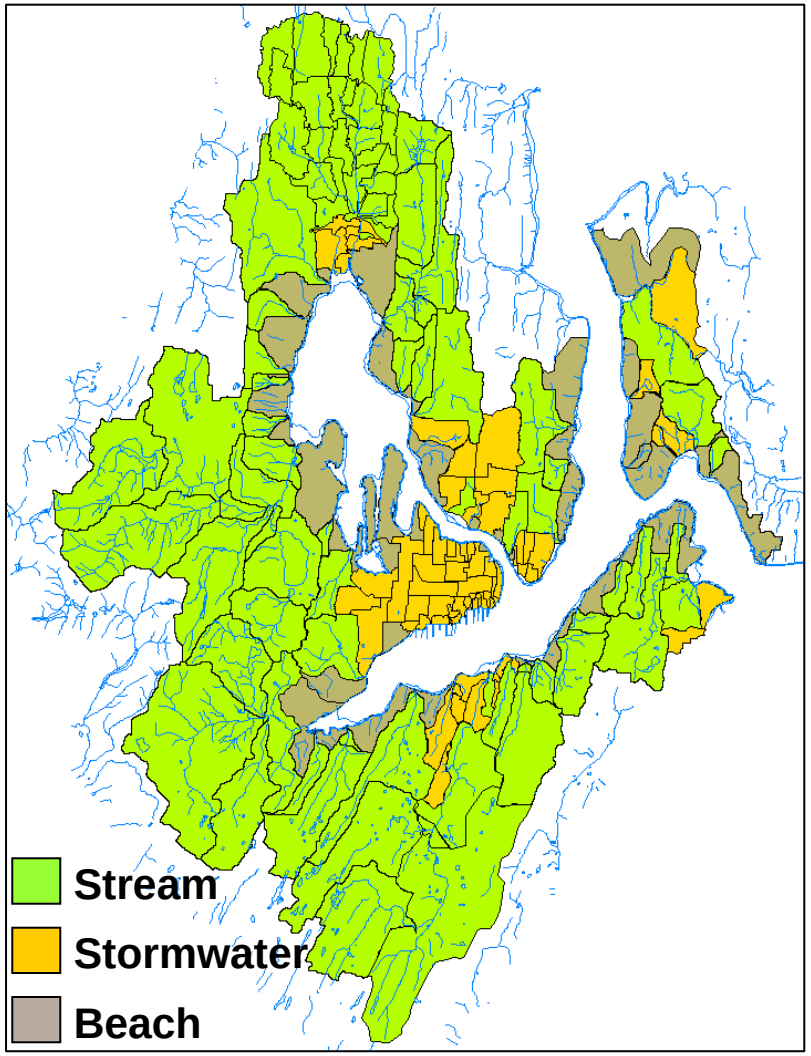
Project ENVVEST

PSNS&IMF, EPA, Ecology and local Stakeholders



a. Current health of the ecosystem (status of indicators)
   - **Water quality**
   - **Sediment quality**
   - **Biota tissue residues (Toxicity)**

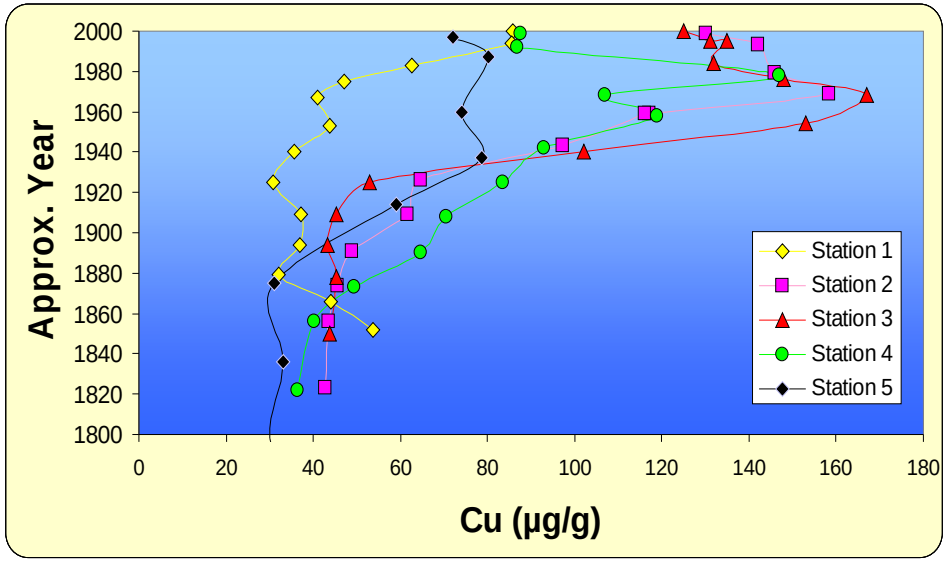
b. Level of improvement needed to achieve a particular target for a healthy ecosystem (benchmarks and ultimate target)
   - **Water/Sediment Quality Standard**
   - **Tissue Residue Benchmarks**

c. Impediments to a healthy ecosystem (threats)
   - **Contaminant Loading**
   - **Watershed assessment**

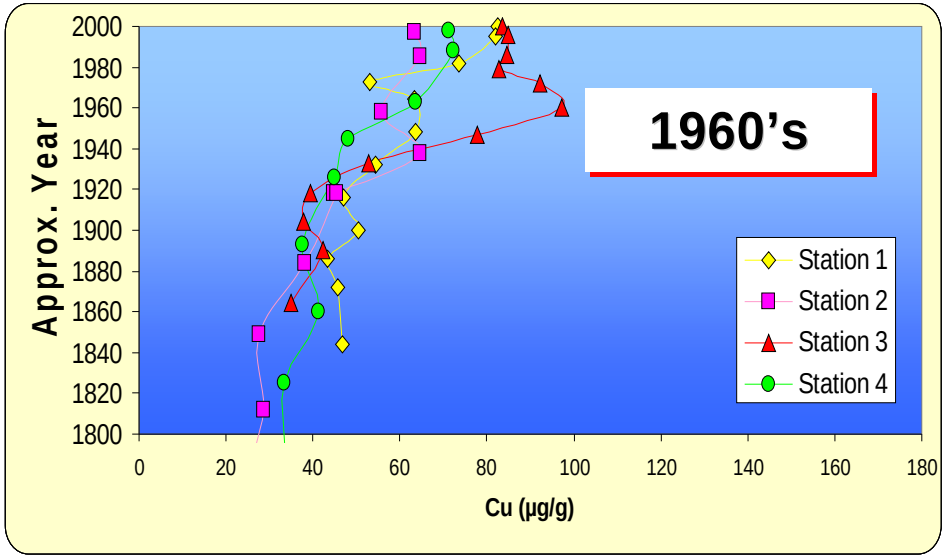
d. Priorities (i.e., Where we should focus our efforts first?)
   - **303(d) List (Fecal Coliform)**

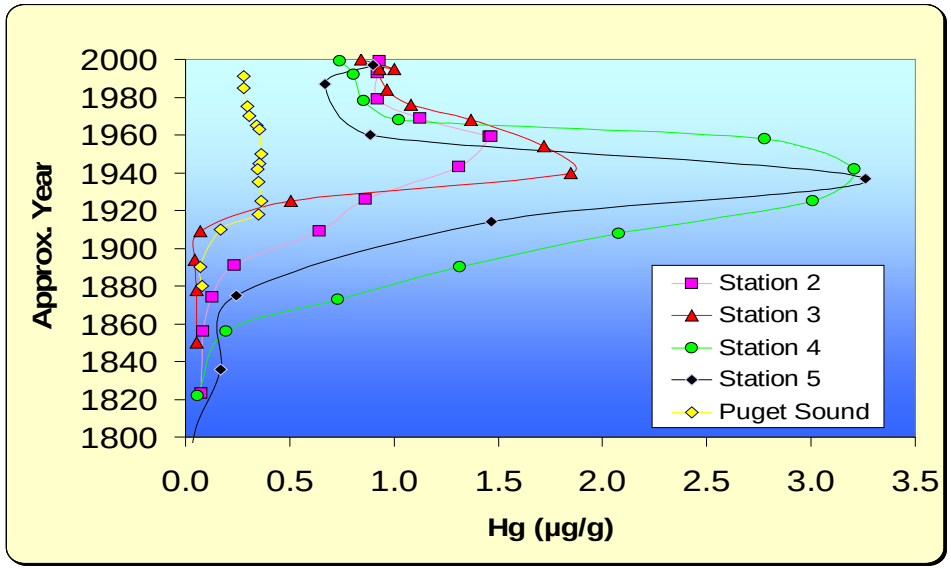
Sediment Core Profiles

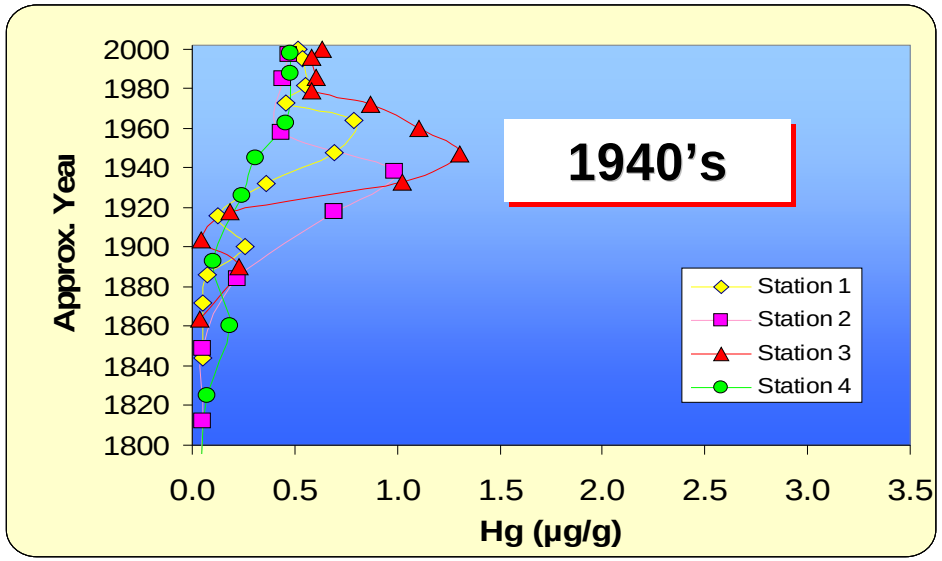
Sinclair Inlet



Dyes Inlet





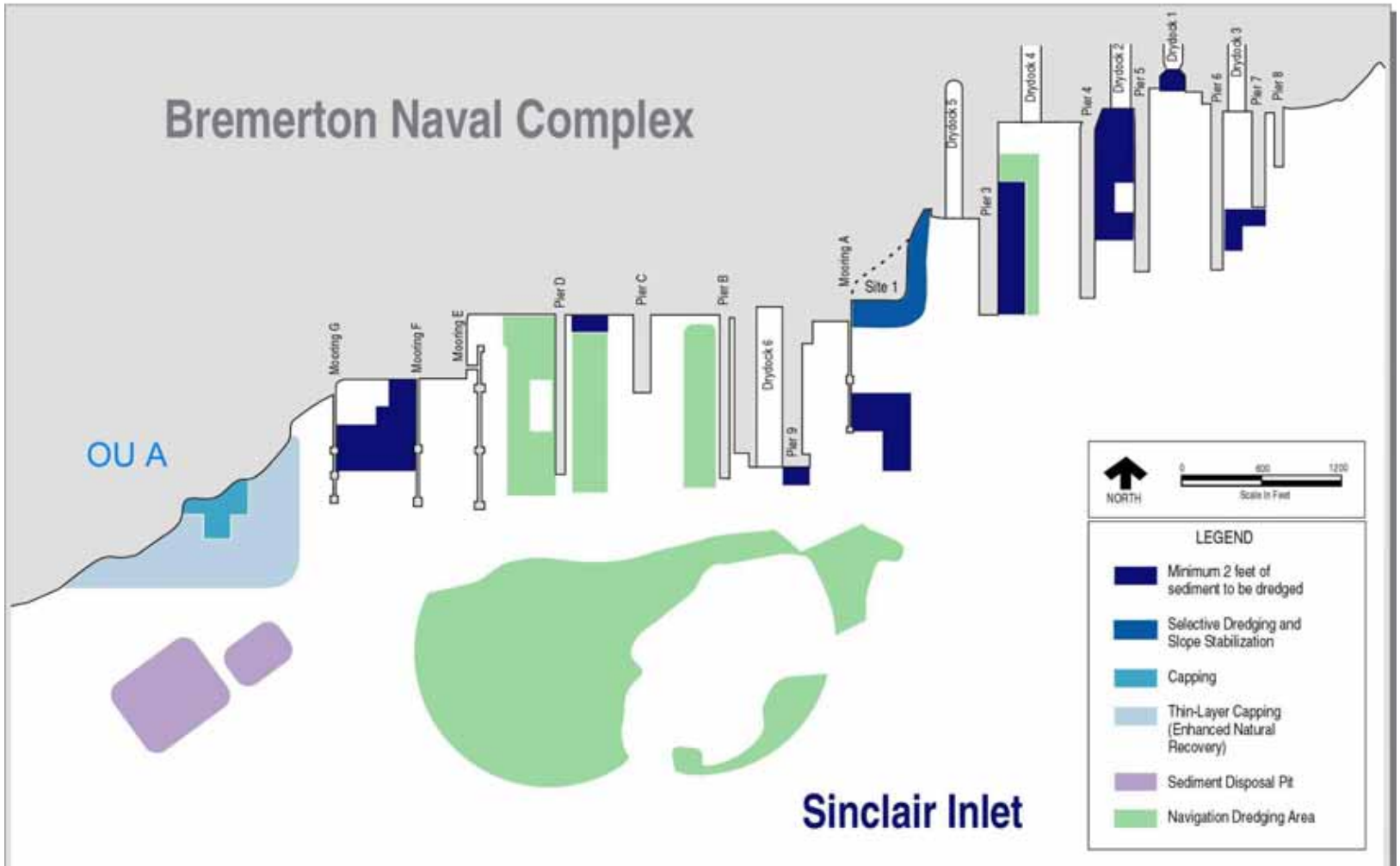


(Crecelius et al. 2003)

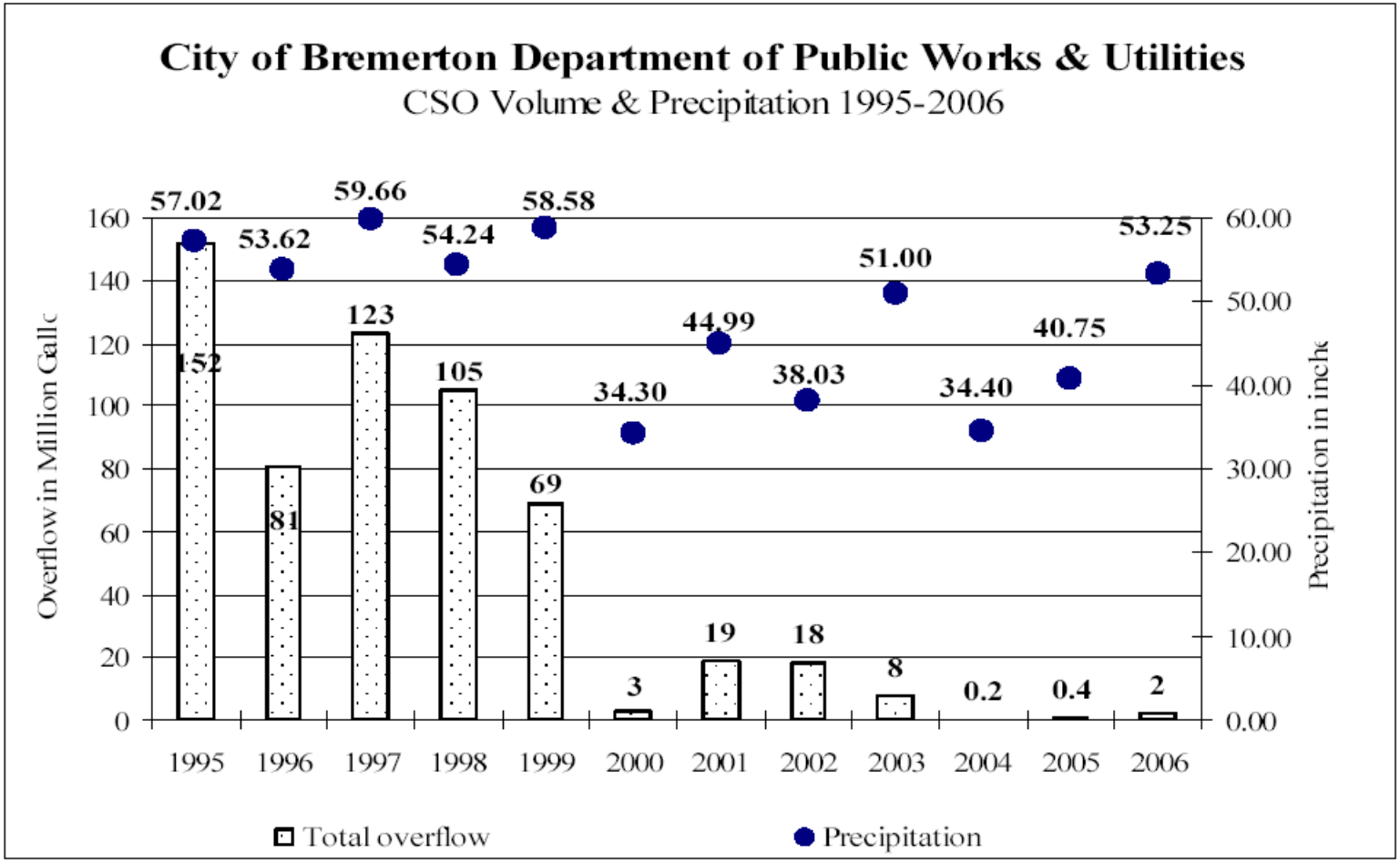
Sediment Remediation

OU B Sediment Cleanup

Sediment Cleanup and Navigational Dredging



CSO Reduction



(City of Bremerton 2007)

