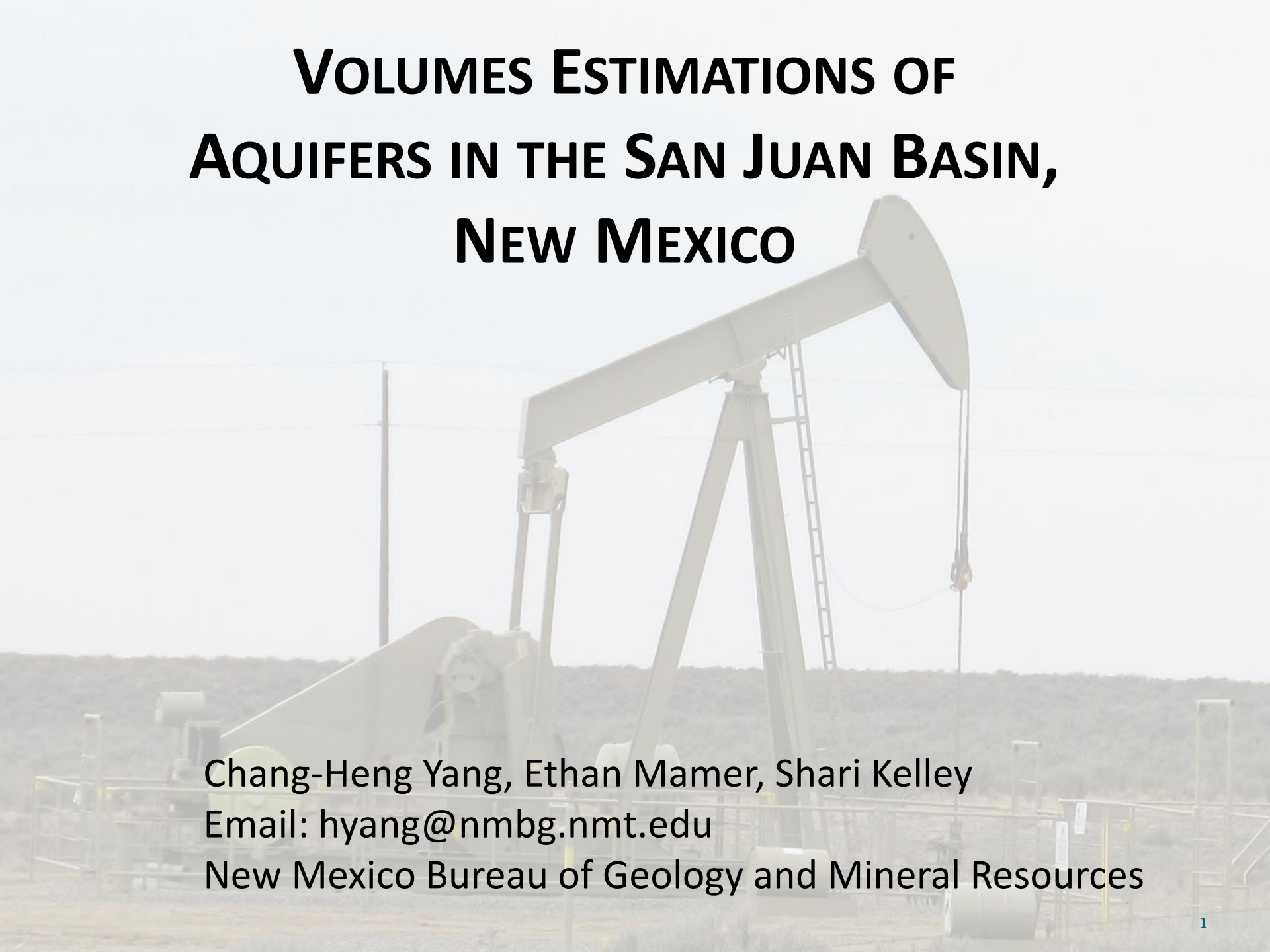


VOLUMES ESTIMATIONS OF AQUIFERS IN THE SAN JUAN BASIN, NEW MEXICO

The background of the slide is a faded, semi-transparent image of an oil pumpjack (jack-o'-lantern) in a desert setting. The pumpjack is the central focus, with its characteristic walking beam and counterweights. The landscape is arid with sparse vegetation and a clear sky. The overall tone is light and professional.

