Ogallala Water Coordinated Agriculture Project

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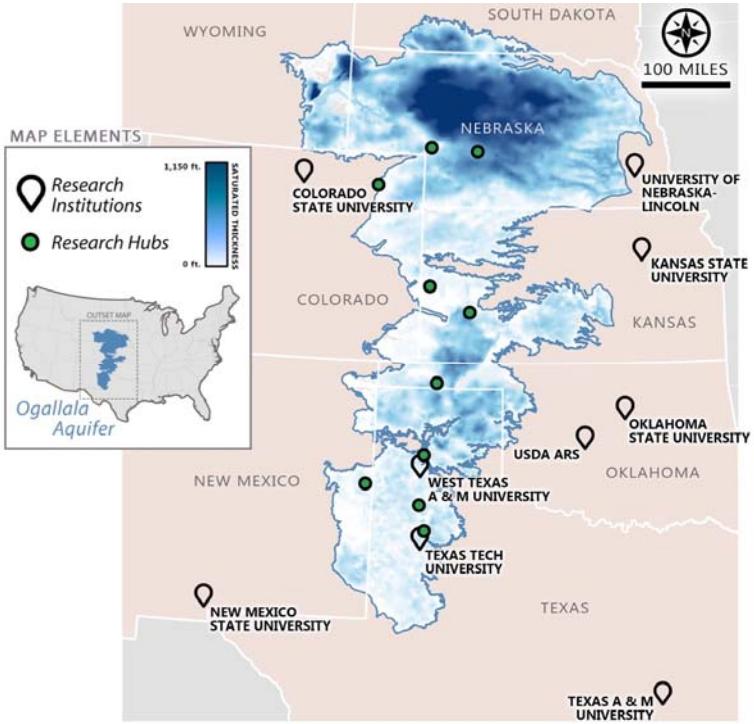
"As soil health declines, we cover many of those mistakes with water.
As soil health improves, water holding capacity improves."
- R.N. Hopper, producer, TX Panhandle

Ogallala Coordinated Agriculture Project

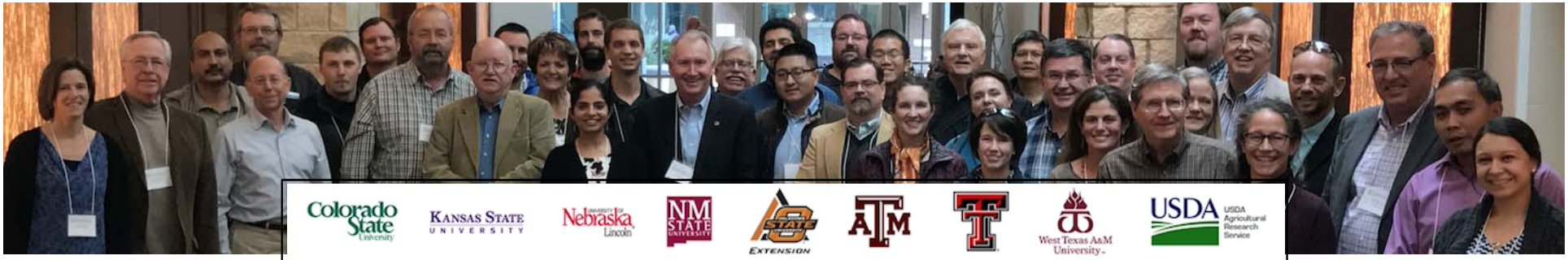
Situations vary locally/by state, but many areas are grappling with similar issues.

