Circulation and Water Quality Modeling of Sinclair and Dyes Inlets and the Surrounding Watershed

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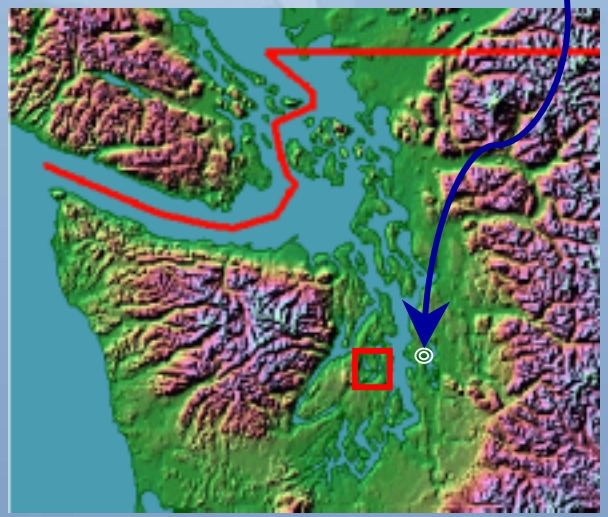
- Introduction
- Modeling Studies
  - Combined Sewer Overflow and Fecal Coliform TMDL
  - Linkage with Puget Sound POM
  - Fish Out Migration Study
- Contributions to Modeling Partnerships

