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Application of Salish Sea model: water quality improvement through anthropogenic nutrient reductions

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Application of Salish Sea Model

Linking Water Quality Improvement to Anthropogenic Nutrient reductions

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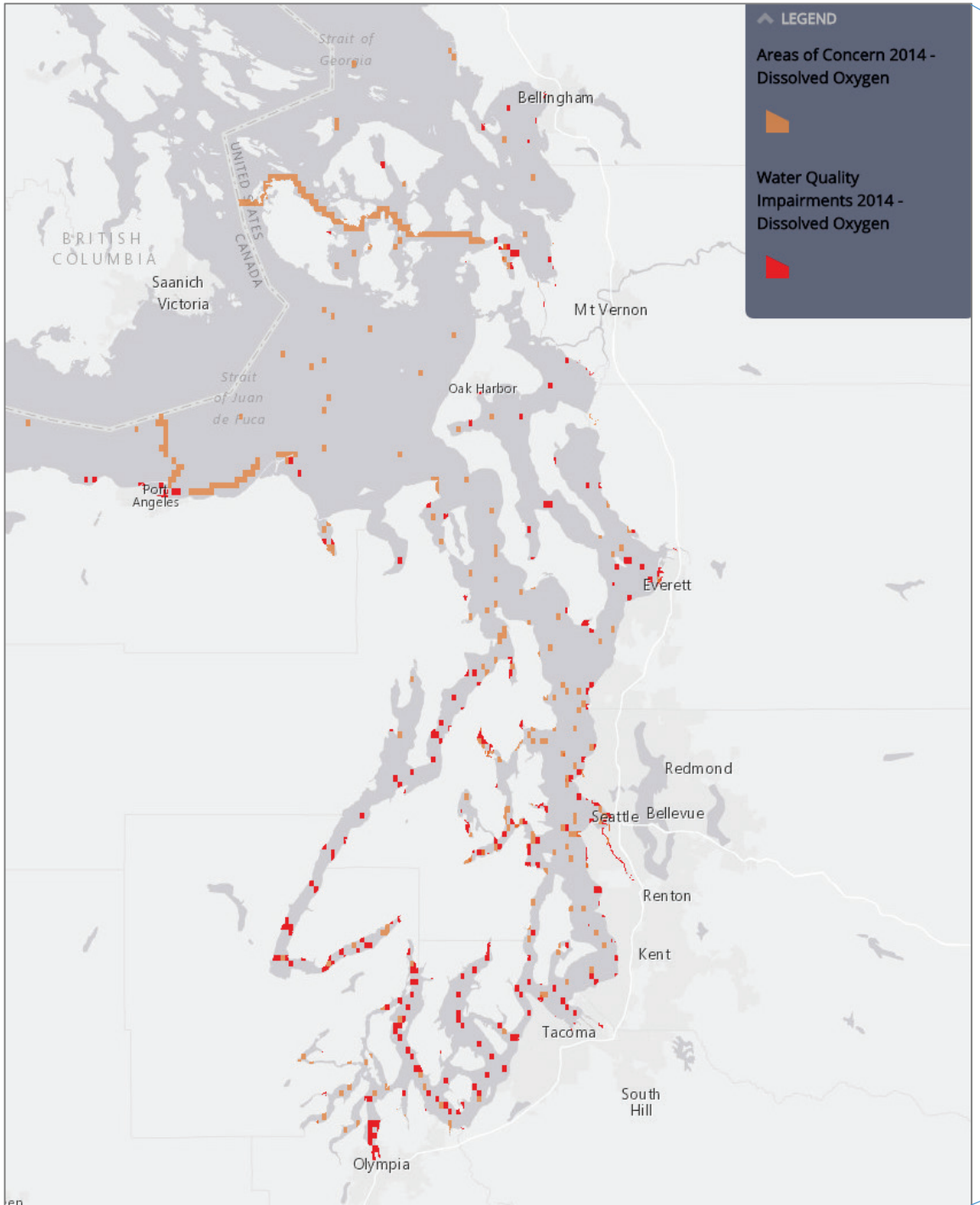
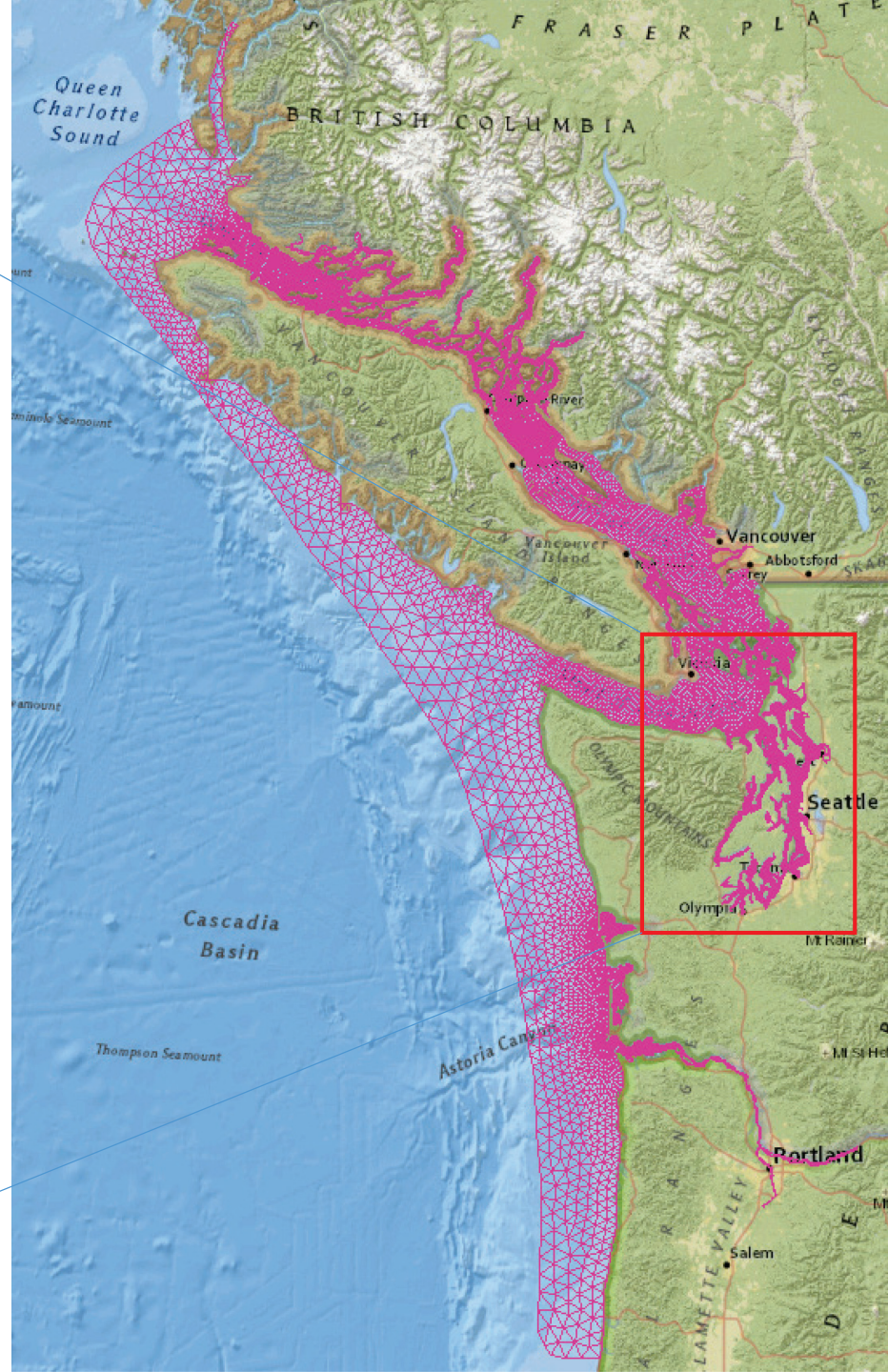


