INTRODUCTION

*Intro to intro* Throughout the past decade more research has gone into droughts into determining how they will occur (Reference). The severity of a drought and it effect on mankind in the modern world is based on how long the drought is the and how drastic the drought is. ***A summarization of a drought vulnerability study (Author, 20xx).***

A bunch of steps can be taken to battle droughts. Conservation being the main step, in addition to system upgrades and management. Over time people have increased in conservation (possibly Utah’s conservation goals ) (Utah.gov, 20xx).

The purpose of this study is to assess the vulnerability of the Weber River Basin water supply system, using a bottom-up approach (Brown et. al. 2012). The vulnerability is assessed based on the District’s vulnerability to changing streamflow, demographics, per-capita water usage and other identified factors.

These factors will be assessed to determine what combination of factors will result in a predefined system failure. The metrics and definition of system failure include values that are below set values found in the reliability, the resilience, and the vulnerability of the system (Loucks et al.,2005). Reliability, resilience and vulnerability are calculated as shown in Equations 1, 2 and 3.

Reliability =

= (1)

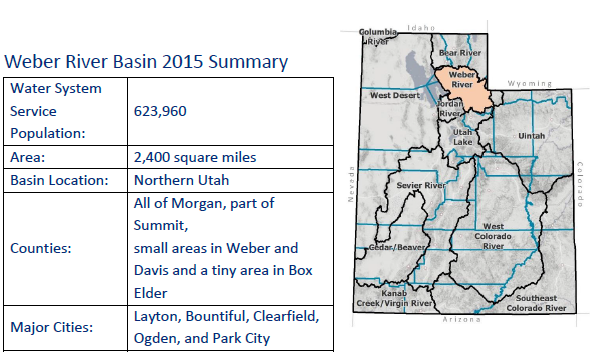
Resilience = (2)

Vulnerability = (3)

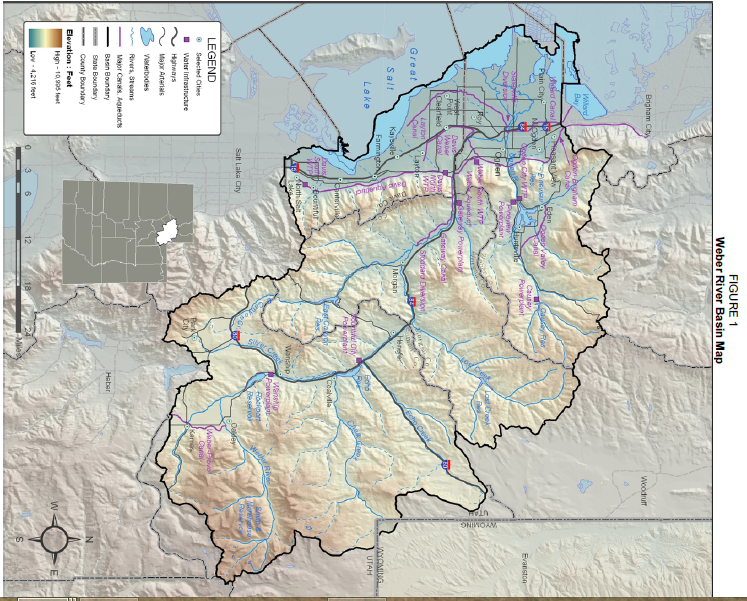
Weber Conservancy district has determined in prior studies that their current water system will be able to manage a two-year drought, going from full reservoirs to empty reservoirs with no inflows (WBCD, 2009??). This study takes a more in-depth approach considering a variety of inflows (drought periods/ severity), and the resulting effects on the system. Finding where the stressed areas of the system are.

The Weber Basin Water Conservancy District Characteristics

The area considered for this project includes all areas which are provided water by the Weber Basin Water Conservancy District. The Weber Basin Water Conservancy District, located on the Northern part of Utah, is a non-profit legal agency in charge of the distribution and sale of water for the people within a five-county area. The district includes parts of Box Elder and Summit Counties and most of Davis, Morgan, and Weber Counties (WBWCD, 2013). As of 2015 the Weber Basin Water Conservancy District services 623,960 people, within an area of 2,400 square miles (UDNR, 2018). The Weber Basin Water Conservancy District was created for the management of water resources developed under the Weber Basin Project which was authorized by the federal government in 1949.



