

Project ENVVEST Technical Update

Introduction

Schedule

FC TMDL Study

Stream and Storm Water
Monitoring

Sediment Studies

Biological Studies

Dr. Robert K. Johnston
ENVVEST Technical Coordinator
Community Advisory Committee Meeting
June 23, 2005

Project ENVVEST

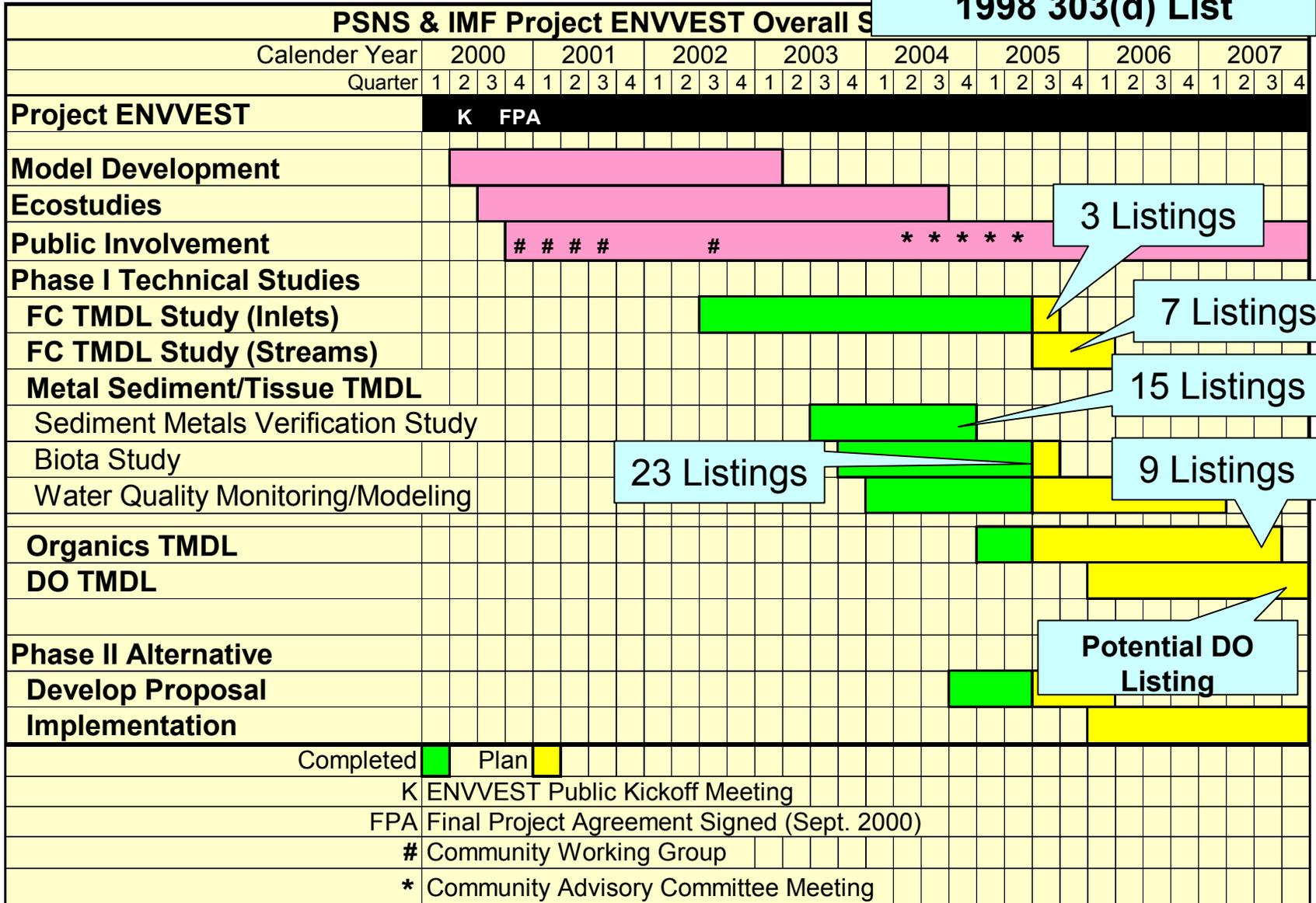
Schedule

PSNS & IMF Project ENVVEST Overall Schedule																																
Calendar Year	2000				2001				2002				2003				2004				2005				2006				2007			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Project ENVVEST	K FPA																															
Model Development	█																															
Ecostudies					█																											
Public Involvement					# # # #				#				* * * * *																			
Phase I Technical Studies																																
FC TMDL Study (Inlets)									█								█															
FC TMDL Study (Streams)													█																			
Metal Sediment/Tissue TMDL																																
Sediment Metals Verification Study													█																			
Biota Study													█																			
Water Quality Monitoring/Modeling													█																			
Organics TMDL													█				█															
DO TMDL													█																			
Phase II Alternative																																
Develop Proposal													█				█															
Implementation													█																			
Completed	█																															
Plan	█																															
K	ENVVEST Public Kickoff Meeting																															
FPA	Final Project Agreement Signed (Sept. 2000)																															
#	Community Working Group																															
*	Community Advisory Committee Meeting																															