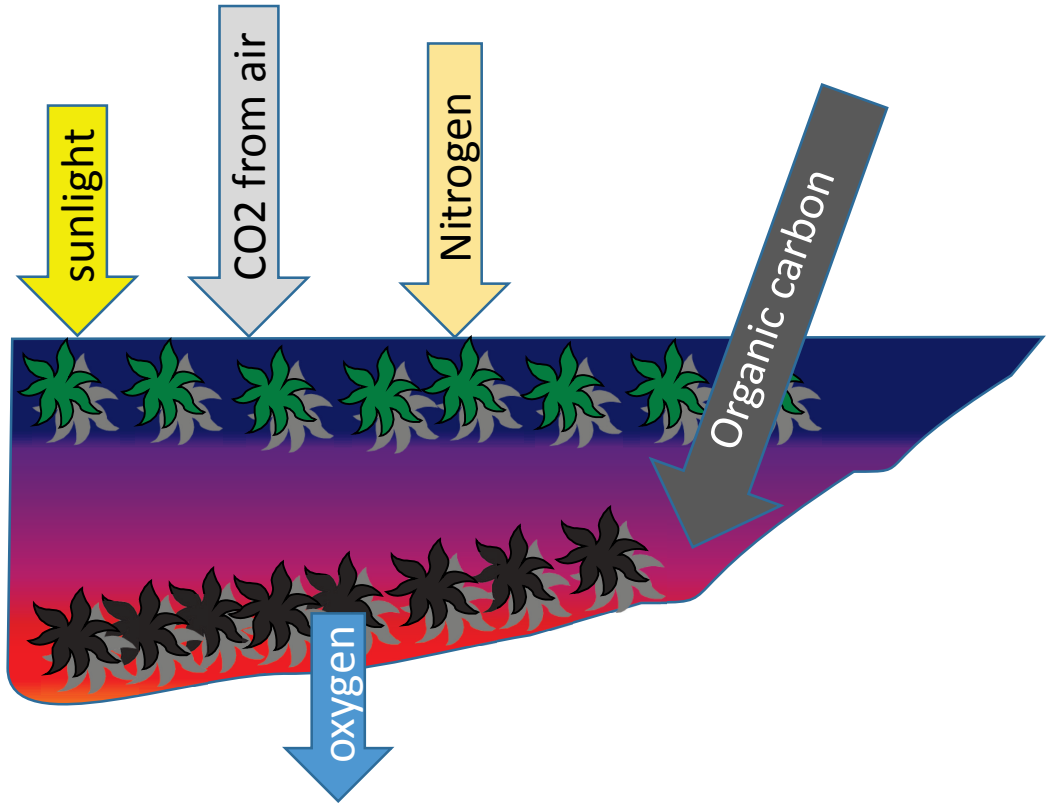
303(d) listings for DO

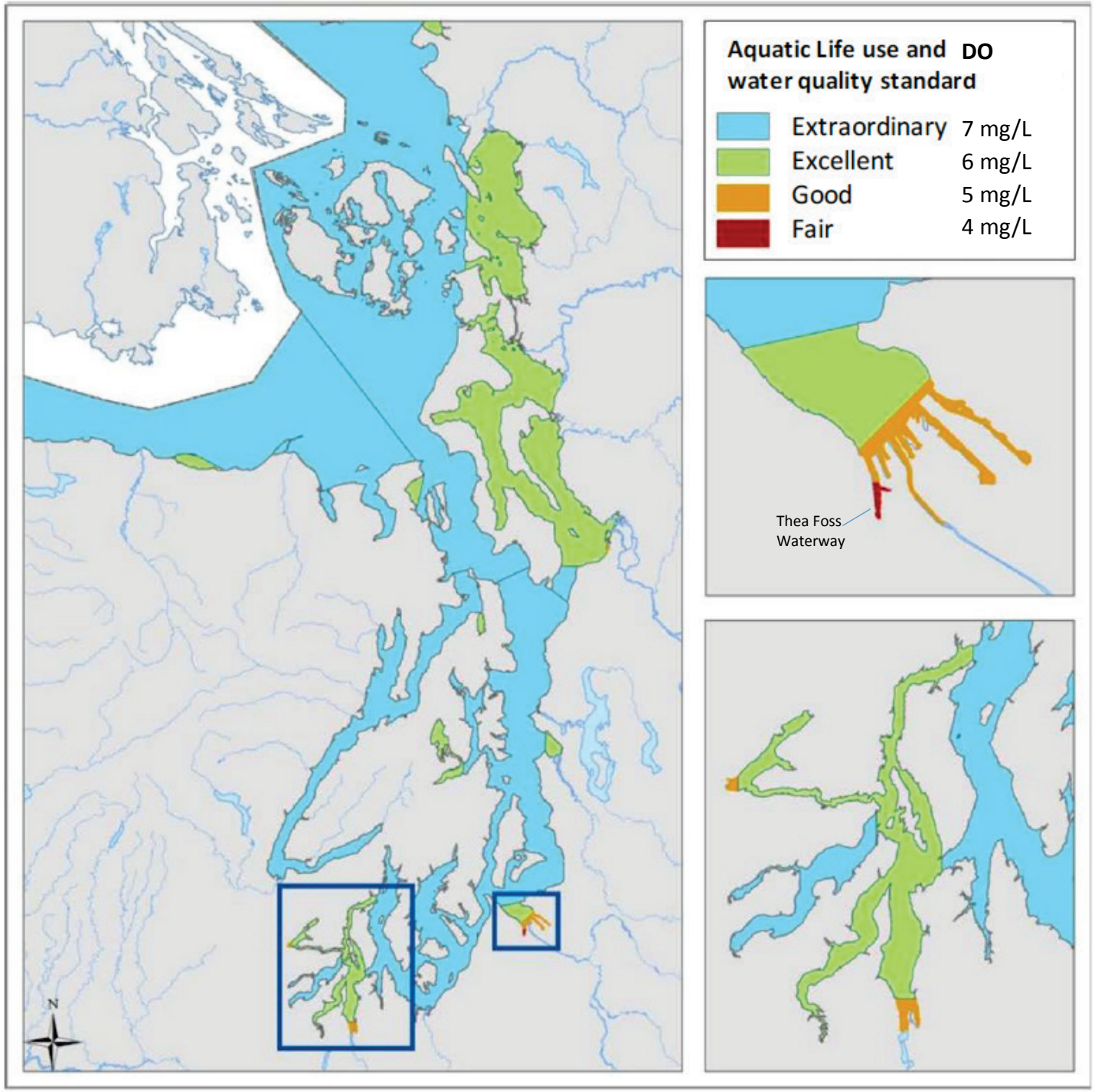


Dissolved Oxygen (DO) standards

(A) Numeric criteria

(B) If natural conditions are below the standard, anthropogenic sources cannot reduce natural DO by more than 0.2 mg/L

