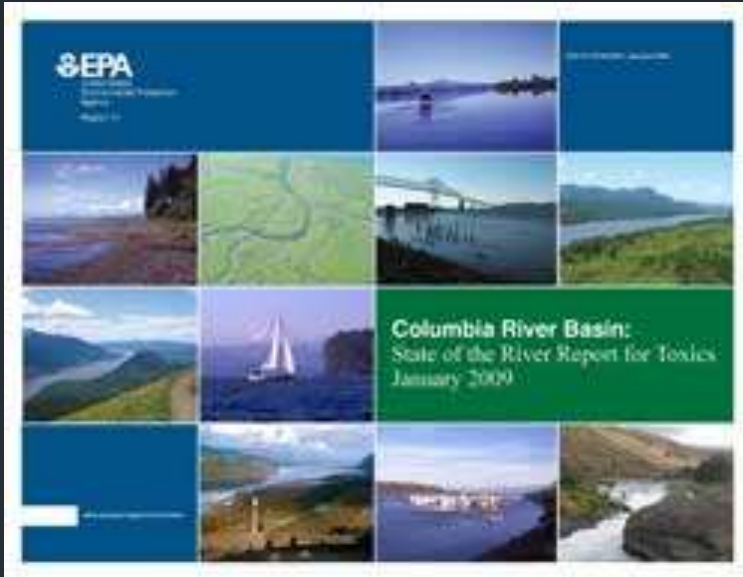




Mapping Contaminants in the Columbia River Basin – What We Can Learn

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Columbia River Toxics Reduction Working Group

Columbia River Toxics Reduction Working Group

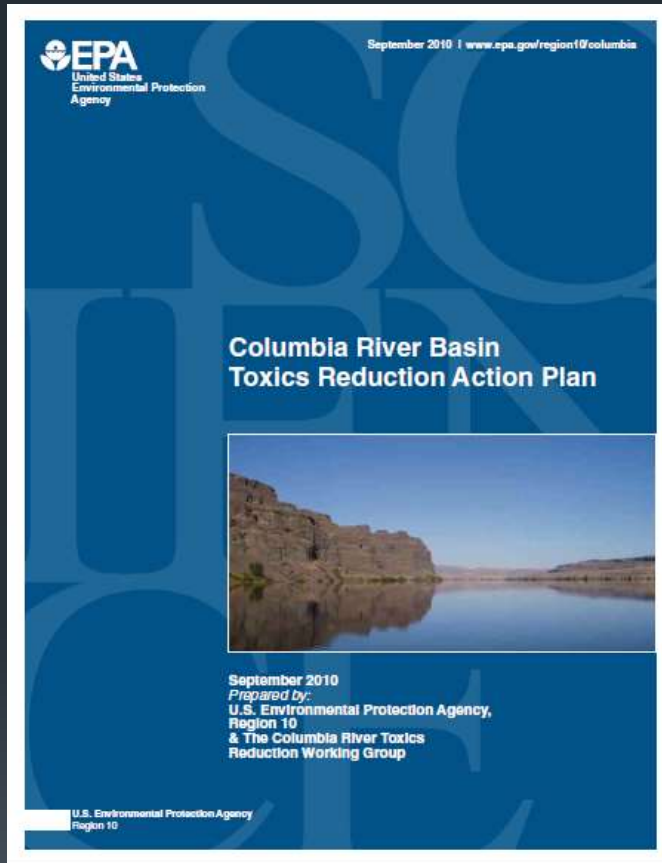


EPA 910-R-08-004 / January 2009

- EPA and other federal, state, tribal, local, and nonprofit partners
- Meeting since 2005 to better coordinate toxics reduction work and share information
- Goal is to reduce toxics and prevent further contamination

“Reducing toxics in the Basin will require a comprehensive, coordinated effort by all levels of government, nongovernmental organizations, and the public. The problems are too large, widespread, and complex to be solved by only one organization.” - State of the River report

Columbia River Action Plan



<https://www.epa.gov/columbiariver/columbia-river-toxics-reduction-action-plan>

1. Increase understanding and political commitment to toxics reduction in the Columbia River Basin
2. Increase toxic reduction actions
3. Conduct monitoring to identify sources and then reduce toxics
4. Develop a regional, multi-agency research and monitoring program
5. Develop a data management system that will allow us to share information on toxics in the Basin

A way to organize – a map

*Need to figure out
WHAT you know and
WHERE you know it
to identify what you
DON'T KNOW and
where TO LOOK*



