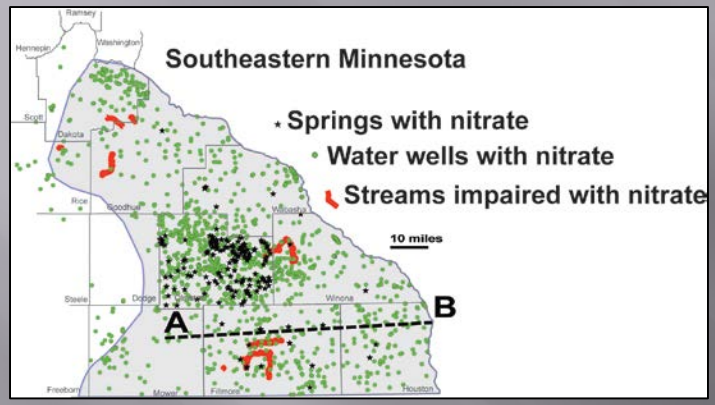
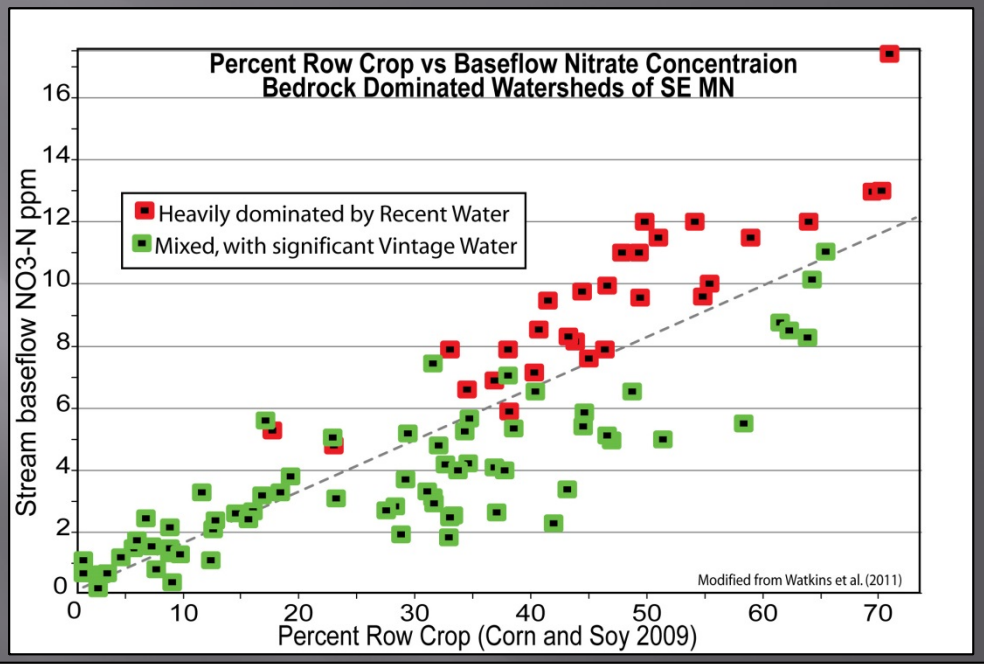
Which Decade Are We Monitoring?
The effect of groundwater lag time on tracking agricultural impacts