1998 3O3(d) Listings for Sediment

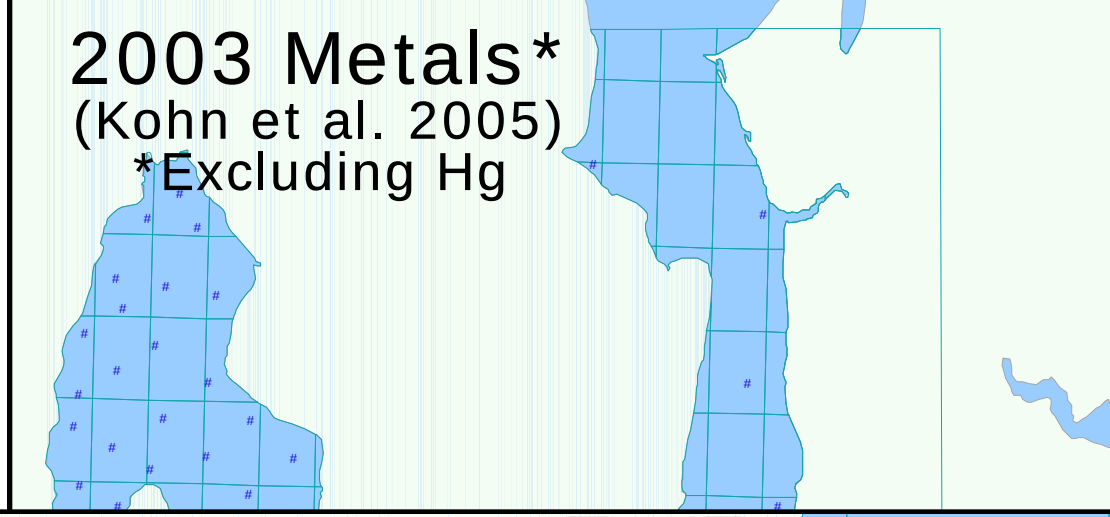
Sinclair In

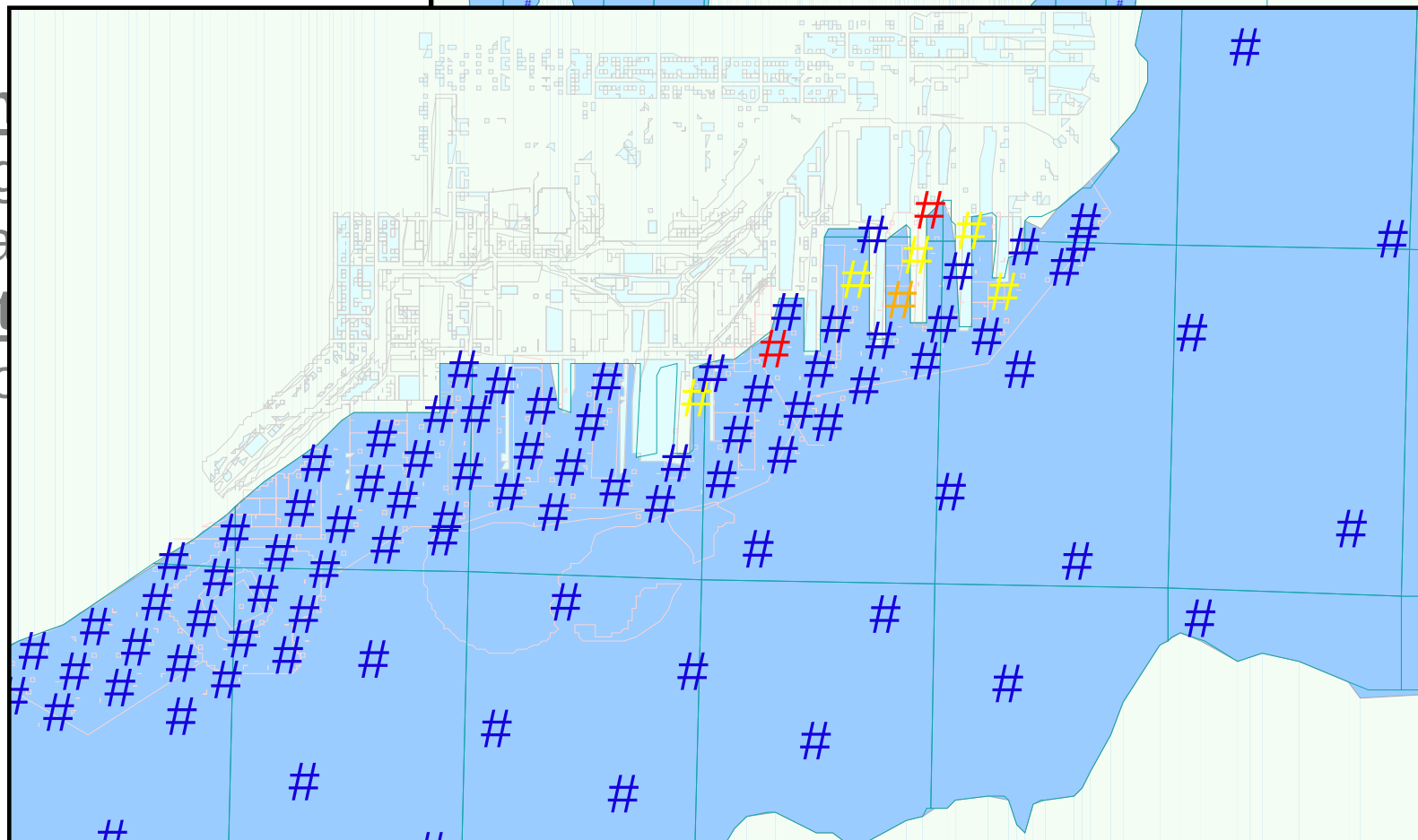
Zn, Cd, Hg

Phalates,a

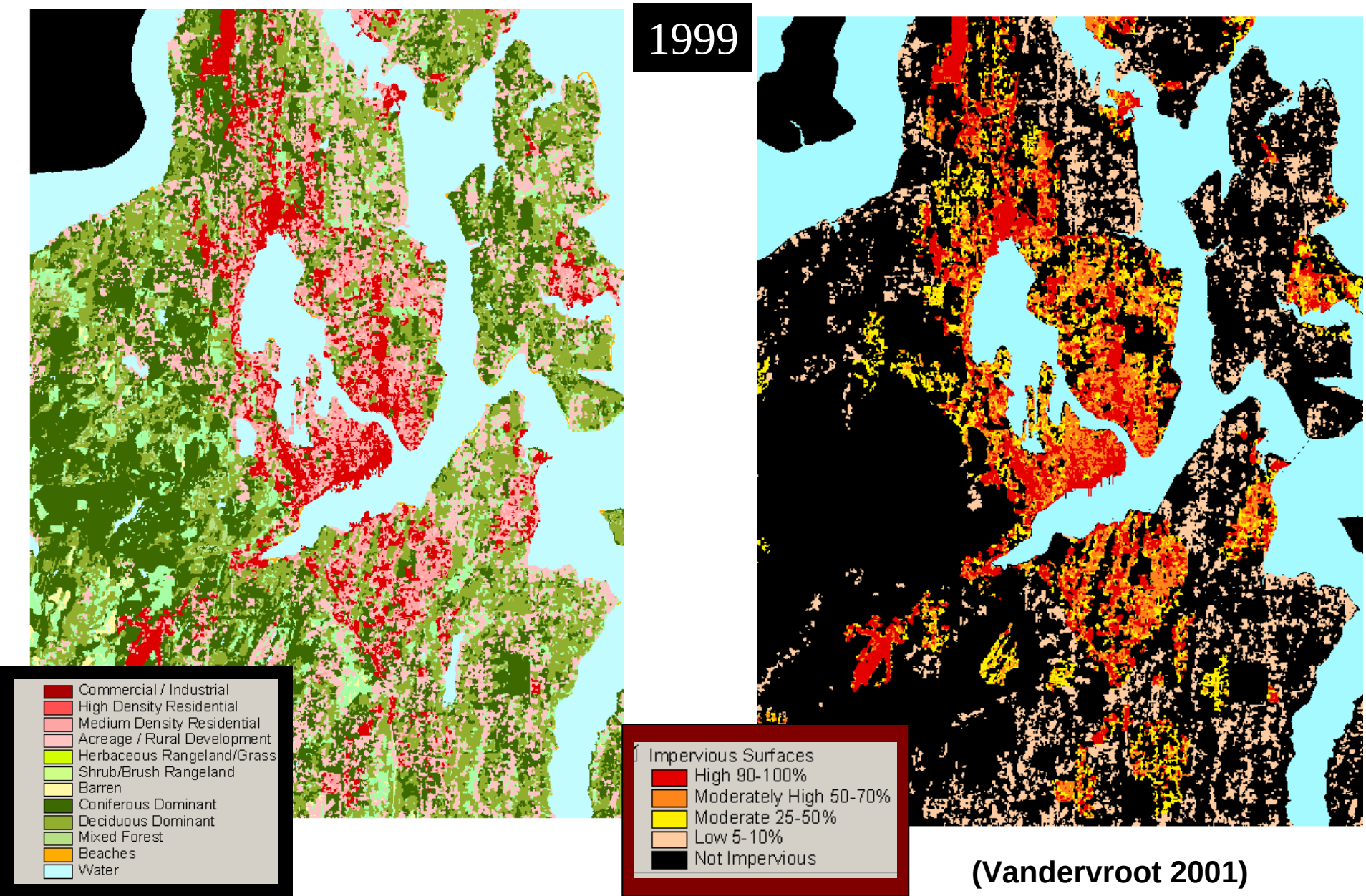
Dyes Inlet

Phenol, To





Watershed Development



(Vandervroot 2001)

Storm Event Sampling

Measure on what is actually coming from the watershed to calculate loading as a function of upstream landuse.

- Pathogens (FC)
- Heavy Metals
- Toxic Organics
- Nutrients
- Particulates and Organic Matter

Measure the impact of runoff on receiving waters and obtain data needed to verify modeling results.

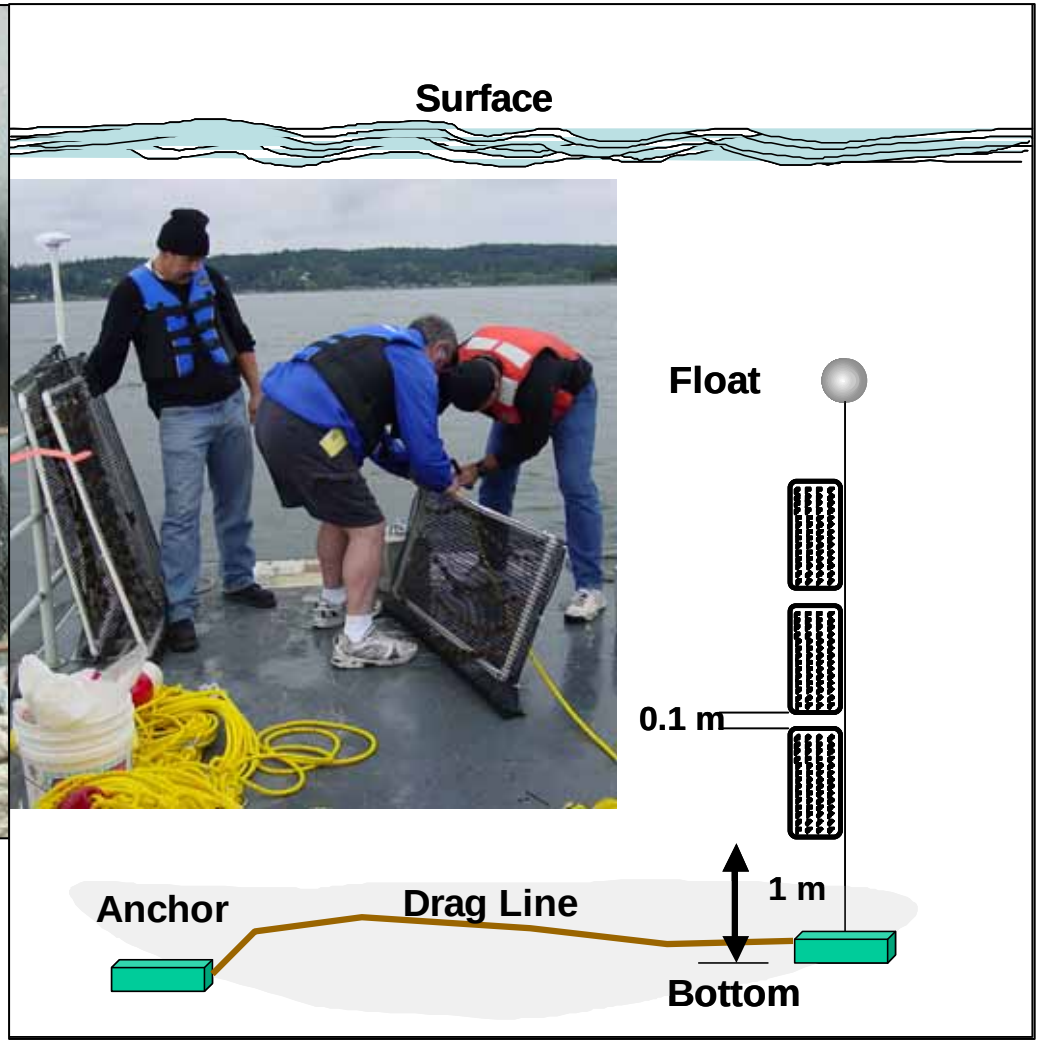
(May et al. 2005, Brandenberger et al. 2007, Cullinan et al. 2007)

Biota Sampling

Bottom Fish Sampling

Bottom fish trawl in Sinclair Inlet.

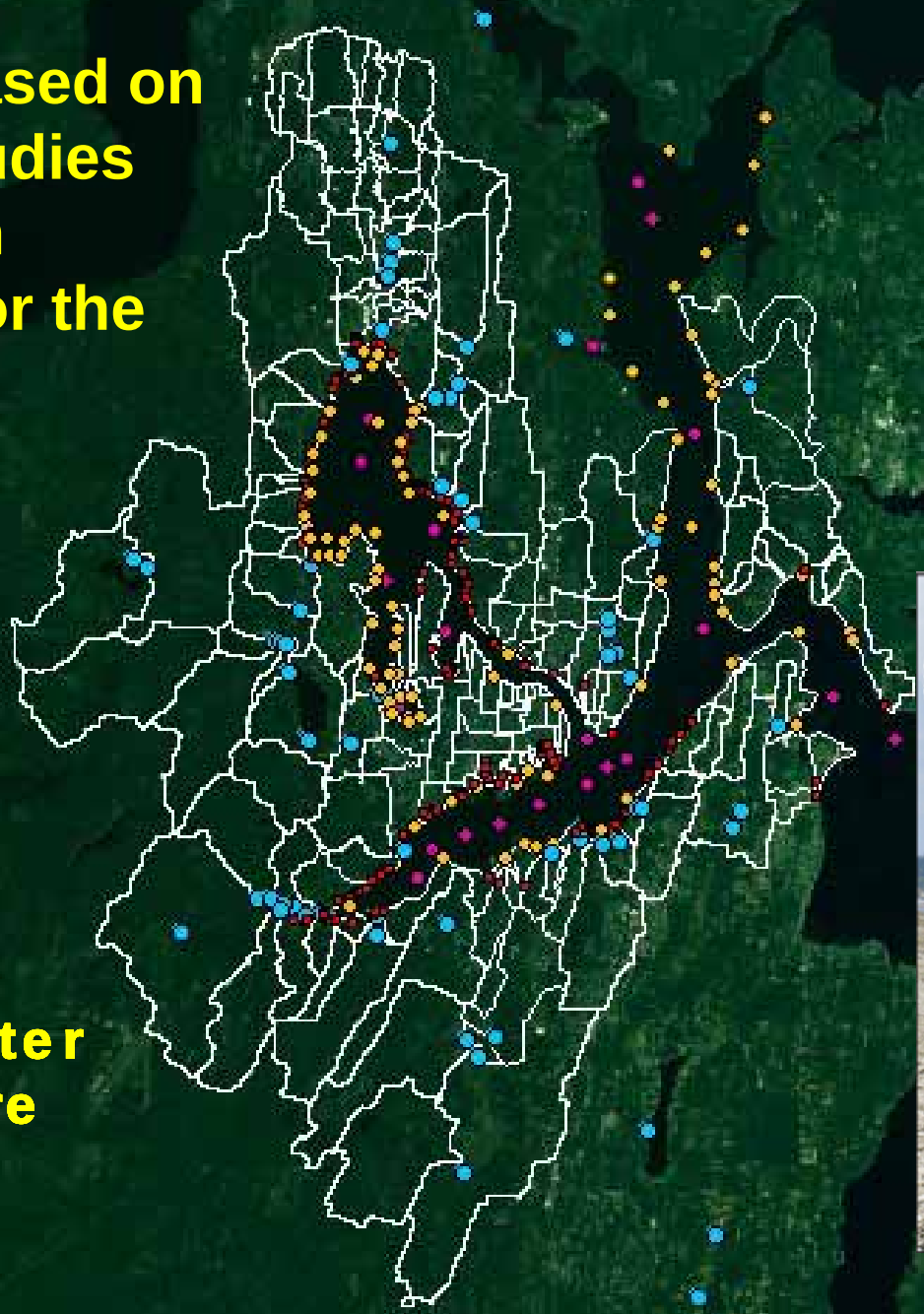
Caged Mussel Study



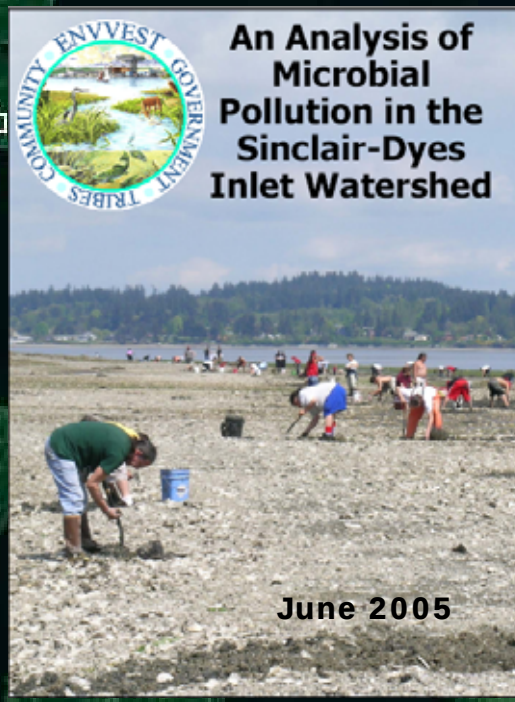
Mussel cage configuration.

FC TMDL Study

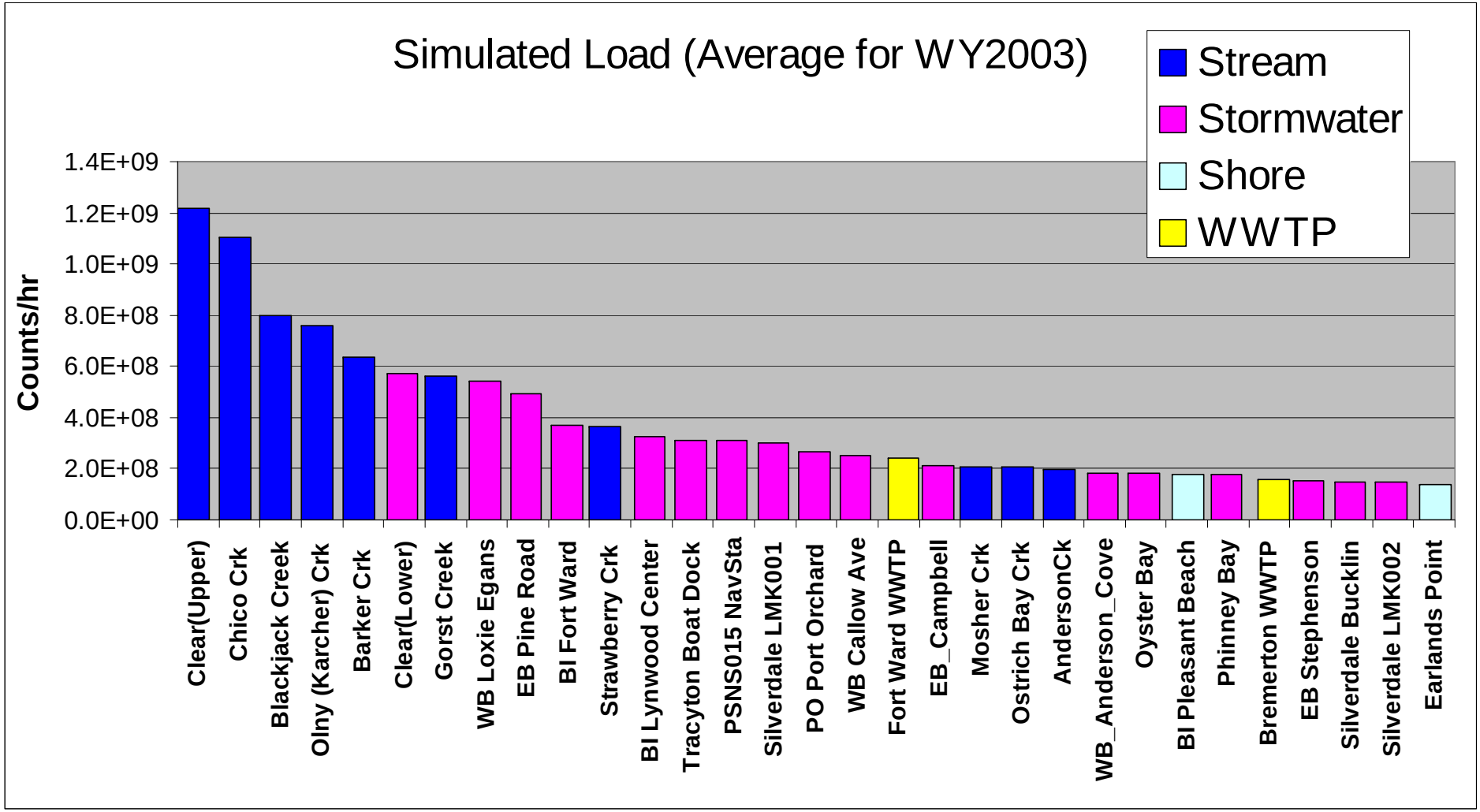
TMDL Study based on cooperative studies conducted with stakeholders for the watershed.