**Figure 0.0 Weber River Basin 2015 Summary (UDWR, 2018)**

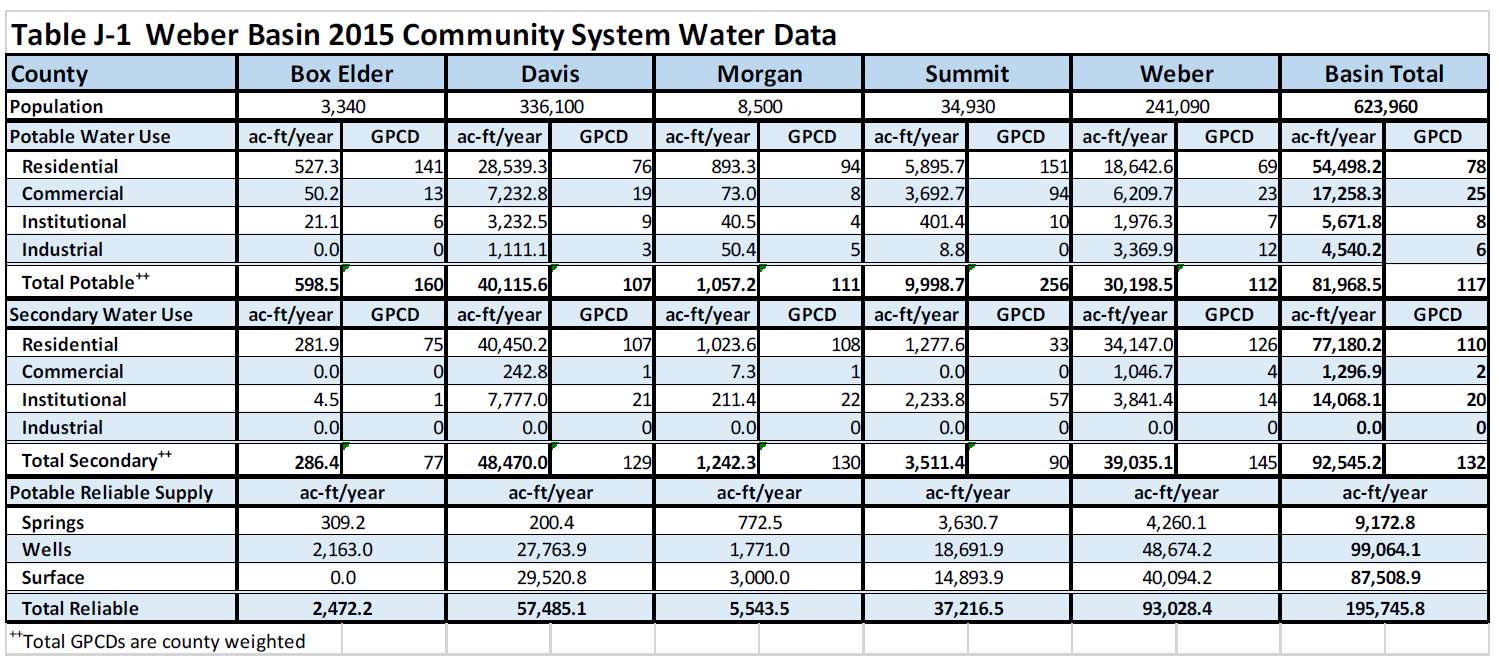


Drought Vulnerability Scenarios (intro to project?)

Inflows changes: Selected are a range of reservoir inflows

Increased population scenarios 2015, 2070, and 2150 (build out scenario from 2011 WBWCD TAZ study).

Per Capita Secondary and Per Capita Municipal water use projections are from the 2025 water usage goals of Utah (Utah.gov), and an arbitrary 40% total per capita water usage reduced. Industrial water use is lumped in with Municipal water per capita due to the great variation in the industrial water use among the different district service areas (WBWCD, 2013).



Agricultural Conversion to Municipal Water Use: Primarily looking at the decreased amount of agricultural use as Municipal water is calculated using population and per capita amounts. Considering WBWCD 2016 report on increased Population and the Division of Water Resources current study into Agricultural water use conversion over the entire state of Utah. Much of the Division of Water Resources data and methodology is from the Wasatch Front Regional Council’s population planning for the Wasatch Front. Other resources describing agricultural conversion is Endter-Wada et al., 2019 report on Urbanization.

Evapotranspiration: Look up Physical Hydrology Paper and use the Abstract for this paper.

Sedimentation flows into reservoirs can reduce reservoir storage drastically. “Projections indicate future increases in wildfire will cause sediment yields to at least double in 35% of western watersheds by 2050” (Sankey et al., 2017). “1% of watersheds are projected to have > 1000% increases in sediment yield” (Sankey et al., 2017). Increased sedimentation in the Western United States is a growing issue as wildfires.

The variability of sedimentation yields into reservoirs is extremely large. The sedimentation is based on the individual characteristics of each watershed and reservoir (Moody and Martin, 2001, 2009). Without doing individual sediment flow study for each watershed no precise values for the effect on the Districts system can are implemented. Therefore, a range of possible sedimentation values is arbitrarily selected for this study. The range of a 0% percent reduction to 50% reservoir capacity. The implementation of reservoir capacity percent reduction is within the Weber River Basin Water Conservancy RiverWare water system simulation program. Implementation of the reservoir capacity implemented within the reservoir data object.

RiverWare

RiverWare is a ***Description (RiverWare/Colorado State, 20xx).***The Utah Division of Water Resources (under the DNR), constructed a RiverWare model for the Weber River Basin in 20XX.