Vancouver Lake and Lake River PCBs, Chlorinated Pesticides, and Dioxin in Fish Tissue and Sediment

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Agencies Involved in the Study

- Washington State Department of Ecology – Provided Funding and Conducted the Study
- Washington State Department of Health – Reviewed Study Design and Monitoring Results; and Evaluated the Need for A Fish Consumption Advisory
- Clark County Public Works – Assisted in Collection of Fish Samples

Background

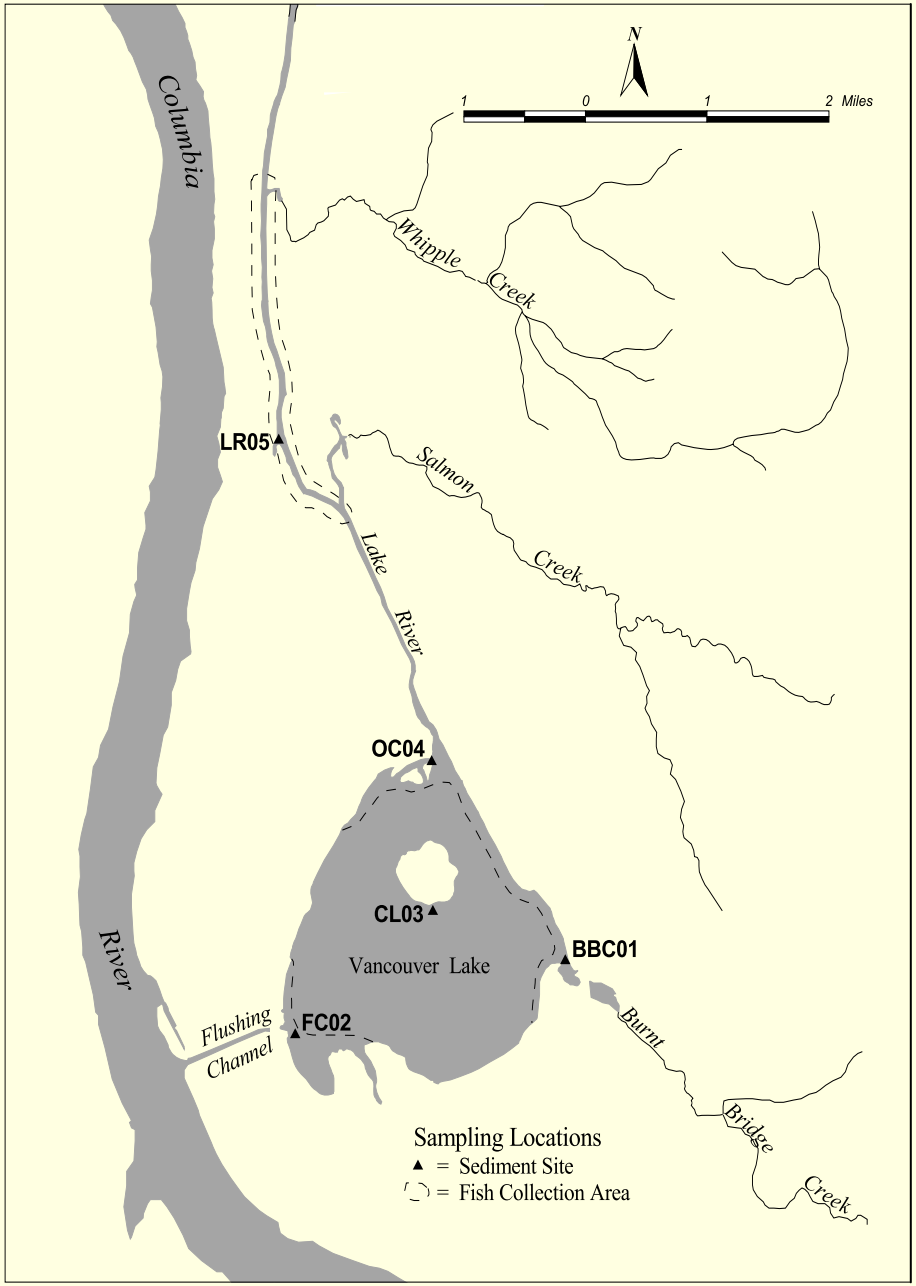
- Vancouver Lake is on the 2002/2004 303(d) List for Total PCBs. The Water Quality Program in Ecology Requested A Study to Determine the Current 303(d) Status for Fish from Vancouver Lake and Lake River.

