COASTAL EMAP IN WASHINGTON STATE: ESTUARIES, INTERTIDAL, AND OFFSHORE

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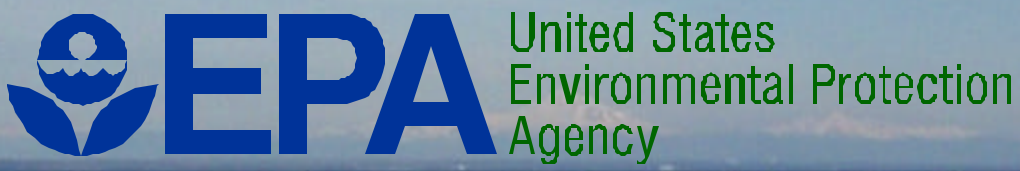
Washington Coastal EMAP

Funding, Design, and Training Provided by



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Office of Research & Development

National Health and Environmental Effects Research Laboratory

Gulf Ecology Division; Gulf Breeze, FL

Walt Nelson

Office of Research & Development

Pacific Coastal Ecology Branch; Newport, OR

West Coast EMAP Partners

- EPA Office of Research and Development
- EPA Regions 9, 10
- NOAA National Ocean Service
- NOAA Fisheries
- NOAA National Marine Sanctuary Program
- US Geological Survey
- Others
- Alaska Dept. of Environ. Conservation
- Moss Landing Marine Laboratories
- Oregon Dept. of Environmental Quality
- San Francisco Estuary Institute
- Southern Calif. Coastal Water Research Project
- Univ. of Hawaii
- Wash. Dept. of Ecology

- Overview of West Coast EMAP Design
- Results - Washington Coastal EMAP 1999
- Preliminary comparison WA sediment chemistry by habitat type
- Integration into existing WA state monitoring programs

West Coast EMAP

- Pilot Study
- Integrated, comprehensive monitoring
- Compatible design
- National Coastal Condition Report, 305(b) Report

West Coast EMAP

Sampling Plan

- 1999 – small estuaries
- 2000 – large estuaries
- 2001 – intensification studies (none in WA)
- 2002 – intertidal
- 2003 – offshore (continental shelf)
- 2004 – reprise 1999 & 2000

West Coast EMAP Indicators

- Biotic condition
  - benthic infauna, fish communities
- Abiotic/pollutant exposure condition
  - contaminants, D.O., toxicity
- General habitat condition
  - water quality, sediment characteristics

