

Numerical Model of Groundwater Flow in the Central and Southern portions of the Gulf Coast Aquifer System

Stakeholder Advisory Forum

Thank you for signing in early.

The meeting will begin at 10:00 am, Central Daylight Time

Please stay muted during the meeting and use the chat box to submit questions



Meeting Information

- An audio and video recording of the meeting, presentation, and the report summarizing the meeting will be made available on the project's TWDB website
- https://www.twdb.texas.gov/groundwater/models/gam/gma15_16/gma15_16.asp

Agenda

GAM Program Introduction

Numerical Model for the Central and Southern portions of the Gulf Coast Aquifer System

Question and Answer

GAM Program Overview

Aim: Develop groundwater flow models for the major and minor aquifers of Texas.

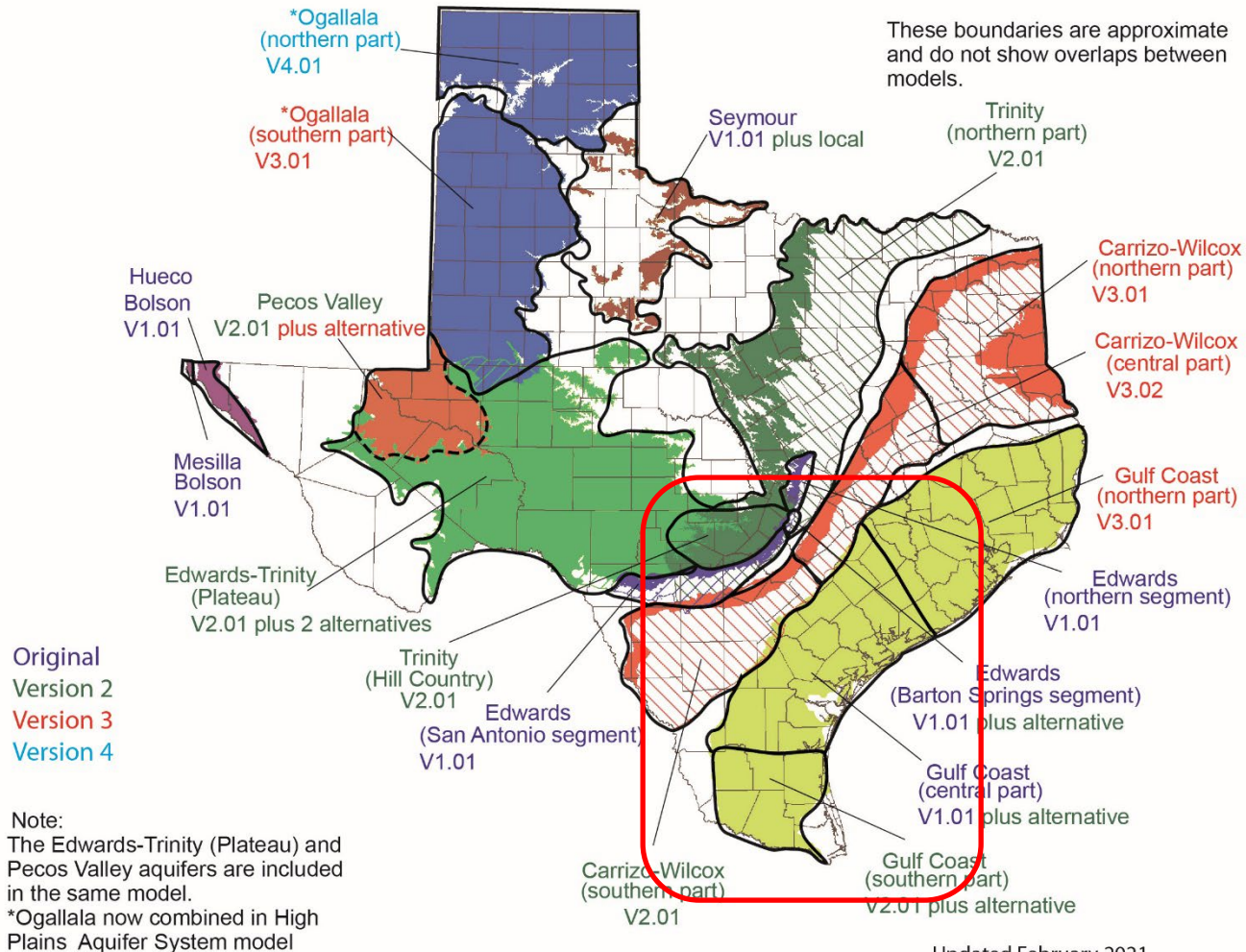
Purpose: Tools that can be used to aid in groundwater resources management by stakeholders.

Public process: Stakeholder involvement during model development process.

Models: Freely available, standardized, thoroughly documented. Reports, data, models are available for download from TWDB download page for models.

Living tools: Periodically updated.

GAMs for Major Aquifers



Why Stakeholder Advisory Forums?

- Keep stakeholders updated about progress of the model
- Inform how the groundwater model can, should, and should not be used
- Provide stakeholders with the opportunity to provide input and data to assist with model development

Contact Information

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Web information:
https://www.twdb.texas.gov/groundwater/models/gam/gma15_16/gma15_16.asp

Update for Stakeholders: Groundwater Availability Model of Central and Southern Portions of Gulf Coast Aquifer System in Texas

Jerry Shi, Ph.D., P.G.
Groundwater Modeling
Texas Water Development Board

May 23, 2022

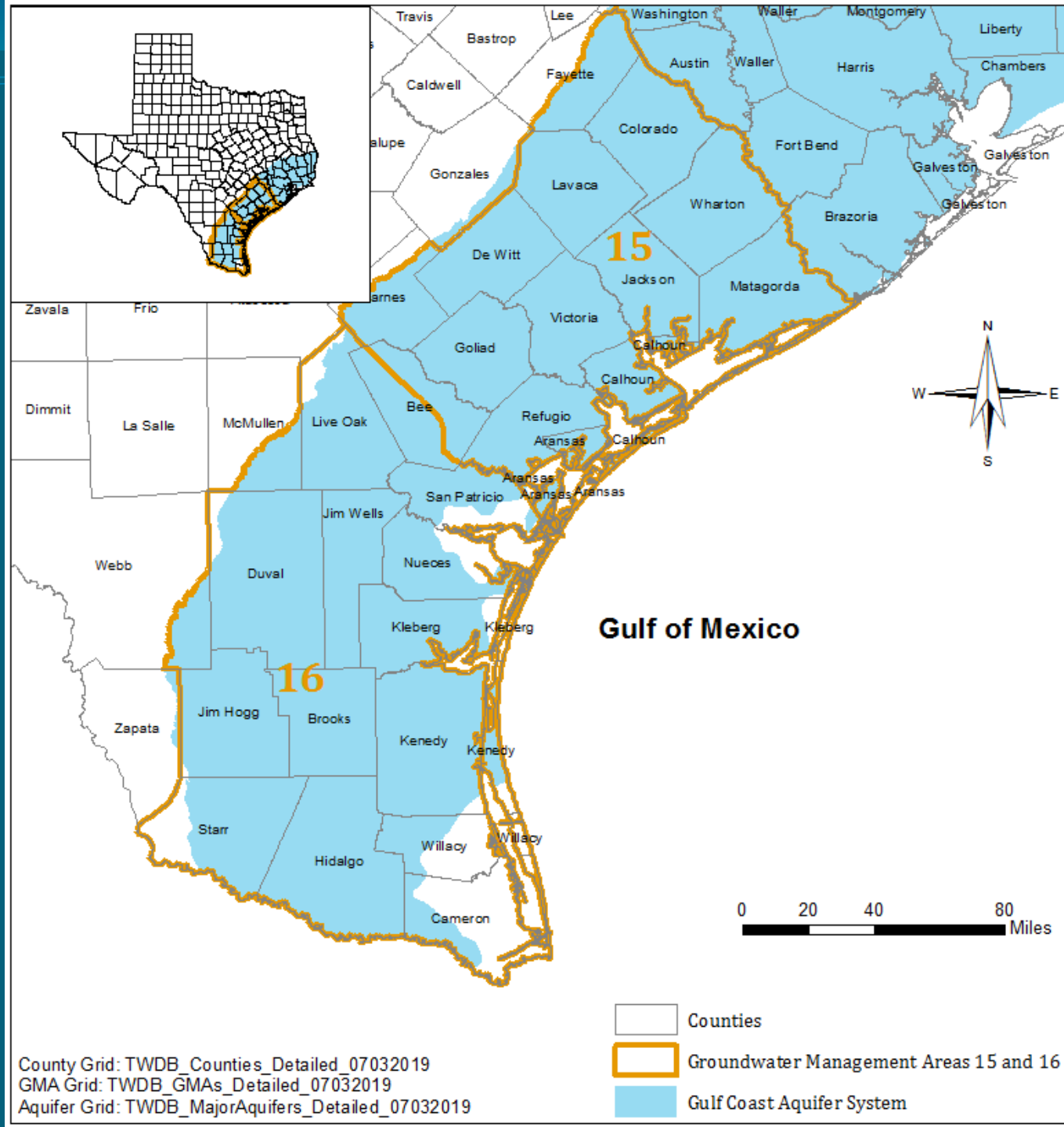
Outline

- Project Team
- Study Area
- Improvements Made by This New Model
- Highlights of Numerical Model
- Acknowledgments
- Schedule
- Inputs and Comments from Stakeholders

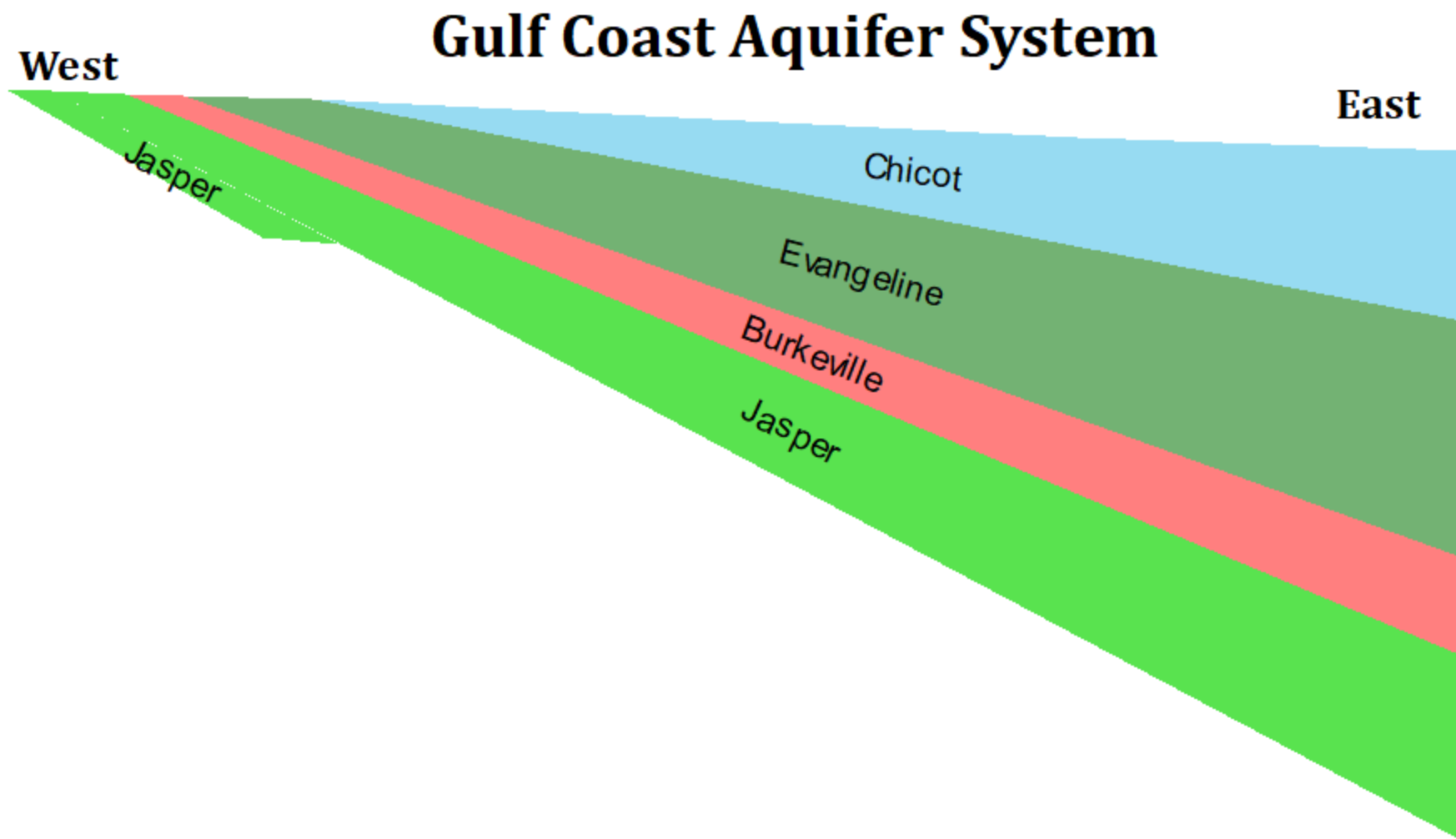
Project Team

- Jerry Shi, Ph.D., P.G.
 - Project Management
 - Modeling
- Radu Boghici, P.G.
 - Pumping

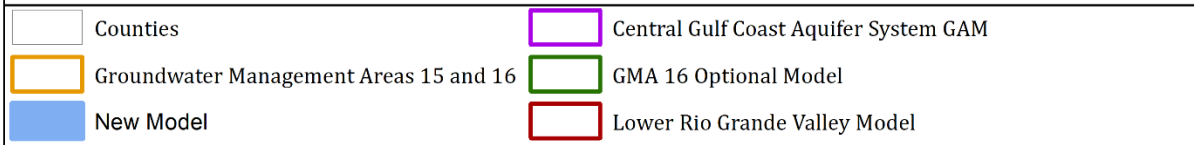
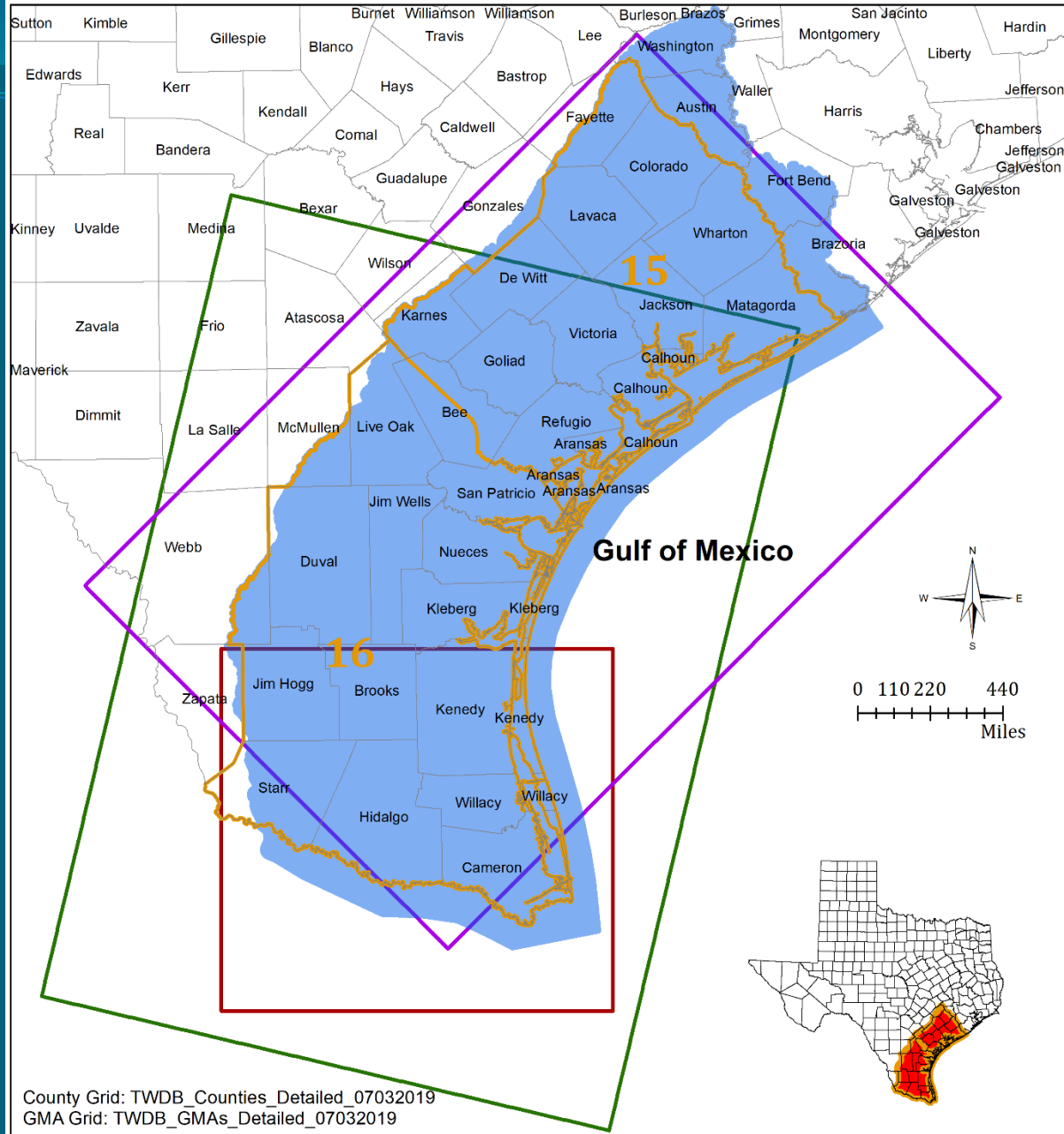
Central (GMA 15) and Southern (GMA 16) Portions of Gulf Coast Aquifer System in Texas



Gulf Coast Aquifer System in Study Area



Comparison between This New Model and Existing Groundwater Availability Models



Improvements from Existing Groundwater Availability Models

- Eliminating the inconsistency at the overlap area between the existing models.
- Incorporating significant amount of additional information.
- Refining model grid along rivers and streams.
- Applying new modeling techniques.
- Calibrating model to water levels and stream baseflow.

Highlights

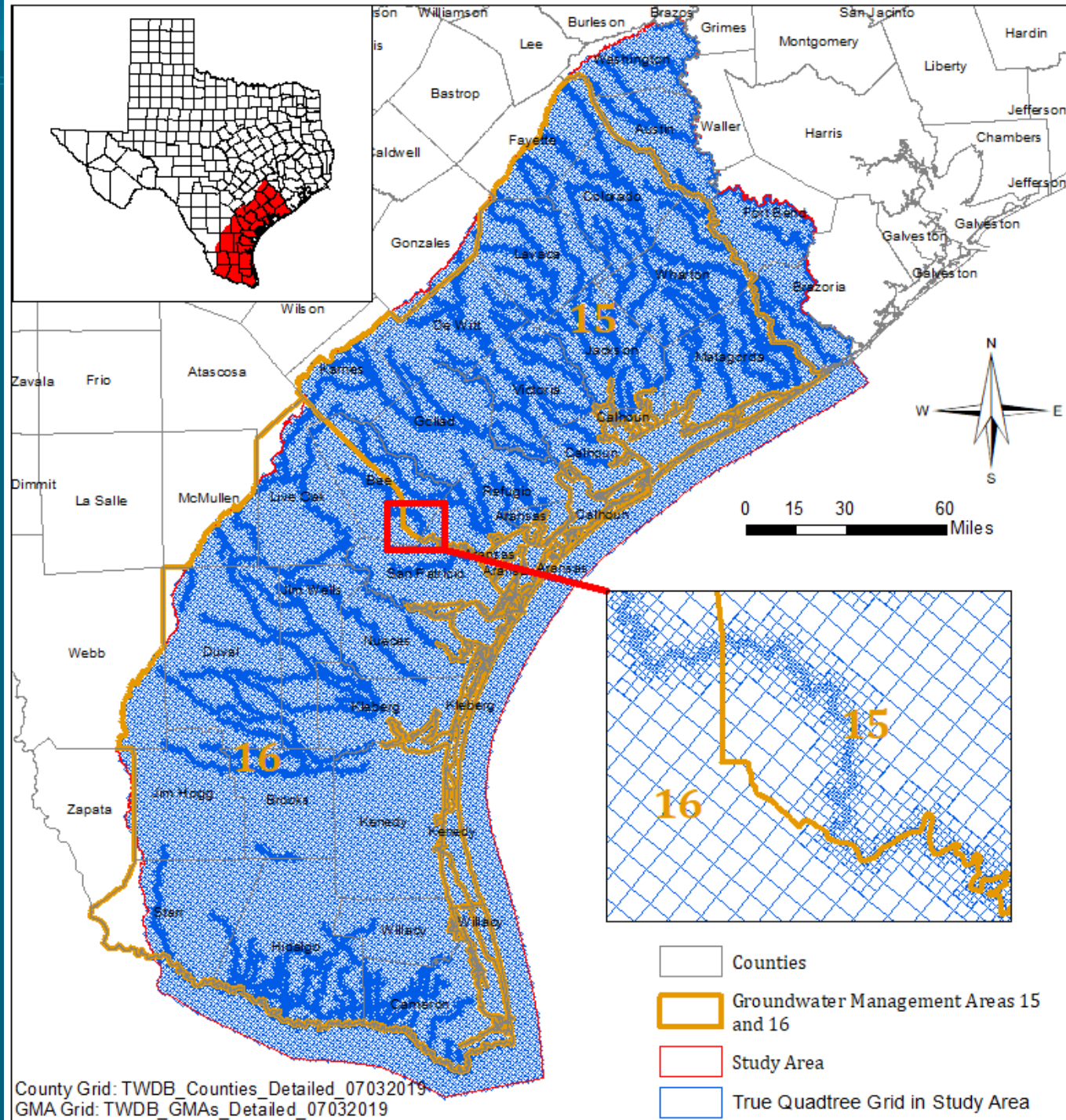


New Numerical Model

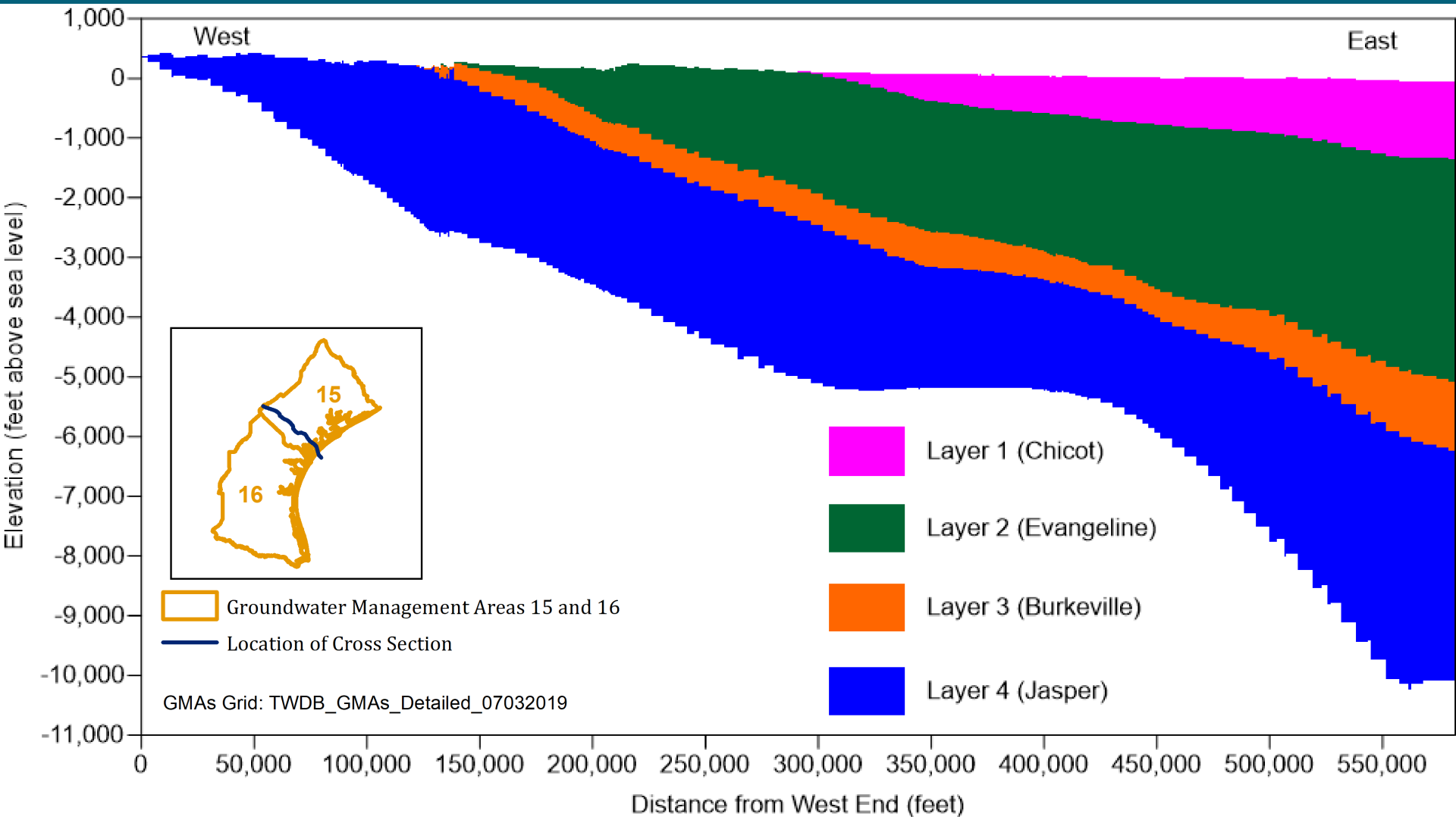
- MODFLOW-USG
- Transient (1980 - 2015)
 - 1980: steady state
 - 1981 – 2015 : Transient

