



Apr 30th, 10:30 AM - 12:00 PM

South Puget Sound dissolved oxygen study: water quality model calibration and scenarios

G. J. Pelletier

Washington (State). Department of Ecology, gpel461@ecy.wa.gov

Anise Ahmed

Washington (State). Department of Ecology

Mindy Roberts

Washington (State). Department of Ecology

Andrew Kolosseus

Washington (State). Department of Ecology

Follow this and additional works at: <https://cedar.wwu.edu/ssec>



Part of the [Terrestrial and Aquatic Ecology Commons](#)

Pelletier, G. J.; Ahmed, Anise; Roberts, Mindy; and Kolosseus, Andrew, "South Puget Sound dissolved oxygen study: water quality model calibration and scenarios" (2014). *Salish Sea Ecosystem Conference*. 104.

<https://cedar.wwu.edu/ssec/2014ssec/Day1/104>

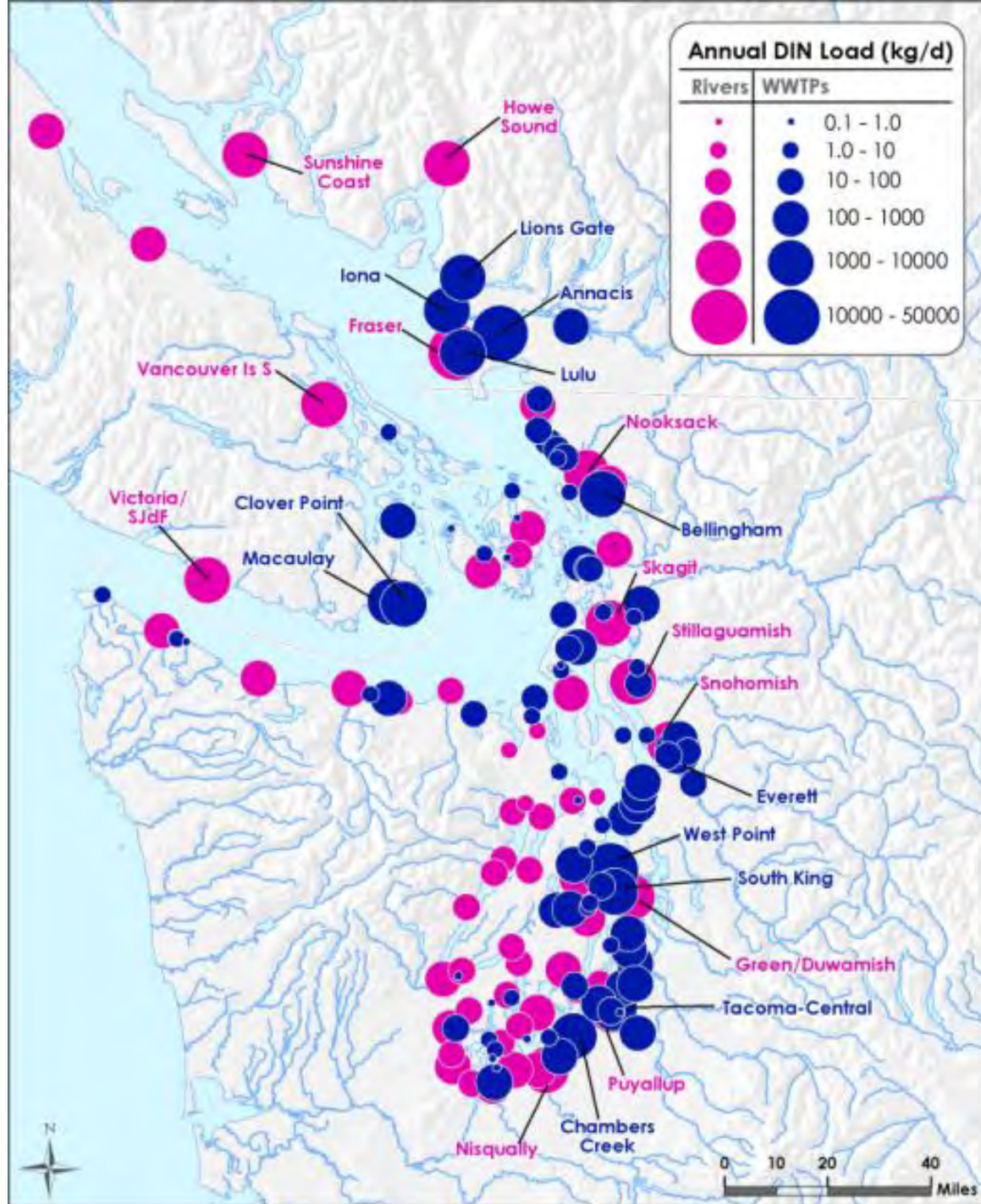
This Event is brought to you for free and open access by the Conferences and Events at Western CEDAR. It has been accepted for inclusion in Salish Sea Ecosystem Conference by an authorized administrator of Western CEDAR. For more information, please contact westerncedar@wwu.edu.

Anthropogenic influence on dissolved oxygen in the Salish Sea, Central and South Puget Sound, and Budd Inlet

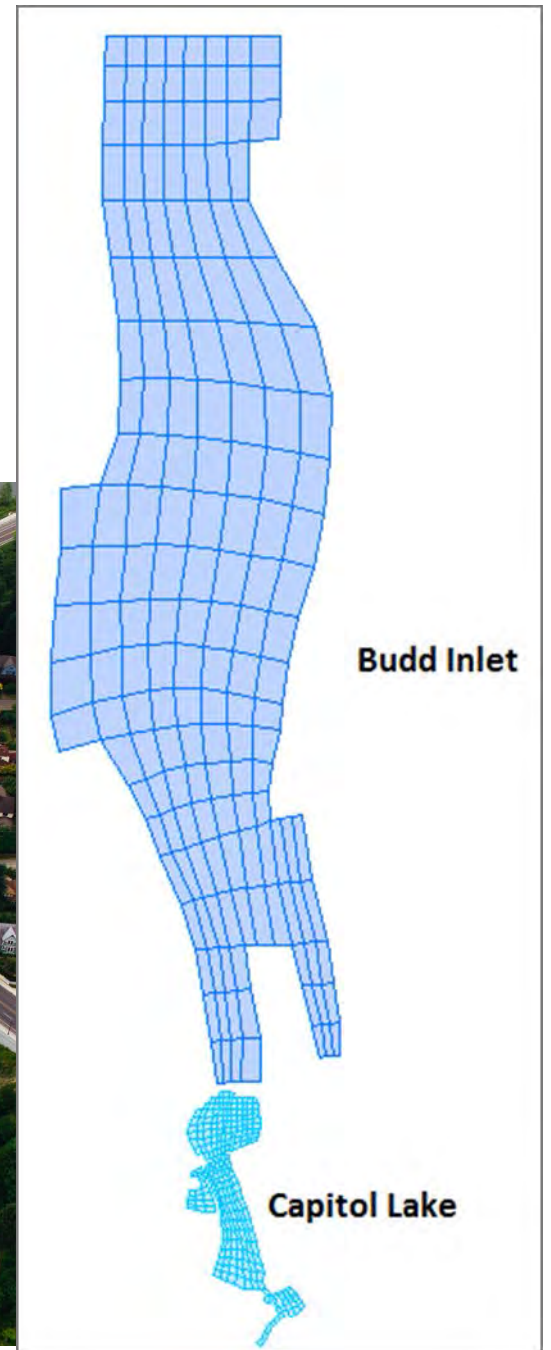
Greg Pelletier
Mindy Roberts
Anise Ahmed
Brandon Sackmann
Andrew Kolosseus