2003

2002

1999

HAROLD W STREETER
2000

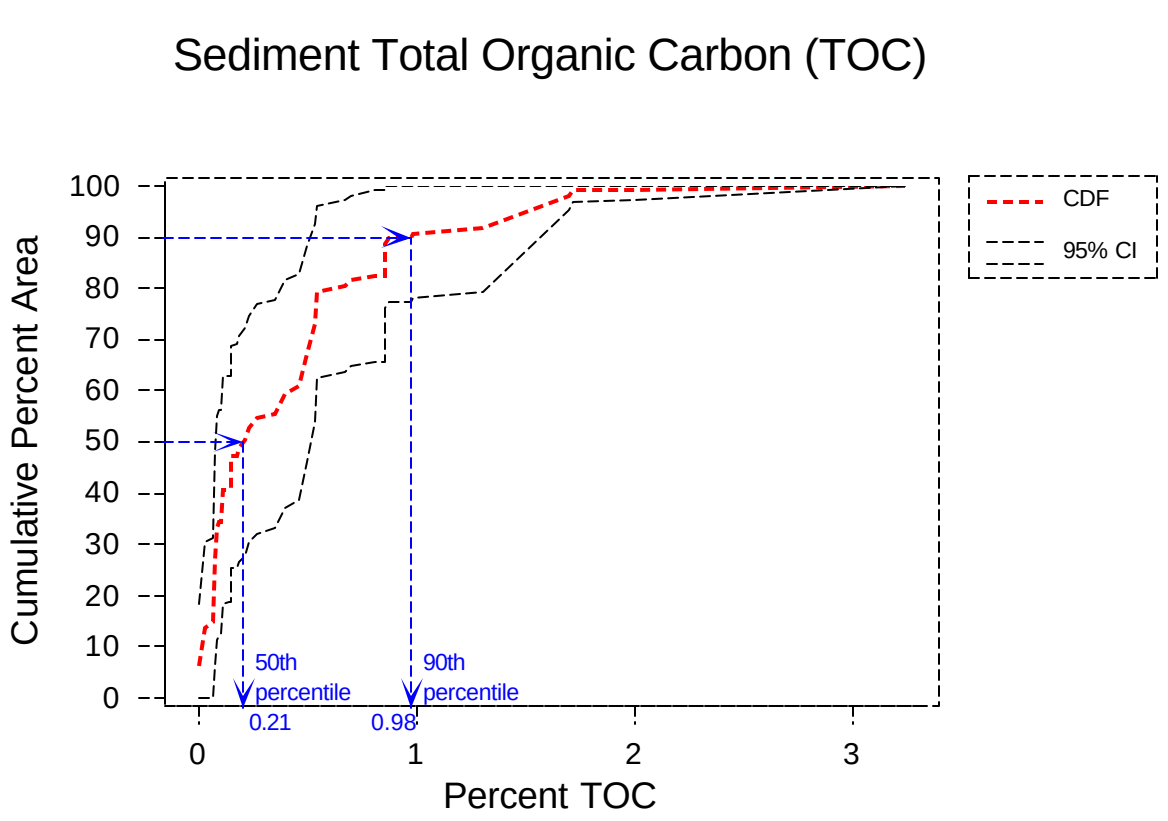
WA 1999 Results
Small Coastal Estuaries

Habitat Condition – Water Column:

- Water column generally well-mixed; a few strongly stratified
- Water clarity mostly good (high transmissivity & low k_d) or moderate
- Water generally N-limited; a few P-limited
- DO generally >6 mg/L
  - no severe hypoxia (<2 mg/L)
  - a few moderate hypoxia (<5 mg/L) at bottom

WA
Small

Habitat Cond
Sediment:



- % Fines tends to be low
- TOC low overall

WA 1999 Results
Small Coastal Estuaries

Abiotic/Pollution Exposure Condition – Sediment Chemistry:

- Metals generally low; a few exceed ERL for As, Cd, Cr, Cu
- PCBs: generally non-detected
- DDT, pesticides: generally non-detected
- PAHs: generally low – all below ERL except…

WA 1999 Results
Small Coastal Estuaries

Abiotic/Pollution Exposure Condition – Sediment Chemistry:

- PAHs: ‘tar ball’ at Station 50 (lab rep #4)

Concentration in Lab Rep 4 Compared to Average Lab Reps 1-3

≤10x	≤50x	≤150x	450x-700x
Acenaphthylene	Acenaphthene	Phenanthrene	2-Methylnaphthalene
Benzo(a)pyrene	Benz(a)anthracene		Anthracene
Benzo(b)fluoranthene	Chrysene		Fluorene
Benzo(g,h,i)perylene	Fluoranthene		
Benzo(k)fluoranthene	Naphthalene		
Dibenz(a,h)anthracene	Pyrene		
Indeno(1,2,3-c,d)pyrene			

WA 1999 Results
Small Coastal Estuaries

Abiotic/Pollution Exposure Condition – Fish Tissue Chemistry:

- Metals generally detected; Hg highly variable
- PCBs: detected in all samples
- DDTs: detected in all samples
- Other pesticides: generally non-detected

WA 1999 Results
Small Coastal Estuaries

Biotic Condition

Benthic Macrofauna:

- 431 Species; top ten = 63.7% 33 exotic (5.7%)
- Taxa richness (# spp.): 1 – 37, mean 27
- Abundance (# indiv/0.1 sq.m): 3 – 3106, mean 483

