Balancing Agricultural and Urban Water Needs in Transitioning Arid Landscapes

Bonnie Roos
Utah State University

Follow this and additional works at: https://digitalcommons.usu.edu/etd

Part of the Life Sciences Commons

Recommended Citation
https://digitalcommons.usu.edu/etd/5017

This Thesis is brought to you for free and open access by the Graduate Studies at DigitalCommons@USU. It has been accepted for inclusion in All Graduate Theses and Dissertations by an authorized administrator of DigitalCommons@USU. For more information, please contact digitalcommons@usu.edu.
BALANCING AGRICULTURAL AND URBAN WATER NEEDS
IN TRANSITIONING ARID LANDSCAPES

by

Bonnie Roos

A thesis submitted in partial fulfillment
of the requirements for the degree

of

MASTER OF SCIENCE

in

Human Dimensions of Ecosystem Science and Management

Approved:

____________________  ____________________
Joanna Endter-Wada    Christopher Lant
Major Professor       Committee Member

____________________  ____________________
James Long            Mark McLellan
Committee Member      Vice President for Research and
                      Dean of the School of Graduate Studies

UTAH STATE UNIVERSITY
Logan, Utah

2016
ABSTRACT

Balancing Agricultural and Urban Water Needs in Transitioning Arid Landscapes

by

Bonnie Roos, Master of Science
Utah State University, 2016

Major Professor: Dr. Joanna Endter-Wada
Department: Environment and Society

In the arid western United States (U.S.), population expansion is dependent on water supply. With the majority of the water being consumed in agriculture, municipalities often obtain water supply needed for growth from agriculture. Water supply reallocation generally occurs through agricultural-to-urban water right transfers. This trend in agricultural-to-urban water transfers drives the question of how to strike a balance between agricultural and urban water needs in rapidly growing arid regions. In the Intermountain West region of the United States, Utah is a state with a rapidly growing population and limited water supply. This study occurred between 2015 and 2016, using a multi-method approach to understand agricultural-to-urban water transfers in Utah. In-person interviews, participant observation, and secondary data collection methods focused on existing challenges and opportunities for striking a balance between these water interests. Data revealed that water transfers out of agriculture and into
municipalities are more significant to areas of Utah experiencing rapid population growth. Policy challenges arise as water is seen as a monetary asset, incentivizing the reintroduction of old water rights into an established water priority system. Further challenges occur as municipal uses are given preference in state development strategies over agricultural uses. This preference can incentivize both the selling of water to municipalities and the gathering of large municipal water right portfolios. Balancing growth and water interests in transitioning landscapes is suggested through the use of agreements, as well as regional planning and collaboration. This transition, if not properly planned and accounted for in the water budget, can create dilemmas with water availability, delivery, and use as separate water providers prepare for growth within their own geographic boundaries. The Mt. Nebo Water Agency provides the opportunity for stakeholder involvement and boundary-spanning to occur between regional municipal and agricultural interests. Stakeholder involvement and boundary-spanning solutions are considered crucial factors for regional planning, particularly with resources like water that traverse political boundaries.
PUBLIC ABSTRACT

Balancing Agricultural and Urban Water Needs
in Transitioning Arid Landscapes

Bonnie Roos

In the arid western United States (U.S.), population expansion is dependent on water supply. With the majority of the water being consumed in agriculture, municipalities often obtain water supply needed for growth from agriculture. This exchange occurs through agricultural-to-urban water right transfers. This trend drives the question of how to strike a balance between agricultural and urban water needs in rapidly growing arid regions.

Utah, located in the Intermountain region of the western U.S., is a state with a rapidly growing population and limited water supply. This research focuses on existing challenges and opportunities for balancing expanding municipal development and existing agricultural water needs in Utah. Data for this study were collected through multiple qualitative methods including: personal interviews were with a selection of Utah Division of Water Rights employees and representatives from the Mt. Nebo Water Agency; participant observations at public meetings; and secondary data obtained through publicly available documents combined with state water law and policy.

The results of this research highlight agricultural-to-urban water transitions from both statewide and local perspectives. Statewide policy challenges arise as water rights increase in monetary value, incentivizing speculation. Further challenges occur as
municipal uses are given preference in state development strategies over agricultural uses. This preference can incentivize both the selling of water to municipalities and the gathering of large municipal water right portfolios. Local challenges arise if population growth and accompanying water needs are not accounted for in the water budget or infrastructure. Opportunities through regional planning involving local collaboration and communication among stakeholders is key for striking a balance between agricultural and urban water interests.
ACKNOWLEDGMENTS

I would like to thank all those people who participated in this study. I am particularly grateful to the interviewees who took the time to answer questions and provided valuable insights into this subject. I appreciate everyone who provided suggestions and edits throughout the writing process. I express admiration and thanks to Dr. Joanna Endter-Wada; her kindness and wisdom has been an inspiration to me. Lastly, I would like to thank my mother for her constant encouragement and my father for his example.

Bonnie Roos
CONTENTS

Page

ABSTRACT .............................................................................................................................. iii
PUBLIC ABSTRACT ............................................................................................................ v
ACKNOWLEDGMENTS ........................................................................................................ vii
LIST OF FIGURES ................................................................................................................ ix
CHAPTER

1. INTRODUCTION .............................................................................................................. 1
   Literature Cited ................................................................................................................ 4

2. THE INTERPLAY OF POLICY AND MARKETING IN STRUCTURING CONTEXTS FOR UTAH'S AGRICULTURAL-TO-URBAN WATER TRANSFERS ................................................................................. 6
   Abstract ........................................................................................................................... 6
   Introduction ..................................................................................................................... 7
   Methods .......................................................................................................................... 14
   Results ............................................................................................................................. 17
   Conclusion ..................................................................................................................... 49
   Literature Cited ............................................................................................................. 53

3. STRUCTURING MUTUALLY-BENEFICIAL USE OF WATER IN URBANIZING ARID LANDSCAPES: A CASE STUDY OF THE MT. NEBO WATER AGENCY ........................................................................... 59
   Abstract ........................................................................................................................... 59
   Introduction ..................................................................................................................... 60
   Methods .......................................................................................................................... 71
   Results ............................................................................................................................. 75
   Conclusion ..................................................................................................................... 100
   Literature Cited ............................................................................................................. 102

4. CONCLUSION ................................................................................................................ 109
<table>
<thead>
<tr>
<th>Figure</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Percent Population Change by County in Utah 1980-2010</td>
<td>11</td>
</tr>
<tr>
<td>2. Rural Development Patterns in the Delta, Utah Area between the 1990s and 2000s</td>
<td>19</td>
</tr>
<tr>
<td>3. Rural Development Patterns in the Vernal, Utah Area between the 1990s and 2000s</td>
<td>20</td>
</tr>
<tr>
<td>4. Urban Development Patterns Southwest of Ogden, Utah between the 1990s and 2000s</td>
<td>20</td>
</tr>
<tr>
<td>5. Urban Development Patterns Southeast of St. George, Utah between the 1990s and 2000s</td>
<td>21</td>
</tr>
<tr>
<td>6. Map of Water-Related Land Use in Utah Compiled between 2010 and 2015</td>
<td>40</td>
</tr>
<tr>
<td>7. Water-Related Land Use in Utah County, Utah</td>
<td>69</td>
</tr>
<tr>
<td>8. Water-Related Land Use in Southern Utah County, Utah</td>
<td>70</td>
</tr>
<tr>
<td>9. Interpretation of MNWA Processes and Functions</td>
<td>83</td>
</tr>
<tr>
<td>10. Mt. Nebo Water Agency Participating Entity Boundary-Spanning</td>
<td>91</td>
</tr>
</tbody>
</table>
CHAPTER 1

INTRODUCTION

In the midst of increasing concern over declining water supply in the western United States (U.S.), attention is turning to irrigated agriculture as a source of water to meet the growing needs of urban development. Agriculture accounts for approximately 80% of consumptive water use in the U.S., and over 90% in some western parts of the country (Schaible and Aillery, 2016). Demands of a growing population and increasing environmental awareness within the arid U.S. West are causing water to be reallocated, with water primarily moving out of agriculture and into urban and environmental sectors.

In the past, growing water needs in locations with limited local sources were supplied through large, structural engineering projects such as dams, reservoirs, canals and pipelines that captured, stored, and transported water from other areas to meet growing demands (Hanak, 2003; Donohew, 2009; Rinaudo and Barraque, 2015). As the practicality of building more projects of this nature becomes increasingly limited, the new dilemma is to meet increasing demands with the same amount of water or less. The solution implemented in various forms throughout the western U.S. is water reallocation through market-based approaches and other transfer mechanisms (Young, 1986; Schempp, 2009; Young and Loomis, 2014). Water reallocation through water transfers and market mechanisms allows water rights to be sold or leased from one type of use or user to another (Young, 1986; NRC, 1992; Schempp, 2009; Young and Loomis, 2014). Various types of water transfers occur among agricultural, urban, environmental, and recreational uses. However, in general, due to the urbanization process, a predominant
trend in water transfers is from agriculture to urban uses (Meinzen-Dick and Ringler, 2008; Molle and Berkoff, 2009; Goemans and Pritchett, 2014). Permanent water transfers that facilitate the removal of water rights from agriculture and transfer to urban uses are driven by growing urban demand and willingness to pay for water (Michelsen et al., 2000; Zollinger and Krannich, 2001).

Large, permanent, inter-basin transfers receive attention due not only to their size, but also due to their often highly-visible impacts (Fort and Nelson, 2012). These impacts affect not only areas receiving water, but also areas water is leaving. In contrast, the subtle transition of agricultural land and water into development for subdivisions and municipal uses within the same geographical area is less obvious because the effects occur more gradually over a period of time. This transition involves third-party impacts from the cumulative, permanent results of inter-sectorial transfers of water out of agricultural uses and into “urban” or municipal and industrial (M&I) uses.

One region where this transition has become particularly apparent is Utah’s Wasatch Front. Utah has one of the fastest growing populations in the country. Most of the population concentration and growth within Utah is centered along the Wasatch Front, the area west of the Wasatch Mountains expanding north and south of Salt Lake City. In order to accommodate rapidly increasing population in this area, the trend has been a decrease in agricultural land as farms are converted to residential and commercial areas (Utah DWR, 2001). The transition from agriculture to urban land and water use is essentially irreversible, resulting in permanent consequences to the agricultural community as it is displaced or declines due to urban encroachment. How to balance
agricultural and urban water interests has become an important public policy question as land and water transfers from agriculture to urban use have accelerated in recent decades.

This thesis presents findings from multi-method research on the urbanization of water from agriculture to municipal and industrial (M&I) use in Utah. The purpose of this research was twofold. The first objective was to understand agricultural-to-urban water transfers from a statewide policy perspective as well as local stakeholder perspectives. The second objective was to identify challenges and opportunities for striking a balance between agricultural and urban water interests in transitioning areas.

Chapter 2 of this thesis discusses the challenges and opportunities in agricultural-to-urban water transfers in Utah. Water policy in Utah allows for flexibility in water use, permitting water rights to be severed from land and sold, exchanged, leased, and transferred from their original place of use and changed to a different type of use. Theoretically, this makes for simple agricultural-to-urban transitions for water apart from land transfers. However, challenges of impairment, timing, quality, and balancing water budgets create complexity in water transfers. As population increases and the land and water available for transfers decline, the balance between agricultural and urban interests can be sought through stakeholder involvement and boundary-spanning in regional water planning forums.

Chapter 3 of this thesis discusses the Mt. Nebo Water Agency (MNWA) as a case study for regional water planning in southern Utah County. In 2014, the MNWA was formed under the Utah Interlocal Cooperation Act. The agency emerged in an area that already has many long-standing and powerful water agencies. One of MNWA’s express
purposes is to work on balancing agricultural and urban water interests. This agency consists of six public entities and one private entity through contract representing agricultural and municipal stakeholders. It holds quarterly public meetings where board members and interested parties discuss water planning and management on a regional scale. The purpose of this case study is to understand why the MNWA was formed and how it plans to address balancing both agricultural and urban needs in southern Utah County. Chapter 4 of this thesis discusses the overall conclusions of this research.

LITERATURE CITED


CHAPTER 2

THE INTERPLAY OF POLICY AND MARKETING IN STRUCTURING CONTEXTS FOR UTAH’S AGRICULTURAL-TO-URBAN WATER TRANSFERS

ABSTRACT

In the arid western United States where population expansion and economic growth are contingent on water availability, conversion of agricultural water rights is being used to fuel urban expansion. This trend in agricultural-to-urban water transfers drives the question of how to strike a balance between agricultural and urban water needs in these rapidly growing areas. Interviews representing both a statewide view, as well as stakeholders in a key agricultural-to-urban water transition zone, were conducted to better understand these water transfers in Utah. Water transfers out of agriculture and into municipal use are more significant in areas of Utah experiencing rapid population growth. Significant policy challenges arise as water is seen as a monetary asset, incentivizing the reintroduction of old water rights into an established legal water priority system. Other policy challenges arise as municipal uses are given preference in state development strategies over agricultural uses. This preference can incentivize both the selling of water to municipalities and the gathering of large municipal water right portfolios. Water transfers not only impact parties within the transaction, but create third-party impacts result as well. These third-party impacts are not fully accounted for in the implementation of water law and policy. Balancing growth in transitioning landscapes is

---

1 This chapter was co-authored with Joanna Endter-Wada
suggested through the use of agreements, as well as regional planning and collaboration. Agreements can create flexibility in the use of existing water supplies, particularly during times of drought. Regional planning and collaboration create opportunities for stakeholder involvement and a wider understanding of local water needs when attempting to plan supply and delivery to current and future populations.

INTRODUCTION

In the midst of increasing demand on scarce water supply in the arid western United States (U.S.), attention is turning to conversion from irrigated agriculture as a source of water to meet the growing needs of urban development. Agriculture accounts for approximately 80% of consumptive water use in the U.S., and over 90% in some western parts of the country (Schaible and Aillery, 2016). Water demands of a growing regional population and economy in the arid U.S., along with increasing environmental awareness, are causing water to be reallocated, with water primarily moving out of agriculture and into urban and environmental sectors.

In the past, growing water needs in locations with limited local sources were supplied through large, structural engineering projects such as dams, reservoirs, canals and pipelines that captured, stored, and transported water from other areas to meet growing demands (Hanak, 2003; Donohew, 2009; Rinaudo and Barraque, 2015). As the practicality of building more projects of this nature becomes increasingly limited, the new dilemma is to meet increasing demands with the same amount of water or less. The solution implemented in various forms throughout the western U.S. is water reallocation
through market-based approaches (Young, 1986; Schempp, 2009; Young and Loomis, 2014). These approaches are mechanisms to voluntarily reallocate water among users to meet new and increasing water demands (Young, 1986; Burke et al., 2004). Market forces are a primary alternative to developing “new water” from large infrastructure projects by facilitating purchases of water rights from agriculture for use in other sectors (Wiener, 2003; Easter and Huang, 2014; McCann and Garrick, 2014).

Various types of water transfers occur among agricultural, urban, environmental, and recreational uses. However, in general, due to the urbanization process, a predominant trend in water transfers is from agriculture to urban uses (Meinzen-Dick and Ringler, 2008; Molle and Berkoff, 2009; Goemans and Pritchett, 2014). Permanent water transfers that facilitate the removal of water rights from the agricultural sector through transfer to the urban sector are driven by growing urban demand and willingness to pay for water (Michelsen et al., 2000; Zollinger and Krannich, 2001). Cities generally have the financial means and political power to purchase water rights from agriculture at prices much higher than other agricultural water users are able or willing to pay, resulting in water moving from low-market-value to high-market-value uses (Brookshire et al., 2004). This concept of moving water is explained by Huffaker et al. (2000) to mean that “given the expected declining marginal-value product of water in irrigated agriculture, many competing uses reasonably might be expected to generate higher marginal-value products for the water” (p. 267).

