Environmental Assessment Program

Overview of Key Monitoring Activities

Water Quality Partnership
St. Placid's Priory, Lacey, WA
November 19, 2009

Outline

- Overview of Monitoring
  - Freshwater/ambient
  - Stream gaging
  - Marine ambient
  - Marine sediment
  - BEACH
  - Toxics
  - Habitat
  - Groundwater
  - Modeling & TMDLs
- Effectiveness Monitoring
- Summary
- Future Direction

Overview

- EAP serves as the monitoring and assessment branch of the agency
- Approximately 150 staff with a biennial budget of $30 million
  - Staff located in 4 regional/field offices across the state
- Conduct ambient monitoring (marine and freshwater) and directed studies
  - Surface water, groundwater, Puget Sound
- Includes the Manchester Environmental Lab, Lab Accreditation Unit and Quality Assurance Program

River and Stream Ambient Monitoring
Primary Objectives

- Evaluate water quality against standards (CWA 303d)
- Wastewater permits and other compliance monitoring
- Loading (e.g., nutrients to Puget Sound)
- Trend assessments
- TMDL support
- Government, academic, and educational uses
- Sometimes used for statewide assessment, but not probabilistic design

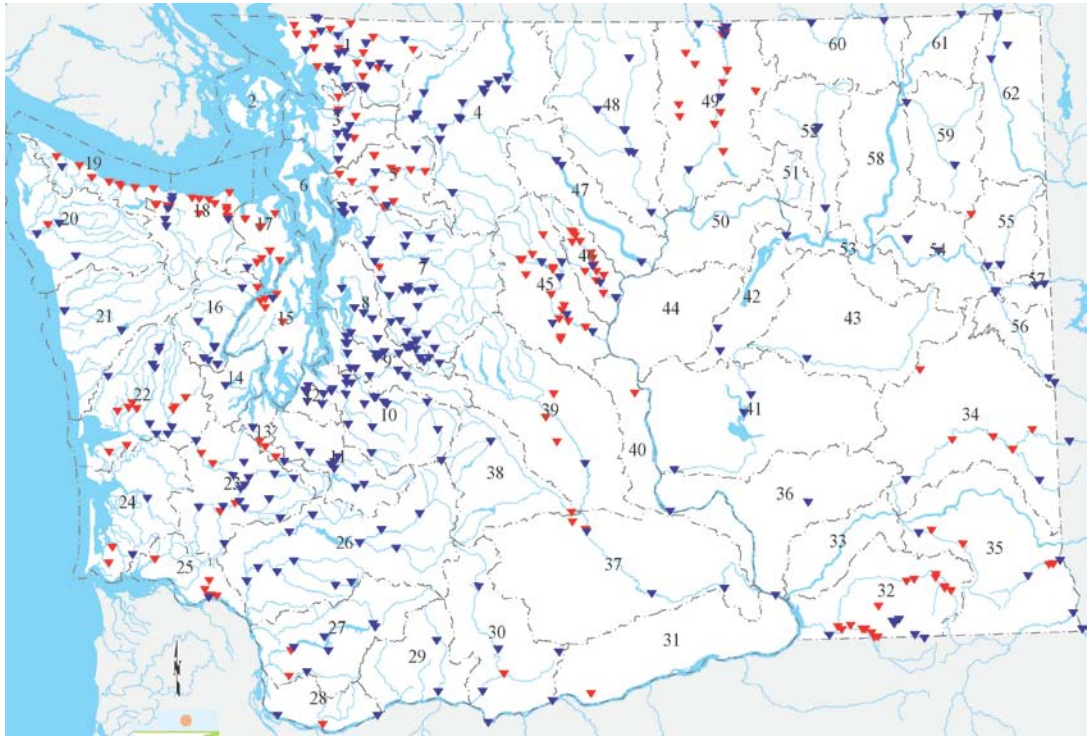
NF Stillaguamish nr Darrington

River and Stream Ambient Monitoring
Monitoring Design

- Monthly sampling at 62 long-term stations (typically major river mouths)
- monthly sampling at 20 basin stations
- Additional stations/parameters in support of other projects if funded
- **Parameters:** nutrients, suspended sediment, turbidity, fecal coliform bacteria, temperature, pH, conductivity, oxygen, metals at select stations
  - continuous temperature and oxygen metrics being developed