- Avoiding duplication
- Generate synergy
- Leveraging & building networks



L. Moore

About the Ogallala Water CAP



- USDA-NIFA funded "Coordinated Agriculture Project" (2016-2020)
- Team of ~70 people: faculty, post-docs and students
- Based at 9 institutions in 6 of 8 Ogallala region states
- Informed by an Advisory Board

Project focus areas:

1. **Integrated Modeling** (crop + hydrology + economic decisions + climate)

2. **Field research:** Irrigation mgmt & tech, Crop mgmt, Soils, Transition to dryland

3. **Sociology and economics**

4. **Outreach**

Integrated Modeling for Ag Water Management

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OPTIMIZING WATER USE TO SUSTAIN FOOD SYSTEMS

Modeling in the News

Toxic algae: Once a nuisance, now a severe nationwide threat

QUESTIONABLE RESULTS

Do the anti-pollution measures subsidized by the government to the tune of billions of dollars actually work?

Agriculture Department studies of selected watersheds, based largely on farmer surveys and computer models, credit them with dramatic cutbacks in runoff. One found nitrogen flows from croplands in the Mississippi River watershed to the Gulf of Mexico would be 28 percent higher without those steps being taken.

Critics contend such reports are based mostly on speculation, rather than on actually testing the water flowing off fields.

John Flesher and Angeliki Kastanis, Associated Press 11/16/2017

Two Types of Modeling

- PROCESS-BASED MODELING
  - Physical relationships
  - Focused on cause & effect
  - Good at prediction
  - Not good at filling in gaps in data
  - MODFLOW, SWAT, DSSAT
- STATISTICAL MODELING
  - Empirical relationships
  - Focused on observed patterns
  - Good at filling in gaps in data
  - Not good at prediction
  - Regressions, machine learning, kriging

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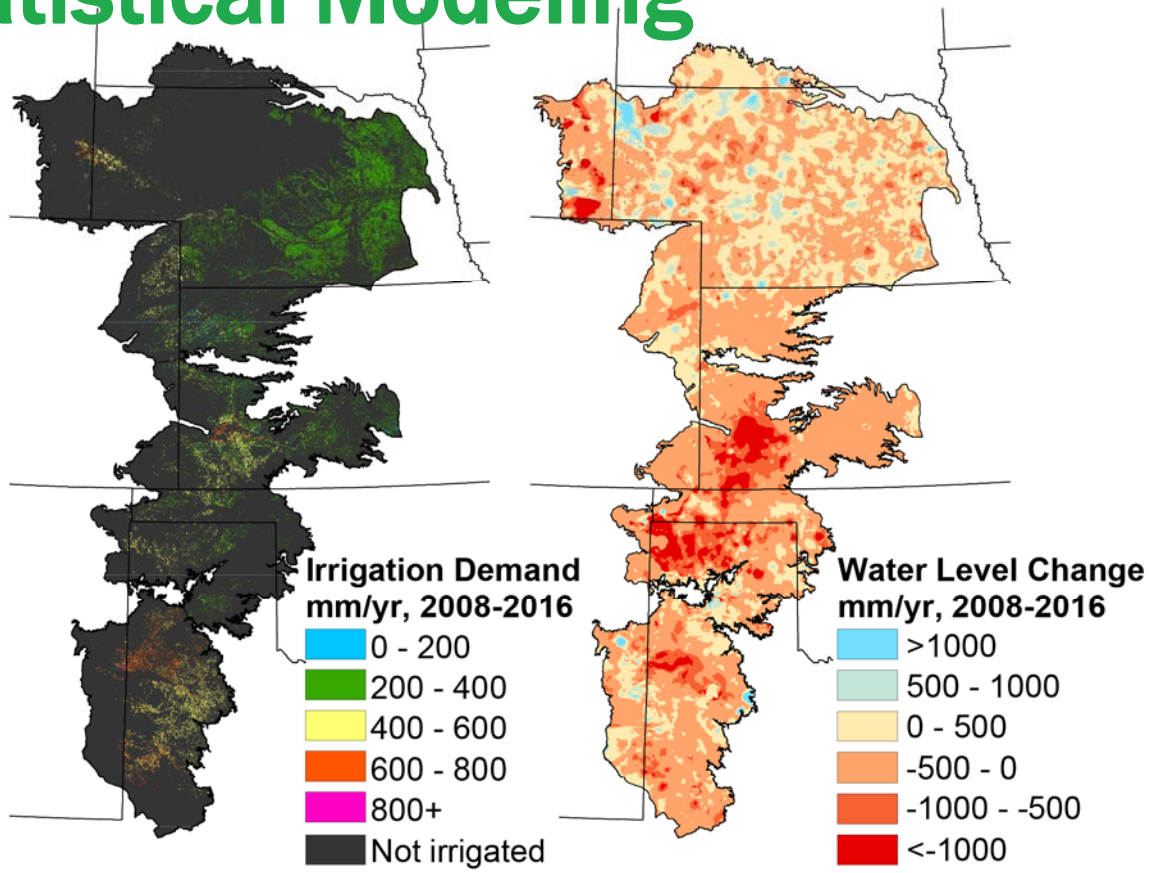
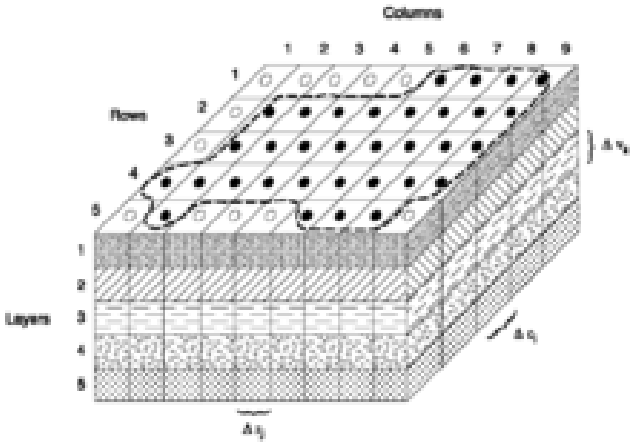
Statistical Modeling