Much of literature concerning water transfers focuses on large, permanent, inter-basin transfers (Fort and Nelson, 2012). These transfers often receive attention due to
their size and also due to their immediate and obvious impacts. These impacts affect not only areas receiving water, but also areas water is leaving. Permanent water transfers are typically beneficial to those parties directly involved; however, third-party impacts from ripple effects may result. Negative third-party impacts occur to people and the public who bear costs involved in the transaction without receiving any benefits (NRC, 1992). These impacts are most often discussed in relation to the water’s area of origin, especially when significant amounts of irrigated agriculture go out of production in one area, generally rural, to free up water to transfer to another area, generally urban.

Third-party impacts that result from permanent water transfers typically fall into three categories: social, economic, and environmental. Social impacts affect agricultural community cohesion and cause a variety of concerns linked to loss of culture, heritage, and control of a community’s or area’s destiny (see Grant, 1987; NRC, 1992; Solis, 2005; Lepper, 2006; Doremus and Hanemann, 2008; Whiteley et al., 2008). Economic impacts result from lost income and reduced economic multipliers within agricultural and rural communities (see NRC, 1992; Rosegrant et al., 1995; Solis, 2005; Bourgeon et al., 2008; Doremus and Hanemann, 2008). Environmental impacts are characterized by the loss of water from riparian and wetland habitats, agricultural land, and local watersheds resulting from water rights conversions that do not take into account hydrologic interdependencies of current water uses (see NRC, 1992; Hanak, 2003; Neuman, 2004; Getches, 2008; Schempp, 2009; Endter-Wada et al., 2009; O’Donnell and Colby, 2010; Downard and Endter-Wada, 2013; Welsh et al., 2013). Specific examples of third-party impacts include: fewer people to pay for canal operation and maintenance as water is transferred
away from irrigated farms for municipal development; loss of on-farm jobs as agricultural lands go out of production; land fallowing that creates weed, dust and other problems for neighboring landowners; replacing transferred surface water rights with groundwater pumping creating difficulty for shallow domestic wells to compete for water supply, and loss of wetland habitat often dependent on irrigation return flows. These impacts are often overlapping, contributing to one another and sharing similar effects.

What is less obvious in the literature is the subtle transition of agricultural land and water into development for subdivisions and municipal uses within the same geographical area. This transition involves third-party impacts from the cumulative, permanent results of inter-sectorial transfers of water out of agricultural uses and into “urban” or municipal and industrial (M&I) uses. One region where this transition has become particularly apparent is Utah’s Wasatch Front. Utah has one of the fastest growing populations in the country. According to the U.S. Census Bureau’s 2015 estimates of five-year population growth rate averages by state from 2010-2014, Utah is ranked fourth in the nation. This growth trend continued from 2012 to 2013 when Utah’s population grew the second fastest by percentage (Utah OLRGC, 2014), only behind North Dakota which was experiencing a temporary population boom fueled by rapid expansion of oil extraction from the Bakken formation. Figure 1 shows the percent change in population by county in Utah from 1980 to 2010, according to U.S. Census statistics. The statewide average percent change in population for this timeframe was 83.77. Much of the population growth within Utah is centered in municipalities along the Wasatch Front, the area west of the Wasatch Mountains expanding north and south of
Salt Lake City. In order to accommodate the demand for land and water by a rapidly increasing urban population in this area, farms have been converted to residential and commercial uses (Utah DWR, 2001). The transition from agriculture to urban land and water use is essentially irreversible, resulting in permanent consequences to the agricultural community as it declines due to urban encroachment.

State leaders take the position that water supply does not have to be a factor limiting population growth in Utah. They operate on the assumption that water can be made available to growing communities through water transfers, agreements, and
infrastructure (Utah DWR, 2001). As with other western states in the U.S., 82% of diverted water is used for agriculture (Utah OLRGC, 2012), creating an increasing urban demand for agricultural water transfers as population increases. It may not be in the best interest of Utah, however, to allow reallocation of the state’s developed water supply to occur solely through private market transactions without incorporating decision making that protects and promotes larger societal interests. Irrigated agriculture was critical to the survival of Mormon pioneers when they settled the area and has deep roots and influence in the history of local communities throughout Utah (Hutchins, 1927). According to Hutchins (1927), “Agriculture under irrigation…became the pioneers’ first industry” (p. 9). Currently, agriculture in Utah creates thousands of jobs, hundreds of millions of dollars in tax revenue, and billions of dollars in production value (Ward et al., 2011; UDAF, 2015). Thus, it is important that agricultural and urban interests are able to coexist.

In Utah, many of the original water rights under territorial and later state law were perfected for agricultural irrigation. Therefore, a source of secure water supply for growing cities and new communities comes from purchasing agricultural water rights with early priority dates. Like in most U.S. western states, water policy in Utah is founded on the Prior Appropriation Doctrine. This doctrine is commonly characterized by the phrase “first in time, first in right.” This is a seniority system where a water right has seniority over all others that come after it and, similarly, is junior to any water right that vested before it. In low water years, junior water right holders yield water to users with more senior rights, and water is delivered on a priority basis while there is enough water
left in the stream for rights to be fulfilled (Getches, 2008). Over time, western states have added flexibility to their prior appropriation-based water laws and policies. These changes allow water to be used and conserved in ways that fit modern societal needs and priorities while keeping the essence of the law as it was created in the 19th Century (Schempp, 2009).

Water policy plays a key role in urban transitions. Water policy in Utah allows for flexibility in water use, permitting water rights to be severed from land and sold, exchanged, leased, and transferred from their original place of use and changed to a different type of use. Theoretically, this makes for simple agricultural-to-urban transitions for water apart from land transfers. However, challenges of impairment, timing, quality, and balancing water budgets create complexity in water transfers. As population increases and the land and water available for transfers decline, questions arise related to finding a balance between agricultural and urban water interests.

This chapter presents findings from interview-based research on the urbanization of water out of agriculture and into M&I use in Utah. The goal of this research is to understand the impacts of water transfers that occur within local geographic areas. Interviewees helped identify challenges and impacts involved in these water transfers as state law and policy interact with local water markets. Additionally opportunities for accommodating agricultural and urban water needs and interests in transitioning areas are discussed.
METHODS

Sampling Frame

This research uses interview data as the primary source of information, supplemented by secondary information from Utah statutory and case law and from published policy documents. Twenty in-depth interviews were conducted to understand the policy impacts of agricultural-to-urban water transfers in Utah and to explore policy alternatives for dealing with this transition. A selection of employees of the Utah Division of Water Rights (DWRi), community leaders, and stakeholders participated in interviews.

The reputational sampling frame was developed before the interviewing process began. Interview questions were designed to focus on the knowledge, expertise and perspectives that the interviewees could provide. The target interviewees were contacted through in-person interactions or phone calls and all invited interviewees agreed to participate under procedures approved by the USU Institutional Review Board (IRB). Additional interviewees were obtained through snowball sampling where interviewees were asked for references to other individuals who would be pertinent sources of information.

Interviewees affiliated with the DWRi were selected due to their involvement in the water transfer process. This involvement comes in many forms: reviewing change applications, making recommendations on change applications to the State Engineer, and handling protests and hearings on change applications. Ultimately this is the level at which water policy is administered and put into practice. This selection within the
sampling frame, along with interviewees with professional background in Utah water law, represented a statewide perspective of agricultural-to-urban water transfers and their impacts. The selection within the sampling frame of community leaders and stakeholders was designed to focus on perspectives of agricultural-to-urban water transfers in the southern Utah County area. This area of the state is experiencing exceptionally rapid growth, which is expected to continue. Utah County is also an area currently invested in agriculture and is undergoing the urbanization of water out of agriculture and into growing municipalities.

*Interview Protocol Design*

A semi-structured interview protocol was followed, and was adapted as interviews proceeded. If an interviewee answered more than one question in response to a single question, the redundant question was then skipped later in the set. This approach was taken in order to be thorough while at the same time avoiding repetition, both out of respect for interviewees’ time and to ensure enough time for all questions be addressed. Responses were based on interviewees’ professional experience concerning water transfers in Utah, as well as personal opinions and ideas about past, current, and future facets of water law and policy, particularly related to agricultural-to-urban water transfers.

The interview questions were developed to address four main themes: (1) key legal provisions enabling water transfers in Utah; (2) current challenges involved in water transfers; (3) how Utah’s water transfer process takes into account third-party impacts; and, (4) how to balance agricultural and urban water needs. The interview protocol was
approved by Utah State University’s Institutional Review Board (IRB), and confidentiality of interviewee responses was ensured.

**Data Collection**

In-person interviews were conducted and digitally voice recorded. All interviewees agreed to be recorded, and were assured by the interviewer that the sole reason for recording the interview was for transcription to ensure accuracy in using the information for research purposes. Recording the interviews provided two distinct advantages. First, it allowed the interviews to have a free flowing, conversational approach without periodic interruptions for note taking. Second, recording interviews created an exact record of responses. This approach provided the ability to compare true responses amongst the interviews, rather than a shortened response recorded through note taking during the interview, or post-interview memory or interpretation of responses. Interviews ranged from just over half an hour to two-and-a-half hours. The recordings were made with the understanding that the transcripts would be used by the researchers to avoid human error in remembering responses and to allow for easier comparison of responses across all interviewees. Supplementary information was gathered in Utah’s legal statutes and policy guidance regarding water, as well as other publicly-available administrative documents.

**Data Analysis**

Interview transcripts were read by researchers and interpreted to extract two main sets of coded data. The first set of coded data was for answers to questions that
could be compared across interviews. These data were used to consolidate interviewee responses to common questions and find points on which there was a general consensus, as well as to identify any unique responses contributing different perspectives to each question. The second set of codes was for overall themes within each interview. These data focused on important points from the perspective, position and expertise of each individual interviewee and on examples given to emphasize specific points they made. Data analysis highlighted points from larger themes across interviews and allowed for greater insight into the overall discussion of water transfers and their resulting impacts. The following results section is the product of both extracting coded data directly from interviews and integrating it with additional information obtained from Utah water law statutes, policy guidance, and other public documents.

RESULTS

In this section, interview results are presented according to five major themes that emerged from the data coding and analysis. The interviews yielded information concerning contemporary trends and patterns in water transfers, significant challenges related to water law and agricultural-to-urban water transfers, how third-party impacts are accounted for in water transfers, the urbanization of agricultural water into municipalities, and opportunities for compromise between competing water interests. Relying on secondary data from Utah water law and policy documents, presentation of interview data is set within the context of key state provisions that lay the foundation for
how water is appropriated and how water is being reallocated through the transfer process.

*Trends and Patterns in Agricultural-to-Urban Water Transfers*

From a statewide perspective, the primary trend documented in the interview data is that the urbanization of agricultural water is more common in areas that have been closed to new appropriations and have a more active water market. Interviewees talked about how water markets have emerged where water is fully appropriated and local area policy states that for any new water use to take place, the retirement of an existing use must occur. These transactions occur in the form of title transfers and change applications, allowing water to transfer from one user to another as well as between types or places of use. Prior appropriation water law has long contained legal provisions and procedures to facilitate such transfers, but such transfers have accelerated recently in urbanizing areas according to our interviewees.

In rural areas, many of which are still open to new appropriations for water, interviewees identified the trend of agricultural water moving into municipal use more as a “natural progression.” This description arose as interviewees talked about their expectations that local population growth will occur, but will happen at a more manageable rate than in other areas of the state. By way of illustration, 2015 U.S. Census Bureau data show population growth rates in Utah from 2010 to 2014 as ranging from 4% in rural counties to nearly 18% in more urbanized counties. Land use changes corresponding to these varying population growth rates are strikingly distinctive. Figures
2, 3, 4, and 5 provide Google™ Earth aerial imagery examples comparing rural (Figures 2 and 3) versus urban (Figures 4 and 5) land change patterns between the 1990s and 2000s in some of the areas discussed by interviewees. More rural cities show slow turnover of agricultural land to urban development, as illustrated with the cases of Delta and Vernal, Utah. More populated areas show a rapid turnover of agricultural land to urban development, as illustrated with the cases of Ogden and St. George, Utah. Water transfers generally accompany these land use changes.

In describing the agricultural-to-urban water transition in rural areas, one interviewee expressed that, “what we actually see is these farms being sold out slowly and the municipalities coming and purchasing that water from [the farms] and pulling it into their group of water rights.” These observations were echoed across the interviews.

FIGURE 2. Rural Development Patterns in the Delta, Utah Area between the 1990s and 2000s.
FIGURE 3. Rural Development Patterns in the Vernal, Utah Area between the 1990s and 2000s.

FIGURE 4. Urban Development Patterns Southwest of Ogden, Utah between the 1990s and 2000s.
Exceptions to municipal purchases are the occasional house in the country that needs water outside of a municipal service area. Often times this requires an individual to purchase water from an existing water user, typically through buying shares of stock in a canal company, to compensate for the new domestic use which might be supplied by drilling a well. In more rural areas, transfers moving water from agriculture to domestic or M&I uses are not currently seen as threatening to agriculture.

In contrast, interviewees representing pockets of the state heavily impacted by population increase reported that the movement of water out of agriculture and into M&I use was a common and obvious trend, although these transfers did not constitute all water transfers. Retirement of agricultural land and water is a common way to provide additional water for municipal growth, but other sources of water are also available. These sources of water for urban transfers occur when an industry goes out of business, making water rights available for other urban uses. For example, after Geneva Steel’s
bankruptcy and the 2002 permanent closure of steel operations in Utah County, most of the company’s large block of water rights were sold to the Central Utah Water Conservancy District, with a small portion purchased by another local firm; that water is now being marketed and redistributed for use in nearby fast-growing communities (Hollenhorst, 2012).

Interviewees also noted that municipalities are making concerted efforts to acquire water rights, mostly to plan for increasing population and to ensure enough water in times of drought. Some Utah municipalities deal with increasing urban water demand through ordinances that require land developers to transfer water to the municipality to offset additional water needs (Stephens, 2010). Water may not necessarily already be attached to the parcels of land being developed and, thus, would require a transfer of water from another location. Some interviewees further noted that fluctuation in the numbers of these types of transfers is reflective of the economy, particularly the housing market. For instance, interviewees reported that water transfers increased as residential development and subdivisions increased, with housing trends moving in relation to growth of the population and job creation. The requirement for developers to find and transfer water rights to municipal use was cited as one reason urban water costs in Utah are relatively inexpensive compared to other arid states. Through this process of municipal acquisition of water rights, developers pass water costs on to real estate purchasers and cities are able to increase their water supplies without increasing water rates for their existing water users (Adams et al., 2010).
According to our interviewees, current trends in water transfers show that the most significant impacts from agricultural-to-urban water transfers are occurring in those areas of the state experiencing the highest amount of growth and that no longer have water available for new appropriations. However, interviewees did not necessarily interpret this transition of agriculture into municipal development as problematic within the water transfer process. Such transfers were characterized as transactions between willing buyers and sellers. Interviewees who were water administrators and managers mostly expressed concern with details involved in keeping the water system “in balance” through these transactions, and less concerned with planning for population growth and its accompanying water use, which is outside their administrative purview.