Bill Ward

Ecology and US Geological Service Stream Gage Locations

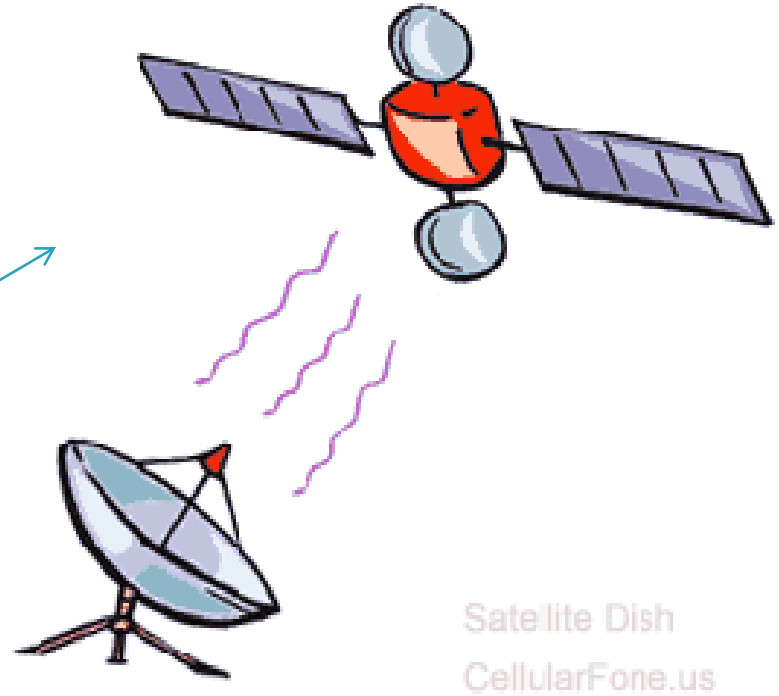


Ecology Stream Gage ▼ USGS Stream Gage

Current Number of Gages:
- Ecology: 195 / USGS: 261

Gages are used for:
- Establishing in-stream flows
- Monitoring control points
- Monitoring compliance
- Managing diversions
- Support TMDLs

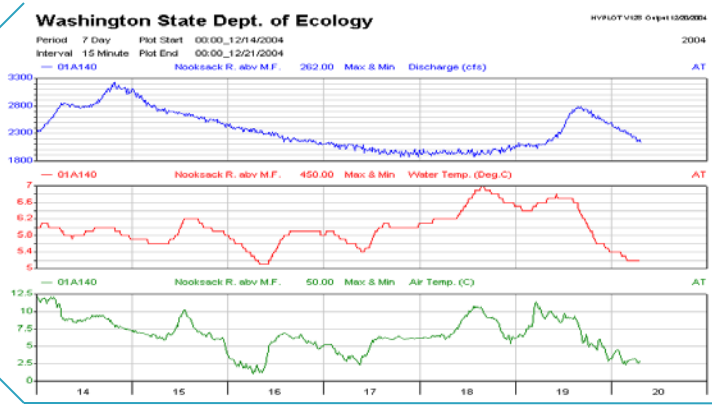
Gaging Data:
- River Stage -15 Minutes
- Rating Curves - 8
- In-stream Measurements



