table 1).

Because the trophic level weighted average exceeded the criterion at Salmon River #2, the associated stream segment (assessment unit ID17060209SL008_07) was placed on Idaho's §303(d) list due to mercury impairment in Idaho's 2008 Integrated Report and has remained on the list. Although the trophic level weighted average at Salmon River #3 also exceeded the criterion (Table 1), the associated stream segment was not placed on the §303(d) list and is currently categorized as not assessed (Category 3) in Idaho's most recent approved Integrated Report (DEQ 2017). The trophic level weighted average value at Salmon River #3 was based on only two Smallmouth Bass individuals, whereas the guidance (DEQ 2005) recommends a trophic level weighted average based on samples from at least 10 fish per species of the typical size consumed by anglers.

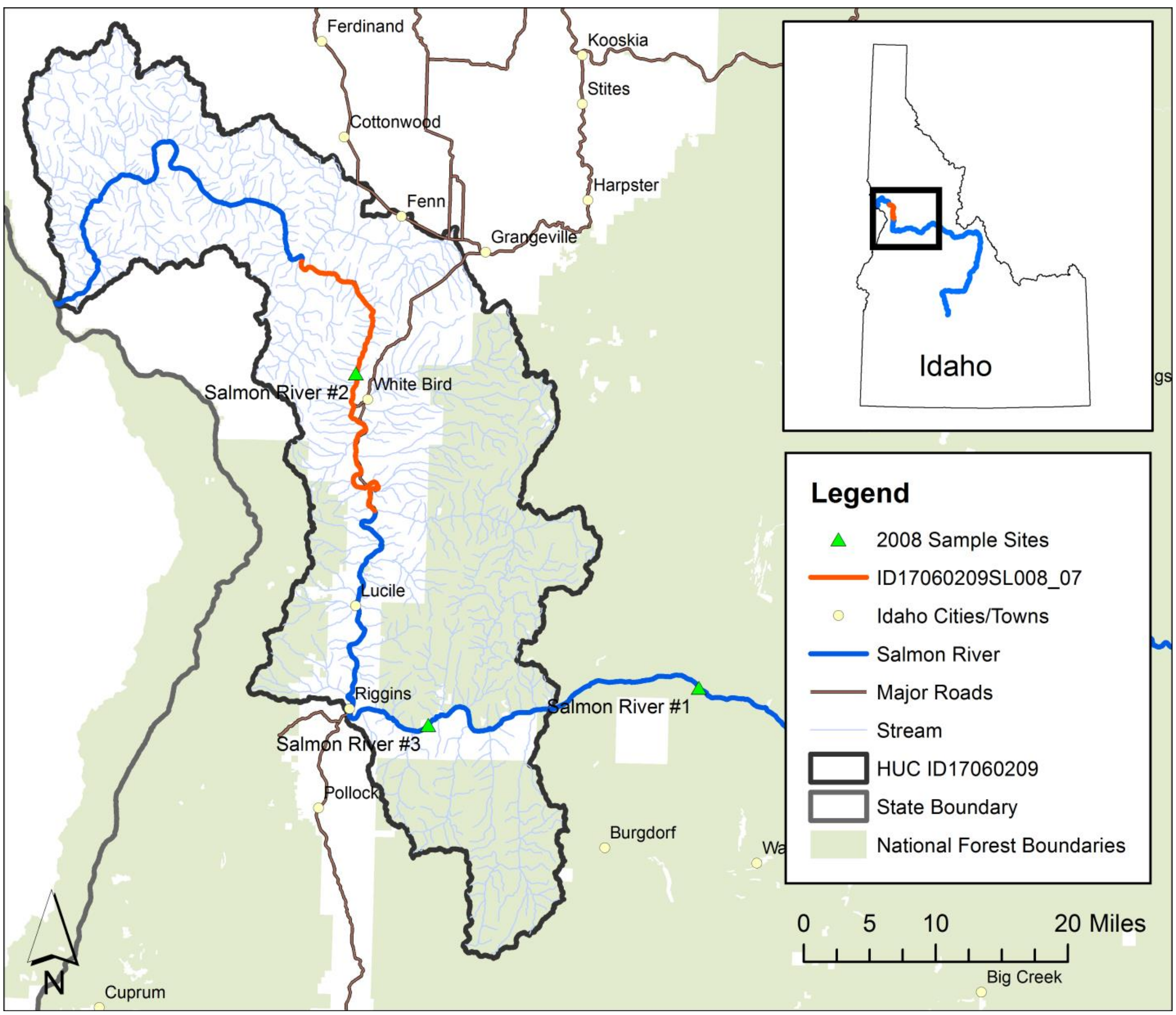

Figure 1. Location of assessment unit ID17060209SL008_07 (sampled in this study), 2008 sample sites, and US Geological Survey lower Salmon River hydrologic unit code (HUC) 17060209.