Model Quadtree Grid in Study Area

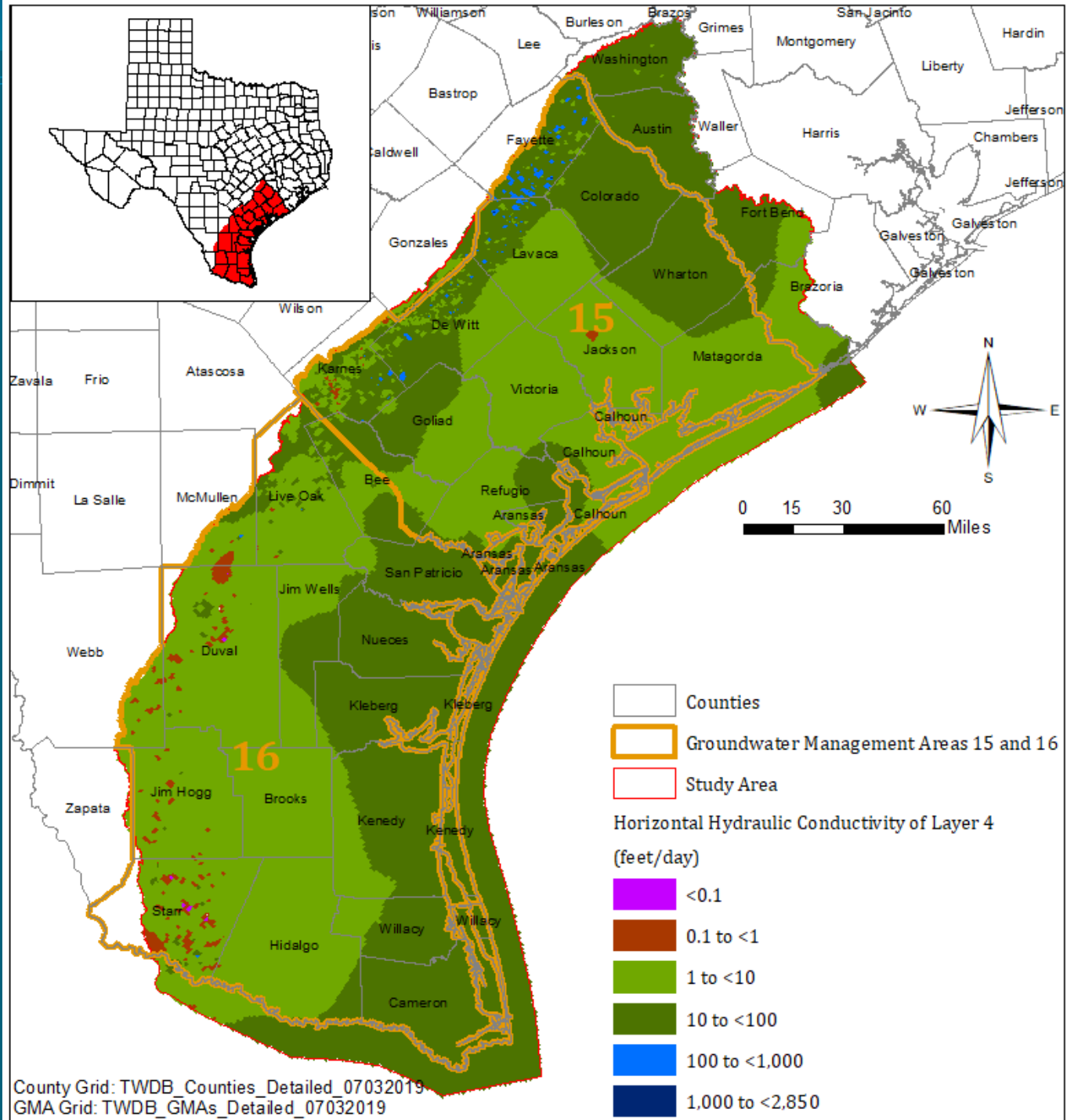
Quadtree:
5280 ft =>
2640 ft =>
1320 ft => 660
ft



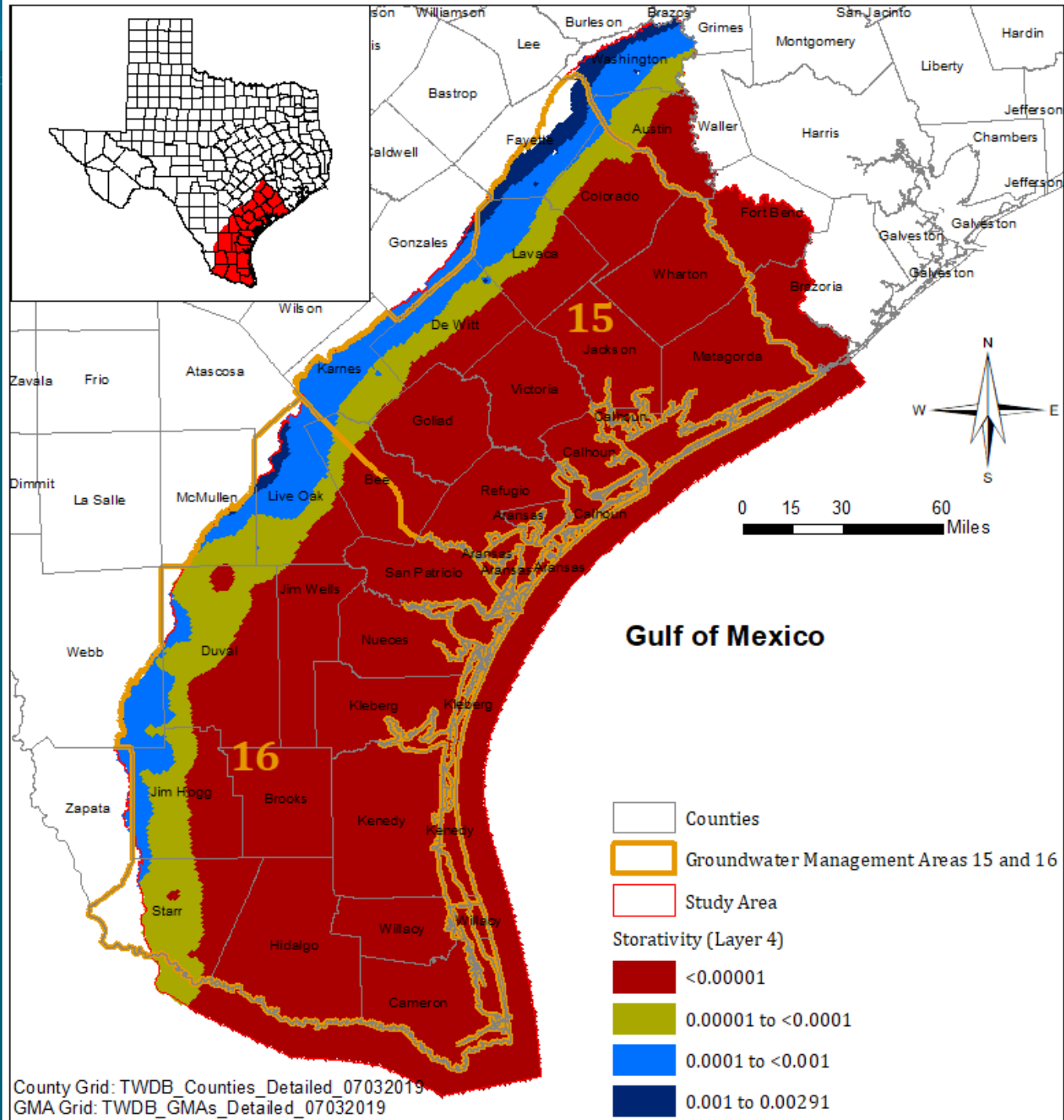
Model Grid in West-East Cross Section



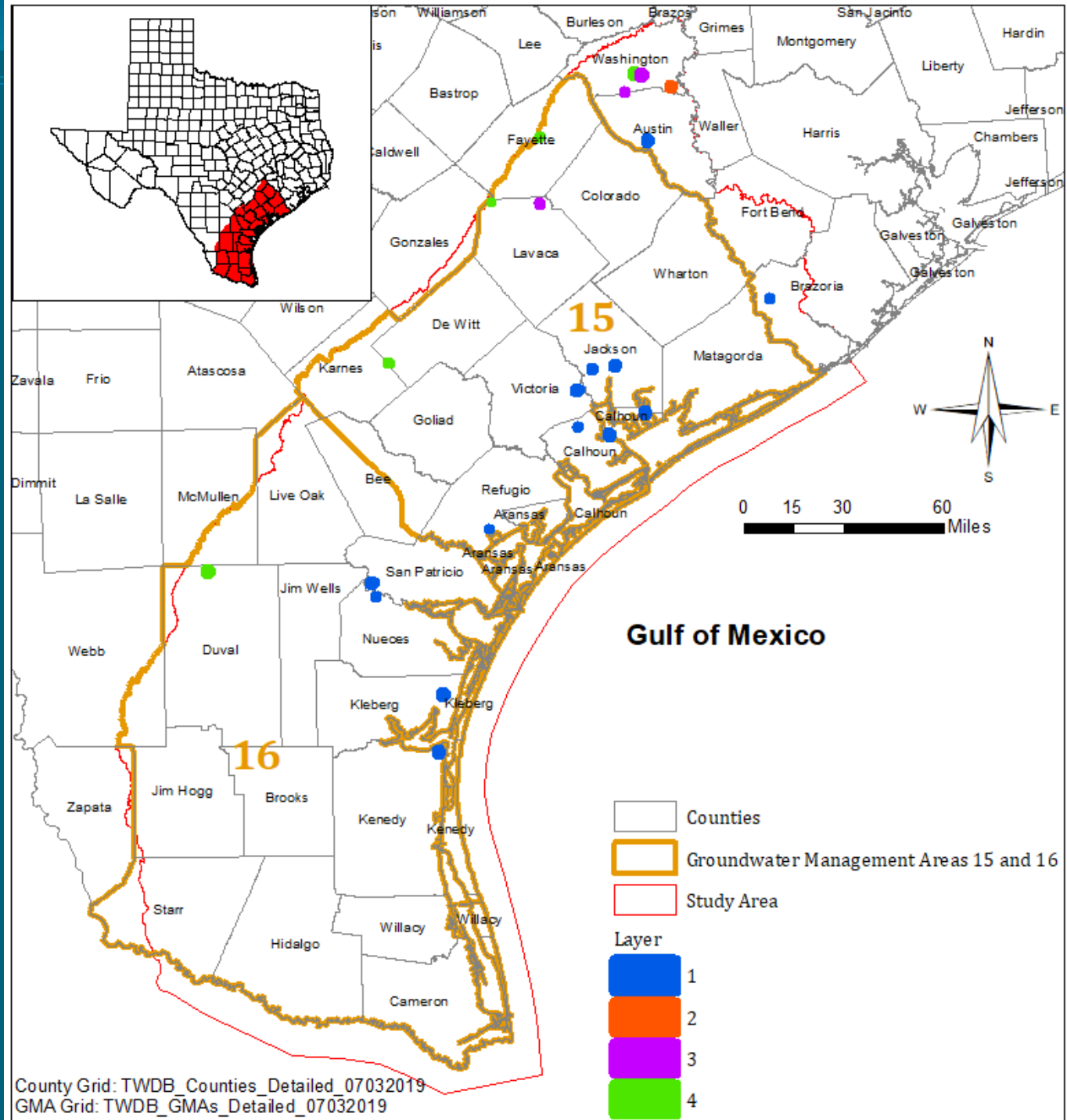
Horizontal Hydraulic Conductivity (Model Layer 4: Jasper)



Storativity (Model Layer 4: Jasper)

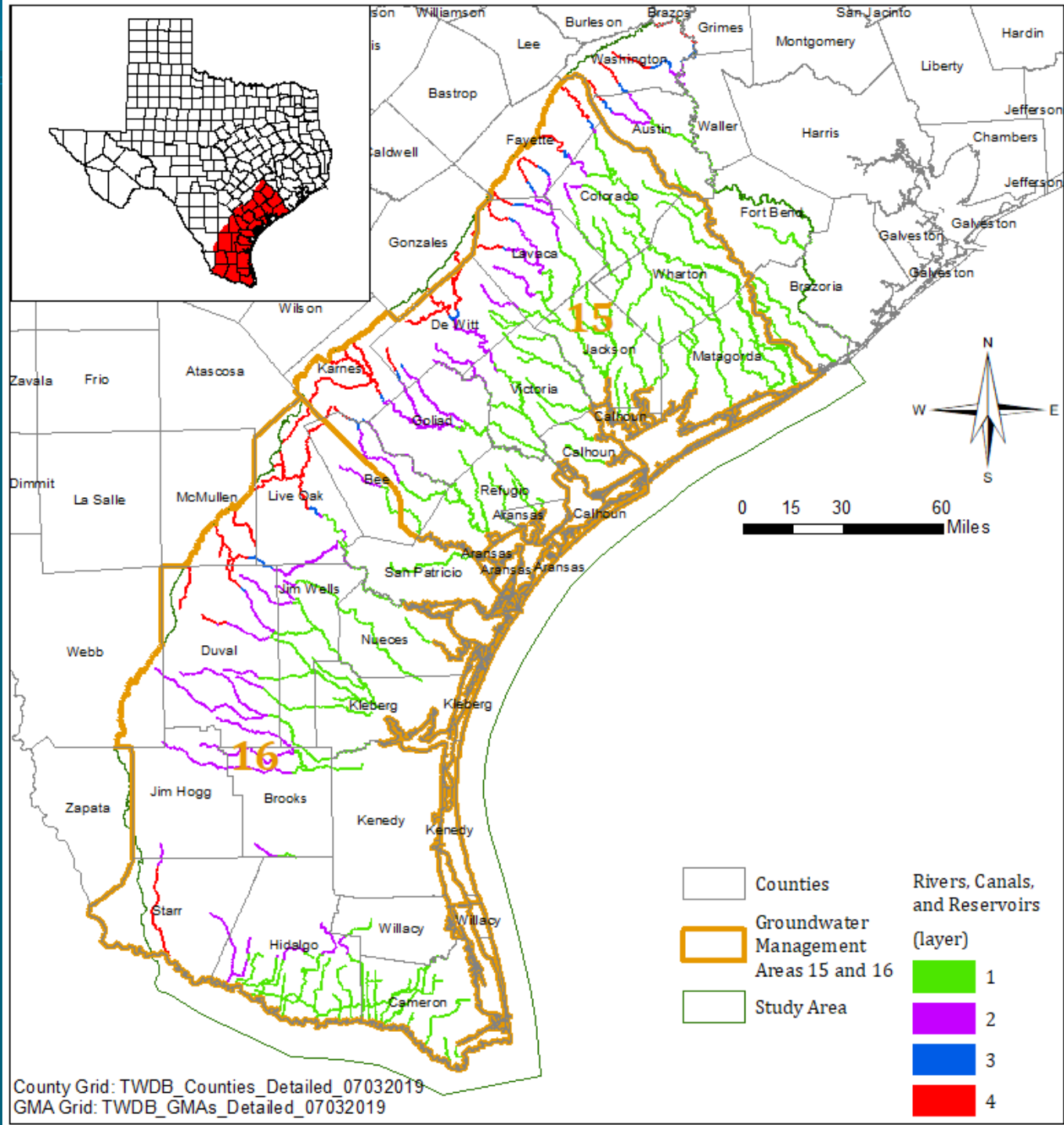


Drains to Simulate Springs

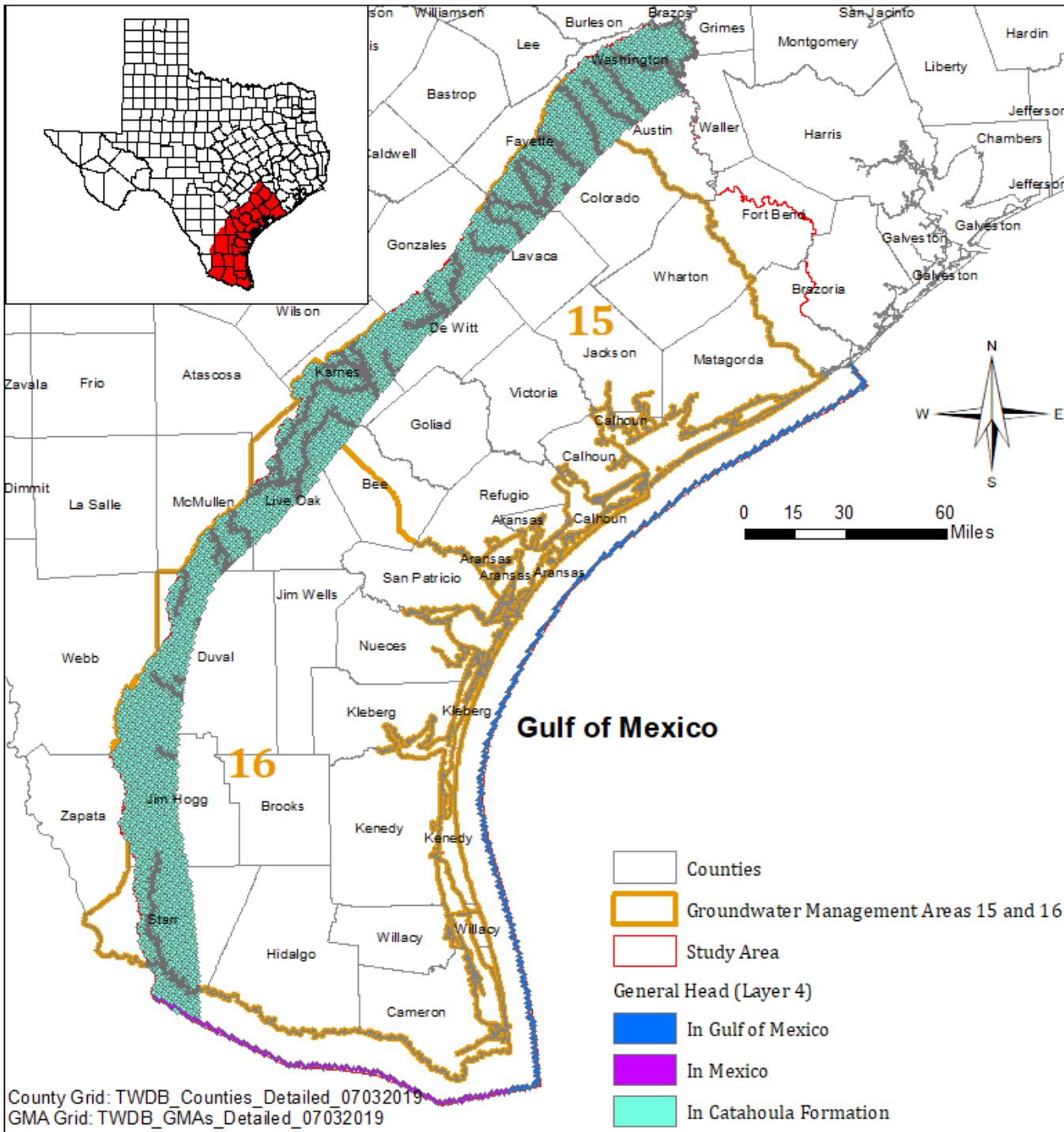


County Grid: TWDB_County_Detailed_07032019
 GMA Grid: TWDB_GMAs_Detailed_07032019

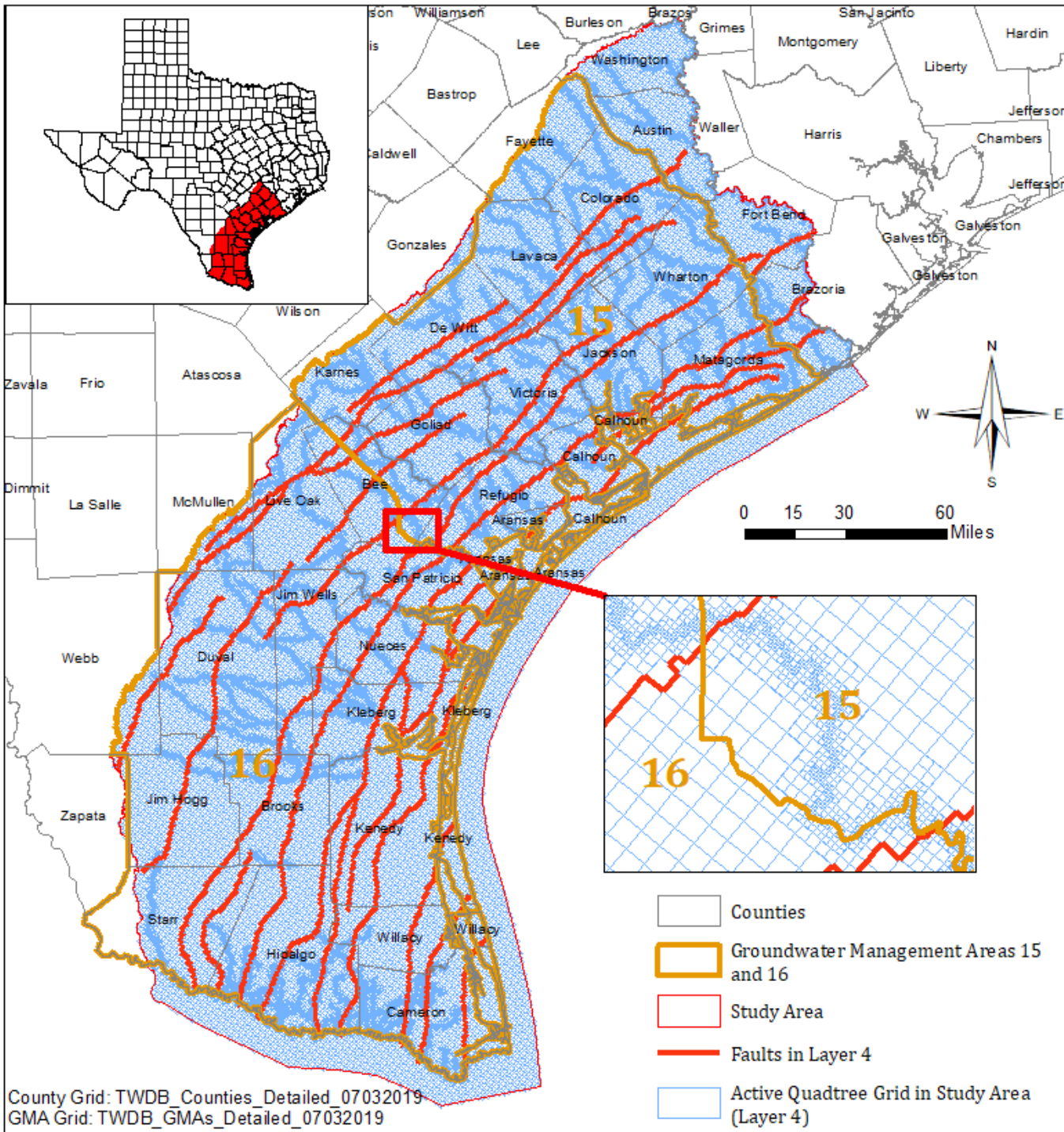
Simulated Rivers, streams, and Canals



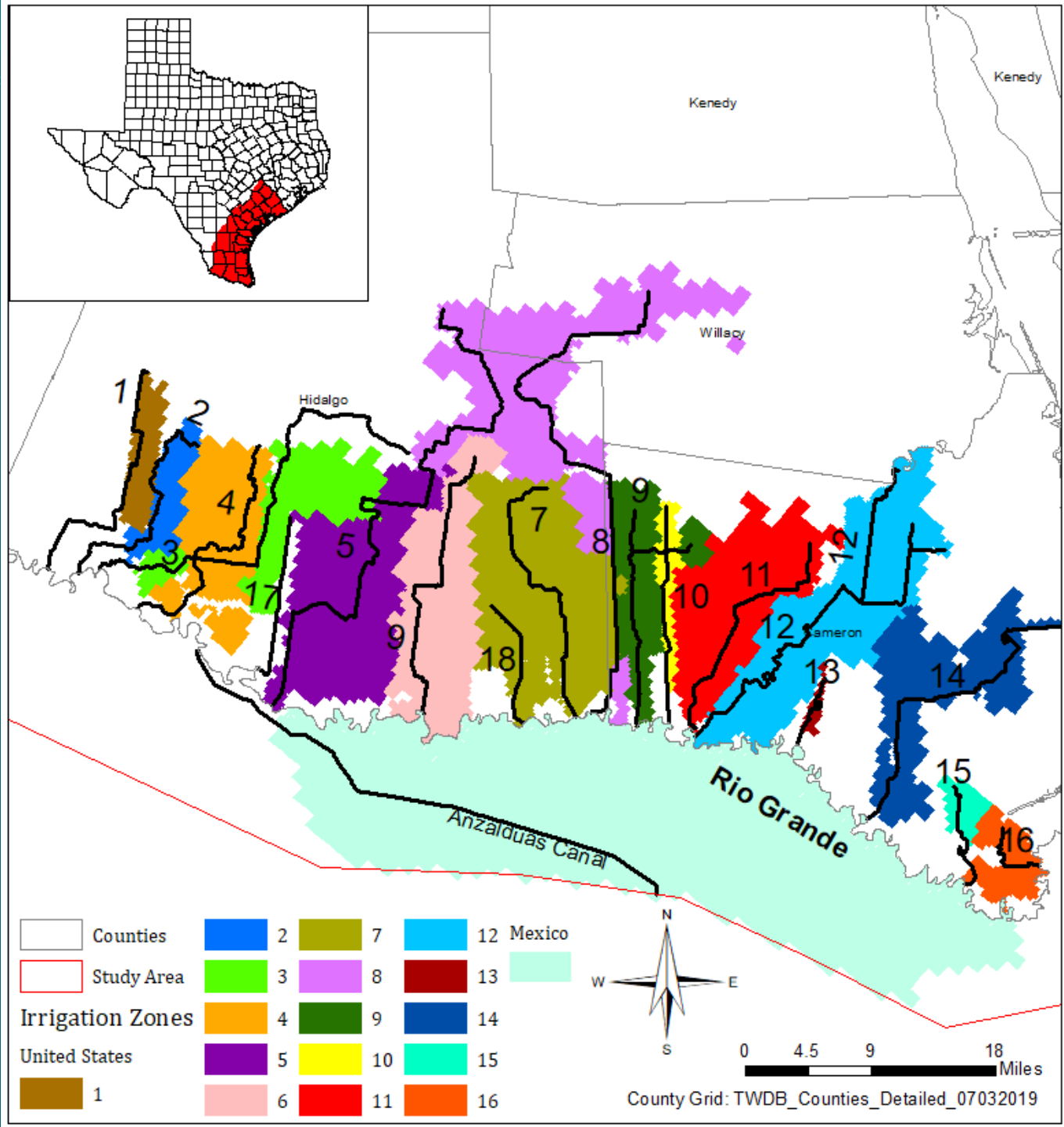
General Head in Model Layer 4 (Jasper) to Simulate Flow from Mexico, Underneath Gulf, and Yegua- Jackson



