



Upper Portneuf River Fish Tissue
and
Water Column Mercury Sampling Results

2007



Idaho Department of Environmental Quality
Pocatello Regional Office
444 Hospital Way
Pocatello ID 83201

Introduction

In September 2006 the United States Geological Survey (USGS) collected 8 large brown trout, average length of 20 inches, from the Portneuf River at Topaz (near but downstream of the City of Lava Hot Springs, Bannock county). The USGS supplied preliminary mercury results of a composite sample of muscle tissue from these 8 fish to DEQ in February 2007 reporting a value of 1.16 $\mu\text{g/g}$ wet weight nearly 4 times the water quality standard of 0.3 $\mu\text{g/g}$ (= mg/kg). Based on these data, the DEQ Pocatello Regional Office in cooperation with Region 5 Idaho Fish and Game fisheries staff (Richard Scully, Fisheries Manager and David Teuscher, Regional Fish Biologist) collected additional fish from two reaches of the upper Portneuf River. In addition, DEQ staff collected water samples for mercury analysis from 3 locations in the upper Portneuf River watershed.

Methods

Site locations for fish collection

Topaz Reach - The upstream bound (= N42° 37' 14.42", W111° 59' 57.69") of this reach is near the town of Lava Hot Springs and ends just downstream of the Hwy 30 crossing. This reach of the river receives multiple inputs from natural geothermal hot springs and is a highly valued recreational resource in the summer (floating and swimming) through Lava Hot Springs. The downstream bound (= N42° 37' 27.55", W112° 07' 04.26") ends at the Portneuf-Marsh Valley Canal Company diversion structure. Topaz refers to a road name located in the middle of this reach and is the location of a long-term USGS discharge measurement station (refer Fig.1).

Croney Road Reach – The upstream bound (= N42° 47' 13.36", W111° 58' 47.37") of this reach is at the Kelly-Toponce Road Bridge just downstream of confluence of the Downey Canal with the old channel of the Portneuf River. The downstream bound (= N42° 44' 36.21", W112° 00' 09.70) is located at the Whiskey Mike's Bridge just upstream of the confluence of Pebble Creek with the Portneuf River. Base flow in this reach is dominated by groundwater inputs with summertime flows enhanced by releases out of Chesterfield Reservoir upstream (refer Fig. 1).

Site locations for water quality sampling (refer Fig. 1)

Near the Idaho Fish and Game Sportsman's Access at the end of Croney Road (N42 46'20.22" W111 59'37.21").

Just upstream of the Blaser Hwy Bridge above the town of Lava Hot Springs (W42 38'02.31" N112 00'08.18").

Behind the Lava Ranch Inn below Lava Hot Springs (N42 37'22.72" N112 02'01.27").

Fish collection

On March 7, 2007 ten brown trout and three rainbow trout were collected utilizing drift-boat mounted electro-fishing equipment in the Topaz reach of the Portneuf R. Fish were immediately placed on ice and transported to the DEQ-PRO laboratory for processing. Fish were measured (total length), weighed (grams) and filleted and skinned individually with cutting board and fillet knife washed withalconox and triple rinsed in between each individual fish. Fillets were split into two roughly same-sized halves, wrapped individually in clean foil, separately bagged in Ziploc baggies, labeled and immediately frozen. Tissue samples were shipped on dry ice the following day via next day air to the Idaho Department of Health and Welfare Bureau of Laboratories in Boise, Idaho and ACZ Laboratories, Inc. in Steamboat Springs, Colorado.

On August 29, 2007 two Yellowstone cutthroat trout, four wild rainbow/cutthroat hybrids and five stocked rainbow trout were collected utilizing a backpack-mounted electrofishing unit from the Croney Road reach of the Portneuf River. Fish were immediately placed on ice and transported to the DEQ-PRO laboratory for processing. Fish were measured (total length), weighed (grams) and filleted and skinned individually with cutting board and fillet knife washed withalconox and triple rinsed in between each individual fish. Fillets were split into three roughly same-sized samples, wrapped individually in clean foil, separately bagged in Ziploc baggies, labeled and immediately frozen. One set of tissue samples was shipped on dry ice on Sept 3 via next day air to the Idaho Department of Health and Welfare Bureau of Laboratories in Boise, Idaho, and another set of samples, excluding the 2 Yellowstone cutthroat samples, was shipped on Sept 3 to the DEQ State office for future compositing and analysis at the Brooks Rand Laboratory in Seattle, Washington.

