



# It all fits together

Understanding the interconnection between land, water, wildlife and people is important in answering the questions of "can I eat the fish, play on the beaches, and swim in the water?"

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## Beach Program

The beach sediment program involves sampling at 34 additional beaches from the 2005 U.S. Environmental Protection Agency program. Two rounds of beach sediment sampling activities were completed at nine beaches from September 8 through 11, 2009, and April 27 through 30, 2010. At each beach along the entire Upper Columbia River, 60 individual surface sediment samples and five subsurface sediment samples were targeted. Surface sediment samples per beach are analyzed for the following parameters:

- Grain size distribution,
- Conventional parameters (pH, total organic carbon[TOC], percent moisture, and total sulfides),
- Metals/metalloids and elemental uranium (uranium238 and radium226 are also analyzed on a fraction of the samples),
- Metals/metalloids and elemental uranium in each of the following fractions: 2 mm to 250 µm, 250 µm to 125 µm, 125 µm to 63 µm, and <63 µm for one composite sample, and

- In vitro Bioaccessibility Assays (IVBAs) for arsenic and lead on the following fractions: <250 µm, 250 µm to 125 µm, 125 µm to 63 µm, and <63 µm.

Similarly, subsurface sediment samples (three depth intervals) per beach are analyzed for the following:

- Grain size distribution,
- Conventional parameters (pH, TOC, percent moisture, and total sulfides),
- Metals/metalloids,
- Pesticides, semi-volatile organic compounds (SVOCs), polycyclic aromatic hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs), and
- PCB congeners, dioxin/furan congeners, and PBDEs for each depth strata with a TOC concentration greater than 1 percent.

All remaining beaches will be sampled in the spring of 2011.

## Fish Sampling Program

In September-October 2009, fish were collected from six sampling areas within a 150-mile stretch of the Columbia River in Washington, between the U.S.-Canada border and the Grand Coulee Dam. Over 2,300 fish were collected in three size classes (<15 cm; 15-30 cm; and >30 cm); and analyzed as whole fish to simulate wildlife diets. Fish in the large size class also had fillet-only analyses conducted for human health assessments.

Targeted species covered different fish feeding guilds (omnivore, insectivore, piscivore), and included yellow perch, smallmouth bass, rainbow trout, walleye, pikeminnow, largescale and longnose sucker, sculpin, lake and mountain whitefish, and burbot. Fish were

composed into groups of 3 -5 fish and analyzed for 385 chemicals, including 21 common metals and metalloids, 34 other metals, 30 organochlorine pesticides, 50 semivolatile organic compounds (SVOCs), 21 polycyclic aromatic hydrocarbons (PAHs), 209 polychlorinated biphenyl (PCB) congeners, and 20 polybrominated diphenyl ether (PBDE) congeners.

Walleye and smallmouth bass filets in the >30 cm size class were analyzed individually for mercury; and burbot were analyzed for arsenic species. The study was conducted in support of the human health and ecological baseline risk assessments being conducted in the upper Columbia River, Washington.



## Surface Water Program

Surface water samples were collected in September 2009, April 2010, and June 2010 from transects located along an approximately 150-mile stretch of river between the U.S. - Canada border and the Grand Coulee Dam, Washington, plus two transects north of the border. At each transect location, a minimum of six samples were taken (one near-surface and one near-bottom) from the right and left banks, and middle portion of the transect. A total of 90 samples per event were analyzed for conventional parameters (hardness, pH, etc.), 7 major cations, nutrients (e.g., phosphorus, nitrogen), and 389 additional chemicals, including 21

common metals and metalloids, 34 other metals, 30 organochlorine pesticides, 50 semivolatile organic compounds (SVOCs), 21 polycyclic aromatic hydrocarbons (PAHs), 209 polychlorinated biphenyl (PCBs) congeners, 20 polybrominated diphenyl ether (PBDE) congeners, 2 radionuclides, and 2 stable isotopes (first event only). Results of this work are presented in comparison to drinking water standards and chronic ambient water quality criteria (AWQC). The study was conducted in support of the human health and ecological baseline risk assessments being conducted in the upper Columbia River, Washington.