- The Limited Historical Results for Largemouth Bass Have Been Mixed.

	PCBs	4,4'-DDE
A 1993 Study Reported Bass at:	110 *u*g/Kg	47 *u*g/Kg
A 2002 Study Reported Bass at:	6.0 *u*g/Kg	2.7 *u*g/Kg
NTR:	5.3 *u*g/Kg	31.6 *u*g/Kg

PCBs, Chlorinated Pesticides, and Dioxin in Fish Tissue Objectives

- Evaluate Current 303(d) Listing Status for Vancouver Lake to Determine if a TMDL to Address Contamination is Needed
- Determine if A Fish Consumption Advisory for Vancouver Lake and Lake River is Warranted
- Collect Fish Tissue from Vancouver Lake and Lake River to Meet Requirements of WDOH to Evaluate if a Fish Consumption Advisory is Needed



Fish and Sediment Sampling Locations

Summary of Sampling and Analysis

- Fish
  - Each tissue sample was a composite made up of edible muscle fillet from five fish. Samples were collected from:

    Vancouver Lake -

    Common Carp (3); Largescale Sucker (3); and Largemouth Bass (1)

    Lake River -

    Common Carp (3); Largescale Sucker (3)

  - Fish tissue was analyzed for:

    PCBs as Aroclors; chlorinated pesticides; dioxins/furans; and lipids

Summary of Sampling and Analysis

- Sediment
  - Each sample was a composite made of three separate grabs

    Vancouver Lake:

    Near the flushing channel inflow; the inlet from Burnt Bridge Creek; the outlet to Lake River; and Lake center just south of the Island

    Lake River:

    Left Bank between Whipple and Salmon Creeks

  - Samples were analyzed for:

    PCBs as Aroclors; chlorinated pesticides; total organic carbon; and grain size

Electro-Shocking Boat

Largemouth Bass

Common Carp

Largescale Sucker

Sediment Grab

Summary of Biological Data on Fish Collected for the Study

- Total Number of Fish Analyzed = 65

Largemouth Bass *(Micropterus salmoides)* = 5

Range of Age = 6 to 12 years
Range of Weight = 1770 to 2818 g (3.9 to 6.2 lbs.)
Range of Length = 445 to 513 mm (17.5 to 20 inches)

Common Carp *(Cyprinus carpio)*= 30

Range of Age = 3 to 15 years
Range of Weight = 240 to 3572 g (0.53 to 7.9 lbs.)
Range of Length = 227 to 636 mm (8.9 to 25 inches)

Largescale Sucker *(Catostomidae macrocheilus)* = 30

Range of Age = 9 to 16 years*
Range of Weight = 320 to 1431 g (0.70 to 3.2 lbs.)
Range of Length = 327 to 534 mm (12.9 to 21 inches)

Summary of Total PCB Levels Reported in Edible Fish Tissue from Vancouver Lake

- Largemouth Bass — 83 *u*g/Kg, wet weight

- Common Carp — Range = 51 – 185 *u*g/Kg, wet weight
  Mean Total PCB Level = 106 *u*g/Kg
  Standard Deviation = 70 *u*g/Kg

- Largescale Sucker — Range = 28 – 54 *u*g/Kg, wet weight
  Mean Total PCB Level = 42 *u*g/Kg
  Standard Deviation = 13 *u*g/Kg

