

# Ecological Risk Assessment at the Portland Harbor Superfund Site

Portland Harbor CAG  
April 8, 2009

# Background

- Risk Assessment approach part of EPA-approved Programmatic Work Plan April 2004 – CAG had input on receptors to be evaluated
- Past 5 years: Sampling, observations, computer modeling, literature review, data analysis
- 2007 Round 2 Report – Preliminary Human and Ecological Risk Assessments
- 2008 – EPA/LWG refined approach for final risk assessment
- 2009 – Baseline Risk Assessments will be part of the Remedial Investigation Report later this year.

# Baseline Risk Assessment Objectives

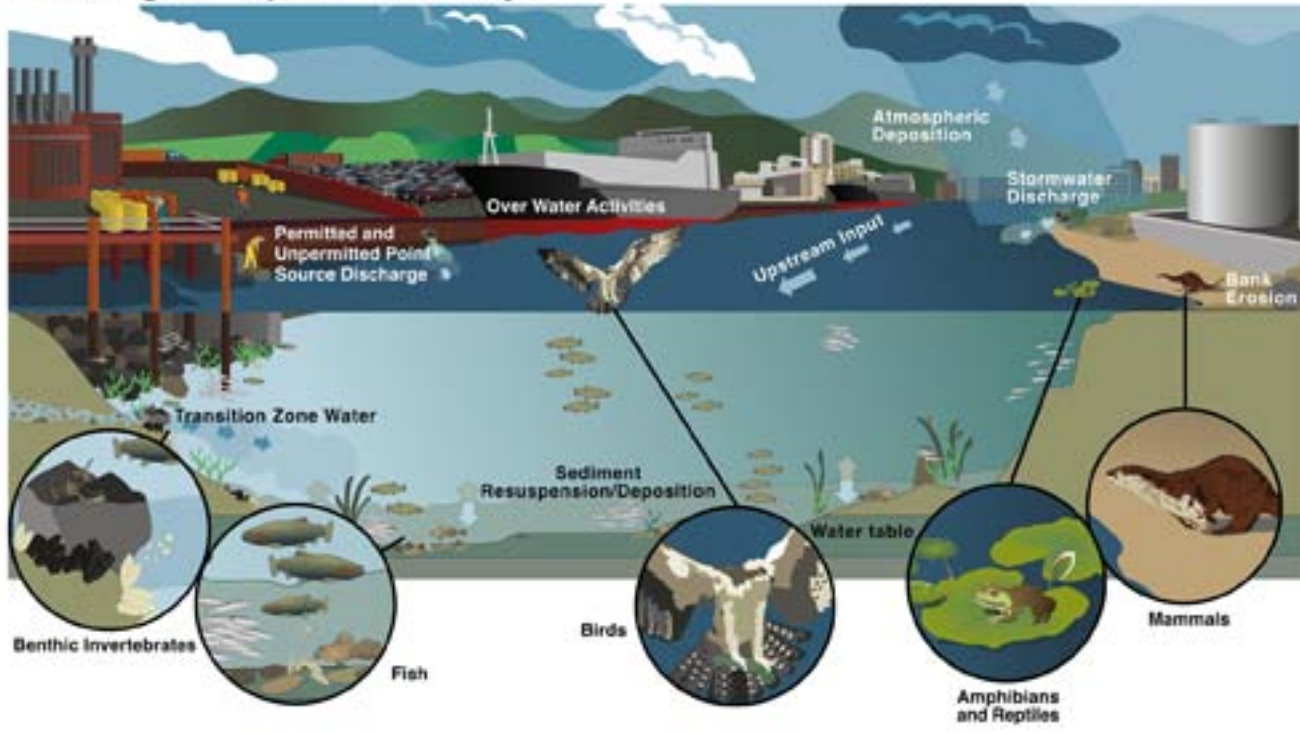
- Follow approach in Programmatic Work Plan and U.S. EPA and DEQ guidance
- Baseline Ecological Risk Assessment will evaluate whether exposure to chemicals at the concentrations present in sediment, water or biota (fish, clams, etc) at the Site results in risks to fish, birds, mammals, or to the community of species living in river sediment
- If risks are found, the BERA will help evaluate appropriate risk management and cleanup goals for the feasibility study

# Reducing Risk vs. Eliminating Risk

- Sediment cleanup can reduce the level of risk but can't eliminate risk
- Other agencies/programs that can reduce risks:
  - Oregon Health Assessment Program (fish advisories)
  - Water quality programs
  - Air quality programs
  - Source control programs

