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

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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

https://www.epa.gov/columbiariver/about-epas-work-columbia-river-basin#about

USGS

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
  - Stormwater management methods (bioswales, green streets)
  - Improved combustion efficiencies for vehicles, boilers, & wood stoves
  - Need for alternative fuels

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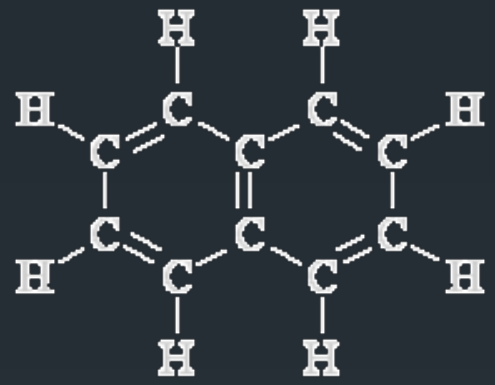
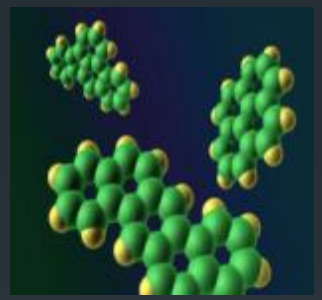
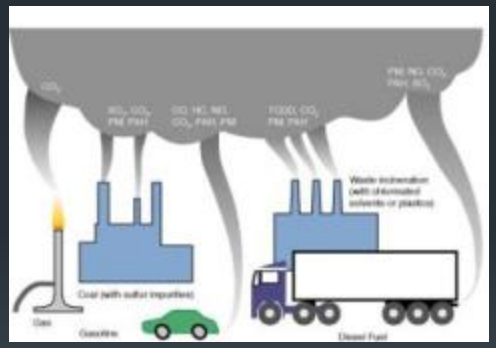
PAHs • Polycyclic aromatic hydrocarbons







Ruben de Rijcke (CC by 3.0)

- 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, …

USGS

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

USGS

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

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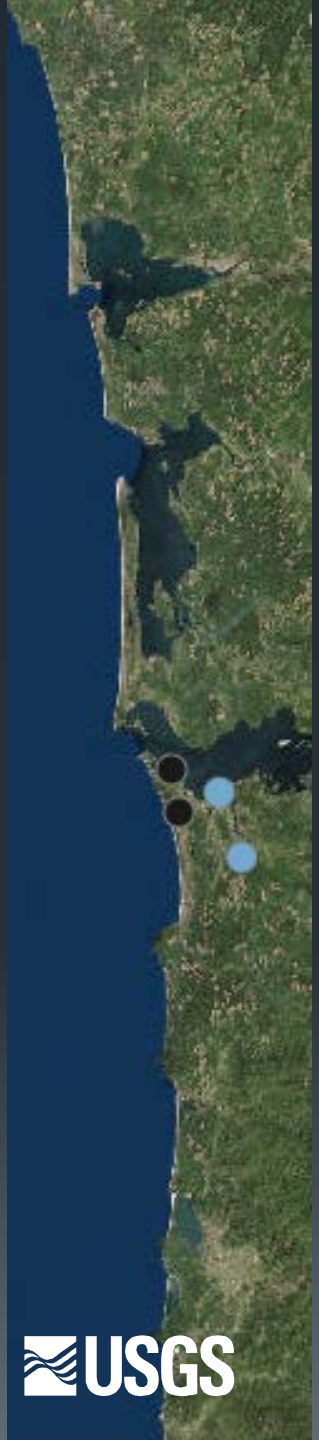


Components of the story map

- 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?

