Broadening River Restoration To Reduce Toxics

River Restoration Northwest
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Today’s Conversation

Recognition of great successes in watershed restoration in the Pacific Northwest

Background on toxics in Columbia River Basin

Actions that can be taken
Congratulations!

In the Columbia River Basin alone:

About 390,000 acres of habitat protected through purchase, lease or easement (larger than Mount Rainier National Park)

Reopened or improved access to 2,418 miles of rivers and streams (more than the length of the Columbia River)

319,316 more acre feet of water protected and flowing (more than Seattle residents use in a year)

373 screens installed or improved
Fish living near Bonneville Dam toxic

Resident fish are contaminated with PCBs and mercury, but migratory fish are OK

By LYNNE TERRY
THE OREGONIAN

Fish that live year-round just above Bonneville Dam are so chock-full of contaminants that health authorities on Monday advised the public not to eat them at all. They also urged the public to limit the consumption of so-called resident fish in a 150-mile stretch upstream from Bonneville Dam.

The advisory does not affect migratory fish, such as salmon, steelhead, American shad and lamprey. But it does include sturgeon and walleye, two species popular with tribes.

Tests were done on Columbia River fish collected in August 2011, under the auspices of the U.S. Army Corps of Engineers. The Oregon Health Authority got the results this past May and then performed extensive analysis.

The results were surprising. The threshold for a health advisory for polychlorinated biphenyls, or PCBs, is 0.047 parts per million. The tests turned up 183 parts per million. "That's higher than I've ever seen," said David Farrer, Oregon's public health toxicologist.

By comparison, tests on carp in the Willamette River around Portland harbor, another contaminated site, turned up 5 parts per million of PCBs.

In the Columbia River, smallmouth bass were tested near the Bonneville Dam. They were collected between the dam and Ruckle Creek, a one-mile stretch.

Please see FISH, Page A3
An Additional Challenge for Watershed Restoration

- Successful watershed restoration depends on reducing toxics.
- We need more toxics reduction and assessment.
Toxics Are A Contemporary Issue
PROTECT YOUR CHILDREN
Against Disease-Carrying Insects!

TRIMZ DDT CHILDREN'S ROOM WALLPAPER and Ceiling Paper

KILLS FLIES, MOSQUITOS, ANTS
... as well as moths, bedbugs, silverfish and other household pests after contact!

MEDICAL SCIENCE KNOWS many common Insects breed in filth, live in filth and carry disease. Science also recognizes the dangers that are present when these disease-carrying insects invade the home. Actual tests have proved that one fly can carry as many as 5,600,000 bacteria! Imagine the health hazard - especially to children - from flies seriously suspected of transmitting such diseases as scarlet fever, measles, typhoid, diarrhea... even dread polo! Some types of mosquitoes carry malaria and yellow fever. And any mosquito bite is painful and easily infected when scratched.

NON-HAZARDOUS to children or adults, to pets or clothes. Certified to be absolutely safe for home use. Tested and recommended by Parent's Magazine.

GUARANTEED effective against disease-carrying insects for 1 year. Actual tests have proven the insect-killing properties still effective after 2 years of use.

NO SPRAYS! NO LIQUIDS! NO POWDERS! So convenient, so safe because the DDT is fixed to the paper. It can't rub off!

BEAUTIFUL! "Jack and Jill" or "Disney Favorites" - gay new patterns that protect as they beautify a child's room.

DDT CEILING PAPERS, TOO! Extra protection for your child's room - for every other room in the house. Choice of two tints.

READY-PASTED! Just Dip in Water and Hang!

Anyone can put Trimz Wallpaper up without help or previous experience. Millions have done it - proved it's quick, clean, easy! Nothing to get ready - no tools, paste or muss. Just cut strips to fit, dip in water and hang. It's dry in 20 minutes! Guaranteed to stick - guaranteed to please or money back. And so inexpensive! You can protect your child for $8 to $12 - depending on size of room.

