Toxic Chemicals and Heavy Metals in the Spokane River

A Public Guide
Valuing the Spokane River

The Spokane River is 111 miles long, originating at the outlet of Lake Coeur d’Alene in Idaho and stretching to its confluence with Lake Roosevelt (the Upper Columbia River) in Washington. The river serves as the region’s “signature” as it passes through urban, suburban, and rural landscapes.

Tribal communities have used the river for at least 9,000 years to meet a variety of subsistence and cultural needs. The Coeur d’Alene Tribe at the headwaters and Spokane Tribe of Indians at the confluence continue this long history.

Today, over half a million people live in the area and see the changing currents. In a 2009 poll of Washington residents living near the river, 70 percent said they go to the river to hike, bike, swim, boat, or fish at least three times a year. Over 33 percent visit the river at least 10 times a year. As river interactions increase, the public’s desire for greater stewardship deepens.

Those connecting with the river also know that during the industrial age this became a “working river” to meet municipal and industrial needs. These activities and the legacy of upstream mining anchor a belief by 25 percent of those polled that water quality is either “poor” or “not so good.” And while 21 percent say they fish in the river, less than half say they believe the fish are safe to eat.

Currently, wastewater treatment facilities, industry, municipal stormwater systems, dams, and new development continue to be part of the river’s landscape. The public is committed to striking a balance among these uses and other interests such as recreation and aesthetics. Indeed, 78 percent of those polled say it is very important that the Spokane River be protected and/or cleaned up.

One of the issues that requires attention in order to have a safe, beautiful, clean river is the presence of harmful chemicals and heavy metals in the water and river sediments. In the new millennium, the Spokane community needs strong leadership and broad commitment to address this issue.

Meeting Spokane River Needs

Thousands of hours and millions of dollars each year are spent on regulatory actions, studies, and on-the-ground actions to address Spokane River issues. Some of the most prominent include:

- Aquifer use and protection.
- Dam relicensing.
- Enhancing and protecting fish and wildlife habitat.
- Issuing permits to municipal and industrial facilities
- Cleaning up litter and hazardous waste.
- Reducing persistent toxic chemicals and heavy metals
- Managing river flows.
- Supporting recreational access.
- Managing the shoreline.
- Improving water quality.
- Watershed planning.
Chemicals and Heavy Metals in Our Environment

Chemicals are a growing human health and environmental concern across the country. Today, more than 80,000 chemicals are in use. Until proven harmful, their use and disposal is not regulated by government.

Some chemicals are toxic and are regulated to assure their safe use. In Washington, for instance, almost 30 million pounds of regulated chemical releases were reported in 2004.

Over time, certain chemicals prove to be particularly harmful and their presence in our land, air, or water poses long-term risks. These are called persistent bioaccumulative toxins because they:
- Remain in the environment for years without breaking down.
- As one species consumes another, toxic chemicals move up the food chain and thus build up in the tissues of fish, animals, and humans.

- Can cause cancer, skin rashes, nervous and reproductive system disorders, immune deficiencies, developmental and learning problems for children, and other health problems.

Heavy metals released by historic mining operations in the Coeur d’Alene Basin pose additional environmental and health concerns.

Chemicals and Heavy Metals in the Spokane River

Persistent bioaccumulative toxins of greatest concern are PCBs (a man-made chemical), PBDEs (a new generation of flame retardant) and dioxins/furans. Lead, arsenic, cadmium, and zinc are heavy metals released from mining operations and are also of concern.

When eating fish from the Spokane River, be aware of Washington State Department of Health (DOH) recommended limits. Eating fish from the stretch of river between the Idaho border and Nine Mile Dam may impact human health. DOH also recommends special precautions when cooking and cleaning fish to reduce contaminants (see page 8).

Sediments at certain recreational beaches from the Idaho border to Upriver Dam are also of concern. The Washington Department of Ecology and other agencies are actively cleaning up and restoring contaminated beaches identified as areas of potential risk (see page 9).

Reducing or eliminating toxic chemicals in the river is a very difficult challenge because:
- Pathways to the river vary widely. While most toxic substances are directly deposited in the river, others migrate to the river via tributaries, runoff, stormwater drains, and air particulates over a period of days or years.
- Sources are both near and far away. It is fairly easy to understand the effects of an industrial plant located on the river bank. It is a little harder to understand the effects of a mining operation 100 miles or so upstream. Still harder to understand are toxic chemicals from household, industrial, or farming products that often find their way into the river via ground water, stormwater drains, or wastewater treatment facilities. Even more difficult to grasp are the possible effects of a coal-fired power plant or incinerators located hundreds of miles away. All, however, can contribute to contaminants in the Spokane River.

