PREPARED FOR:

Weber Basin Water Conservancy District

Great Salt Lake Advisory Council

PREPARED BY:

Bowen Collins & Associates

# CONSERVATION IMPACTS STUDY

OCTOBER 2020

FINAL DRAFT

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October 2020

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# EXECUTIVE SUMMARY

# CONSERVATION IMPACTS STUDY

Understanding the potential impact of water conservation on water resource planning and the timing of large water development projects.

September 2020

GREAT SALT LAKE ADVISORY COUNCIL

WEBER BASIN WATER CONSERVANCY DISTRICT

## INTRODUCTION

Water resource planning and development is a topic of great interest to the stakeholders concerned about the future of Great Salt Lake. **How water is used upstream has significant impact on the quantity and quality of water reaching the lake.** To inform future water resource planning decisions that may affect the lake, the purposes of this study are to:

- Examine the potential impacts of water conservation on water resource planning.
- Develop an action plan of additional studies needed to assist policy makers in more completely understanding the role of conservation in future water resource planning.

One important component of this project is understanding the potential impact of water conservation on the timing of the Bear River Development project. In 1991, this major water development project was initially projected to be needed as early as the year 2015. Since then, agricultural conversions, water conservation, and some smaller water development projects have significantly delayed the projected need for the project. If additional water conservation efforts can significantly decrease water use, there is the potential to further delay or reduce the magnitude of large water development projects such as the currently defined Bear River Development project.

## POTENTIAL IMPACTS OF CONSERVATION BASED ON AVAILABLE DATA

This evaluation focuses on four primary water providers in northern Utah: Bear River Water Conservancy District (WCD), Cache Water District, Jordan Valley WCD, and Weber Basin WCD. These water providers have been selected for analysis because they have indicated an expected need for significant additional future water supply, including participation in, and delivering water from the Bear River Development project.

The following four figures summarize projected supply[1] and demand for each of these districts for various levels of per capita water use: historical use (from 2005 or earlier)[2], current use[3], and use at current regional water conservation goals as defined by the State or Utah Division of Water Resources[4]. Where applicable, the figures also show the additional conservation that would be needed to postpone the Bear River Development project beyond the current planning window of 2065.

1. Supply as defined in the master plans for each district. Includes maximizing use of existing sources, development of some smaller new sources, and a conservative estimate of water converted from agricultural uses to M&I as part of development activities, but does not include any water from the Bear River Development project. Both supply and demand consider the effects of climate change based on the limited, but best information available. It should be noted that two different population projection alternatives were considered for Bear River and Cache. For space reasons, only the more conservative aggressive growth scenario is shown here.
2. Based on District records or Utah Division of Water Resources 2005 Municipal and Industrial Water Use Database. Note that there is some question as to the accuracy of historical use data for Bear River WCD. Correspondingly, this data has not been shown.
3. "Current" use based on 2015 data - Utah Division of Water Resources 2015 Municipal and Industrial Water Use Database
4. Utah's Regional M&I Water Conservation Goals (Hansen Allen & Luce / Bowen Collins & Associates, Nov. 2019)

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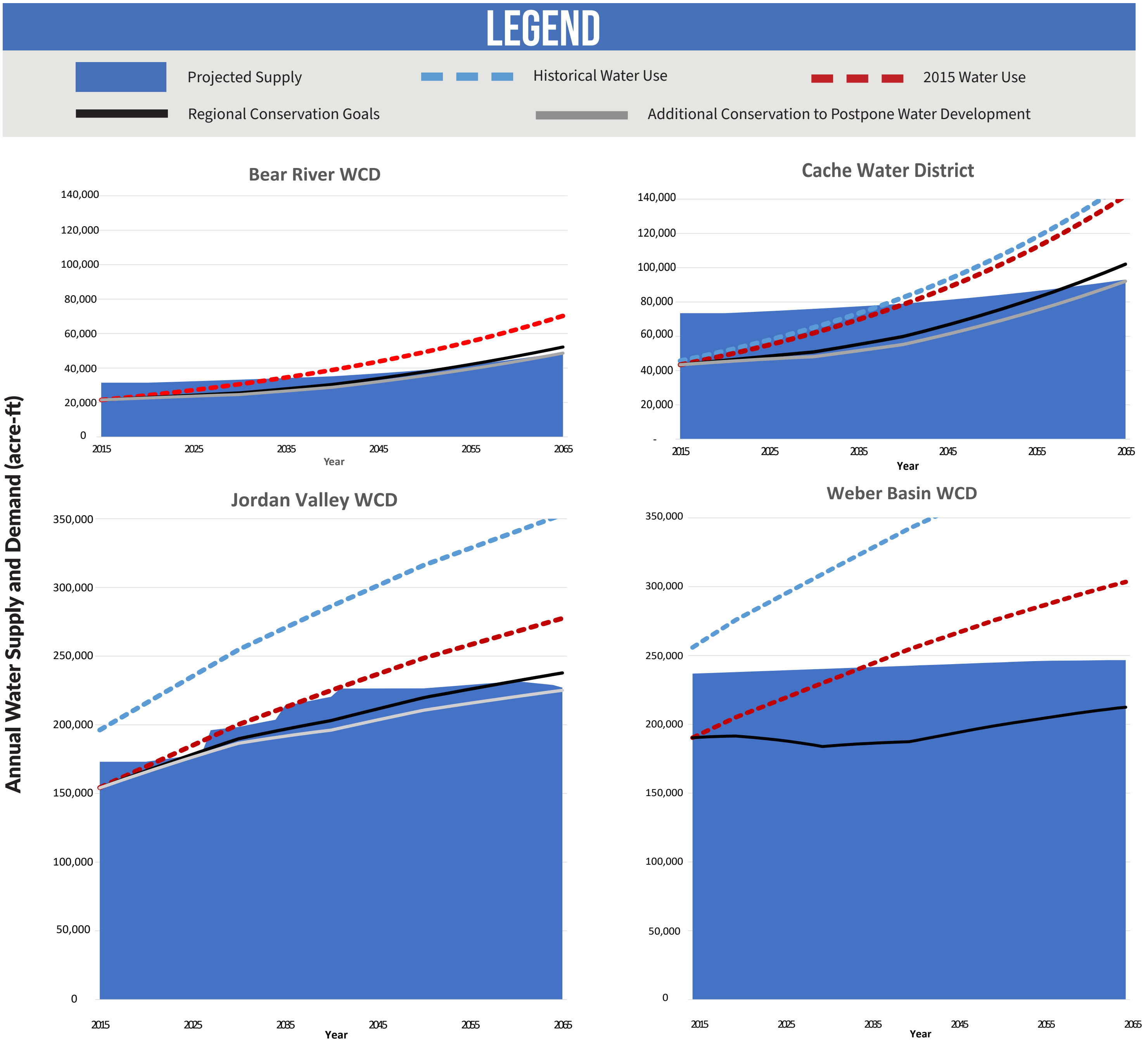



## Conclusions from Supply and Demand Figures

- **Conservation efforts to date have significantly delayed the need for future water development projects.**
- **Meeting the current Utah Division of Water Resources Regional Water Conservation Goals could significantly postpone the need for future water supply development projects.**
- **To postpone water development projects beyond 2065, all entities except the Weber Basin Water Conservancy District will require additional conservation beyond the regional goals.**

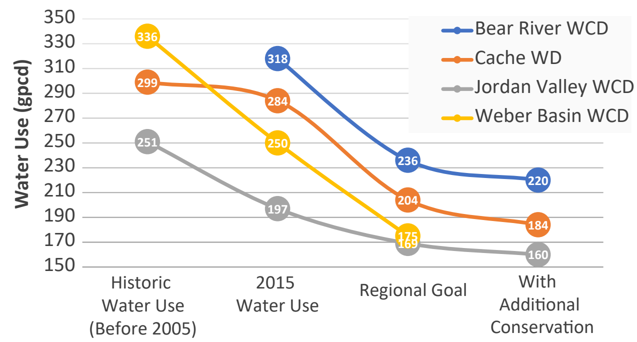
Water use in each District for various levels of conservation and the resulting impact on Bear River Development timing are as follows:

**Impact of Water Conservation on Timing of Expected Need for Bear River Development**

| | Historic Water Use (Before 2005) | 2015 Water Use | Regional Goals | With Additional Conservation |
|---|---|---|---|---|
| Bear River WCD | 2035 | 2035 | 2055 | > 2065 |
| Cache WD | 2040 | 2045 | 2055 | > 2065 |
| Jordan Valley WCD | 2010 | 2040 | 2060 | > 2065 |
| Weber Basin WCD | 2010 | 2035 | > 2065 | > 2065 |

**Per Capita Water Use With Conservation (gallons per day)**

| | 2015 Water Use | 2065 Regional Conservation Goal | % Reduction from 2015 to Regional Goal | Additional Conservation Needed to Postpone Bear River Project | % Reduction from 2015 to Additional Conservation |
|---|---|---|---|---|---|
| Bear River WCD | 318 | 236 | 25.8% | 220 | 30.8% |
| Cache WD | 284 | 204 | 28.2% | 184 | 35.2% |
| Jordan Valley WCD | 197 | 169 | 14.2% | 160 | 18.8% |
| Weber Basin WCD | 250 | 175 | 30.0% | 175 | 30.0% |
| **Weighted Average** | **232** | **181** | **22.1%** | **173** | **25.4%** |

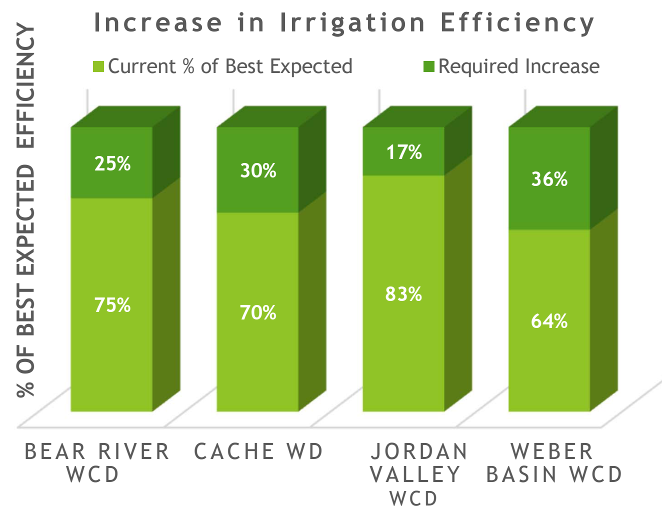


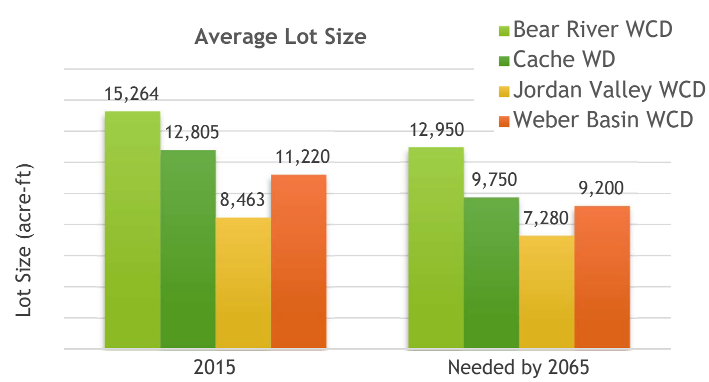

## REQUIRED CONSERVATION TO POSTPONE BEAR RIVER DEVELOPMENT PROJECT

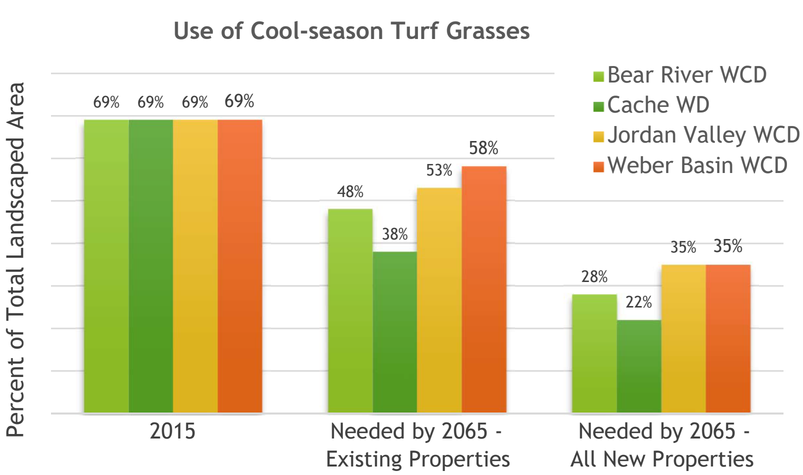
If Utahns want to achieve the level of conservation required to postpone the Bear River Development project beyond 2065, **it will require some dramatic changes to current water use habits and the way we develop land.** Reaching this level of conservation will require active participation and acceptance by homeowners, businesses, municipalities, and legislators. Required actions to achieve this level of conservation include:

- Near 100% conversion of all indoor fixtures to high efficiency (including faucets, showers, toilets[5], and washing machines)
- 50% reduction in indoor leaks and other indoor water waste
- Near 100% implementation of secondary water metering
- Increase in irrigation efficiency to near 100% of best expected[6] (see figure).
- Average lot size[7] reduced by 14% to 24%[8] (see figure).
- Significant reduction of high water use turf grasses to other waterwise options, including conversion of existing residential landscapes and limited use of high water use turf grasses on all new development (see figure).

While some of these changes will not be difficult for Utah residents (e.g. conversion to high efficiency fixtures), others represent **a major change in the traditional approach to development** (e.g. reducing average residential lot size by 24% or limiting cool-season turfgrasses to 20% of landscaped areas).




5. Assumes 25% of toilets will meet current high efficiency standards (1.6 gallons/flush) with remaining 75% meeting ultra high efficiency standards (1.28 gallons/flush)

6. This is 100% of best expected, not 100% efficiency. It is not reasonable to expect that all irrigation systems can be run at 100% efficiency all the time. Best expected has been based on 70% total efficiency for sprinkler systems and 80% total efficiency for drip systems.

7. Average lot size should not be confused with new lot size. To bring the overall average lot size down across each district, the average size of new lots will need to be significantly smaller the values shown.

8. There are an infinite number of combinations between lot size and % of turf grass that could be considered. If lot size is further decreased in any District, the percentage of allowable turf grass could be correspondingly increased. The values shown are for one example scenario.

# FUTURE STUDIES ACTION PLAN

The analysis contained here is based on the best available data but is missing important considerations in many areas. While the analysis contained here may provide some insight into the role of conservation in future water supply and demand planning, **additional analysis is needed to inform policy makers** before any firm decisions regarding future water development can be made.

As part of this project, input regarding additional needed study in this area was secured from stakeholders in the water industry (both agricultural and M&I), environmental interests, and state regulatory agencies. The following action plan is a summary of the most highly recommended studies based on the input received and observations during the study regarding **what additional information is needed to make informed water resource planning decisions.** Because this plan includes needed study at multiple levels, it is unlikely that any single entity will be able to implement the full action plan. Instead, it is recommended that stakeholders work together to complete their applicable portions of the action plan to provide a more complete water resources planning picture. Leadership at the state level is recommended to coordinate these efforts.

## CONSERVATION IMPACTS STUDY ACTION PLAN

### PRIORITY 1

Water Conservation Impacts Study Continued (Expanded Scope)

STUDY KEY ELEMENTS

- Refine Water Supply Data (Current and Future)
- Further Study Population Growth and Land Use Change Interactions, Especially in More Rural Areas
- Study Regional Water Supply Sharing
- Study and Refine Regional Water Demand Numbers

### PRIORITY 2

Agricultural Water Conversion Study

STUDY KEY ELEMENTS

- Better Quantify Agricultural Conversion Potential within Study Area
- Evaluate Agricultural Conversion Impacts on Future Municipal Water Supply
- Consider Agricultural Water Efficiency Impacts on Conversion Quantity

### PRIORITY 3

Cost of Water Conservation Study

STUDY KEY ELEMENTS

- Estimate Cost Range of Municipal Water Conservation Efforts
  * Compare total conservation costs to costs of large water project development
- Rank Conservation Efforts by Cost
  * Identify low hanging fruit for water conservation

### PRIORITY 4

Study of Water Use and Conservation Behaviors

STUDY KEY ELEMENTS

Answer the questions:

- What are the drivers to municipal water use behavior changes?
- What market forces could best encourage conservation?
- What is public's receptiveness for higher levels of water conservation?
- What public relations or outreach strategies will be most effective?

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# CONSERVATION IMPACTS STUDY

# CONSERVATION IMPACTS STUDY

## INTRODUCTION

Water resource planning and development is a topic of great interest to the stakeholders interested in Great Salt Lake. How water is currently used and will be used in the future obviously have significant impact on the quantity and quality of water reaching the lake. One aspect of future water resource planning of particular interest to Great Salt Lake stakeholders is conservation, specifically for municipal and industrial (M&I) water uses. Conservation has the potential to significantly reduce future water demands which could dramatically change the timing and/or magnitude of future water development projects. There are obviously many other significant water uses that impact the quantity of water reaching Great Salt Lake, such as mineral extraction and agricultural production, but a discussion of these types of water use are not addressed in this study.

Weber Basin Water Conservancy District (WBWCD), in coordination with the Great Salt Lake Advisory Council (GSLAC) has commissioned Bowen Collins & Associates (BC&A) to prepare a preliminary examination of the impacts of conservation. The purpose of this study is to show the potential impacts that continued/increased water conservation could have on water resource planning affecting Great Salt Lake. This includes the impacts of conservation on the need for and timing of large water development projects. The study will also identify a recommended action plan for additional studies and information needed to more completely examine the effects of water conservation.

