Budd Inlet, Capitol Lake, and Deschutes River TMDL Technical Report Status and Overview

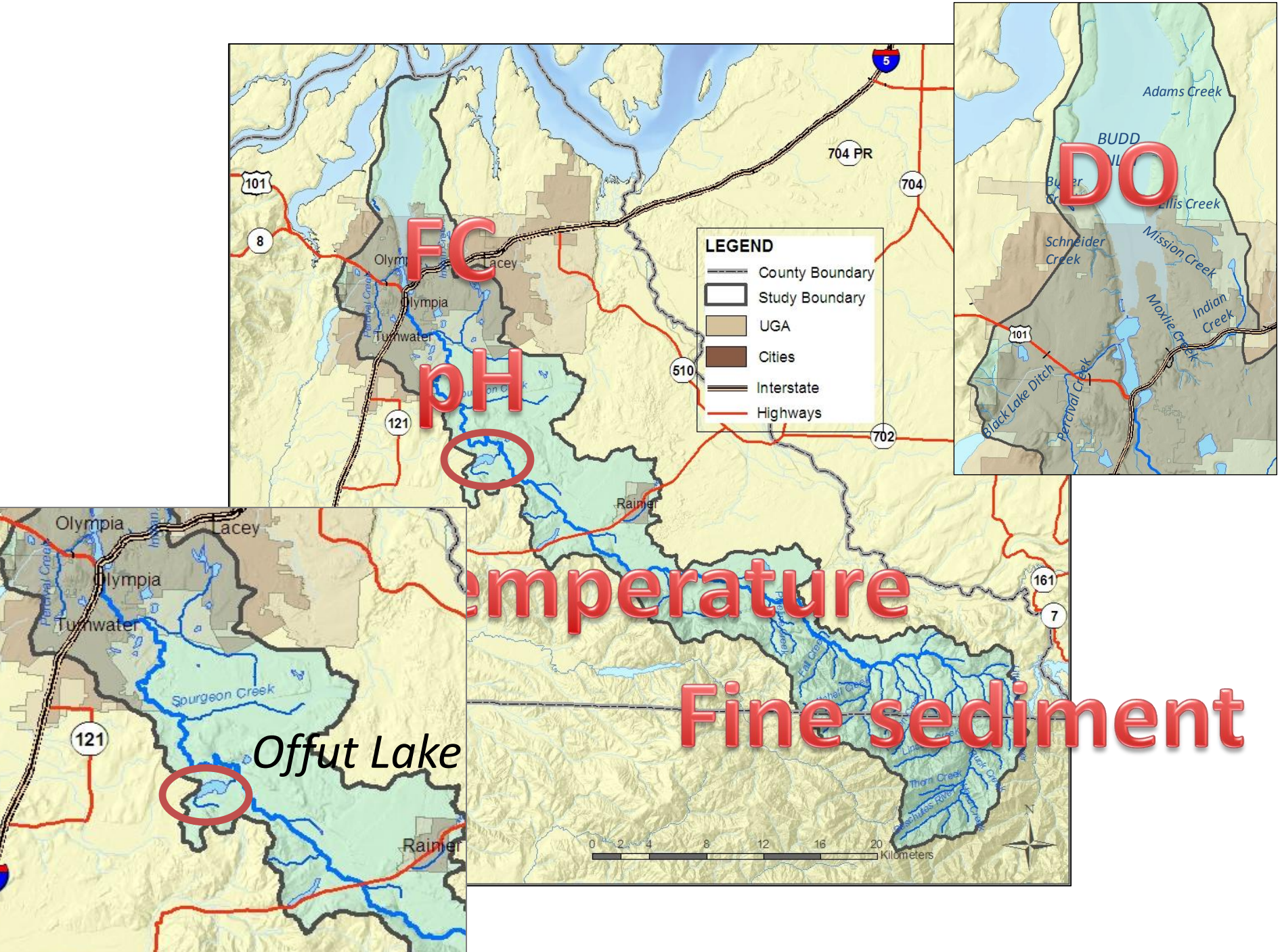
January 26, 2012

Briefing for Deschutes Advisory Group

Purpose

- Brief Advisory Group on project status
  - Report updates since October 2008 draft
    - >250 pages!
    - Plus 450-pages of appendices
  - Model changes

- Highlight major findings
  - Deschutes River watershed (and Percival)
  - Capitol Lake and Budd Inlet model



FC
pH
DO
emperature
Fine sediment
Offut Lake
LEGEND
County Boundary
Study Boundary
UGA
Cities
Interstate
Highways
Olympia
Lacey
Tumwater
Rainier
Spurgeon Creek
Percival Creek
Adams Creek
BUDD
Ellis Creek
Schneider Creek
Mission Creek
Moxlie Creek
Indian Creek
Black Lake Ditch
Percival Creek
Thorn Creek
Kilometers

Content of Deschutes River, Capitol Lake, and Budd Inlet Technical Report

- Deschutes River and tributaries bacteria, temperature, nutrients, dissolved oxygen, pH, and fine sediment impairments
- Percival Creek (tributary to Capitol Lake) bacteria, temperature, dissolved oxygen, and pH impairments
- Bacteria impairments in streams discharging to Budd Inlet
- Nutrients and dissolved oxygen impairments in Capitol Lake and Budd Inlet

Technical Report schedule

- October 2008 draft report
  - Completed external stakeholder, peer, and independent review
  - Revised report to address comments and recalibrated Budd Inlet and Capitol Lake models
  - Response to external stakeholder comments with revised report

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- Deschutes Advisory Group external review
- Jan – Feb 2012 – Supplemental independent review of marine model phytoplankton
- June 2012 – Final publication as Vol. 2 of WQIR
  - WQP WQIR Volume 1 to be published in January 2013

Changes since October 2008 report

1. 303(d) listings updated to reflect 2008 approval
2. Water Quality Standards, Watershed Description
3. Study Methods figures
4. Fecal Coliform TMDL – fixed upper Deschutes bacteria targets to reflect more stringent criteria, clarified stormwater-only targets
5. Freshwater DO and pH TMDL – recommended nutrient load reductions, added groundwater scenario, clarified interpretation of maximum pH
6. Deschutes River fine sediment target = 12%
7. Capitol Lake and Budd Inlet models were recalibrated since October 2008 external review report
8. Conclusions expanded to capture more detail

303(d) listings

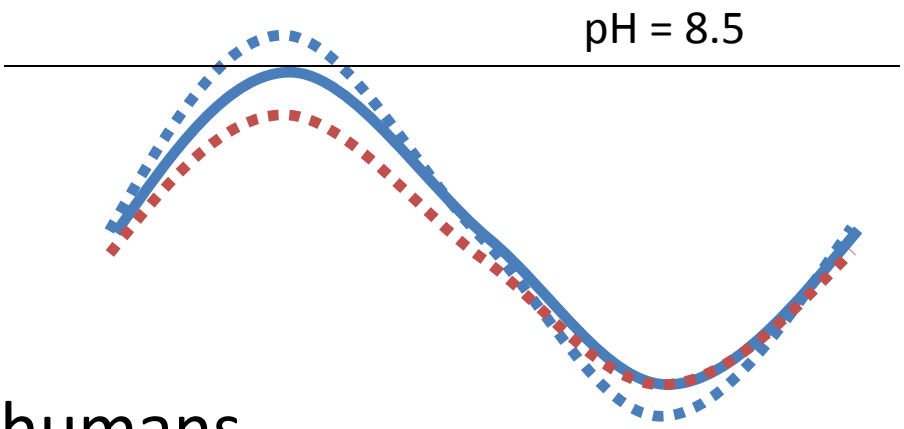
- 2008 list was <u>proposed</u> at the time of the external review draft
- Now <u>approved</u> by EPA
- Overall parameters, water bodies did not change

- *(Tables 1-3)*

Water Quality Standards

- Clarified pH max, human influence
  - pH max < 8.5

and



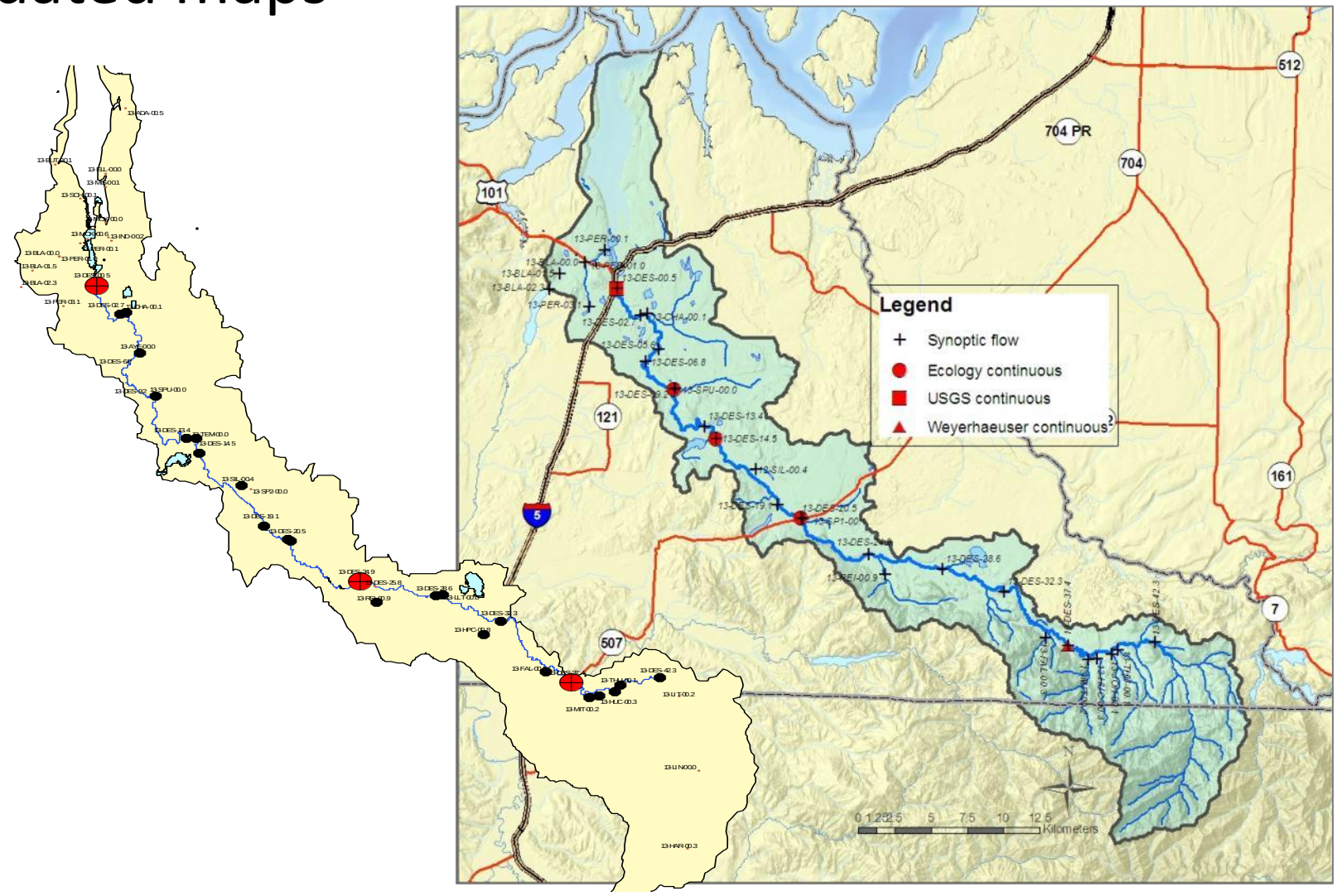
  - Delta pH max due to humans
    - < 0.2 upstream of Offut Lake
    - < 0.5 downstream of Offut Lake

Watershed Description

- Regulatory Activities
  - Updated general permits to reflect 2008-2010 versions
- Potential Pollutant Sources
  - Grouped fecal coliform, nutrients, dissolved oxygen and pH to respond to comments