Contaminants story map

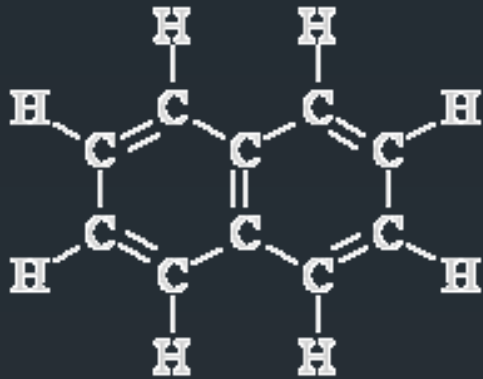
- Funding from the Northwest Power and Conservation Council
- Data collected from various monitoring sources: Oregon DEQ, Washington Ecology, USGS, EPA, NOAA Fisheries, Lower Columbia Estuary Partnership
- Not comprehensive, as monitoring is not uniform throughout the Basin
- Addresses measures identified in the Water Quality Strategy of the Council's Fish and Wildlife Program

Choosing a contaminant - PAHs

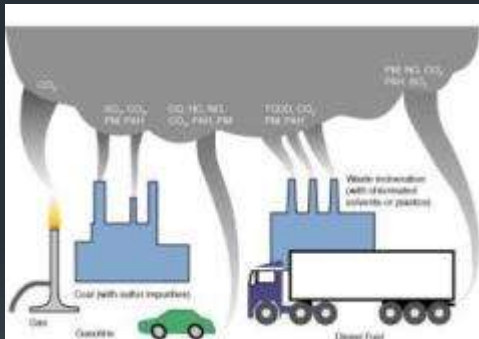
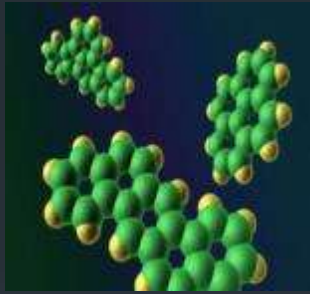
- Ubiquitous – can show linkage between air, land, and water
- Mainly non-point sources; some point sources (petroleum spills)
- Major impacts on aquatic organisms – both acute and chronic
- Actively being generated and released
 - Air toxics issues that result in deposition to both urban and rural lands, and subsequent runoff into our surface waters
- Chance to highlight reduction/PREVENTION measures
 - Erosion control measures can
 - Stormwater management methods (bioswales, green streets)
 - Improved combustion efficiencies for vehicles, boilers, & wood stoves
 - Need for alternative fuels



PAHs • Polycyclic aromatic hydrocarbons



- Formed during the combustion of carbon-based fuels (wood, coal, diesel), as well as being present in crude oil
- Commonly attach to particles
- Metabolized by salmon
- Suspected carcinogens
- Anthracene, benzo[a]pyrene, chrysene, fluoranthene, naphthalene, phenanthrene, ...



Ruben de Rijke (CC by 3.0)

Story map concept

Northwest Power and Conservation Council

Polycyclic Aromatic Hydrocarbons: Locations in the Columbia River Basin Where the Toxics Could Be Affecting Fish and Wildlife

Many factors influence fish and wildlife recovery and survival in the Columbia River Basin (Basin) including toxic contaminants. This story map provides information related to one group of contaminants, polycyclic aromatic hydrocarbons (PAHs). PAHs are a class of chemicals that occur naturally in coal



Components of the story map

- Where have PAHs been measured in the Basin?
- Where are PAHs present and the levels highest?
- Are locations with PAHs used by juvenile salmonids?
- What efforts are underway to clean-up contaminated areas?
- What can you do to reduce the introduction of PAHs into the environment?

Effects on fish and wildlife



Potential health effects include:

- Reduced reproductive success
- Reduced resistance to disease
- Impaired growth and physical condition
- Impaired embryo development

