



2013-07-09

An Analysis of the Provo River Decree and Its Current Application to Provo Area Water Rights

Karsten Eugene Busby
Brigham Young University - Provo

Follow this and additional works at: <https://scholarsarchive.byu.edu/etd>

 Part of the [Civil and Environmental Engineering Commons](#)

BYU ScholarsArchive Citation

Busby, Karsten Eugene, "An Analysis of the Provo River Decree and Its Current Application to Provo Area Water Rights" (2013). *All Theses and Dissertations*. 3726.

<https://scholarsarchive.byu.edu/etd/3726>

This Thesis is brought to you for free and open access by BYU ScholarsArchive. It has been accepted for inclusion in All Theses and Dissertations by an authorized administrator of BYU ScholarsArchive. For more information, please contact scholarsarchive@byu.edu, ellen_amatangelo@byu.edu.

An Analysis of the Provo River Decree and Its Current
Application to Provo Area Water Rights

Karsten Eugene Busby

A thesis submitted to the faculty of
Brigham Young University
in partial fulfillment of the requirements for the degree of
Master of Science

Rollin H. Hotchkiss, Chair
A. Woodruff Miller
E. James Nelson

Department of Civil and Environmental Engineering
Brigham Young University

July 2013

Copyright © 2013 Karsten Eugene Busby

All Rights Reserved

ABSTRACT

An Analysis of the Provo River Decree and Its Current Application to Provo Area Water Rights

Karsten Eugene Busby
Department of Civil & Environmental Engineering, BYU
Master of Science

Water scarcity in the west has created a long history of conflict. When Utah was settled, laws were instituted (both officially and otherwise) that allowed water users to use streams and springs in efficient ways without causing harm to other users.

The Provo River Decree is a physical example of local water law that has been in place for almost a hundred years. While many changes have arisen in its area of jurisdiction, it is still drawn upon to determine water rights. Ambiguity, rigidity, and overall changes to use patterns have limited the application of the decree to present situations.

The current application of the Provo River Decree is therefore insufficient within the context of prior appropriation to deal with the fluid and changing nature of water use in the area. Additional research should be done to determine whether the system of prior appropriation in Utah is flexible enough to allow for changing use and human-controlled watercourses. This research should include an economic analysis on the impacts of free water right exchange on relative benefit of water rights as well as an analysis of the past and present impacts of external agencies on water use.

Keywords: Karsten Eugene Busby, Provo River, Morse, decree, Timpanogos Canal

ACKNOWLEDGEMENTS

I have received help from many individuals in writing this paper. I would like to thank Brigham Daniels and David Hartvigsen for their time and help on the legal aspects of my research. I appreciate the funding and support from Roy Peterman of the grounds department. I thank Dr. A. Woodruff Miller and Dr. E. James Nelson for serving on my graduate committee. I would also like to thank Dr. Rollin H. Hotchkiss for the inspiration, guidance, and support he has given me throughout my undergraduate and graduate education.

Finally, I would like to thank my wife, Candice, for supporting me every day and giving me the motivation I needed to finish.

TABLE OF CONTENTS

List of Tables	x
List of Figures.....	xi
1 Introduction and Background	1
1.1 Purpose.....	1
1.2 History of Utah Water Law	2
1.2.1 Common Law Era	2
1.2.2 Intent of Original Laws.....	4
1.2.3 Current Water Law	4
1.2.4 Prior Appropriation in the Utah Code.....	4
1.2.5 Permit System	5
2 Provo River Decree	7
2.1 Limitations of the Decree	8
2.1.1 Ambiguity	8
2.1.2 Inflexibility	11
3 Timpanogos Irrigation Company Proof	14
3.1 Background.....	14
3.2 Map Requirement	15
3.3 Delineation.....	19
3.4 Results.....	20
4 Options for Change.....	23
4.1 Water User Changes	23
4.2 Barriers to Change	24
4.2.1 The Permit System.....	24