Significant Challenges Related to Contemporary Water Transfers

Challenges related to current water transfers are closely related to the urbanization of water out of agriculture and into municipal use. Three main challenges were brought up by the interviewees. The first is the monetization of water and the corresponding incentive to find water rights to sell on the market, even rights that have long been out of use. The second and related challenge concerns the nonuse of water and attempts to revive dormant water rights that are assumed to be forfeited, thus disrupting infrastructure investments and the uses supporting infrastructure cost repayments. Tied to the nonuse of water is the third challenge of varying extensions of time to put water to beneficial use granted to different water appropriators. These challenges are explained in the following subsections.
**Monetization of Water.**

One of the main challenges explained by interviewees is that some areas of the state have been closed to new water appropriations because they are “over allocated,” meaning there is not sufficiently reliable water available to serve all of the existing water rights that are on the books. Over allocation creates a marketplace for transactions to take place since water must be transferred through change applications out of historic uses and into new uses, usually through purchases or leases. Interviewees recognized the monetary value of water by using phrases such as “monetization of water” and “water is money now.” They observed that rising interest in water marketing has incentivized the search for dormant water rights. Some interviewees explained that as more people become involved in water trading, it becomes increasingly difficult to use existing administrative processes to move the right to use water from one place or type of use to another. Impediments to smooth water rights trades include the large amounts of paper work and research involved in water transfers as well as legal actions which can take many years to resolve, which significantly increase the transaction costs for water trading.

Interviewees also discussed concerns over increases in prices for water rights as water becomes increasingly monetized. Michelsen *et al.* (2000) note that anticipated changes in supply and demand influence the price of water rights. In relation to municipal growth, these authors also note that, “[a]nticipated future population growth causing additional demands for municipal water suggests that expectations and speculation may play an important role in [the water] market” (p. 214). Price increases have the potential to limit participation in the market to only people who can afford the water, rather than
including people who might put water to beneficial uses deemed best from a larger societal perspective. Interviewees expressed more specific concerns, both from personal and professional perspectives, that increasing prices for water rights could push agricultural water users out of the market. As one interviewee stated, “I jokingly say that everybody thinks they have a parcel that is the next subdivision…you can’t afford to buy farm ground with water at $20,000 an acre.” As is often true with land, agriculture may not be able to compete for water when urban and commercial uses have the capital to outbid other uses. Water generally has more monetary value if it is sold to municipal buyers than within the agricultural sector. It is difficult to find readily available datasets of water transfers concerning buyers, sellers, and price. This lack of information makes it difficult to fully assess the price differences between agricultural and urban water purchases. However, a comparison of price disparities between water sales from agriculture-to-agriculture and agriculture-to-urban in the Nevada’s Truckee Basin from 2002-2009 by Edwards and Libecap (2015) demonstrates this tendency. The median price for agriculture-to-urban water sales were $17,685 per acre-foot, while the median price for agriculture-to-agriculture water sales was $1,500 per acre-foot. Realistically, though, interviewees noted that for water right holders in agriculture looking toward retirement or setting up inheritances, selling to municipal water buyers is an enticing financial option. Similarly, for those people whose intrinsic meaning of water rights has changed from supporting a livelihood to being an inheritance, water can be seen as a onetime payout, rather than a yearly dependence, fueling the sale of water from agriculture into municipal development.
Nonuse and Forfeiture.

Interviewees generally agreed that nonuse and forfeiture are the biggest water law challenges facing Utah’s water stakeholders and policy makers today. Various interviewees explained how these particular challenges relate to the overarching problem of over allocation of water resources, resulting in dormant water rights. A fundamental principle on which the Utah water right system was built is that a person is given the opportunity to put water to a beneficial use within a certain period of time. As explained by interviewees, this idea essentially treated water like other natural resources (hunting, fishing, etc.) that could be captured, but required a permit to obtain the resource within a certain period of time. If the resource could not be captured, the permit would expire, the water right would revert to the public, and another party would have the opportunity to establish a usufruct right to the resource. Where water is concerned, if a person fails to put the resource to a beneficial use, the opportunity goes to the next appropriator. As a result, water became over appropriated because it was recognized that many water applications would lapse and never be put to beneficial use. Interviewees noted that when a water right is brought back into the existing priority system after not being used for a period of time, it can cause impairment for other water rights holders who have lawfully been putting water to continuous beneficial use in the meantime. Interviewees who were water rights administrators explained how managing active water rights and weeding out nonuse are important for physically keeping the water budget in balance to promote sustained yield of water sources, and for legally balancing the needs and interests and mitigating impacts among multiple water users. When a water transfer occurs, an actual
facet of a water right has to be given up in exchange for the new use to occur. For example, the water use in one area needs to stop for the water right to be used in another area, and the actual consumptive amount available for transfer needs to be determined. Interviewees noted this concept can be misunderstood or overlooked by persons unfamiliar with water law and policy who find old water right documents and assume they are valid and marketable in the full use amounts indicated for their current location.

Interviewees from the DWRi explained that for many years their office operated on a straight-forward reading of Utah Code § 73-1-4. This section stipulated that if a water right had not been put to beneficial use for a period of seven years, had not met any of the various exceptions, and the appropriator had not filed a nonuse application with the state engineer, then the water reverted back to the public. The various exceptions provided by the law included the following: the water was under lease; the land was fallowed under a federal conservation program; the source failed to yield sufficient supply to satisfy the right; water was unavailable because of the right’s priority date; the right was subject to an approved change application in the process of being certified; or, the water right was owned by a public supplier and being held for future use. So if a change application was filed on a water right that had not been used, did not meet any of the exceptions, and was not covered by nonuse paperwork, it would not be approved.

However, as interviewees explained, in recent years a provision known as the “Lazarus Clause” was added to the Utah Code. This provision stated that if a water right which had historically not been put to beneficial use was put back into use for a period of 15 years without protest, it was no longer subject to forfeiture (Utah Code § 73-1-
4(2)(c)(i)). As a result, if 15 years of unprotested use could be proven, then that right was not deemed forfeited unless there was a subsequent period of nonuse. As interviewees explained, this legal provision ultimately opened the door for many dormant water rights to re-enter Utah’s prior appropriation system. Such dormant water rights are generally less expensive to acquire when title is clouded by the period of nonuse and can turn a greater profit if their transfers are eventually approved. However, bringing water rights back into use disrupts the historic legal allocation system that assumed a water right was forfeited if it had not been in use for a period of time. As municipalities acquire water rights, more opportunities exist for people to enter the market and sell water rights to them. Using future population growth as the motivation for increasing their water portfolios, and under their protected status of not needing to put water to present beneficial use, public water suppliers inadvertently fuel speculation in water markets. In a study of this issue elsewhere, Michelsen et al. (2000) conclude that, “[t]herefore, future-valued models can account for speculative pressures: what people expect the price to be in the future is a major factor leading to speculative behavior” (p. 213).

Interviewees explained how political controversy in Utah over the nonuse issue intensified in recent years with increases in market values of water and led to recent court cases and legislation concerning how the state engineer’s office is to handle such cases. Nonuse came to the forefront of state water politics with the Utah Supreme Court ruling in the Jensen v Jones case in 2011 (Jensen v. Jones, No. 20090742, October 28, 2011, 2011 UT 67), which most DWRi interviewees discussed. The State Engineer had rejected a change application on the basis that the water had not been used for decades. The case
went to the Utah Supreme Court, which ruled that the only person who can determine forfeiture of a water right is a judge.

As a result of this ruling, the State Engineer could not determine a water right forfeited in a change application proceeding and weed it out of the system; a court case would be the only mechanism for doing so. The DWRi faced a dilemma since the State Engineer retained many responsibilities for administering the state’s water rights. The Utah Legislature addressed the issue in 2015 through House Bill 25, outlining the process that the DWRi is to follow when a change application is filed on a right that is in jeopardy of nonuse. This process involves sending a “Quantity Impairment” letter to both the applicant and to parties who own water rights that would be impaired if the water right in question was brought back into use after a long period of nonuse. Before the 2015 legislation was enacted, responsibility rested solely with other water right holders in an area to look for advertisements of water right change applications in local newspaper circulations and protest if changes proposed in an application would impair their beneficial use of water.

The 2015 amendments provide an avenue for the State Engineer to reject a change application when the issue of nonuse exists. This action returned to the State Engineer some of the “gate-keeping” functions that office previously performed under its administrative responsibilities to prevent impairment to existing water users in the water application and transfer process. In the opinion of many interviewees, this change provides renewed opportunities to weed water rights out of the system that have not been
used and to maintain a proper balance between available water and approved rights to use it.

**Extensions of Time and Special Treatment of Municipalities.**

In addition to the monetization of water and nonuse controversies, the third significant challenge related to contemporary water transfers discussed by interviewees was the amount of time given to different appropriators to establish beneficial use. Municipalities are given 50 years to prove water use (Utah Code § 73-3-12). If water use has not been established in 50 years, municipalities can file an extension of time by showing that the water fits within their forty-year development plan. Cities can gather water rights to ensure enough water to provide for their current needs as well as long-term future growth. Utah Code § 73-1-4 2(f)(i) states “The reasonable future water requirement of the public is the amount of water needed for the next 40 years by the persons within the public water supplier’s projected service area based on projected population growth or other water use demand.” This special treatment for municipalities essentially allows cities to hold on to water rights in perpetuity, not only because the opportunity to put water to beneficial use can continue to be extended, but also because Utah water law does not allow cities to dispose of water rights in their possession (Article XI, § 6 of the Utah Constitution). Not allowing water rights to leave a municipality once they have been obtained essentially creates a political avenue for water to be permanently held in municipal water portfolios.
Agricultural water users are given up to 14 years to put water to a proposed beneficial use under either an application to appropriate or a change application. Any extensions beyond 14 years must be advertised and extensions cannot go beyond 50 years (Utah Code § 73-3-12). Compared to the municipal sector, the agricultural sector does not have the same flexibility in long-term water strategy planning. Some interviewees noted a way to avoid forfeiting a water right that had not yet been put to beneficial use or that had become dormant due to nonuse is to sell, lease, or give the water to a public water supplier because it would not be subject to forfeiture within the municipal water portfolio. Some interviewees noted that contracts or other types of agreements would likely go along with these transfers if an individual or entity wants to retain options on future use of water that they have transferred to a municipality.

Interviewees pointed out various reasons why municipalities receive special treatment when it comes to extensions of time and their requirement to retain water rights. Municipalities are viewed as working for the public interest through providing culinary water for their current and future populations. However, as mentioned above, according to Utah Code § 73-1-4, municipalities cannot gather more water than they reasonably need. Interviewees noted this restriction, along with Article XI, Section 6 of the Utah Constitution, prevents municipal water purveyors from becoming water brokers and having total control of the water market. With this restriction in mind, some interviewees questioned what constitutes reasonable assumptions concerning future population growth and trends in water use per capita, and what type of transparency should exist for water rights being held by public entities. They suggested such analyses
are needed to determine at what point municipalities should stop adding to their water rights portfolios.

A water right holder can get an extension on the amount of time it takes to put the water to beneficial use, linking concepts of nonuse and extensions even further. Previous laws prevented change applications from protecting people against nonuse. However, in the 2015 Utah legislative session, Senate Bill 15 added clarifying language to Utah Code § 73-1-4 regarding nonuse. This amendment essentially added that if an applicant is diligently pursuing the certification of a water right (i.e., the process of proving water use that would result in an official document for the right to use water), it is protected against nonuse. Interviewees suggested that this change is significant because municipalities can get extensions of time, but if they are not diligently pursuing the certification of the water right, it is possible for that water right to be subject to nonuse. Much of the new legislation pertaining to nonuse has not been tested yet and further changes are under discussion.

Third-Party Impacts

The three challenges identified by interviewees and discussed in the previous section demonstrate current concerns about how the existing water right policy and allocation system will handle an increase in claims to water rights. As more water rights are legitimized in an already over-appropriated system, these challenges contribute to third-party impacts. This section discusses how Utah water law and policy takes third-party impacts into account to avoid or mitigate negative effects of water transfers.
Third-party impacts are the effects on people outside of a transfer transaction, beyond the buyer and seller. These effects can impact not only individual water right holders, but also any economic, environmental, and social interests “related to the transfer who claim a ‘nonproprietary’ stake in the process” (NRC, 1992, p. 2). If third-party interests are not brought into the transfer process, and mitigation or compensation is not considered, water conflicts may continue through court or political action (Jordan, 1999). Third-party impacts are typically avoided or mitigated in water transfers, adding an element of fairness to the process. Water law has developed to eliminate transfers that would cause negative third-party impacts among water users. Government oversight of water transfers is intended to both protect property rights in water and protect third-parties from externalities generated by transfers (Howe and Goemans, 2003). The third-party impacts of agricultural water being transferred to another use is illustrated in the following statement by Howe and Goemans (2003):

“When agricultural production falls, activities linked to agriculture are negatively affected: suppliers of agricultural inputs lose business; processors of agricultural outputs lose supply sources; financial institutions lose the demand for loans etc. While the selling farmer is presumably better off, the surrounding community suffers losses of income and social displacements as people must move and change jobs while the community loses some of its ability to support community services” (p. 1062).

Common themes that came up during interviews and were either directly or indirectly discussed in connection with third-party impacts were water transfer law and process, water right impairment and enlargement, and implementation of local policies and groundwater management plans.
**Water Transfer Law and Process.**

Utah Code § 73-3-3 and 73-3-8 define how water transfers through change applications are to be handled. Section 73-3-3(3)(a) of Utah Code states that a person entitled to the use of water may make a permanent or temporary change to an existing right to use water as long as the change does not impair an existing right without just compensation or adequate mitigation. Applicants have the burden of producing sufficient evidence that the change will not cause quantity impairment (Utah Code § 73-3-3(5)).

Section 73-3-3 of Utah Code is used in conjunction with section 73-3-8 and supplies a list of criteria that must be met by applicants of water transfers. These criteria include: not impairing existing rights or interfering with the more beneficial use of water (73-3-8(1)(a)(ii)), being economically feasible (73-3-8(1)(a)(iii)), not being detrimental to the public welfare (73-3-8(1)(a)(iii)), and filing in good faith and not for speculation or monopoly (73-3-8(1)(a)(v)).

The change application process requires that notice of the proposed change be advertised in a local newspaper and on the DWRi website. This action makes the public aware of the application and allows for protests to be made if an individual or entity thinks they will be impacted by the proposed transfer. This is one way to negate third-party impacts; however, as noted by interviewees, it only works if affected stakeholders participate. An additional measure was added in 2015 through House Bill 25, as discussed earlier in this chapter, requiring that the state engineer send written notice to owners of water rights that would be impaired by a change application if the owner has not sent in a protest within the protest period. If other water right owners or members of
the public do not participate in the protest period, they cannot become a party to the administrative process. Through this revised process, all parties have a better opportunity to work through quantity impairment mitigation. Interviewees agreed that the fairness in this process comes from, first, it being a public process, and second, sufficient attempts to get all relevant parties to participate.

DWRi interviewees further described the rationale of public participation in change applications. The protest period allows local knowledge of the water system to be shared. This local knowledge is included with administrative knowledge and used to make informed decisions on change applications. An informal hearing is held where people bring forward more information, after which a decision is made. If the parties affected by the decision feel the need to further pursue unresolved issues, the administrative decision can be taken to the court system for judicial review.

