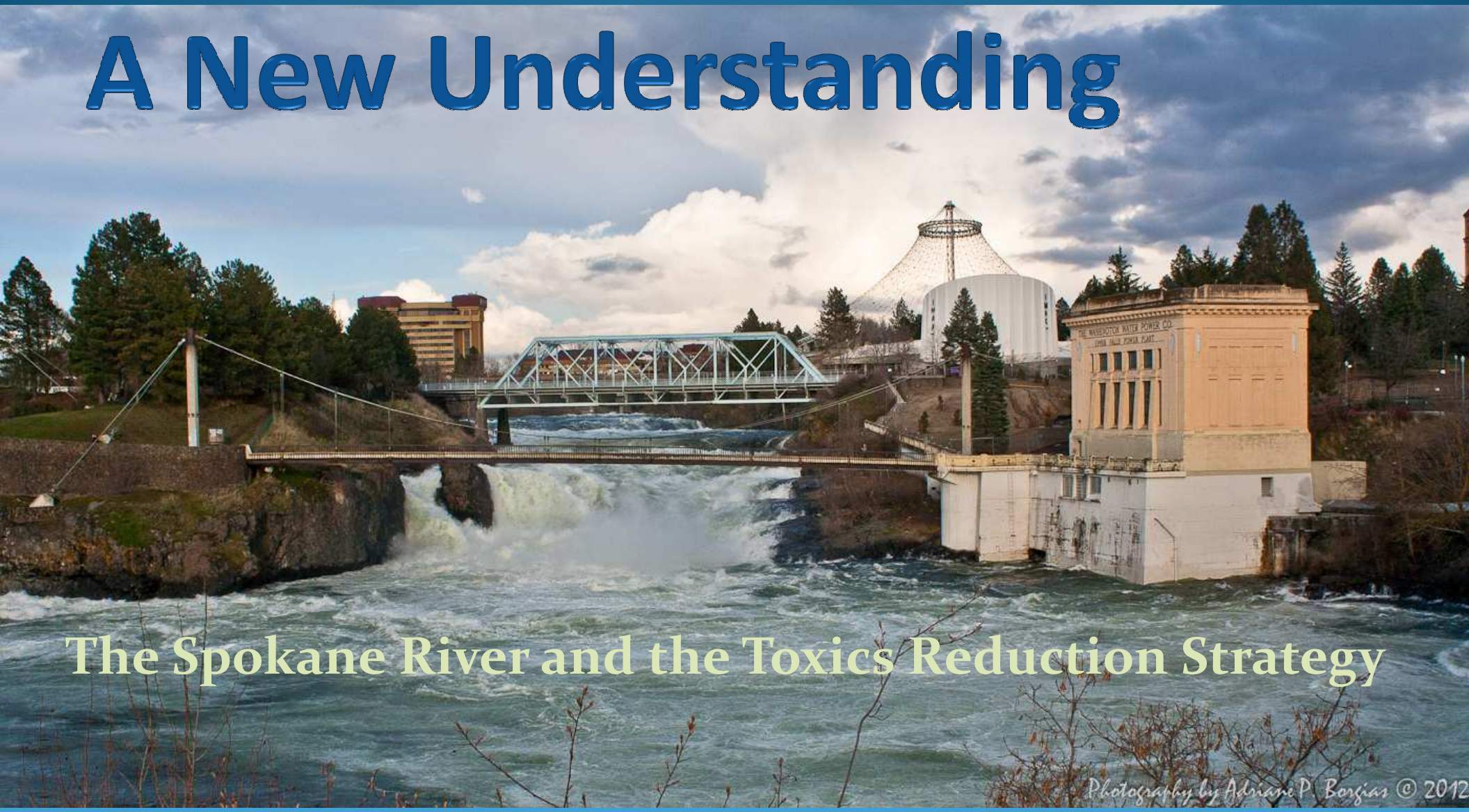
Polychlorinated Biphenyls:

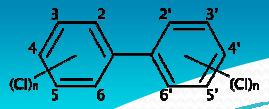
A New Understanding



The Spokane River and the Toxics Reduction Strategy

Overview

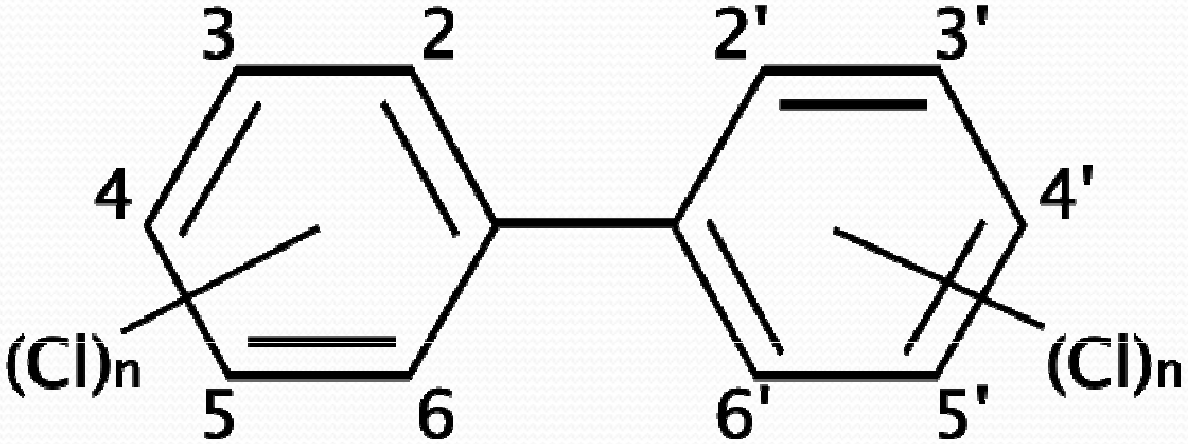
- **What is PCB?:** Chemical Structure
- **History of PCB:** Toxic Substances Control Act
- **The Spokane River:** What Happened Next
- **Path Forward:** Problem Solving Options



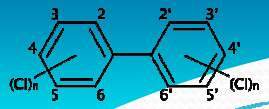
What are Polychlorinated Biphenyls?

- A family of chemicals with a characteristic structure and properties
  - Good insulating properties and fire resistance
  - Does not biodegrade (half life of months to years)
  - Bioaccumulates in the food chain
  - Persistent organic pollutant
    - Carcinogen
    - Nervous system
    - Reproductive system
    - Endocrine disruptor

Chemical Structure



- **Aroclors**: Name for certain commercial mixtures (16)
- **Homologs**: PCBs with the same number of chlorine atoms (10)
- **Congeners:** Individual molecules (209)
- **Toxic Equivalency Factors:** Relates the toxicity of a PCB congener to a specific, potent dioxin (2,3,7,8-tetrachloro-*p*-dioxin or "TCDD")



History of PCB

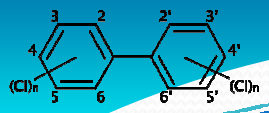
1881 PCB first synthesized

1927 First commercial manufacture

1935 Monsanto increased production and distribution of the "perfect industrial chemical"

- Italy, France, Japan, Germany and Russia
- GE, Westinghouse used in electrical equipment

1970 85 million pounds of PCB produced



Toxic Substances Control Act

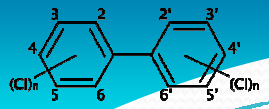
1976 EPA Regulates PCB above 50 ppm

- Prohibits manufacture and import of PCB
- Use of PCB in an unenclosed manner prevented
- Certain other uses still allowed

1977 Commercial manufacture stopped

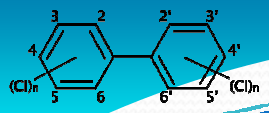
- Eliminated approximately 26,000 tons per year
- 600,000 tons total had been produced in US
- 450,000 tons in Europe

1989 Estimated global inventory of 1.5 million tons



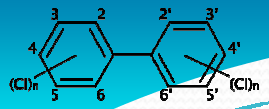
PCBs Legacy

- More than 200 documented uses
- Adverse health effects known since 1933
  - IBT Labs scandal: Monsanto interference
- History of contaminated feed and food sources:
  - Cattle feed, hogs, 236,000 chickens, milk, salmon, drinking water
  - 9 major cases between 1969-1971
- Significantly contaminated sites
  - Monsanto, Westinghouse (4 sites), Hudson River, GE (74 sites)
- More evidence of damage to wildlife: marine mammals
- Exposure to humans through the food chain



Why Do We Care?