Study Area

You are Here



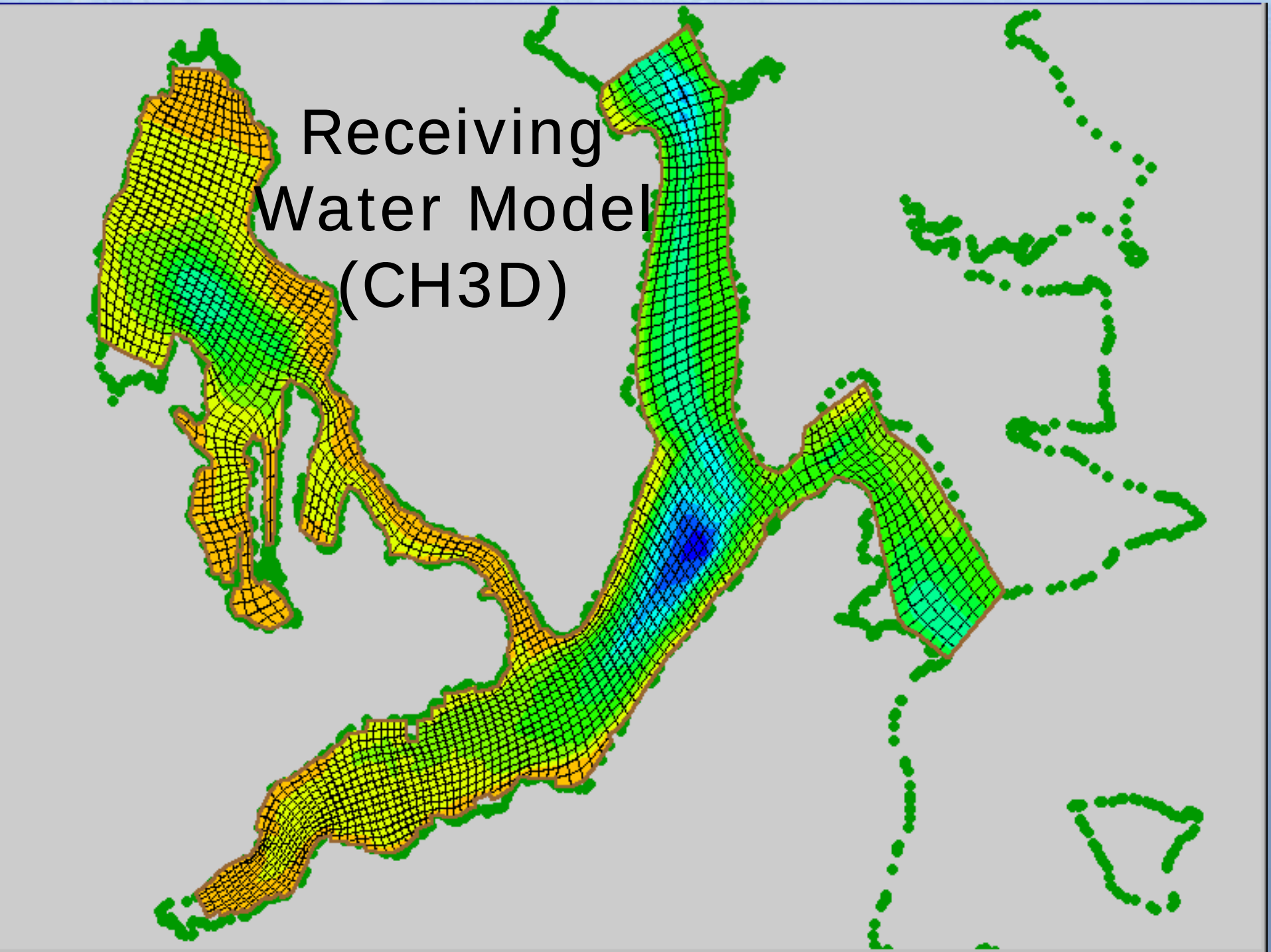
Dyes Inlet

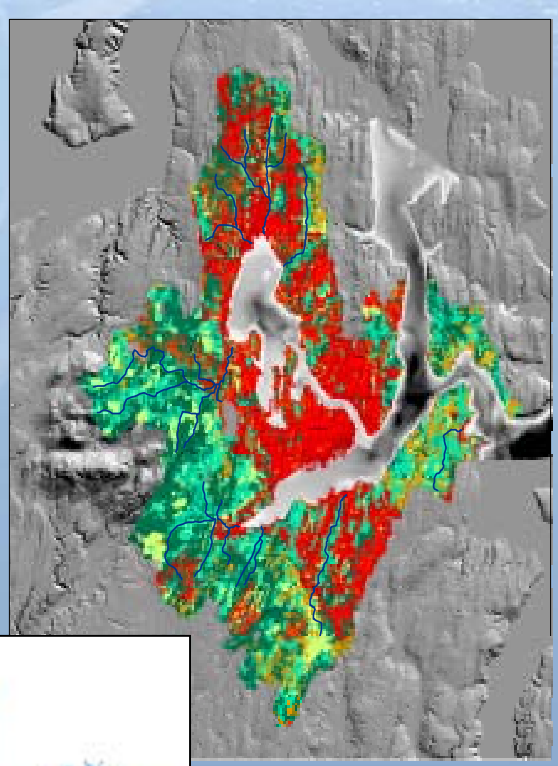
Bainbridge Island

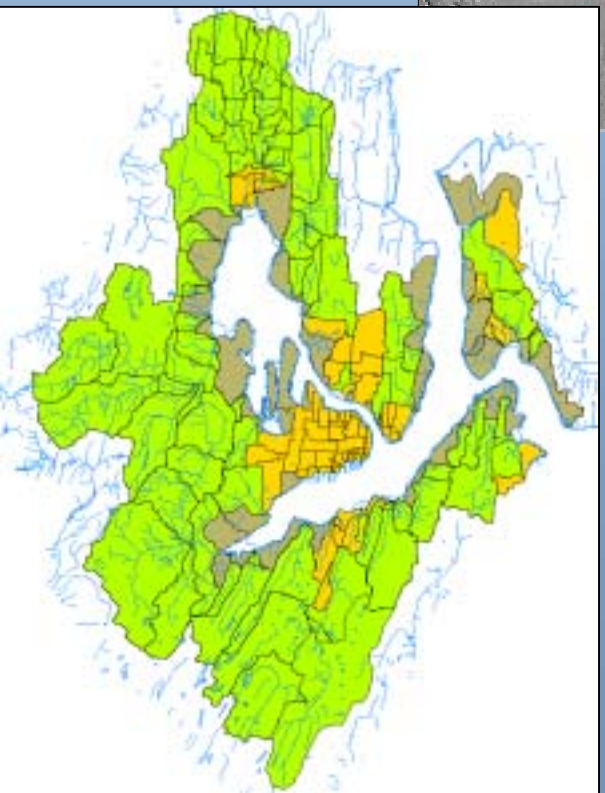
Bremerton

Sinclair Inlet

Port Orchard


Receiving
Water Model
(CH3D)



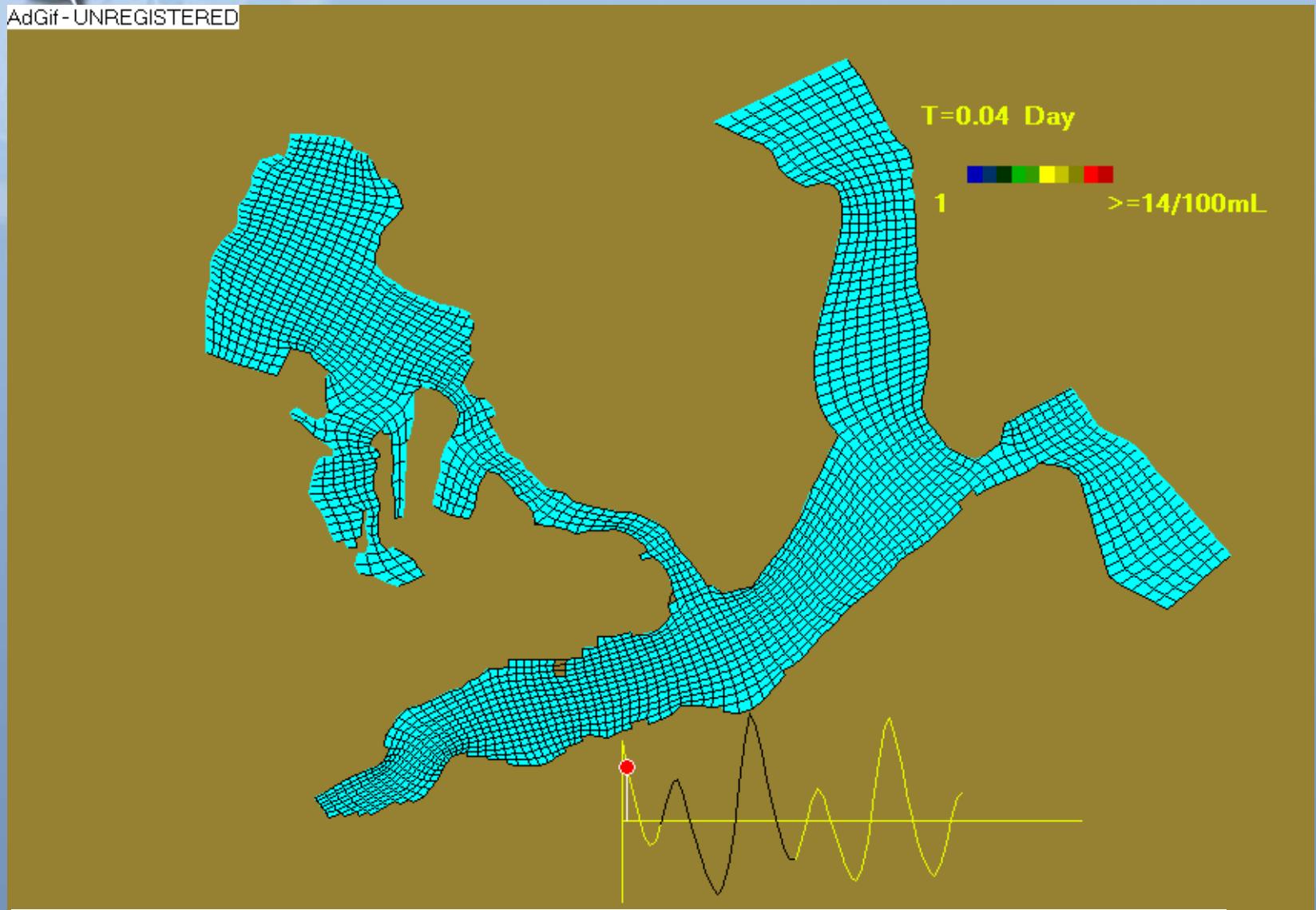


Watershed Model – HSPF

Simulations:

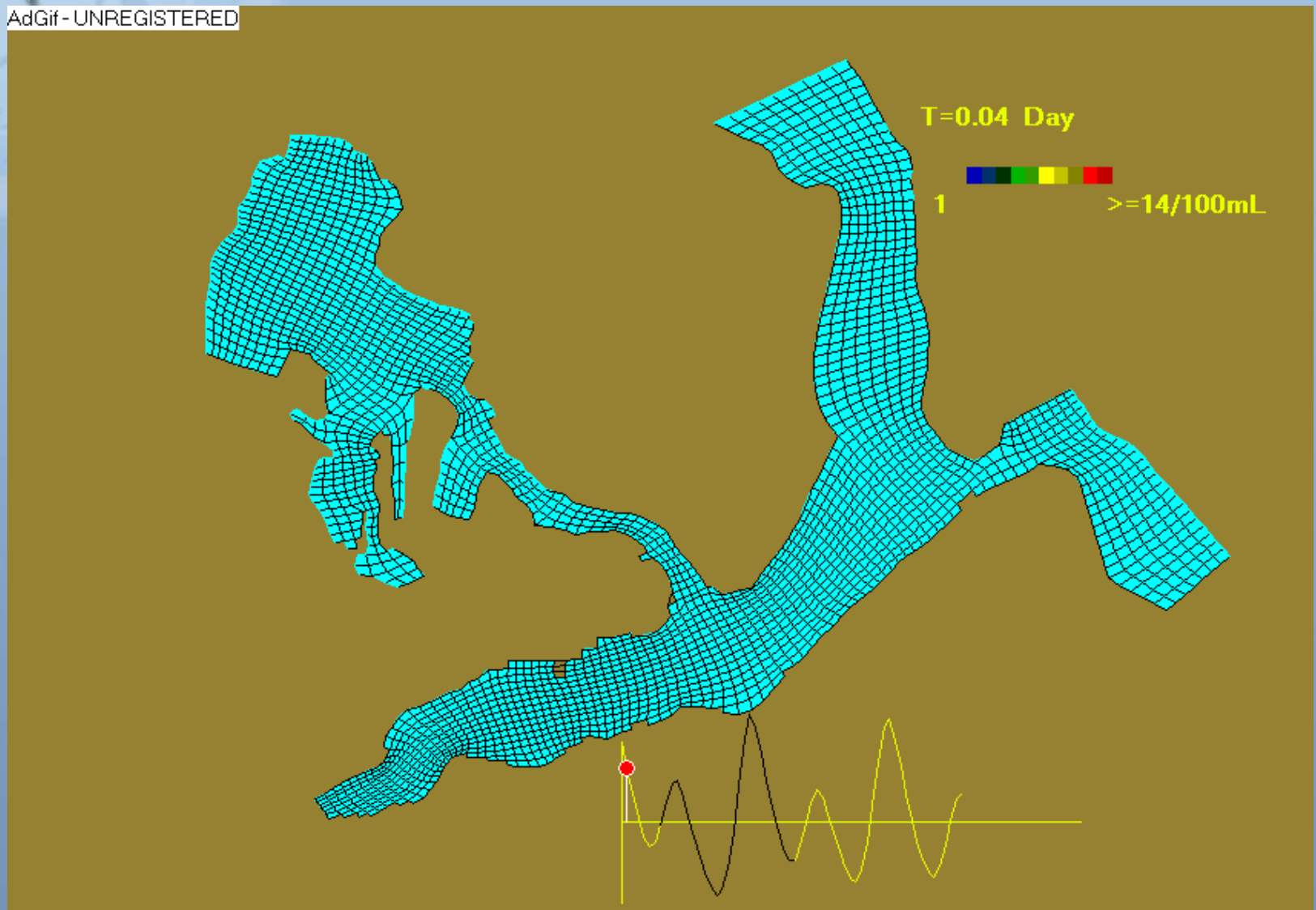
1. FC discharge from 12 major streams during a 2-year storm event (2.7” rain/24hr)
2. + Combined Sewer Overflow

