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# TRENDS IN GROUNDWATER LEVELS AND CHLORIDE CONCENTRATION IN MCHENRY COUNTY

A comparison of a 1979 groundwater network to the  
current groundwater network

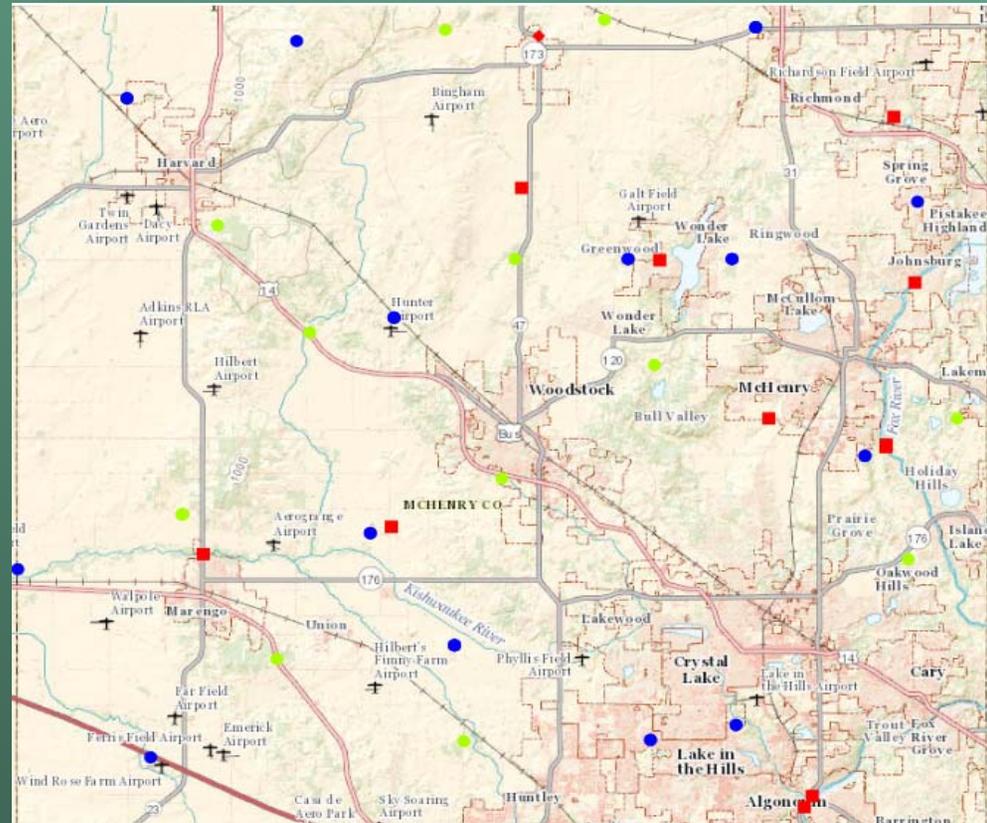


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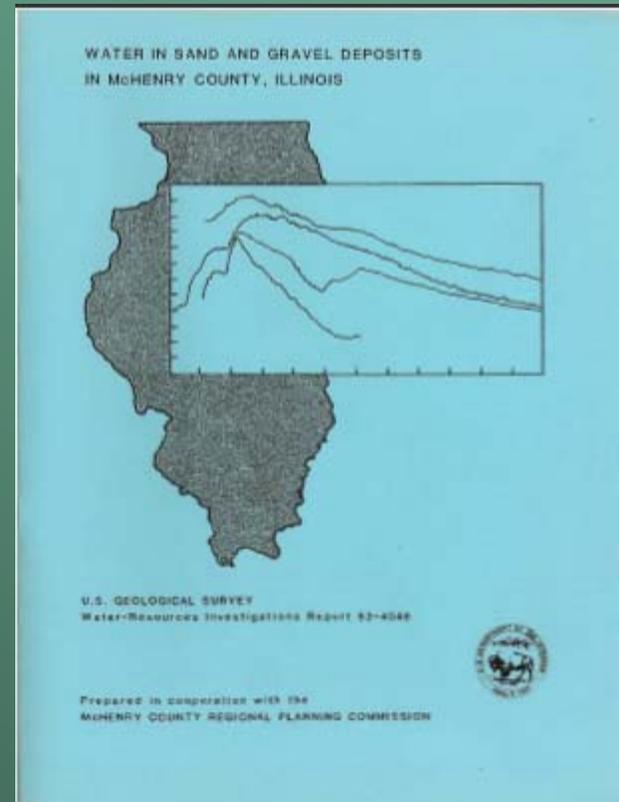
# McHenry County