Ecology Staff

gy's Web Page

End User



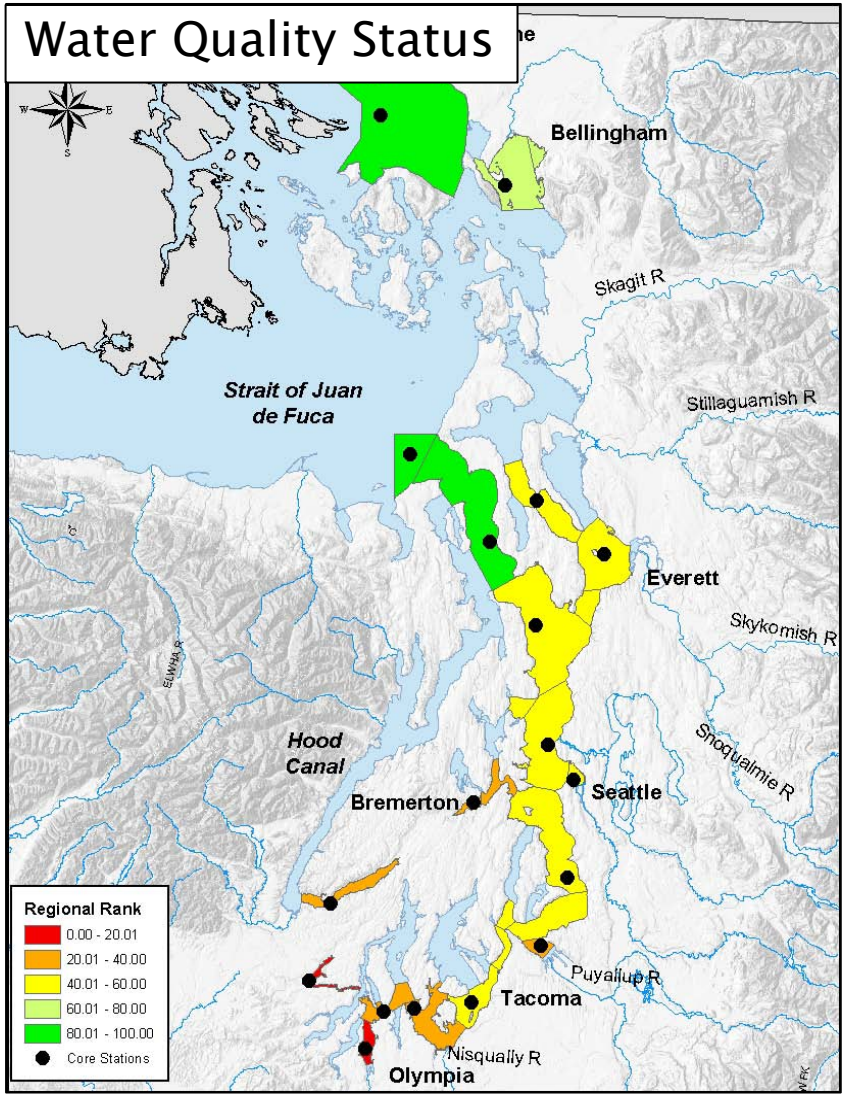
Ambient Marine Monitoring Program

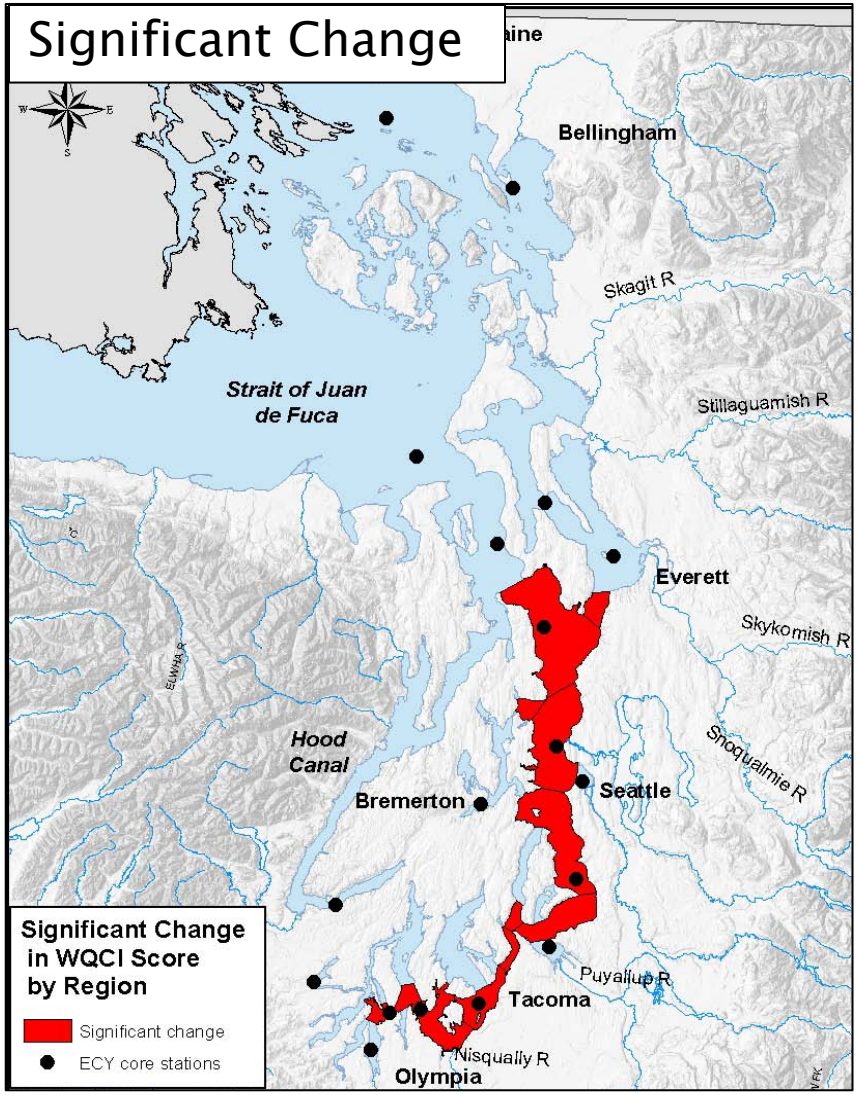
- **35 years of monthly** sound-wide and coastal water quality samples (>1973)
  - **21** Long-term stations
  - **45** Rotational stations
  - Continuous & discrete water samples
- **Continuous water** quality measurements using 3-5 moorings (>1998)
- **Focused studies** with high spatial resolution
  - E.g. South Sound

<u>Variables:</u> Temperature , Salinity, Density, in situ Fluorescence, Transmissivity, pH, Oxygen, Nutrients, Chlorophyll *a*, Secchi, Fecal bacteria