USGS

Effects on fish and wildlife

Photos: Mark Crals, NOAA

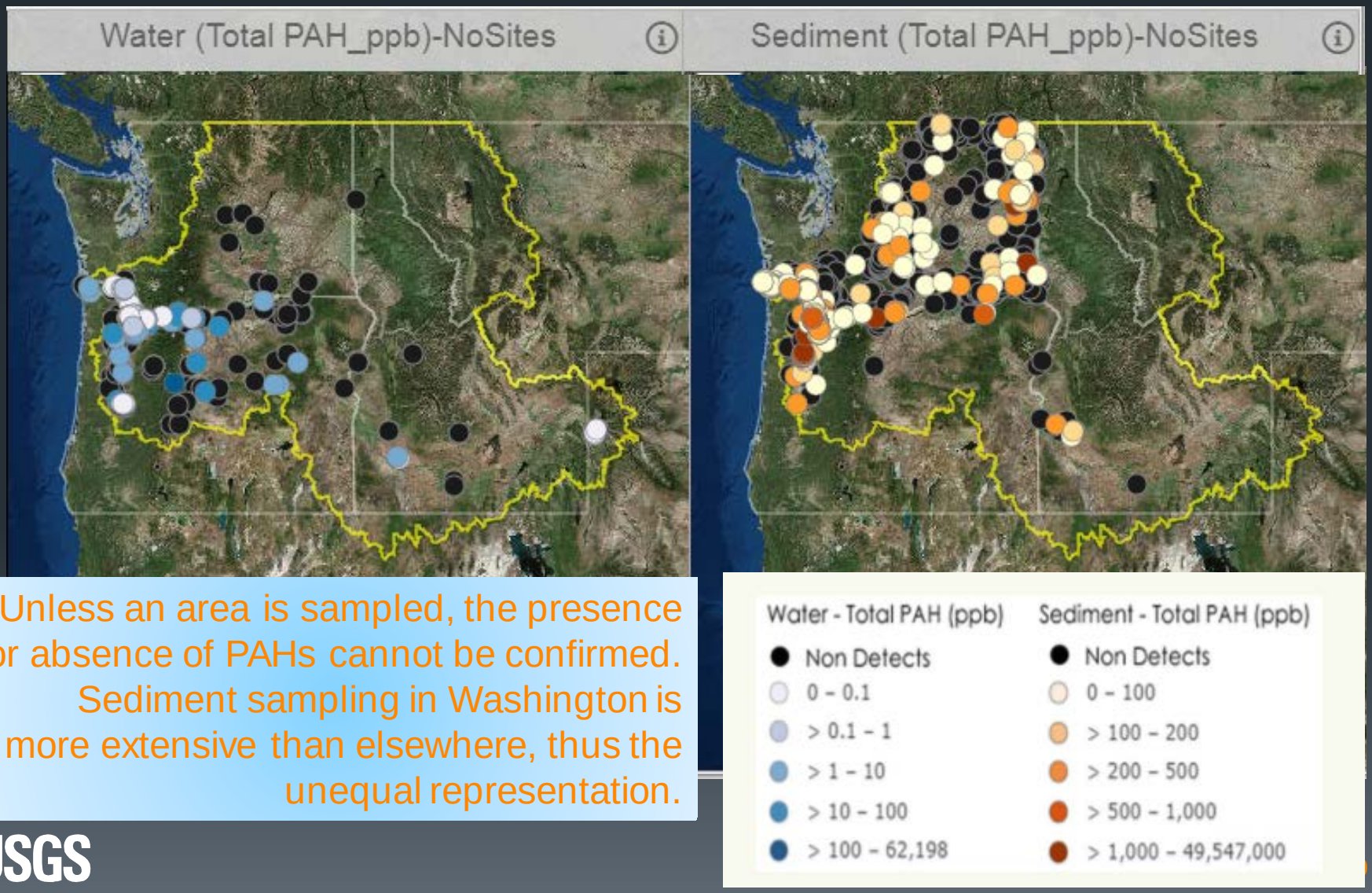
Potential health effects include:

- 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).

USGS

Where are PAHs in the Basin?



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.