- Uses the shallow aquifer as a primary source of water.
- Have historic and current concerns about their aquifer quantity and quality.
- To address these concerns, McHenry County worked with various state and federal agencies to install a real-time, continuous groundwater monitoring network.
- USGS maintains and operates this monitoring system.



- A previous USGS Water-Investigation report had assessed the sand and gravel aquifer water quality and recorded groundwater elevation:
  - Nicholas, J.R. and Krohelski, J.T., 1984, Water in Sand and Gravel Deposits in McHenry County, Illinois, U.S. Geological Survey Water-Resources Investigations Report 83-4048
- The 1979 data is compared to the current well network to assess changes in groundwater quantity and quality.



## 1979 Data

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- 25 residential wells were sampled at least once and analyzed for major ions and nutrients.
  - Specific conductance
  - Chlorides
  - Nitrates
  - Ammonia
  - TDS
- 131 data points of water level
  - Water level
  - Specific conductance

## 2010 Data

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- Data from 51 monitoring wells were compared
  - Chlorides
  - Water level
  - others...(not presented)

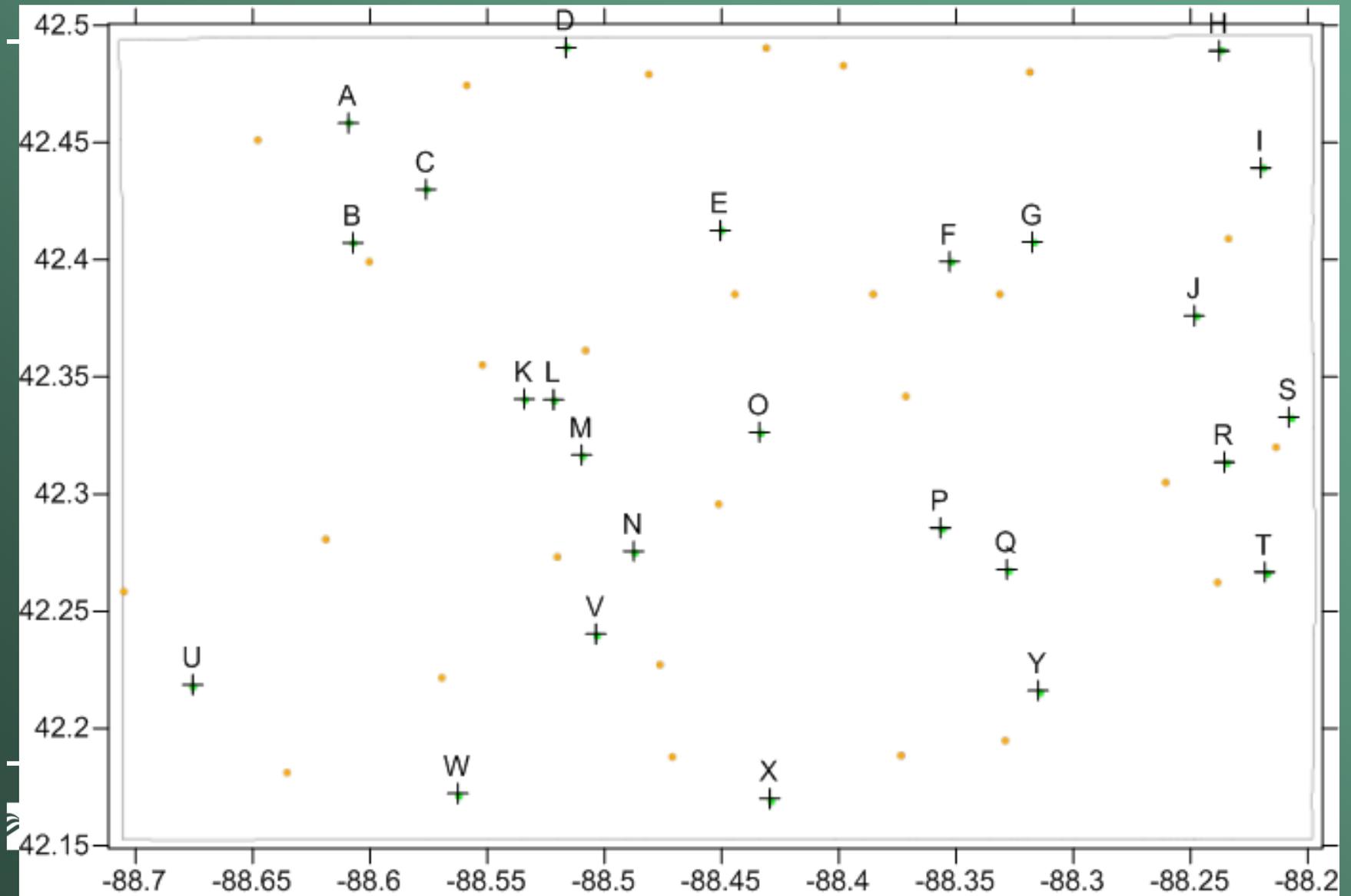
# Disclaimer

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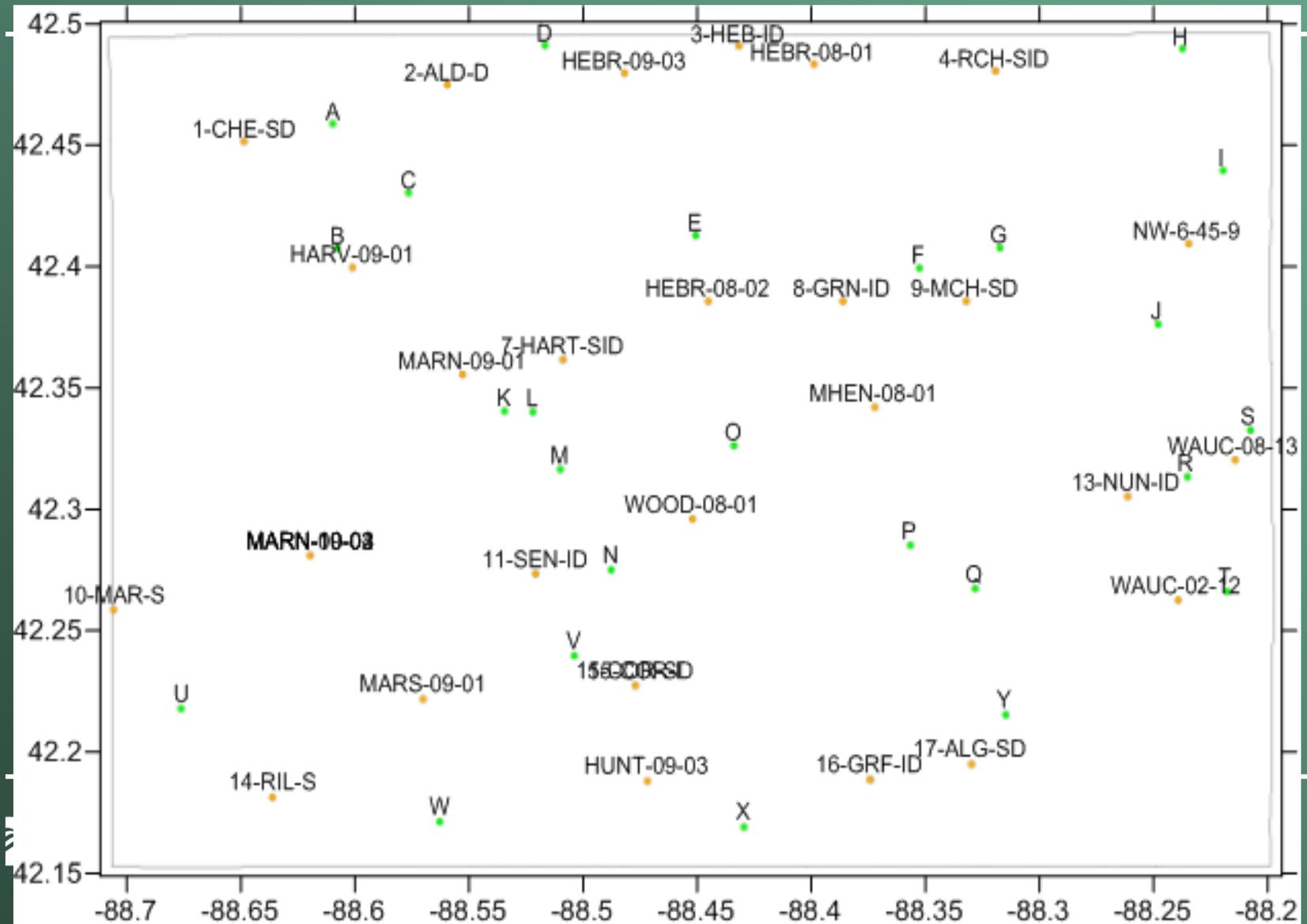
- Understandably, well construction and sampling methods are different in each type of well.
  - Residential wells are sampled from an outside spigot and are designed for maximum flow into the well (i.e. large screen intervals).
  - Monitoring wells have only 5 ft screen intervals and are sampled directly within that screen interval. This may have an impact on the accuracy of this comparison.