Marine Water Quality Index

Puget Sound Changes 1999-2008

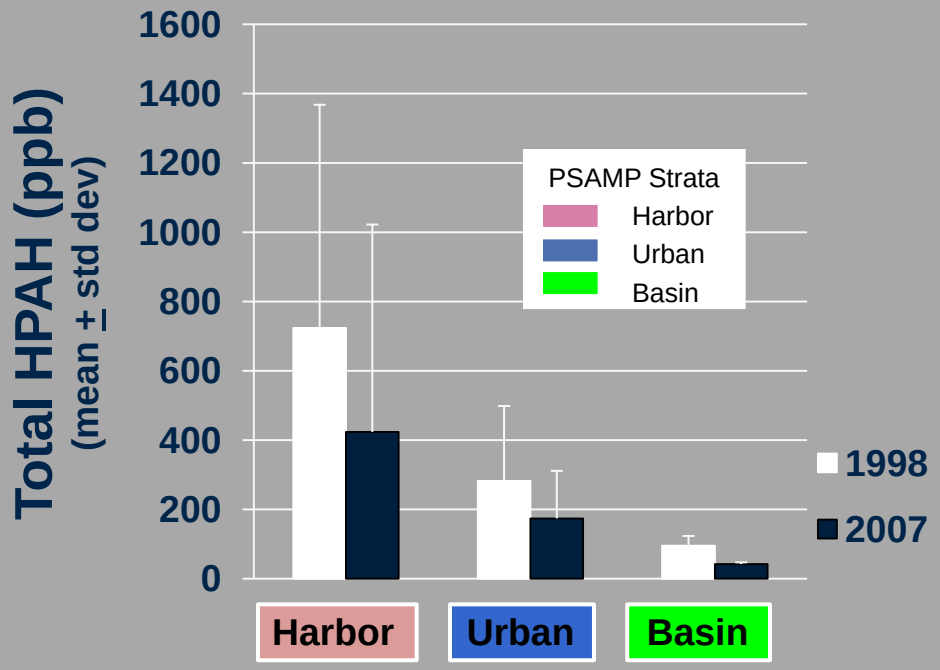


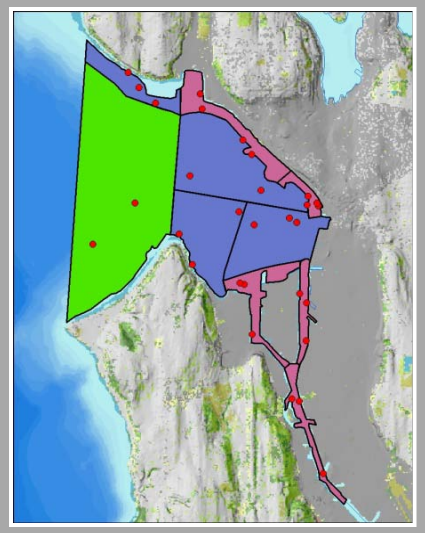


Puget Sound Sediment Monitoring

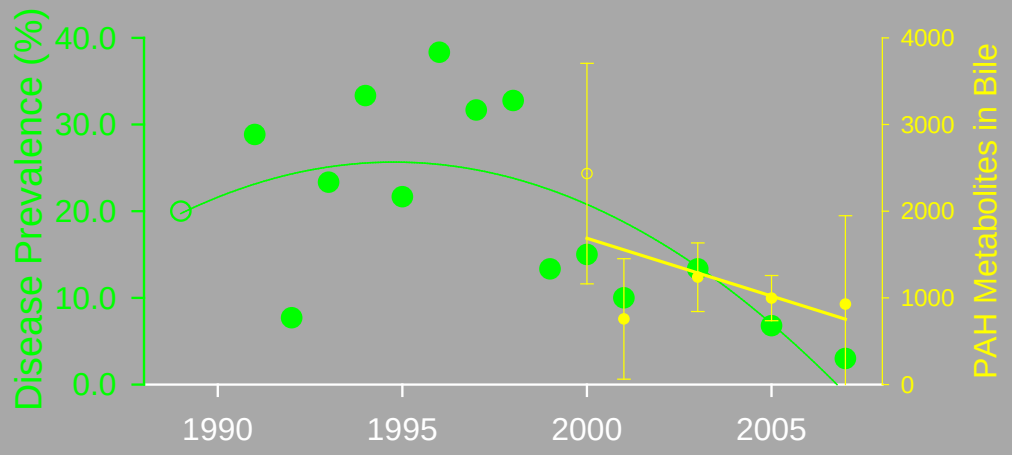
- Annual sampling of Puget Sound sediments
- Sediment Quality Index
  - chemistry, toxicity, benthos
- Two types of monitoring:
  - Long-term – Changes and trends in sediments at 10 long-term sentinel stations (since 1989)
  - Spatial/Temporal – estimate of spatial extent of sediment quality degradation at nested scales
    - Sound-wide down to urban bays
    - Also differentiated by sediment type