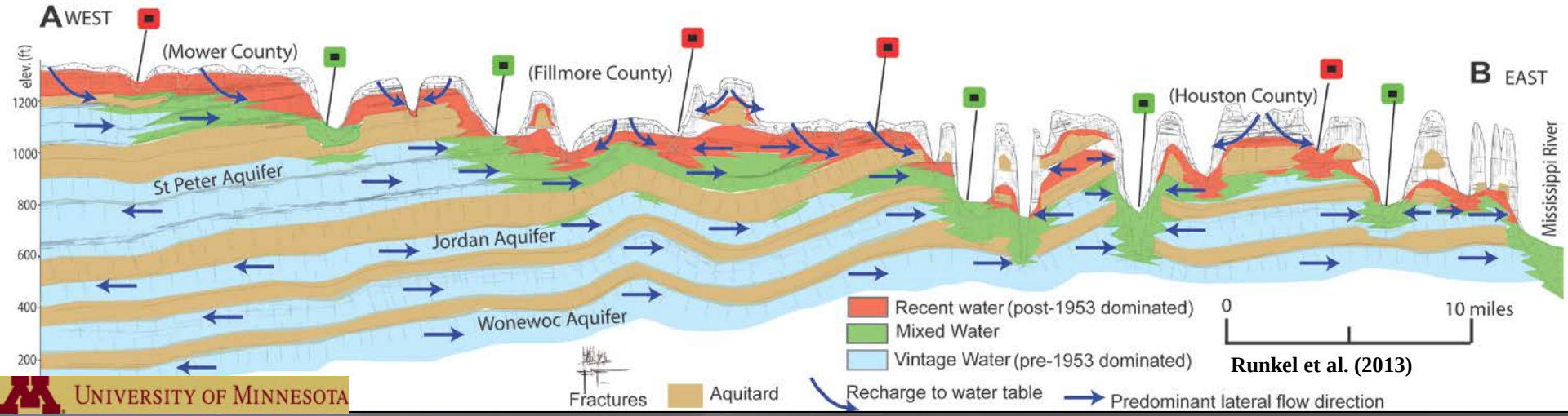
Anthony Runkel, Robert Tipping, Julia Steenberg, Andrew Retzler, Minnesota Geological Survey

Take Aways:

- **The average age of groundwater is highly variable even locally**
- **A significant "lag time" is associated with older water**
- **Much of what we sample may reflect land surface conditions of decades ago.**