4.2.2	Problems with Prior Appropriation.....	25
4.3	Future Change.....	27
5	Conclusions.....	29
	REFERENCES.....	30
	Appendix A. Completed Delineation Map.....	33
	Appendix B. Calculations.....	34

LIST OF TABLES

Table 2-1: Flow and duration specified for the.....	11
Table 3-1: Irrigated area by type.....	22
Table B- 1: Adjusted time periods	35
Table B- 2: Total quantity determined by flow-duration.....	35

LIST OF FIGURES

Figure 2-1: Map of consumptive use for irrigation..... 10

Figure 3-1: Page one of questionnaire 17

Figure 3-2: Page two of questionnaire 18

Figure 3-3: Example GIS delineation 20

Figure 3-4: BYU property delineation 21

1 INTRODUCTION AND BACKGROUND

1.1 Purpose

The Provo River Decree is an important piece of judicial water law that continues to significantly impact Provo River water users almost a century after its inception. As the water use and the nature of the Provo River have changed with time, the decree remains a static document. The purpose of this paper is to examine the Provo River Decree and whether it sufficiently meets the changing needs of water users whose rights fall under the decree's jurisdiction. This will be accomplished by examining the changes in the area since the decree and the avenues of change available to water users. The underlying statutory law behind water rights in Utah will also be considered.

It is important to note that this thesis will undertake an analysis of Utah water law only in its application to the Provo River Decree and associated water rights. It is beyond the scope of this paper to discuss other issues that may affect the general suitability of the current system of water law. An economic analysis, details regarding water right exchange, and details of specific water rights (other than that of the Timpanogos Irrigation Company) are outside of the scope of this paper.

1.2 History of Utah Water Law

1.2.1 Common Law Era

Utah is one of the driest states in the country. It has the second lowest average annual precipitation of any state (NOAA National Climatic Data Center 2013) and a significant portion of its water is in the form of inaccessible snowpack during most of the year. This presented a unique challenge to early settlers.

At the time, traditional water law granted rights only to those with property directly adjacent to a watercourse (Hutchins 1971). This system is known as “riparian doctrine.” While riparian doctrine had proven effective in eastern states with large bodies of water and heavy rainfall, it could not adequately serve a large settlement in the Salt Lake Valley. Utah’s arid climate necessitates irrigation during much of the growing season, making it impossible to maintain viable crops without access to flowing water (Clyde 2011). Thus, applying riparian doctrine to the area would create the logistical impossibility of requiring all inhabitants to live and grow crops adjacent to Utah’s limited waterways.

To address these issues, early settlers used a system already common among mining communities of the west, known now as “prior appropriation.” The doctrine of prior appropriation has four basic tenets (Gittins 2013):

1. First in time is first in right.

In disputes over water rights, priority was given to the user that first built a diversion structure. In times of drought, priority users were allowed to use their full water right before any remaining water was distributed to subsequent users. Thus, instead of sharing the effects of a scarcity as in riparian doctrine, lower priority users suffered disproportionately.

2. Beneficial use is the measure and limit of a water right.

In order to lay claim to any amount of water, the claimant must use that water in a “beneficial” way. Historically, the definition of beneficial was very broad and extended to almost any economic activity (Getches 2009). When strictly applied, it meant that a user could not divert more water than could be used beneficially.

3. Water use must not impair other water rights.

Any new appropriations or changes to existing use (such as moving a diversion structure or changing the type of use) could not negatively impact any other water rights, regardless of priority. This applied to all water rights, old and new, and prevented water users from affecting existing water rights.

4. Water must be used or be subject to forfeiture.

If water was not used beneficially over a specific time period (usually years), the right would be forfeited. This “use it or lose it” principle is related to beneficial use and discouraged non-use that would restrict the available water to new settlers.