- Studies dating back to the 1933 through today link PCB with health effects
  - Skin ailments, loss of appetite, loss of energy
  - Liver damage, “internal bodily injury”
  - Toxicity of some congeners similar to dioxin
  - Low concentrations can cause neurological effects
- PCB is a persistent, bioaccumulative, toxic
  - Takes a long time to degrade in the environment
  - Increases in concentration in food (fish)
  - Affects wildlife that feed on fish



What Happened Next?

San Francisco Chronicle: March 23, 1984

PCBs found in newsprint ink

SAN FRANCISCO (UPI) — The Environmental Protection Agency today hunted for the source of PCBs, a suspected cancer-causing substance, in the yellow ink of several newspapers in California and Arizona.

Small amounts of PCBs were found by the newspapers in yellow ink used at the San Jose Mercury News, the Sacramento Bee in California, the Arizona Daily Star and Tucson Citizen in Arizona.

The EPA spokesman said the PCB levels reported in the ink were unlikely to cause any health problem for pressmen or anyone handling the newspapers. Only long-term exposure could be harmful at those levels, he said.

Spokesman Review, May 8, 2003

Paper firm on notice for PCBs

State tells Inland Empire Paper It may have to share in cleanup

By Karen Dorn Steele
Staff writer

The state has formally notified Inland Empire Paper Co. that it's potentially on the hook for polluting the Spokane River with PCBs.

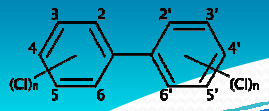
The Millwood plant recycles tons of newsprint for newspapers in 11 states, including The Spokesman-Review.

The company says the process it has used since 1991 keeps mountains of paper out of landfills. But some of the newsprint ink contains small amounts of PCBs, a suspected carcinogen.

Ecology's April 30 notice was a surprise, said Wayne Andresen, Inland Empire Paper Co.'s president and general manager.

"Naming us is pretty petty. We've only been recycling since 1991," Andresen said. "But they're trying to gather up as many people as they can."

Inland Empire Paper Co. is owned by Cowles Publishing Co., which also owns The Spokesman-Review.



The Spokane River

Welcome to The Spokane River
Let's Protect, Preserve and Enjoy It

Protect Our Shoreline and Water Quality
- Pack it in, pack it out
- Dispose of waste properly
- Leave habitat the way you found it
- Remove litter

Help Protect Native Redband Trout
- Release wild trout, they have an intact adipose fin
- No bait, use only single point barbless hooks
- Check Washington Department of Wildlife regulations
- Report poaching: 509-227-6560

Preserve Stream Flows
- The river and aquifer are one, water flows from one to the other
- Conserve water in the aquifer area to preserve stream flows for fish, habitat and recreation

Stay Healthy, Stay Safe
- Follow the fish consumption advisory
- Always wear a U.S. Coast Guard approved personal floatation device
- Know your abilities on the river
- Know river flows and conditions
- Observe warning signs and never boat immediately above or below a dam
- Use proper clothing and equipment
- Carry a first aid kit

Fish Consumption Advisory

From the Idaho Border to Upriver Dam:
Do not eat any fish. Catch and release only.