The USGS is planning to resample the residential wells within the next month to confirm any changes and verify the results of this dataset comparison study.

# 1979 Residential Well Network



# Spatial Comparison of 1979 and 2010 data



# Groundwater Elevation Data Comparison

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## 1979 Data (April)

- Groundwater elevation data available for 131 wells

## 2010 Data (September)

- Groundwater elevation available for 51 wells

1979 Data		2010 Data	
Geometric Mean	825.13	Geometric Mean	823.27
max	1011.00	max	956.49
min	733.00	min	736.34
median	835.50	median	837.96

P(T<=t) two-tail	0.801754396
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No statistical difference

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\*\*Well construction in residential wells and monitoring wells is typically different.

# Water Quality Data

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## 1979 Data

- 25 residential wells were sampled at least once and analyzed for major ions and nutrients.
  - Specific conductance
  - Chlorides
  - Nitrates
  - Ammonia
  - TDS
  - Water level
  - ...etc.

## 2010 Data

- Data from 49 monitoring wells
  - Chlorides
  - others...(not presented)

# Statistical Analysis of Chloride Data

## 1979

### ■ 25 wells

Geometric mean	5.40
Average	11.74
Max	60.00
Min	1.00
Median	5.20

P(T<=t) two-tail	5.49001E-06
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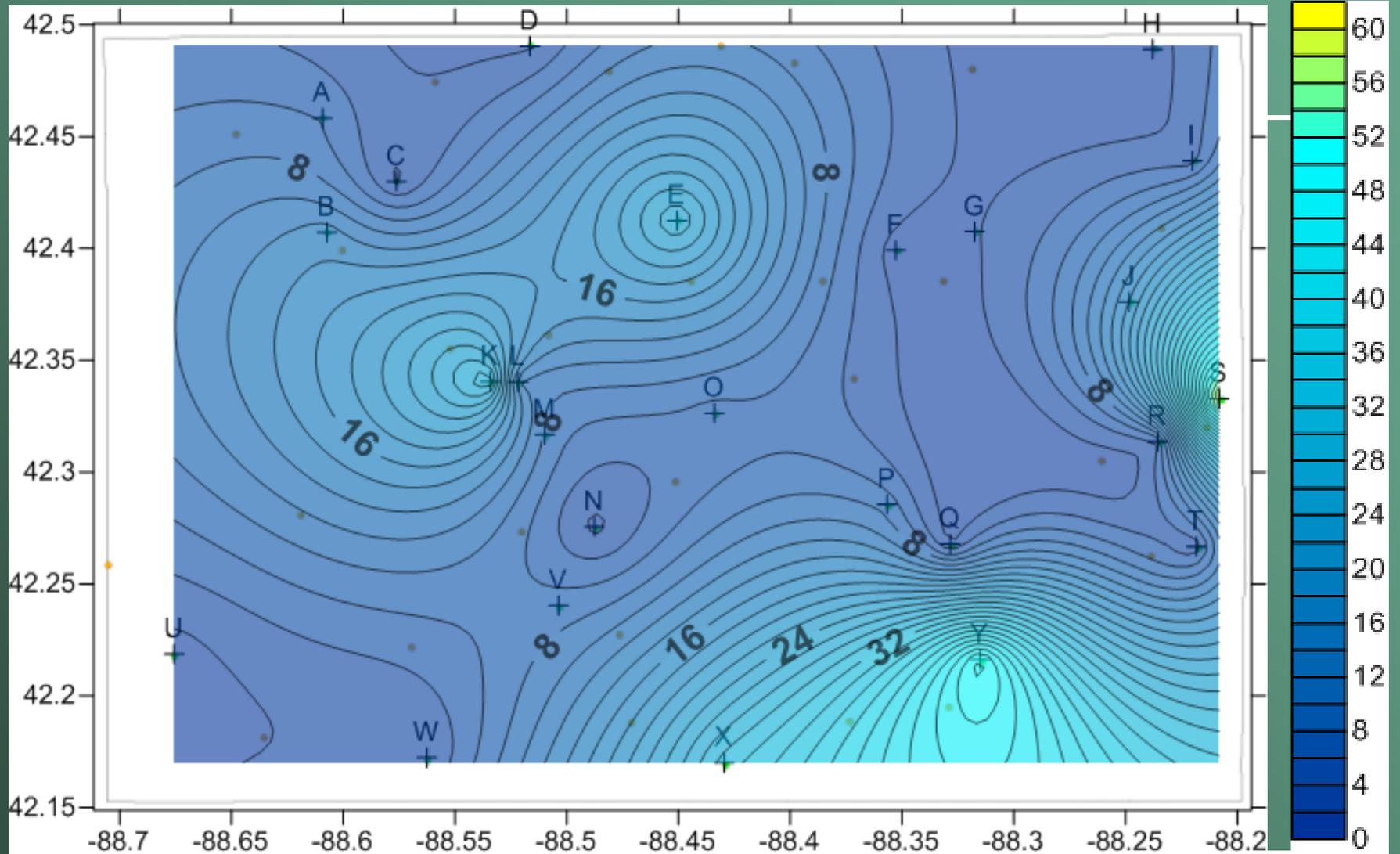
## 2010

