Progress Report:
North Texas and Red River GCD Management Model

November 20, 2025

AGS
Advanced Groundwater Solutions, LLC

District Management Model

Objectives:

- Develop sub-model of the NTGAM to aid in management and permitting

- Update conceptual model to better represent district hydrogeology

- Update MODFLOW packages and re-calibrate to district data
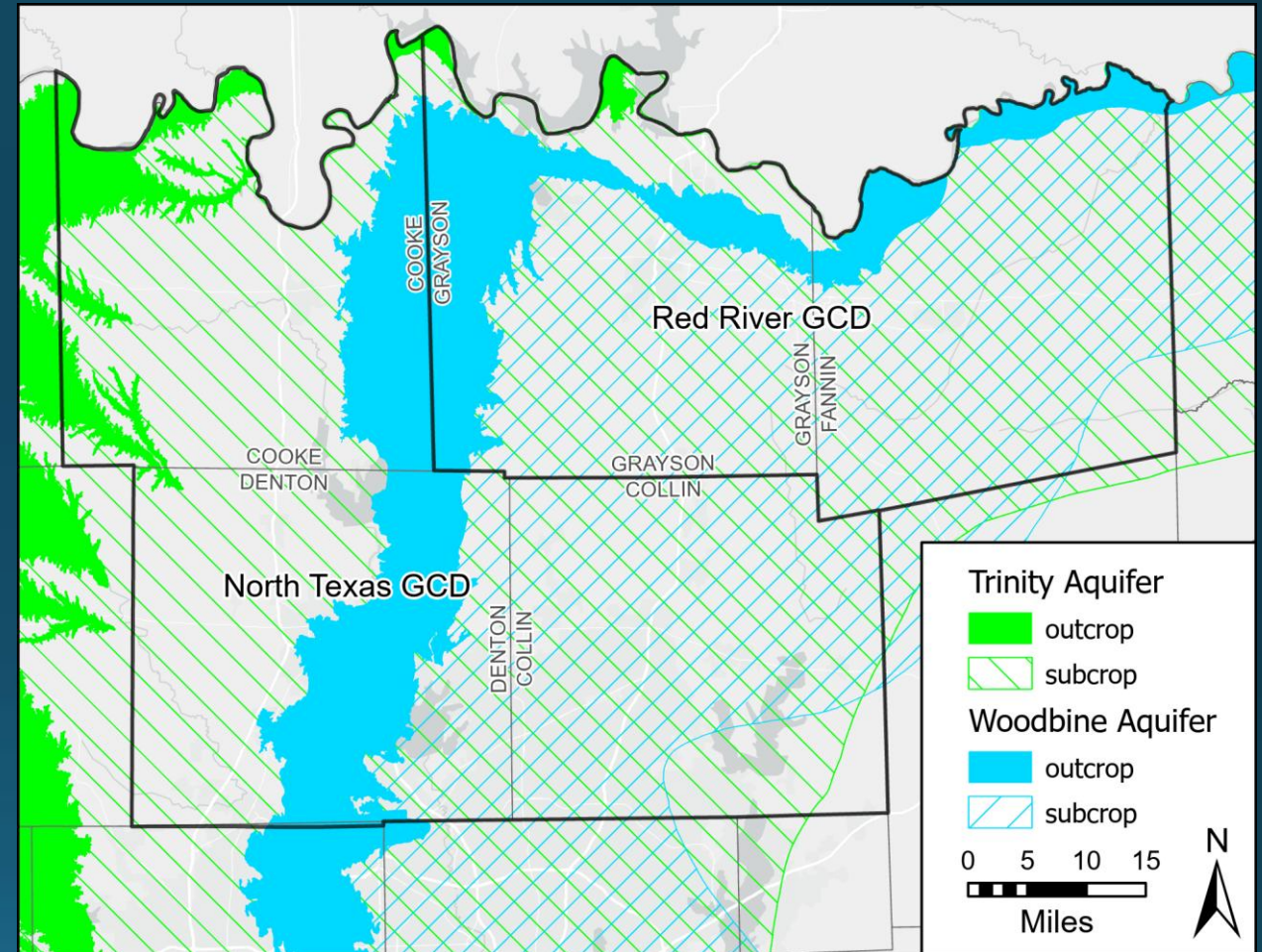
District Aquifers
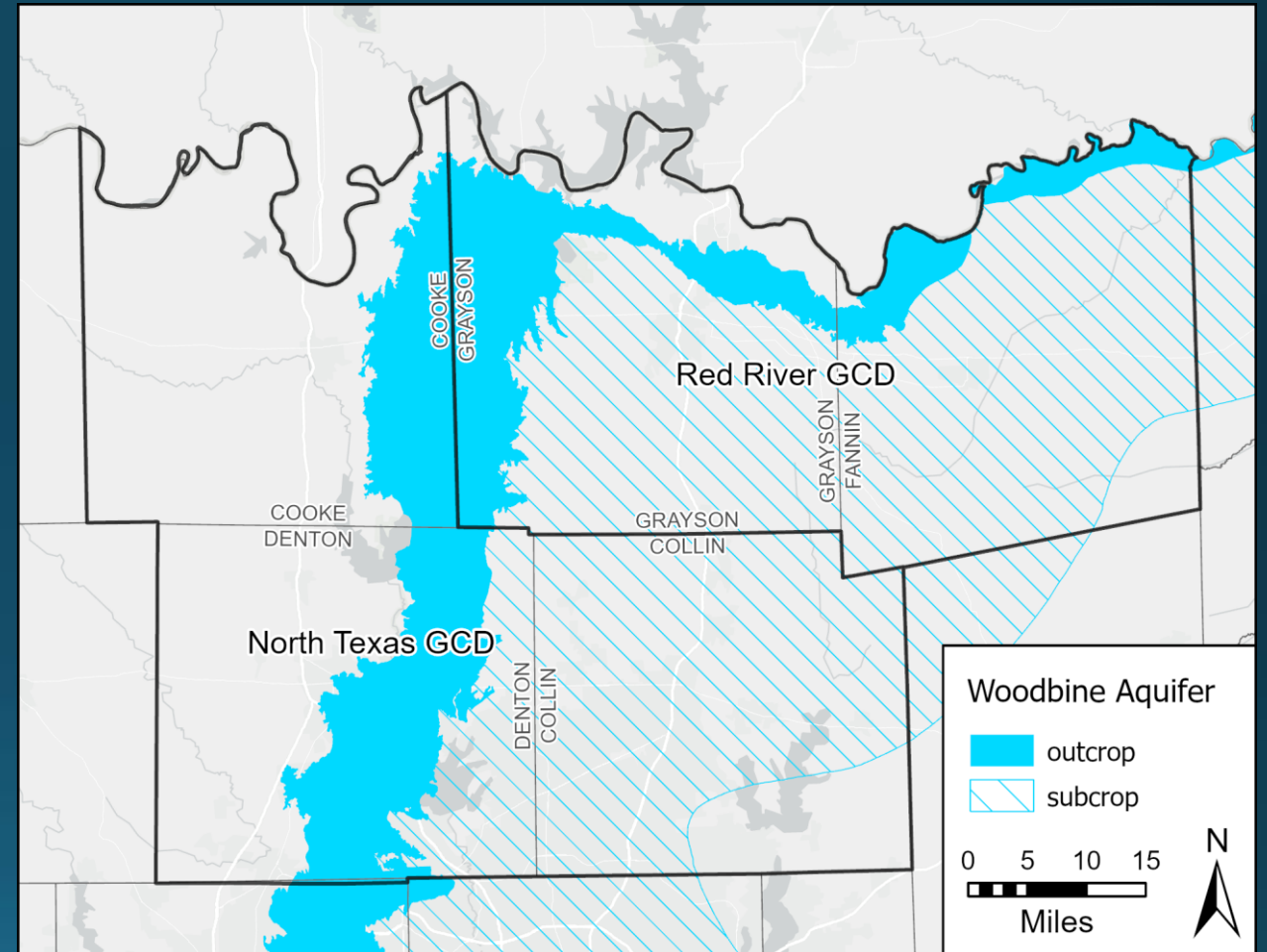## Northern Trinity

- Major aquifer composed of sandstone and limestone

- Consists of:

  - Antlers

  - Twin Mountains

- Low to moderate transmissivity
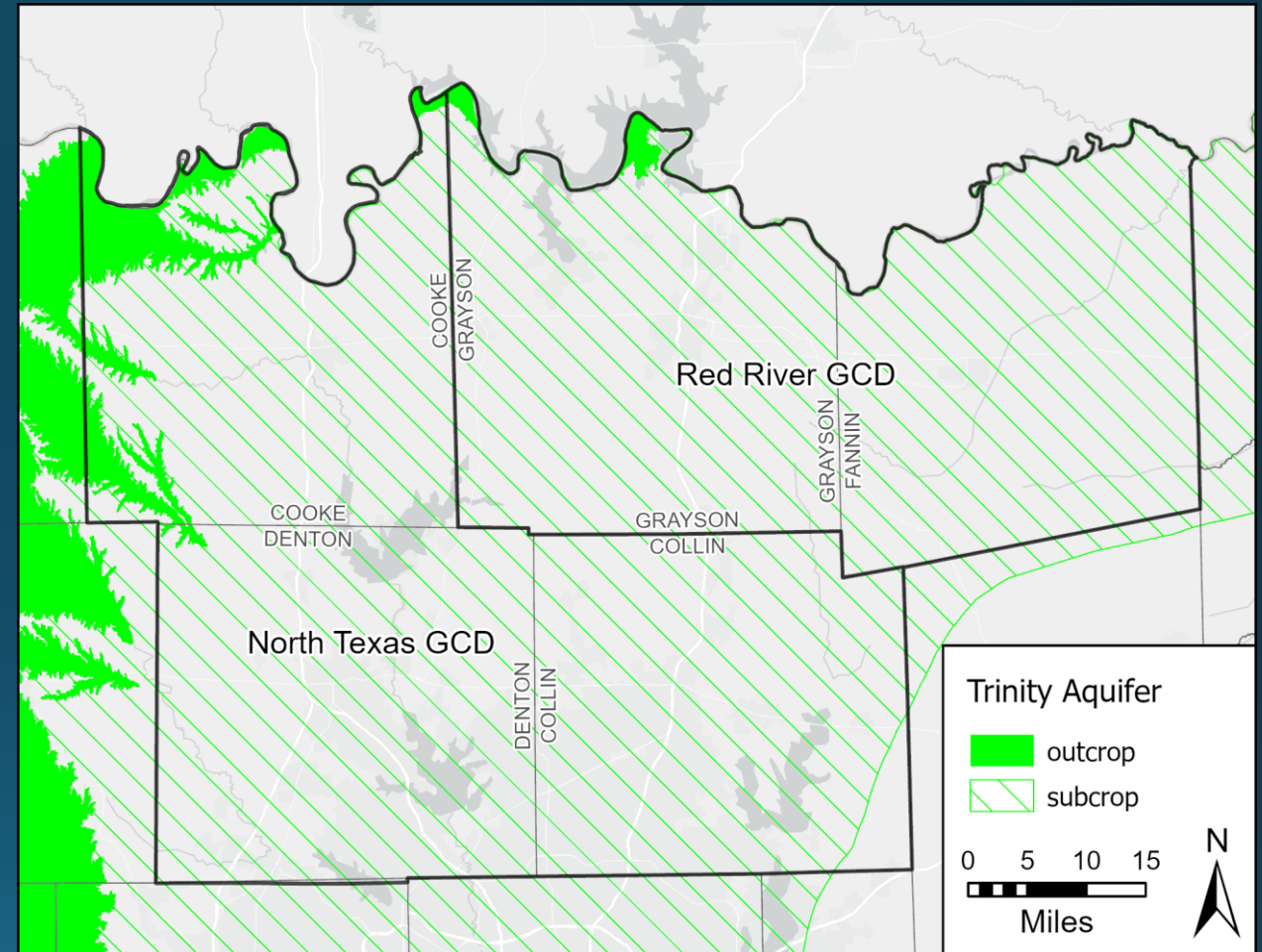
District Aquifers
Woodbine

- Texas minor aquifer composed of interbedded sand and shale

- Overlies Trinity Aquifer, separated by Washita and Fredericksburg Group

- Low to moderate transmissivity

GAM Hydrogeology

Hydrostratigraphic Regions

- Aquifer nomenclature and stratigraphy varies by region

- Subdivided by aquifer lithology, depositional systems, and properties
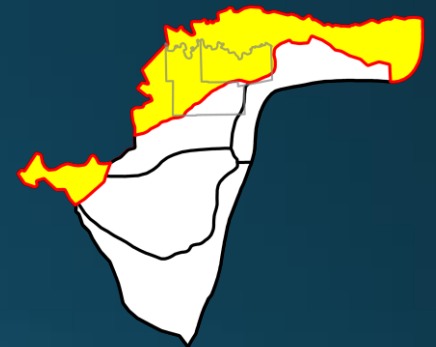
- Districts span Regions 1 and 2
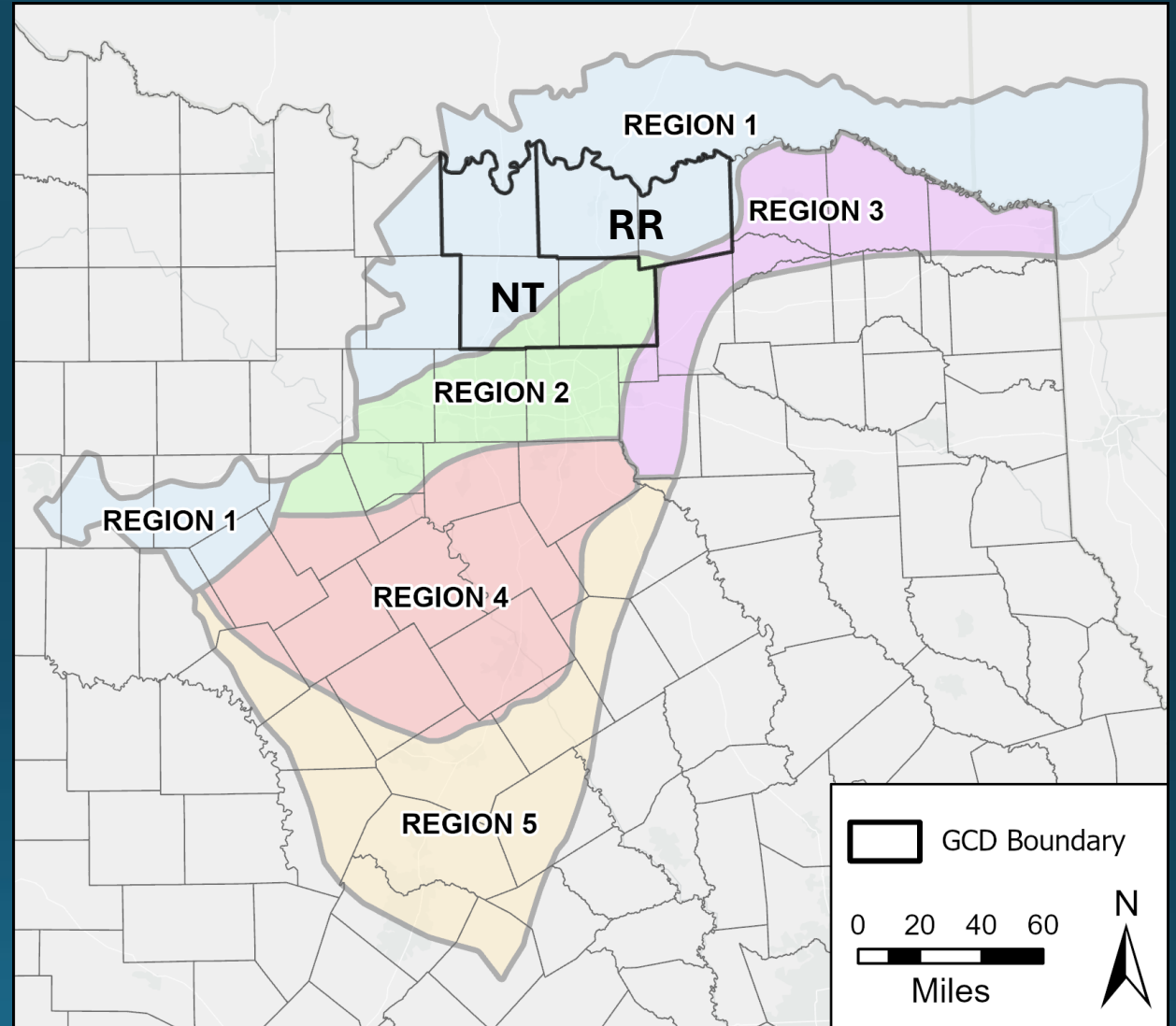
GAM Hydrogeology

Hydrostratigraphic Regions

- Region 1: Trinity Aquifer referred to as Antlers
  - Glen Rose interval is sandstone dominant
- Region 2: Trinity referred to as Twin Mountains
  - Glen Rose limestone separate from Trinity aquifer units