## BACKGROUND

Water resource planning involving Great Salt Lake and its upstream river basins has been an ongoing, evolving effort for many decades. Due to the rapid population growth that Utah has experienced, one important component of this planning has always been the development of future water sources through larger development projects. This can be demonstrated by the construction of several large federal water projects within the basin and the studying of the Bear River Development project (since the mid 1960's, with more focused studies beginning in the 1980's). The initial studies indicated that the Bear River Development project would be needed as early as the year 2015. Since then, the project timing has been adjusted with each new study, currently being projected to be needed by 2045-50. A history of the estimated Bear River Development project timing in past studies is summarized in Table 1.

**Table 1**
**Bear River Development Project Timing Summary**

| Year of Study | Study Authors and Title | Anticipated Project Need |
|---|---|---|
| 1991 | Bear River Development Act | 2015 |
| 1997 | WBWCD/JVWCD - *Bear River Pipeline Alignment Study* | 2015 |
| 2004 | Division of Water Resources - *Bear River Basin, Planning for the Future* | 2025 |
| 2010-14 | Division of Water Resources - *Bear River Pipeline Concept Report* | 2035 |
| 2019 | Division of Water Resources - *Bear River Development Report and Associated November 19, 2019 Press Release* | 2045-2050 |

The change in anticipated timing of the project is largely attributed to agricultural conversions and water conservation, as stated in the Division of Water Resources November 19, 2019 press release:

*"When the legislation passed almost 30 years ago, the projected need for this water was in 2015. Thanks primarily to conservation efforts, new technology and some smaller water development projects, current projections indicate the need for this project has been pushed out between 2045 to 2050."*

It should be noted that more recent studies have identified that the Box Elder County area may need water from the Bear River Development project sooner than 2045-50.

One area that has contributed to postponing the Bear River Development project, and other water development projects, is conservation. For many years, Utah's statewide water conservation goal has been "25% by 2025," that is, to reduce per capita M&I water use by 25% by the year 2025[1]. Thanks to the efforts of many Utahns and their water providers, statewide M&I per capita water use in the year 2015 declined by at least 18% from the value estimated for the year 2000. Annual reporting from many individual water suppliers confirms significant progress in water conservation. These excellent results show that water conservation efforts can significantly decrease water use which have and can continue to potentially delay or reduce the magnitude of future large water development projects, such as the currently defined Bear River Development project.

It should be remembered, however, that Utah is still among the fastest-growing states in the country. Even with aggressive conservation goals, its demand for water is expected to continue to increase along with its population. While this report will present the best available information for a planning window through 2065, accurately understanding and projecting water needs beyond this window is beyond the scope of this report. Thus, the analysis and conclusions of this report will focus on the impact of conservation on the timing and magnitude of water development through 2065. This means that this report will not include any conclusions regarding the permanent elimination of any specific projects. Decisions regarding water needs beyond 2065 and the long-term need for any specific project will be left for future studies.

## SCOPE OF STUDY

As noted in the introduction, this study has two main purposes:

1. **Prepare a preliminary examination of the potential effects of conservation on water resource planning.** For this first task, this study utilizes readily available existing historical water use and conservation data from each of the four major water districts associated with the Bear River Development project in order to develop a preliminary understanding of the potential impacts of future water conservation. Given the scope and schedule of this project, this evaluation is not intended to be a comprehensive evaluation of all issues pertinent to conservation but a cursory look at a few illustrative scenarios to provide perspective and insight into the potential impacts of conservation. The feasibility or cost associated with any of these scenarios will not be considered at this stage but will be items for inclusion in the subsequent action plan development.
2. **Identify an action plan of additional studies and information needed to more completely examine the effects of water conservation.** In drafting the scope for the evaluation above, it was fully understood that completion of this study would not result in answers to all the questions needed to make decisions regarding future water resource planning around Great Salt Lake. As a result, this second task involves gathering suggestions from stakeholders and then preparing general information regarding additional studies and/or information that may need to be gathered to more thoroughly inform policy makers

[1] Based on a starting point for per capita use as estimated for water use observed in the year 2000.

regarding future water resource planning. This list of studies forms the basis for an action plan to ultimately answer whether or not conservation alone will be sufficient to meet the water demands of the subject area without the need to develop large water projects through 2065.

The remainder of this report will be organized around discussing the results of these two activities.

## CONSERVATION IMPACTS ANALYSIS BASED ON EXISTING AVAILABLE DATA

### Approach

This evaluation focuses on four primary water providers in northern Utah: Bear River Water Conservancy District (BRWCD), Cache Water District (CWD), Jordan Valley Water Conservancy District (JVWCD), and Weber Basin Water Conservancy District (WBWCD). These water providers have been selected for analysis because they have indicated an expected need for significant additional future water supply, including participation in the Bear River Development project.

Because water needs and conservation potential are different for each of these districts, an analysis of conservation impacts have been prepared for each one. To facilitate presentation of the results and subsequent discussion, analysis for each district has been organized into the following sections:

- ***Supply and Demand Analysis:*** This section contains a figure (or figures) comparing projected supply and demand for the district through 2065. Included in the figure(s) are:
    - Expected yield of both existing and projected future supplies
    - Projected demands based on current water use patterns
    - What projected demands would have been for historic water use patterns
    - Projected demands if the district can achieve the State of Utah's current regional water conservation goals (regional goals)

  Comparison of available supply with the various projected demands can then be used as the basis for discussion in the subsequent sections.

- ***Projected Need for Future Water Based on Existing Water Use:*** Based on a comparison of the supply analysis with current demands, this section summarizes when the district is projected to need development of additional water supply.
- ***Impacts of Historic Conservation Efforts:*** Based on a comparison of the supply analysis with historic demands, this section summarizes the impact historic conservation efforts have had on the timing of large water development projects.
- ***Projected Impacts of Reaching Regional Water Conservation Goals:*** Based on a comparison of the supply analysis with projected demands with conservation, this section summarizes the impact that reaching the regional goals would have on the timing of large water development projects.
- ***Additional Conservation Needed to Postpone Future Water Development Projects:*** If future water demands are projected to surpass future supplies before 2065, this section summarizes the additional conservation efforts that would be required to delay large water development projects until sometime after 2065.

For each section it should be noted that this is a global analysis of supply and demand only. It does not include consideration of the quality of specific water sources, the location of demand and the ability to convey supply to where needed, or water right issues. In other words, an identification of excess water supply in one location should not be interpreted as the ability to move that water to an area with a deficit, nor should all water supply sources be considered as equally suited for M&I use.

## Data Sources for Analysis

Developing a full understanding of supply, demand, and the effects of conservation for each of these four large water providers obviously requires an extensive amount of analysis. Due to the limited scope and relatively short schedule of this preliminary conservation impacts study, it was not possible for BC&A to personally perform all the analysis that would be required to fully understand all the issues and complexities behind the water supply and demand data. As a result, most of the data (and underlying analysis forming the basis of this data) has been taken directly from other sources. To document the sources for this data, two appendices have been prepared:

- Appendix A summarizes the sources of data and identifies how each of these sources was used to assemble the supply and demand analysis for each district.
- Appendix B contains a series of issue papers addressing specific topics of interest to the analysis. This includes:
    - *Issue Paper I – Climate Change:* How has climate change been incorporated into the analysis?
    - *Issue Paper II – Long-Term Growth Potential:* How does projected growth for the current planning window (through 2065) fit into the expected long-term growth potential for the area, specifically in the comparatively undeveloped areas of Box Elder and Cache Counties?
    - *Issue Paper III – Regional Water Conservation Goals:* What are the Regional Water Conservation Goals and how have they been incorporated into the analysis?

The reader should reference these appendices for additional details regarding this analysis.

## Results

### Bear River Water Conservancy District (BRWCD)

***Supply and Demand Analysis:***

The supply and demand analysis for BRWCD is shown for two different population projections. Figure 1 shows the analysis using more conservative population projections from the Kem Gardner Institute (Kem Gardner). Figure 2 shows the same analysis using more aggressive population growth rates suggested in BRWCD's 2017 Water System Master Plan. Both of these projections are being considered as they appear to represent the full range of potential growth for BRWCD (see Issue Paper II in Appendix B for further discussion).

**Figure 1**
**Potential Impacts of Conservation on BRWCD Water Supply Planning**
**(Kem Gardner Projections)**

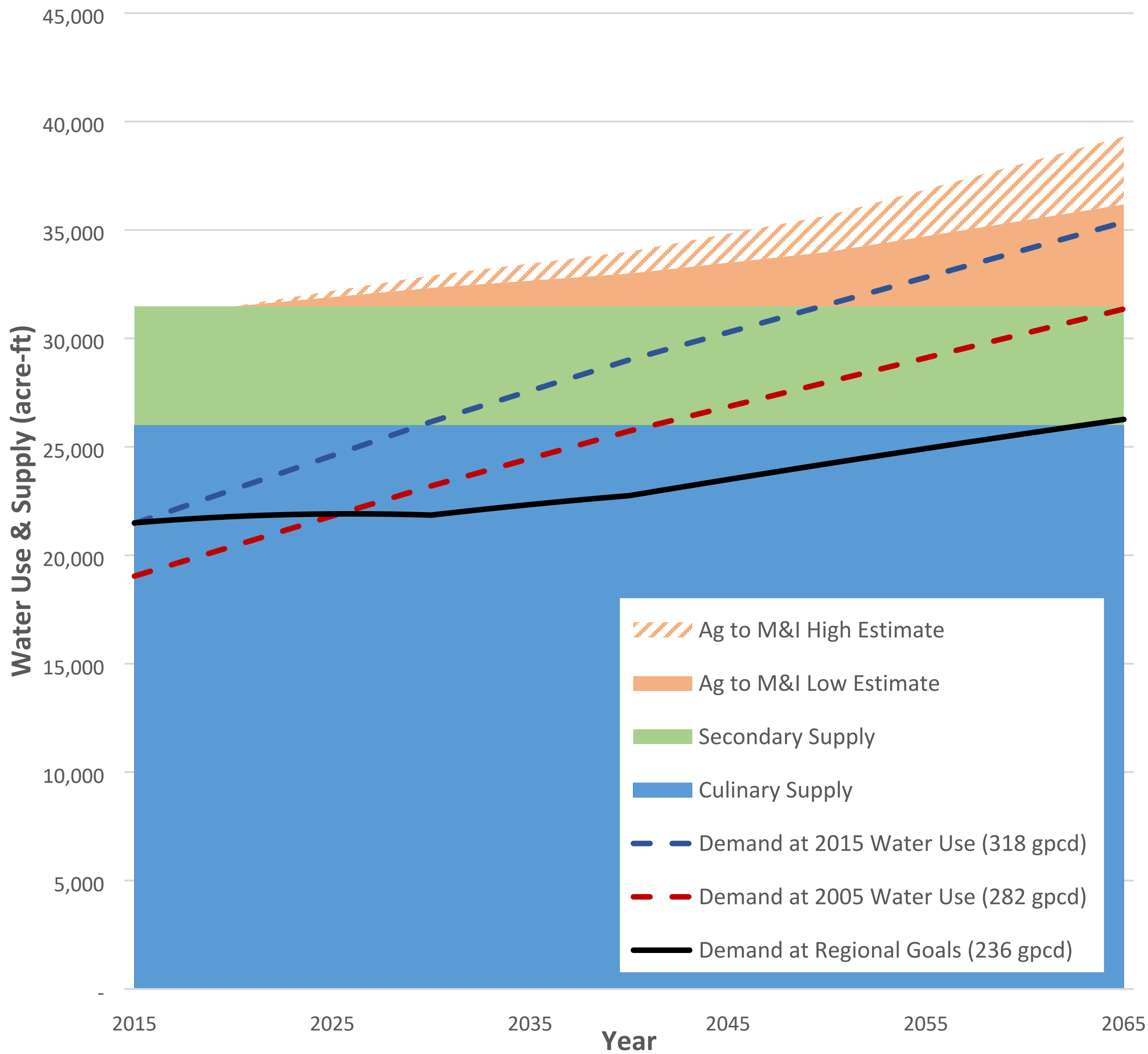
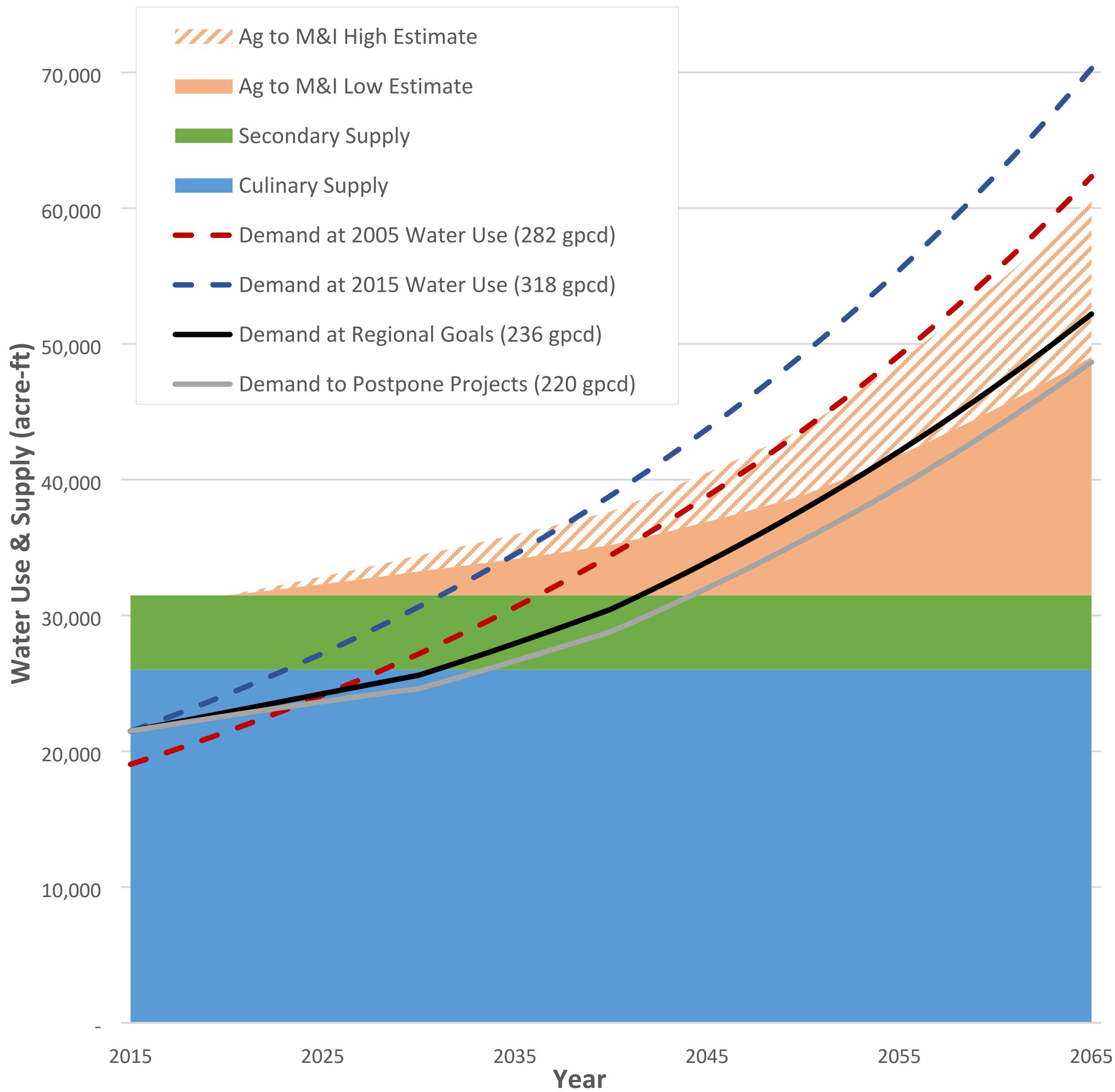


**Figure 2**
**Potential Impacts of Conservation on BRWCD Water Supply Planning**
**(BRWCD's 2017 Master Plan Projections)**




***Projected Need for Future Water Based on Existing Water Use:***

In comparing Figures 1 and 2, it can be seen that BRWCD's need for future water will depend greatly on which population projection is realized and how much agricultural (Ag) water is converted to M&I use in association with development. At the lower Kem Gardner projections, no additional supply is projected to be needed within the 2065 planning window, even for the lower estimate of Ag to M&I water conversion. Conversely, the more aggressive BRWCD master plan growth scenario results in projected demands surpassing the water supply around the year 2035, even when incorporating high estimates of Ag to M&I conversions.

***Impacts of Historic Conservation Efforts:***

As shown in the water use projections in both figures, the reported water use levels (and secondary water use estimates) for BRWCD actually show an increase from 2005 to 2015. Based on this data, it could be concluded that conservation efforts have not had any effect on projected water needs for the BRWCD. However, while the data shown represents the best information available, there is some doubt as to the accuracy of the 2005 numbers for BRWCD. It is best to abstain from making any firm conclusions on the effectiveness of past conservation in this district until additional data can be gathered.

***Projected Impacts of Reaching Regional Water Conservation Goals:***

If BRWCD successfully reaches the regional goals, the projections decrease significantly from 2015 levels. The regional goals are projected to reduce water use levels to approximately 236 gpcd, a reduction of 82 gpcd from the current water use level of 318 gpcd. For the most conservative scenario in terms of water needs (more aggressive growth and the lower level estimate of Ag to M&I conversion), reaching the conservation goals would postpone BRWCD's need for additional water development to 2055, a delay of approximately 20 years. For all other scenarios (more conservative growth or higher level estimate of M&I), the need for additional water development could be postponed outside the current planning window (2065).

