Sediment Monitored Natural Recovery Evaluation Update

RTDF Sediments
Remediation
Action Team Meeting

October 29, 2002

John Davis, Dow Chemical
Tim Dekker, LimnoTech
Clay Patmont, Anchor Env.
Mike Swindoll, ExxonMobil

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Presentation Outline

- RTDF Subgroup Overview
- Goals and Objectives
- Progress of Subgroup Activities
- Five Evaluation Elements
- Example Case History
- Path Forward

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RTDF Sediments Remediation Action Team

- One of five current Action Teams under RTDF
- Representatives from government, industry, and academia
- Four sub-groups:
  - Assessment
  - Monitored Natural Recovery (MNR)
  - Capping
  - Treatment

RTDF Sediments MNR Core Workgroup

- John Davis: The Dow Chemical Company
- Tim Dekker: Limno-Tech, Inc.
- Victor Magar: Battelle Memorial Institute
- Dale Matey: EPA Office of Emergency and Remedial Response
- Douglas McLaughlin: Blasland, Bouck, and Lee, Inc.
- Clay Patmont: Anchor Environmental, LLC
- Mike Swindoll: ExxonMobil Biomedical Sciences, Inc.

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Goals and Objectives

- Provide guidance on the technical confirmation of MNR for contaminated sediment
  - Framework for Evaluation (5 elements)
  - Case History Examples
- Apply the framework to assess the effectiveness of sediment MNR as a risk management alternative to reduce risk to human health and the environment

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Sediment MNR: Five Assessment Elements

1. Characterization of historical contaminant sources/controls
2. Characterization of sediment stability and fate/ transport processes
3. Compilation of a sufficient historical record for chemicals of interest to characterize temporal trends
4. Compilation of historical trends in relevant biological endpoints to corroborate chemical data
5. Development of acceptable and defensible modeling tools to allow prediction of future MNR

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Progress of Workgroup

Baltimore Sediment RTDF Meeting – February 2002:

- Reviewed approach for evaluating MNR at sites
- Presented 2 example case histories

Recent Activities:

- Meetings - Ann Arbor (spring) & Columbus (summer)
- Conference calls
- Refined evaluation framework/developed template
- Additional case history examples

Initial Case History Sites

- Bellingham Bay, Washington
- Eagle Harbor, Washington
- Commencement Bay (Sitcum Wtwy under-pier), Washington
- Spokane River/Lake Coeur d'Alene, Washington/Idaho
- Palos Verdes Shelf, California
- Lake Hartwell, South Carolina
- Morrow Lake, Michigan
- James River, Virginia

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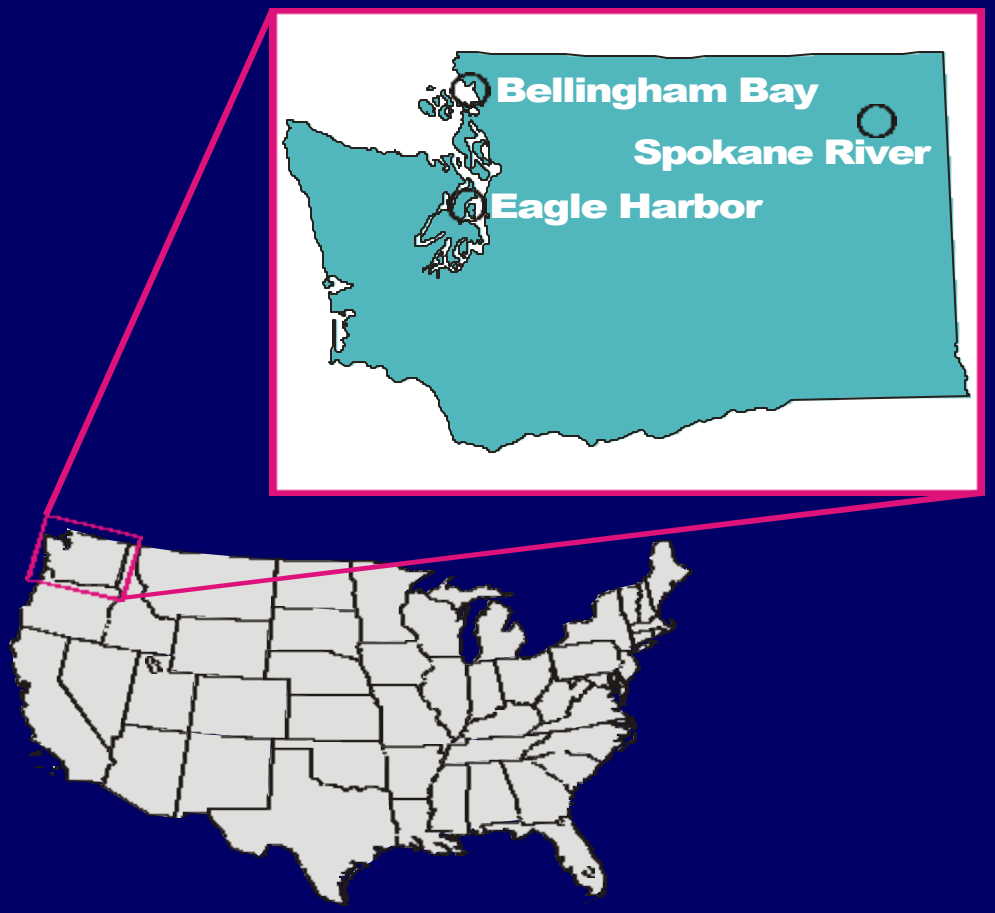
MNR Case Histories – Washington State



