



# In situ management of contaminated sediment, habitat restoration and community interests – can they co-exist?



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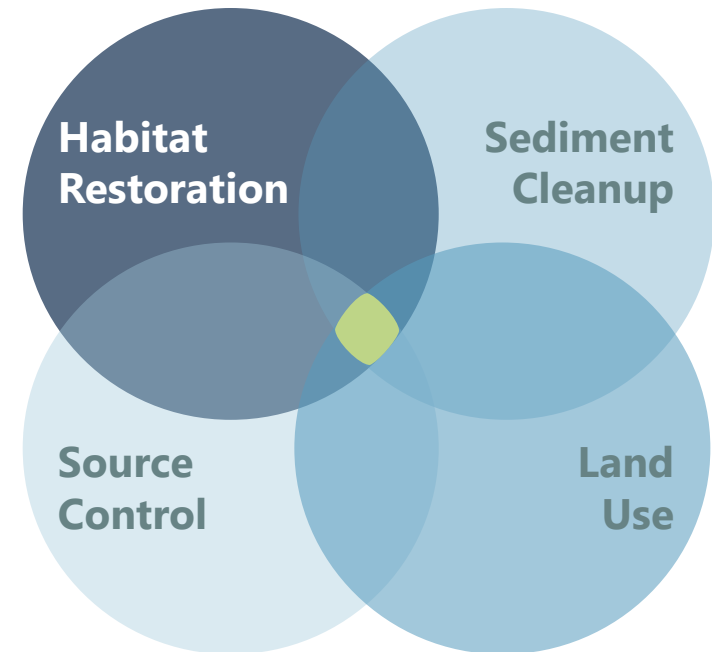
# Overview



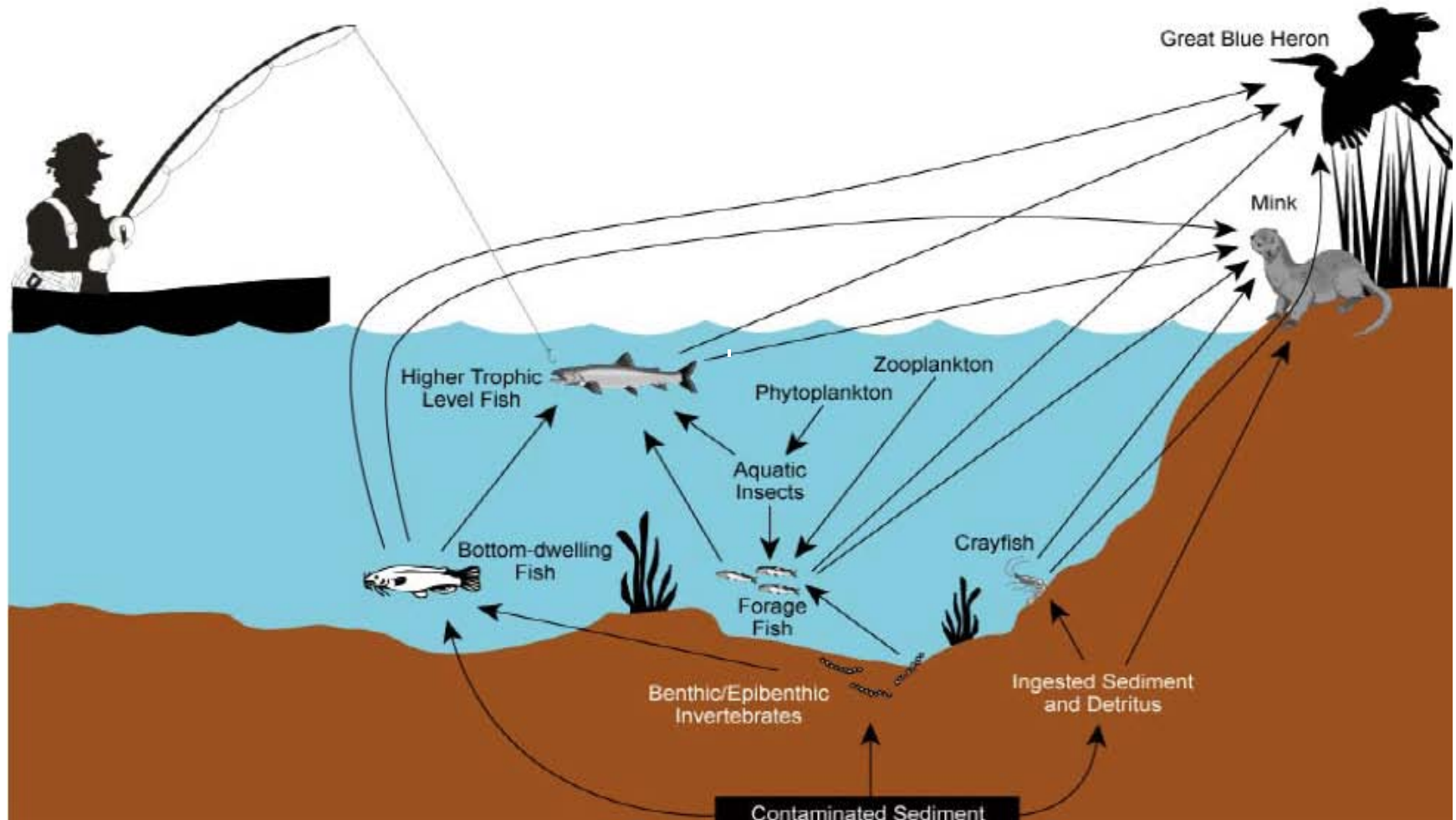
- An approach for integrating goals
  - Think beyond separate directive/regulatory processes
  - Focus on risk reduction and ecosystem function together
  - Include stakeholders early and often
- Case studies