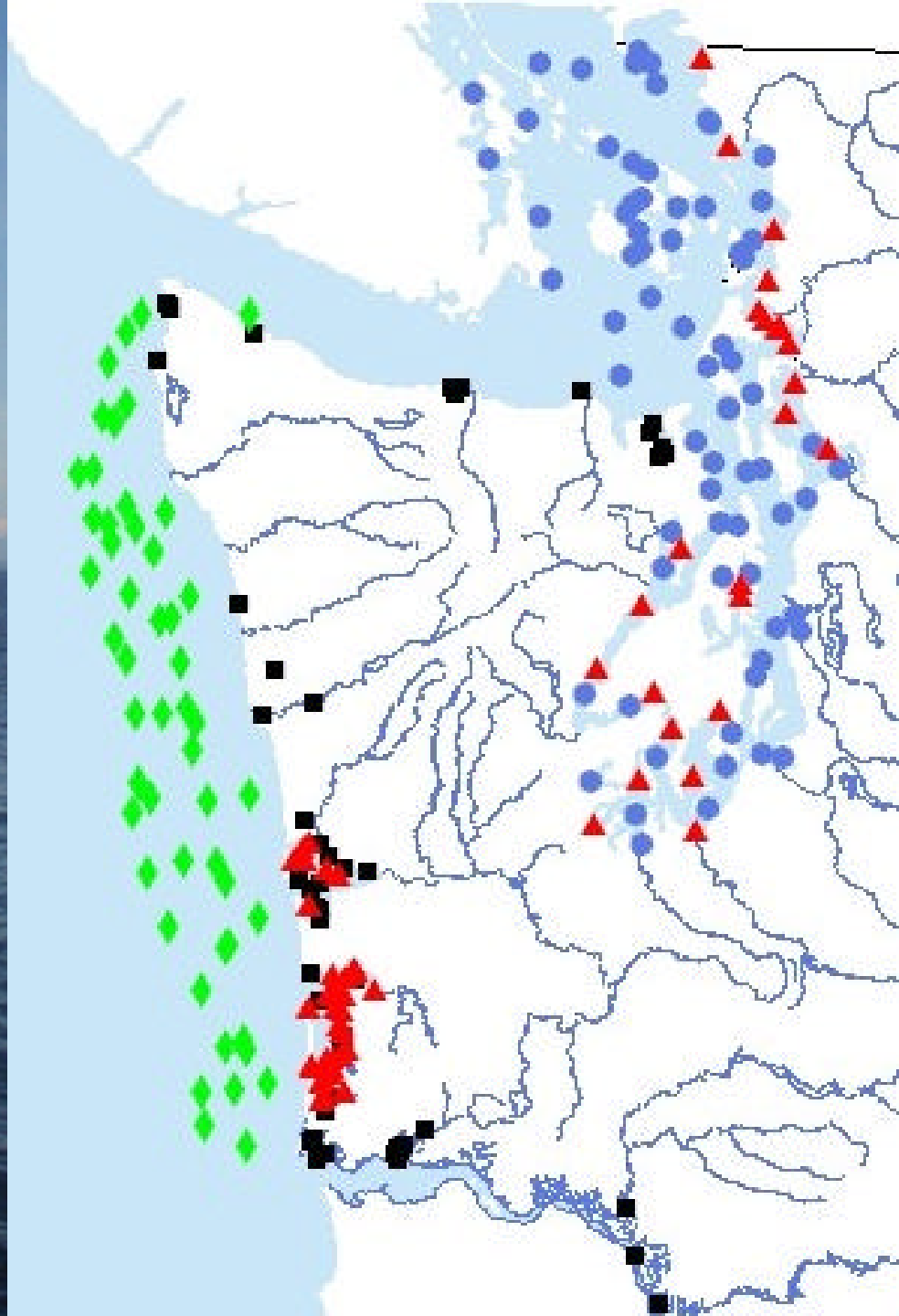
Demersal Fish:

- 34 Species; top ten = 93.4%
- Taxa richness (# species/trawl): 1 – 11, mean 3
- Abundance (# fish/trawl): 1 – 336, mean 37