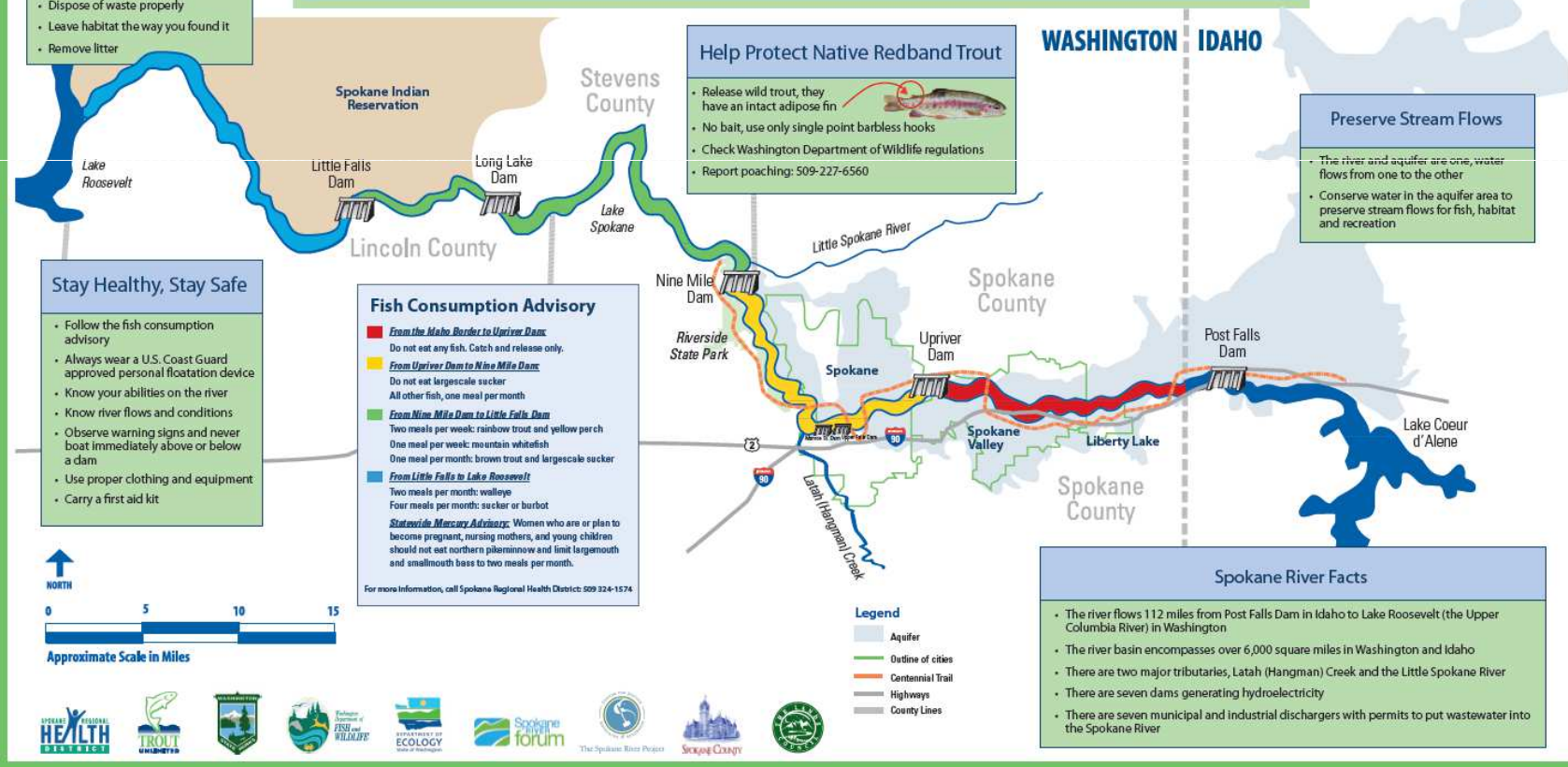
From Upriver Dam to Nine Mile Dam:
Do not eat largescale sucker
All other fish, one meal per month

From Nine Mile Dam to Little Falls Dam
Two meals per week: rainbow trout and yellow perch
One meal per week: mountain whitefish
One meal per month: brown trout and largescale sucker

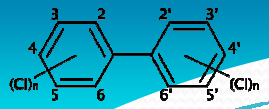
From Little Falls to Lake Roosevelt
Two meals per month: walleye
Four meals per month: sucker or burbot

Statewide Mercury Advisory: Women who are or plan to become pregnant, nursing mothers, and young children should not eat northern pikeminnow and limit largemouth and smallmouth bass to two meals per month.