* NTR = 5.3 *u*g/Kg

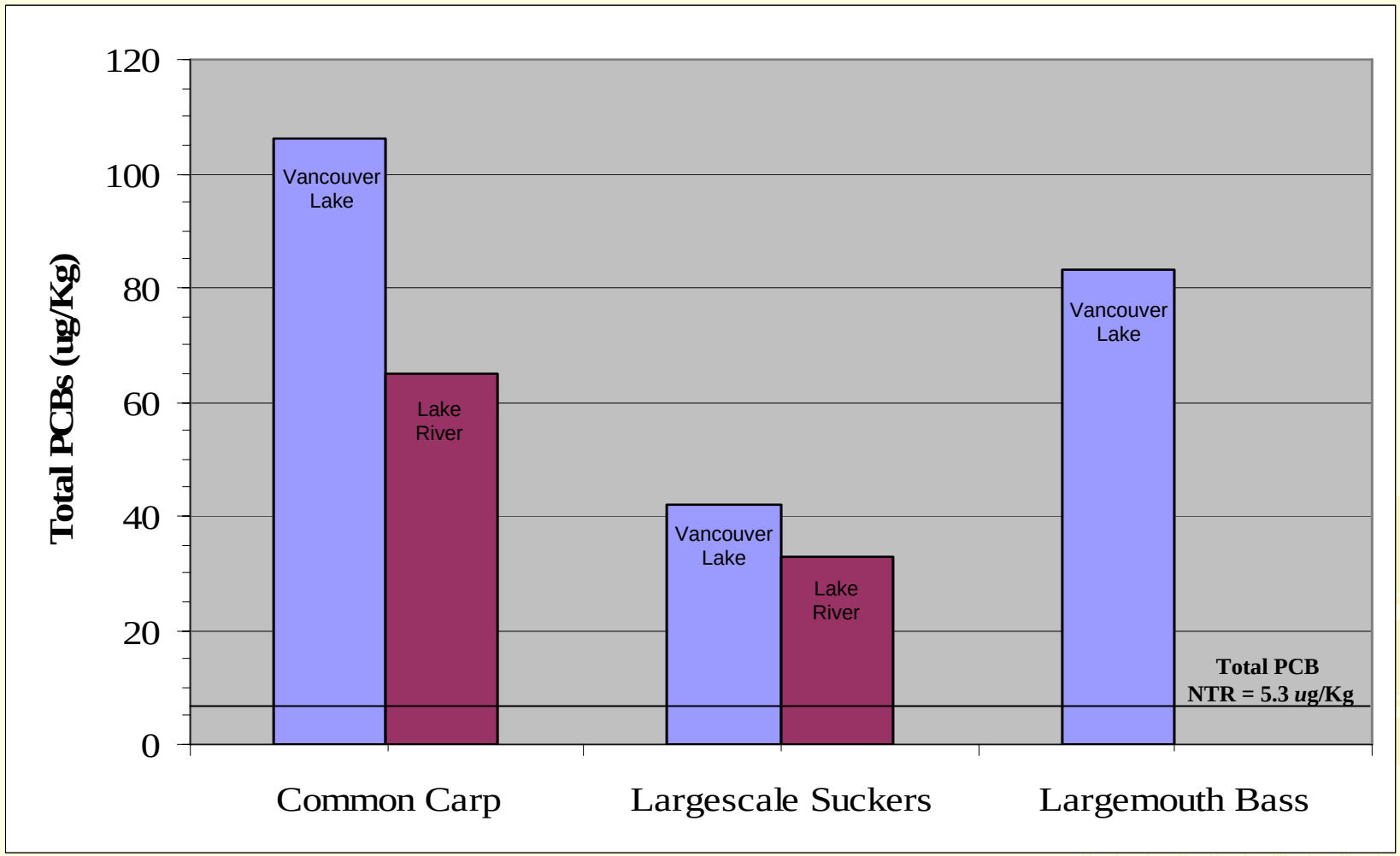
Summary of Total PCB Levels Reported in Edible Fish Tissue from Lake River

