

**Lake Lowell Mercury Assessment
Fish Tissue Study
Results and Field Summary**



Prepared by Lauri Monnot

Distribution List

Don Bledsoe, Quality Assurance Director, DEQ Administration

Marti Bridges, TMDL Program Manager, DEQ State Programs

Xin Dai, DEQ Technical Services

Jeff Dillon, Regional Fishery Manager, Idaho Dept. of Fish and Game, Region 3

Michael Edmondson, 303(D) and 305(B) Program Manager, DEQ State Programs

Don Essig, Water Quality Standards Coordinator, DEQ State Programs

Bryan Horsburgh, Regional Water Quality Manager, U.S. Bureau of Reclamation

Joe Kozfkay, Regional Fishery Biologist, Idaho Dept. of Fish and Game, Region 3

Richard Lee, DEQ Technical Services

Michael McIntyre, DEQ Surface Water Manager, DEQ State Programs

Craig Shepard, Regional Watershed Manager, DEQ Boise Regional Office

Hawk Stone, Water Quality Science Officer, DEQ Boise Regional Office

Summary of Activities

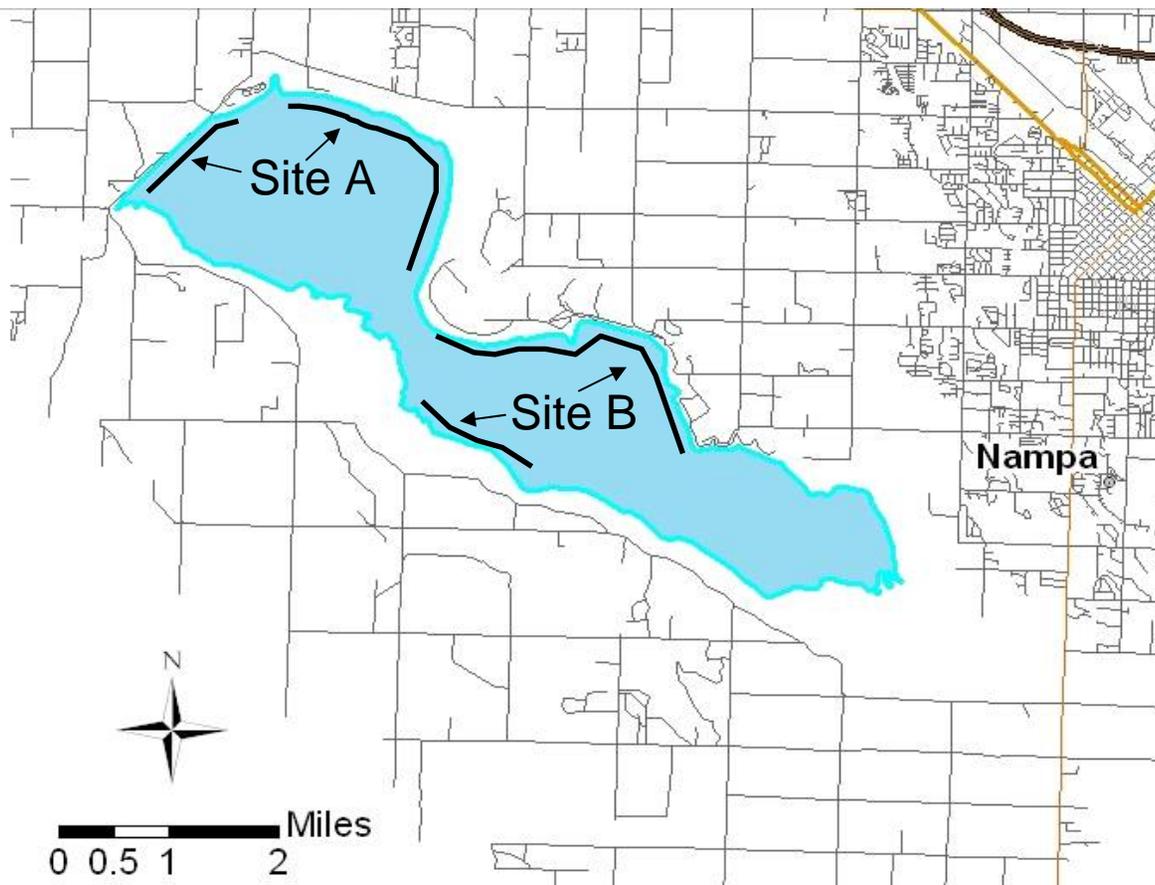
In October 2006, DEQ collected fish specimens from Lake Lowell to determine the concentration of mercury in fish tissue. For a detailed description of the monitoring protocol please see the Quality Assurance Project Plan.

