Fish from Lake Chelan and Wenatchee River Tested for Chemicals

In 2010, the Department of Ecology tested fish from Lake Chelan in the Wapato basin and five sites in the Wenatchee River basin for chemicals of concern. This testing was part of the 2010 Washington State Toxics Monitoring Program which also sampled other sites (Figure 1).
The full report for 2010 is at www.ecy.wa.gov/biblio/1203023.html

Scope and Goals

Fillet tissue was tested for a variety of persistent, bioaccumulative, and toxic chemicals such as mercury, chlorinated pesticides (CPs), polychlorinated biphenyls (PCBs), polybrominated diphenyl ethers (PBDEs), and poly-chlorinated dibenzo-p-dioxins and -furans (PCDD/Fs).

The main goals of the Lake Chelan and Wenatchee River efforts were to:

- Evaluate whether levels of certain contaminants had changed since fish were tested in 2003.
- Provide the Washington State Department of Health with data so they could determine whether the current Fish Consumption Advisories for Lake Chelan and the Wenatchee River needed revision.
- Determine whether differences in sample preparation methods affected the results from chemical analyses of fish fillets.

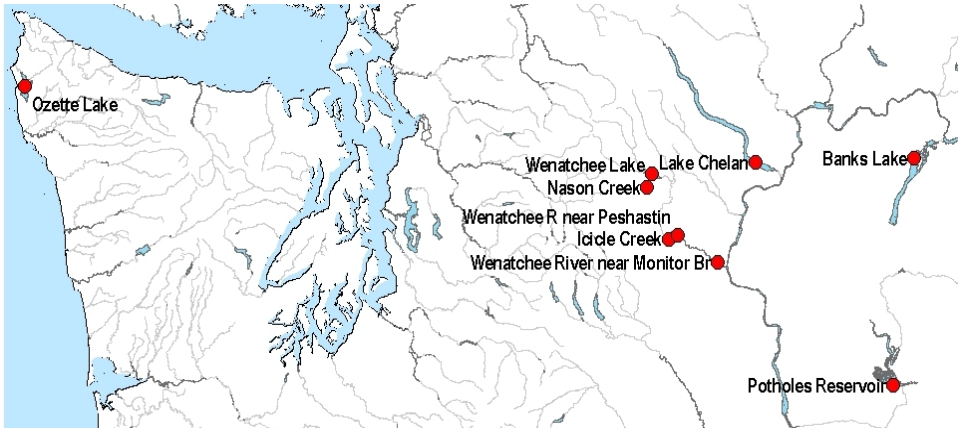

Figure 1. Fish Collection Sites for the Washington State Toxics Monitoring Program in 2010.

Angler with lake trout from Lake Chelan

Why It Matters

DDT and PCBs were banned over 30 years ago, yet they are still found at harmful levels in fish. Once toxic chemicals such as these enter the food chain, they can remain there for decades.

Fish is very nutritious food. However, fish consumption can be the greatest source of toxic chemical exposures to people.

The Department of Ecology's monitoring programs help decision-makers choose effective ways to control sources of toxic chemicals and advise consumers of hazards.

Summary of Findings

- Levels of DDT in lake trout from Lake Chelan remain high and are higher than levels measured in 2003.
- Levels of PCBs in mountain whitefish from the Wenatchee River are similar to levels found in 2003.
- The current Fish Consumption Advisories for Lake Chelan and the Wenatchee River are unlikely to be changed. The Washington Department of Health conducted a preliminary review of fish testing results and expects to conduct a full review later in 2012.
- No significant differences were found in results from skin-on and skin-off fillets for DDTs, PCBs, PBDEs, or lipids in fish from Lake Chelan and the Wenatchee River.

Lake Chelan

A total of 55 lake trout were collected in areas frequented by anglers from the Wapato Basin in early June 2010. These fish were assigned to composite samples based on weight to mimic the 2003 sampling for the Lake Chelan TMDL study. Nine composite samples of five fish each were formed using skin-on fillets. All samples were analyzed for the chlorinated pesticide DDT (and degradates DDE and DDD), PCBs, lipids, and mercury. Six samples were analyzed for other CPs and PBDEs, and five samples were analyzed for PCDD/Fs.