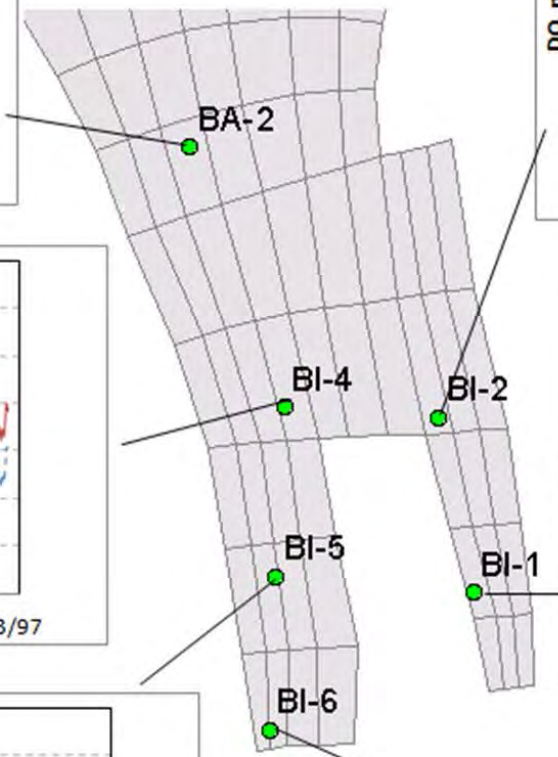
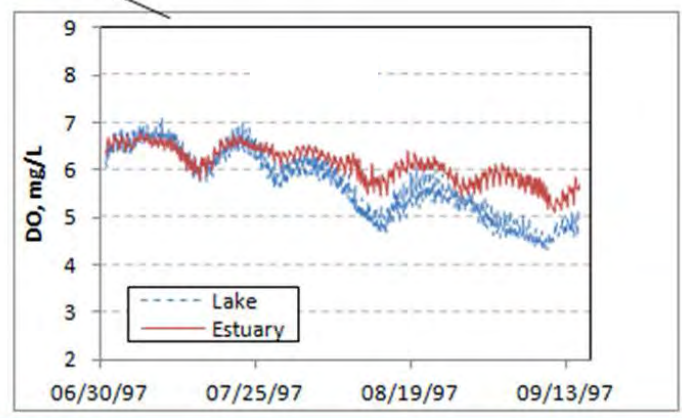
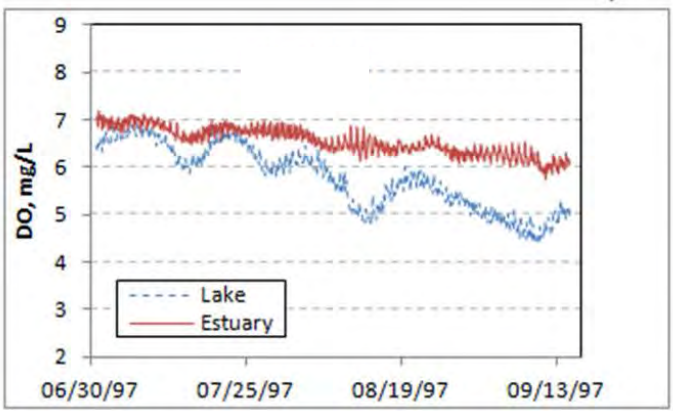
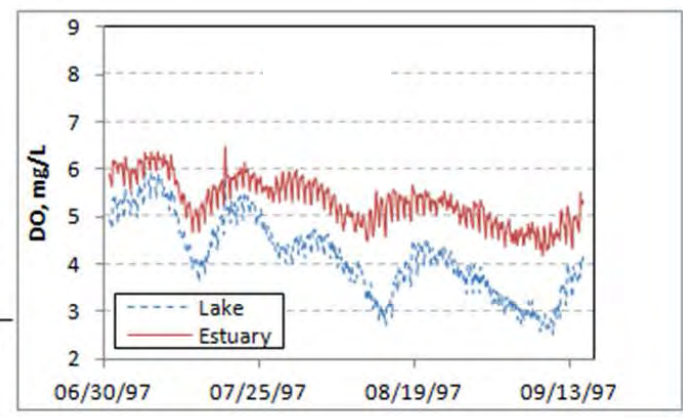
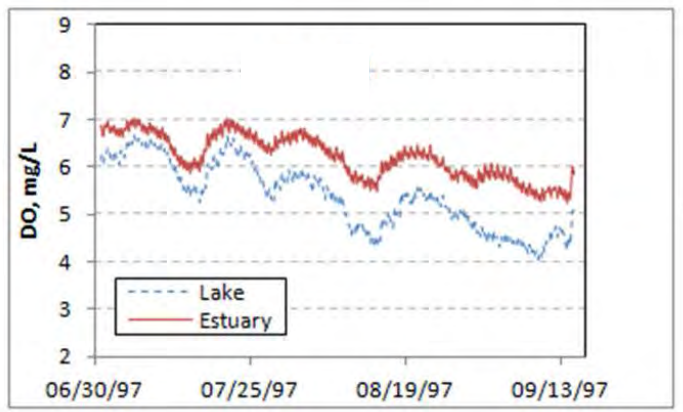
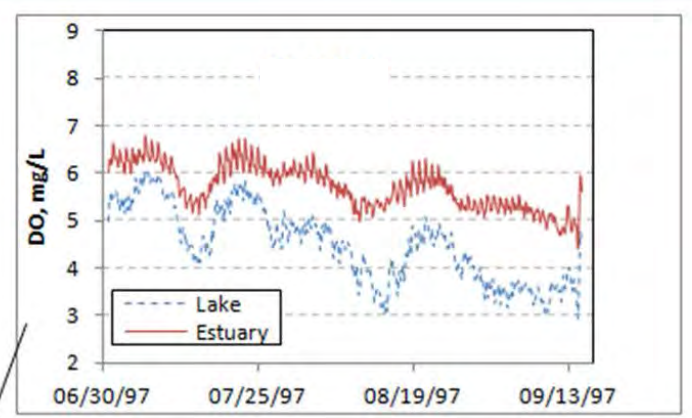
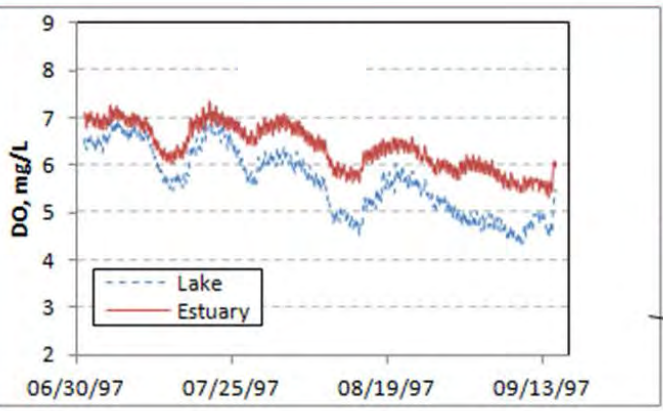