Model Layer	Model Terminology	Region 1	Region 2
2	Woodbine Aquifer	Woodbine	Woodbine
3	Washita/ Fredericksburg Groups	Washita/ Fredericksburg	Washita/ Fredericksburg
4	Paluxy Aquifer	Antlers	Paluxy
5	Glen Rose Formation	Antlers	Glen Rose
6	Hensell Aquifer	Antlers	Twin Mountains
7	Pearsall Formation	Antlers	Twin Mountains
8	Hosston Aquifer	Antlers	Twin Mountains

Modified Figure 4.1.6 from Kelley and others (2014)

GAM Hydrogeology

Hydrostratigraphic Regions

- Region 1: Trinity Aquifer referred to as Antlers

  - Glen Rose interval is sandstone dominant

- Region 2: Trinity referred to as Twin Mountains

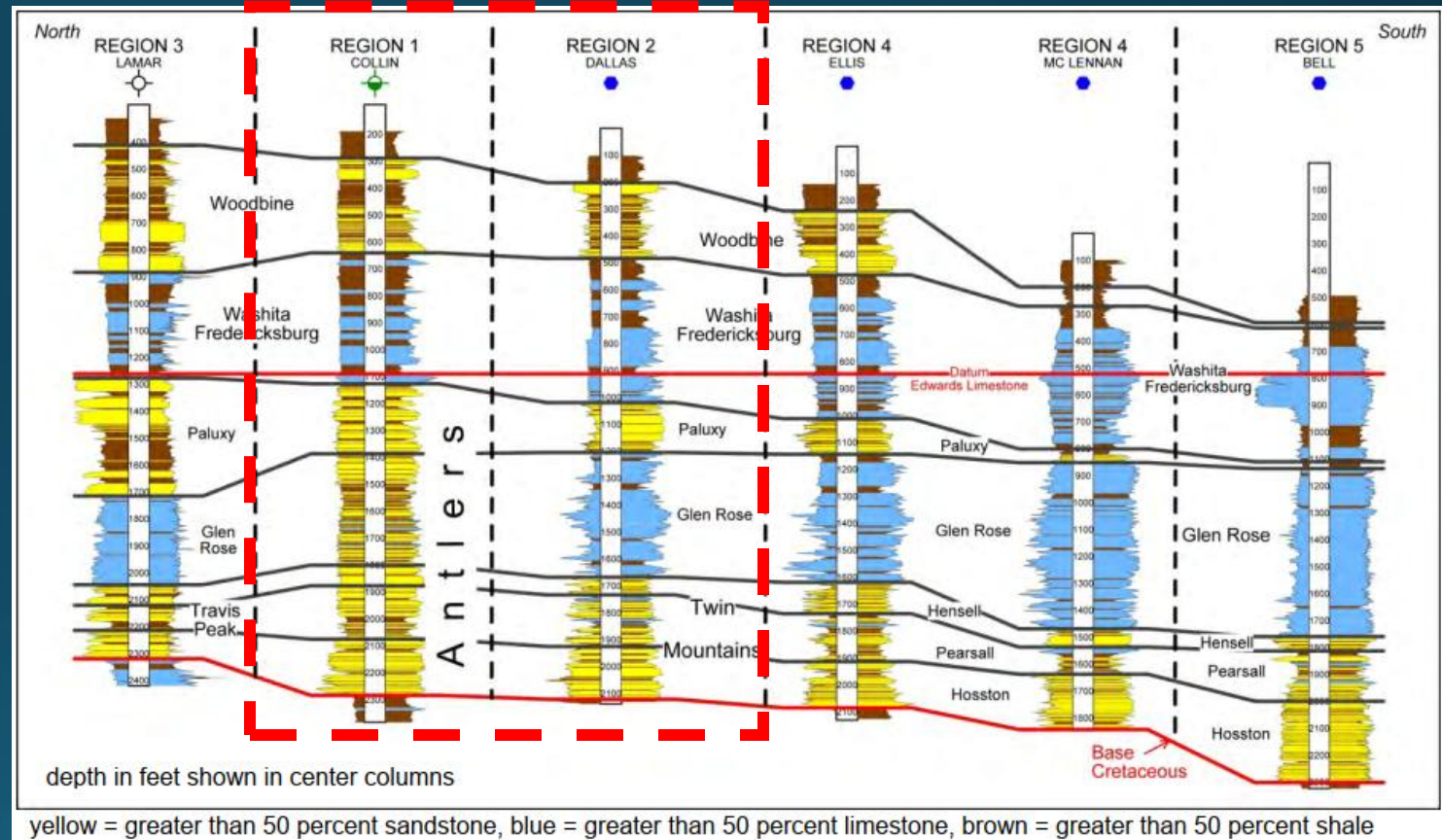 - Glen Rose limestone separate from Trinity aquifer units