Water sample collection

Water samples for analysis of total mercury were collected by DEQ staff on 10 September 2007 from three sites. Clean hands/dirty hands techniques as described by Brooks Rand Laboratory's SOP entitled "Field Sampling Protocol for Sampling Waters for Trace Metals" were employed with bottles supplied by Brooks Rand Laboratories. Samples were collected in a well-mixed section of the thalweg at each stream location. Samples were placed on ice and shipped overnight to the laboratory in Seattle, WA.

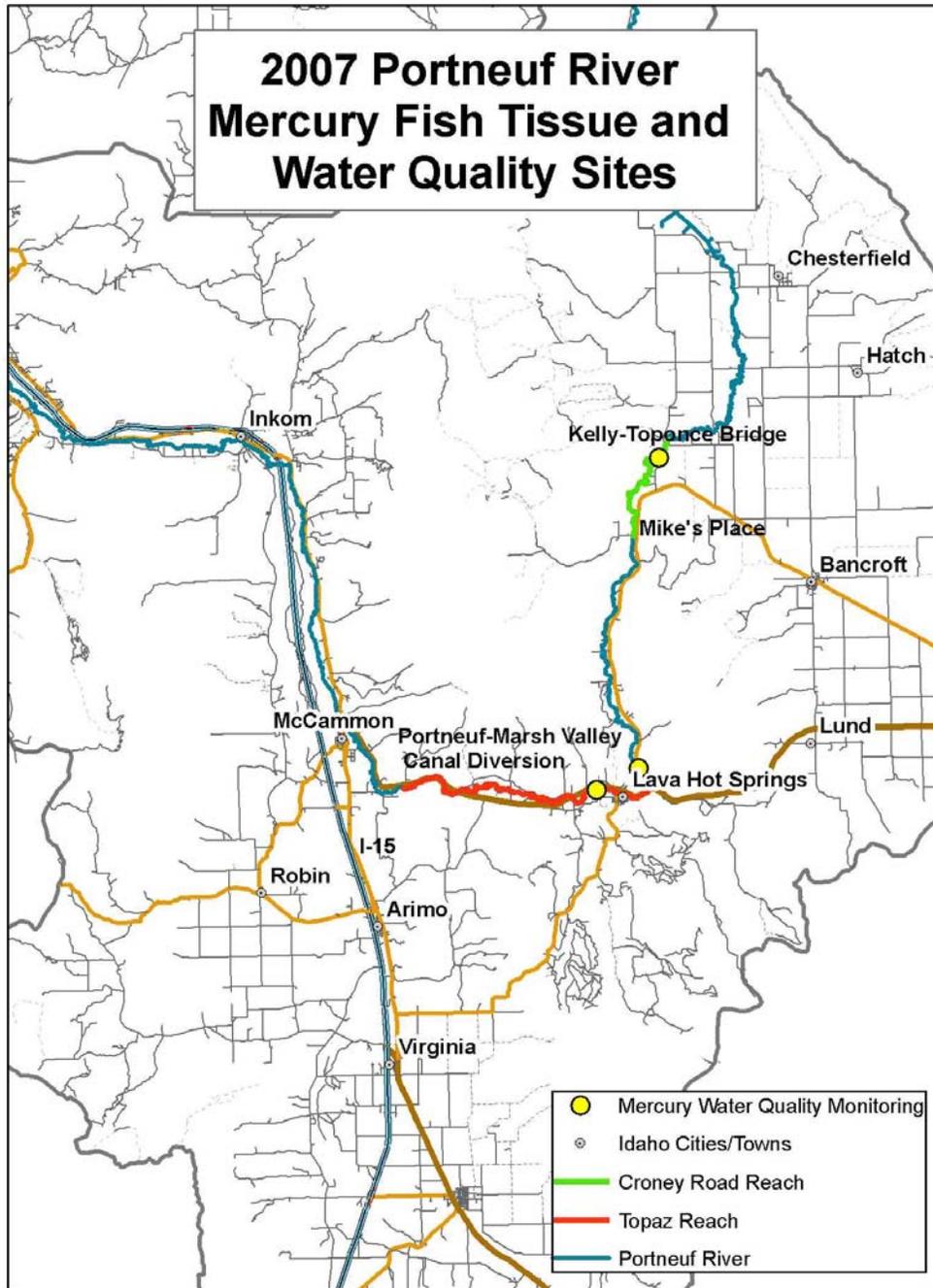


Figure 1. 2007 Portneuf River sampling sites for collection of fish and water for mercury analysis.