What are the sources of nitrogen?



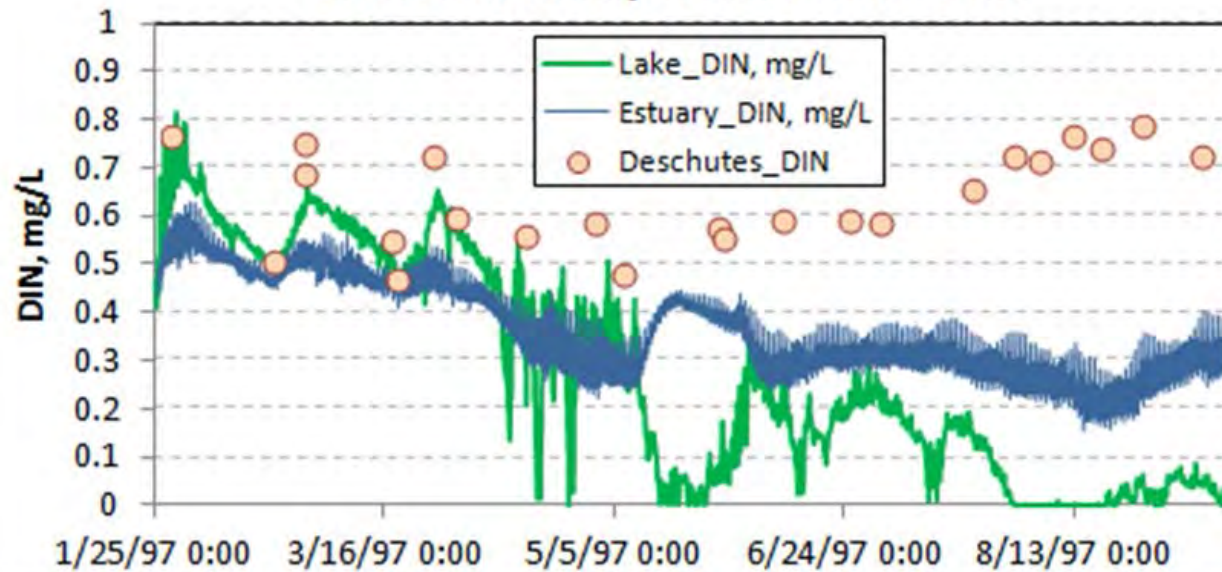
Budd Inlet and Capitol Lake



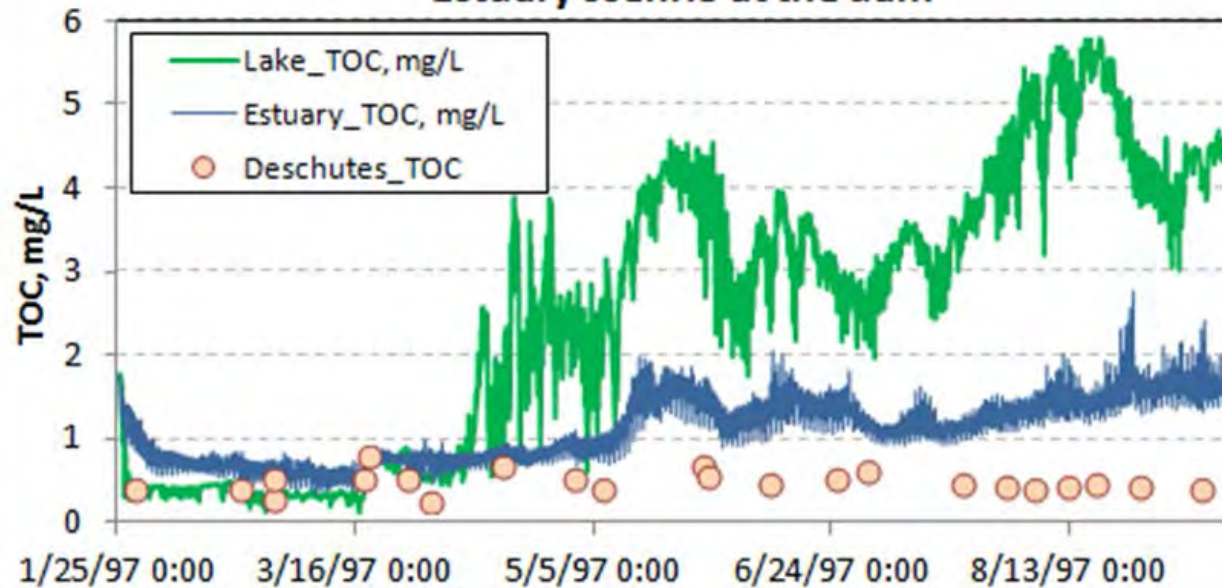


Bottom layer

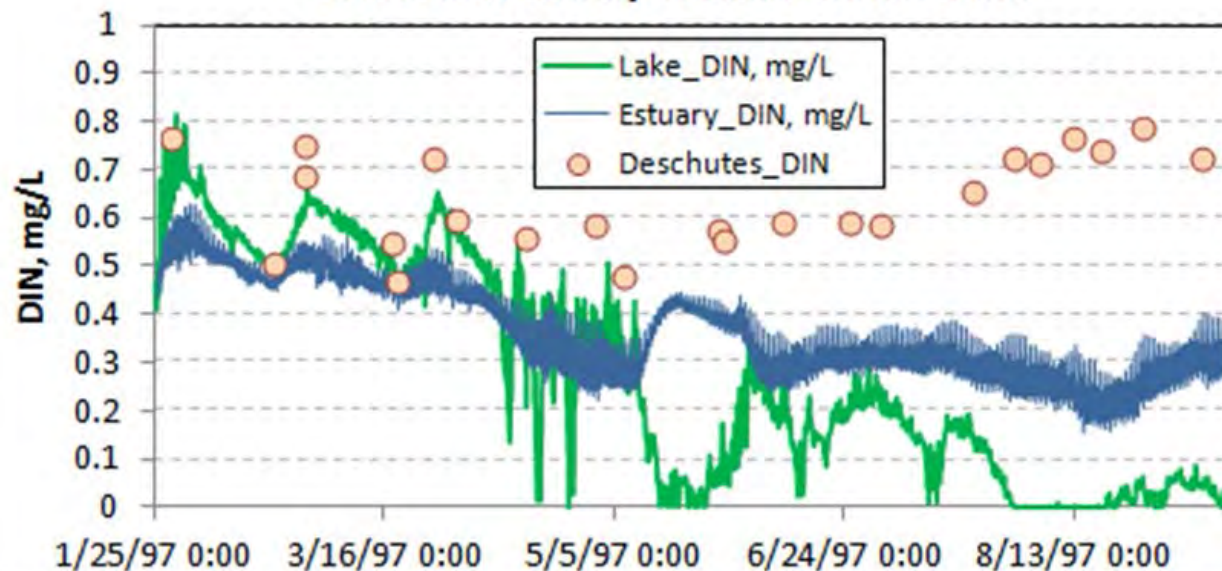
Dissolved inorganic Nitrogen (DIN) in surface layer of Lake and Estuary scenario at the dam

