TMDL Effectiveness Assessments for the Union River and Dungeness River Watersheds, Washington

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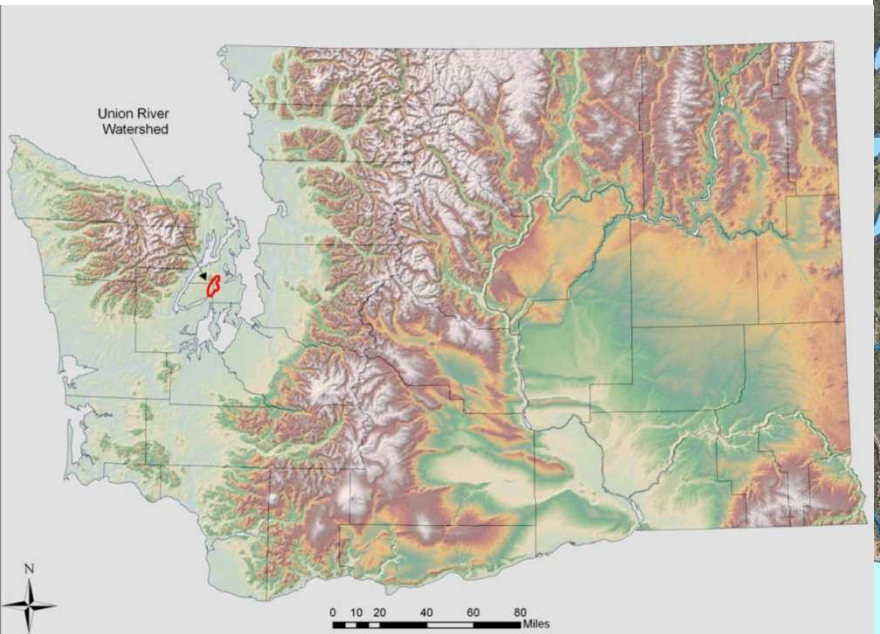
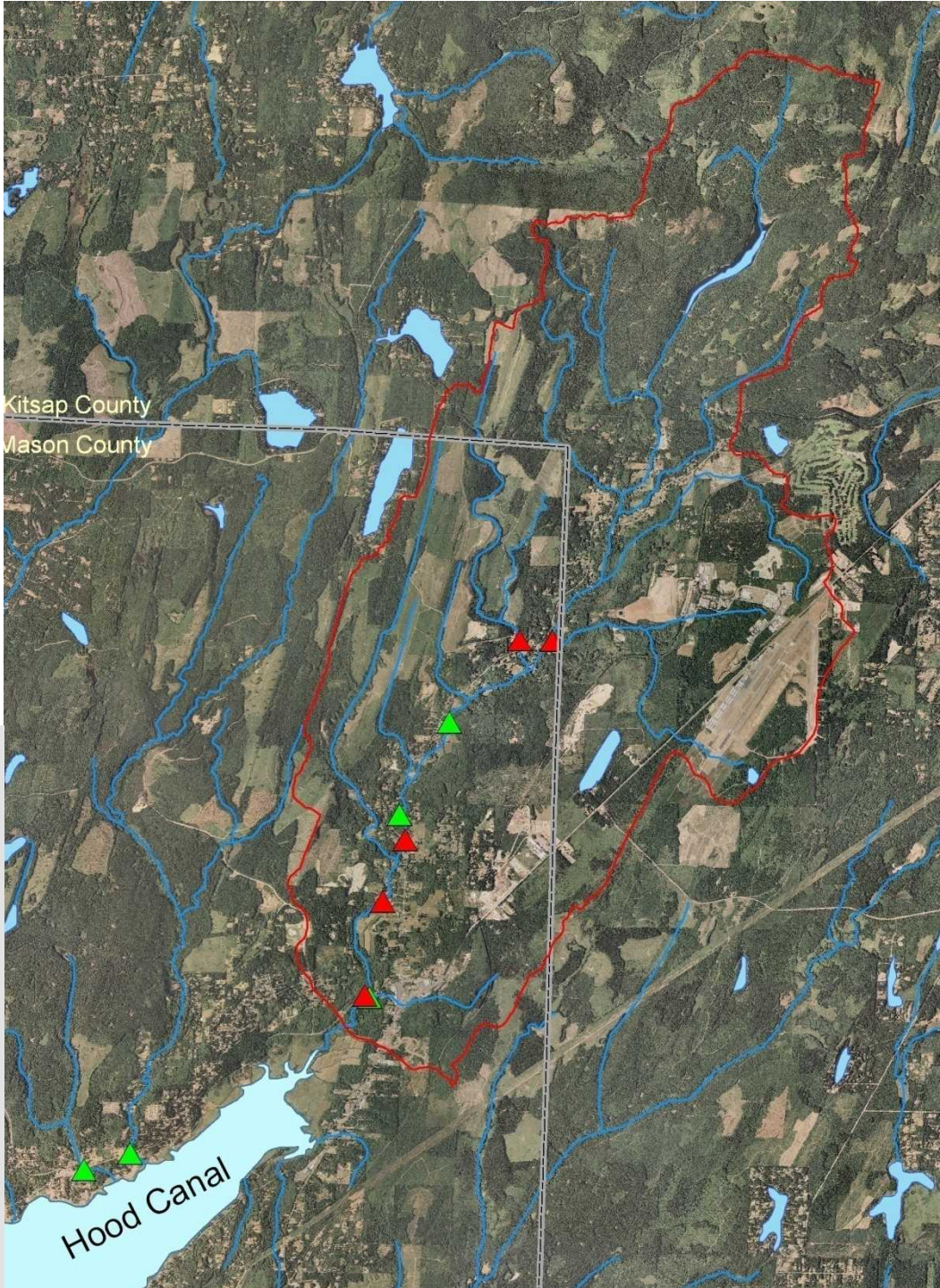
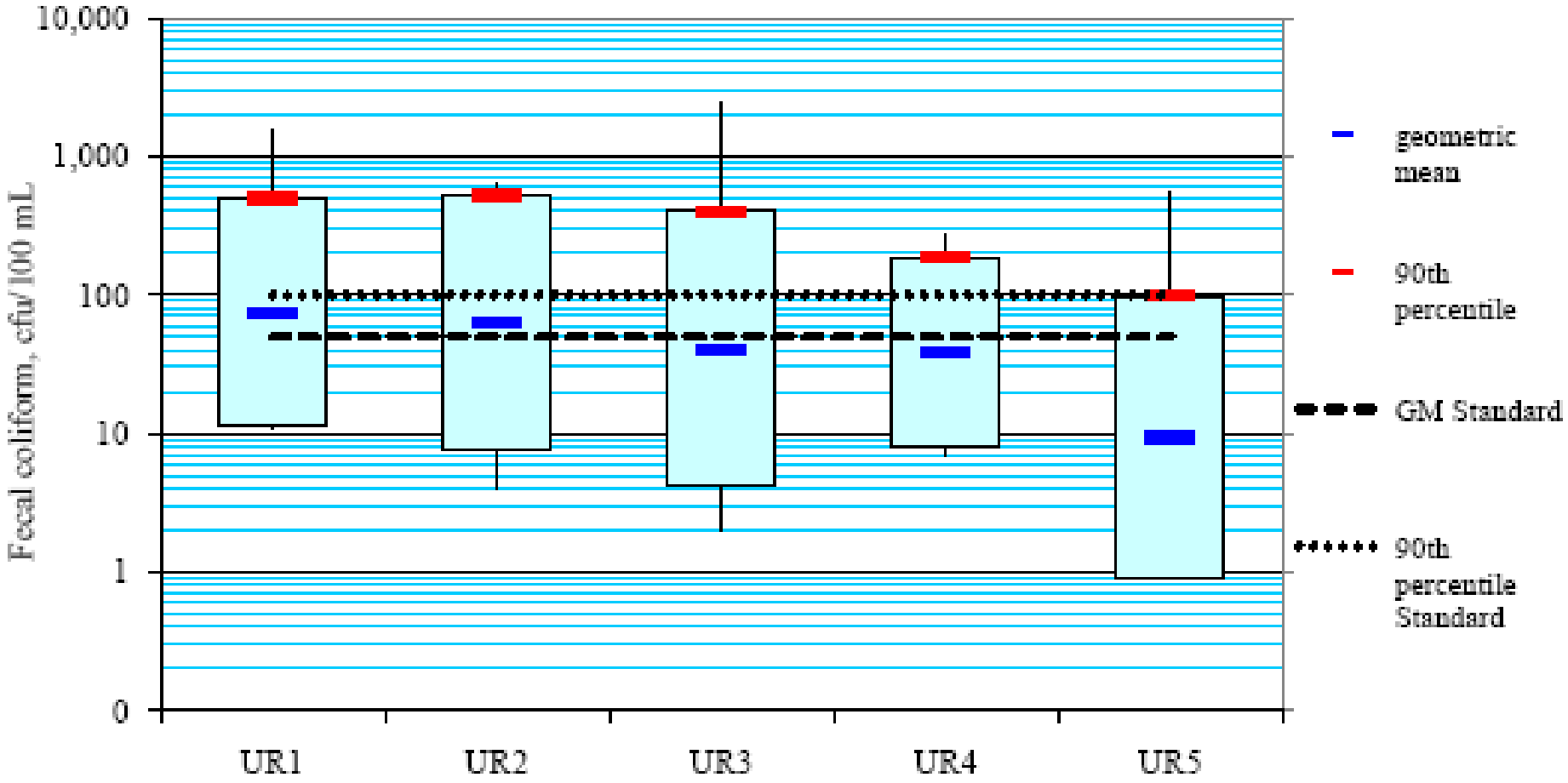
Union River