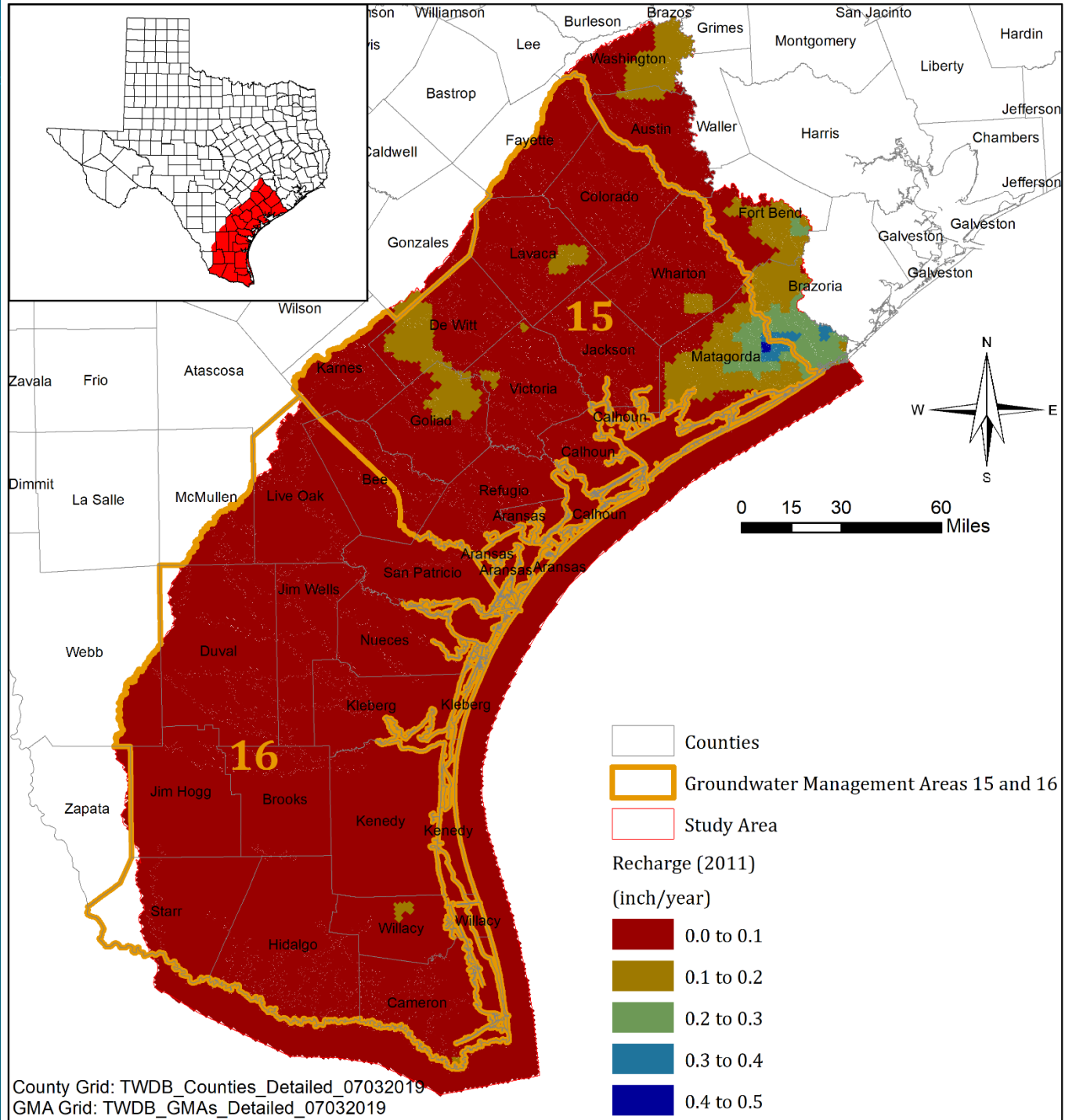
Horizontal Flow Barrier to Simulate Faults (Model Layer 4: Jasper)



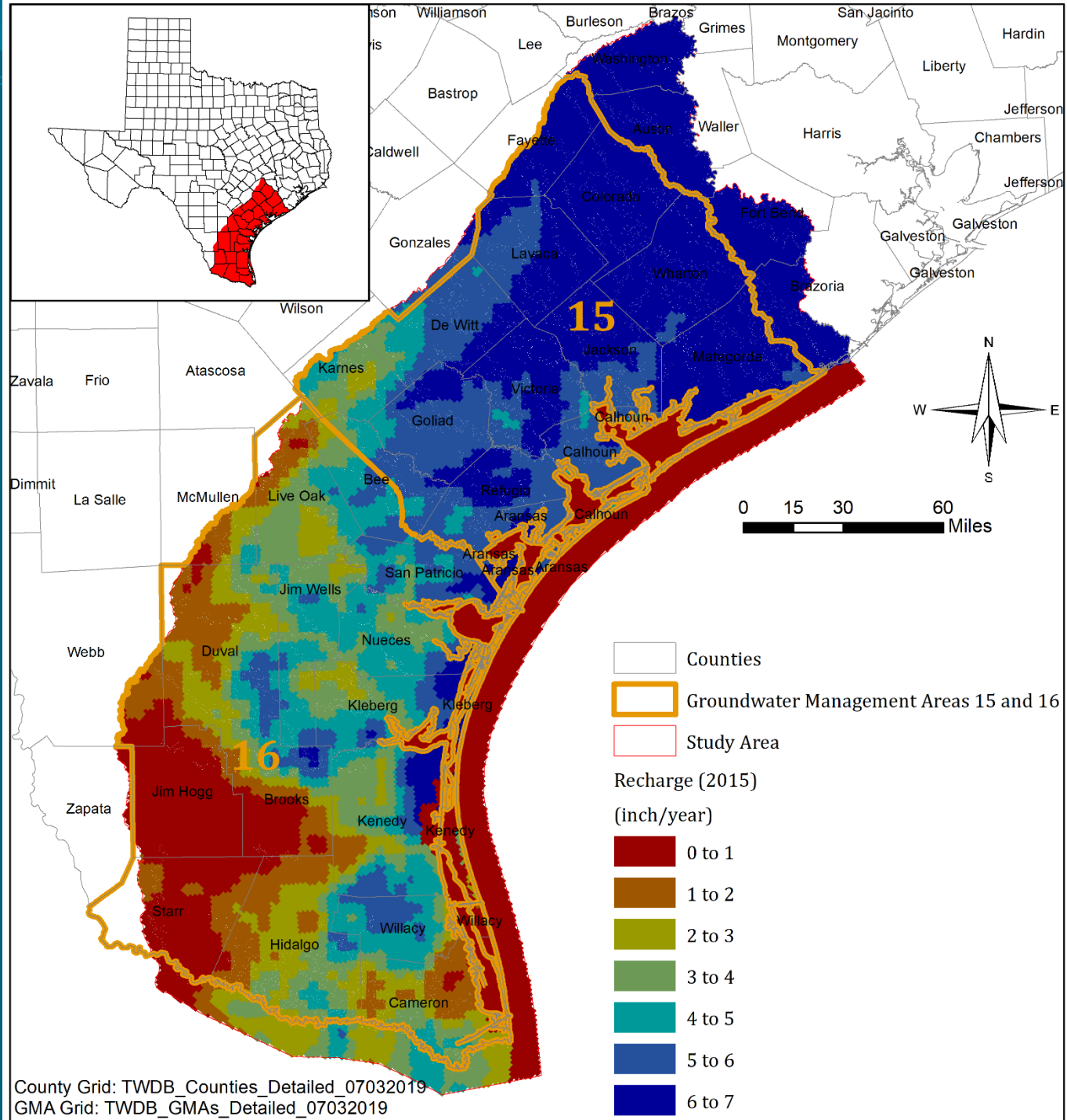
Irrigation Zones



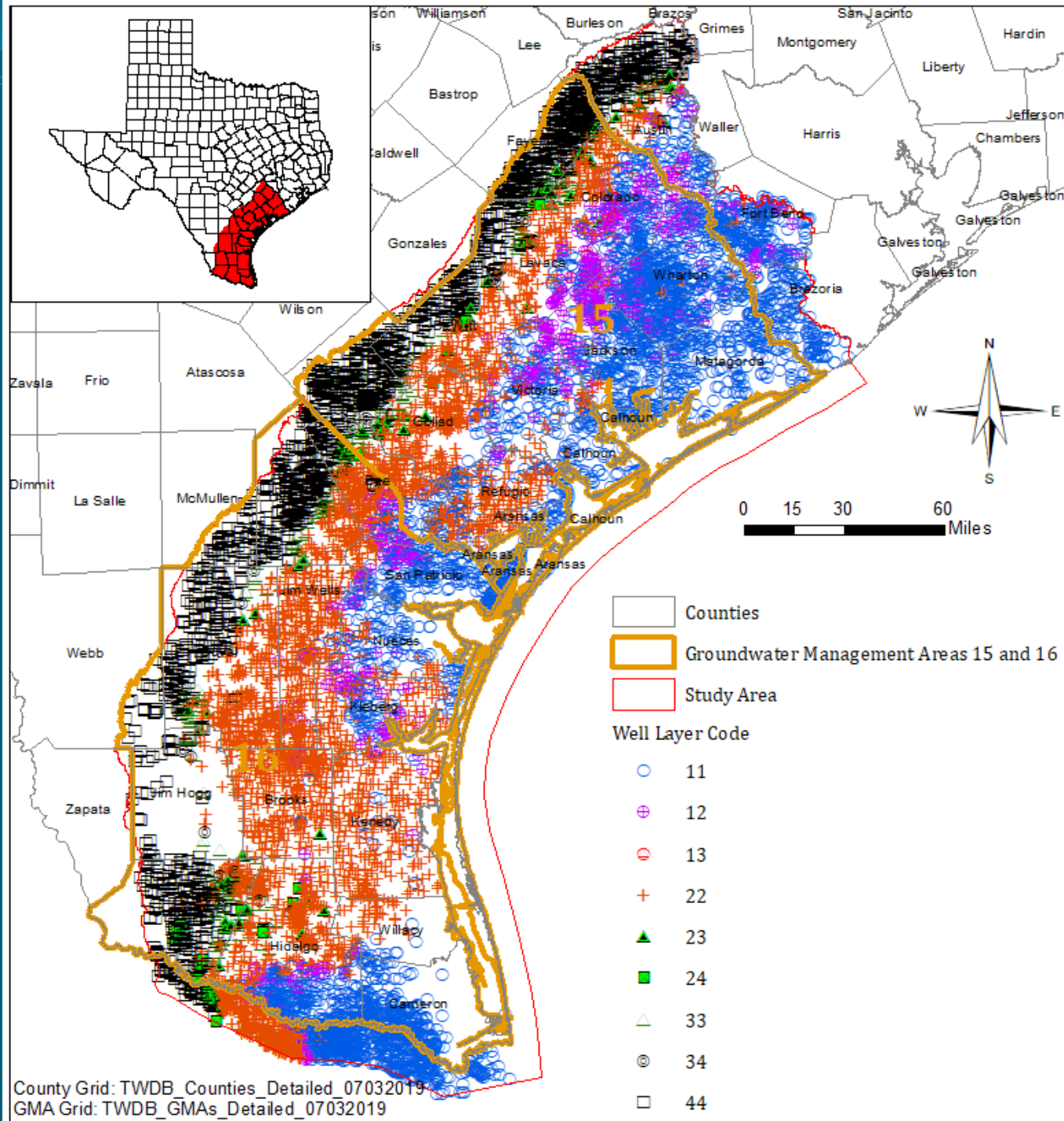
Simulated Recharge (2011): Dry Year



Simulated Recharge (2015): Wet Year



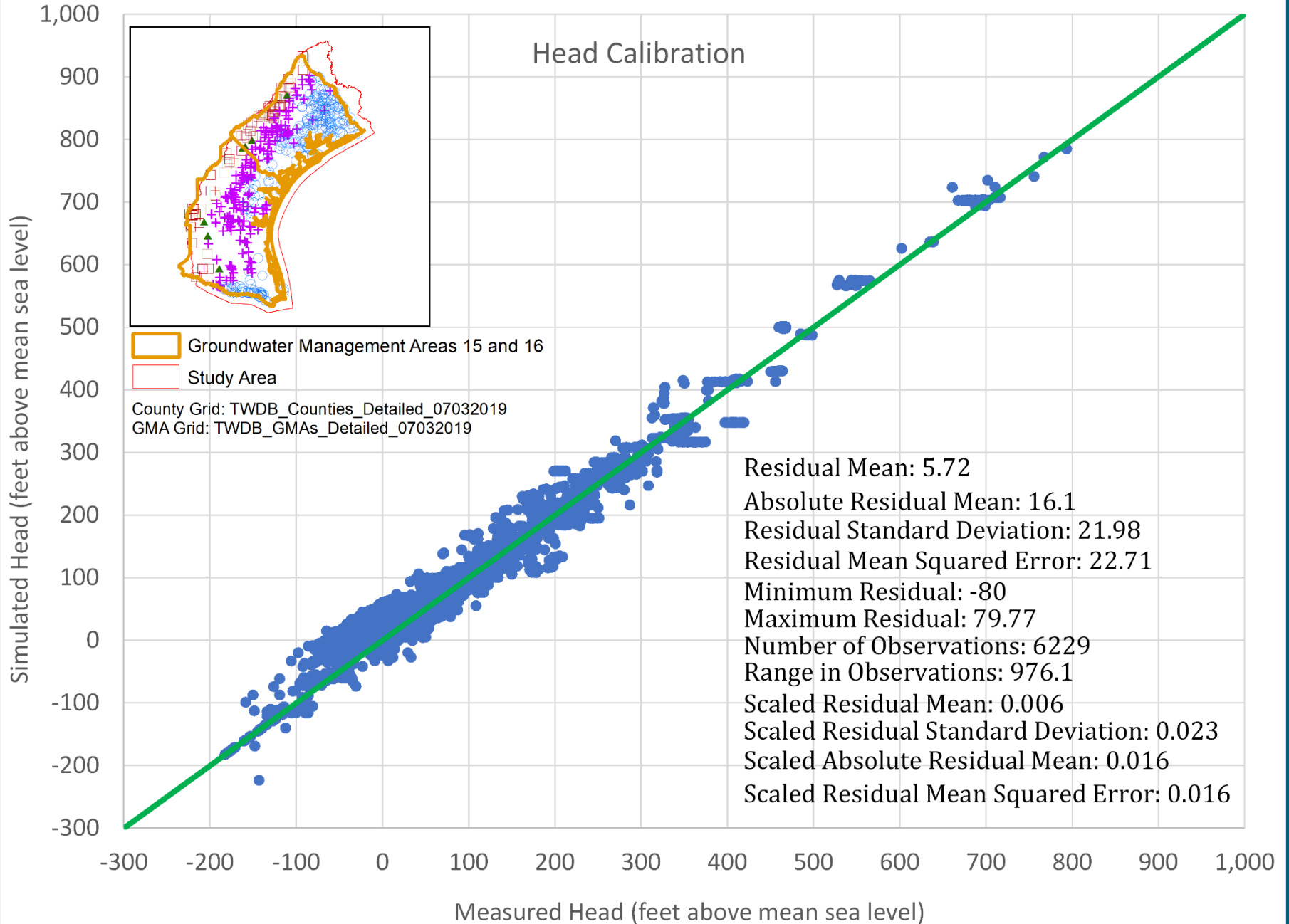
Simulated Pumping Wells



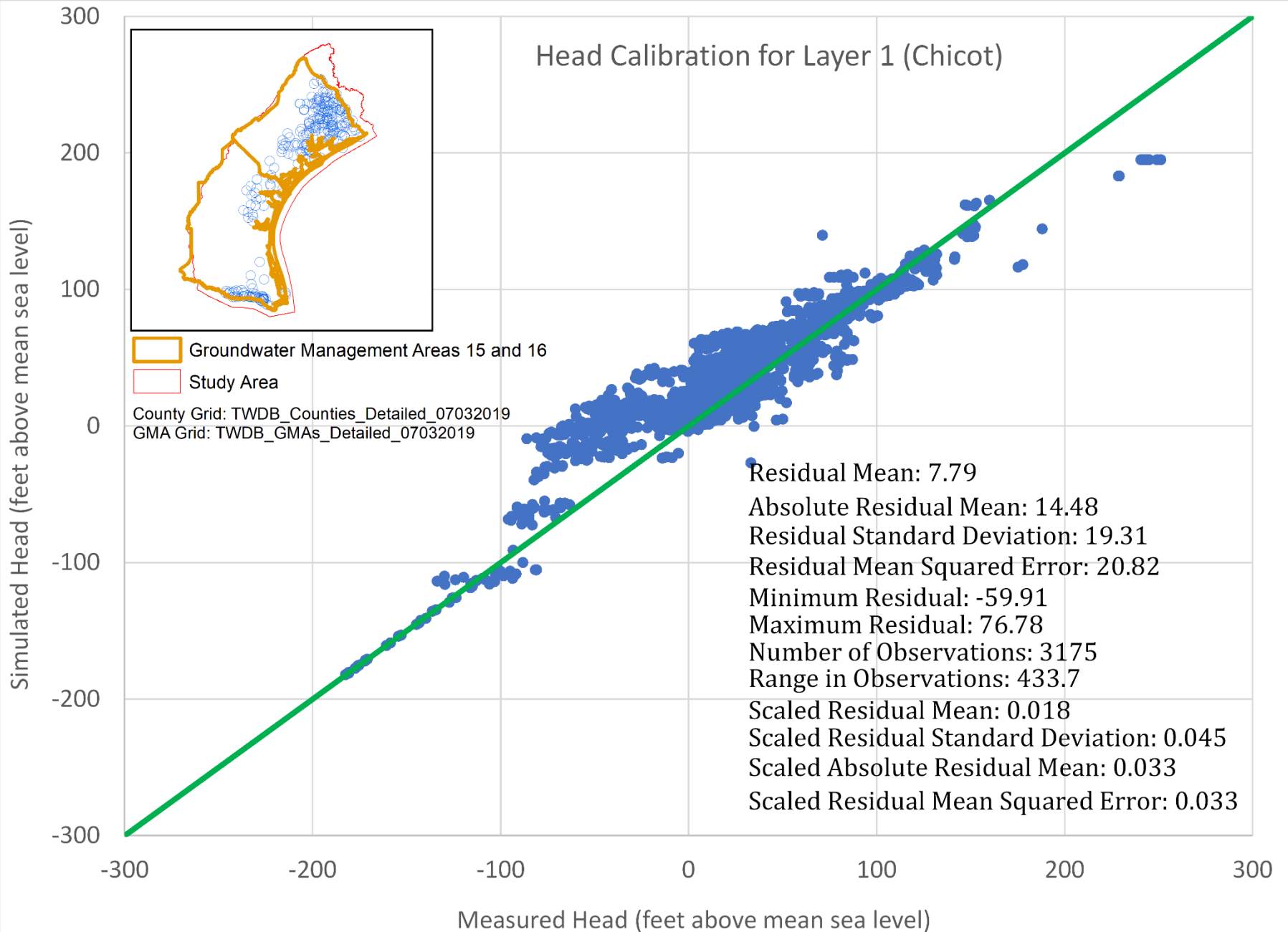
Model Calibration

Calibration to Water Level (Head)

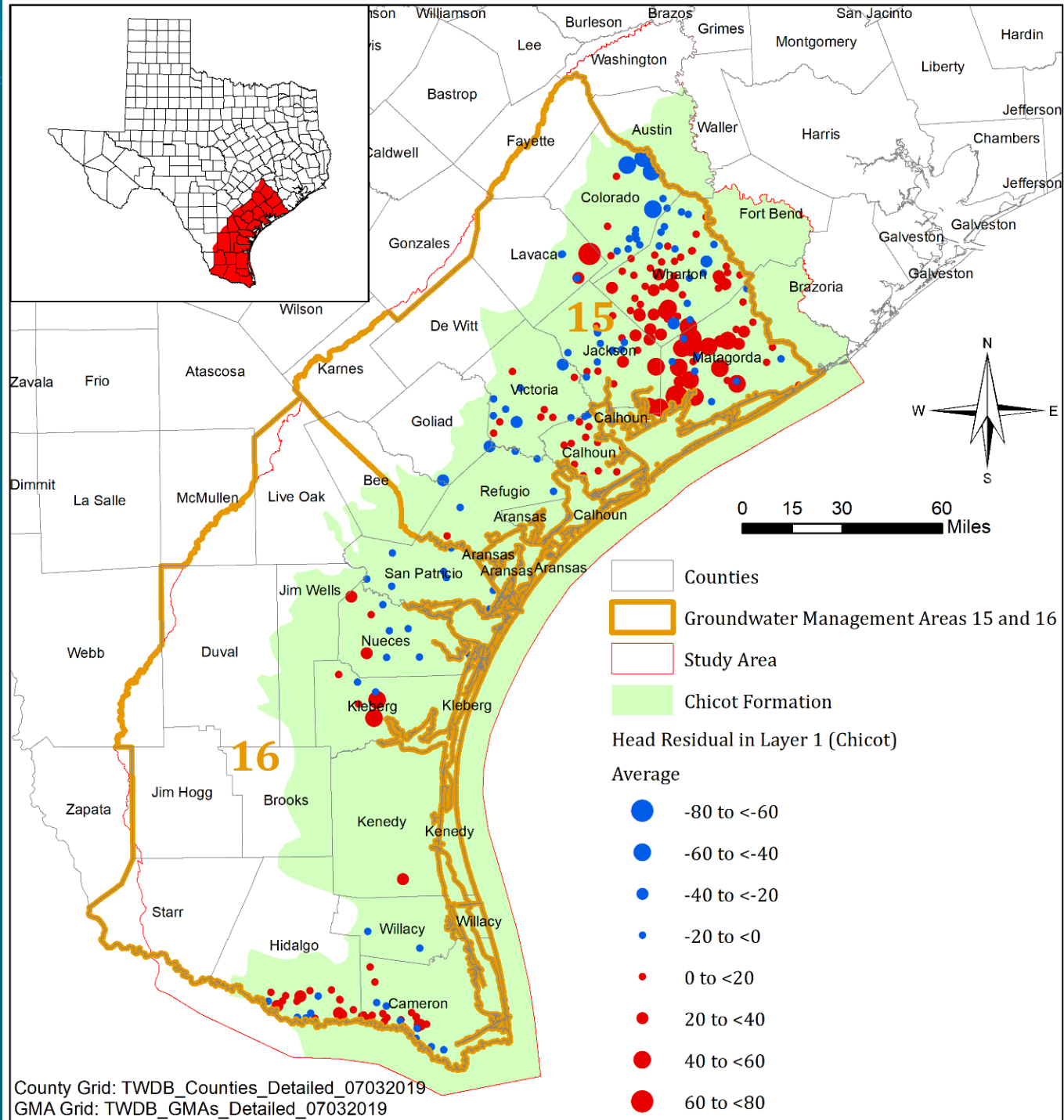
Water Level Calibration Result (all 4 layers)