Table 1. 2008 mercury fish tissue results from lower Salmon River sites. THg values for individual species are from composite samples. Trophic level weighted averages were calculated as described in Equation 1.

Site Name	Assessment Unit Number	Species	# of fish	THg (mg/kg)
Salmon River #1	ID17060207SL001_07	Mountain Whitefish	1	0.097
		Northern Pikeminnow	5	**0.674**
		Smallmouth Bass	1	0.253
		Trophic level weighted average	7	0.249
Salmon River #2	ID17060209SL008_07	Mountain Whitefish	1	0.142
		Smallmouth Bass	9	**0.548**
		Trophic level weighted average	10	**0.311**
Salmon River #3	ID17060209SL019_07	Smallmouth Bass	2	**0.380**
		Trophic level weighted average	2	**0.380**

Note: Bold values exceed the Idaho methylmercury criterion of 0.3 mg/kg.

2 Objective

The objective of this study was to confirm if fish tissue mercury concentrations in assessment unit ID17060209SL008_07 (Figure 1) still exceed the methylmercury criterion. Although the previous assessment yielded a trophic level weighted average at Salmon River #2 exceeding the criterion (Table 1), additional investigation was needed for several reasons. First, the trophic level weighted average was calculated based on data from only one location within a 27.89 mile long reach. Additional sampling was needed to determine if elevated fish tissue mercury is localized or occurs throughout the entire assessment unit. Second, the trophic level weighted average THg concentration was within 20% of the 0.3 mg/kg methylmercury criterion. DEQ guidance (DEQ 2005) states additional elective monitoring can be conducted to confirm water body impairment due to mercury when THg concentrations are within 20% of 0.3 mg/kg (0.24 to 0.36 mg/kg). Third, the DEQ guidance for implementing the methylmercury criterion (DEQ 2005) recommends that a trophic level weighted average be calculated based on samples from at least 10 fish of the typical size consumed by anglers per species, but fewer than 10 fish per species were sampled previously (Table 1). Sampling performed in 2016 allowed for a more comprehensive assessment.

3 Methods

Assessment unit ID17060209SL008_07 was sampled on October 3 and 4, 2016, to quantify THg concentrations in Smallmouth Bass (*Micropterus dolomieu*). Smallmouth Bass were sampled because they are a primary resident game fish consumed by anglers within the assessment unit. In addition, Smallmouth Bass was the only species at Salmon River #2 with a composite sample concentration exceeding the criterion (Table 1). Fish approximately 10 inches and longer were analyzed because this is the minimum length most people keep for consumption (Joe DuPont, IDFG, personal communication). A 10-inch Smallmouth Bass is approximately 4 to 6 years old.

Sampling was performed by a five person crew using two rafts (Appendix A). The crew met at Hammer Bar Campground near White Bird, approximately the half way point of the assessment unit. Vehicles were shuttled to the Pine Bar take-out point near Cottonwood, just above Rice Creek. On October 3, rafts were launched at the Slate Creek Campground and boat launch just below the mouth of Slate Creek. Sampling occurred between Slate Creek and Hammer Creek on October 3, and between Hammer Creek and Pine Bar on October 4.

To collect fish, an electrofishing raft was used and supplemented by hook and line fishing. Sample sites were approximately evenly spaced throughout the assessment unit, with sampling sites located at approximately 5 mile intervals throughout the 27-mile reach. Collected fish were euthanized, measured, wrapped in foil, and placed on dry ice in sealed coolers.

