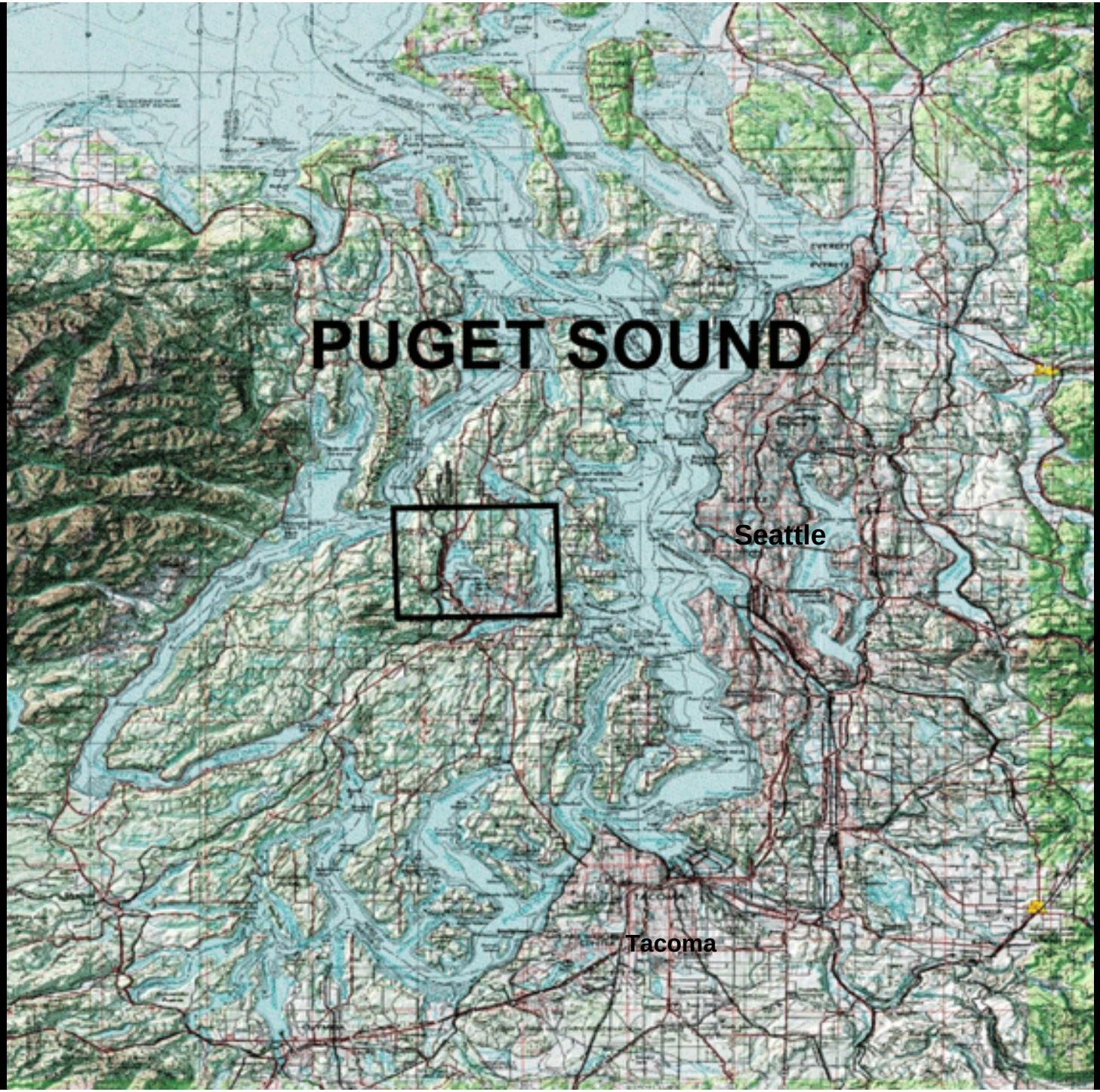
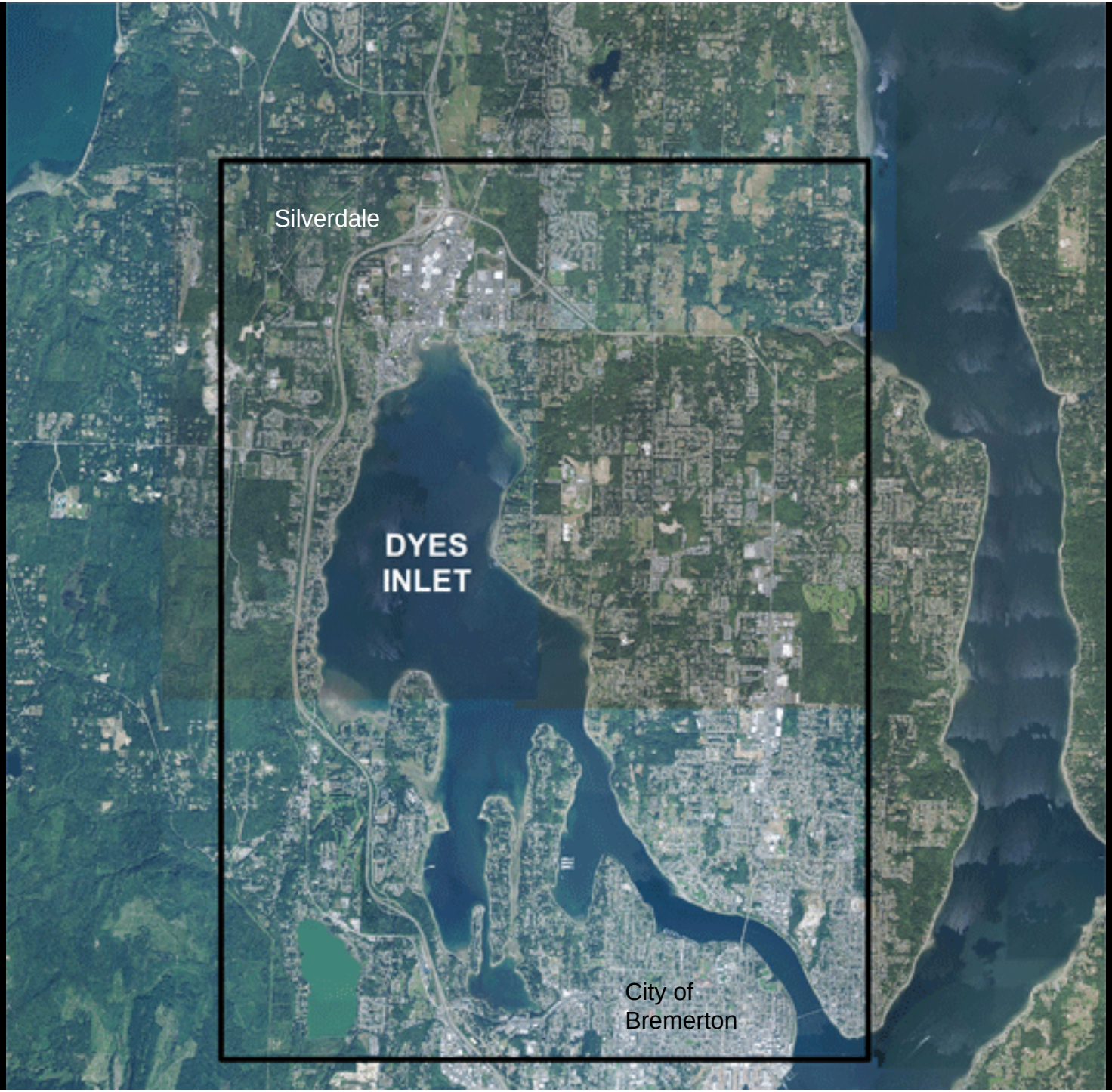