Elliott Bay





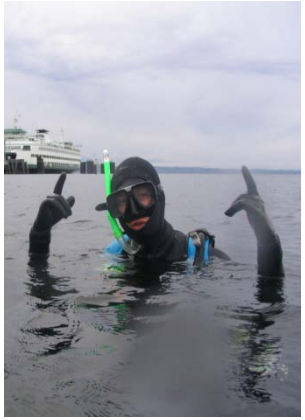
Decline in PAHs in sediment



Decline in fish tumors

BEACH Program

Beach Environmental Assessment, Communication and Health

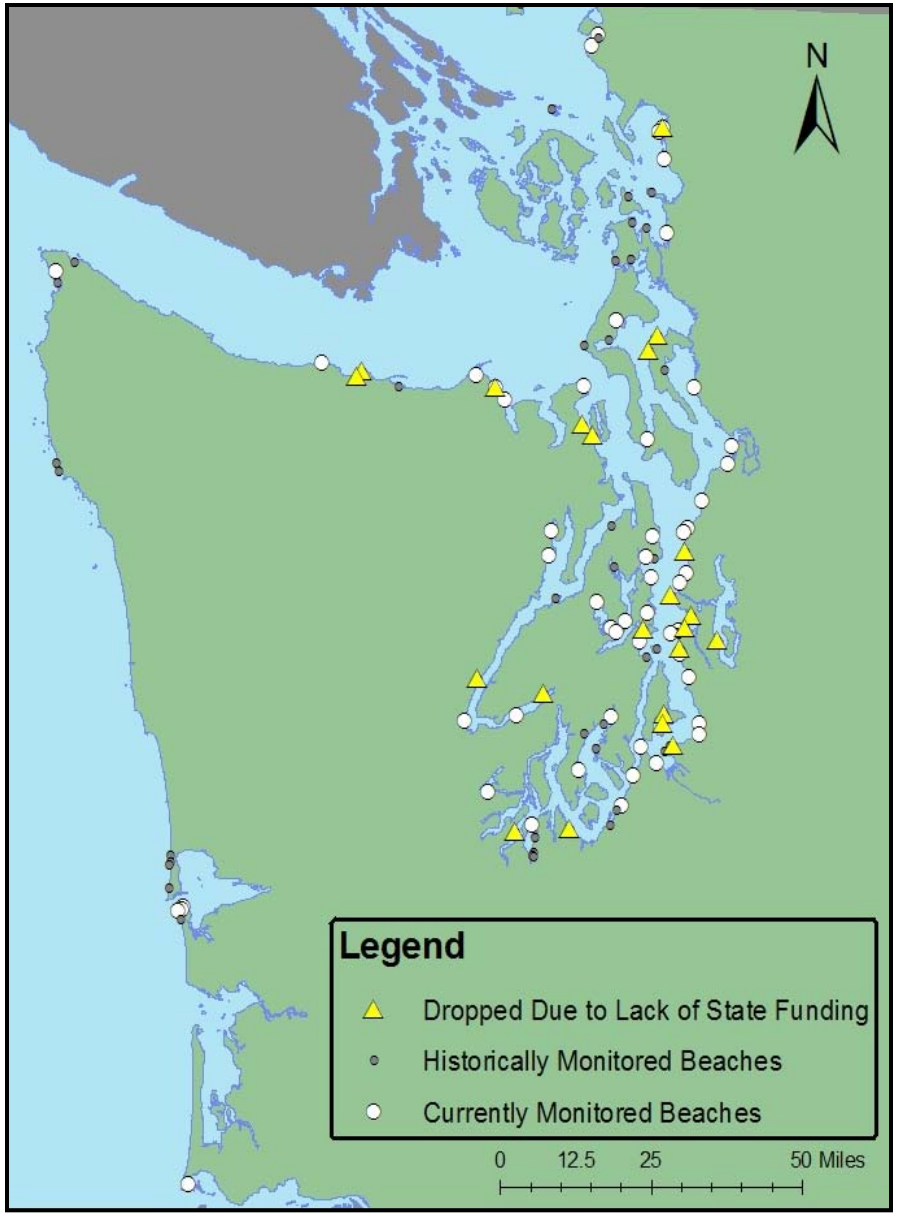


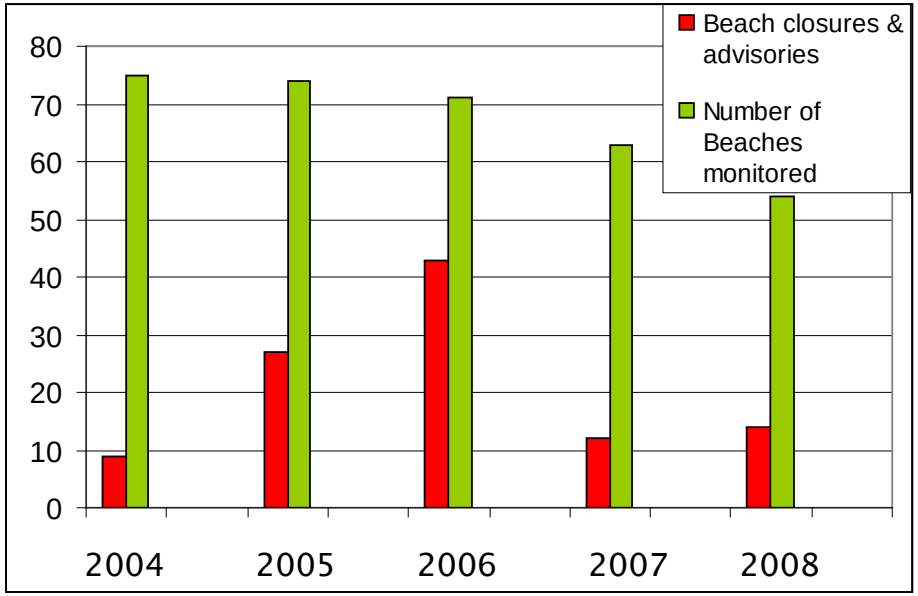
Bacteria monitoring to protect surfers, swimmers, and other beach goers

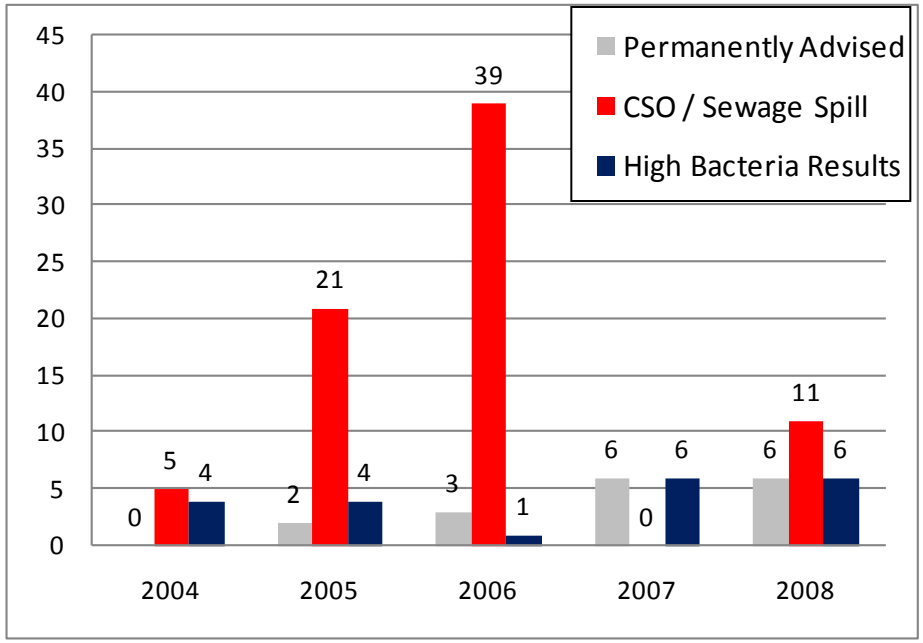
DEPARTMENT OF ECOLOGY
State of Washington