Project ENVVEST

Schedule

Number of Listings on
1998 303(d) List



3 Listings

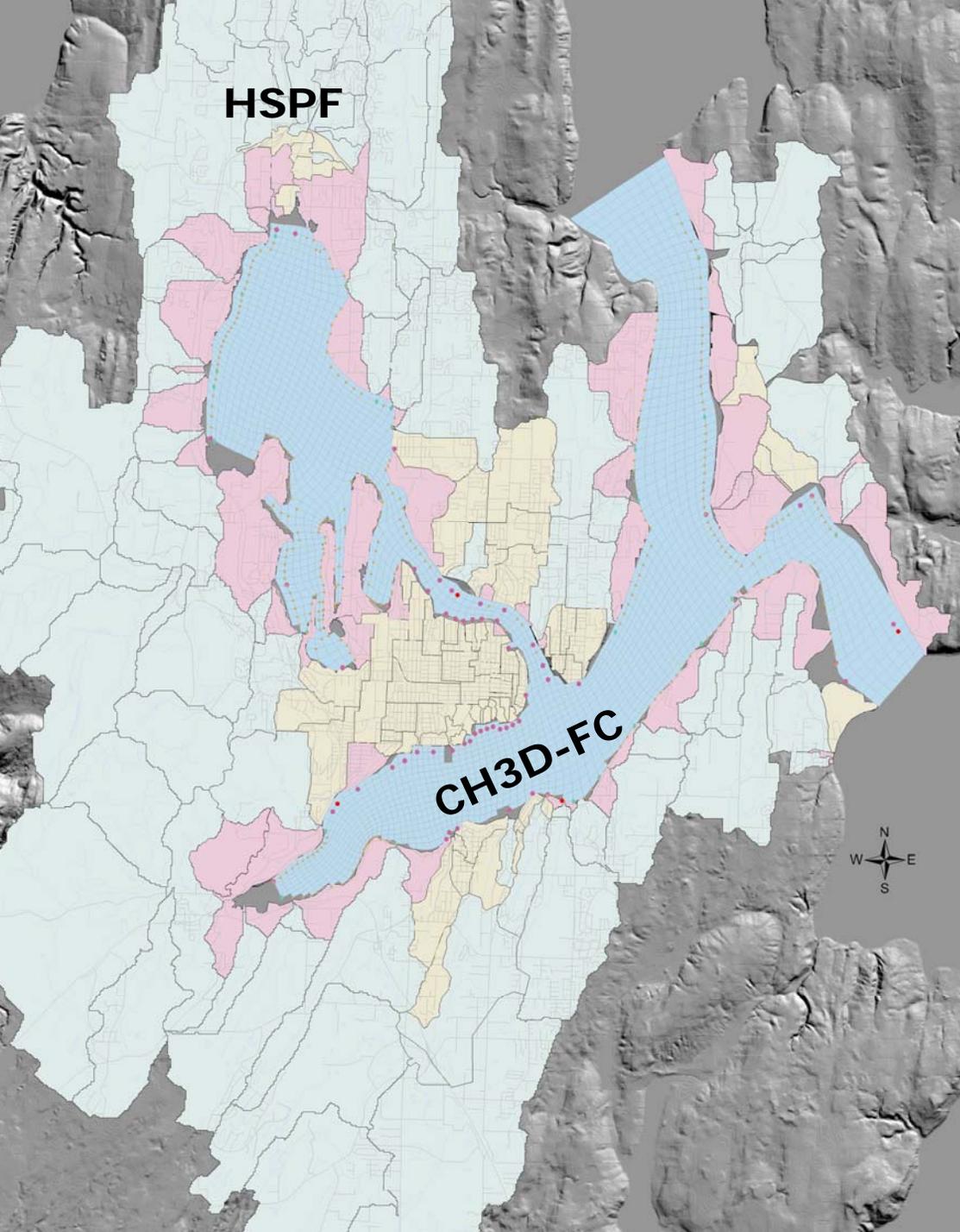
7 Listings

15 Listings

23 Listings

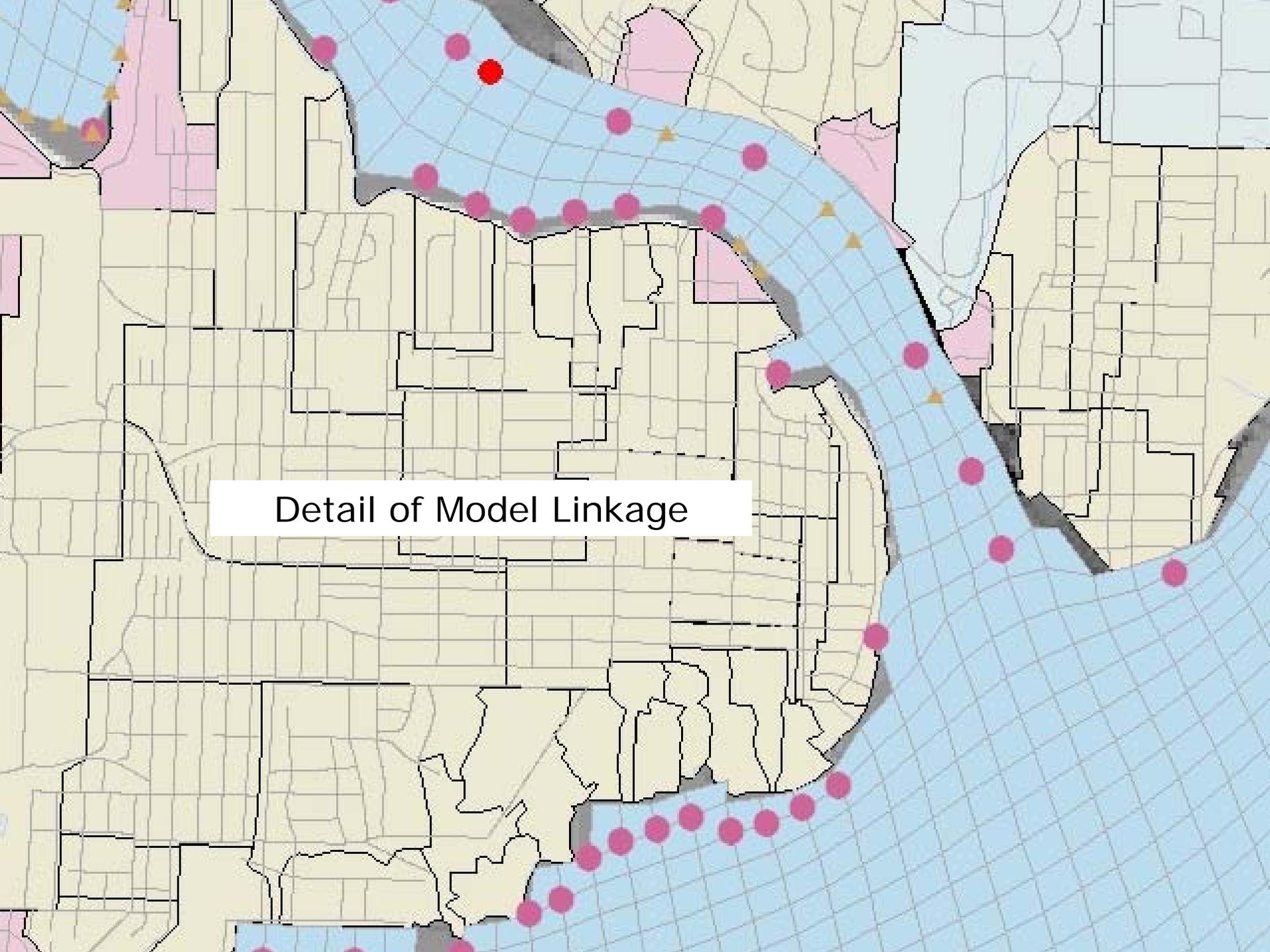
9 Listings

Potential DO Listing



Integrated Watershed and Receiving Water Model

- Simulate all sources
 - Treatment Plants
 - Streams
 - Storm Water
 - Shoreline Drainage
- Identify Critical Conditions



Detail of Model Linkage

Technical Reports

- **An Analysis of Microbial Pollution in the Sinclair-Dyes Inlet Watershed (June 2005)**
- Watershed Model Calibration Report for Streams and Storm Water (July 2005)
- Integrated Model Verification Report (Aug 2005)
- Simulation and Scenario Analysis Report (Sep 2005)



An Analysis of Microbial Pollution in the Sinclair-Dyes Inlet Watershed



June 2005

Cover: Members of the Suquamish Tribe harvesting Manila clams from Dyes Inlet, April 2005.

(Photo by P. Williams, Shellfish Program, Suquamish Fisheries Department)

Storm Event Monitoring

- Sample representative storm events
- Relate landuse to environmental quality
- Cooperation among PSNS & IMF, Cities, and Kitsap County SSWM & Health District



Project ENVVEST Technical Update

Sediment Studies

Sediment Mass Balance

Sediment flux study

Metals Verification Study

Organics Verification Study



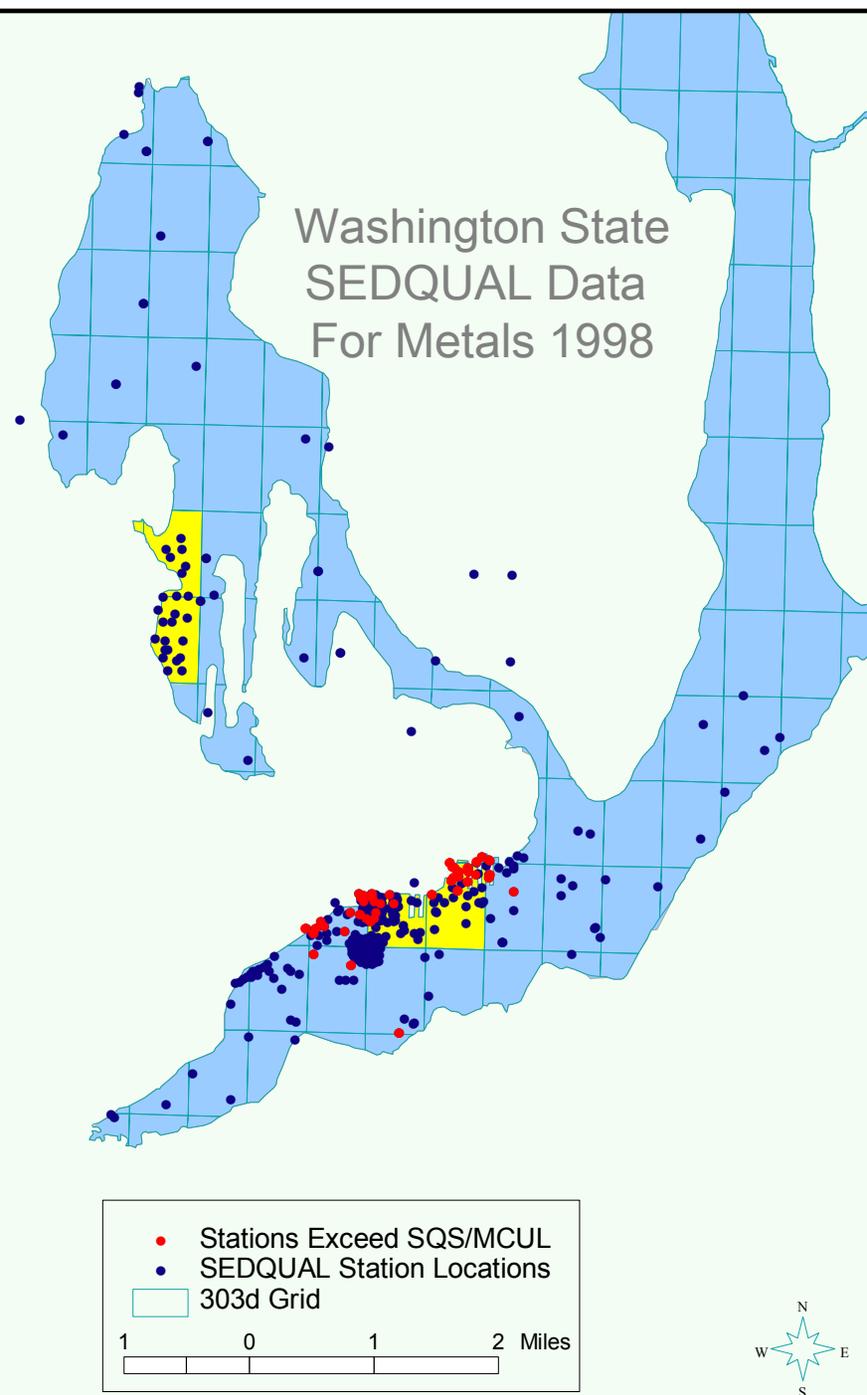
Sediment Studies



- Metals Verification Study
 - Synoptic sampling of Sinclair and Dyes Inlets.
 - Screening with confirmation
 - Basis for delisting
- Organics Verification Study