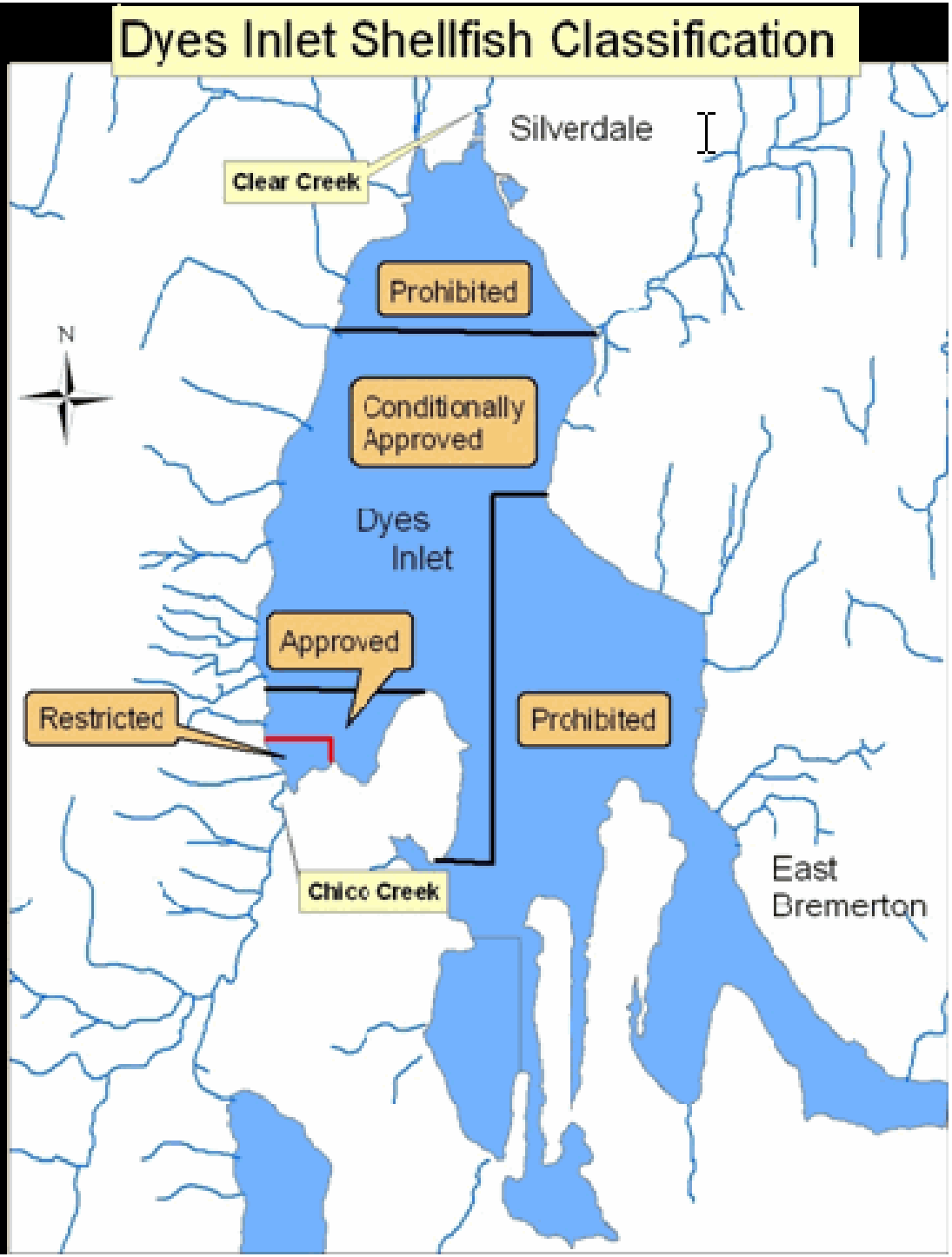
Bacterial Pollution Reduction in an Urban Watershed