Trimz DDT Children's Room Wallpaper, Trimz DDT Cedar Close! Wallpaper now available at Department, Chain, Hardware, Paint, and Wallpaper stores everywhere.

Many beautiful new patterns also available in regular Trimz Ready-Pasted Wallpaper at $1.98, $2.49, $2.99 per box.

Women's Day
June 1, 1947
Pacific NW History
Celilo Falls

Tribal Culture based on Fish
2002 EPA/CRITFC Fish Contaminant Study

- 92 pollutants detected in fish
- Fish taken from 24 Tribal fishing sites in Columbia River Basin - 1996 - 1997
  - Anadromous: Fall/spring chinook, steelhead trout, smelt and Pacific lamprey
  - Resident: rainbow trout, mountain whitefish, white sturgeon, walleye, large scale sucker, bridgelip sucker
- PCBs, dioxins, furans, arsenic, mercury, and DDE, a breakdown product of DDT
Columbia River Toxics Reduction Strategy

- Collaborative Watershed Effort to Reduce Toxics
- Columbia River Toxics Reduction Working Group
- State of River Report—“tell toxics story”
- Columbia River Basin Action Plan –61 actions
- Columbia River Basin legislation introduced in Congress in 2010 & 2014—toxics focus
Key Partners

✓ Federal, State and Local Govts
✓ Columbia River Tribal Governments
✓ Lower Columbia River Estuary Partnership
✓ NW Power and Conservation Council
✓ Columbia River Inter-Tribal Fish Commission,
✓ Upper Columbia River United Tribes
✓ Agriculture – farmers, SWCDs, NRCS
✓ Industry - Pulp and Paper, (NWPPA), Nike, Toyota, Longview Fiber
✓ Municipal Dischargers (ACWA)
✓ NGOs - Columbia Riverkeeper, Oregon
✓ Environmental Council, Salmon Safe
✓ Local Watershed Councils
2009 Columbia River Basin State of the River Report for Toxics

Contaminants of Concern

• Toxics are widely distributed and at levels of concern throughout Basin
• Reduction efforts have been successful
• Gaps in sources, effects and levels

Mercury – major source is air deposition, some regional sources
DDT – Banned in 1972, still persists
PCBs – Manufacturing banned in 1979, still widespread, learning about new sources
PBDEs – flame retardants are a growing concern
Identified indicator species to track over time
✓ Juvenile salmon
✓ Resident fish
✓ Sturgeon
✓ Predatory birds – osprey and bald eagle
✓ Aquatic mammals – mink and river otter
✓ Sediment-dwelling shellfish – Asian clam
State of River Report
Toxics Effects Information

- PBDEs increasing in juvenile fish – LCREP 2007
- PCB concentrations in some sites are above levels that can cause harm in juvenile salmon
- PCB levels in juvenile salmon increase as fish travel down the estuary
- High mercury in liver and other organs from Lower Columbia River white sturgeon
- DDT – higher levels in white sturgeon above Bonneville Dam
Documented Effects on Fish
Mercury, PCBs, DDTs, & PBDEs

- **PCBs**  - thyroid function, growth and metabolic problems, reduced disease resistance and increased disease-induced mortality; reproductive impairment. (Meador et al. 2002)

- **DDTs** - delayed mortality, reduced fertility and larval survival, changes in foraging and predator avoidance behaviors, reproductive impairment. (Beckvar et al. 2005, Johnson et al. 2007)

- **PBDEs** - thyroid function and cause neurological damage; also may reduce disease resistance. (Arkoosh et al 2010).

- **Mercury** - correlated with low physical health indices and reproductive defects in fish
Vitellogenin: Columbia River male sturgeon

- Columbia River Sturgeon
  - USGS – 2005 - 3 pools and estuary
- Increased vitellogenin in males
- Vitellogenin is a biomarker of occurrence of estrogenic compounds in water
- Also saw some intersex fish

Polycyclic aromatic hydrocarbons (PAHs) affect juvenile salmon growth and lipid content, and are toxic to embryos.