- Stream
- Stormwater
- Nearshore
- Marine

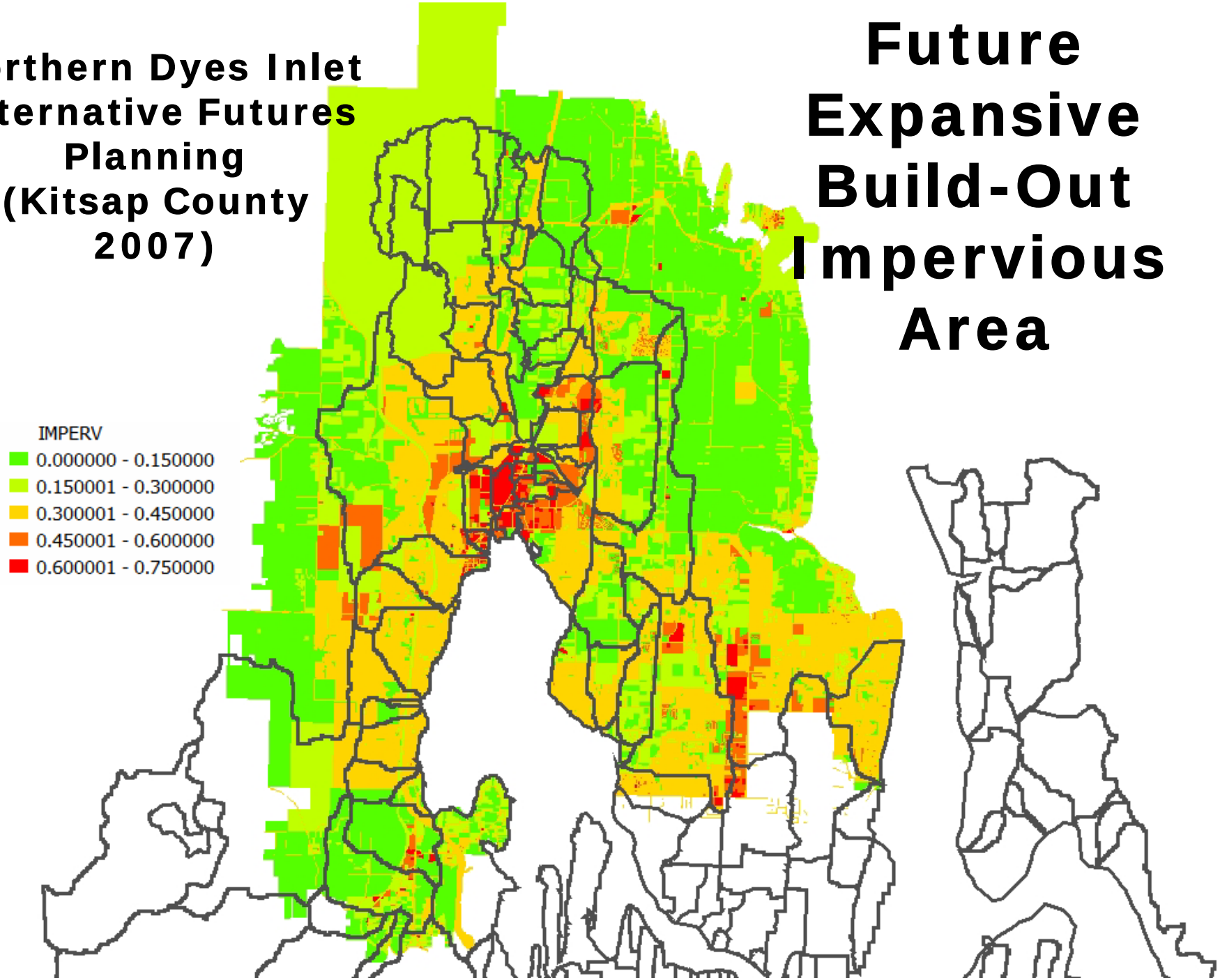


Top 30 Loads from Watershed



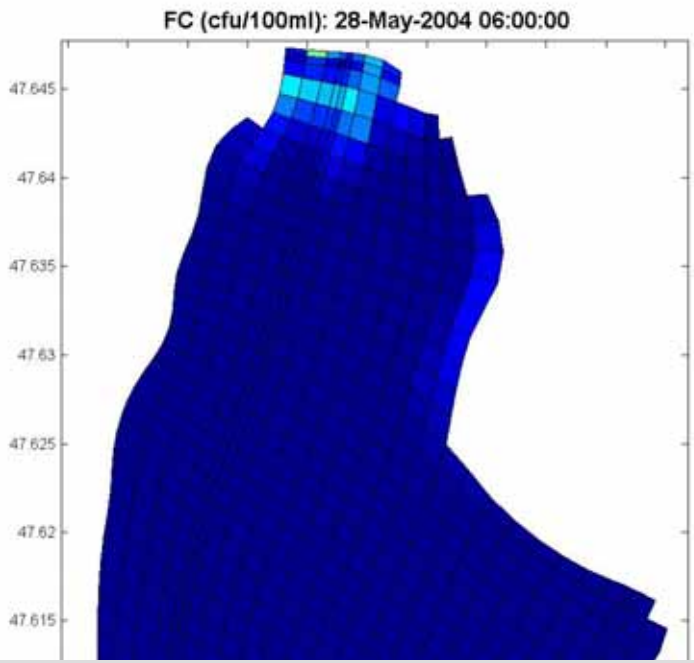
Northern Dyes Inlet Alternative Futures Planning (Kitsap County 2007)

Future Expansive Build-Out Impervious Area

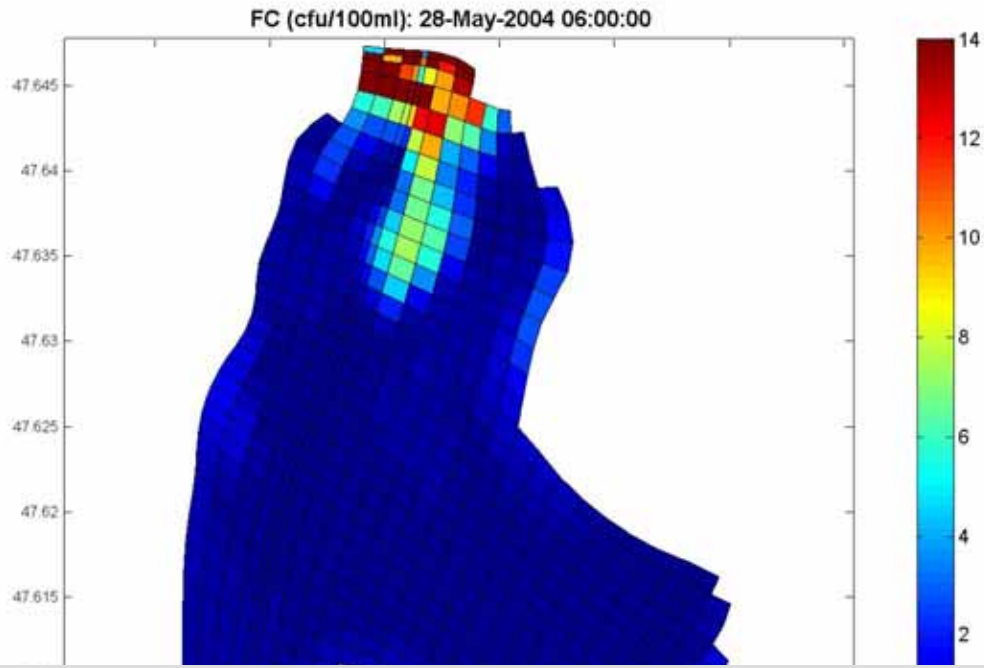


Current and Future Build Out

Current Conditions



Future Expansive Build Out



- **Effect of Future Build Out on FC Loading**
  - **Low confidence because future is unknown**
  - **Expanded Build Out would likely increase the frequency, magnitude, extent, and duration of FC levels exceeding water quality standards through out the watershed**
- **Likely that any actions that effectively eliminate or reduce current problems would also be effective in addressing future problems**

Water Quality - Status of Indicators
- Trends

Priorities - How we focus our efforts

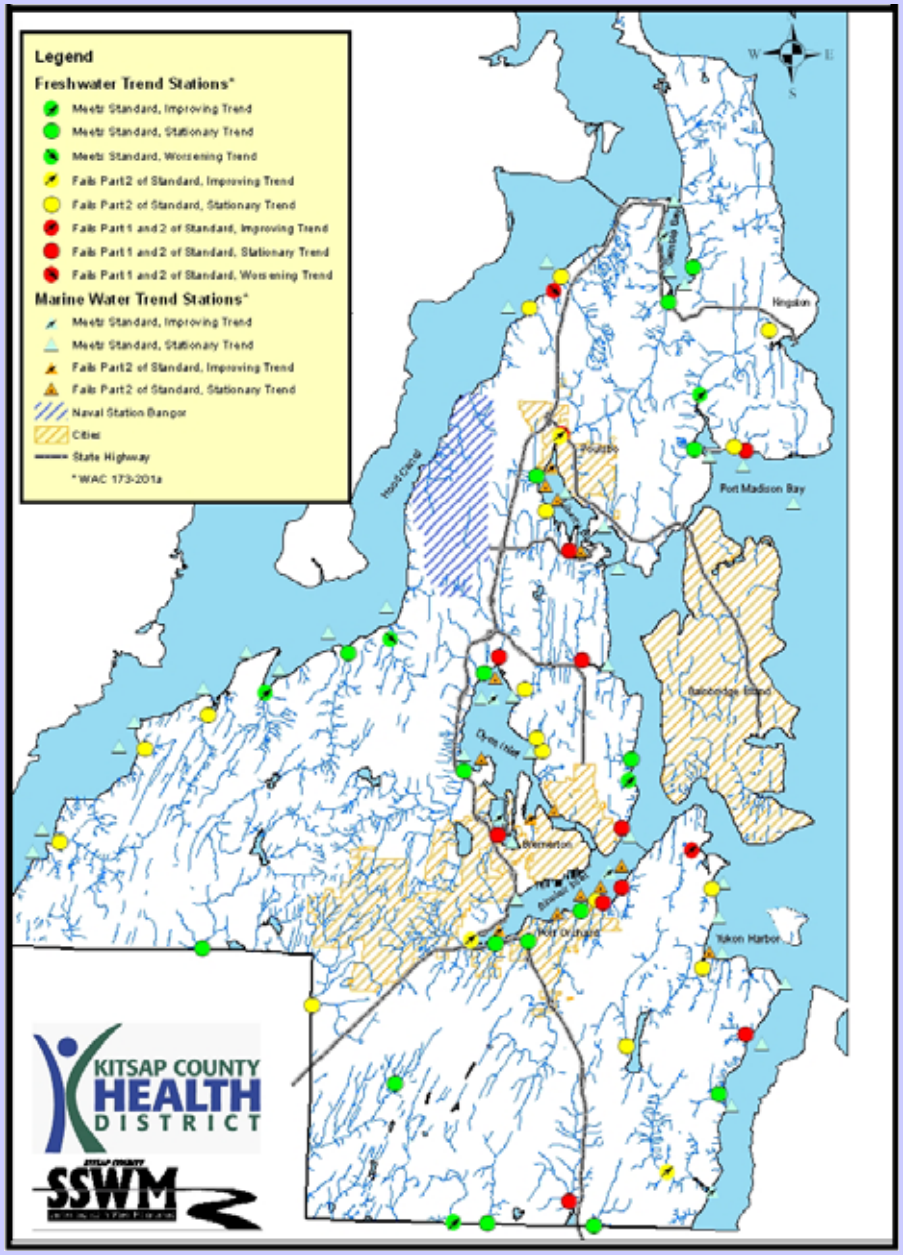
Human Health - Streams
- Swimming Beaches
- Shellfish

Sources of Information

Funded by the Kitsap County Surface and Stormwater Managemement Program.

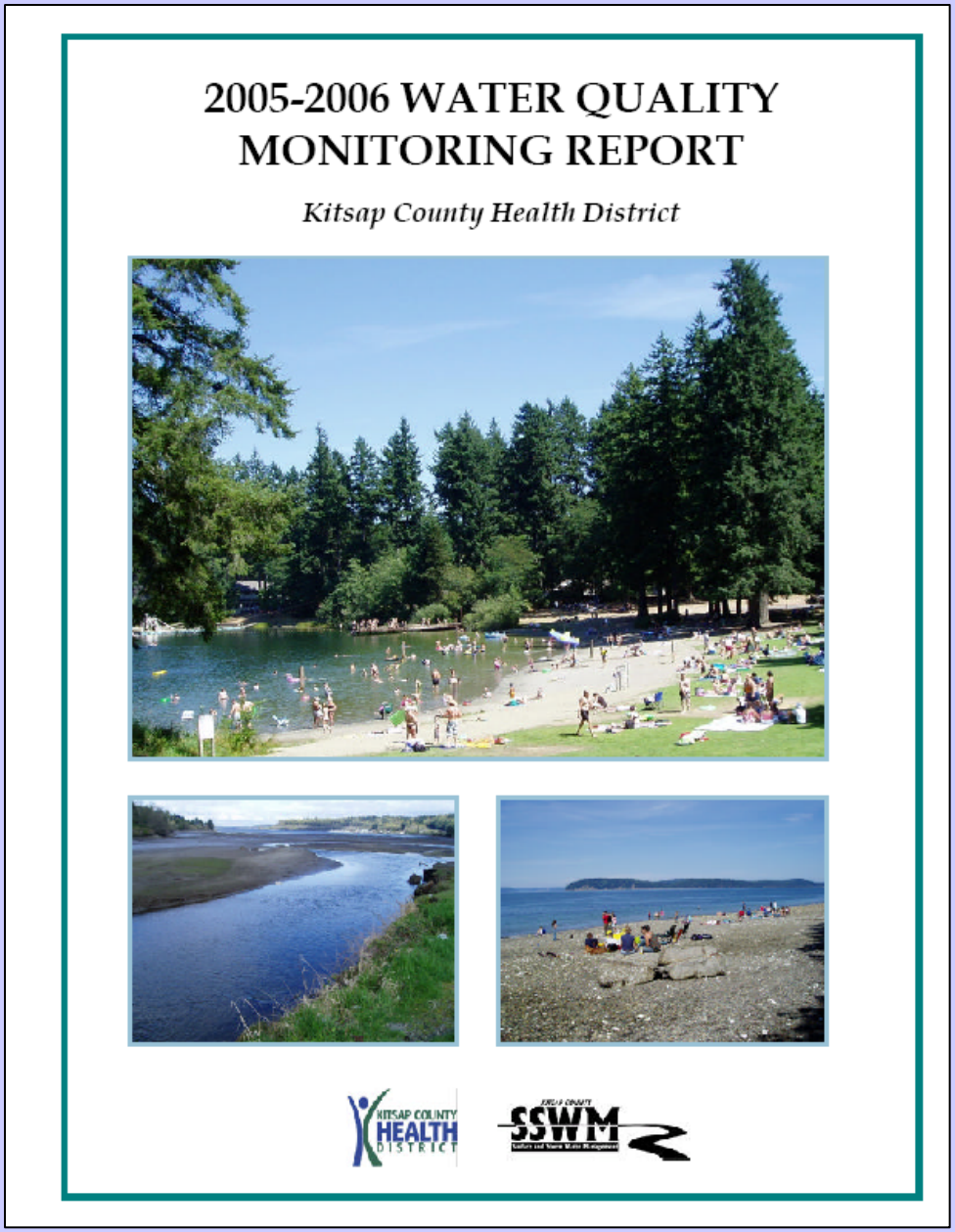
Water Quality

- **Monitoring Efforts**



Water Quality

- **Monitoring Efforts**



KITSAP COUNTY HEALTH DISTRICT

Water Quality

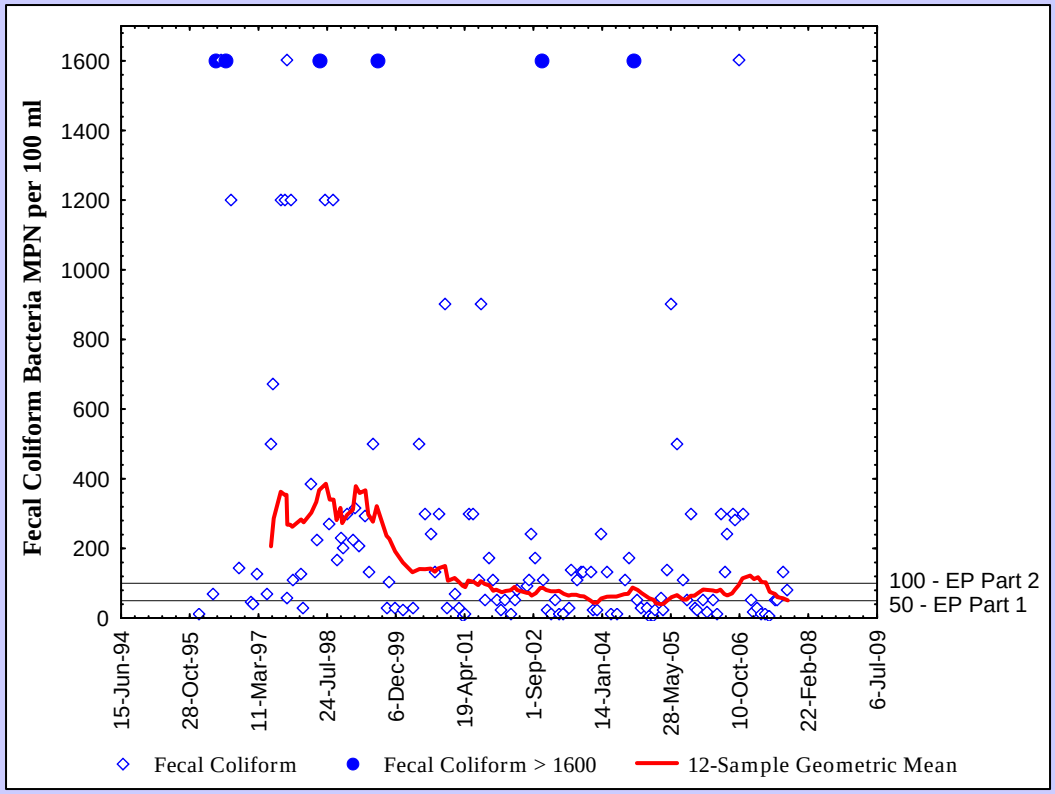
- Monitoring Efforts
- Status of Indicators

Waterbody	Long term trend	Short term trend	Meets WQ Standard?	Annual FC Bacteria GMV	Health Advisory?
Anderson Creek (AN01)	→	→	🟢	17	No
Annapolis Creek (AP01)	→	→	🟡	70	STOP
Beaver Creek (BV01)	↗	→	🔴	53	No
Blackjack Creek (BJ01)	→	→	🟢	45	No
Gorst Creek (GR01)	↗	→	🟡	56	No
Karcher Creek (KA01)	→	→	🔴	189	No
Ross Creek (RS02)	→	→	🟢	52	No
Sacco Creek (SC01)	→	→	🔴	146	STOP
Overall marine water[1]	↗	⊘	10 of 13		