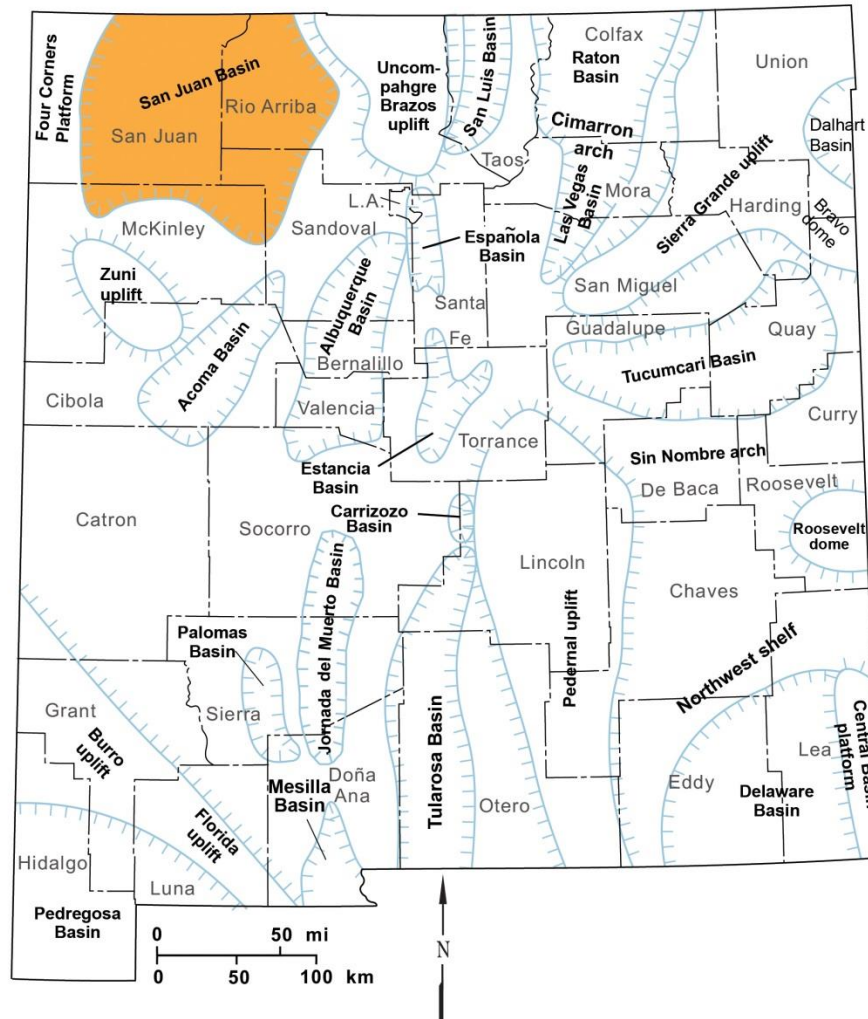
Chang-Heng Yang, Ethan Mamer, Shari Kelley

