Outline

• Synoptic study details
  – Snapshot of conditions during 3rd week of October
  – IDWR Fall measurements: 2016, 2017

• 2018 Synoptic Results

• Primary source of water is snowpack
2006 Synoptic

- 98 wells
- 23 Oct - 27 Oct
- Within model boundary: 93
2012 Synoptic

- 102 wells
- 22 Oct - 26 Oct
- Measured in 2006 and 2012: 92
- Within model boundary: 94
2018 Synoptic

- 105 wells
- 22 Oct – 26 Oct
- Measured in 2018 & 2006: 79
- Measured in 2018 & 2012: 83
- Within model boundary: 100
2018 Synoptic Results

Map notes:
- X – Well levels above land surface
- O – Well levels below land surface
- Negative is flowing

Levels:
- Most deeper wells are in upper portion of the triangle
2018 vs. 2017

- Water level differences
  - X – 2018 deeper than 2017
  - O – 2018 shallower than 2017
  - Negative means 2018 levels are lower
- Levels are lower on average in 2018 relative to 2017
2017 vs. 2016

- Water level differences
  - X – 2017 deeper than 2016
  - O – 2017 shallower than 2016
  - Negative means 2017 values are lower

- Levels are higher on average in 2017 relative to 2016
All synoptic data

- Visualize with boxplots

- Key:
  - Q1: 1\textsuperscript{st} quartile, 25\textsuperscript{th} percentile
  - Median: 50\textsuperscript{th} percentile
  - Q3: 3\textsuperscript{rd} quartile, 75\textsuperscript{th} percentile
  - IQR: Inner-quartile range, Q3 – Q1
  - Whiskers: Extend beyond the 1\textsuperscript{st} and 3\textsuperscript{rd} quartiles by 1.5 times the IQR
  - Circles: Outliers
All synoptic data

- Median changes +/- 20 ft from 2006 – 2018
  - Function of selected wells?
- IQR relatively stable from 2006 – 2018
- Varies with total annual snowpack
Synoptic Well Selection

- IDWR well measurements biased against N-Central region
- Greater proportion of wells measured in southern valley in 2016, 2017
Groundwater level variation is due to snowmelt
Snowpack data

- 5 SNOTEL stations
- Snow Water Equivalent (SWE)

\[ SWE = \text{Snow depth} \times \text{Snow density (percent)} \]
Galena Summit

- Water years 1982-2018 mean
  - 23.2 inches
- 19 higher than average years
- 18 lower than average years
Streamflow tracks snowpack
Groundwater levels track snowpack.
Synoptics and SWE

- Years: 2006, 2012, 2018
- 2006 SWE is high
- SWE low in 2012 and 2018
- Declining trend
Synoptics and SWE

- What if we had started in 2005?
- Low SWE in 2005, increases in 2011 and 2017
- Increasing trend
- Useful data for model calibration
Conclusions

• Mean water level depth raises ~6 ft in 2017, drops ~4 ft in 2018
• Aquifer levels dependent on prior winter snowpack
• Synoptic data useful for model calibration