Water Quality

- Monitoring Efforts
- Status of Indicators
- **Trend Analysis**

Fecal Coliform Bacteria Trend Analysis
Dogfish Creek (Station DF01), 1996 - 2007



Priorities

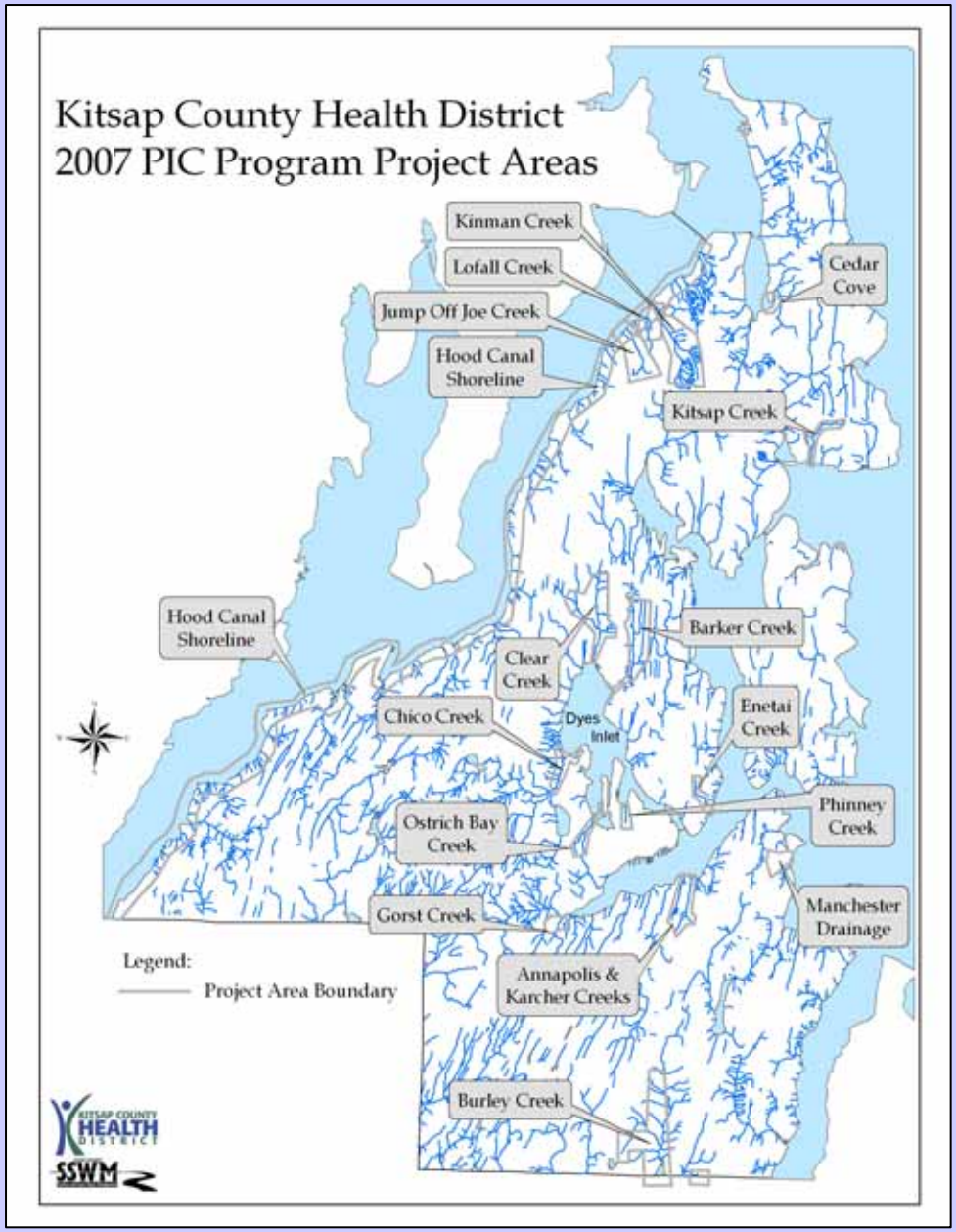
- **How we focus our efforts**

Priority Area Work List

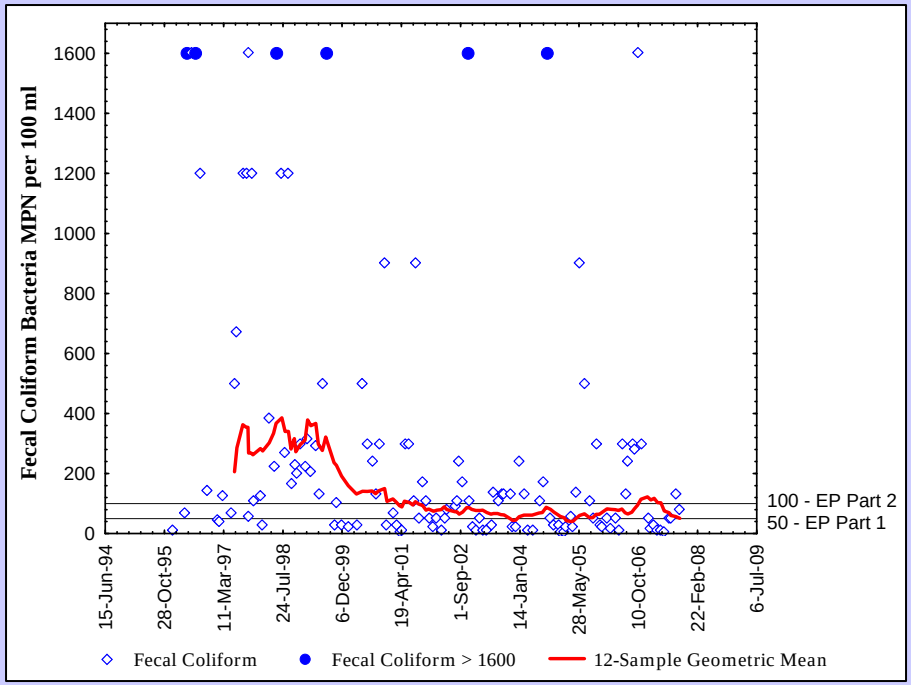
Pollution Identification and Correction Program

Priorities

- How we focus our efforts
- **PIC Projects**



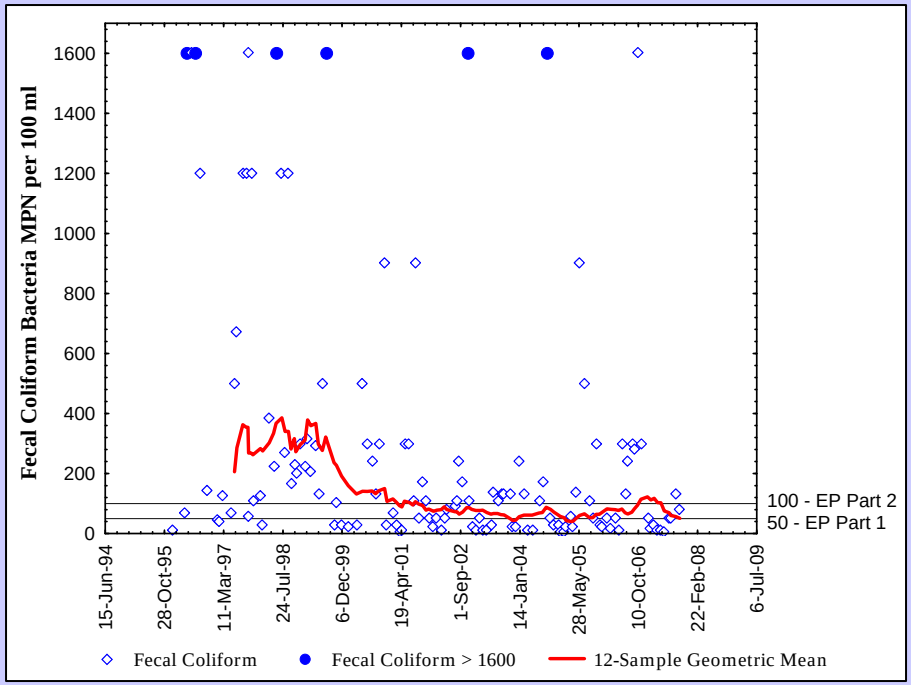
Fecal Coliform Bacteria Trend Analysis
Dogfish Creek (Station DF01), 1996 - 2007



Priorities

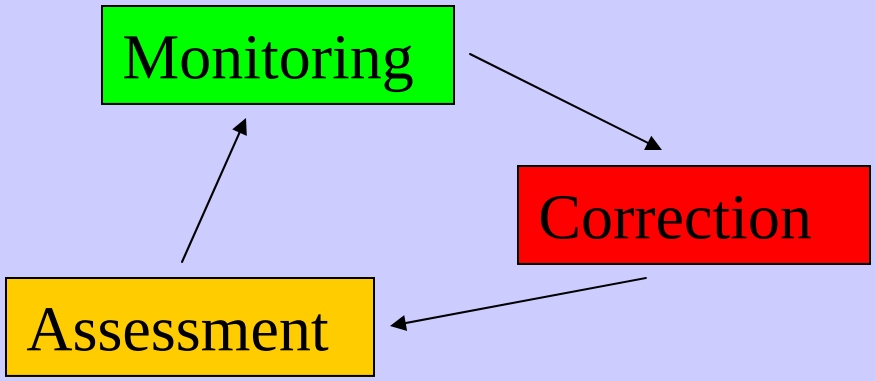
- How we focus our efforts
- PIC Projects
- **Making a Difference**