Email: hyang@nmbg.nmt.edu

New Mexico Bureau of Geology and Mineral Resources

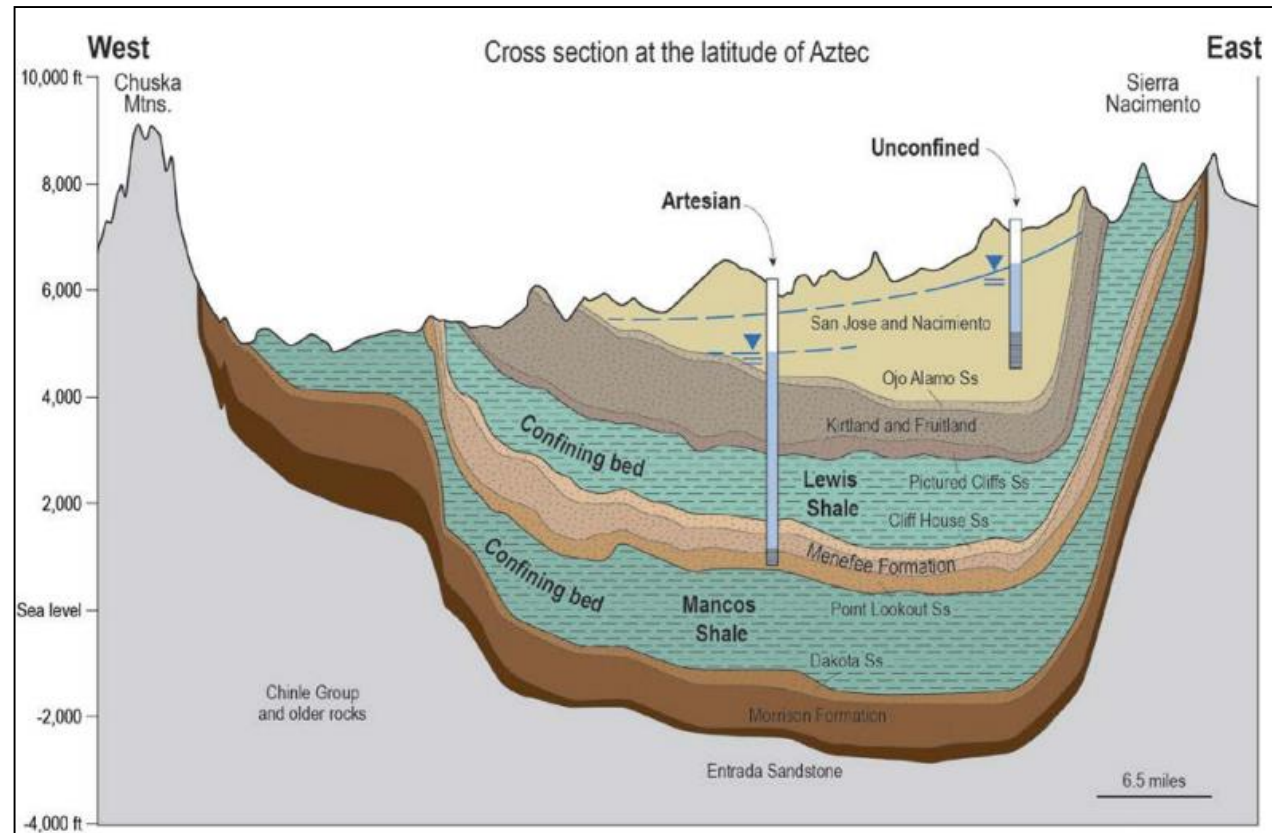
San Juan Basin(New Mexico) Location

2nd largest natural gas field in the United States (U.S. Energy Information Administration, 2010)



The Rock Formations

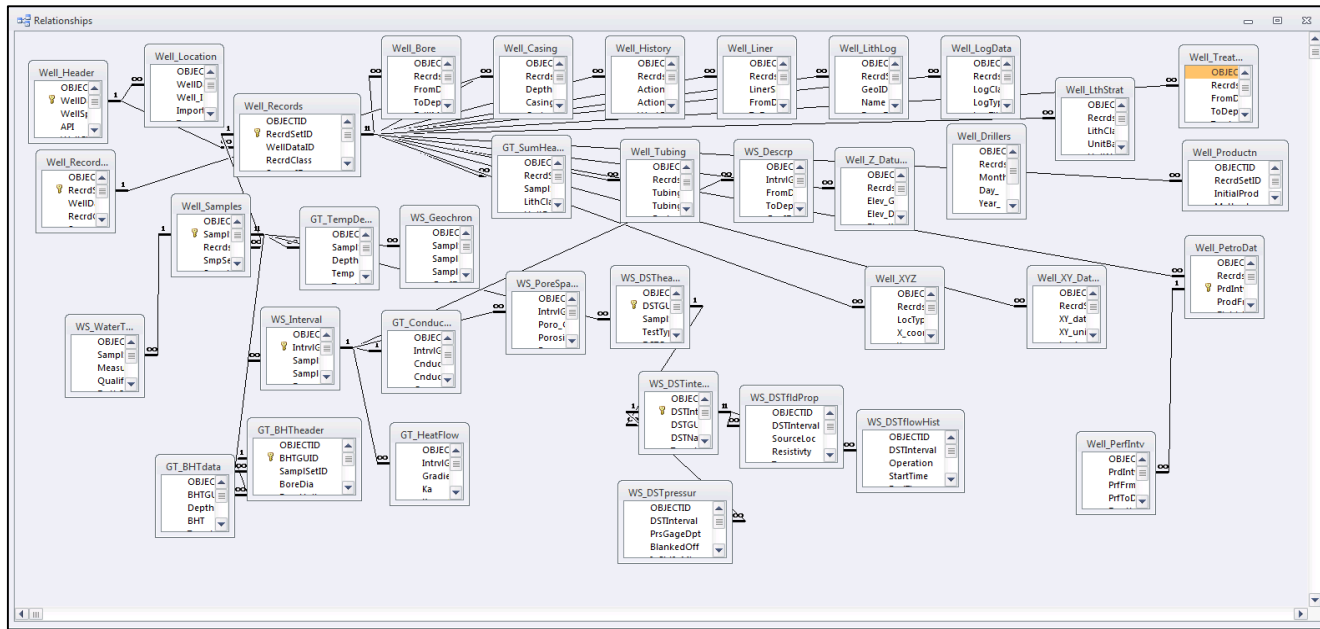
- Ojo Alamo
- Kirtland/Fruitland
- Pictured Cliffs
- Lewis
- Cliff House
- Menefee
- Point Lookout
- Mancos
- Gallup
- Dakota
- Morrison
- Entrada