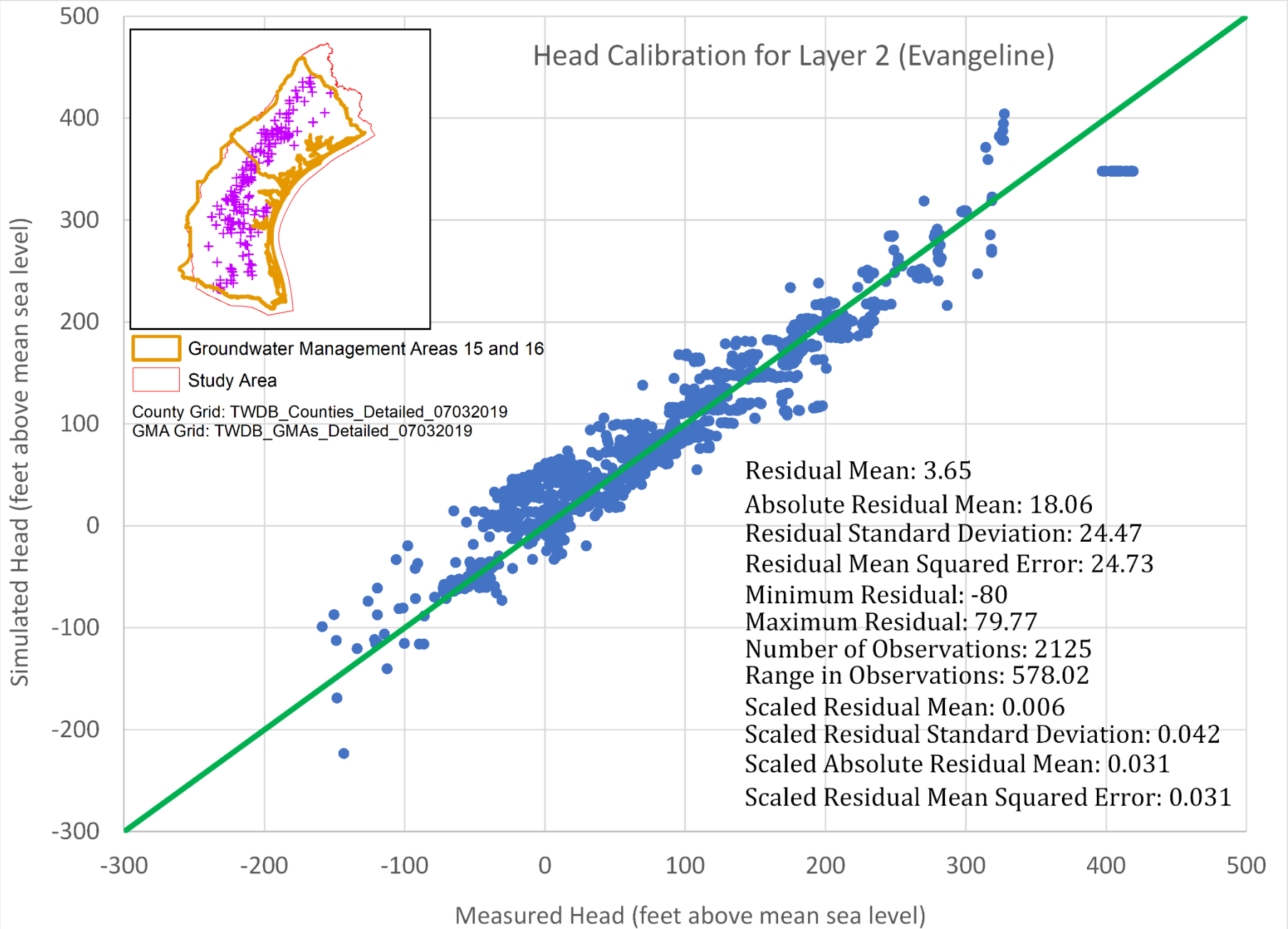
Water Level Calibration Result (Model Layer 1: Chicot)



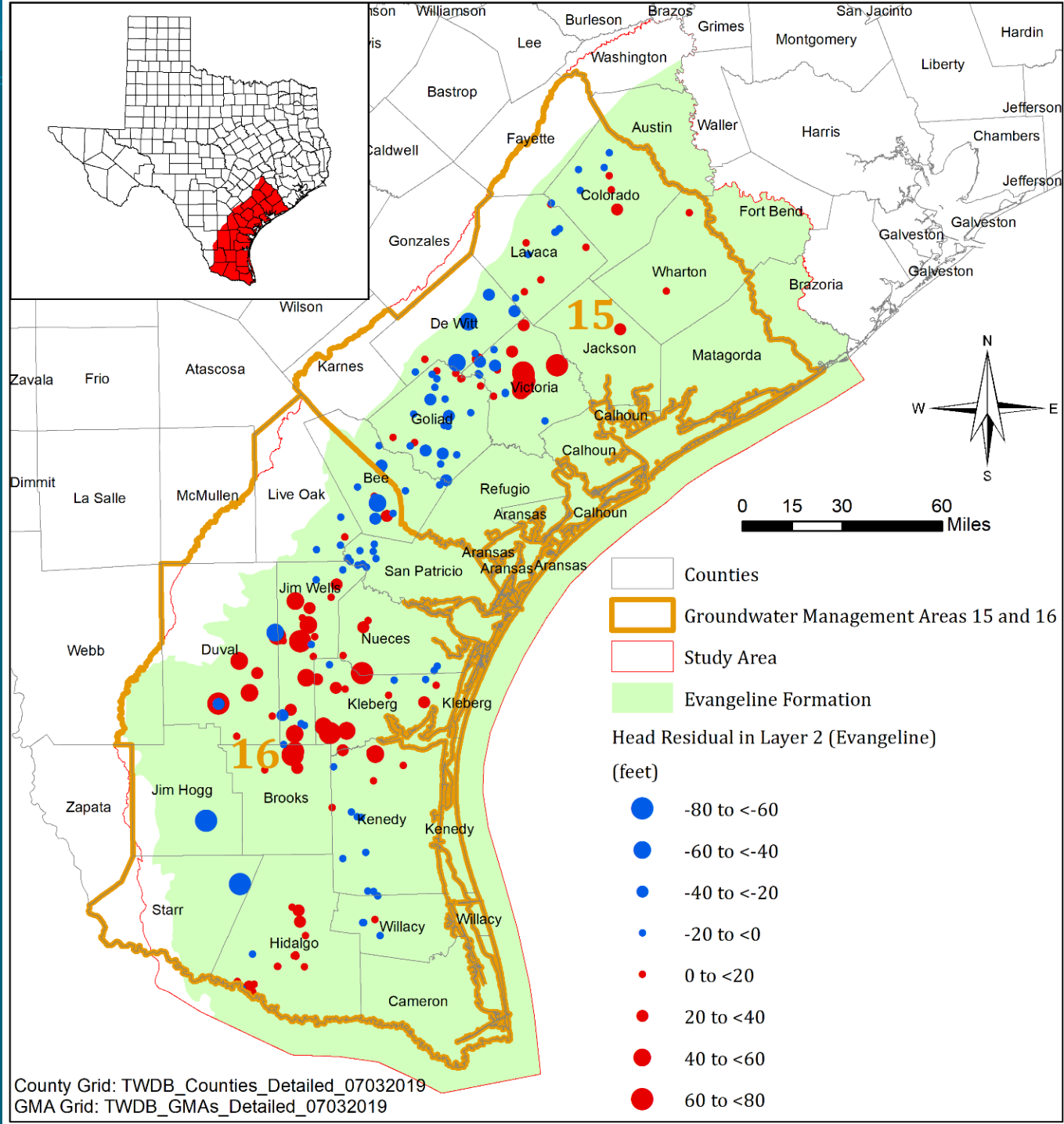
Water Level Residual (Model Layer 1: Chicot)



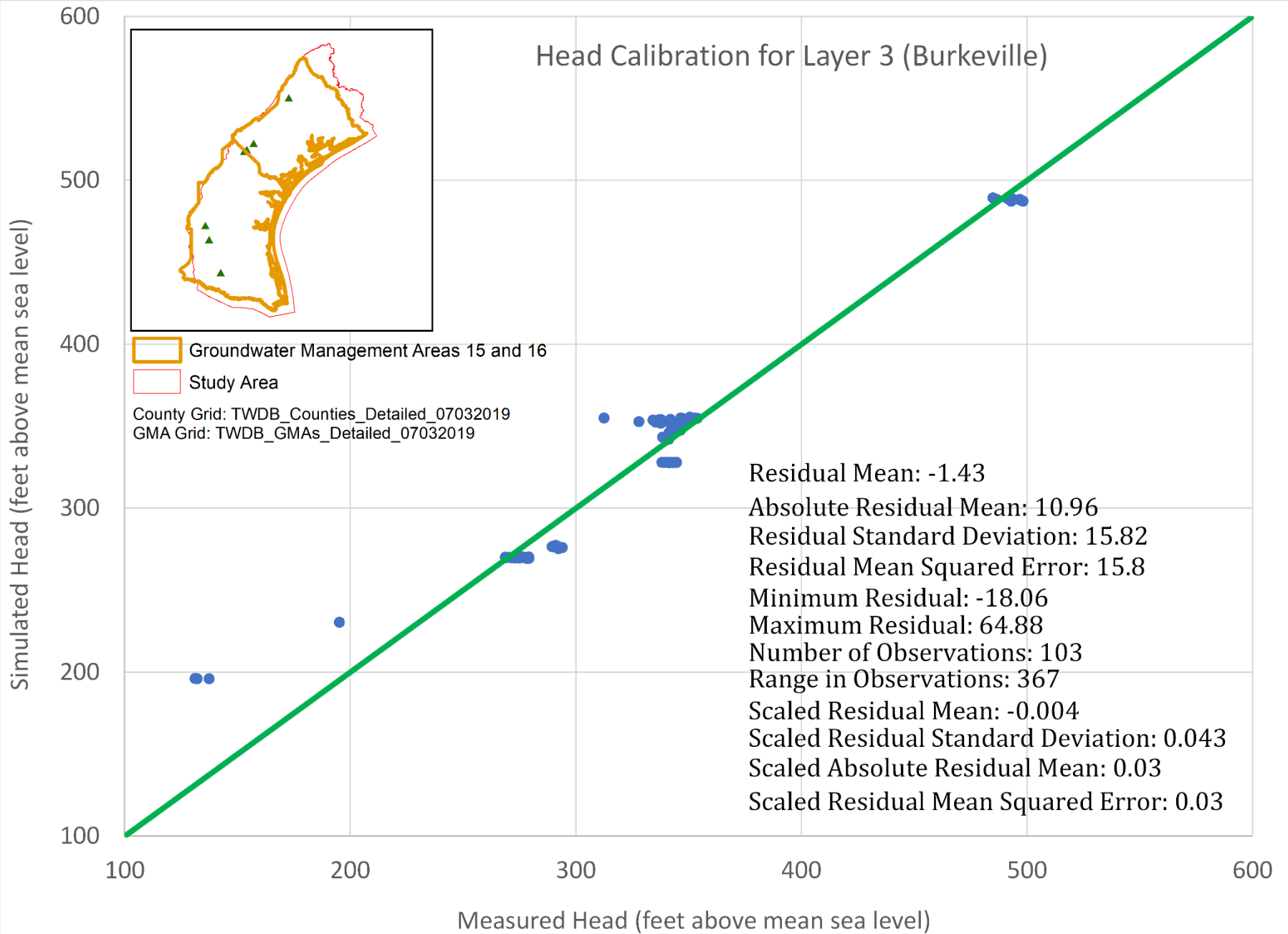
Water Level Calibration Result (Model Layer 2: Evangeline)



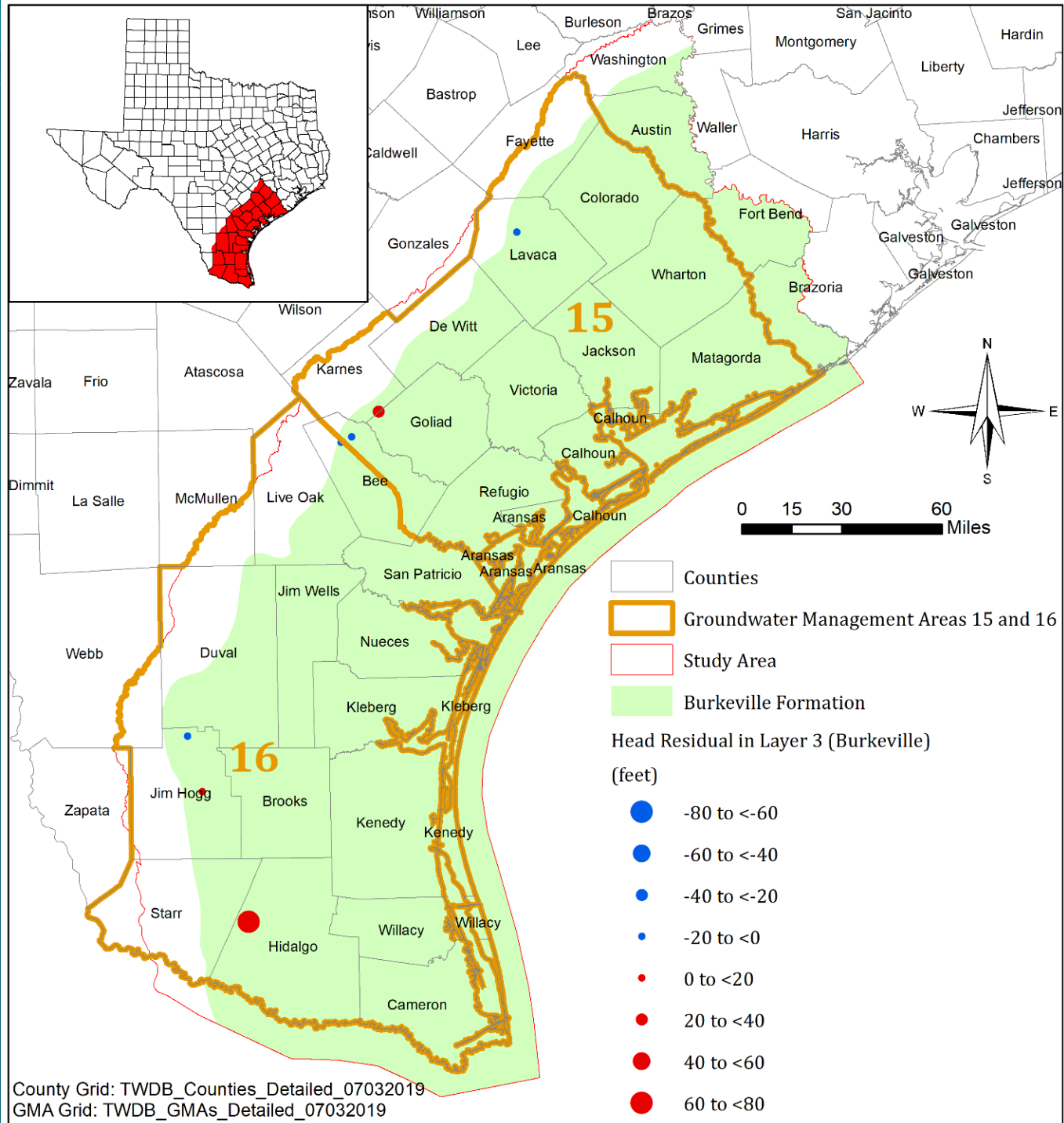
Water Level Residual (Model Layer 2: Evangeline)



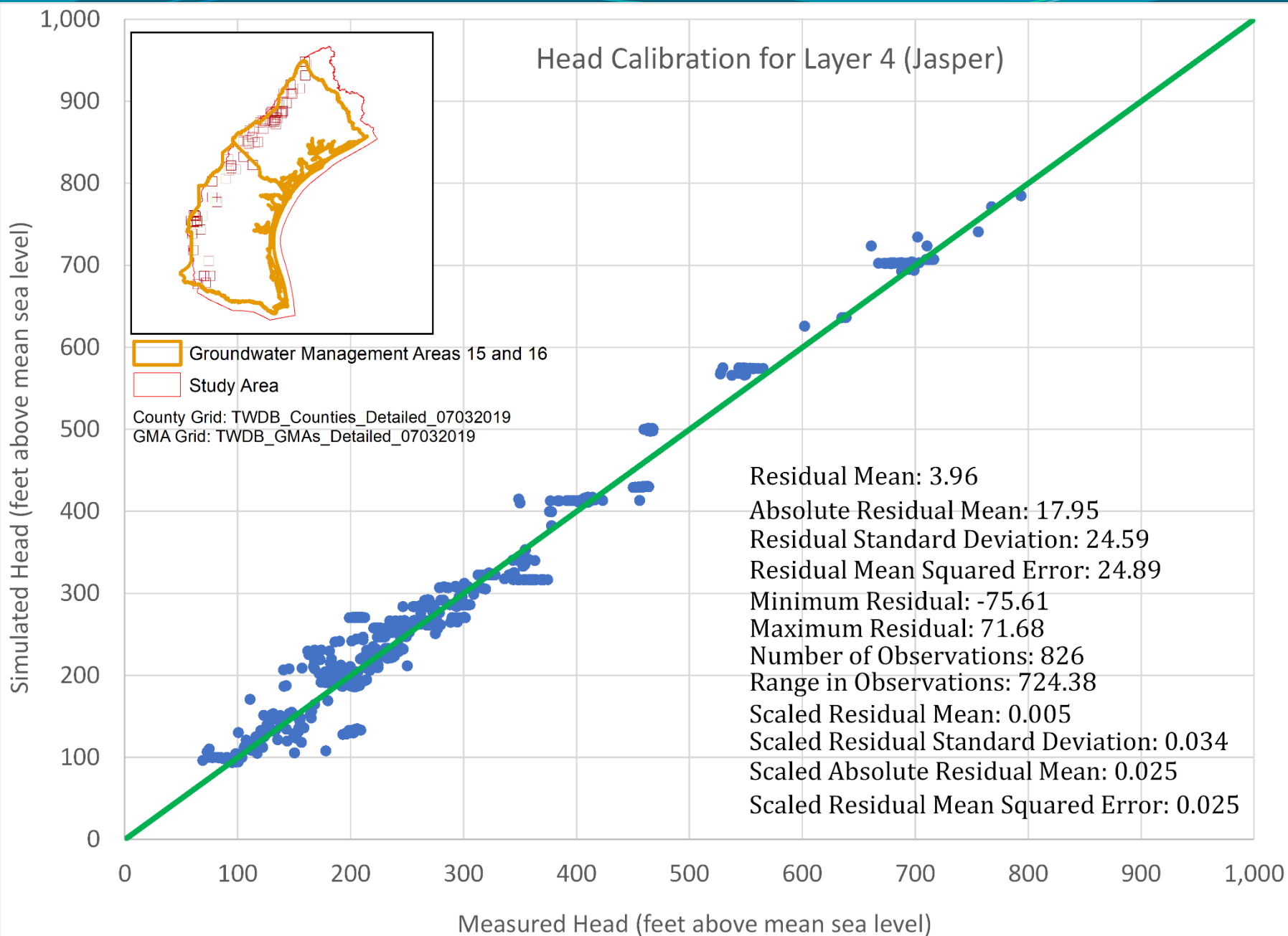
Water Level Calibration Result (Model Layer 3: Burkeville)



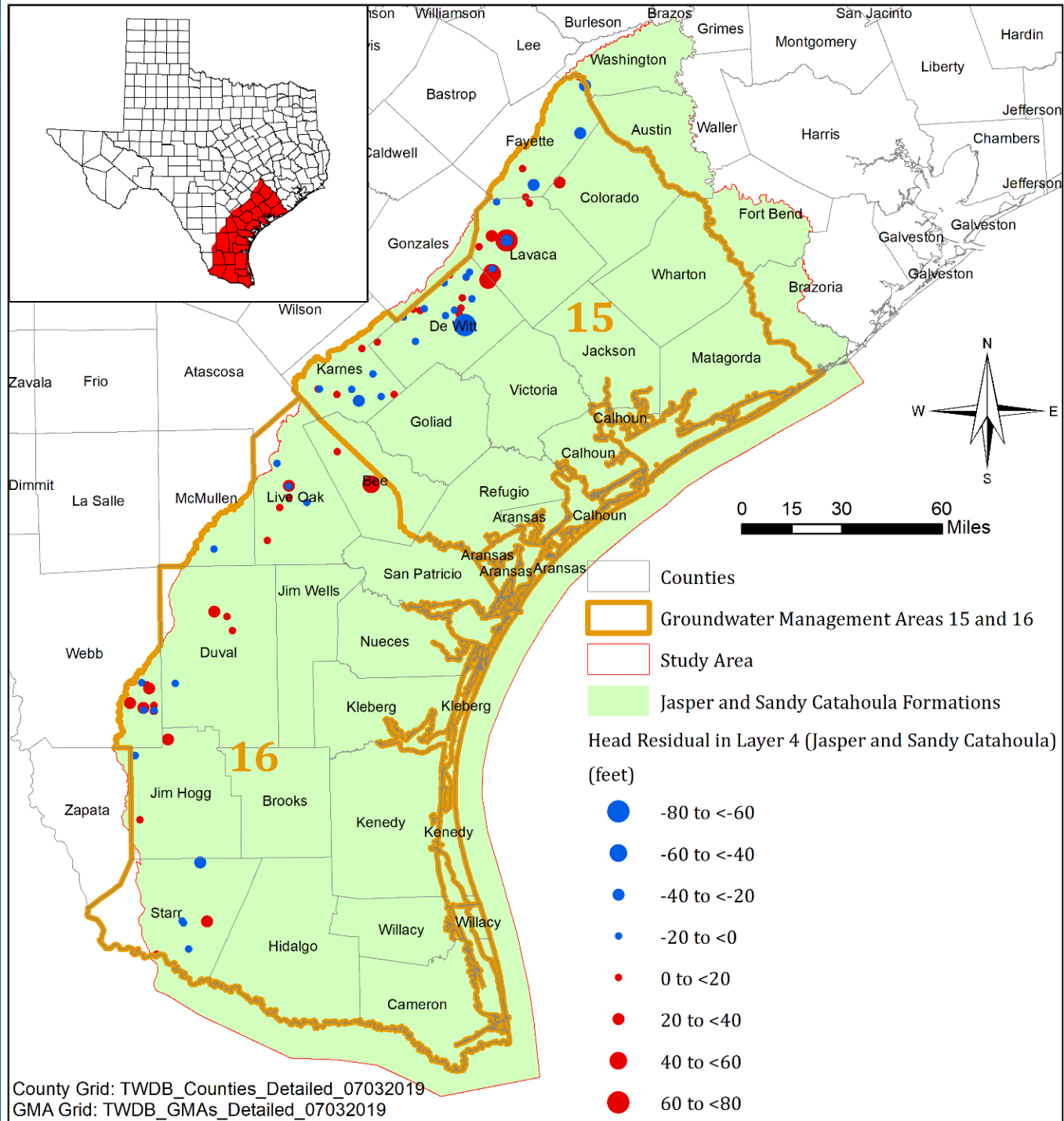
Water Level Residual (Model Layer 3: Burkeville)