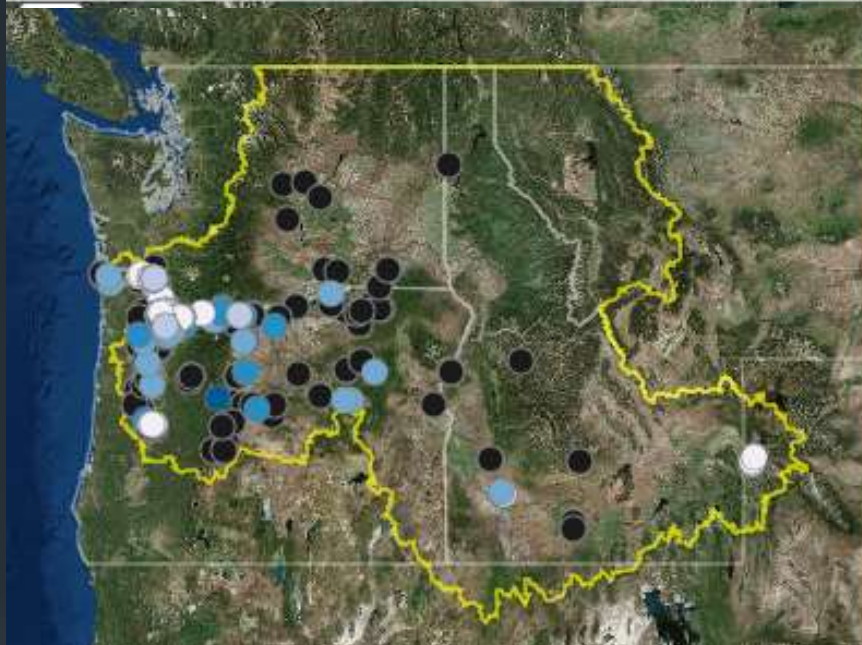


Pink salmon embryos not exposed (control) and exposed to PAHs (15 ppb total) during development. The exposed fish has fluid accumulation around the heart and yolk sac that can lead to death (Incardona and Scholz, 2017).

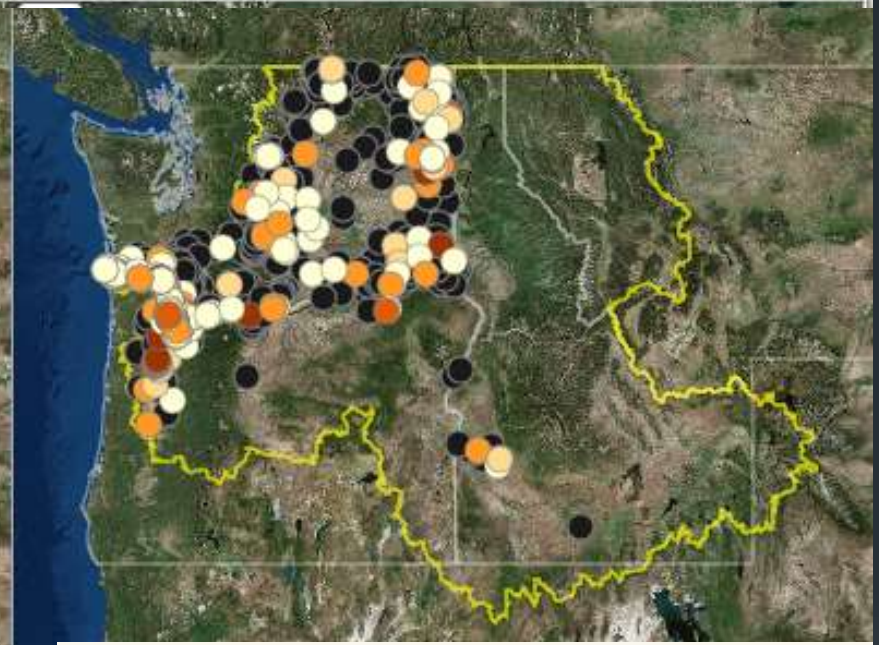
Photos: Mark Crals, NOAA

Where are PAHs in the Basin?

Water (Total PAH_ppb)-NoSites



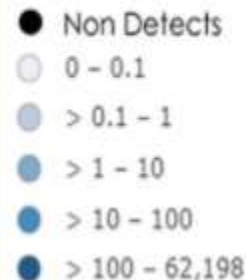
Sediment (Total PAH_ppb)-NoSites



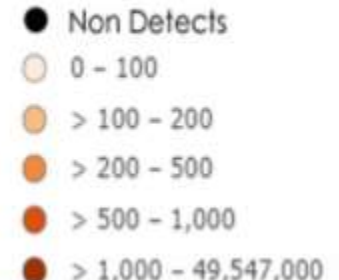
Unless an area is sampled, the presence or absence of PAHs cannot be confirmed.

Sediment sampling in Washington is more extensive than elsewhere, thus the unequal representation.