1998 303(d) Listings for Sediment

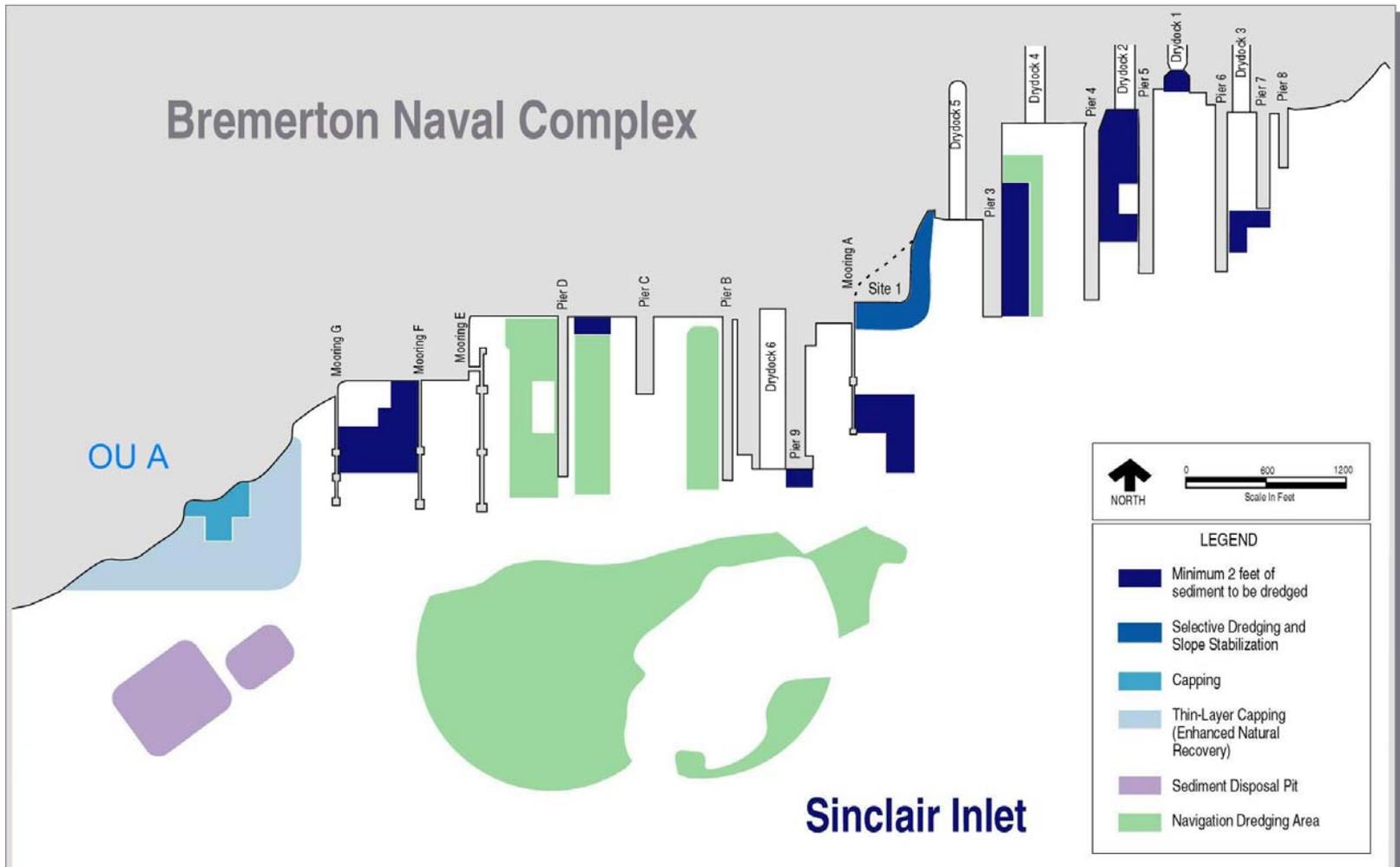
Sinclair Inlet: As, Cu, Pb,
Zn, Cd, Hg, PCBs,
Phalates, and PAHs
Dyes Inlet: Cd, Ag, Hg,
Phenol, Toxicity