**Water Right Impairment and Enlargement.**

Two concepts related to third-party impacts frequently discussed in the interviews were impairment and enlargement. These concepts are inter-related as the enlargement of one water right can impair the quantity of water available to satisfy another water right. Impairment and enlargement are addressed in Utah Code § 73-3-3, which defines impairment as:

“[A]ny reduction in the amount of water a person is able to receive in order to satisfy an existing right to the use of water that would result from an action proposed in a change application, including: (A) diminishing the quantity of water in the source of supply for the existing right; (B) a change in the timing and availability of water from the source of supply for the existing right; or (C) enlarging the quantity of water depleted by
the nature of the proposed use when compared with the nature of the currently approved use.”

Other forms of impairment referred to in Utah Code include impairing water quality, interfering with a more beneficial use of water, unreasonably affecting public recreation or the natural stream environment, and proving detrimental to the public welfare (Utah Code § 73-3-3.5 and 73-3-8).

Interviewees pointed out that an interesting twist to Utah water law, in the context of impairment, is that a change application to transfer a water right cannot be denied simply because the change would impair another water right. This provision provides opportunity for a transfer to be approved if the impacts of impairment are mitigated. Offering mitigation plans in an effort to compensate for negative impacts appears to add flexibility to the prior appropriation system, as some of the interviewees explained. As a companion subject to impairment, the enlargement of a water right occurs when an element of the water right is improved or exceeded beyond its approved scope. Multiple interviewees illustrated this concept with a discussion of diversion and depletion. For instance, when an agricultural water right is transferred to municipal use, the limitation on water available for transfer must be determined based on diversion and depletion amounts. These rights have to be quantified in order to move water to a public water supplier without enlarging the historical diversion or depletion amounts, two limits which have to be maintained. The transfer process requires documentation of the amounts of water that were diverted, the percentage of that water historically consumed by the specific beneficial use of the water, and the remaining percentage that was returned to a water source through runoff or seeping into the ground. In order to keep the water budget
in balance, only the amount of water historically depleted by an existing use can be transferred to another use. For example, an irrigation water right might allow for 4 acre-feet of diversion, but if crops use only 2 acre-feet of the water applied, the other 2 acre-feet return to the water system either as groundwater or surface water. This return water then supplies other water rights. In order to not upset the water budget and to uphold other water rights by preventing impairment, only the amount that was used by the crops can be transferred into a municipality or another industry. With that transfer, a new diversion amount is assigned in relation to the new depletion rate.

**Implementation of Local Policies and Groundwater Management Plans.**

In addition to statewide water law and policies, each water basin in Utah has an area policy that outlines how water transfers are to be administered. As water-use patterns change due to transfers, these policies can have a major impact on other water users and the environment within a basin. Thus, “water transfer policy must fully account for basin hydrology in order to be effective” (Green and Hamilton, 2000, p. 198). Local policies help address appropriate environmental concerns such as maintaining streams and wetlands and making sure that they are not being impaired or damaged. According to DWRi interviewees, policies at local levels are vetted by the public and address unique hydrologic situations of water availability and use. Another local effort to eliminate wide-ranging and potentially negative third-party impacts is the development of groundwater management plans to protect against depletion of aquifers. Management plans include guidelines that help to spatially distribute use of a water resource and alleviate
environmental issues, such as drawdown, in a localized area. Utah statutes in conjunction with groundwater management plans and area policies help to integrate third-party interests into management decisions.

Third-party impacts are taken into account by the DWRi at the transaction level. Interviewees felt that it was not within the scope of water policy administrators’ responsibility to determine the water plan of a region, but that is a task better suited for local and regional water planning authorities or agencies. As one interviewee from the DWRi said, “We don’t really look at the effect of urbanization…We say whoever holds the water, if they are within policy, then they can do that transfer as long as they are not enlarging that right or impairing other people.” So, within their authority of decision making on an individual transaction level, third-party impacts are taken into account by the DWRi. However, on a larger level, there may be more of a cumulative impact that is outside the scope of any individual division of government to consider in land and water planning and mitigation decisions. The following section will discuss sentiments of interviewees on the impacts of urbanization moving water out of agriculture and into municipal use.

Urbanization of Water out of Agriculture and into Municipalities

Our interviewees, many of whom have closely observed and been involved with the water transfer process for many years, offered measured and mixed perspectives on the urbanization of water out of agriculture and into municipalities. On one hand, interviewees noted that the transfer of water is market driven and characterized by willing
buyers and willing sellers. DWRi interviewees noted that the conversion of water from agriculture does not necessarily represent a problem from an administrative point of view. Within the transaction process, a win-win situation theoretically exists (the buyer receives water and the seller receives financial reimbursement) and state water law contains provisions for protecting other water users. On the other hand, many interviewees offered a larger perspective from outside of the particularities of individual transactions, commenting on the larger cumulative impact of farmland going out of production while municipalities grow, and raising questions about having less agricultural production available to feed a larger population. Figure 6 shows water-related land use throughout Utah and illustrates how irrigated farmland in rapidly growing areas is mostly located in urban fringe areas.

The interviewee discussions of agriculture-to-urban water transfers and how to find balance between the two sectors of water use yielded insights and ideas concerning local nonpolicy solutions, the timing of market pressures, and incentives to keep agriculture viable. These challenges are discussed in the following subsections.

Local, Nonpolicy Solutions.

Interviewees were asked what types of policies would contribute to finding a balance between agricultural and urban water interests. The overall consensus among most interviewees was an expressed sentiment that there is more opportunity in existing market systems to find a balance than in government issued policy-related “fixes.” Policies involving natural resources are difficult to create because of the uncertainty and
FIGURE 6. Map of Water-Related Land Use in Utah Compiled between 2010 and 2015. In the urbanized areas, including Salt Lake City and extending north to Ogden and south to Provo, water use for irrigation is found mainly in urban fringe areas. Data for this figure come from the Utah Division of Water Resources.
the dynamic nature of those resources. McCann (2013) describes this difficulty: “time lags, natural variability in space and time, biological diversity, heterogeneity of agents, measurement difficulties, etc. all increase uncertainty and thus pose problems for design of environmental and natural resource policy” (p. 257).

However, interviewees suggested that along with market forces, a variety of collaboration, planning, and innovation efforts could be implemented to create unrealized transaction opportunities and find a balance between water use sectors. Water right transfers, with minimal governmental oversight outside of the DWRi, reflect societal priorities through the market. “Water right transfers are one of the means by which our water distribution can adapt to…changing values, demands, and supplies” (Johnson et al., 2008, p. 27). Interviewees noted, if society decides that agriculture is important to keep in an area, then the market will have to change and farmers will need to be provided with incentives to stay in business. Interviewees commented on the strength that a “willing-buyer and willing-seller” market approach has with people in Utah, and none of them felt that the market needed interference or re-evaluation. Some interviewees argued that there is no conflict of competing interests when it comes to market trading of water, where one party receives money and the other party receives water; rather, it is a mutually-rewarding transaction.

An interesting concept brought up by some interviewees was that the agricultural sector is not necessarily expanding in the state, which is currently helping to keep the agricultural-to-urban transition from becoming a more contentious issue. An issue would exist if agriculture was attempting to expand throughout the state, but at present it is
primarily trying to remain viable. Some interviewees noted that as water stresses get tighter, societal priorities may change, and that change will be reflected in the types of water right transactions that will occur in the future.

**Timing of Market Pressures.**

When it comes to agricultural-to-urban water transfers resulting from farmers selling out and cities expanding into farmland, interviewees note that timing is an issue which can cause conflict. Many times, farmers depend on the option of selling out, either to another farmer or to development, as a source of income for retirement. Interviewees recognized the rights of farmers to make these decisions. However, as more farmers sell out, pressures intensify on surrounding farmers to also sell. These pressures come in many forms. Interviewees mentioned increased liabilities, sounds, smells, and expenses as potential points of conflict with nonagricultural neighbors. More population in an area where farm equipment is prevalent creates more dangerous road conditions and inconveniences to both farm operators and general traffic. In particular, interviewees talked about risks from urban developments in areas where there are irrigation canals, which have become increasingly problematic, especially in light of some high-profile canal failures in recent years (see ASCE, 2015, p. 31 for a summary of recent canal failures in Utah). Risks if a canal failure occurs create greater liability at the present time than in the past; rather than flooding fields which can be drained, as was done historically, houses are flooded, creating much more dangerous and disastrous circumstances.
Interviewees representing agricultural water stakeholders explained that as urban residents complain and band together to put restrictions and limits on farming operations in their neighborhoods, farmers have difficulty functioning efficiently. It is often easier for them to sell out than to fight those pressures. Similar results were found in an older study by Zollinger and Krannich (2001), which presented farmer perceptions of developments closing in on farmers throughout the Wasatch Front. Some interviewees noted that these pressures may come much earlier than farmers anticipate, forcing them to sell sooner than they would have preferred, or eliminating the time they may have needed to find solutions for farm preservation. These interviewee insights cause reflection on whether the market is actually creating situations of voluntary transfers between “willing-buyers” and “willing-sellers.” This characterization of market transactions might be too optimistic of a portrayal of the agriculture-to-urban transition, especially as the agricultural sector in some areas falls below the critical mass needed to maintain its viability.

**Incentives to Keep Agriculture Viable.**

Financial incentives are theoretically a key component of the free market system. “Individual water transfers have been occurring in many areas since the time water rights were established by prior appropriation laws one hundred years ago. The incentive for water transfers or reallocation is based on the perception that economic gains may be captured by transferring water from lower-value to higher valued uses” (Michelsen, 1994, p. 972).

Interviewees commented that the free market system may be the best way to move water to where it is most desirable. The agricultural sector is often blamed for using much more
water than municipalities, justifying moving water to other sectors. However, based on their extensive experiences observing land and water use transfers, many interviewees acknowledged that the current trend may not have considered how people want their future landscapes to look. As one interviewee stated, “I have to admit that I worry about where the balance is between agriculture and other uses. Right now that’s being driven by the market…one day we may be wishing that we had done something different.”

Interviewees noted that if people want to preserve open space and agriculture for future generations, there needs to be an incentive to keep farming. They suggested society needs to determine water priorities before the opportunity for agricultural preservation is gone. One interviewee summed this idea up with the phrase, “We’ll get smarter as we get hungrier.” The next section discusses opportunities that exist to work within the market system while at the same time planning for lasting impacts that may occur at a larger societal scale.

Opportunities for Compromise between Competing Agricultural and Urban Water Interests

As noted earlier, interviewees reported that it would take collaboration, planning, and innovation to find the right balance between agriculture and municipal interests in water allocation. Interviewees suggested that potential policy solutions would be born from the unique understanding of local needs and challenges. Another possible solution pointed to by interviewees was involvement in importation projects to move additional water to urbanizing areas, but they noted this option is increasingly less viable. Two opportunities commonly noted by interviewees for balancing agricultural and municipal
water needs were: first, developing agreements between those people who have water and those who need water; and second, participating in local and regional water planning.

Agreements.

Overall, among interviewees, a policy “fix” was not seen as the sole solution to striking a balance between agricultural and urban water interests. Interviewees felt that policies theoretically limit opportunity and reduce the fairness of individual choice, as opposed to a free market which theoretically maximizes individual choice while reducing societal choices. As a whole, interviewees felt it is the prerogative of people to sell or lease their water right as they choose. Interviewees commented that if there is going to be any sort of policy influence in this situation, it will most likely be on a local level, not a statewide level. State-level policies were perceived by interviewees as being more rigid and difficult to change, while more flexible opportunities for dealing with water as a dynamic and unreliable resource could be found through negotiated agreements.

For cities to have the water that they need without putting agriculture completely out of business, options are available through having water shortage agreements in place. Interviewees recognized that Utah water law is made for drought, and in order to reduce risk, a portfolio of water rights and water access options is helpful to satisfy water needs and cover contingencies in water availability. Preparation through building more complex water right portfolios can help cities prepare for cutbacks. This preparation is in line with what interviewees noted as a trend with municipalities gathering water rights. One interviewee noted, “Rather than having the governor do an emergency declaration that takes water away from agriculture to municipalities, a municipality ought to have a
portfolio of water rights or agreements or contracts where they will pay a going rate in
times of drought to make sure they have enough water for their needs.” Interviewees
noted that water supply entities and water users were better off financially and in terms of
water availability by working cooperatively and making agreements instead of exercising
takings through eminent domain.

Interviewees also noted the strength of having agreements already in place where
water can be leased from one use to another during times of drought. These agreements
are referred to as “dry-year options.” With these options in place, cities do not necessarily
have to buy the water rights they need and permanently hold them. Water is able to stay
in agriculture and when drought comes the water can be leased to municipalities. The
agricultural interests would receive payment for fallowing their fields and the cities
would have the water they need for periods of drought. These sorts of contracts keep
fields in production in the long-run rather than severing water from the land and
permanently drying or converting farm fields. This method of dealing with drought and
balancing agricultural and urban water needs has been implemented throughout the
western United States, notably in California between the Metropolitan Water District of
Southern California and the Palo Verde Irrigation District (Huffman, 2004; Colby and
Pittenger, 2005; Colby et al., 2014). Properly structured incentives, that take into account
economic as well as social considerations, are key to the success of these programs.
Agricultural interests require enough monetary incentive to make the tradeoff worth a
temporary cessation in farming, while at the same time, municipal interests require
reliability that water will be available in times of need.
Local and Regional Planning.

Planning helps water stakeholders manage water transfer transactions without eliminating the willing-buyer and willing-seller aspect of the free market. Multi-actor collaborative approaches are becoming common mechanisms for addressing a variety of issues that require spanning the boundaries between different interests. Particularly with issues regarding mobile and shared natural resources, planning provides forums for diverse interests to come together to resolve conflicts. These interests often include a combination of farmers, government officials (at multiple levels), other resource users, environmental interests, and the general public (de Loe et al., 2015). Planning looks at the long-term impact of water transactions on a region, either a single large transaction or a group of transactions over time, rather than the impact or benefit for one single area. This approach allows for improving efficiencies in the overall use of water. For example, the best place to construct a well for one municipality may actually be within the boundary of another municipality. This situation would require cross-boundary planning to benefit more than one entity. This type of planning, that often requires integrating land and water use perspectives, is outside the purview of any one division of government.

The disconnect between water planning and land use planning was not directly discussed in interviews, however interviewee comments indicated that there is a separation between the two domains when it comes to decision making. The gaps between these two institutional responsibilities and ways of thinking can be bridged with regional planning and collaboration. In the example of agricultural-to-urban water transfers, interviewees acknowledged that it is important to involve agricultural interests
and the potential water users in understanding inherent problems of managing water in a
hydrologic and landscape context. Involving affected parties helps determine if and how
the parties want to structure their transaction, knowing what the problems are, in order to
find solutions potentially beneficial to multiple parties. Interviewees noted the
importance of coming together to manage a resource with each party’s interests
acknowledged. One person selling water could drastically affect how surrounding water
users are able to maintain their current water operations. Endter-Wada et al. (2009) add
that cooperation with water resources “are not just human-hydrologic adaptations but
simultaneously the adaptations of people responding to each other within that
hydrological context” (p. 56). Collaboration rather than particular policy changes was
discussed as a more acceptable mechanism for handling difficult situations between
parties. This sentiment was summed up by one interviewee who said, “I suppose at some
point the legislature could mandate some of that, but that doesn’t seem to be the kind of
government that we operate under.”