Water - Total PAH (ppb)



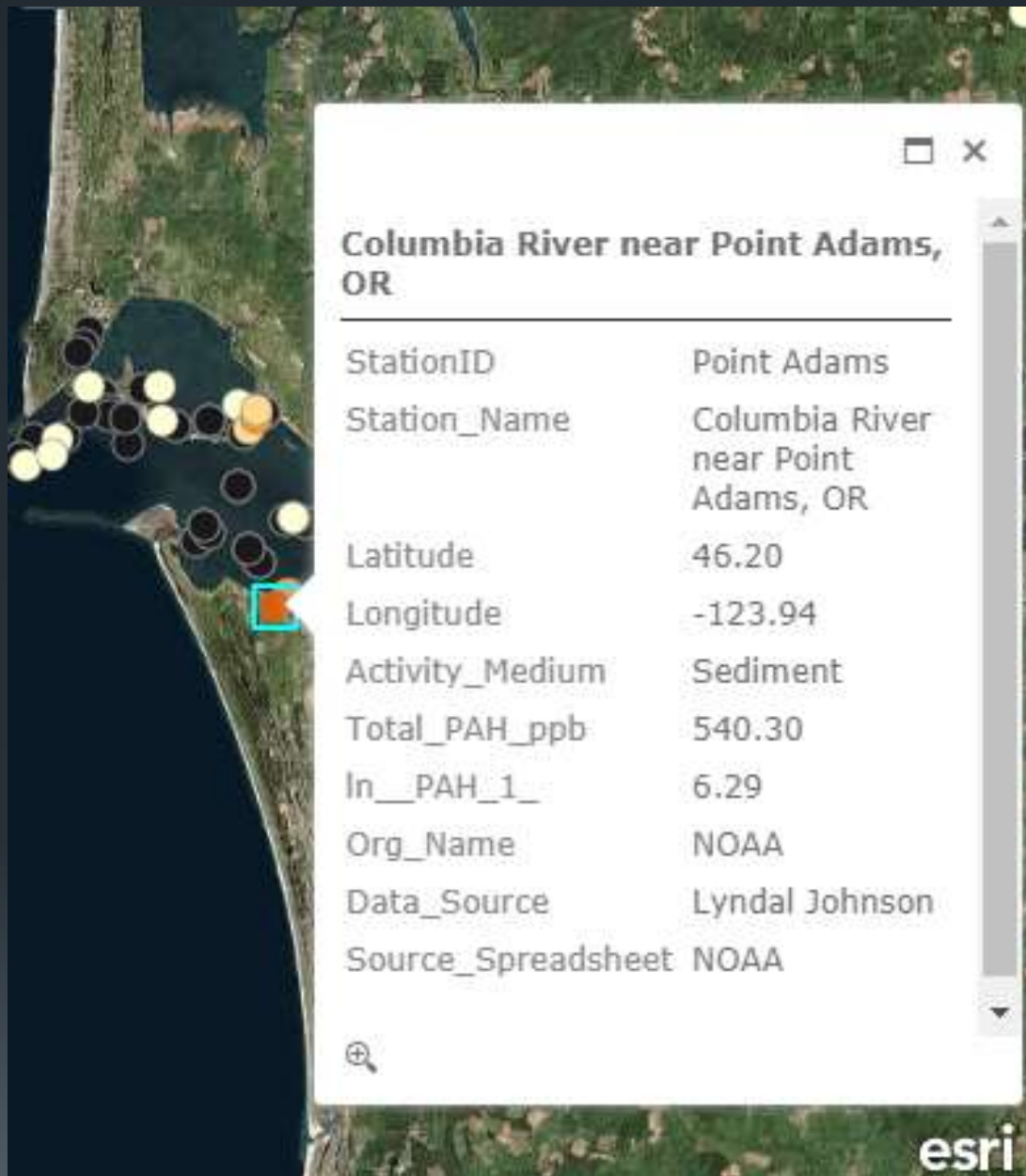
Sediment - Total PAH (ppb)



Zooming in

Can see details of

- Where (lat-long)
- Medium (water or sediment)
- Concentration
- Reporting agency
- Contact person



The image shows a satellite-style map of the Columbia River near Point Adams, Oregon. A red square on the map indicates the location of a specific data point. A white popup window is overlaid on the map, displaying the following information:

Columbia River near Point Adams, OR	
StationID	Point Adams
Station_Name	Columbia River near Point Adams, OR
Latitude	46.20
Longitude	-123.94
Activity_Medium	Sediment
Total_PAH_ppb	540.30
In__PAH_1_	6.29
Org_Name	NOAA
Data_Source	Lyndal Johnson
Source_Spreadsheet	NOAA

The popup window includes a close button (X) in the top right corner and a search icon (magnifying glass) in the bottom left corner. The Esri logo is visible in the bottom right corner of the map area.