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BELLINGHAM BAY

Element 1: Bellingham Bay Site Conditions - Verification of Source Control

Identify Chemicals of Potential Concern

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Source Control Implementation

Mercury & Wood Debris

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Mercury - ’70
Wood - ’72, ’78, ‘99

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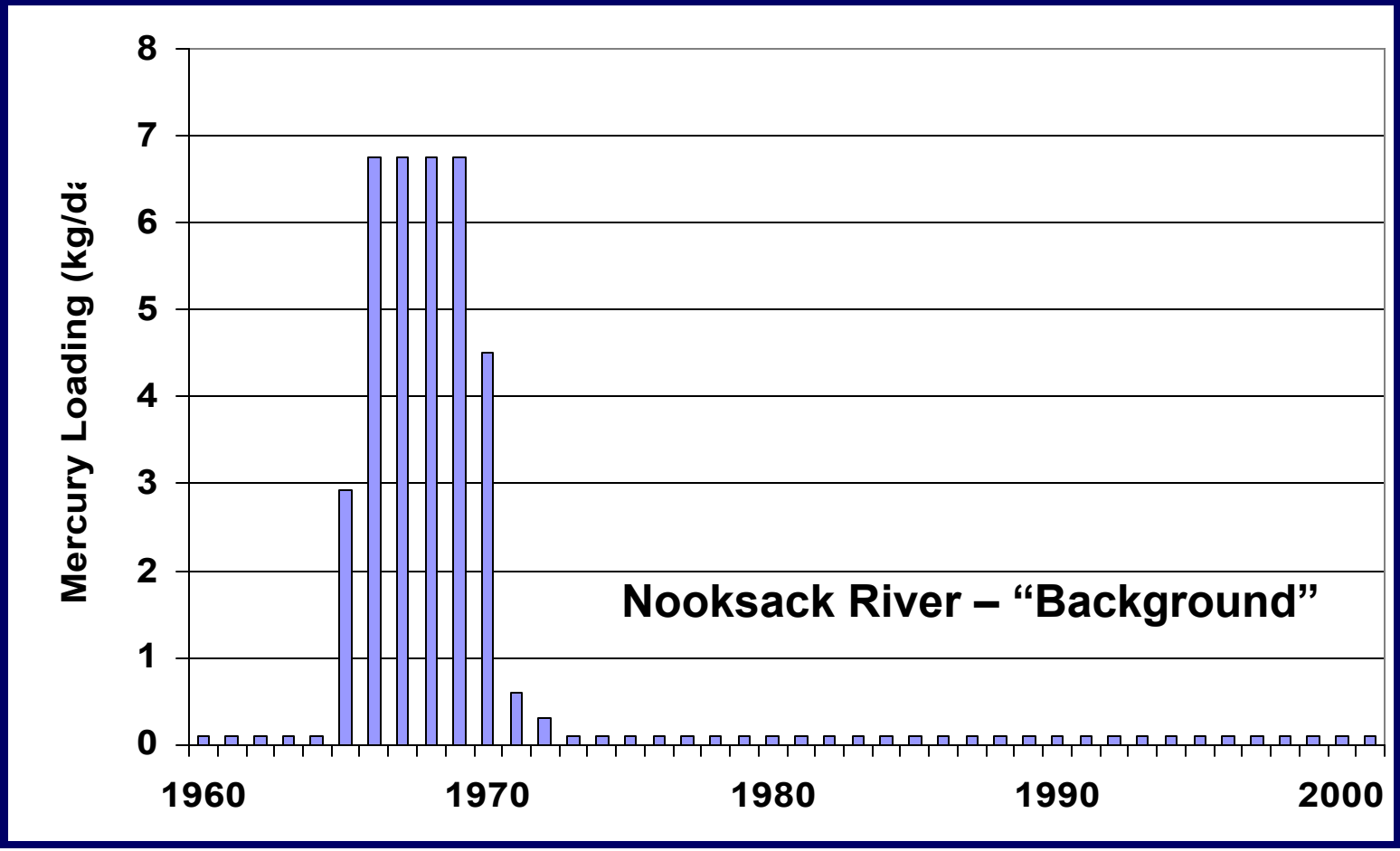
Element 1: Mercury Release and Source Control in Bellingham Bay