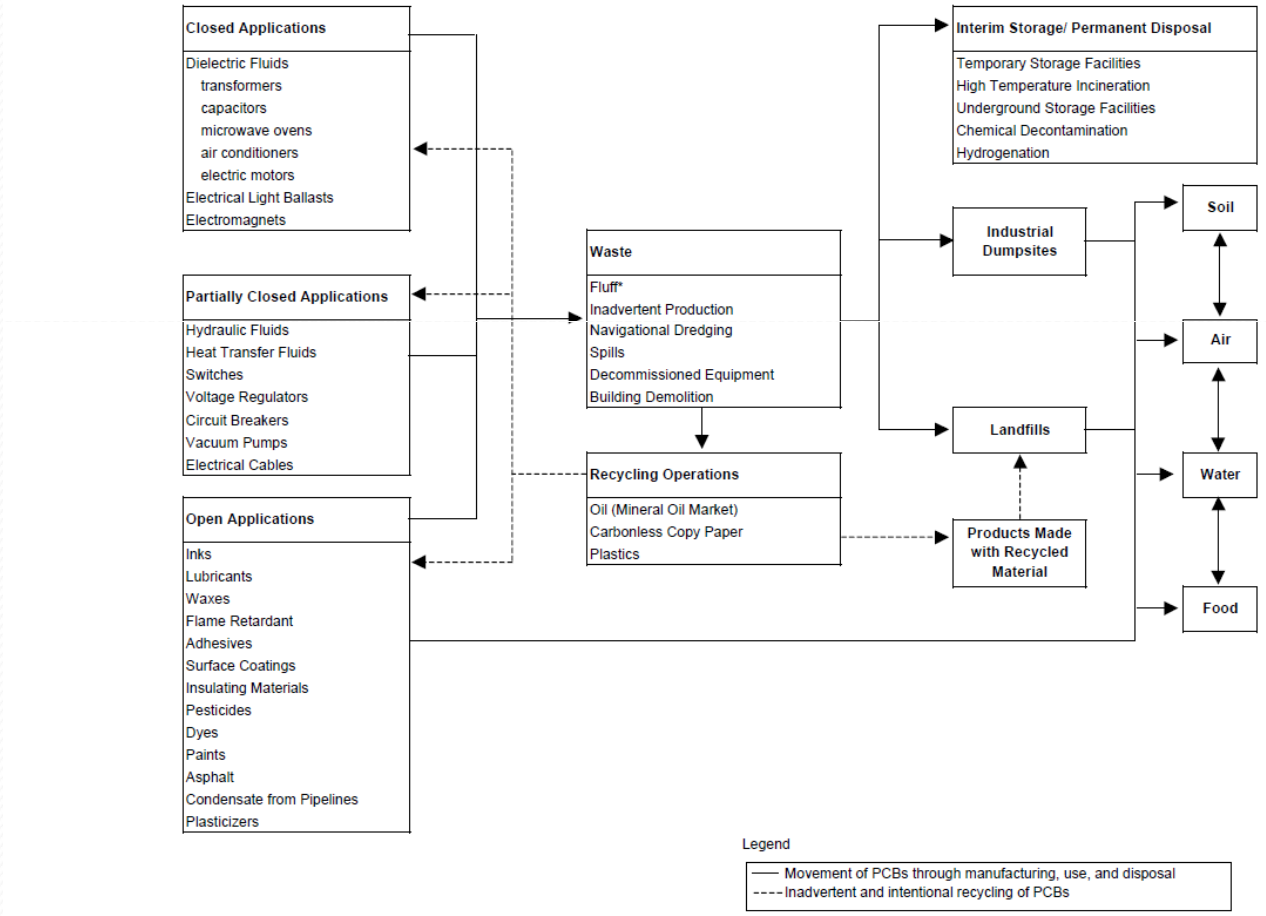
For more information, call Spokane Regional Health District: 509 324-1574



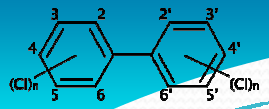
Spokane River Facts
- The river flows 112 miles from Post Falls Dam in Idaho to Lake Roosevelt (the Upper Columbia River) in Washington
- The river basin encompasses over 6,000 square miles in Washington and Idaho
- There are two major tributaries, Latah (Hangman) Creek and the Little Spokane River
- There are seven dams generating hydroelectricity
- There are seven municipal and industrial dischargers with permits to put wastewater into the Spokane River



PCB in the Environment



* Fluff is waste in the form of upholstery, padding, and insulation materials produced from the shredding of appliances and automobiles that become saturated with PCB-containing oils and fluids.