Portland Harbor Superfund Cleanup

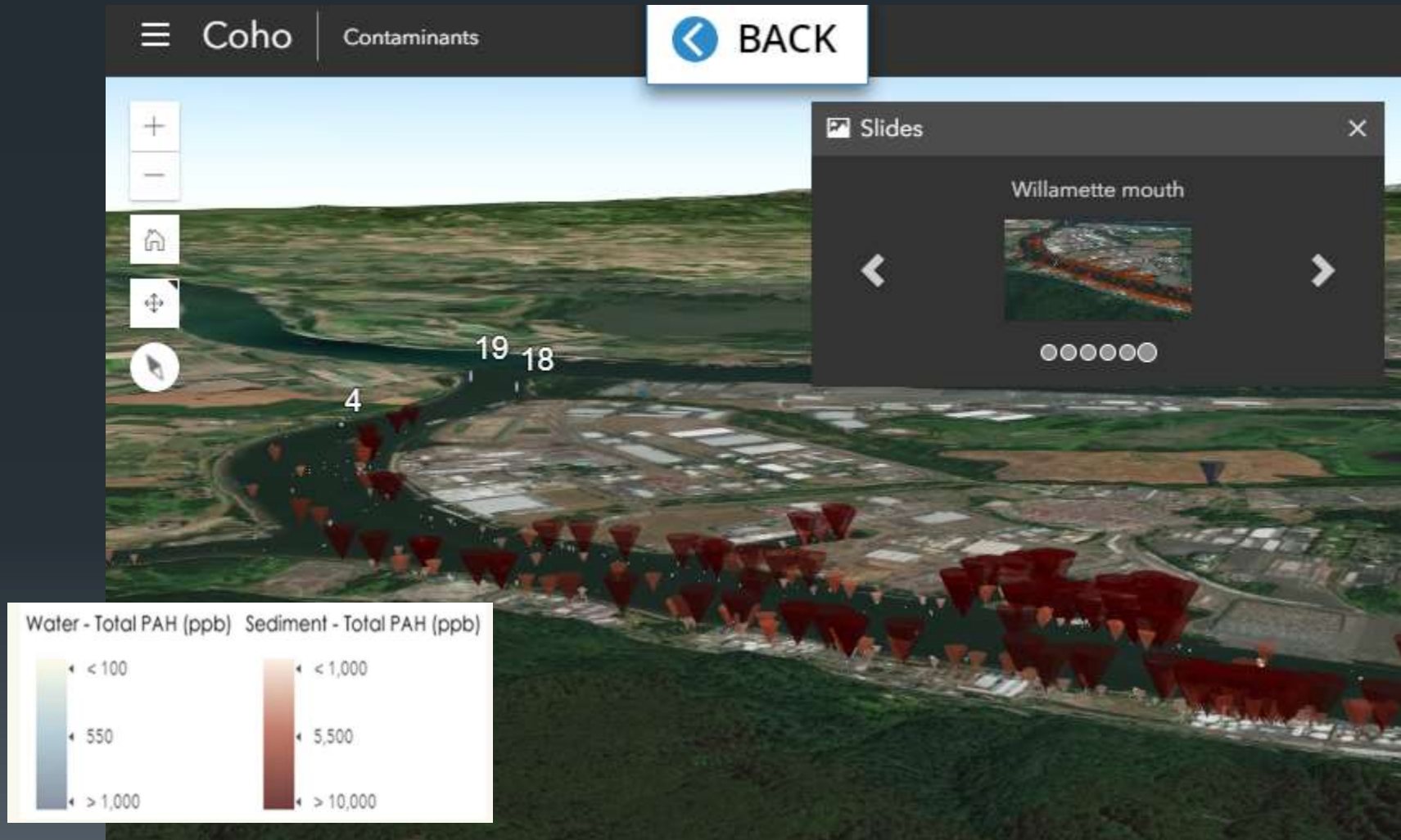
The Portland Harbor Superfund comprises a 10-mile section of the lower Willamette River from near the confluence with the Columbia River to the Fremont Bridge in downtown Portland.