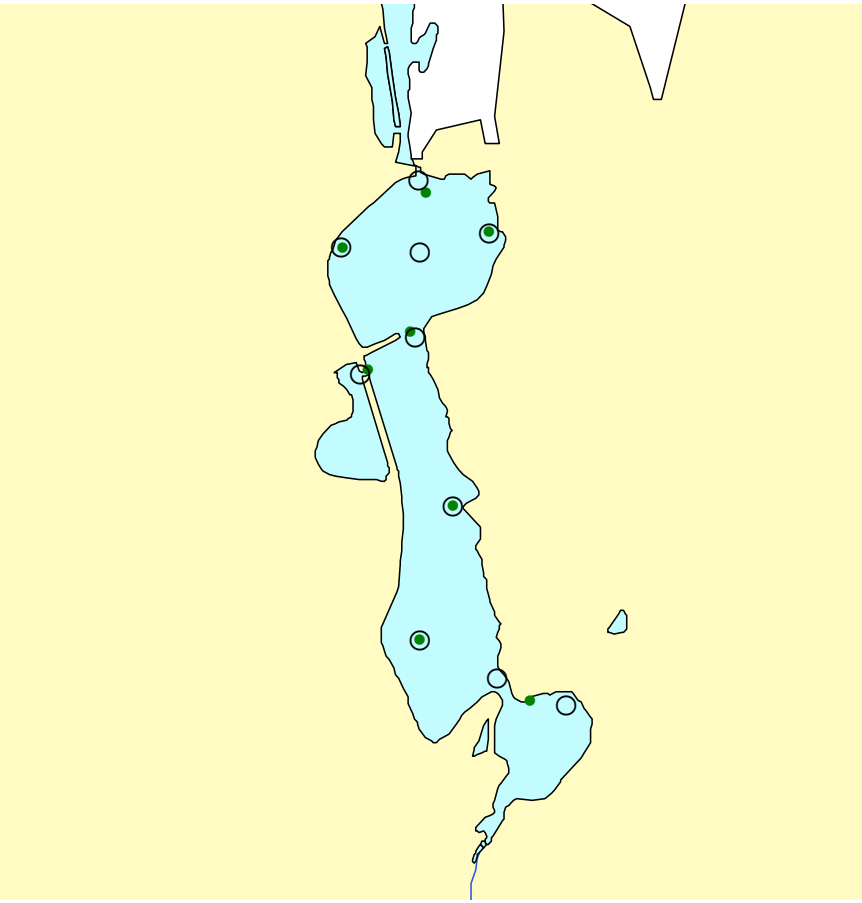
Study Methods

- Updated maps



Study Methods

- Updated maps

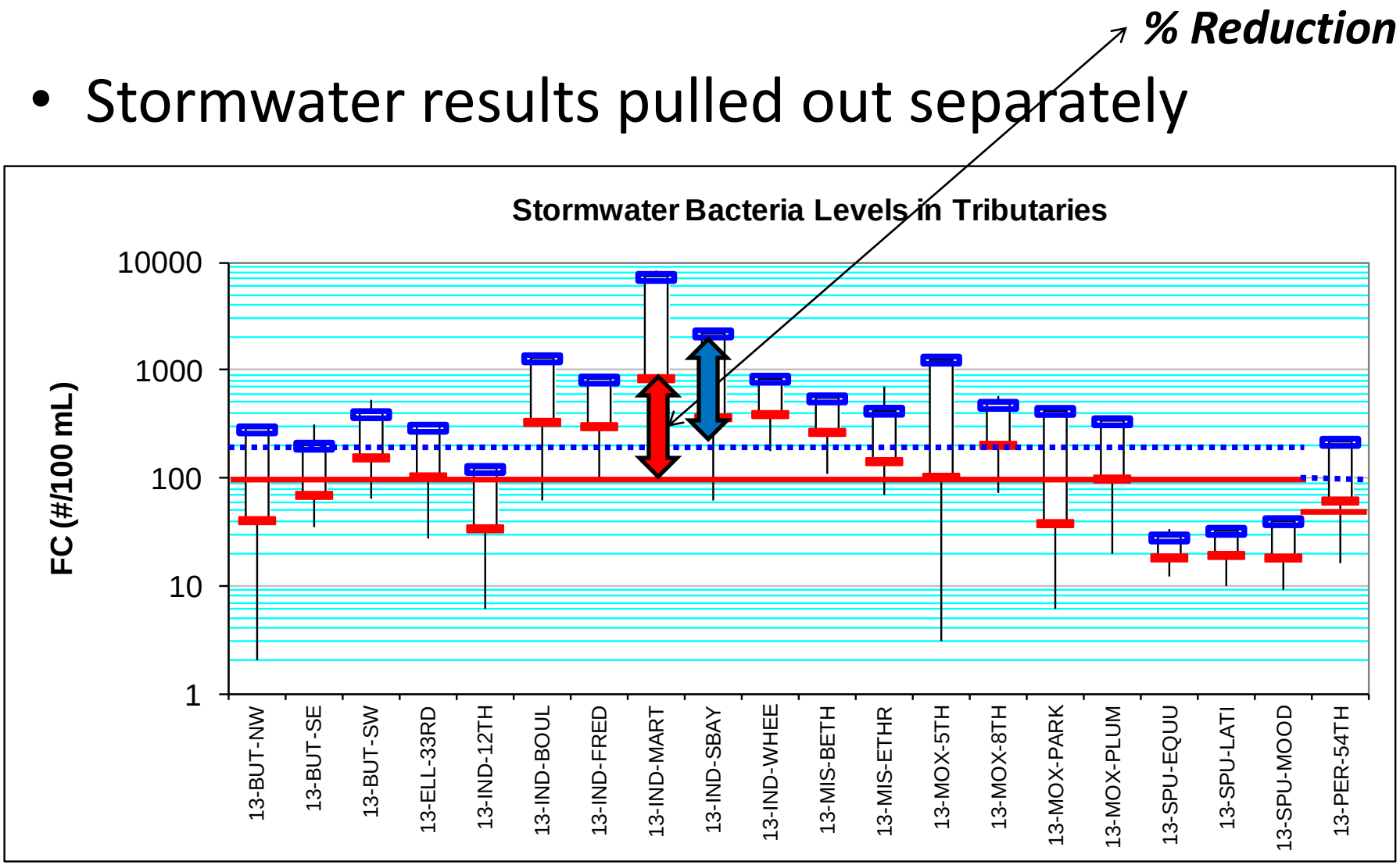


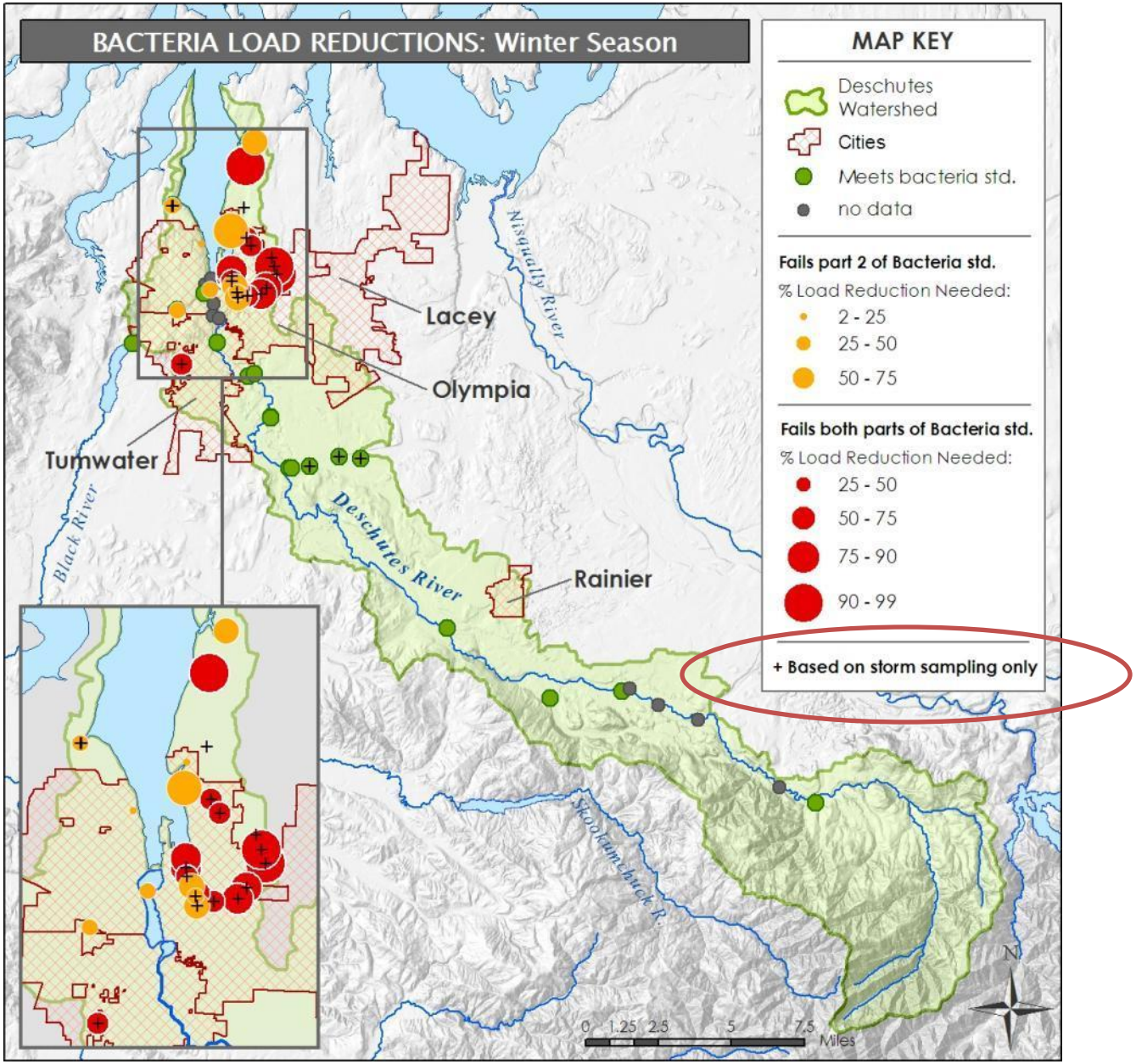
Fecal Coliform TMDL

- WQ Standards:
  - Applied to concentration data
  - Geometric mean < (50 or 100) organisms per 100 mL
  - <10% of the samples < (100 or 200) organisms per 100 mL
  - Applied seasonally (cannot mask sources)
    - Summer – May to September
    - Winter – October to April

Fecal Coliform TMDL

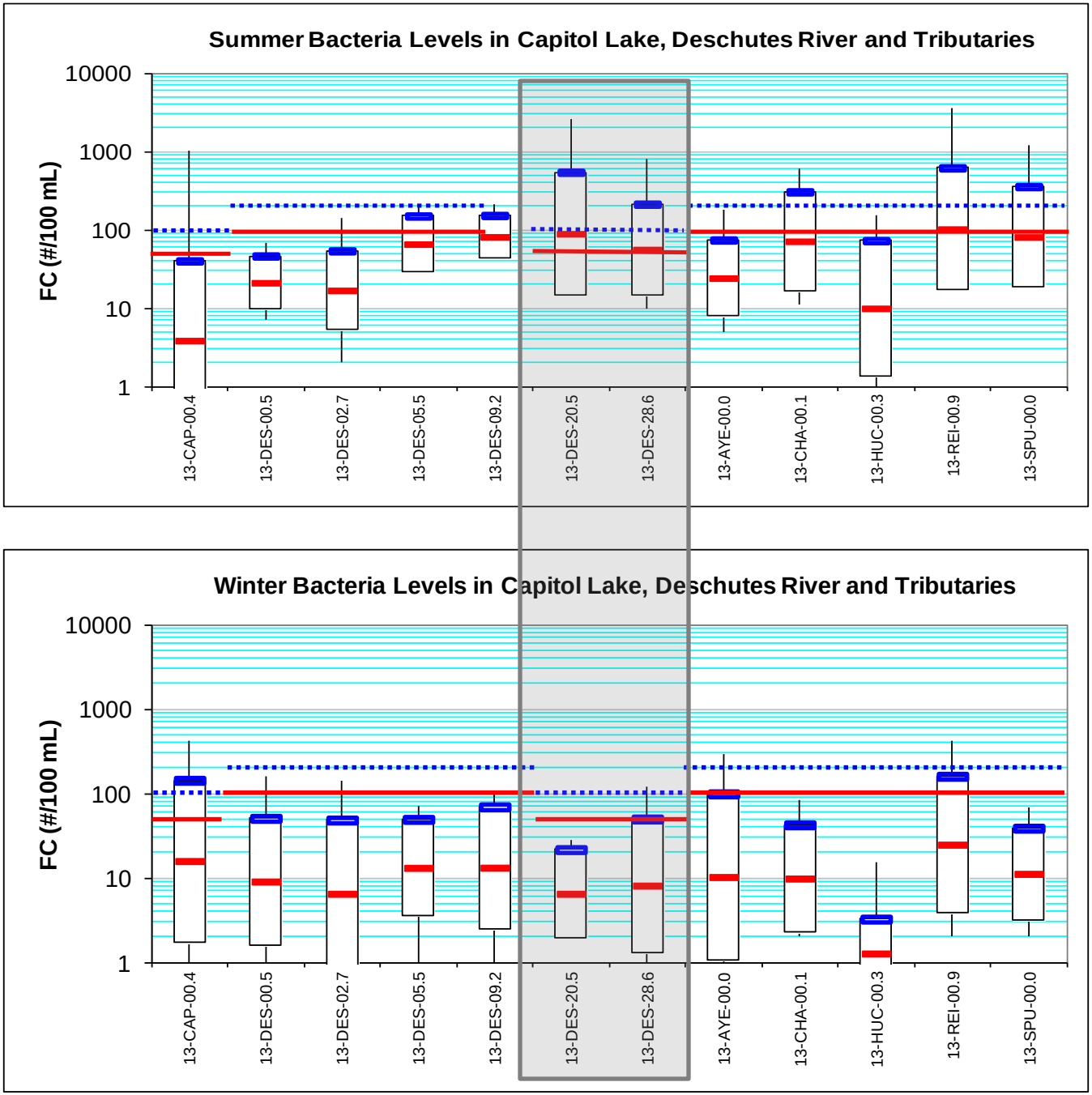
- Stormwater results pulled out separately




BACTERIA LOAD REDUCTIONS: Winter Season
MAP KEY
Deschutes Watershed
Cities
Meets bacteria std.
no data
Fails part 2 of Bacteria std.
% Load Reduction Needed:
2 - 25
25 - 50
50 - 75
Fails both parts of Bacteria std.
% Load Reduction Needed:
25 - 50
50 - 75
75 - 90
90 - 99
+ Based on storm sampling only
Lacey
Olympia
Tumwater
Rainier
Nisqually River
Black River
Deschutes River
Skookumchuck R.
0 1.25 2.5 5 7.5 Miles
N

