

# Assessment of Spatiotemporal Groundwater Level Changes Throughout New Mexico

Spencer E. Willman and Kenneth C. Carroll  
New Mexico State University

## Introduction

- The southwest region of the United States has recently been under drought conditions, this has the potential to impact the long term sustainability of water resources in New Mexico.
- The purpose of this study is to advance our understanding of changes in groundwater levels and how they relate to water use and sustainability across the State of New Mexico
- If drought conditions continue, access to surface water reservoirs may be restricted, this could increase the rates of groundwater elevation decline.
- Additional research is needed develop our monitoring capabilities and to understand what policy actions need to be taken in response to groundwater elevation declines.

## Methods

- Loess nonlinear regression was used to predict the depth to water in times when no measurements were made as well as account for the non-linear nature of changes in groundwater elevation.
- Once the data was processed, geographic information system (GIS) tools were used to evaluate spatial variability of groundwater elevation changes.
- Summary statistics and graphs with regression were then used to quantify changes in both space and time.
- Groundwater elevation rate of change analysis was determined in 5 year intervals for the years between 1990 and 2013.
- Different GIS tools were then used to query and map data based on their spatial characteristics.

Contact: Spencer Willman  
Email: swillman@nmsu.edu  
Phone: 575-621-7464

## Results

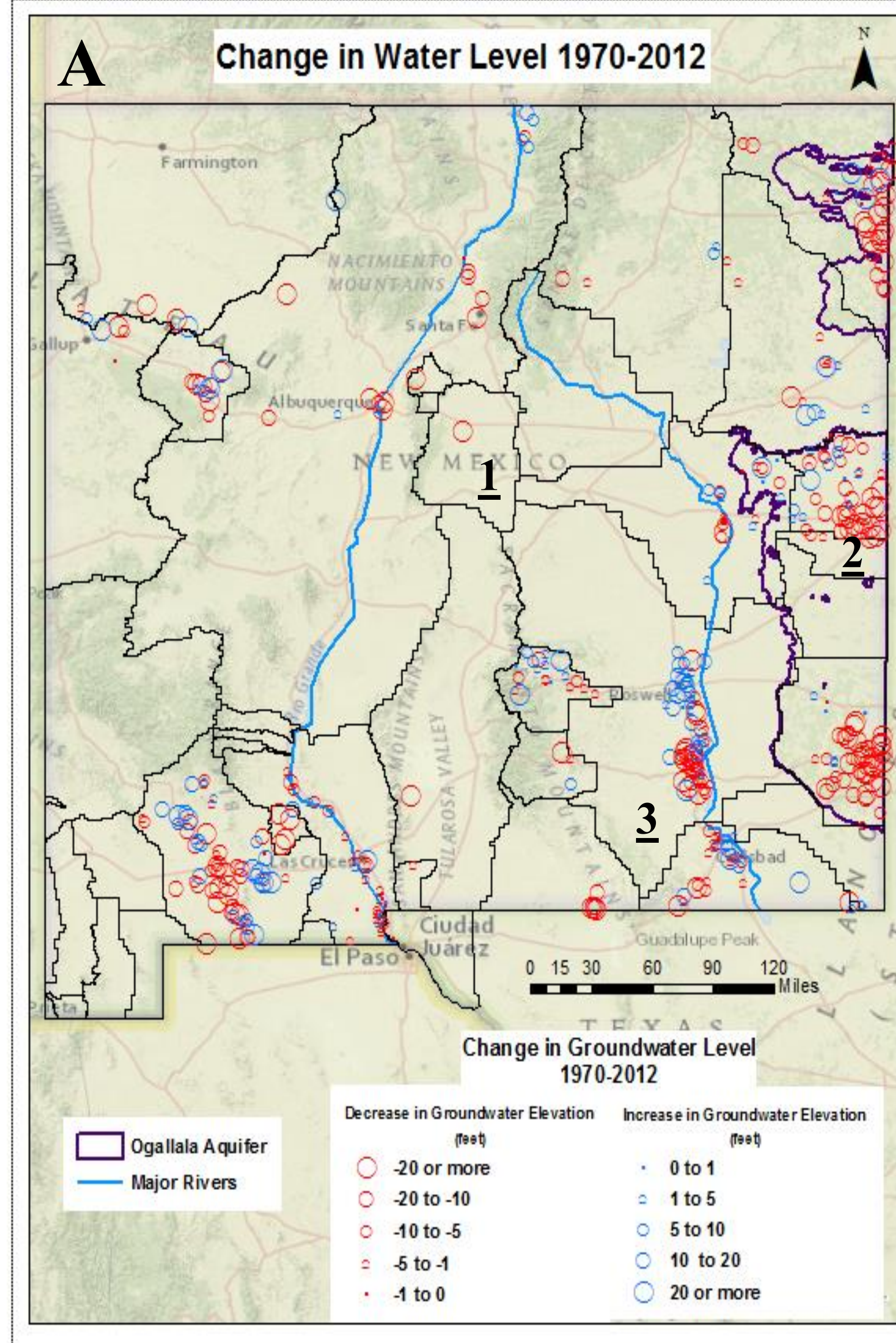


Figure A: Illustrates the change in groundwater elevation from 1970 to 2012.

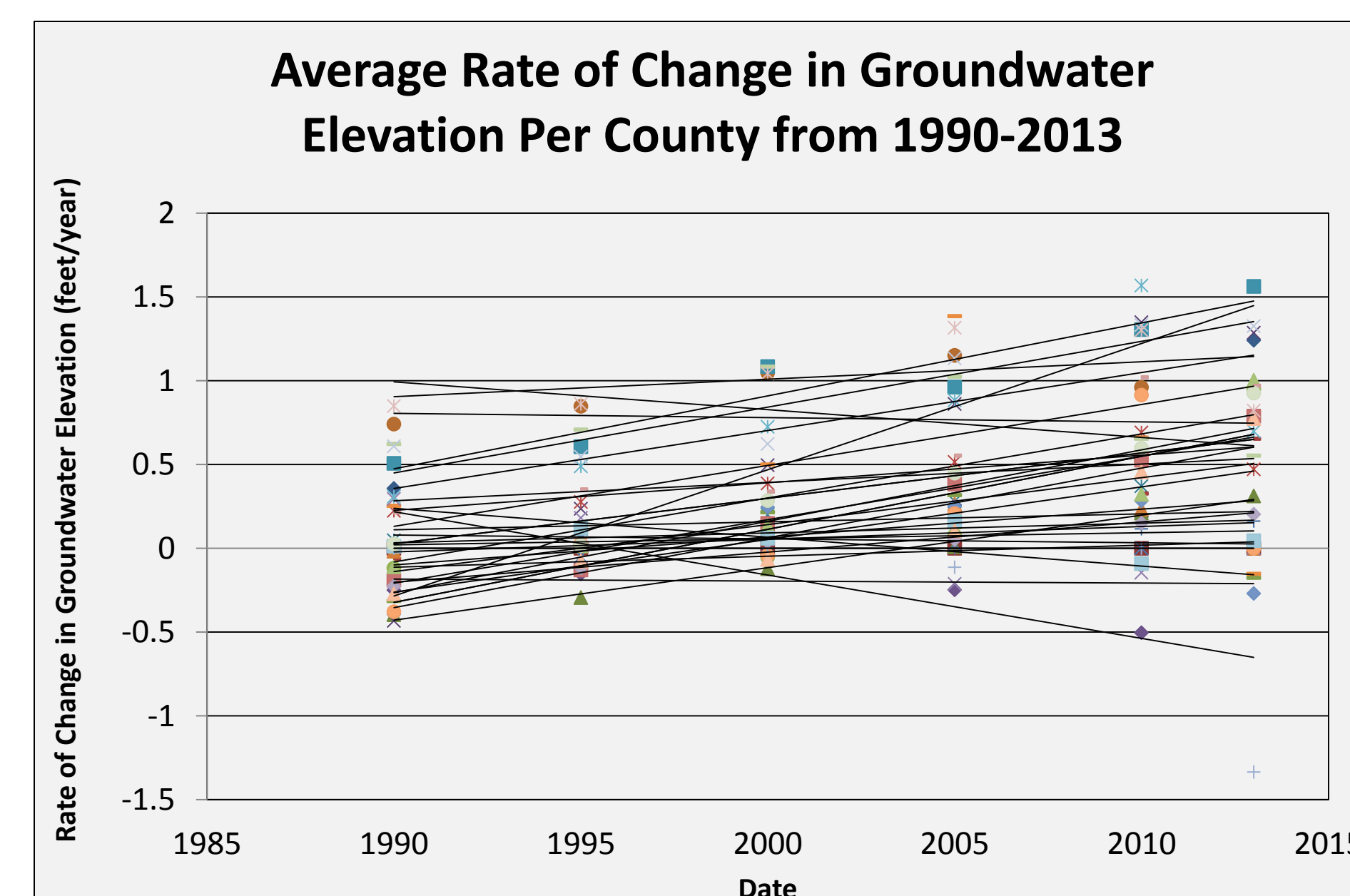


Figure 4: Illustrates the average rate of change in groundwater elevation per county. Positive values indicate decrease in groundwater elevation.