The goal of this project was to determine the mean Me-Hg fish tissue concentration across fish trophic levels in the reservoir. The data were used to determine whether mercury is a pollutant exceeding DEQ's water quality criteria in Lake Lowell resulting in a 303(d) listing for mercury. The Idaho Department of Health and Welfare currently has the following fish consumption advisory on Lake Lowell due to mercury contamination:

		Women who are pregnant, nursing or planning to become pregnant	Children under the age of 7 years	General public (people not in the first two groups)
Do NOT eat more than:				
Lake Lowell  sucker  carp  small mouth bass	3 meals a month of sucker 4 meals a month of carp 5 meals a month of small-mouth bass	2 meals a month of sucker or carp 3 meals a month of small-mouth bass 5 meals a month of large-mouth bass 7 meals a month of bluegill	No consumption restrictions  largemouth bass	

On October 5, 2006 A DEQ and Idaho Department of Fish and Game (IDFG) crew collected 70 fish from Lake Lowell. Fish were collected between the hours of 7pm-3am using an electrofishing boat. Fish were collected in live wells on the boat then transferred to a live well in a second boat where they were measured and placed into sample bags by Lauri Monnot. Ten largemouth bass, bluegill and largescale suckers were collected from 2 different sections of Lake Lowell. In addition, 10 Ictalurid (catfish family) specimens were collected throughout the reservoir. Fish were processed into composite samples by species and Site ID in the DEQ clean room lab on October 6th and shipped to Brooks Rand LLC for total mercury analysis.

Map of Lake Lowell Fish Tissue Collection Sites



0 0.5 1 2 Miles

— Electrofishing Transects

Results

The mercury levels in composited fish tissue samples are listed in the table below:

Site ID	Description	Mercury (mg/kg fish tissue)
F001	Site A Largemouth Bass	0.189
F002	Site A Bluegill	0.166
F003	Site A largescale Suckers	0.391
F004	Site A Duplicate of F003	0.416
F005	Site B Bluegill	0.121
F006	Site B Largemouth Bass	0.205
F007	Site B Duplicate of F006	0.194
F008	Site B largescale Sucker	0.257
F009	Catfish Family from Site A and B	0.349
F010	Catfish Family Duplicate of F009	0.453
W002	Trip Blank	< 0.001
W003	Sample Processing Blank	< 0.001

For calculation of the trophic level weighted average for Lake Lowell duplicate sample mercury measurements were averaged with the appropriate original sample measurement. After duplicate and original samples were averaged, averages were calculated for each trophic level and used to calculate the average measurement for Lake Lowell in the following equation:

$$C_{avg} = ((IR2 * C2) + (IR3 * C3) + (IR4 * C4))$$

$$IR2 + IR3 + IR4$$

Where:

C_{avg} = Average Fish Tissue Concentration (mg/kg)

- C2 – largescale sucker
- C3 – bluegill and catfish
- C4 - bass

IR = Consumption Value for Trophic Level (mg/kg)

- IR2 (largescale sucker) - 3.8 g/day
- IR3 (bluegill and catfish) - 8.0 g/day
- IR4 (bass) - 5.7 g/day

2006 Samples C_{avg} = 0.240

Deviations from protocol

Even the most carefully devised monitoring plan is occasionally changed due to unexpected occurrences in the field or laboratory. All deviations from the Quality Assurance Project Plan are summarized below:

- Due to low reservoir water levels there was no Site C
- Due to concerns about the mercury levels of long-lived bottom feeding predators we added an Ictalurid (catfish family) sample. High levels of mercury in these fish and the largescale suckers which occupy a lower trophic level could indicate lake bottom sediments as a possible source of mercury. A total of ten fish were collected from all sites sampled on Lake Lowell.
- Due to their large size some of the catfish did not fit into the largest Ziploc bags. In addition their spines punctured the bags. These fish were separated from ice and other fish samples using large plastic garbage sacks. No meltwater or contamination of other specimens was apparent when fish were processed in the lab.

Quality Assurance - were quality assurance measures met?

Representativeness data quoted at 90% confidence, with maximum error of ± 0.05 ppm

Completeness – 70 fish at 2 sites were collected. This represents 77% of the planned 90 fish anticipated. A complete data set was considered 10 fish from each of the following three species: Largemouth bass, bluegill and largescale sucker. Twenty fish from each of these species were collected indicating a complete data set.

Precision – duplicate samples of the anticipated sample species were within 6% of each other. The quality assurance objective was $\leq 20\%$. The Ictalurid duplicate sample had a relative percent difference of 25%. The accepted laboratory and method RPD value is $< 30\%$, therefore archived samples were not submitted to the lab for analysis.

Trip Blank and Processing Blank – contained less than 0.001 mg/kg mercury indicating that mercury contamination did not occur during sampling, processing or shipping.

Duplicate samples

Precision was calculated from a duplicate sample from each sample site. The relative percent difference for each duplicate sample is listed below:

Site A- 6.20%

Site B – 5.51%

Catfishes (Family Ictaluridae) – 25.94%

Conclusions/Evaluation

This project was successful in determining a trophic-level weighted average (C_{avg}) mercury fish tissue concentration in Lake Lowell. The C_{avg} was 0.240 mg/kg fish tissue, which is below the mercury criterion of 0.3 mg Hg/kg fish tissue weight. The data support that mercury is not a pollutant exceeding DEQ's water quality criteria and do not result in a 303(d) listing for mercury.