Results

Fish tissue

Analytical results for fish collected from the Topaz reach are shown in Table 1. The average concentration of tissue mercury in the ten brown trout was 0.396 mg/kg wet weight with concentrations ranging from 0.22 mg/kg to 0.73 mg/kg. Average fish length was 303 mm ranging from 270 to 376 mm. Generally speaking, larger fish had higher concentrations of tissue mercury (Fig. 2).

Three rainbow trout were collected in this reach, these fish were larger than 10 inches and were identified as hatchery-reared, stocked fish. The average concentration of these three fish was 0.246 mg/kg. Even though these fish were hatchery-reared and stocked in this reach they had likely been in the reach for 6 or more months.

Results from the samples that were analyzed by ACZ Laboratories have not been reported here because of data quality concerns. These concerns could not be addressed by the laboratory because of insufficient remaining sample material. DEQ elected to utilize the Idaho Department of Health and Welfare Laboratory information as it was deemed of sufficient quality.

Table 1. Analytical results for fish collected in the Topaz reach of the Portneuf River on 7 March 2007.

IDEQ sample ID	Tissue Hg (mg/kg)*	fish length (mm)	Species
D-0476	0.32	270	BRT
D-0570	0.46	272	BRT
D-0431	0.32	300	BRT
D-0596	0.35	285	BRT
D-0404	0.39	335	BRT
D-0500	0.56	350	BRT
D-0527	0.36	265	BRT
D-0438	0.22	300	BRT
D-0412	0.25	280	BRT
D-0501	0.73	376	BRT
D-0580	0.18	460	RBT
D-0540	0.34	390	RBT
D-0498	0.22	312	RBT

BRT = Brown Trout
RBT = Rainbow Trout
*IDHW Lab results

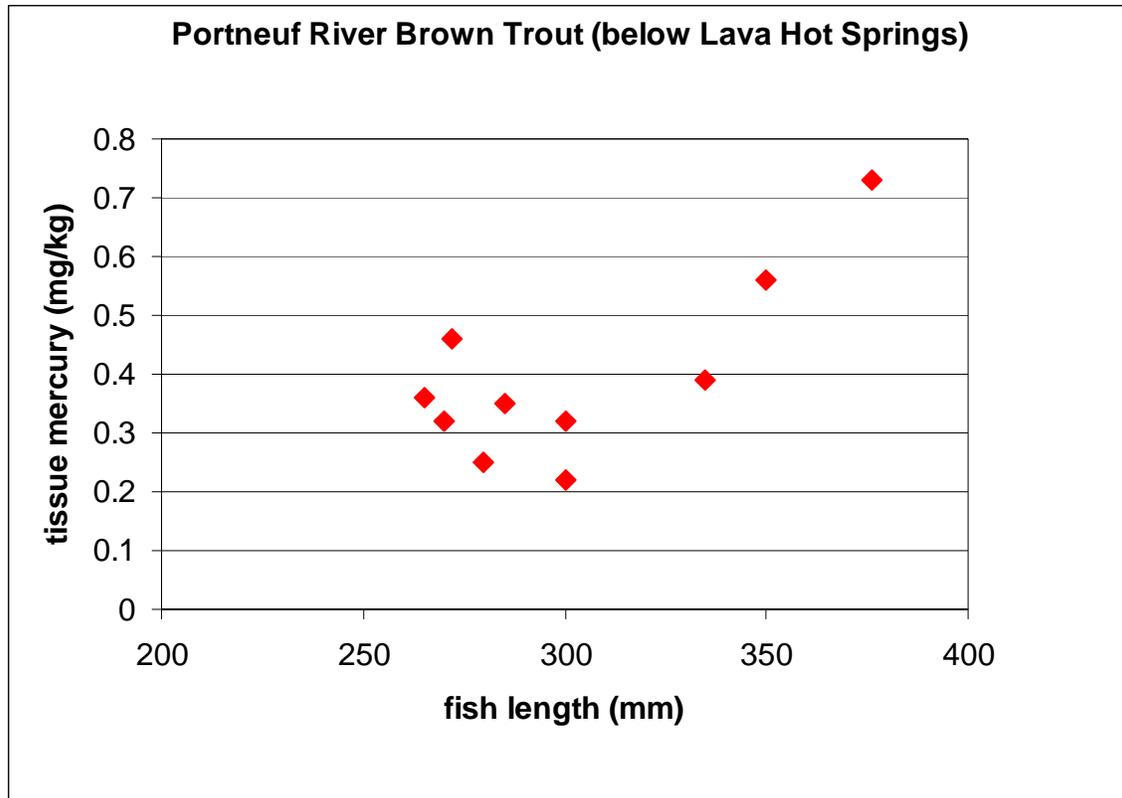


Figure 2. Tissue mercury concentration vs. fish length for brown trout collected in the Topaz reach of the Portneuf River on 7 March 2007.