Blue – Aquifer; Green – Mixed Aquifer + Aquitard; Black: Aquitard

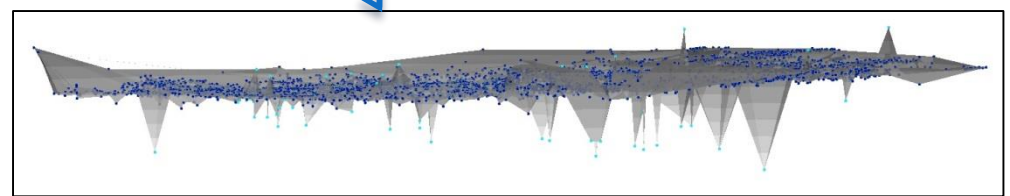
Model Builder

Tables in Access



Feature to 3D By Attribute

GIS 3D data



Triangular Irregular Network

Create TIN

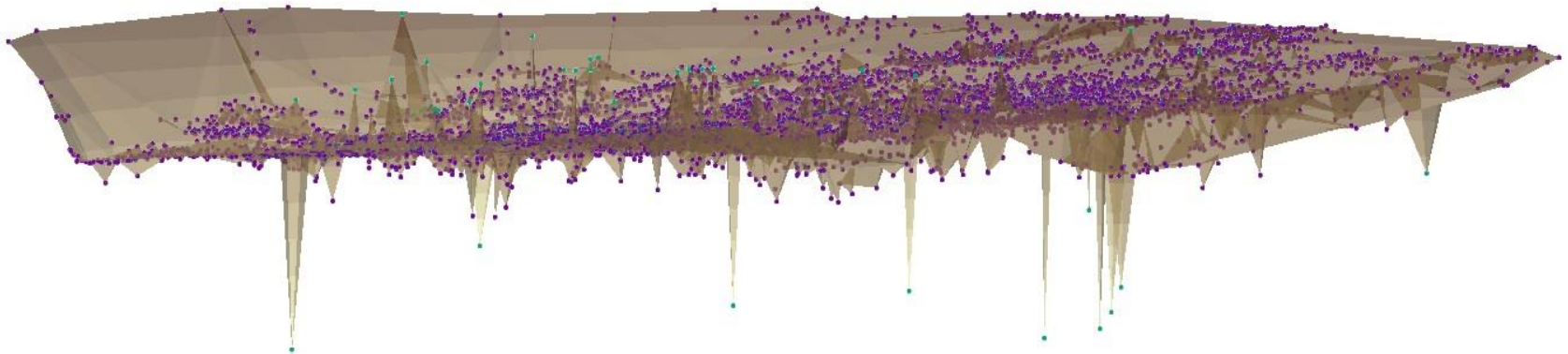
Evaluate outlier



Locate Outliers



Manually
Remove
Outliers



Ojo Alamo Formation Top derived from Scout Cards:

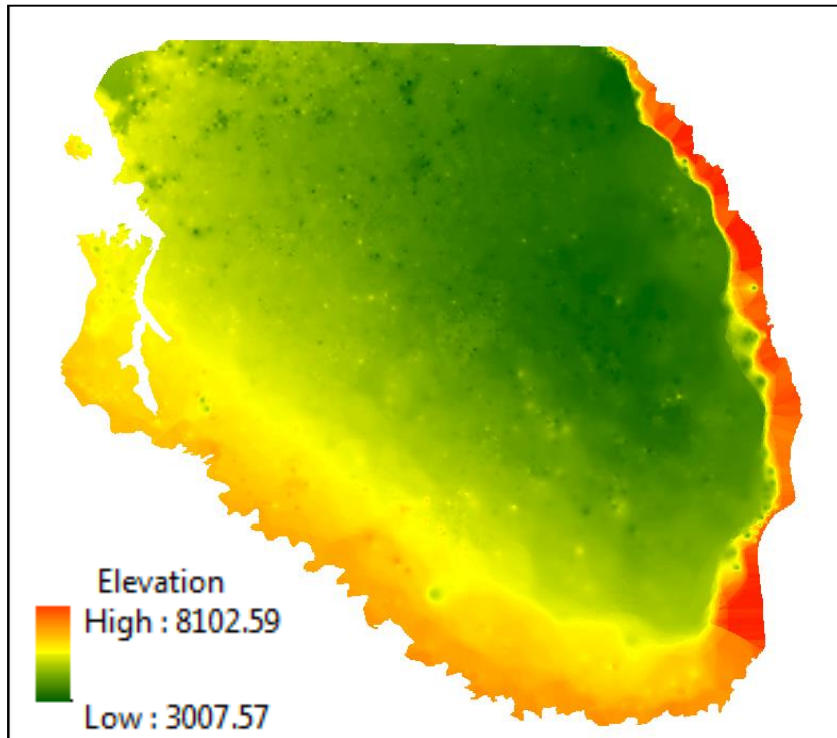
Dark Green points: Peak (above/below the surface)