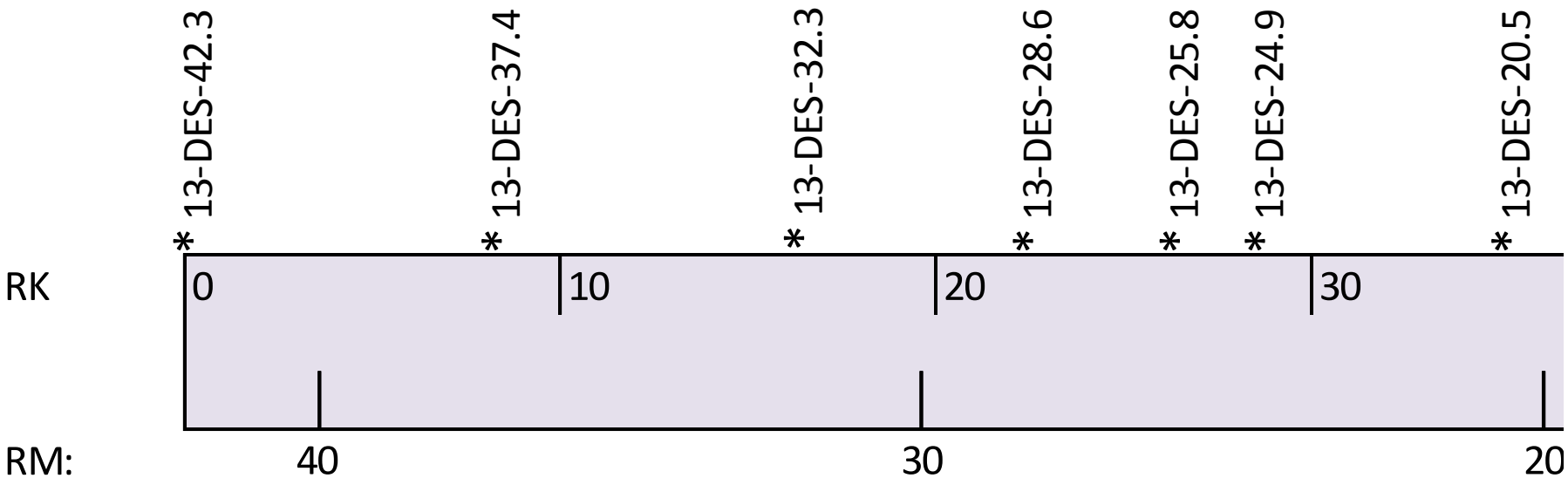
Fecal Coliform TMDL

- Upper Deschutes River standards
  - October 2008 report had error
    - Geomean < 100 #/100 mL
    - <10% samples < 200 #/100 mL
  - Correct standard
    - Geomean < 50 #/100 mL
    - <10% samples < 100 #/100 mL

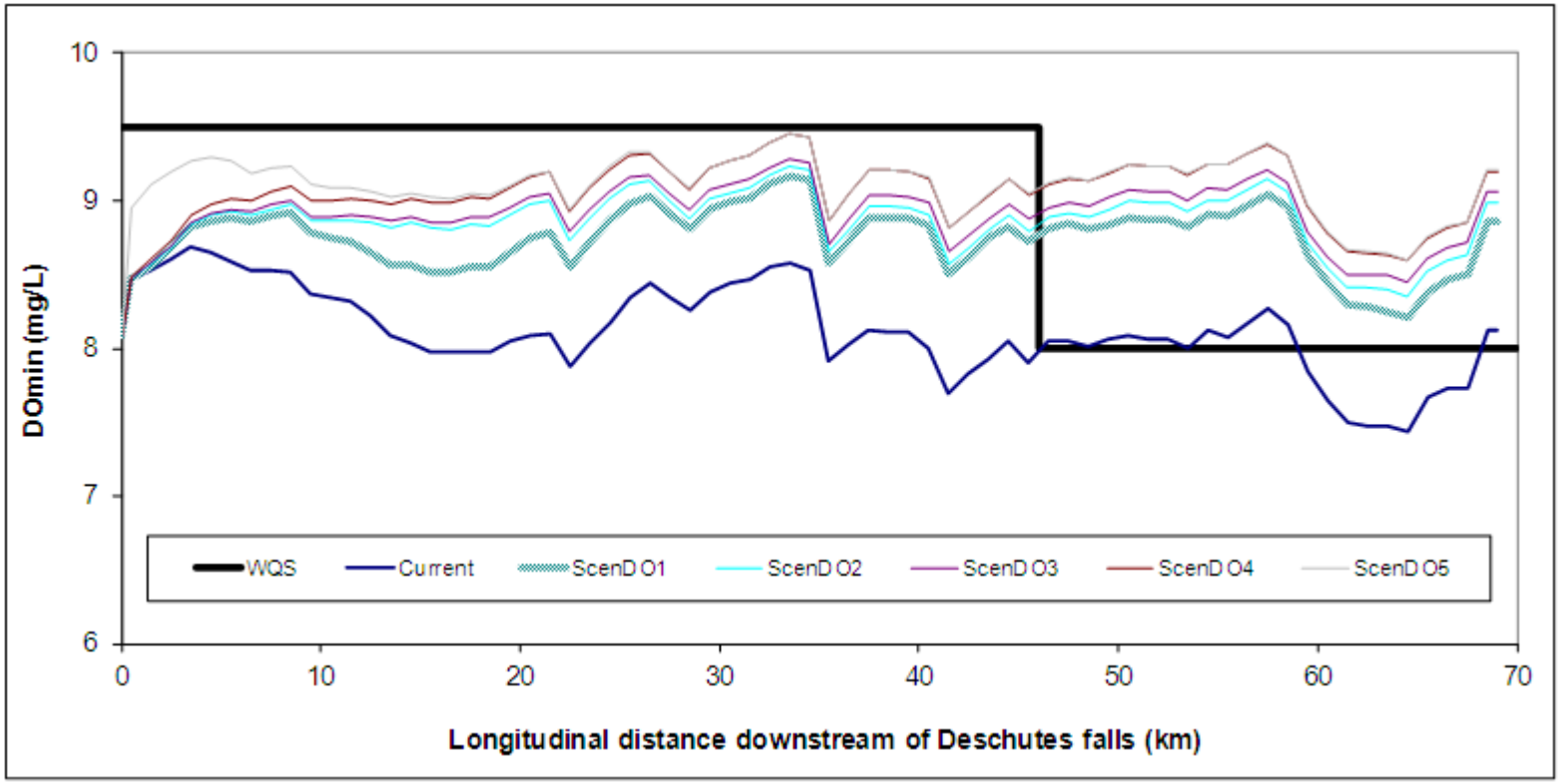

Summer Bacteria Levels in Capitol Lake, Deschutes River and Tributaries
FC (#/100 mL)
10000
1000
100
10
1
13-CAP-00.4
13-DES-00.5
13-DES-02.7
13-DES-05.5
13-DES-09.2
13-DES-20.5
13-DES-28.6
13-AYE-00.0
13-CHA-00.1
13-HUC-00.3
13-REI-00.9
13-SPU-00.0
Winter Bacteria Levels in Capitol Lake, Deschutes River and Tributaries
FC (#/100 mL)
10000
1000
100
10
1
13-CAP-00.4
13-DES-00.5
13-DES-02.7
13-DES-05.5
13-DES-09.2
13-DES-20.5
13-DES-28.6
13-AYE-00.0
13-CHA-00.1
13-HUC-00.3
13-REI-00.9
13-SPU-00.0

Temperature TMDL

- No substantive changes
- Added lookup between river km from headwaters and river miles from downstream:



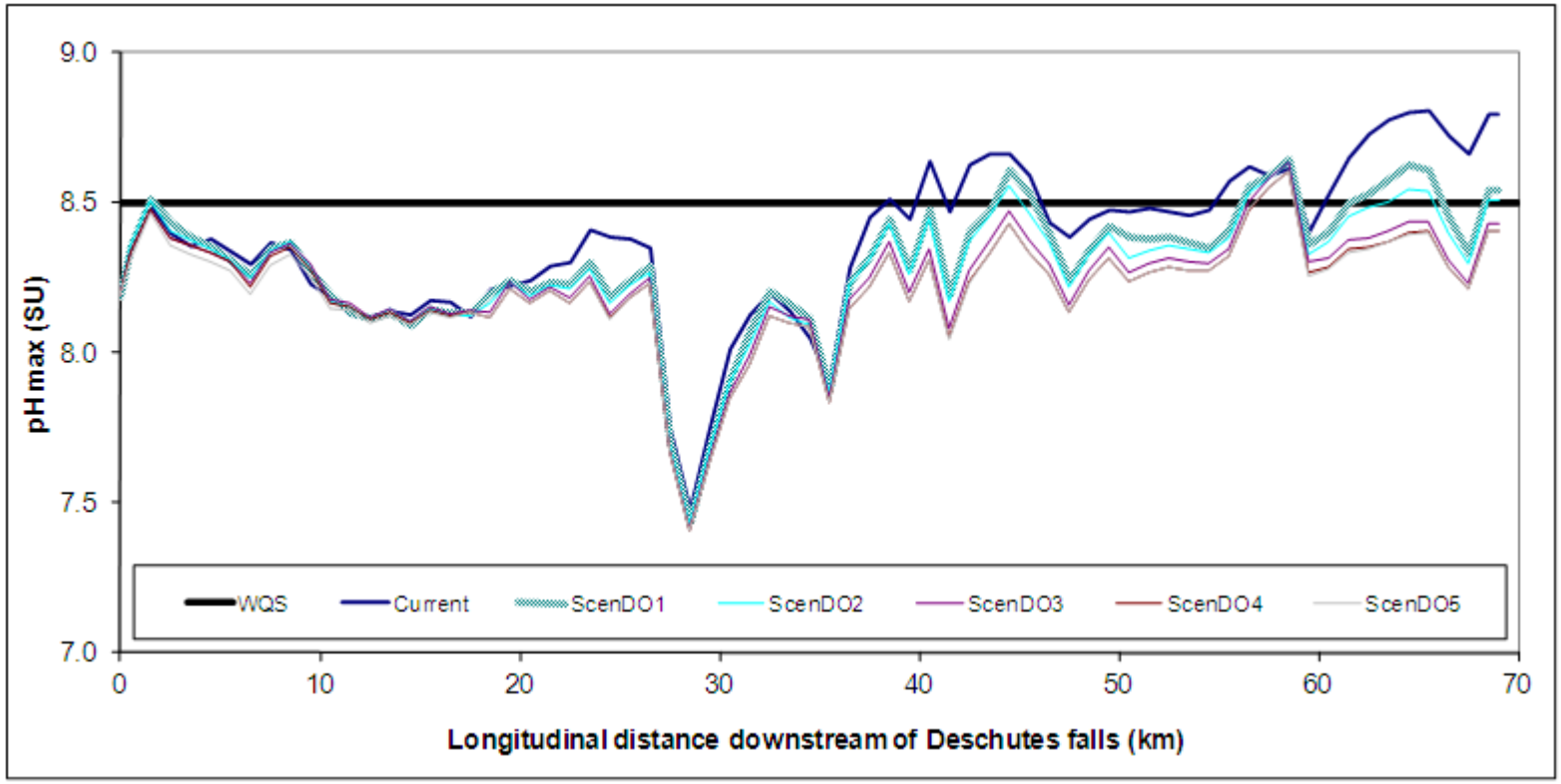
Deschutes River DO and pH (temperature scenarios)



(as reported in October 2008 draft report)