***Additional Conservation Needed to Postpone Future Water Development Projects:***

If BRWCD is able to reduce its per capita water use to the current regional goals, then its water demands are projected to remain below the high estimate of Ag to M&I conversions (even for the more aggressive growth projections). However, if BRWCD wants to keep its water use levels within the more conservative low estimate of Ag to M&I water conversion, additional conservation will be needed. The per capita water use for BRWCD would need to be reduced to at least 220 gallons per capita day (gpcd) by 2065, a reduction of 98 gpcd from the current water use level of 318 gpcd. This represents an increase in conservation savings of 20 percent from the savings already identified in the regional goals (98 gpcd vs. 82 gpcd).

Table 2 below details some options that may be required to meet various levels of conservation[1]. Additional discussion regarding each of these categories is contained in Appendix B, Issue Paper III. In terms of reaching the additional conservation required to postpone the need for additional water development in all scenarios, two options (Option 1 and Option 2) have been included in the table. Option 1 looks at simply moving more landscaping into the waterwise category (for both existing and future users). Option 2 looks at reducing average lot size (which correspondingly allows higher percentages of cool-season turf grasses to remain)[2]. In both options some additional indoor conservation is also included.

[1] For this table (and all similar tables for subsequent districts), the information presented represents just one of an infinite number of combinations that could be used to reach the target levels of conservation. An increased level of conservation in one area could be used to reduce required conservation in another area.

[2] Reaching this average lot size would require some very significant changes in development patterns in Box Elder County. To reach this reduced lot size, all new development would need to average a lot size of no more than 4,360 SF. This does not mean that all lots would need to be this small, but there would need to be enough high density housing incorporated in the mix of future development to offset any larger lot sizes constructed.

**Table 2**
**BRWCD Required Action to Achieve Various Conservation Scenarios**

| | Current | Regional Conservation Goal | Option 1: Conservation to Postpone Water Development Projects | Option 2: Conservation to Postpone Water Development Projects – Small Lot Option |
|---|---|---|---|---|
| **Indoor Water Use** | | | | |
| % High Efficiency Faucets/Showers | 80% | ~100% | ~100% | ~100% |
| % High Efficiency Toilets | 63% | ~100% (including 10% ultra-high efficiency) | ~100% (including 75% ultra-high efficiency) | ~100% (including 75% ultra-high efficiency) |
| % High Efficiency Washing Machines | 46% | ~100% | ~100% | ~100% |
| % Reduction in Leaks and Other Indoor Water Waste | - | 20% | 50% | 50% |
| **Outdoor Water Use** | | | | |
| % Secondary Connections Metered | 2% | ~100% | ~100% | ~100% |
| % of Best Expected Irrigation Efficiency | 75% | ~100% | ~100% | ~100% |
| Existing Development - % Cool-season Turf Grasses | 69% | 58% | 48% | 60% |
| Existing Development - % Other Waterwise Landscape Options | 31% | 42% | 52% | 40% |
| New Development - % Cool-season Turf Grasses | - | 35% | 28% | 50% |
| New Development - % Other Waterwise Landscape Options | - | 65% | 72% | 50% |
| Lot Size | 15,264 SF | 12,950 SF (15% reduction) | 12,950 SF (15% reduction) | 9,975 SF (35% reduction) |
| **Total Water Use** | | | | |
| Use per capita | 318 gpcd | 236 gpcd | 220 gpcd | 220 gpcd |

## Cache Water District (CWD)

### *Supply and Demand Analysis:*

The supply and demand analysis for CWD is also shown for two different population projections. Figure 3 shows the analysis using more conservative population projections from the Kem Gardner Institute. Figure 4 shows the same analysis using more aggressive population growth rates similar to the BRWCD Master Plan (see Issue Paper II for further discussion). Both of these projections are being considered as they appear to represent the full range of potential growth for CWD.

**Figure 3**
**Potential Impacts of Conservation on CWD Water Supply Planning**
**(Kem Gardner Projections)**

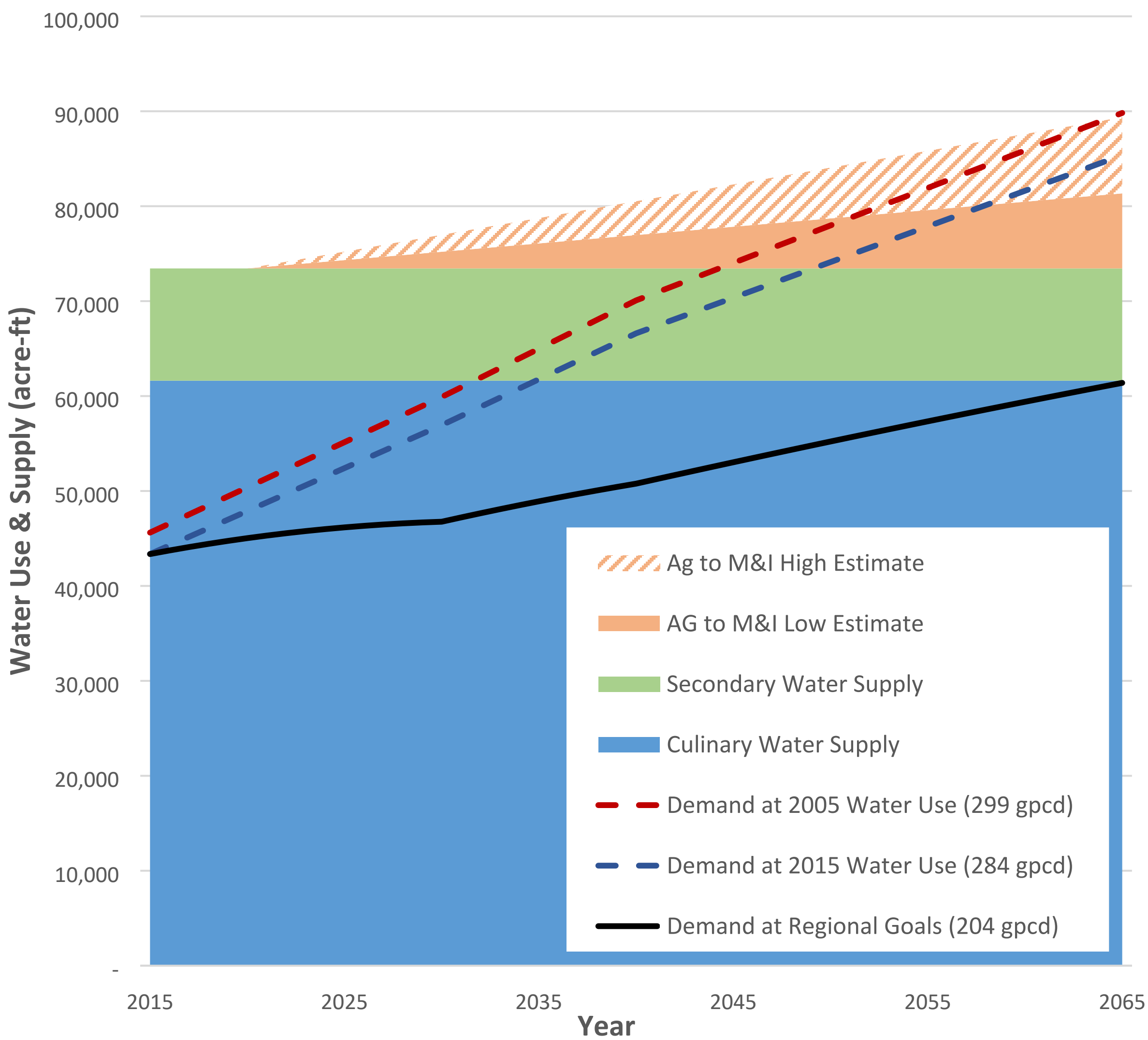
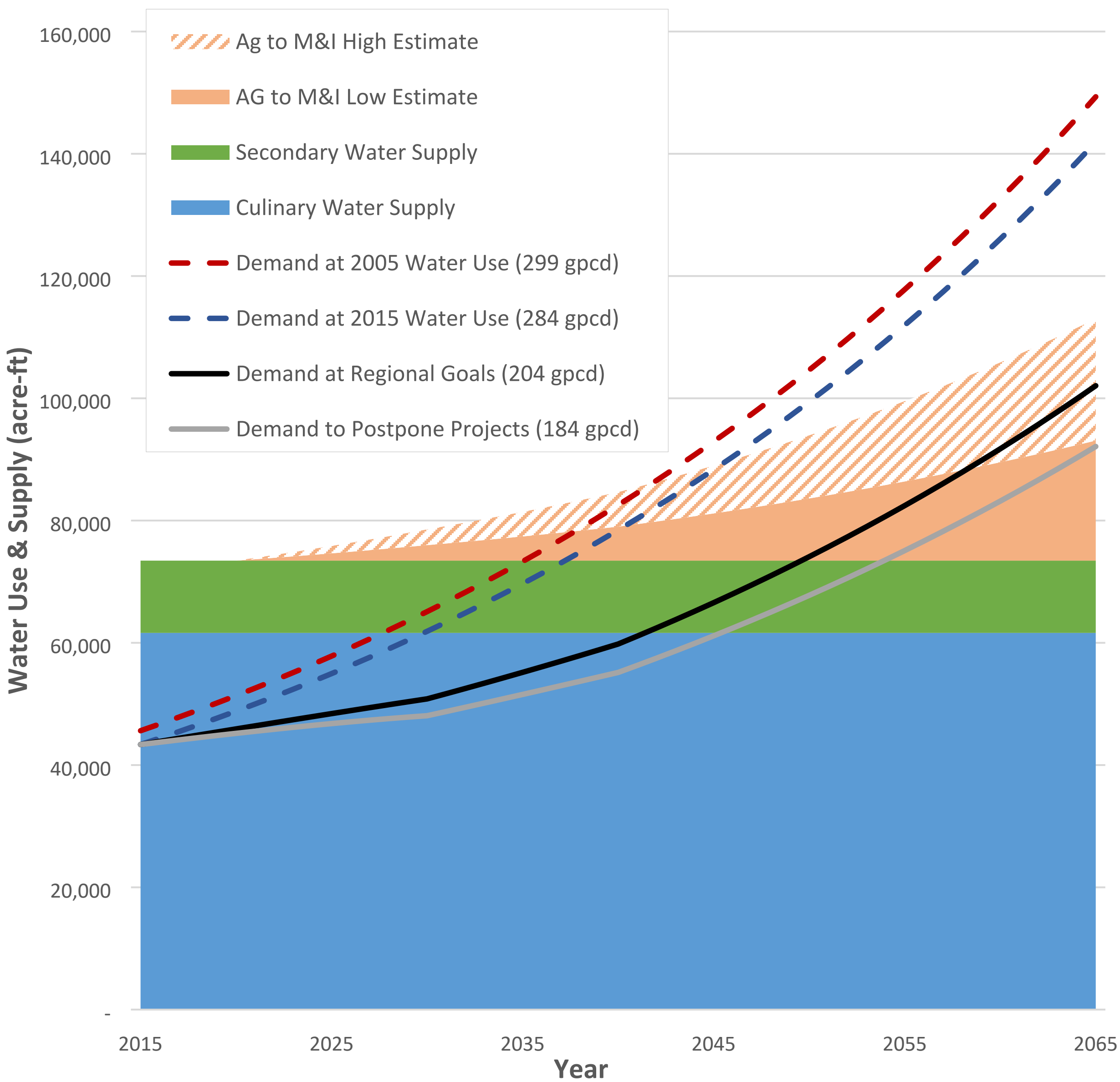


**Figure 4**
**Potential Impacts of Conservation on CWD Water Supply Planning**
**(Aggressive Growth Scenario)**




***Projected Need for Future Water Based on Existing Water Use:***

As seen when comparing Figures 3 and 4, CWD's need for future water depends greatly on which population projection is used and how much agricultural water is converted to M&I use in association with development. At the lower Kem Gardner projections, no additional supply is needed through 2065 for the high Ag to M&I conversion estimate. At the lower estimate of Ag to M&I water conversion, additional supply is projected to be needed around 2057. However, with the more aggressive growth scenario results, CWD projected demands surpass the water supply between 2040 and 2045, even when incorporating the high estimate of Ag to M&I conversion.

***Impacts of Historic Conservation Efforts:***

As shown in the water use projections in both figures, CWD has decreased its per capita water use from historic levels. The 2015 projected water use levels are about 5 percent less than the 2005 projections. As shown in the figures, the future need for additional water supply has been delayed between 3 and 5 years as a result of this conservation (depending on which scenario is being considered).

***Projected Impacts of Reaching Regional Water Conservation Goals:***

Figure 3 shows that if CWD reaches the regional goals and the Kem Gardner population projections are used, then future demand will stay below current supply through at least 2065, independent of Ag water conversion estimates. The regional goals are projected to reduce water use levels to approximately 204 gpcd, a reduction of 80 gpcd from the current water use level of 284 gpcd. For the most conservative scenario in terms of water needs (more aggressive growth and CWD's need for additional water development to 2057, a delay of approximately 17 years. For all other scenarios (more conservative growth or higher level estimate of M&I), the need for additional water development could be postponed outside the current planning window (2065).

***Additional Conservation Needed to Postpone Future Water Development Projects:***

If CWD is able to reduce its per capita water use to the current regional goals, then its water demands are projected to remain below the high estimate of Ag to M&I conversions (even for the more aggressive growth projections). However, if CWD wants to keep its water use levels within the more conservative low estimate of Ag to M&I water conversion, additional conservation will be needed. The per capita water use for CWD would need to be reduced to at least 184 gpcd by 2065, a reduction of 100 gpcd from the current water use level of 284 gpcd. This represents an increase in conservation savings of 25 percent from the savings already identified in the regional goals (100 gpcd vs. 80 gpcd).

Table 3 below presents a few different options for actions that would be required to meet various levels of conservation. Additional discussion regarding each of these categories is contained in Appendix B, Issue Paper III. In terms of reaching the additional conservation required to postpone the need for additional water development in all scenarios, two options (Option 1 and Option 2) have been included in the table. Option 1 looks at simply moving more landscaping into the waterwise category (for both existing and future users). Option 2 looks at reducing average lot size (which correspondingly allows higher percentages of cool-season turf grasses to remain)[3]. In both options some additional indoor conservation is also included.

[3] Reaching this average lot size would require some very significant changes in development patterns in the District. To reach this reduced lot size, all new development would need to average a lot size of no more than 4,360 SF. This does not mean that all lots would need to be this small, but there would need to be enough high density housing incorporated in the mix of future development to offset any larger lot sizes constructed.

**Table 3**
**CWD Required Action to Achieve Various Conservation Scenarios**

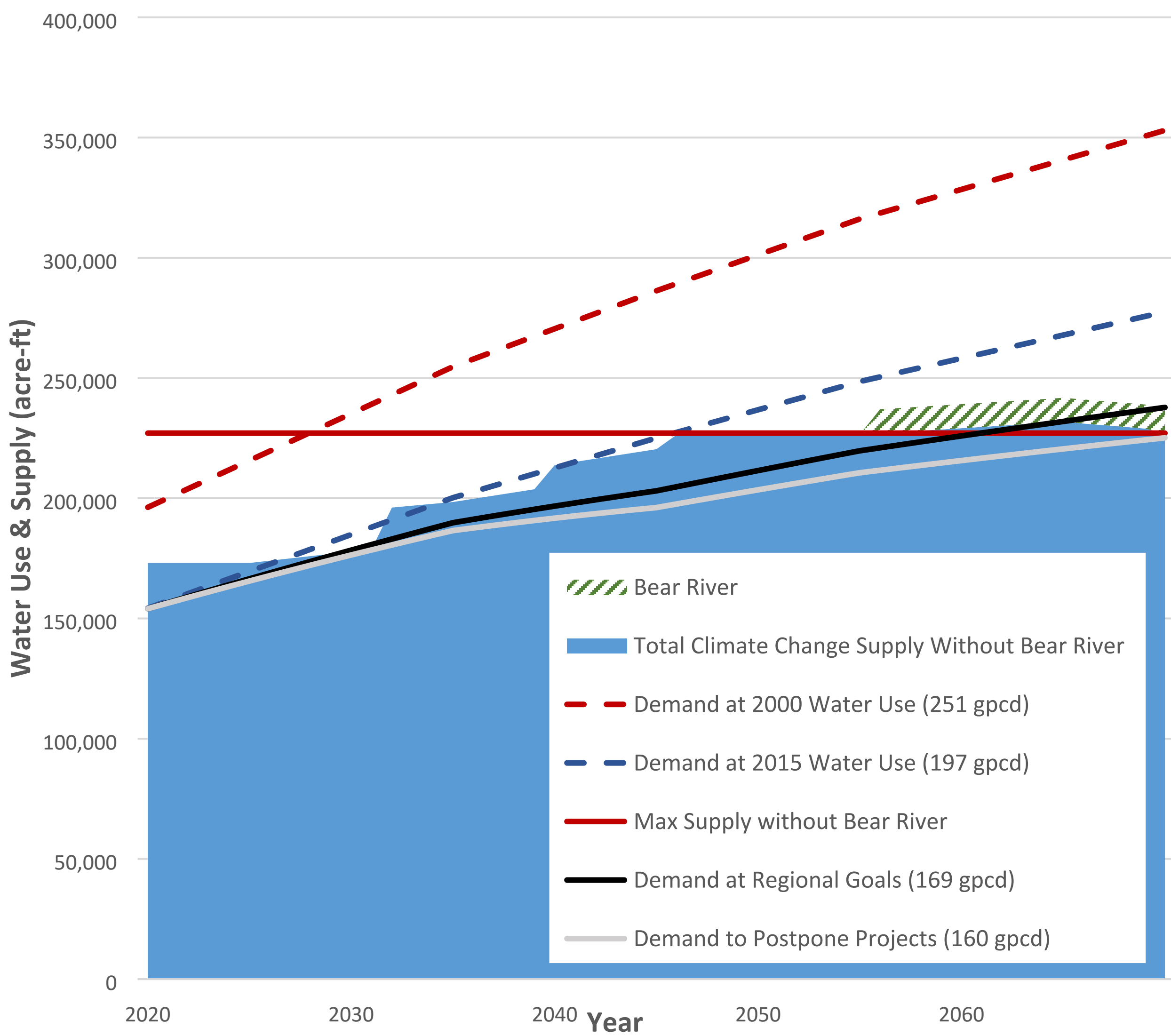
| | Current | Regional Conservation Goal | Option 1: Conservation to Postpone Water Development Projects | Option 2: Conservation to Postpone Water Development Projects – Small Lot Option |
|---|---|---|---|---|
| **Indoor Water Use** | | | | |
| % High Efficiency Faucets/Showers | 80% | ~100% | ~100% | ~100% |
| % High Efficiency Toilets | 63% | ~100% (including 10% ultra-high efficiency) | ~100% (including 75% ultra-high efficiency) | ~100% (including 75% ultra-high efficiency) |
| % High Efficiency Washing Machines | 46% | ~100% | ~100% | ~100% |
| % Reduction in Leaks and Other Indoor Water Waste | - | 20% | 50% | 50% |
| **Outdoor Water Use** | | | | |
| % Secondary Connections Metered | 2% | ~100% | ~100% | ~100% |
| % of Best Expected Irrigation Efficiency | 70% | ~100% | ~100% | ~100% |
| Existing Development - % Cool-season Turf Grasses | 69% | 58% | 38% | 50% |
| Existing Development - % Other Waterwise Landscape Options | 31% | 42% | 62% | 50% |
| New Development - % Cool-season Turf Grasses | - | 35% | 22% | 30% |
| New Development - % Other Waterwise Landscape Options | - | 65% | 78% | 70% |
| Lot Size | 12,805 SF | 9,750 SF (24% reduction) | 9,750 SF (24% reduction) | 8,125 SF (37% reduction) |
| **Total Water Use** | | | | |
| Use per capita | 284 gpcd | 204 gpcd | 184 gpcd | 184 gpcd |