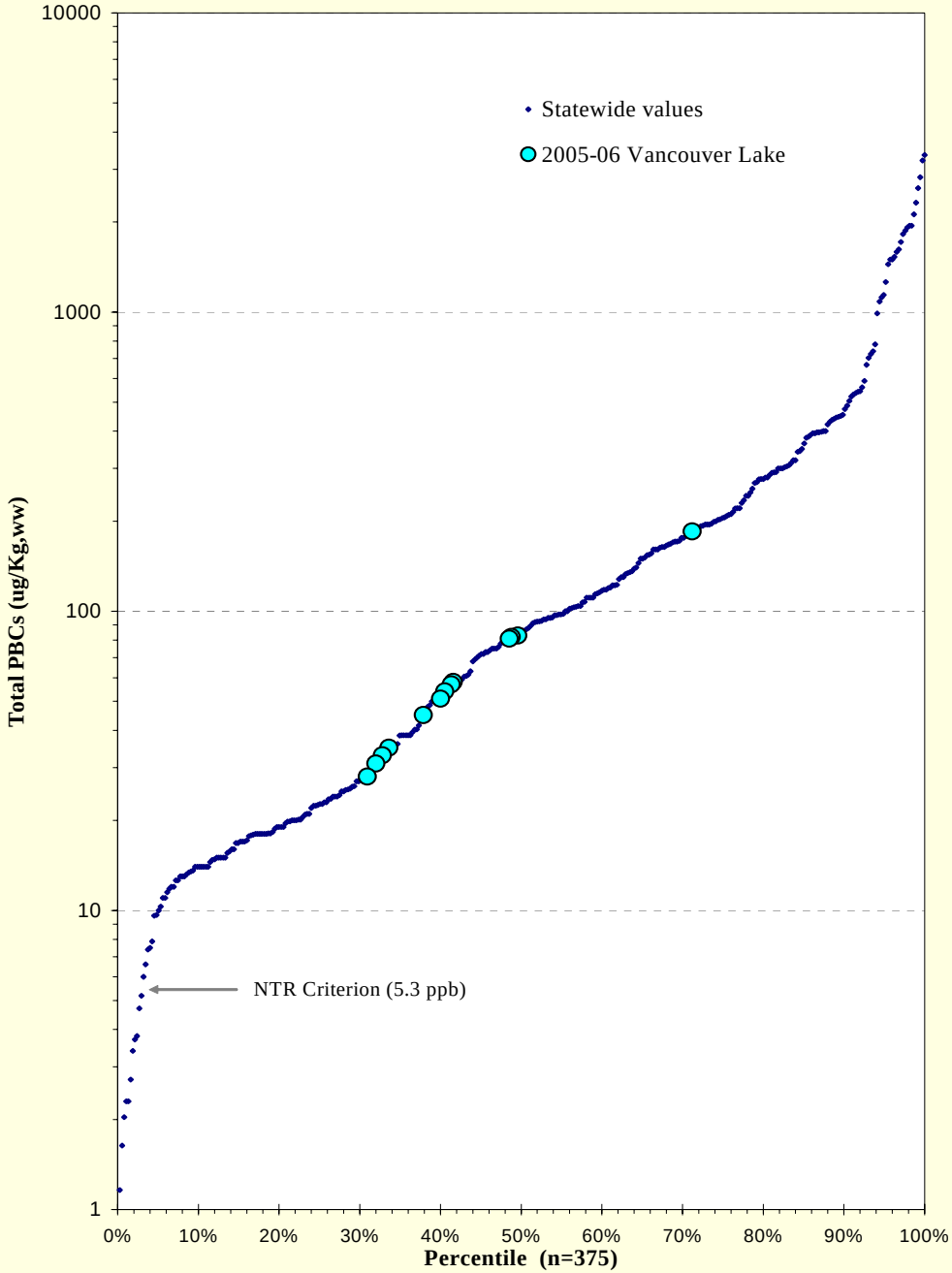
- Common Carp
  Range = 57 – 81 *u*g/Kg, wet weight
  Mean Total PCB Level = 65 *u*g/Kg
  Standard Deviation = 14 *u*g/Kg