SEE PAGE 3 OF HANDOUTS

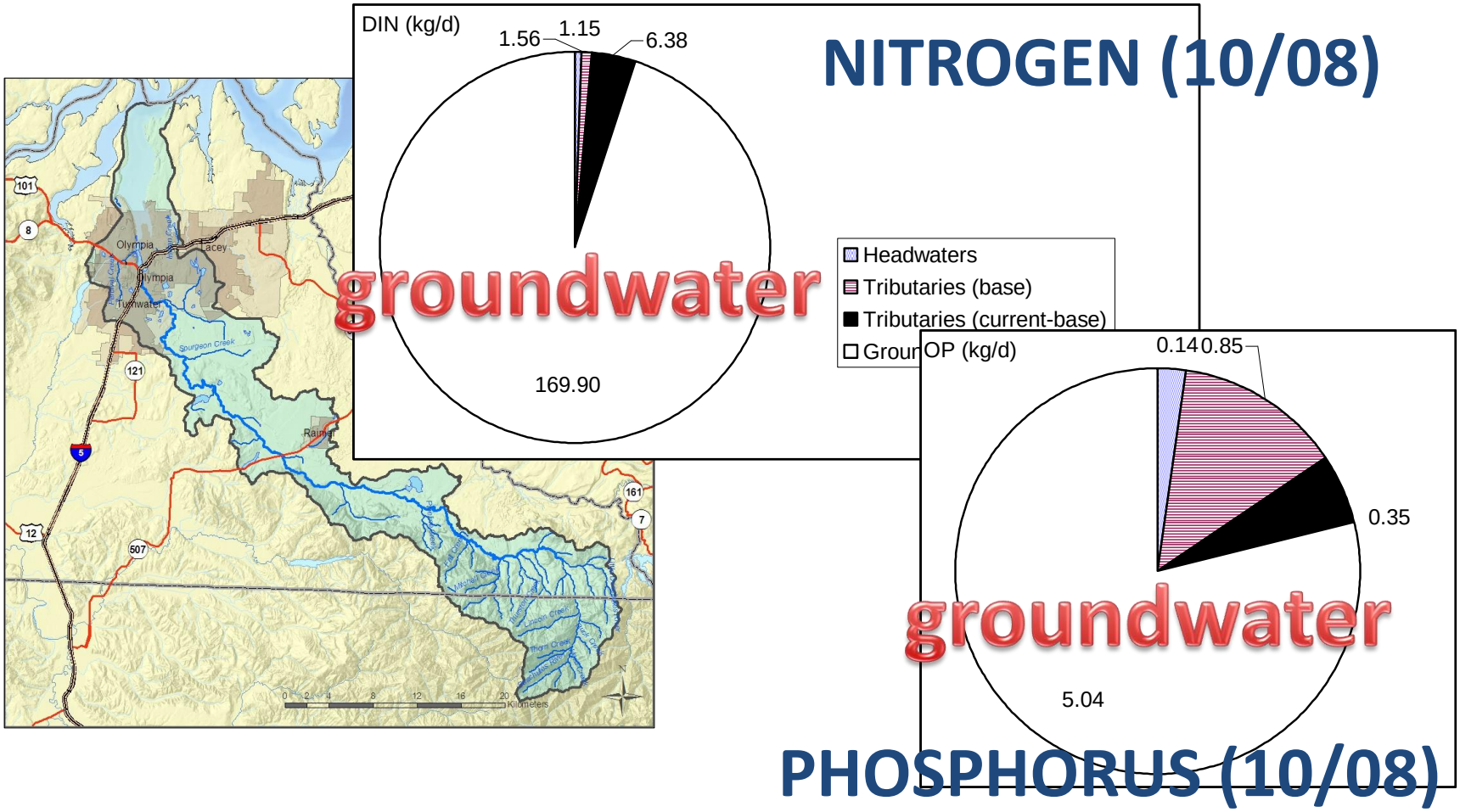
Deschutes River DO and pH (temperature scenarios)



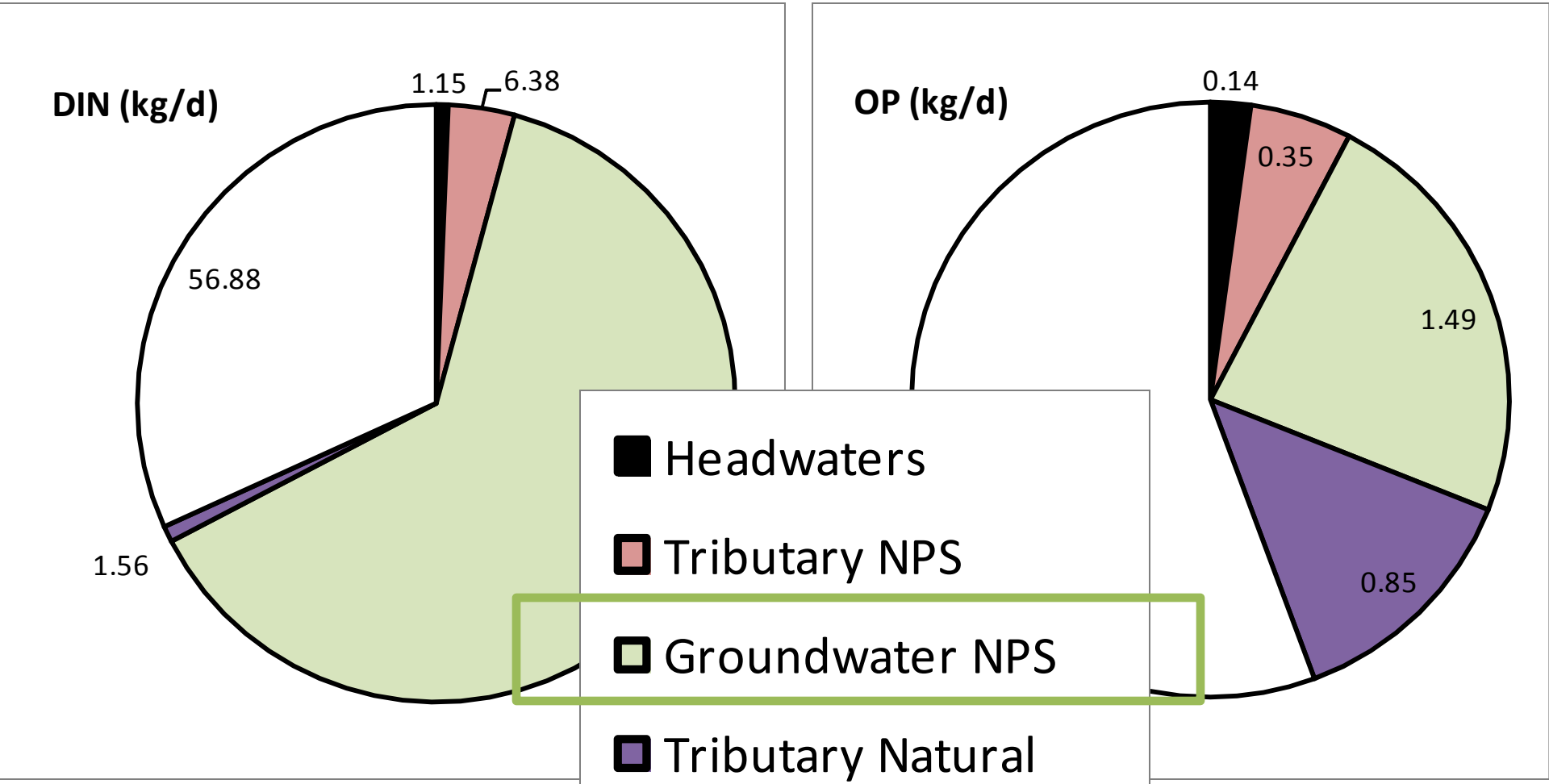
(as reported in October 2008 draft report)

Freshwater DO and pH TMDL

- Evaluated groundwater contribution to DO, pH



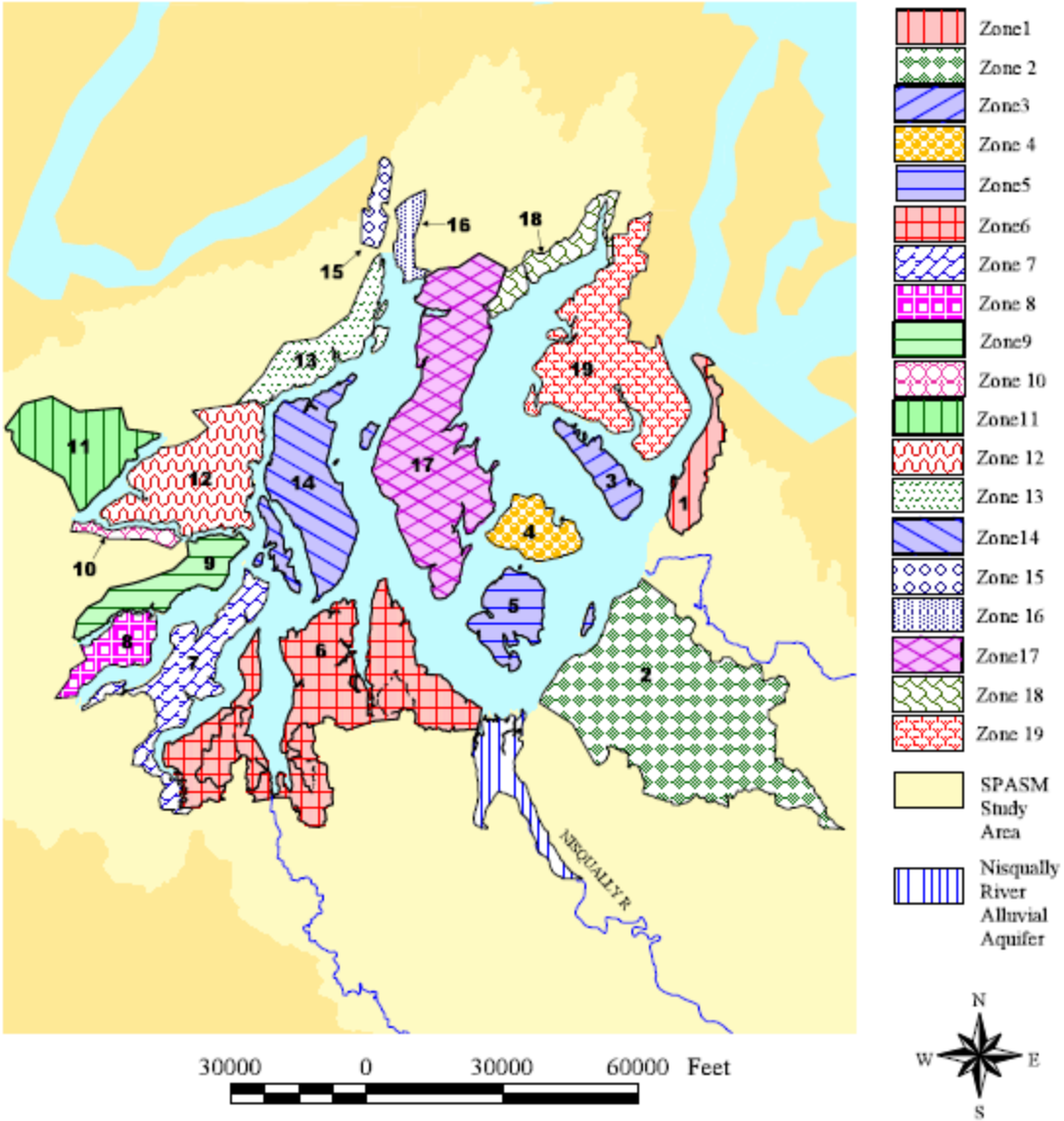
Nonpoint source contribution to GW



Scenario DO 8
Groundwater at natural conditions

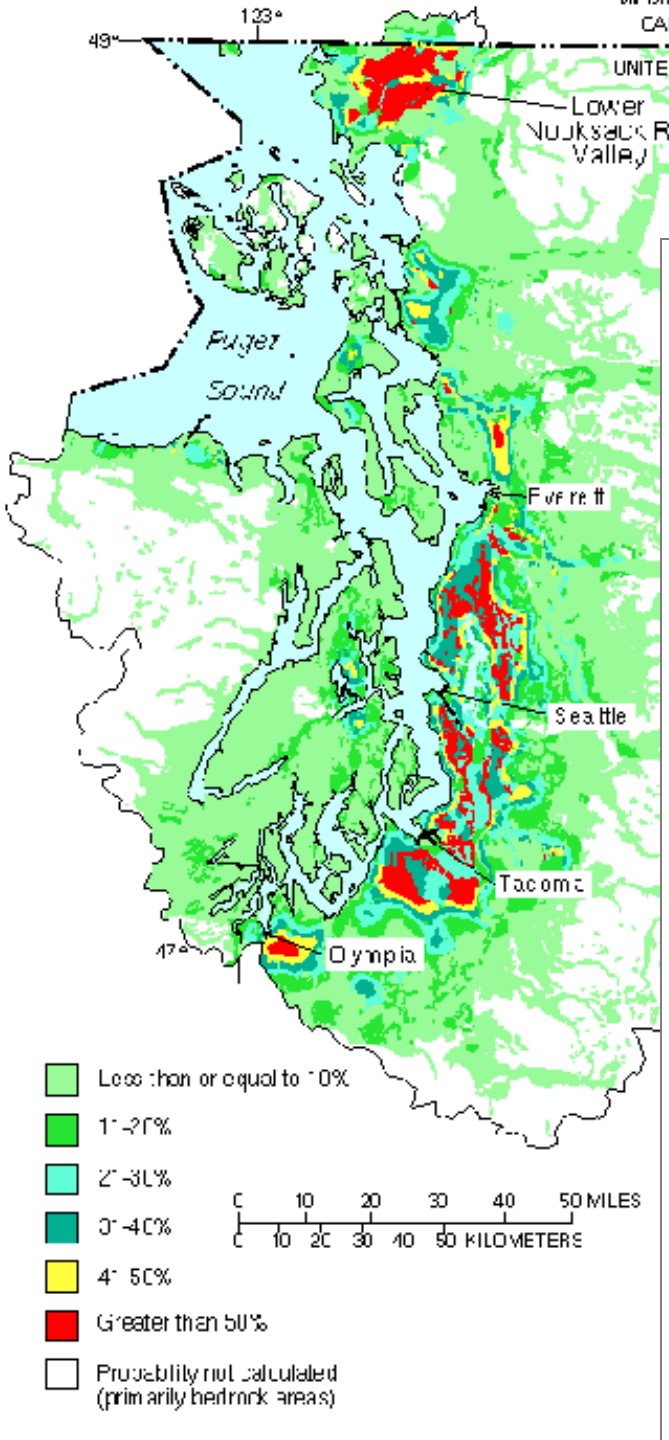
- Pitz (1999)
  - Nitrate concentrations in groundwater in South Puget Sound
    - DOH drinking water well geomean by region
    - USGS well data
- Sinclair and Bilhimer (2007)
  - Median orthophosphate 0.052 mg/L