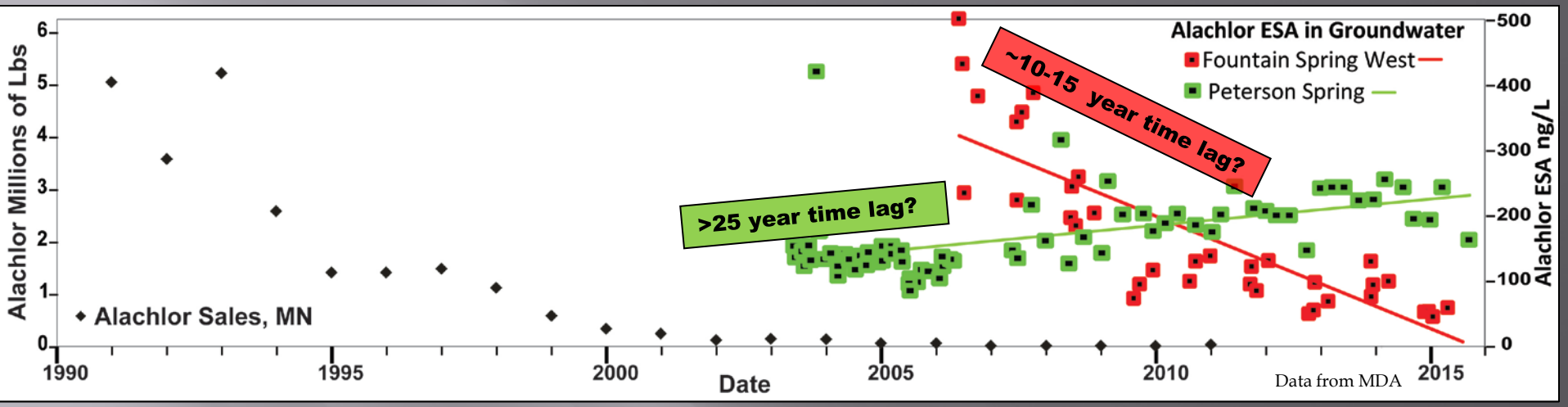


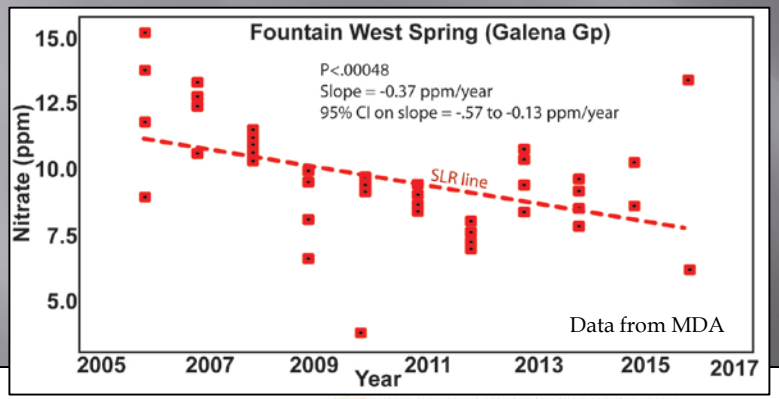


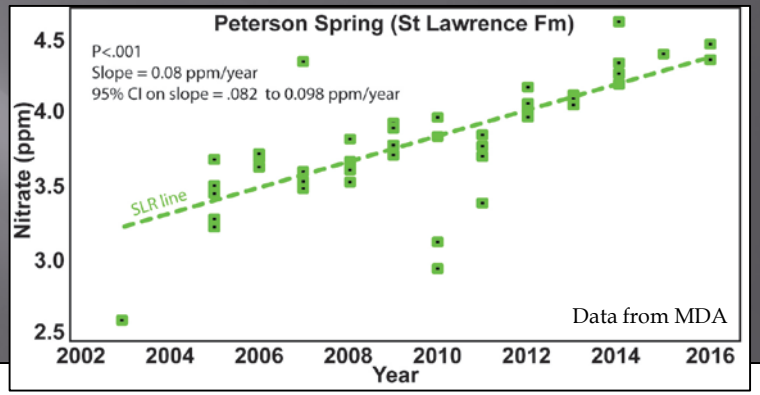
Runkel et al. (2013)