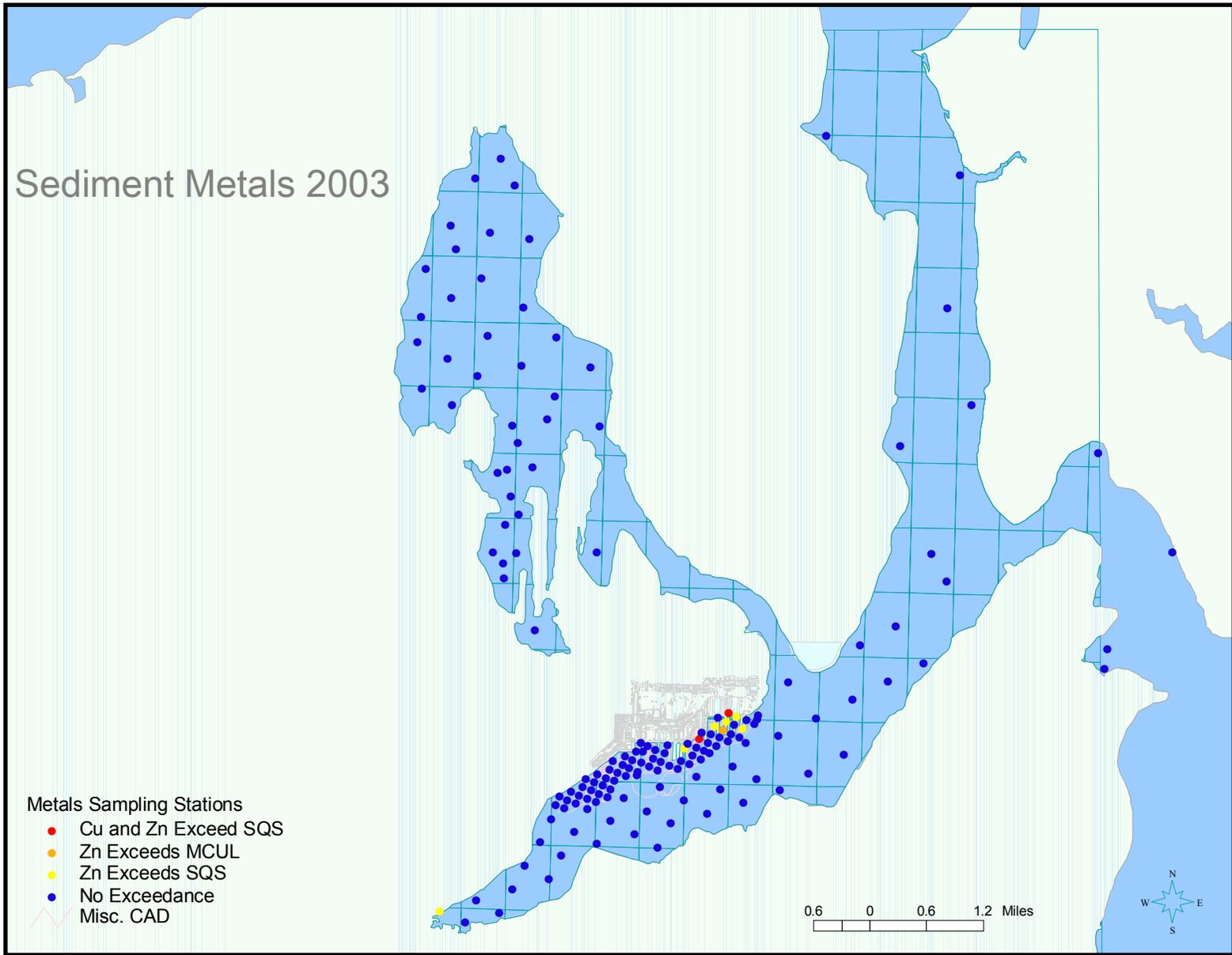
Sediment Remediation

OU B Sediment Cleanup

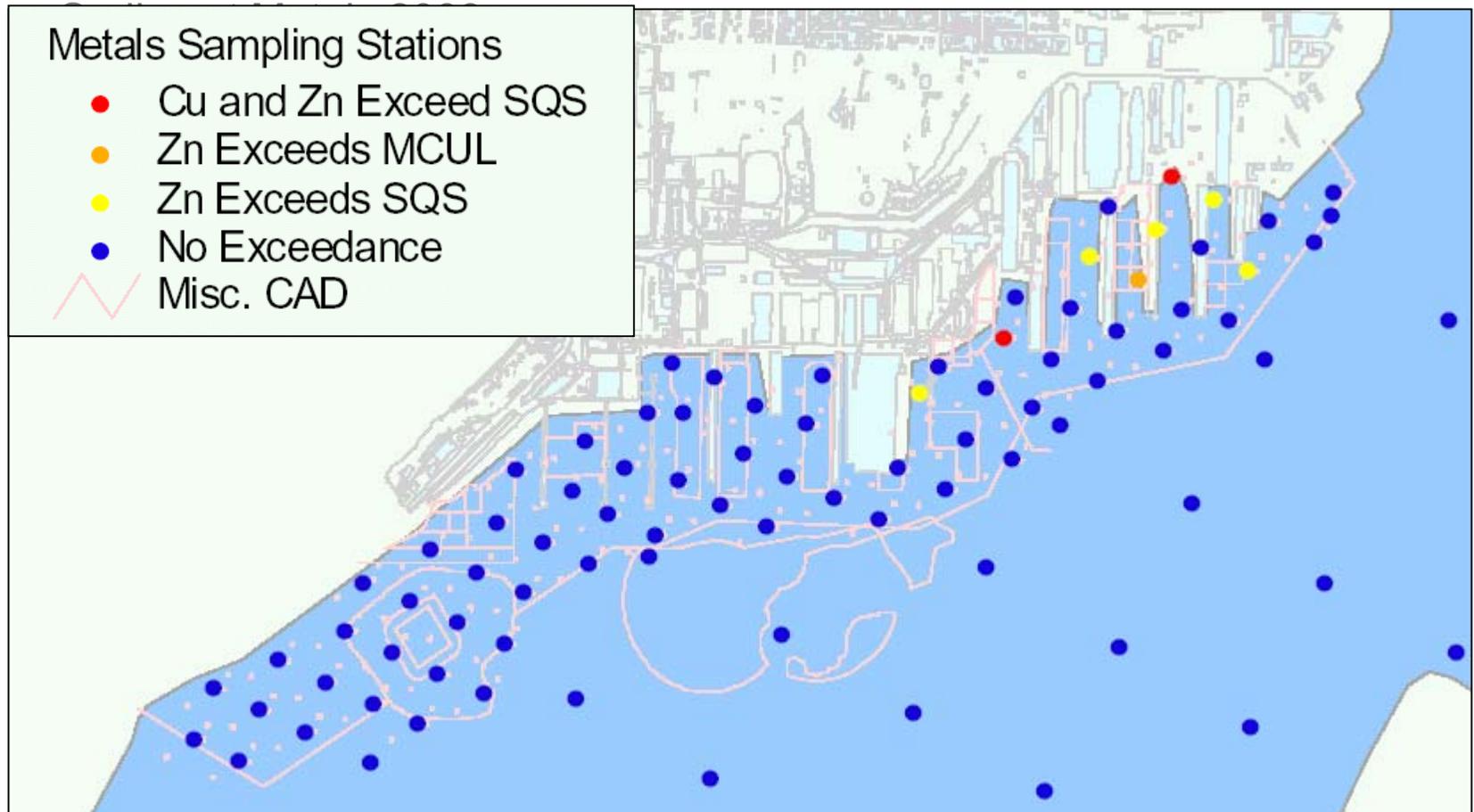
Sediment Cleanup and Navigational Dredging



Post Cleanup Sediment Metals



Post Cleanup Sediment Metals



Metals Verification Study for Sinclair and Dyes Inlets, Washington

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September 2004

Prepared for the
Puget Sound Naval Shipyard and
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Project ENVVEST
Bremerton, Washington

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Pacific Northwest National Laboratory
Richland, Washington



