

Groundwater Flow Model of the Southern Willamette Valley Groundwater Management Area

Jeremy Craner and Roy Haggerty
Department of Geosciences



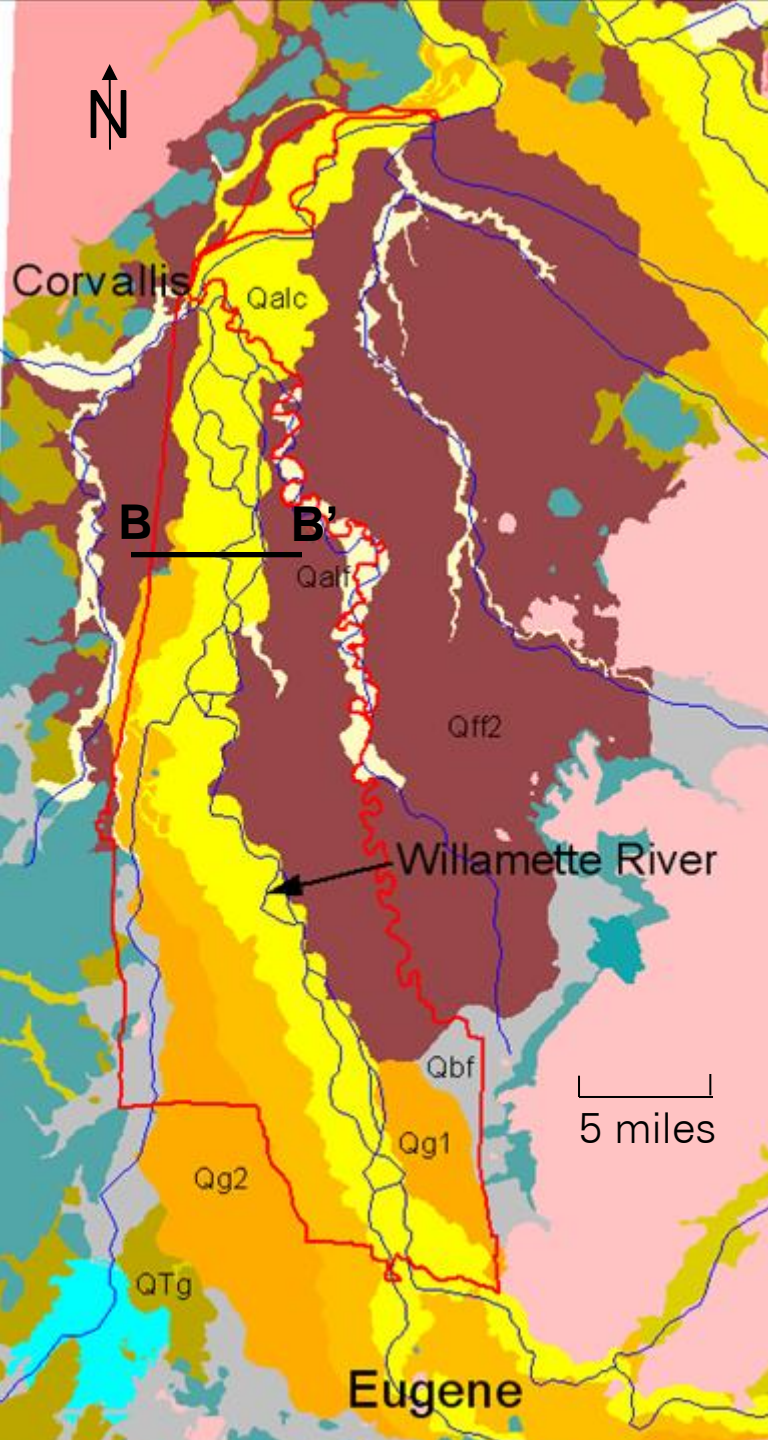
Overview

- Geology
- Data collection and field work
- Modeling
- Wrap-up with details of model capabilities

Project Goal

To develop a three-dimensional groundwater flow model to be used as a tool by local policy makers, water quality educators, and scientists to help make management decisions.