Figure 5: Illustrates the rate of change in groundwater elevation as a function of distance to a river. The rate of decreases in groundwater elevation increase with distance from major rivers, because recharge decreases groundwater elevation declines.

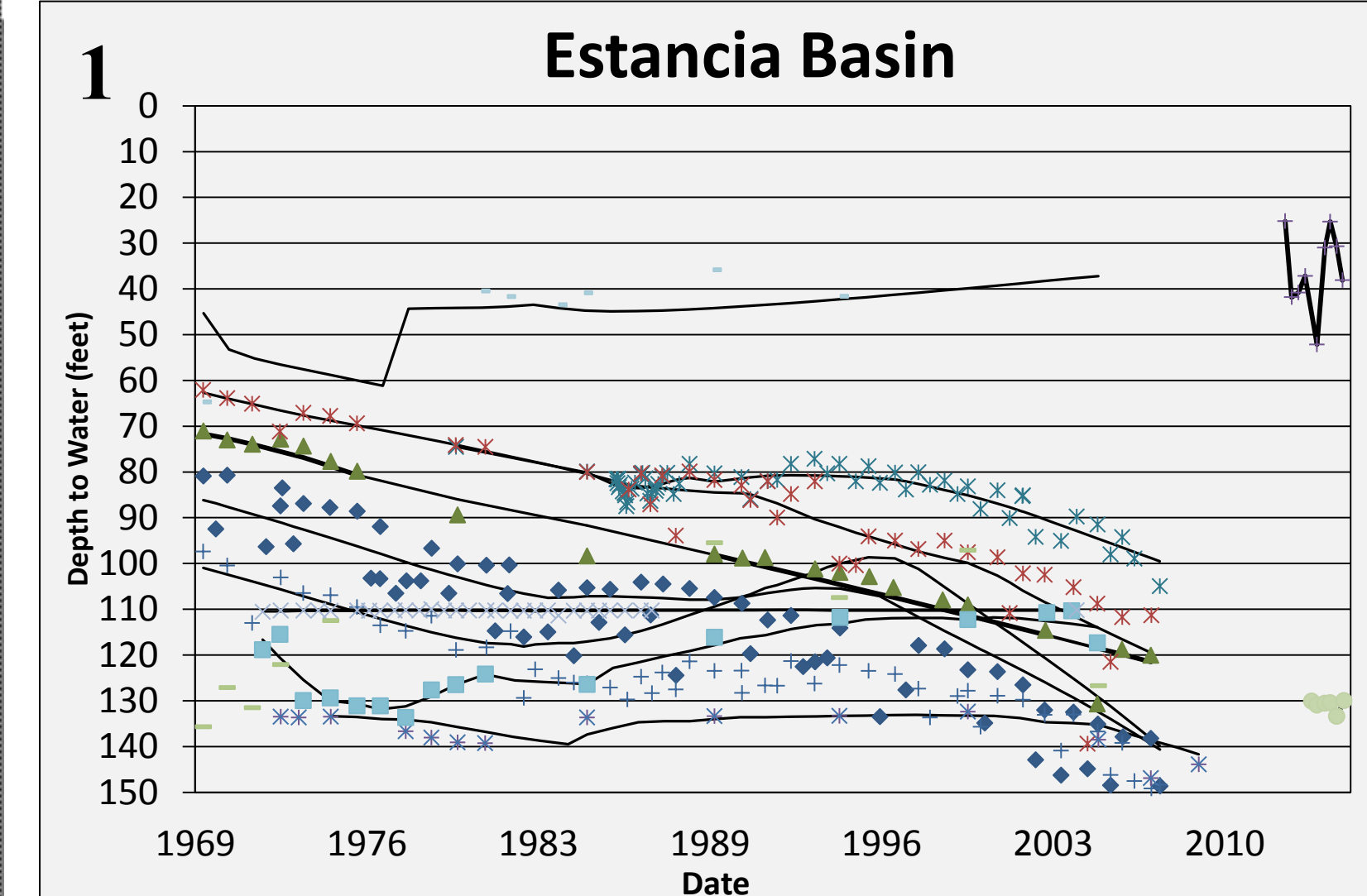


Figure 1: Shows the change in groundwater elevation in the Estancia Basin. Consistent measurements existed up to 2008.