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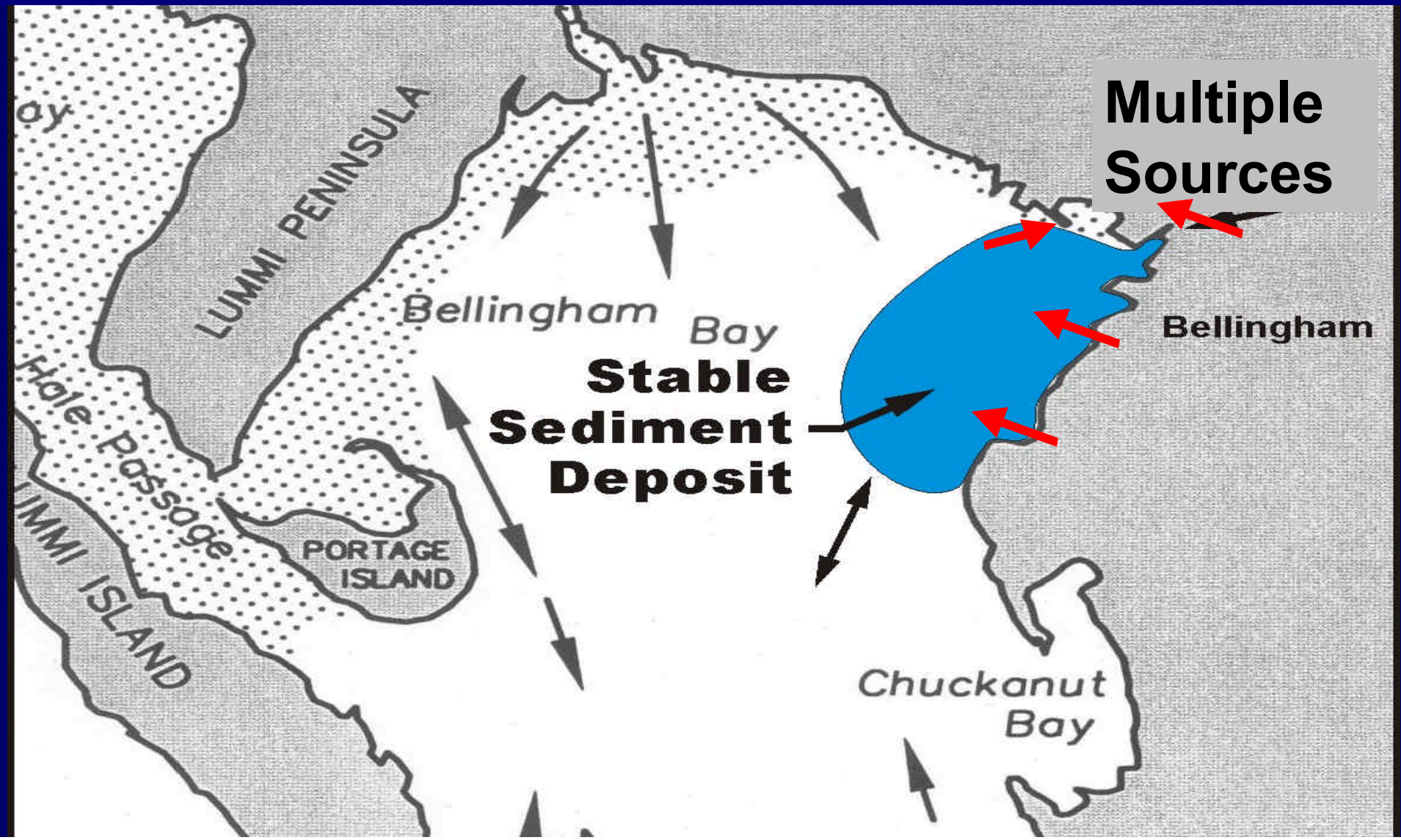
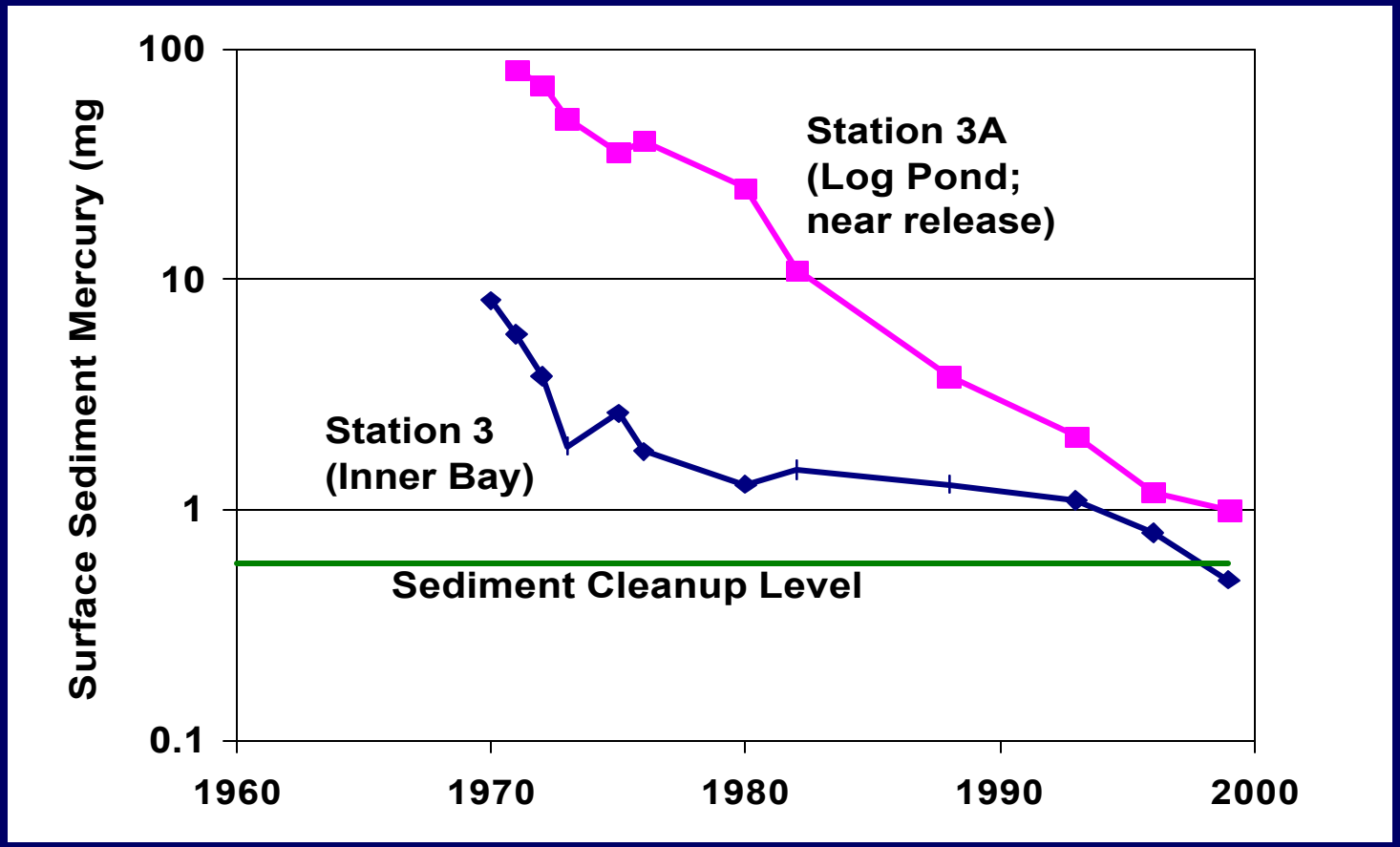
Element 2: Sediment Stability and Fate/Transport Characterization – Bellingham Bay