Figure 4.1.5 from *Kelley and others (2014)*

GAM Hydrogeology

Hydrostratigraphic Regions

- Region 1: Trinity Aquifer referred to as Antlers

  - Glen Rose interval is sandstone dominant

- Region 2: Trinity referred to as Twin Mountains

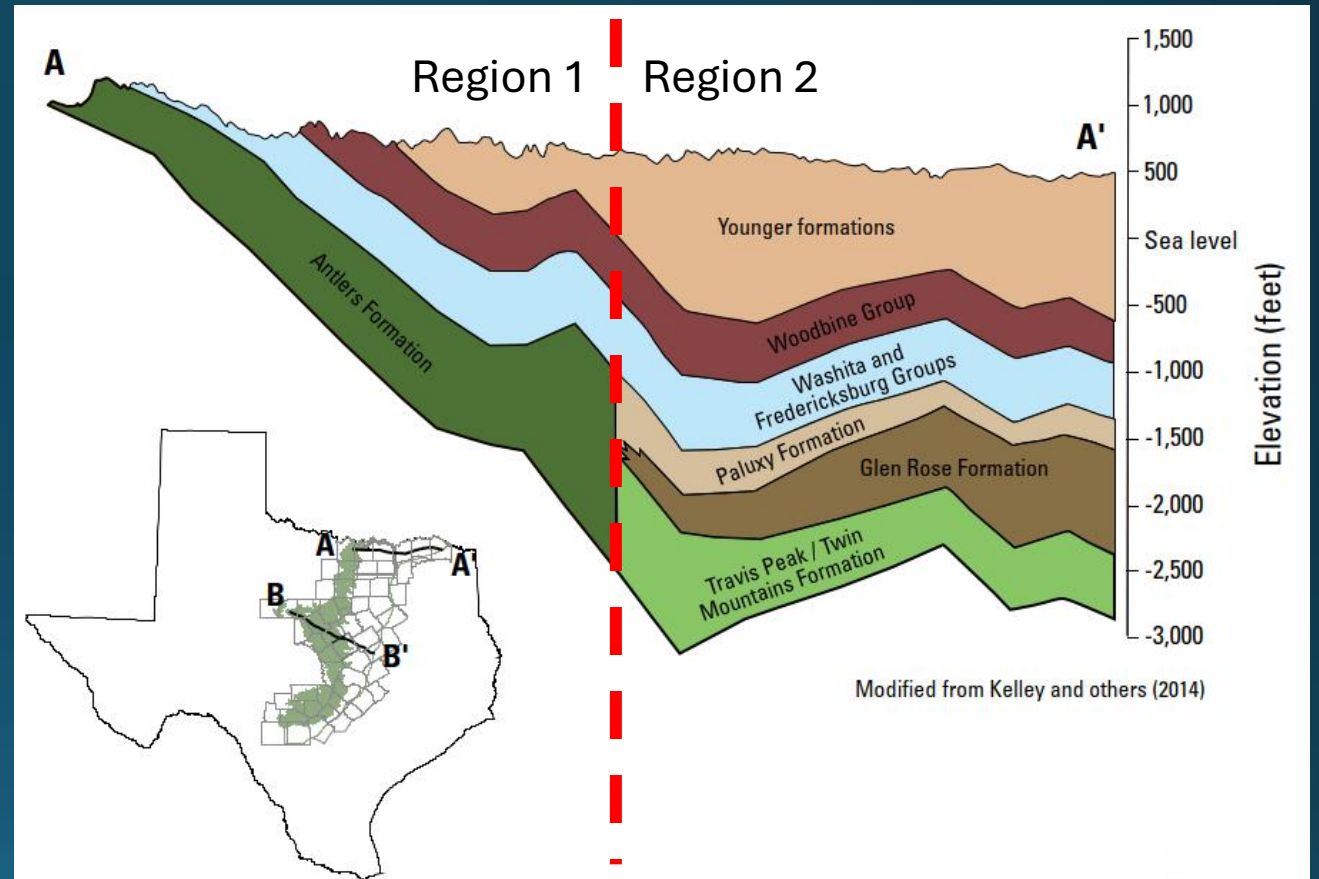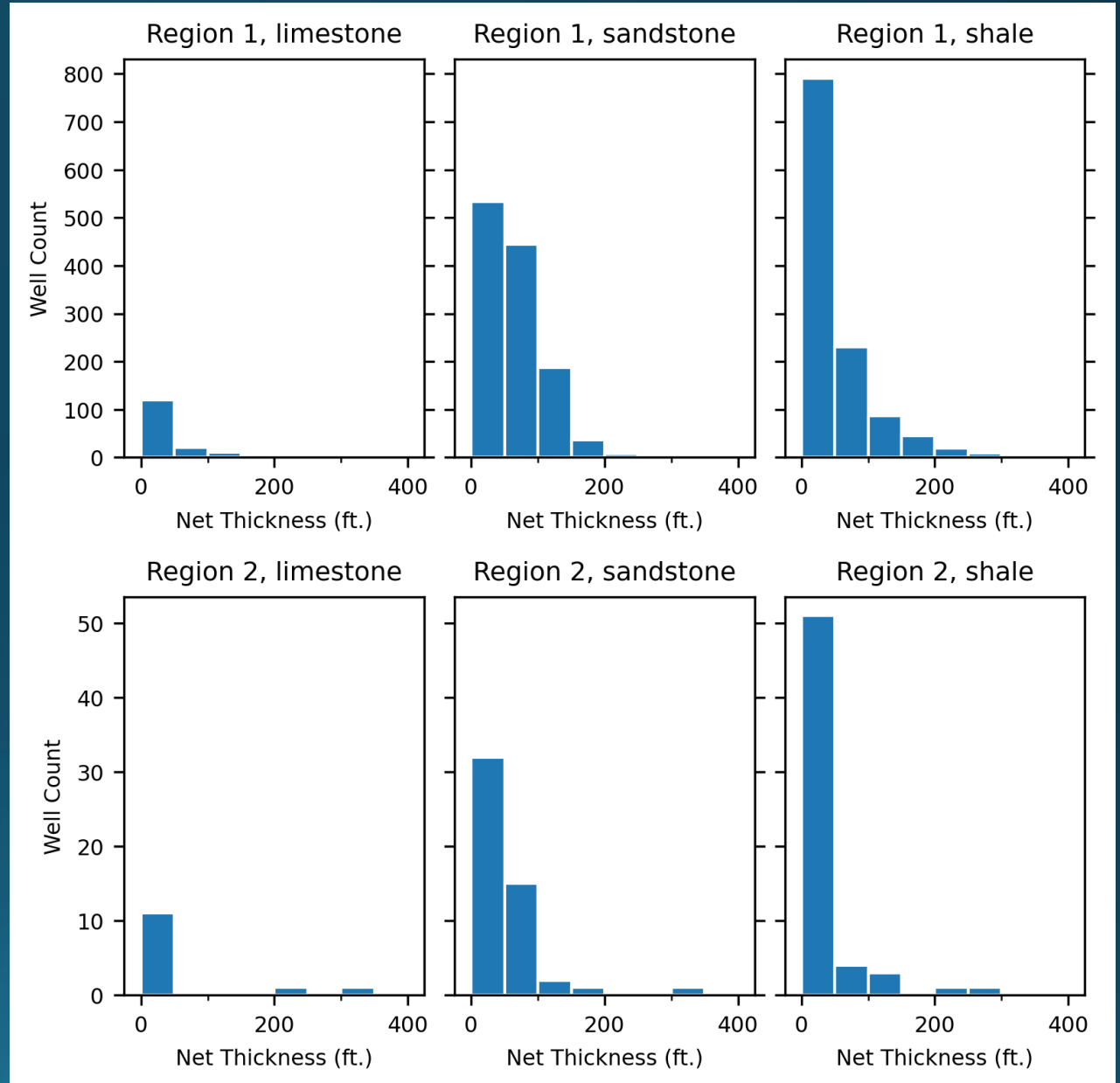 - Glen Rose limestone separate from Trinity aquifer units

Figure 2-2 from Ellis and others (2025)