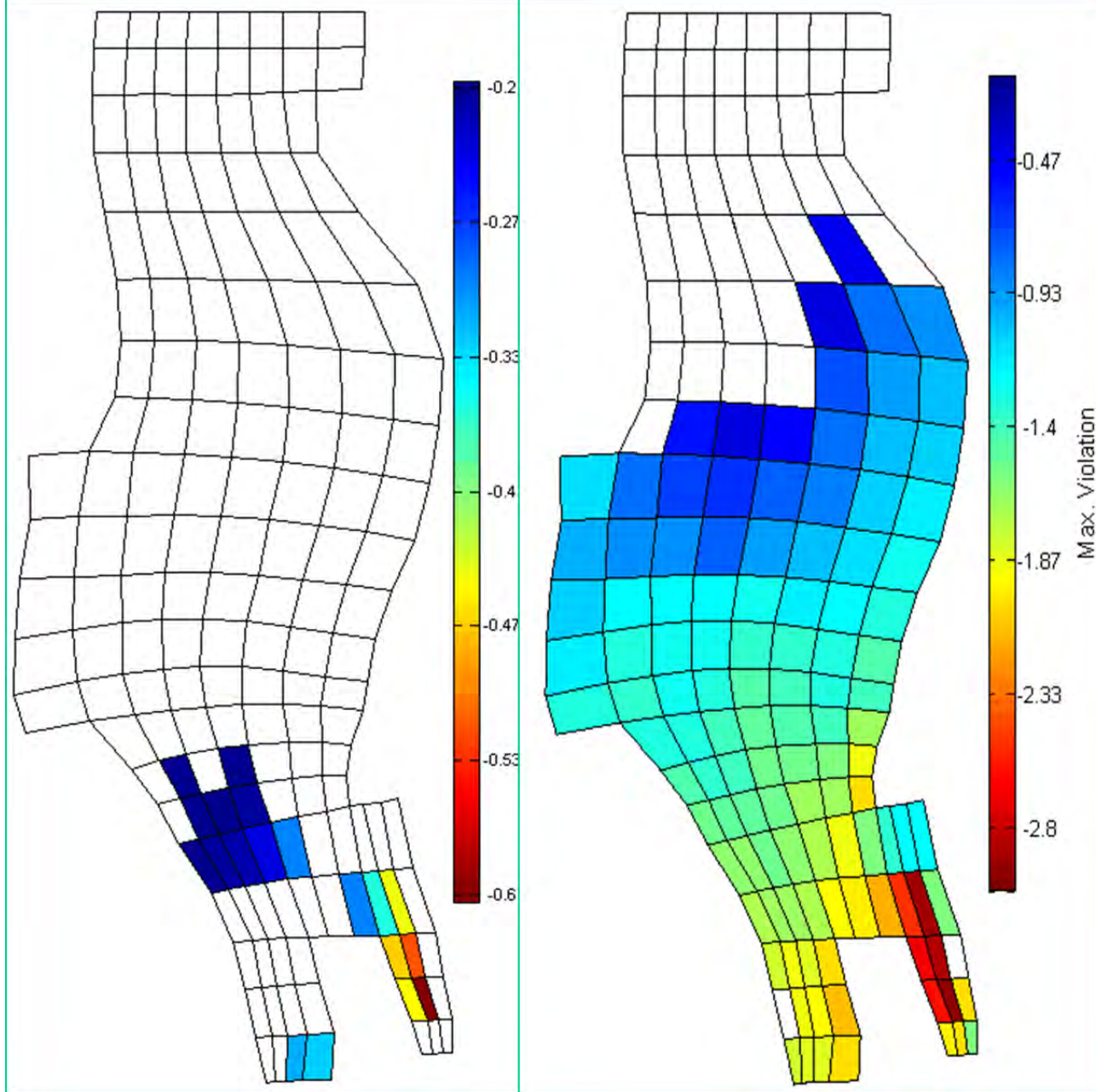


Total organic carbon (TOC) in surface layer of Lake and Estuary scenrio at the dam



Dissolved inorganic Nitrogen (DIN) in surface layer of Lake and Estuary scenario at the dam