Stream Discharge



http://www.psmem.org/models/graphics/Streamtoscn0.gif

Stream Discharge and CSO Event



http://www.psmem.org/models/graphics/avscn1_all.gif

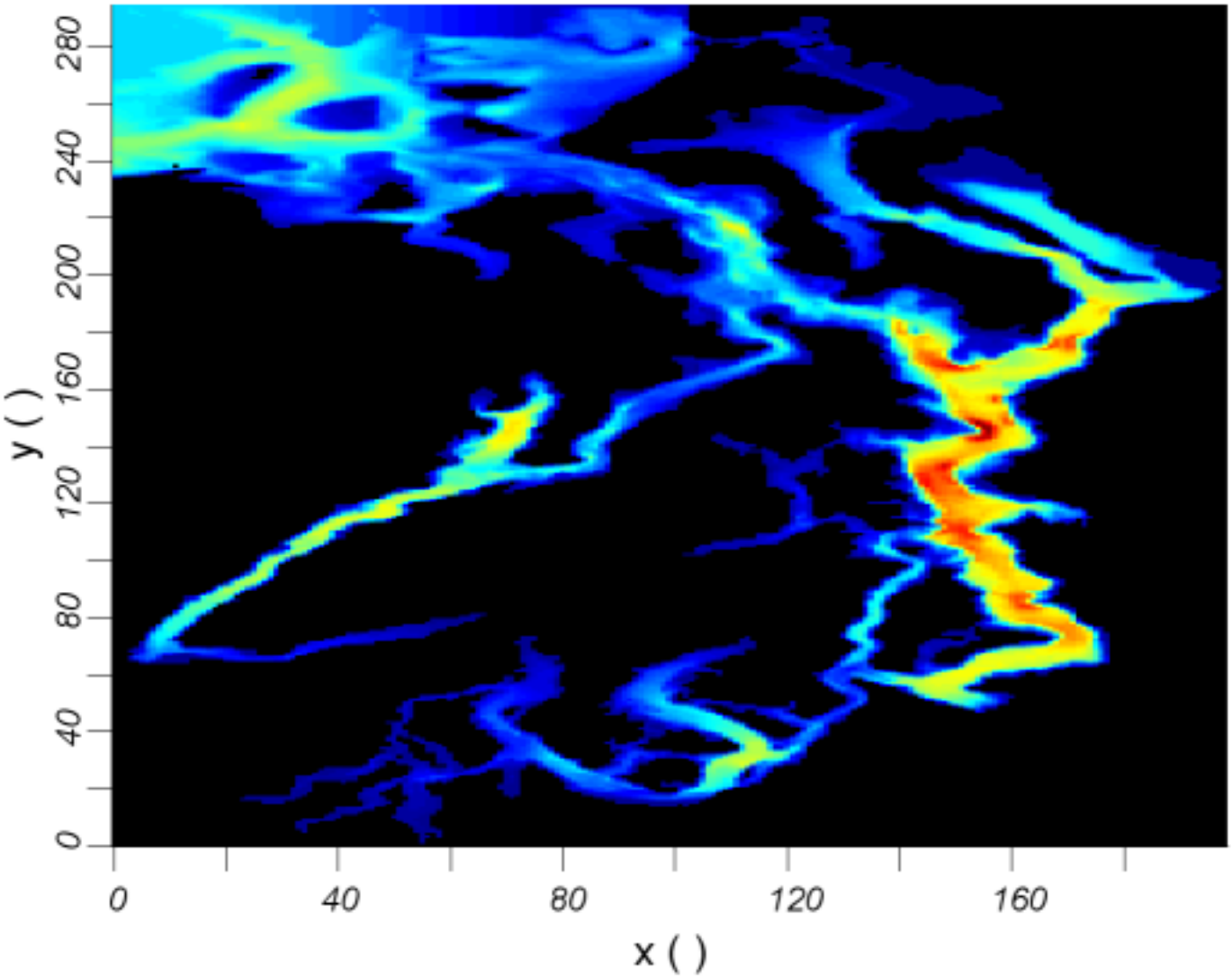
Accomplishments

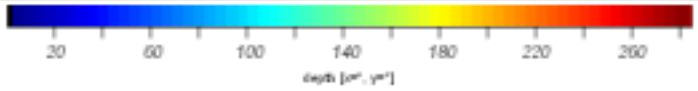
- Developed models for simulating runoff and loading from the watershed
- Bremerton's elimination of CSOs and the ability to simulate FC fate and transport in the Inlets resulted in the re-opening of **1500 acres** of shellfish beds in Dyes Inlet
- The integrated watershed-receiving water model is being verified so that the models can be used to simulate waste load allocation (WLA) and load allocation (LA) targets needed for the Total Maximum Daily Load (TMDL) Study


FIGURE #4
NORTHERN DYES INLET
PROPOSED CLASSIFICATION BOUNDARIES
PROHIBITED
BARKER CREEK
47.63699° N, 122.70068° W
47.63596° N, 122.67299° W
CONDITIONALLY APPROVED
47.62498° N, 122.68413° W
47.62498° N, 122.67775° W
CONDITIONALLY APPROVED
PROHIBITED
DYES INLET
47.60955° N, 122.70786° W
47.60955° N, 122.69115° W
RESTRICTED
47.59699° N, 122.68842° W
47.59631° N, 122.68842° W
47.59631° N, 122.68413° W
466
463
464
477
483
482
484
481
462
465
492
491
480
468
470
469
471
467
474
472
473
478
479