Geologic and Hydrogeologic Units



Qalc = Upper Sedimentary Unit

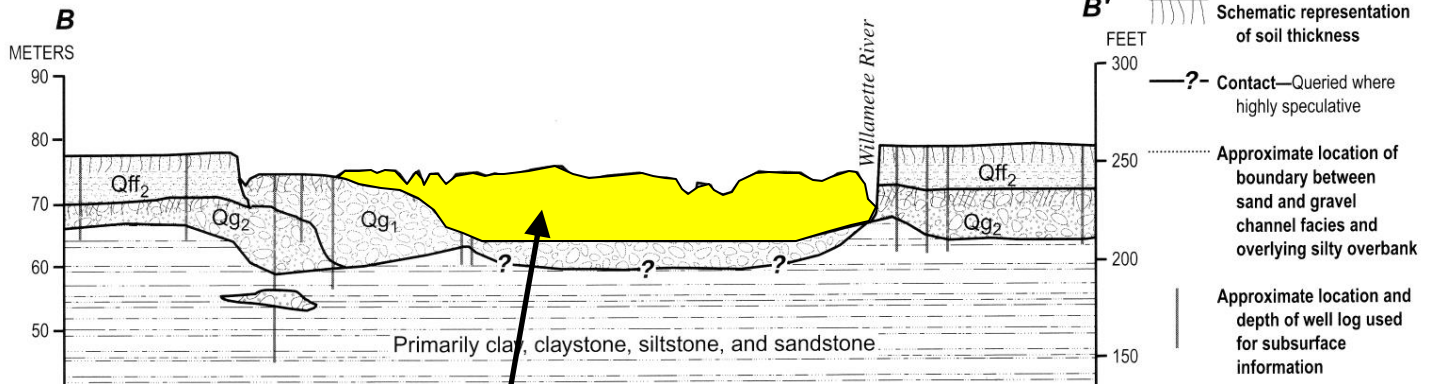
Qff2
Qalf = Willamette Silt Unit

Qg1
Qg2 = Middle Sedimentary Unit

Qbf = Lower Sedimentary Unit

*Bedrock units not included in model

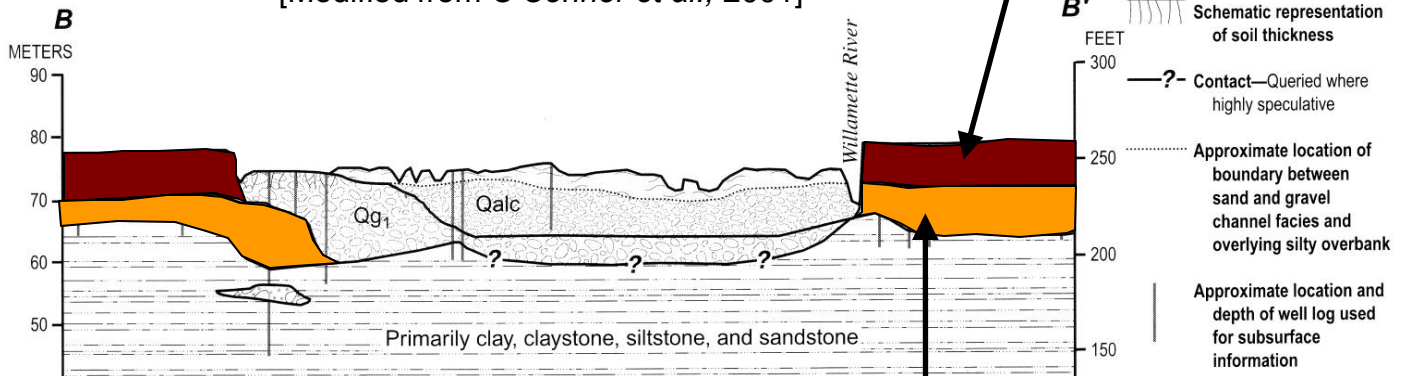
[Modified from O'Connor et al., 2001]