Frozen samples were delivered to the IDHW laboratory in Boise on October 5, 2016, for analysis. The laboratory thawed and weighed each whole fish and then subsampled muscle tissue for analysis. Muscle tissue was analyzed for THg according to EPA method 7473 (EPA 1998). The laboratory filleted each fish to collect and then analyze a muscle tissue sample; samples were not composited prior to analysis.

Analytical results were used to calculate a trophic level weighted average fish THg concentration for the assessment unit following Equation 1:

$$\text{Cavg} = \left(\frac{\sum_{i=1}^{n} (IR_i * C_i)}{\sum_{i=1}^{n} IR_i} \right)$$

Equation 1. Trophic level weighted average fish tissue concentration.

where:

Cavg = site trophic level weighted average fish tissue concentration (mg/kg)

IR_i = consumption factor species for a fish species of the *i*th trophic level (kg/day)

C_i = species average fish tissue concentration for a species of the *i*th trophic level

Following DEQ guidance (2005), EPA default consumption factor (*IR*) values were used in the calculation (5.7 grams/day for trophic level 4, Smallmouth Bass). Because only one fish species was collected and analyzed in this study, the trophic level weighted average is the same as the arithmetic mean of sampled fish. The mean THg concentration in collected fish was compared to the mercury fish tissue criterion to assess if recreation use is supported within the assessment unit. Data quality assurance / quality control (QA/QC) was evaluated according to guidelines in the *Quality Assurance Project Plan: Lower Salmon River Mercury Fish Tissue Sampling Project (Assessment Unit ID17060209SL008_07)* (DEQ 2016). A summary of the QA/QC evaluation is provided in Appendix B.

4 Results

A total of 22 Smallmouth Bass were collected and analyzed. Fish lengths and weights ranged from 10.25 to 17.5 inches and 205–984 grams, respectively (Table 2). All but one of the analyzed fish had THg concentrations greater than 0.3 mg/kg. The lowest muscle THg concentration (0.28 mg/kg) was in a 10.75-inch fish, and the highest concentration (1.1 mg/kg) was in a 17.5-inch fish (Table 2). All data met project QA/QC goals and are considered suitable for calculating a trophic level weighted mean and assessing beneficial use support status (Appendix B). The trophic level weighted mean concentration (equivalent to the arithmetic mean in this case) was 0.579 mg/kg, which exceeds the 0.3 mg/kg criterion.

Table 2. Length, weight, and total mercury concentrations in sampled Smallmouth Bass.

Lab Sample ID	DEQ Sample ID	Total Mercury (mg/kg)	Weight (grams)	Length (inches)
E161000040-001	001	0.75	468	13.5
E161000040-002	002	0.41	467	12.5
E161000040-003	003	0.49	352	12.0
E161000040-004	004	0.32	205	10.25
E161000040-005	005	0.41	377	11.75
E161000040-006	006	0.59	432	13.0
E161000040-007	007	0.47	401	12.5
E161000040-008	008	0.85	734	15.5
E161000040-009	009	0.64	625	14.0
E161000040-010	010	0.37	320	11.75
E161000040-011	011	0.93	591	14.5
E161000040-012	012	0.9	791	15.5
E161000040-013	013	1.1	984	17.5
E161000040-014	014	0.68	675	15.0
E161000040-015	015	0.79	536	13.75
E161000040-016	016	0.54	369	12.0
E161000040-017	017	0.28	254	10.75
E161000040-018	018	0.5	317	11.5
E161000040-019	019	0.42	396	13.0
E161000040-020	020	0.52	499	13.5
E161000040-021	021	0.32	418	12.75
E161000040-022	022	0.46	386	12.0

5 Potential Sources of Mercury

Definitively identifying potential sources of mercury to assessment unit ID17060209SL008_07 is beyond the scope of this report. However, a general discussion of potential impacts of local sources and anthropogenic atmospheric deposition is provided below.