Fecal Coliform Bacteria Trend Analysis
Dogfish Creek (Station DF01), 1996 - 2007



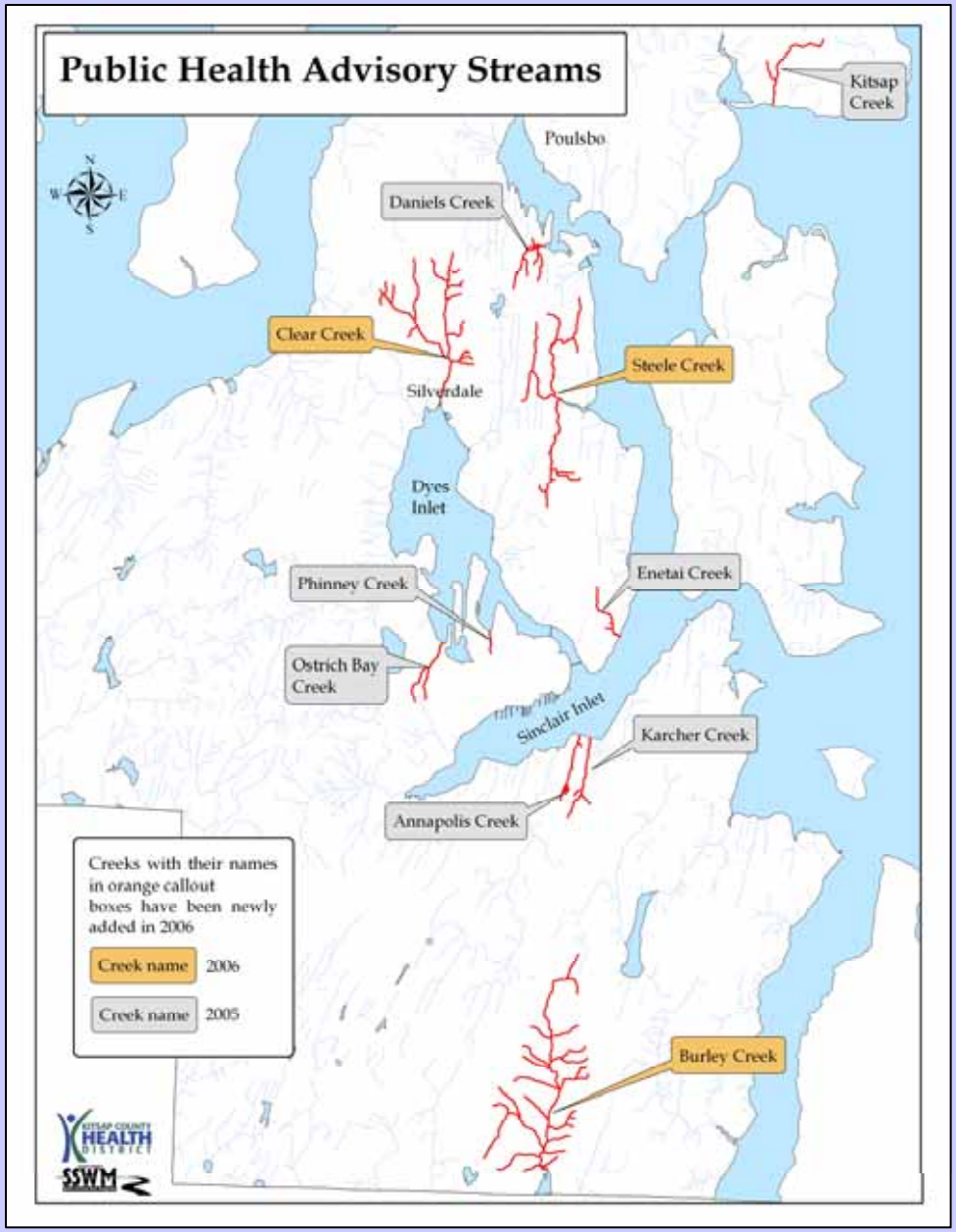
Priorities

- How we focus our efforts
- PIC Projects
- **Making a Difference**



Human Health

- **Streams**



KITSAP COUNTY HEALTH DISTRICT

Human Health

- **Streams**

KITSAP COUNTY HEALTH DISTRICT

Human Health

- Streams
- Swimming Beaches

KITSAP COUNTY HEALTH DISTRICT

Human Health

- Streams
- Swimming Beaches

KITSAP COUNTY HEALTH DISTRICT

Human Health

- Streams
- Swimming Beaches
- **Shellfish**

KITSAP COUNTY HEALTH DISTRICT

- **Water Quality Monitoring Report**
- **PIC Priority Area Work List**

www.kitsapcountyhealth.com

Nearshore Assessments
&
Kitsap Salmon Refugia Report

Three Nearshore Assessments

- Bainbridge Island – Completed

  http://www.ci.bainbridge-isl.wa.us/nearshore_report.aspx

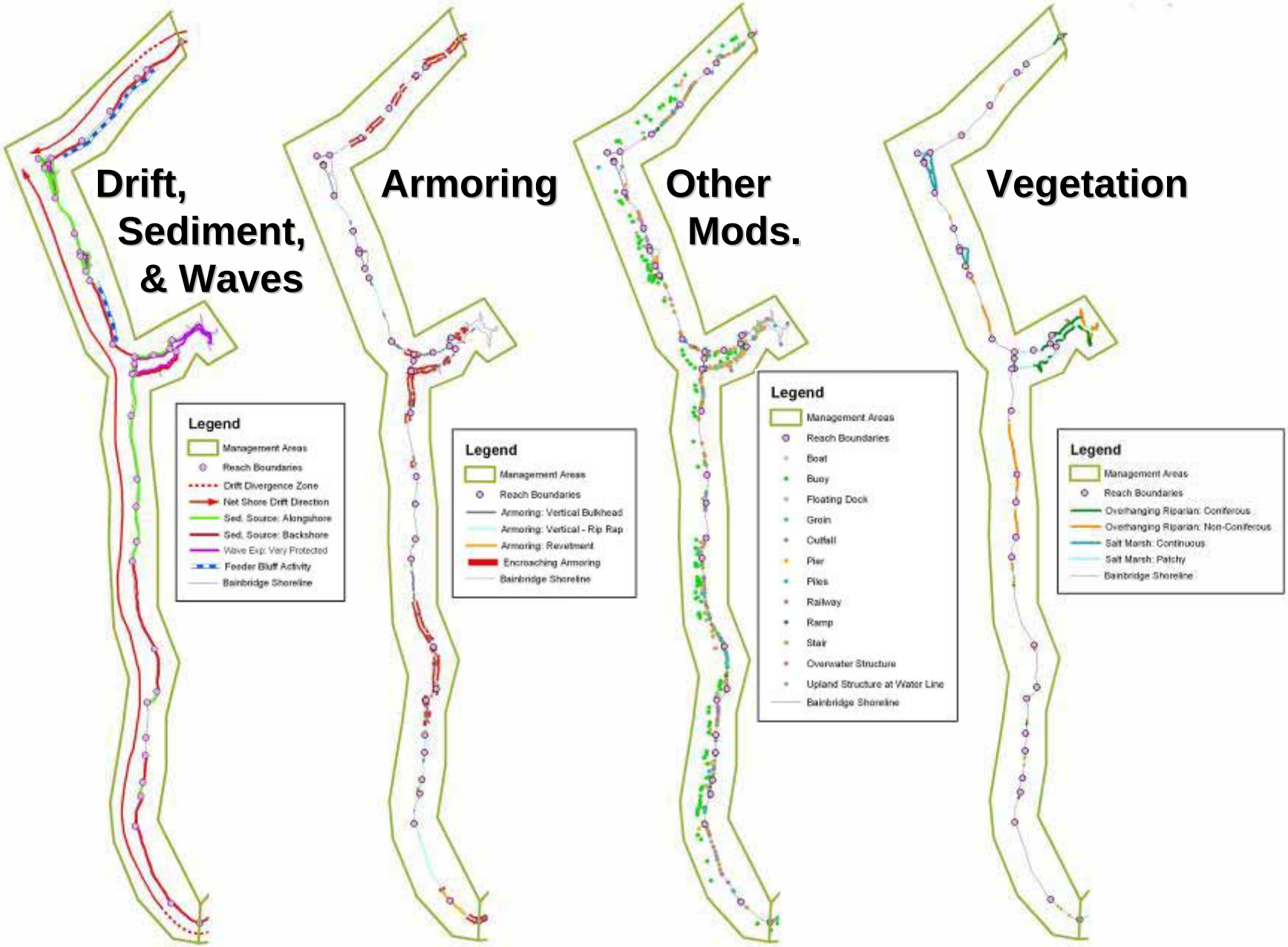
- Pierce County (KGI) – Completed

  http://www.co.pierce.wa.us/pc/services/home/environ/water/ps/main.htm

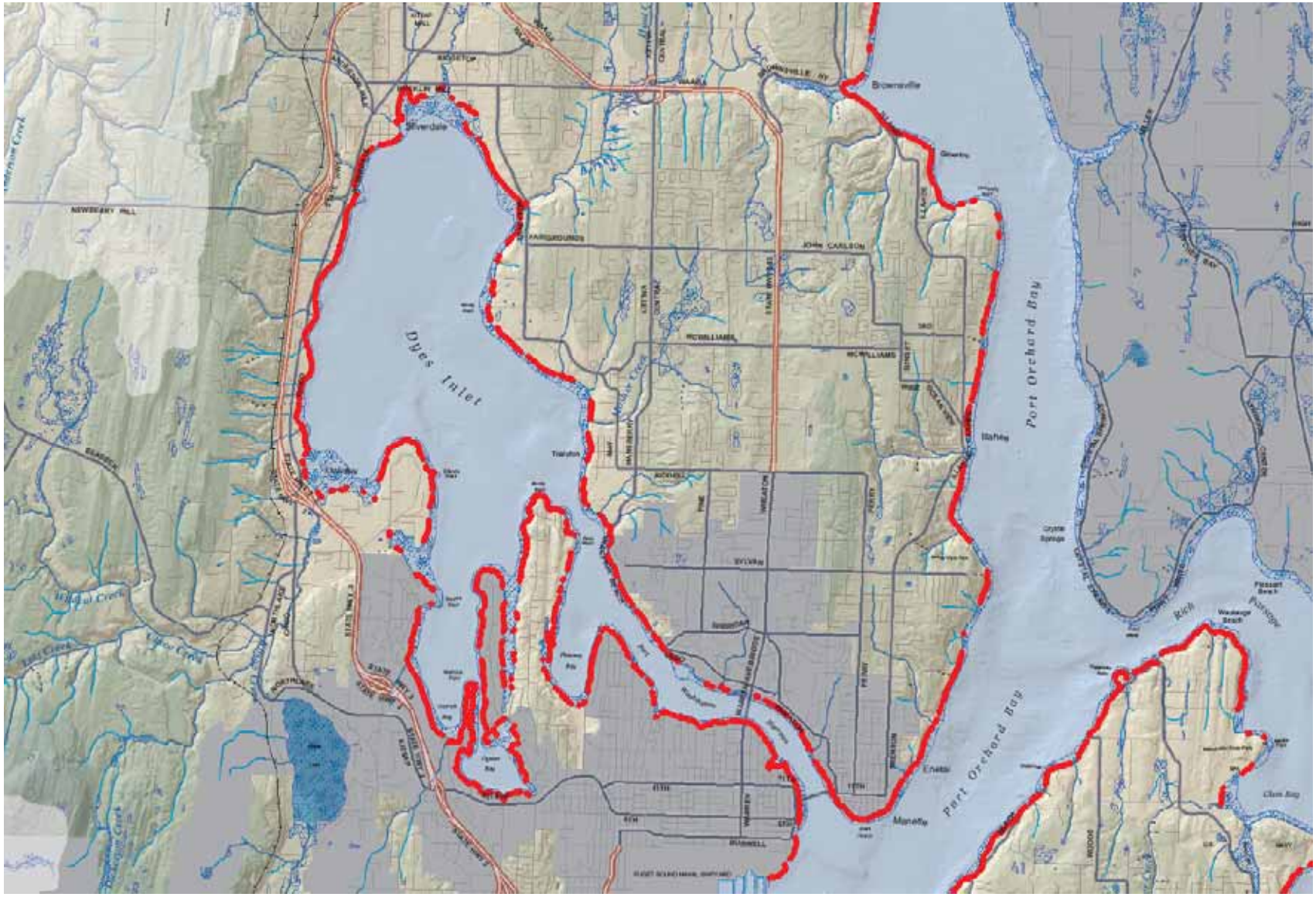
- Kitsap County (east) – In process

  http://www.kitsapgov.com/dcd/nr/nearshore/nearshore1.htm

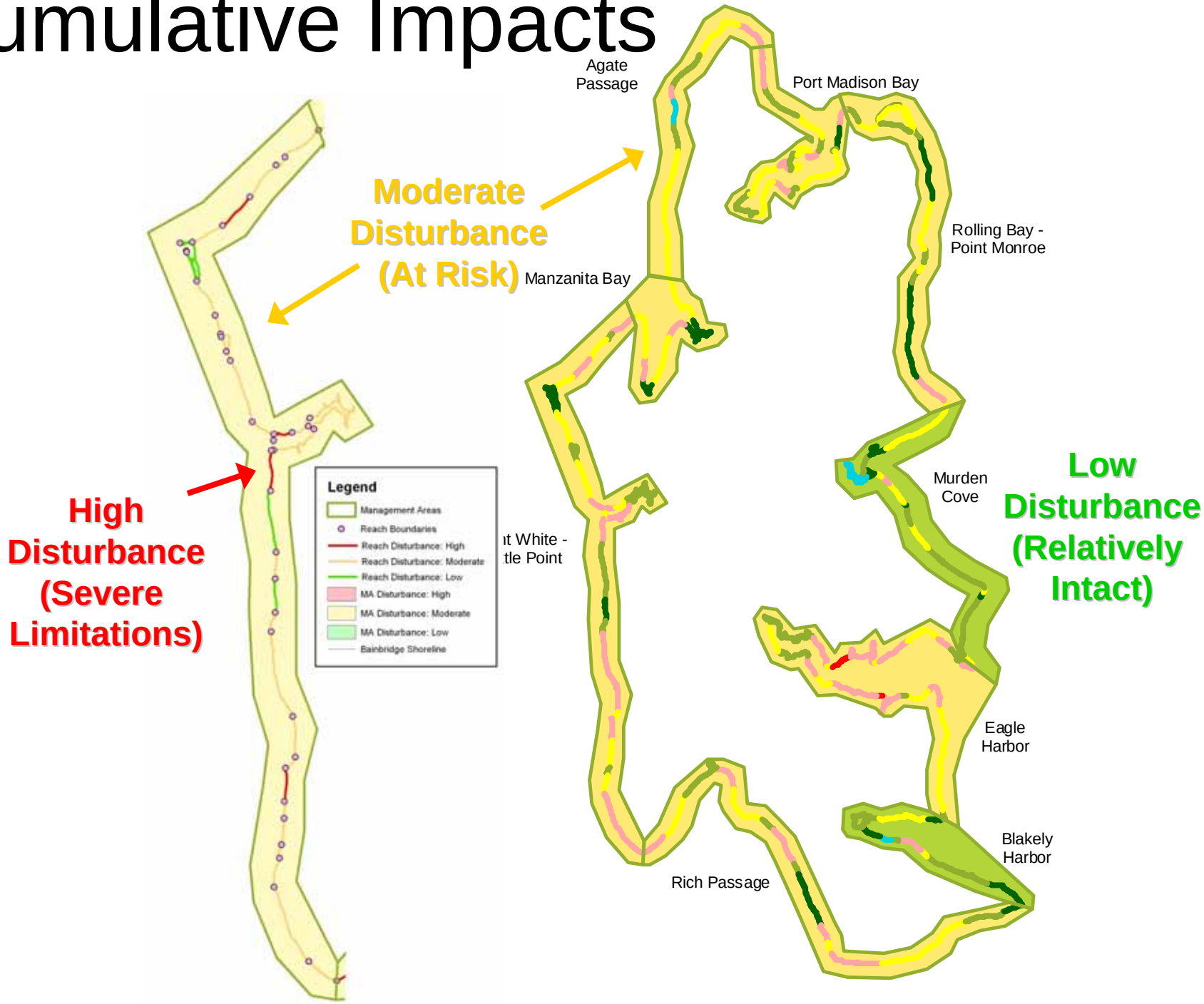
Inventory & Characterization



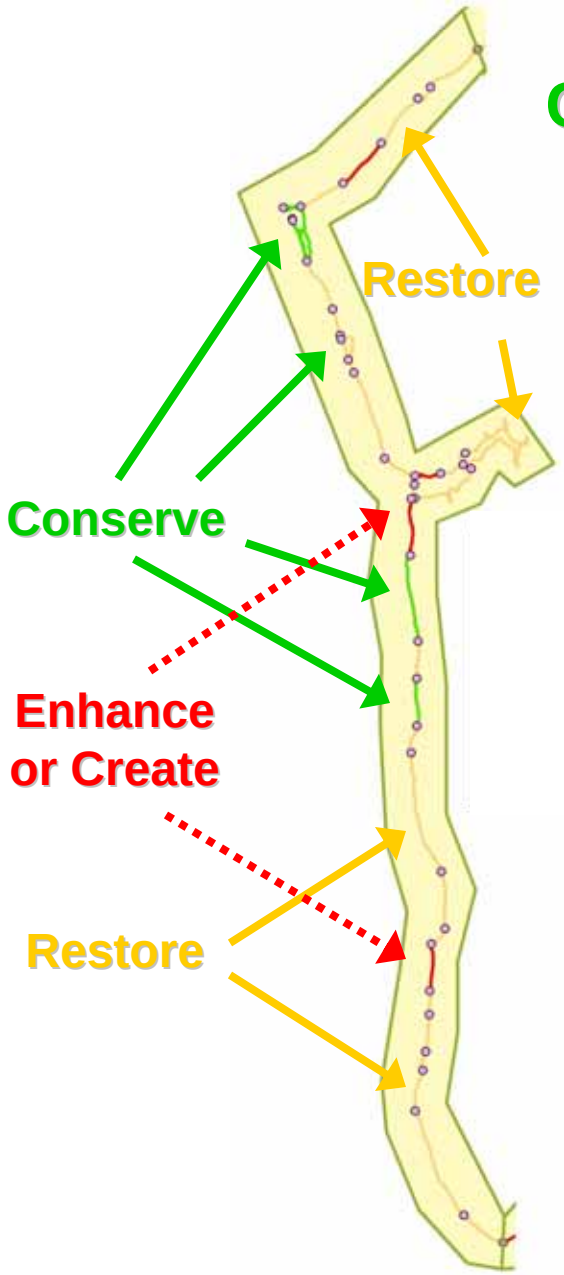
East Kitsap Armoring

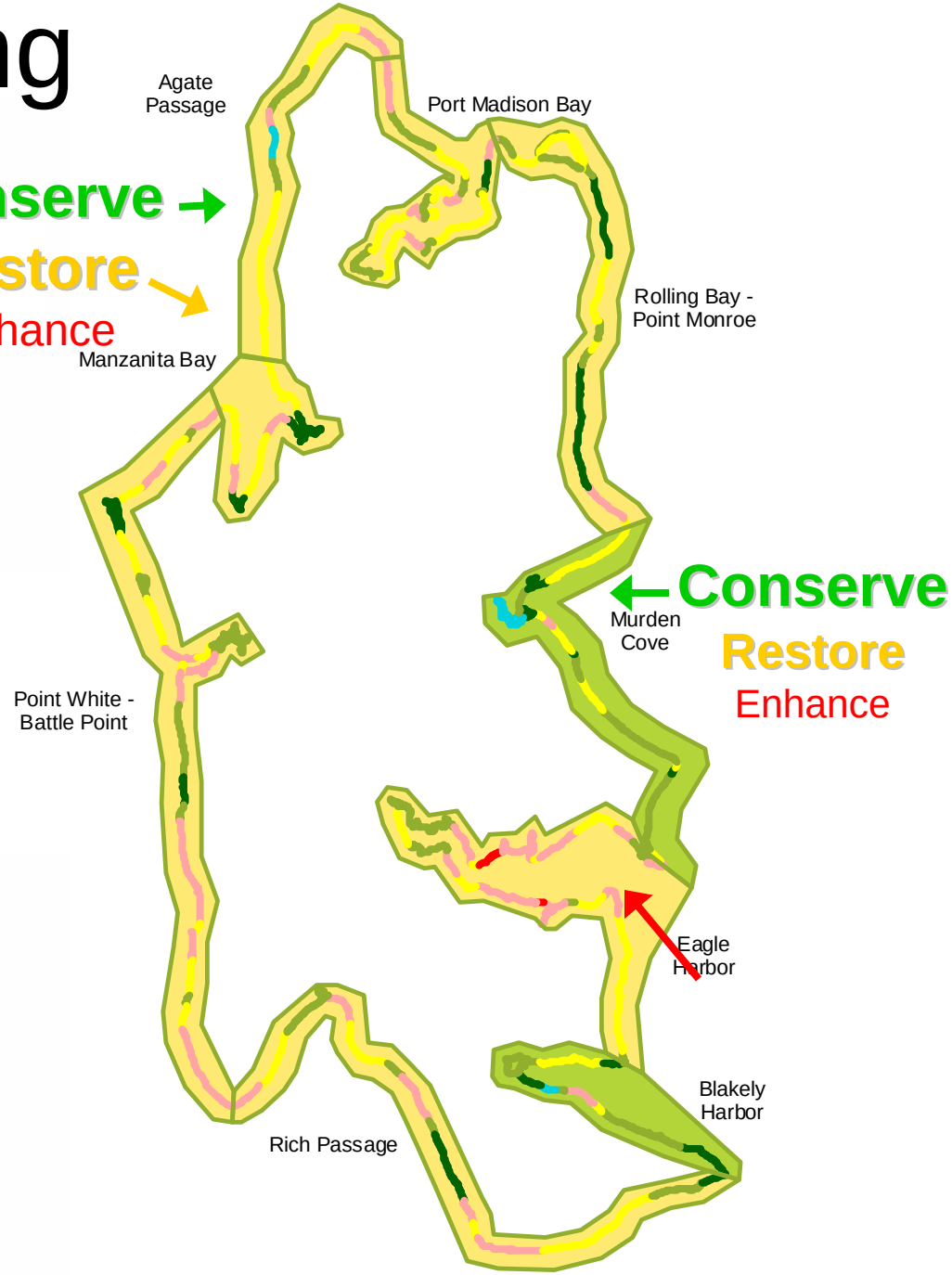

Dyes Inlet
Port Orchard Bay
Port Orchard Bay
Silverdale
Brownsville
Manette
Chico
Tekalet
Ostrich Bay
Clam Bay
NEWBERRY HILL
FAIRGROUNDS
JOHN CARLSON
MCWILLIAMS
BUCKNER
BRUSHWELL
ELEVENTH
TENTH
NINTH
EIGHTH
SEVENTH
SIXTH
FIFTH
FOURTH
THIRD
SECOND
FIRST
WARREN
WRIGHT
WOODS
IRRIGATION
PERRY
BUCKNER
SYLVAN
SHORELINE
SHORELINE DR
SILVERDALE WAY
BRUSHWELL
ROSEDALE
ROSEDALE
ROSEDALE

Cumulative Impacts



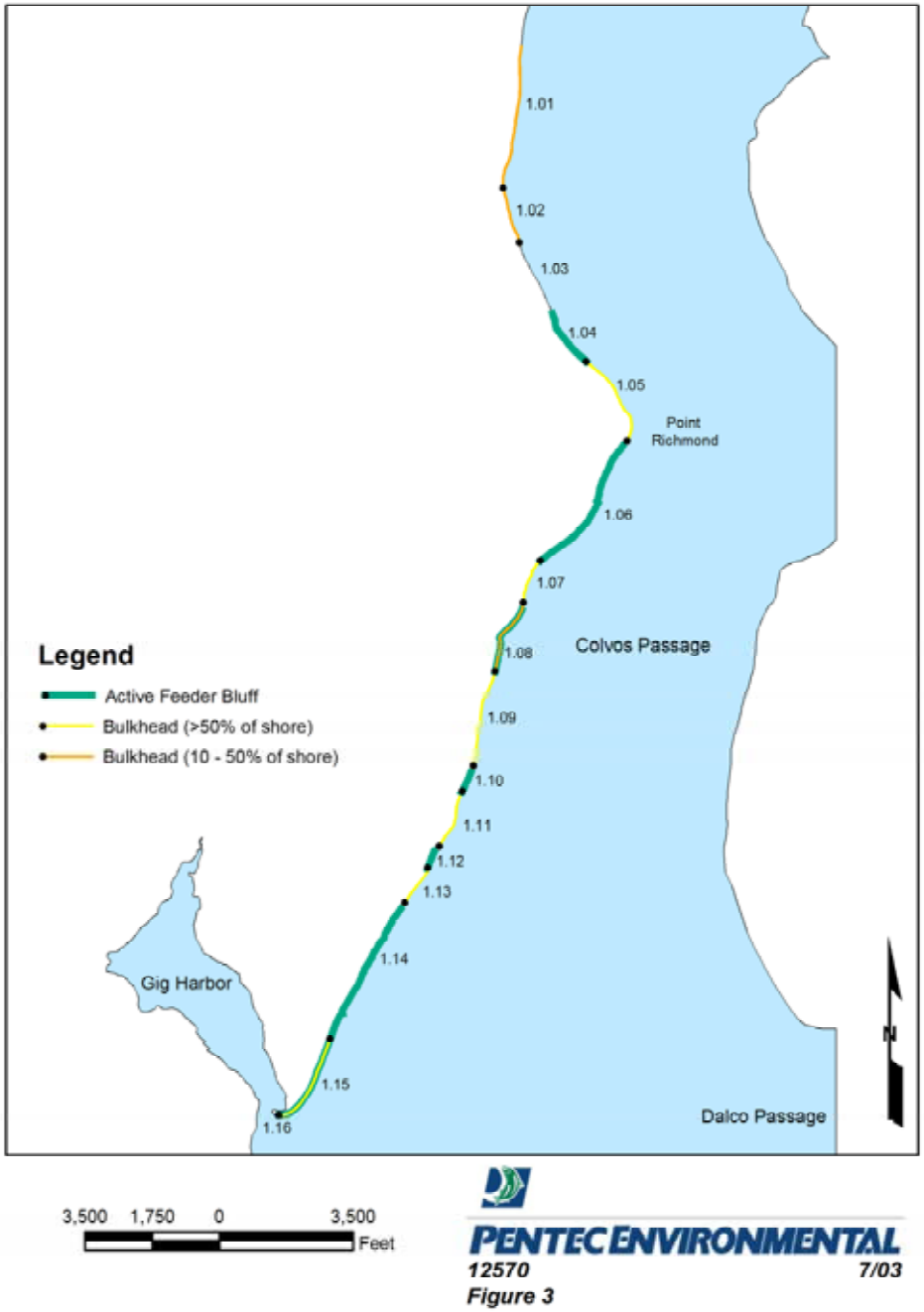
Action Planning





KGI Watershed Nearshore Salmon Habitat Assessment

- Tidal Habitat Model (THM)
- Inventory
- Characterizations
- Restoration Actions