Element 3: Historical Declines in Surface Sediment Mercury After Source Control – Bellingham Bay



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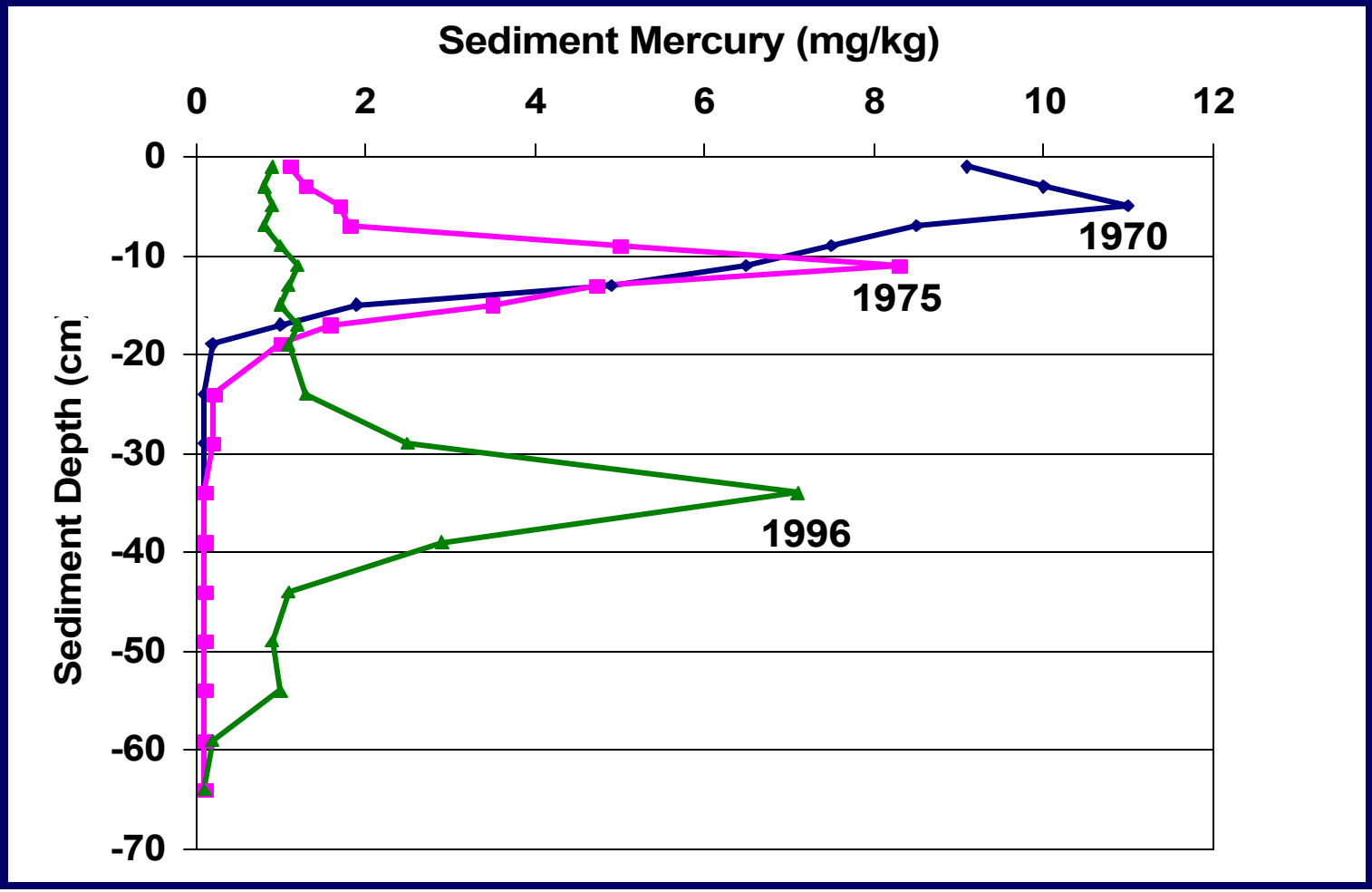
Element 3: Temporal Changes in Core Profiles - Inner Bellingham Bay