Purple points: well points

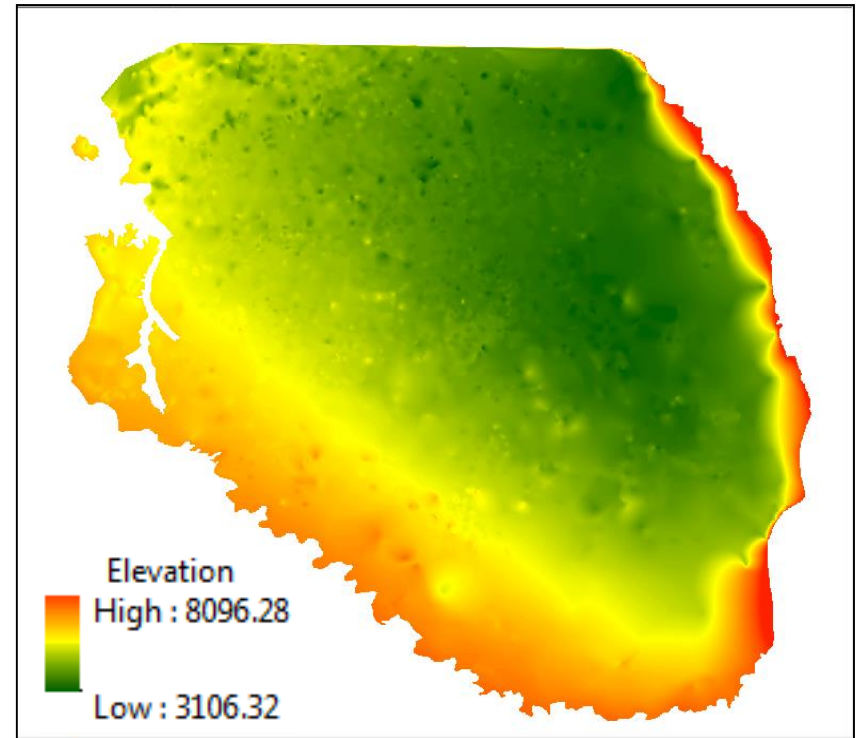
Interpolated Raster Surfaces

Ojo Alamo Formation Top

Inverse Distance Weighted

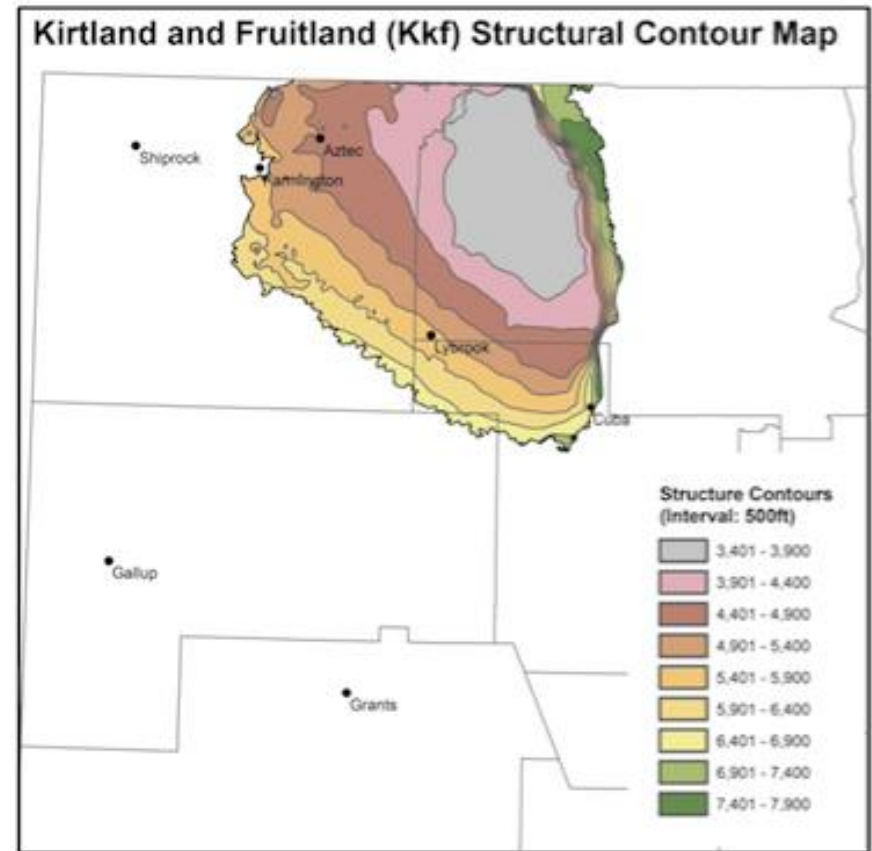
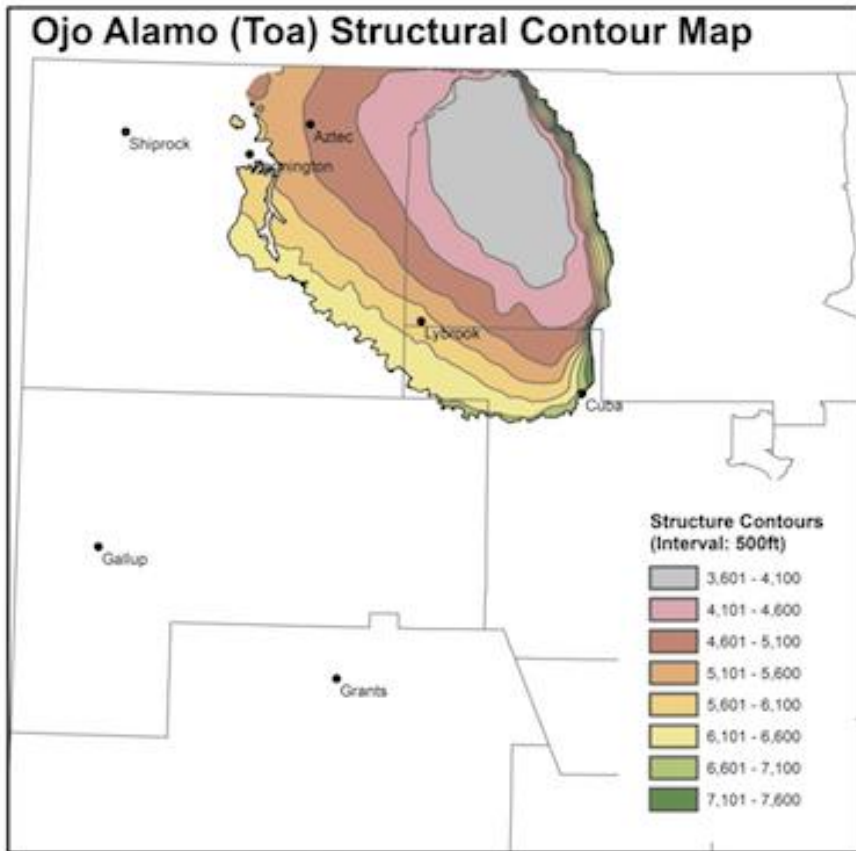