Mindy Fohn
Kitsap County Public Works
Surface & Stormwater Management Program
Port Orchard, WA


PUGET SOUND
Seattle
Tacoma


Silverdale
DYES
INLET
City of
Bremerton

- Closed 1960's
- Utility formed 1995
- 1990's Restoration Projects
- Upgraded 2003 and 2006
- 2005 FC TMDL stormwater a significant contributor in northern Dyes
- Preliminary loading reductions for Clear Creek
- Early TMDL Implementation Project



Project Area

Lower watershed

- 65% impervious surface
- 1,243 acres
- Commercial & multi-family residential
- Storm facilities from the 70s to current standards
- >90% sewer

Project Goals

- Reduce FC contamination of Clear Creek
- Prevent downgrade of shellfish beds to the south

Pre-Project Conditions

- No sewer illicit connections
- No stormwater outfall illicit discharges
- Good WQ north of commercial corridor
- Inconsistent commercial maintenance
- Consistent annual ROW maintenance

Pre-Project WQ

- **Water Quality**
  - **Clear Creek public health risk-posted in 2002**
  - **Clear Creek fails FC standard 1996-2005**
  - **North Dyes Inlet marine stations-fails standard 1995-2005**

Study Design

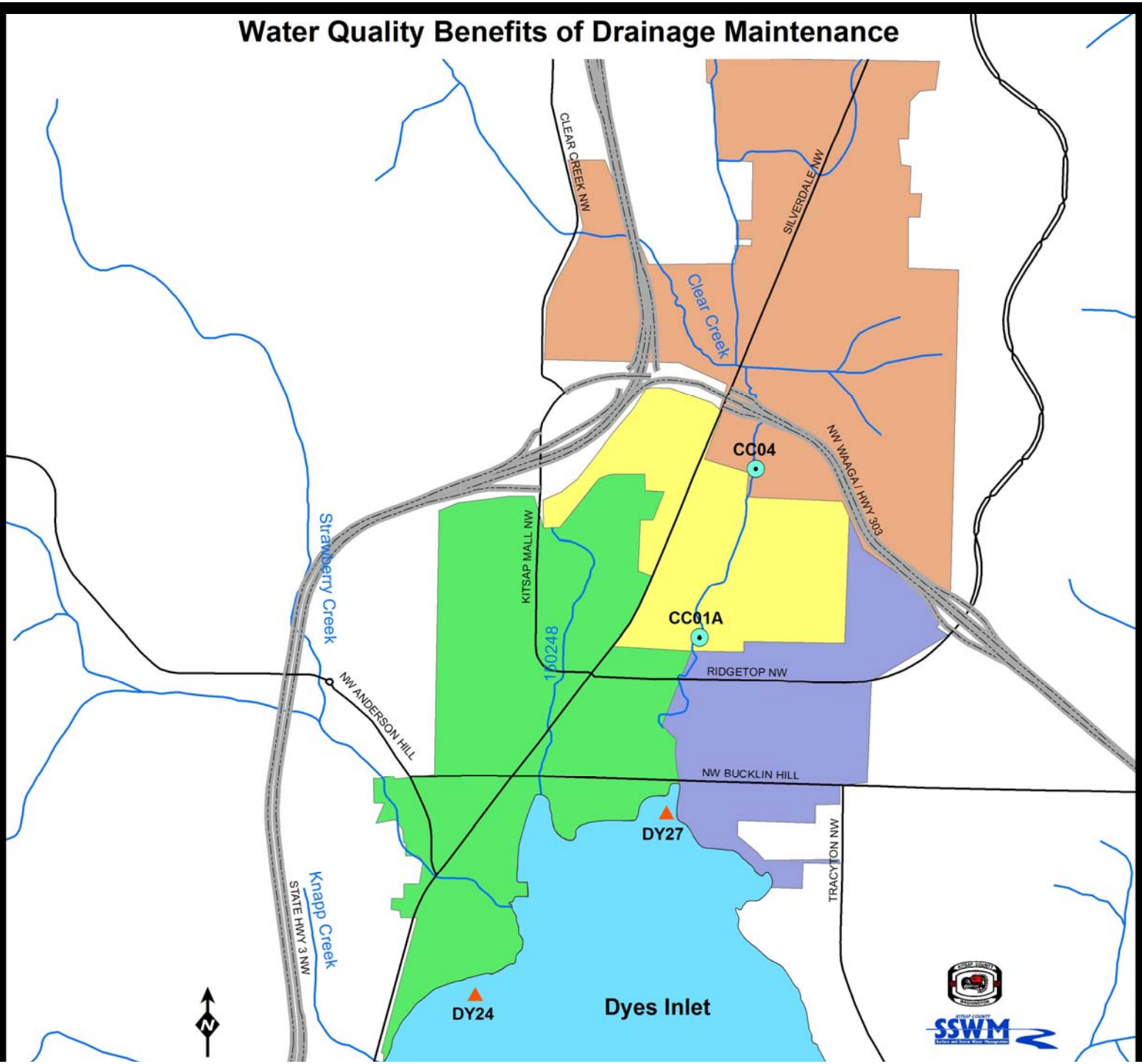
- Education and Inspection Approach
  - Notified property owners (207): fecal pollution, stormwater and maintenance
  - SSWM and Kitsap County Health District joint site visits 2006 &2008
  - Food source control inspections
  - Utilized Health District enforcement when applicable