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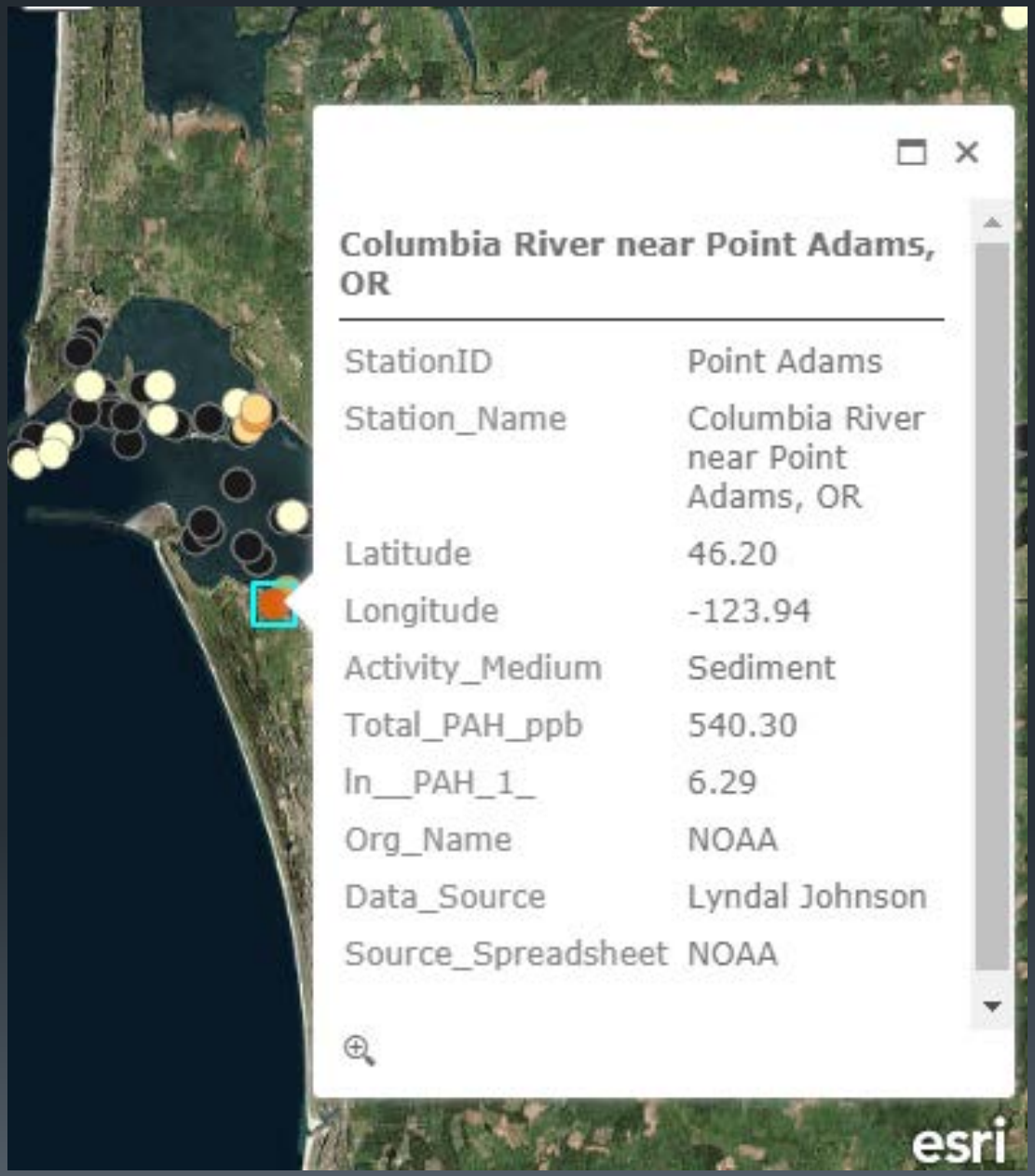

Zooming in

Can see details of

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

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

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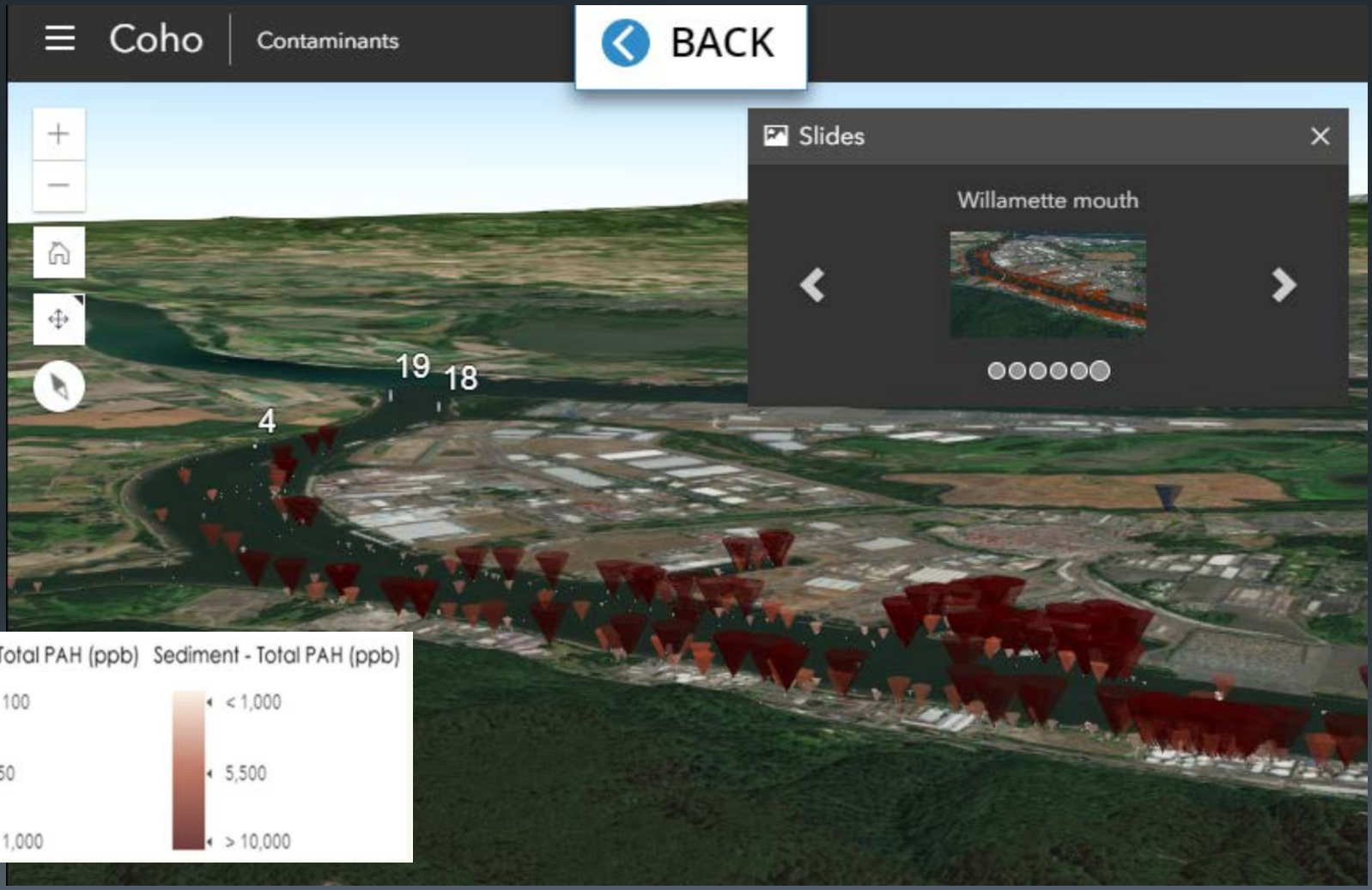
PAHs in water and sediment in Lower Willamette River