# Begin with the end in mind...

- Develop vision framework early
  - Know the required elements first
  - Process for stakeholder input, public-private partnerships
  - Timing of community feedback
  - Mine feedback for useful information
- Perception of success linked to visual project elements



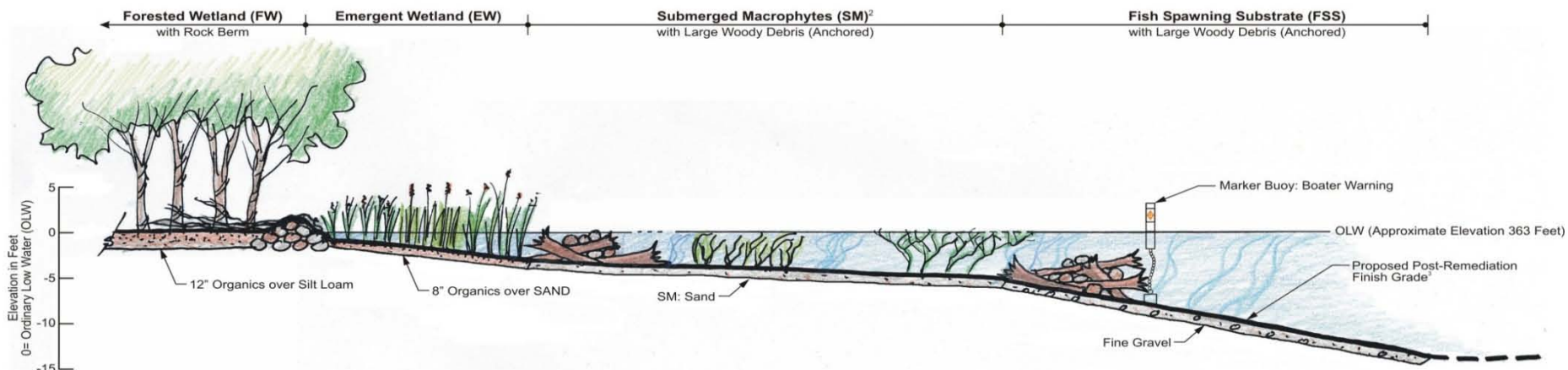
# Understand the problem(s) and establish goals



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# Develop and evaluate integrated solutions

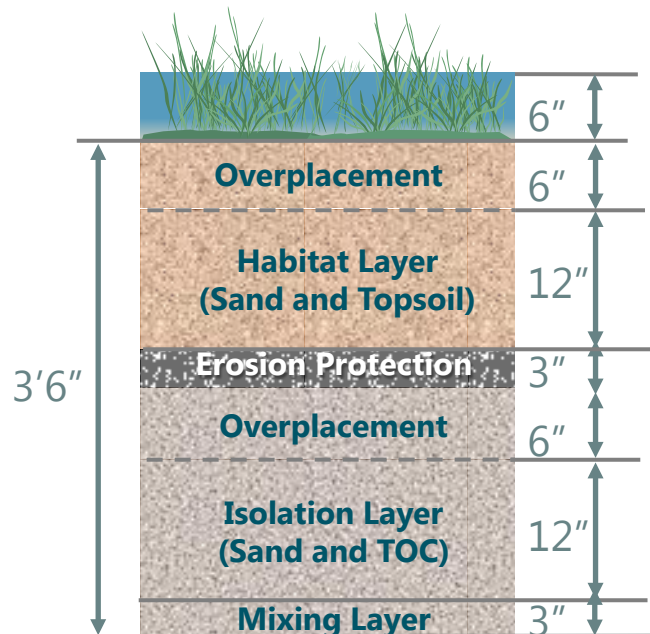
- Understand future land use and ownership
- Evaluate potential alternatives using multiple criteria
- Optimize diverse, high functioning habitats
  - Support fish, plants, BMI, birds, amphibians, reptiles, mammals
- Consider use of adaptive management