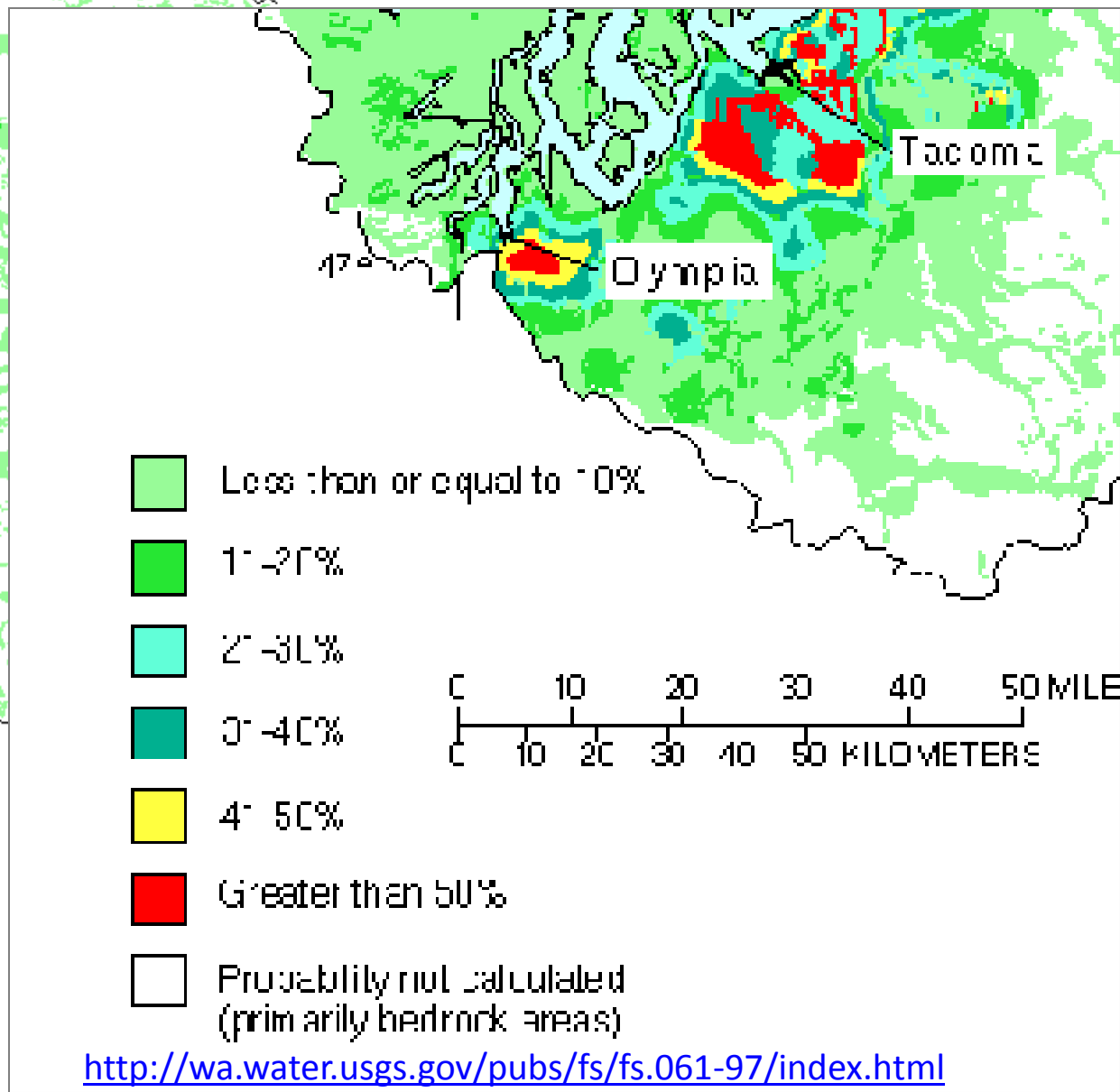
DOH nitrate in groundwater



- Zone 6 – 0.65 mg/L geomean of 61 wells
- 0.42 mg/L overall geomean
- Nisqually underflow – 1.5 mg/L assumed (no data)

Groundwater Vulnerability (USGS 1997)





http://wa.water.usgs.gov/pubs/fs/fs.061-97/index.html

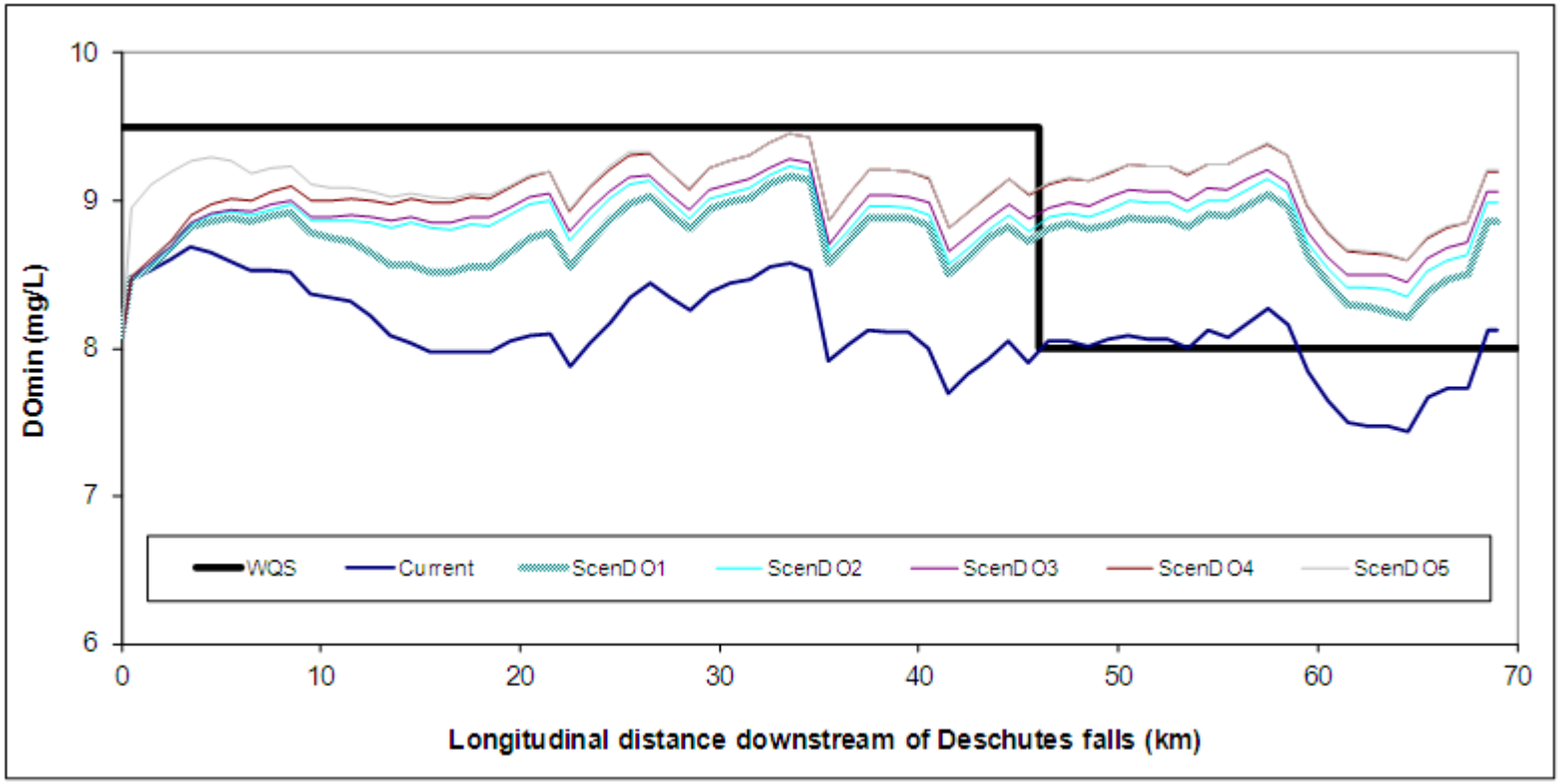
Deschutes/South Sound Nitrate Hot Spot

- Factors from Tesoriero and Voss (1997) from regression approach:
  - Shallow well depth
  - Surficial geology (coarse > fine > alluvial)
  - %urban increase
  - %agricultural increase
  - %forest decrease

Other resources on groundwater nitrogen

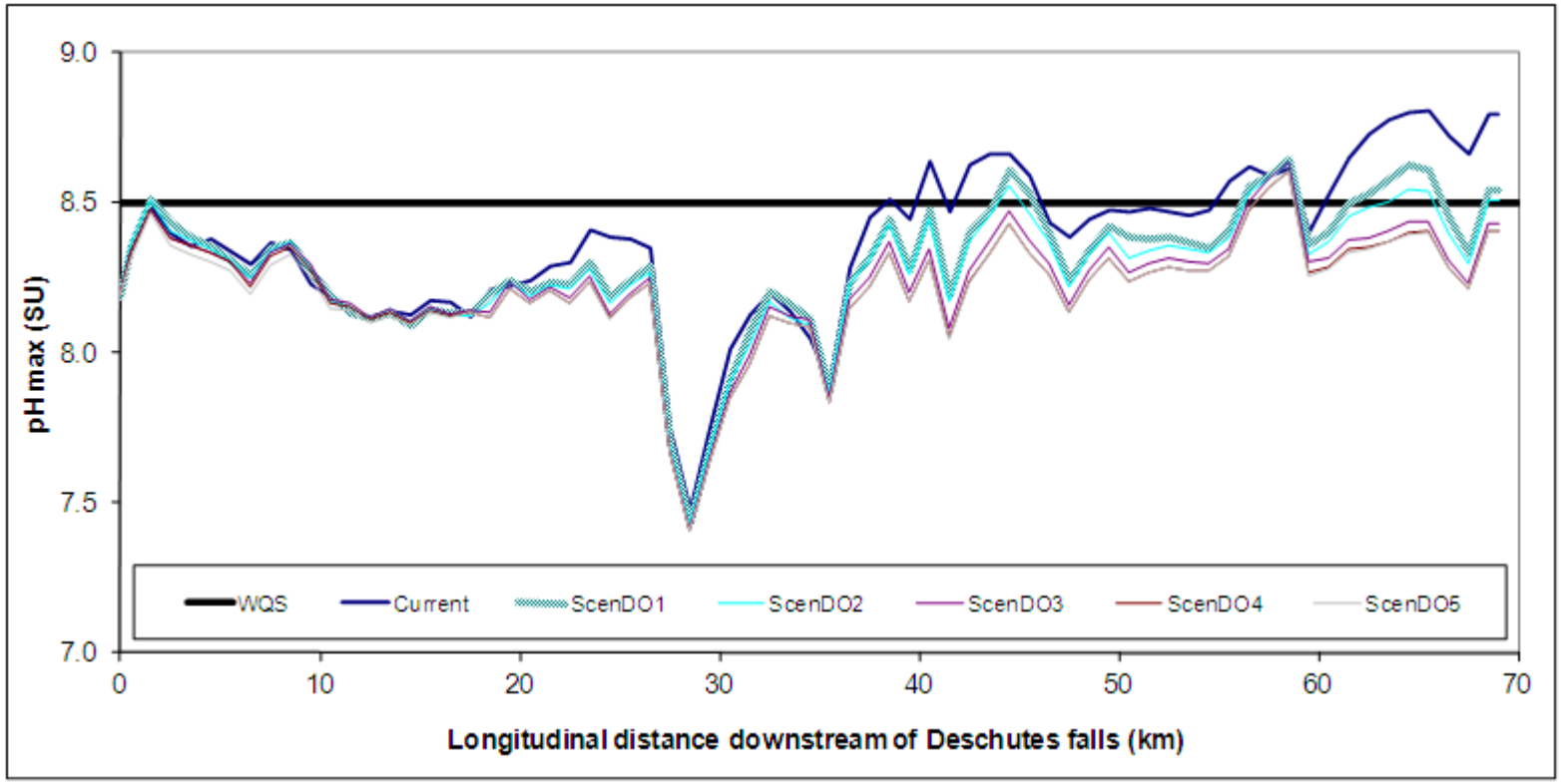
- http://wa.water.usgs.gov/pubs/wrir/ps.wrir00-4100.ab.html
  - Regional median nitrate concentration 1.0 mg/L
  - Agricultural areas 64% samples > 10 mg/L
  - Urban areas nitrate > regional
    - Septic systems
    - Other nitrogen sources
- http://wa.water.usgs.gov/pubs/wrr/ps.wrr.vol36.no6.html
  - Groundwater nitrate converted to nitrogen gas as it moves through reduced sediments (Whatcom, Canada)
- Ecology publications …

Deschutes River DO and pH (temperature scenarios)



(as reported in October 2008 draft report)

Deschutes River DO and pH (temperature scenarios)