The Mt. Nebo Water Agency is an example of regional planning and
collaboration. Located in southern Utah County, the agency operates in an area
undergoing this agricultural-to-urban water transition. The agency is composed of both
agricultural and municipal representatives and acts as a water planning forum for the
area. The agency is a place where water projects can be discussed and entities can choose
to participate or not participate depending on their individual circumstances and
assessments of project benefits and costs. The goal of the agency is to allow cities to
grow while at the same time allowing agriculture to thrive. The key for Mt. Nebo Water
Agency to attain its aims is to get people talking to each other and working together. Interviewees noted that each entity needs to stop thinking about themselves as their own end-all kingdom, and work together and plan ahead for following generations. The story of the recent formation of the Mt. Nebo Water Agency is the subject of Chapter 3 of this thesis.

CONCLUSION

Water in Utah was originally allocated on a first-come-first serve basis under prior appropriation water law common in western states of the U.S. Now, in an era of reallocation, the market plays a large role in the movement of water rights among users. This changing water regime impacts decision making criteria as water right policies, rooted in a 19th Century-style priority system, are needed to provide certainty to guide decisions in current market transactions. The monetization of water creates challenges for policy administrators as dormant water rights are put back into use or traded on the market, disrupting established local priority allocations that have been in compliance with the law. Municipalities are commonly involved in water rights transactions from agriculture to urban use. This pattern is due to state policies that favor municipal use and municipalities’ general ability to pay more than agricultural water users. As this pattern occurs, the need for proactive planning in conjunction with the market system is recognized as an important opportunity for finding a balance between agricultural and urban interests. Proactive coordination and planning through agreements, as well as
regional planning, is key to making sure that water supply is available for multiple current and future water needs within a region as population increases.

The monetization of water began as water supplies were over allocated, creating the need to purchase water rights from existing water users and giving these rights increasing monetary value as new supply options dwindled. The increased value of water rights incentivized the revitalization of dormant water rights. Water, like other natural resources that can be captured, requires a permit to obtain the resource within a certain period of time. Where water is concerned, if a person fails to put the resource to a beneficial use, the opportunity should go to the next appropriator. As a result, water has been over appropriated because it was assumed that many water right applications would lapse and never be put to beneficial use. Allowing these dormant water rights back into the existing water allocation regime creates disorder in the existing priority system. The monetization of water and existing state water policy incentivize the flow of water rights away of agriculture and toward municipalities.

Purveyors of water for municipal use develop water right portfolios to ensure water supply for current and future populations, as well as to prepare for drought contingencies. Not only do municipalities generally have the ability to pay for water rights, state policy is also favorable to them. Municipalities have a reliable tax base to draw upon when accruing water rights through market transactions. In addition, some municipalities require developers to provide water for new developments, often allowing cities to acquire water without taxpayer or ratepayer expense. Once water is obtained by a municipality it cannot be sold or exchanged. On the one hand, this provision ensures
enough future water to support growing populations and industries; on the other hand, water transfers are permanent and reduce future market flexibility. This situation essentially limits the productivity of water if it is being held for future use without any current demonstrated need for it within the municipality. These water right portfolios give cities flexibility in how they choose to use, or not to use, water. This flexibility is in stark contrast to agricultural uses which are required to be proactive in their use of water rights by continually putting water to beneficial use or be subject to forfeiture. Ultimately this provision in the law protects some water uses over others. These provisions of state law allow cities to stockpile large portfolios of water rights and limit water marketing, as the market for transfers between uses stops at the municipal door.

Interestingly, the market system is intended to push water to its highest and best use. However, the highest and best use of water is subjective, and current economic and societal trends may not necessarily consider the long-term impacts of certain water use strategies that may be incompatible with a community, county, or state’s vision of the future. One of the most obvious third-party impacts of water transfers is the cumulative, permanent results of inter-sectorial transfers of water out of agricultural uses and into “urban” or M&I uses. Temporary trends in the market that create permanent changes in water allocation may make for more difficult transitions in the future if societal priorities change. In particular, as urban pressures make farming more difficult in areas where developments are encroaching on agriculture, land and water become more valuable if they are sold to developers than if they remain in agriculture. Acknowledging these existing pressures, opportunities exist to find a balance between agricultural and
municipal water needs through innovatively-structured agreements and integrating public planning considerations into the market transactions.

With the understanding that both drought and population increase create added pressure on an already-stressed water supply, having agreements in place before these pressures manifest themselves is helpful to easing burdens on water supply and water users. These opportunities can help agricultural and urban water needs find balance by allowing the status quo of water use to continue with the understanding that in certain conditions or years the water use may change with compensation provided to those who give up their water use for others. Local and regional planning can be used as another opportunity to make sure growth and development happen in places that make sense for local areas by allowing stakeholders an opportunity to have a voice in water planning. The land and water markets left to themselves may not necessarily have a long-term perspective of multiple needs for a particular region. Current societal interest that creates permanent changes to land and water use may not have forethought for future needs of a region. Integrating collaboration and planning into the existing interplay of policy and market structures can help create win-win situations where certain water users are not pressured out of the market without sufficient time to investigate various options. Informed by public interest and stakeholder participation in regional water planning and coordination, the market can continue to be used to sensibly reallocate water supply among uses in a region. As stress on water supply increases with population growth, these opportunities allow for flexibility within the existing water allocation system to find a balance between agricultural and urban water needs.
LITERATURE CITED


CHAPTER 3
STRUCTURING MUTUALLY-BENEFICIAL USE OF WATER IN URBANIZING ARID LANDSCAPES: A CASE STUDY OF THE MT. NEBO WATER AGENCY

ABSTRACT

Increasing population and economic growth in the western United States creates escalating demand on the region’s variable and uncertain future water supply. With the majority of the water being consumed in agriculture, municipalities often obtain water supply needed for growth from agriculture. Water supply reallocation generally occurs through agricultural-to-urban water transfers. In southern Utah County, Utah, population growth is accommodated through the transitioning of agricultural land and water supplies into municipal and industrial developments. This transition, if not properly planned and accounted for in the water budget, can create dilemmas with water availability, delivery, and use as separate water providers prepare for growth within their own geographic boundaries. Regional planning agencies can be used to help coordinate and balance growth in transitioning landscapes. The Mt. Nebo Water Agency provides the opportunity for stakeholder involvement and boundary-spanning to occur between both municipal and agricultural interests within the region. This agency faces challenges and opportunities to function within the local and regional context of water, while also working within the statewide and national water policy landscape. Stakeholder involvement and boundary-spanning solutions are considered crucial factors for regional

---

2 This chapter was co-authored with Joanna Endter-Wada
planning, particularly with resources like water that traverse political and institutional boundaries.

INTRODUCTION

*Water Transfers in an Urbanizing United States West*

Increasing populations in the arid western United States (U.S.) strain existing water allocations. Tightening regional water supply options has growing municipalities turning to irrigated agriculture as a source of water to meet development needs. Agriculture accounts for approximately 80% of consumptive water use in the U.S. as a whole, and over 90% in some parts of the nation’s western regions (Schaible and Aillery, 2016). Demands of a growing population and economy, along with increasing environmental awareness, within the arid U.S. West are causing agricultural water to be considered as a source for reallocation, moving water out of agriculture and into urban and environmental sectors.

Water reallocation through water transfers and market mechanisms allows water rights to be sold or leased from one type of use or user to another (Young, 1986; NRC, 1992; Schempp, 2009; Young and Loomis, 2014). Various types of water transfers occur among agricultural, urban, environmental, and recreational uses. However, in general, due to the urbanization process, a predominant trend in water transfers is from agriculture to urban uses (Meinzen-Dick and Ringler, 2008; Molle and Berkoff, 2009; Goemans and Pritchett, 2014). Permanent water transfers that facilitate the removal of water rights from agriculture to urban uses are driven by growing urban demand and willingness to pay for
water (Michelsen et al., 2000; Zollinger and Krannich, 2001). Water transfers are a mechanism to reallocate existing water supply to growing communities rather than develop new sources of supply, which often require building large infrastructure projects such as dams and reservoirs (Young, 1986; NRC, 1992; Wiener, 2003; Easter and Huang, 2014; McCann and Garrick, 2014). Along with these agricultural-to-urban water transfers comes the monetization of water, which incentivizes the sale of water in high-valued market exchanges (Michelsen et al., 2000). This trend promotes increased interest in water rights transactions, which can create disruption in the existing water allocation regime as unused water rights that could be considered abandoned or forfeited under prior appropriation water law enter the market.

Provisions in Utah water statutes allow municipal water purveyors to acquire and hold water rights for future growth (Utah Code § 73-1-4). As a result, municipalities are allowed to delay putting water rights to beneficial use, a protection not granted to agricultural and other private water users. Agriculture in the western U.S. is heavily dependent on irrigation for survival. As municipalities continue to purchase agricultural water rights to allow population to grow and urbanization to spread, policy makers are confronted with decisions about how to balance water allocation between societal sectors of water use. One method for addressing these decisions is through coordination and collaboration between stakeholders in a region to plan for current and future water needs.

This chapter presents findings from multi-method research on the urbanization of water from agriculture to municipal and industrial (M&I) use in Utah. The goal of this research is to understand stakeholder involvement and boundary-spanning occurring in
the Mt. Nebo Water Agency (MNWA), a newly-formed regional water planning agency located in southern Utah County. Utilizing data from personal interviews, public meeting observations, and public documents, this chapter discusses the formation, participants, purposes, challenges, and opportunities the MNWA has for balancing agricultural and urban water interests.

*Water Management Needs and Approaches*

Water planning traditionally has been done separately from land planning (Arnold, 2005). Often, these areas of planning occur within separate legal, administrative and institutional silos (Li *et al.*, 2015). Water planning typically occurs at a state or regional level and is largely administered by water engineers. In contrast, land planning is normally conducted at a local level and is shaped by community values, politics, and economics (Gober *et al.*, 2013). In these institutional settings, stakeholder involvement is usually incorporated on an ad hoc basis (Lienert *et al.*, 2013). However, approaches have been pursued to promote collaboration and communication, not only between government agencies, but also with private stakeholders. Land use planning and water planning coordination is essential to meet the gap between water supply and demand, especially in arid regions where water is a limited natural resource (Griffin and McVicker, 2014). Among these approaches are integrated water resources management (IWRM), stakeholder involvement, and boundary-spanning. These approaches are becoming more common as people see the benefits of collaboration and communication when dealing with natural resources, such as water, that transcend political boundaries.
The framework of IWRM is designed to holistically manage land and water across sectors in order to maximize economic and social welfare without compromising the sustainability of vital ecosystems (Hassig et al., 2009; Bateman and Rancier, 2012). This holistic management is done by linking land and water use planning with multiple levels of participation. The intent is to “stop fragmentary approaches to water management and high-handed development decisions made for the benefit of a single user group or faction” (Giordano and Shah, 2014, p. 364). IWRM does not have a set definition, allowing it to be adapted to each unique situation in practice. The basis for understanding IWRM typically comes from a set of key values known as the Dublin Principles presented at the World Summit in 1992. Key points include: freshwater is a finite and vulnerable resource; water development and management should involve a participatory approach between water users, planners, and policy makers at all levels; women play a central role in water management; and water is an economic good with value in all its competing uses (Hassig et al., 2009). Lubell and Edelenbos (2013) discuss these principles and various interpretations of IWRM and note that in the absence of a single set definition, principles and themes are generally applied. These themes emerge in the application and practice of IWRM and “tend to pay attention to matters of coordination and participation” (Lubell and Edelenbos, 2013, p. 180). The IWRM concept has faced many challenges dealing with existing institutional settings, infrastructure, and regulations (Ahmadi et al., 2012). However, this concept of integrating land and water resource planning is noteworthy and could be implemented to various degrees within currently existing institutional landscapes.
The two overarching themes of IWRM, greater citizen participation and agency coordination, link to the key concepts of stakeholder involvement and boundary-spanning. Stakeholder involvement is key to successfully implementing planning and management of natural resources at local levels. Stakeholders are defined by Grimble and Wellard (1997) as “any group or people, organized or unorganized, who share a common interest or stake in a particular issue or system” (p. 175). These groups are found at all levels of society and can be any size (Grimble and Wellard, 1997). Although stakeholders fall into a general category when compared to decision makers, stakeholders are a heterogeneous group when it comes to their perspectives and opinions about a particular decision making process (Lafreniere et al., 2013). In the context of regional water planning, stakeholders can include municipalities, counties, water districts, canal companies, environmental groups, industry groups, landowners, and individual citizens representing various geographic areas and socioeconomic backgrounds. Planning is usually facilitated by a government entity, but stakeholders represent a variety of perspectives and have knowledge to contribute to this process. Baldwin and Jeffrey (2014) state that “facilitating meaningful dialogue between stakeholders relies on data about both existing conditions and scenario-informed futures being accessible” (p. 2569). Stakeholder involvement is a powerful tool for surfacing knowledge of different local systems and impacts that would result from decisions and planning processes, particularly when those decisions are made at higher levels without a comprehensive understanding of the impacted region (see KRIRM, 2012 for an agricultural perspective on the
importance of joining agricultural and nonagricultural interests to foster good water planning).

Boundary-spanning is the key to linking stakeholders and planning agencies by encouraging collaboration and communication across political, social, and institutional lines. This concept is not only an attempt to cross geopolitical lines for planning purposes, but also an attempt to bridge knowledge between specific domains. Carlile (2004) notes that “acknowledging both domain-specific and common knowledge at a boundary provides a useful distinction to better understand the challenges as actors try to work across domains when innovation is desired” (p. 555). The idea is that all stakeholders can come together and share their perspectives, goals, and needs for a particular shared resource, which can be incorporated into the planning and management of that resource. In the case of water, there are multiple stakeholders, both institutionally and individually, who would benefit from boundary-spanning collaboration and communication that ensures particular needs and sources of knowledge on the subject are not overlooked. Kark et al. (2015) define collaboration as “two or more organizational actors with shared interests and/or collective responsibilities working together to pursue complex goals” (p. 12). Intermediary organizations can bridge types and scales of boundaries to bring participating organizations and interests together (Guston, 2001; Daniell and Barreteau, 2014). Boundary-spanning tools allow participating entities the ability to see the resource from multiple perspectives without losing individual identities; participation in an organization with a mediating role is one such boundary-spanning tool (Guston, 2001). Using fragmented governance systems to manage a complex
interconnected water system creates conflict and confusion if institutions do not develop and integrate management (Edelenbos and van Meerkerk, 2015). Within the domain of water management, a regional water agency could serve as a boundary-spanning organization to help stakeholders share and gain knowledge and understanding of water resources. Boundary-spanning allows participants to leave the myopic view of resource planning within solitary political boundaries and widen the scope of resource planning to meet the needs of a whole region (see Ruhl et al., 2003).

Regional planning can be viewed as the marriage of stakeholder involvement and boundary-spanning. The need for regional water planning comes from the simple fact that water is not contained within political boundaries, as a single body of water can cross multiple management and jurisdictional lines. Thus the nature of the resource itself makes water a transboundary issue. Foster (2010, p. 490) describes the problem of regional planning as “a territorial mismatch between the scale of a regional problem and the scale of a political organisation to address those problems. Regional problems transcend local political borders, causing externalities and generating coordination problems that defy solutions by a single local unit.” The interconnectedness of water within a region makes planning and managing water resources necessary, particularly in regions experiencing rapid growth. Planning is vital to preparing for and managing growth in a way that makes sense for a region.