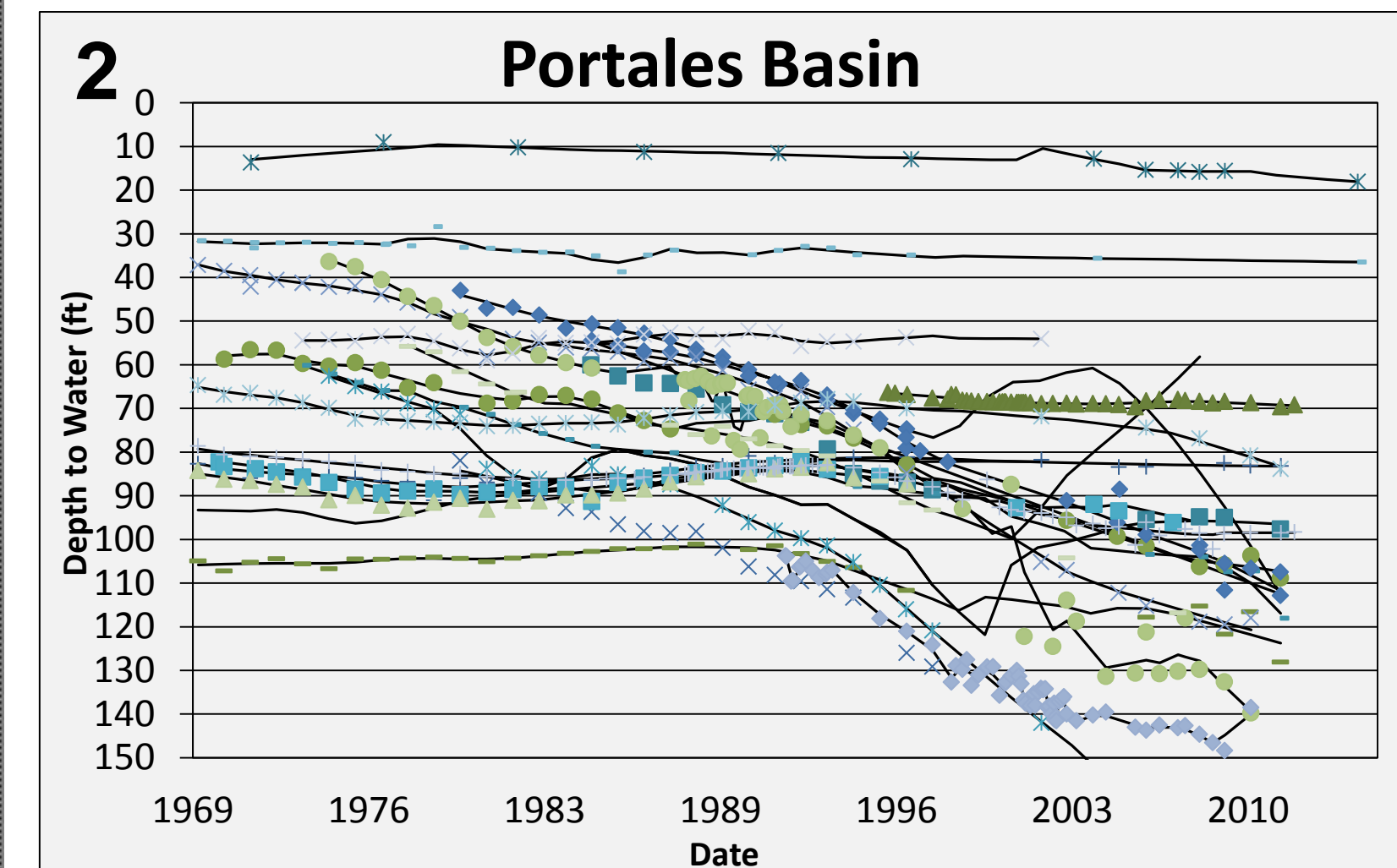


Figure 2: Illustrates the change in groundwater elevation in Portales Basin.