Fossil fuels, car exhaust, creosote

Current use pesticides and dissolved copper are toxic to fish sensory systems

Problems w/ olfaction and related behaviors (prey capture, predator avoidance) at concentrations as low as 0.2 ug/L.

USGS sites detected a median copper concentration of 1.2 ug/L.

Impairment of sensory functions important to survival of juvenile salmonids is likely to be widespread.

(See Hecht et al. 2007. NOAA Tech Memo NMFS-NWFSC-83).

Organophosphate pesticides disrupt olfaction in salmon, interfere with prey capture and predator avoidance

Some combinations have lethal synergistic effects

Other Contaminants Also Pose Risks

Wastewater Compounds—Pharmaceuticals, personal care products, caffeine, nicotine

Current use pesticides—organophosphate insecticides (diazanon, chlorpyrifos)
carbamate insecticides (carbaryl, carbofuran)
pyrethroid insecticides (cypermethrin, esfenvalerate)
Herbicides (2,4-D, atrazine)

Trace metals (e.g., copper, found in road runoff and storm water)
USGS Con-Hab Study - April 2014

- Investigated transport pathways, chemical fates, effects of PBDEs and other endocrine disrupting chemicals in water, sediments & foodweb of the Lower Columbia River

- Contaminants detected at all 11 sites and in nearly all tissues sampled over a 3 year period

- Contaminants in sediments, fish tissues, and osprey eggs increased moving downstream to urbanized areas

• Contaminant concentrations exceeded environmental quality screening levels in some cases.
• Certain chemicals increased up the food chain from water to sediment to insects to fish to bird eggs.
• Reproductive health indicators (like thyroid hormone levels and fish sperm health) were correlated with chemical concentrations. Both were worse at the more urbanized sites.
• Fish abnormalities were higher near urbanized sites (kidney, spleen, liver and gill histopathology or structure)
• **Contaminants pose concern for human health and the river system’s food web in general.**
Sources of off-target movement often hard to trace:

**Point Sources**
- 1-2 locations
- Disposal sites
- Wells, sinkholes
- Storm drains

**Non-Point Sources**
- Wide area
- Drift
- Runoff
- Leaching

Figure 1. Pathways of pesticide movement in the hydrologic cycle (modified from Barbash and Resek, 1996).
Promising Framework: Columbia River Basin Toxics Reduction Action Plan

61 Actions

5 Initiatives

- Increase public understanding & political commitment
- Increase toxic reduction actions
- Increase monitoring to identify sources
- Develop research program
- Develop data management system

2 Tiers

- Existing resource
- New resource
Columbia River Toxics - Key Work Efforts

4 workshops to collaborate on reducing toxics
- May 09 - Agriculture - Pendleton w/Umatilla Tribe
- July 09 - PCBs - Portland
- Aug 09 - Agriculture – Wenatchee
- Feb 10 - PBDEs and other Flame Retardants – Portland
- Oct 2012 – Pesticide Stewardship Partnerships– Hood River
- July 2014 - Pesticide Stewardship Partnerships - Walla Walla

Working Group continues dialogue and collaboration
Opportunities

• Expand collaborative partnerships with agriculture - sediment reduction, IPM

• Expand Pesticide Stewardship Partnerships – Focus on monitoring and best practices

• Expand Agricultural Take Back Programs

• Increase green purchasing

• Increase stormwater management in local communities/businesses
Salmon-Safe

• Providing market-incentive, collaborative approach to farmers to protect water quality and wild salmon using a “whole farm approach”
  http://www.salmonsafe.org

• Use land management standards for:
  – Integrated Pest Management
  – Irrigation Water Use and Reductions
  – Riparian and Wetland Management
  – Erosion and Sediment Control

• Over 60,000 acres of agricultural land has been certified, joined by corporate collegiate campuses and municipal parks
Northwest Momentum

- Portland Parks
- Nike
- PSU
- Toyota
- OMSI
- Epson
- Port of Seattle Parks
- Oregon Convention Center
- Washington State Dept. of Ecology
- UW Bothell
- Seattle Art Museum Olympic Sculpture Park
- Portland South Waterfront
Ted Casteel, Bethel Heights Vineyard, OR