A: Soheil Nozari; B: Erin Haacker

Process-based Modeling

- Can be simple ($E=mc^2$) or complex
- Often uses dedicated software
- Relies on processes + data



Wang and Anderson 1982

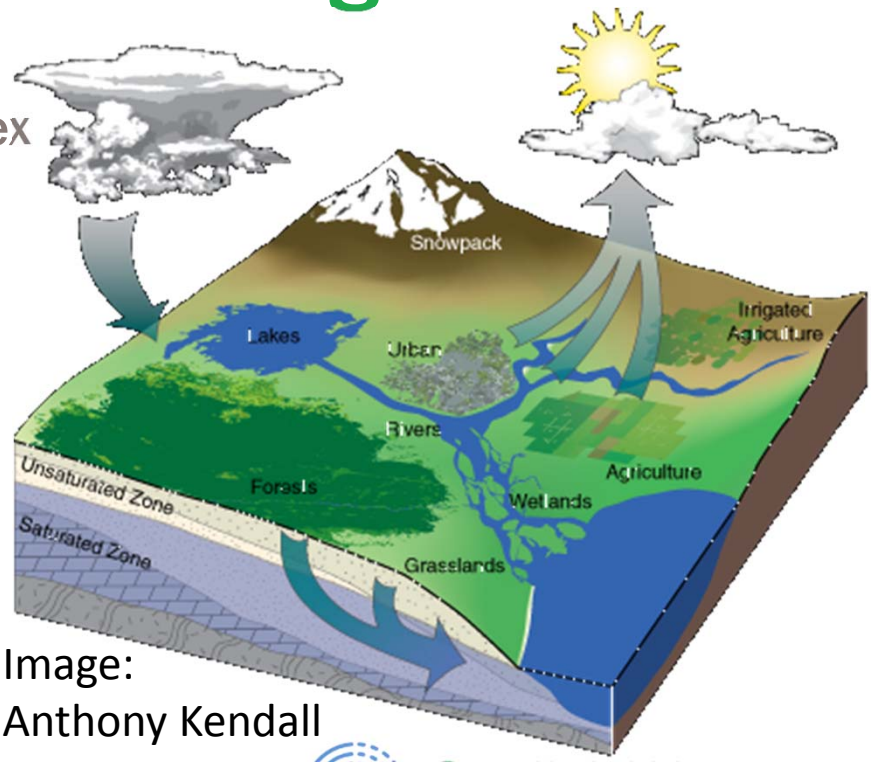


Image:
Anthony Kendall

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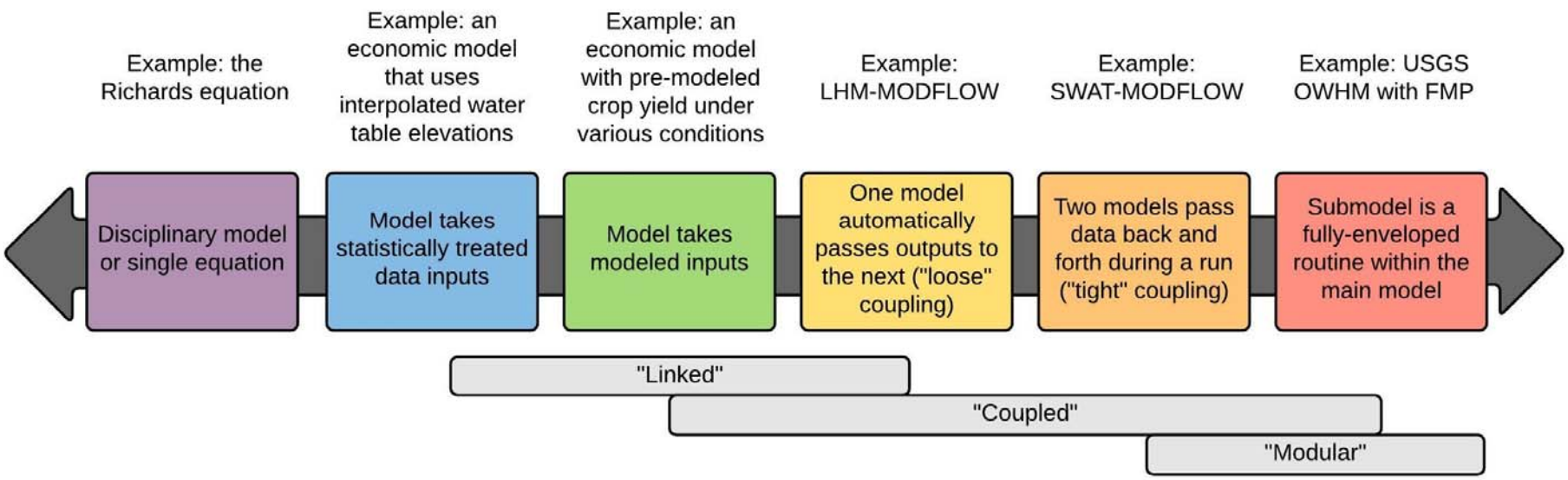
Model Integration