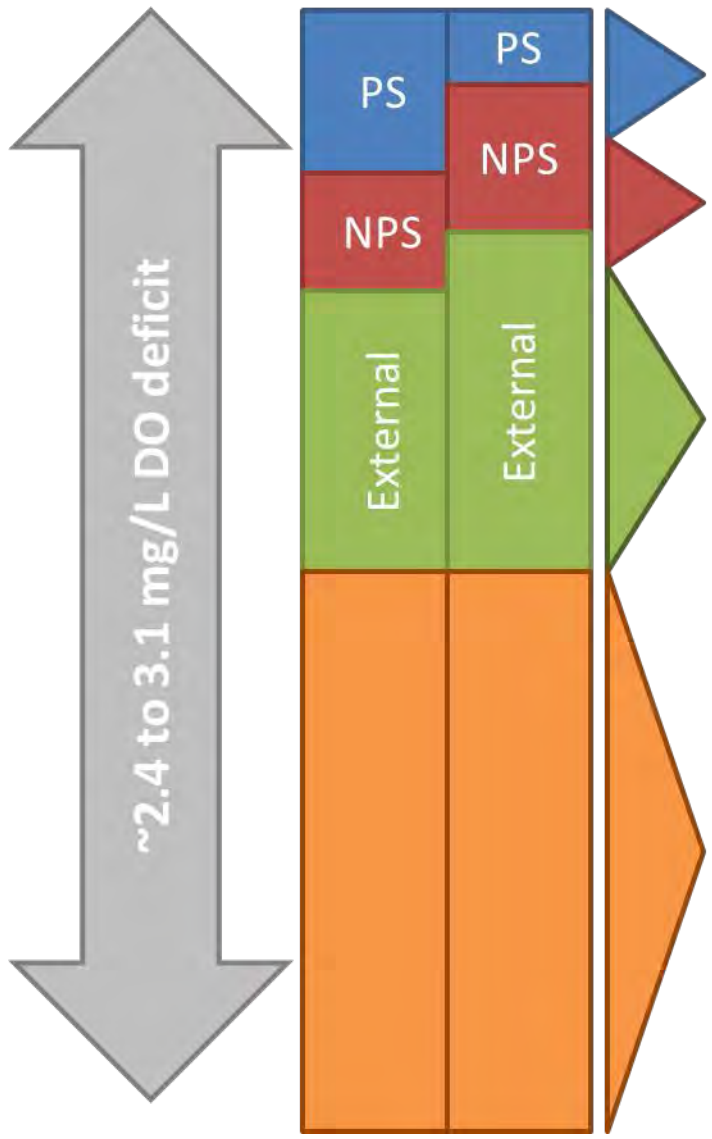


Estuary alternative

Lake alternative

Violation of the water quality standard for dissolved oxygen from existing human causes

Budd Inlet model results for critical cell in East Bay – DO deficits from existing sources



~0.1 to 0.2 mg/L DO deficit from local Budd Inlet point sources

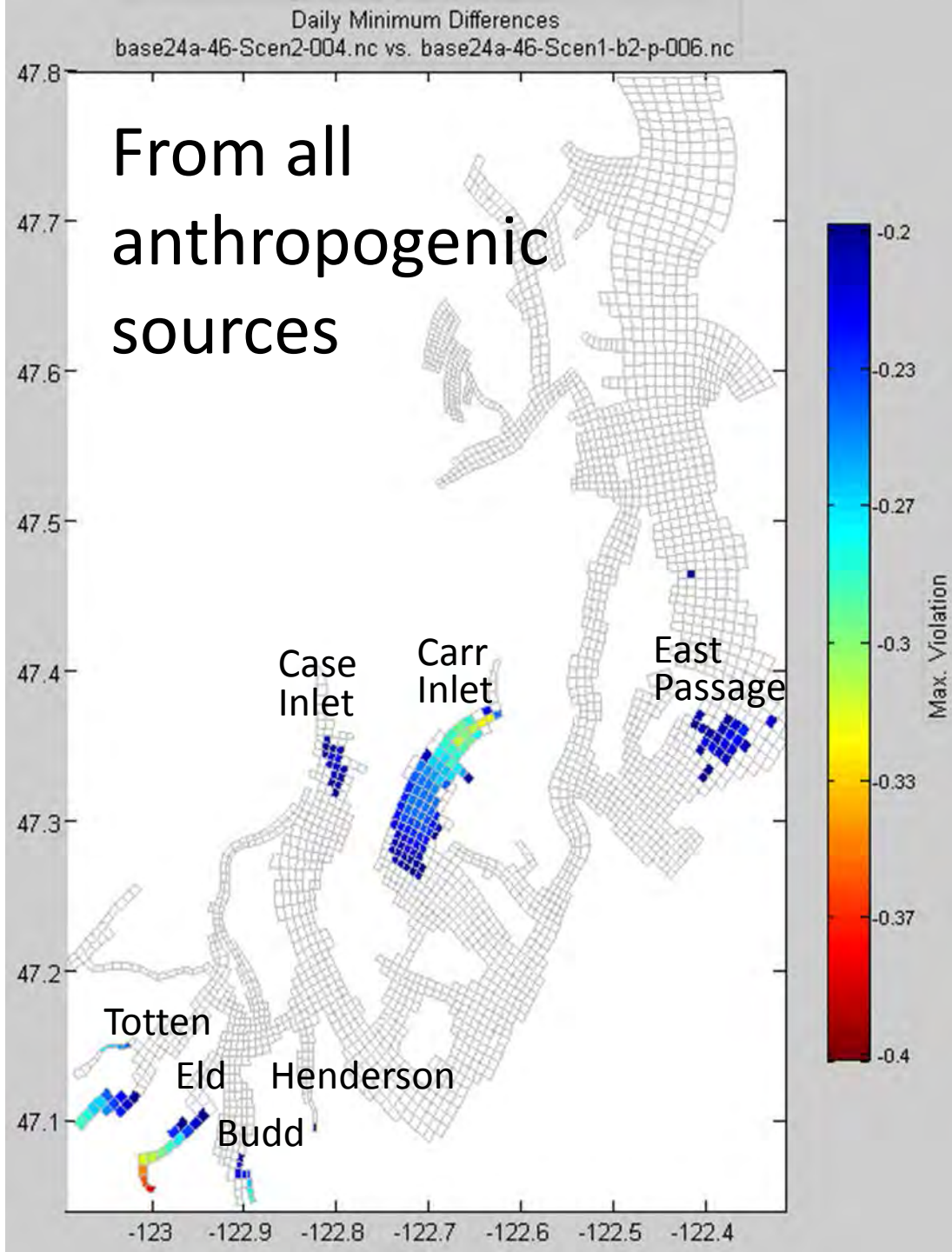
~0.1 to 0.2 mg/L DO deficit from local Budd Inlet non point sources

~0.3 to 0.4 mg/L DO deficit from external human sources (PS/NPS?)