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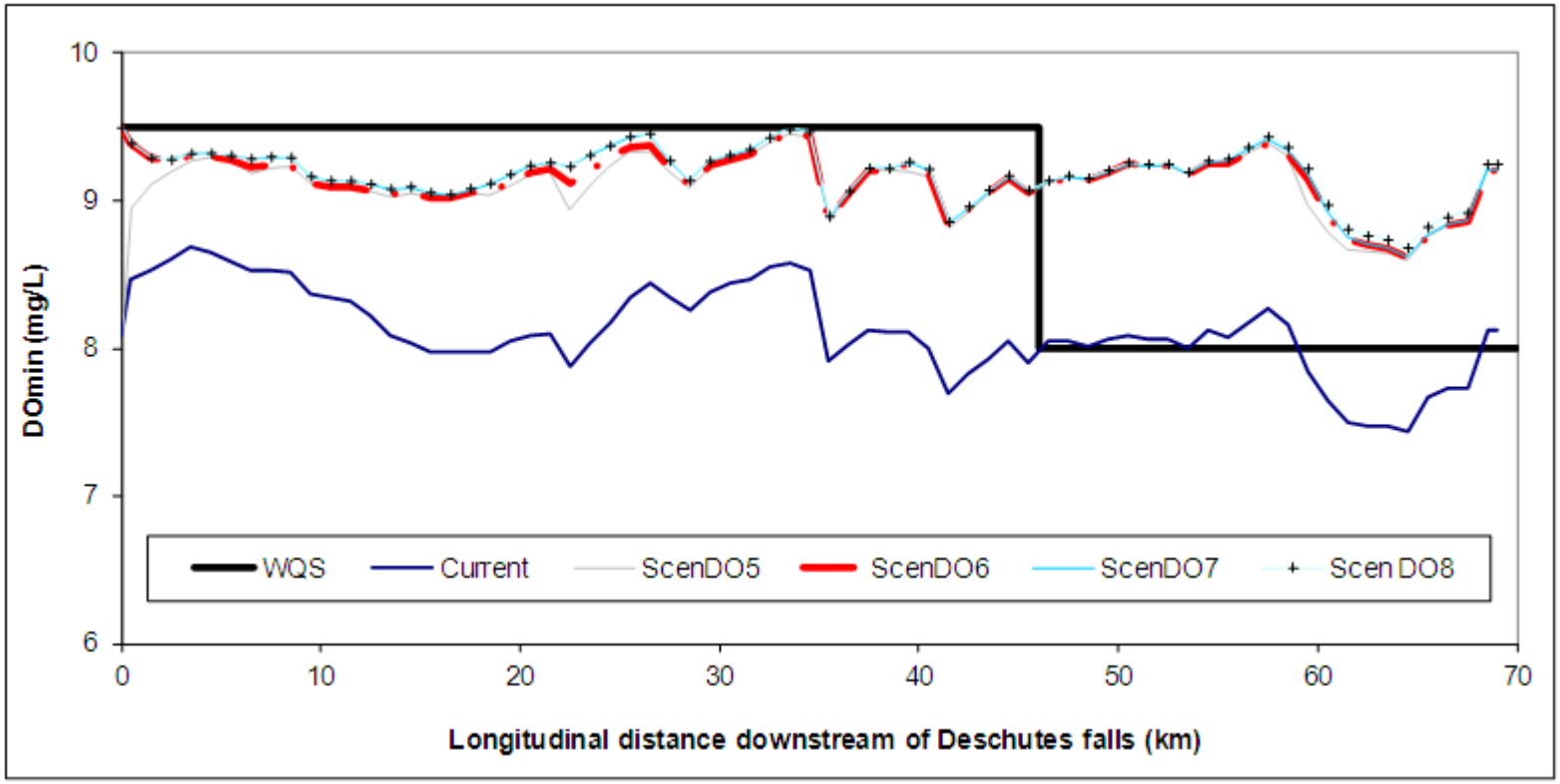
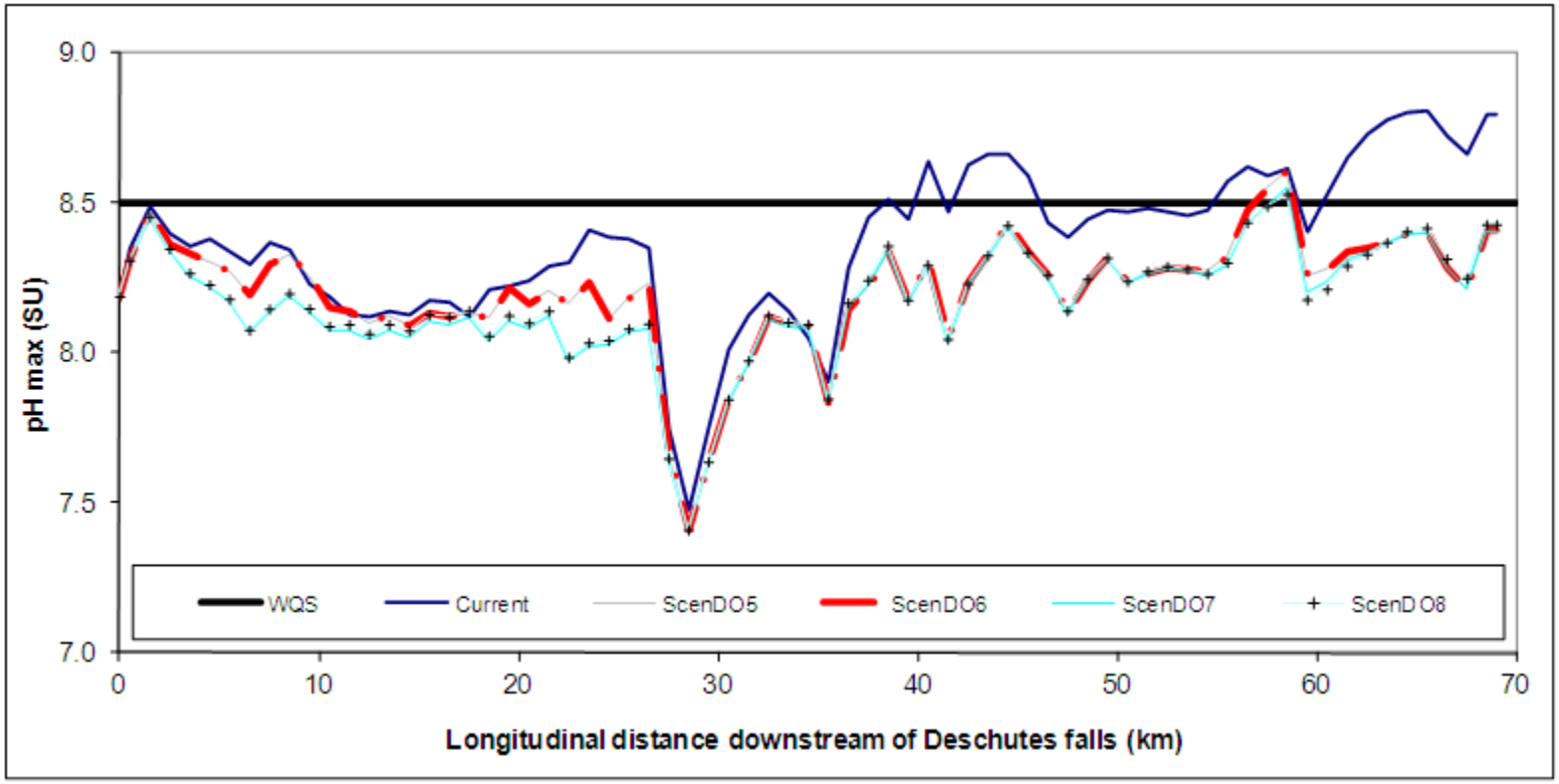
Deschutes River DO and pH (nutrient scenarios)



New – + groundwater analysis

Deschutes River DO and pH (nutrient scenarios)



New – + groundwater analysis

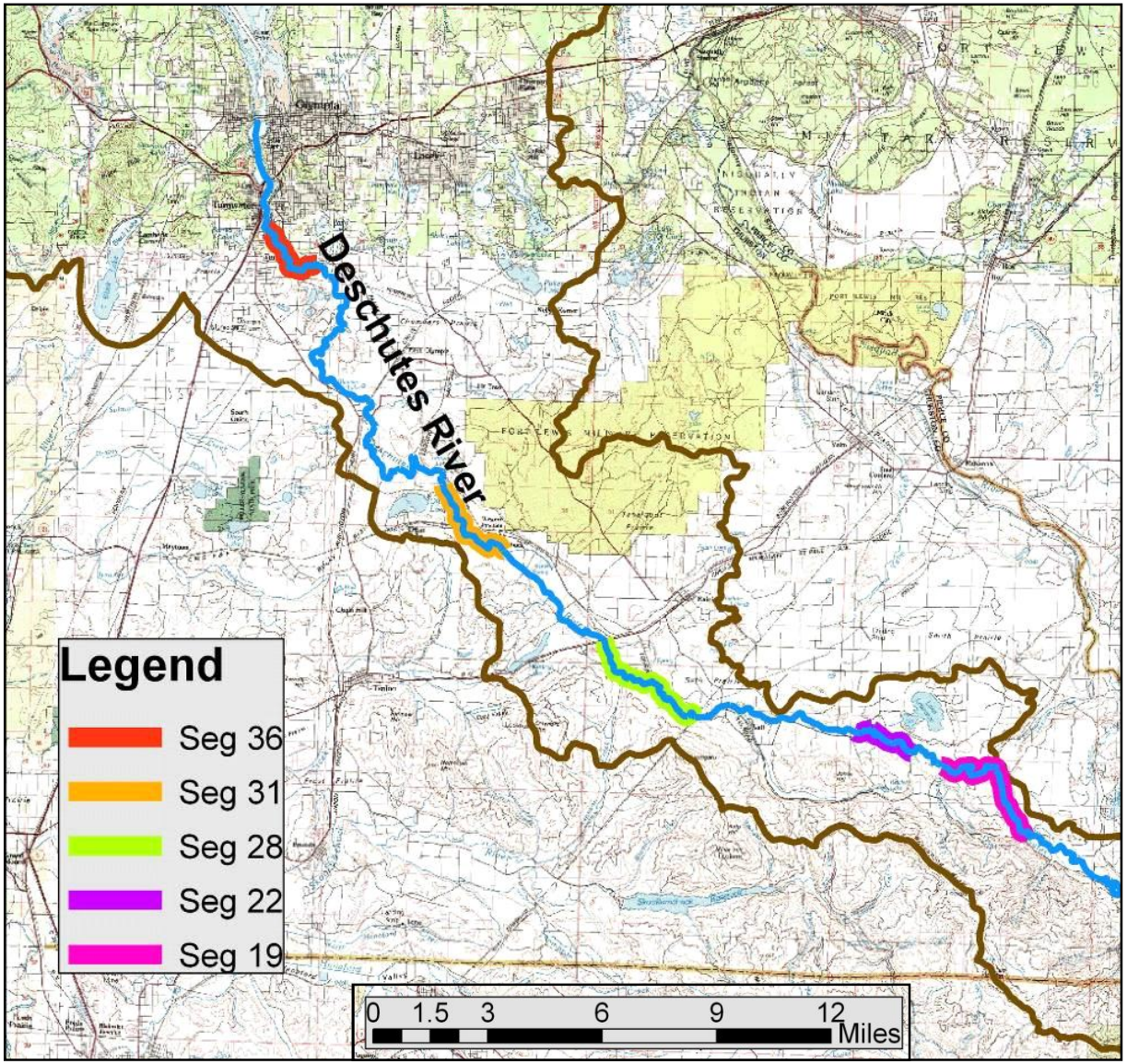
Fine Sediment TMDL

- Targets based on habitat conditions

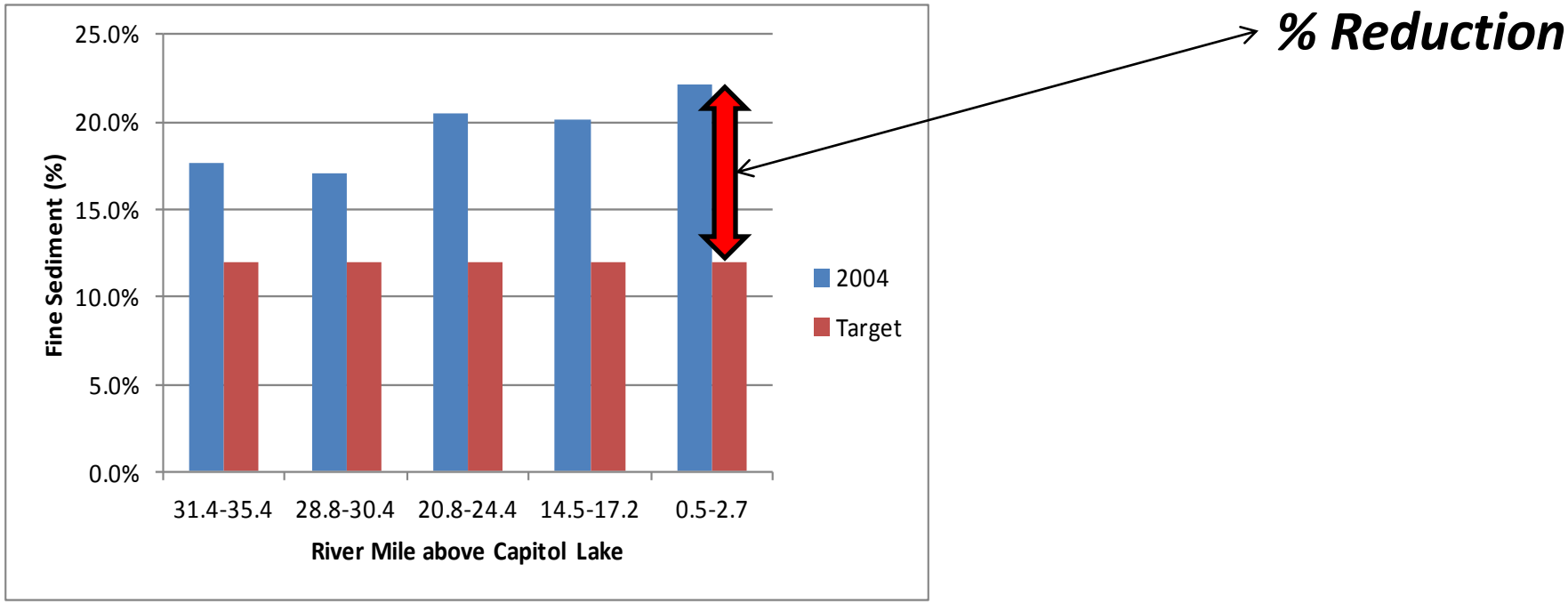
Percent fine sediments in gravels	Habitat quality
>17%	Poor
12 to 17%	Fair
<12%	Good