Water Quality Analysis

KCHD collects monthly FC data on streams and marine stations, historical record to 1995

- Before inspections & source control
  - WY 2003 — 2005
- During/After inspections & source control
  - WY 2006 — 2008
- Statistics
  - Stream data T-test
  - Marine data seasonal Kendall Test $p<0.5$

Water Quality Benefits of Drainage Maintenance



Results

- Storm system inspections
- Food source control inspections
- Clear Creek water quality
- Marine water quality

Storm Inspections

- **Jan 2006-June 2007 100% inspected**
  - **41% deficient**
- **Jan-June 2008 100% inspected**
  - **8% deficient**
  - **Sediment removal**
  - ***100% Compliance***

Food Source Control Retrofits

- 21% of properties handle food
- 16% food waste discharge to storm
- Utilize Health District Solid Waste Regs/Enforcement
- 2 sites retrofitted and water quality evaluated

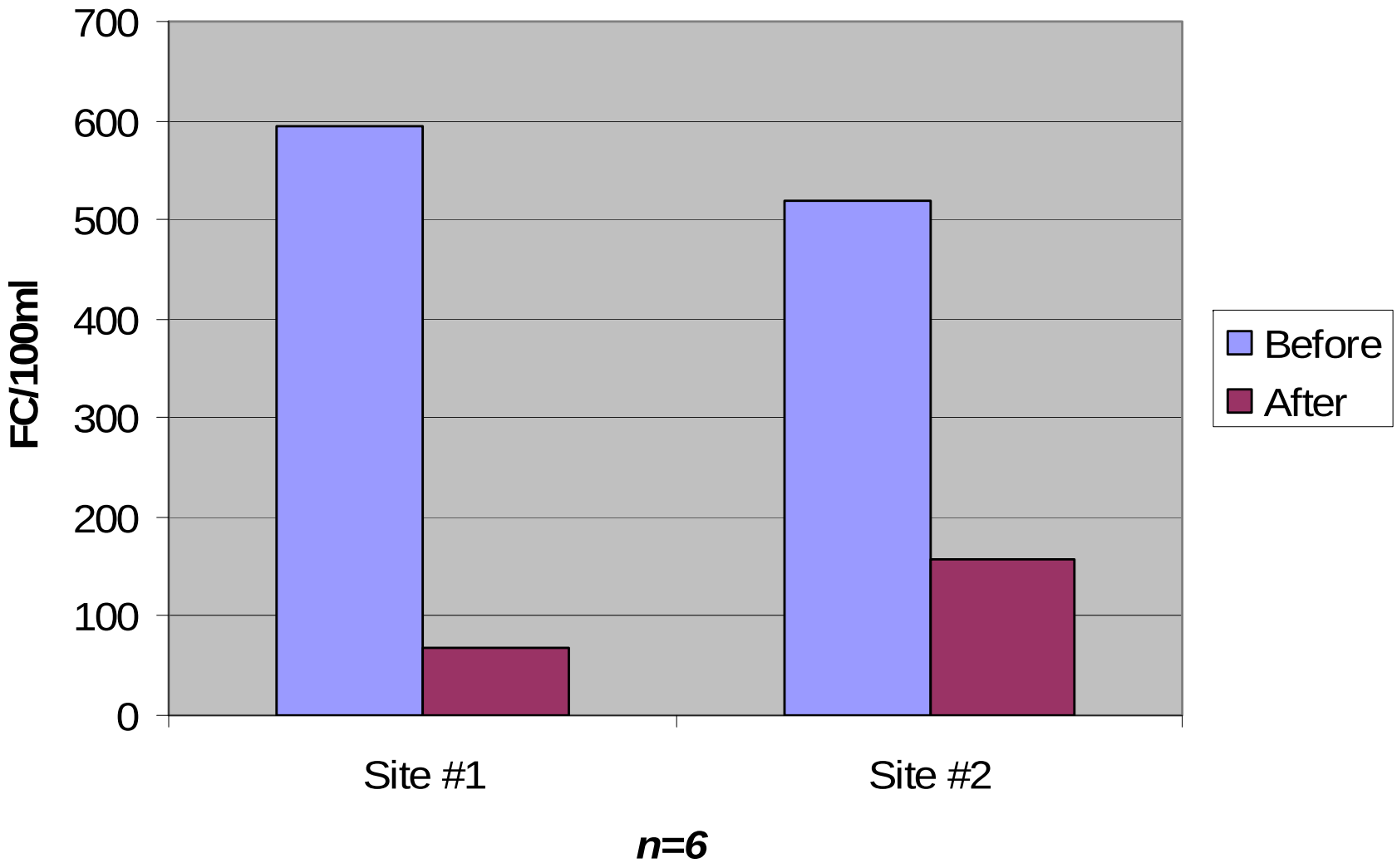
Before

Before

After

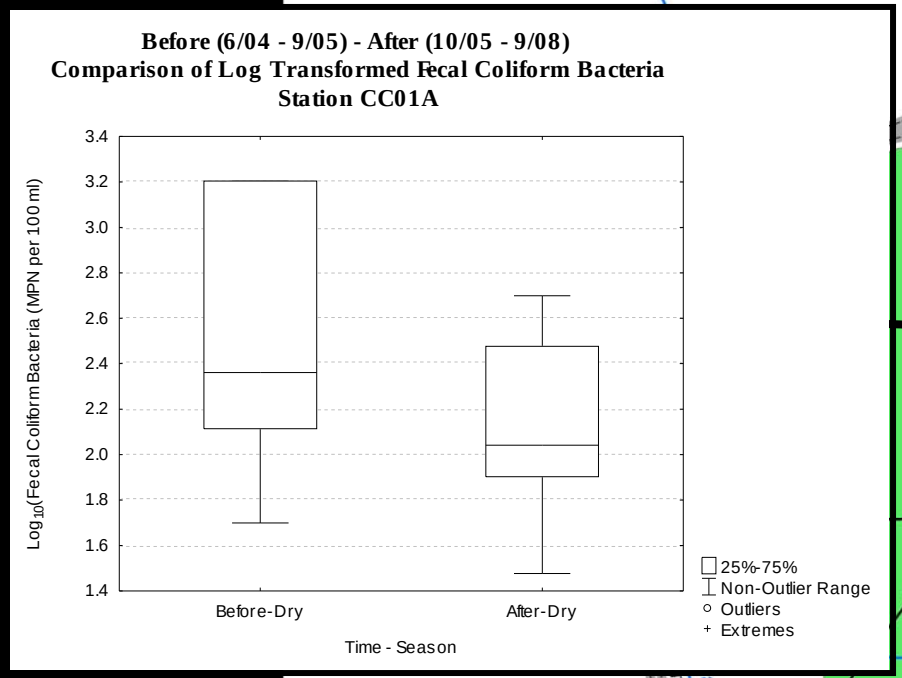
After

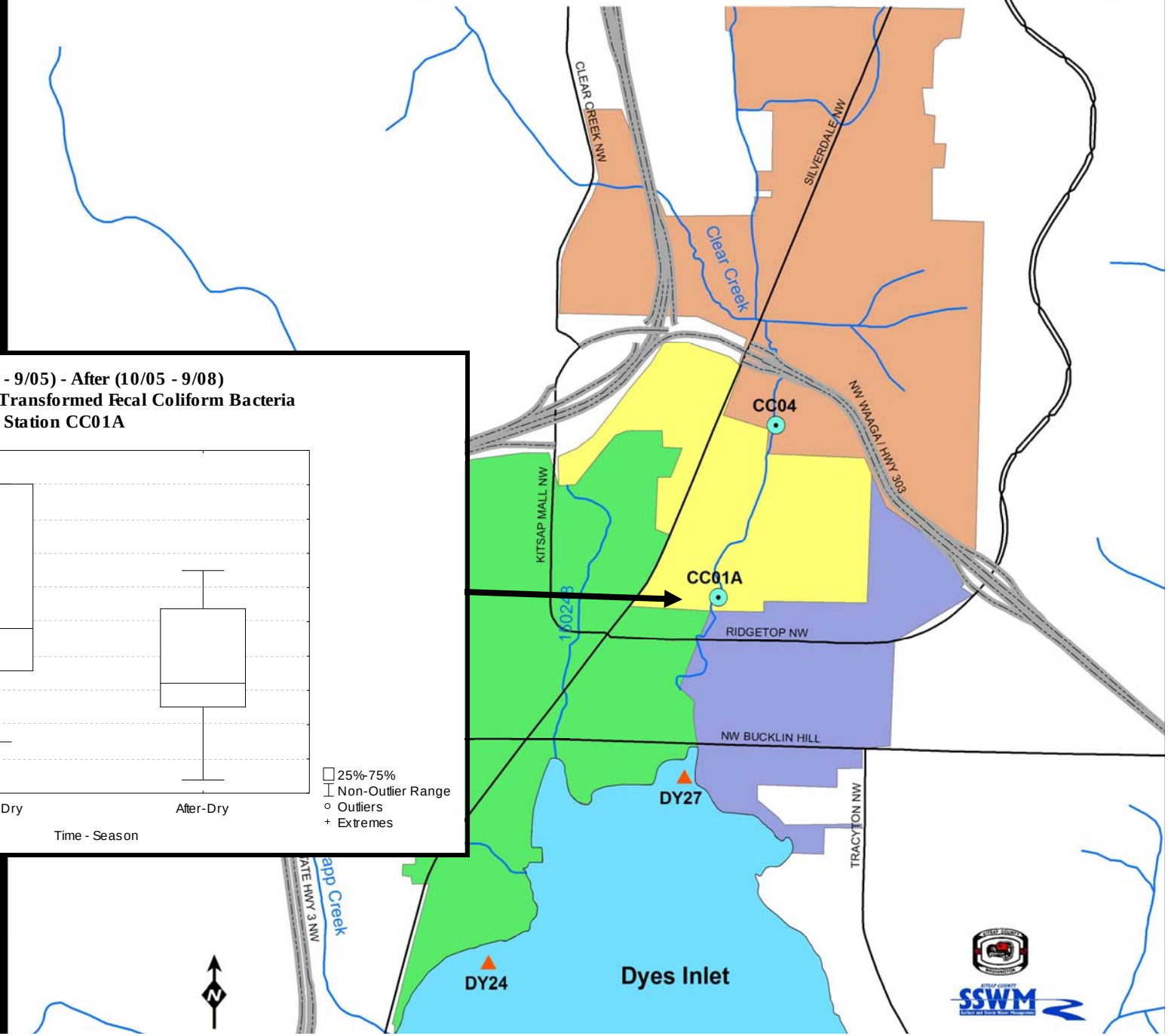
FC Concentrations Before and After Food Source Control Retrofit Construction