Washington State Department of Health

BEACH Program 2003 – 2008







Long-term Toxics Monitoring Programs

- Washington State Toxics/PBT Monitoring Program
  - Exploratory (15-20 sites annually)
  - PBT Trends (12 freshwater sites/2x per year)
  - Mercury Trends (6 sites/yr)
  - Contaminant Trends in Sediment Cores (3 lakes/yr)
- Surface Water Monitoring for Pesticides in Salmon Bearing Streams
  - 5 Watersheds (2 Puget Sound and 3 Eastern WA)
  - Weekly sampling from April-September
  - Interagency Agreement with WSDA

FY09 Focused Toxics Studies

- Puget Sound
  - Toxics loading analysis
    - Toxics in marine waters and selected rivers
    - PPCP removal efficiency by wastewater treatment
  - PCB loading to Lower Duwamish River
  - Elliott Bay background sediment and fish
  - Boatyard receiving water metals
- Statewide Studies
  - Background levels of PCBs and dioxins in fish tissue
  - Statewide PFC baseline study
  - Freshwater sediment reference sites

FY09 Focused Toxics Studies

- Total Maximum Daily Load Studies for Toxics
  - Yakima River toxics (DDT and PCB)
  - Des Moines Creek zinc
  - West Medical Lake (PCBs and Dioxins)

- Other
  - Lake Washington sediment PCBs
  - Synthetic pyrethroids in stormwater sediments

Habitat Monitoring

- Intensively Monitored Watersheds
  - Does habitat restoration increase salmon production
  - Federal and state money thru Salmon Recovery Funding Board
- Cooperative Monitoring Evaluation and Research
  - Committee established by the Forest Practices Board
  - Type N studies
    - Effectiveness of riparian buffers on non-fish bearing streams (e.g., temperature)
  - Extensive Riparian Status and Trends
    - Evaluate temperature using probability based sampling frame (including some limited habitat measures)

Habitat Monitoring

- Watershed Health Monitoring Program
  - Non-federal lands
  - Status and trends probability framework
  - Evaluate if watershed conditions are getting better or worse using biological and habitat indicators.

Groundwater Monitoring

Current Monitoring and Assessment

- Regional water-level monitoring for water rights decision-making
- Long-term water quality monitoring at hazardous waste cleanup sites
- Support for water quality improvement plans (TMDLs)
- Site-specific studies
  - Sumas-Blaine Nitrate
  - Whatcom County soil fumigants

Groundwater Monitoring

Next Steps

- Inventory and capture existing data
- Migrate to new database
- Evaluate assembled monitoring data
- Continue and expand regional water-level monitoring
- Establish a state groundwater status and trends monitoring program

TMDL Studies
Total Maximum Daily Load

- Maximum amount of a pollutant that can be discharged without violating water quality standards
- For 303(d) listed water bodies
  - Temp, fecal, toxics, pH, DO nutrients
- Intensive data collection and modeling effort
  - Waste load allocations and load allocations
- Water Quality Improvement Plan (also called a TMDL)
  - Lays out how to reduce pollutant sources in order to meet water quality standards

TMDLs need supplemental data and models to diagnose unique problems

- Ambient data – *checking the pulse*

- TMDL Supplemental data – *CAT scans*

- Models – *diagnosis*

Models

- Sampling alone can't get us the answers
- Water quality models allow us to predict how pollutants move through a water body
- Even better, they show how water quality would improve if we turn off a pollutant source
- Multiple models used for different purposes
  - Nutrients - predict what the nutrient level might do to dissolved oxygen in the water.
  - Toxics - predict how the chemical would move between the water, sediment and biota.

TMDL Effectiveness Monitoring Program

- Statewide monitoring responsibility
- Current staff – 5 FTEs statewide
  - 3 FTEs lost due to budget reductions
- EM staff work on focused projects
  - Skokomish River bacteria
  - Yakima River turbidity, toxics
- Washington State is ahead of other states in EM program development

Different Types of Monitoring used for Effectiveness Evaluation (cont'd)

- Characterization Monitoring – identify and determine the impacts of suspected or unknown pollution sources
- Compliance Monitoring – assess compliance with a set target limit
- Effectiveness Monitoring – determine whether management activities achieved the desired goal or effect
- Status & Trends Monitoring – assess overall status and track change over time