GAM Hydrogeology

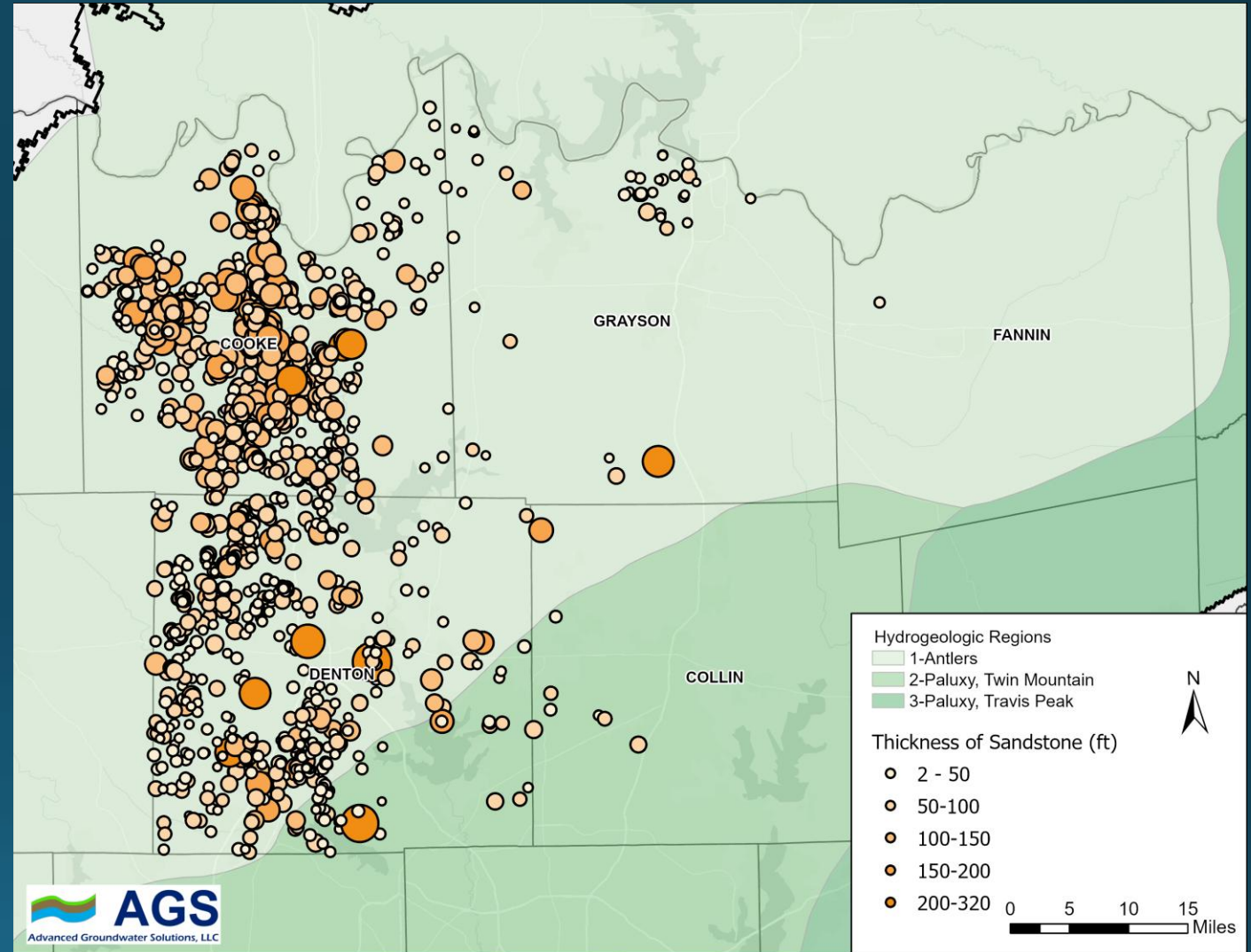Glen Rose Lithologic Descriptions

- Reviewed TDLR lithologic descriptions

- Wells intersecting the Glen Rose

- Majority of wells located in Region 1

- Most wells with "limestone" describe mixed with sand/shale
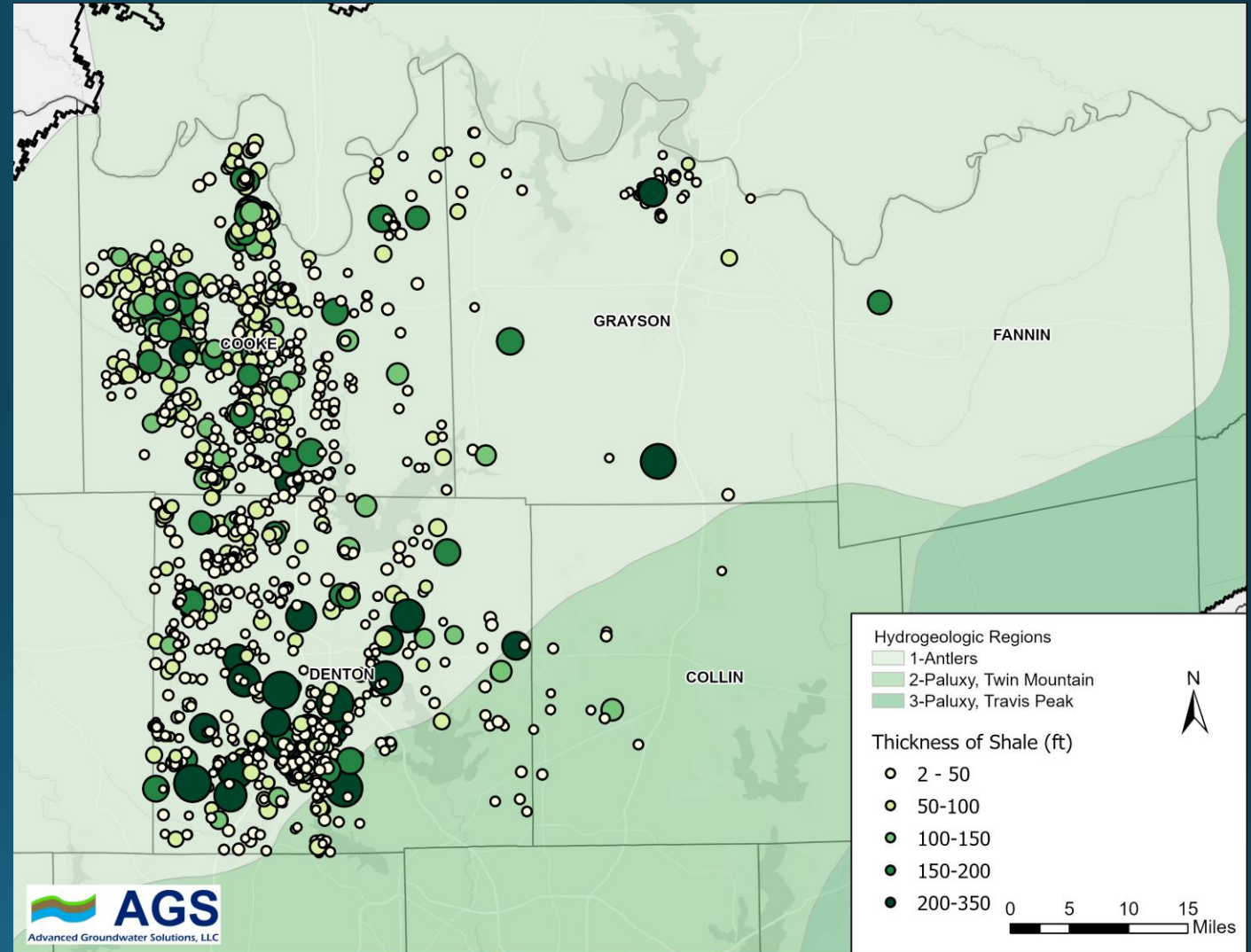
GAM Hydrogeology

Glen Rose Net Sandstone

- Reviewed TDLR lithologic descriptions

- Wells intersecting the Glen Rose BRACS structure

- Majority of these wells limited to Region 1

GAM Hydrogeology

Glen Rose Net Shale

- Reviewed TDLR lithologic descriptions

- Wells intersecting the Glen Rose BRACS structure

- Majority of these wells limited to Region 1

Hydrogeologic Regions
- 1-Antlers
- 2-Paluxy, Twin Mountain
- 3-Paluxy, Travis Peak

Thickness of Shale (ft)
- 2 - 50
- 50-100
- 100-150
- 150-200
- 200-350

0 5 10 15 Miles

GAM Hydrogeology

Glen Rose Net Limestone

- Reviewed TDLR lithologic descriptions

- Wells intersecting the Glen Rose BRACS structure

- Majority of these wells limited to Region 1
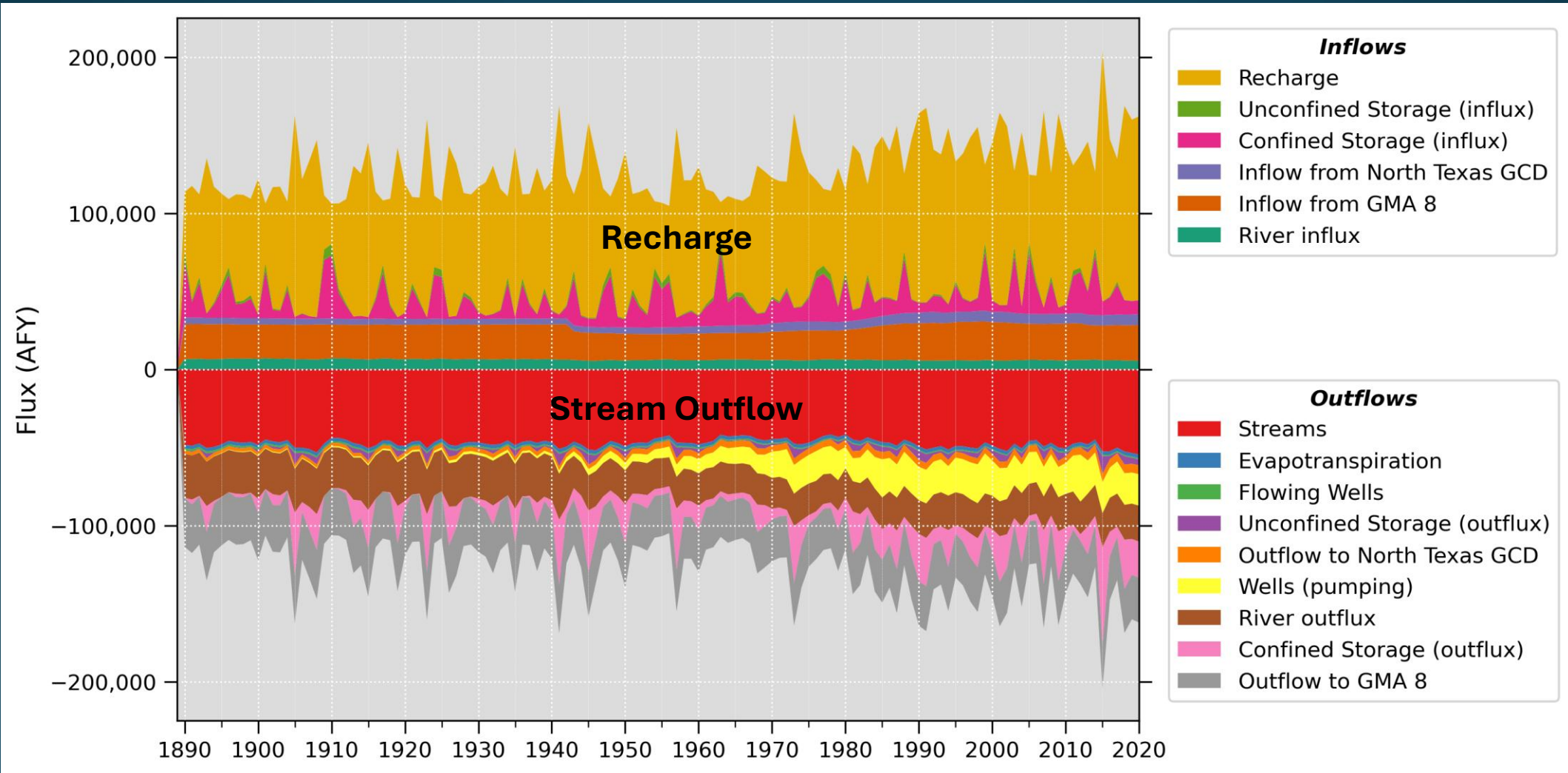
- DRAFT results – still reviewing
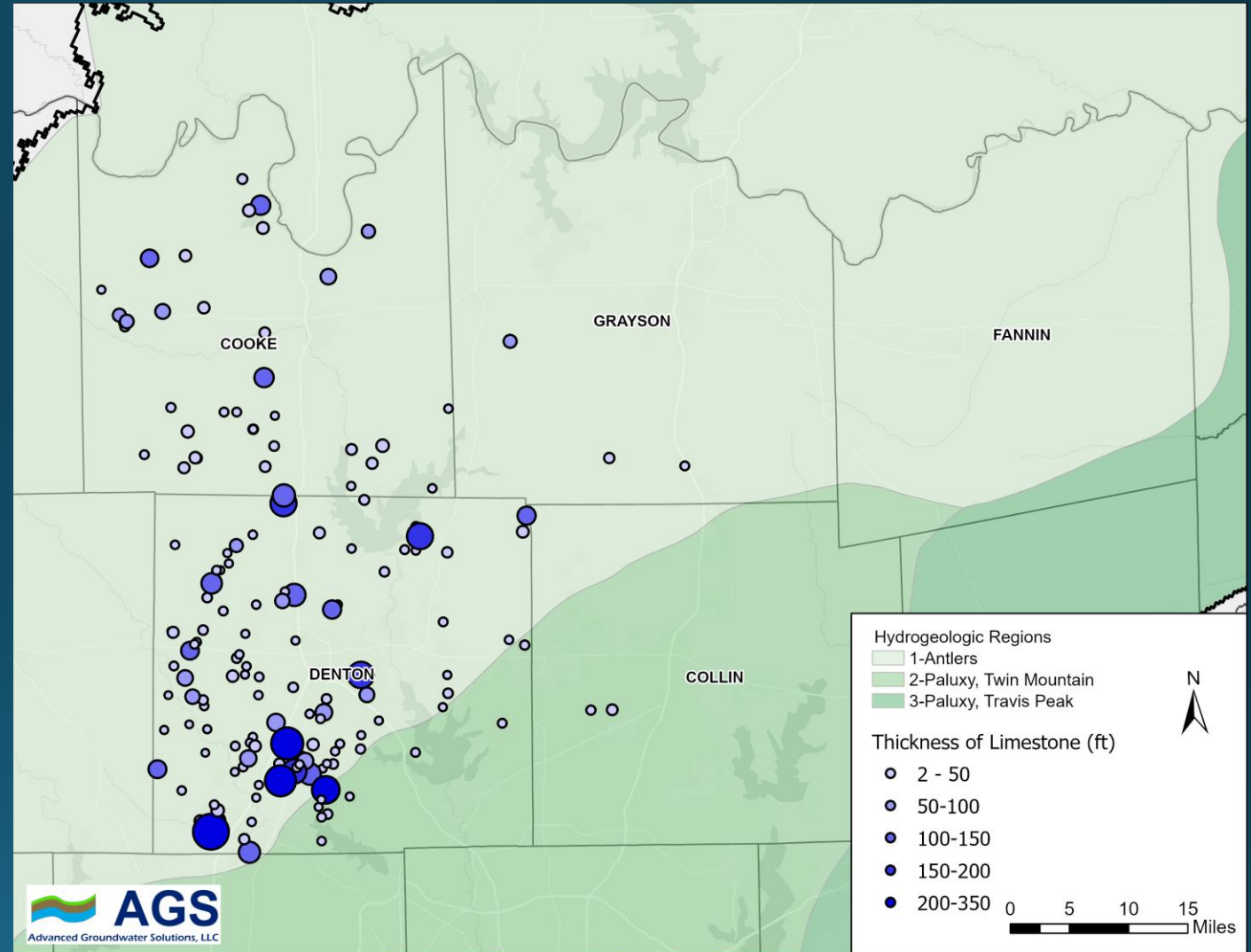
GAM Structure
Antlers Thickness