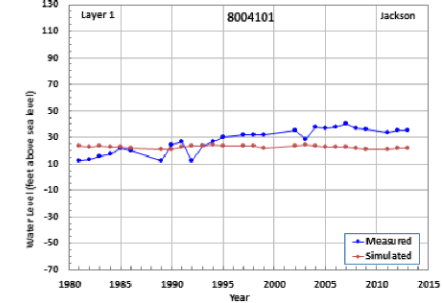
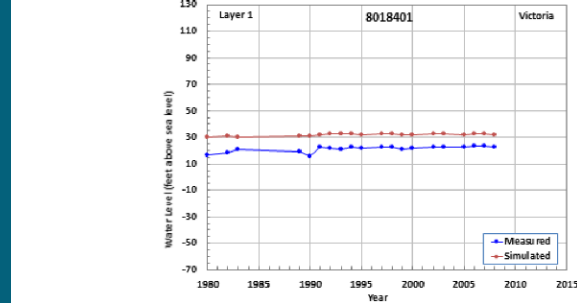
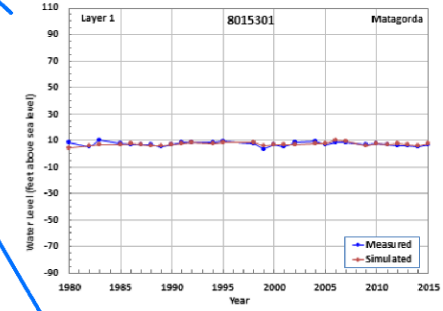
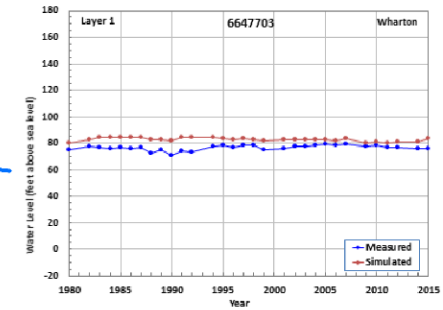
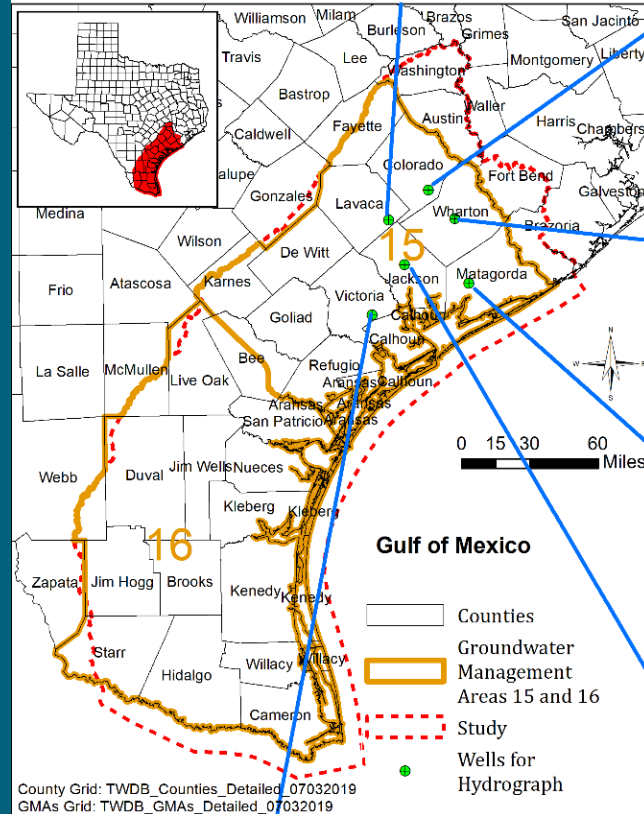
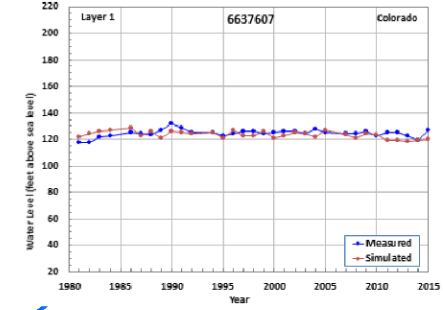
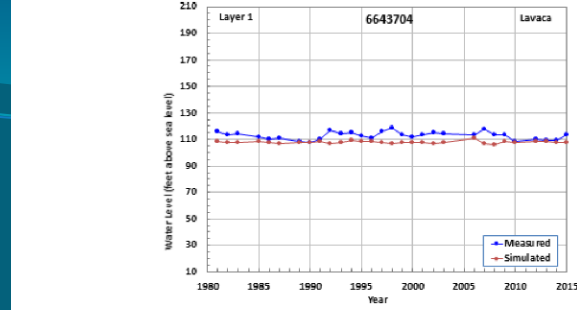
Water Level Calibration Result (Model Layer 4: Jasper)



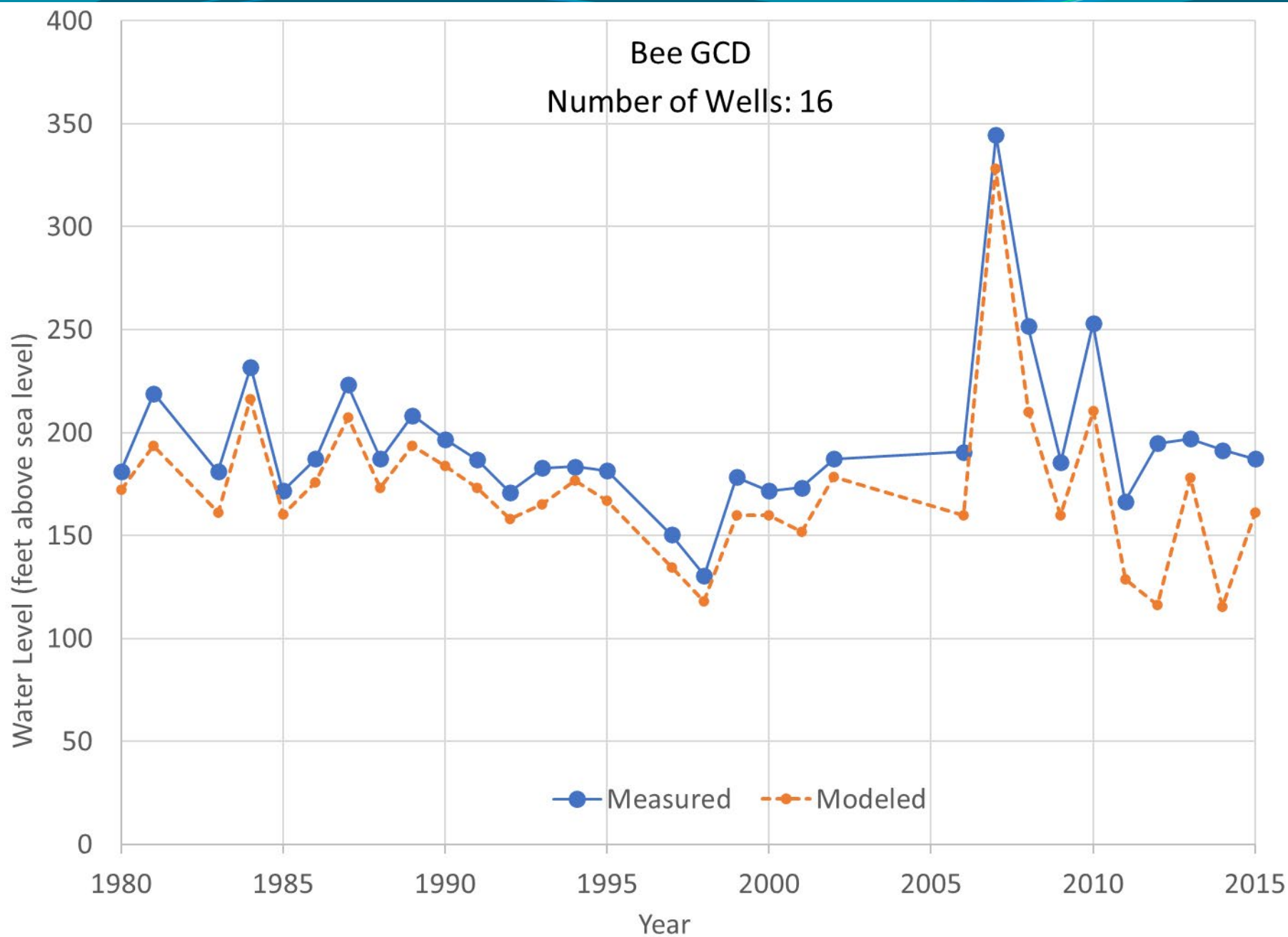
Water Level Residual (Model Layer 4: Jasper)



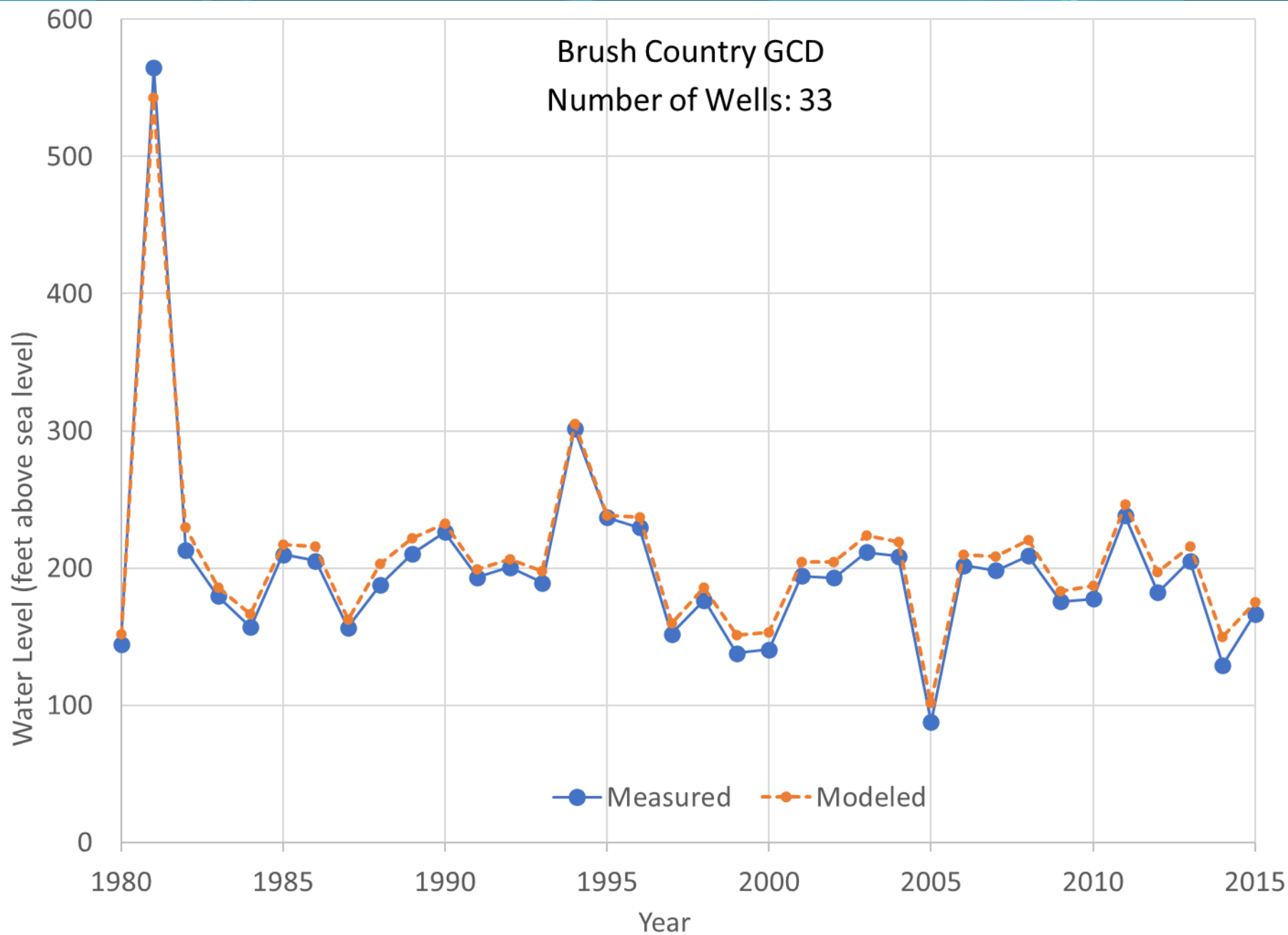
Head Hydrograph (Model Layer 1: Chicot)



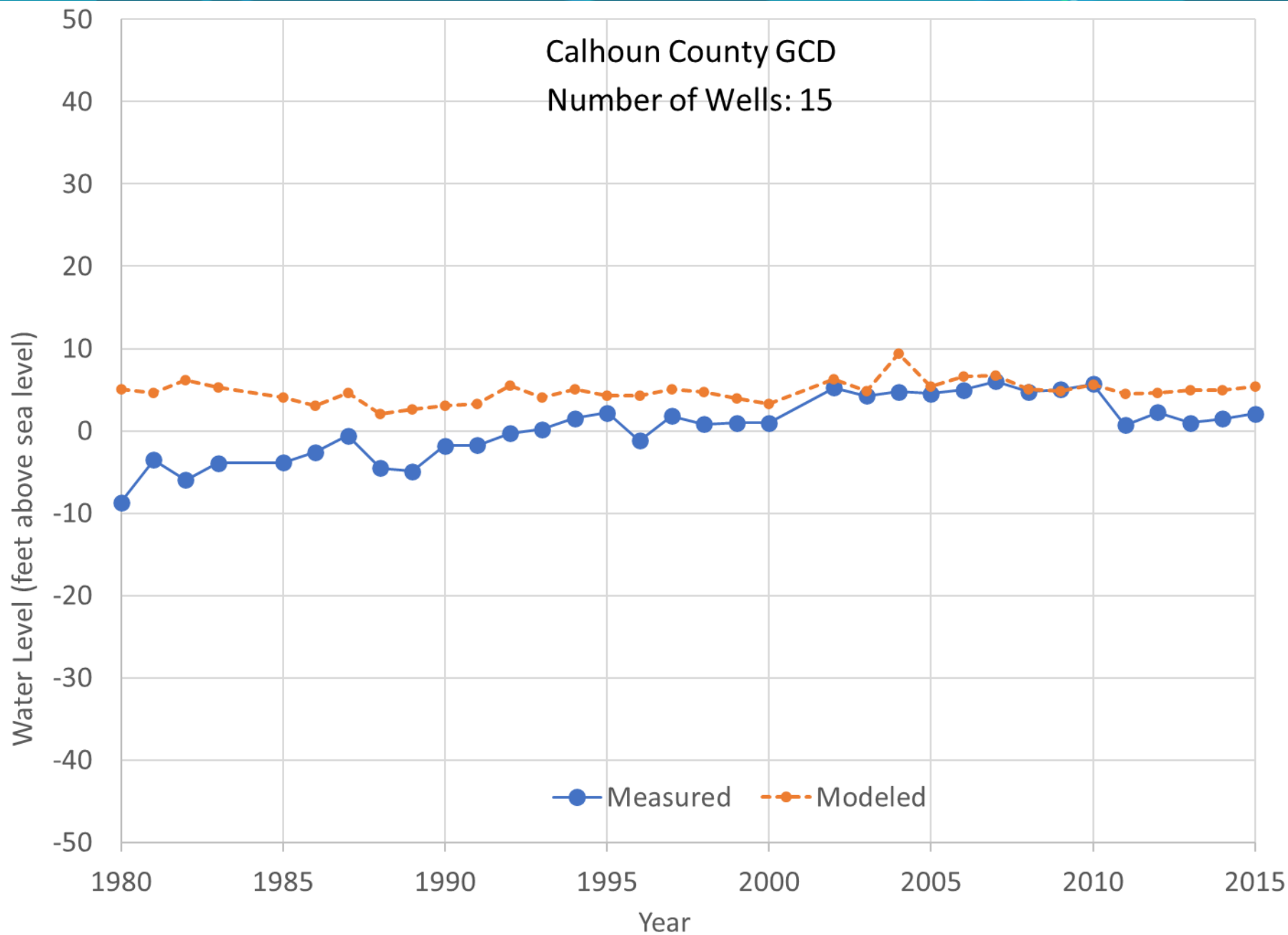
Comparison between Model and Measured Water Levels on GCD Scale



