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## Stage 1: Topic and Data

We'll be looking at how water-related land use in Utah counties lying within the Great Salt Lake Basin have contributed to variations in Great Salt Lake (GSL) water levels, as well as stream flows entering the GSL. There are several variables that we need to control for in trying to find a relationship that would warrant a larger study project, so we'll primarily be controlling for weather factors like precipitation and temperature. By controlling for weather factors, as well as other factors, we can isolate correlations between water-related land use and water levels and streamflows. Utah has been the [fastest growing state since 2010](#), and much of this growth comes in counties closely connected to the Great Salt Lake. The GSL has also been facing dangerously low and decreasing water levels over the past several decades. If this trend continues, the economic and environmental consequences to the region would be drastic. Thus, it's important to understand how the changing composition of water-related land use in the Great Salt Lake Basin will impact the health and future of the Great Salt Lake and its surrounding communities. Furthermore, since agriculture is the largest water user in the state of Utah ([it uses about 75% of the state's water supply](#)), it's important to understand the economic consequences of water use in this sector. Here are a couple particular research questions we're interested in:

1. How does water use in different sectors in the Great Salt Lake Basin affect Great Salt Lake water levels?
2. What relationships might exist between agriculture crop yields and water-related land use in the GSL Basin, agricultural water use, and GSL levels/streamflows?

We'll be working with several datasets from a few different sources. Our data covers 1986-2022 since one of our datasets constrains us to those years. 2016 is missing from the water-related land use data, so we'll try to reach out to the appropriate Utah agency to obtain that dataset; otherwise, we'll exclude that year from our analysis. We'll be focusing on counties that lie fully or mostly within the Great Salt Lake Basin. This includes Box Elder, Cache, Davis, Morgan, Rich, Salt Lake, Tooele, Utah, and Weber counties. When possible, we'll focus on the specific sub-basins of the GSL Basin, namely Bear River, Weber River, Jordan River, and West Desert basins. The water-related land use data contain these basins. All datasets contain the relevant locations and time periods within Utah that we're interested in.

1. Great Salt Lake daily water level observations dating back to 1966:  
<https://www.usgs.gov/centers/utah-water-science-center/science/great-salt-lake-elevations#overview>  
The two relevant gauges here are the Saltair Boat Harbor gauge at the South end of the lake, and the gauge near Saline, UT in the North arm of the lake (the lake was essentially

split into two by a railroad in the 1950s, though water levels in both arms of the lake are similar). The gauges measure surface elevation above sea level.

2. Daily observations on streamflows flowing into the Great Salt Lake dating back to 1963 or earlier:

<https://webapps.usgs.gov/gsl/data.html>

Of the 4 streamflow gauges here, we won't be looking at the Farmington Bay outflow gauge, as it does not have much historical data since it was installed in the recent past. Streamflows are measured as discharge in cubic feet per second.

3. Utah weather data: <https://www.ncei.noaa.gov/products/precipitation>

We'll obtain yearly or monthly data for each Utah County primarily on precipitation and temperature. If possible, we'll obtain this data for each sub-basin of the GSL Basin.

4. Yearly water-related land use in Utah by county and water basin for the years 1986-2022, but no data on 2016:

<https://dwre-utahdnr.opendata.arcgis.com/pages/wrlu-data>

These data detail the composition of water-related use for each year, so we'll be able to look at changes in year-to-year land use within the Great Salt Lake Basin. Each observation in a given year contains the acreage of a specific plot of land area as well as a description of the water-related use on that land (for example, crop type, urban use, corn, etc.).

5. Water use records:

[https://waterrights.utah.gov/asp\\_apps/generalWaterUse/WaterUseList.asp](https://waterrights.utah.gov/asp_apps/generalWaterUse/WaterUseList.asp)

We'll want to reach out to the Utah Division of Water Rights to understand how much data this actually includes. It appears that it includes all holders of water rights, present and past, and their annual water use. This water use is broken down by use categories like domestic, commercial, industrial, and institutional.

6. Utah NASS crop data:

<https://quickstats.nass.usda.gov/>

Economic crop data broken down by GSL Basin counties for the years 1972-2017. Each entry indicates the specific type of crop.