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# Engineering the details

## Example Enhanced Cap with Wetland



## Slope



## Bulkhead



# Benefits

- More efficient and cost-effective projects meeting cleanup and ecological goals in parallel
- Working with nature opportunities
- Public involvement and perception
- Improved aesthetics
- Potential public access



# Project Examples from Washington State, USA

St. Paul Waterway: Commencement Bay, Tacoma

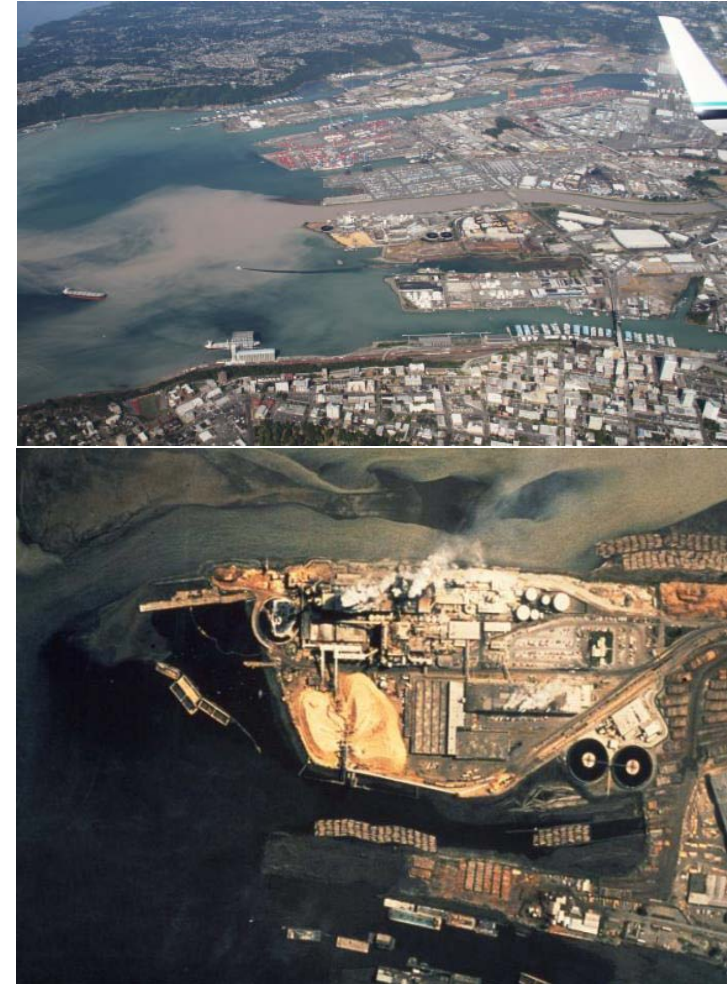
Whatcom Waterway Log Pond: Bellingham Bay