DEQ previously reviewed potential sources of mercury to Idaho waters (DEQ 2005). Natural sources of mercury include ore deposits and geothermal features within Idaho and distant sources such as emissions from volcanoes and mercury volatilization from the oceans (DEQ 2005; Driscoll et al. 2013). Cinnabar ore deposits are a primary geologic source of mercury. Cinnabar generally occurs as a vein-filling mineral associated with recent volcanic activity and alkaline hot springs and is a concern within the Salmon River basin. Cinnabar deposits and mercury mines are located within the Salmon River basin upstream of the study area, including a cinnabar mining district near Yellow Pine, Idaho (Larsen and Livingston 1920). Previous site investigations evaluated legacy mercury contamination associated with mercury mine sites within the Yellow Pine district (Etheridge 2015; EPA 2017). The lower Salmon River watershed was also a historically active gold mining area, and mining was a major land use along the Salmon River and in the Florence area (DEQ 2010). Mining was prohibited on land within a quarter mile of the lower Salmon River in 1986 when the Bureau of Land Management withdrew the area from mineral entry (DEQ 2010). The degree to which historic or current mining activities within the lower Salmon River watershed affect fish mercury concentrations observed in the lower Salmon River is not known.

Globally, the atmosphere is the primary transport pathway for mercury (Driscoll et al. 2013; UNEP 2013) and is an important source of mercury to ecosystems in the western United States (Eagles-Smith et al. 2016a). DEQ previously reviewed patterns of measured and modeled atmospheric wet deposition of mercury in Idaho (DEQ 2013). Those patterns did not suggest any major anomalies that could be attributed to local atmospheric emissions sources (DEQ 2013). Output of the EPA REMSAD mercury deposition model suggests mercury sources from outside the US may contribute 75% or more of mercury in Idaho wet deposition (DEQ 2013). The United Nations Environment Programme estimated Asia contributes almost half of global anthropogenic mercury emissions and is the dominant source for long-range airborne mercury transport (UNEP 2013).

The nearest mercury deposition monitoring site to the study area is operated by the National Atmospheric Deposition Program (NADP) Mercury Deposition Network (MDN), site ID99 in McCall, Idaho. The MDN measures mercury in wet deposition (rain and snow). Dry deposition may also be significant but is difficult to measure, and very limited measurement data are available. At the McCall mercury wet deposition monitoring site, the 2007-2010 average annual mercury concentration in precipitation was the lowest among monitoring stations in Idaho, but the average annual mercury wet deposition was highest due to high annual precipitation rates (DEQ 2013). Unfortunately, site ID99 has not been active since 2010 and other MDN monitoring sites in Idaho have not been active since 2011. Measured annual wet mercury deposition rates at ID99 and in Idaho in general were low relative to those in other regions of the United States. However, low mercury wet deposition rates don’t necessarily mean elevated mercury observed in fish tissue is not ultimately derived from atmospheric deposition. Mercury contamination in fish tissue is widespread throughout the western US (Eagles-Smith et al. 2016b), including remote locations such as national parks and wilderness areas with no known local sources and deposition rates similar to those in Idaho (Eagles-Smith et al. 2014). Mercury concentrations in fish tissue are mediated by mercury methylation rates and ecological factors within water bodies that influence mercury bioaccumulation and biomagnification (Eagles-Smith et al. 2016a) in addition to mercury input sources to a watershed or water body.

6 Conclusions

- The average Smallmouth Bass muscle tissue THg concentrations in assessment unit ID17060209SL008_07 was 0.579 mg/kg, which exceeds the 0.3 mg/kg methylmercury criterion.

- Exceedance of the criterion value indicates the secondary contact recreation beneficial use in assessment unit ID17060209SL008_07 is not supported, and this assessment unit will remain on Idaho's §303(d) list in Idaho's next Integrated Report.
- The final version of this report will be provided to the IDHW Fish Advisory Program. Smallmouth Bass within ID17060209SL008_07 are already covered by an existing statewide mercury fish consumption advisory.
- Within assessment unit ID17060209SL008_07, further investigation would be needed to identify sources of mercury and their relative contribution to elevated fish tissue concentrations. Developing a total maximum daily load would only be effective if reduction in local anthropogenic sources within the watershed, rather than atmospheric deposition from regional or global sources, could reduce fish tissue concentrations to below the 0.3 mg/kg methylmercury criterion.
- This AU may not be the only segment of the lower Salmon River with elevated fish tissue mercury concentrations. The 2006–2008 statewide assessment also identified other river segments with elevated mercury concentrations (Figure 1, Table 1), but a conclusive assessment is not possible in those other segments because of small sample sizes. Further sampling is needed to determine if fish tissue concentrations are also elevated in other segments of the lower Salmon River or its tributaries.