## Jordan Valley Water Conservancy District (JVWCD)

### *Supply and Demand Analysis:*

Figures 5 and 6 show the analysis for the expected future water supplies[4] and demands[5] for JVWCD. Two figures have been included to consider different levels of required conservation to postpone future water development projects beyond 2065. Figure 5 shows what would be required for JVWCD to postpone the Bear River Development project only, while Figure 6 shows what would be required to postpone all future water development projects currently identified by JVWCD.

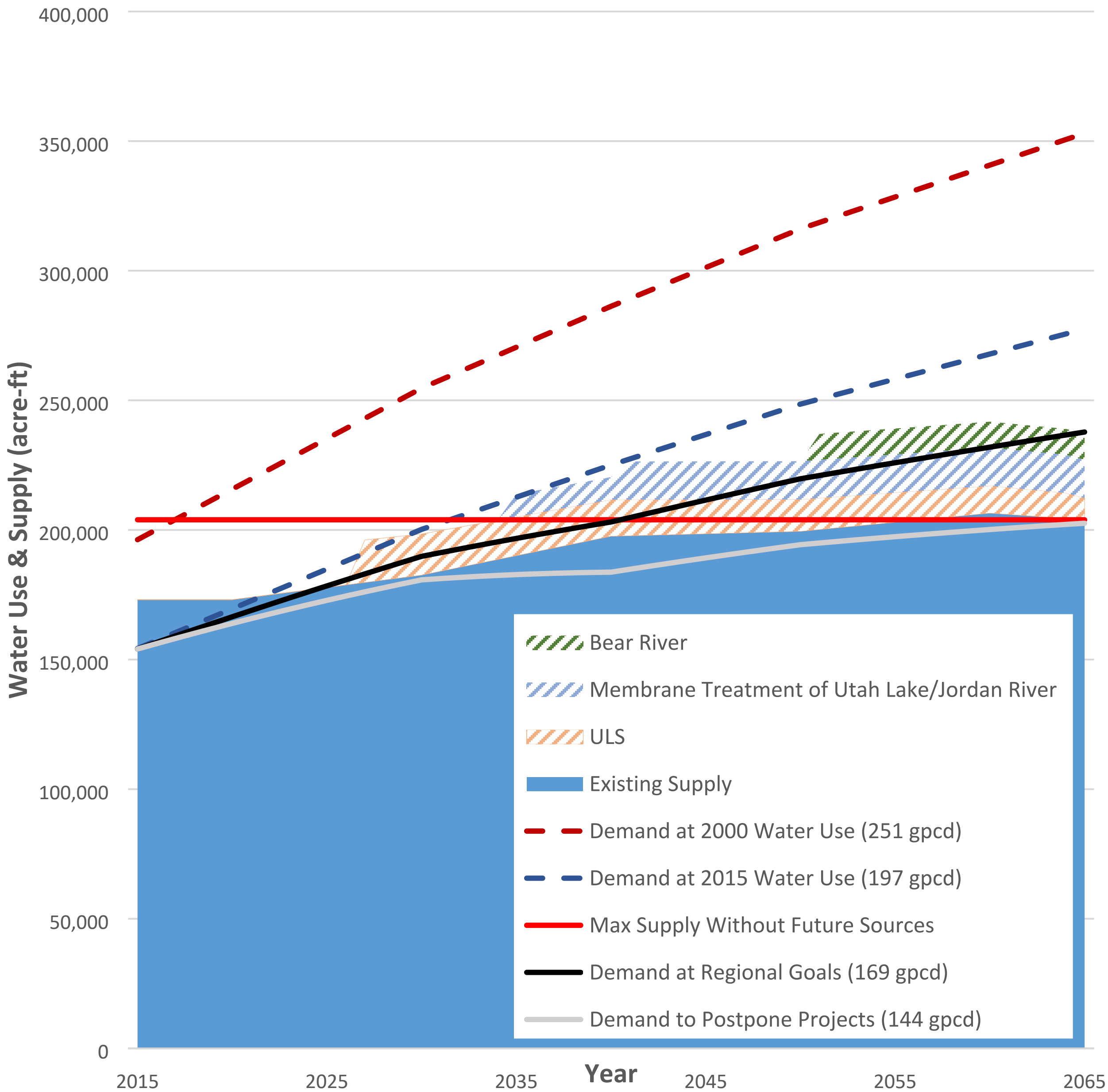
**Figure 5**
**Potential Impacts of Conservation on JVWCD Water Supply Planning**




[4] Includes consideration of climate change. See Issue Paper I.

[5] Demands are based on current JVWCD service area as identified in their current 40-year plan. JVWCD has recently received some requests for service from areas outside its current service area including portions of the Salt Lake County west bench (previously assumed to be self-supplied) and Tooele County. If these areas were to annex into JVWCD, this would represent additional demand from the amount shown.

**Figure 6**
**Potential Impacts of Conservation& Future Supply Loss on JVWCD Water Supply Planning**




***Projected Need for Future Water Based on Existing Water Use:***

As seen in Figures 5 and 6, JVWCD's projected demand based on current water use levels (2015) are projected to surpass its current supply before 2025. If future large water development projects other than the Bear River Development project are included, projected demand at current water use levels could be satisfied through about 2040. Implementation of the Bear River Development project would extend supplies for another 5 or so years, but JVWCD would then be unable to meet projected demands. Thus, it is projected that JVWCD will not be able to meet projected demands at existing water use levels, even if all identified water development projects occur.

***Impacts of Historic Conservation Efforts:***

Figures 5 and 6 show that, if JVWCD were currently using water at the use levels observed in the year 2000[6], additional water supply would have already been necessary and water from the Bear River Development project would be needed as early as 2023. This shows that historic conservation efforts have already delayed the Bear River Development project by nearly 20 years.

***Projected Impacts of Reaching Regional Water Conservation Goals:***

JVWCD's projected demands at the current regional goals are slightly less than its projected supply when including all future large water development projects (including the Bear River Development project). With this level of conservation, the Bear River Development project isn't needed until 2056, an additional delay of approximately 16 years.

***Additional Conservation Needed to Postpone Future Water Development Projects:***

For this analysis, required conservation to postpone future water projects beyond the 2065 planning window has been considered at two levels. In Figure 5, the data shows that even if JVWCD reaches its regional goals, all planned future water development projects will be needed. In order to postpone the need for the Bear River Development project, the per capita water use for JVWCD would need to be reduced to at least 160 gpcd by 2065, a reduction of 37 gpcd from the current water use level of 197 gpcd. This represents an increase in conservation savings of 32 percent from the savings already identified in the regional goals (169 gpcd vs. 160 gpcd).

In Figure 6, the analysis shows what would need to happen if JVWCD does not develop any future new water sources, such as the ULS and the membrane treatment of Utah Lake/Jordan River. In this case, in order to postpone all of JVWCD's planned future water development projects, the per capita water use for JVWCD would need to be reduced to at least 144 gpcd by 2065, a reduction of 53 gpcd from the current water use level mentioned above. This represents an increase in conservation savings of 89 percent from the savings already identified in the regional goals (169 gpcd vs. 144 gpcd.)

Table 4 below presents a few different options for actions that would be required to meet the various levels of conservation. Additional discussion regarding each of these categories is contained in Appendix B, Issue Paper III. Both options for additional conservation (postponing the Bear River Development project or postponing all new water development projects beyond the 2065 window) have been included in the table.

[6] For JVWCD, historical water use has been based on the year 2000 instead of 2005 as done for the other entities. This has been done because water use data for JVWCD is based on the District's own records and not records from the DWRe. These records contain more detailed data for the year 2000 than 2005.

**Table 4**
**JVWCD Required Action to Achieve Various Conservation Scenarios**

| | Current | Regional Conservation Goal | Additional Conservation Needed to Postpone Bear River Project | Additional Conservation Needed to Postpone All Projects |
|---|---|---|---|---|
| **Indoor Water Use** | | | | |
| % High Efficiency Faucets/Showers | 80% | ~100% | ~100% | ~100% |
| % High Efficiency Toilets | 63% | ~100% (including 10% ultra-high efficiency) | ~100% (including 75% ultra-high efficiency) | ~100% (including 75% ultra-high efficiency) |
| % High Efficiency Washing Machines | 46% | ~100% | ~100% | ~100% |
| % Reduction in Leaks and Other Indoor Water Waste | - | 20% | 50% | 50% |
| **Outdoor Water Use** | | | | |
| % Secondary Connections Metered | 2% | ~100% | ~100% | ~100% |
| % of Best Expected Irrigation Efficiency | 83% | ~100% | ~100% | ~100% |
| Existing Development - % Cool-season Turf Grasses | 69% | 58% | 53% | 30% |
| Existing Development - % Other Waterwise Landscape Options | 31% | 42% | 47% | 70% |
| New Development - % Cool-season Turf Grasses | - | 35% | 35% | 20% |
| New Development - % Other Waterwise Landscape Options | - | 65% | 65% | 80% |
| Lot Size | 8,463 SF | 7,280 SF (14% reduction) | 7,280 SF (14% reduction) | 7,280 SF (14% reduction) |
| **Total Water Use** | | | | |
| Use per capita | 197 gpcd | 169 gpcd | 160 gpcd | 144 gpcd |

## Weber Basin Water Conservancy District (WBWCD)

***Supply and Demand Analysis:***

Supply and demand data for WBWCD is somewhat unique in that it has historically been carefully separated into secondary and potable water supplies. This is largely a function of how water is accounted for as part of the Weber Basin Project. Water developed as part of that project needs to be used for the specific purpose it was identified and cannot be easily converted from one type to another. Infrastructure costs and water rights also complicate WBWCD's ability to move water between secondary and culinary water uses. To be consistent with WBWCD's historic analysis, WBWCD's supplies and demands have been evaluated separately as shown in Figures 7 and 8. However, Figure 9 combines WBWCD's total water supply (both secondary and potable) in order to provide a summary of all water uses[7].

[7] All supply analysis includes consideration of climate change. See Issue Paper I.