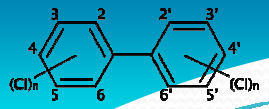
The EPA Myth #1

Myth: "Although no longer commercially produced in the United States, PCBs may be present in products and materials produced before the 1979 PCB ban."

Fact: PCB can be in products as a result of processes that "inadvertently generate" PCB

- Inks, dyes, pigments
- Caulks, paints
- Up to 50 ppm, or 50,000,000,000 ppq

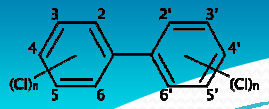
- Used motor oil can contain up to 2 ppm PCB



EPA Myth #2

Myth: If a product is declared "non-PCB" then that means there is no PCB in the product

Fact: PCB can be present in concentrations of up to 50 ppm and still be labeled "non-PCB." This includes enclosed uses such as electrical equipment and PCB in products as a result of "inadvertent generation"

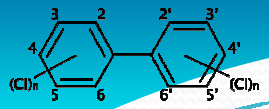


EPA Myth #3

Myth: PCBs in the environment are the result of

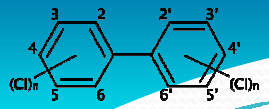
- Poorly maintained hazardous waste sites
- Illegal or improper dumping
- Leaks or releases from electrical transformers
- Disposal of PCB-containing consumer products into municipal or other landfills not designed to handle hazardous waste
- By the burning of some wastes in municipal and industrial incinerators

Fact: PCBs are also found in inks, dyes, paints, colored paper, motor oil and a variety of consumer products and they enter the environment through normal use.



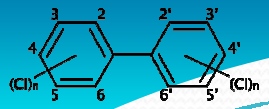
Water Quality Standards

- Water Quality Standards are based on:
  - Designated use
  - Location
  - Water Quality Criteria
  - Anti-degradation policy
- Washington State
  - 170 pg/l (parts per quadrillion) PCB in water
  - Translates to 5.3 ppb (parts per billion) for fish tissue
- Spokane Tribe
  - 3.37 pg/l PCB in water
  - Translates to 0.1 ppb for fish tissue



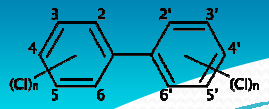
What is a Part per Quadrillion?

- 1 part in 1,000,000,000,000,000
- Two 8.5 x 11 inch pieces of paper in Washington State
- 1 drop of water in a cube 102 stories tall
- About 10 million PCB molecules in a breath of air
- 2.5 minutes out of the age of the Earth
- **Not very much and not easy to measure!**



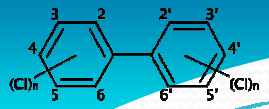
Spokane River Assessment Studies

- Spokane River is the most intensively sampled freshwater area in Washington for PCBs
  - **1980:** first PCB sampling
  - **Through 2003:** 20 studies conducted, not including site cleanup work
- Variety of samples included
  - Fish
  - Sediments
  - Effluents
  - Sludge
  - Water: Surface and ground



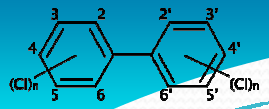
2007 Assessment Conclusions

- PCB levels in Spokane River
  - Have declined since 1990s
  - Are still above the Water Quality Standards
  - Elevated compared to most other areas of Washington
- Stormwater from the City of Spokane has the largest measured PCB loading to the river
- 95% reduction of all sources needed to meet the Water Quality Standard



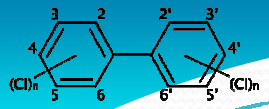
What We Know

- PCB is not manufactured in Spokane
- PCB enters the river from a variety of sources
  - Air deposition in the watershed
  - Stormwater contamination in urban environments
  - Legacy contamination and spills
  - Recycling processes
  - Wastewater treatment of domestic and stormwater



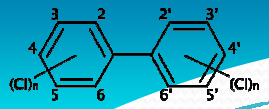
Problem Solving Options

- **Not do anything**
- **Work Individually**
- **Work Collaboratively**
- **Lawsuit**
- **All of the above**