# Portland Harbor Site Ecological Exposure Pathways

Portland Harbor Superfund Site Illustration  
of Ecological Exposure Pathways



# Ecological Receptors

- Aquatic Plant Community
- Benthic Invertebrate Community
- Fish – Sculpin, Peamouth, Juvenile Chinook Salmon, Largescale Sucker, Carp, Pre-Breeding White Sturgeon, Smallmouth Bass, Northern Pikeminnow, Pacific Lamprey  
Ammocoetes
- Amphibians/Reptiles – e.g., Northern Red-Legged Frog
- Birds – Osprey, Bald Eagle, Hooded Merganser, Spotted Sandpiper, Belted Kingfisher
- Mammals – Mink, River Otter

# Ecological Exposure Media

- Sediment
- Prey
- Surface water
- Transition zone water (the mixture of groundwater and surface water that has infiltrated into sediment)

# Ecological Risk Assessment Approach

- Evaluate risks to ecological populations and communities, not individual organisms
- Use direct information about risks, e.g.
  - toxicity tests
  - physical examinations
  - tissue samples from exposed organisms
- Requires understanding how ecological receptors use habitat in (and outside) the area

# Assessing Potential Risks to Fish and Wildlife

- Measure chemical concentrations to which organisms are exposed
- Use models to predict risks to avoid disrupting a nest or capturing an animal
- Use information about the chemical concentrations that may affect organisms' survival, growth or reproduction.
- Compare exposure concentrations to the lowest concentrations that have been shown in a laboratory to affect organisms' survival, growth or reproduction.
- For threatened, endangered or other culturally significant species compare the exposure concentrations to concentrations that have been shown to have no effects.

# Assessing Potential Risks to the Benthic Community

- Measure chemicals in many hundreds of sediment samples from the study area and from a reference area (upstream of Ross Island, downstream of Willamette Falls).
- Compare chemical exposure levels to toxicity values that other scientists have measured in laboratories.
- Conduct bioassays (toxicity tests) on benthic organisms exposed to the sediment to measure effects on growth and survival.
- Bioassay results indicate whether growth or survival of the tested benthic organisms in Site sediment was significantly different than for reference area sediment.
- Bioassay results may identify which chemicals and concentrations were related to toxicity.

# Does the Ecological Risk Assessment Look at Scenarios in the Same Way as the Human Health Risk Assessment?

- The human health risk assessment looks at the way people use the Harbor, e.g., what exposure and risk if they eat fish from the Harbor every day, or if they are underwater divers.
- The ecological risk assessment looks at the way other species use the Harbor, examining those that use the Harbor the most, in order to be protective of others
- Some important factors in how the selected species use the harbor are –
  - whether they are migratory, or relatively immobile
  - critical life stages that might depend on the Harbor's habitat (e.g., for rearing versus for spawning), and
  - whether they get all their food from the Harbor, or forage upland, or forage across an even wider area.

# Status of Risk Assessment

- Initial findings from Round 2 Report (2007) are being refined
- Baseline Risk Assessments are being prepared
- Baseline Risk Assessments will be incorporated in Remedial Investigation Report (mid 2009)
- Risk-based goals will be developed for the Feasibility Study

# Status of Risk Assessment

- Initial findings from Round 2 Report (2007) are generally holding up:
  - More risk to wildlife than to fish
  - PCBs are the biggest contributor to the harbor-wide risk
  - Other contaminants being evaluated include: PAHs, pesticides, metals, dioxins/furans, and butyltins
  - Areas where there's risk to the benthic community are being delineated but not always clear which chemicals are causing toxicity

# *Risk Assessments*

## *One Component Used to Determine Cleanup Goals*

### Factors EPA may Consider

Risk management criteria

What has been achieved  
at other sites

Net risk reduction

Cleanup  
Goals

### Tools the LWG will Provide

#### **Risk Assessment:**

Risk-based goals

- Ranges of risk levels
- Different receptors

Uncertainty of estimates  
Uncertainty of risk models

#### **Remedial Investigation:**

Background concentrations

#### **Feasibility Study:**

Remedial alternatives  
Remedial effectiveness  
Implementability  
Costs

**Superfund goal:**  
**Protect human and environmental health**

# Next Steps

- Baseline Risk Assessments to EPA – mid 2009
- Feasibility Study – mid 2010
- EPA ROD
- Remedial design process
- Cleanup construction