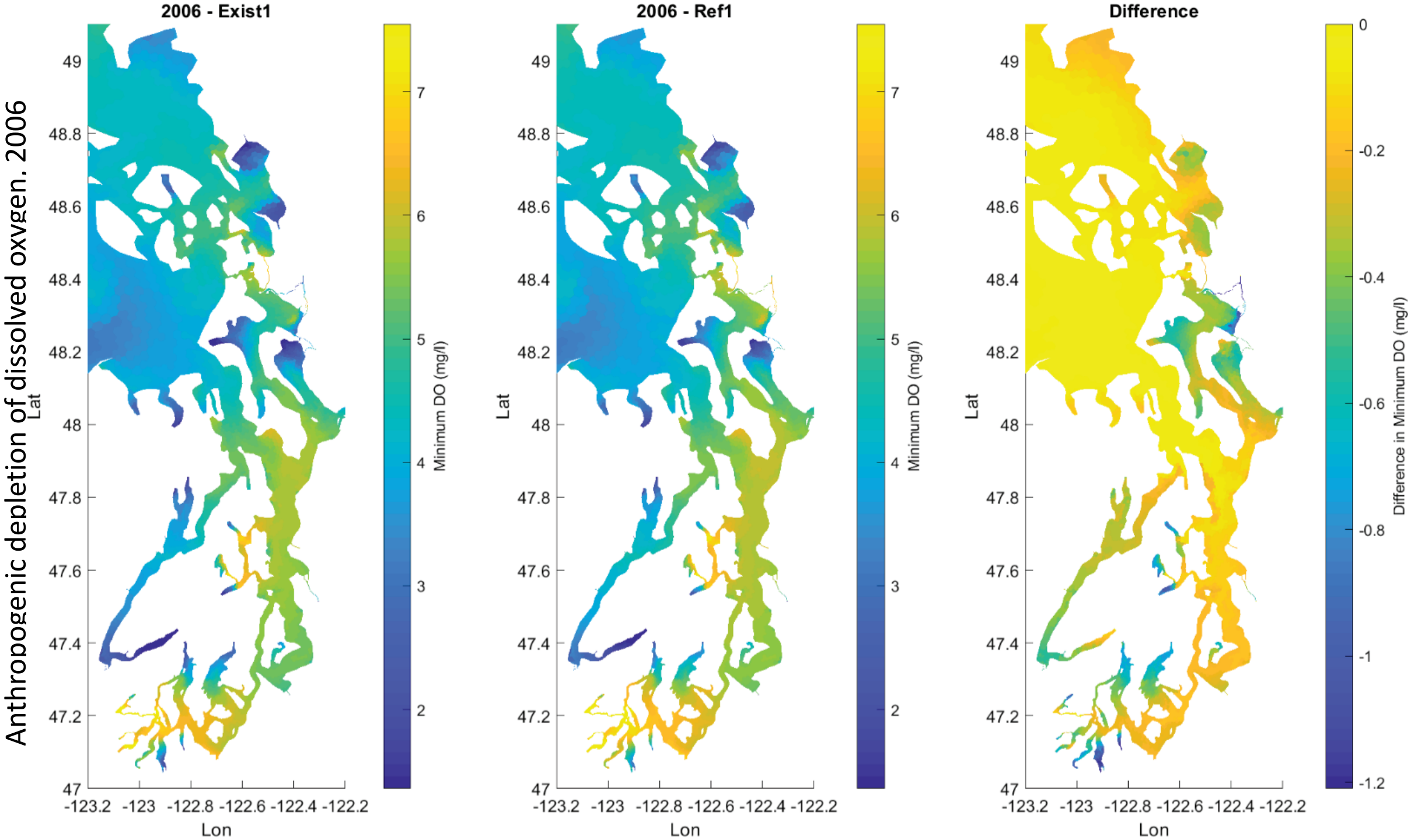




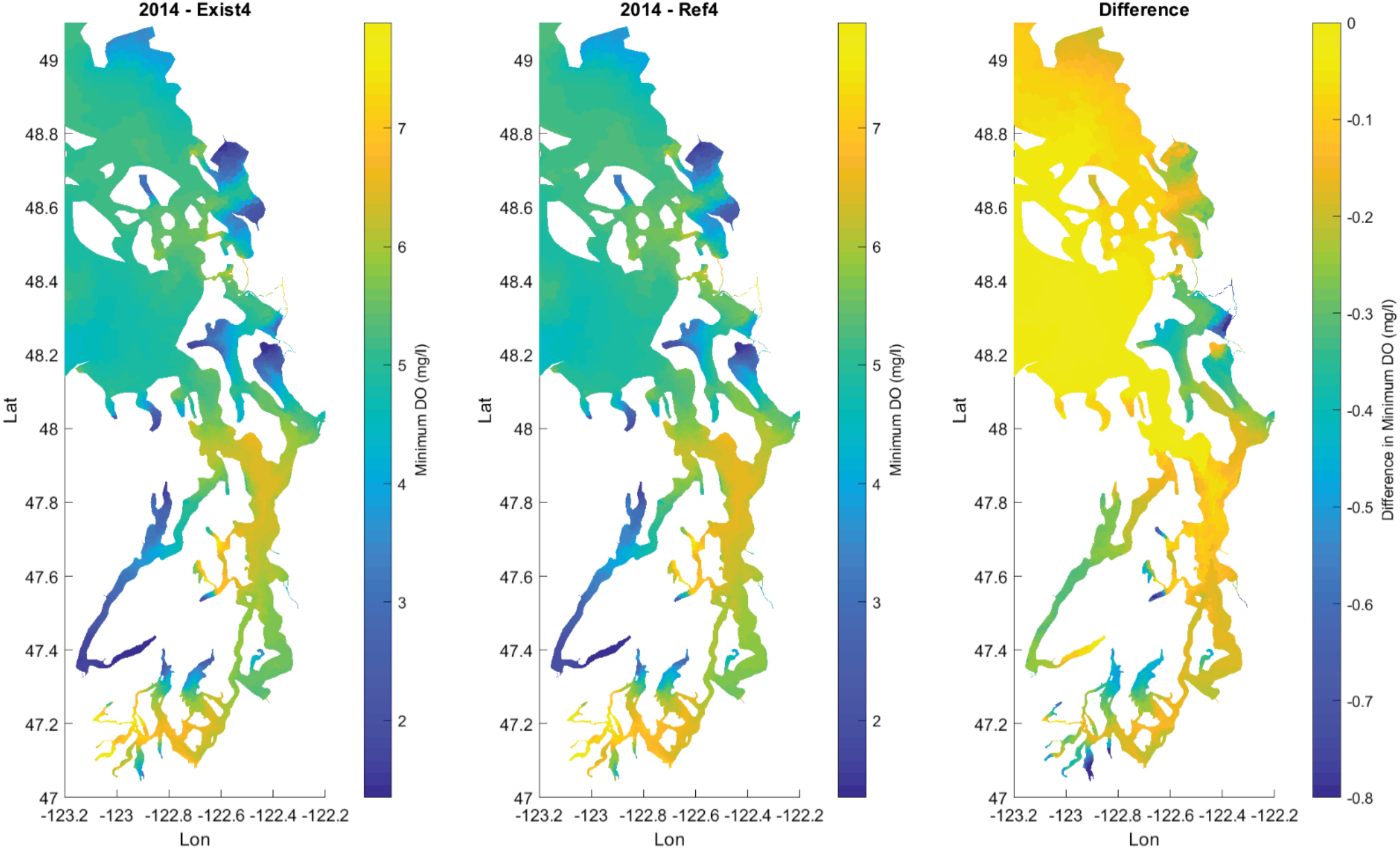
Application of Salish Sea Model:
Dissolved Oxygen (DO) improvement through Anthropogenic Nutrient Reduction