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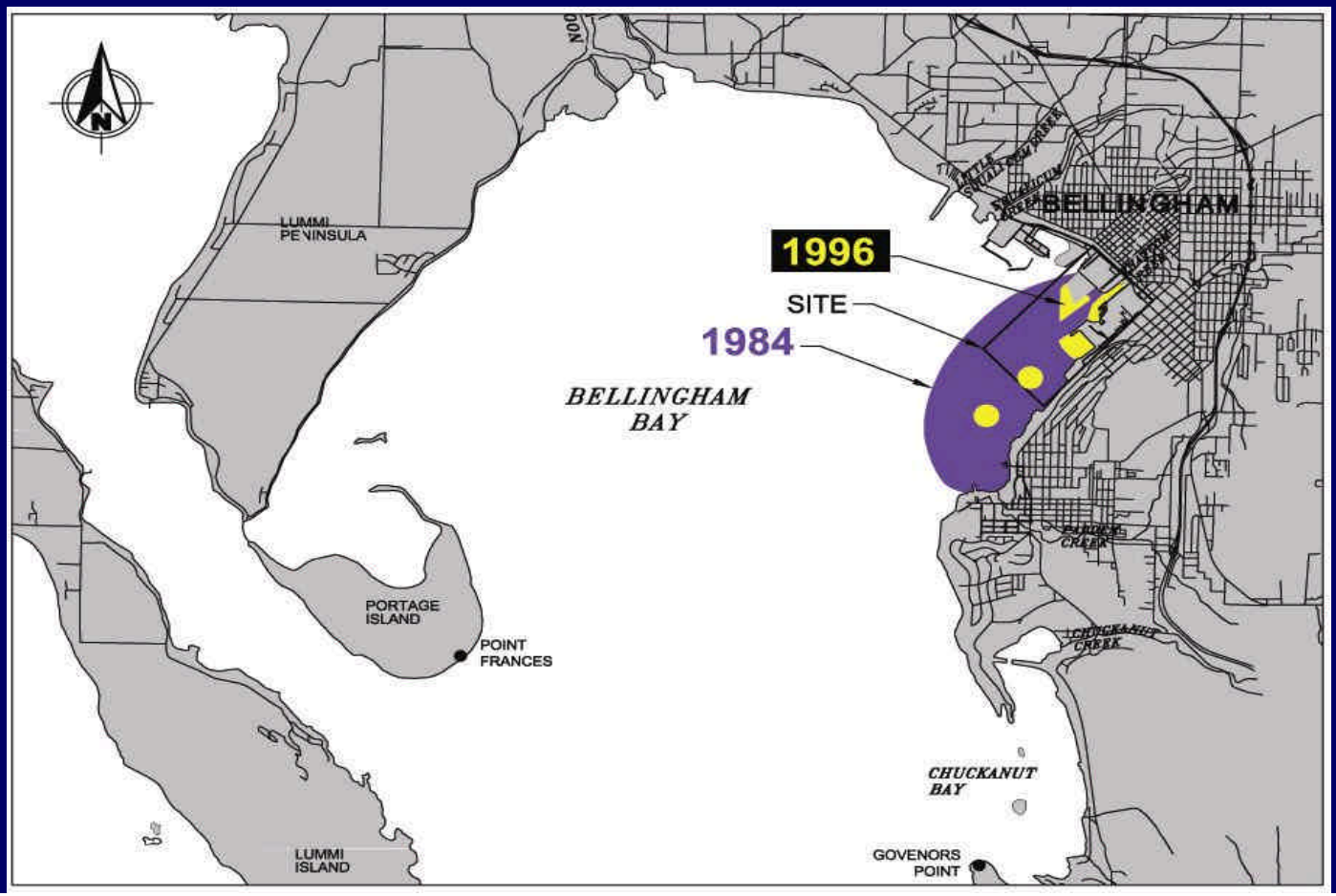
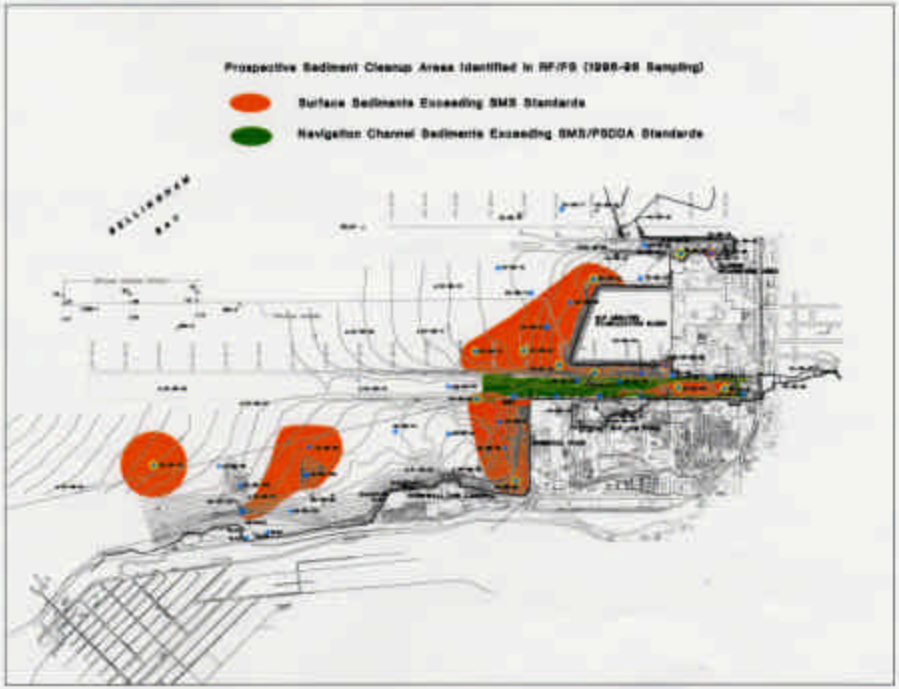
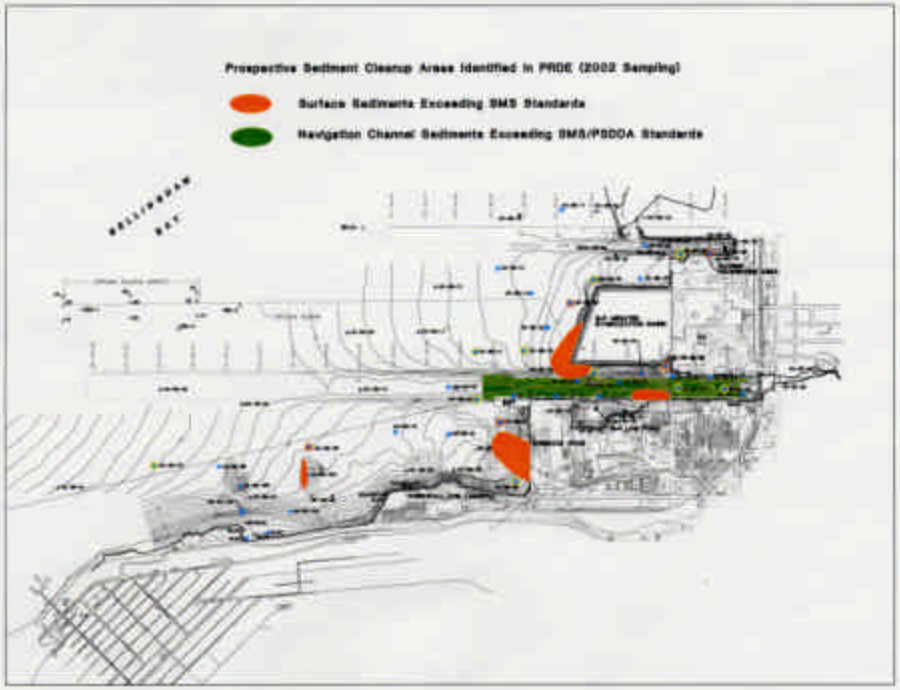
Element 4: Biological Recovery - Reduction in Sediment Toxicity, 1984 to 1996