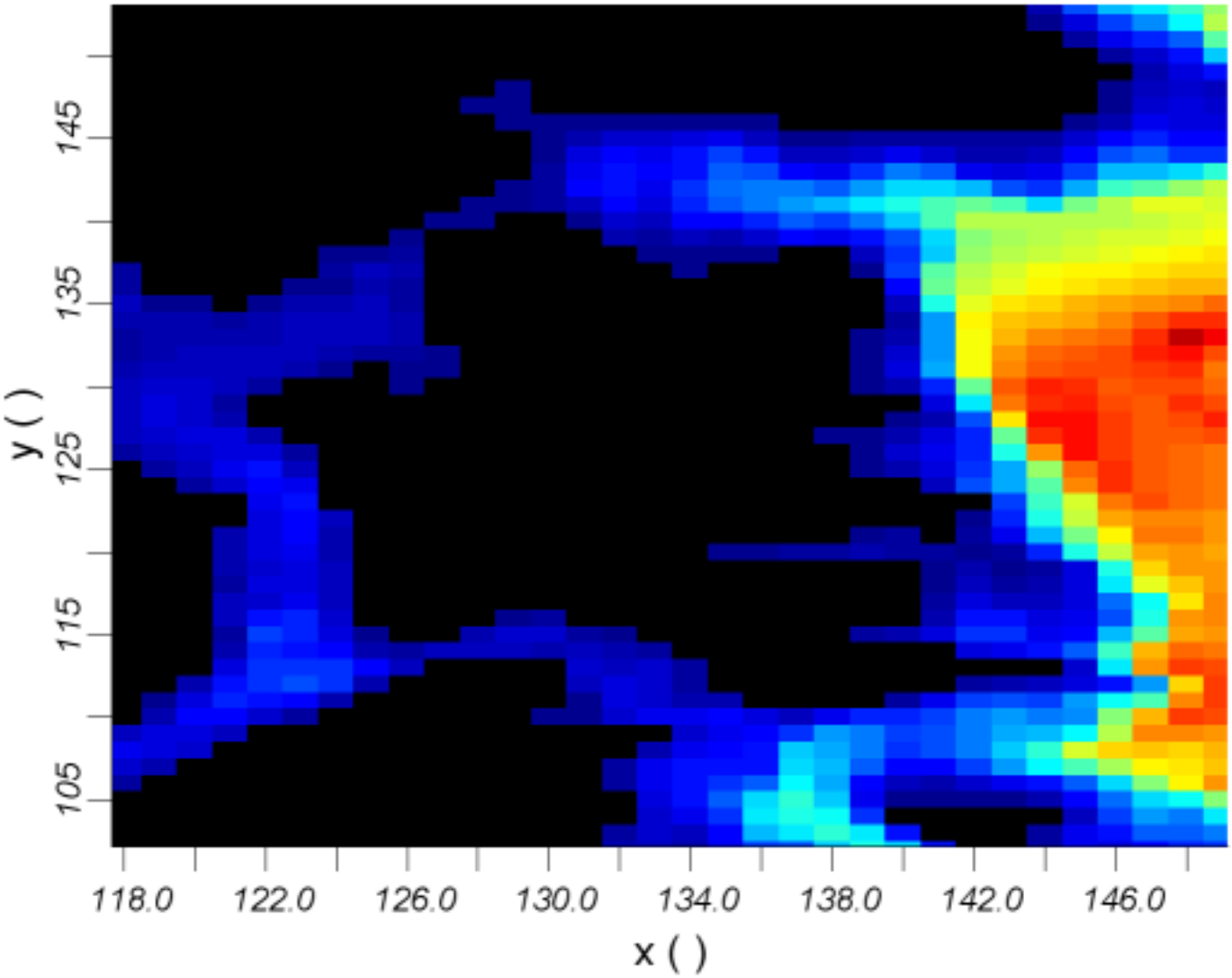
Coupling between Inlet and Sound

Numerical Grid for UW POM Model of the Puget Sound

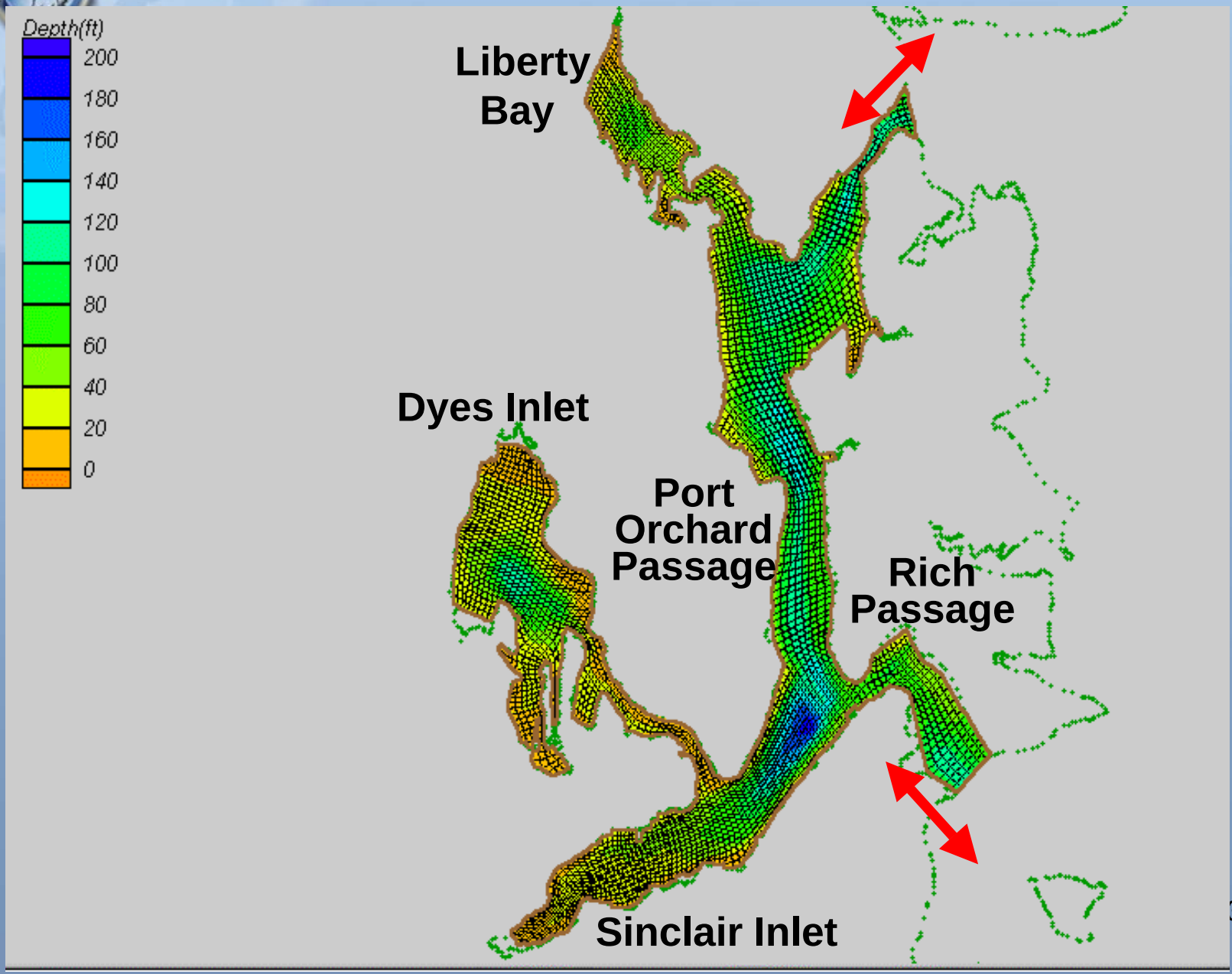




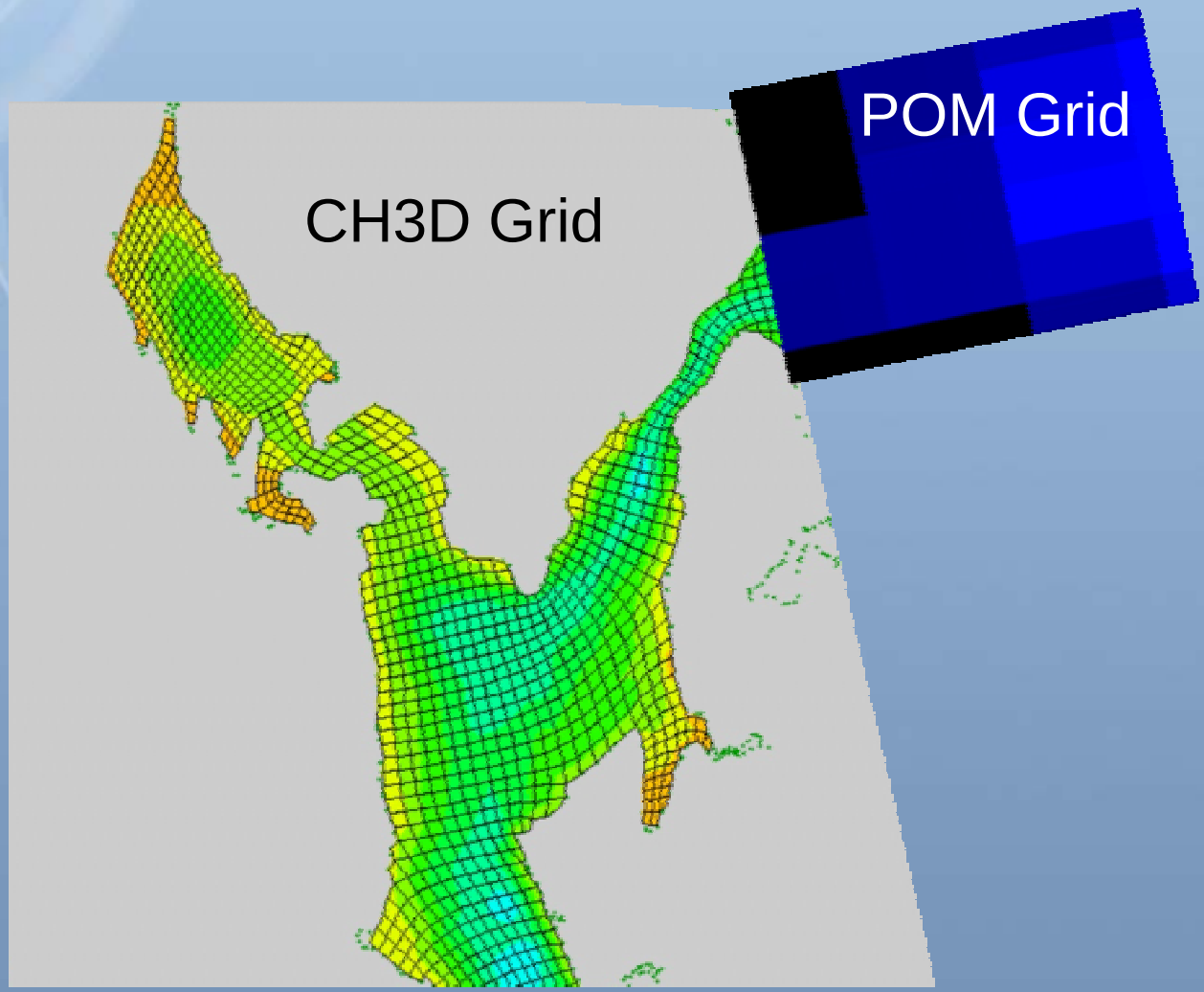
POM Model Grid around Bainbridge Island