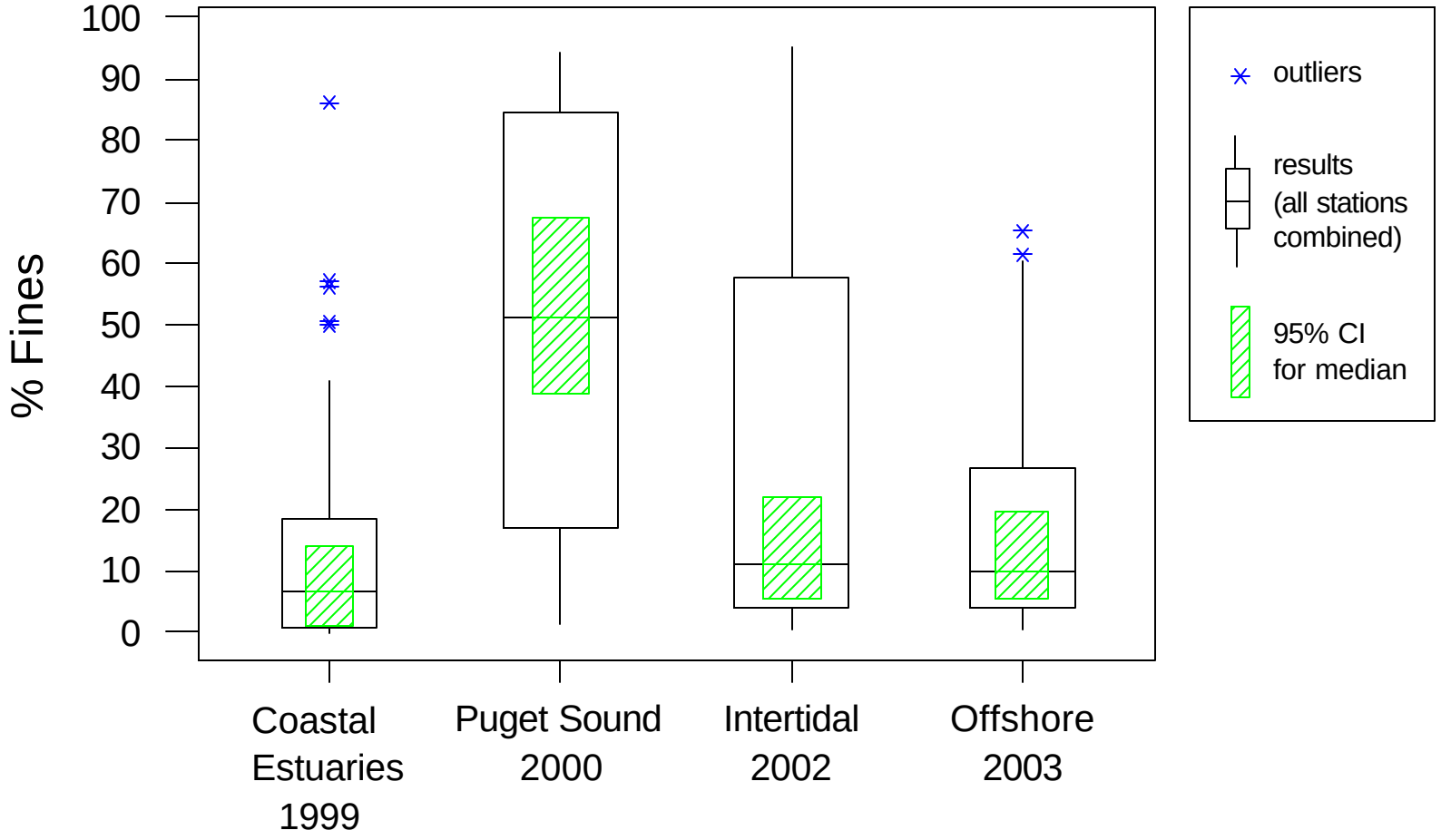
WA Coastal EMAP

Comparison of Sediments

- 1999: Small coastal estuaries
- 2000: Puget Sound
- 2002: Intertidal
- 2003: Offshore