*A Case Study in Institutional Innovation*

Utah, located in the heart of the Intermountain West, has one of the fastest growing state populations in the country. According to the U.S. Census Bureau’s 2015
estimates of five-year population growth rate averages by state between 2010 and 2014, Utah is ranked fourth in the nation. Most of the population concentration and growth within Utah is centered along the Wasatch Front, the area west of the Wasatch Mountains expanding north and south of Salt Lake City. In order to accommodate rapidly increasing population in this area, the trend has been a decrease in agricultural land as farms are converted to residential and commercial areas (Utah DWR, 2001). The transition from agriculture to urban land and water use is essentially irreversible, resulting in permanent land use changes and livelihood consequences to the agricultural community as it is displaced or declines due to urban encroachment. How to balance agricultural and urban water interests has become an important public policy question as land and water transfers from agriculture to urban use have accelerated in recent decades.

Utah County is situated at the south end of the Wasatch Front and was traditionally a heavily agricultural area. Along with a high percentage of the total population growth coming from natural increase, several factors make Utah County the likely location where a large amount of the state’s future growth will occur. These factors include land availability to accommodate urban expansion, expanding economic and job opportunities provided by a thriving tech industry, two of the largest universities in the state (Brigham Young University in Provo and Utah Valley University in Orem), relative proximity to Salt Lake City, and locally-desirable climate and cultural quality of life. Northern Utah County is growing rapidly with most agriculture already gone. As the population continues to increase, studies suggest that this growth will be directed towards southern Utah County (Robert Charles Lesser & Co., 2014; Utah Foundation, 2014),
where the majority of the county’s agriculture remains. Figures 7 and 8 illustrate water-related land use in Utah County. Recent statewide planning efforts and public surveys (Envision Utah, 2014; Endter-Wada et al., 2015) have found general public support for maintaining a viable agricultural sector. Thus, as growth occurs in southern Utah County, decision makers are seeking ways to allow this area to grow without sacrificing the remaining agriculture.

State leaders take the position that water supply does not have to be a factor limiting population growth in Utah. They operate on the assumption that water can be made available to growing communities through water transfers, agreements, and infrastructure (Utah DWR, 2001). As with other western states, 82% of water is used for agriculture (Utah OLRGC, 2012), creating a potential source of water transfers to meet the increasing urban demand as municipal populations increase. It may not be in the best interest of Utah, however, to allow reallocation of the state’s water to occur solely through private market transactions without incorporating decision making that protects and promotes larger societal interests. Agriculture plays a large role in Utah’s history, culture, and economy. Irrigated agriculture was critical to survival of the Mormon pioneers when they settled the area and has deep roots and influence in the history of local communities throughout Utah (Hutchins, 1927). According to Hutchins (1927), “Agriculture under irrigation…became the pioneers’ first industry” (p. 9).
FIGURE 7. Water-Related Land Use in Utah County, Utah. This figure shows that the majority of land use on the northern end of the county consumes “urban” water, while the majority of land use on the southern end of the county consumes agricultural irrigation water.

Currently, agriculture in Utah creates thousands of jobs, hundreds of millions of dollars in tax revenue, and billions of dollars in production value (Ward et al., 2011; UDAF, 2015). Thus, it is important that agricultural and urban interests are able to coexist.

In 2014, the MNWA was formed in southern Utah County under the Utah Interlocal Cooperation Act (Utah Code, Title 11, Chapter 13). The agency emerged in an area that already has many long-standing and powerful water agencies. One of MNWA’s
express purposes is to work on balancing agricultural and urban water interests. This agency consists of six public entities and one private entity through contract representing agricultural and municipal stakeholders. It holds quarterly public meetings where board members and interested parties discuss water planning and management on a regional scale. The purpose of this research is to understand how and why the MNWA took on its current institutional form and how it plans to address balancing both agricultural and urban needs in southern Utah County.
METHODS

Sampling Frame

This research used a multi-method approach consisting of interview data as the primary source of information, supplemented by secondary sources of information and participant observation in public meetings. Twenty interviews were conducted to understand the impacts of agricultural-to-urban water transfers in Utah and to explore interviewees’ ideas on a collaborative approach for dealing with this transition. This selection of interviewees included individuals who could provide a statewide perspective of the agricultural-to-urban transition process, as well as individuals who could provide a more focused perspective on the local case study of the MNWA. A subset of employees of the Utah Division of Water Rights (DWRi) and individuals affiliated with the MNWA in southern Utah County participated in the interviews.

A reputational sampling frame was developed before the interview process began. Interview questions were designed to focus on the knowledge, expertise and perspectives that a sample of interviewees from DWRi and MNWA could provide. The target interviewees were contacted through in-person interactions or phone calls and all invited interviewees agreed to participate under procedures approved by the USU Institutional Review Board (IRB). Additional interviewees were obtained through snowball sampling where interviewees were asked for references to other individuals who would be pertinent and valuable sources of information.

Interviewees related to the DWRi were selected because of their involvement in the water transfer process, which is an integral part of the agricultural-to-urban transition.
Their involvement comes in many forms: reviewing change applications, making recommendations on change applications to the State Engineer, and handling protests and hearings for decisions made on change applications. The case-study interviewees were selected due to their involvement with water in southern Utah County and their ties to the MNWA. Within this group, community leaders, water managers, and stakeholders were interviewed. These interviews were designed to focus on perspectives of agricultural-to-urban water transfers in the southern Utah County area of the state. This region is experiencing rapid growth and is expected to be a focal area for projected future growth in the state. It is also an area currently invested in agriculture and is experiencing the urbanization of water out of agriculture and into growing municipalities.

Interview Protocol Design

A semi-structured interview protocol was followed; however, it was adapted as interviews were administered. If an interviewee answered more than one question in response to a single question, the already-answered and redundant question was then skipped later in the set. This approach was taken in order to be thorough while at the same time avoiding repetition, both out of respect for interviewees’ time and to ensure enough time for all the questions to be addressed. Responses were based on interviewees’ professional experience concerning the agricultural-to-urban transition in water rights, as well as personal opinions and ideas about current and future opportunities for finding a balance between agricultural and urban water needs.

The interview questions were developed to understand statewide agricultural-to-urban water transfer dilemmas, solutions for overcoming these dilemmas, and how the
MNWA can be a tool for striking a balance between agricultural and urban water needs. In order to gain a statewide perspective of agricultural-to-urban water transfers and impacts, questions were developed to focus on: (1) policy enabling water transfers in Utah; (2) current issues involved in water transfers; (3) third-party impacts of water transfers; and, (4) balancing agricultural and urban water needs. The results of these interviews provided an understanding of the importance of cooperative and collaborative water planning. A second set of interview questions focused on understanding the MNWA as a tool for cooperation and collaboration in a setting where agricultural-to-urban land and water transitions are expected to occur. This second set of questions focused on: (1) understanding the need for the MNWA; (2) the challenges facing the MNWA; and, (3) potential opportunities for the MNWA to strike a balance between agricultural and urban water needs. The two-part interview protocol was approved by the IRB, and confidentiality of interviewee responses were ensured.

Data Collection

In-person interviews were conducted and digitally voice recorded. All interviewees agreed to be recorded, and were assured by the interviewer that the sole reason for recording the interview was for transcription to ensure accuracy in using the information for research purposes. Recording the interviews provided two distinct advantages. First, it allowed the interviews to have a free flowing, conversational approach without periodic interruptions for note taking. Second, recording interviews created an exact record of responses. This approach provided the ability to compare true responses amongst the interviews, rather than a shortened response recorded through note
taking during the interview, or post-interview memory or interpretation of responses. Interviews ranged from just over half an hour to two-and-a-half hours. The recordings were made with the understanding that the transcripts would be used by the researchers to avoid human error in remembering responses and to allow for easier comparison of responses across all interviewees. Additional data collection occurred through participant observation at public meetings where the MNWA projects and water-related matters in southern Utah County were discussed. Further supplementary information was found in publicly available documents.

Data Analysis

Interview transcripts were read by researchers and interpreted to extract two main sets of coded data. The first set of coded data was for answers to questions that could be compared across interviews. These data were used to consolidate interviewee responses to common questions and find points on which there was a general consensus, as well as identify any unique responses that contributed different perspectives to each question. The second set of codes was for overall themes within each interview. These data focused on important points from the perspective, position and expertise of each individual interviewee and on examples given to emphasize specific points they made. Data analysis highlighted points from larger themes across interviews and allowed for greater insight into the overall discussion of water transfers and their resulting impacts. The following results section is the product of both extracting coded data directly from interviews and integrating it with additional information obtained through observation and public documents.
RESULTS

Interviews yielded five major themes concerning regional water planning in southern Utah County. The first theme presented is characterizations of the regional planning context in southern Utah County. Regional planning is not new to Utah County, however, the MNWA fills a gap in water’s existing institutional landscape. The second theme presented is factors leading to the formation of the MNWA by its participating entities within that existing institutional landscape. The third theme is centered on the goals and objectives of the MNWA. Commonly mentioned goals include long-term water resource planning, protecting and preserving water locally, collective use of knowledge and resources, and boundary-spanning opportunities. The fourth theme is focused on how these goals and objectives can be used to seek mutually-beneficial use of water by moving from an atmosphere of conflict to an atmosphere of collaboration. And finally, the fifth theme relates to ideas for how the agency can take on the challenge of bridging agricultural and urban interests through projects that serve multiple needs.

Regional Planning Context in Southern Utah County

Even though agriculture generally accounts for roughly 80% of overall water use in the western United States, there is a sharp difference when focusing on more local areas of land and water use transition. For example, in Utah’s once agricultural but now more urbanized counties of Davis, Salt Lake, Utah, and Weber, agricultural water use accounts for only 50% of the total water use (Adams et al., 2010). Located at the south end of the population-growth corridor along the Wasatch Front, southern Utah County is
a prime example of suburban expansion at the expense of agricultural land and water. All interviewees in this study recognized the importance of agriculture in Utah, both historically and currently, but noted variation in the degree to which urbanization had affected it in different areas of the state. From interviewees with a statewide decision making perspective, this pattern was often characterized as simply the result of the market system providing win-win situations for farmers to obtain money and developers to obtain land and water. From the perspectives of interviewees involved in the local case study, this pattern was often portrayed as a situation needing balance so that land, water, and cultural resources associated with agriculture are not permanently lost from the region.

The south end of Utah County is still heavily invested in agriculture, while at the same time urban growth is becoming a reality. Interviewees noted that a plan will need to be developed to accommodate future growth and the resulting transitions that will occur with land use changes and accompanying changes in water use and demand. Regional water planning, involving collaboration and communication of stakeholders, was suggested as a way to seek this balance. Interviewees noted that Utah County is familiar with regional cooperation on services such as power and transportation. Water cooperation has occurred, but interviewees suggested MNWA might be able to fill the current gap in regional water planning by being in a position to convene the diversity of water users and institutions in the area.

Regional planning is not new in southern Utah County. Several existing regional planning and collaboration agencies are currently operational in this area, including the
Southern Utah Valley Municipal Water Association (SUVMWA), Utah Municipal Power Agency, and Mountainland Association of Governments. SUVMWA has focused on specific water studies such as groundwater recharge and sustainability in Southern Utah County. Although SUVMWA has focused on water, it reportedly has not been active in developing a regional perspective for long-term water supply provision and demand management. This organization is made up of ten municipalities and is mostly focused on water issues within annexed municipal boundaries, endeavoring to collectively address the needs of individual municipalities. Utah Municipal Power Agency is made up of six members, all of which are municipalities located in Utah, Juab, and Sanpete counties. This agency’s mission is to “develop a reliable and economic power supply program to meet all the required electric power and energy needs of its member municipalities” (see UMPA Mission Statement at http://www.umpa.cc). Mountainland Association of Governments is a regional planning organization with a very strong focus on transportation and social issues other than water. It serves Summit, Utah, and Wasatch counties, cities, and towns by addressing coordination needs for “community and economic development, regional transportation planning, and aging and adult services” (see Mountainland AOG Mission at https://www.mountainland.org).

An array of water providers, project facilitators, and water user associations operate in southern Utah County, for example Central Utah Water Conservancy District, Strawberry Water Users Association, several canal companies, and multiple municipalities. Interviewees noted that regional water planning in southern Utah County has been attempted in the past, but has not taken hold. A history of conflict and distrust
was cited by interviewees as a stumbling block toward unification and regional water planning (for an example of this conflict see Strawberry Water Users Association vs. United States et al., Tenth Circuit Case 07-4172). Interviewees expressed that in an already-crowded institutional atmosphere, it has become necessary for a new institution to enter the scene, free of the historical “baggage” that the other water institutions have, and to take on the role of water planning with a clean slate. The MNWA has been designed to assume that role. Entities involved in the MNWA have their own water interests, yet share the vision of finding a way to cooperate together for the mutually-beneficial use of water throughout the region. Participating entities in the MNWA all have political boundaries that intersect with other members, which creates the necessity and desire for cross-boundary planning and coordination of water resources. As summed up by one interviewee on the MNWA board:

“We are looking with all of the various interests to see what we can do to enhance the quality of our water, to make sure that we have got appropriate agricultural water and that we have got appropriate urban water to meet growth demands and see if we can’t work together. There are some challenging issues…the best way to tackle those is through cooperation.”

Mt. Nebo Water Agency Formation

The Utah Interlocal Cooperation Act is the legal basis on which the MNWA was formed in 2014. Interlocal agreements are common throughout the United States. Through managerial connections and networking of local governments, interlocal agreements allow public goods or services, such as fire and emergency response services, waste/garbage pickup, water delivery, and so forth, to extend beyond a single town’s
borders to multiple neighboring municipalities (Morton et al., 2008). The Utah Interlocal Cooperation Act has two purposes, as stated in the statute:

(1) “to permit local governmental units to make the most efficient use of their powers by enabling them to cooperate with other localities on a basis of mutual advantage and thereby to provide services and facilities in a manner and under forms of governmental organization that will accord best with geographic, economic, population and other factors influencing the needs and development of local communities; and, (2) to provide the benefit of economy of scale, economic development, and utilization of natural resources for the overall promotion of the general welfare of the state” (Utah Code § 11-13-102).

Interviewees voiced hope that interlocal cooperation would provide an innovative institutional opportunity for agricultural and urban interests to cooperate and jointly participate in long-term regional water planning that includes contingencies for population growth and drought.

The MNWA is a group of six public entities and one private entity represented through contract, all operating in southern Utah County and representing both municipal and agricultural interests. Working together, the entities of the MNWA share a common interest in developing, protecting, and managing water resources to maximize the beneficial use of available water supplies and to satisfy the demands of agriculture and a growing municipal population (MNWA ILA, 2014). The MNWA is designed to create long-term regional water planning for southern Utah County as it “works to protect and preserve precious water resources for the benefit of present and future agricultural, residential, municipal, and industrial users, and to plan for water supplies needed to sustain population growth and economic expansion within the Agency boundaries” (see MNWA Mission Statement at http://www.mtnebowater.com).
The Utah Interlocal Cooperation Act allows public agencies to contract with each other to carry out projects formed by public agencies. According to interviewees, an agency formed under this Act can use any of the powers that each individual member entity has. The idea originating the MNWA was essentially the idea of cooperation between the different governments in the area, and the entire region as far as water usage and sharing. It was created by public entities who manage public water supplies, although, during interviews, representatives of public entities saw a real need to involve private water companies that deliver irrigation water. Using the Interlocal Cooperation Act to structure the MNWA allowed for a simpler implementation than organizing under Utah’s Water Conservancy District Act (Utah Code § 17B-2a-10), which would have required an election because of taxing authority. Forming the MNWA was done by agreements between the governing bodies of the respective entities, creating a more streamlined process. Interviewees indicated that a major benefit of using the Interlocal Cooperation Act was through combining the powers that each of the public entities has separately, in essence creating strength in numbers.