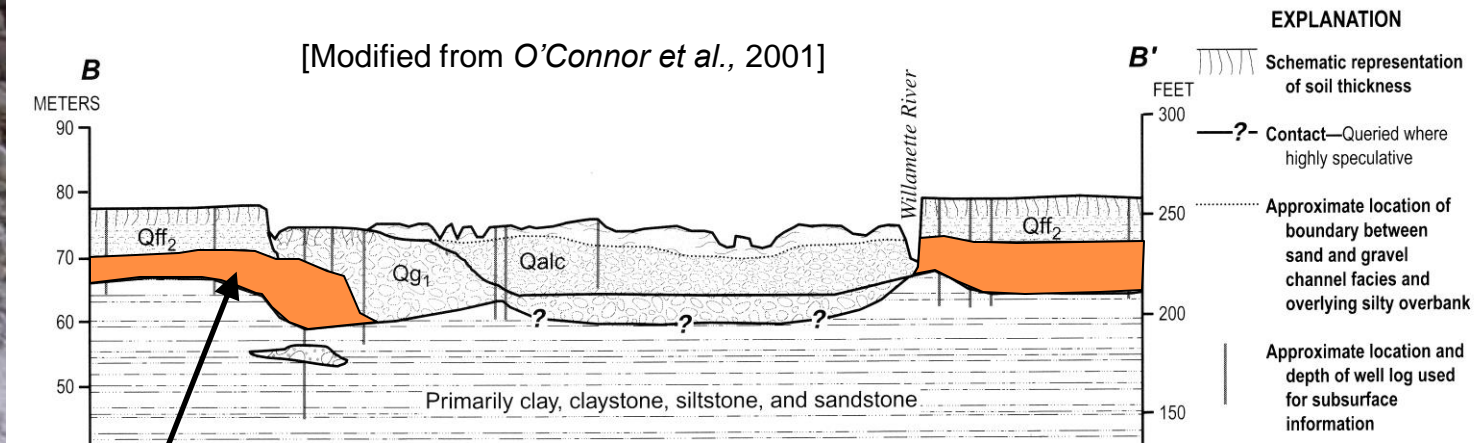
Qalc, Upper Sedimentary Unit

Qff₂, Willamette Silt Unit

[Modified from O'Connor et al., 2001]



