GROUP 2

Columbia Slough Sediment Program Retrospective:
>25 Years of Data - Is it Telling Us What We Need to Know?

Rod Struck[1], Kevin Huniu[2], Libby Smith[3]

Background/Objectives

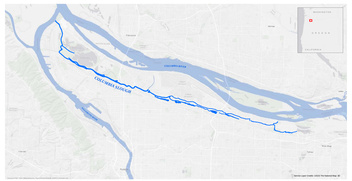
The Columbia Slough (Slough), a 19-mile-long urban waterway with about a dozen miles of side channels, contains widespread low-level sediment contamination (e.g., polychlorinated biphenyls [PCBs], pesticides, metals) associated with more than 100 years of urbanization, industrial, and agricultural activities. It is located in the City of Portland, Oregon (City).

The Slough is a heavily managed system with engineered dikes to prevent flooding of the surrounding watershed including the Portland International Airport. Because of its flood control purpose, a certain amount of water-carrying capacity must be retained in the Slough to safely and efficiently convey water.

The Slough's watershed contains numerous potential contaminant sources including (but not limited to):

- >200 City stormwater outfalls
- >500 private outfalls
- >320 Oregon Department of Environmental Quality (ODEQ) Environmental Cleanup sites
- >120 National Pollutant Discharge Elimination System (NPDES) permitted stormwater sites
- Tracking from private properties to City rights-of-way
- Air deposition within the watershed

The City's Columbia Slough Sediment Program is working with ODEQ under an intergovernmental agreement to complete source control and sediment evaluation work throughout the Slough as it relates to discharges from City stormwater outfalls.



Record of Decision

ODEQ issued a record of decision (ROD) in 2005. The ROD addresses Slough-wide contaminant sources and is unique in that it is:

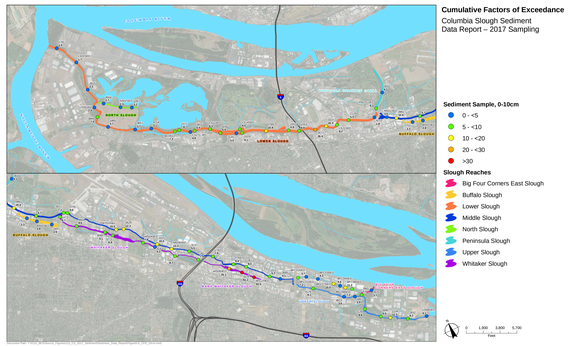
- Based on a coordinated interagency long-term approach for improving watershed health
- Does not include specific cleanup requirements for individual parties;
- Provides a framework for ODEQ decision-making for Slough-wide sediment sites
- Integrates upland source control with in-water actions
- Establishes sediment cleanup objectives based on anthropogenic baseline concentrations

The remedy selected in the ROD includes the following components:

- Upland source control
- Hot spot cleanup/additional remedial measures
- Natural recovery and appropriate institutional controls
- Long-term monitoring and evaluation

Primary Data Collected

- 20 years of Slough-wide fish tissue (1994, 2005, and 2015)
- 24 years of in-water sediment data (1993-2017 with Slough-wide sampling in 1994, 2005, and 2017)
- 10 years of stormwater and stormwater sediment data (2008-2018)
- Chemical analyses include: PCB Aroclors, PCB congeners, pesticides, metals, polycyclic aromatic hydrocarbons (PAHs), dioxins/furans, etc.
- Data collected from eight Slough reaches

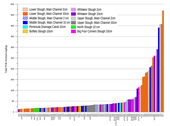


Data Uses

- Identify and describe spatial distribution of contaminants of potential concern (COPCs)
- Identify potential COPC sources and refer identified sources to appropriate regulatory programs
- Demonstrate effectiveness of upland source control and sediment cleanup efforts
- Prioritize sediment areas and upland stormwater basins for further action to improve sediment quality
- Evaluate concentration trends over time;
- Inform the Slough Fish Advisory issued by Oregon Health Authority
- Obtain regulatory closure for City outfall basins

Long-term Monitoring Conclusions

- Sediment and fish tissue COPC concentrations are well characterized spatially and over time.
- Spatial patterns of COPC concentrations in sediment are consistent over time and confirm widespread low-level contamination throughout the Slough.
- PCBs, pesticides, and metals are identified as the primary COPCs in 1994, 2005, and 2017 in sediment and fish tissue with PCBs being the main driver of risk.
- COPC concentrations in sediment and fish tissue are generally decreasing over time except for PCBs in fish tissue, which are stable or decreasing slightly over time.
- Stormwater and stormwater solids data are useful in identifying sources discharging to the City's stormwater system.



Slough Monitoring Retrospective

Agile project management concepts and processes were used to reflect on past monitoring programs and identify actions for improving monitoring going forward.

The objectives of the retrospective analysis were to:

- Identify aspects of past monitoring programs that provided useful data
- Modify elements that did not work well
- Make changes to improve long-term monitoring programs to meet multiple data needs

Given the complexity of the data and changes to the monitoring programs over time, an expert panel was recruited to collaboratively identify obstacles and opportunities for future monitoring program improvements.

AGILE PRIME DIRECTIVE

Regardless of what we discover, we understand and truly believe that everyone did the best job they could, given what they knew at the time, their skills and abilities, the resources available, and the situation at hand.

— Norm Kerth, Project Retrospectives: A Handbook for Team Review

Retrospective Analysis Findings

What worked well?

- Sediment and fish tissue monitoring programs documented nature and extent of contamination
- Sediment and fish tissue data documented COPC concentration decreases over time
- Stormwater monitoring identified sources of contamination
- Monitoring results helped prioritize the City's work
- Results focused source tracing efforts on primary risk drivers
- Implementation of regulatory programs:
  - ODEQ's NPDES program by the City
  - Municipal Separate Storm Sewer System (MS4) permit requirements and best management practices (BMPs) by the City
  - ODEQ and City source identification and source control actions

What did not work well?

- Changing sediment and fish sampling methodologies - introduced uncertainty in results
- Numerous variables (species, home range, age, etc.) made fish tissue results not useful for remedy effectiveness monitoring
- Reliance on PCB Aroclor analyses - uncertainties from numerous variables (e.g., methods, detection limits, Aroclor reporting)

What changes can we make?

- Refine data quality objectives to demonstrate sediment quality improvements and source control effectiveness
- Refine sediment and stormwater data quality objectives to support City-specific objectives (e.g., City outfall basin closure; Slough segment closure)
- Refine data quality objectives for fish tissue to inform the Columbia Slough Fish Advisory
- Improve City and ODEQ control of upland sources
  - Incorporate NPDES industrial stormwater permit monitoring results
  - Improve City code for controlling sources (e.g., material track out)

Findings

- Conditions in the Slough are getting better over time
- Regulatory tools and programs can be used to achieve objectives
- Retrospective analysis is useful for updating City goals and objectives and prioritizing source control actions
  - Developing and evaluating updated long-term monitoring program alternatives
  - Supporting risk-based management decisions
  - Identifying and prioritizing future source investigations and source control activities

Contact

[1] Rod Struck, rodney.struck@portlandoregon.gov
[2] Kevin Huniu, kevin.huniu@portlandoregon.gov
City of Portland Bureau of Environmental Services,
Portland, OR, USA

[3] Libby Smith, LSmith@gsiws.com
GSI Water Solutions, Inc.
Portland, OR, USA

ENVIRONMENTAL SERVICES
CITY OF PORTLAND

GSI Water Solutions, Inc.