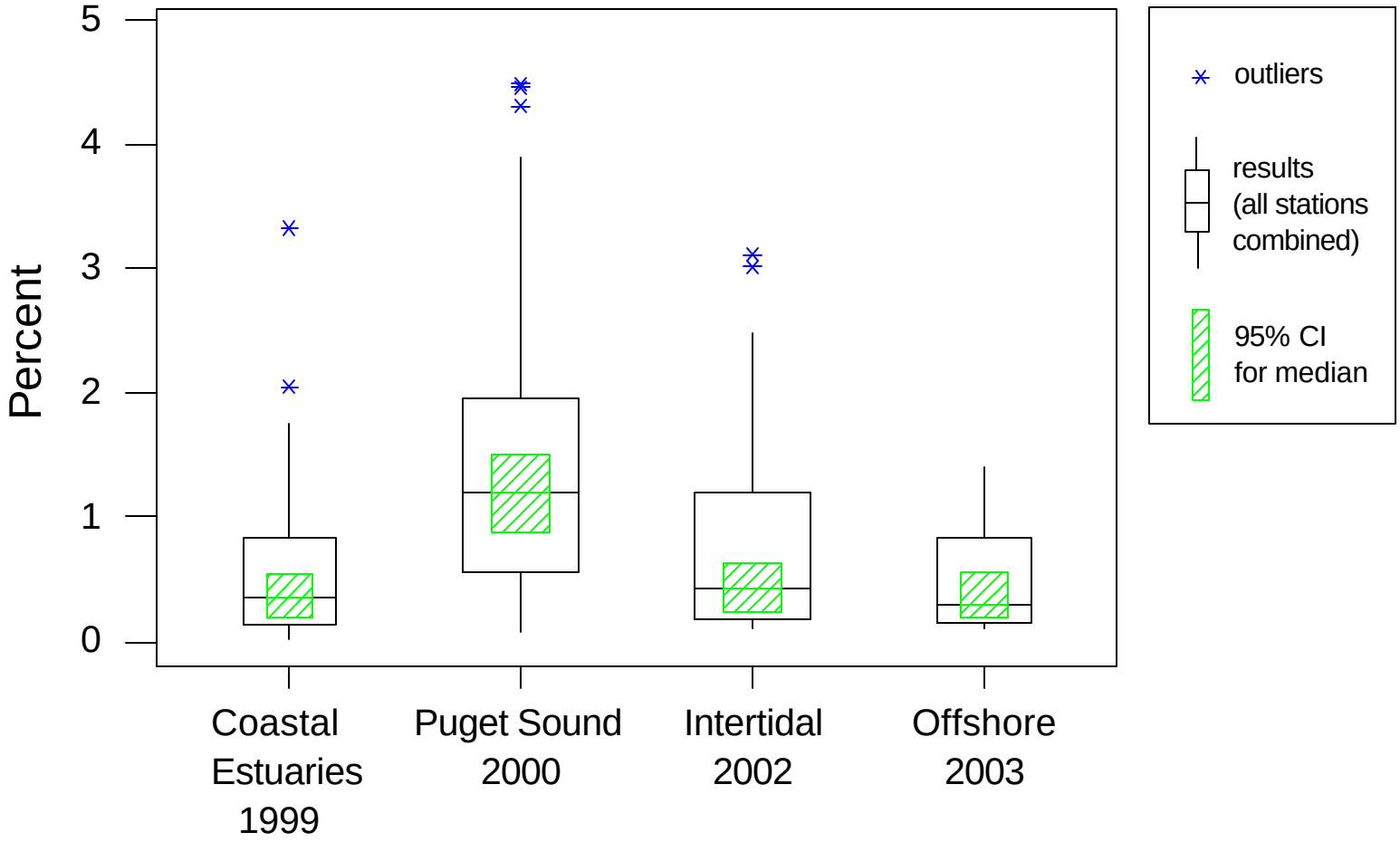


WA Coastal EMAP Preliminary Results
Sediment Grain Size



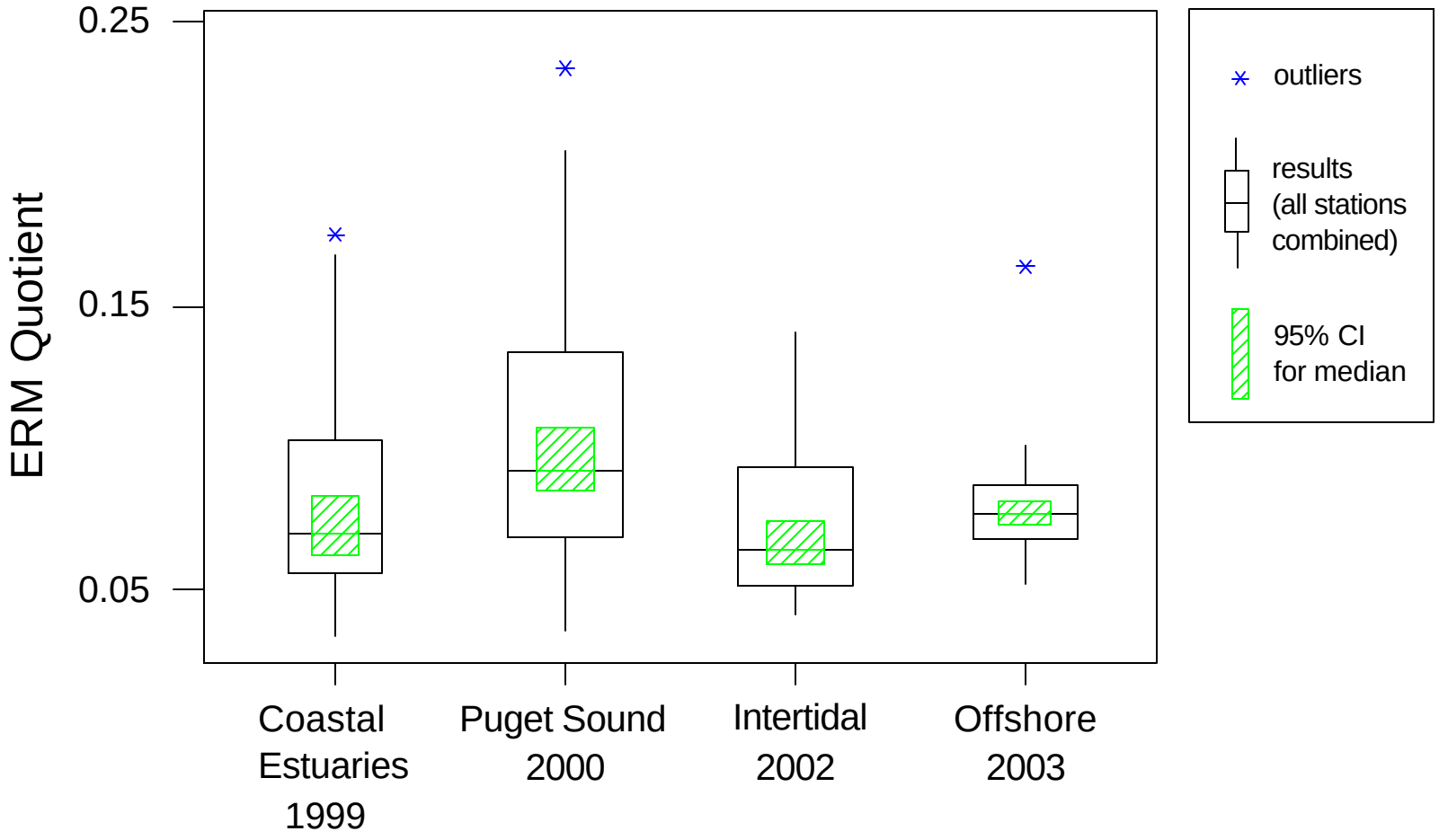
WA Coastal EMAP Preliminary Results

Total Organic Content



WA Coastal EMAP Preliminary Results

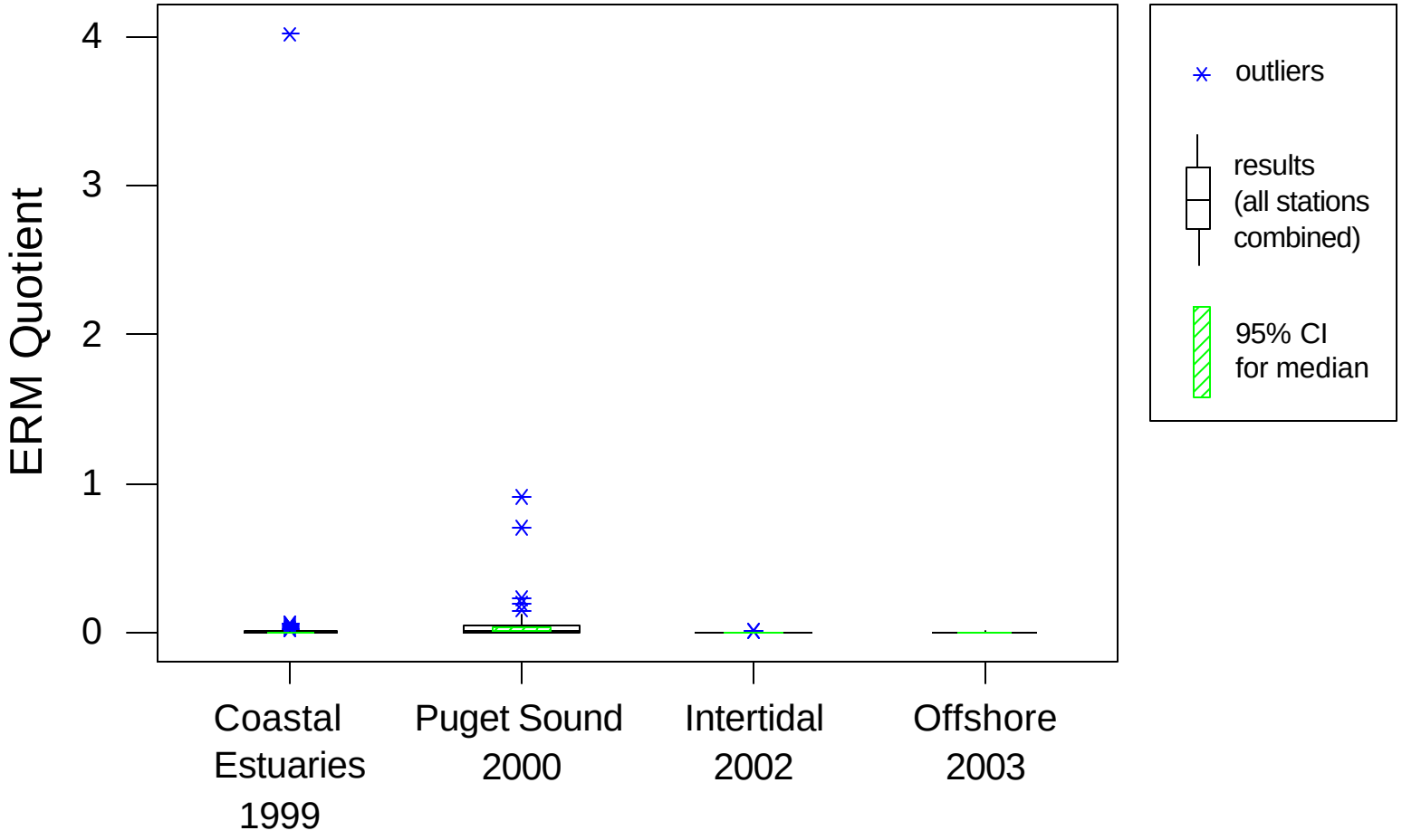
Metals Mean ERM Quotient



WA Coastal EMAP Preliminary Results

PAH Mean ERM Quotient

including outlier in 1999 at station WA99-0050



WA Coastal EMAP Preliminary Results