Element 4: Biological Recovery - Reduction in Sediment Toxicity, 1996 to 2002





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Element 5: Forecasting Models – Bellingham Bay

- Initial Model Development in 1980
  - Radioisotope Dating
- Model Refinements in 1989 and 1996
  - Sediment Traps; Resuspension Rates
- Several Models Used
  - Officer and Lynch; WASP
- Model Validation
  - Predicted Changes in Core Profiles

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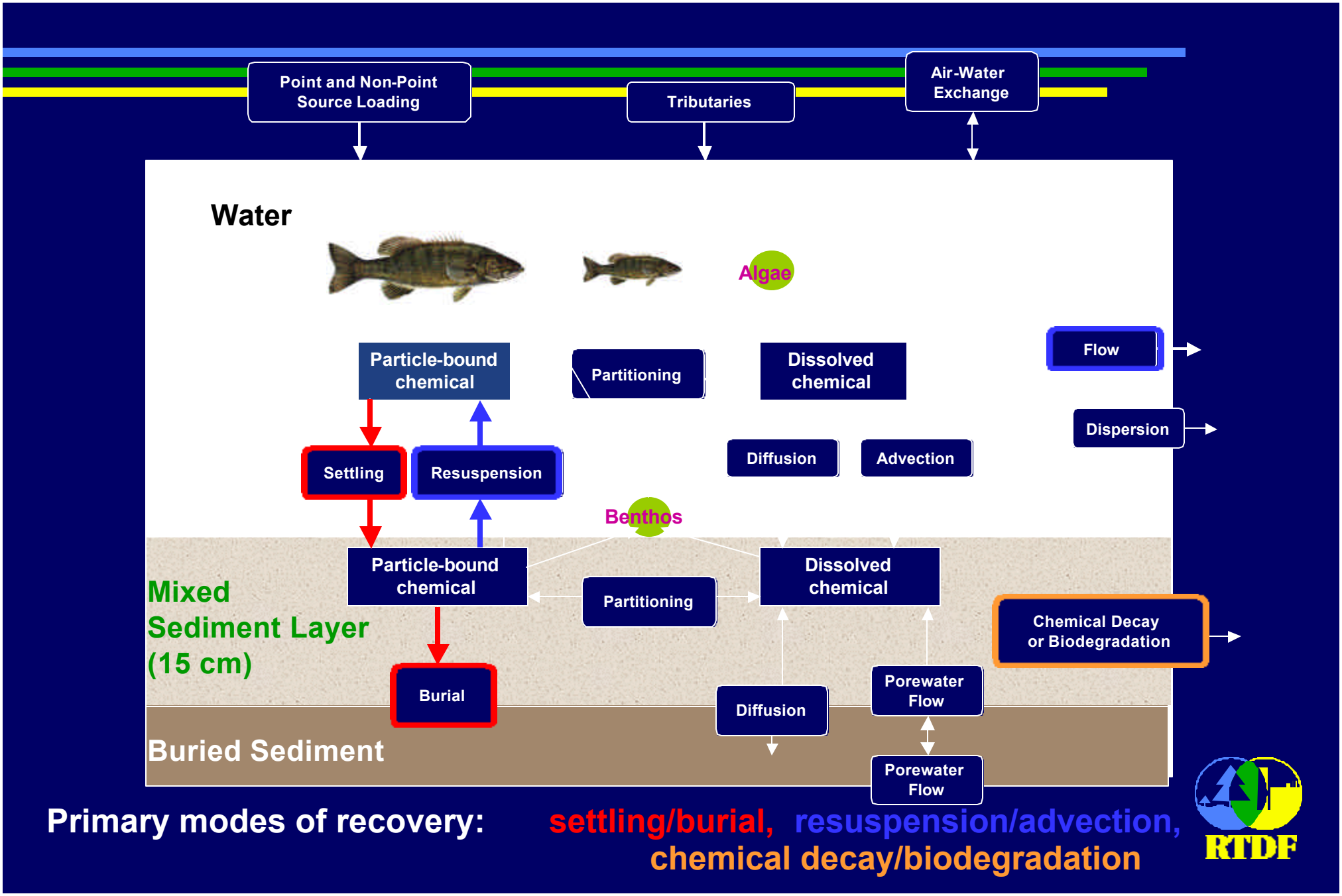
Point and Non-Point Source Loading
Tributaries
Air-Water Exchange
Water
Algae
Particle-bound chemical
Partitioning
Dissolved chemical
Flow
Dispersion
Settling
Resuspension
Diffusion
Advection
Benthos
Particle-bound chemical
Partitioning
Dissolved chemical
Chemical Decay or Biodegradation
Mixed Sediment Layer (15 cm)
Burial
Diffusion
Porewater Flow
Porewater Flow
Buried Sediment
Primary modes of recovery:
settling/burial, resuspension/advection, chemical decay/biodegradation
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Natural Recovery and Navigation Dredging in Bellingham Bay