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Appendix A. Photos.

Figure A1. Preparing sampling rafts.

Figure A2. Smallmouth Bass (*Micropterus dolomieu*).

Figure A3. Measuring Smallmouth Bass and lab preparation with tin foil.

Appendix B. Quality Assurance/Quality Control Summary

Prior to sampling, a quality assurance project plan (QAPP) was developed: the *Quality Assurance Project Plan: Lower Salmon River Mercury Fish Tissue Sampling Project (Assessment Unit ID17060209SL008_07)* (DEQ 2016). The QAPP described planned field and laboratory methodology, quality assurance and quality control procedures, and data quality objectives. Data quality objectives and criteria were specified for data accuracy, precision, measurement range, representativeness, comparability, and completeness; these and other QA/QC evaluations are reviewed below.

DEQ Quality Assurance Procedure

DEQ requires several internal quality assurance procedures. These include consultation with the DEQ quality assurance manager, registration of the project in a tracking spreadsheet, completion of three standardized quality assurance checklists, and review of all quality assurance data points. All four of these items were completed for this project.

Sample Holding Time

Fish were collected 10/3–10/4, 2016, and delivered to the laboratory on 10/5/2016. The laboratory analyzed the samples on 12/29/2016. Method 7473 requires a maximum 28-day sample holding time (EPA 1998), but the laboratory did not flag analytical results based on holding time. The laboratory stated fish were kept frozen prior to filleting and analysis. Exceedance of the 28-day holding time is not a concern because previous studies have demonstrated that freezing fish samples for up to 4 years prior to analysis results in no statistically significant changes in fish tissue total mercury concentrations (Peterson et al. 2007). Holding time was discussed with the laboratory in advance of sample delivery, and the laboratory had no concerns about exceeding the 28-day holding time.

Accuracy

For laboratory analyses, the project QAPP specified an accuracy requirement of 75–25% percent recovery in laboratory control samples or matrix spikes (DEQ 2016). The laboratory analyzed three matrix spike samples that had percent recovery values of 104-107% and thus satisfied project accuracy requirements.

Precision

The QAPP (DEQ 2016) specified an analytical precision requirement of +/- 20% relative percent difference (RPD) for laboratory duplicate samples. The laboratory analyzed three laboratory duplicate samples that had RPD values of 0.7–5% and thus satisfied project precision requirements.

Representativeness

Data representativeness is the degree to which the sample data accurately and precisely represent site conditions. The project QAPP did not provide specific representativeness criteria; rather it provided guidelines for evaluating representativeness (DEQ 2016). Considering that field sampling and laboratory analysis followed standard procedures, fish samples were collected throughout the extent of the assessment unit, laboratory accuracy and precision requirements were met, fish collected were of a size typically caught by anglers, and there were no issues with laboratory QA review, project data are considered to satisfy representativeness requirements.

Data Comparability

Comparability is the confidence with which one data set can be compared to another data set. The project QAPP provided did not provide specific comparability criteria; rather it provided guidelines for ensuring data comparability (DEQ 2016). Considering standard sampling and laboratory procedures were followed and no issues were identified during project data verification and validation, project data are considered to satisfy comparability requirements. However, when comparing data from this project to that from the previous statewide assessment, data users should be aware that composite samples were analyzed in the previous study whereas muscle tissue samples from individual fish were analyzed in this study, and that this study was based only on Smallmouth Bass.

Data Completeness

Data completeness is the percentage of valid data relative to the total possible data points. The project QAPP defined a data completeness objective of 80%. Considering all data met the criteria described above, project data completeness is 100%.

Special Requirements for Implementation of the Idaho Mercury Water Quality Criteria

The *Implementation Guidance for the Idaho Mercury Water Quality Criteria* (DEQ 2005) states that at least 10 samples per species should be collected per sample location in order for sample data to be statistically relevant and that Idaho Department of Fish and Game regional fishery biologists should be consulted to select a minimum fish length for sampling that is representative of that consumed by anglers. Twenty-two Smallmouth Bass were collected within the targeted assessment unit, satisfying the fish number requirement. In addition, fish collected and analyzed ranged from 9.75 to 17 inches total length. Idaho Department of Fish and Game staff indicated anglers typically consume fish >10 inches.