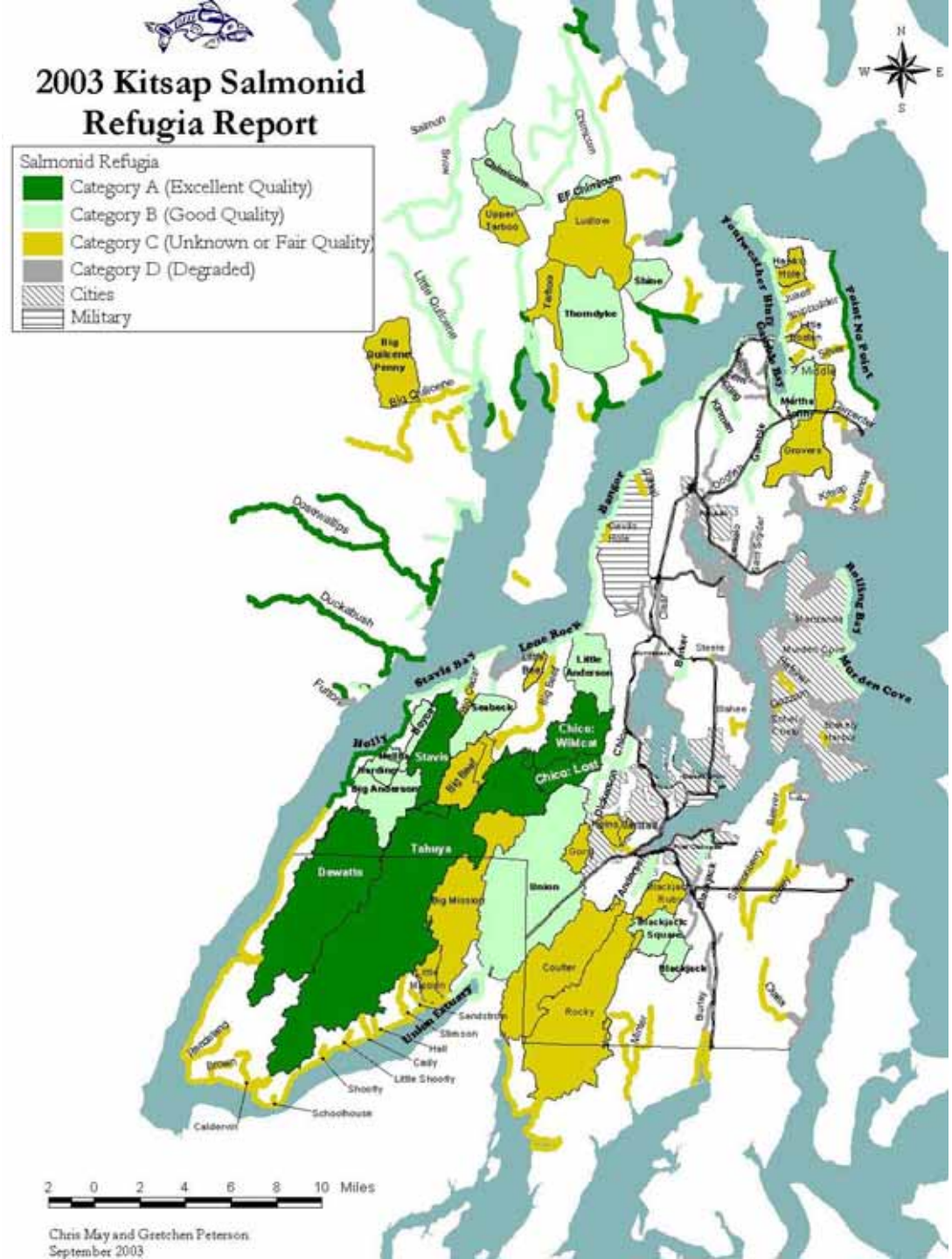
2003 Kitsap Salmonid Refugia Report

http://www.kitsapgov.com/dcd/nr/refugia/kitsap_refugia_report_2003.pdf

Refugia Categories

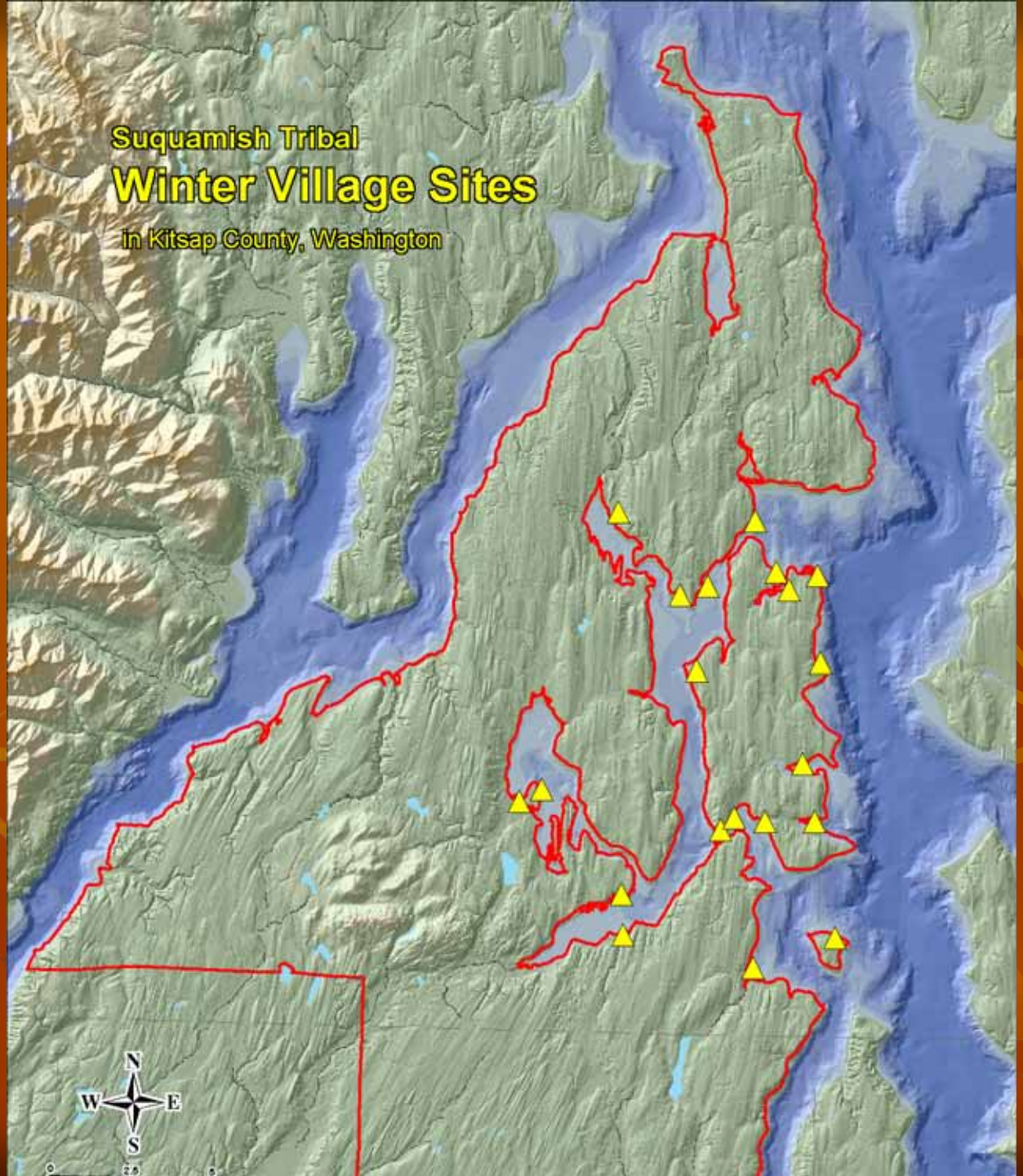
- Category A: Excellent Quality
- Category B: Good Quality
- Category C: Unknown or Fair Quality
  - Includes several refugia where there was not enough data available to justify a “A” or “B” rating
- Category D: Degraded
  - “Potential future refugia”
- Non-refugia

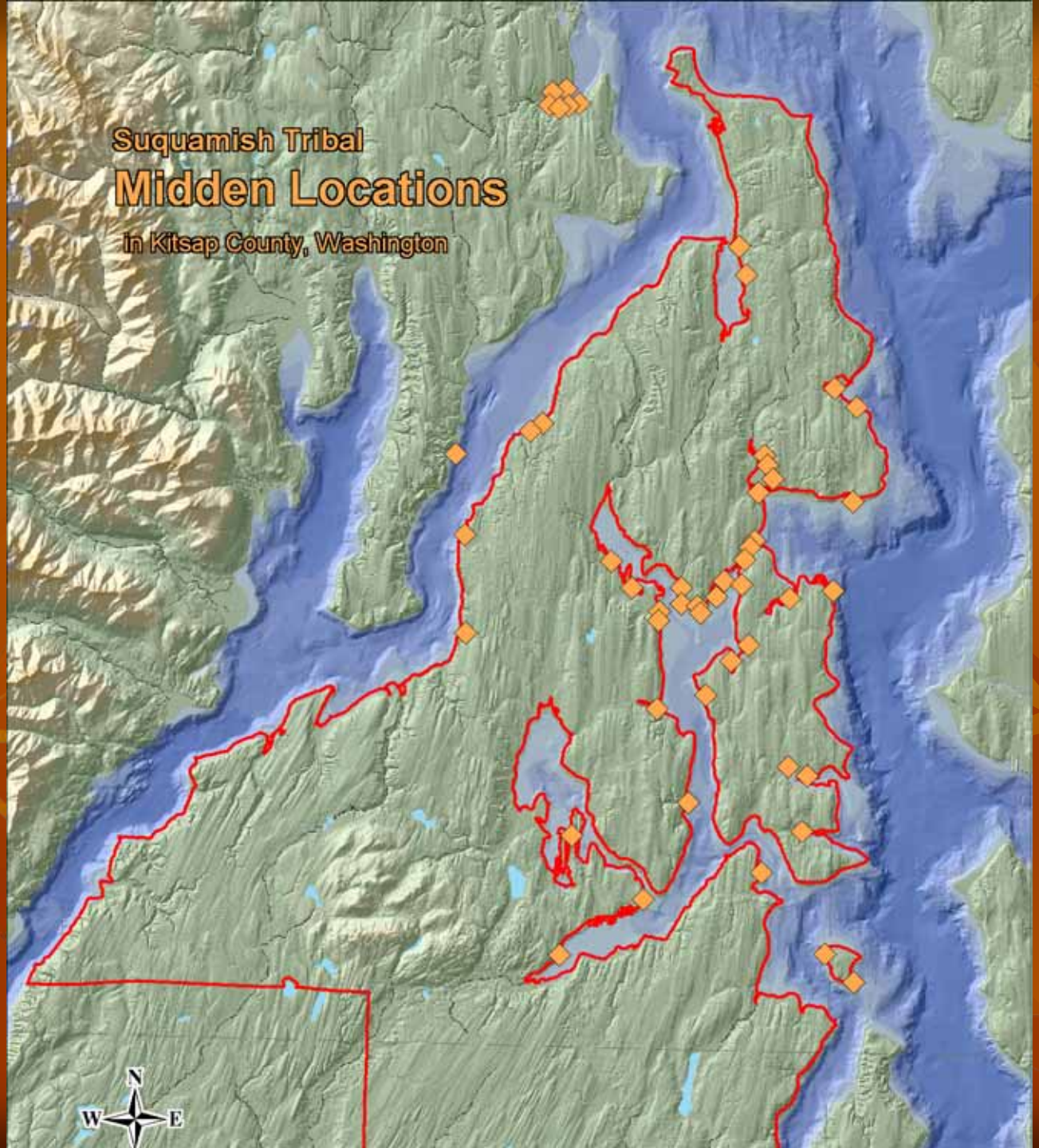
Kitsap Refugia Map



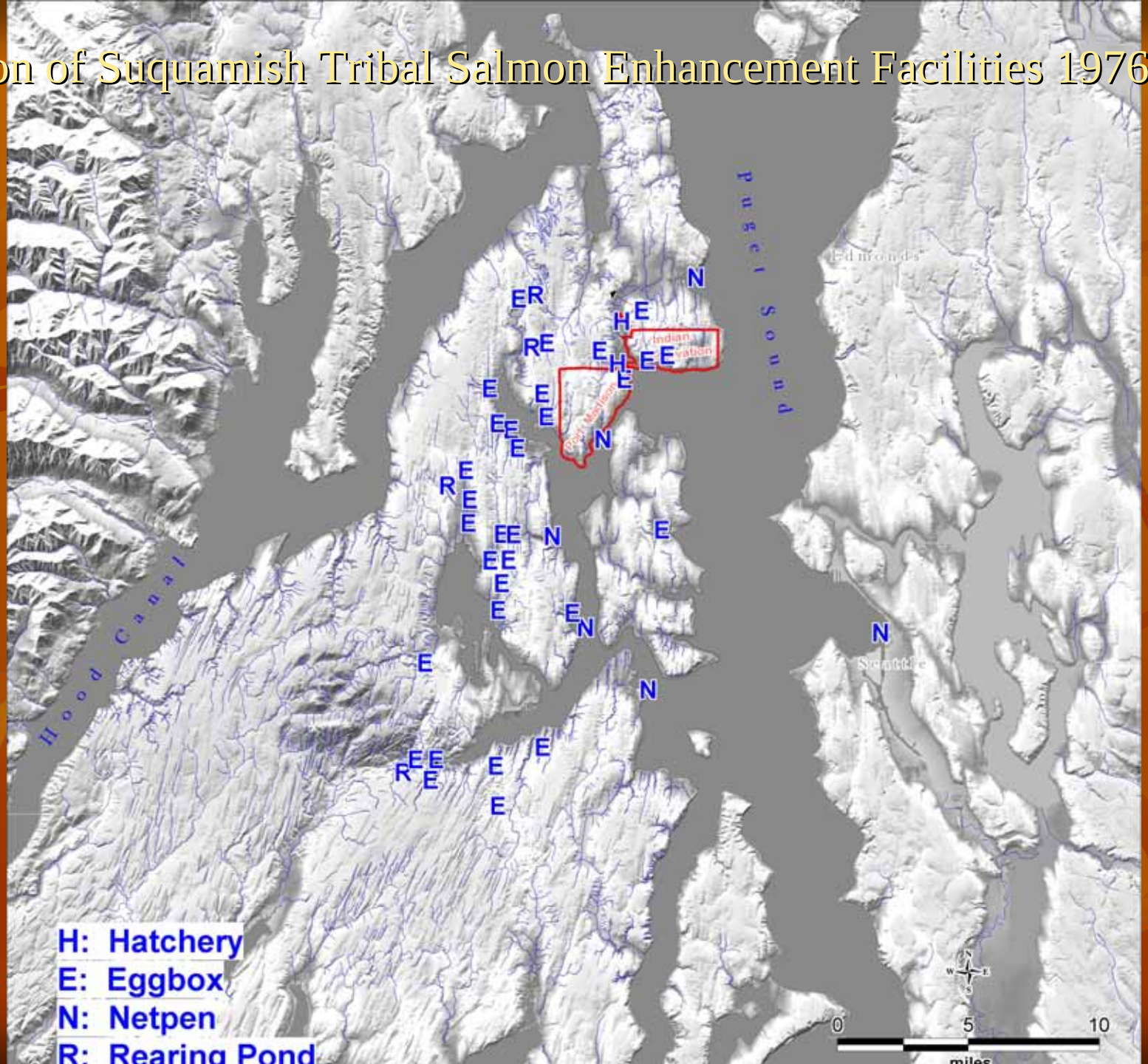
Suquamish Tribal Assessments
Puget Sound Partnership
February 28, 2008 Workshop

Suquamish Tribe U&A
Port Madison Indian Reservation
STRAIT OF GEORGIA
JUAN DE FUCA
VICTORIA
Bellingham
Everett
SEATTLE
TACOMA
Port Angeles
Mt. Olympus
Bremerton
Great Peninsula
Shelton
PUGET SOUND
Suquamish Tribe U&A

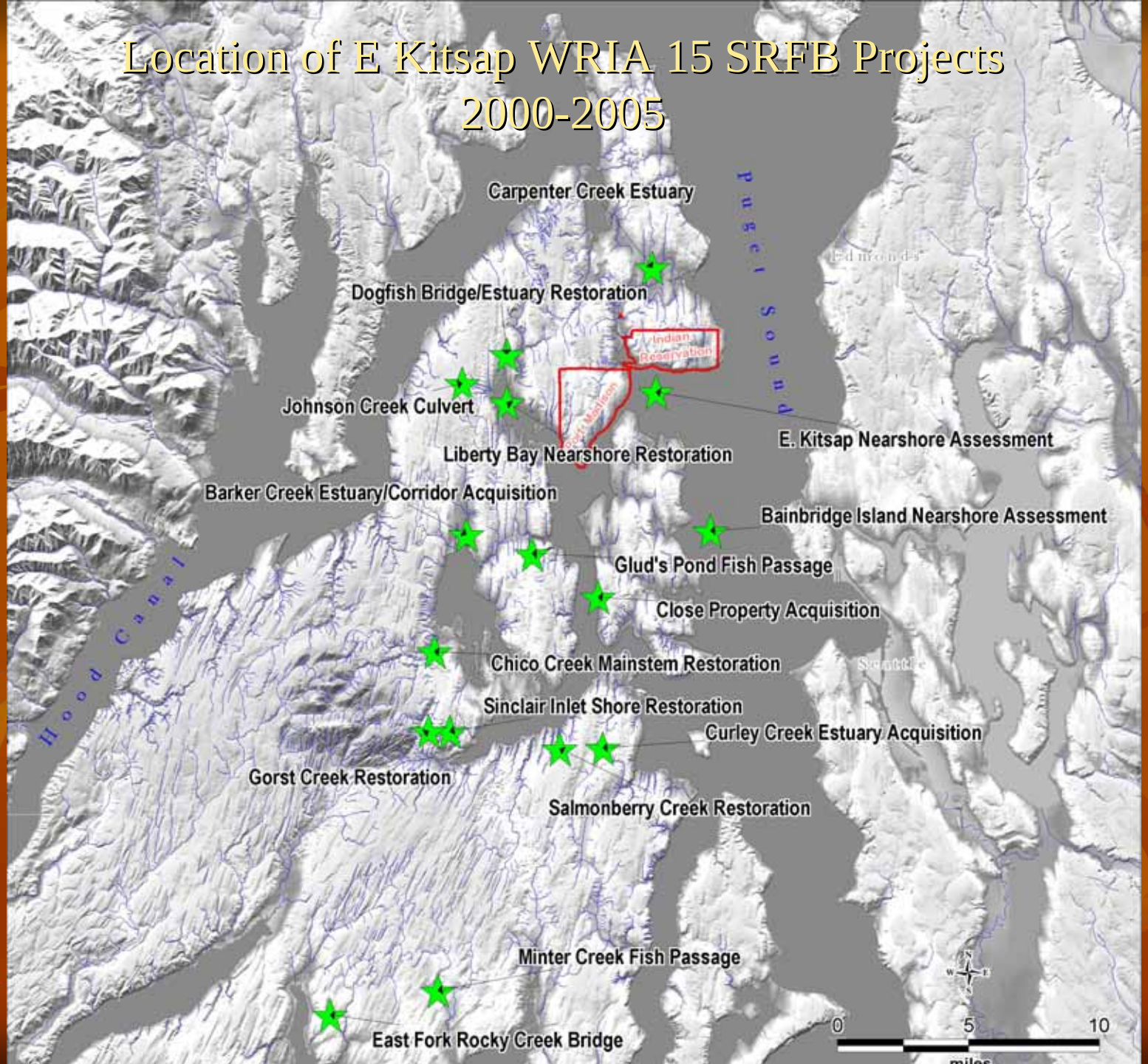

Suquamish Tribal
Winter Village Sites
in Kitsap County, Washington
N
W
E
S


Suquamish Tribal
Midden Locations
in Kitsap County, Washington
N
W
E

Location of Suquamish Tribal Salmon Enhancement Facilities 1976-2005

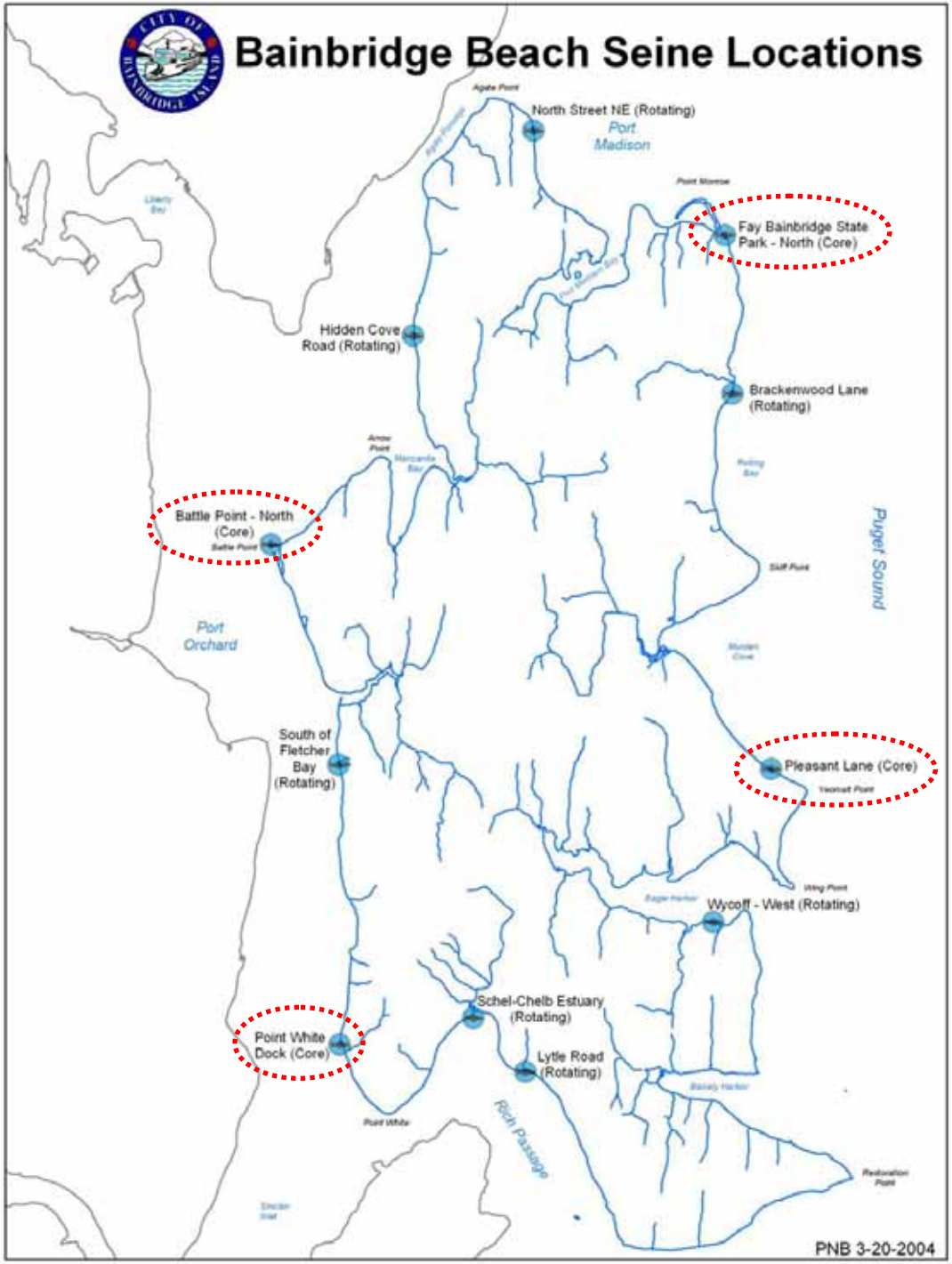


Location of E Kitsap WRIA 15 SRFB Projects 2000-2005



Sample Sites

- 4 Regular Sites
- 10 Rotating Sites
- Additional sites sampled during initial exploration