**Figure 7**
**Potential Impacts of Conservation on WBWCD Potable Water Supply**

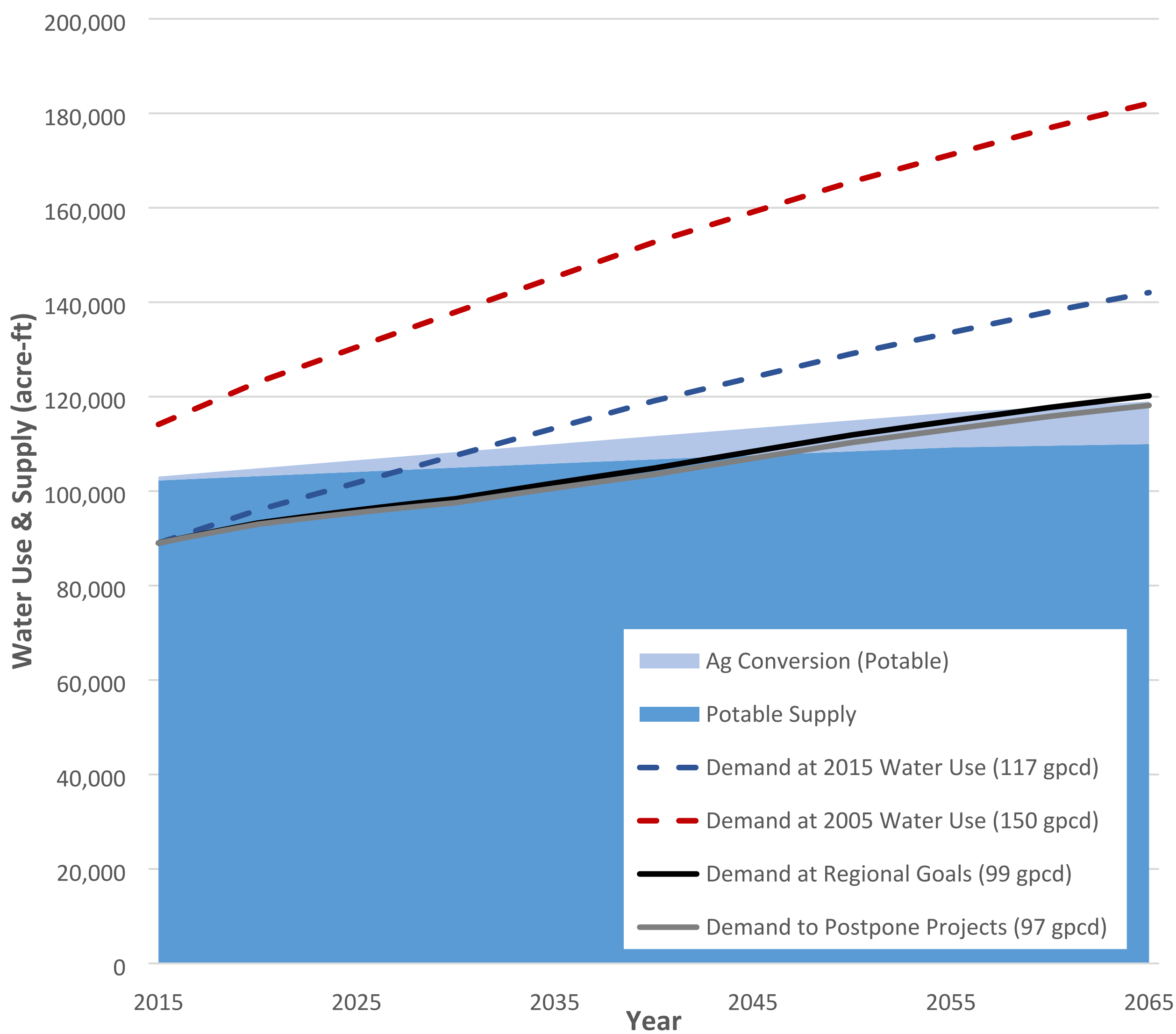


**Figure 8**
**Potential Impacts of Conservation on WBWCD Secondary Water Supply**

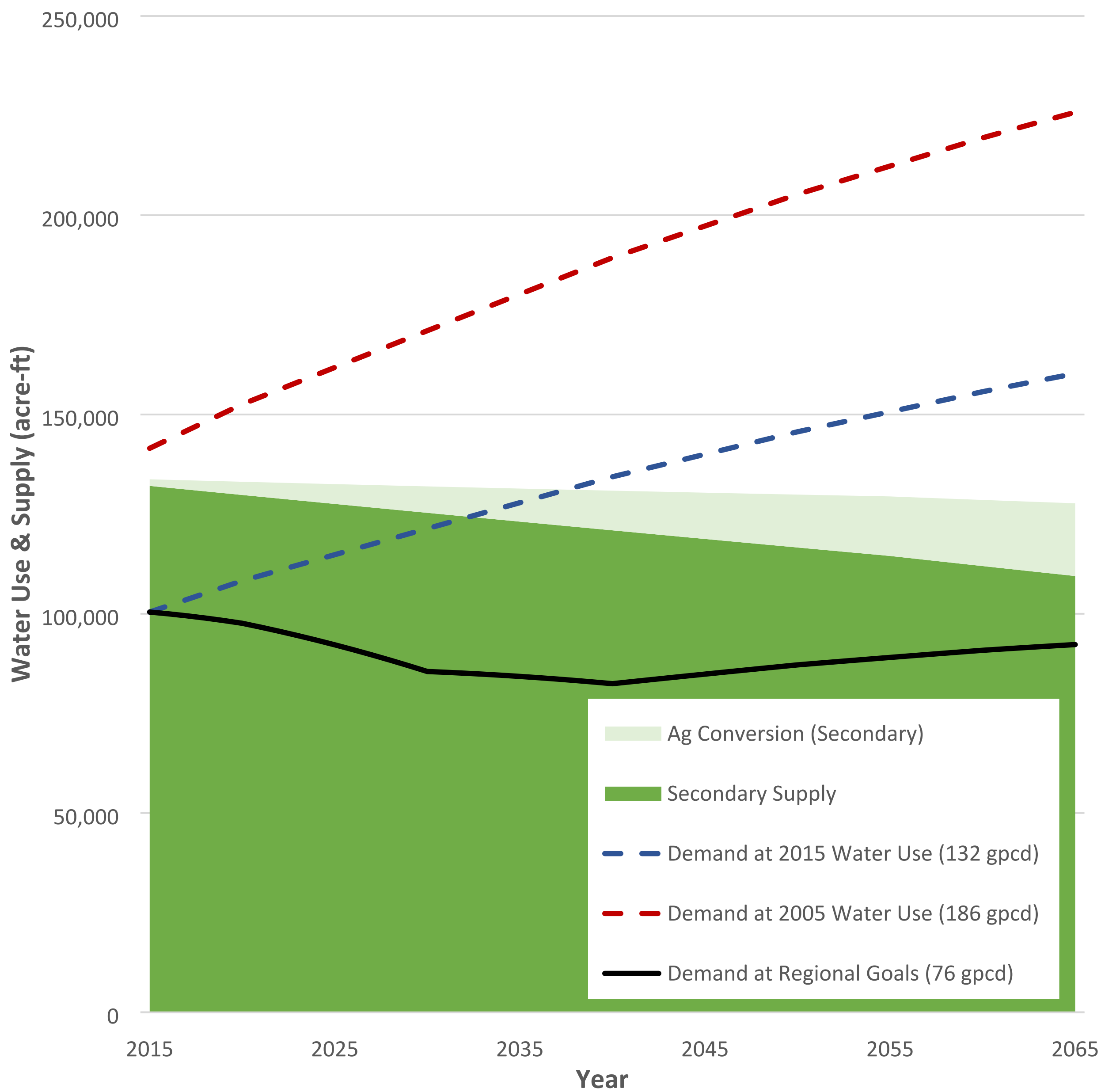
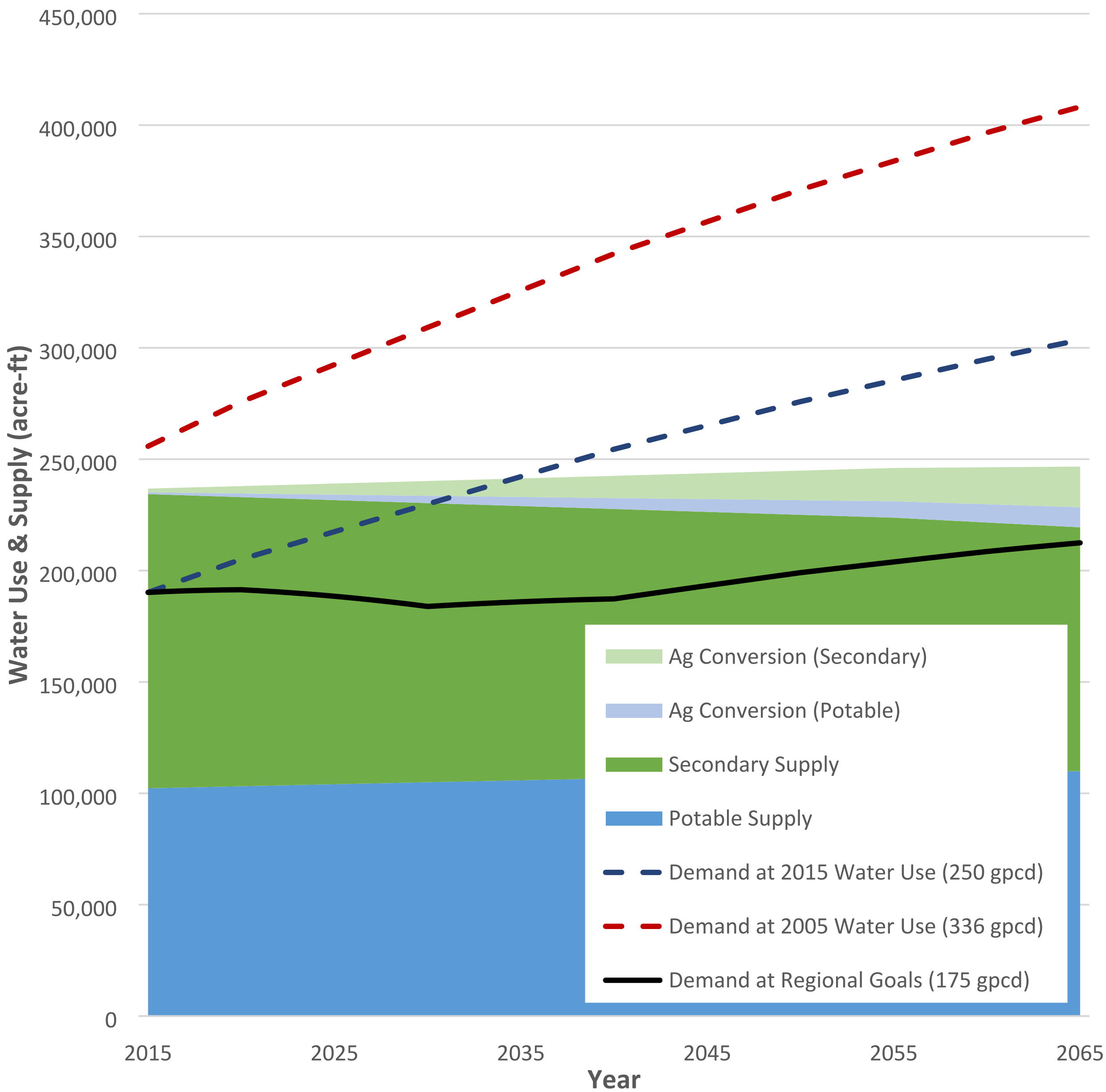


**Figure 9**
**Potential Impacts of Conservation on WBWCD Total Water Supply**



***Projected Need for Future Water Based on Existing Water Use:***

A comparison of Figures 7 and 8 indicates that WBWCD will need potable water earlier than it needs secondary water. For current conditions and water use levels, the potable water demands will surpass the supply by approximately 2030. In contrast, secondary supplies appear to be adequate through 2037.

If WBWCD can successfully convert some of its secondary water to potable water, the total water supply will be as shown in Figure 9. For this approach, projected demands surpass the existing supplies around the year 2035.

***Impacts of Historic Conservation Efforts:***

WBWCD's water use levels have decreased significantly within the last 10 years. If demands were at the same level observed in 2005, the figures show that WBWCD would already be out of both potable and secondary water by now. With the reduction in water use through conservation observed since 2005, WBWCD has delayed the need for additional water supplies by more than 15 years.

***Projected Impacts of Reaching Regional Water Conservation Goals:***

The potable supply and demand data shows that if WBWCD reaches its current regional goals, then existing supply will be adequate until almost 2065. When considering only secondary water supply or combining potable and secondary supplies, reaching the regional goals means that additional supplies are not projected to be needed until sometime after 2065.

***Additional Conservation Needed to Postpone Future Water Development Projects:***

As noted above and as shown in Figure 9, if WBWCD can reach the regional goals and if some secondary water supply can be successfully converted to potable supply, it appears that WBWCD's need for additional water development can be postponed beyond 2065. If only the potable water projections are considered, then demand will surpass supply just before 2065 and the Bear River Development project will be needed. In order to postpone the Bear River Development project, the per capita potable water use for WBWCD would need to be reduced to at least 97 gpcd by 2065, a reduction of 20 gpcd from current potable water use of 117 gpcd. This represents an increase in conservation savings of 9 percent from the savings already identified in the regional goals (99 gpcd vs. 97 gpcd.)

Table 5 below presents a few different options for actions that would be required to meet the regional conservation goals. Additional discussion regarding each of these categories is contained in Appendix B, Issue Paper III.

**Table 5**
**WBWCD Required Action to Achieve Various Conservation Scenarios**

| | Current | Regional Conservation Goal |
|---|---|---|
| **Indoor Water Use** | | |
| % High Efficiency Faucets/Showers | 80% | ~100% |
| % High Efficiency Toilets | 63% | ~100% (including 10% ultra-high efficiency) |
| % High Efficiency Washing Machines | 46% | ~100% |
| % Reduction in Leaks and Other Indoor Water Waste | - | 20% |
| **Outdoor Water Use** | | |
| % Secondary Connections Metered | 2% | ~100% |
| % of Best Expected Irrigation Efficiency | 64% | ~100% |
| Existing Development - % Cool-season Turf Grasses | 69% | 58% |
| Existing Development - % Other Waterwise Landscape Options | 31% | 42% |
| New Development - % Cool-season Turf Grasses | - | 35% |
| New Development - % Other Waterwise Landscape Options | - | 65% |
| Lot Size | 11,220 SF | 9,200 SF (18% reduction) |
| **Total Water Use** | | |
| Use per capita | 250 gpcd | 175 gpcd |

## Conservation Impact Conclusions

Based on the analyses above, the following major conclusions can be made regarding the impacts of conservation on water supply and demand planning:

- **Additional analysis is needed.** All analysis presented in this report is based on current, readily available data. This means that some data is more detailed and complete than other data. It also means BC&A has not been able to verify the accuracy of all the data. While it is anticipated that the analysis contained here will provide some insight into the role of conservation in future water supply and demand planning, additional analysis is needed before any firm decisions regarding future water development can be made.

- **Conservation efforts to date have significantly delayed the need for future water development projects.** Results for most of the water providers show that conservation efforts have been successful in postponing needed water development projects. The need for the Bear River Development project has been postponed by as much as 20 years.
- **Expected need for and timing of future water development projects varies significantly between water providers**:
  - BRWCD's and CWD's need for future water will depend greatly on each district's future development and growth. If growth in these areas continues at historic rates, additional water supply will not be needed for the foreseeable future, even with relatively modest conservation efforts. However, if growth follows patterns more typical of the more developed counties in the State, additional water supply may be needed before 2065 even with aggressive conservation efforts.
  - JVWCD needs additional water supply in the very near future. Because of the short time frame until this water is needed, it will be nearly impossible to conserve enough water to eliminate the need for the development of at least some of this supply. It may be more feasible for conservation to postpone future water development projects including the Bear River Development project beyond the 2065 planning window.
  - WBWCD's need for future water development projects will depend greatly on the level of conservation achieved by its customer agencies. Without conservation, WBWCD is projected to need additional water sooner than any other water provider. With conservation, however, there appears to be the potential to significantly postpone future large supply development projects.
- **Meeting the current Utah Division of Water Resources Regional Water Conservation Goals would significantly postpone the need for future water supply development projects.** In most cases, these goals are not sufficient to completely eliminate the need for additional water supply, but in all cases reaching these goals would delay the time in which the new supply is needed by 15 years or more.
- **To postpone water development projects beyond 2065, most entities will require additional conservation beyond the regional goals.** The magnitude of additional conservation varies by water provider but is as much as a 32 percent increase in required water savings beyond what is already identified in the regional goals. Table 6 shows a summary of the results, which includes the amount of conservation that each district would achieve if it meets the 2065 regional conservation goals and the amount of conservation that would need to be achieve by 2065 in order to delay the Bear River Development project beyond the 2065 planning window. A weighted average between all four districts was also calculated to provide an additional insight into the overall conservation efforts that are needed.

**Table 6**
**Required Conservation to Postpone Bear River Development Beyond 2065**

| | 2015 Water Use (gpcd) | 2065 Regional Conservation Goal (gpcd) | % Reduction from 2015 to Regional Goal | Additional Conservation Needed to Postpone Bear River Development (gpcd) | % Reduction from 2015 to Additional Conservation |
|---|---|---|---|---|---|
| **BRWCD** | 318 | 236 | 25.8% | 220 | 30.8% |
| **CWD** | 284 | 204 | 28.2% | 184 | 35.2% |
| **JVWCD** | 197 | 169 | 14.2% | 160 | 18.8% |
| **WBWCD** | 250 | 175 | 30.0% | 175 | 30.0% |
| **Weighted Average** | 232 | 181 | 22.1% | 173 | 25.4% |

In summary, changing levels of per capita water use will impact the timing for the estimated need for the Bear River Development project as shown in Table 7.

**Table 7**
**Estimated Impact of Conservation on Timing of Bear River Development**

| | Historic Water Use (Before 2005) | 2015 Water Use | Regional Goals | With Additional Conservation |
|---|---|---|---|---|
| **BRWCD** | 2035 | 2035 | 2055 | > 2065 |
| **CWD** | 2040 | 2045 | 2055 | > 2065 |
| **JVWCD** | 2010 | 2040 | 2060 | > 2065 |
| **WBWCD** | 2010 | 2035 | > 2065 | > 2065 |

- **Achieving the level of conservation required to postpone water development projects beyond 2065 will require very dramatic changes to current water use habits.** Reaching the level of conservation recommended in the regional goals will be a challenge requiring active participation and acceptance by homeowners, businesses, municipalities, and legislators. Reaching the increased level of conservation required to postpone water development projects beyond 2065 will be even more so. While some of the required changes will not be a difficult change for Utah residents (e.g. conversion to high efficiency fixtures), others represent a major change in the traditional approach to development (e.g. reducing average residential lot size by 37 percent or limiting cool-season turfgrasses to 20 percent of landscaped areas).

## FUTURE STUDIES ACTION PLAN

As noted above, the analysis contained here is based on the best available data but is missing important considerations in many areas. An important part of this study is to provide a prioritized list of additional studies related to helping further understand a wide range of water conservation impacts. This list of studies forms the basis for an action plan to ultimately answer whether or not conservation alone will be sufficient to postpone water development projects beyond 2065 and how well the public will accept the needed conservation measures. These studies will also help to answer what impacts water conservation will have on Great Salt Lake. The information gathered and analyzed in these studies is needed to more thoroughly inform policy makers regarding future water resource planning.

## Approach

The following list of additional studies was assembled from input received from stakeholders in the water industry (both agricultural and M&I), environmental interests, and state regulatory roles. The input for additional studies was sought from the following organizations:

- Water Districts:
  - Weber Basin WCD
  - Jordan Valley WCD
  - Bear River WCD
  - Cache Water District
- State Agencies:
  - Division of Water Resources
  - Division of Water Rights
  - Division of Water Quality
  - Division of Wildlife
- Environmental Interests:
  - The Nature Conservancy
  - Friends of Great Salt Lake
  - Audubon Society
  - Trout Unlimited
- Compass Minerals
- Others: Bear River Canal Company, Clyde Snow, and Jacobs Engineering

The recommended studies are listed according to general categories:

1. **Watershed Scale –** Impacts on a larger scale for Great Salt Lake and its watershed
2. **Water Supplier Scale –** Impacts on a regional scale related to water suppliers within the sub-watersheds
3. **Water User Scale –** Impacts on an end-water user or municipal scale, including industrial, commercial, and institutional

Each category list is provided in order of priority.

## Recommended Areas of Additional Study

### Watershed Scale

1. **Agricultural Conversion Evaluations** – Evaluations to understand the quantity of water made available as development moves onto agricultural lands. Further understand the geographical patterns of future development and how agricultural water conversion plays a role in securing M&I water supplies. What impacts will more efficient agricultural water use have on future conversion to M&I supply?
2. **Trans-Basin Water Imports** – Study to evaluate opportunities and resulting impacts of importing additional water from adjacent basins (Snake or Colorado) to the Wasatch Front.
3. **Historical Great Salt Lake (GSL) Levels and Human Impacts** – Develop a more detailed and in-depth analysis of the subject briefly evaluated in the White Paper "Impacts of Water Development on Great Salt Lake and the Wasatch Front". This will need to include more detailed analysis of how conservation activities ultimately affect the amount of water that reaches GSL. This would also include a more detailed look at impacts of agricultural water diversions as well as other large water diversions from the lake.
4. **Inflows to GSL:** Understand and quantify the inflow contributions to GSL, with emphasis on the following:
    a. **Stormwater Impacts on GSL –** Study the impacts of anticipated future land use changes on stormwater management. Evaluation and quantification of stormwater impacts on GSL from present conditions to anticipated future growth scenarios. Study the West Desert and salt flats runoff contribution to GSL.
    b. **Groundwater Impacts on GSL –** Study to quantify the contribution of groundwater to GSL. Identify the potential impacts of shallow groundwater development for secondary water on GSL. Identify the potential impacts of long-term sustained deep groundwater pumping on GSL – if any.
5. **Idaho Bear River Water Usage Evaluation** – Study to evaluate the present and anticipated future Bear River water usage in Idaho and the impacts on GSL.