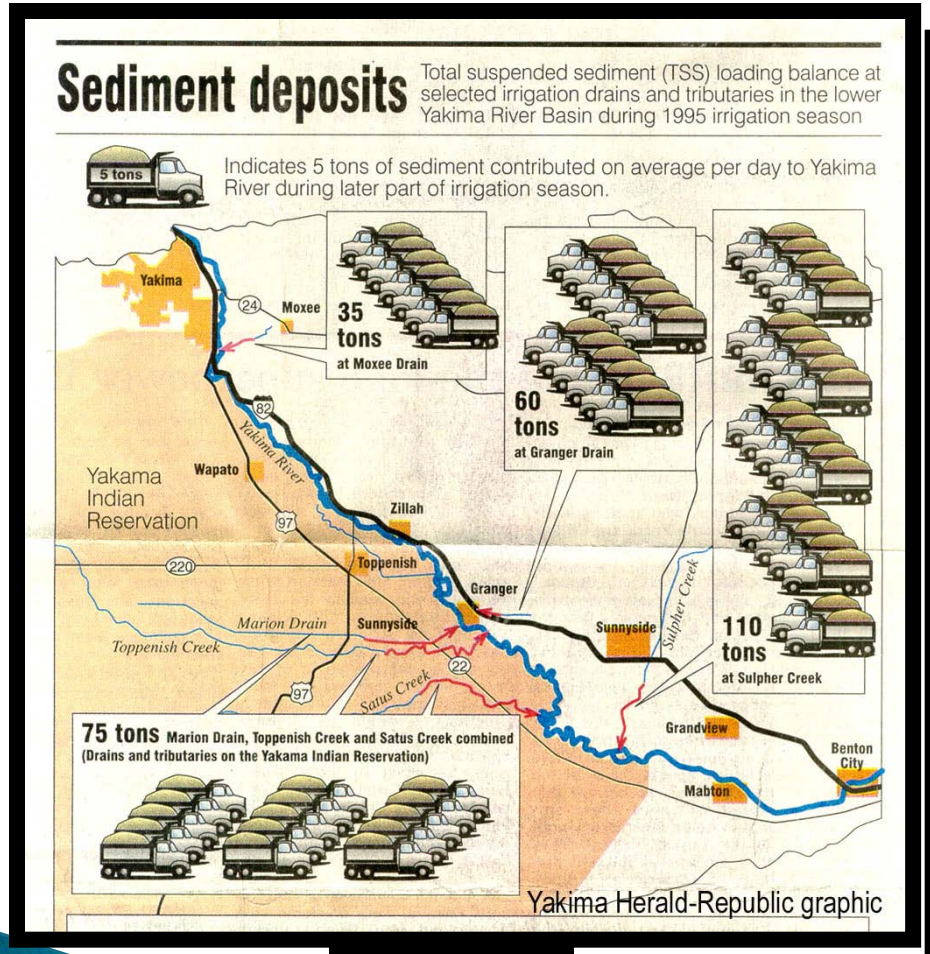
Case Study 1

Skokomish River EM Study Result

Sampling Site	Target		EM study		Meets Targets?	Required Change
	GMV* FC/100 mL	Geometric 90th %tile FC/100mL	GMV* FC/100mL	Geometric 90th %tile FC/100mL		
Weaver Creek	17.5	100.0	22.0	64.4	No	– 20%
Ten Acre Creek	25.6	100.0	13.4	28.7	YES	None
Purdy Creek	25.7	69.4	19.0	48.2	YES	None
Skokomish River	18.5	67.7	17.6	38.2	YES	None