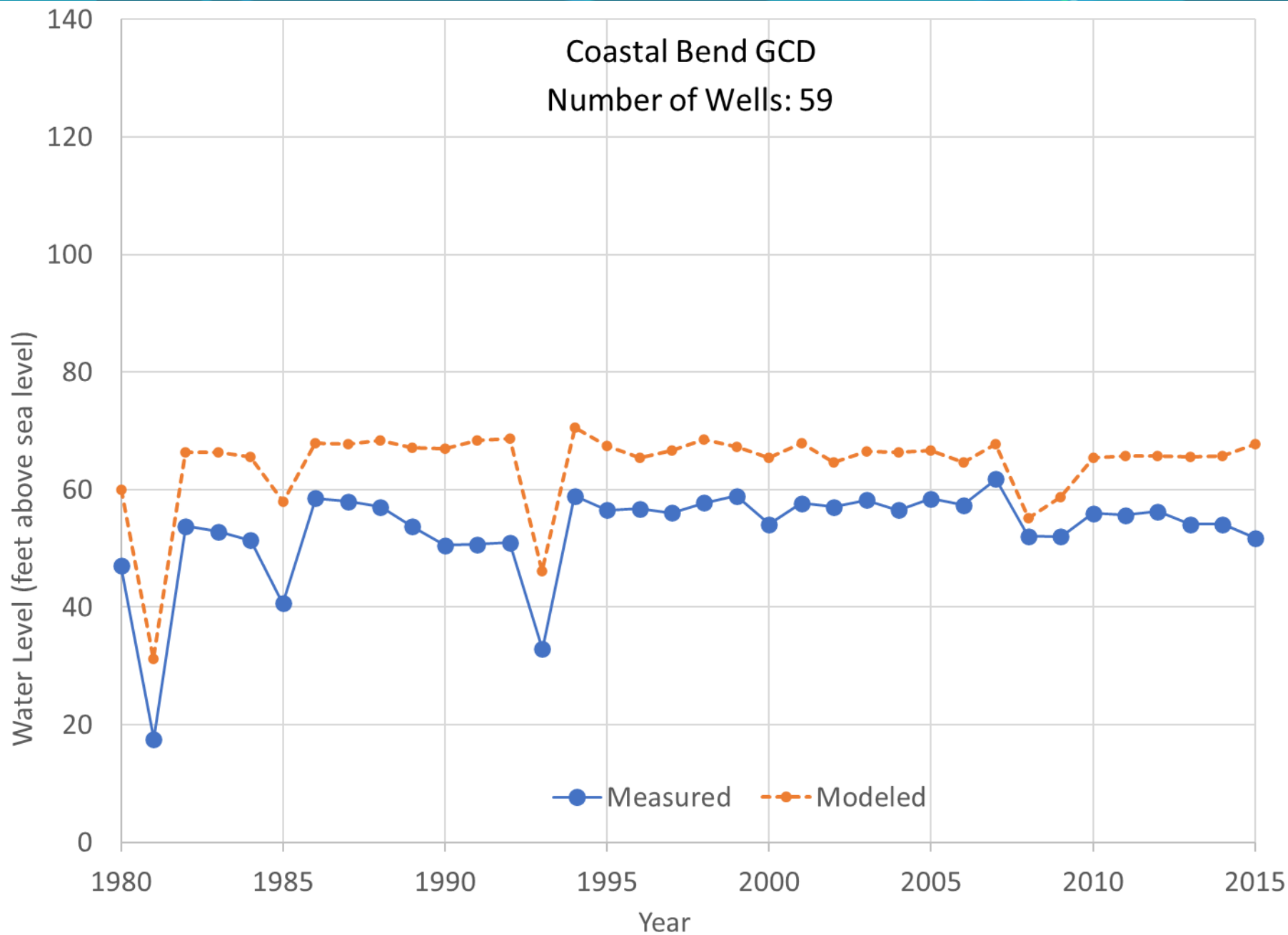
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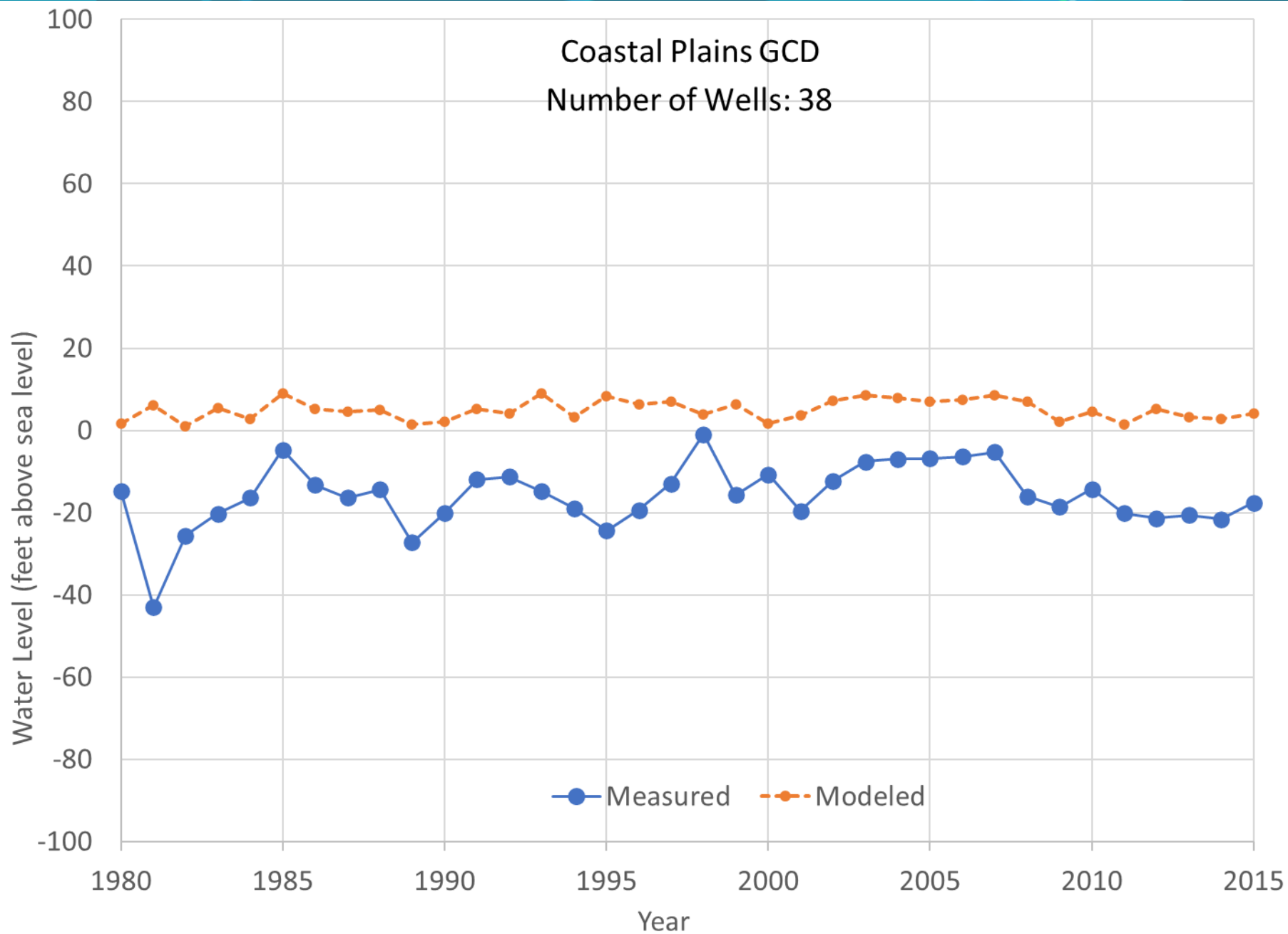
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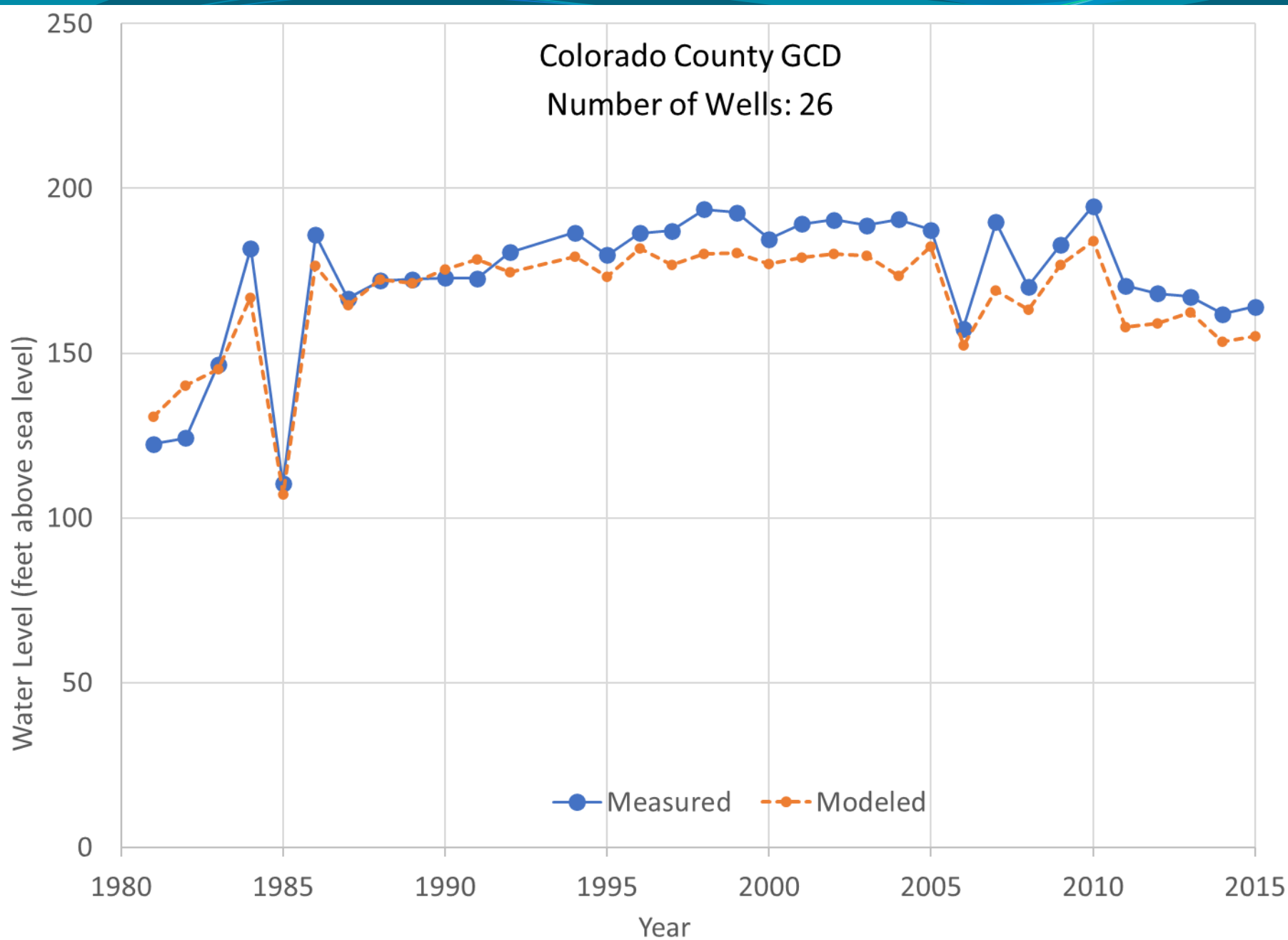
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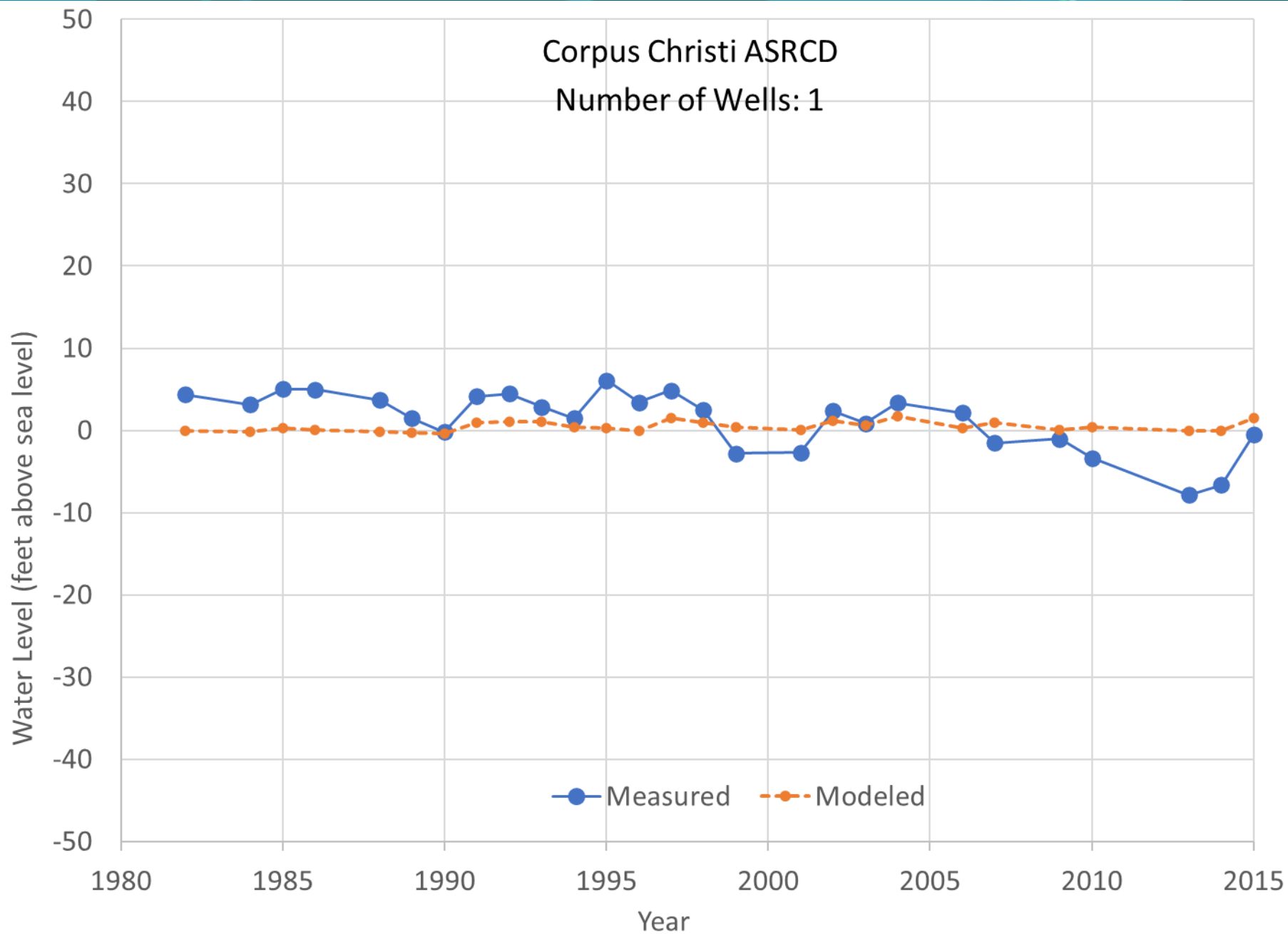
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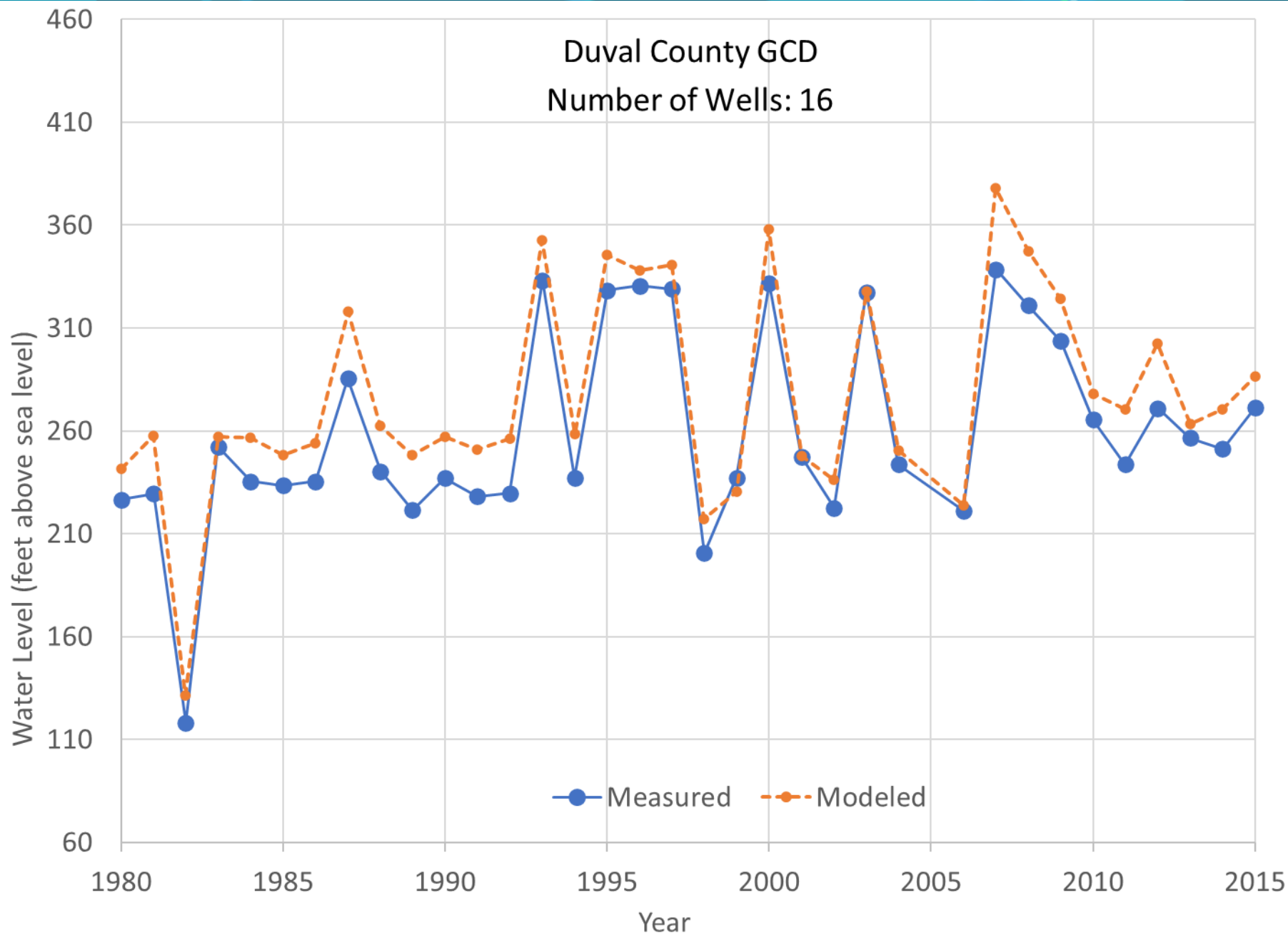
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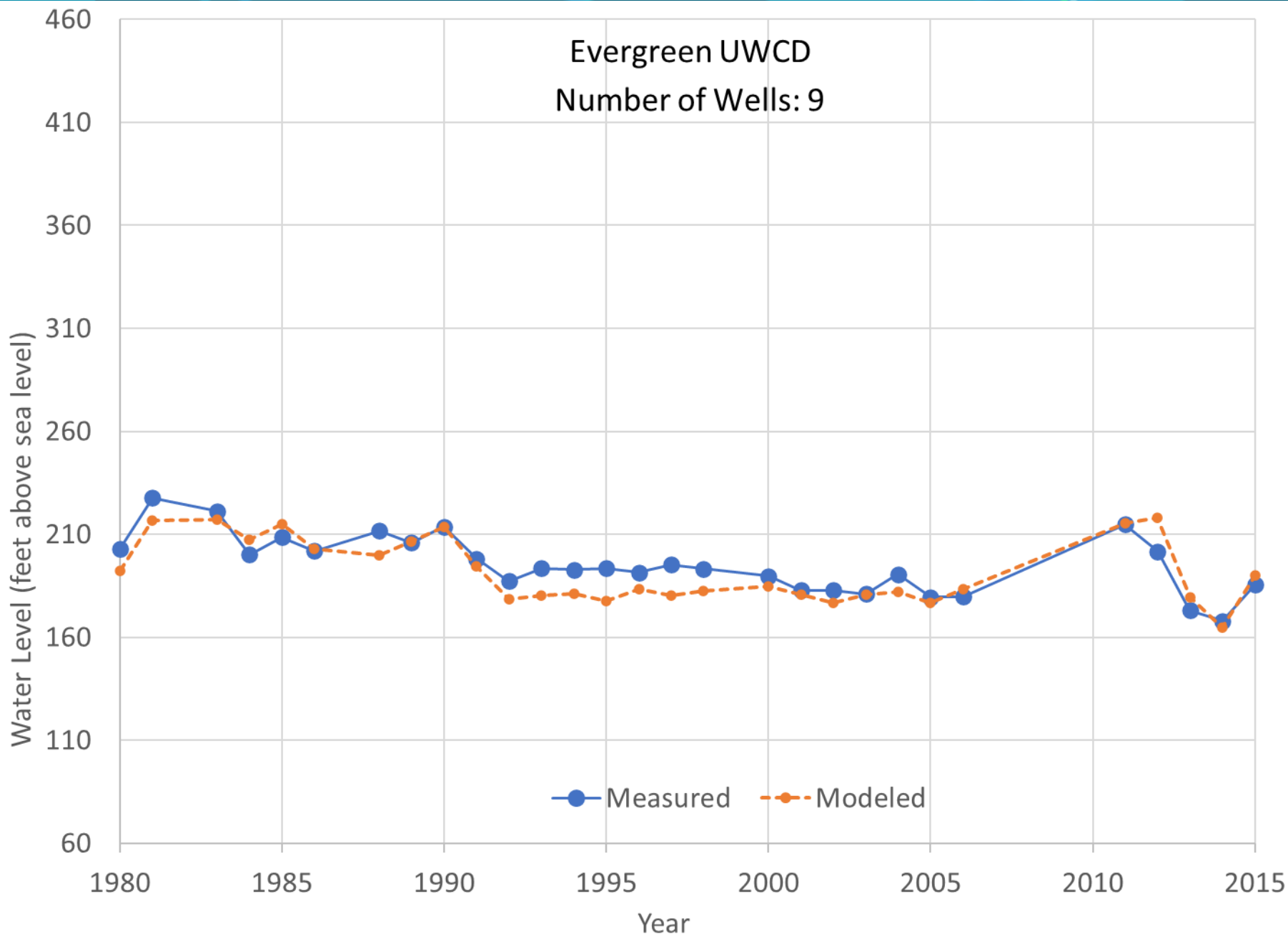
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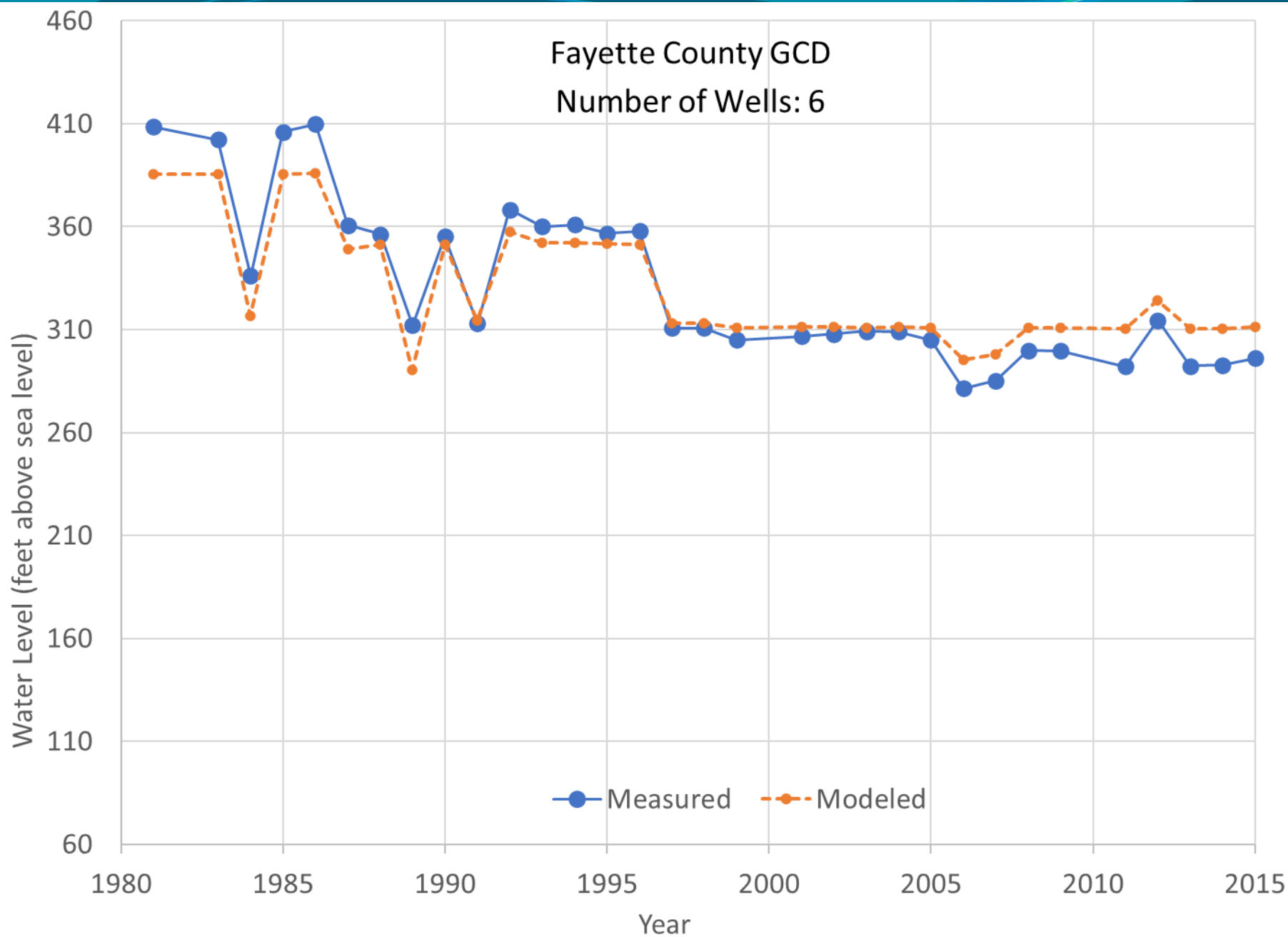
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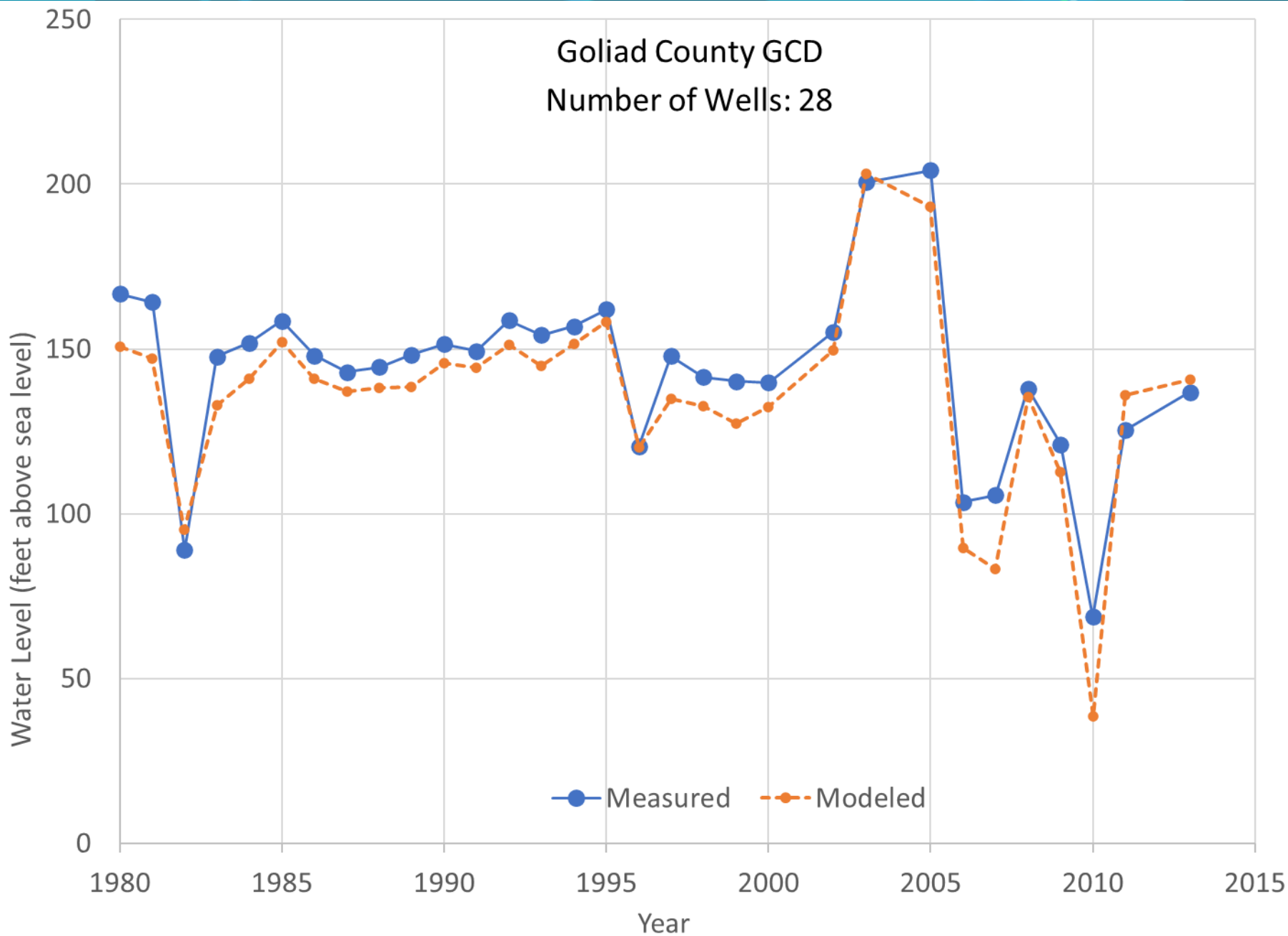
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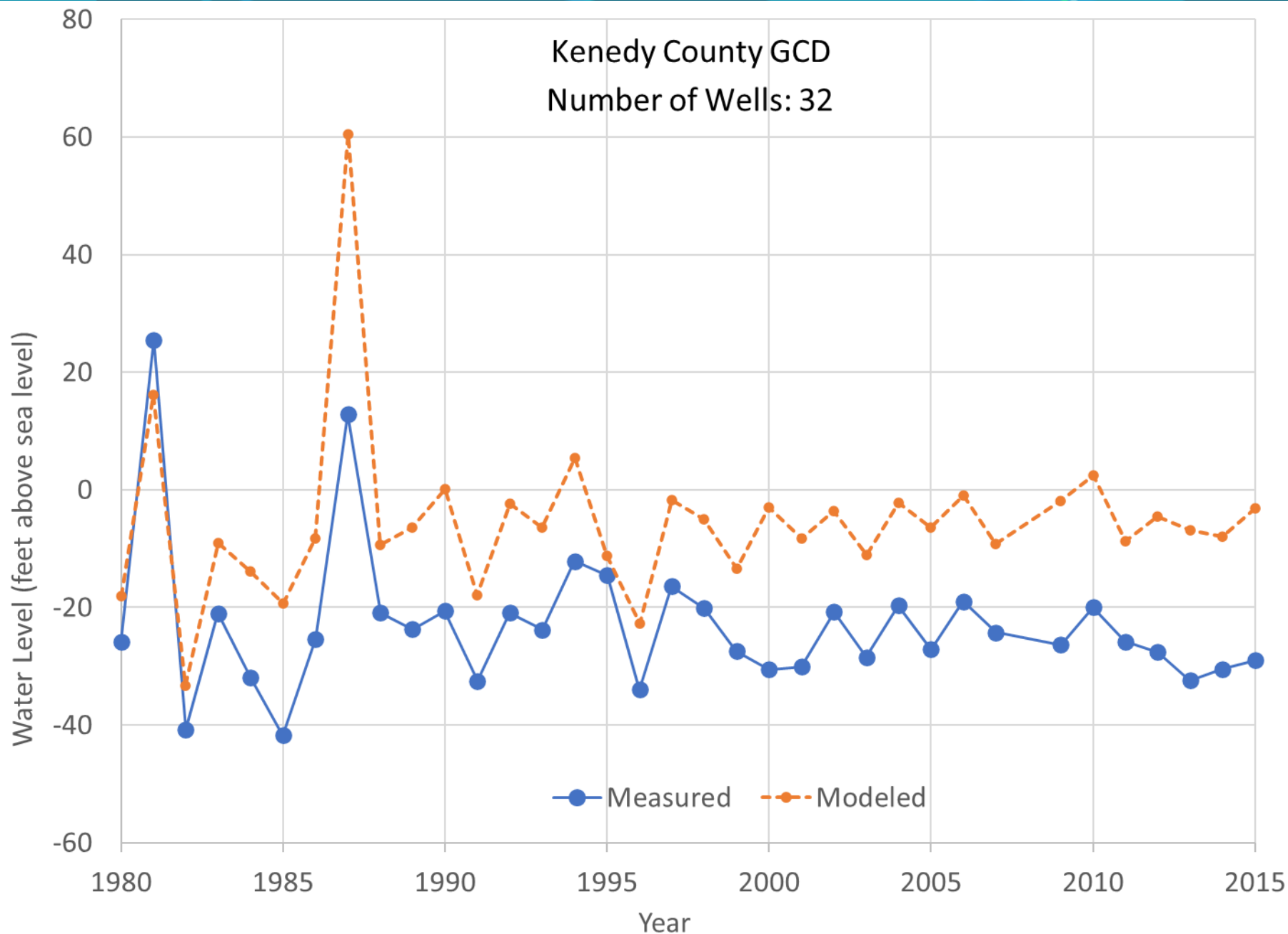
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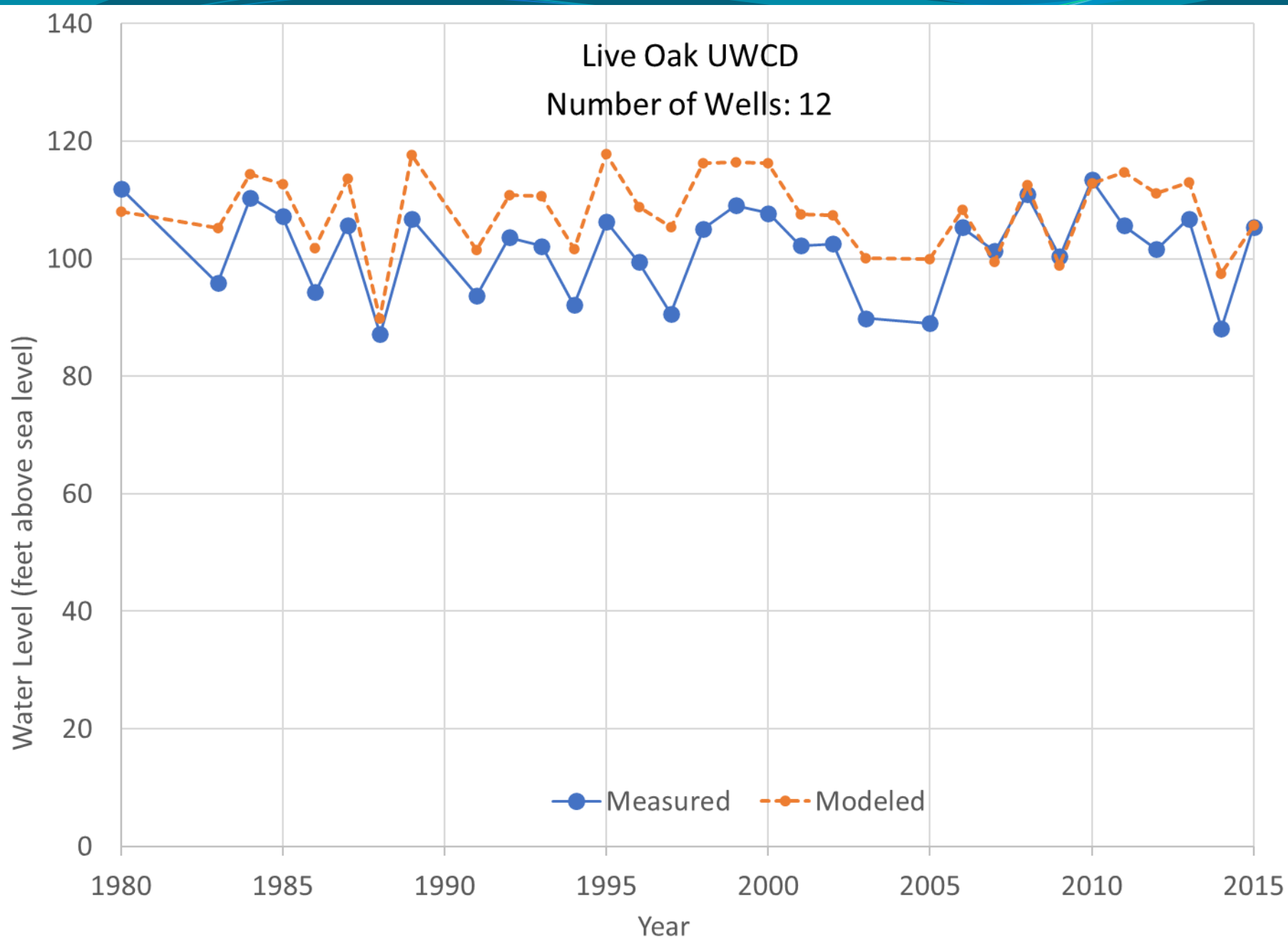
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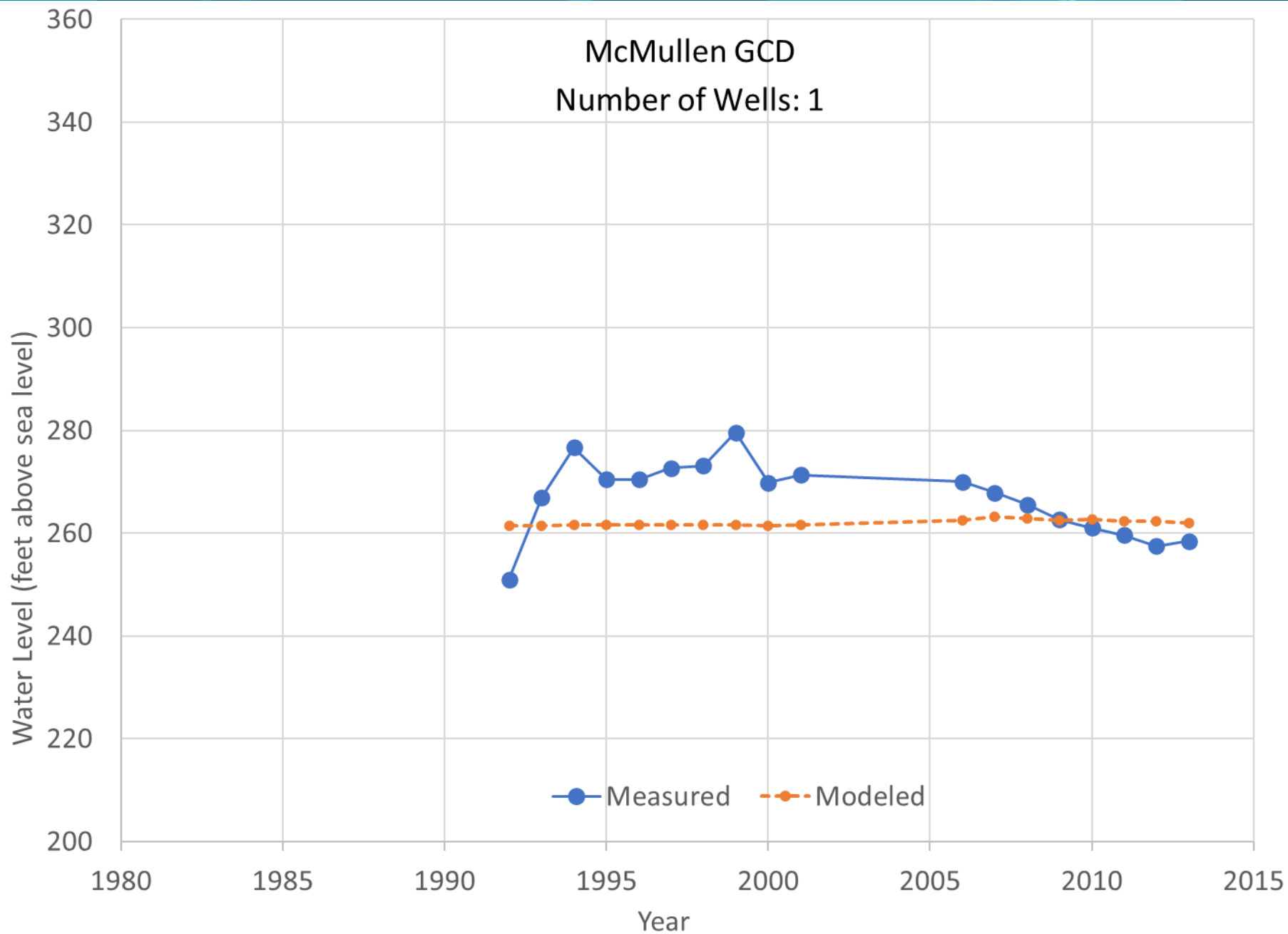
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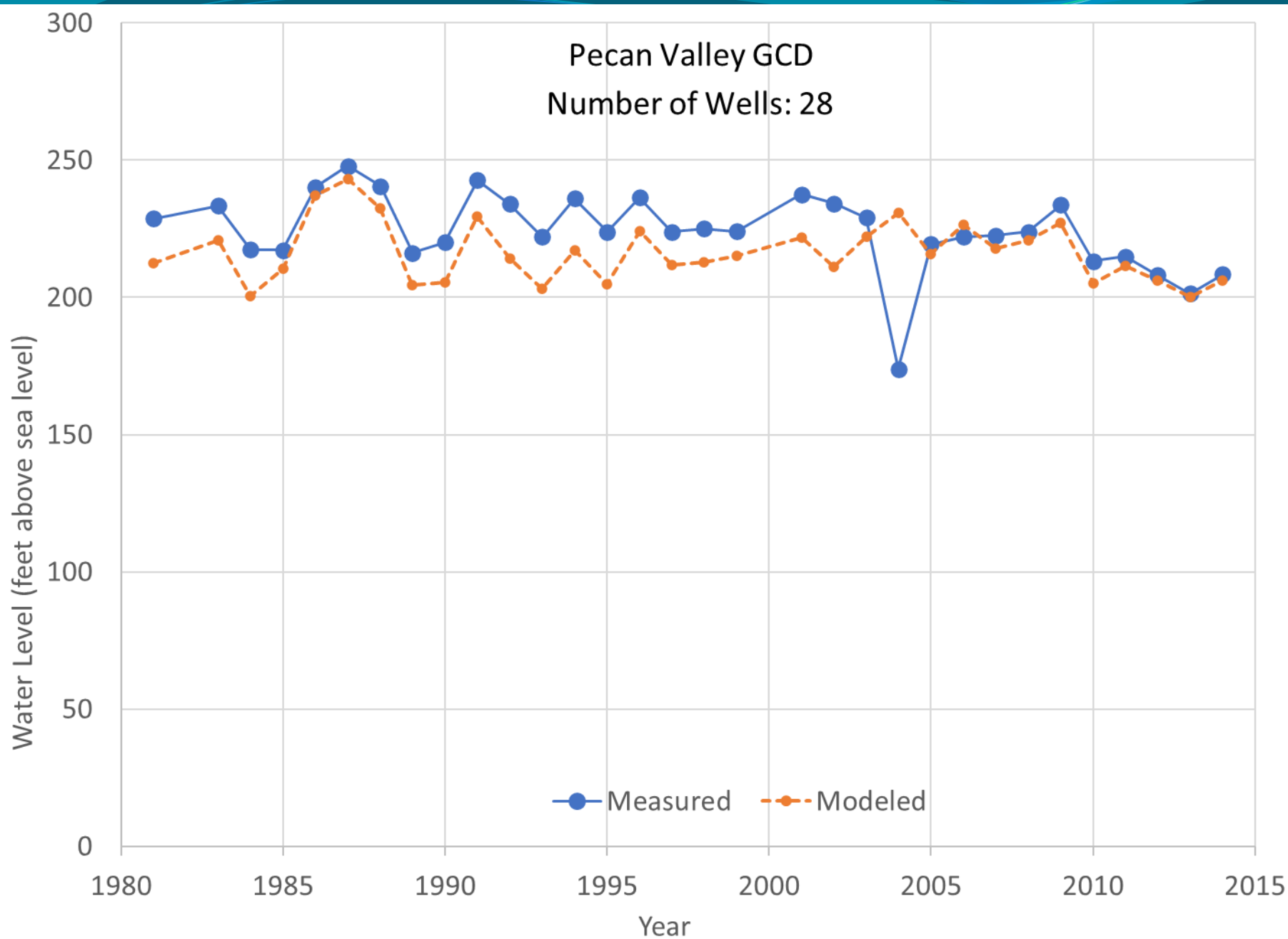
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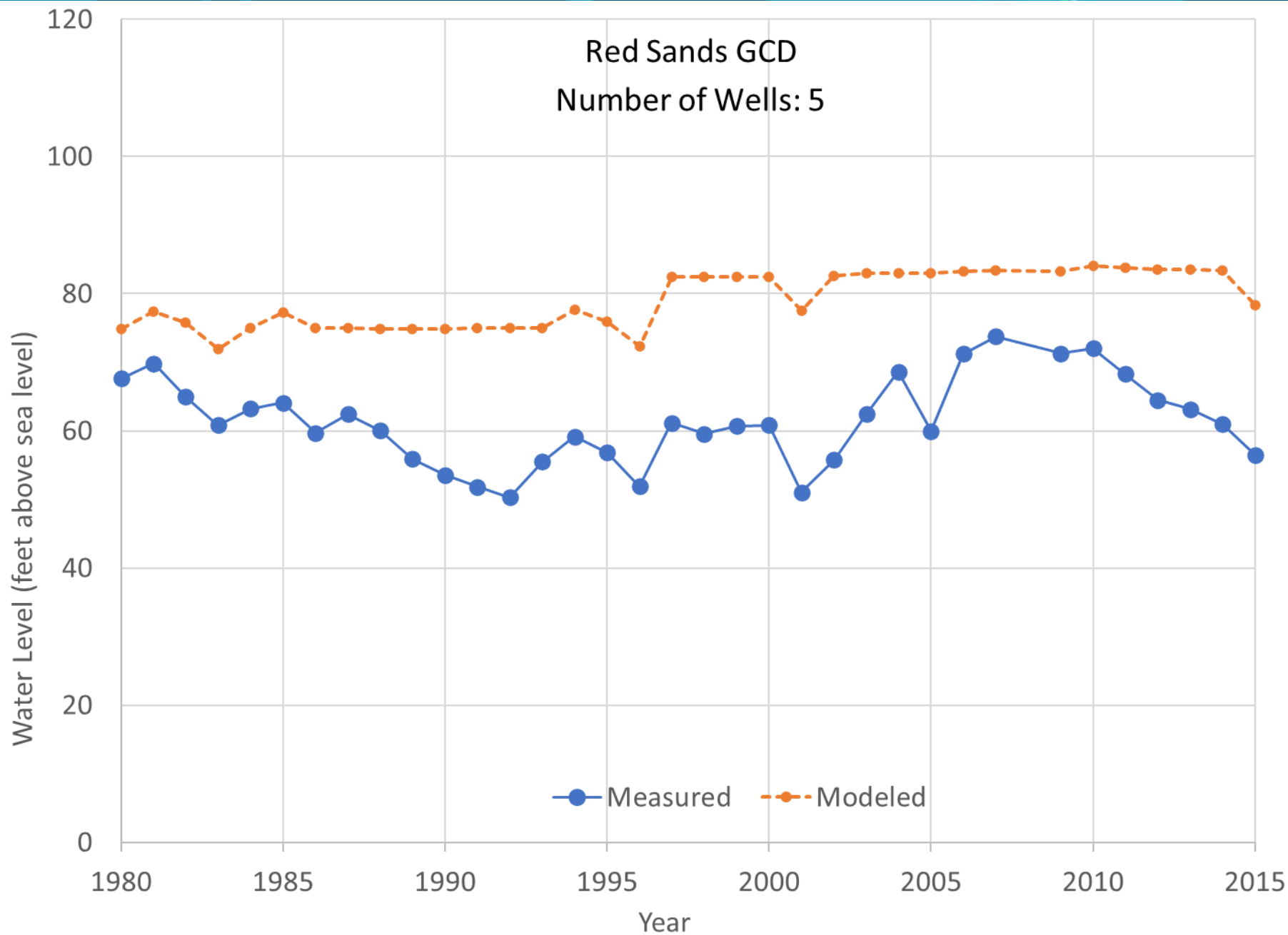
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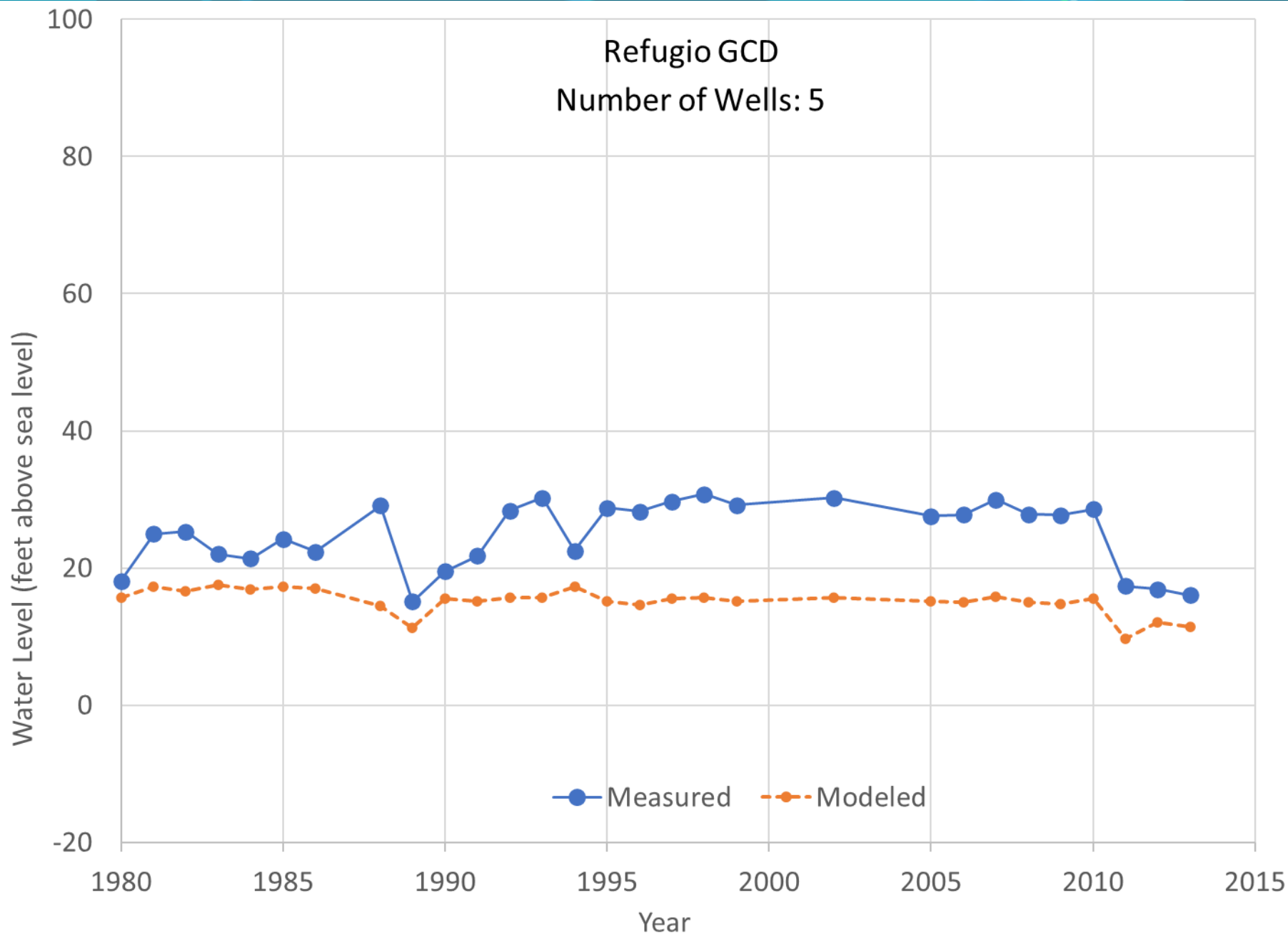
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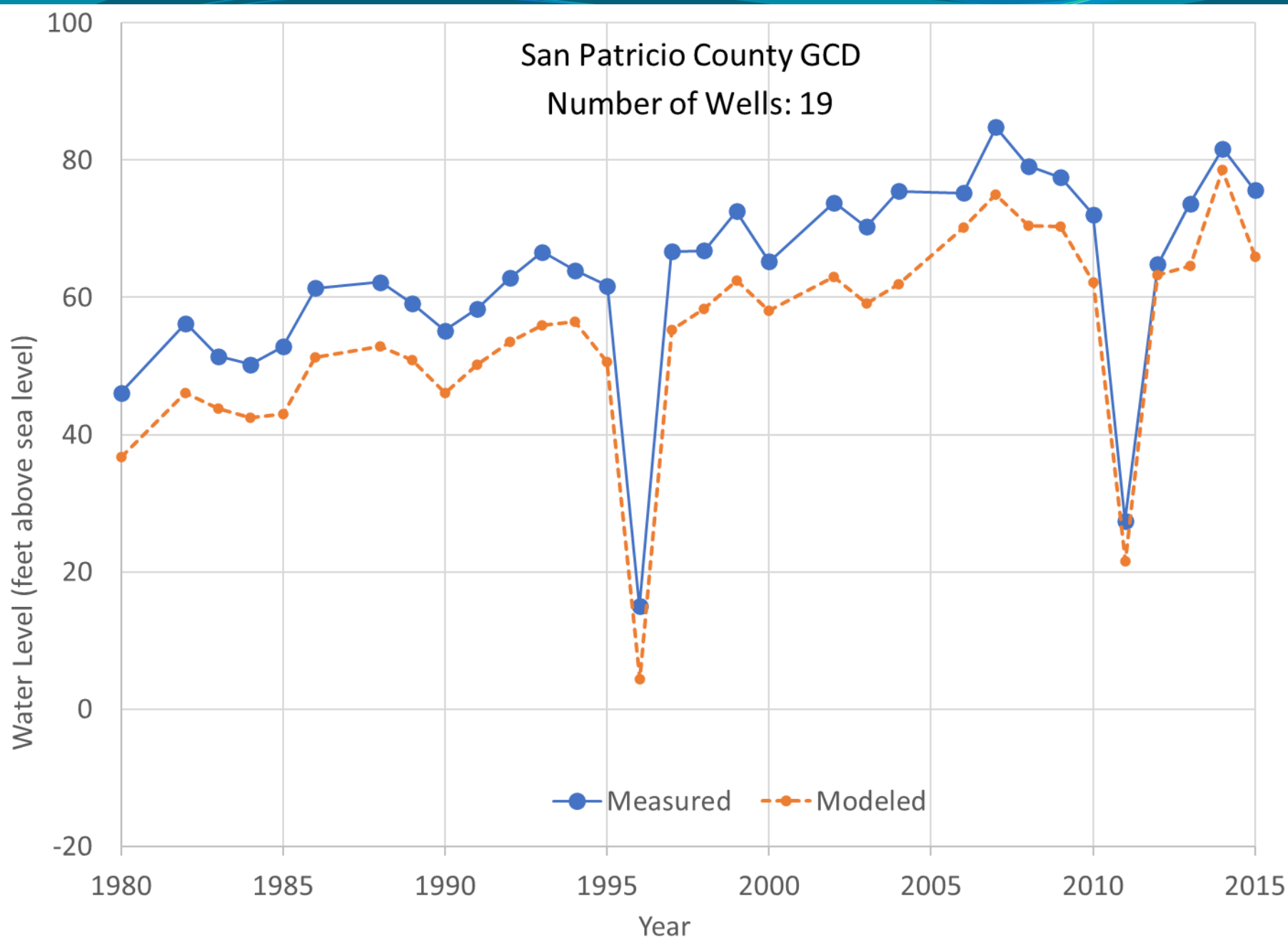
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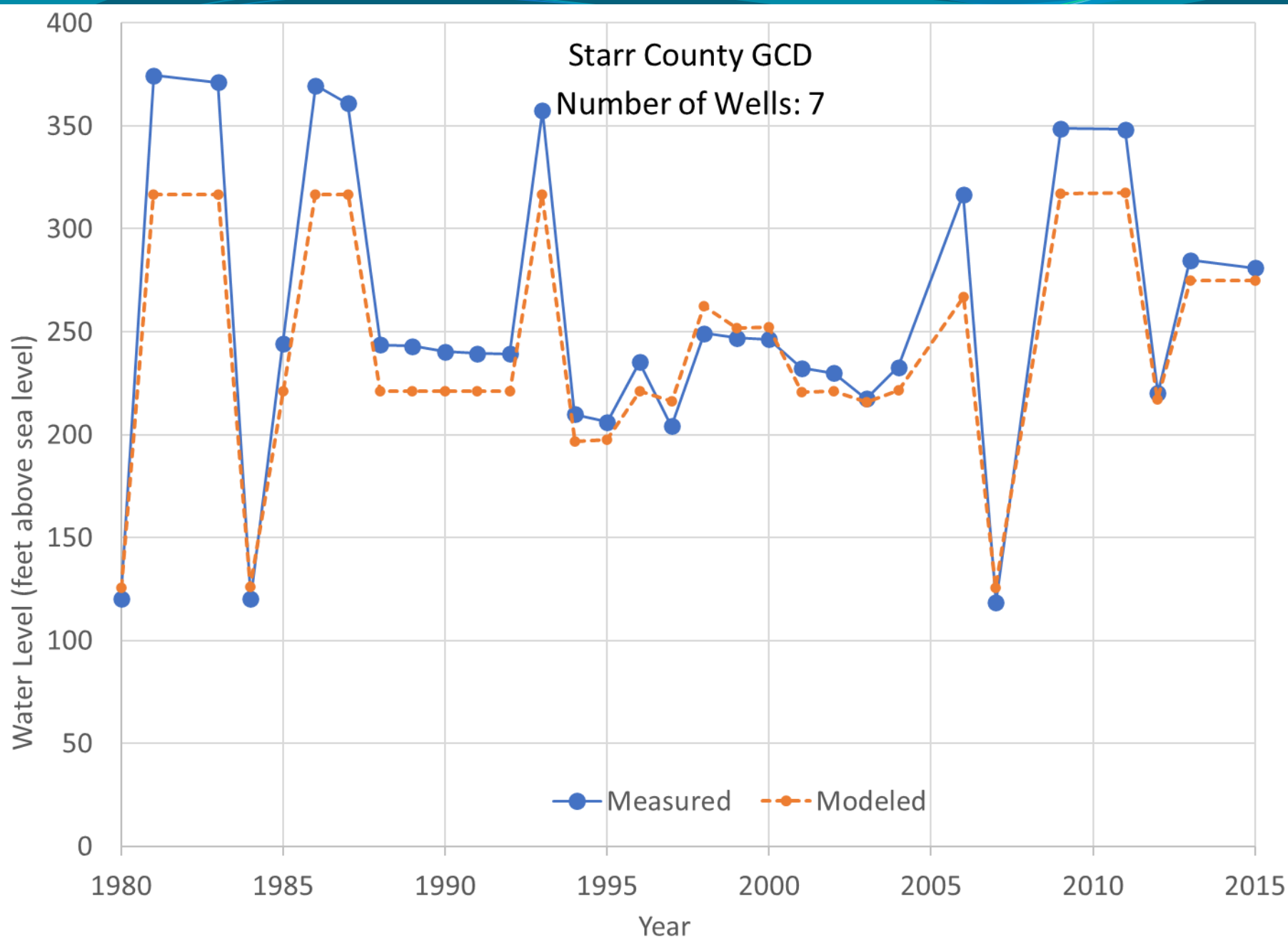
Comparison between Model and Measured Water Levels on GCD Scale