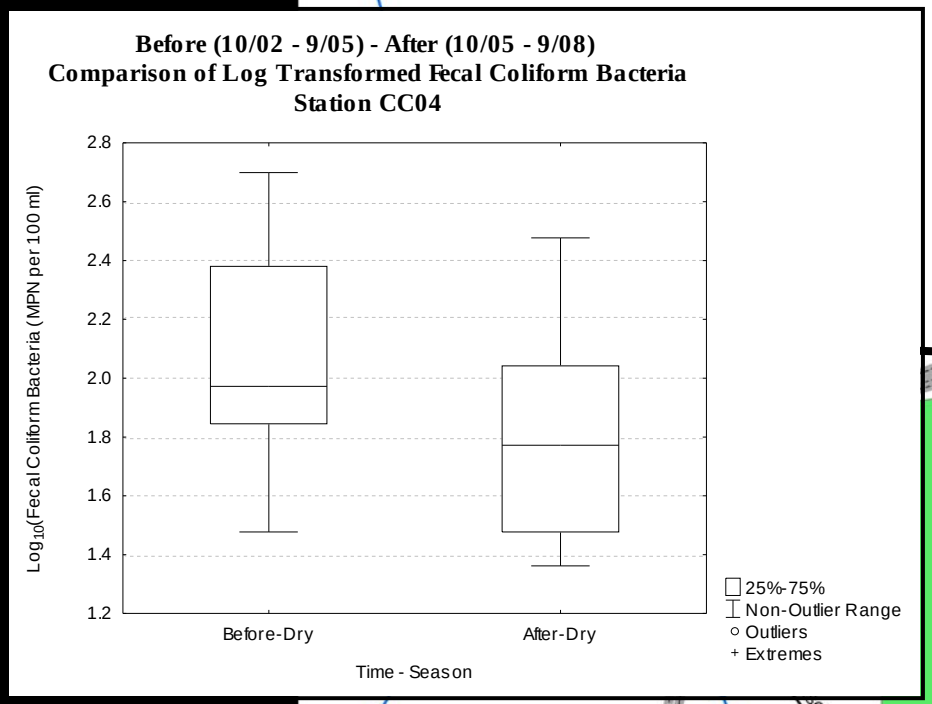
Clear Creek WQ Data

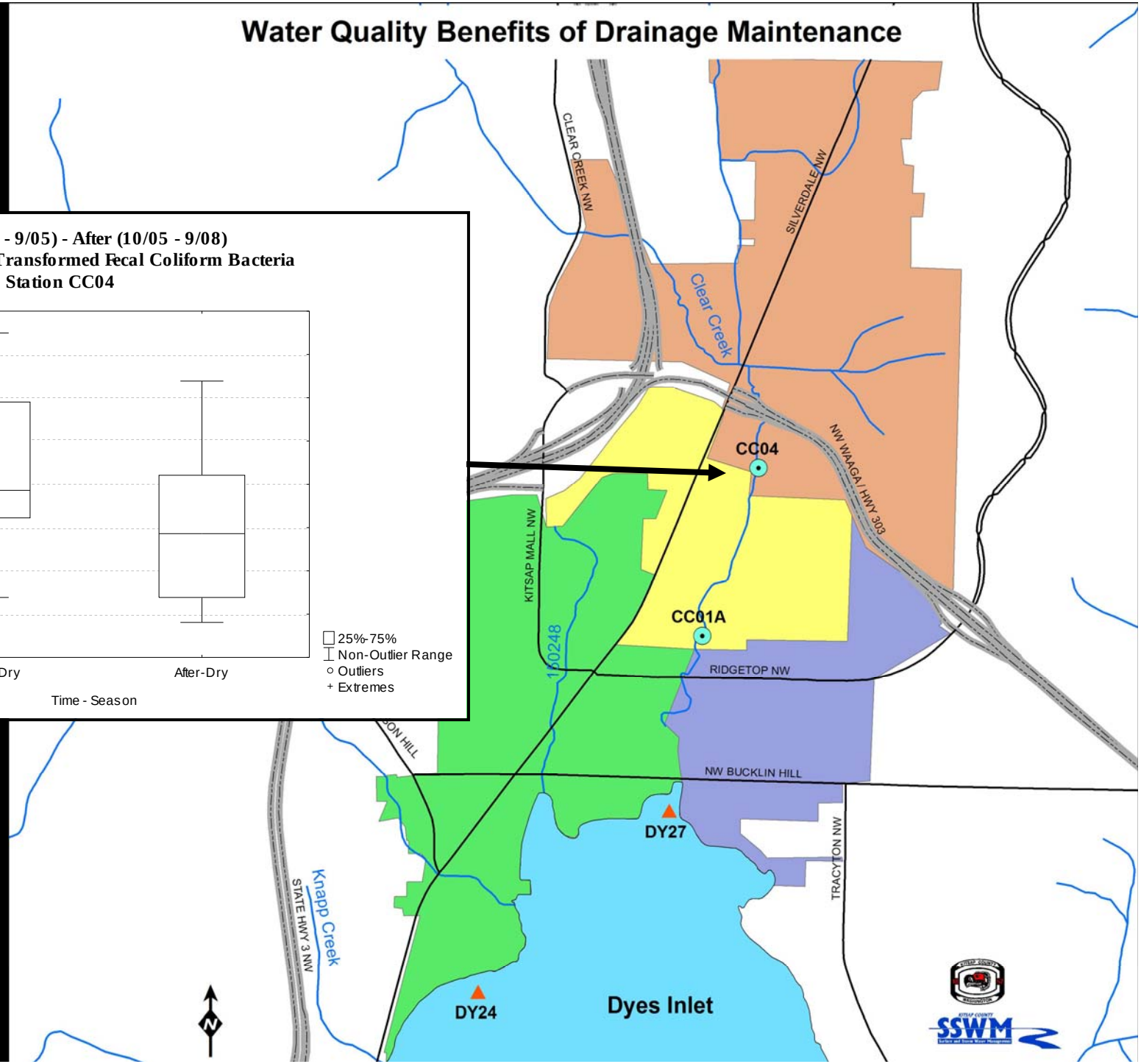
Water Quality Benefits of Drainage Maintenance