- Drains 23 mi^2
- Flows into Lynch Cove (shellfishing area)
- Impaired for Fecal Coliform (FC)
- 2001 TMDL





Status in 2008-2009: Comparison Against WQS



Trend Evaluation 1999 - 2009

- Seasonal Kendall Test
  - Evaluate for trends at each monitoring station
  - Account for differences among months
    - Avoids identification of false trends based on monthly variability
- Regional Kendall Test
  - Evaluate watershed-wide trends
  - Account for differences among sites
- General Linear Model

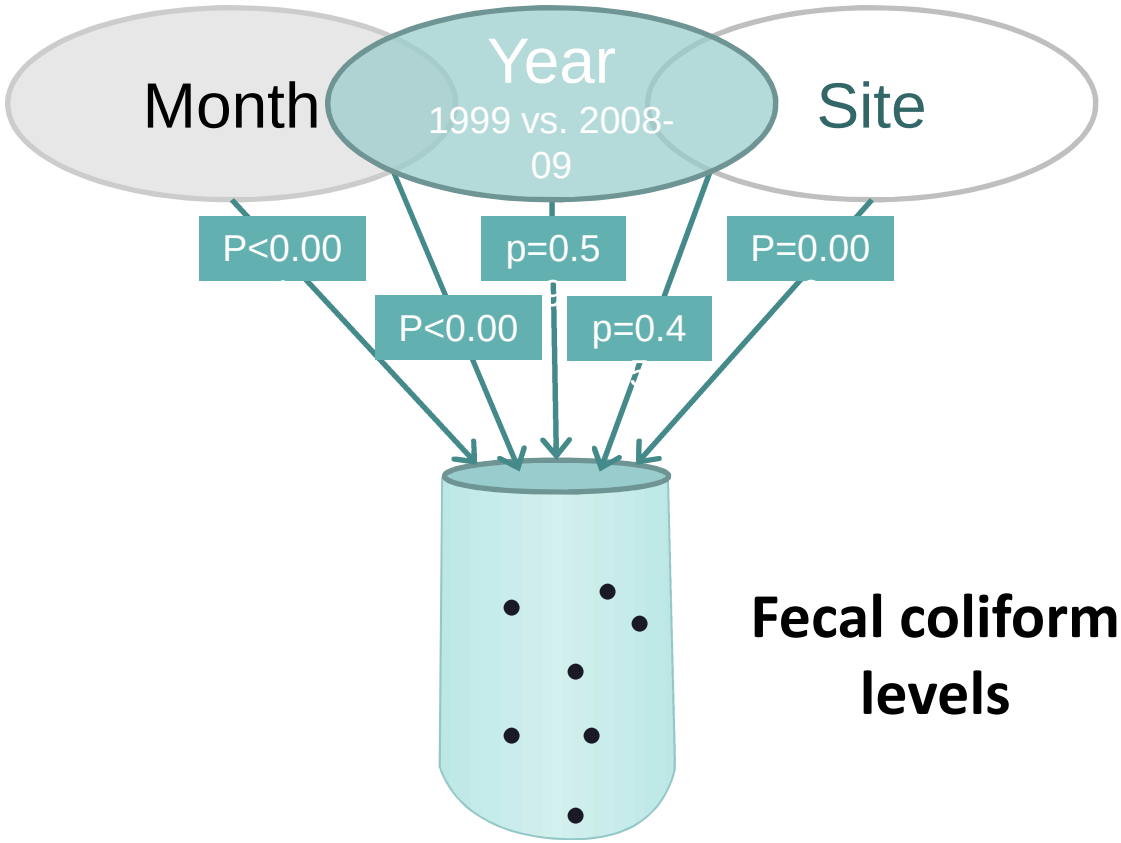
Kendall Trend Test

Station	Z-Score	Trend	Statistically Significant?
UR1HY300	0.439	↑	No
UR2Tmbr	0.34	↑	No
UR3River	-0.376	↓	No
UR4Arch	0	---	No
UR5Bear	0	---	No
Regional geometric mean	-0.22	↓	No
Regional 90th percentile	2.348	↑	Yes (98%)

Positive Z-Scores and ↑ indicate an increasing trend in FC levels and, therefore, no improvement in water quality and possible worsening of conditions

Negative Z-Scores and ↓ indicate a decreasing trend in FC levels and possible improvements in water quality

