
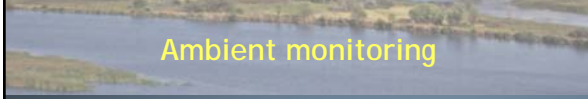


Water quality monitoring in Osoyoos Lake and downstream in the Okanogan River



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Ambient monitoring

- Ecology has monitored some stations longer than 30 years
- Parameters measured in the lower Okanogan River basin include:
 - Flow
 - Temperature, oxygen, pH, conductivity
 - Suspended solids, turbidity
 - Ammonia-nitrogen, nitrate-nitrogen, total nitrogen, fecal coliform bacteria, phosphorus, metals (select locations)
- <http://www.ecy.wa.gov/apps/watersheds/riv/stationlistbywria.asp?searchterm=oroville>



Ambient monitoring (data sources)

id	station name	type	last yr.
1	Okanogan R nr Brewster	Basin	1971
2	Okanogan R @ Malott	Long-term	2007
3	Okanogan R @ Okanogan	Basin	2006
4	Okanogan R @ Omak	Basin	2006
5	Okanogan R @ Riverside	Basin	2006
6	Okanogan R @ Janis	Basin	1976
7	Okanogan R @ Tonasket	Basin	1996
8	Okanogan R @ Oroville	Long-term	2007
9	Similkameen R @ Oroville	Long-term	2007
10	Similkameen R @ Nighthawk	Basin	1996
11	Similkameen R @ Chopaka, BC	Basin	2001
12	Bonaparte Cr @ Tonasket	Basin	2007
13	Bonaparte Cr above Tonasket	basin	2007


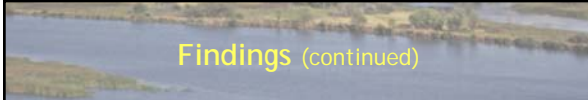
Pesticide monitoring in basin

- Ecology has completed several surveys of DDT and PCB concentrations in fish tissue, sediments, and water from 1983-2006
- Ecology's data supplemented by studies done by Okanogan Conservation District (2000-2001) and Colville Confederated Tribes (2001)
- Some samples with concentrations above standards established to protect beneficial uses of surface water
 - Fish consumption
 - Aquatic habitat


Findings

- Measured loads
 - Loads delivered by wastewater treatment plants low (average 200 mg/day t-DDT; 3 mg/day t-PCB)
 - Loads in several reaches of lower Okanogan River range from 1,500-4,300 mg/day t-DDT; no measurable PCB loading
 - 61% of DDT load delivered by tributaries is from Tallant Creek; probably episodic, seasonal loadings
 - 27% of tributary load delivered from Nine Mile, Tonasket, and Elgin creeks
- Loads calculated based on fish tissue concentrations are higher (13,000-32,000 mg/day t-DDT; 0-6,500 mg/day t-PCB)
- No measurable DDT load from Similkameen River

Findings (continued)

- TMDL technical study estimated combined loads for t-DDT to be 200 mg/day, and for t-PCB <1.0 mg/day
- 2001-2002, 2006 data show DDT concentrations in fish tissue lower than in 1980s and 1990s
 - Highest concentration in 2001-2002 was 600 ng/g t-DDT
 - Highest in earlier studies was 3,200 ng/g
- Most DDT loading in fish probably from direct and indirect exposure to bed sediments in water bodies



DDT and PCBs - legacy pollutants

- DDT use in U.S. banned in 1972
 - Low solubility in water, affinity for solids
 - Resists degradation
 - DDT and its breakdown products DDE and DDD sorb to sediments and particulate matter in the aquatic environment
 - Bioaccumulates in fish tissue
 - Used widely by U.S. and Canadian fruit growers in region
- PCB manufacturing banned in U.S. in 1979
 - Used from 1929 until 1979, widely used
 - Similar characteristics to DDT and its derivatives
 - No major sources known in lower Okanogan River basin

Clean Water Act, Section 303(d) list

- § 303(d) of the CWA requires states to list all surface waters where beneficial uses are impaired by pollutants - "303(d) list"
- Total maximum daily loads (TMDLs) or "water quality improvement projects" are developed for water bodies on 303(d) list
- State surface water standards, chapter 173 201A WAC (<http://www.ecy.wa.gov/pubs/0610091.pdf>)

Water quality criteria for protection of human health and aquatic life

Parameter	Human health ^a , water (ng/l)	Human health, tissue (ng/g)	Aquatic life ^b , water (ng/l)
4,4'-DDE	0.59	32	1
4,4'-DDD	0.83	45	1
4,4'-DDT	0.59	32	1
T-DDT	ne	ne	1
PCB Aroclors	0.17	5.3	14
T-PCB	0.17	5.3	14

^a National Toxics Rule (40 CFR 131) for consumption of organisms and water
^b Ch. 173-201A WAC, chronic criteria
 ne = not established

Clean Water Act, Section 303(d) list

- South end of Osoyoos Lake and portions of lower Okanogan River and tributaries placed on 303(d) list in 1998
 - Concentrations of DDT, its derivatives DDE and DDD, and PCBs in fish tissue
 - Risk of human exposure when consuming contaminated fish
- Other listings in basin:
 - Okanogan River, some tributaries - fecal coliform bacteria
 - Okanogan River, Similkameen River - temperature
 - Similkameen River - arsenic

DDT/PCB TMDL completed in 2005

- Sets targets for lowering DDT and PCB concentrations in fish to align with human health criteria
- Covers lower Okanogan River and tributaries from Canadian border to mouth of river, portions of Osoyoos Lake
- Chemicals: 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, t-DDT [total DDT]; and PCBs as Aroclors or t-PCB [total PCBs]
- Water quality improvement plan completed in 2006
 - Prevent erosion and transport of contaminated soil and sediment into lower Okanogan River system
 - Natural attenuation may be important for reductions in fish

Recommendations for future work

- Expand sampling effort around Osoyoos Lake basin
- Reassess pesticide concentrations in lake fish
- Improve understanding of distribution of DDT and PCBs in fish, sediments, and water in the lower Okanogan River system
- Assess episodic loading of DDT into surface waters from tributaries
- Develop strategies to address fecal coliform loads and temperature impairments in basin



Key studies and reports

- *Ambient monitoring data for lower Okanogan stations*
<http://www.ecy.wa.gov/apps/watersheds/riv/stationlistbywria.asp?searchterm=oroville>
- *TMDL Technical Assessment of DDT and PCBs in the Lower Okanogan River Basin* (June 2003)
<http://www.ecy.wa.gov/biblio/0303013.html>
- *Lower Okanogan River Basin DDT and PCBs Total Maximum Daily Load* (October 2004) <http://www.ecy.wa.gov/biblio/0410043.html>
- *DDT in Osoyoos Lake Fish* (December 1998)
<http://www.ecy.wa.gov/biblio/98337.html>
- *Washington State Pesticide Monitoring Program: 1994 Fish Tissue and Sediment Sampling Report* ((December 1996)
<http://www.ecy.wa.gov/biblio/96352.html>



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