Results for total DDT from the nine samples using skin-on fillets from 2010 were plotted with several data sets from 2003: all composite samples (n=10), all composite samples except one having the largest fish (n=9), and all samples of individual fish (n=30). Figure 2 shows that the median value for the 2010 sample set was higher than each of the 2003 sample sets.

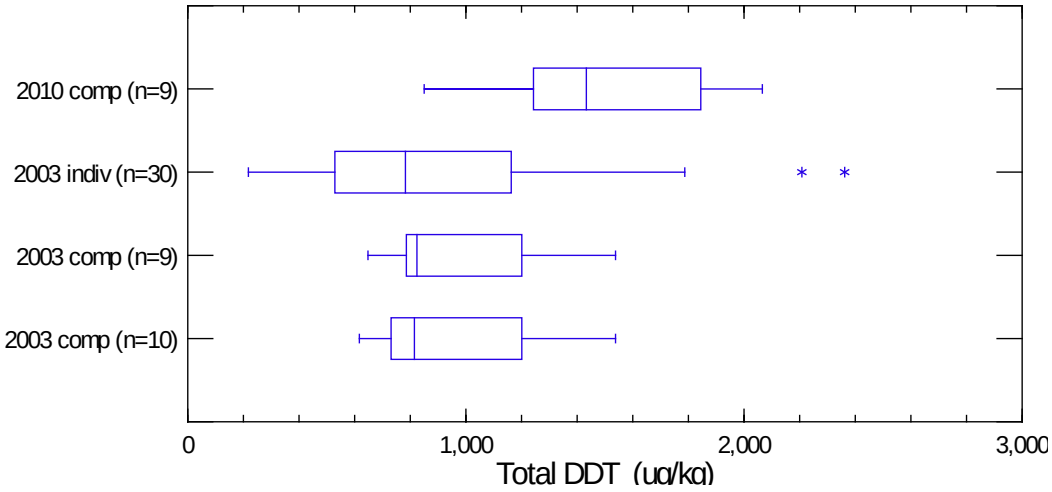

Figure 2. Boxplots of the 2003 and 2010 results for total DDT in Fish from Lake Chelan.

Boxplots show the range of results in a data set: the median is the vertical line within the box; the left and right ends of the box show the 25th and 75th percentiles, respectively; the horizontal lines extending from each end of the box show the range of results beyond the 25th and 75th percentiles; and the few dots beyond the ends of horizontal lines show outliers.

Two statistical tests showed that the mean values of the 2003 and 2010 data sets were significantly different. The Mann-Whitney rank test and the two-sample t-test were used. The 2010 mean total DDT value of 1505 ug/kg was higher than means from the 2003 data sets by 503 to 569 ug/kg. These results show that DDT levels in lake trout sampled in 2010 were higher than they were in 2003. The Washington Department of Health conducted a preliminary review of these results and indicated that the previously issued Fish Consumption Advisory for DDT in lake trout from Lake Chelan is unlikely to be changed.

Other contaminants found at levels of concern in lake trout from Lake Chelan included PCDD/Fs, PCBs, and PBDEs. Mercury and other CPs were found at levels of minimal concern for human health.

Wenatchee River and Wenatchee Lake

A total of 57 mountain whitefish were collected from four sites in the Wenatchee River basin in the fall of 2010 (Figure 3). Fish were assigned to composite samples based on length, as was done for studies in 2003 and 2004. While the 2010 fishing effort did not obtain the desired numbers and sizes of fish to meet all goals, some samples were comparable to samples from historical efforts.