- Regulatory practices often come after a problem becomes known. For instance, PCBs were only banned after years of being released into the environment. PBDEs were banned in Washington State in 2007. Recently, EPA adopted a reference dose, which is the maximum acceptable oral dose of a toxic substance, for PBDEs. For future advisories, this will help determine safe levels of fish consumption.

In addition, some chemicals are regulated but become too concentrated in certain locations. This may happen when persistent chemicals deposited in an area build up over time. Some deposits build up when persistent chemicals travel to a location via air and water.

Addressing these challenges requires a collaborative effort across many public agencies, private industries, environmental groups, citizens and others with expertise and commitment to meeting the needs of the Spokane River.
Air

Chemicals from hundreds to thousands of miles away can travel as particulates in the air, eventually coming back down to earth. This type of atmospheric fallout can be concentrated in particular locations. For instance, fallout in the St. Joe, St. Maries and Coeur d’Alene river basins may be particularly high, enabling contaminants to migrate through Lake Coeur d’Alene and into the Spokane River.

Sources and Pathways

Stormwater and Combined Sewer Overflows (CSOs)

The City of Spokane has over 700 miles of storm drains and sewer drains. Stormwater drains take urban runoff from rain and snow and discharge it into the ground or directly into the Spokane River. There are 130 storm drain outfalls into the river. Sewer drains carry wastewater from homes and businesses to a wastewater treatment plant. At times, primarily during large storm runoff events, wastewater that is not treated at the city’s treatment plant discharges directly into the Spokane River from 22 combined sewer overflow outfalls.
Sources and Pathways

Upstream Mining Legacy

Heavy metals from over one hundred years of mining in the Coeur d’Alene Basin travel downstream to and through Lake Coeur d’Alene. Most metals settle on the lake bottom while others flow into the Spokane River. Flooding causes the most movement of metals downstream.

Industry and Municipal Treatment

The Clean Water Act requires permits in order to discharge pollutants directly into the Spokane River. Called the National Pollutant Discharge Elimination System (NPDES), permits for the seven existing municipal and industrial dischargers are being reviewed as part of a renewal process. Although regulated and treated, some pollutants still enter the river. The proposed waste water treatment facility for Spokane County must also go through the NPDES permitting process.
Evaluating Exposure and Risk

**PATHWAYS**
Contaminant pathways to the river include industrial and municipal discharges, stormwater drains, tributaries, atmospheric deposition and urban runoff.

**CONTAMINATION**
Contaminants can be trapped in sediment on the river bottom, banks, and beaches. They can also attach to fine particulates that travel through the water column.

**BIOACCUMULATION**
Sediment contaminants can build up in the tissues of worms, insect larvae and other organisms (called the benthic community) that inhabit the river bottom.

**BEACHES**
People recreating on beaches upstream of Upriver Dam in Spokane Valley may be directly exposed to metals-contaminated sediments.

**Playing It Safe On Beaches and Shorelines**
Help protect your children from any contaminants by washing hands, face, feet and toys before eating and/or leaving the beach. Also, remember to use life jackets when playing in or by the river.
BIOMAGNIFICATION AND FOOD CHAIN
Contaminant concentrations can biomagnify (increase) in the tissues of species as they move higher in the food chain, e.g.—caddis fly, to fish, to humans. This happens as species higher in the food chain ingest and further concentrate toxins in their tissues.

FISH CONSUMPTION
For fish species that accumulate contaminants in their tissue and organs, toxins can move up the food chain to humans, birds, and other species consuming fish.

PCB Water Cleanup Plan
A Total Maximum Daily Load (TMDL) report, also called a water cleanup plan, is being developed for PCBs. This plan will regulate the amount of PCBs that can enter the Spokane River.

Although banned, previous PCBs still persist in the environment. A draft PCB TMDL in 2006 identified industrial discharges, wastewater treatment plants and storm water as sources of PCBs still entering the river.

To determine the amount of PCBs that can be in the river, standards are based on the amount of fish that can be safely eaten (consumed) without risking human health. For the Spokane River, standards set by the Spokane Tribe of Indians are used because they are a sovereign government located farthest downstream.

In 2007, the Washington Department of Health provided a health consult with new fish tissue analysis. In 2008, Ecology produced a report to further clarify the amount of PCBs entering the river from storm water drains. The Washington Department of Ecology plans to reissue a draft PCB TMDL, perhaps as early as 2010.
The Washington Department of Health updated a fish consumption advisory for PCBs in 2008. PBDEs and metals have also been detected at elevated levels in fish tissue. Idaho has issued no fish consumption advisories for the Spokane River.