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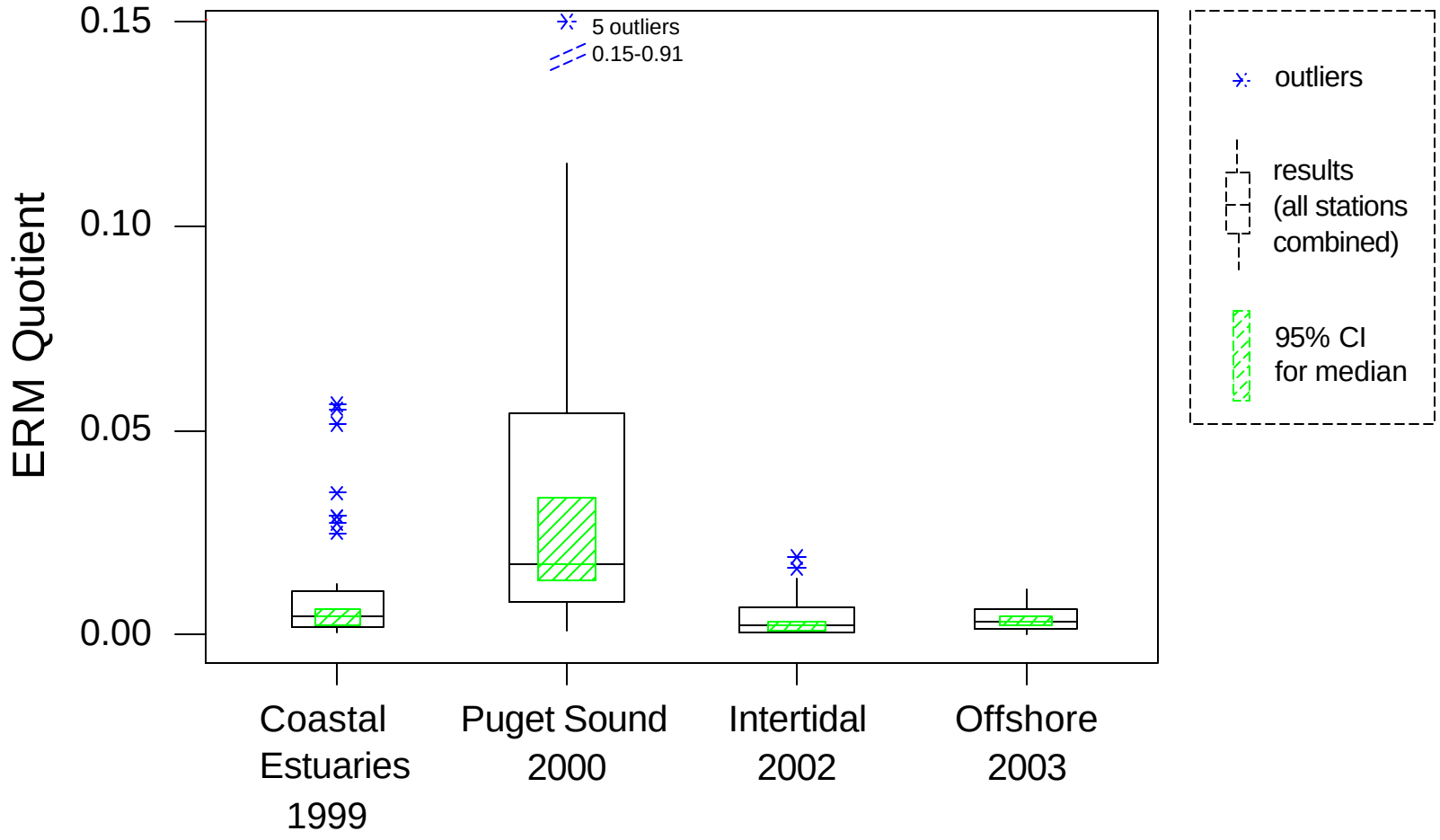


EMAP Components Integrated into Existing WA State Monitoring Programs

- Study design
  - probabilistic, random stratified
  - multi-density categories
  - comparability
- CDF tools
- Database design
- Benthic indicator development
- Partnerships and other collaborations

Puget Sound Ambient Monitoring Program (PSAMP)

- Mandated by legislature since 1989
- Administered by Puget Sound Water Quality Action Team (now Puget Sound Action Team)
- Interagency program
  - WA State Depts. of Ecology, Fish and Wildlife, Health, Natural Resources
  - King County Dept. of Natural Resources
  - National Marine Fisheries Service
  - U.S. Environmental Protection Agency
  - U.S. Fish and Wildlife Service

Puget Sound Ambient Monitoring Program (PSAMP)

Multiple components:

- marine water
- fresh water
- marine sediment
- nearshore habitat
- fish
- shellfish
- marine birds
- marine mammals