Olympic Sculpture Park: Downtown Seattle



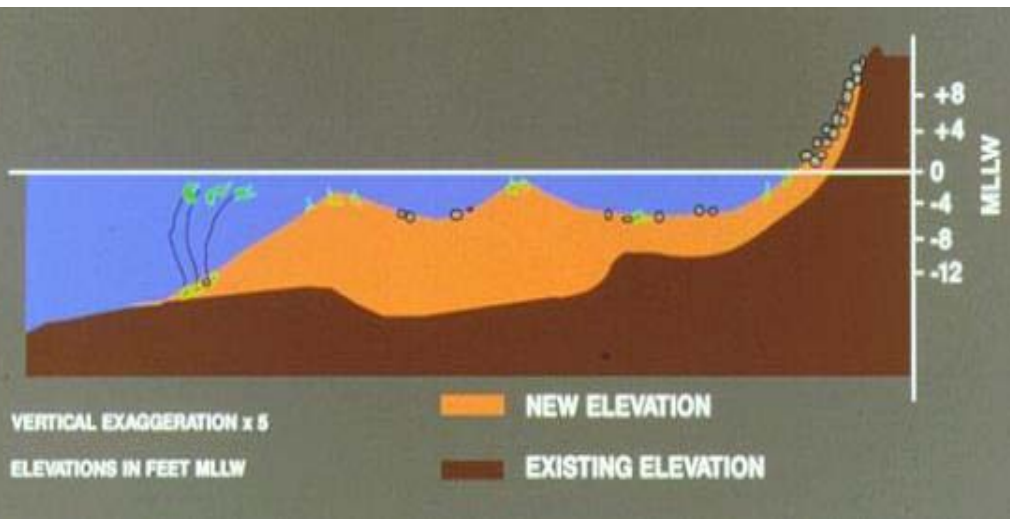
# St. Paul Waterway Project

- One of first integrated projects
- Part of larger Commencement Bay USEPA Superfund Site – habitat restoration and cleanup work completed in 1988 before bay-wide remedy
- Cleanup and natural resource damage resolution
- Considerable stakeholder involvement
- Consistent with ongoing paper mill operations



# Remediation and Restoration Overview

- Up to 6 meters of clean with sands and silts similar to upstream river sediments placed over a 6.9-hectare area to restore intertidal habitat
- Cobbles and boulders placed in intertidal and shallow subtidal areas to enhance long-term beach stability and improve habitat diversity



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# Benefits of Integrated Approach

- Cooperative projects have multiple benefits
  - Process and implementation efficiencies
  - Overall project was highly cost-effective
- Integrated intertidal habitat restoration and cleanup
- Success confirmed with 25+ years of monitoring
  - Rapid recolonization
  - Chemical isolation
  - Future monitoring now tied to episodic events (e.g., storm surges, earthquakes)



# Whatcom Waterway Log Pond Site

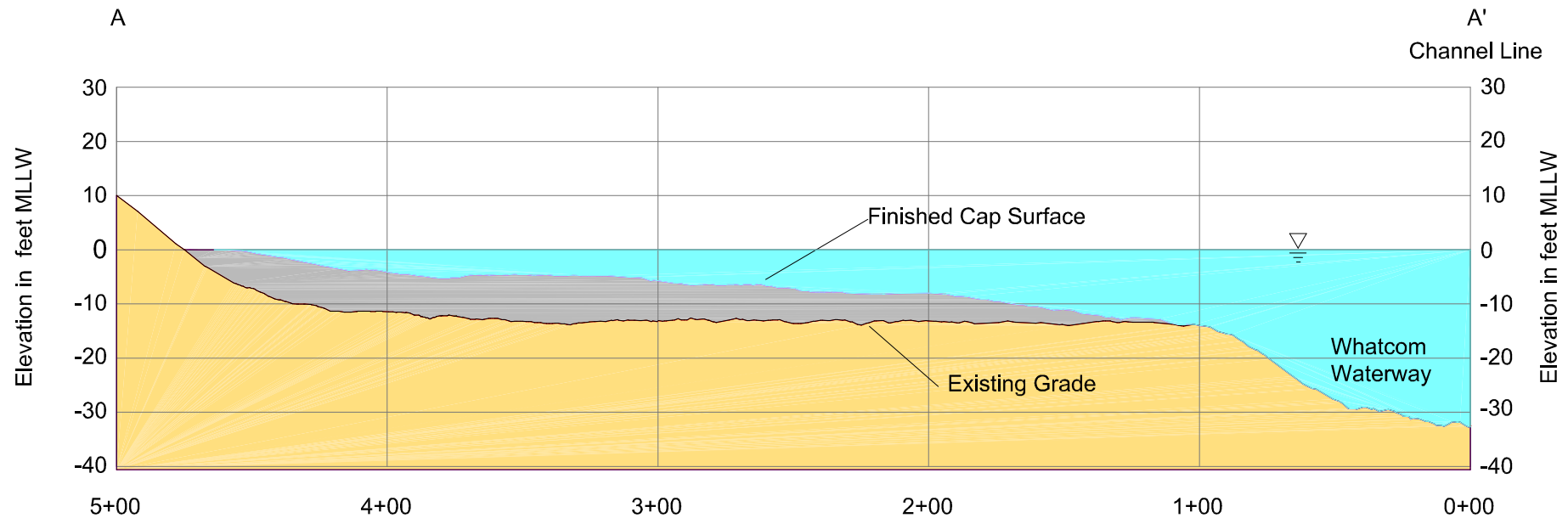
- Comprehensive study identified need for shallow water aquatic restoration in Bellingham Bay salmon estuary
- Natural recovery timeframes too long to support cleanup
- Dredging approach challenges
  - Short-term water quality impacts
  - Structural impacts to facilities
  - Higher cost with fewer benefits
- Capping selected as cleanup