### Water Supplier Scale

1. **Water Conservation Impacts and Supply Studies** – Continue the efforts of this study to quantify the overall regional water supply by putting more effort into data collection/evaluation from the large water districts. This would also include efforts to develop more water supply data (especially in rural areas with large growth potential) to better identify reliable yield of available existing supplies. Other parts of this study should include:
    a. **Study to Refine Population Growth and Land use Change Projections –** Evaluation of water supply/demand impacts from population densification, growth on non-agricultural lands, build-out potential, and large commercial/institutional developments. Of specific importance is better understanding the future of growth in Box Elder and Cache Counties. Will these counties continue as largely rural communities or will the more rapid growth experienced along other areas of the Wasatch Front spill over into these counties?
    b. **Incorporate System Loss Considerations Into Conservation and Supply Studies** – Conduct a water loss assessment to determine the water savings implications of

increasing the efficiency of existing M&I water supply and delivery infrastructure. This study would include quantifying "non-revenue water" and the costs of repair, replacement and redesign of existing water infrastructure. This study would examine the water savings that would occur with upgraded water infrastructure projects. This analysis would identify the water savings associated with system improvements in addition to end user conservation.

c. **Regional Water Conservation and Water Supply Sharing Study** – Study to evaluate the question: What impacts would a more open regional water sharing program (water banking, etc.) have on future large water development projects? Are there opportunities to better share water that is already developed between neighboring entities? Compare regional conservation efforts (water use changes) and theoretical combined regional water supplies and evaluate their potential impact (delay) to large future water development projects.

d. **Update and Refine the Division of Water Resources Demand Model** – Any changes resulting from the other studies discussed here will need to be reflected in the Division of Water Resources Demand Model. This model is the basis of much of the water resource planning at a State level. Keeping this model updated with any new information identified regarding conservation or other demand issues will help stakeholders to understand historical and projected water demands on a regional level.

e. **Great Salt Lake Integrated Model (GSLIM) Updates –** Integration of newly refined water supply, water demand/usage, and land use data into the GSLIM model. Refine the model with the latest range of water conservation projections.

2. **Water Conservation Costs Comparison** – Study to estimate the overall costs ($/ac-ft) of general M&I water conservation and compare to overall cost of new water project development. Evaluate quantity of water savings from M&I conservation and answer the questions: Is it really the low hanging fruit? What happens to saved M&I water? This study should include comparisons of how much money is used for water development compared to water conservation, and what policies and practices are in place to require analysis of these tradeoffs in future projects.

3. **Impacts of Wastewater Reuse** – Quantify and evaluate the direct impact of reuse on water contribution to GSL. Evaluate the impact of reuse as a source of supply water on future water development projects.

4. **Water Implications of Utah Growth Strategies** – A thorough assessment is needed of the commercial and industrial growth strategies that Utah is promoting and how water to support that growth would be accommodated within the existing water supply and its infrastructure. This study needs to answer the question: How can Utah grow in water conscious ways and ensure that its growth strategies are not in contradiction with its strategies to promote the health of Great Salt Lake? This assessment needs to include: a) analysis of the water use implications of different growth strategies; b) water use requirements and reporting criteria that cities could require developers to meet in their individual development proposals; and c) various avenues for ensuring growth occurs in water wise ways (e.g.: policy strategies to reduce water district and city obligations to service new development from existing supplies; integration of county and city land and water planning, M&I building codes; developer codes; landscaping policies, etc.).

## Water User Scale

1. **Commercial and Institutional Water Conservation –** Study to identify what outreach needs to occur to educate commercial/industrial and institutional water users of the importance of water conservation. What water use changes can these entities make and what are the motivating factors (since they are different than residential users)? What standards or tools could be developed to save water from these users? Quantify the average commercial/industrial/institutional water use in the system and potential water savings. How can land use and zoning be more aligned with State water conservation goals?
2. **Quantify Secondary Metering –** Study to estimate the potential quantity of water that could be saved under regional secondary metering programs. Understand where this saved water is applied in the overall system.
3. **Water Usage and Conservation Studies** – The following studies would be considered all under one scope or divided up into multiple studies:
    a. **Conservation Tolerance:** Study to understand the public's tolerance for higher levels of water conservation. What levels of pricing and other incentives as well as potential regulations will be palatable to residents and policy makers?
    b. **Value of Water:** Study to understand what are the drivers behind water use behavior changes. What studies have been done to understand this? What market forces could encourage more M&I water conservation and change attitudes? How would these potential market forces impact all demographics (how do you provide water for essential needs and what definitions could be used to define essential as it relates to outdoor uses)? How is the cost of water conveyed to and perceived by the end user? What are the impacts of water billing rate changes (tiered rates) to water conservation? Compile a list of past studies and results that would help to answer these questions.
    c. **Public Outreach and Education on Water Conservation:** Study to identify strategies that have worked to educate the public on the importance of water conservation and the value of "environmental water" in the ecosystem. What strategies could be implemented to encourage elected officials to emphasize and promote policies on the importance of water conservation?

## Other suggested studies from stakeholder input (not necessarily conservation related):

1. Bear River Canal Company: Quantify return flows from the irrigation system that flow back into GSL. Evaluation of agricultural efficiency projects and how/if they would really put water back into the ecosystem. Are Ag efficiency projects worth the cost?
2. Cloud seeding studies to look at the success of past cloud seeding and making recommendations for future cloud seeding programs.
3. Climate change impacts to evaporation rates within the GSL watershed. Will the new climate norms with warmer/wetter climate increase or decrease evaporation rates?

## Action Plan

The action plan shown in Table 8 is a summary of the most highly recommended studies taken and combined from the studies listed in the previous section. The information gathered and analyzed in this action plan represents what is needed to more thoroughly inform policy makers regarding future water resource planning. Because this plan includes needed study at multiple levels, it is unlikely that any single entity will be able to implement the full action plan. Instead, it is recommended that stakeholders work together to complete their applicable portions of the action plan to provide a fuller water resources planning picture. Leadership at the state level is recommended to coordinate these efforts.

**Table 8**
**Conservation Impacts Study Action Plan**

| Study Title | Study Key Elements |
|---|---|
| **PRIORITY 1**<br>**Water Conservation Impacts Study Continued (Expanded Scope)** | • **Refine Supply Numbers**<br>- Estimate rural area water supply data (current and projected)<br>- Study WBWCD's ability to shift contract Ag water to M&I<br>- Update JVWCD's expanded demand projections<br>• **Study Growth and Land Use Change Interactions**<br>- Geographic growth patterns (densification vs sprawl) and the impact on water supply and demand<br>- Update GSLIM and State Demand Models<br>• **Regional Water Supply and Demand Study**<br>- Impacts and challenges of supply sharing and impacts of regional conservation to large water project timing |
| **PRIORITY 2**<br>**Agricultural Water Conversion Study** | • **Quantify Ag Conversion Potential within Study Area**<br>• **Ag Conversion Impacts on Future M&I Supply**<br>- Integrate findings from Priority #1 Study<br>• **Ag Water Efficiency Impacts on Conversion Quantity** |
| **PRIORITY 3**<br>**Cost of Water Conservation Study** | • **Estimate Cost Range of M&I Water Conservation**<br>- Quantify Industrial/Commercial water conservation savings and range of costs<br>- Quantify secondary metering savings and costs, and impacts on water supply<br>- Estimate water savings and costs for water infrastructure upgrades<br>- Compare total conservation costs to costs of large project development<br>• **Conservation Efforts Cost Ranking**<br>- Identify low hanging fruit for M&I water conservation |
| **PRIORITY 4**<br>**Study of Water Use and Conservation Behaviors** | • **What are the drivers to M&I water use behavior changes?**<br>• **What market forces could be developed to encourage conservation?**<br>• **What is public's tolerance for higher levels of water conservation?**<br>• **What past public relations or outreach strategies have worked?** |

# APPENDIX A
# DATA SOURCES

## Data Sources by Origin:

| Origin of Data Source: | Data Source Gathered: |
|---|---|
| **Bear River Water Conservancy District (BRWCD)** | • BRWCD Drinking Water System Master Plan (Hansen Allen & Luce, Published Sept. 2017) |
| **Cache Water District (CWD)** | • 2019 Water Master Plan Cache Water District (J-U-B Engineers, Inc./The Langdon Group, Not yet published)<br>• Cache County Water Master Plan (J-U-B Engineers, Inc./The Langdon Group, Published Aug. 2013)<br>• Cache County Water Master Plan Handout (J-U-B Engineers, Inc., The Langdon Group, Utah DNR, Cache County) |
| **Jordan Valley Water Conservancy District (JVWCD)** | • Preparing for Climate Change – A Management Plan (Bart Forsyth & Todd Schultz, Published May 2017, Revised March 1st, 2018)<br>• 40-Year Plan (JVWCD, Not yet published, expected 2020)<br>• 2019 Conservation Plan Update Jordan Valley Water Conservancy District (Public Draft, www.JVWCD.org) |
| **Weber Basin Water Conservancy District (WBWCD)** | • WBWCD 2018 Conservation Plan Update (WBWCD Staff, Published 2018)<br>• WBWCD Supply and Demand Study 2016 – 2018 Amendment (Derek Johnson & Darren Hess, Published Oct. 6, 2018)<br>Weber River Basin Climate Vulnerability Assessment (Seth Arens, Logan Jamison, Paul Brooks, Alex Weech, & Court Strong, Published Dec. 2019) |
| **Great Salt Lake Advisory Council** | • Great Salt Lake Integrated Model (GSLIM)<br>An Integrated Water Resource Management Tool for the Great Sale Lake Watershed (Jacobs, Phase II-GSLIM Evaluation, Published Sept. 26, 2019) |
| **State of Utah Division of Water Resources** | • Utah Division of Water Resources: 2015 Municipal and Industrial Water Use Databases, M&I Report 2015 Culinary Water Suppliers (Updated Apr. 9, 2020, dwre-utahdnr.opendata.arcgis.com/)<br>• Utah's Regional M&I Water Conservation Goals (Hansen Allen & Luce/Bowen Collins & Associates, Nov. 2019) |
| **Kem C. Gardner Policy Institute – The University of Utah** | • Utah's Long-Term Demographic and Economic Projections Summary (Research Brief, Published Jul. 2017) |

## Data Sources By Application:

| | Data: | Source: | Notes: |
|---|---|---|---|
| BRWCD | **Growth Projections** | • Kem C. Gardner Policy Institute Population Projections<br>• BRWCD 2017 Drinking Water System Master Plan | Population data comes from two sources. The first, more conservative projections come directly from Kem Gardner population projections. However, the BRWCD Master Plan indicated a belief that the KGI projections did not reflect observed growth trends in neighboring areas facing development and a higher growth rate was believed to be a more accurate. Both population projections are included in this document. See Issue Paper II. |
| | **Water Demand** | • Utah Division of Water Resources 2005, 2010, and 2015 Municipal and Industrial Water Use Databases<br>• Utah's Regional M&I Water Conservation Goals | Population projections were multiplied by historical water use as calculated in the Division of Water Resources database. 2019 Regional Water Conservation Goals (RWCGs) were also used in order to determine future water use levels that incorporate conservation. For BRWCD projections, both the KGI population projections and the recommended rapid growth rate from the BRWCD Master Plan were used. |
| | **Water Supply** | • BRWCD 2017 Drinking Water System Master Plan<br>• Utah Division of Water Resources 2015 Municipal and Industrial Water Use Databases | BRWCD's latest master plan indicates that water supply data from the DWRe open water use website was used for planning purposes. That same data was used in this report. |
| | **Agricultural to M&I Water Conversion** | • Utah Division of Water Resources' conversion estimates | The Utah DWRe has developed a preliminary method to calculate Agricultural to M&I water use conversions for specific Utah counties. These conversions were used as a baseline for BRWCD, and CWD's Agricultural to M&I conversions. |

| | Data: | Source: | Notes: |
|---|---|---|---|
| CWD | **Growth Projections** | • Kem C. Gardner Policy Institute Population Projections | Due to location and land use similarities, the population scenarios used for BRWCD were also applied to CWD. Both conservative and aggressive growth rates are shown for CWD. See Issue Paper II. |
| | **Water Demand** | • Utah Division of Water Resources 2005, 2010, and 2015 Municipal and Industrial Water Use Databases<br>• Utah's Regional M&I Water Conservation Goals | Population projections were multiplied by historical water use as calculated in the Division of Water Resources database. 2019 Regional Water Conservation Goals (RWCGs) were also used in order to determine future water use levels that incorporate conservation. For CWD projections, both the KGI population projections and the recommended rapid growth rate were used. |
| | **Water Supply** | • Utah Division of Water Resources 2015 Municipal and Industrial Water Use Databases | Because CWD's latest master plan has not yet been completed and recent water supply data is not readily available directly from the District, water supply data from the DWRe open water use website was used. |
| | **Agricultural to M&I Water Conversion** | • Utah Division of Water Resources' conversion estimates | The State's methodology was also used as a baseline for CWD's Agricultural to M&I water conversion calculations; however, to be consistent between the districts, the same proportion of water conversion was used for CWD as BRWCD. |

| | Data: | Source: | Notes: |
|---|---|---|---|
| JVWCD | **Growth Projections** | • JVWCD 40 Year Plan | The JVWCD 40 Year Plan document projects JVWCD's population from 2020 to 2060 and is specific to the Jordan Valley service area. |
| | **Water Demand** | • 2005 Demand Supply and Major Conveyance Study<br>• JVWCD 40-Year Plan<br>• Utah's Regional M&I Water Conservation Goals | Historic 2000 and 2015 per capita water use levels have been taken directly from the District's own records.<br><br>Goals were used with JVWCD population projections to project future water use levels. |
| | **Water Supply** | • JVWCD 40-Year Plan | The water supply was based on the District's own analysis in the 40-Year Plan, and then adjusted to incorporate climate change. |
| | **Climate Change** | • JVWCD Climate Change Management Plan with appendices | JVWCD has conducted a detailed study that shows the effects of future climate change on its water resources.  See Issue Paper I. |
| WBWCD | **Growth Projections** | • WBWCD 2016 Supply and Demand Study w/ 2018 Amendment | The 2016 WBWCD Supply and Demand Study projects WBWCD's population from 2020 to 2060 and is specific to the Weber Basin service area. |
| | **Water Demand** | • Utah Division of Water Resources 2005, 2010, and 2015 Municipal and Industrial Water Use Databases<br>• Utah's Regional M&I Water Conservation Goals | Population projections were multiplied by historical water use as calculated in the Division of Water Resources database.<br><br>Goals were used with WBWCD population projections to project future demands with conservation. |
| | **Water Supply** | • WBWCD 2016 Supply and Demand Study w/ 2018 Amendment<br>• Utah Division of Water Resources | Because WBWCD's potable and secondary water supplies are separate, they must be analyzed separately. Each supply type has a unique supply and demand projection which is shown in |

| | Data: | Source: | Notes: |
|---|---|---|---|
| | | 2015 Municipal and Industrial Water Use Databases | the report. Because of this, potable and secondary water supply data were taken direction from the supply and demand master plan. |
| | **Agricultural to M&I Water Conversion** | • WBWCD 2016 Supply and Demand Study w/ 2018 Amendment | A detailed GIS analysis of projected areas of development was conducted as part of WBWCD's supply and demand master plan. This was used to estimate available ag water for conversion to M&I. |
| | **Climate Change** | • WBWCD Climate Vulnerability Assessment | WBWCD has conducted a detailed study that shows the effects of future climate change on its water resources. See Issue Paper I. |

# APPENDIX B
# ISSUE PAPERS

# ISSUE PAPER I – CLIMATE CHANGE

## INTRODUCTION

Climate change is a variable that could significantly affect supply and demand planning. Changes in evapotranspiration, precipitation, and runoff patterns resulting from climate change could all have major implications on both observed demand and available supply.

While any detailed evaluation of the effects of climate change are obviously beyond the scope of this project, there has been some efforts made by others to look at this issue. The purpose of this issue paper is to document how climate change has been incorporated into the current document, both in terms of demand and supply.

## DEMAND

As discussed in other section of this report, projected demands with conservation are based on results from the conservation potential model prepared as part of the State of Utah's Regional Water Conservation Goals. Included in this model was an estimated 10 percent increase in evapotranspiration rates as a result of climate change by the year 2065 (*Utah's Regional M&I Water Conservation Goals, p. 34).* This results in a corresponding increase in outdoor demands of 10 percent. Thus, all projected demands with conservation as identified in this report include a 10 percent increase in outdoor demand by the year 2065 in association with potential climate change.

It should be noted that projected demands based on historic water use are based on a constant per capita demand and correspondingly do not include any increase in evapotranspiration or outdoor demand associated with climate change. This means that future demands without conservation would be higher than the demands shown in the report if the projected effects of climate change were added.