Qg₂, part of the Middle Sedimentary Unit

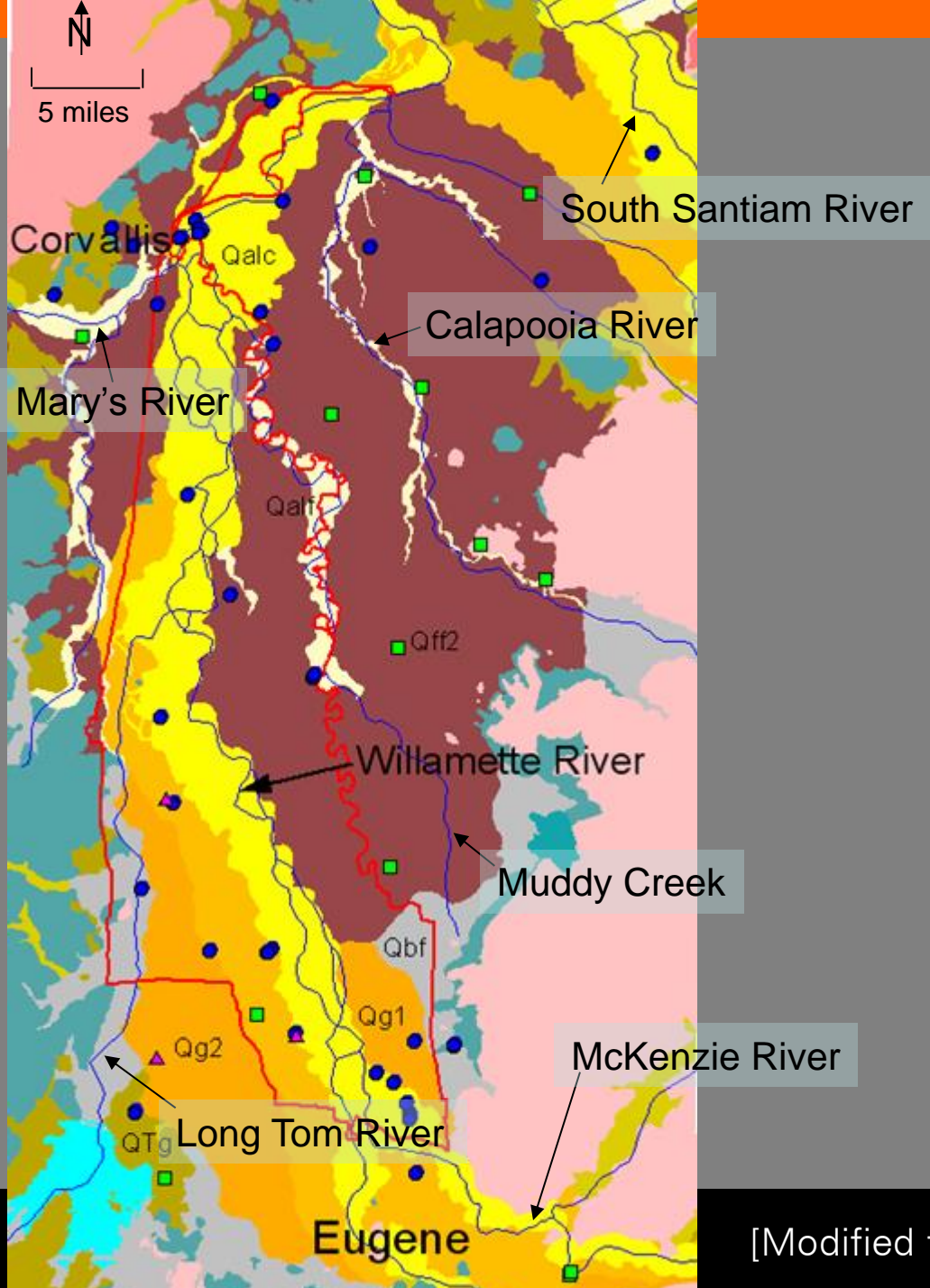


Qg₂, part of the Middle Sedimentary Unit

Field Work

What type of work was completed
and/or data collected?





Water Level Measurements

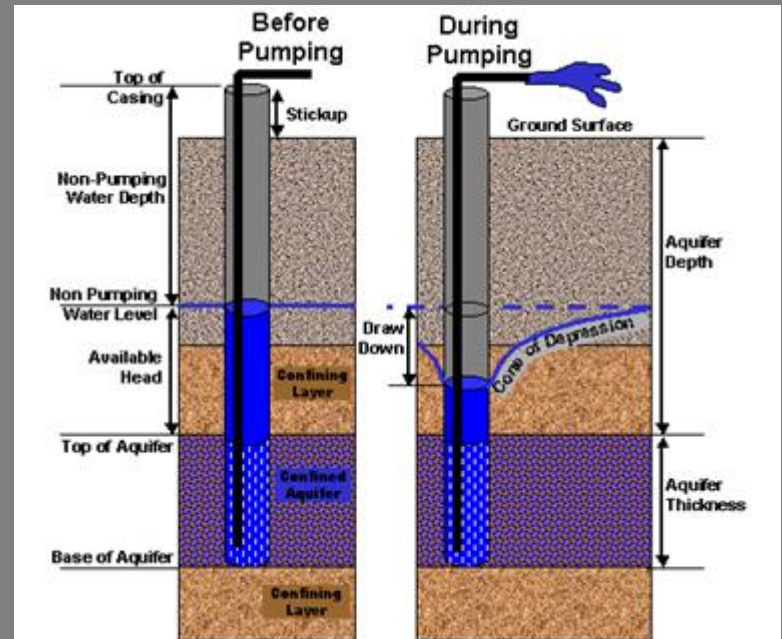
- **6 sets** of quarterly measurements from network of **42** wells, **14** from Oregon Water Resources Department, **1** from Eugene Water and Electric Board
- Long-term water level data from **3 locations**

[Modified from *O'Connor et al.*, 2001]

Field Work/Data Collection

Aquifer Tests

- Pump Tests ($N = 3$)
- Slug Tests ($N = 17$)