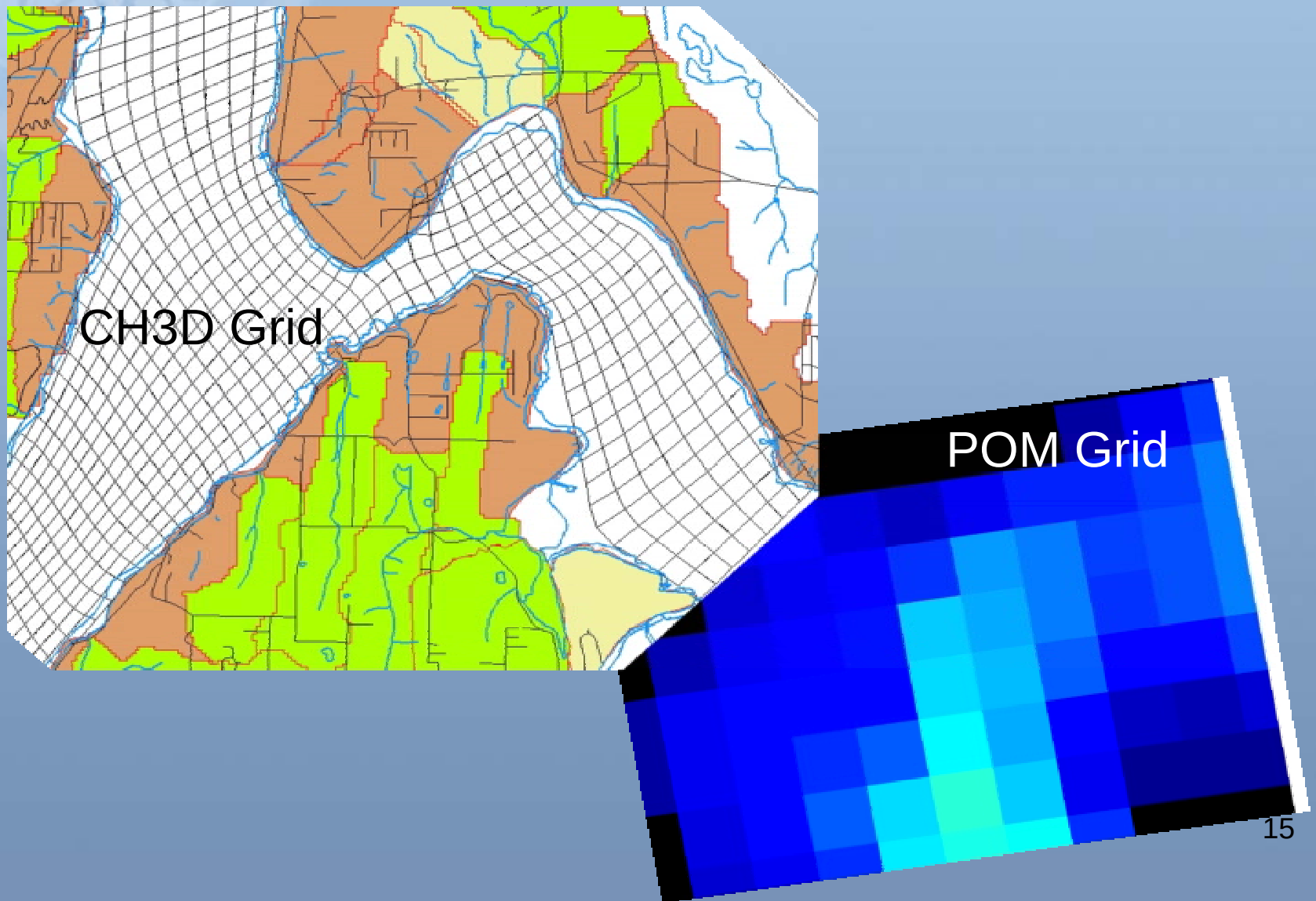
Extended CH3D Grid



Northern Boundary



Southern Boundary



Modeling Fish Out Migration

Life History and Ecology of Juvenile Salmonids in Sinclair Inlet

Kurt Fresh, Doris Small, Hwa Kim,
Chris Waldbillig, Mike Mizell & Mark Carr

April 2003 (Draft)