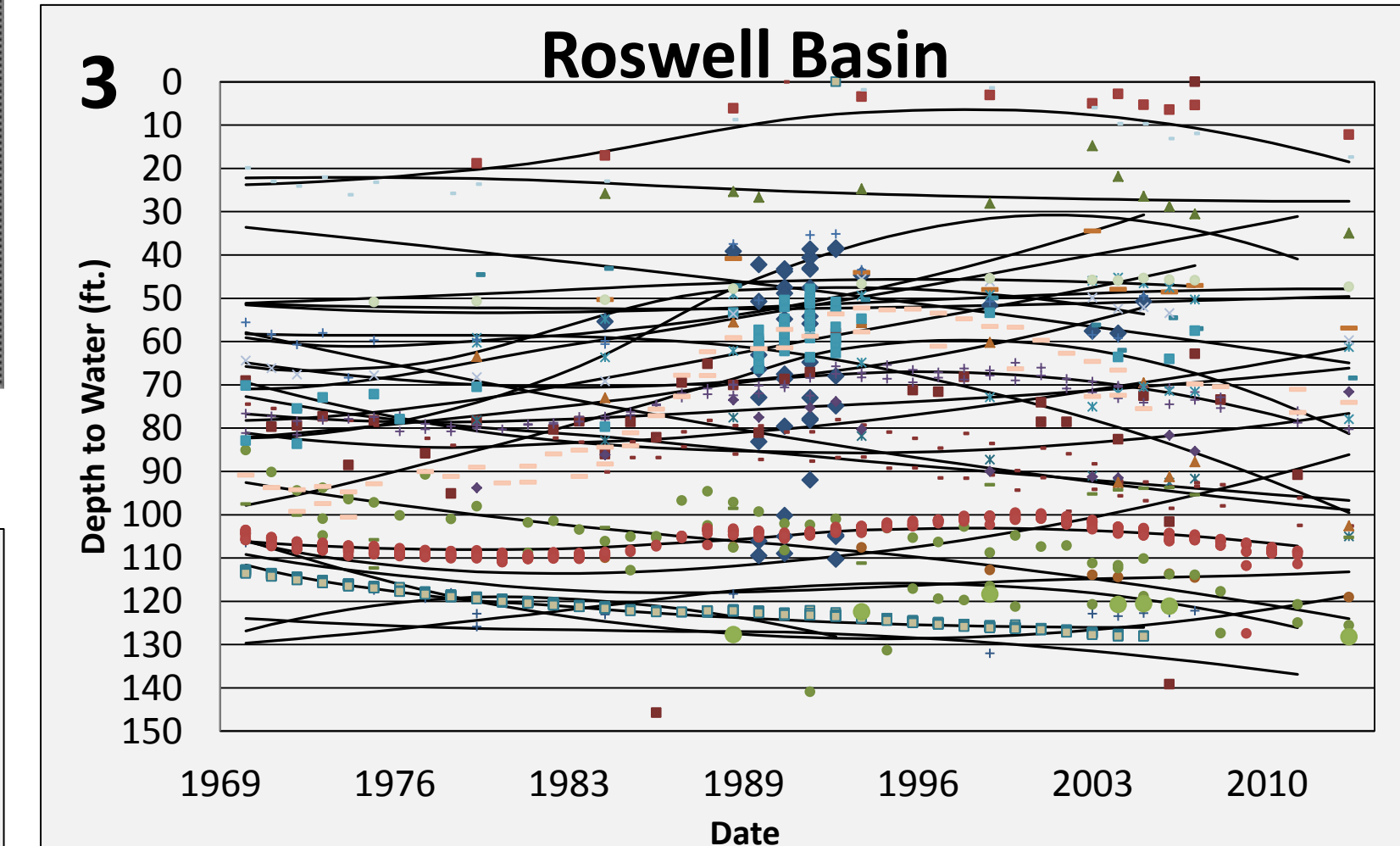