Analytical results for fish collected from the Croney Road reach are shown in Table 2. The average concentration of tissue mercury in two wild Yellowstone Cutthroat trout was 0.675 mg/kg. These two fish were 315 and 500 mm in length.

The average concentration of a mix of 4 rainbow/cutthroat trout hybrids and 5 rainbow trout was 0.332 mg/kg wet weight with concentrations ranging from 0.2 mg/kg to 0.48 mg/kg. Average fish length for the mix of 9 trout (excluding the Yellowstone Cutthroats) was 362 mm ranging from 270 to 510 mm. The general trend of higher tissue mercury with increasing fish length evident in the Topaz data is not as readily discernible in these data with the possible exception of the Yellowstone Cutthroats (however only two data points make this a tenuous argument) (see Fig 3).

A composite sample of the mix of 9 rainbow/cutthroat hybrids and rainbow trout was sent to Brooks Rand Laboratory in Seattle, Washington. The result of this composite sample was 0.232 mg/kg. This is a difference of approximately 30% from the average of the fish that were analyzed individually and has significance because this composite number is less than the standard of 0.3 mg/kg while the average of the individually analyzed fish is over the standard.

Table 2. Analytical results for fish collected in the Croney Road reach of the Portneuf River on 29 August 2007.

IDEQ sample ID	tissue Hg (mg/kg)*	fish length (mm)	species (sex)
D-0496	0.87	500	YCT(f)
D-0557	0.48	315	YCT(f)
D-0451	0.25	330	RbCt HY(f)
D-0413	0.48	510	RbCt HY(f)
D-0560	0.36	500	RbCt HY(f)
D-0513	0.2	362	RbCt HY(f)
D-0471	0.28	270	RBT ??
D-0457	0.28	330	RBT (m)
D-0461	0.32	350	RBT ??
D-0533	0.46	275	RBT (hatc)
D-0448	0.36	330	RBT (hatc f)

YCT = Yellowstone Cutthroat trout
RbCt Hy = Rainbow/Cutthroat hybrid (wild)
RBT = Rainbow trout
*IDHW Lab results

