GW Analysis December 2022

**Data Used: MBMG Extracted**

* Daily Average Data 1970s to September 2022
* Raw Data till 10/17/2017
* Merged both files stated above for a final dataset used in this analysis

**Grouped Data By**

* Created season bins
  + Spring = April, May, June
  + Summer = July, August, September
  + Fall = October, November, December
  + Winter = January, February, March
* Created Time-Period Bins for time-series analysis
  + **We created the bins to be 4 years instead of 3 or 5 years because we needed 205% of the data to span across three time-period bins. A 10-year requirement was set so 5 was too many years per bin and 3 was too much**
  + Prior to 2000
  + 2000-2003
  + 2004-2007
  + 2008-2011
  + 2012-2015
  + 2016-2019
  + 2020-2022 (current)

**Creation of Sample Size**

* No filters applied
  + n = 612 wells
* Set a length of study requirement
  + **10** years of data across 2000 to 2022
    - **We chose 10 years as our requirement since we wanted to be able to have data that spanned a decent amount of time to compare changes instead of 8 or 9 years.**
    - n = 172 wells
* Set number of observation requirement
  + **8** observations over 1 year with **1.75** observations per season
    - n = 67 wells
    - We chose to select 8 observations per year per 1.75 per season to create a sample that had sound data for each season and year to make the comparison more precise
      * **We changed the number of observations to see what our sample size would be. 10 and 9 observations was too high that we thought we wouldn’t see spatially well and 7 was too loose where we thought the comparison would not be precise**
      * Table of Comparisons

|  |  |  |
| --- | --- | --- |
| **Year Observations** | **Season Observations** | **Sample Size** |
| 10 | 2 | 34 |
| 10 | 1.5 | 37 |
| 10 | 1 | 38 |
| 9 | 2 | 45 |
| 9 | 1.5 | 55 |
| 8 | 2 | 54 |
| **8** | **1.75** | **67** |
| 8 | 1.5 | 77 |
| 7 | 2 | 54 |
| 7 | 1.5 | 82 |

**Python Analysis**

* swl\_analysis
  + Created a mean static water level (**swl\_ground)** value across each season for a time-period with the included number of wells that created the mean (**count**)
  + Calculated the difference between the mean swl for a season with the previous entry as a decimal (**change**)
    - Negative value means water level has dropped
    - Positive value means water level has increased
* swl\_season
  + Placed each season in own tab to be able to compare the differences across a single season. Did this in Pro.
* fall, spring, summer, winter
  + Time-Period field was spread out from one column of **time\_period** to have each time-period be its own column where the **mean swl** populates the value for each column
    - This will help calculate the differences better in Arc Pro

**Pro Analysis**

* Imported all dataset and targeted the **season datasets**
* Created a new field for each dataset to compare the percent difference between the mean swl from the time-period 2008-2011 to 2016-2019 since these were the most complete time-periods on record
  + **percent\_diff\_2011\_2019**
    - **percent\_diff =** (latest-earliest)/ earliest \*100
* Created figures for each season by mapping the **percent\_diff\_2011\_2019** field as a graduated color
  + There were 4 bins created to spatially see the data
    - Red = Outside 1 standard deviation negative values
    - Orange = Within 1 standard deviation, negative values
    - Green = Within 1 standard deviation, mean into positive values
    - Blue = Outside 1 standard deviation, positive values