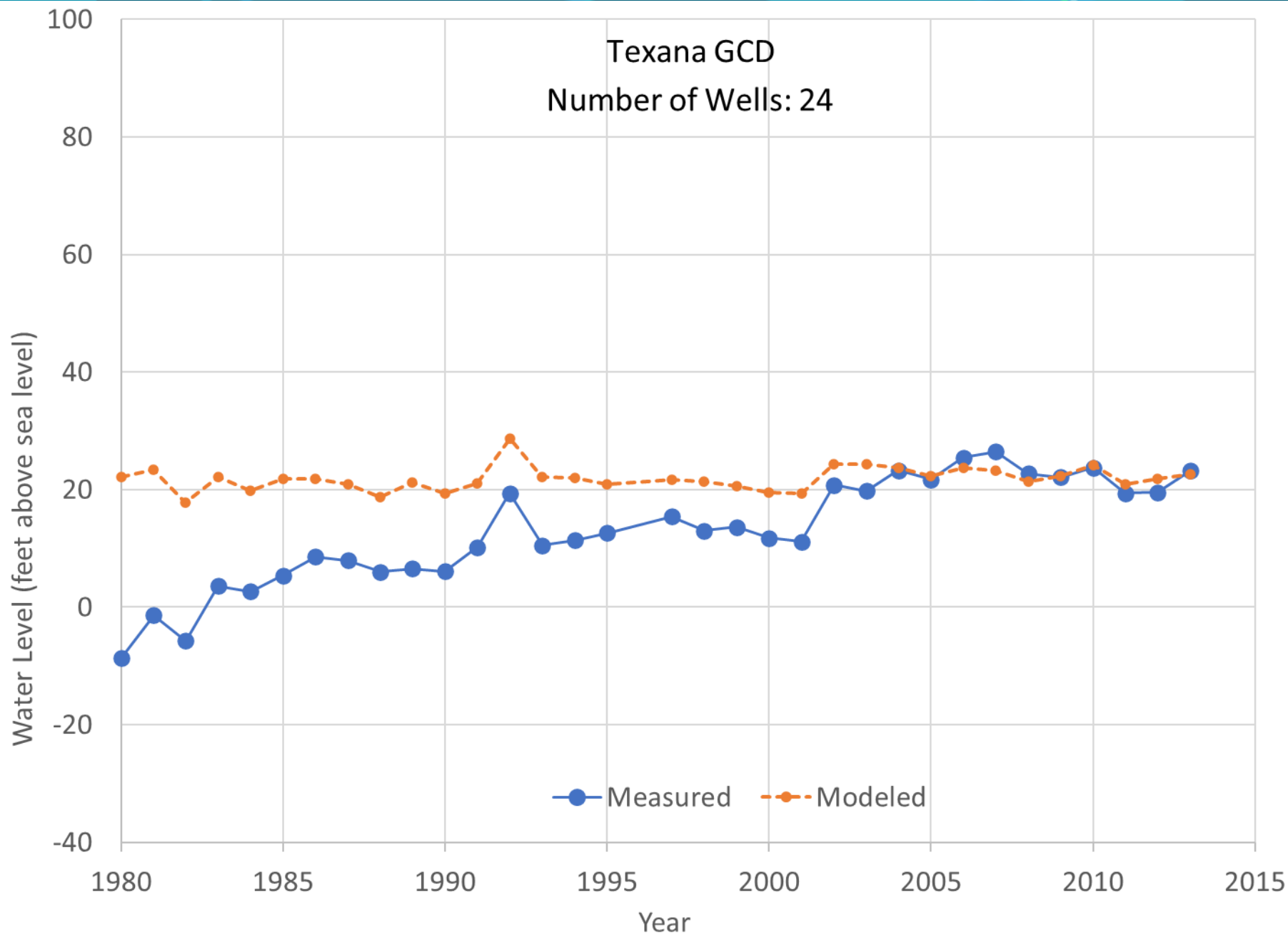
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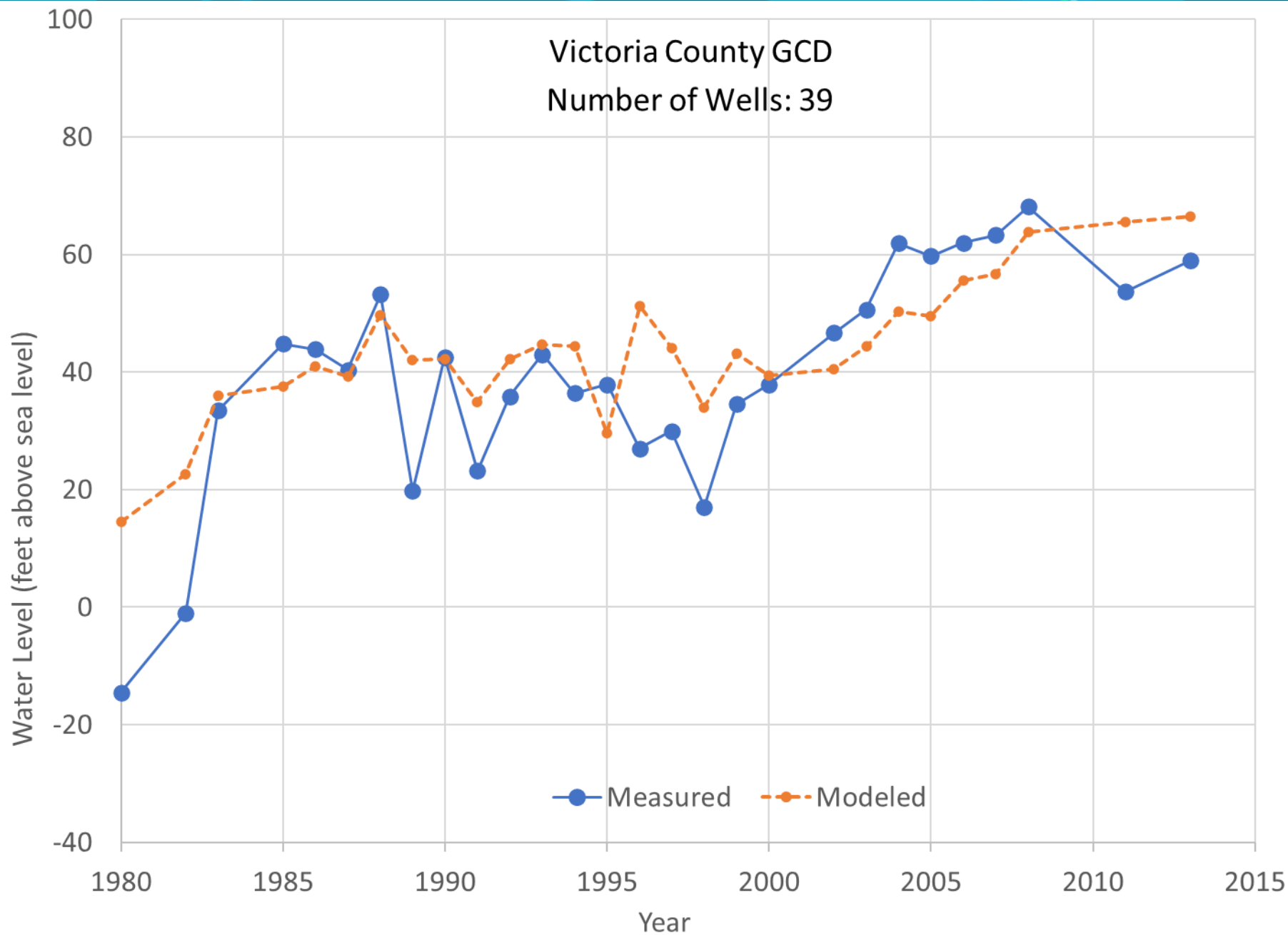
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Comparison between Model and Measured Water Levels on GCD Scale