Project ENVVEST Technical Update

Biological Studies

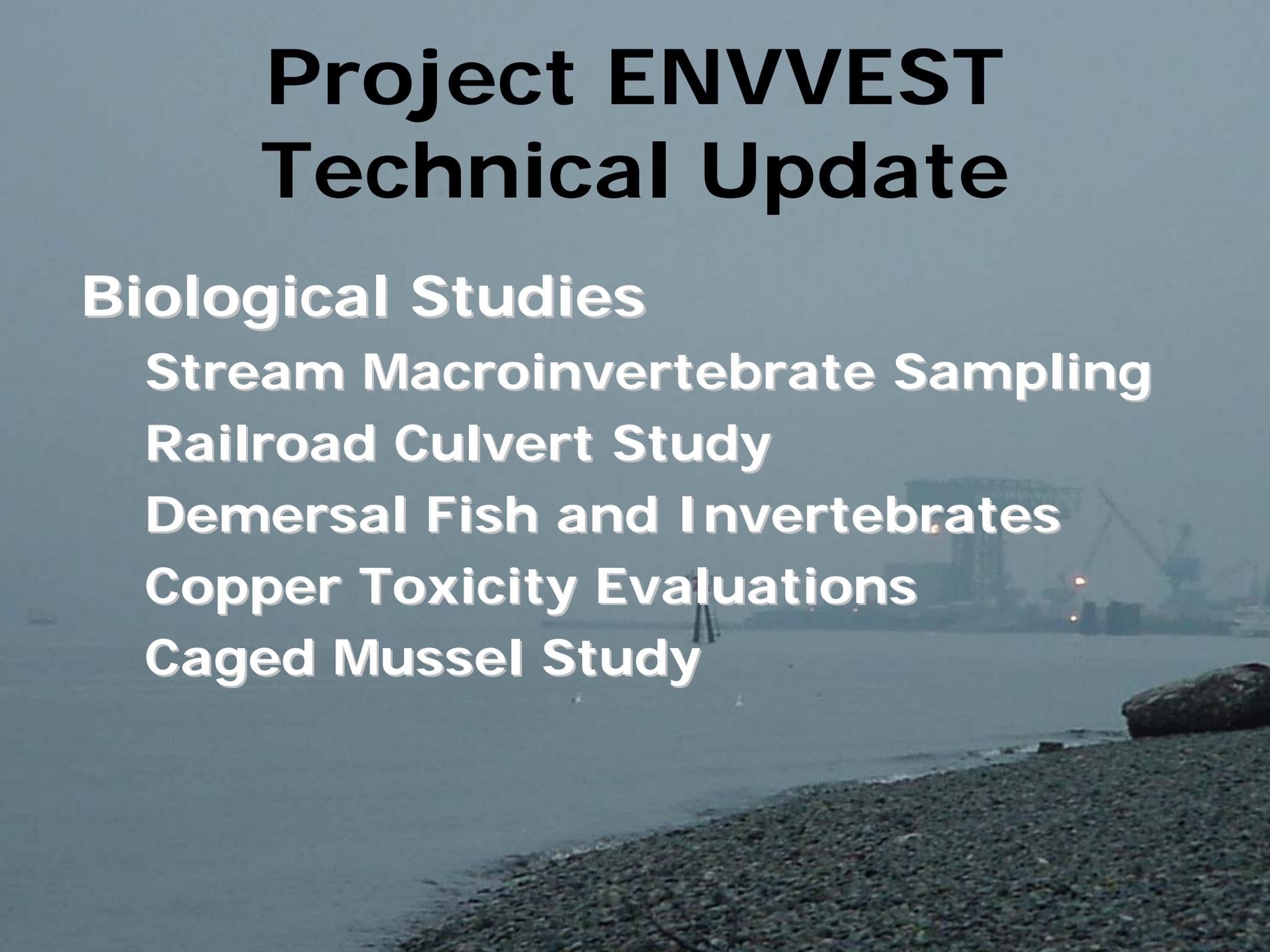
Stream Macroinvertebrate Sampling

Railroad Culvert Study

Demersal Fish and Invertebrates

Copper Toxicity Evaluations

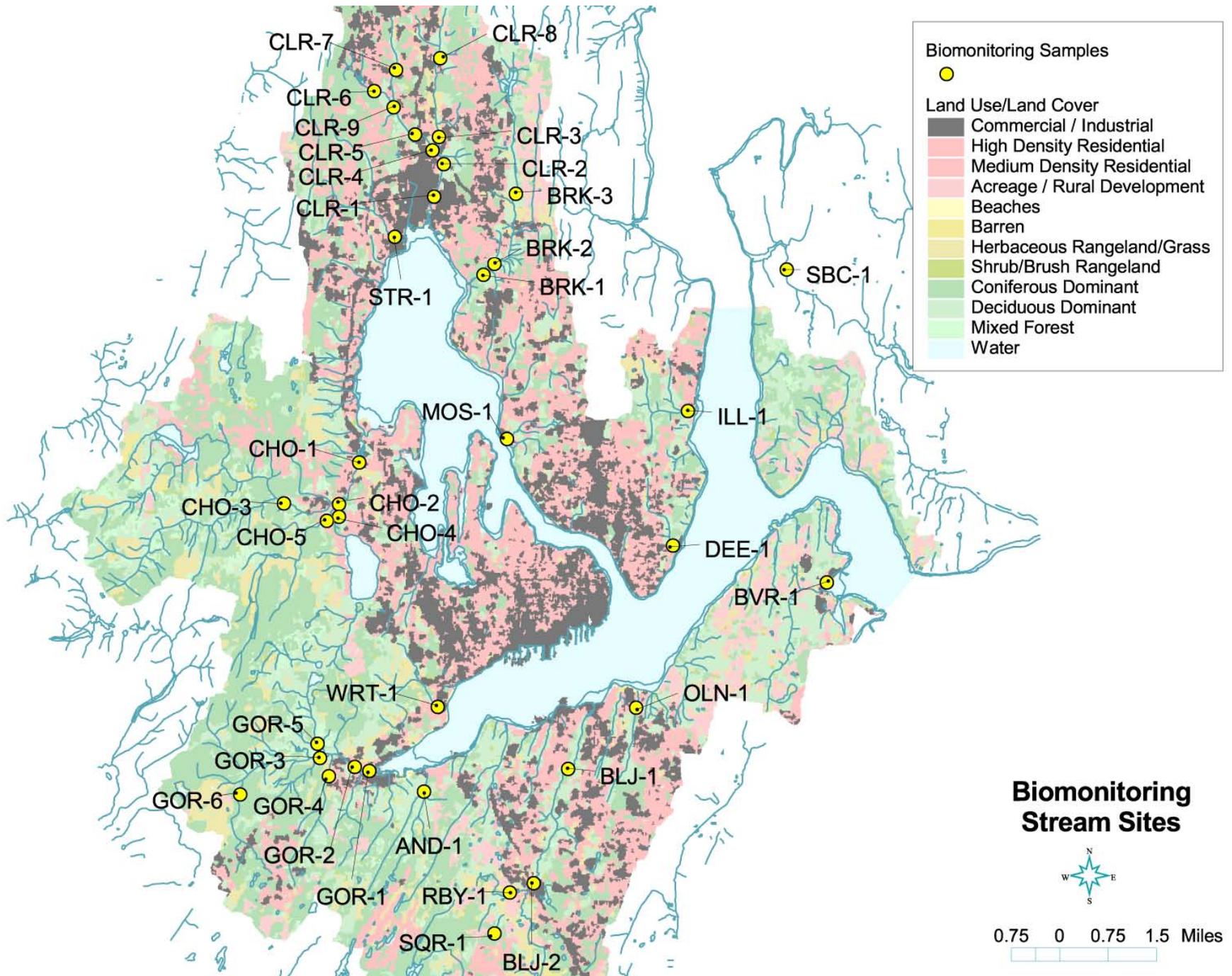
Caged Mussel Study



Stream MacroInvertebrate Sampling

- Coordinated Sampling
 - ENVVEST, Kitsap County, Cities of Bremerton, and Bainbridge Island
- Sampling Events
 - Summer 2001
 - Summer 2002
 - Summer 2003





Railroad Culvert Study

An Analysis of Stream Culvert Fish
Passage on the Navy Railroad Line
between Bremerton and Shelton,
Washington

Prepared by: C.W. May, M.C. Miller, and J.A. Southard

Battelle Marine Sciences Laboratory
Sequim, Washington



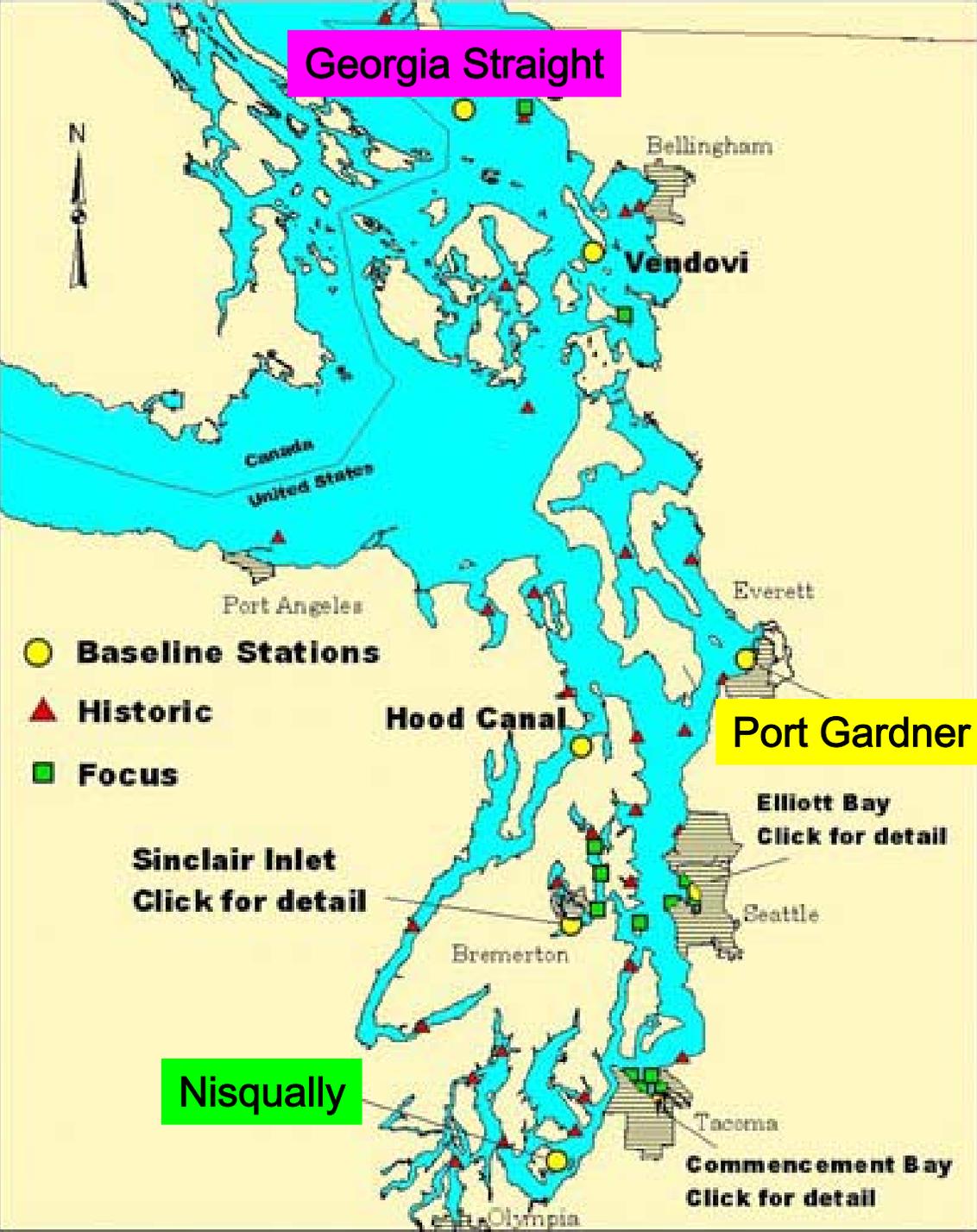
- Evaluated fish passage issues for culverts along Navy Railroad line between Bremerton and Shelton
- Recommendations for Prioritizing culvert replacement and repair

Demersal Fish



- **Contaminants in bottom fish and invertebrates**
 - 8 species from Sinclair Inlet and reference areas
 - Tissues analyzed for metals, PCBs, and pesticides
- **Concentrations compared to reference and Ecological Benchmarks**