## SUPPLY

The expected effects of climate change on supply is just beginning to be studied by communities in northern Utah. However, information as available has been used to estimate the impacts of climate change on supply for each of the water districts as detailed in the following sections

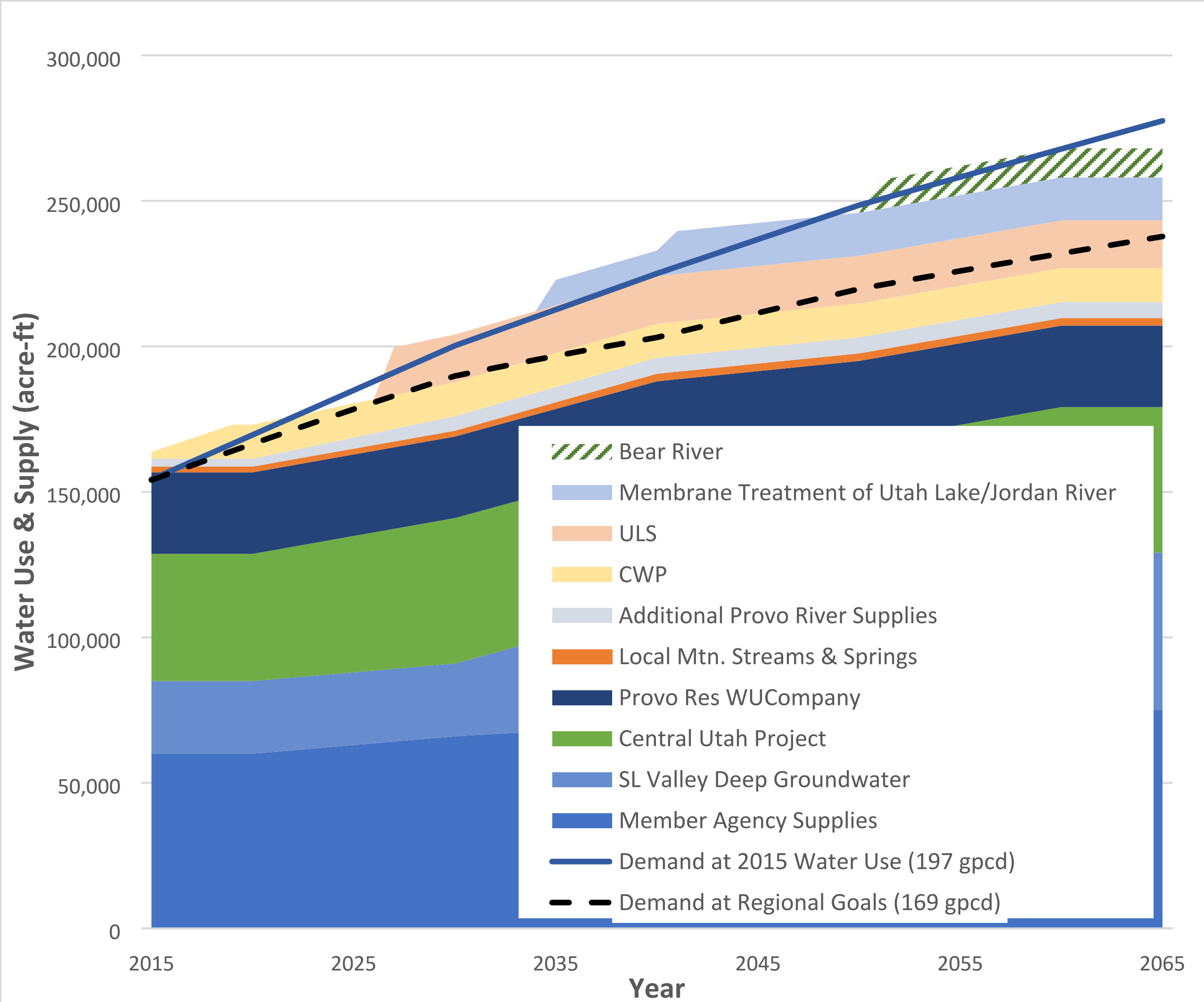
### BRWCD and CWD

For BRWCD and CWD, no detailed information is currently available regarding the projected effect of climate change on water supplies. Culinary supplies for both of these District's rely heavily on groundwater. Groundwater supplies are generally expected to be less impacted by climate change than other sources. Based on the nature of BRWCD and CWD supplies, and in the absence of any additional information to suggest any other approach, no changes have been made to projected BRWCD and CWD supplies as a result of climate change.

### JVWCD

Figure 1 shows JVWCD's total projected water supply without incorporating losses due to climate change.

**Figure 1**
**JVWCD Projected Water Use Levels with Total Supply**




However, because JVWCD has performed a detailed study on the effects that climate change may have on its supplies, these effects were incorporated into this study and are shown in Figure 2 (see Appendix A). JVWCD projected its water supply under both drought conditions (1 in 50 year, 5-year duration drought) and adverse climate conditions (1 in 50 year, 5-year duration drought). The difference in acre-ft of supply from the drought conditions to the adverse climate conditions was found for each supply source, except the Bear River Project (*Preparing for Climate Change - A Management Plan, p. 37 & 38)*. The total difference in supply of 31,000 acre-ft was then subtracted from the supply shown in Figure 1. Figure 2 shows the District's projected water supply when incorporating the loss of supply due to climate change. The amount of future supply loss due to climate change is shown in Table 1.

**Figure 2**
**Potential Impacts of Conservation & Climate Change on JVWCD Water Supply Planning**

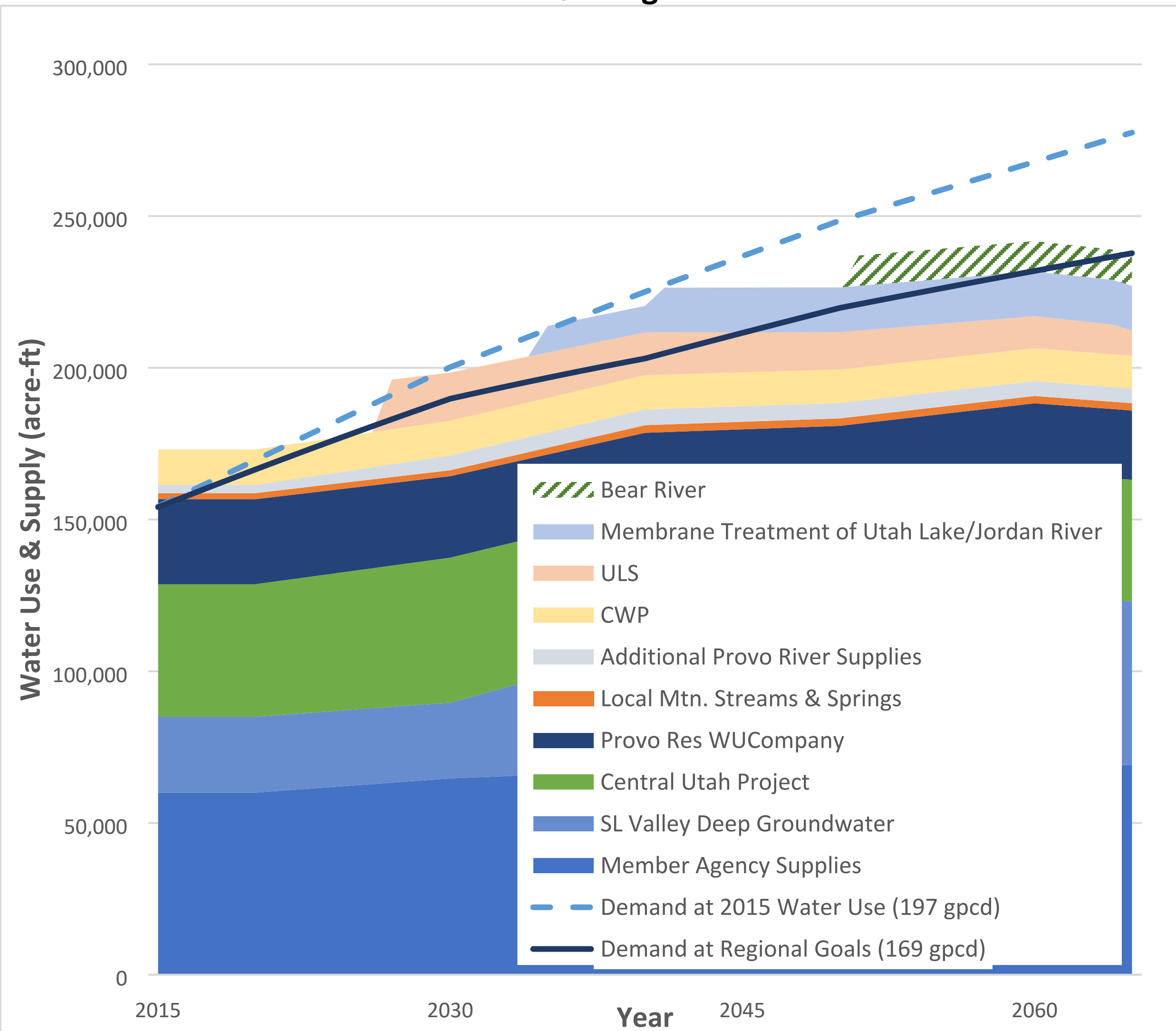



**Table 1**
**JVWCD Projected Supplies**

| Year | JVWCD Total Supply (acre-ft) | JVWCD Total Supply w/ Climate Change (acre-ft) |
|---|---|---|
| 2015 | 163,736 | 163,736 |
| 2025 | 180,380 | 177,824 |
| 2035 | 222,880 | 213,791 |
| 2045 | 242,430 | 226,452 |
| 2055 | 261,999 | 239,132 |
| 2065 | 268,068 | 237,068 |

### WBWCD

Like JVWCD, Weber Basin Water Conservancy District (WBWCD) has also performed a detailed study of the potential effects that climate change may have on its water supply (see Appendix A). In the study, the central tendencies of climate change are shown to result in a 3.7 percent decrease in supply by 2055 and a 9 percent decrease in supply by 2085 *(Weber River Basin Climate Vulnerability Assessment, p. 50).* These percentages of supply loss were incorporated into the report and the figures for WBWCD are reflective of a 9 percent loss in total supply. The amount of WBWCD's future supply loss due to climate change is shown in Table 2.

**Table 2**
**WBWCD Projected Supplies**

| Year | WBWCD Total Supply (acre-ft) | WBWCD Total Supply w/ Climate Change (acre-ft) |
|---|---|---|
| 2015 | 234,331 | 234,331 |
| 2025 | 233,647 | 231,635 |
| 2035 | 232,963 | 228,974 |
| 2045 | 232,280 | 226,348 |
| 2055 | 231,596 | 223,756 |
| 2065 | 230,912 | 219,432 |
| 2075 | 230,912 | 215,721 |
| 2085 | 230,912 | 212,011 |

## SUMMARY OF CONCLUSIONS

Understanding the effects of climate change on supply is relatively limited and based on the best available information. BRWCD and CWD supplies have not been reduced due to climate change because of lack of information. JVWCD and WBWCD's projected 2065 supplies have been reduced by 31,000 acre-ft and 18,900 acre-ft respectively based on available studies. For future demands, an estimated 10 percent increase in evapotranspiration rates was also incorporated by the year 2065 as a result of climate change.

# ISSUE PAPER II – LONG-TERM GROWTH POTENTIAL

## INTRODUCTION

One challenge of long-term water supply planning is trying to predict what development patterns will look like many decades from now. In the more densely developed service areas of JVWCD and WBWCD (Wasatch Front portion), it is generally accepted that urban and suburban development will gradually expand to fill most remaining undeveloped and agricultural properties. With this assumption in place, it becomes comparatively easy to project the future growth potential of the services areas. For JVWCD, the current planning window through 2065 extends far enough to capture the expected full development of properties within its service area. For WBWCD, significant growth is expected to occur beyond 2065, but an expected full development population is still able to be predicted and planned for

This is not the case for BRWCD and CWD. These two districts are still comparatively undeveloped. They also contain large areas of agricultural development and district residents have expressed a strong desire to preserve these agricultural activities. As a result, there is not consensus regarding what future development will look like in these districts or how quickly it will occur. The purpose of this issue paper is to explore a few different possibilities for long-term growth potential in these districts and examine how these possibilities might affect water supply planning.

## BEAR RIVER WCD LONG-TERM GROWTH POTENTIAL

Both BRWCD and CWD exhibit similar challenges relative to projecting long-term growth potential. Because BRWCD planning efforts are a little further along, it will be discussed first and in greater detail. However, the same principles will apply to CWD.

### POPULATION PROJECTIONS THROUGH 2065

The current planning window for this study is through 2065. This planning window has been selected because it is the period for which population growth projections are available from the Kem C. Gardner Institute (KGI). According to the KGI projections through 2065, the population of Box Elder County (essentially the service area of BRWCD) will continue to slowly increase at a rate of 0.8 percent per year for at least the next 45 years. This is a little less than the average historical growth rate for Box Elder County of about 1.2 percent per year[1].

This growth rate is in stark contrast to growth projected internally by BRWCD. In 2017, BRWCD prepared a master plan to evaluate its water supply and demand. One major conclusion of the BRWCD Master Plan was that the population of Box Elder County is likely to grow more rapidly than the growth that is shown in the Kem Gardner Institute projections. As stated in the BRWCD 2017 Master Plan,

> "The following list summarizes the reasons the BRWCD believes that Box Elder County is likely to experience more rapid growth than historical growth rates and current projections:
>
> - Population density in Box Elder County is about the same as Salt Lake, Utah, Davis, Weber, and Tooele counties were just prior to their experiencing rapid growth.
> - Box Elder County is located adjacent to a rapidly growing county that has a much higher density resulting in development pressure (Population density of Weber

[1] U.S. Census Bureau historic population growth for Box Elder County from from 1980 to 2015.

County was about 1,400 people per square mile in 2010).

- Box Elder County is located along the major transportation route (I-15) connecting the urbanized areas of Weber, Davis, Salt Lake, and Utah counties.
- Recent expansion of I-15 to three lanes through Box Elder County has made the commute into the more urbanized areas quicker and more convenient.
- UDOT plans to extend the Front Runner commuter rail to Brigham City would provide additional convenience for commuting into the more urbanized areas.
- Some communities are already experiencing more rapid growth.
- Community planners and other stakeholders are seeing increased building permit requests.
- Multiple large industries are showing interest in locating in Box Elder County due to the availability of large parcels at a significantly lower cost relative to the more populated counties along the Wasatch Front. An example of this is the Proctor & Gamble plant that was constructed west of Bear River City within the last 10 years."

Based on these observations, the BRWCD master plan included much more aggressive growth scenarios based on a growth rate of up to 3 percent per year. Ultimately, the master plan recommended that a growth rate be selected for planning that resulted in a population somewhere near the average of the historical growth rate and most rapid growth rate scenarios. This resulted in a planning growth rate of 2.4 percent per year.

While the difference between 0.8 percent and 2.4 percent growth may seem small, the compounding nature of population growth means that projected population in Box Elder County for a growth rate of 2.4 percent will be nearly twice that of the population for a growth rate of 0.8 percent by the year 2065. Trying to determine which of these projections is more likely is beyond the scope of this project. However, some additional information can be provided to add perspective regarding what each of these scenarios mean. One specific item interest is the long-term potential for development in the county.

## POPULATION PROJECTIONS BEYOND 2065

Long-term population projections for Box Elder County will be highly dependent on the community's vision for its future. In short, will the county continue to be a largely rural community with large sections of land preserved for agriculture, or will the county follow the trend of its more developed neighbors to the south? The answer to this question will depend on the complicated interaction of economic and demographic forces not easily predicted. It will also be determined by policies implemented in both the county and the State of Utah regarding future growth. With this in mind, it is useful to consider the full range of long-term growth that might be expected.

### Buildout Population

Unless a community actively implements policies to limit where growth can occur, it is possible that development will eventually expand to fill all the available area in the county. Based on available information, the future population of the county at full development can be estimated as shown in Table 1. This is based on information regarding developable area contained in the *2017 BRWCD Master Plan*, lot size projections per *Utah's Regional M&I Water Conservation Goals*, and existing population and household size per KGI estimates. As shown in the table, the estimated potential population of the county with full development is over 660,000, a massive increase from the existing population of 54,000 and historic population of 42,872 in the year 2000.

**Table 1**
**BRWCD Buildout Population Projections**

| | |
|---|---|
| Developable Acres | 150,000 acres |
| Currently Developed | 12,000 acres |
| Remaining Available | 138,000 acres |
| Estimated Residential Available | 71,760 acres |
| Projected Res. Lot Size | 12,947 SF |
| Lots at Projected Size | 241,436 Unit |
| KGI Household Size 2060 | 2.52 Persons/Unit |
| Additional Population | 608,156 Persons |
| Current Population | 53,971 Persons |
| Buildout Population | 662,127 Persons |

### Long-Term Growth Scenarios

Based on the estimated potential buildout population of the county and the nearer-term projections discussed previously, two long-term growth scenarios have been developed:

1. **BRWCD Master Plan Projections with Unrestricted Future Growth** – This scenario looks at what might occur if Box Elder County follows the same type of growth pattern that has been observed in more developed counties to the south. For the years through 2065, it uses the recommended growth projections from the BRWCD Master Plan. After 2065, it follows a logistic growth curve based on an initial growth rate of 2.4% and buildout population of 662,000.
2. **Extrapolated Kem C. Gardner Institute Projections (KGI Projections)** – This scenario looks at what will happen if Box Elder County continues to grow at essentially historic rates. For the years through 2065, it uses the KGI growth projections. After 2065, it also follows a logistic growth curve but uses an initial growth rate of 0.8%.

Projected populations for these two scenarios are shown in Figure 1 and Table 2.