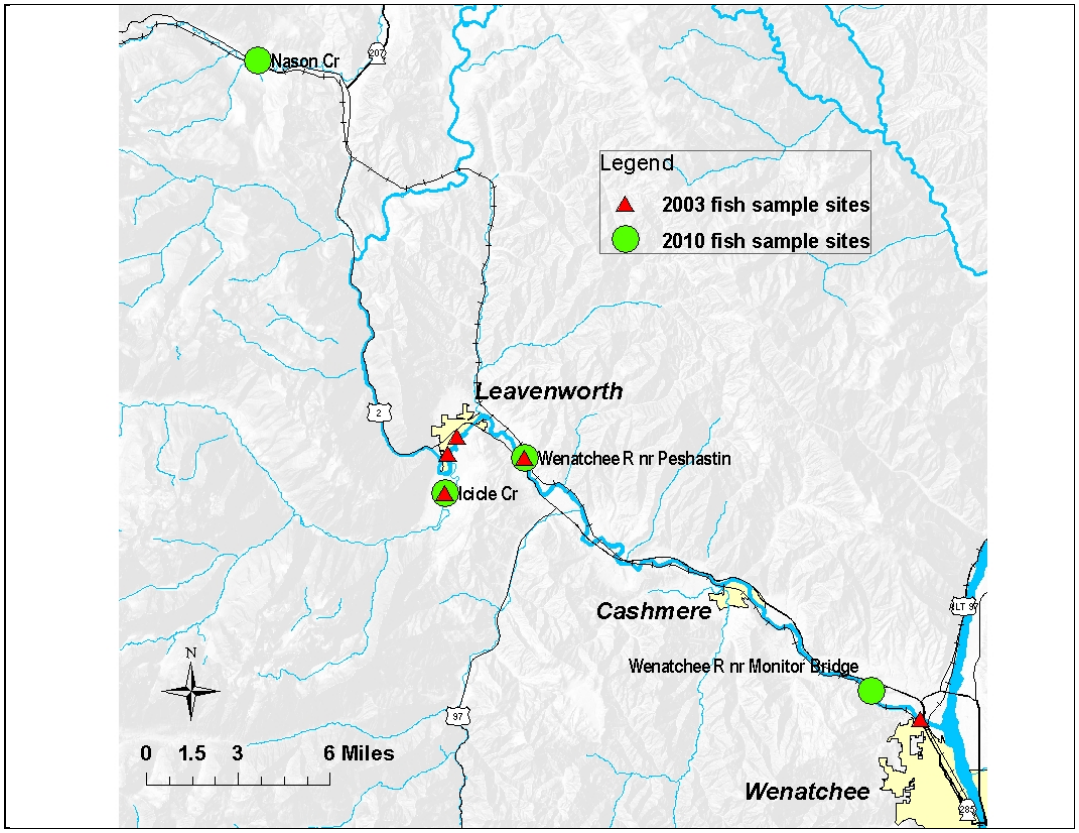

Figure 3. Wenatchee River basin sites where mountain whitefish fish were collected in 2003 and 2010.

Results for PCBs from 2010 were plotted with historical data from similar sites (Figure 4). The 2003 study collected fish from sites indicated in Figure 3, while the 2004 results were from two of the samples collected in 2003. Levels of PCBs in mountain whitefish appear highest in the lower river and decrease in an upstream direction to the Leavenworth area and Icicle Creek. PCB levels in Nason Creek fish were low and appear to represent an environment with minimal PCB contamination.

The levels of PCBs in fish from the mainstem sites within and between sample years display a wide range, suggesting high variability in the sampled population. For example, total PCBs in fish from the Monitor Bridge site ranged from 690-1700 ug/kg, and fish from the Leavenworth area had levels ranging from 43 to 1300 ug/kg. Such high variability of PCB levels could be due to factors such as seasonal movement of fish within the river, mixtures of older fish with younger fish within similar size classes, variation in feeding habits of fish, and multiple sources of PCBs.