Puget Sound
 Ambient
 Monitoring
 2003 Demersal
 Fish Surveys

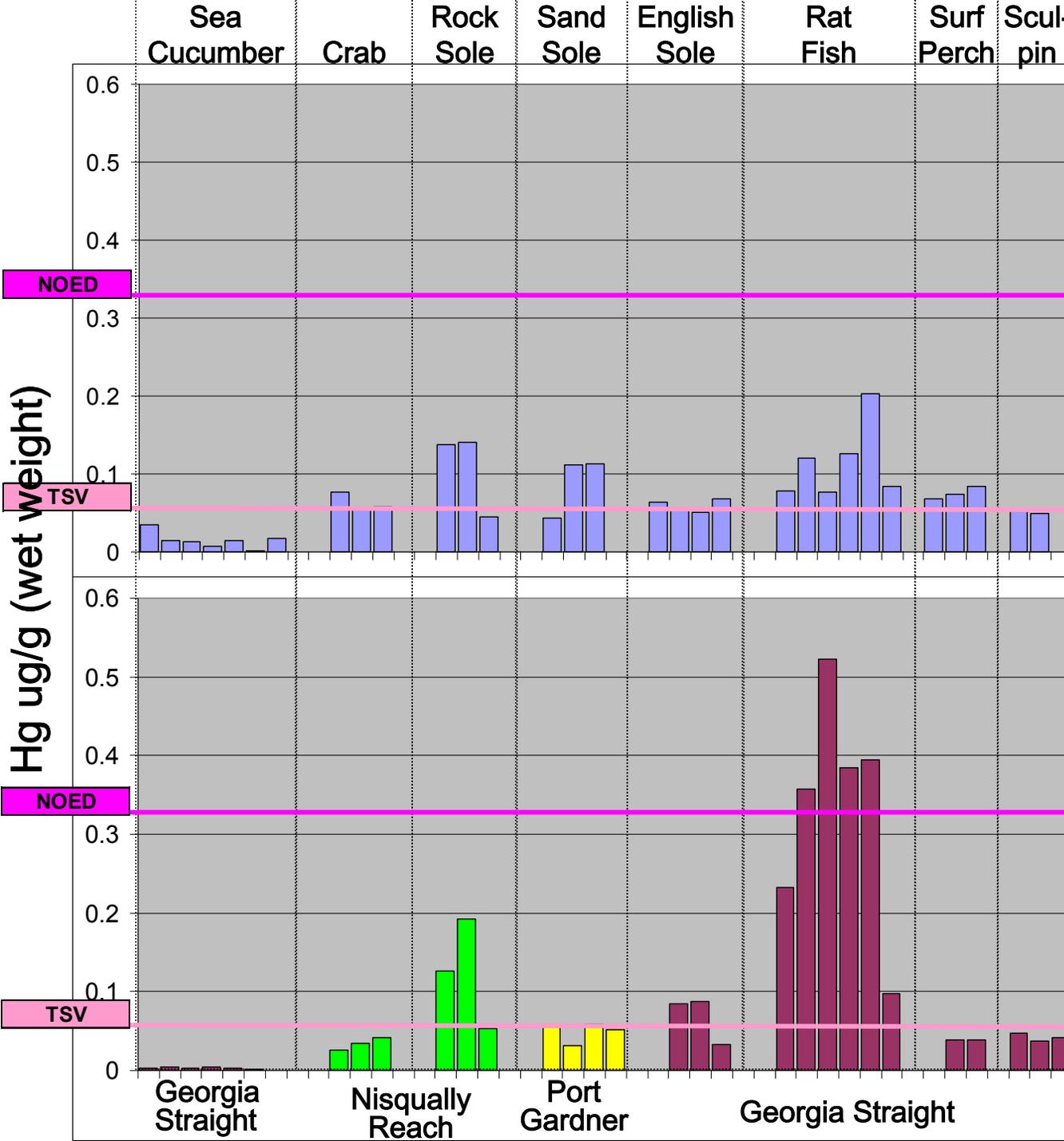
2005 Surveys
 May 2005

- Georgia Straight
- Vendovi
- Nisqually
- Hood Canal
- Sinclair Inlet

Summary of Tissue Residue Benchmarks

Benchmark	Applicable Endpoints	Comment
TSV Tissue Screening Value	Aquatic Organisms	Very conservative safety factor
B_{CV} Bioaccumulation Critical Value	Marine Organisms	Tissue residue above which suggests WQC exceeded
NOED No Observed Effects Dose	Demersal Fish Invertebrates	Tissue residue below which effects will probably not occur
LOED Lowest Observed Effects Dose	Demersal Fish Invertebrates	Tissue residue above which effects may occur
Dietary (Concentration in Prey)	Omnivore – Black Duck Piscivore – Osprey Mammal – Harbor Seal	Concentration in diet below which effects will probably not occur

Total Mercury Tissue Residues Sinclair Inlet

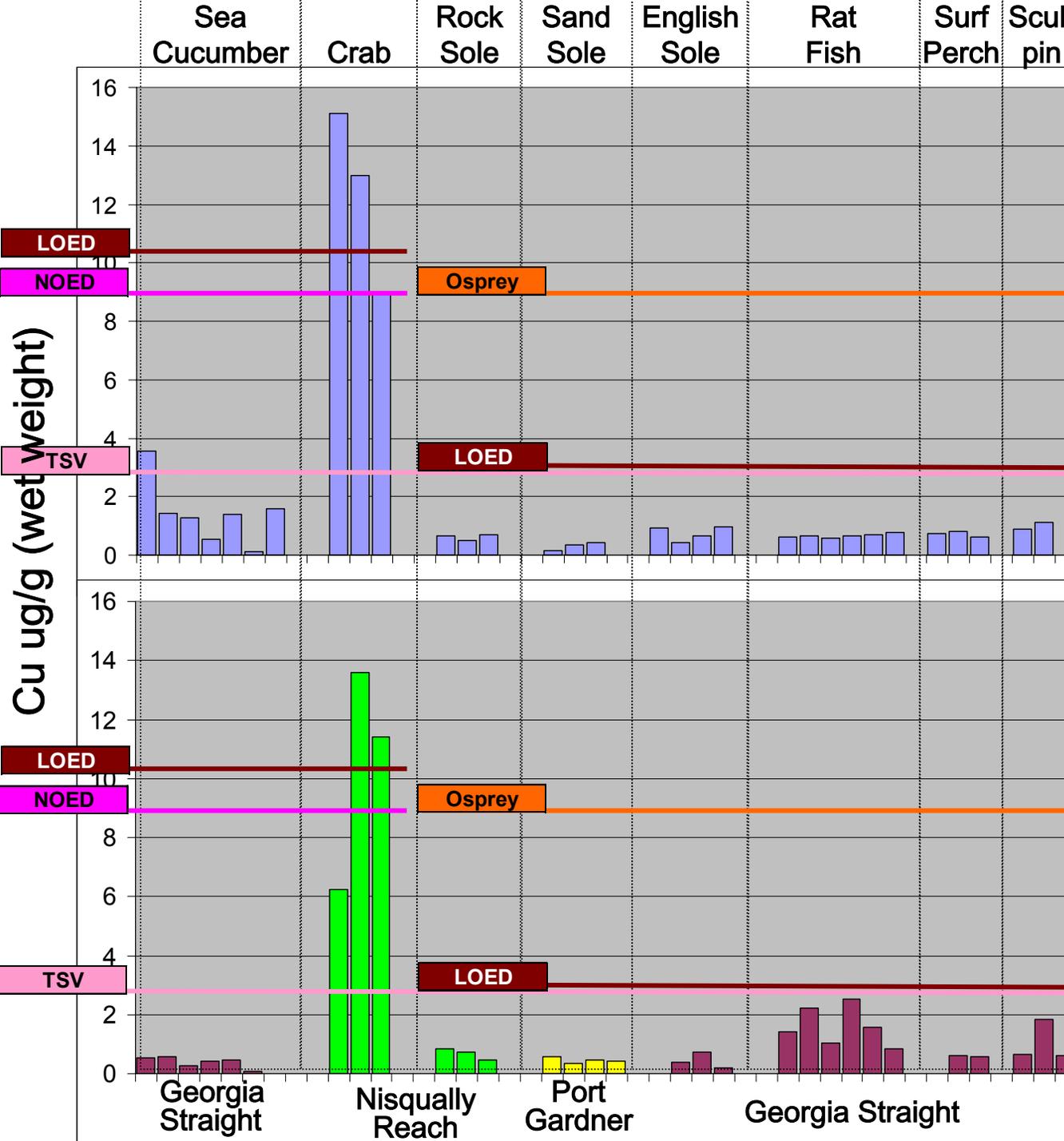


Ecological Benchmarks Total Hg		
	Fish	Invert.
	ug/g wet	ug/g wet
TSV	0.06	0.06
Bcv	4.69	19.65
NOED	0.32	1.64
LOED	1.31	6.00
Harbor Seal	5.83	5.83
Osprey	2.50	na
Black Duck	5.00	5.00

Reference

Copper Tissue Residues

Sinclair Inlet



Ecological Benchmarks (Cu)		
	Fish	Invert.
	ug/g wet	ug/g wet
TSV	3.00	3.00
Bcv	0.62	62.00
NOED	0.34*	9.00
LOED	3.40	10.13
Harbor Seal	68.25	68.25
Osprey	9.22	na
Black Duck	18.44	18.44