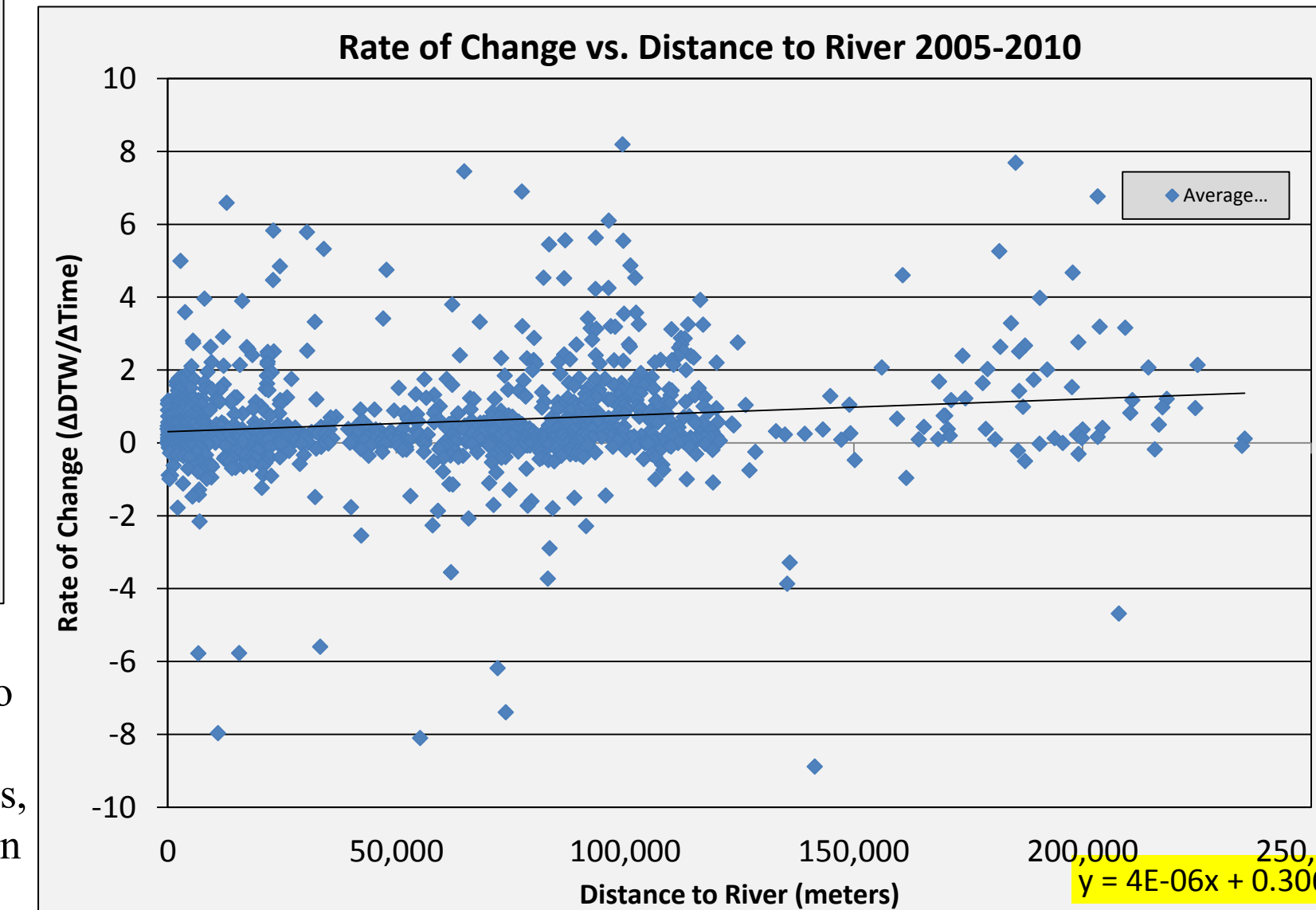