The MNWA currently has six members which include Spanish Fork City, Payson City, Salem City, the Central Utah Water Conservancy District (CUWCD), Goshen Valley Local District (GVLD), and Utah County. By a contract for representation with Utah County, the Strawberry High Line Canal Company (SHLCC) recommends a person for appointment to the board by Utah County. The three participating municipalities have a combined population of nearly 70,000 residents. Interviewees stated that these municipalities have a history of working together on shared resources such as electric
utilities and water. The CUWCD boundary spans ten counties in Utah. CUWCD has been involved in water planning and project building for water development used for municipal, industrial, irrigation, hydroelectric power, fish, wildlife, conservation, and recreation purposes (see: http://www.cuwcd.com/administration/administration.htm). The GVLD represents an area currently devoted to agriculture, but with the potential for population growth throughout the entire Goshen Valley, and located on the west side of Utah Lake. Utah County is represented on the MNWA board to involve the broader county interests in water planning. The SHLCC delivers about 39,000 acre-feet of water through southern Utah County. The SHLCC is not a public agency but operates a major portion of the region’s water infrastructure that supplies some public entities; thus, an additional seat was given to representatives from Utah County and the SHLCC recommends a person for appointment to the board. This is one way to allow both public and private entities to work together in the MNWA. Additionally, allowing private entities that do not have a board member to enter into contracts with public entities in the MNWA was mentioned as a way to bridge the gap between public and private participation. The agreement under which MNWA was formed includes provisions for adding more members in the future. Two additional entities have expressed interest in joining MNWA, either directly or through an arrangement like the one pertaining to SHLCC: the Strawberry Water Users Association and Santaquin City (see MNWA public meeting minutes from May 16, 2016).

Each of these participating entities sees reasons to be involved with the MNWA. The predominant reason interviewees noted for entities to be involved was the benefit of
regional water planning. As an essential part of urban growth and development, water planning on a regional hydrologic scale helps determine where there is development potential and where future water needs will be. Interviewees were concerned that planning should be done in a way that is sensitive and supportive of agriculture and in a way that can balance the water needs of agriculture and urban interests as development occurs. Interviewees also felt that interacting with other MNWA members would be a beneficial opportunity to pull together and have a bigger voice when it comes to protecting local water resources within their area of the state. Stakeholders felt it was important to keep water local, making the resource available for a diversity of legally-beneficial and economically-productive uses. This interaction between water stakeholders was cited by interviewees as an opportunity to have “boots under the table” to become aware and involved with water issues in the region.

The institutional and political overlap makes it important for all of these entities to participate. Public meetings are held, allowing individual citizens as well as other public and private entities to come and address the board about water concerns or projects. The MNWA is designed so that entities involved in the agency can contract with each other to join projects. Additional flexibility is also added to allow private entities to participate in agency projects through contracts. This opens the door for full stakeholder participation in projects that may emerge from regional water planning in southern Utah County.
Goals and Objectives of the MNWA

When asked what the MNWA could accomplish in terms of water availability, delivery and use, interviewees reported long-term planning of water resources, protecting and preserving water locally, collective use of knowledge and resources, and cross-boundary communication. These responses can be supplemented by looking to the purposes of the MNWA written in Section 3 of its Interlocal Agreement (MNWA ILA, 2014). Figure 9 is an interpretive illustration of the MNWA processes and functions. It shows that participating entities bring their ideas, knowledge, concerns and technical resource-sharing entities.

FIGURE 9. Interpretation of MNWA Processes and Functions.
resources to the MNWA platform. Through communication and collaboration the entities are able to work together for proactive growth planning, measures to protect water resources and keep them local, and to generate and finance water resource projects.

**Long-Term Planning of Water Resources.**

Long-term planning of water resources was often cited by interviewees as necessary in a rapidly growing region where water will likely be a limiting resource. The beginning of this regional planning with the MNWA was described by interviewees as consisting of two phases. Phase I was collection and analysis of all existing water studies previously conducted within the region to understand what has already been done and to assess information needs. Phase II will be a comprehensive water supply and demand study to understand water availability in the region as a whole in order to integrate information previously collected for separate parts of the region and to augment where necessary. The Phase II study will help determine what additional water resources are available in the region and how they could be utilized (see MNWA public meeting minutes from March 27, 2015 regarding MNWA’s regional water study). Interviewees noted that knowing what water resources and supplies the region has will help with planning the best ways to deliver and use water in the future as growth and land transition occurs. Interviewees talked about their desire to plan not only for current use but for use 50 to 100 years into the future. This goal was connected to respect for past individuals and communities who labored to build the dams and dig the canals and ditches that are still used today (see Hutchins, 1927 and Harvey, 1989 for histories of the economic, political, and cultural influences of early mutual irrigation companies in Utah).
Interviewees expressed admiration for the foresight and diligence that people of the past showed in planning for future water uses which allowed the southern Utah County region to prosper. These interviewees feel the same desire to prepare now for future water needs. As one interviewee said, “It is a matter of people feeling like they have an obligation and a responsibility to the future, as well as the current, to be good stewards of that resource [through] fulfilling the responsibilities that they have.”

The MNWA can also provide planning for how water delivery systems are going to handle growth. One way interviewees thought this could be accomplished is by making sure that growth happens strategically in places that are prepared for it. Some interviewees gave examples of handling growth through water delivery systems when agricultural irrigation water is transferred to municipalities. According to interviewees, as irrigation water is transferred from agricultural use to municipal developments, the water may remain untreated for secondary use, or it may be treated and made available for indoor use. Some communities have dual systems that have treated water for indoor use, and untreated water for outdoor use. Newer areas have dual systems which allow sprinkler systems to be dewatered in the winter to prevent freezing and which provide a less expensive water source if it does not have to be treated. This information can be part of a regional study to understand where it makes sense to provide secondary water for the future, and where it makes sense to only provide treated water for both indoor and outdoor uses.

Interviewees offered that another opportunity the MNWA has to help prepare for growth is the ability to do cross-boundary planning and calculate expected demands on
future water systems. Incorporating future demands in the building of present water delivery systems could save much time and money rather than trying to keep up with growth demands as they occur over time. This is especially true in relation to major elements of a regional water infrastructure system. Similarly, interviewees noted that strategic plans could foresee areas where after a certain amount of acre-feet have converted from agriculture to urban, it would make sense to have a treatment plant and additional conveyance systems.

As a planning function, the MNWA can be proactive about water conservation both with water currently in agriculture and with water that has been transferred into M&I use. Southern Utah County still has a lot of agricultural flood irrigation; however, some parts of the region are more water rich than others. Interviewees noted that areas that struggle with water towards the end of the irrigation season could benefit from newer irrigation systems such as sprinkler and drip systems that help extend water use throughout the whole crop season, rather than using up available water supply early in the irrigation season. Interviewees suggested that through the MNWA, grants or cost sharing programs might be pursued to make these new systems more affordable to the local agricultural community. Another scenario would be municipalities using the MNWA as a planning tool for putting water rights not immediately needed in municipal uses to other beneficial uses. Municipalities are allowed to gather water rights that will meet their projected water needs 40 years in the future. Interviewees suggested that water rights owned by municipalities without an immediate use may be leased to agricultural users through temporary agreements. Interviewees suggested that the MNWA could be used as
a mechanism to put this water to use without creating dependencies on the water, as it will eventually be drawn back into municipal use.

**Protecting and Preserving Water Locally.**

Protecting and preserving water locally was a major theme at the forefront of MNWA interviewees’ minds. They talked not just about protecting water in Utah from being sold to other desert states, but protecting it within southern Utah County. Water coming from reservoirs and flowing in Utah County has the ability to also flow north through canals to more populous areas in Salt Lake County. In interviewee’s minds, using water locally is tied to keeping water decisions local. Summed up by one member of the MNWA, “We don’t want somebody from back east telling us what we need to charge or do with our water. We make our own decisions here on this end and keep our water here.” Allowing everyone a voice through the MNWA’s public meetings is one way to coordinate local decision making. Even if an entity is not represented on the board, they still have the ability to participate in public meetings and bring up water issues that can be addressed through a wide range of perspectives and resources.

Local control helps keep local priorities in mind when making plans and decisions. Keeping water local is a main focus of participating entities, to make sure that there is enough water for current and future needs within the area. These sentiments are common within agricultural communities, where local control of water resources is desirable and threats to water from outsiders is not uncommon (see Hanak, 2003; Singletary and Narayanan, 2003; Solis, 2005; Lepper, 2006; Whitely et al., 2008; Mariola, 2012). Interviewees thought it is important to look many years ahead, just as
people in the past looked many years ahead. As one interviewee said, “You need to think about your kids, your grandkids, look to the future needs that we are going to be faced with down the road.” Interviewees recognized the need to be prepared for change as it occurs with growth and development. Analyzing water availability on a local and regional level helps with creating plans to accommodate growth.

An overarching theme among interviews was the concept of strength in numbers. Interviewees noted multiple ways that strength in numbers is manifested. Sharing knowledge and opinions opens up conversations to wider viewpoints and new ways of thinking. As one interviewee said, “By having everybody’s input, you end up with a much better plan than if you have a few or even a majority pursuing the concept of what the plan might be with a few detractors.” Another benefit of strength in numbers mentioned by interviewees comes when a local area is dealing with the state or federal governments. Multiple interviewees mentioned that a petition or request is much more likely to get considered if a coalition of entities are working together for one cause that will benefit many thousands of people, rather than if one city or town tried on their own, only representing a few thousand people. Also, greater bonding capability and securing grants and loans are more easily attainable if more people are invested in a project, showing that it is worthwhile and necessary. One interviewee summed up this concept of strength in numbers with this statement: “I think that would be their biggest impact, having a united group, make the motions and support it and then go. I think you can make great headway, whether it be funding or changing legislation.”
Collective Use of Knowledge and Resources.

Collective knowledge and resources to optimize the use of water was another goal interviewees identified for the MNWA. Interviewees noted that each member of the MNWA has both expertise and resources which can be used to help other people, cities, and towns in the region. The MNWA’s interlocal agreement defines finding economies of scale as one of its purposes (MNWA ILA, 2014, Section 3.A.4; see also MNWA Purposes as stated at http://www.mtnebowater.com/). However, the interviewees made an important clarification: the goal is to achieve a collection of knowledge and resources, and not a combination of resources. By this clarification they mean that no municipality or canal company is necessarily going to pool their water rights with other entities; rather, it is putting all the resources on the table for open discussion. For example, if one municipality wants to know how another municipality designed a water system to meet a certain need, the municipal engineers could share that information with each other. As one interviewee said, “It is more of an opening up of the collective studies and technical resources, and an attempt to try to take off our city hats and say, ‘Hey, now we are a player in a regional context. How do we meet the needs of the region?’” Sharing of knowledge and resources was seen as a way to protect and preserve water, which is what everyone expressed was at stake when making a long-term regional water plan for southern Utah County.

Technical and financial resources come from each entity having legal advisors and engineers on staff, as well as a joint political lobbyist for the MNWA in Washington
D.C. Individual entities are also able to tax and assess within their geographic boundaries to pay for projects that will benefit their members or citizens.

**Boundary-Spanning Activities.**

Interviewees agreed that communication is key to sharing collective knowledge and resources. Interviewees stressed the need for cross-boundary communication. As one interviewee said in reference to getting people to talk to each other about regional issues, “Generally, planning is done in a way that makes things better for everyone than if planning happened in silence.” Interviewees emphasized the importance of coming together to discuss issues and opportunities. If an entity becomes aware of an issue that is going to impact the region’s water, then it can be discussed on a regional level rather than having people try and solve the same problem multiple times within separate municipal or district boundaries. An overarching theme expressed by MNWA interviewees was the need to look beyond municipal boundaries and service areas in order to solve a larger water provision problem. Interviewees recognize both that water does not stop at political boundaries, and that the political boundaries of the participating entities overlap (see Figure 10). For examples: Utah County is a participating entity, covering the entire area of interest to the MNWA; the CUWCD’s service area also covers the MNWA boundaries; and, the SHLCC service area intersects with the municipalities, county, and CUWCD service area. With all of these intersecting institutional interests, it is critical that planning happen across these boundaries.
FIGURE 10. Mt. Nebo Water Agency Participating Entity Boundary Spanning. Map showing participating entity boundaries or service areas as they relate to each other within southern Utah County. Data for this figure comes from Utah Automated Geographic Reference Center (AGRC) and Utah Division of Water Rights GIS Data.

Interviewees mentioned that people are recognizing the need for regional planning and collaboration and leaving behind the mentality of planning only within the geographic boundaries of their individual entities. Local mayors of small towns that do not have as many resources as some of the larger municipalities in the region have acknowledged that the towns are not able to meet future needs without a regional perspective as they grow. As one interviewee said, “We have got to overcome the idea
that if I share, I am at a loss. We need to get the idea that if I share, I am ahead.”

Adopting a new mentality to think regionally increases people’s ways of knowing as they learn from other entities. Increasing people’s ways of knowing as they work together helps both in understanding the dynamic nature of the water, as well as understanding the needs and desires of the people involved (Endter-Wada et al., 2009; Ingram and Endter-Wada, 2009).

*Seeking Mutually-Beneficial Use of Water by Moving from Conflict to Collaboration*

The challenges that the MNWA faces in accomplishing its purposes were identified by interviewees as: it is a small, newly formed agency in a political arena of other powerful water agencies; it must battle a deeply-held mentality of individual interests; and, it must overcome distrust that lingers from past conflicts over water in this region.

The most common MNWA challenge cited by interviewees is the fact that it is a new agency in an area with a long history of water use and established water authorities. The MNWA has no staff, a limited budget, and no track record. It is in a position where it needs to prove that it can produce a service that is not provided by other water entities. Water project development and water delivery services are already established in the area through the conservancy district, municipalities, water users associations, and canal companies. The challenge for the MNWA is to become a forum where existing institutions can come together and these established water services can create mutually-beneficial water use within southern Utah County.
Another challenge is battling the long history and mentality of planning based on individual entity interests and only within established political boundaries or service areas. As interviewees explained, each of the entities has their own political powers, interests and issues to deal with and they may not necessarily coincide or coordinate with everyone else’s. Interviewees continually mentioned the need to see the bigger picture and think regionally. Key phrases that were repeated throughout interviews included: “planning on a basin-wide approach instead of just pretending our little corner of the world exists all by itself”; “work together and contribute to solve a problem, not just be worried about their own little areas”; “it has always been this is my kingdom, this is your kingdom”; “let’s not just look at our little puzzle piece, let’s look at the region.” Interviewees discussed the MNWA as the mechanism for bringing all of these individual interests together.