- What is the current state of Dissolved Oxygen (DO) in Salish Sea?
  - Are DO standards currently being met?
  - Are DO standards met under reference conditions?
  - What is the net anthropogenic DO impact?
  - Is there inter-annual variability in anthropogenic DO impact?
- What would happen to DO if we did nothing?
- How much DO can be improved from anthropogenic nutrient reductions?

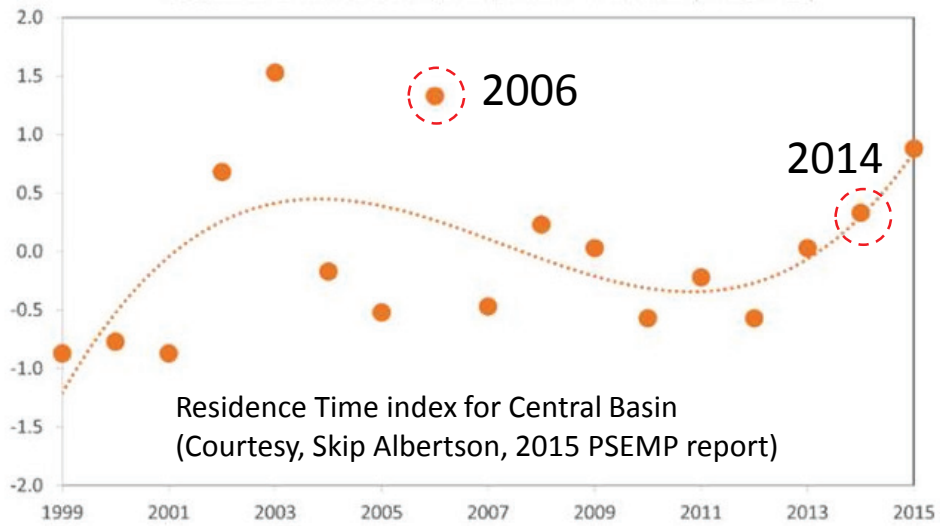
Anthropogenic depletion of dissolved oxygen, 2006