### ■ 49 wells

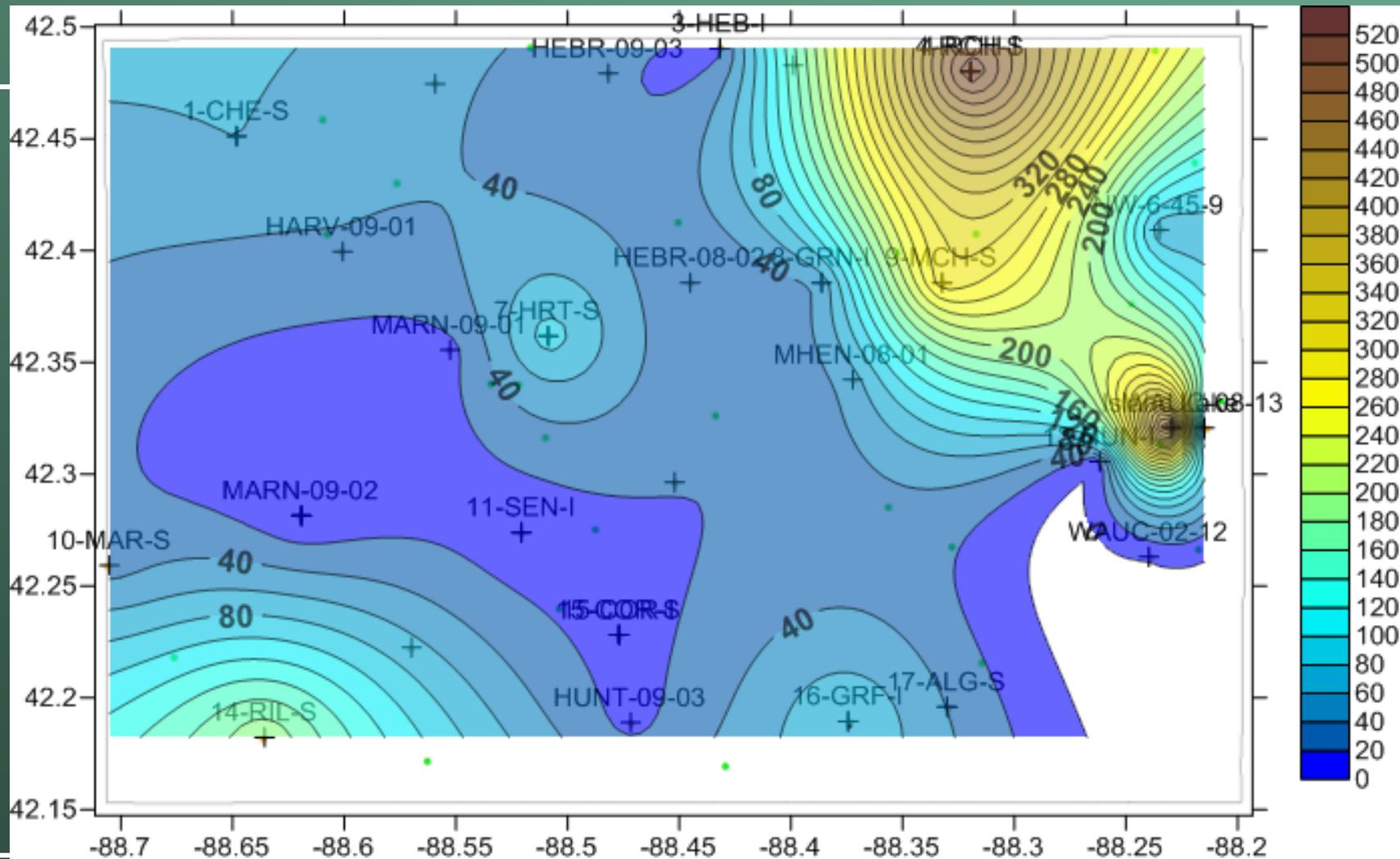
Geometric mean	27.55
Average	113.69
Max	610
Min	0.49
Median	36.7

Statistically significant difference in chloride concentration

# 1979 Chloride



# 2010 Chloride



\*Shallow and intermediate data only

# Summary

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- This method seems to indicate that water levels have not changed significantly over time. However, wells in specific areas may have changed.
- \*But need to go back to original wells and verify
  - Residential well construction and sampling methods are different than monitoring wells.

Chloride concentrations have had significant increases (concentrations are 5X greater than in 1979)

- The USGS is planning to sample the same residential wells for the same analytes to verify any changes in the groundwater elevation and water quality.