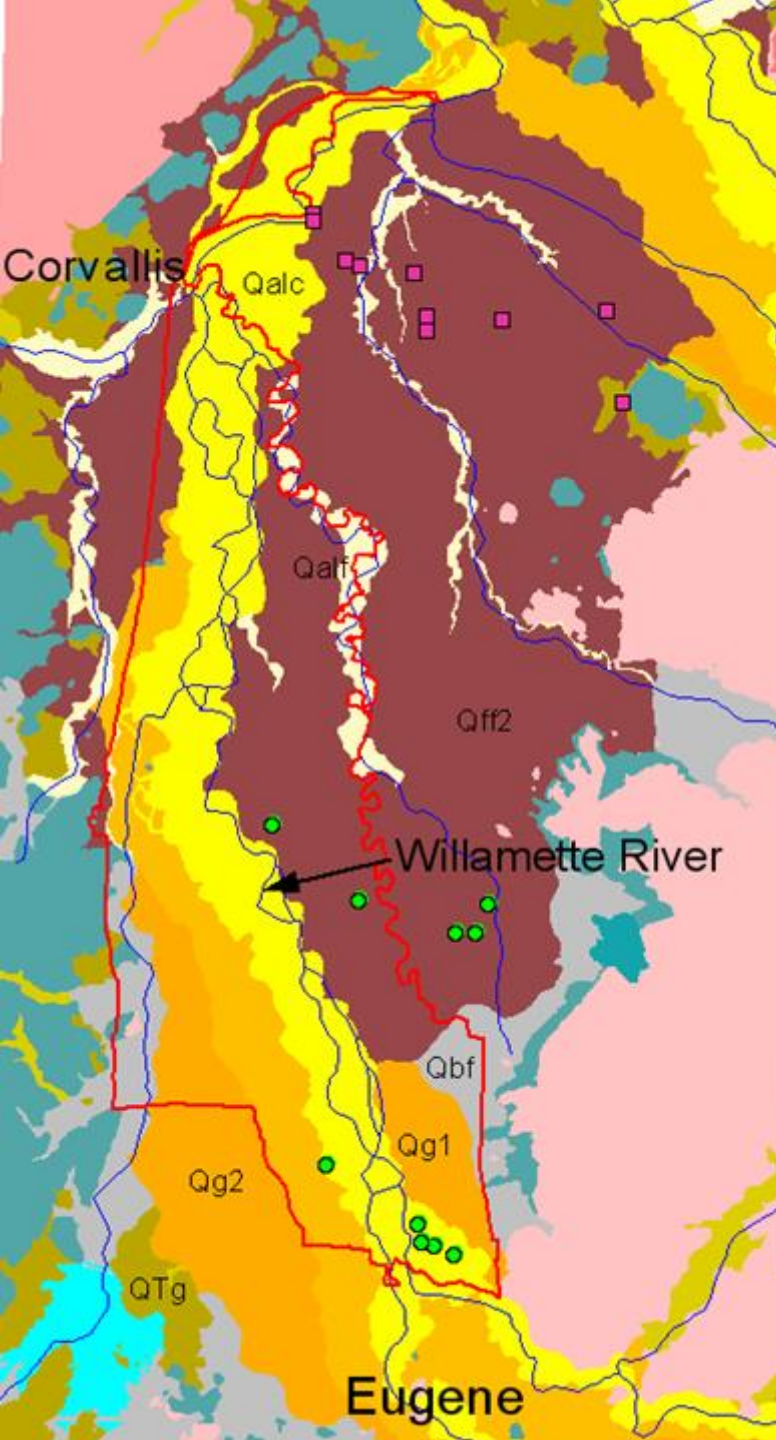


Compiled variety of other data

Construction of cross-sections and stratigraphic columns

Field Work

- Groundwater age and chemistry sampling
- Results indicate ages from 13 to >57 years [Conlon *et al.*, 2005 and this study]
- Groundwater sampled where Qff2 exists greater in age than groundwater sampled where no Qff2 exists



[Modified from O'Connor *et al.*, 2001]