Photo by WDFW

Gorst Hatchery

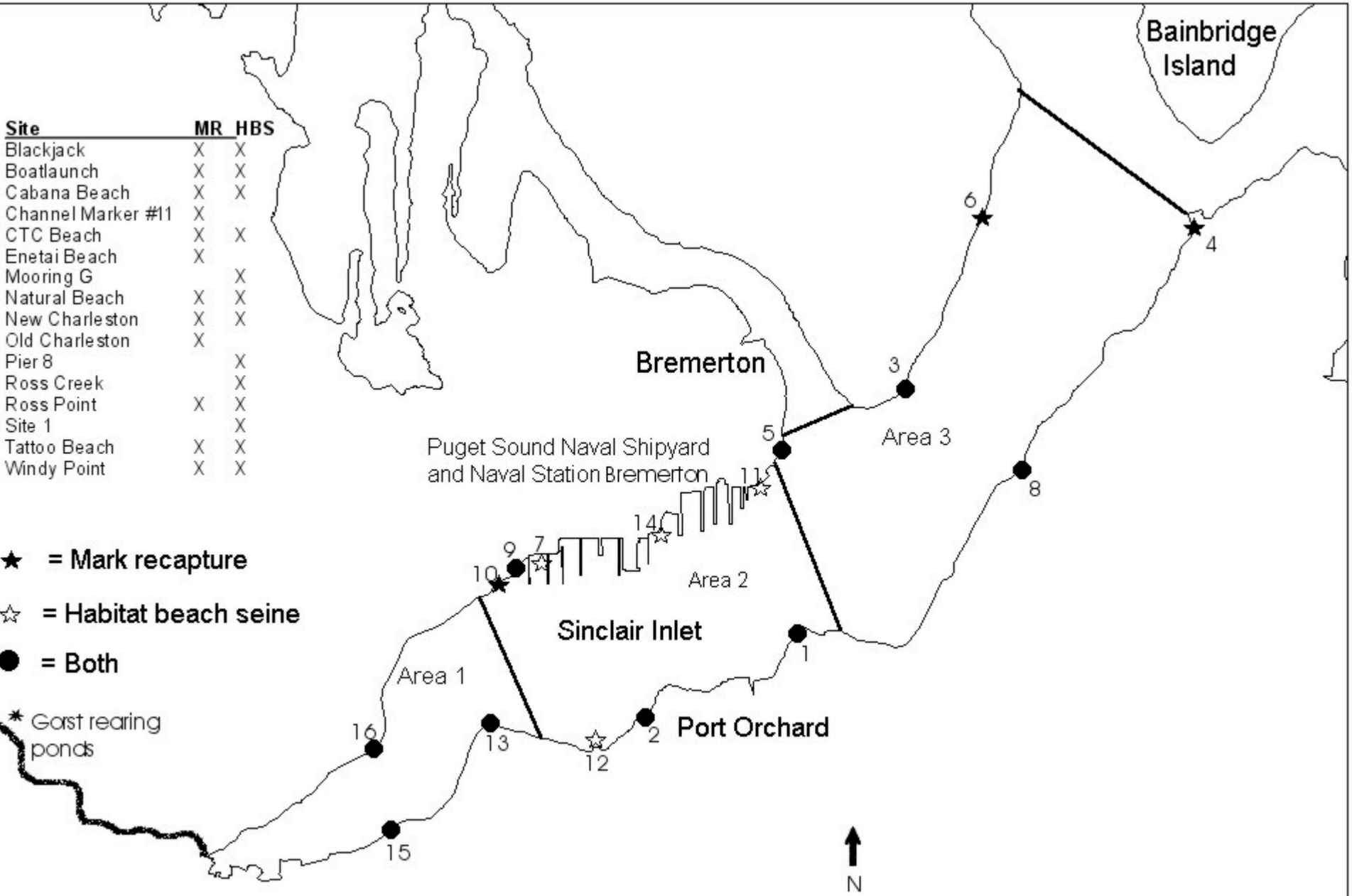
Photo by WDFW


Photo by WDFW


Photo by WDFW

Photo by WDFW

Photo by WDFW



Site	MR	HBS
Blackjack	X	X
Boatlaunch	X	X
Cabana Beach	X	X
Channel Marker #11	X	
CTC Beach	X	X
Enetai Beach	X	
Mooring G		X
Natural Beach	X	X
New Charleston	X	X
Old Charleston	X	
Pier 8		X
Ross Creek		X
Ross Point	X	X
Site 1		X
Tattoo Beach	X	X
Windy Point	X	X

Figure 2. Sinclair Inlet with mark recapture and habitat beach seine locations by area.

Modeling Fish Out-Migration

Objective: use the existing model to assist in evaluating the results of WDFW's out-migration study.

Modeling Fish Out-Migration Cont.

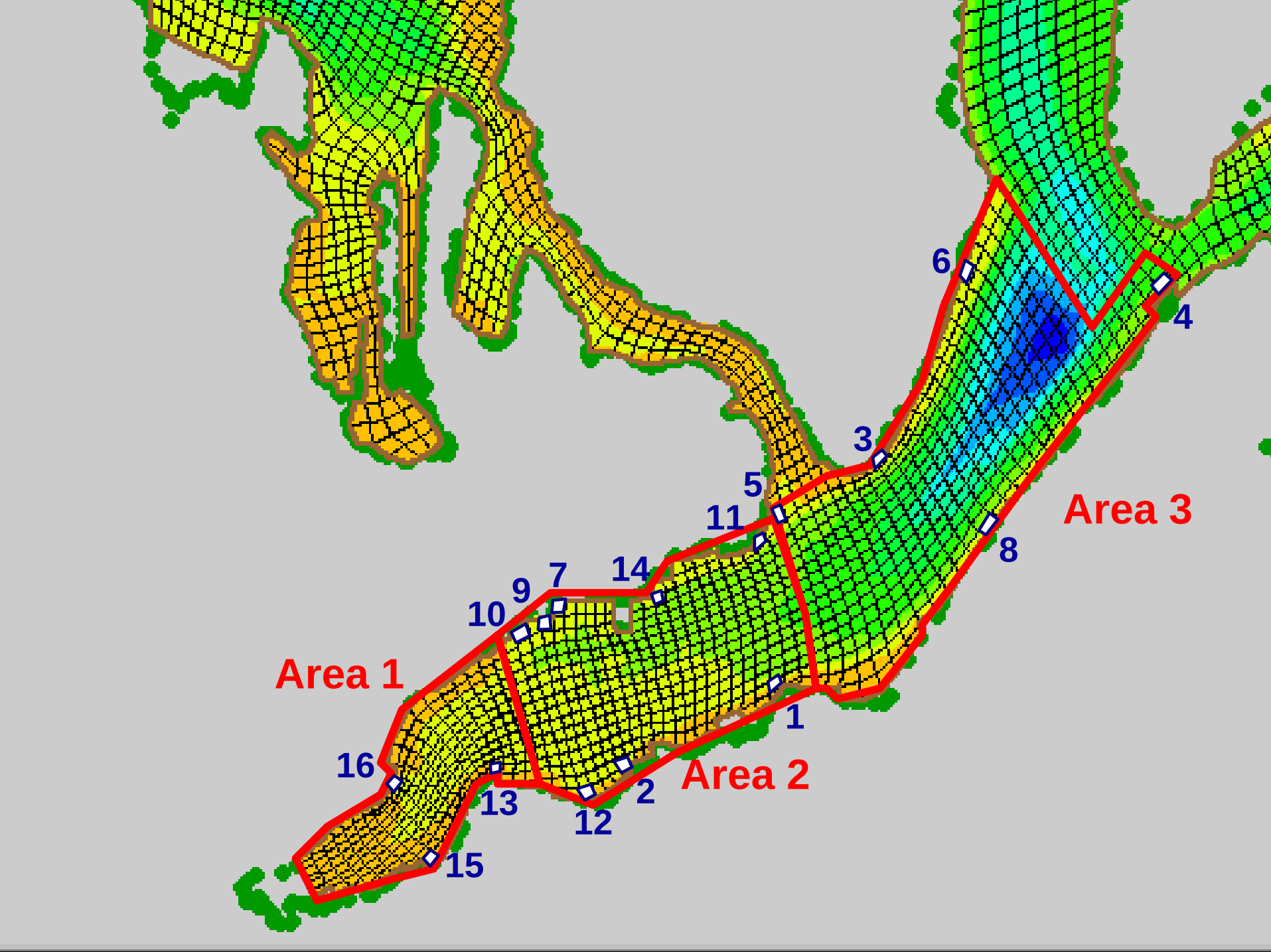
- Model the hydrological and tidal conditions present during the out migration sampling (19 May - 30 Jun 2002) to simulate the salinity distribution and currents during the release period.
- Release “tracer” in the simulation (roughly corresponding to when the majority of the marked fish were released into Gorst Creek) and track the “plume”.