Figure 2: Illustrates the change in groundwater elevation in Roswell Basin.



## Interpretation of Findings

- The rate of change in groundwater elevation is not homogeneous in either time or space.
- There is a correlation between the change in groundwater elevation and distance from the river. Wells closer to the river receive more surface water leading to less pumped from groundwater sources.
- The rate of change in groundwater elevation is relatively linear over time.
- Average rate of change can be used as a linear metric to assess changes in groundwater elevation.

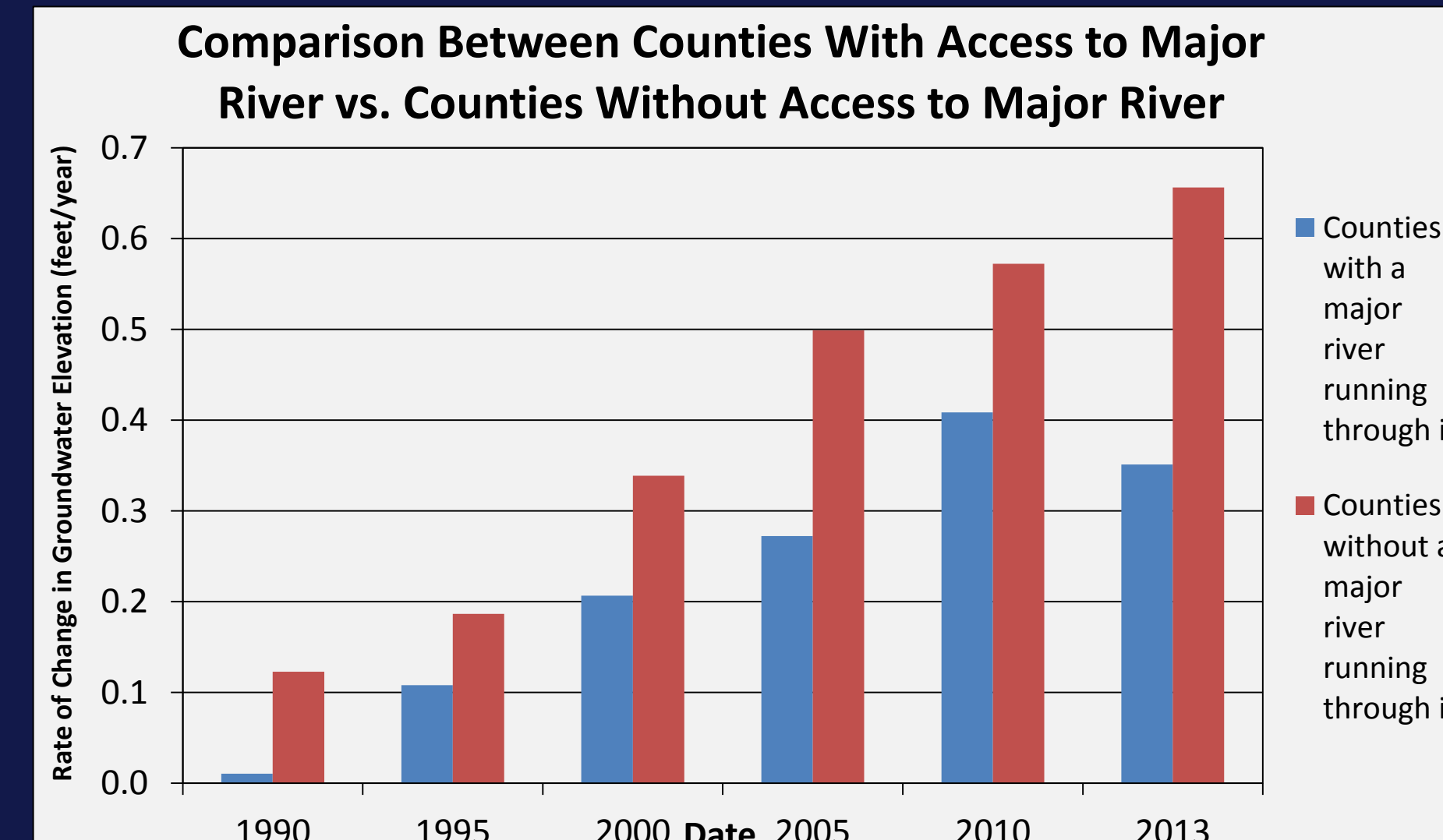


Figure 6: Comparison of the average rate of change per county for counties that have a major river (San Juan, Rio Grande, Pecos) running through it to those without a major river. Larger positive values indicate larger rates of decline in groundwater elevation.

## Recommendations

- Groundwater elevations on average are and have been declining, some locations have negligible declines or even increases, and other locations have larger rates of declines.
- More consistent well monitoring needs to take place over time and space.
- Further resources should be allocated to regions of the state that are experiencing greater rates of change.
- Resources would allow for a more detailed analysis of the hydrogeological characteristics of particular formations.

## Acknowledgements

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