Modeling

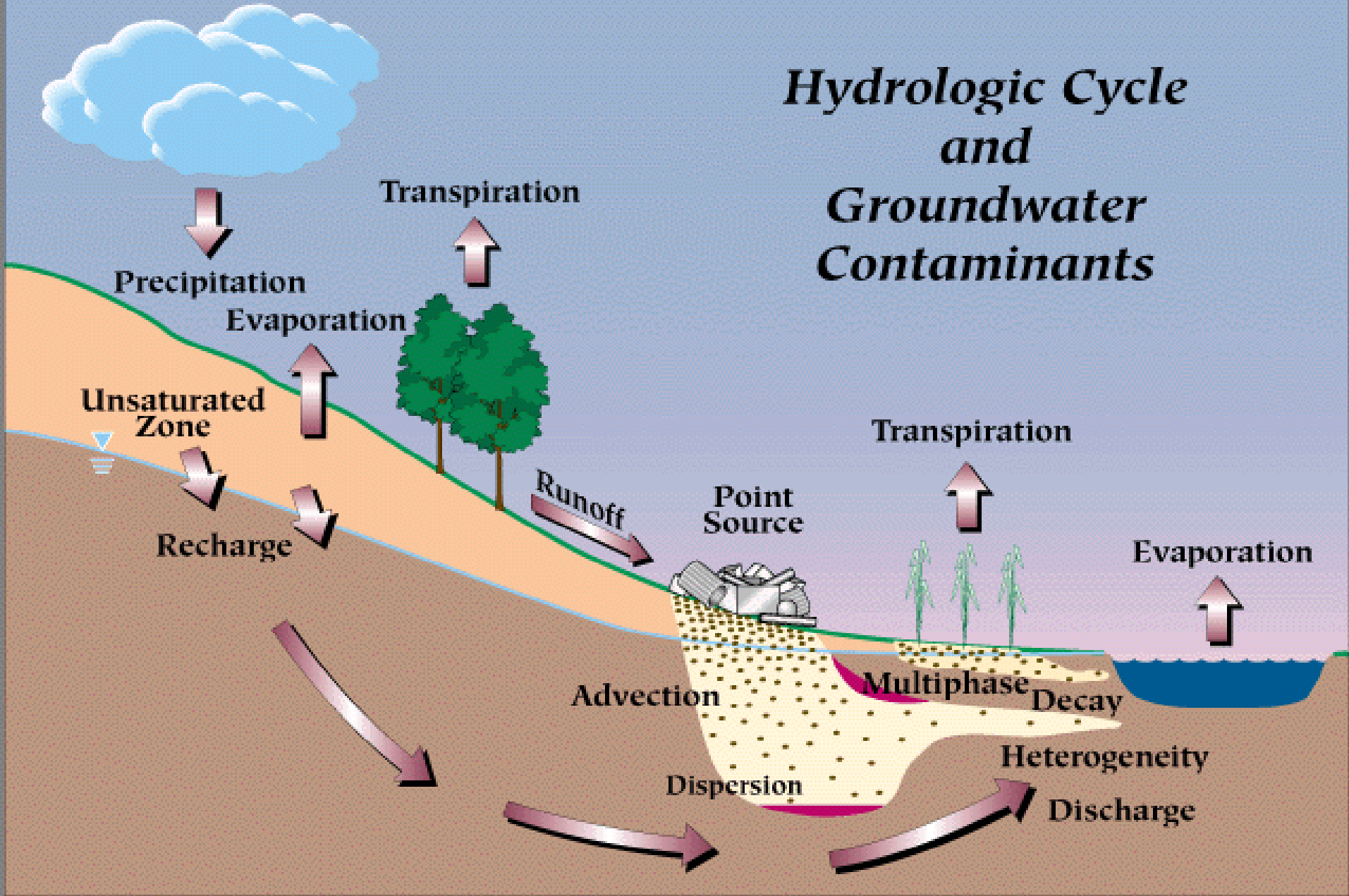
What is a model?

Why is a model so important?

What can a model do?