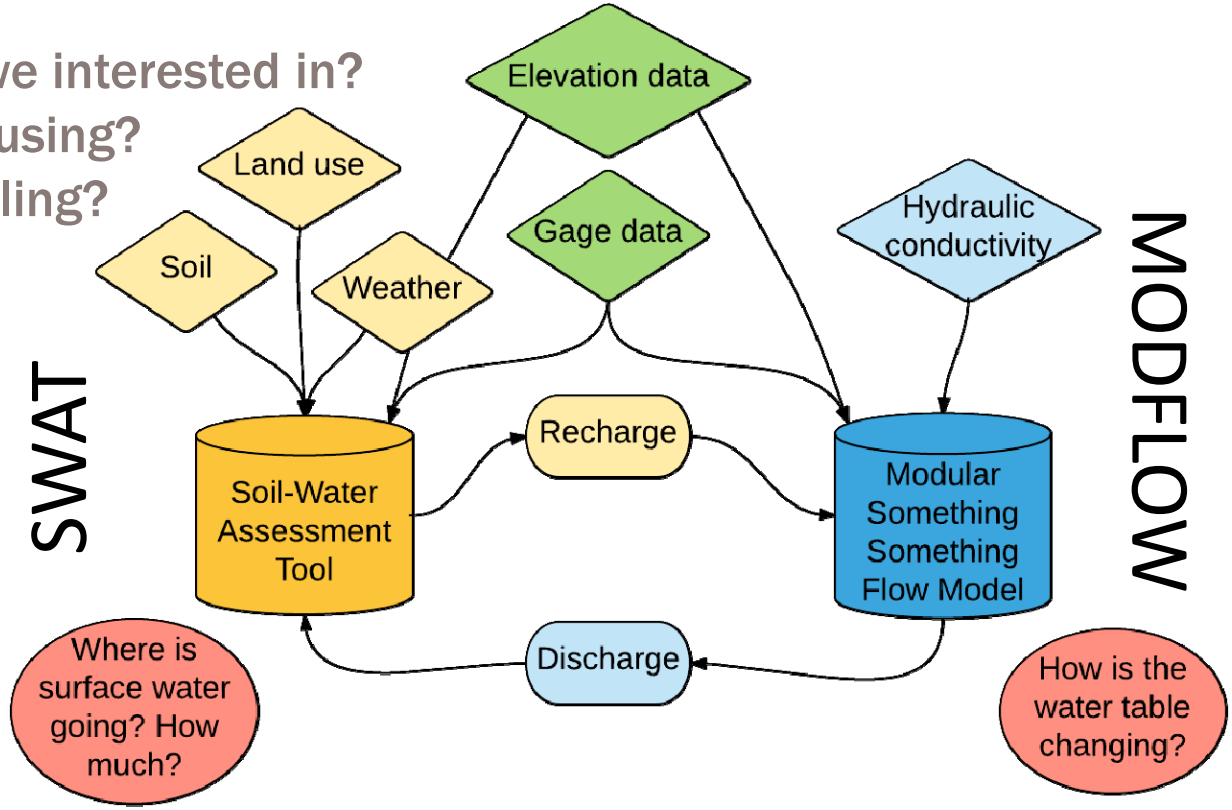
OWCAP Models

- What processes are we interested in?
- What models are we using?
- Why integrated modeling?