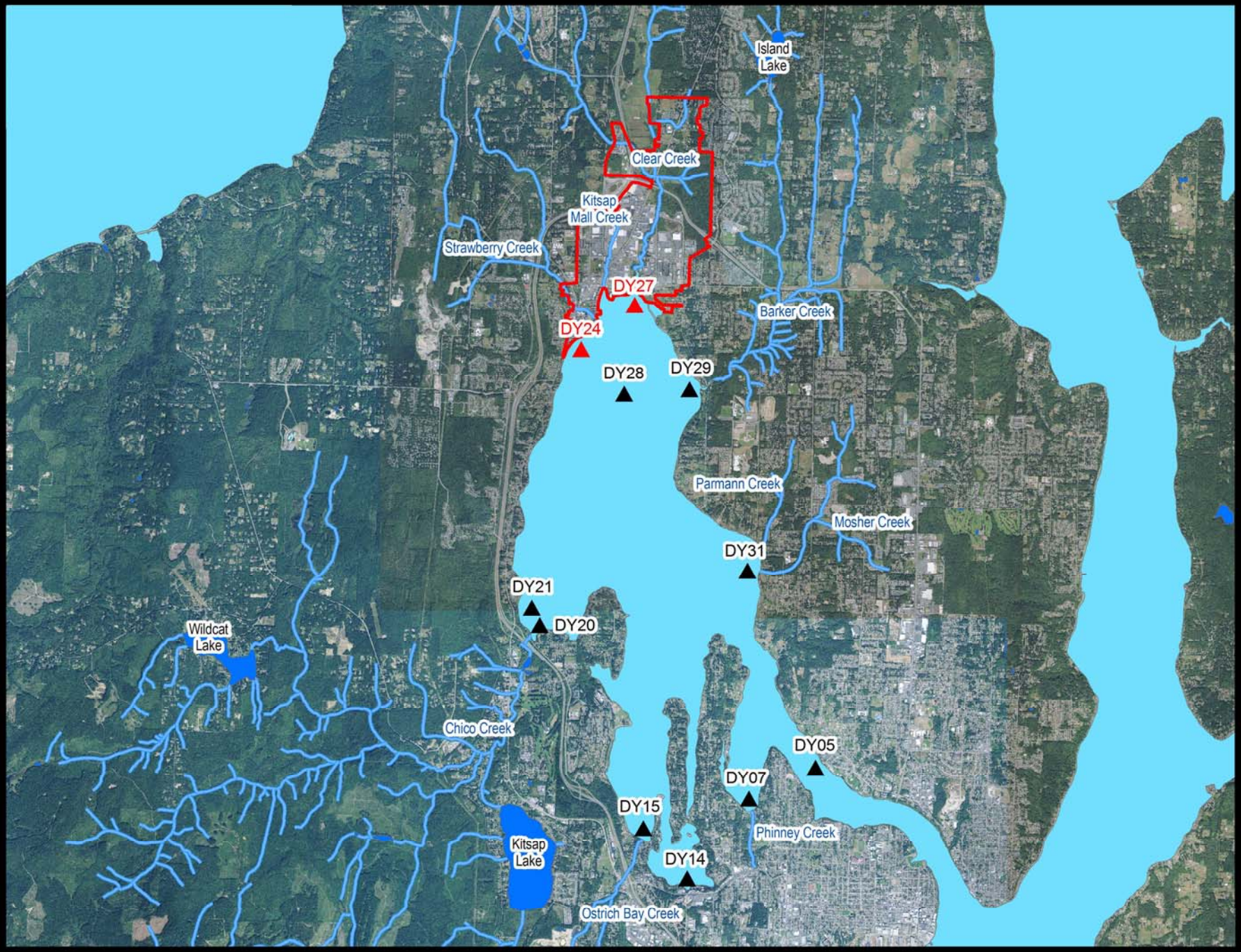


Water Quality Benefits of Drainage Maintenance



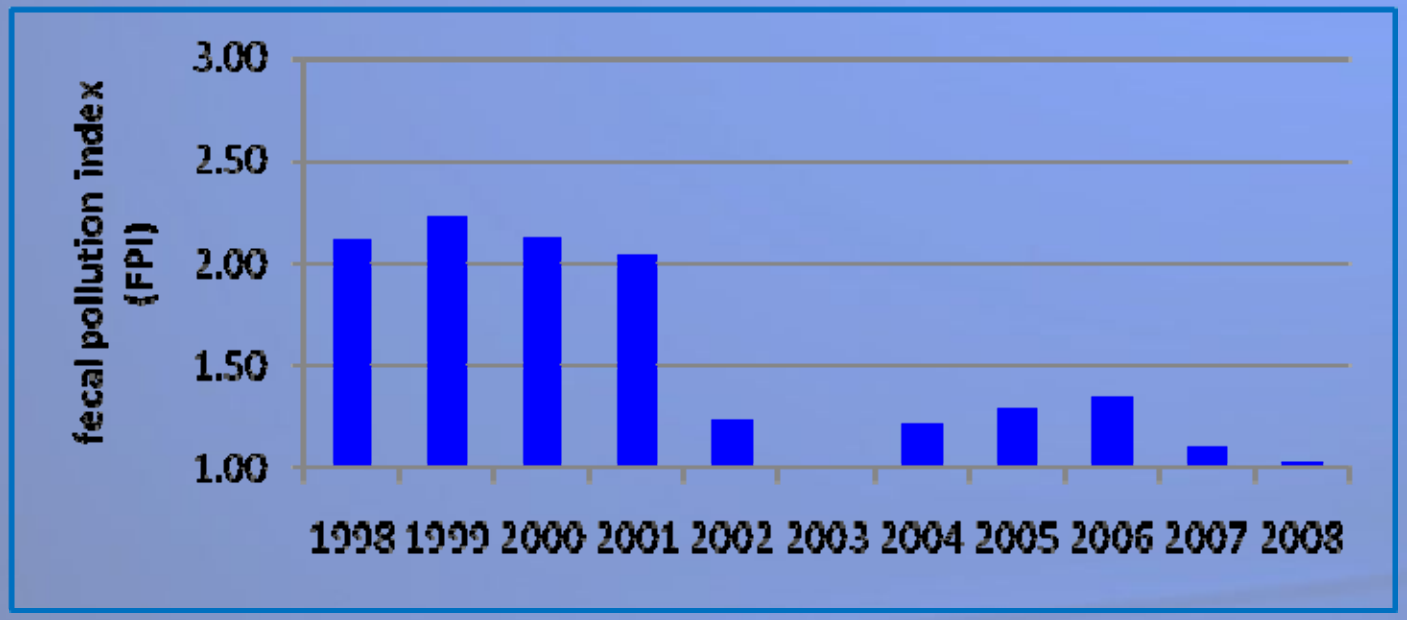


Dyes Inlet Marine Data


Island Lake
Clear Creek
Kitsap Mall Creek
Strawberry Creek
DY27
DY24
Barker Creek
DY28
DY29
Parmann Creek
Mosher Creek
DY31
DY21
DY20
Wildcat Lake
Chico Creek
DY05
DY07
DY15
Phinney Creek
Kitsap Lake
DY14
Ostrich Bay Creek

WSDOH 2009 Report

Dyes Inlet
(Area 26)



Conclusions

- FC concentrations were reduced
  - At two sites retrofitted to control food sources
  - At three stream stations in Clear Creek
  - At two marine stations

Clear Creek meets Part 1 and 1 sample shy of Part 2 in WY 2009

Lessons Learned

- Partner with Health District resulted in additional enforcement layer (especially food source control)
- Stronger source control view of properties by inspectors
- Commercial property owners/managers responsive to water quality /maintenance message

Promoting Clean Runoff

•**Education**-Thank property owners when inspection is passed, assist those failing, provide continued contact by mail.

•**Inspection-**Annual ROW and commercial visits, look for source control problems.

•**Monitoring**-Robust FC program at the basin level.

WASHINGTON STATE DEPARTMENT OF ECOLOGY

SSWM KITSAP COUNTY Surface and Storm Water Management

KITSAP COUNTY 1857 WASHINGTON