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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.

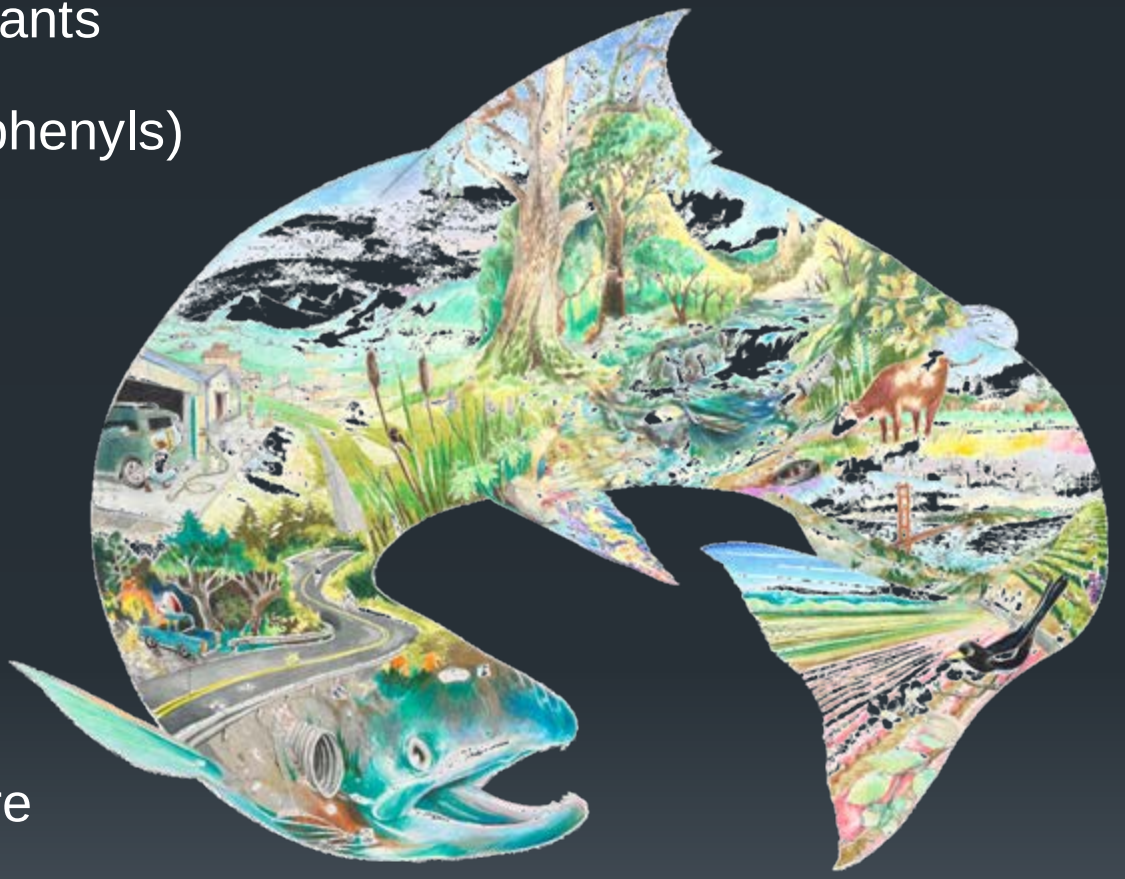
- Vehicle emissions and leaks
- Residential fuel combustion – wood
- Residential fuel combustion – petroleum, natural gas, kerosene
- Lawn, garden, & recreational equip
- Residential trash/yard waste burning
- Residential runoff