Objectives

- Baseline Inventory of Nearshore Aquatic Species, including:
  - Presence
  - Life Stage (i.e. larval, juvenile, adult)
  - Duration
  - Habitat Associations
- Monitor Hatchery vs “Wild” Salmonid Interactions
- Increase Public Awareness about Nearshore Environment

Methods

- Beach Seine
- Bi-Weekly to Monthly Sampling
- Sampling Sites Determined by:
  - Geographic Location
  - Coastal Features & Habitats
  - Access
- 4 Regular Sites & 10 Rotating Sites
  - Rotating Sites Sampled less Frequently than Regular Sites
- Crews: Volunteers w/ Biologist on Board
- Data Storage: Access Database/ArcGIS Geodatabase

Volunteer Crews

2003-2004:

- 121 Volunteers
- 1,128 Hours

Example Sample Site

Battle Point

- Spit
- Pocket Estuary
- Mixed-Fine Beach

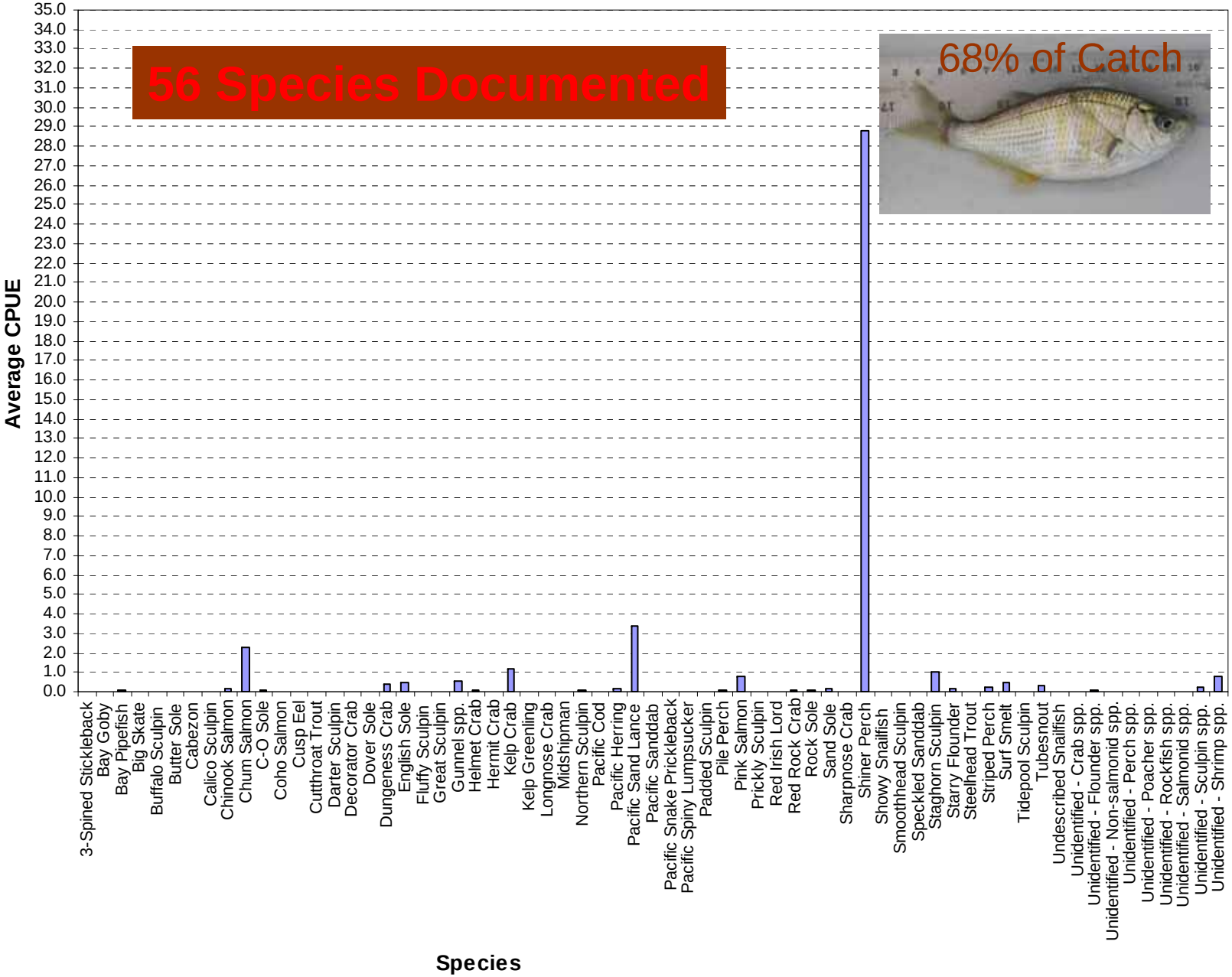
Example Sample Site

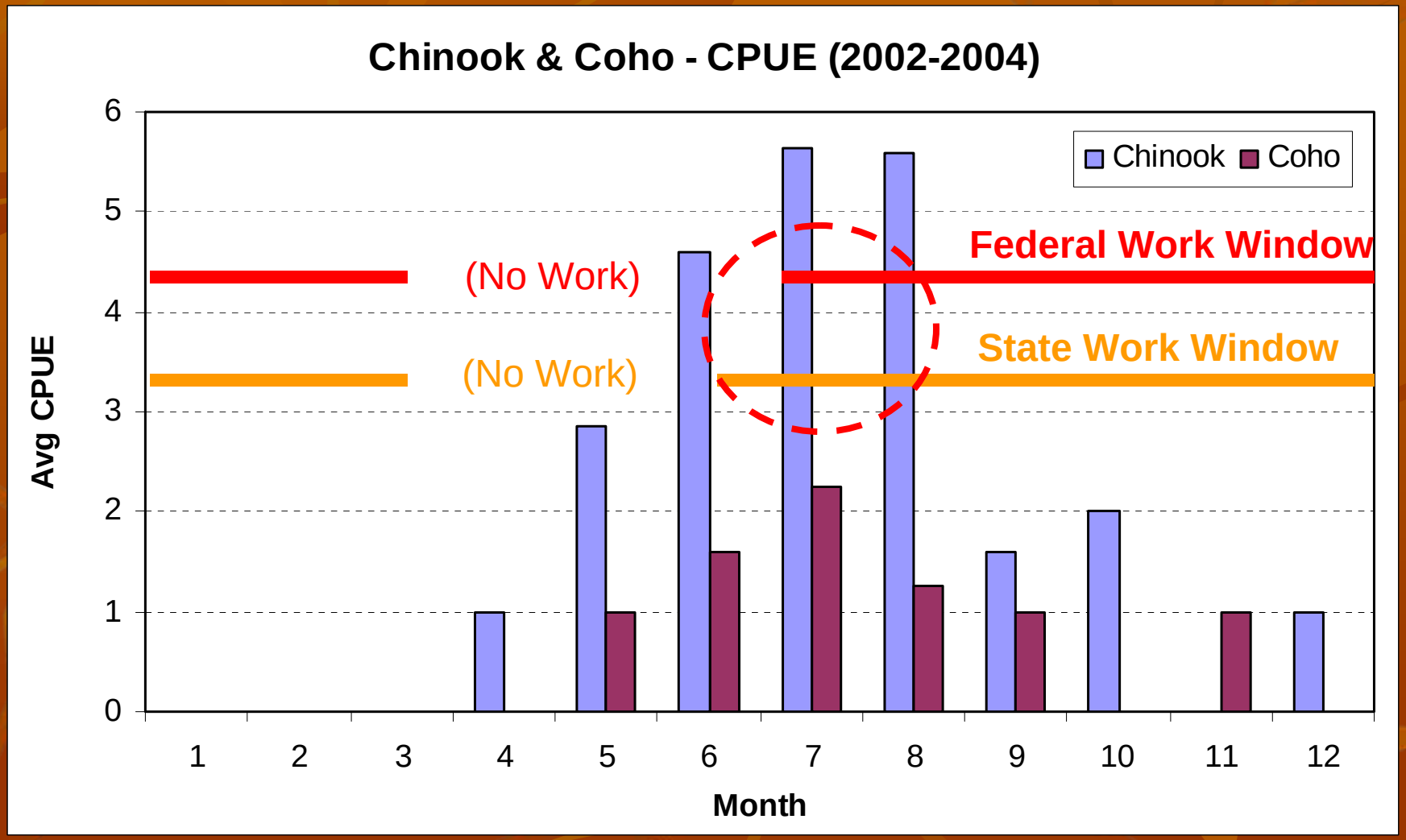
Example Sample Site

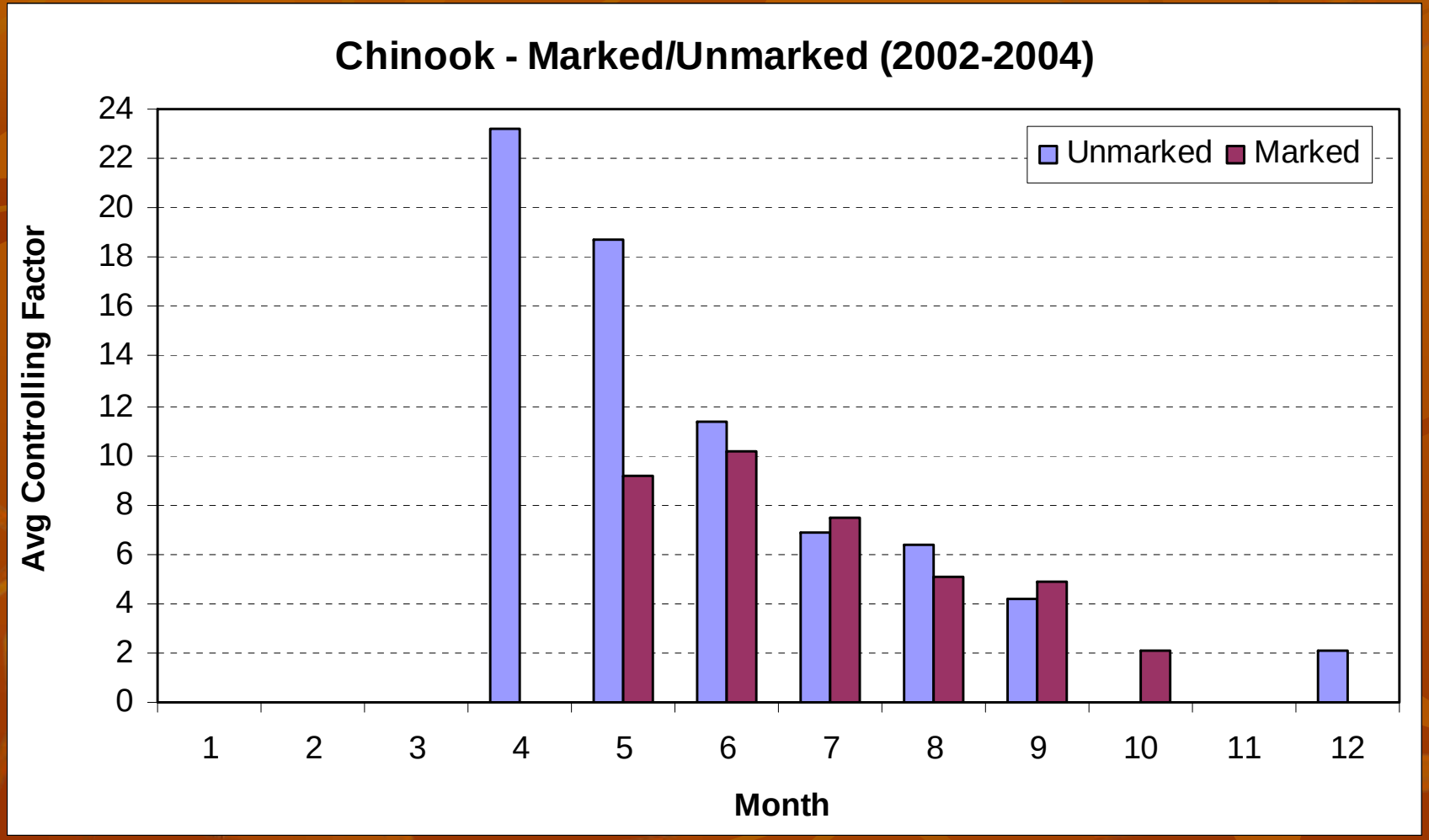
South of Fletcher Bay

- Open Shoreline
- Riparian Forest
- Mixed-Course Beach

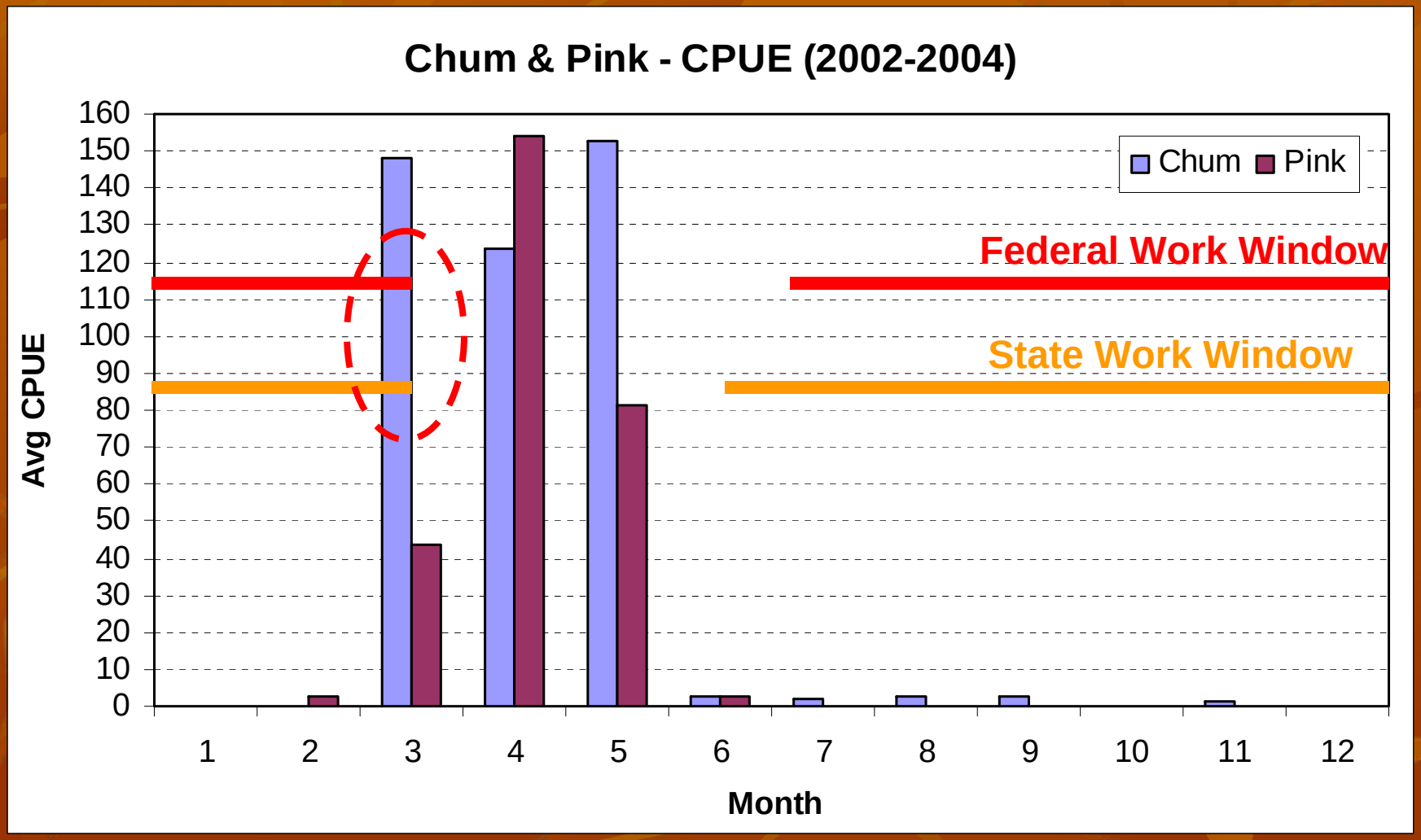
CPUE by Species (2002-2004)



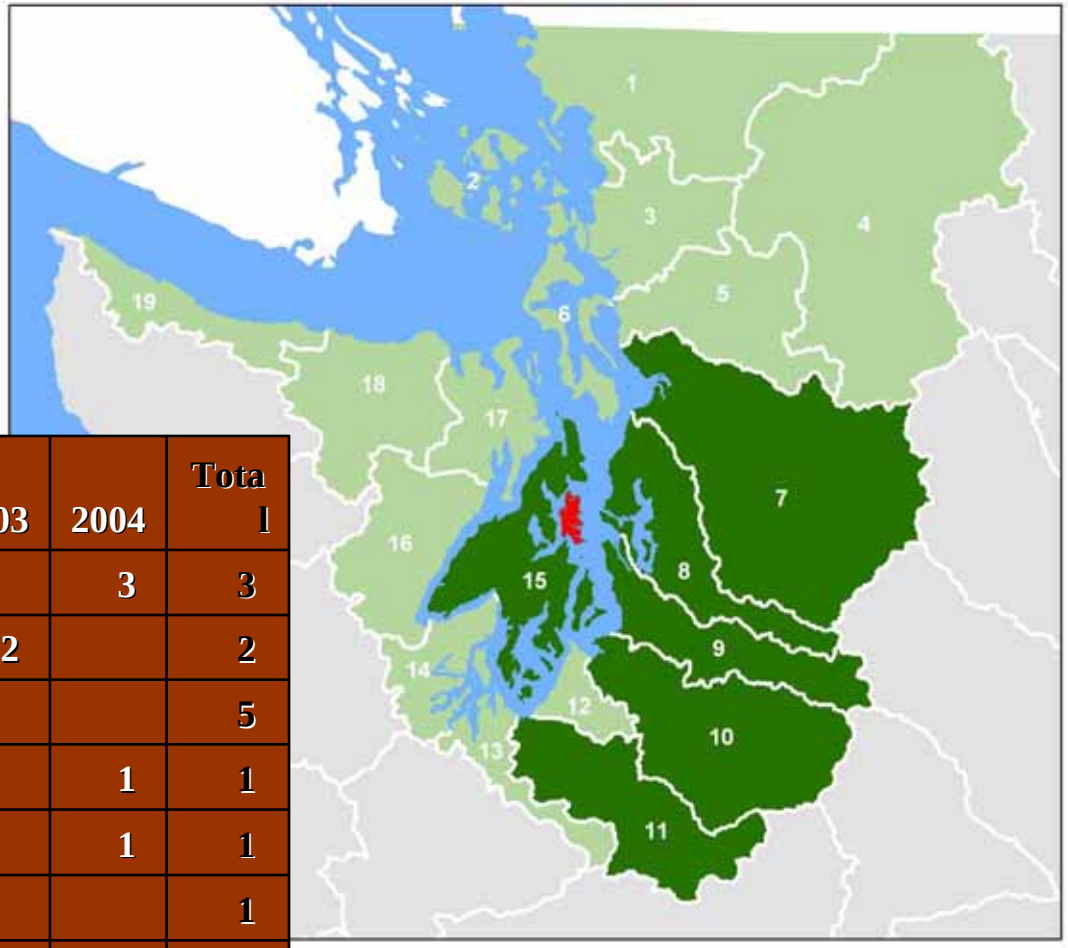

Chinook & Coho - CPUE (2002-2004)
Chinook
Coho
Federal Work Window
State Work Window
(No Work)
(No Work)
Avg CPUE
0
1
2
3
4
5
6
1
2
3
4
5
6
7
8
9
10
11
12
Month


Chinook - Marked/Unmarked (2002-2004)
Avg Controlling Factor
24
22
20
18
16
14
12
10
8
6
4
2
0
Unmarked
Marked
1
2
3
4
5
6
7
8
9
10
11
12
Month