A third challenge for the MNWA, and a major overarching theme among interviews, was the idea of distrust. From the point of view of the general public, interviewees noted that although the MNWA is not well known among the general public in southern Utah County, there is some knowledge of it as a newly-formed government agency, which naturally creates suspicion in a politically-conservative area of what its purposes are and why another level of government is needed in the area. Interviewees addressed this issue by emphasizing that the MNWA has no policing or taxing authority, but its strength comes from shared knowledge and resources. Their hope is that having an organization that can coordinate across jurisdictional boundaries may ultimately reduce the transaction costs involved in re-distributing water to meet new needs. Rather than
choosing not to participate because a person or an entity does not trust what the MNWA is trying to do, interviewees stated that they are interested in other people’s opinions and would like suggestions on how people think planning and projects could be done better. One interviewee’s statement about the MNWA and its purposes was, “That is all this agency is, is just to help protect our area, preserve our water, protect our water, and to stretch our water.”

The most common issue of distrust noted by interviewees was the lack of trust the agricultural sector has with the MNWA (also see MNWA public meeting minutes from January 15, 2015 and May 16, 2016). Two main themes were identified as reasons for this distrust: fear and money. First, the area has a long history of water fights. As a result, people are very protective of what they have and do not want to feel threatened that their water will be taken through economic, political or legal means. Second, the agricultural community fears the price of water will get too high to enable them to continue farming, since agricultural water is typically less expensive than municipal water. Fears from the agricultural community result from municipalities encroaching on agricultural land and having more economic power to bid both land and water away from farmers. Also, as municipal development encroaches on areas near canals, safety concerns and liability costs also increase, raising canal assessments and costing farmers more money. As a result, shareholders in the canal companies have to internalize the costs of increased liability, often without any realized economic benefit (see Jordan, 1999 for a discussion on internalizing externalities). Mariola (2012) found that motivation for the agriculture community to participate in other water-related programs is not purely based on
economics, but on overall trust in the program and the people running the program. Interviewees noted that at this point canal company representatives of agricultural water use have been resistant to join or participate in the MNWA, although it is recognized that they can bring a lot of knowledge and perspective to regional water planning through their participation. Willing involvement of the agricultural community in collaborative processes may be essential to the success of stakeholder and cross-boundary cooperation due to the environmental, social, and economic significance of agriculture in the area (de Loe et al., 2015).

The Challenges of Bridging Agricultural and Urban Interests

Part of the MNWA mission statement is to find a balance to allow municipalities to grow, while allowing agriculture to thrive (MNWA ILA, 2014, Statement C of the Recitals). Interviewees discussed their thoughts on this delicate balance. This issue is at the core of understanding the value of regional water planning in the context of agricultural-to-urban water transfers.

The Interlocal Agreement forming the MNWA states that one of its purposes is to make sure that the long-term agricultural water needs are provided for in southern Utah County while at the same time allowing cities to grow (see MNWA ILA, 2014: statements C, D and E in the Recitals and Section 3.A.5.). One interviewee summed up this predicament by stating:

“We need to preserve agriculture. We need to preserve local agriculture. It can be a large source of the food supply for an area. We also realize that as agricultural land converts to houses that there is water there that is
going to need to provide water for those [houses]. So there is going to be some water that inevitably will move from agriculture to urban.”

Interviewees noted the need to get away from the notion that all agricultural water amounts to is the reserve bank for municipal water in the future. One interviewee mentioned that a driving force for creating the MNWA was to find a way to shake off the notion that agricultural water “doesn’t have any virtue or value on its own, no social value, no economic value to speak of…[that] it is just a reservoir there waiting for water to be brought in and used by the cities.” Other considerations interviewees mentioned were how much agricultural heritage to preserve in the area and that people value open space agriculture and undeveloped areas.

These issues can be addressed through a regional planning agency that brings multiple stakeholder perspectives to the table, not just water perspectives, but also land use planning perspectives. Interviewees mentioned that it is not the desire of the MNWA to force people to stay in agriculture by designating areas for agriculture through zoning. The idea is to work with city councils and planning and zoning departments to control and plan growth in a practical way, especially to help avoid having prime farmland be converted to a housing development if it would make more sense to have development in a part of town already zoned for residential use. At the same time, there is still a delicate balance to strike between allowing individuals to sell their agricultural land to who they want, when they want, versus dictating which land can be sold to developments and which cannot. As one interviewee stated:

“There is somewhat of a popular movement I think among the public outside of agriculture to try to somewhat force preserved agriculture. I don’t see the agency and its members really being along that mindset, but
to the extent that local growers want to stay in agriculture and want to
grow, then I do see the agency playing a major role in making sure they
have the water to do so and protecting particularly the cheaper water for
their needs.”

**Projects for Mutually-Beneficial Use of Water.**

Interviewees were asked what the MNWA could provide in terms of regional
water planning. This question shed light on how a balance between agricultural and urban
water interests could be found through the MNWA. According to members of the
MNWA, there appears to be two directions that the MNWA could go in terms of what its
function will be in southern Utah County. The first, and its current function, is a place
where ideas are generated. The MNWA is a forum where people can discuss ideas and
projects. It is a place where collaboration and sharing of technical and knowledge-based
resources can be used to benefit the region’s water planning, supply, and delivery. The
second direction would be developing water projects. Interviewees felt that if the MNWA
remains more of a planning and collaborating entity, there will not be any staff. However,
if the MNWA evolves into building projects and supplying water, there will need to be
staff to maintain those projects or to bring staff from participating members together.

In the scenario of being a forum for discussion rather than a project-based
institution, interviewees identified ways the MNWA could provide water services in the
region. The MNWA could help with succession planning for farmers or contingency
plans for how to deal with growth. For example, if there is interest in conservation
easements on farmlands so farming stays a viable option for years into the future, the
MNWA can help find the revenue and get the proper political authorities involved to help
make that an option should farmers desire it. This approach is particularly important to allow farmers the option to continue to farm, especially in southern Utah County where there are still many acres of orchards that have been deemed a valuable resource even at the state level. As one interviewee stated, “Fruit trees need about a 30-year life in order to make any kind of economic benefit. So there has to be some concept of planning how that could occur. I think the agency can facilitate that on a regional basis as opposed to farm by farm or city by city.”

Within the scenario that the MNWA is involved in project-based work, the agency is designed to be flexible. This flexibility comes through voluntary participation in projects. Project-specific construction will be done by those who see a benefit from the project, isolating the costs to those beneficiaries. “Entities, whether they are part of [the MNWA] or not, who may wish to get involved can do so either by contract or otherwise” (MNWA public meeting minutes from November 16, 2015). Thus, through flexibility in design, projects can be developed and paid for by people who find mutually-beneficial water use in the project. Those entities who do not see benefit from the project can choose not to participate or contribute their technical and financial resources toward it. Some interviewees discussed ideas about having MNWA possibly be a potable water supplier since treatment facilities can be very expensive for each community to build. The key would be that the agency is not developing the water supply, but treating it and delivering to the different entities as a regional treatment provider. Using the economy of scale, interviewees explained that it makes much more sense to develop one project rather than multiple little projects. This is a way to look beyond political boundaries and seek
economies of scale. One interviewee remarked that, “Ultimately we are dealing with public dollars, we are dealing with a public resource that in my mind ought to be made available as efficiently as possible to the benefit of the public. That is the bottom line.” Some interviewees believe the MNWA has the ability to facilitate projects, where the individual municipalities or communities cannot simply because their boundaries and municipal authorities limit their ability to do some of that regional planning and implementation.

Another project mentioned frequently by interviewees was the Strawberry Highline Canal enclosure. This project would involve piping the 100-year-old canal, which is showing signs of aging and experienced a break in August 2015. However, it is not feasible for the canal company to accomplish the project purely based on agricultural assessments. The MNWA could be a place where different member entities and interested stakeholders in the community contribute money to pipe the canal through their jurisdictional boundaries. This project would benefit those entities involved by reducing canal liabilities such as flooding homes and by greatly improving water management. This sort of a project can provide a benefit to all involved as well as to the public at large. For example, the canal company increases efficiencies, cities reduce flood risks, and trails can be added to allow for public recreation opportunities. By working together, costs and benefits can be shared.
CONCLUSION

The MNWA is in its early stages of development, and is critically dependent on full participation of stakeholders to effectively operate as a regional planning agency. In terms of finding a balance between agricultural and urban water interests, the participating entities of the MNWA “recognize that the success of agriculture and economic growth in southern Utah County depend on an affordable and sufficient supply of water.” They see the best way to obtain this supply is by “economies of scale, minimizing duplication of costs, reducing transmission losses, use of aquifer recharge and recovery, and managing return flows” (MNWA ILA, 2014). Opportunity exists to find this balance in southern Utah County through stakeholder participation and boundary-spanning.

The MNWA encourages participation in water planning discussions from all water entities in the area, as well as from private interests. Stakeholder involvement is a powerful tool in decision making and planning processes by bringing together diverse sources of knowledge and perspectives. The perspectives of both agricultural and urban representatives can help provide an array of ideas and knowledge in water resources planning projects. The public nature of the MNWA creates transparency in agency actions and allows all people a voice in the matter, even without a formal seat on the board. An invitation for all to participate, whether formally or informally, is an opportunity for the MNWA to develop trust with local stakeholders. The MNWA is designed to be flexible and allow for people to come together and share ideas. When projects need to be built, the use of economies of scale can be implemented to allow
multiple entities to enter into an agreement for a project and allow those who will benefit to participate, and those who do not foresee a need or a benefit for a particular project to not participate. As a result, stakeholders who might otherwise be in competition for water can come together and plan for future water needs collectively. Strength in numbers can be developed through collective collaboration centered on the common platform of regional water planning. Bringing stakeholders together through a common purpose is key to maintaining local control of water resources, which is a high priority in southern Utah County.

Collaboration, trust, and transparency are vital to boundary-spanning in regional planning. The MNWA has the opportunity to act as a forum for entities with overlapping boundaries and interests to come together and plan water use holistically with land use to manage the growth slated for southern Utah County and direct it towards areas that make sense for the region. As projects are planned and built, future growth can be incorporated into these plans to ensure large projects are built with the capacity to handle future water demands brought on by growth. Boundary-spanning allows stakeholders greater perspectives of resource planning without losing their individual identities. Water resource planning can incorporate regional interests while planning for individual needs. As stakeholders plan for their individual water interests, knowledge can be gained by seeing how others use, interact with, and need the resource. Boundary-spanning encourages collaboration and communication across existing political, social, and institutional lines to create a regional perspective.
As water is now in an era of reallocation, people recognize the need to move beyond conflict and embrace cooperation and collaboration when dealing with limited resources. Currently the MNWA is a place where collective studies and technical resources can be looked at from a regional context. As the MNWA progresses, it can become a clearinghouse of ideas and a place where projects can be planned, conceptualized, and coordinated. Although there is no absolute solution for striking a balance between agricultural and urban water interests, carefully implementing stakeholder participation and boundary-spanning has the potential to allow the MNWA to create mutually-beneficial use of water resources within southern Utah County. The future of whether the MNWA can fulfill its purposes depends on how people in southern Utah County seize the opportunities and face the challenges of managing land and water use transitions occurring in the region.

LITERATURE CITED


CHAPTER 4
CONCLUSION

Water was originally allocated on a first-come-first serve basis under prior appropriation water law common in western states of the U.S. Now, in an era of reallocation, the market plays a large role in the movement of water rights among uses. This changing water regime impacts decision making criteria as water right policies, rooted in a 19th Century-style priority system, are used to guide decisions in current market transactions. The monetization of water creates challenges for policy administrators as dormant water rights are put back into use or traded on the market, disrupting established local priority allocations that have been in compliance with the law. Municipalities are commonly involved in water rights transactions from agriculture to urban use. This pattern is due to state policies that favor municipal use and municipalities’ general ability to pay more than other users. As this pattern occurs, the need for proactive planning in conjunction with the market system is recognized as an important opportunity for finding a balance between agricultural and urban interests. Proactive coordination and planning through agreements, as well as regional planning, is key to making sure that water supply is available for multiple current and future water needs within a region as population increases.

The monetization of water began as water supplies were over allocated, creating the need to purchase water rights from existing water users and giving these rights increasing monetary value as new supply options dwindled. The increased value of water rights incentivized the revitalization of dormant water rights. Allowing these dormant
water rights back into the existing water allocation regime creates disorder in the existing priority system. The monetization of water and existing state water policy incentivizes the flow of water rights away from agriculture and toward municipalities. Once water is obtained by a municipality it cannot be sold or exchanged. These provisions of state law allow cities to stockpile large portfolios of water rights and limit water marketing, as the market for transfers between uses stops at the municipal door.

The market system is intended to push water to its highest and best use. However, the highest and best use of water is subjective, and current economic and societal trends may not necessarily consider the long-term impacts of certain water use strategies that may be incompatible with a community, county, or state’s vision of the future. One of the most obvious third-party impacts of water transfers is the cumulative, permanent results of inter-sectorial transfers of water out of agricultural uses and into “urban” or M&I uses. Temporary trends in the market that create permanent changes in water allocation may make for more difficult transitions in the future if societal priorities change. In particular, as urban pressures make farming more difficult in areas where developments are encroaching on agriculture, land and water become more valuable if they are sold to developers than if they remain in agriculture. Acknowledging these existing pressures, opportunities exist to find a balance between agricultural and municipal water needs through innovatively-structured agreements and integrating public planning considerations into market transactions.

With the understanding that both drought and population increase create added pressure on an already-stressed water supply, having agreements in place before these
pressures manifest themselves is helpful to ease burdens on water supply and water users. These opportunities can help agricultural and urban water needs find balance by allowing the status quo of water use to continue with the understanding that in certain conditions or years the water use may change with compensation provided to those who give up their water use for others. Local and regional planning can be used as another opportunity to make sure growth and development happen in places that make sense for local areas by allowing stakeholders an opportunity to have a voice in water planning. The land and water markets left to themselves may not necessarily have a long-term perspective of future needs for a particular region. Conditioned by public interest and stakeholder participation in regional water planning and coordination, the market can continue to be used to sensibly reallocate water supply among uses in a region. As stress on water supply increases with population growth, these opportunities allow for flexibility within the existing water allocation system to find a balance between agricultural and urban water needs.

Opportunity exists to find this balance in southern Utah County through stakeholder participation and boundary-spanning. The MNWA encourages participation in water planning discussions from all water entities in the area, as well as from private interests. Stakeholder involvement is a powerful tool in decision making and planning processes by bringing together diverse sources of knowledge and perspectives. The perspectives of both agricultural and urban representatives can help provide an array of ideas and knowledge in water resources planning projects. The public nature of the MNWA creates transparency in agency actions and allows all people a voice in the
matter, even without a formal seat on the board. An invitation for all to participate, whether formally or informally, is an opportunity for the MNWA to develop trust with local stakeholders. The MNWA is designed to be flexible and allow for people to come together and share ideas. When projects need to be built, the use of economies of scale can be implemented to allow multiple entities to enter into an agreement for a project and allow those who will benefit to participate, and those who do not foresee a need or a benefit for a particular project to not participate. As a result, stakeholders who might otherwise be in competition for water can come together and plan for future water needs collectively. Strength in numbers can be developed through collective collaboration centered on the common platform of regional water planning. Bringing stakeholders together through a common purpose is key to maintaining local control of water resources, which is a high priority in southern Utah County.

As water is now in an era of reallocation, people recognize the need to move beyond conflict and embrace cooperation and collaboration when dealing with limited resources. Although there is no absolute solution for striking a balance between agricultural and urban water interests, carefully implementing stakeholder participation and boundary-spanning has the potential to allow the MNWA to create mutually-beneficial use of water resources within southern Utah County. The future of whether the MNWA can fulfill its purposes depends on how people in southern Utah County seize the opportunities and face the challenges of managing land and water use transitions occurring in the region.