- Outcrop thickness up to 800 feet in NTGCD

- Little to no outcrop in RRGCD

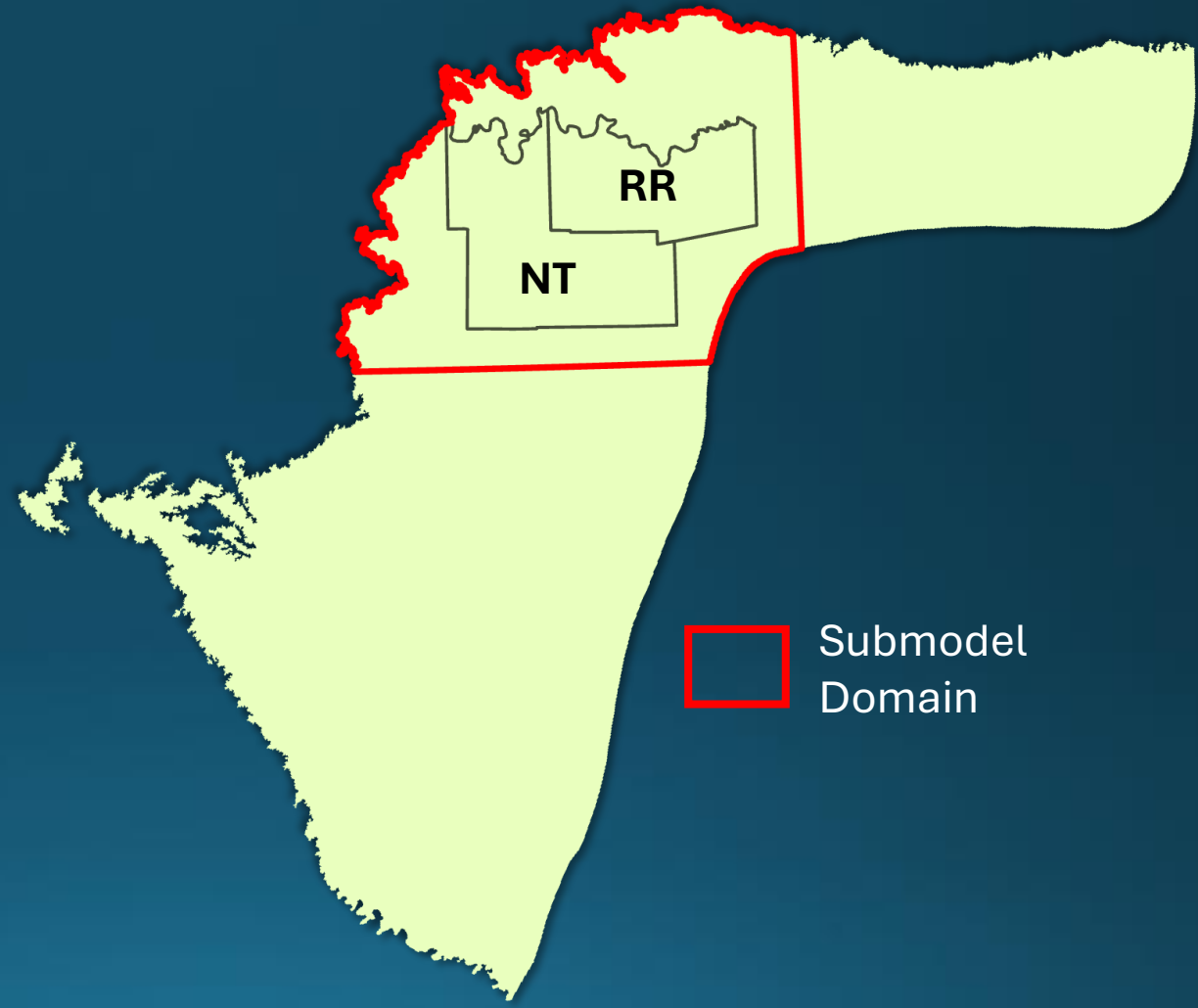- Downdip thickness increases to >1,600 feet in RRGCD
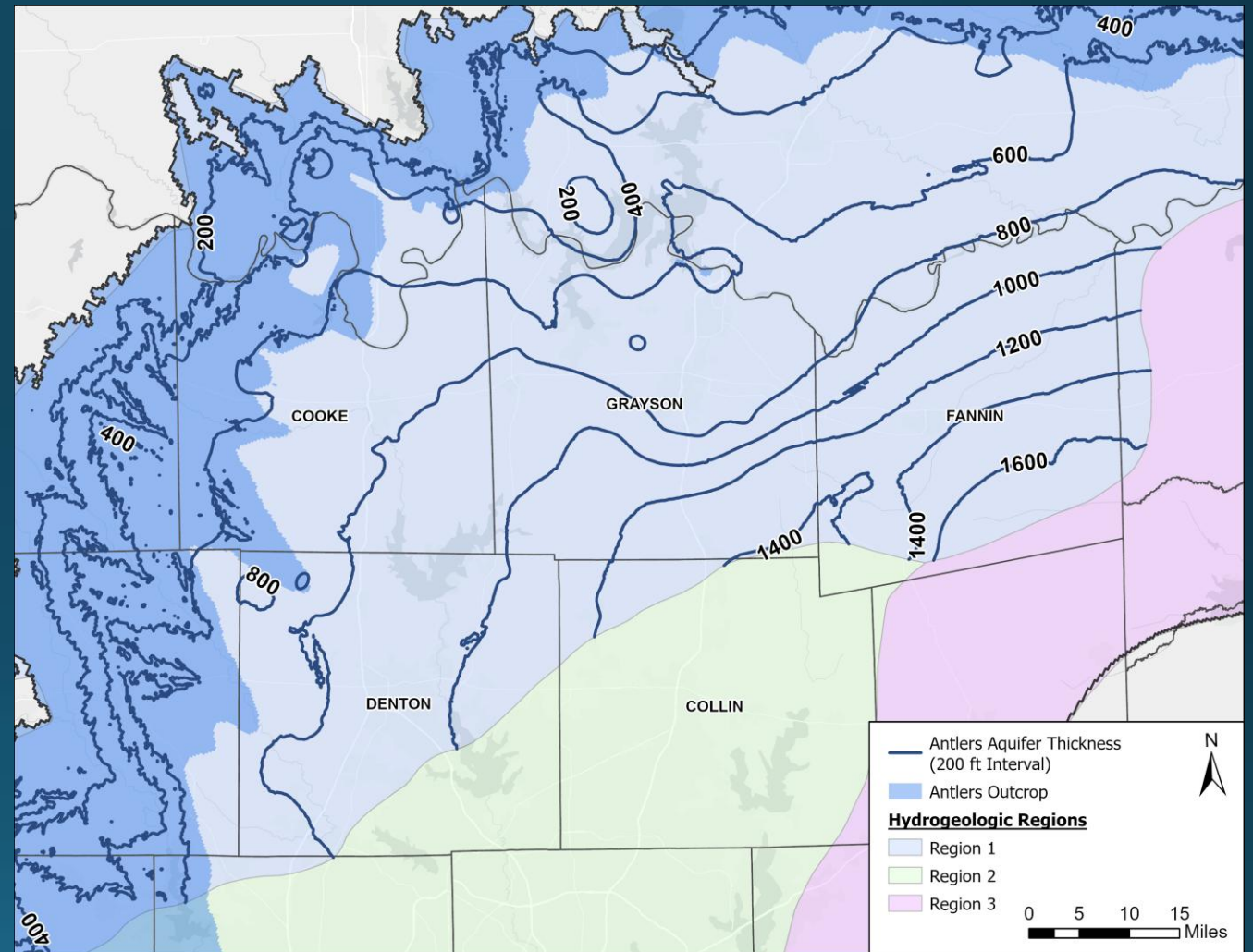
NTGAM Water Budget – Red River GCD