Anthropogenic depletion of dissolved oxygen. 2014

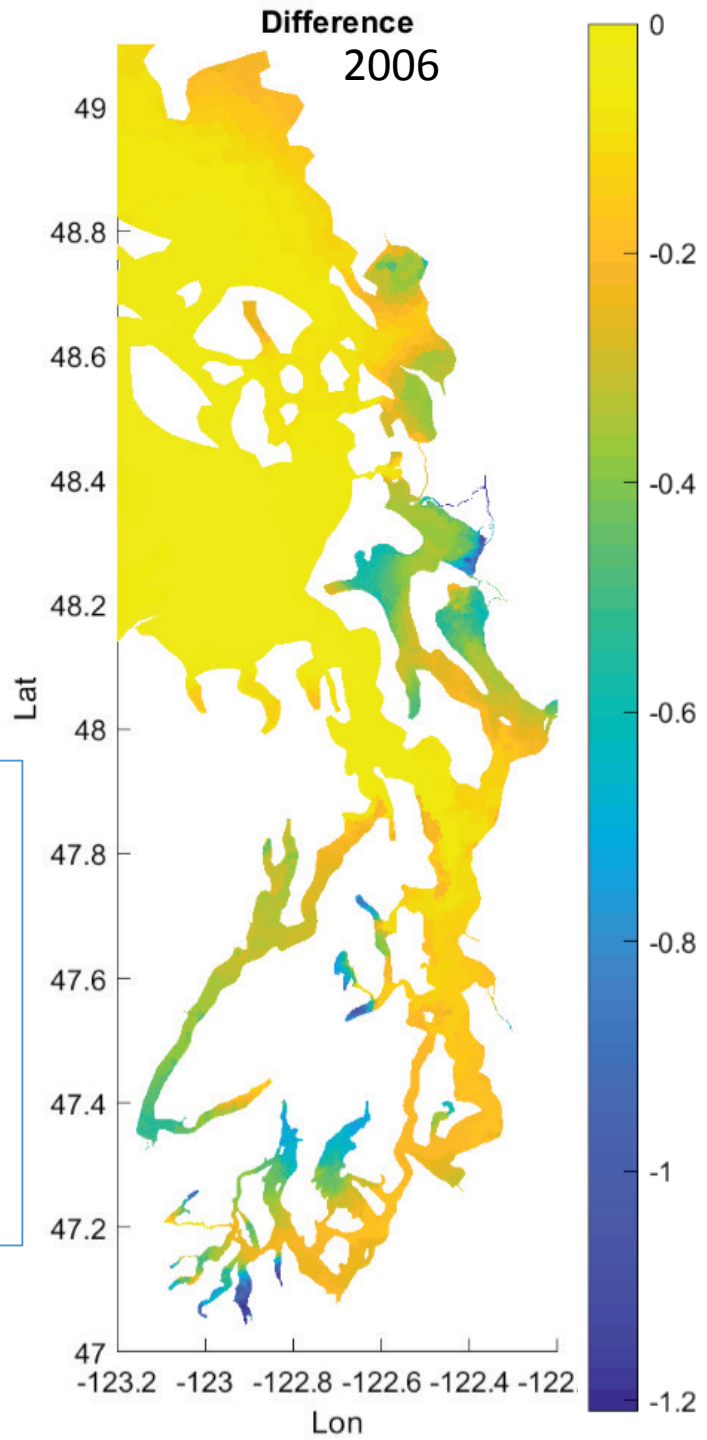


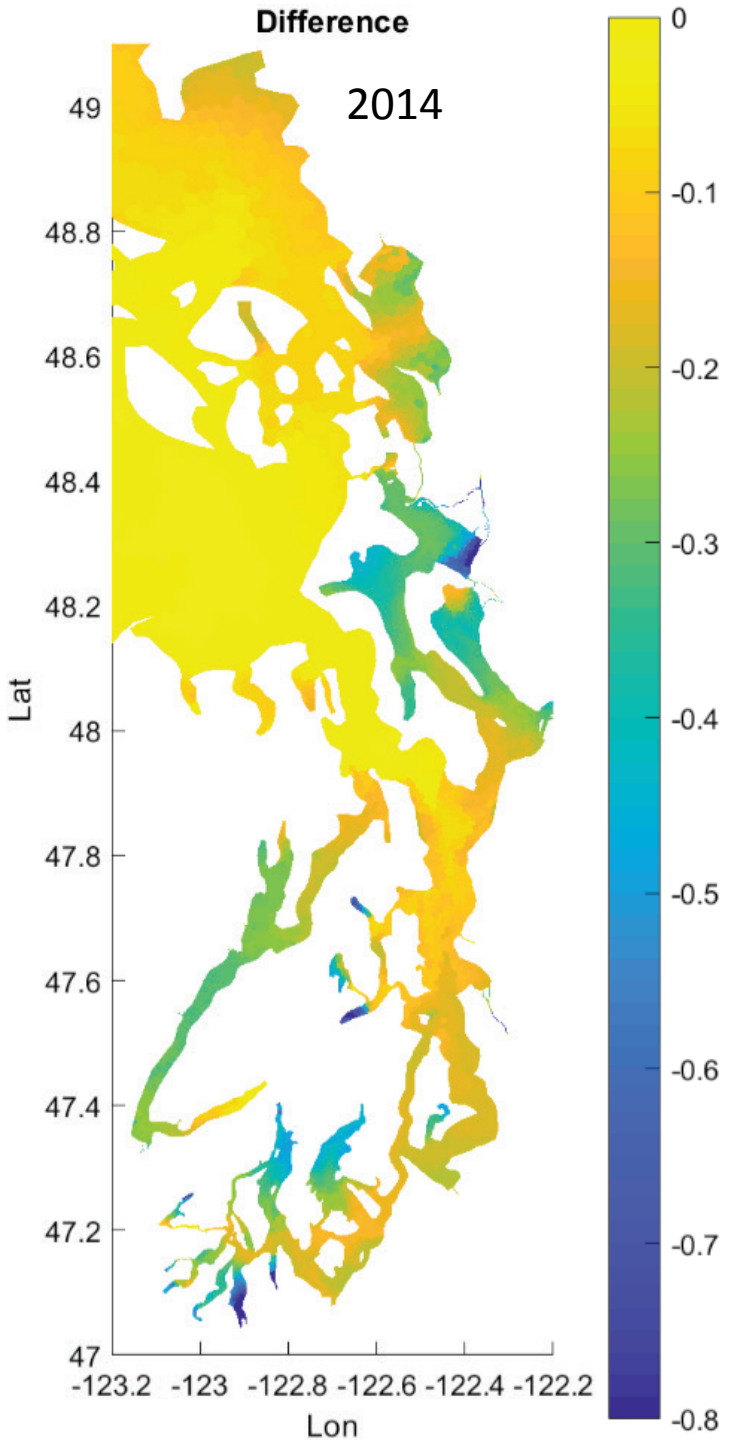
Consider Inter annual variability in DO depletions



Lower freshwater flows

- Increase residence times (i.e. how long it takes to flush water out of a region)
- Buildup of pollutant concentrations
- Increased productivity and depletion of nutrients
- Promotes oxidation of ammonia to nitrate
- Promotes decomposition of organic carbon





Application of Salish Sea Model:

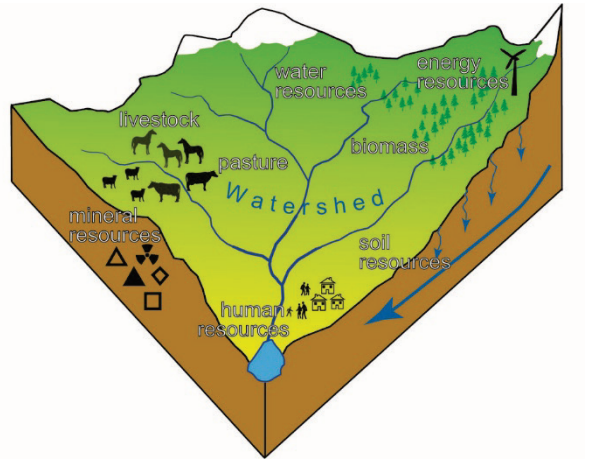
DO improvement through Anthropogenic Nutrient Reduction Strategies (multiple year analysis)

Bounding Scenarios

- What is the maximum improvement in DO with BNR at WWTPs?
- What is the maximum improvement in DO from nutrient reductions in watersheds?
- What would DO be under status quo?

Strategic Scenarios through collaborative process

- Impact of BNR at selected WWTPs?
- Impact of different nutrient reduction levels in watersheds?
- Combination of BNR and watershed reductions?



Application of Salish Sea Model:

Bounding scenario: WWTP at BNR?

BNR levels for ammonia and nitrate set by 2011 Puget Sound WWTP report*

- Use only dry weather treatment (May – Oct)
- DIN (ammonia + nitrate) = 8 mg/L (NH3 = 0.25 mg/L, NO3 = 7.75 mg/L)

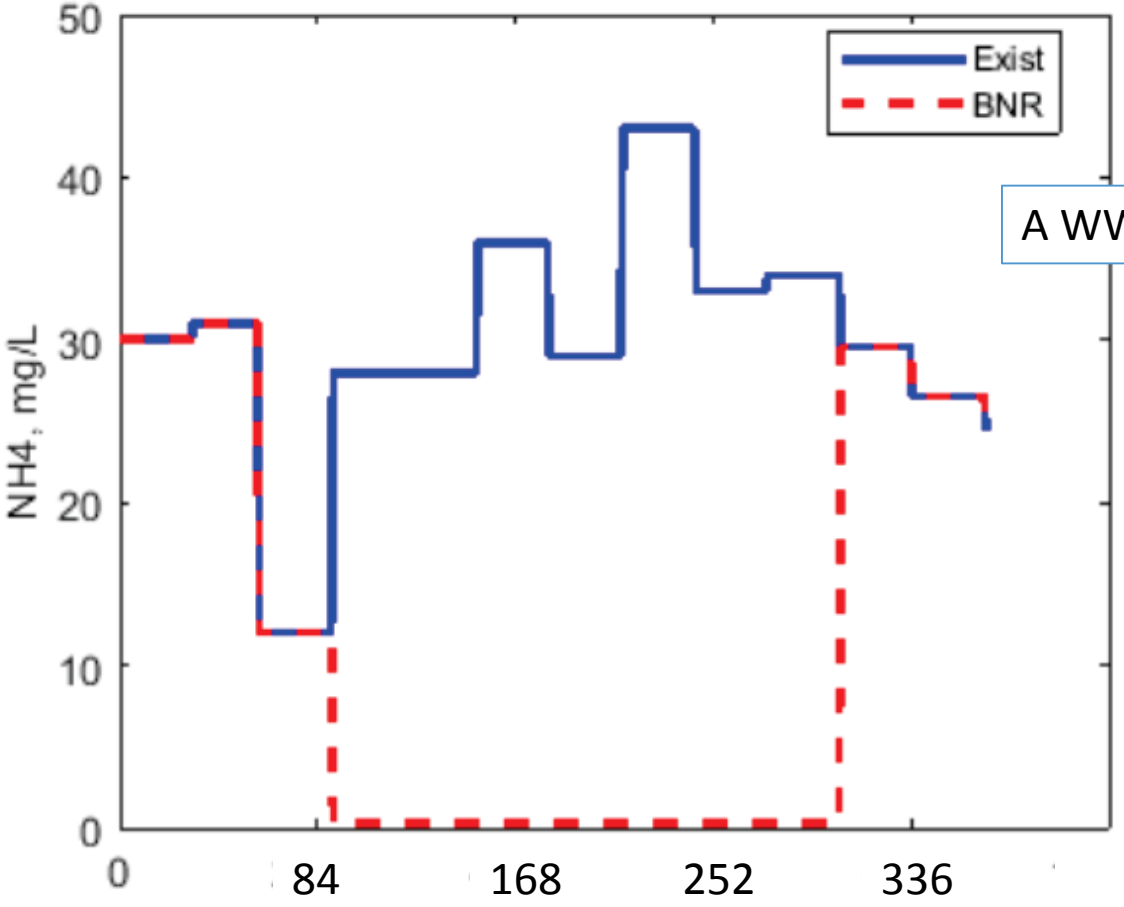
LOTT has already achieved levels of DIN = 3 mg/L

* TetraTech 2011. Technical and Economic Evaluation of Nitrogen and Phosphorus Removal at Municipal Wastewater Treatment Facilities in Washington State. Ecology Publication Number 11-10-060

Application of Salish Sea Model:

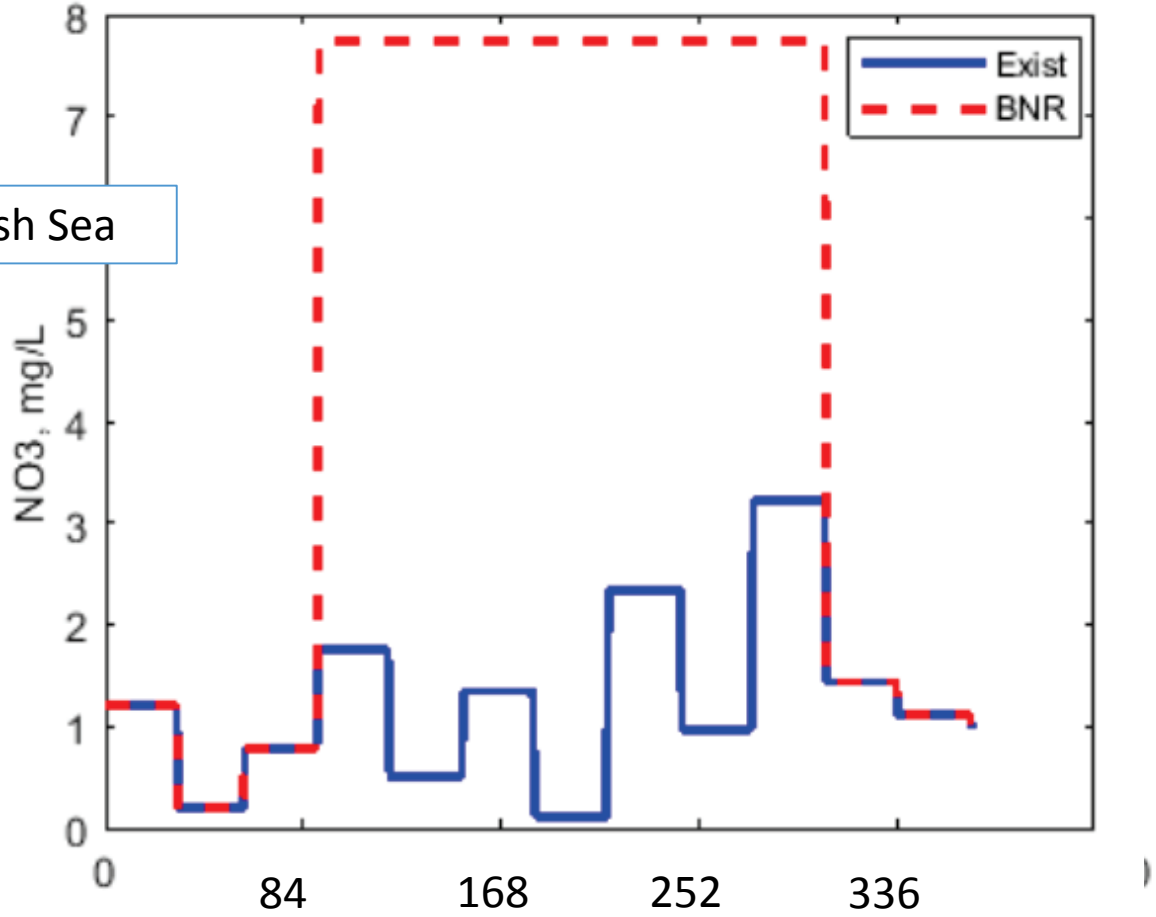
Bounding scenario: WWTP at BNR?

NH_3 ----------Nitrification----------> NO_3



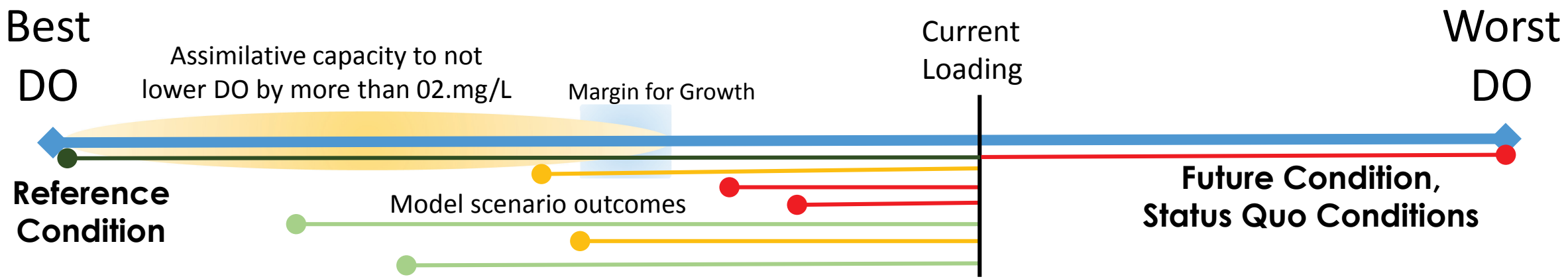
A WWTP in Salish Sea

NO_3 ----------Denitrification----------> N_2



Application of Salish Sea Model:

- Strategic Scenarios through collaborative process



- Multiple scenarios of point and nonpoint source reductions will be evaluated
- Final solution set includes regulatory requirements and considers costs, feasibility, priority, and sequencing

Questions:

- Bounding Scenarios Draft Report: end of 2018
- Scenarios for Nutrient Management Strategy >= 2019

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