- Largescale Sucker
  Range = 31 – 35 *u*g/Kg, wet weight
  Mean Total PCB Level = 33 *u*g/Kg
  Standard Deviation = 2 *u*g/Kg

* NTR = 5.3 *u*g/Kg

Total PCBs in Fish Tissue





Cumulative Frequency Distribution of Total PCBs in Freshwater Fish from Washington State

Summary of Total DDT Levels Reported in Edible Fish Tissue from Vancouver Lake

- Largemouth Bass — 43 *u*g/Kg, wet weight

- Common Carp — Range = 30 – 125 *u*g/Kg, wet weight
  Mean Total DDT Level = 67 *u*g/Kg
  Standard Deviation = 51 *u*g/Kg

- Largescale Sucker — Range = 11 – 30 *u*g/Kg, wet weight
  Mean Total DDT Level = 23 *u*g/Kg
  Standard Deviation = 10 *u*g/Kg

*Total DDT defined as sum of 4,4'-DDE + 4,4'-DDD + 4,4'-DDT + 2,4'-DDD

NTR = 32 ug/Kg for 4,4'-DDT and 4,4'-DDE; and 45 ug/Kg for 4,4'-DDD

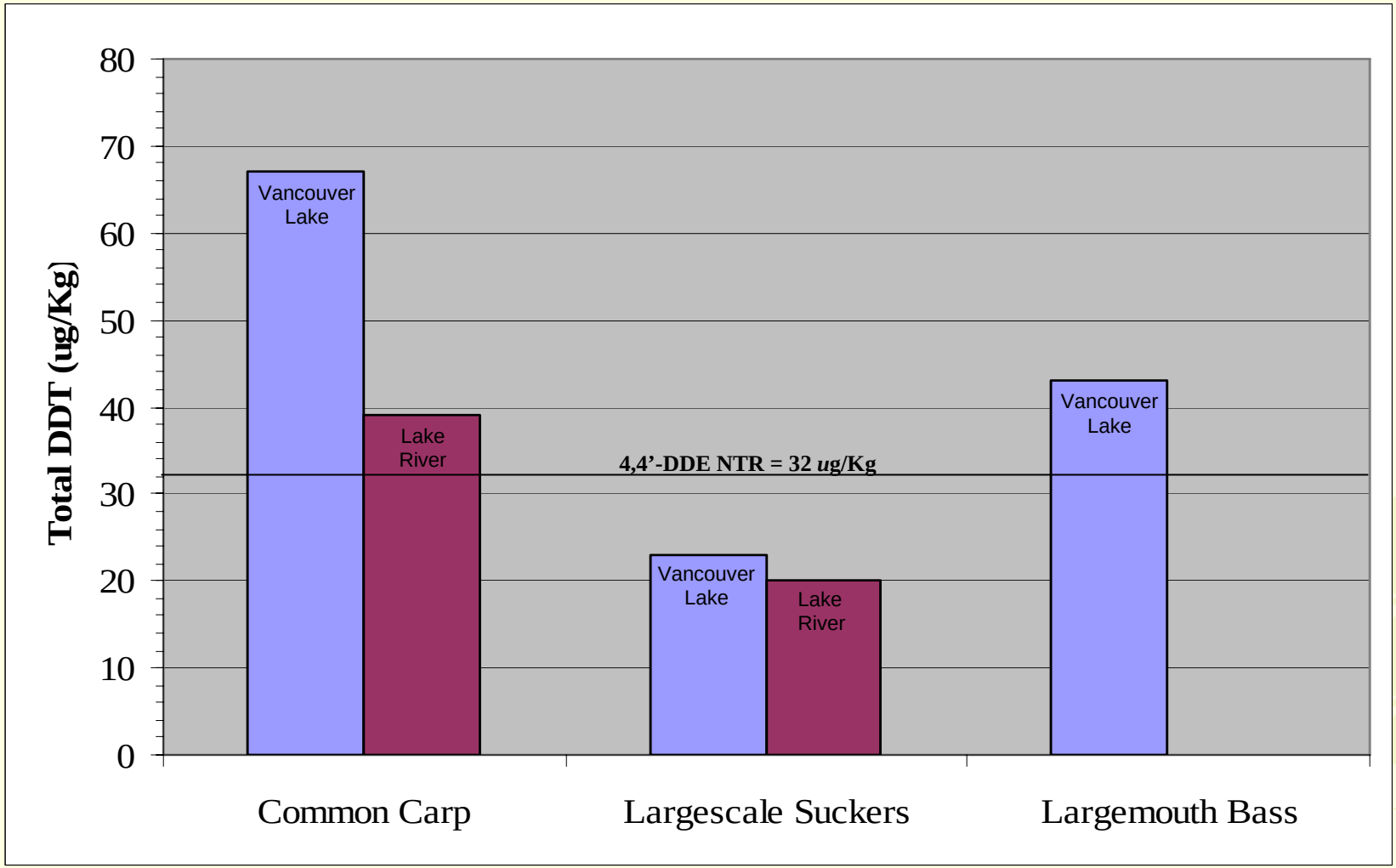
Summary of Total DDT Levels Reported in Edible Fish Tissue from Lake River