* NOED = LOED/10

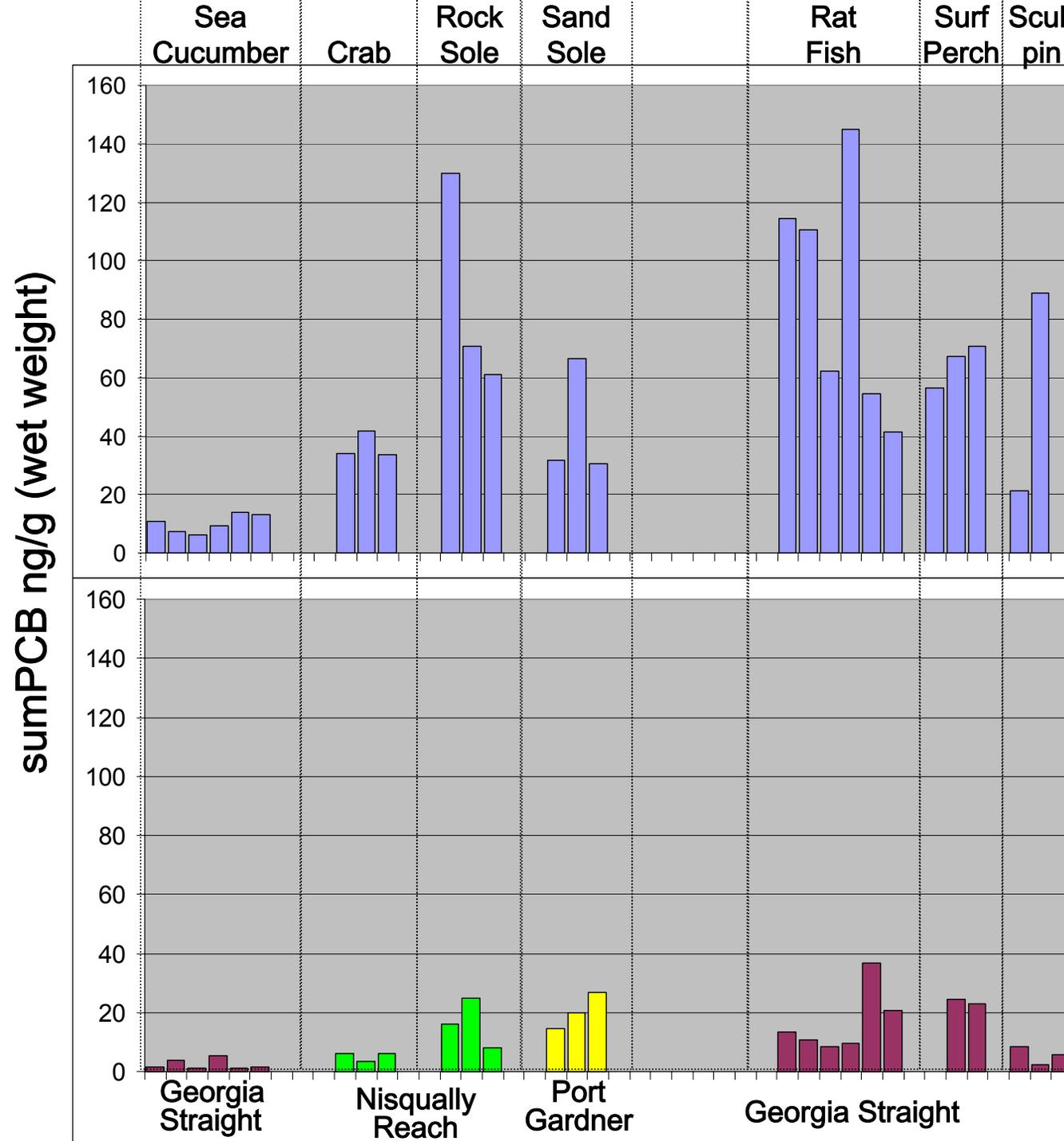
Reference

sumPCB Tissue Residues

Sinclair Inlet

Ecological Benchmarks (sumPCB)		
	Fish	Invert.
	ng/g wet	ng/g wet
TSV	218	218
Bcv	3038	468
NOED	750	375
LOED	900	688
Harbor Sea	400	400
Osprey	500	na
Black Duck	1000	1000

Reference

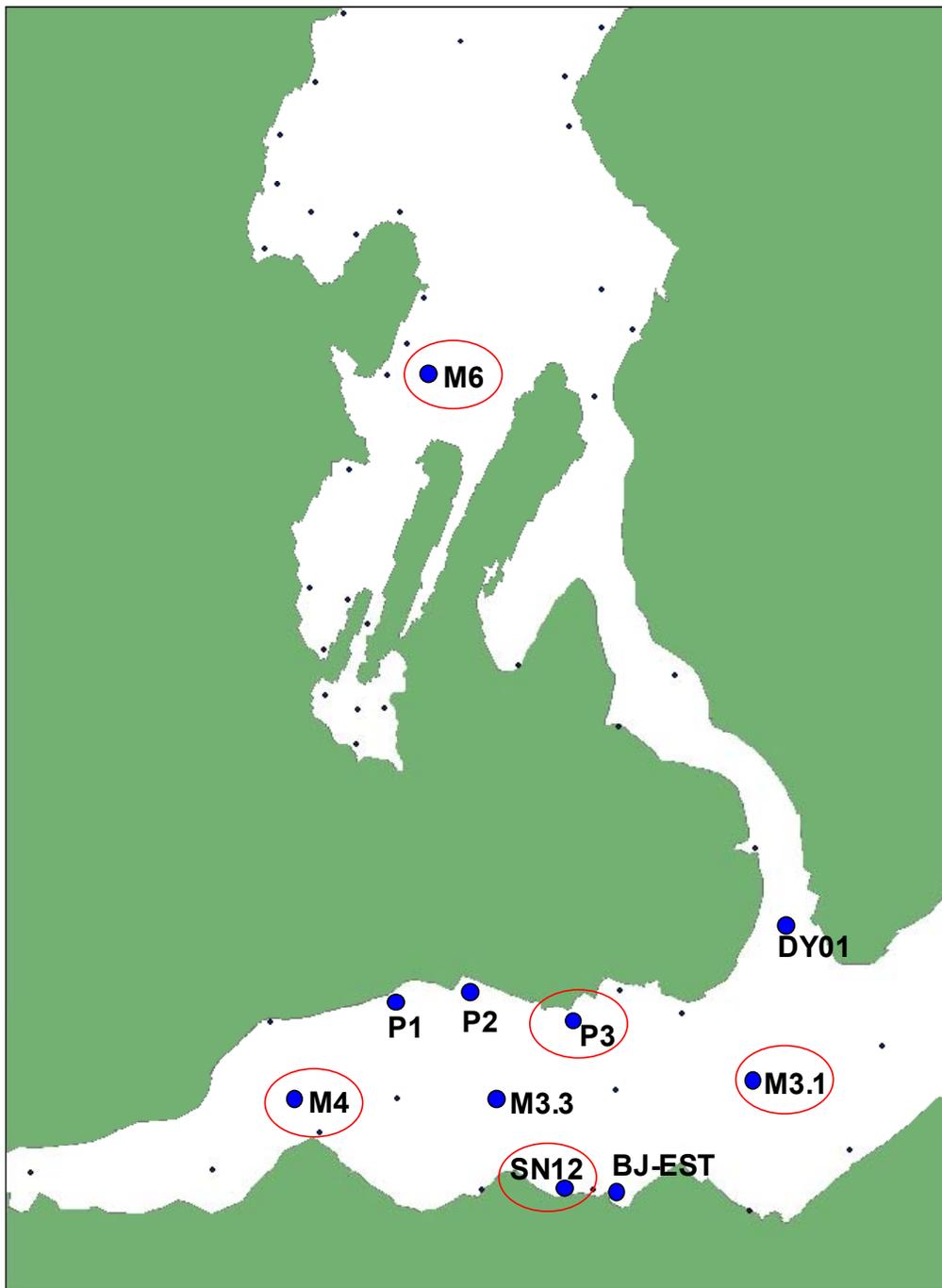


Copper Toxicity Evaluations

- Assess ambient toxicity in surface water at site
 - Using sensitive and economically important test organism
- Assess bioavailability/toxicity of Cu to marine organisms

Ambient Marine Sampling Stations

Circles are
stations being
sampled for Cu
toxicity analysis



Caged Mussel Study

Objective:

Deploy caged mussels at seven locations in Sinclair and Dyes Inlets to evaluate potential biological effects from ambient exposures to marine organisms.



Rationale

Why Bivalves?