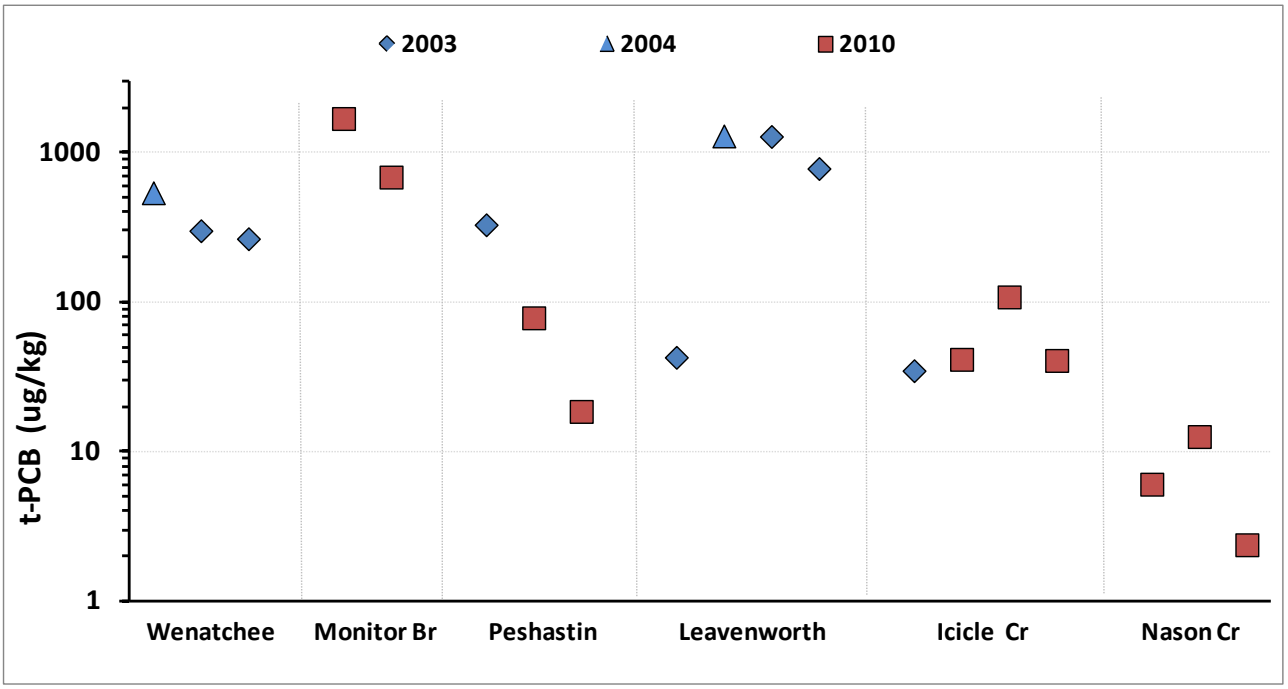

Figure 4. PCBs in Fish from the Wenatchee River and Icicle and Nason Creeks, 2003, 2004, and 2010.

The results show that PCB levels in mountain whitefish sampled in 2010 remain high. The Washington Department of Health conducted a preliminary review of these results and indicated that the previously issued Fish Consumption Advisory for PCBs in whitefish from the Wenatchee River is unlikely to be changed.

Other contaminants found at levels of concern include DDT compounds and PCDD/Fs. Chlordanes, endosulfans, and chlorpyrifos were also detected, though were below levels of concern for human health.

Cutthroat trout and northern pikeminnow collected from Wenatchee Lake in 2010 formed one composite sample each. Contaminant levels in both samples were low.

Comparison of Sample Preparation Methods

To address questions about how different sample preparation techniques affect the results of chemical analyses, two preparation methods were used on selected fish. For each fish used, both a skin-on fillet and a skin-off fillet were removed from opposite sides of the fish. Five skin-on fillets formed one composite sample, and the corresponding skin-off fillets formed the other composite sample. Two groups of samples were analyzed for various chemicals: nine paired samples of lake trout from Lake Chelan and five paired samples of mountain whitefish from the Wenatchee River.

Paired t-tests on the two groups of samples indicated no difference between the two preparation methods for DDTs, PCBs, PBDEs, and lipids. Test results for mercury showed that the different preparation methods produce different results for mercury measured in samples, but the difference appears to be small.

For more information

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Web sites

Full report: Washington State Toxics Monitoring Program: Freshwater Fish Tissue Component, 2010. www.ecy.wa.gov/biblio/1203023.html

***Washington State Toxics Monitoring Program*:** Washington State Department of Ecology. www.ecy.wa.gov/programs/eap/toxics/wstmp.htm.

Fish Consumption Advice: Washington State Department of Health. www.doh.wa.gov/fish

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