**Fish Consumption Advisory and Cleanup**

**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 white fish
One meal per month: brown trout and largescale sucker

**From Little Falls Dam to Lake Roosevelt:**
Two meals per month: walleye
Four meals per month: sucker or burbot
Two meals per month: any species listed in this river section

**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.

**To reduce your exposure when eating fish:**

Prepare fish the following way to reduce PCBs and other contaminants that collect in the fatty parts of the fish by up to 50 percent:

- When cleaning fish remove the head, skin, fat, and internal organs before cooking. Do not use for sauce or gravy.
- Grill, bake, or broil fish so that the fat drips off while cooking.
- Mercury is stored in the muscle (fillet) of fish and cannot be reduced by cleaning this way.

Check local fish advisories:
1-877-485-7316 or www.doh.wa.gov/fish
Clean up and Restoration

Ecology’s Cleanup Program is leading efforts in areas between Upriver Dam and the Idaho Stateline where contaminated sediment deposits pose human health or ecological risks. Thus far four recreational areas and two habitat areas have been cleaned up. In the next two to four years, five more recreational areas will be cleaned up.

Cleanup Actions to Date

2008: Capping (isolation) and removal of contaminated sediments at Harvard Road public access recreation area. Also, an improved boat launch and parking area were completed.

2007: Cleanup at the Island Complex and Murray Road created safe river-side public recreation areas.

2006: As directed by Ecology, sediments just upstream of Upriver Dam were successfully “capped.” Further, contaminated sediments were removed from a sensitive backwater area known as Donkey Island, which is adjacent to the Centennial Trail.

Ecology, in coordination with EPA, cleaned up and established the Starr Road recreational area.

In Idaho, no shoreline cleanup activities of contaminated sediments have been initiated or are planned.
In 2007 the Washington State Legislature funded the Urban Waters Initiative program to look for sources of pollution to the Spokane River. Of particular concern are PCBs, PBDEs (flame retardants), dioxins/furans and metals that are found in fish, water and river sediment.

**Source Tracing**

For the Spokane River, finding the source of these pollutants began with assessing 14 locations within the City of Spokane’s storm drainage system. The results showed an outfall (drain pipe) for two catchment areas had the highest levels of PCBs, PBDEs and dioxins/furans. See map.

Finding the source of toxic chemicals coming through this outfall will be complicated. As the map shows, several storm drains feed into this outfall over a broad distance. Personnel from the Washington Department of Ecology will act like detectives to sample storm drains until they find one or more sources. Once a source is found, cleanup can begin.

**Inspections**

While personnel are finding pollutants in the drain system, the Spokane Regional Health District is working with businesses in these catchment areas to make sure hazardous waste is being properly managed and disposed. Specialists are asking businesses that use hazardous materials (like auto mechanic shops and printing companies) to examine their operations. If specialists find a practice that needs improvement, they will work with the owner to better manage these pollutants.

**What You Can Do To Protect River and Aquifer Water Quality**

### Storm Drains
- Never dump anything into storm drains, dry wells or drainage swales.
- Report materials being dumped into storm drains.
- Keep trash out of storm drains.
- Never allow roof gutters to drain directly into the street or storm drains.
- Avoid spilling fertilizers and pesticides in areas that can wash into storm drains.

### Household Waste
- For free, dispose household hazardous waste (paints, solvents, used oil, antifreeze, batteries, pesticides and fluorescent bulbs) at a regional solid waste disposal site.
- Never flush prescription or over the counter medications down toilets or drains.
- Use water-based rather than oil-based paints.
- Recycle used oil and antifreeze at a regional solid waste disposal site. Oil can also be recycled at approved drop sites, such as automotive shops.

### Lawn and Garden
- Follow product directions, do not over apply.
- Don’t over water, it can allow fertilizers to reach ground water or storm drains.
- Use slow-release, environmentally friendly fertilizers.
- Consider using natural pest control, such as lady bugs.
- Plant ground cover to reduce erosion.
- Scoop pet waste and put into your garbage.
Combined Sewer Overflow Upgrades

During large storm and runoff events, raw sewage mixed with rain or snow melt flows directly into the Spokane River through 26 combined sewer overflow control points. Usually unseen to the naked eye, this can happen at 22 outfall locations where corrugated pipe is typically buried and discharges effluent a few feet offshore and underwater.

Unfortunately, 11 of these control points have a history of malfunctioning, discharging raw sewage into the river when the weather is dry. This is also the time when people are more likely to be recreating and river flows to dilute sewage are far less. The culprit is mostly debris plugging up control points (drains) and an aging system that makes monitoring difficult.