Photo: *The Oregonian*

USGS

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

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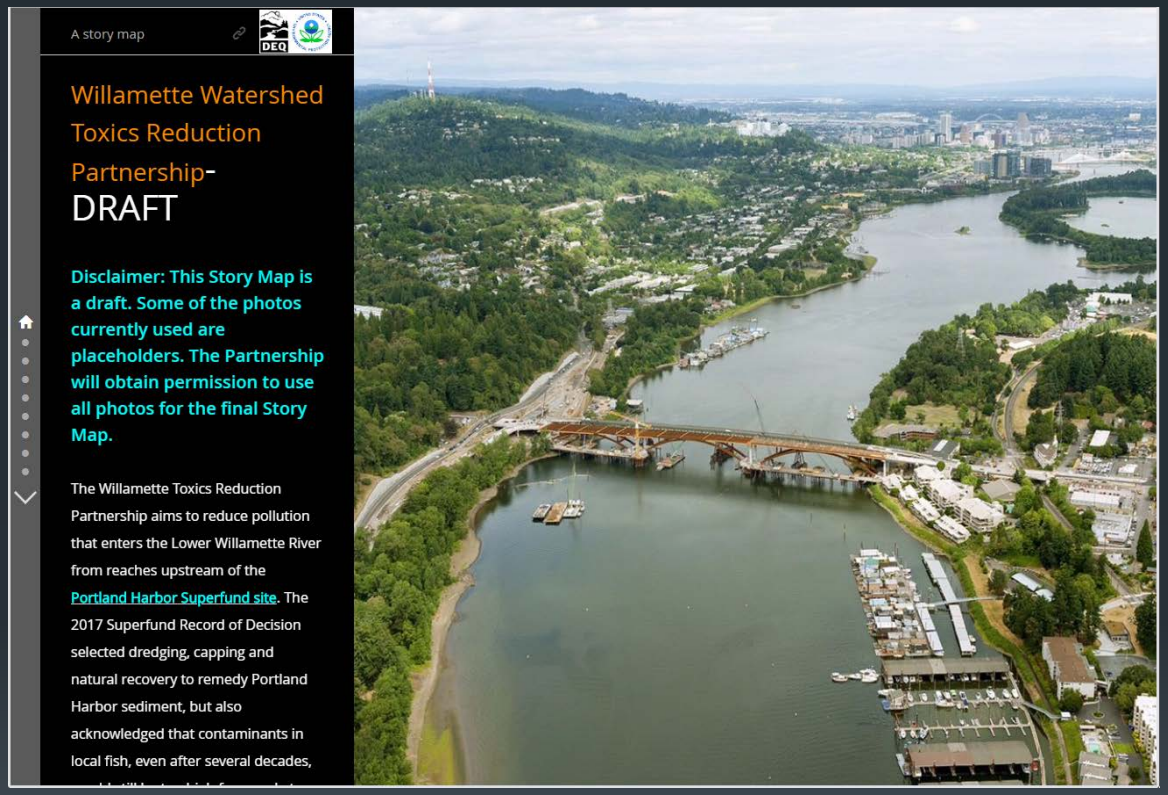
Willamette Watershed Toxics Reduction Partnership

Goals:

- Compile existing watershed contamination data and identify data gaps.
- Describe existing efforts, and evaluate the efficacy of these programs.
- Investigate potential upstream sources of contamination to the Portland Harbor Superfund site, considering any data gaps identified.
- Identify new strategies to reduce contaminant loading.



https://www.epa.gov/columbiariver/willamette-watershed-toxics-reduction-partnership

USGS

How to access the story map

The Northwest Power and Conservation Council

Integrating energy and the environment in the Columbia River Basin

https://www.nwcouncil.org/ext/maps/Contaminants/