General Linear Model

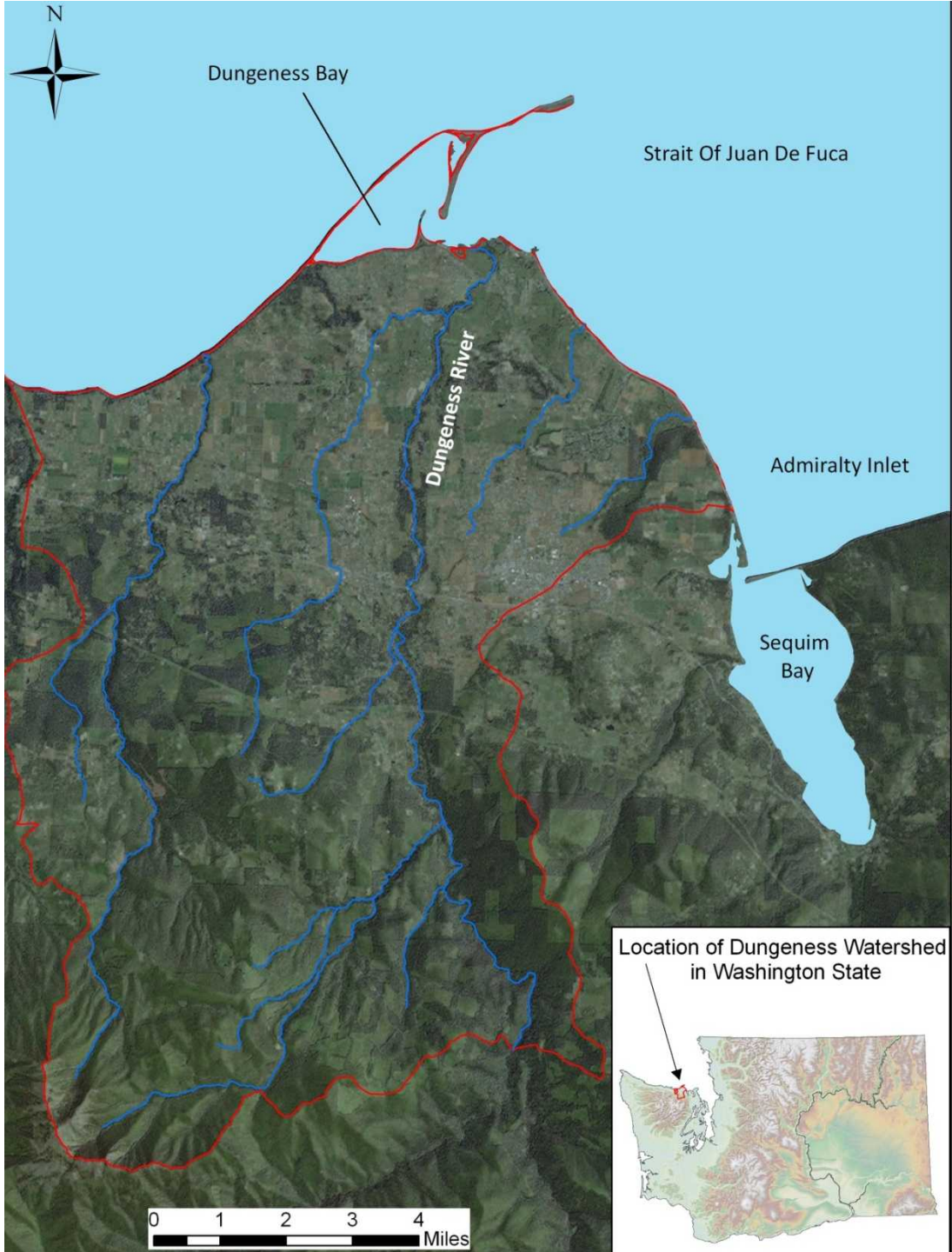


Conclusions

- TMDL targets and WQS are not being met.
- Noticeable change in the timing of high FC levels suggests that the on-site sewage system upgrades may be having a positive effect on water quality.
  - Exceedances still common in the summer, underlining the importance of continued on-site system upgrades and sewer connections.