Case Study 2

Yakima River Turbidity EM Study



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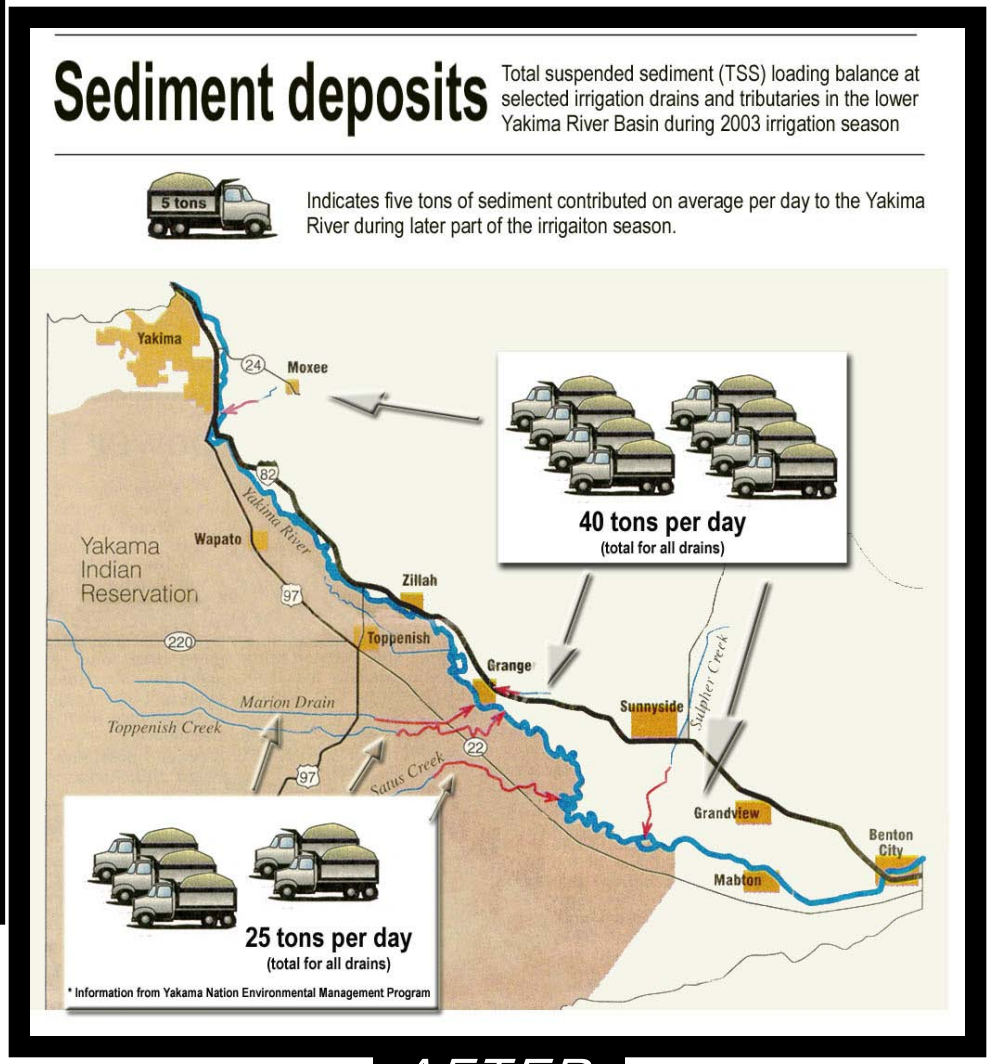
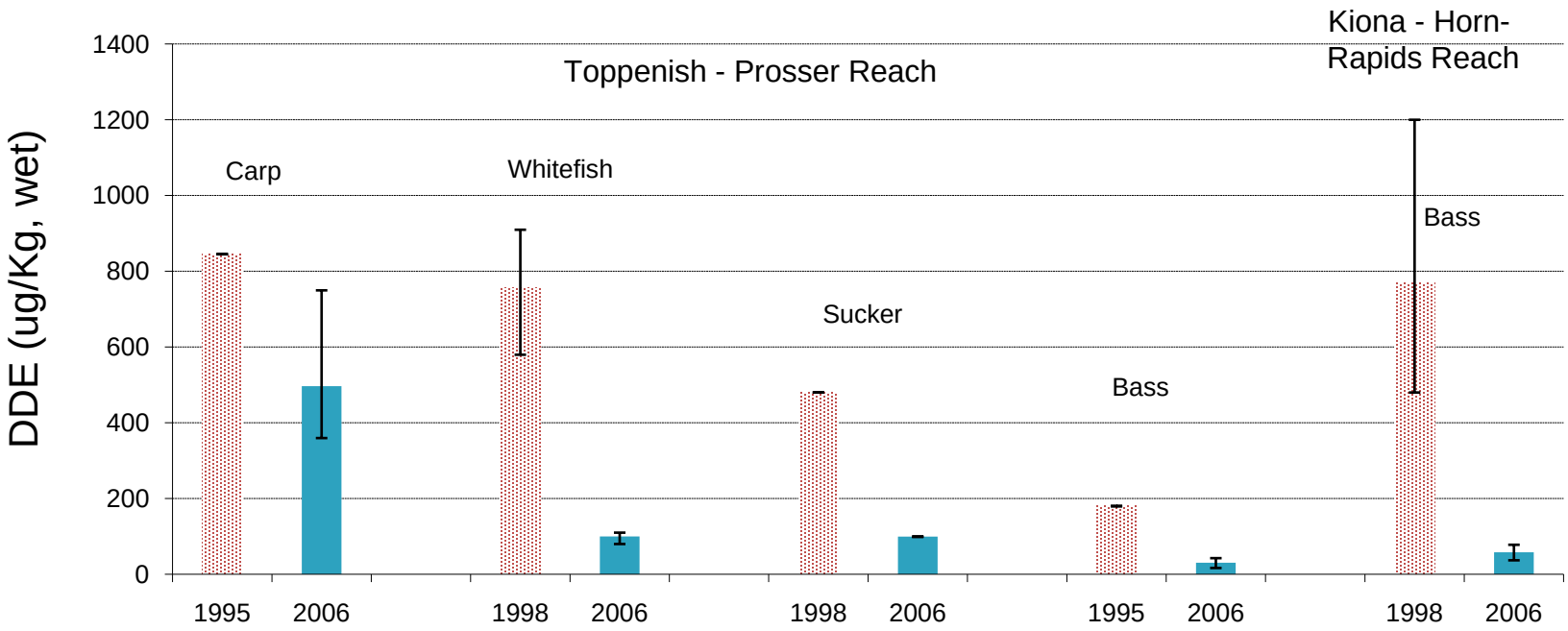


AFTER

Case Study 2

Yakima River Toxic EM Study



- TMDL identifies elevated DDT in fish
- Drip irrigation initiated by growers
- DOH removes fish consumption advisory for select species

Completed Effectiveness Monitoring

Waterbody Name	Parameter	Monitoring Status	Status
Campbell Lake	Total P	**Completed**	**Meeting Target**
Erie Lake	Total P	**Completed**	**Meeting Target**
Snohomish River	Dioxin	**Completed**	**Meeting Target**
Fenwick Lake	Total P	**Completed**	**Not Meeting Target**
Sawyer Lake	Total P	**Completed**	**Inconclusive**
Pipers Creek	FC	**Completed**	**Not Meeting Target**
Skokomish River & Tributaries	FC	**Completed**	**Meeting Most Targets**
Commencement Bay	Dioxin	**Completed**	**Meeting Target**

Completed Effectiveness Monitoring

Waterbody Name	Parameter	Monitoring Status	Status
Strait of Juan de Fuca	Dioxin	**Completed**	**Meeting Target**
Grays Harbor	Dioxin	**Completed**	**Meeting Target**
Willapa River	FC	**Completed**	**Meeting Most Targets.**
Salmon Creek	FC/Turbidity	**Completed**	**Meeting Most Targets**
Union River	FC	**Completed**	**Not meeting Targets**

Cadmus Group Report Findings

- Increase funding for TMDL effectiveness monitoring
- Need up to 7 FTEs and $150,000 in lab funding for TMDL EM
- Use biological assessment approaches

Summary

- Versatility of EAP monitoring
  - Both freshwater and marine
  - Nutrients, toxics, habitat
  - Long and short-term
    - Status and trends, effectiveness
- Quality of data
  - Regulatory decision making
- Modeling capacity
- Data availability
  - Databases, reports, focus sheets, press releases
  - Continuous data – gaging, water qulaity –marine and freshwater, groundwater
  - Indices