~1.8 mg/L DO deficit from Capitol Lake dam

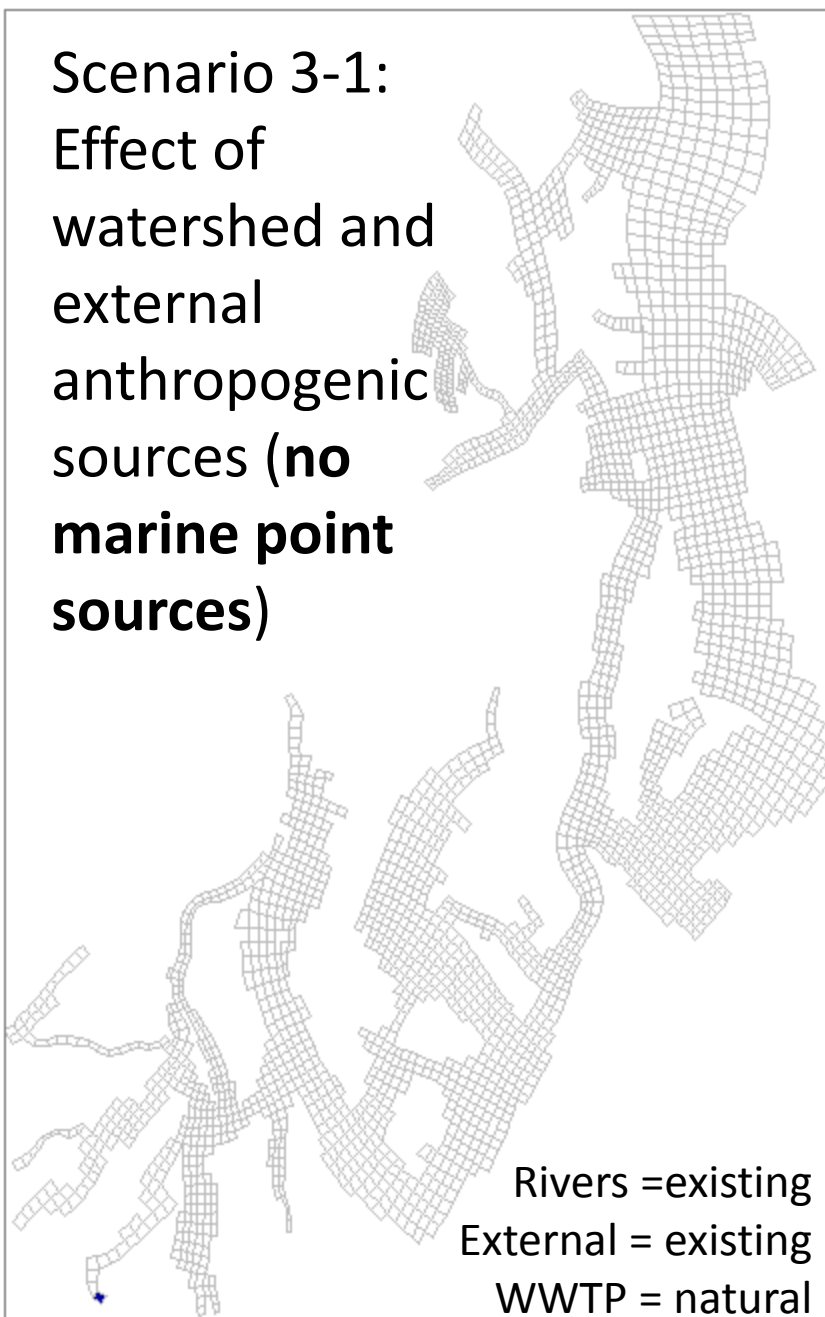
Central and South Puget Sound

Violations of the water quality standard for dissolved oxygen

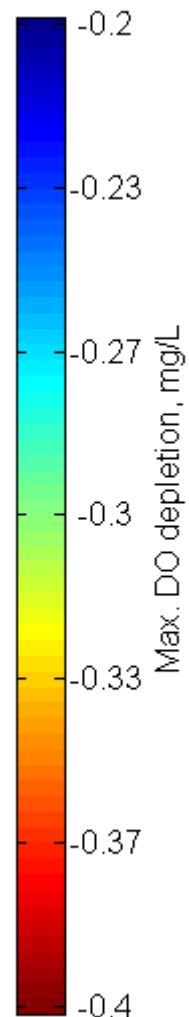
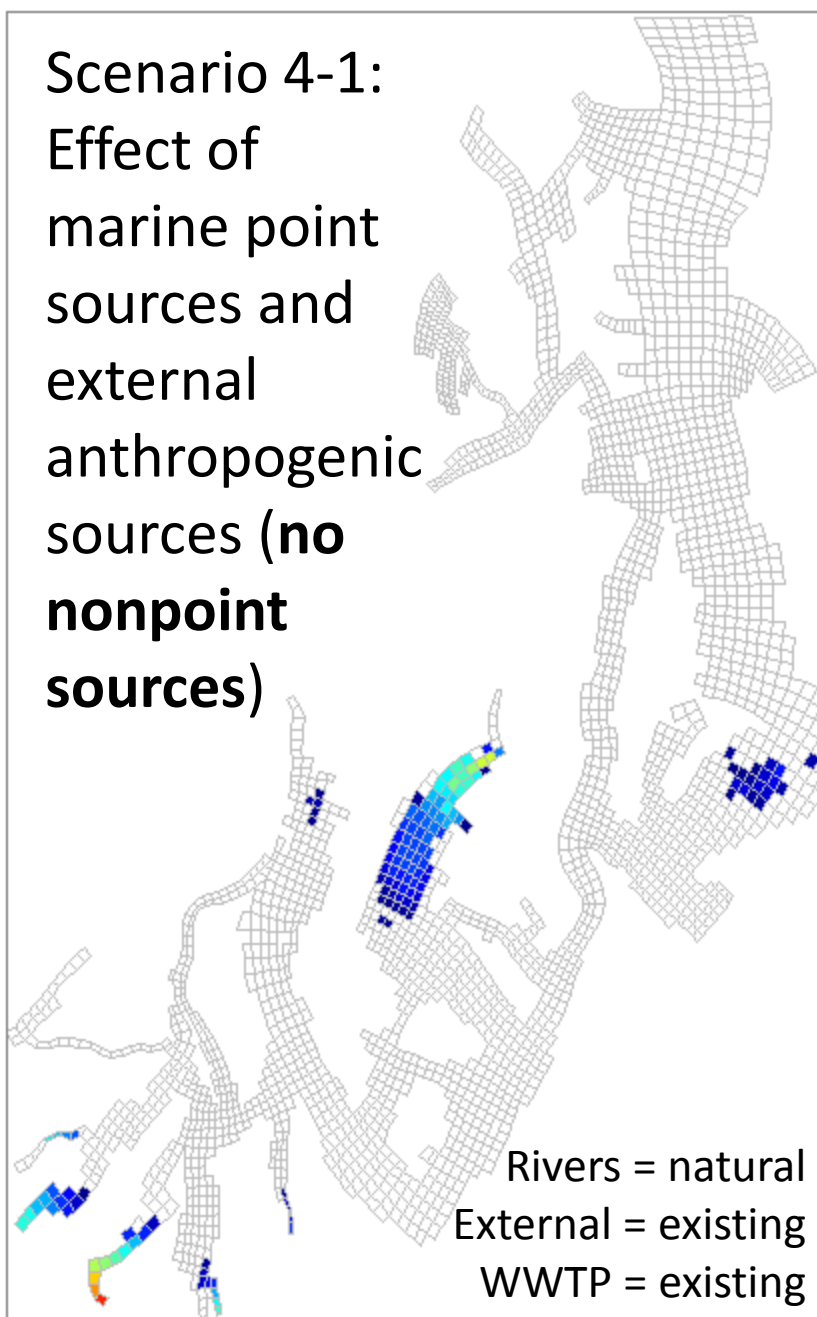