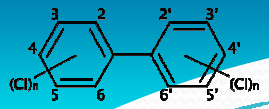
Problem Solving Options

- **Not do anything**
  - Has not shown to be effective!
- **Work Individually**
  - Washington, Idaho, Tribes
  - Permittees
  - Environmental Groups
- **Work Collaboratively**
  - Spokane River Regional Toxics Task Force
- **Lawsuit**
  - Riverkeeper
  - Sierra Club
- **All of the above**



Path Forward

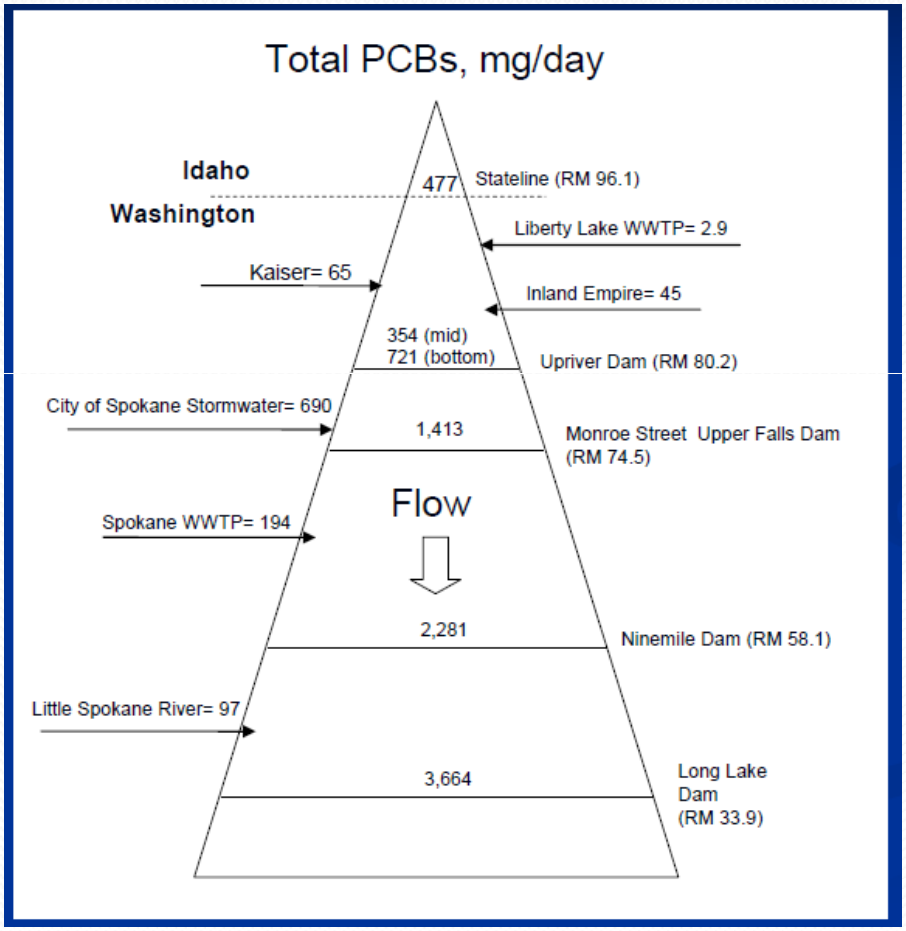
- **Total Maximum Daily Load** vs. **Direct to Implementation**
- **Understanding the River System**
- **Toxics Reductions**
- **Measuring Progress**



The PCB "Budget"

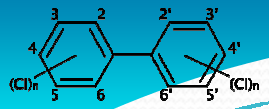
- **Total Maximum Daily Load**
  - Term used to describe the total amount of pollutant that can be allowed in a waterbody and still meet state Water Quality Standards
  - Requires an assessment of the
    - Amount (mass, weight) of the pollutant
    - Flow rate
  - Allocates the discharge of the pollutant
    - Point sources (permittees)
    - Nonpoint sources (aerial deposition, storm water)
- **Direct to Implementation**
  - Achieve reductions concurrently with the TMDL process