DSSAT
Decision Support System for Agrotechnology Transfer

+

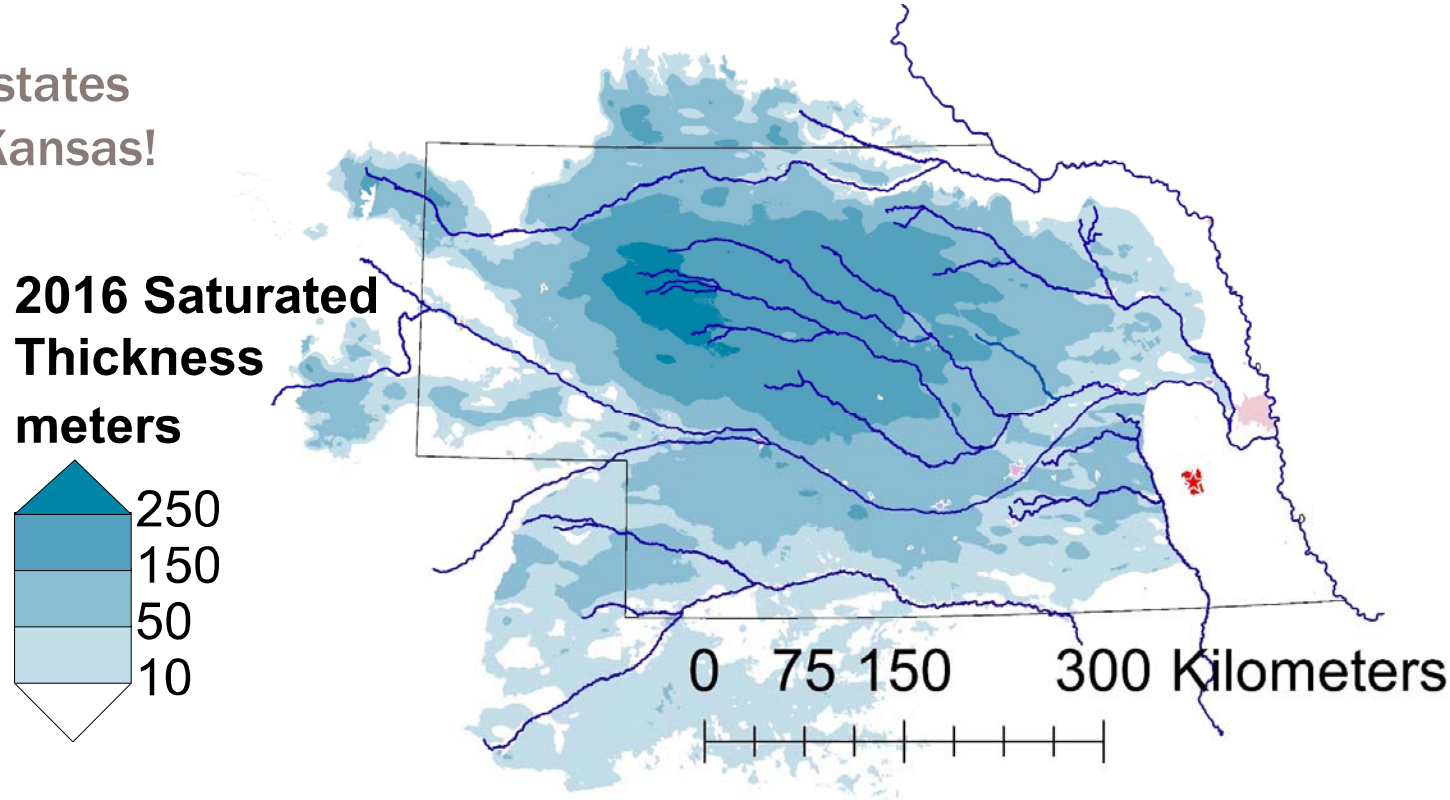
SWAT



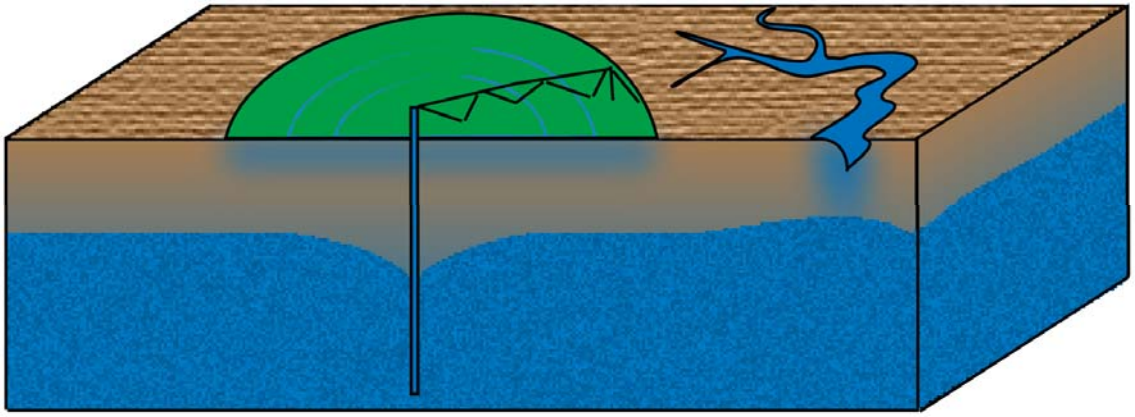
MODFLOW

The Northern High Plains Aquifer

- Parts of 5 states
- Including Kansas!



What are we trying to accomplish?