- October 2008
  - “interim target” <17%
  - “final target” <12%

Fine Sediment TMDL



Fine Sediment (12% target)



Segment	Name	River mile	1995	2004	Target	% reduction
19	Weyerhaeuser	31.4-35.4	15.5%	17.7%	12%	32%
22	Lake Lawrence	28.8-30.4	22.5%	17.1%	12%	30%
28	Hwy 508	20.8-24.4	19.4%	20.5%	12%	41%
31	Waldrick	14.5-17.2	19.9%	20.1%	12%	40%
36	Pioneer	0.5-2.7	22.0%	22.1%	12%	46%

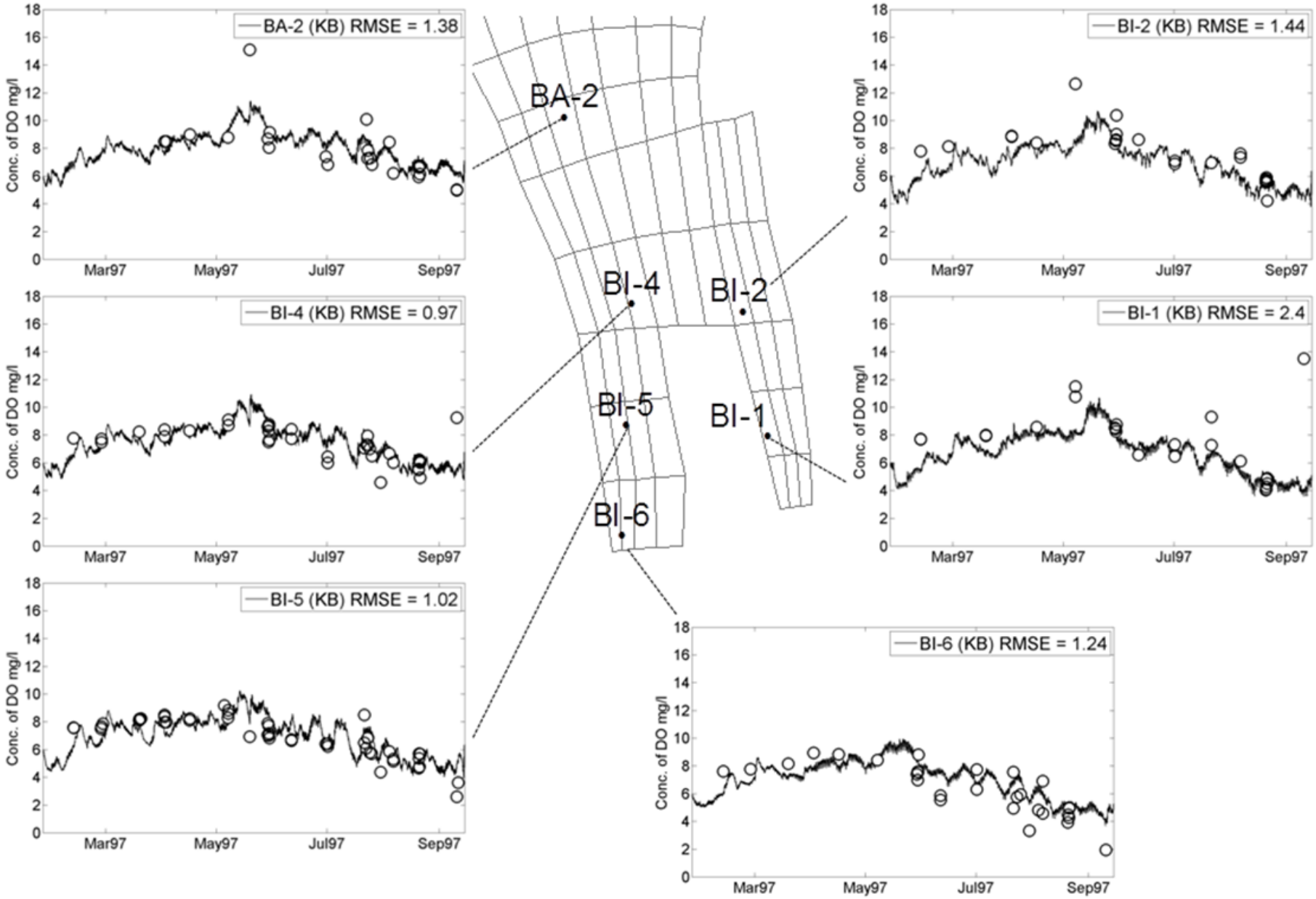
Conclusions

- Each TMDL subsection has Conclusions
- Overall report Conclusions expanded to encompass details from subsection
  - October 2008
    - 2.5 pages
  - Current draft
    - 5.5 pages
    - Organized by parameter
  - Updated to capture modifications discussed today

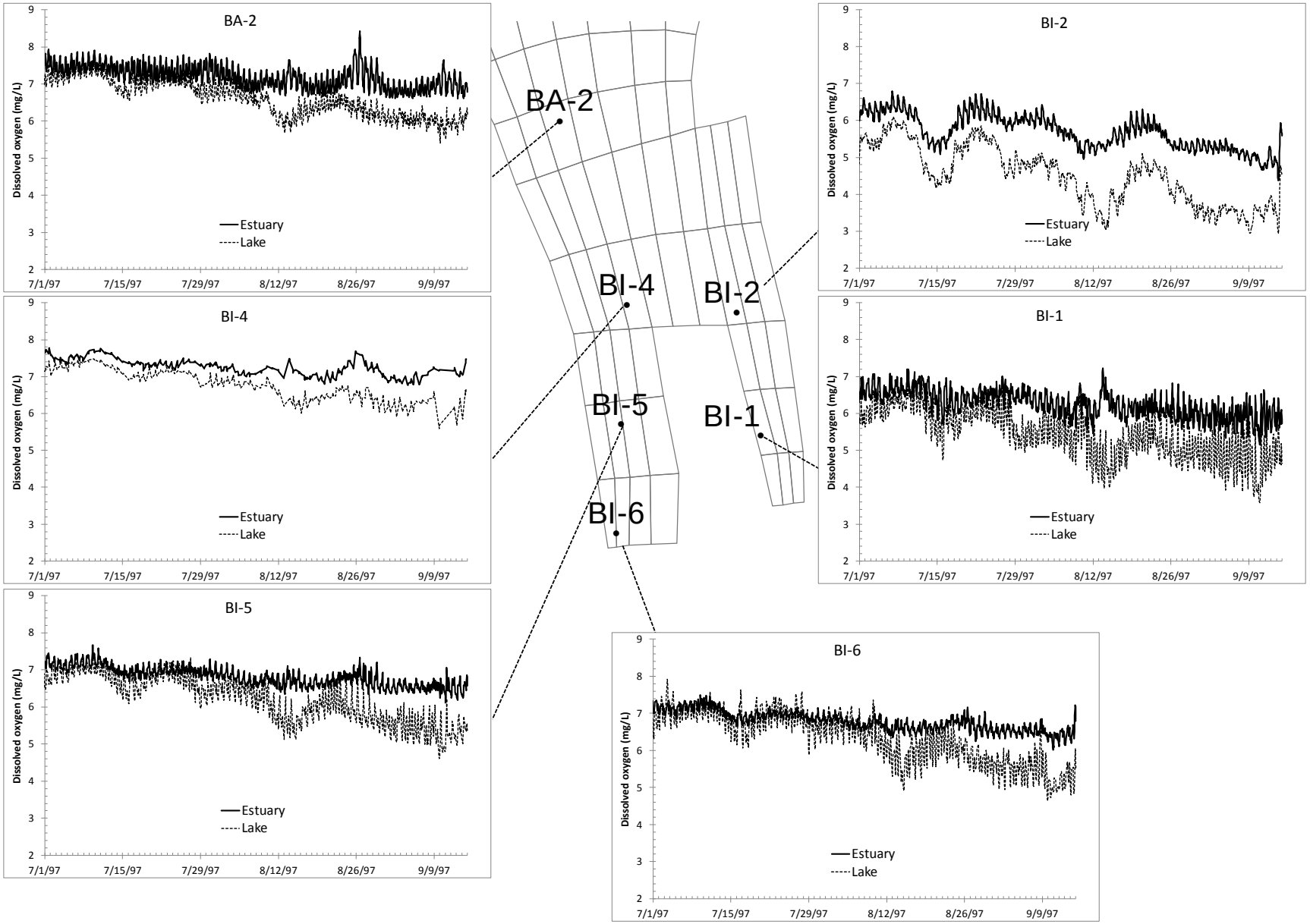
Budd Inlet and Capitol Lake Models

- Modeling team: Ecology, Bob Ambrose, and ERM.
- Updates to GEMSS were found to be necessary. Most of the updates were discovered during the South Puget Sound Dissolved Oxygen Study.
- All updates were vetted by the outside experts on the team (Ambrose and ERM). ERM agreed with all changes and updated GEMSS.
- The updates required re-calibration of the model for Budd Inlet and Capitol Lake.

Measured and predicted concentrations of DO in the bottom layer (KB) in inner Budd Inlet



Predicted concentrations of DO in inner Budd Inlet with Capitol Lake as an estuary and with Capitol Lake in place for current loading (in layers with maximum difference)



- **Scenario 1: Baseline estimated natural conditions.** Wastewater treatment plants (WWTPs) are assumed to be at zero flow; the Deschutes River and other tributaries were estimated to be at natural conditions based on the low end of nutrient levels measured historically.

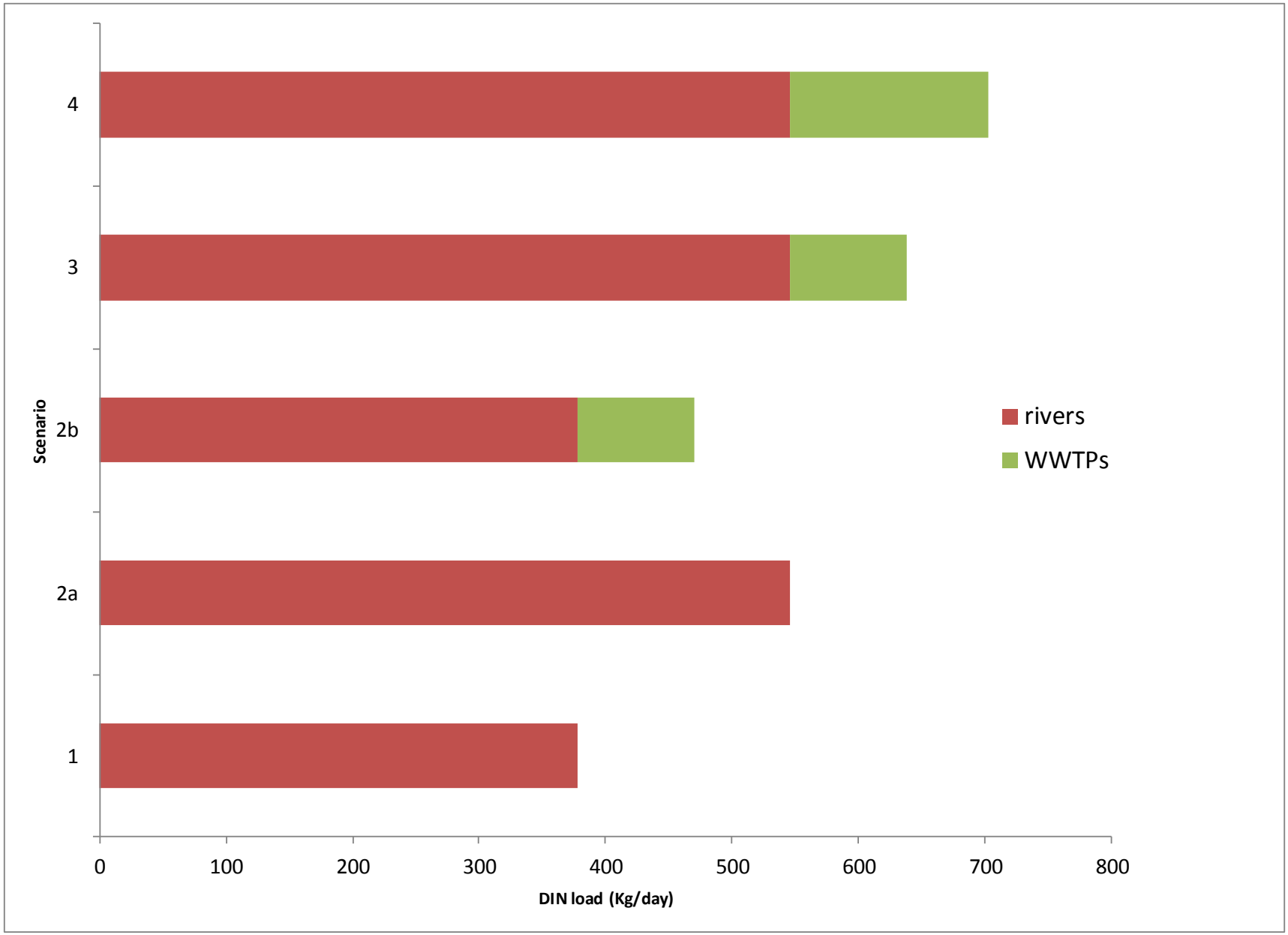
- **Scenario 2a: Current nonpoint sources without point sources.** All tributaries and nonpoint sources discharge at existing conditions, and point sources/WWTPs are set to zero.