The City of Spokane is fixing this dry weather problem by upgrading the city’s system. Three overflow points are being outfitted with control vaults and storage tanks to contain overflows and improve monitoring. The other eight overflow points are receiving interim control vaults to reduce plugging and support quick response until tanks are completed over approximately 8 years.

The City agreed to these measures as part of an agreement negotiated by the Center for Justice on behalf of the Sierra Club.
PCBs

Description and Use
Polychlorinated biphenyls (PCBs) are human-made, chlorinated chemical compounds originally developed in 1929. Because they do not burn, break down or conduct electricity, they were used in electrical transformers, capacitors, lubricants, and many other commercial and household products, e.g.—fluorescent lighting fixtures and newsprint. Manufacturing of PCBs was banned in 1979.

Sources and Pathways to The Spokane River
Although banned, previous PCB releases still persist in the environment. Products with PCBs are still in use and may release this toxic chemical into the air, water, or soil. Current testing shows about 55% of PCBs enter the river through the City of Spokane combined sewer overflow and storm water system, 25% at the Idaho border, 15% through industrial and wastewater treatment discharges, and 5% from the Little Spokane River.

Possible Human Health Effects
PCBs can cause skin rashes, immune deficiencies, liver disease, reproductive disorders, and neurological and behavioral problems. They are also a probable human carcinogen. Their presence in Spokane River fish tissue led to an updated fish consumption and preparation advisory.

Cleanup and Restoration
In 2006, high concentrations of PCBs in sediments were “capped” behind Upriver Dam. Capping trapped PCBs and other contaminants on the river bottom by placing layers of coal (carbon), sand, and gravel on top of contaminated areas. A couple of miles upstream, PCB sediments were removed in an environmentally sensitive backwater area of Donkey Island and replaced with clean sand.

A draft PCB Total Maximum Daily Load (TMDL) report was released in 2006. Also called a water quality cleanup plan, the report calls for 95 to 99 percent reductions of all PCBs entering the river. 2007 studies helped determine storm drains releasing PCBs. A new draft report is expected in 2010.

PBDEs

Description and Use
Polybrominated diphenyl ethers (PBDEs) are chemical additives used in everyday household products to reduce death and injury from fires. Also called flame retardants, they are found in everyday items like cushions for chairs and couches, computer casings, carpet pads, and coatings for draperies.

Sources and Pathways to The Spokane River
PBDEs can leach out of products and enter the air, soil, and water. Specific pathways to the Spokane River are not yet known.

Possible Human Health Effects
In lab tests with animals, some PBDEs are linked with brain development (learning, memory and behavior) and thyroid problems. Most problems stem from pre-natal and newborn exposure. Further, the level of PBDEs in human bodies (including breast milk) is doubling every 2 to 5 years. If this rate continues, levels in humans could cause the same problems as those found in animals.

2005 testing showed fish in the Spokane River had the highest levels of PBDEs sampled in Washington State. Concentrations were highest in the Nine Mile area of the Spokane River. EPA recently adopted a reference dose, which is the maximum acceptable oral dose of a toxic substance, for PBDEs. For future advisories, this will help determine safe levels of fish consumption.

Cleanup and Study
In 2007, Washington banned many uses of Deca and all uses of Penta and Octa (the most popular PBDE compounds). Even though PBDEs are banned for use in Washington, products that contain them are still being used. Further, EPA estimates that most exposures to PBDEs (up to 80%) occur in the home and not from eating fish.

2007 studies helped determine storm drains releasing PCBs into the rivers. A 2009 study will track changes in PBDE levels in fish, and assess possible effects on osprey reproduction. The Urban Waters Initiative is using this data to investigate cleanup options.
Dioxins/Furans

Description and Use
Dioxins/furans refer to a group of toxic substances that share a chemical structure. They are mostly produced as a by-product of burning items such as municipal waste, sludge, medical waste, and wood. They can also be produced as part of manufacturing herbicides and pulp/paper products.

Sources and Pathways to The Spokane River
Dioxins/furans can be released into the air, soil, and water. Limited data has shown the presence of dioxins/furans in the Spokane River. Specific pathways to the Spokane River are not fully known at this time.

Possible Human Health Effects
Dioxins/furans are a probable human carcinogen. Non-cancer effects include neurological, immune, and reproductive issues. No state or federal standards currently exist to determine safe levels in fish for consumption.

Cleanup and Study
2007 studies helped determine storm drains releasing dioxins/furans. The Urban Waters Initiative is using this data to investigate cleanup options.