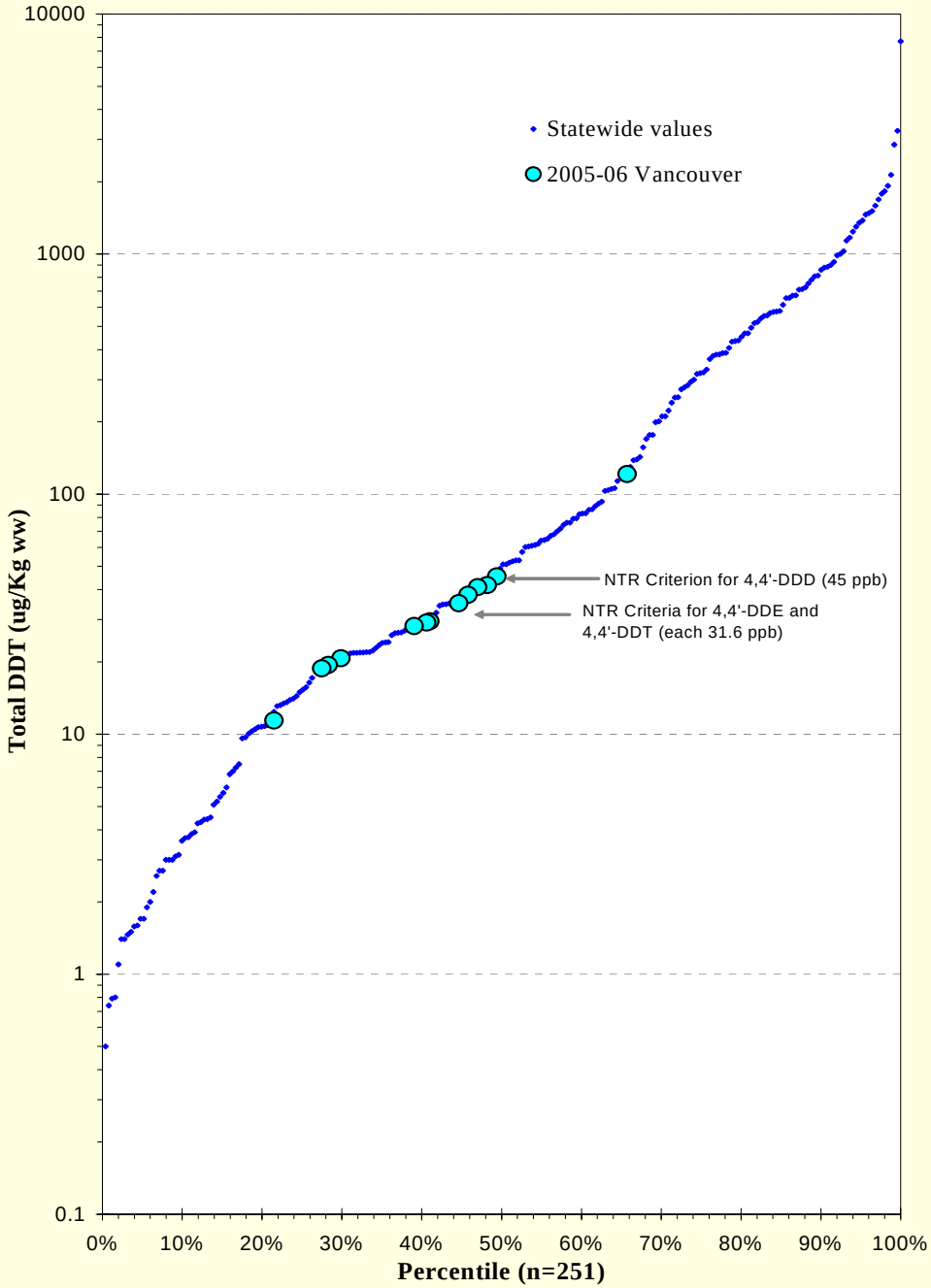
- Common Carp — Range = 36 – 42 *u*g/Kg, wet weight
  Mean Total DDT Level = 39 *u*g/Kg
  Standard Deviation = 2.9 *u*g/Kg