- Well documented 30-yr sediment natural recovery
  - Natural recovery of sediments now largely complete
- Washington State sediment standards also consider maintenance dredging in stability evaluation
- Navigation dredging – natural recovery connection
  - Natural recovery evaluation used to develop performance standards of dredge residuals
  - Models predict recovery of post-dredge residuals within 1 to 3 years

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Path Forward

- Finalize MNR evaluation framework
- Complete case history template
- Document representative set of case histories
- Develop framework and case study presentations and publications
- Develop web site

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Draft Case History Template

Monitored Natural Recovery Case Studies -
Morrow Lake, Michigan

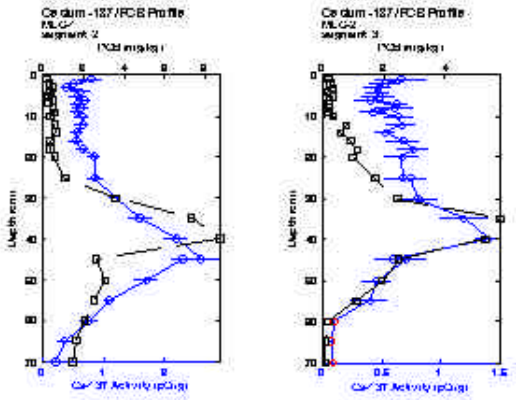
Introduction

Morrow Lake is located just east of Kalamazoo, Michigan, at the upstream end of the Kalamazoo River Superfund site. While the lake is not part of the Superfund site, extensive data has been collected in the lake because the fish, sediment and water in the lake contain PCBs that are representative of upstream sources to the system. Morrow Lake is approximately XX acres in size, with average flow-through rate of XX cfs, and is downstream of the cities of xx, xx, and Battle Creek.

Assessment Elements

1. Summary of historical contamination sources and controls.

Major industrial sources of PCB to the Kalamazoo River system are primarily downstream of Morrow Lake. PCB discharges upstream of the Lake are not well characterized, and are related to diffuse industrial sources. Because of the diffuse nature of the sources, specific actions taken to reduce upstream contaminant discharges are generally unknown, but are thought to coincide with the general phase-out of PCBs that occurred in the early- to mid- 1970s. Coring data from the lake also indicates a trend of decrease in loadings since the 1970s.