- **Scenario 2b. Current point sources with natural nonpoint sources.** All WWTPs and tributary nonpoint sources were set to existing conditions. Nonpoint sources were estimated to be at natural conditions (same as scenario 1)

- **Scenario 3: Current point and nonpoint sources.** All WWTPs and tributary nonpoint sources were set to existing conditions.

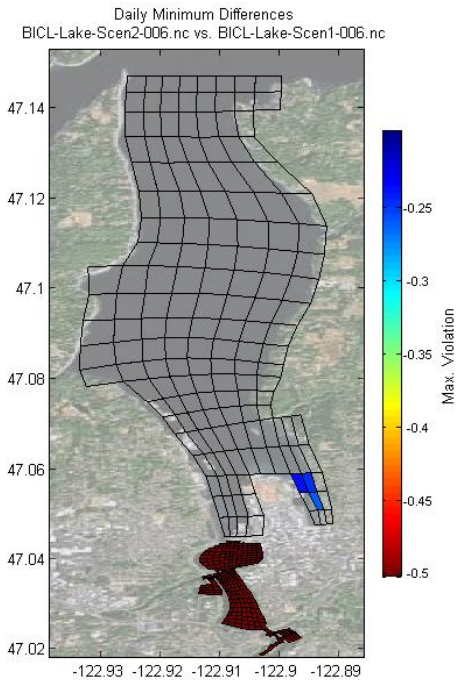
- **Scenario 4: Permitted point sources and current nonpoint sources.** WWTPs were set to permit limits; nonpoint sources were set to existing conditions.

Comparison of April-September DIN loads from rivers and WWTPs for each scenario

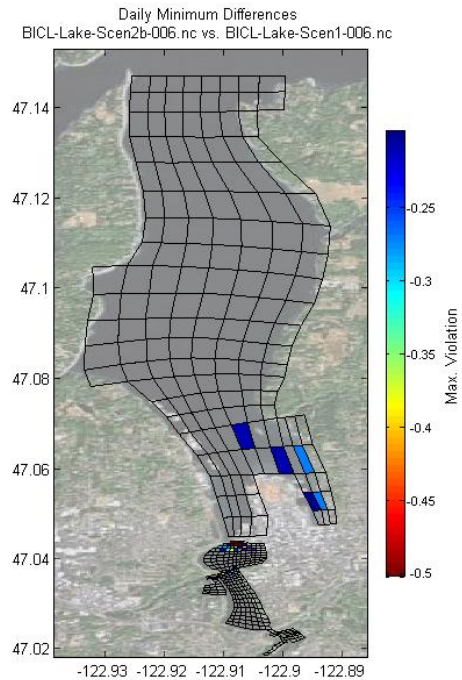


Predicted maximum violation of the DO water quality standard with Capitol Lake in place

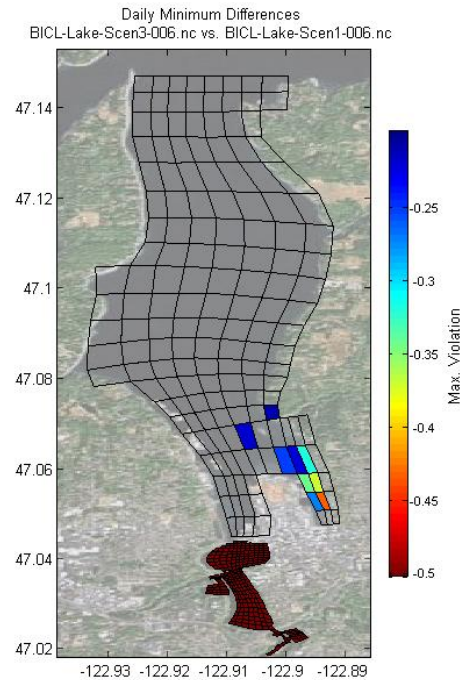
Scenario 2a-1
(current nonpoint)



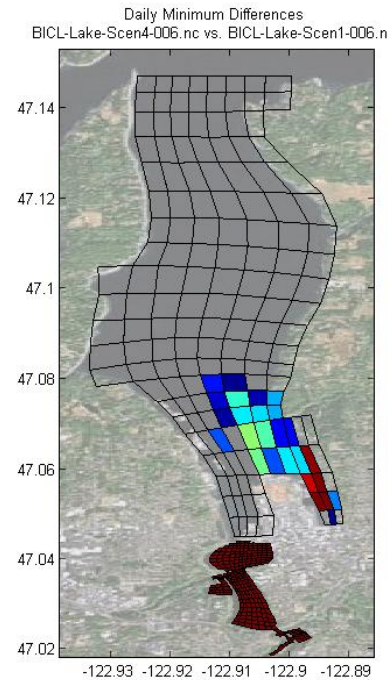
Scenario 2b-1
(current WWTPs)



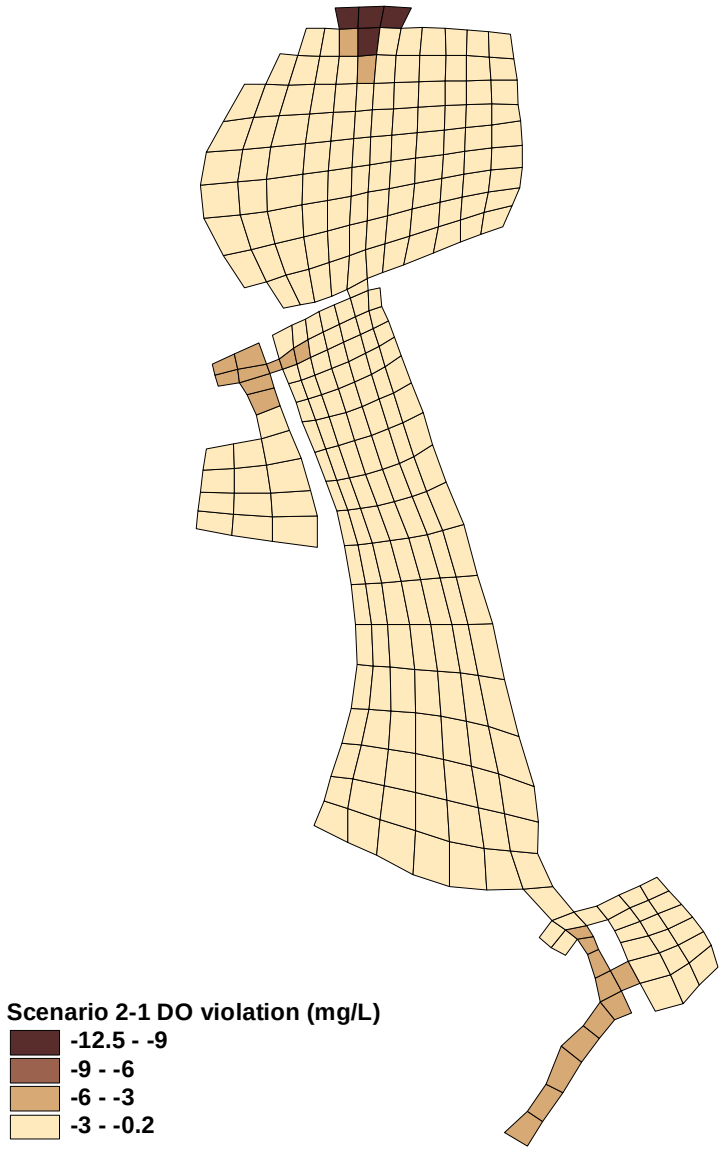
Scenario 3-1
(current nonpoint & current WWTPs)



Scenario 4-1
(current nonpoint & permitted WWTPs)

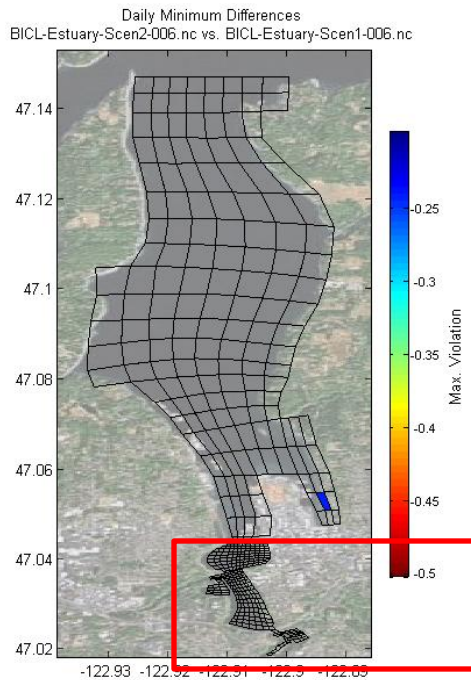


Predicted maximum violation of the DO water quality standard with Capitol Lake in place due to nonpoint sources only (scenario 2a-1)

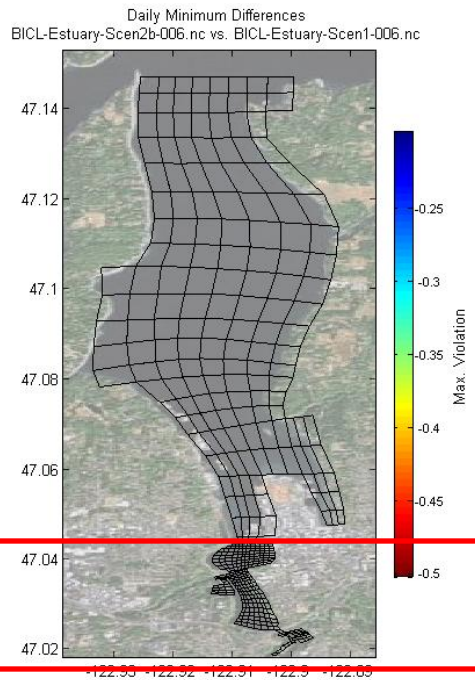


Predicted maximum violation of the DO water quality standard with Capitol Lake as an estuary

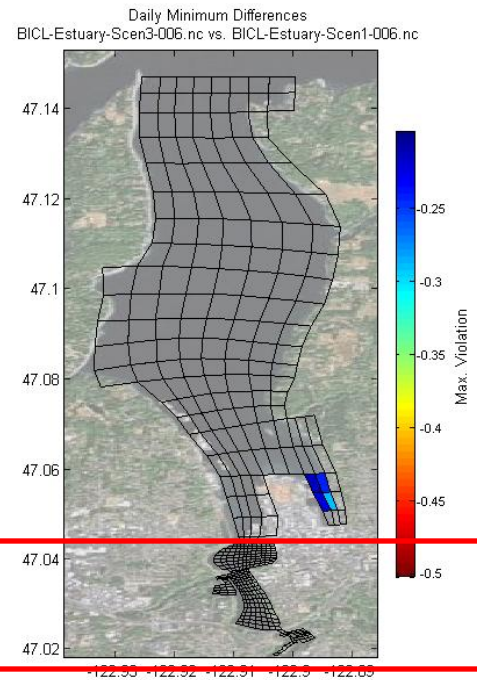
Scenario 2a-1
(current nonpoint)



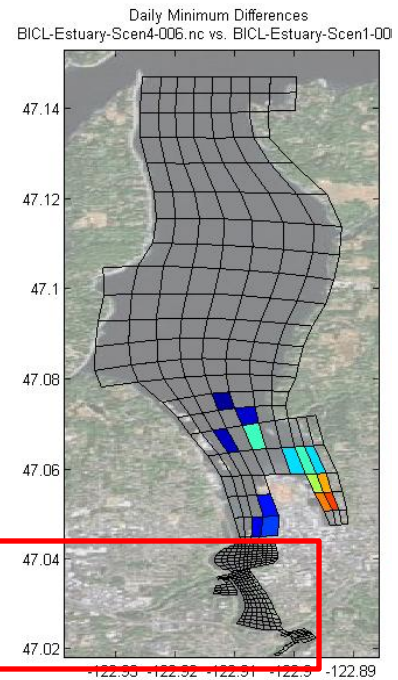
Scenario 2b-1
(current WWTPs)



Scenario 3-1
(current nonpoint & current WWTPs)



Scenario 4-1
(current nonpoint & permitted WWTPs)



No violations in “Capitol Lake” (all scenarios) or for Scenario 2b-1 (all cells)

Next steps for inlet and lake

- Prepare Water Quality Improvement Report *Volume 1* and publish by January 2013
  - Refine Deschutes Advisory Group scenarios (February 2012 meeting?)
  - Apply model to subset of scenarios (March – June)
  - Establish load and wasteload allocations based on existing Capitol Lake (Summer/fall 2012)

Next steps for technical report (Vol. 2)

- Briefings (Deschutes Advisory Group 1/26/12)
- External review by stakeholders
- Paid independent review of model code
- Revise report (February – April)
- Publish technical report (June 2012)