PSAMP Sediment Component
Revised Sampling Design

Design Assistance and Training Provided by

EPA United States Environmental Protection Agency

NOAA National Oceanic and Atmospheric Administration, U.S. Department of Commerce

Tony Olsen

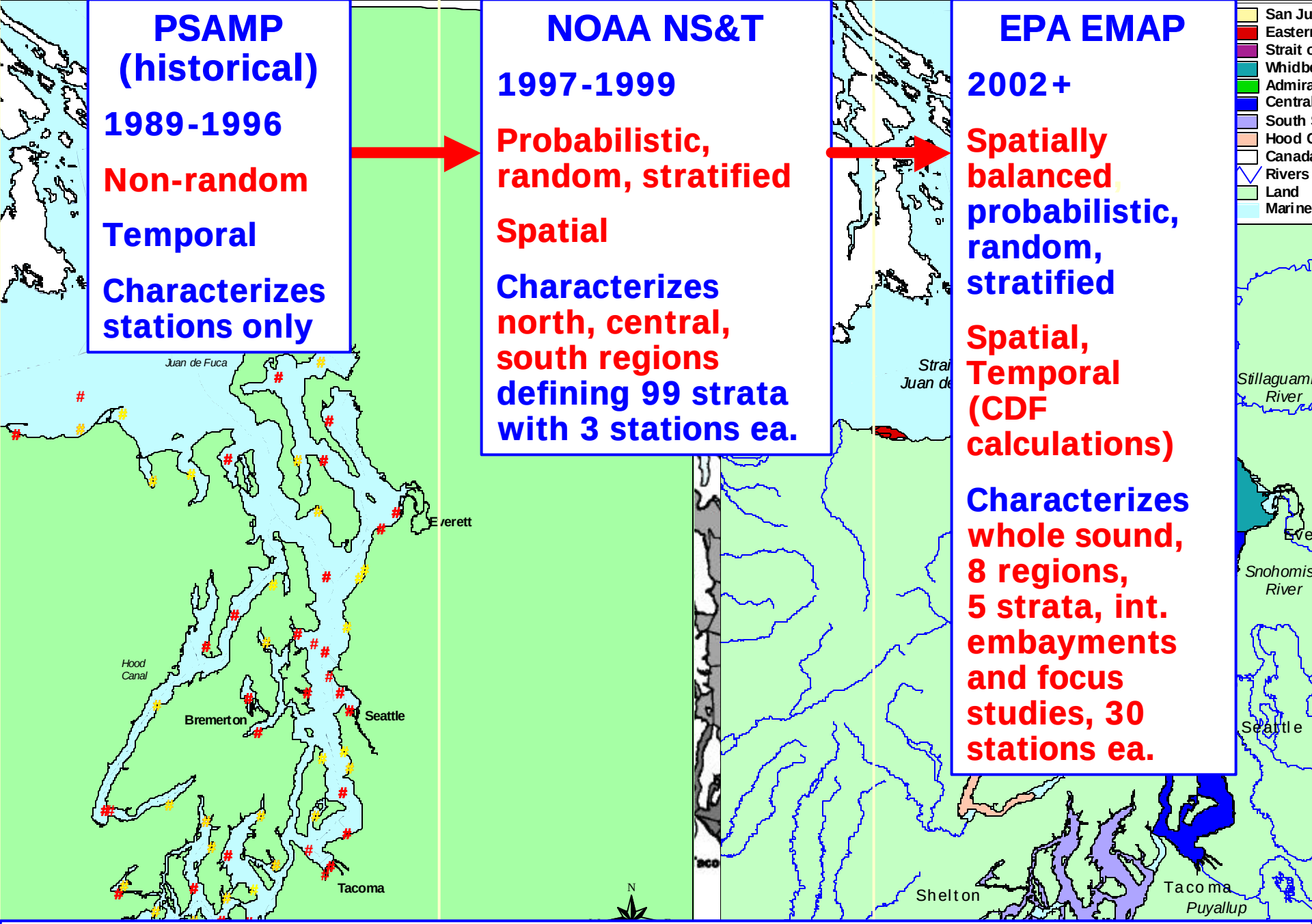
Kevin Summers

Walt Nelson

Henry Lee

Ed Long, retired

Jawed Hameedi



PSAMP SEDIMENT COMPONENT PROGRAM EVOLUTION

Challenges for Future

- More multidisciplinary integration
- Decreasing funds mean partnerships increasingly important
- Improved temporal and spatial assessments

Final Thoughts

- Baseline for areas previously not studied
  - › before completely developed
- Comparison of coast to Puget Sound
  - › Puget Sound more sensitive
  - › where majority of WA population lives
- Put Puget Sound in regional context
- Other issues – e.g., orcas