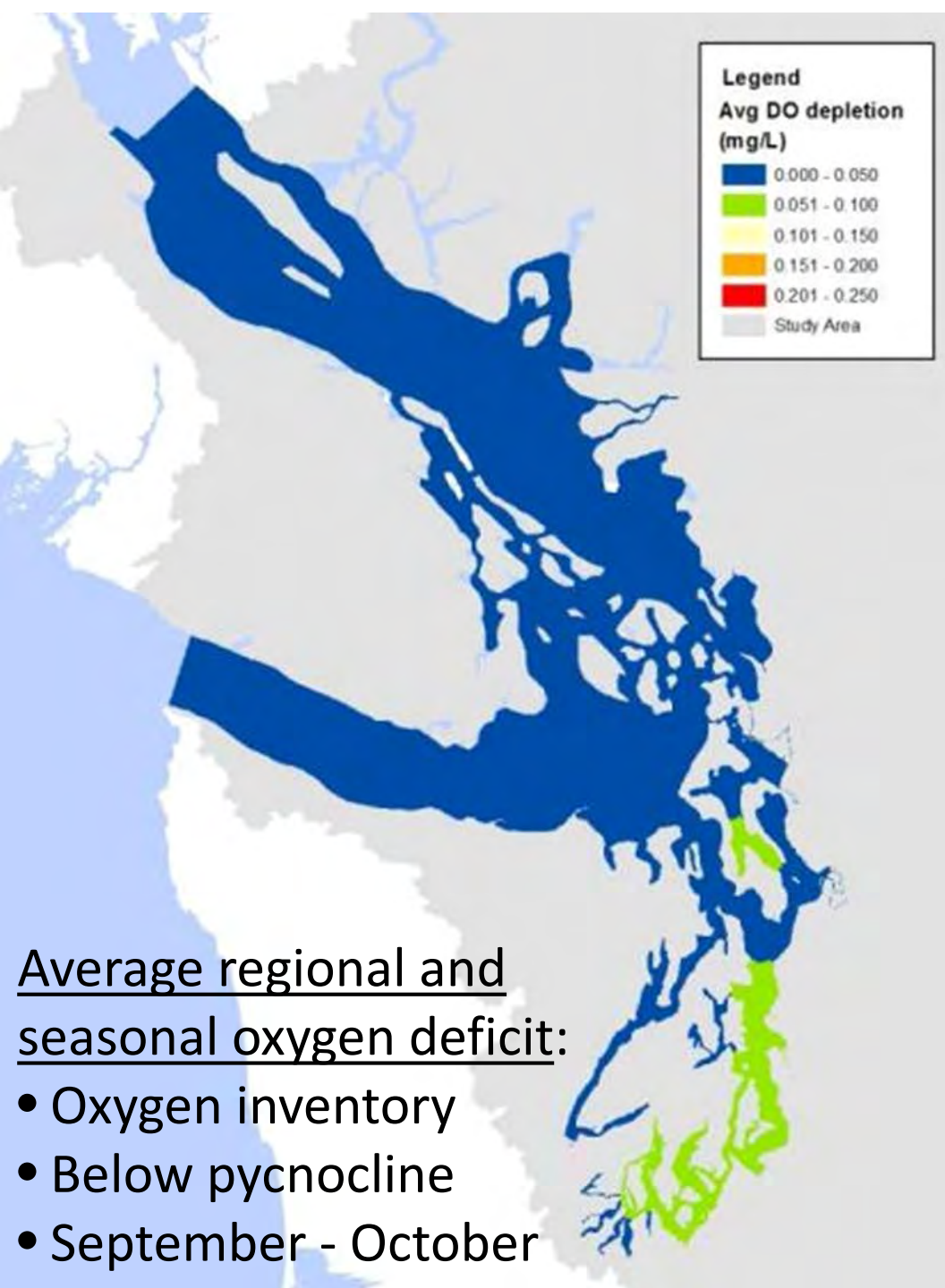
Marine point sources have greater influence than watershed sources

Scenario 3-1:
Effect of
watershed and
external
anthropogenic
sources (**no
marine point
sources**)



Scenario 4-1:
Effect of
marine point
sources and
external
anthropogenic
sources (**no
nonpoint
sources**)





Salish Sea DO depletion – current sources (wastewater, watersheds)

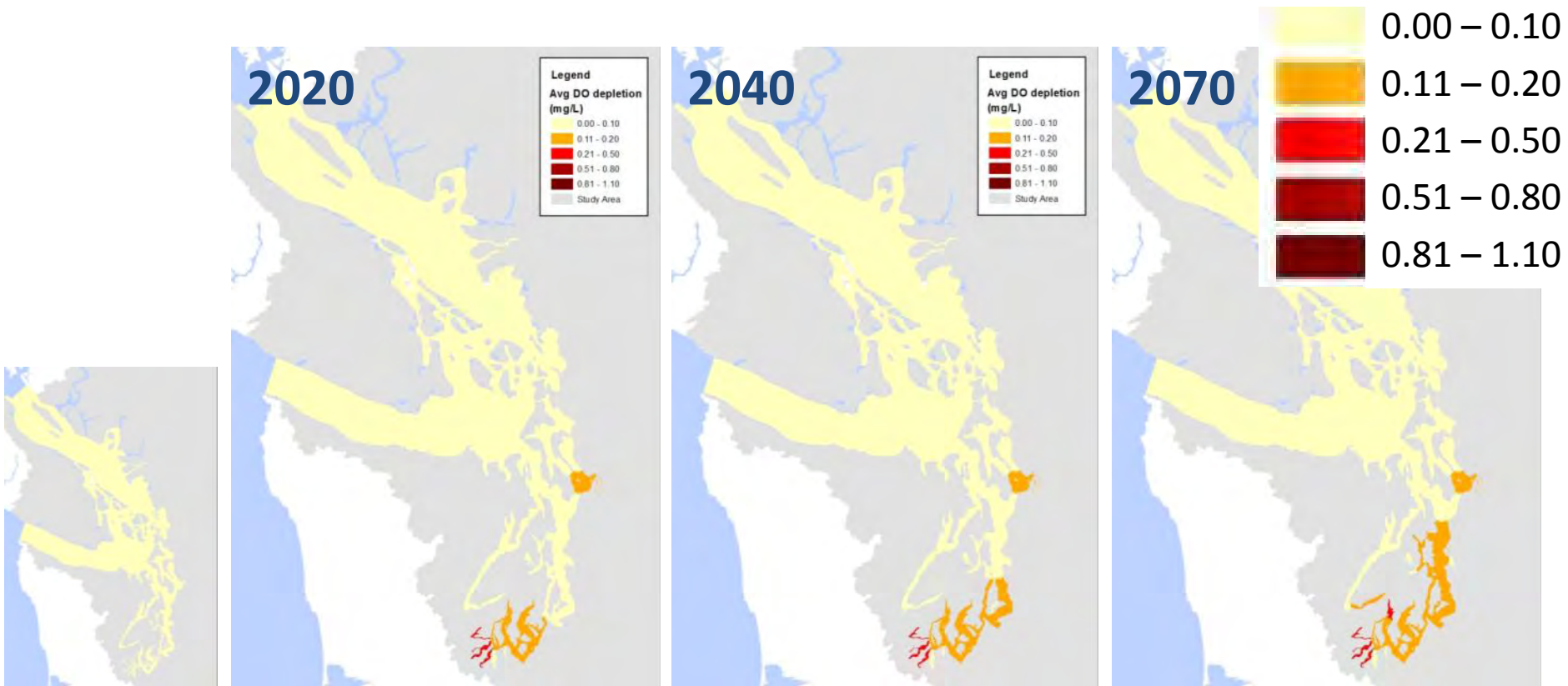
- *Biggest impacts in South and Central Puget Sound*
- *Not directly applicable to State of WA water quality standards*