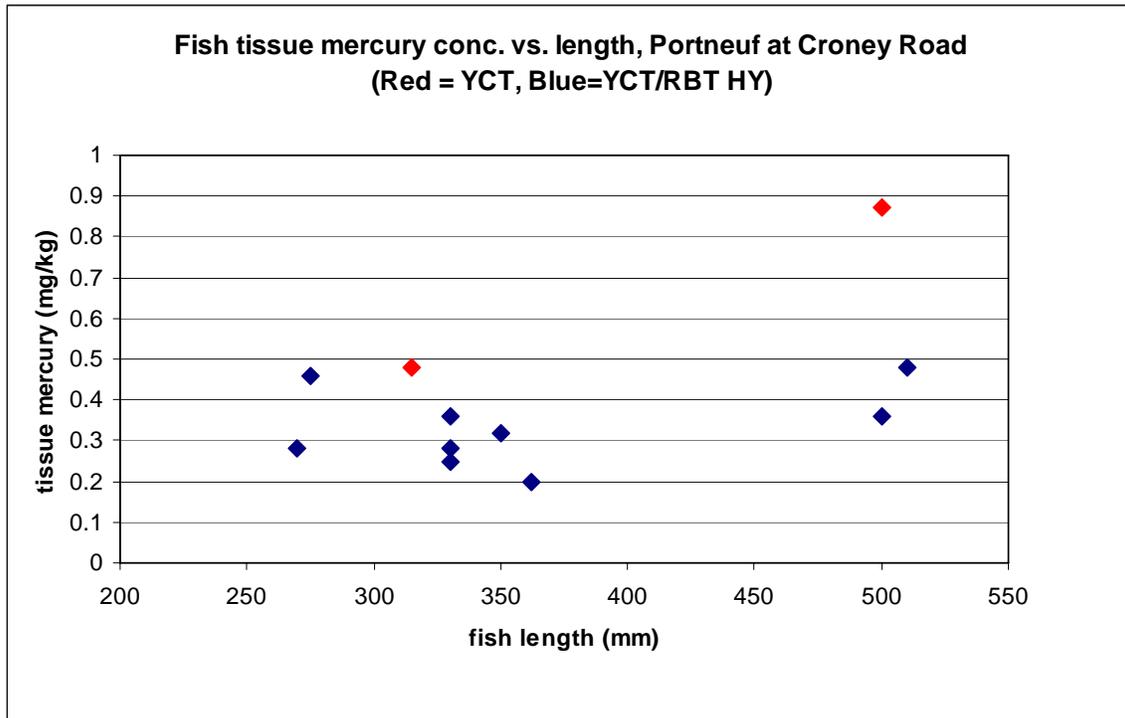


Figure 3. Tissue mercury concentration vs. fish length for Yellowstone Cutthroat, Rainbow/Cutthroat hybrids and Rainbow trout collected in the Croney Road reach of the Portneuf River on 29 August 2007.

Water quality

Analytical results for water samples collected on 10 September 2007 are presented in Table 3. Results from all three sites were low, with the below Lava Hot Springs site (Ranch Inn) showing 6.98 ng/L. The previous water quality standard for mercury was 12 ng/L. The remaining two samples from sites above Lava Hot Springs were reported as being above the minimum detection limit but less than or equal to the practical quantitation limit and should be considered estimates.

Fish tissue and water quality analytical results are attached in appendix A.

Table 3. Water quality results for total mercury from 3 sites in the upper Portneuf River, 10 September 2007.

	total mercury ng/L*
Croney Road (N42 46'20.22" W111 59'37.21")	0.21
Blaser Hwy Bridge (above Lava Hot Springs) (W42 38'02.31" N112 00'08.18")	0.21
Ranch Inn below Lava Hot Springs (N42 37'22.72" N112 02'01.27")	6.98
blank = 0.10 ng/L	
Duplicate at Lava Ranch Inn = 6.61 ng/L	
*Brooks Rand Lab results	

Discussion

Brown trout in the reach of the Portneuf River below Lava Hot Springs make up the majority of the salmonid fish community. Based on data collected at part of this effort and the USGS data from fall 2006 it appears that brown trout of catchable size (10 inches or larger) are either approaching the fish tissue limit of 0.3 mg/kg or are over that concentration. The rainbow trout fishery in this reach is generally supplied through hatchery-stocked catchables and more data need be collected to characterize hatchery-stocked rainbows that may hold over and grow to a larger size thus potentially having a longer-time in the river to bioaccumulate mercury. One large (18 inch) rainbow was collected in March 2007 however this fish showed the lowest mercury level (0.18 mg/kg) of all fish collected on that date.

The fish assemblage collected in the upper Portneuf near Croney Road were a mix of native (wild) Yellowstone Cutthroat trout (YCT), wild rainbow/cutthroat hybrid trout and sterile (triploid) hatchery rainbow trout. The two YCT showed tissue mercury levels over the criteria. One of those fish (19.5 inches in length) was nearly 3 times the standard.

The upper Portneuf River above Pebble Creek is managed by the Idaho Department of Fish and Game as a catch and release sport fishery for native cutthroat trout. Other trout species (stocked or wild) in this reach have either migrated downstream out of Chesterfield Reservoir (currently stocked with sterile rainbows) or have been naturally recruited in the reach by existing wild hybrids or rainbows. Comparison of tissue concentrations between the individual analytical results and the composite of the nine rainbow/cutthroat hybrid fish indicates some disparity. In order to better evaluate tissue levels in non-native salmonids, DEQ recommends additional sampling in the near future to evaluate tissue levels for trout potentially harvested for consumption in the upper Portneuf.

Analytical tests for mercury in the water column indicate that mineralization from geothermal activity in Lava Hot Springs may be elevating mercury levels below the town. DEQ knows of no active source that may be contributing to these elevated (albeit below the previous water quality criteria) levels. More detailed (both spatial and temporal) water quality sampling would be necessary to better quantify sources.

Acknowledgements

DEQ Pocatello Regional Office would like to thank the Idaho Department of Fish and Game Region 5 fisheries staff for their assistance in collecting fish and the Twin Falls DEQ Regional Office (Clyde Lay and Sonny Buhidar) for assistance in water sampling.