*Aerial by Washington Department of Ecology*

# Capping/Habitat Restoration Approach

- 1-meter thick cap required to meet cleanup goals
- Enhancement to salmon estuary through creation of 2.4-hectare intertidal beach



# Monitoring Confirmed Restoration Success



- Opportunity for collaborative project with local university
- Cap continues to be protective
- Highly productive benthic and riparian communities established within few years
- Major increase in use by salmon and other forage fish
- Eelgrass meadow restoration after several years

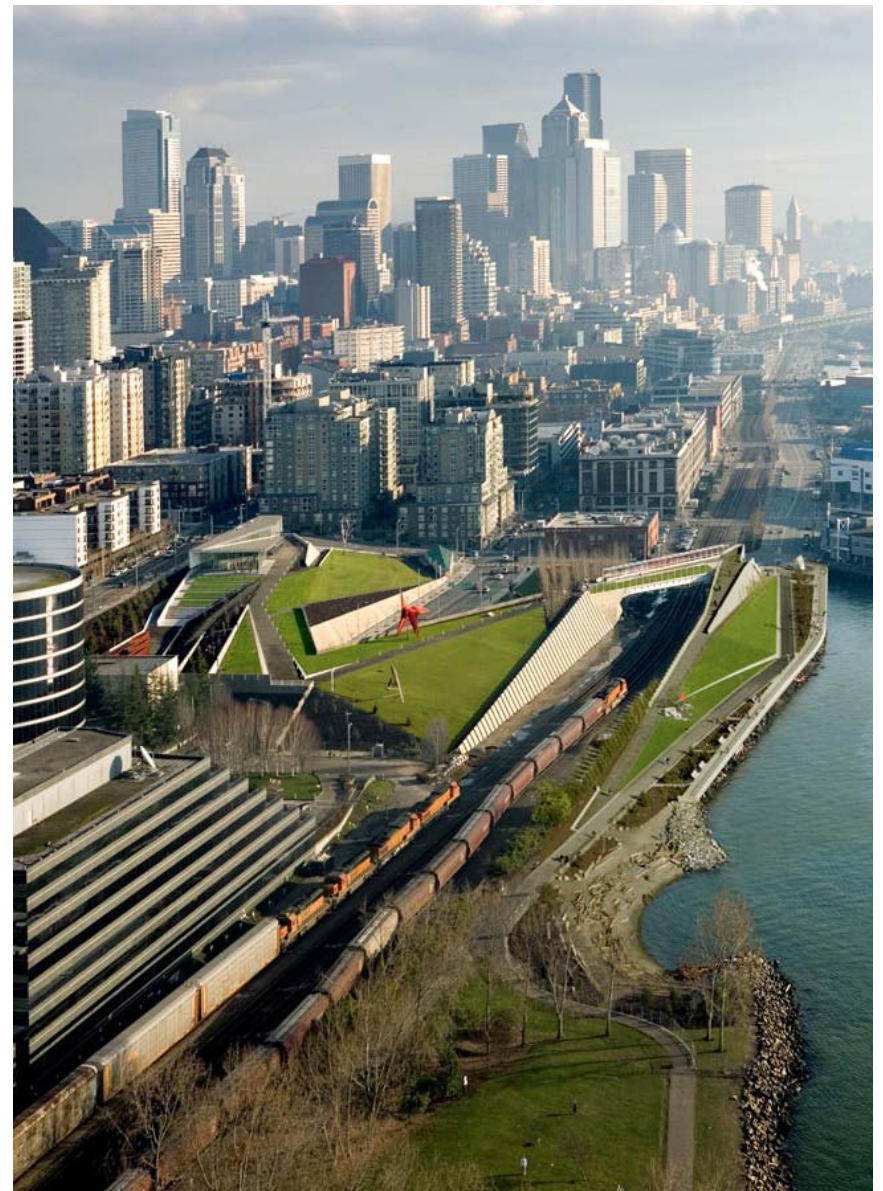
# Seattle Olympic Sculpture Park

- Fuel storage and transfer facility constructed in early 1900s, operating until 1975
- Seattle Art Museum (SAM) purchased site in 2000
- Company addressed major environmental cleanup issues
- State provided grants to assist SAM with continued cleanup and redevelopment of publicly-owned site



*Eagle by Alexander Calder*

# Site Transformation





# Shoreline Restoration and Salmon Habitat



# Can the goals co-exist?

- Yes, with early planning and engagement of stakeholders
- Requires strong public and agency support
- Think beyond the 'sediment cleanup' project
- Develop integrated solutions and weigh benefits
- Integration of community interests is most challenging



# Questions?

*Sørenga Sjøbad, Oslo, Norway*



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