Understanding the River System



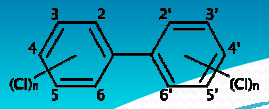
Source	Load (mg/day)
City of Spokane Stormwater	690
Stateline	477
Spokane WWTP	194
Little Spokane River	95
Kaiser	65
Inland Empire Paper	45
Liberty Lake WWTP	2.9
Total Measured	1569
Long Lake	3,664

Only ½ the in-stream load is accounted for



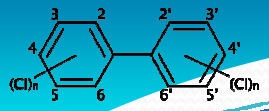
Unanswered Questions

- **Air**
  - Regional and global sources
  - How much is deposited over the watershed?
- **Stormwater**
  - How much comes from the air?
  - How much comes from consumer product uses?
  - How much comes from legacy pollution?
- **Industrial and Waste Water Discharge**
  - What can be achieved?



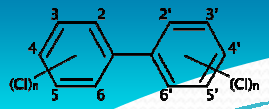
The Starting Point

- **Reduce PCB at the source**
  - Stop producing products with PCB contamination
    - Green chemistry, re-engineering, consumer choice
  - Encourage the use of truly PCB-free products
    - Product stewardship and voluntary certification
    - Green purchasing programs
    - Use less product
- **Regulatory Tune Up**
  - Correct the myths
  - Eliminate regulatory inconsistencies
  - Ban production of inadvertently generated PCB
- **Improve/install end-of-pipe technology as needed**
- **Measure progress and be patient**



Examples of Measures of Progress

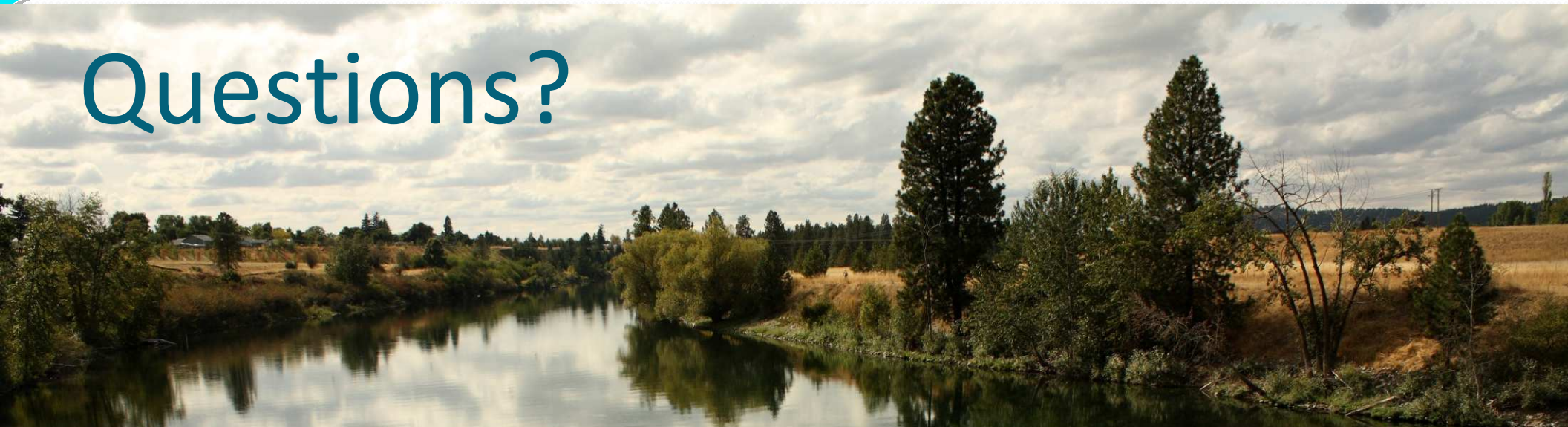
- **Environmental measures**
  - Trends in PCB concentrations in fish, sediments, soils, water
  - Pounds of PCB removed through clean up actions, water treatment or other types of management activities
  - Pounds of PCB prevented from entering the environment through source reductions
- **Other measures**
  - Number of short and long term actions or activities
  - Public outreach and effectiveness measures
  - Collaborative efforts and funding that contributes to the long term goal



Evaluate Progress

- Evaluate progress towards achieving the WQS
- Fine tune as understanding improves
- Celebrate success

Questions?



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