Integrate & concentrate chemicals

Why Transplants?

Experimental control, environmental realism

Why Growth?

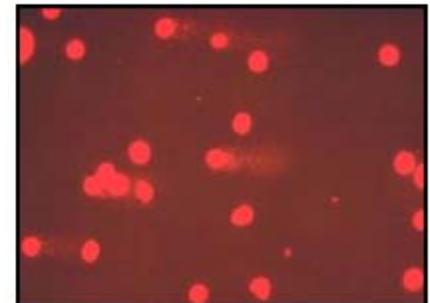
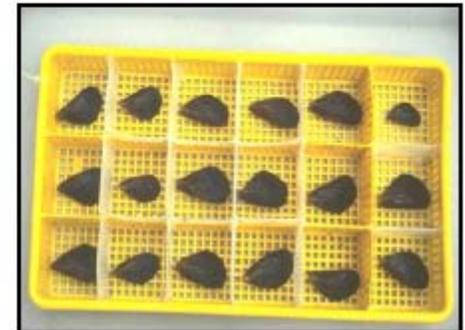
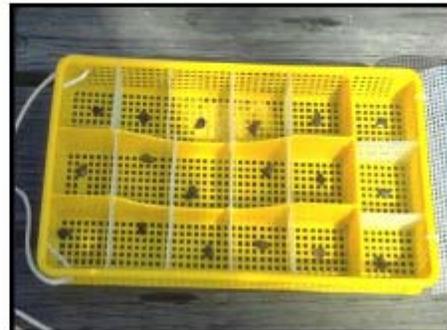
Associated with population effects

Why Bioaccumulation?

Most direct method of confirming exposure

Why Biomarkers?

*Characterize & understand processes,
vitellin links with fish reproductive effects*



Mussel Deployment

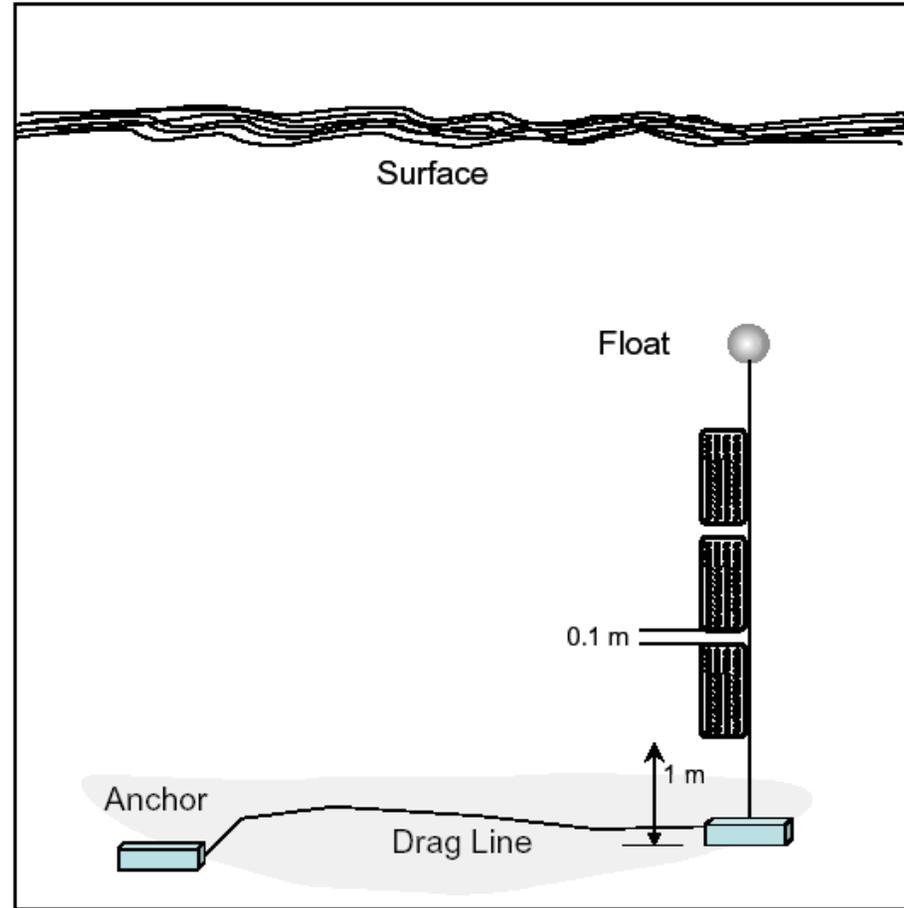
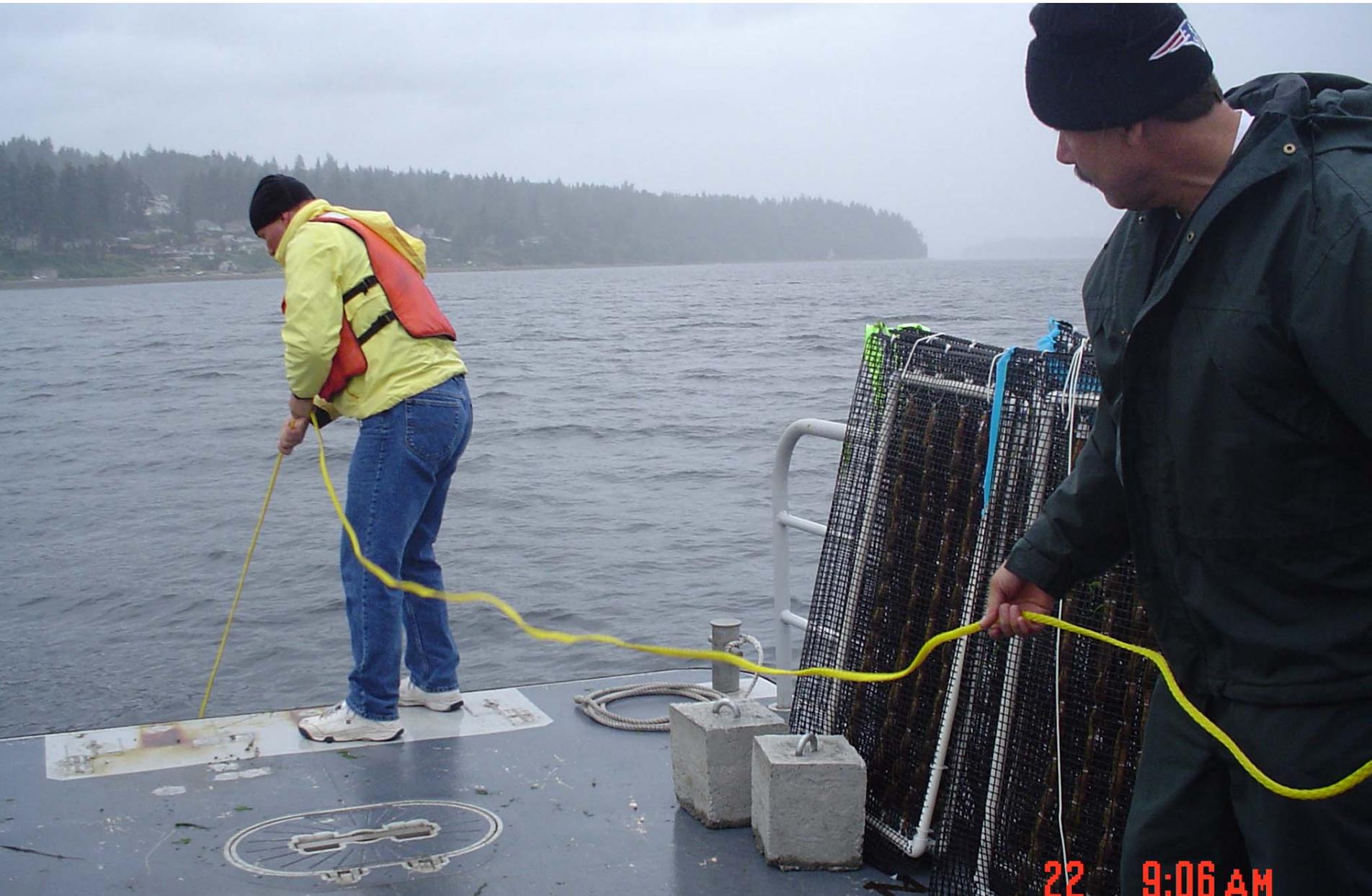


Figure 2. Mussel cage deployment configuration.

Mussel Deployment



Mussel Deployment Stations



SUMMARY

- Pool resources and data to get a better product.
- Watershed approach facilitates partnering.
- Much better chance for successful implementation.
- Compliance with Clean Water Act will cost less and do more.

ENVEST Technical Working Group Clambake featuring Manila clams harvested from Dyes Inlet provided courtesy of the Suquamish Tribe



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