Model Set Up

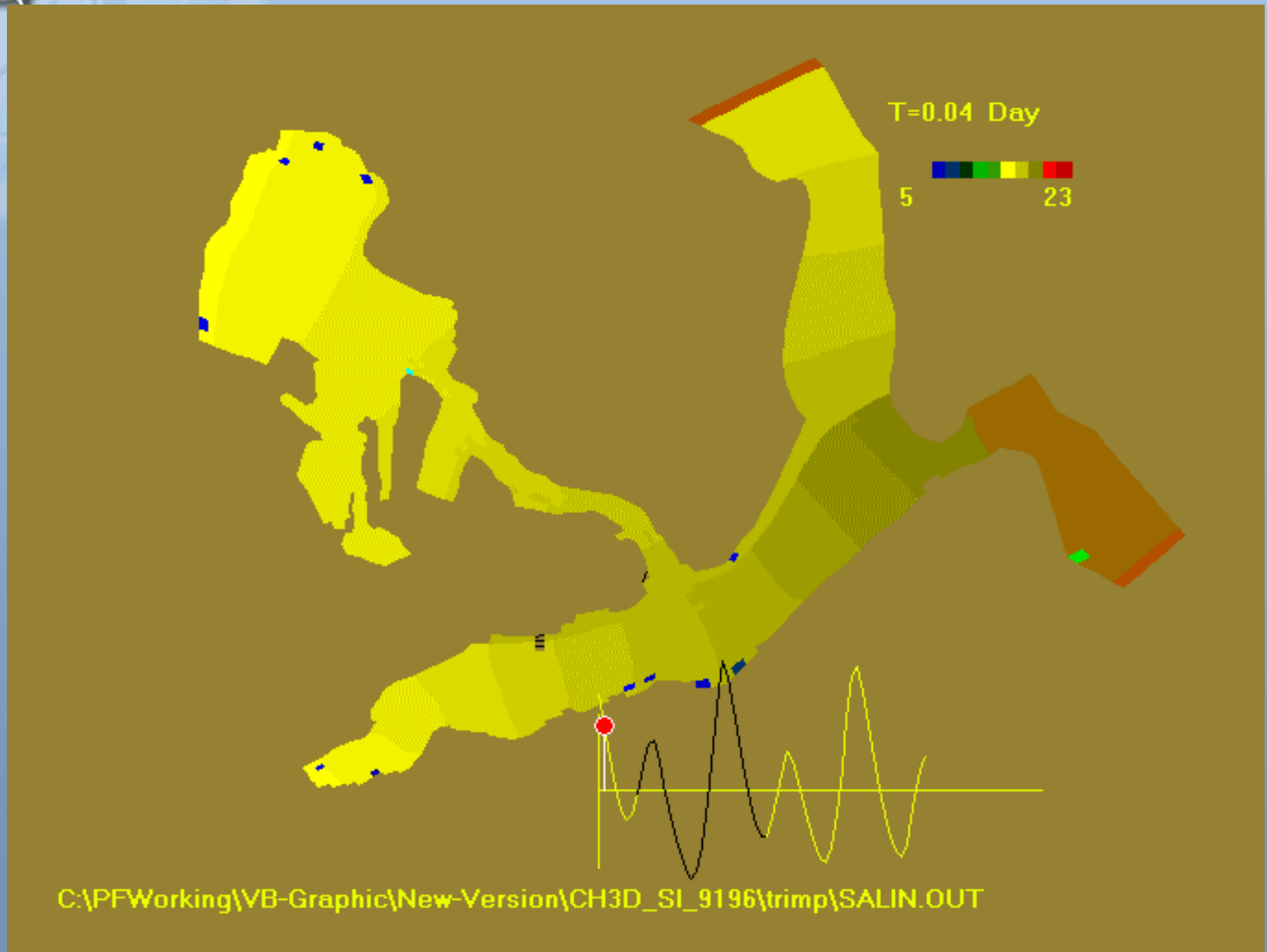
- Tidal Conditions
- Wind and Weather Conditions
- Fresh Water Flow
  - Stream flow simulated by HSPF
  - Stormwater flow simulated by HSPF
  - WWTP input into model
  - Other?

“ Tracer” Release

- Conservative tracer release (dye)
  - Disperse as a function of mixing
- Lagrangian Particles (dumb particles)
  - Disperse as flotsam or drifting nonmotile material
- Produce time series of tracer concentrations in portions of the model corresponding to sampling areas
- Null hypothesis: “No difference between fish density and tracer concentration”


6
4
3
5
11
8
Area 3
14
7
9
10
Area 1
1
16
Area 2
2
13
12
15

Salinity Animation



Contributions to Modeling Partnerships

- Focal point for watershed partnering
- Linkage between Inlet-Scale and Puget Sound
- Flux of constituents between domains
- Interactions between landscape and marine system
  - Water Quality
  - Natural Resources
  - Ecological Processes

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NAVSEA
NAVAL SEA SYSTEMS COMMAND
Puget Sound Naval Shipyard & Intermediate Maintenance Facility

NOPP