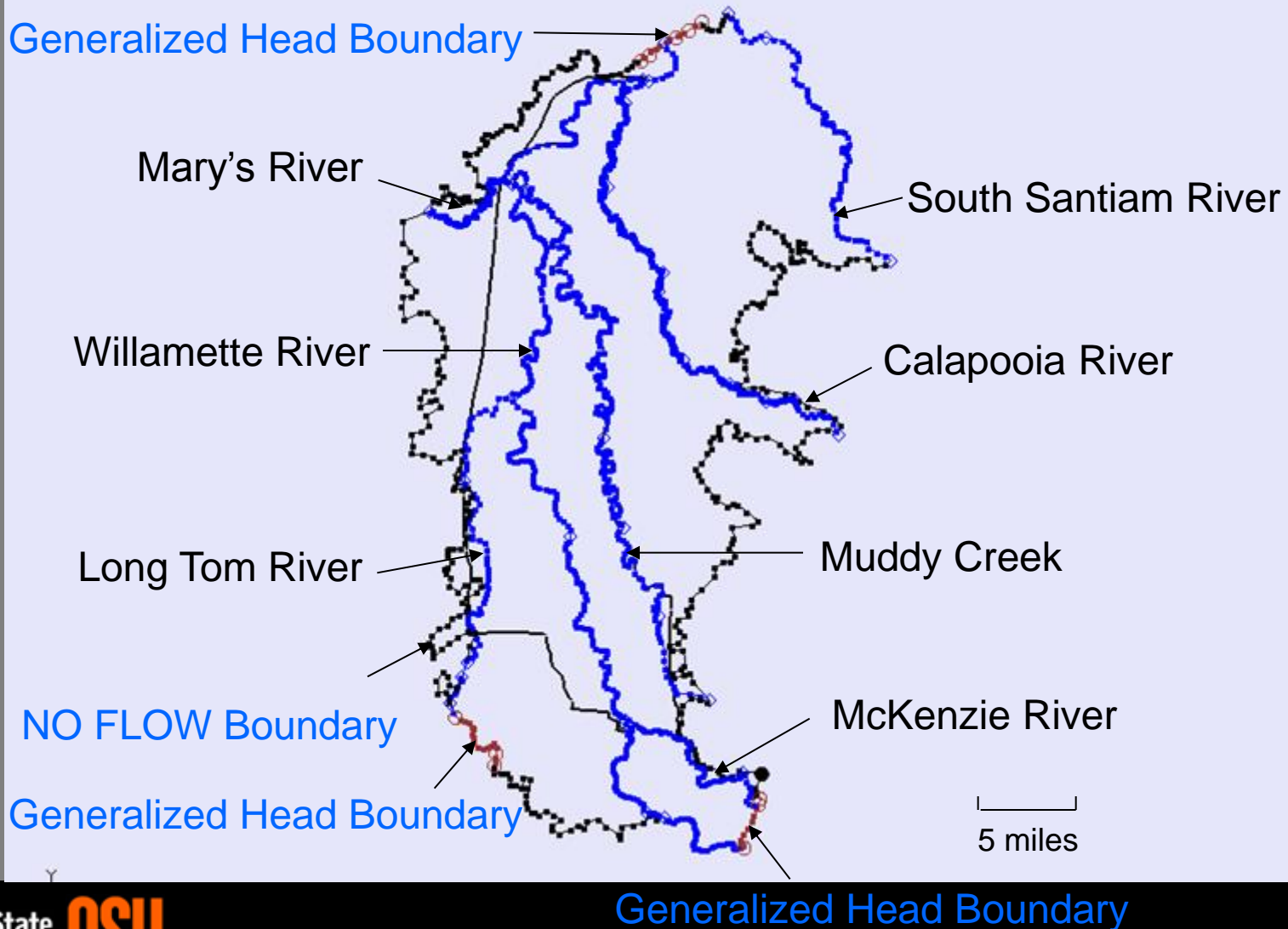


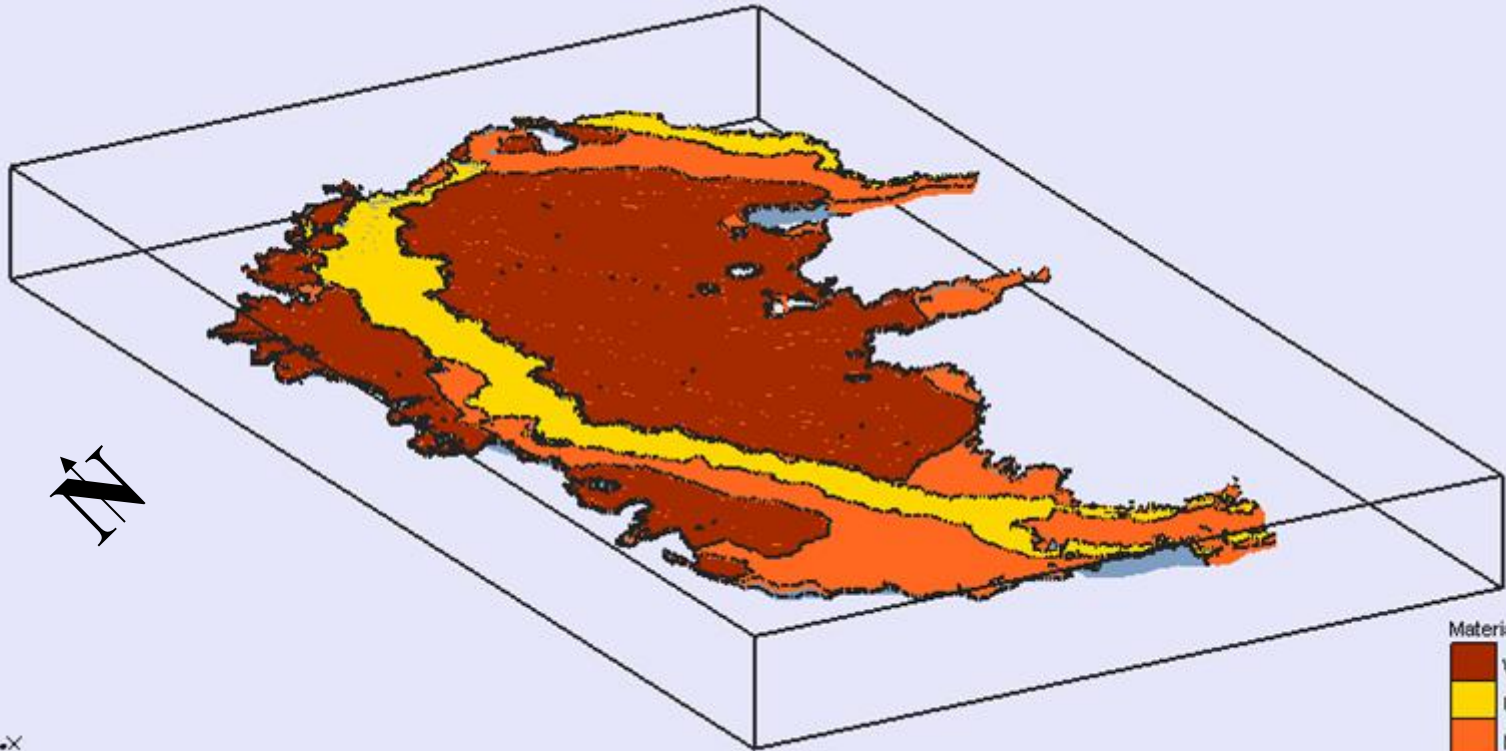
Hydrologic Cycle and Groundwater Contaminants