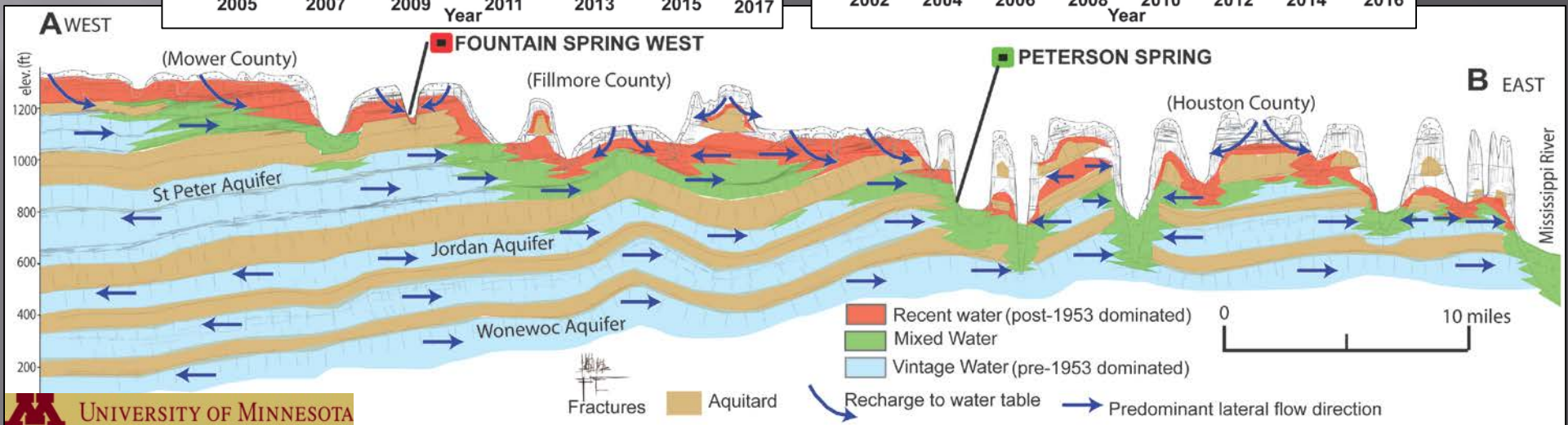
UNIVERSITY OF MINNESOTA

VARIABLE TRENDS AND LAG TIME: NITRATE AND PESTICIDES, SPRING WATER

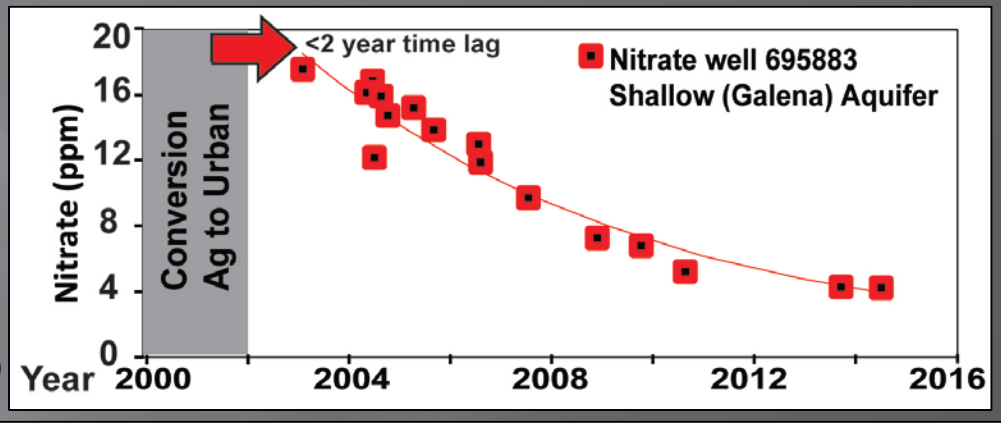




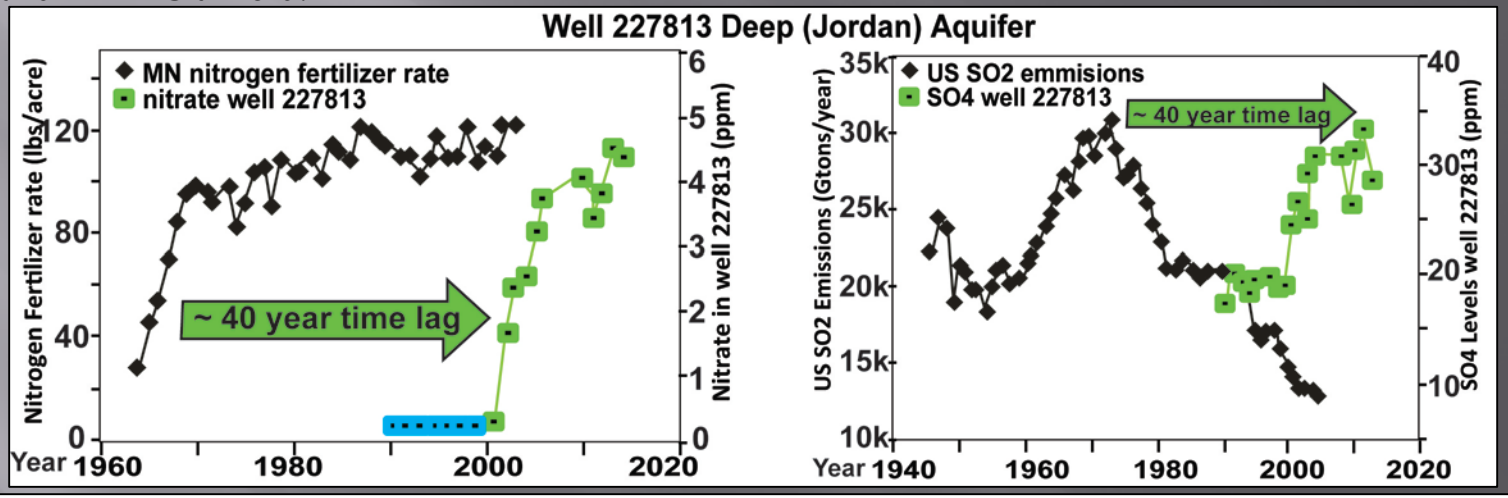


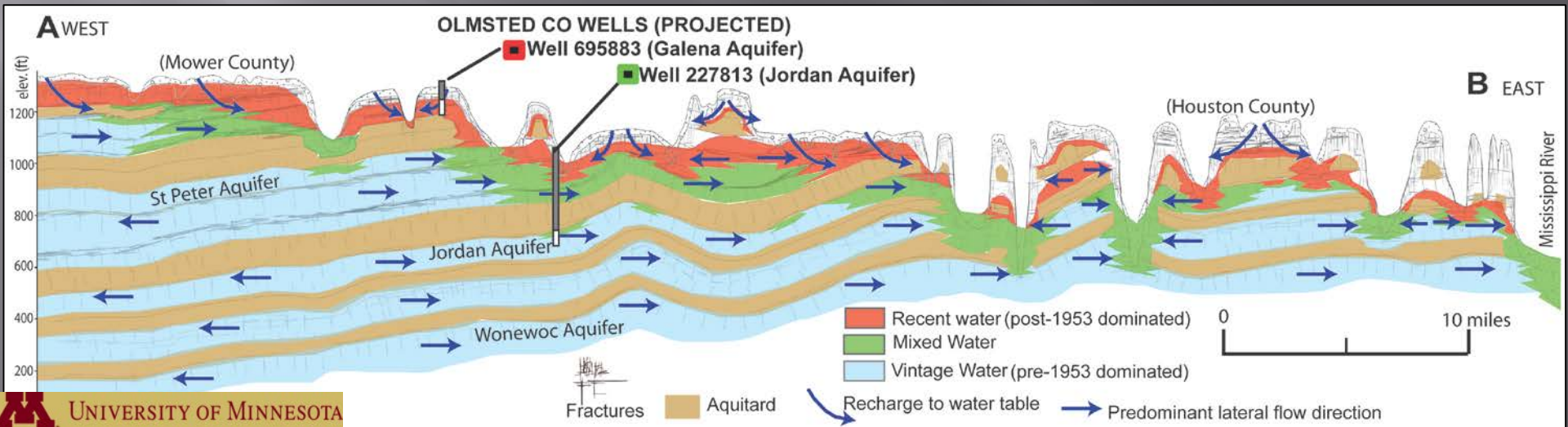


VARIABLE LAG TIME IN NITRATE AND SULFATE TRENDS IN WELL WATER
(Rochester area, Olmsted Co.)



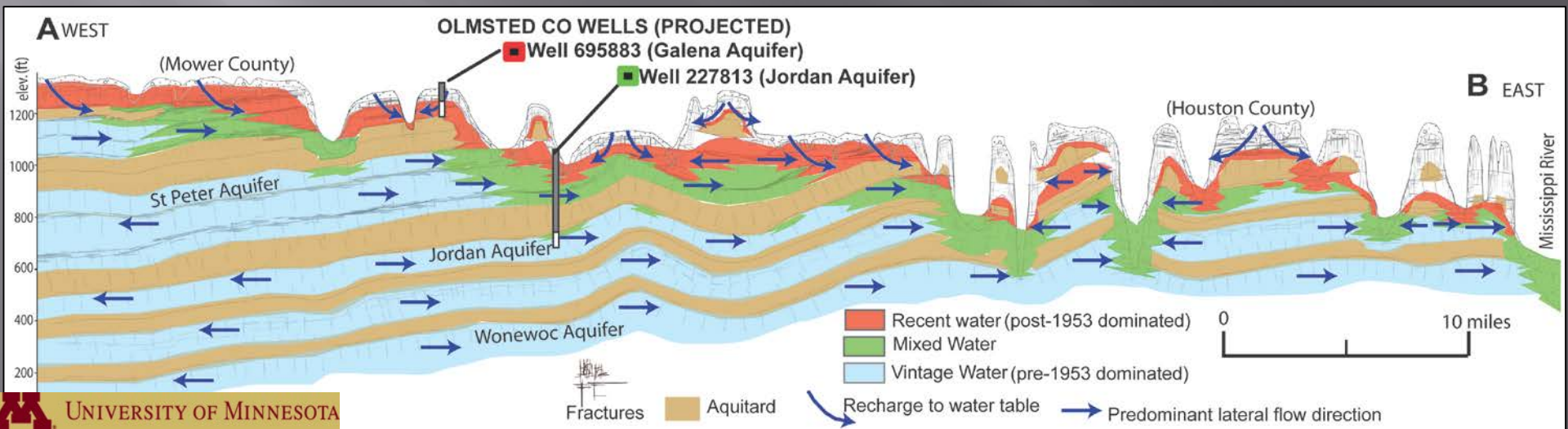
From Terry Lee (Olmsted County) and Kimm Crawford.





Conclusions/Recommendations

- **Much of what we sample may reflect land surface conditions of decades ago.**
- **If we want to track the effect of recent changes in Ag practices…**

  We NEED more SHALLOW (RECENT DOMINATED) water monitoring.

- **Come along to discuss all of this on our North Central GSA field trip in SE MN on April 14, 15!!!!**