Dungeness Bay / River

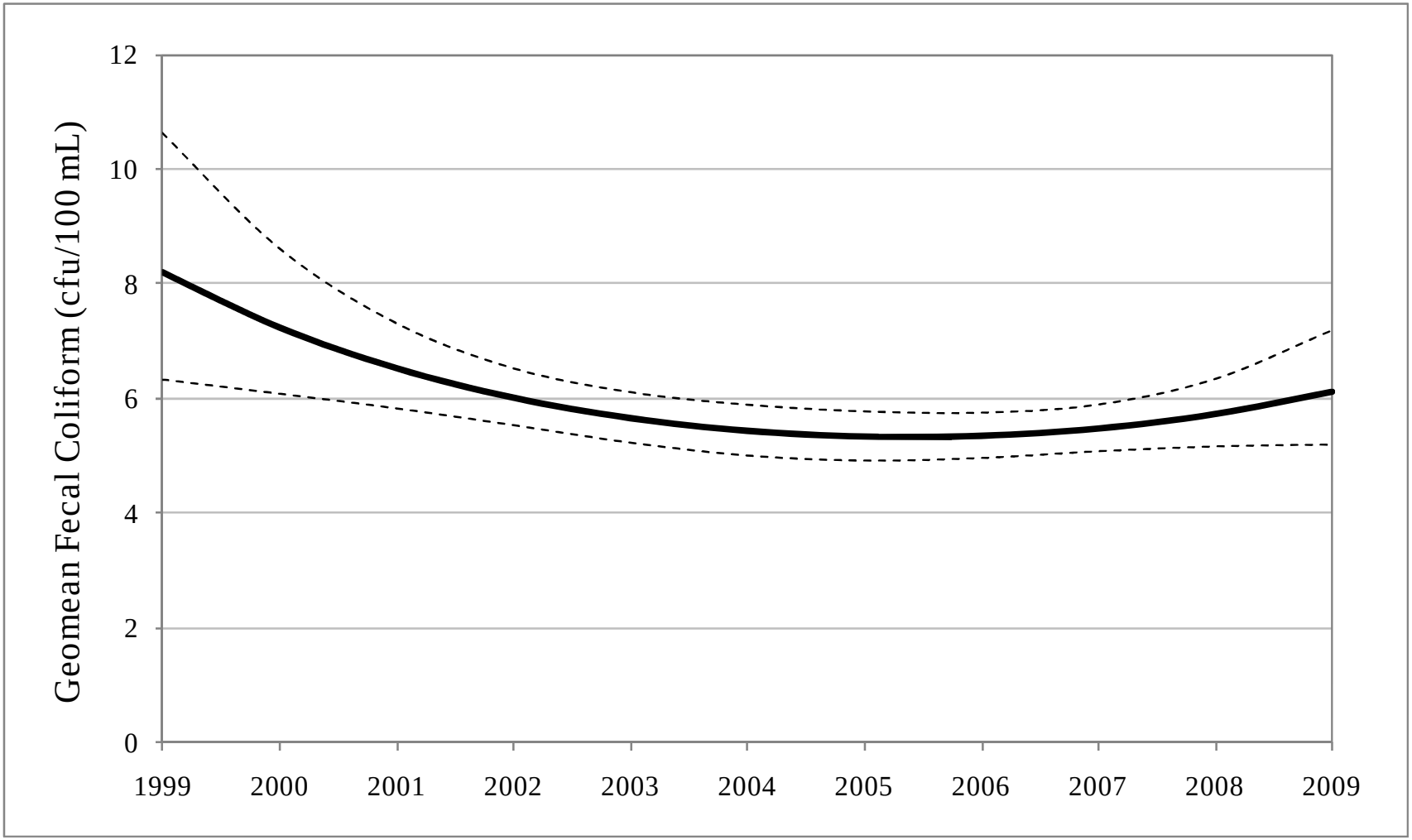
- Northeast coast of Olympic Peninsula
- River drains 270 mi^2
- Commercial and recreation shellfish harvesting in Bay
- River and Bay both impaired for Fecal Coliform (FC)
- 2001 TMDL for River
- 2004 TMDL for Bay



Trend Evaluation

- Multiple Linear Regression (MLR)
  - Evaluate for temporal trends in FC
  - Factors out influence of variables that may influence FC levels (e.g., water temperature), making it easier to detect a change over time
- Change in loads at Matriotti Creek

Trend in geometric mean fecal coliform concentrations for all marine sample stations



FC Loads at Matriotti Creek

- Reduced by 67% from pre-TMDL levels
- Have not yet reached TMDL target reduction of 78%

Station	Non-irrigation Season	Irrigation Season	Annual
CASSALERY (2008-09)	194	386	284
MAT3.2 (2008-09)	88	255	161
MAT1.9 (2008-09)	72	132	100
MAT0.1 (2008-09)	2238	1474	1944
Target for MAT0.1	**--**	**--**	**1267**
MAT0.1 (1999-2000)	4223	8268	5972

Measure SP-12 Determination for Dungeness River Watershed

- May qualify for SP-12 using Option 2a:
  - Valid scientific information (FC data), AND
  - Statistical evidence (greater than 90% confidence based on MLR analysis) that FC levels have decreased at 6 of 7 monitoring stations that were consistently monitored between 1999 and 2009
  - Reductions resulted in Dungeness River meeting WQS at some sites
- May also qualify for Measure WQ-10

Conclusions

- FC levels have decreased in Matriotti Creek and in Dungeness River between 1999 and 2009
  - Most of the decrease occurred early
  - Data suggest a slight increase in recent years from the lowest levels that occurred in 2005
- FC loads at mouth of Matriotti Creek, which are more relevant to the health of the Bay, have been reduced by 67% since 1999
- Despite improvements, 9 of 13 stations exceeded WQS and TMDL targets

Question & Answer

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