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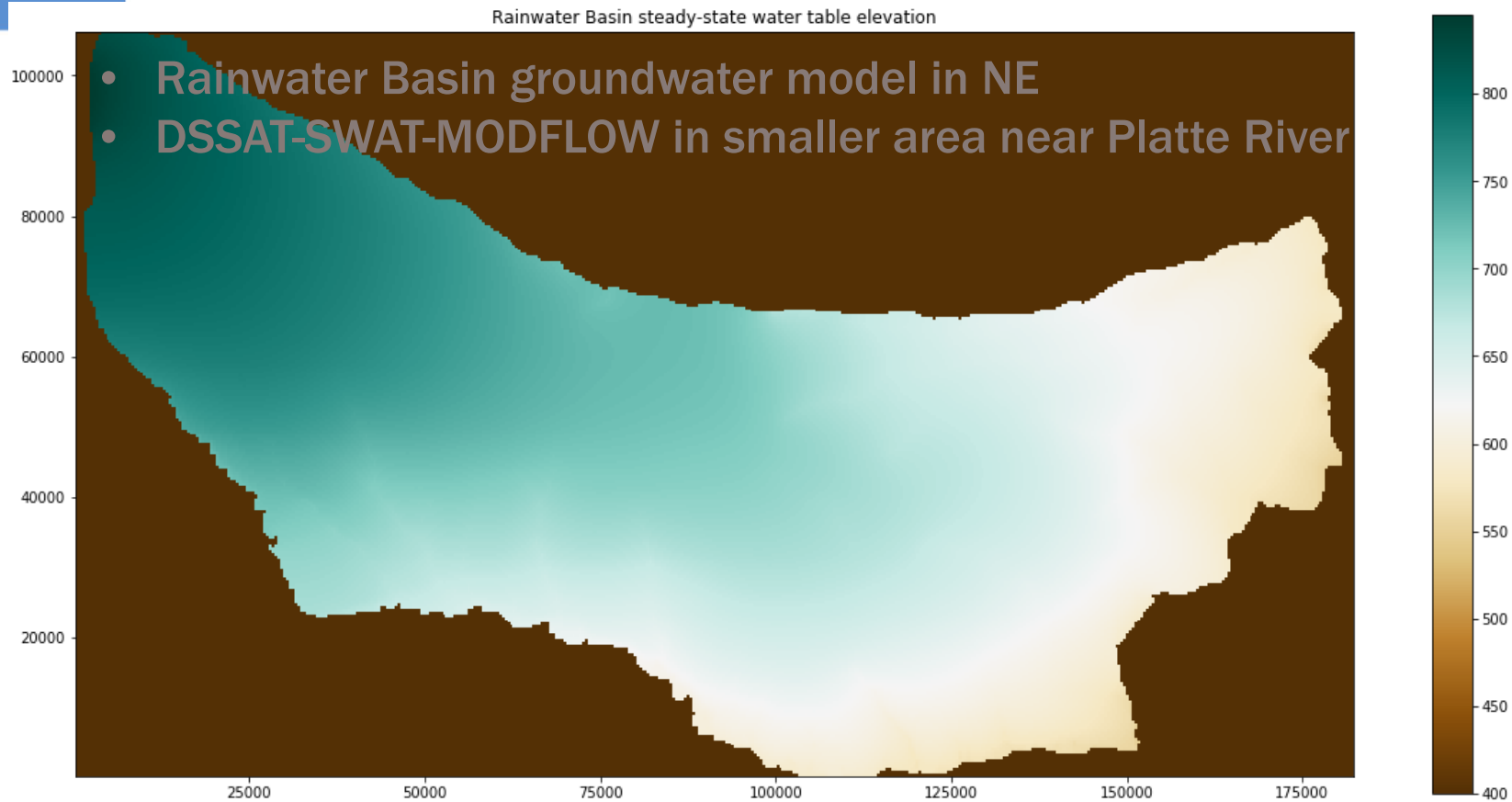
Current efforts

- Rainwater Basin groundwater model in NE
- DSSAT-SWAT-MODFLOW in smaller area near Platte River



Questions?

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