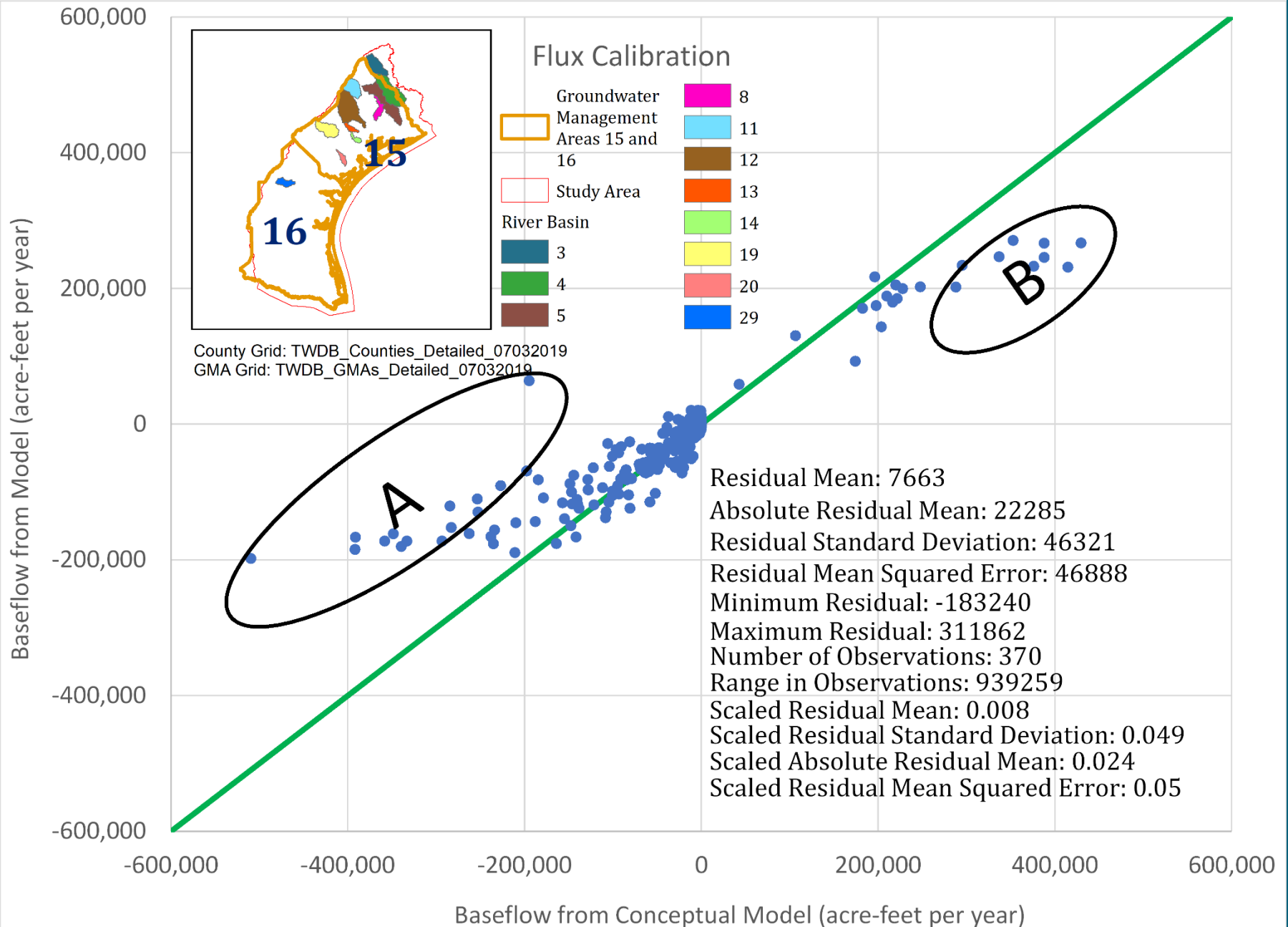


Comparison between Model and Measured Water Levels on GCD Scale

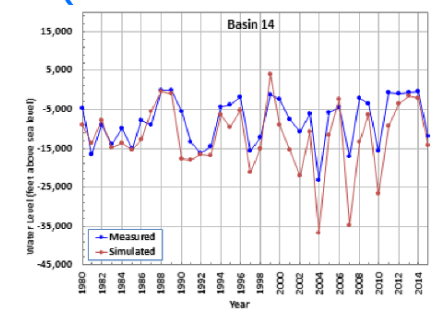
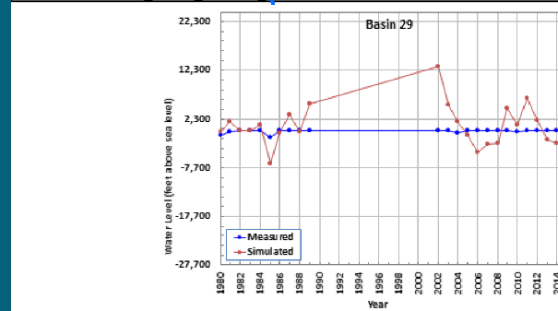
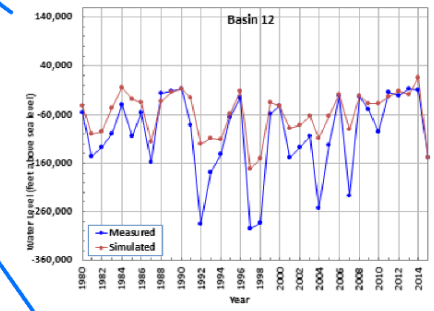
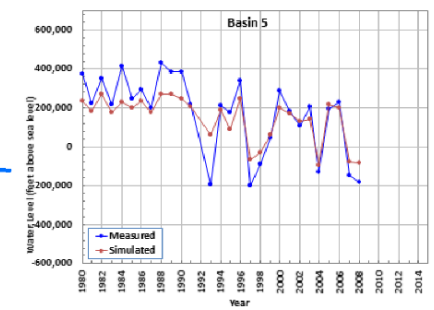
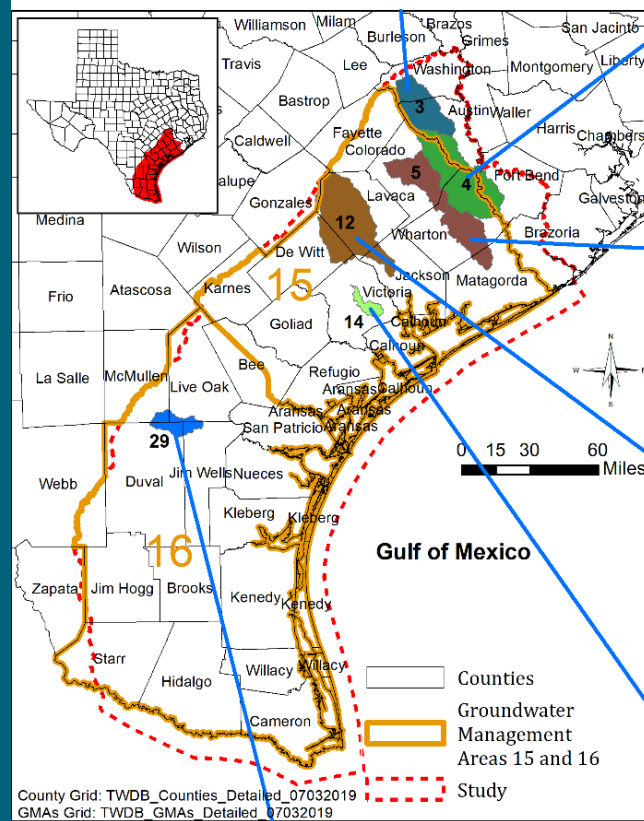
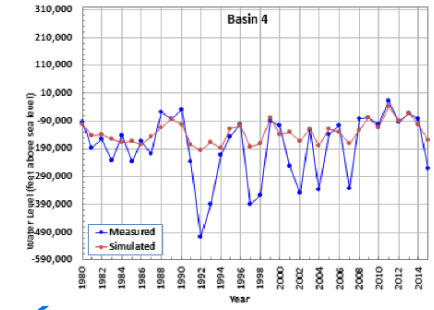
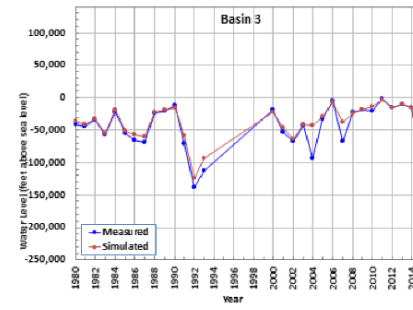


Calibration to Stream Baseflow

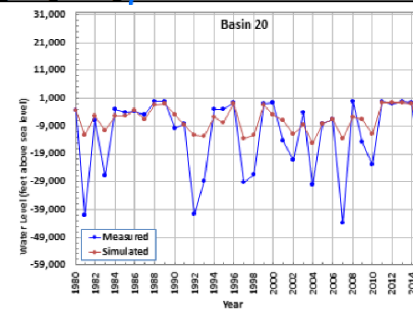
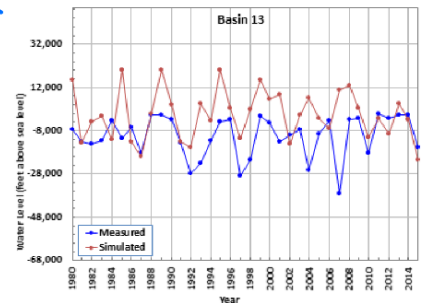
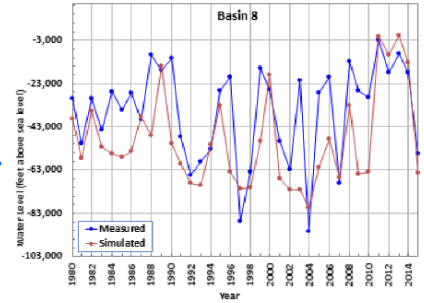
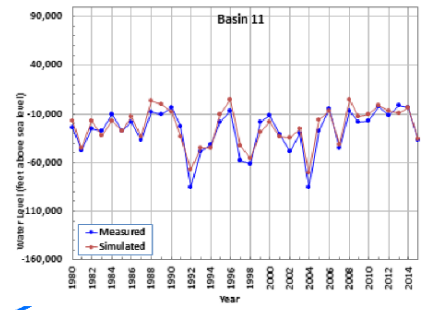
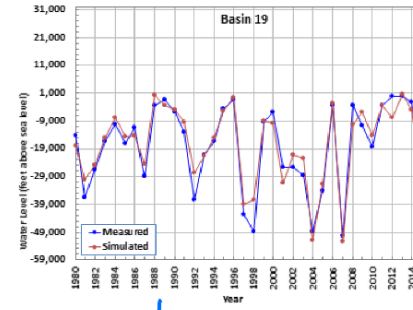
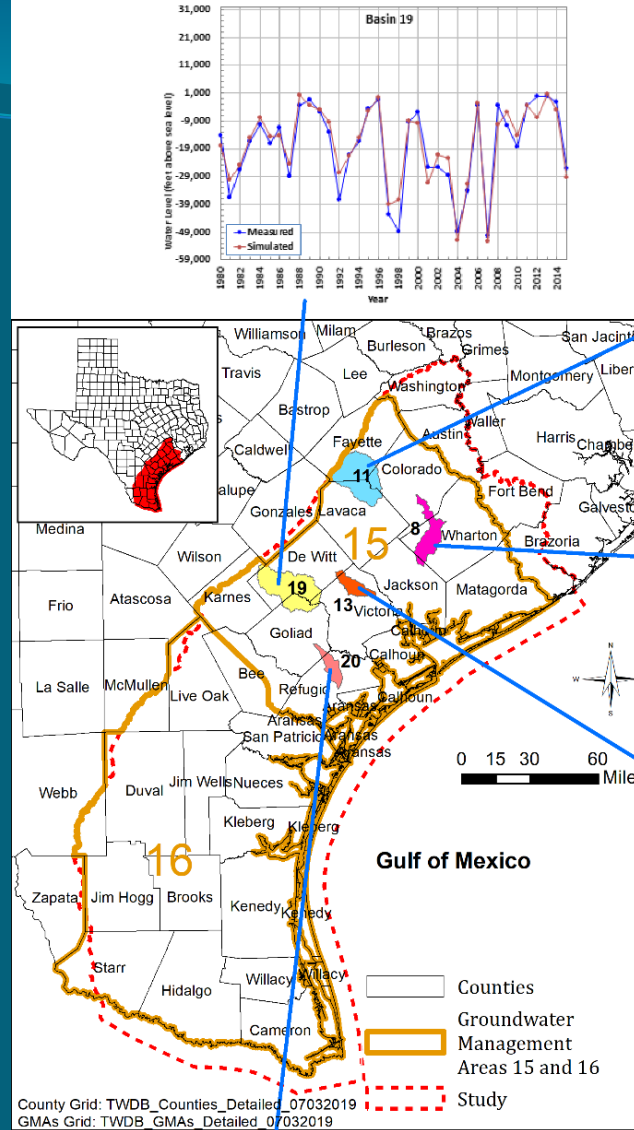
Stream Baseflow Calibration Result



Baseflow Hydrograph



Baseflow Hydrograph



Uncertainty and Limitation

- Pumping
 - Matagorda County and southern Wharton County
 - Central Victoria County
 - Kleberg County and Jim Wells County
- Baseflow impacted by anthropogenic activities
 - Stream diversion
 - Irrigation return flow
 - Controlled discharge from reservoirs

Acknowledgments

- All stakeholders.
- Groundwater Conservation District managers and staff.
- TWDB management:
 - Ms. Cindy Ridgeway
 - Dr. Daryn Hardwick
 - Mr. Larry French

❖ To locate draft numerical model report and this presentation, please go to

https://www.twdb.texas.gov/groundwater/models/gam/gma15_16/gma15_16.asp

❖ Model files available upon request

❖ Please send your comments and suggestions

❖ By July 29, 2022

❖ To Dr. Daryn Hardwick daryn.hardwick@twdb.texas.gov

Tentative Schedule

- ❖ Finalize Project – Fall 2022

Thank You Questions?

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