10
11
12
13

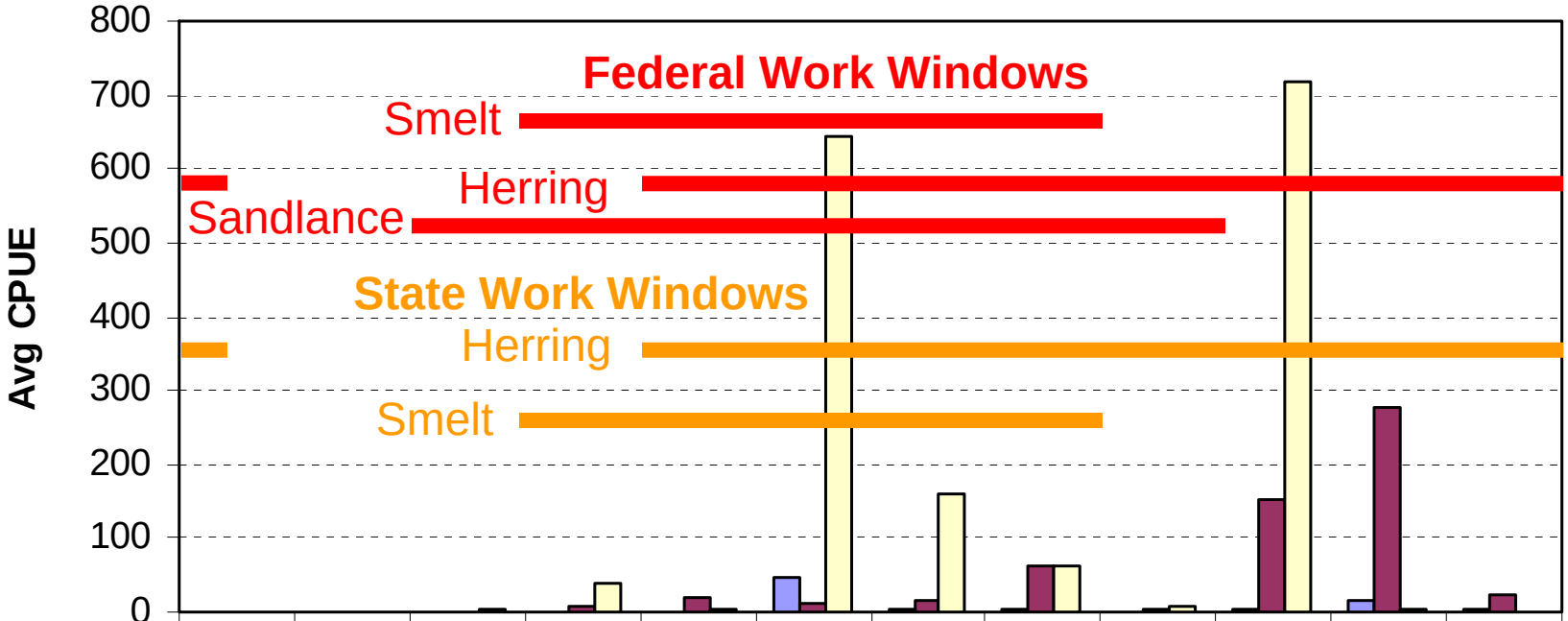

Chum & Pink - CPUE (2002-2004)
Avg CPUE
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
Chum
Pink
Federal Work Window
State Work Window
1
2
3
4
5
6
7
8
9
10
11
12
Month

Chinook CWT Recoveries

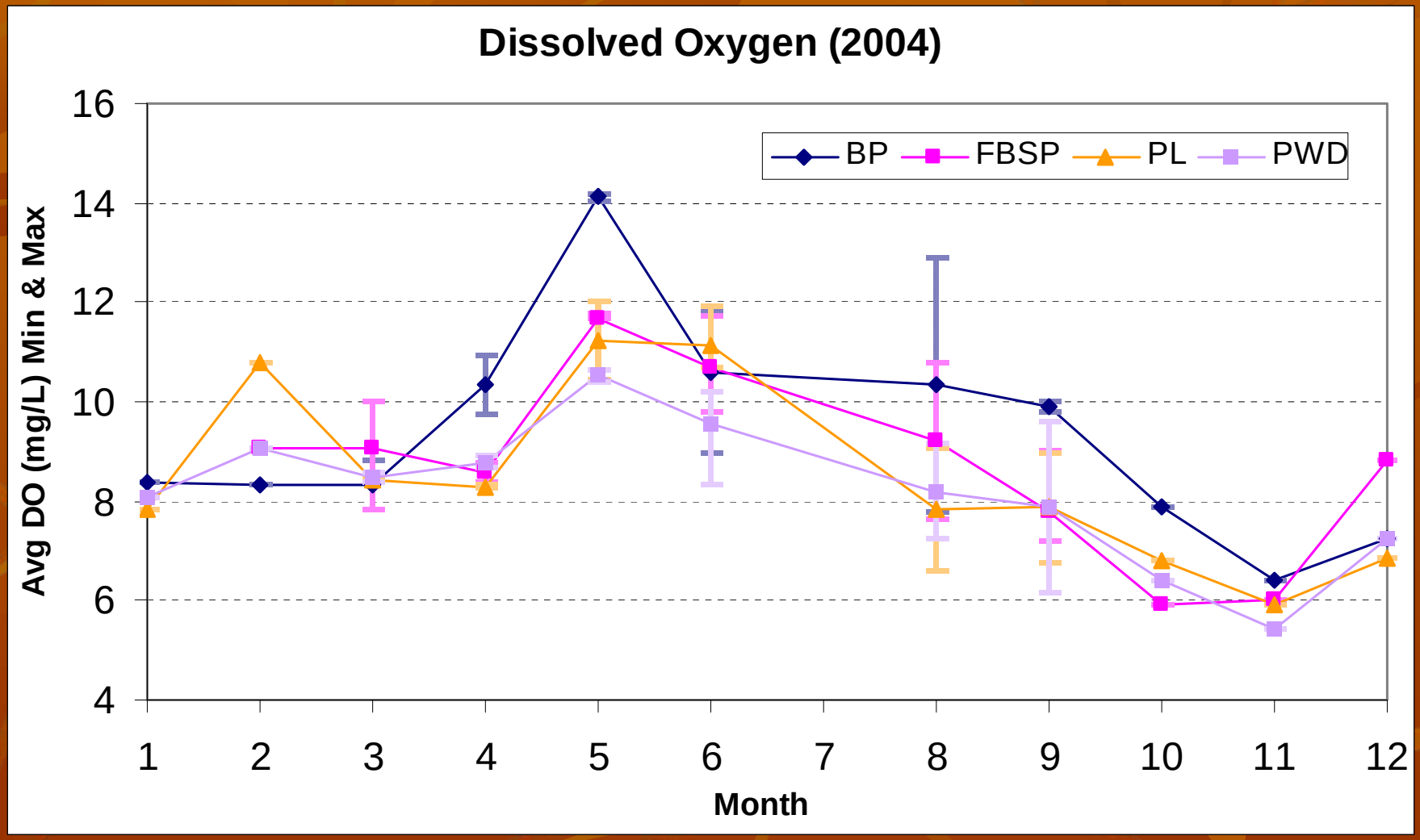


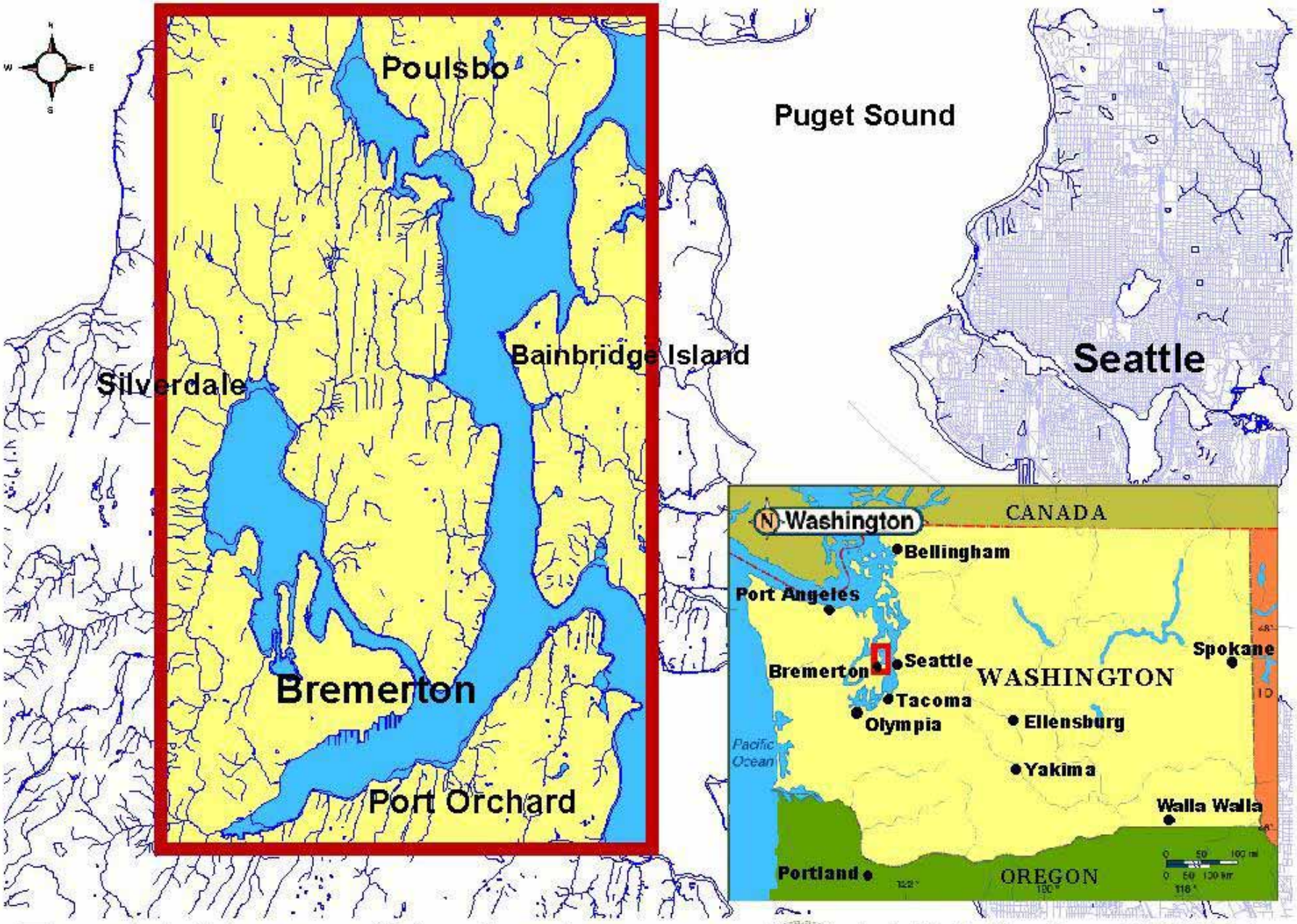
WRIA	Release Location	2002	2003	2004	Total
7	Wallace River			3	3
8	Issaquah Creek		2		2
9	Big Soos Creek	5			5
10	Clarks Creek			1	1
10	Voight Creek			1	1
10	White River	1			1
11	Nisqually River	1			1
15	Clear Creek			1	1
15	Gorst Creek	1	4	2	7
15	Grovers Creek		13	4	17
15	Minter Creek			2	2
	Total	8	19	14	41

Forage Fish - CPUE (2002-2004)



Month	1	2	3	4	5	6	7	8	9	10	11	12
Herring	-	-	-	1	1	48	5	2	2	3	16	3
Surf Smelt	-	-	-	10	18	12	16	62	3	151	279	22
Sand Lance	-	-	3	39	3	644	160	63	6	720	2	-

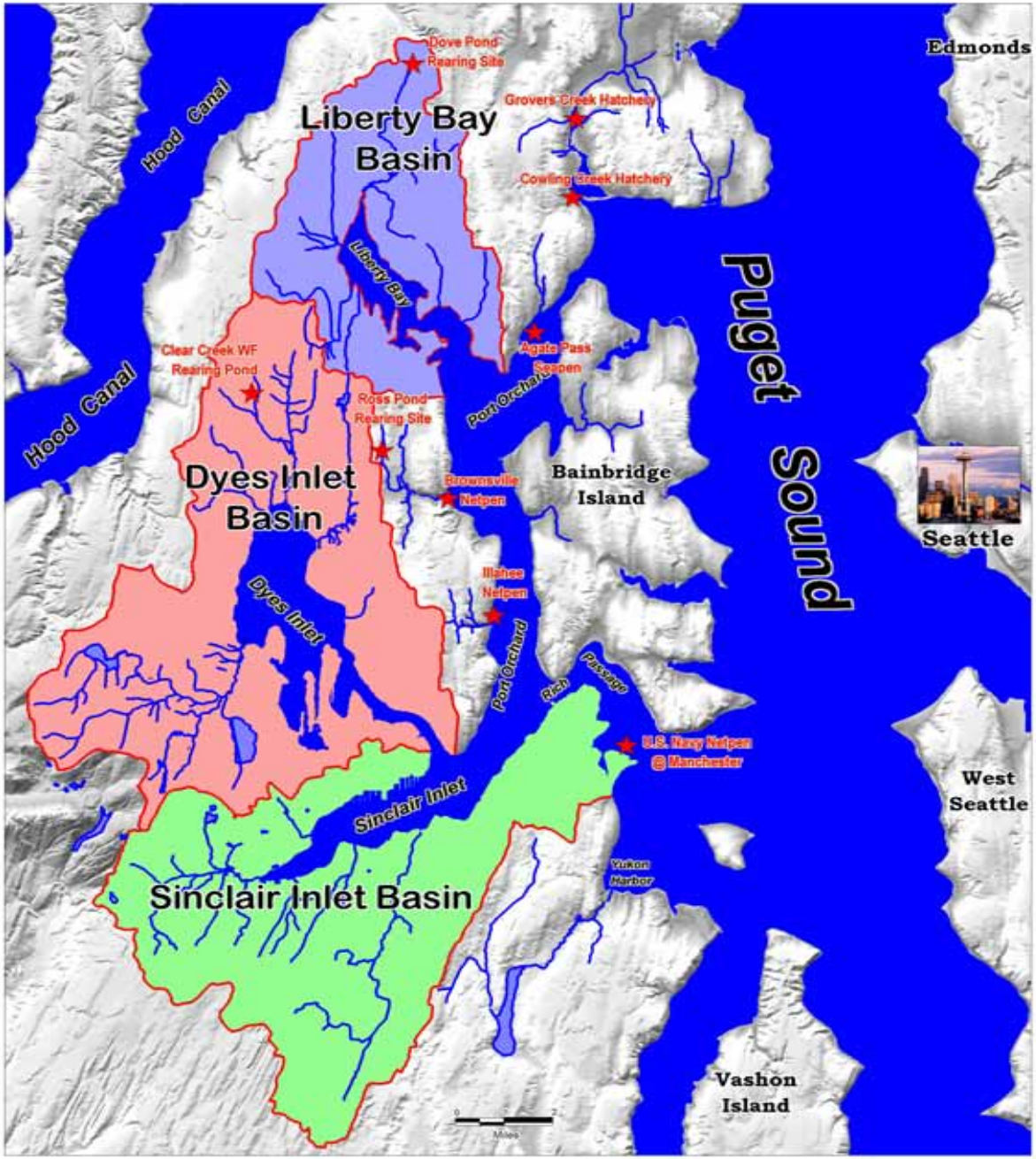

Dissolved Oxygen (2004)
Avg DO (mg/L) Min & Max
16
14
12
10
8
6
4
1
2
3
4
5
6
7
8
9
10
11
12
Month
BP
FBSP
PL
PWD



East Kitsap Study Area

Created for Jon Oleyar, Suquamish Tribal Fisheries
By Eron Drew, NWIFC SSHIAP
April 30, 2003

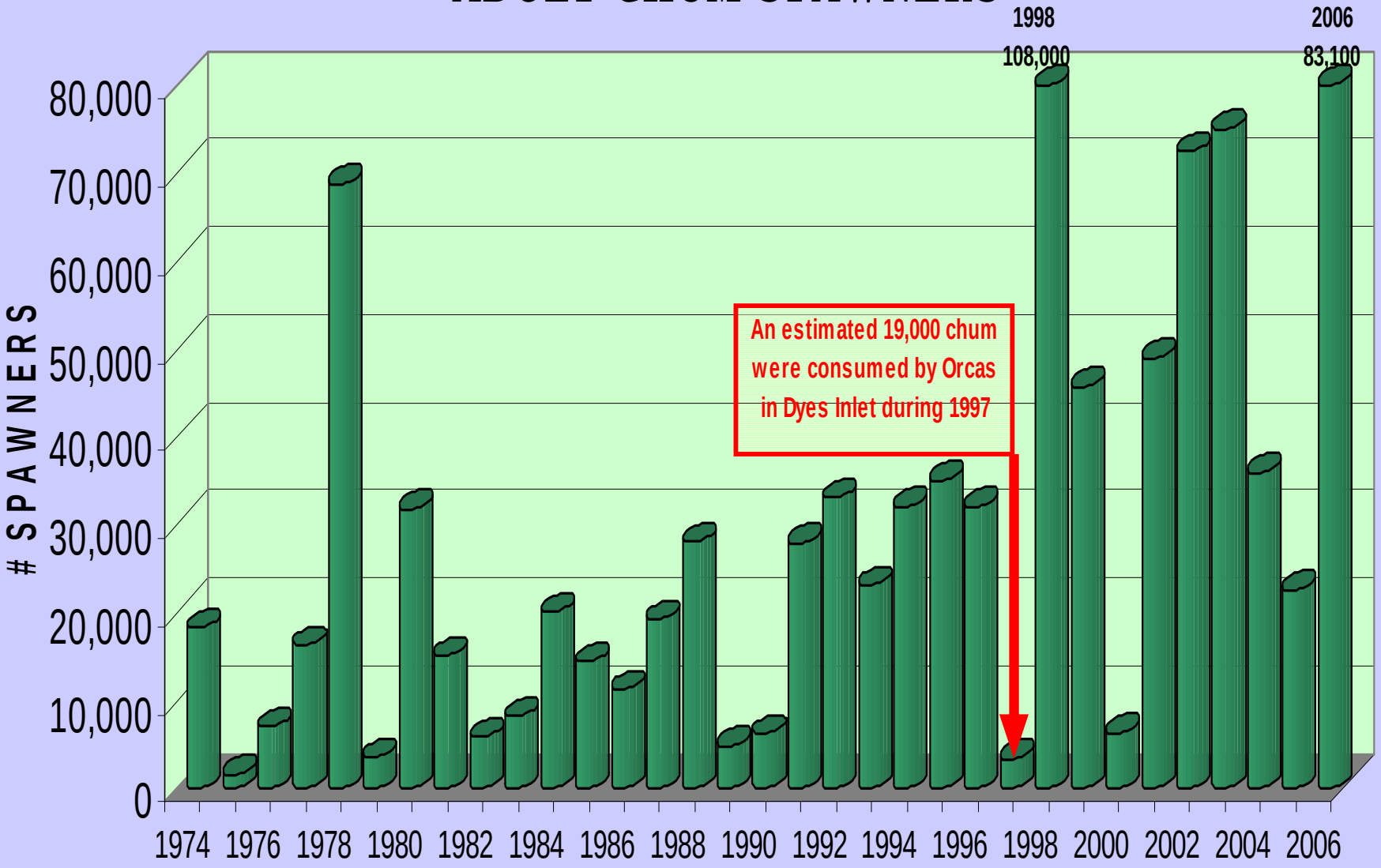
Suquamish Tribe Coho Study Area



Coho Escapement Mark Sampling Study Area
Liberty Bay, Dyes Inlet and Sinclair Inlet Basins

Chico Creek

CHICO CREEK
ADULT CHUM SPAWNERS



More Information…

Documents & Information on-line:
www.ci.bainbridge-isl.wa.us/seine

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