Average regional and seasonal oxygen deficit:

- Oxygen inventory
- Below pycnocline
- September - October

Oxygen depletion – future marine point sources and watershed inflows

Average DO depletion (mg/L)



current

2020 loads, current circ, current ocean

2040 loads, current circ, current ocean

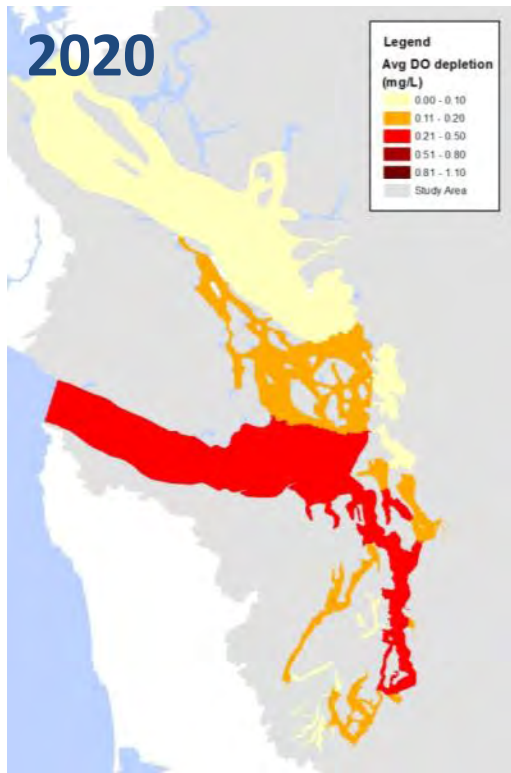
2070 loads, current circ, current ocean

Oxygen depletion – future human loads, circulation, and ocean

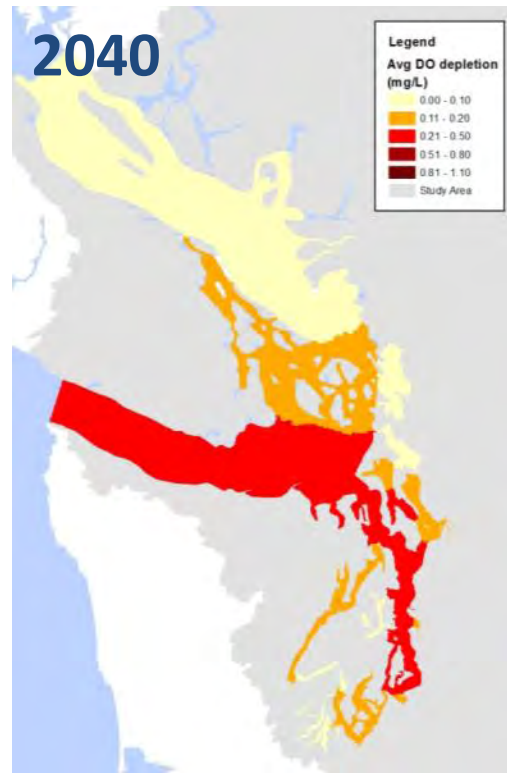
Average DO depletion (mg/L)



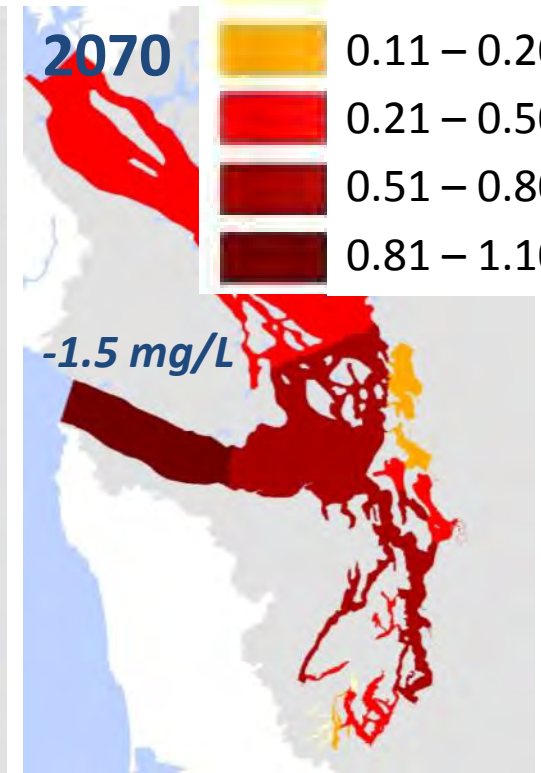
current



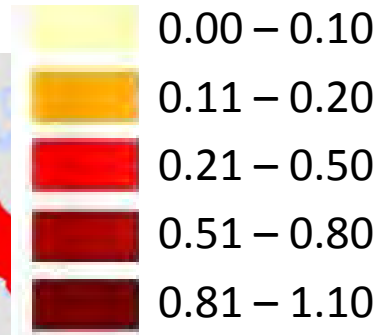
2020 loads, future ocean, future circ



2040 loads, future ocean, future circ



2070 loads, future ocean, future circ



What are the main drivers of DO depletion?

Budd Inlet

- Capitol Lake dam
- Local point and nonpoint sources
- External point and nonpoint
- Sediment/water exchanges

Central and South Puget Sound

- Local point sources
- Local nonpoint
- External/reflux of local
- Sediment/water exchanges

Salish Sea

- Pacific Ocean trends
- Point sources, nonpoint sources, meteorology
- Sediment/water exchanges

the end