Submodel Development
Model Boundary

- Inclusive of outcrop (recharge) and downdip flow system

- Buffered 10-15 miles from districts to mitigate model boundary effects

RR

NT

Submodel Domain
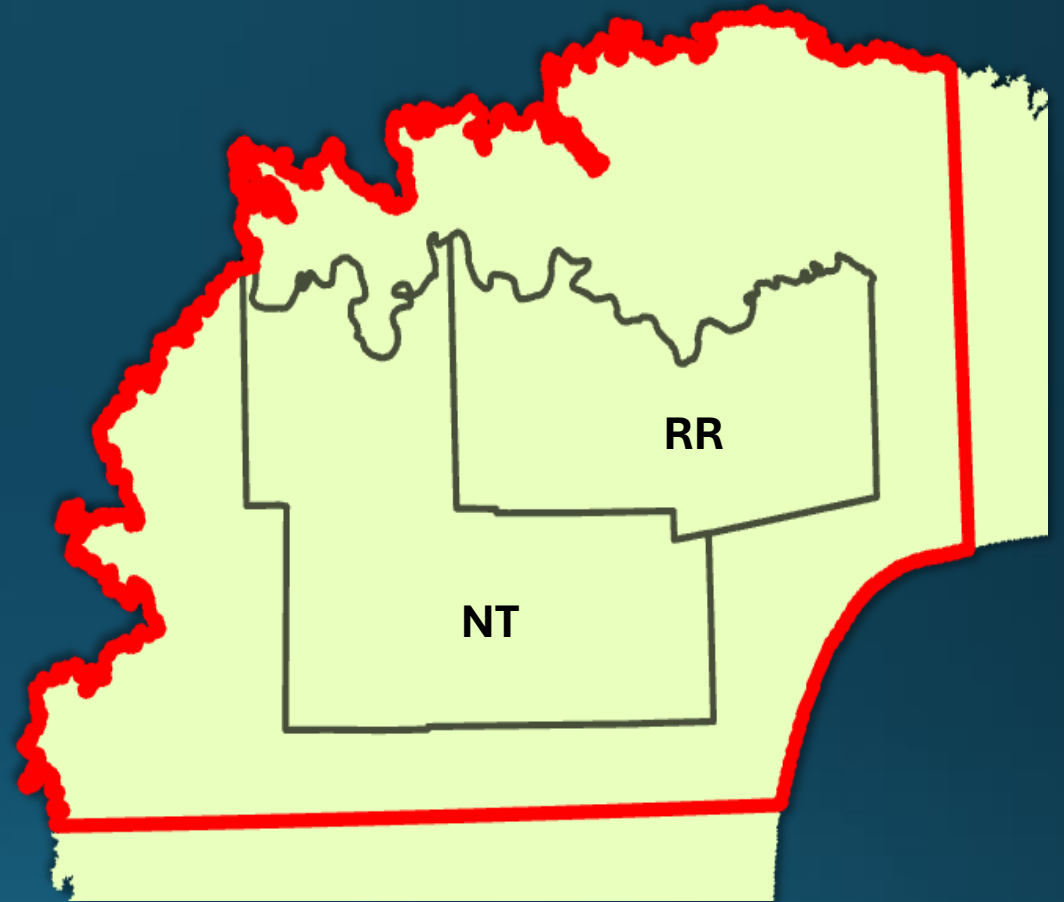
Submodel Development
Parallel MODFLOW

- "Parent" model split into "child" models

- Improved model run time

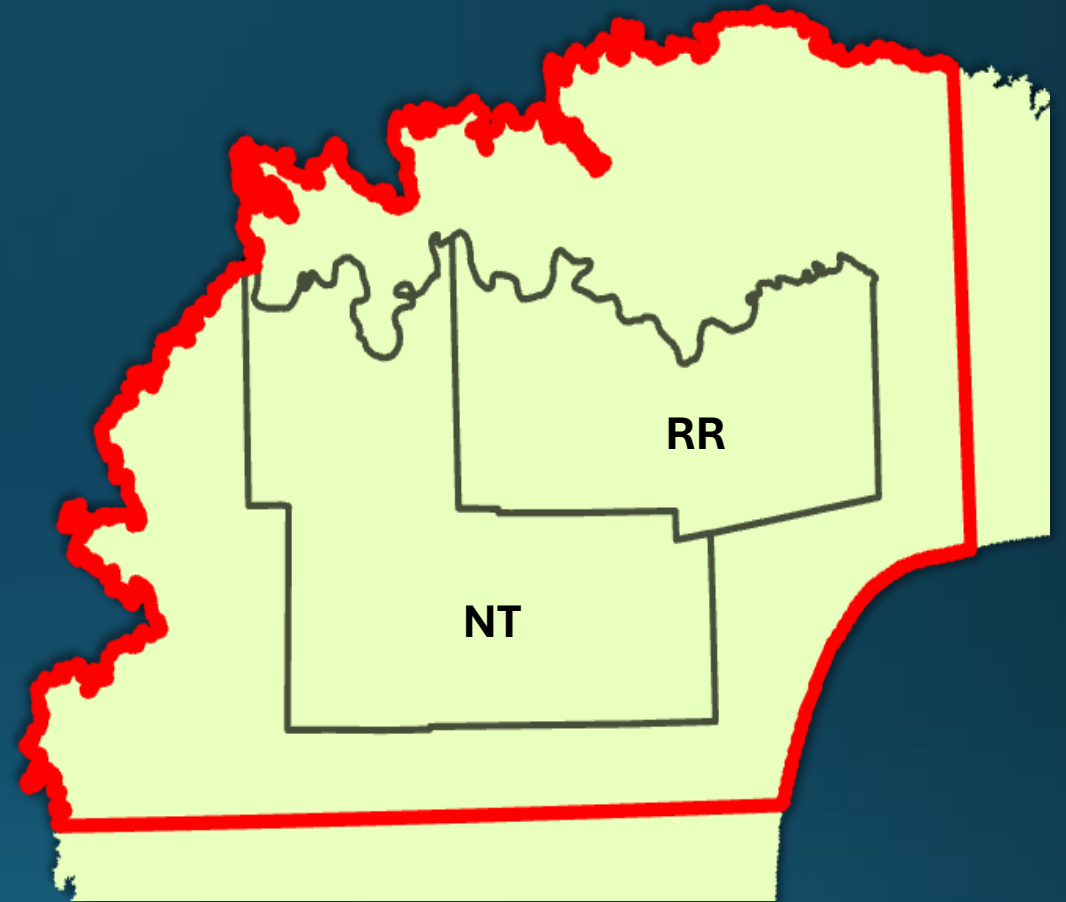- Automated partitioning into smaller model domains