Metals

Description
Lead, arsenic, cadmium, and zinc are part of a group of contaminating metals released into the environment as part of mining, milling, and ore processing. Metals concentrated in these wastes can be toxic.

Sources and Pathways to The Spokane River
Since the 1880’s, an estimated 100 million tons of mine wastes were released into the river system from the Upper Coeur d’Alene Basin in Idaho. Contaminants traveled downstream, moved through Lake Coeur d’Alene, and can be deposited in the Spokane River.

Possible Human Health Effects
Ingestion of lead and arsenic from shoreline sediments at recreational beaches from the Idaho border to Upriver Dam are of primary concern, particularly for children playing in the sand. Lead exposure can have multiple effects, including causing behavior and learning problems in children, nervous system damage, kidney damage, and reduced growth. Arsenic can also have multiple effects, including cardiovascular disease, stroke, and changes in the skin.

Elevated levels of lead are present in Spokane River fish tissue. The current fish advisory, see page 8, provides guidance for consumption.

Cleanup and Restoration
Ecology-guided cleanup activities of metals-contaminated shorelines began in 2006. Cleanup of Island Complex, Starr Road, Murray Road and Harvard Road North locations are now complete. A combination of digging out (removal) of contaminants, capping (isolation) of contaminants, and general improvements to these shoreline recreational areas reduced public exposure to metals such as lead and arsenic, while improving public access and river habitat.

Between 2009 and 2013 cleanup of Barker Road South, Barker Road North, Flora Road, Myrtle Point, and Island Lagoon recreational areas is planned.
Are Fish in the Spokane River Safe to Eat?
The Washington Department of Health issued a PCB fish advisory in 2008. See page 8 for details. There is also a 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.

Is the Water Quality Safe for Swimming, Water Sports, and Recreating on Beaches?
Yes. Between 2009 and 2013, however, there are five remaining shoreline recreational locations between the Idaho border and Upriver Dam scheduled for cleanup of lead, arsenic, and other metals. See page 9 for cleanup locations and page 13 for more details. For general hygiene and safety, it is always safest to wash hands, face, feet and toys before eating and/or leaving a beach. Particularly follow this advice with children between the Idaho border and Upriver Dam. These areas may contain elevated concentrations of metals in non-developed shoreline areas not address by cleanup activities.

What Additional Precautions Can I Take?
Always wear a U.S. Coast Guard approved personal floatation device, use proper clothing and equipment and know your limits when on the river. Observe warning signs, and never boat immediately above or below a dam. Dispose of waste properly and help keep our shorelines clean by removing litter. Leave habitat the way you found it.

Who Sets and Enforces Water Quality Regulations?
The federal Clean Water Act authorizes the Environmental Protection Agency (EPA) to set water quality standards for all contaminants in surface waters. EPA partners with states and tribes to implement the Clean Water Act with pollution control programs, water cleanup plans (TMDLs), permits for wastewater treatment and other facilities, and other tools. The Washington Department of Ecology is the lead state agency responsible for working with EPA to enforce the Clean Water Act in Washington.

Who is Responsible for Sediment Cleanup and Restoration Activities?
PCB cleanup work behind Upriver Dam was supervised by Ecology and funded by Avista Development, Inc. and Kaiser Aluminum as part of a settlement agreement. EPA (Superfund) and Washington State funded cleanup and restoration of the Starr Road recreation area. Cleanup actions at seven additional shoreline sites between the Idaho border and Upriver Dam are being funded by the State of Washington and implemented by Ecology. As cleanup and restoration activities proceed, sources of funding and responsibility for carrying out actions are expected to vary.

Who is Paying for Investigations?
Ecology is currently taking the lead in identifying sources and pathways of PCBs, PBDEs and dioxins/furans entering the Spokane River. Many agencies and stakeholders will be engaged in this process and, depending on findings and needs, may contribute to further investigations.

Where Can I Get More Information?
Washington Department of Health: www.doh.wa.gov/fish or call toll free: 1-877-485-7316
Environmental Protection Agency: http://yosemite.epa.gov/r10/cleanup.nsf/webpage/Spokane+River+Cleanup
Spokane Regional Health District: http://www.srhd.org/safety/environment/default.asp
Center for Justice: www.cforjustice.org/programs/river
The Lands Council: www.landscouncil.org/water/toxics_education.asp
Spokane River Forum: www.spokaneriver.net

Washington Department of Health: www.doh.wa.gov/fish or call toll free: 1-877-485-7316
Environmental Protection Agency: http://yosemite.epa.gov/r10/cleanup.nsf/webpage/Spokane+River+Cleanup
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