MODFLOW w/GMS Model

BOUNDARY CONDITIONS





Simulated Head Contour Map

- 20 ft. contours

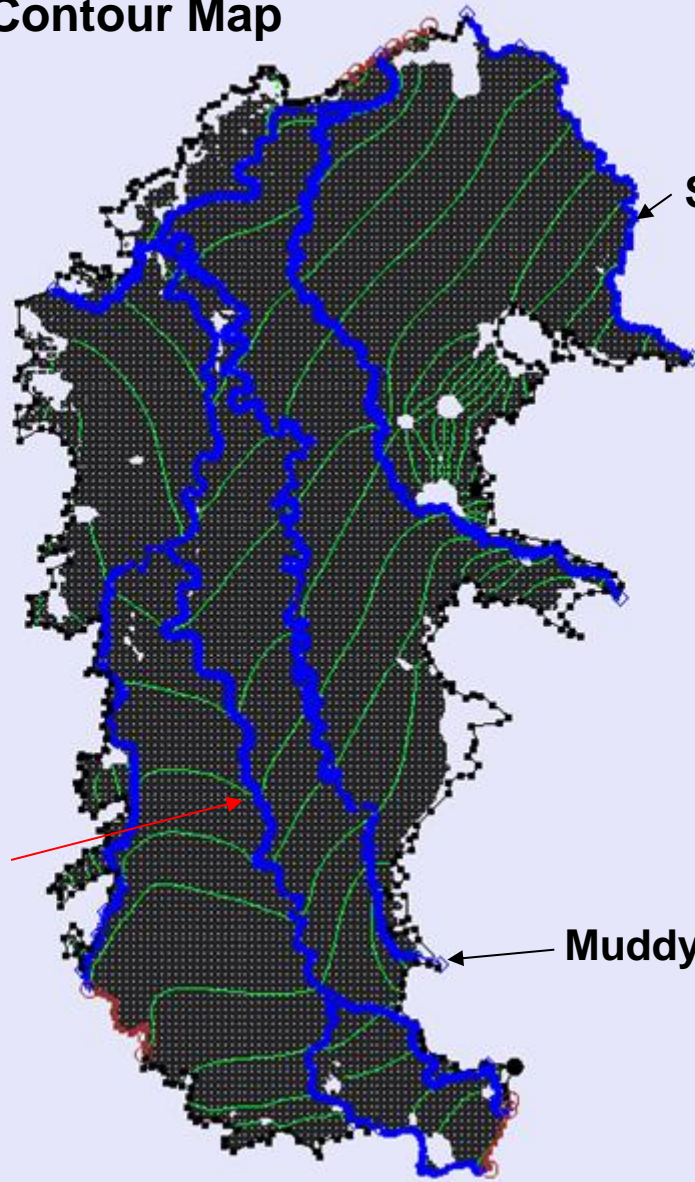
Willamette River

South Santiam River

Muddy Creek



5 miles



How can my study/data fit with the mission of the GWMAC?

- Groundwater age (cleanup time, how fast the water is moving)
- Direction of groundwater flow
- Groundwater/surface water interactions
- Predictions, “see what will happen if...”
- Give **best estimation** of:
 - Where is the nitrate coming from?
 - How long before we see a change?
 - What can we do now to best reduce nitrate levels?

What other study/data could also help address the mission of the GWMAC?

- MORE DATA!
 - Groundwater age
 - Water level measurements
 - Aquifer tests (pump and slug)
 - Transient model

Thanks!



- To the Environmental Protection Agency for funding (Regional Geographic Initiative 2004 grant # X5-970838-01)
- To the many landowners and local agencies who have helped me along the way