- Largescale Sucker — Range = 19 – 21 *u*g/Kg, wet weight
  Mean Total DDT Level = 20 *u*g/Kg
  Standard Deviation = 1.3 *u*g/Kg

*Total DDT defined as sum of 4,4'-DDE + 4,4'-DDD + 4,4'-DDT + 2,4'-DDD
NTR = 32 *u*g/Kg for 4,4'-DDT and 4,4'-DDE; and 45 *u*g/Kg for 4,4'-DDD

Total DDT in Fish Tissue





Cumulative Frequency Distribution of Total DDT in Freshwater Fish from Washington State

Chemicals Detected in Sediments

- Contaminant levels were low in sediments. Only 4 of 31 compounds were detected in sediments from Vancouver Lake.

- Only about 2% (4 of 186) of the total analyses detected target chemicals above the reporting limit.

	Burnt Bridge Creek	Flushing Channel	Center Lake	Outlet Channel	Lake River	Sediment Quality Guidelines LAET
TOC 70°C (%)	2.01	0.36	0.68	0.93	1.04	9.82
PCB - 1248	13 UJ	3.9 U	4.3 U	**5.0 J**	4.5 U	NA
PCB - 1254	**14 J**	3.9 U	4.3 U	4.5 U	4.5 U	230
4,4'-DDE	**3.3**	0.79 U	0.85 U	0.89 U	0.91 U	21
4,4'-DDD	**1.6**	0.79 U	0.85 U	0.89 U	0.91 U	96

Study Recommendations

- A surface water quality study of potential sources should be conducted for PCBs and chlorinated pesticides in Vancouver Lake and the Lake River.
- Total PCBs and 2,3,7,8-TCDD in fish tissue should be addressed through a statewide assessment to determine background levels.
- A TMDL study should be considered for 4,4'-DDE, dieldrin, and toxaphene in Vancouver Lake fish, and 4,4'-DDE and dieldrin in Lake River fish if follow-up sampling indicates potential pollutant sources are present.
- Vancouver Lake and Lake River fish should be monitored for PCBs and chlorinated pesticides again in five years.

Ecology Information on Toxics

- Vancouver Lake PCBs, Chlorinated Pesticides, and Dioxins in Fish Tissue and Sediment, Website:
  http://www.ecy.wa.gov/biblio/0703017.html

- Monitoring of Toxic Contaminants in Washington State Website:
  http://www.ecy.wa.gov/programs/eap/toxics/index.html

- Ecology's PBT Strategy Website:
  http://www.ecy.wa.gov/programs/eap/pbt/pbtfaq.html