Natural Neighbor



Structural Contour Maps

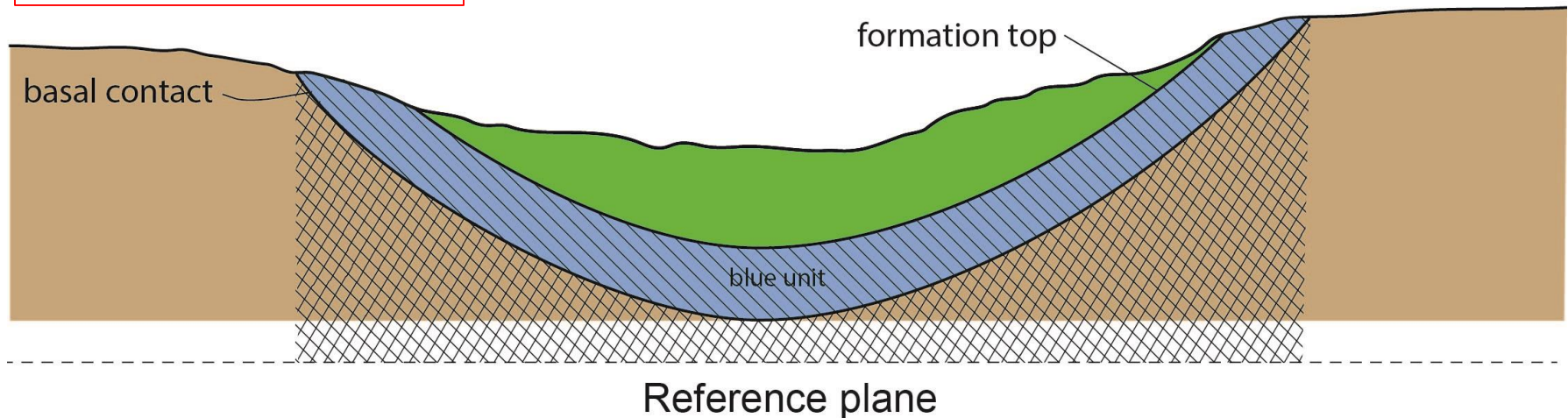
Clean Surfaces



Volume Calculations

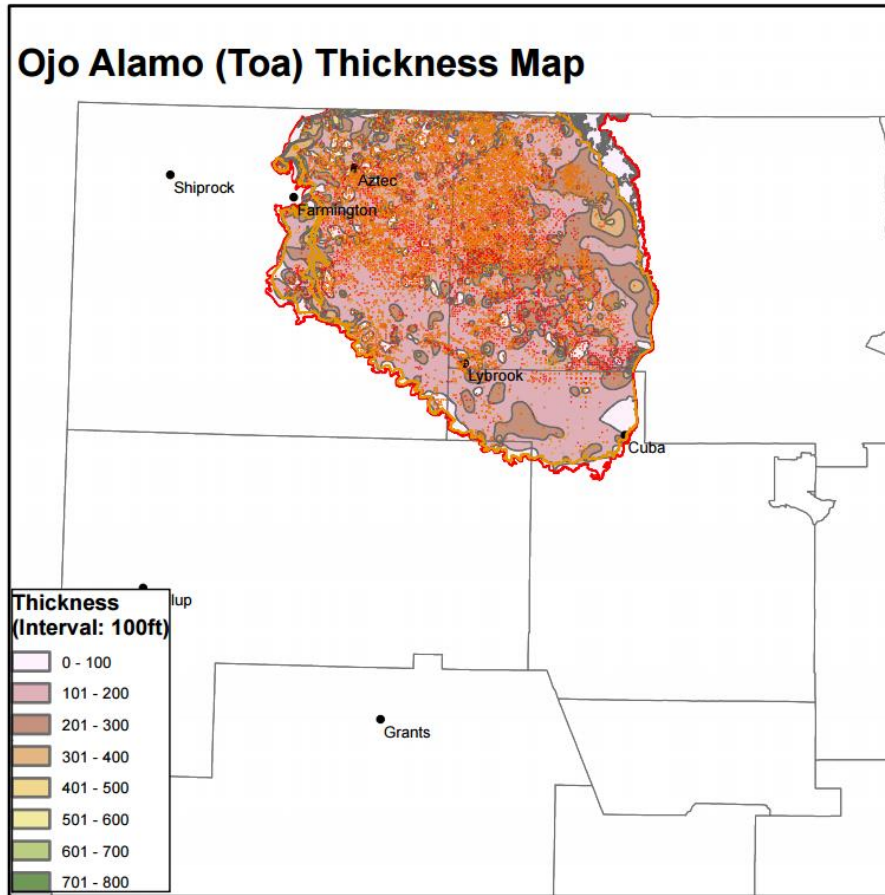
Calculate volume of material
between formation tops