- One of first Salmon Safe certified farms in 1996
- Leader on OR wine industry Low Input Viticulture and Enology Program – LIVE – limiting pesticides, fertilizer, water, chemical, fuels, etc
Brown and Sons, Orchard, Milton Freewater, OR

- Multi-generational family business
- Salmon Safe certification
- Supporting an initiative to certify all 6000+ acres in the Walla Walla Valley
Yakima River DDT

• Lower Yakima - agriculturally diverse farming, intense irrigation, and disease and pest controls

• 1972 DDT banned. Had been widely used in basin.

• DDT attached to soil particles carried to river through irrigation runoff.

• 1985 fish had T-DDT concentrations of up to 3,000 ppb (Johnson et.al., 1988)

• 1993 Fish consumption advisory

• 1997 Water cleanup plan specifies actions
What Happened?

• Erosion control needed (300 tons of sediment runoff during irrigation season)
• TMDL established reduction targets using inexpensive surrogate measure (turbidity) for TSS and DDT (Implementation began in 1998)
• Irrigation districts took ownership of implementation
  – Set specific on-farm turbidity targets
  – Converted irrigation practices from rill and furrow to sprinkler and drip irrigation
Before and After

1995: 280 tons / average day during late irrigation season

2003: 65 tons / average day during late irrigation season
Suspended Sediment Reductions

Total suspended solids in mainstem have decreased by 50 to 70% (2003)
How?

- Source reduction
- Turbidity targets
- Irrigation BMPs
Pesticide Stewardship Partnerships (PSPs)

Key Steps in Partnership Projects

Monitor for current use pesticides in surface waters from drift & runoff

Identify streams with elevated pesticide concentrations or high # of detections

Collaborate to implement voluntary management practices

Follow-up monitoring to determine improvements over time
Hood River PSP: What Can Be Achieved?

Goal: Reduction in concentrations & frequency of detections over time

**Early Spring Chlorpyrifos - Lower Neal Creek**

- **Average**
- **Chronic WQS**
- **Acute WQS**
- **Frequency**

![Graph showing reduction over time](image-url)
Little Walla Walla River Distributaries (3 sites)  
Diuron (Karmex) - Average Concentrations  
Spring 2010-2013

Max = 18.9 ug/l

EPA Aquatic Life Benchmark = 2.4 ug/l

Max = 6.4

Max < 0.1 ug/l

97% reduction since 2009
What Types of Watershed Actions Have Been Implemented?

- Spray Drift Reduction Trainings & Practices
- Installation of Weather Stations
- Use of Biological Controls (e.g., mating disruption)
- Integrated Pest Management Training & Technical Assistance
- Use of Less Toxic Pesticides
- Buffer Strips & Minimize Spraying near Streams
Legacy Pesticide Collection
Over 1,714,755 Pounds of Pesticides Collected in Idaho Since 1993
Stormwater Retention

- Great benefits in toxics reduction
NRCS Funding Opportunity

• NRCS Regional Conservation Partnership Program
  – Focus on water quality, healthy productive soils, enhanced wildlife and pollinator habitat
  – 14/15 projects include OR Sage Grouse Protection (9), North Slope Ochoco Holistic Restoration (7), Upper Columbia Irrigation Enhancement, North Willamette Valley Upland Oak Restoration Partnership(2)
2015-16 Urban Waters Grant Program

- Promote clean urban waters.
- Reconnect people to their waterways/focus on underserved communities.
- Use urban water systems as a way to promote economic revitalization and prosperity.
- Encourage community improvements through active partnerships.
- **FY 15 grant program will focus on community based stormwater management.**

http://www2.epa.gov/urbanwaters
Toxics are prevalent and widespread in fish.

Toxics reduction is a critical *though neglected* component of habitat restoration.

Watershed restoration leaders must look at opportunities to reduce toxics as a part of restoration work efforts.

*We need increased reduction, monitoring and assessment work to reduce toxics.*