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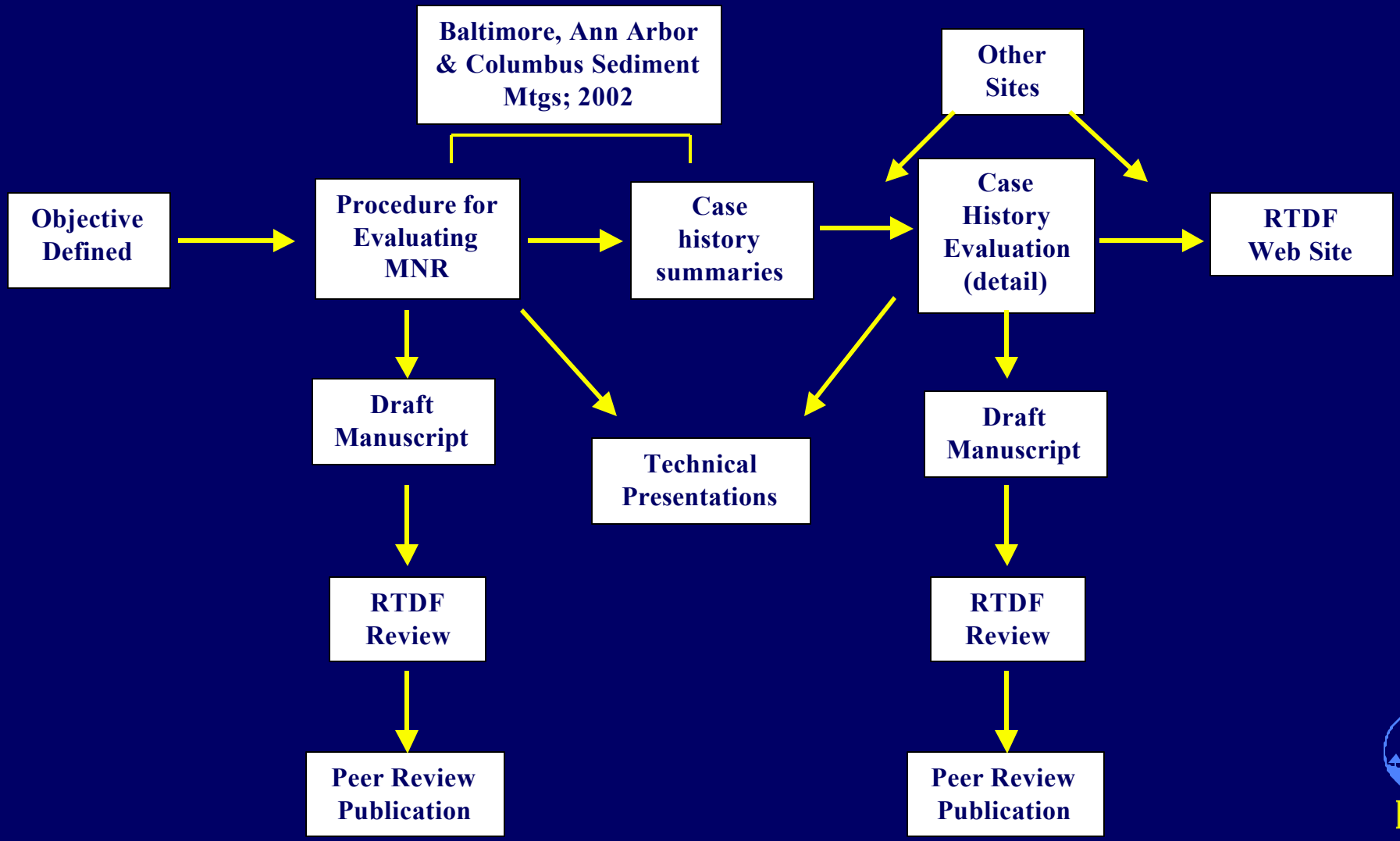
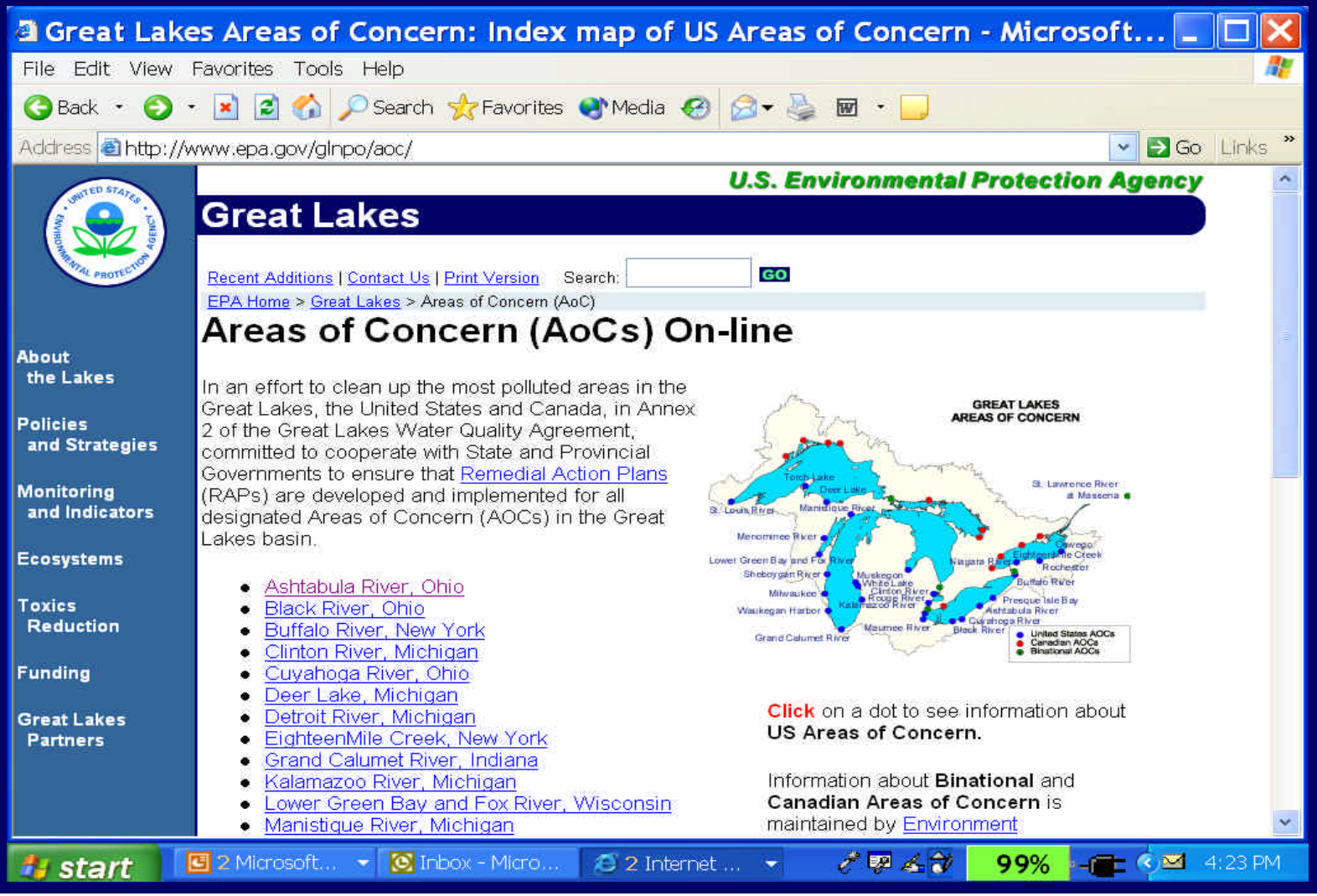
RTDF MNR Review and Publication Process



Model for Sediment RTDF MNR Web Site



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