A GIS solution to evaluating remedial alternatives in sediment remediation and recovery

Leon M. Delwiche
*NewFields, United States, ldelwiche@newfields.com*

Follow this and additional works at: [https://cedar.wwu.edu/ssec](https://cedar.wwu.edu/ssec)

Part of the Fresh Water Studies Commons, Marine Biology Commons, Natural Resources and Conservation Commons, and the Terrestrial and Aquatic Ecology Commons


This Event is brought to you for free and open access by the Conferences and Events at Western CEDAR. It has been accepted for inclusion in Salish Sea Ecosystem Conference by an authorized administrator of Western CEDAR. For more information, please contact westerncedar@wwu.edu.
Leon M. Delwiche and Jon Nuwer, PhD

Sediment Remediation/Recovery Modeling

A GIS solution to evaluating remedial alternatives in sediment remediation and recovery – April 4 2018
Sediment Cleanup – Recovery and Remediation

- Objectives
- Where does GIS help?
- Scenario Modeling – Tools and applied example
Primary Objectives

- Determine whether existing conditions are compliant with proposed sediment cleanup levels (SCLs) for hazardous substances. (COCs)
- Must attain SCL within reasonable timeframe
- Combination of active remediation and natural recovery
How can GIS-based models help?

• What is the spatial extent of the ‘site’?
• Will cleanup levels be met through natural recovery?
• What is the optimized remediation to comply with regulations?
• What are the outcomes of different management decisions?
Spatial Data Modeling Scenarios

• Need a way to model multiple scenarios to help in management decisions
• Model parameters are COC dependent
• Becomes a data management problem

Customized Toolbox
1. Natural Recovery
2. Active Remediation
3. Integrated Remediation With Recovery
Scenario Modeling – Dioxin/Furan Example

Initial Concentration
How much time will it take for the system to recover on its own?

Model Parameters

- Chemical Loading ($C_d$)
- Bioturbation ($B$)
- Sedimentation Rate ($R$)

1. Depositing solids and solids in the mixed layer have the same density
2. No diffusion/degradation of COC
Scenario Modeling – Natural Recovery

30 Year Recovery Result

Active Remediation?
What’s the area of remediation required to meet cleanup level?
Integrated Remediation and Recovery

After remediation, how much time to meet the sediment cleanup level?

- Model variables frequently vary depending on management decisions
- Can reevaluate using toolset
Scenario Modeling – Optimal Dioxin/Furan Remediation

Graph showing average concentration over time with site average and sediment cleanup level.

Map indicating various concentrations of Dioxin/Furan TEQ in µg/Kg, with areas shaded in different colors, including a Remediation Area and Sediment Cleanup Unit.
Scenario Modeling – Optimal Site-Wide Remediation

- Represents a maximal extent of remediation
- Model does not optimize the remediation for multiple COC
Summary

- Local Sediment Cleanup Standard have become more complex
- GIS-based models allow for scenario evaluation
- What is the optimized remediation to comply with regulations?
Questions?