Cleanup Process

- Removal of sediment from the river by dredging
- Capping the river bottom with layers of clay, rock, and sand



PAHs in water and sediment in Lower Willamette River



What you can do

Regardless of where you live in the Basin, you can help to reduce the release of PAHs. There are some actions you can take immediately, and you can do even more when it is time to replace household and personal products.

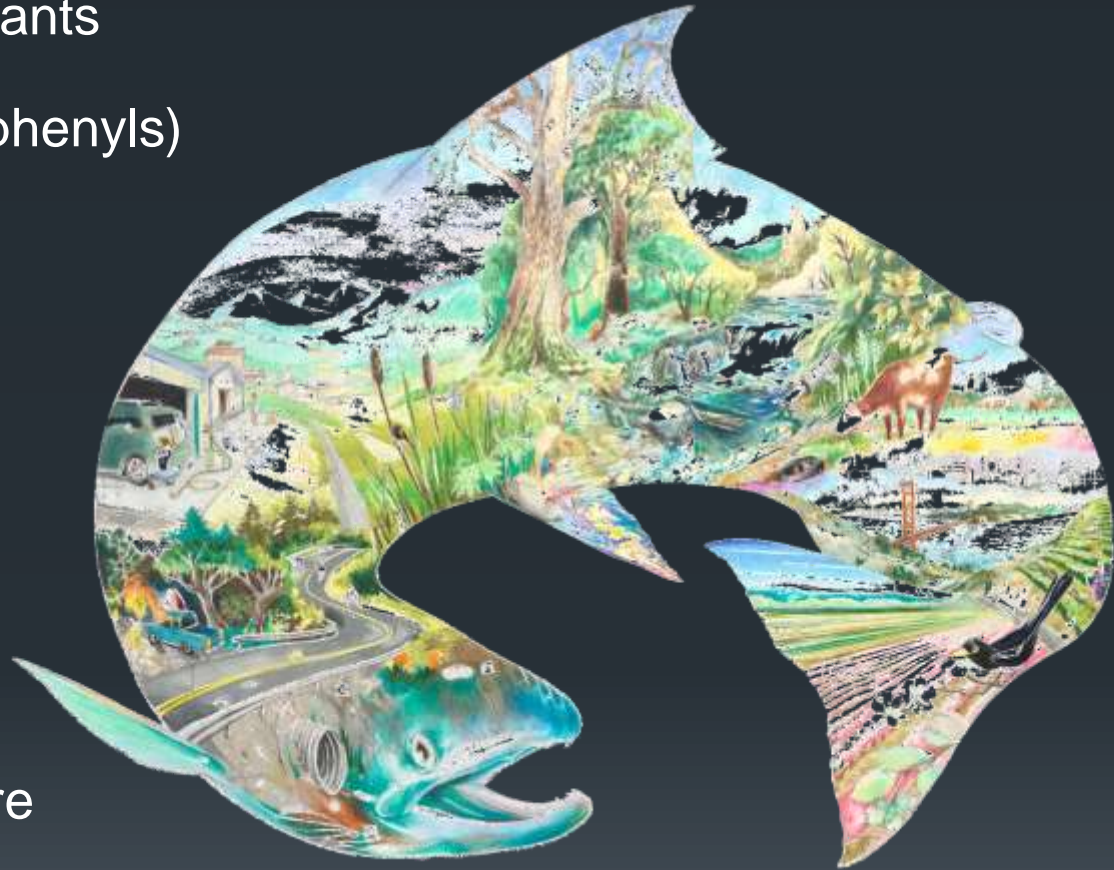
- Vehicle emissions and leaks
- Residential fuel combustion – wood
- Residential fuel combustion – petroleum, natural gas, kerosene
- Lawn, garden, & recreational equip
- Residential trash/yard waste burning
- Residential runoff



Photo: *The Oregonian*

Future goals

- Want to map more contaminants
 - PCBs (Polychlorinated biphenyls)
 - Currently used pesticides
 - Copper
- Can be used to highlight:
 - Data gaps
 - Areas of concern
 - Where reduction efforts are underway
 - Where efforts would be beneficial



*Esteban Camacho Steffensen,
winner of 2015 Science in Studio Award*

How to access the story map

The Northwest Power and Conservation Council

Integrating energy and the environment in the Columbia River Basin



Explore maps of Artificial Production Programs O&M, Fish Screens O&M, Objectives and more



TOXIC
CONTAMINANTS



Contact info



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USGS Oregon Water Science Center