Acknowledgements:

The success of this project is due to the hard work of DEQ staff at the Boise Regional and State Offices as well as the cooperation of the Idaho Department of Fish and Game. I would especially like to thank the following people for their effort: Jeff Dillon and Joe Kozfkay for coordination and review of the QAPP, Richard Lee and Xin Dai for coordination and implementation of fish processing in the lab, and our field sampling crew Hawk Stone, Jacob Nelson and Joe Kozfkay.

Appendix Individual Fish Information

Fish ID	Species	Length (TL mm)	Fish Weight (g)	Fillet Sample (g)	Composite ID
A1LMB	Largemouth Bass	314	463	11	F001
A3LMB	Largemouth Bass	294	375	10	F001
A5LMB	Largemouth Bass	330	564	11	F001
A6LMB	Largemouth Bass	345	834	12	F001
A7LMB	Largemouth Bass	300	479	14	F001
A8LMB	Largemouth Bass	333	648	12	F001
A9LMB	Largemouth Bass	315	538	11	F001
A10LMB	Largemouth Bass	335	676	14	F001
A11LMB	Largemouth Bass	263	286	15	F001
A12LMB	Largemouth Bass	270	371	12	F001
A1BLG	Bluegill	172	127	14	F002
A2BLG	Bluegill	154	90	12	F002
A3BLG	Bluegill	192	142	11	F002
A4BLG	Bluegill	200	181	11	F002
A5BLG	Bluegill	187	171	17	F002
A6BLG	Bluegill	175	126	11	F002
A7BLG	Bluegill	221	304	15	F002
A8BLG	Bluegill	164	90	10	F002
A9BLG	Bluegill	174	120	11	F002
A10BLG	Bluegill	135	64	10	F002
A1LSS	Largescale Sucker	535	1145	13	F003 & F004
A2LSS	Largescale Sucker	550	1328	15	F003 & F004
A3LSS	Largescale Sucker	520	1484	13	F003 & F004
A4LSS	Largescale Sucker	525	955	11	F003 & F004
A5LSS	Largescale Sucker	565	1071	13	F003 & F004
A6LSS	Largescale Sucker	530	1141	15	F003 & F004
A7LSS	Largescale Sucker	580	1341	13	F003 & F004
A8LSS	Largescale Sucker	555	1120	12	F003 & F004
A9LSS	Largescale Sucker	550	1111	15	F003 & F004
A10LSS	Largescale Sucker	575	974	12	F003 & F004
B1BLG	Bluegill	143	53	6	F005
B2BLG	Bluegill	145	61	9	F005
B3BLG	Bluegill	175	116	15	F005
B4BLG	Bluegill	127	37	5	F005
B5BLG	Bluegill	145	66	8	F005
B6BLG	Bluegill	200	172	17	F005
B7BLG	Bluegill	170	102	15	F005
B8BLG	Bluegill	142	49	8	F005

Fish ID	Species	Length (TL mm)	Fish Weight (g)	Fillet Sample (g)	Composite ID
B9BLG	Bluegill	160	104	13	F005
B10BLG	Bluegill	186	175	16	F005
B1LMB	Largemouth Bass	366	976	10	F006 & F007
B2LMB	Largemouth Bass	345	682	10	F006 & F007
B3LMB	Largemouth Bass	320	595	11	F006 & F007
B4LMB	Largemouth Bass	365	766	11	F006 & F007
B5LMB	Largemouth Bass	330	591	11	F006 & F007
B6LMB	Largemouth Bass	345	589	10	F006 & F007
B7LMB	Largemouth Bass	330	479	10	F006 & F007
B8LMB	Largemouth Bass	325	481	10	F006 & F007
B9LMB	Largemouth Bass	322	460	10	F006 & F007
B10LMB	Largemouth Bass	260	280	10	F006 & F007
B1LSS	Largescale Sucker	540	1298	11	F008
B2LSS	Largescale Sucker	535	1663	13	F008
B3LSS	Largescale Sucker	530	1208	13	F008
B4LSS	Largescale Sucker	510	1011	11	F008
B5LSS	Largescale Sucker	530	959	10	F008
B6LSS	Largescale Sucker	490	1045	13	F008
B7LSS	Largescale Sucker	525	1183	13	F008
B8LSS	Largescale Sucker	530	1252	12	F008
B9LSS	Largescale Sucker	540	1044	12	F008
B10LSS	Largescale Sucker	560	1114	13	F008
LOW1CCF	Channel Catfish	620	1544	10	F009 & F010
LOW2CCF	Channel Catfish	680	2194	11	F009 & F010
LOW3CCF	Channel Catfish	770	>2300	11	F009 & F010
LOW4CCF	Channel Catfish	780	>2300	12	F009 & F010
LOW5CCF	Channel Catfish	790	>2300	12	F009 & F010
LOW6CCF	Channel Catfish	700	2042	13	F009 & F010
LOW7CCF	Channel Catfish	660	>2300	12	F009 & F010
LOW8CCF	Black Bullhead	390	524	10	F009 & F010
LOW9CCF	Black Bullhead	310	268	10	F009 & F010
LOW10CCF	Black Bullhead	370	536	12	F009 & F010