Next Steps

Review and Update Boundary Conditions

- Recharge
  - Review estimates from Soil-Water-Balance model used in NTGAM
  - Estimates in UTGCD had to be reduced for predictive runs in order to get any drawdown in 2080
- Streams and Evapotranspiration
  - NTGAM assumes large volume of recharge goes to "streams" and "evapotranspiration" (and exit model)
- Refine historic pumping as needed

RR

NT

Next Steps

- Update initial model properties
    - Transmissivity
    - River and Stream conductance

- Extract sub-model using parallel workflow

- Grid refinement
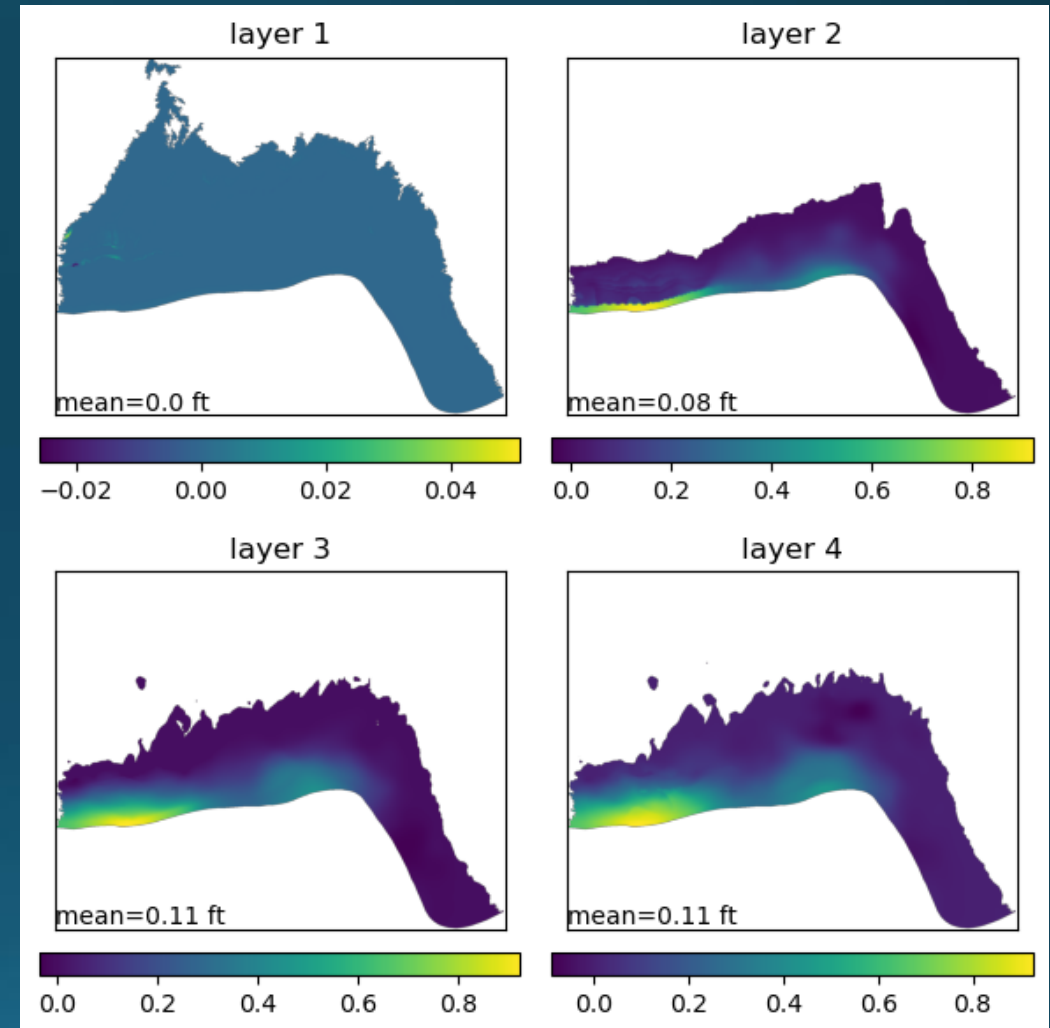
- Re-calibration using PEST suite

Support slides

Submodel Development
Parallel MODFLOW

- "Parent" model split into "child" models

- Improved model run time

- Automated partitioning into smaller model domains

- QA child model reproduces parent model results

  - Head residuals less than 1 ft at end of simulation

Head residual between original and parallel NTGAM

Submodel Development
Parallel MODFLOW

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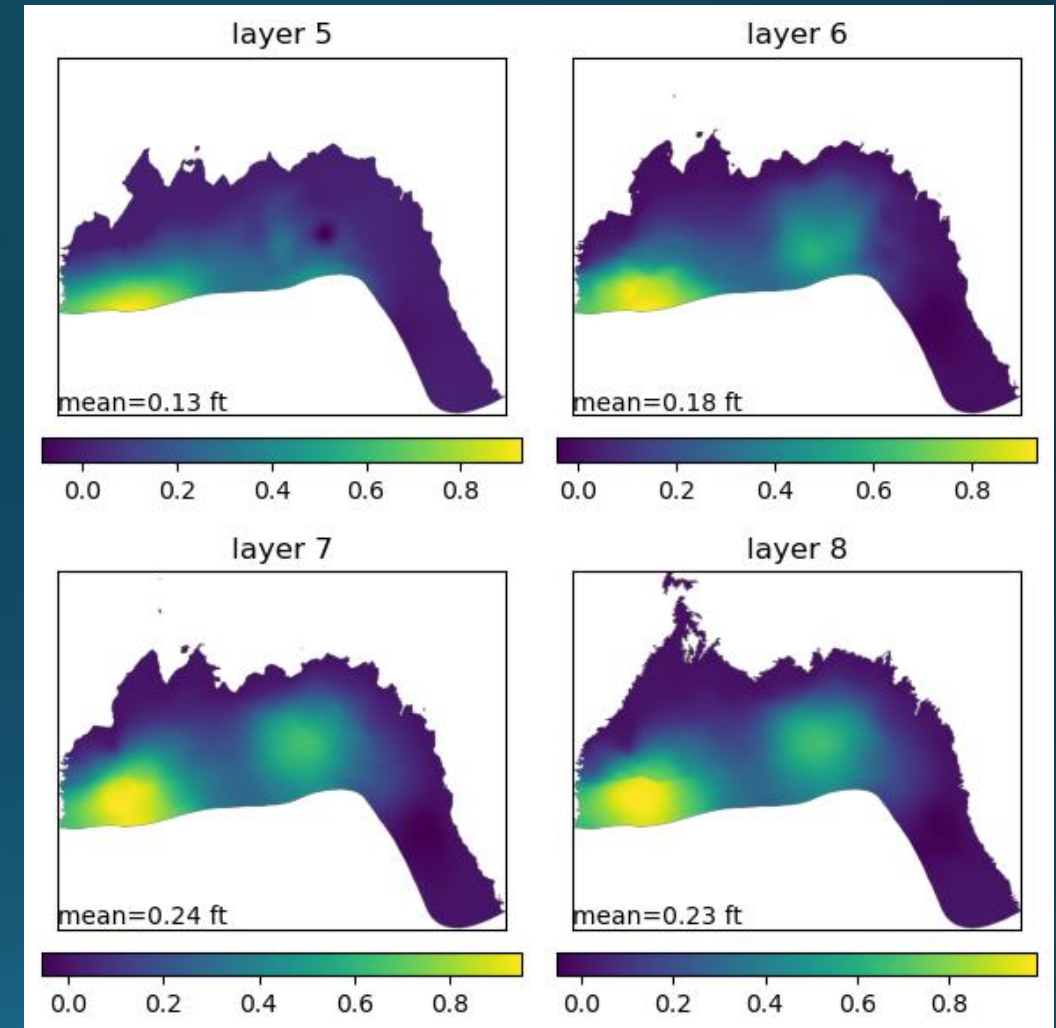 - Head residuals less than 1 ft at end of simulation

Head residual between original and parallel NTGAM