**Figure 1**
**BRWCD Population Projections**

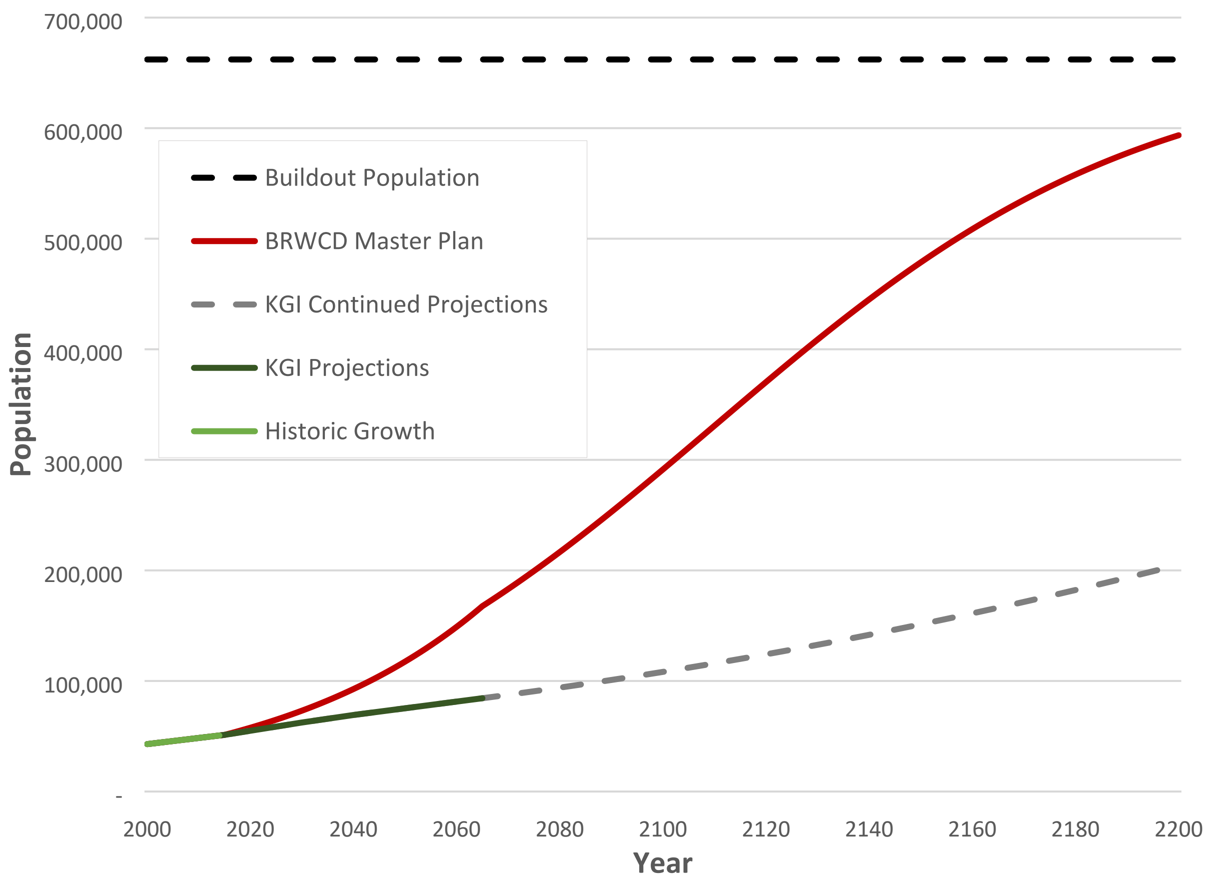



**Table 2**
**BRWCD Population Projections**

| Year | BRWCD Master Plan Projections with Unrestricted Future Growth | Extrapolated KGI Projections |
|---|---|---|
| 2015 | 51,228 | 51,228 |
| 2025 | 64,939 | 58,688 |
| 2035 | 82,321 | 65,818 |
| 2045 | 104,354 | 72,249 |
| 2055 | 132,284 | 78,311 |
| 2065 | 167,690 | 84,372 |
| **Buildout** | **662,000** | **205,000** |

### Long-Term Growth Potential Conclusions

Based on the observed results in Figure 1 and Table 2, it appears reasonable that either one of the projected growth scenarios identified here could occur given the right set of circumstances:

- If Utah continues to see rapid population growth, increased pressure to develop will eventually expand to the north of the state's most populous counties. Unless development limitations are put in place, it is not unreasonable to expect that Box Elder County will begin to experience growth similar to that of other densely populated counties, even if the timing of this growth is different from that projected in the more aggressive growth scenario shown here.
- If long-term growth in Utah slows, or if Box Elder County decides that portions of its land will be reserved for purposes other than future development (e.g. preserving farmland or open space), it is not unreasonable to expect that Box Elder County will continue to grow at the modest rates observed in the past. If this occurs, the County may never approach anywhere near the buildout population estimated here and the modest growth rates projected by KGI may continue indefinitely.

With both of these scenarios being possible future outcomes, it seems prudent to consider the full range of potential growth as part of this project. Thus, it is recommended that both these scenarios continue to be considered until there is additional clarity regarding the nature of future growth in Box Elder County.

## CACHE WATER DISTRICT LONG-TERM GROWTH POTENTIAL

While CWD has not yet competed the same type of growth analysis as has been done for Box Elder County, it is easy to see that the same types of considerations would apply to Cache County. Tables 3 and 4 along with Figure 2 present the same information regarding population growth potential in Cache County as was presented previously for Box Elder County.

**Table 3**
**CWD Buildout Population Projections**

| | |
|---|---|
| Remaining Developable Area | 151,000 acres |
| Estimated Residential Available | 78,520 acres |
| Projected Res. Lot Size | 9,744 SF |
| Lots at Projected Size | 351,019 Unit |
| KGI Household Size 2060 | 2.75 Persons/Unit |
| Additional Population | 966,687 Persons |
| Current Population | 121,855 Persons |
| Buildout Population | 1,088,542 Persons |

**Figure 2**
**Cache County Population Projections**

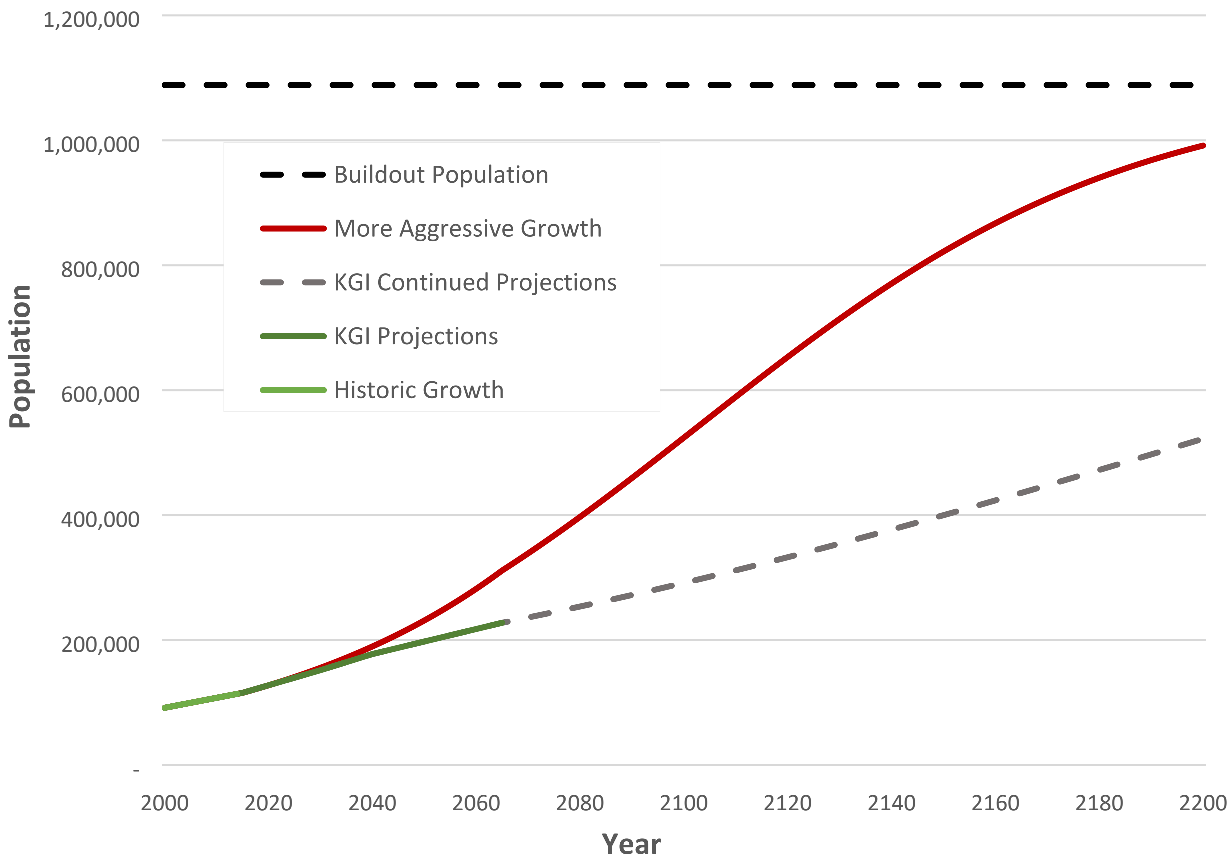



**Table 2**
**Cache Population Projections**

| Year | Unrestricted Future Growth Projections | KGI Extrapolated Projections |
|---|---|---|
| 2015 | 115,765 | 115,765 |
| 2025 | 141,116 | 139,929 |
| 2035 | 172,020 | 164,923 |
| 2045 | 209,691 | 187,856 |
| 2055 | 255,613 | 207,899 |
| 2065 | 311,591 | 227,942 |
| **Buildout** | **1,088,000** | **522,442** |

While the two growth scenarios are more similar to each other in Cache County than in Box Elder County, they still represent a broad range of possible future outcomes. The potential population at buildout is much higher than both the current population of 128,289 and the year 2000 population of 91,851. Thus, it is recommended that both these scenarios continue to be considered until there is additional clarity regarding the nature of future growth in Cache County.

# ISSUE PAPER III – REGIONAL WATER CONSERVATION GOALS

## INTRODUCTION

Residents and water providers in the state of Utah have been thinking about and working toward conservation for many years. For the last few decades, Utah's statewide water conservation goal has been "25% by 2025," that is, to reduce per capita municipal and industrial (M&I) water use by 25% by the year 2025[1]. Thanks to the efforts of many Utahns and their water providers, statewide M&I per capita water use in the year 2015 declined by at least 18% from the value estimated for the year 2000. Annual reporting from many individual water suppliers confirms significant progress in water conservation.

More recently, the State of Utah Division of Water Resources issued a new set of conservation goals as summarized in its report, *Utah's Regional M&I Water Conservation Goals* (Hansen Allen & Luce/Bowen Collins & Associates, November 2019) . This report includes new recommended regional municipal and industrial (M&I) water conservation goals for 2030, and projections for 2040 and 2065. These goals are created on a per capita basis and applied to individual counties throughout the state depending on various factors (e.g. historic use, projected population growth, climate, etc.).

As part of the analysis contained in study, projected water use will be considered if each entity is able to reach the newly adopted Regional Water Conservation Goals. The purpose of this issue paper is to document the goals and provide a brief summary of what will be required to reach each goal according to information contained in the report *Utah's Regional M&I Water Conservation Goals.*

## REGIONAL WATER CONSERVATION GOALS

As noted in the main body of the report, this evaluation focuses on four primary water providers in northern Utah: Bear River Water Conservancy District (BRWCD), Cache Water District (CWD), Jordan Valley Water Conservancy District (JVWCD), and Weber Basin Water Conservancy District (WBWCD). For the purpose of this study, water use levels were projected using the State of Utah's current regional conservation goals in order to show what demands could be expected if these goals are accomplished. Projected water use for each provider at the regional conservation goals are shown in Table 1. The goals are shown according to year and are presented in gallons per capita day (gpcd).

**Table 1**
**Major Water Provider Regional Water Conservation Goals (gpcd)**

| Water Provider | Basis of Goal | Current Use | 2030 Goal | 2040 Projection | 2065 Projection |
|---|---|---|---|---|---|
| BRWCD | Box Elder County | 318 | 266 | 249 | 236 |
| CWD | Cache County | 284 | 233 | 217 | 204 |
| JVWCD | Salt Lake Region | 197 | 187 | 178 | 169 |
| WBWCD | Weber Region | 250 | 200 | 184 | 175 |

There are several items that should be noted regarding these goals:

[1] Based on a starting point for per capita use as estimated for water use observed in the year 2000.

- Goals have been based on the political subdivision most representative of the water provider. In the case of JVWCD and WBWCD, goals are based on the region in which they reside (Salt Lake Region and Weber Region). For BRWCD and CWD, goals are based on a county level (Box Elder County and Cache County). Using the region to set the goal is deemed preferable as this is the official approach of the Division of Water Resources regional goals. However, in the case of BRWCD and CWD, the water use characteristics of these two providers are different enough that using the single regional goal for the Bear River Region did not appear to adequately represent conservation potential in each area for the purposes of this report. Correspondingly, the conservation potential model from the Regional Conservation Goal study was used to further break down the goal to a county level.
- The only true goal established by the Division of Water Resources is for 2030. The value reported by the Division for 2040 are projections of what future goals may be but are recommended for reconsideration and possible change as more data is collected in the future. Since the analysis being considered in this project looks at long-term water needs, it is necessary to provide some kind of forecast through 2065. Correspondingly, the values published for 2040 and 2065 have been used in this analysis even though they are expected to change in the future.
- The numbers reported in Table 1 are based on water sales (consistent with the Regional Goals) and do not include system losses. For planning purposes, projected demands include system losses as appropriate for each water provider. For the water providers in this study, estimated system losses range from 5 to 15 percent. It has been assumed that system losses remain constant over time[2].
- For the analysis of Weber Basin Water Conservancy District (WBWCD), projected demand has been separated into both secondary and potable water demand. This is done to more fully understand the future supply and demand of WBWCD. the conservation potential model from the Regional Conservation Goal study was used to further break down the Weber Region goal into potable and secondary components. At the year 2065, this equates to 99 gpcd potable demand and 76 gpcd secondary demand.

## REQUIRED ACTION TO ACHIEVE REGIONAL GOALS

To meet the regional conservation goals identified here, there will need to be some significant changes in how water is used. These changes are documented in detail in the report *Utah's Regional M&I Water Conservation Goals* and are summarized here. Changes associated with conservation will affect both indoor and outdoor use[3].

[2] While no change in system losses has been considered here, this is an area where additional research could be beneficial. While not considered "conservation" as defined in the regional water conservation goals, any reduction in system losses would represent a decrease in the total demand for water and correspondingly advances the same goal. Reducing system losses has been added as a recommended area for additional consideration as part of the final action plan of this report.

[3] To facilitate discussion, conservation outcomes discussed here focus predominantly on residential water use. This is of necessity given the broad range of uses in commercial, industrial, and institutional (CII) water uses. However, it should be emphasized that it is not expected that residential users will bear the burden of conservation alone. Consistent with the guidance outlined in *Utah's Regional M&I Water Conservation Goals,* it is expected that CII water users will implement the exact same types of conservation measures as identified for residential customers. Additional research is needed to understand how these conservation principles apply to CII uses and better quantify what the resulting savings will be, but the expectation for conservation effort is the same for all users.

### Indoor Conservation Efforts

Current water use data does not provide detailed information regarding indoor water use patterns for each individual provider considered here. However, statewide estimates indicate that current indoor infrastructure has the following characteristics:

- 80 percent of faucets and showers qualify as high efficiency (high efficiency defined as 1.5 gallons per minute (gpm) for faucets, 2.0 gpm for showerheads)
- 63 percent of toilets at high efficiency (high efficiency defined as less than 1.6 gallons/flush)
- 46 percent of washing machines at high efficiency (high efficiency defined as less than 25 gallons/load)
- 6.3 gpcd leaks and other indoor water waste

To reach the regional conservation goals identified in Table 1, all of the water providers will need to achieve the following by 2065:

- ~100 percent conversion of faucets and showers to high efficiency
- ~100 percent conversion of toilets to high efficiency with at least 10 percent of the total qualifying as ultra-high efficiency (ultra-high efficiency defined as 1.28 gallons/flush)
- ~100 percent conversion of washing machines to high efficiency
- 20 percent reduction in household leaks and other waste

### Outdoor Conservation Efforts

In addition to the indoor efforts above, water providers will also need to achieve conservation in a number of outdoor areas. Estimates of current outdoor infrastructure characteristics are as follows:

- 2 percent of secondary connections currently metered (statewide)
- Current percentage of best expected irrigation efficiency[4]:
  - BRWCD - 75 percent
  - CWD - 70 percent
  - JVWCD - 83 percent
  - WBWCD - 64 percent[5]
- Current landscape mix: 69 percent cool-season turf grasses, 31 percent other waterwise landscape options (average mix of landscaping for northern Utah populated areas including all water providers considered here)
- Current average residential lot sizes:
  - BRWCD - 15,264 SF

[4] For the purposes of the regional goals, irrigation efficiency was defined as "the ratio of water needed by vegetation to the amount of water actually applied through irrigation." While it may be possible to reach 100 percent irrigation efficiency in demonstration gardens or other controlled settings, there is a practical limitation on how efficient an average home owner can get. The regional conservation goal report uses 70 percent as the best expected irrigation efficiency for sprinkled systems and 80 percent for drip systems. The "percentage of best expected" is therefore a measurement of how close efficiency is to these expected values.

[5] WBWCD's efficienct number is notably lower than other areas as a result of the large number of unmetered secondary connections in its service area.

- CWD - 12,805 SF
- JVWCD - 8,463 SF
- WBWCD - 11,220 SF

To reach the regional conservation goals identified in Table 1, all of the water providers will need to achieve the following by 2065:

- 100 percent of secondary connections metered
- 100 percent of best expected irrigation efficiency
- Landscape mix:
  - Existing Homes convert 11 percent of their landscapes to achieve the following mix: 58 percent cool-season turf grasses, 42 percent other waterwise landscape options
  - New Homes: 35 percent cool-season turf grasses, 65 percent other waterwise landscape options
- Lot sizes – Increased density and redevelopment occur to achieve the following average residential lot sizes:
  - BRWCD - 12,950 SF (15 percent reduction)
  - CWD - 9,750 SF (24 percent reduction)
  - JVWCD - 7,280 SF (14 percent reduction)
  - WBWCD - 9,200 SF (18 percent reduction)

In reviewing the values for both indoor and outdoor water use practices, it should be noted that these values are based on current technologies. It is entirely possible that advances in technology in one or more areas may allow more savings to be achieved than predicted under current technologies. In this case, the regional goals might be reached even if water use patterns don't reach the values listed above (e.g. development of lower water use cool-season turf grasses could allow goals to be achieved with higher percentages of turf as landscaping than shown here). However, the numbers above reflect the best available information today.

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