Surface Volume

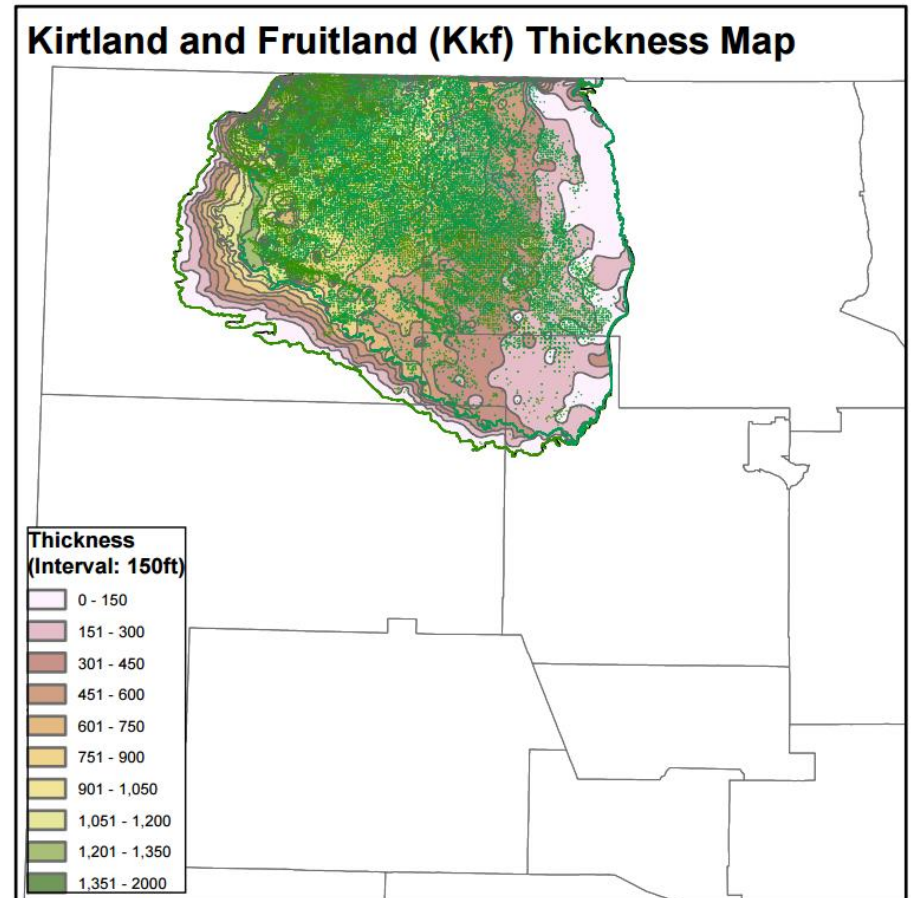


Thickness (Isopach) maps

Ojo Alamo (Toa) Thickness Map



Kirtland and Fruitland (Kkf) Thickness Map



Storage calculation

- For estimated specific storage values of 1.40 to 1.96 x 10⁻⁶ /m, the maximum volume of pre-development water in the shallow portions of confined aquifers <2500 bgs was ~3.25 million acre-ft; this estimate does not include Quaternary aquifers.

Conclusion

- **Model Builder** helps convert the tabular data into GIS format data
- The difference in volumes calculated using the two approaches is on the order of **0.1 to 4%**

Acknowledgement

- Funded by Bureau of Land Management (Farmington office)
- Thanks to the participation, research team and advisors including Dr. Thomas Engler, Martha Cather, Cathryn Pokorny, Gretchen Hoffman, Joe Wilch, Peggy Johnson, and Dr. Kate Zeigler