These tenets became part of common law before Utah gained its statehood. The Church of Jesus Christ of Latter-Day Saints, a significant part of early Utah government, encouraged and even enforced these water laws (Daniels 2007). This may have been because beneficial use and the doctrine of forfeiture mirrored early church practices with regard to property. Brigham Young declared water a public resource and the privilege of using water was contingent upon a contribution to the community as a whole (Clyde 2011).

1.2.2 Intent of Original Laws

The driving factor behind the doctrine of prior appropriation was the lack of water in the West. The tenet of beneficial use discouraged speculation and waste while the tenet of forfeiture allowed abandoned water rights to be reallocated to more recent applicants. Water conservation, therefore, was the ultimate goal of these two principles.

The tenet of “first in time, first in right,” on the other hand, was not driven by a goal to use resources wisely, but rather served as an incentive for colonization. When non-Native Americans began to move west, uncertainty over the availability and right to use water was a deterrent to would-be settlers (Daniels 2007). Priority provided a guarantee to those that arrived first. In essence, it rewarded the original settlers that risked the most in settling the west. This proved to be very effective in drawing a greater population not only to Utah, but to many of the dry western states (Getches 2009).

1.2.3 Current Water Law

In 1903, Utah adopted a system that codified earlier common-law practices into statutory law (Utah State 2013). Prior appropriation was officially put into place with a new system of applications and permits for water users. Water users that had been using water prior to this system were allowed to apply for a permit to make their water right permanent (Clyde 2011). This system is still in effect today and the four original tenets of prior appropriation are respected.

1.2.4 Prior Appropriation in the Utah Code

The doctrine of prior appropriation remains codified in state law and is found in the Utah Code Title 73 (Utah Code Ann (UCA) §73). It states that all water is public property and that

water rights holders simply have a right to use it (§73-1-1). The four tenets of prior appropriation were individually codified as well. When there are disputes between water rights holders, priority is still given to the first appropriator, thus “first in time is first in rights” (§73-3-1). The notion of beneficial use is still in effect, and is the “basis, the measure and the limit of all rights to the use of water” (§73-1-3). The non-impairment clause, otherwise known as the “no harm rule,” is codified in §73-3-8 and states that a proposed use of water cannot “impair existing rights or interfere with the more beneficial use of the water.” Finally, if a water right is abandoned or not used within seven years, the right is reverted to the public for appropriation to other beneficial use (§73-1-4).

1.2.5 Permit System

In order to organize and maintain the growing list of water rights in the state, Utah developed a permit system that requires all water users to submit a “proof of beneficial use” in order to secure their water right. Under this system, if a water user has been diverting water previous to other users in the area, the original priority remains in effect and they need only submit an application that describes the time, place, and type of use, and water quantity. This document constitutes a proof of their beneficial use of the water, and if approved, grants them the legal right to use the water (§73-3-1). This system of proving water rights still applies to water users; both those that have historically used water and those that desire to apply water to new endeavors.

In order to manage the system of permits, the Utah legislature created the Division of Water Rights and the office of state engineer (§73-2-1, 73-2-2). The state engineer is responsible for reviewing applications for appropriation and approving those applications if they meet all requirements. Once an application is approved, the water right is considered “perfected,”

meaning that it is a valid water right under Utah law. Any time a water user makes a change to their water use such as the quantity, type of use, or place of use, he or she must submit a change application to the state engineer (§73-3-3). The water right is reevaluated under the new conditions and must be approved in order for the water user to make such changes.

For complicated areas where many users laid claim to the same water, an adjudication or decree is necessary. In an adjudication, the state engineer requires documentation from every water user in a watercourse showing the details necessary to prove their water right (use history, type of use, quantity, etc.). The state engineer then uses all the information provided to determine the nature of each water right including its priority, quantity, type of use, and duration of use. A decree is similar to an adjudication but differs in that it is a court order to the state engineer to evaluate a watercourse and arises out of direct conflict between water users. After review, a judge decrees the details of the resulting water rights (Briem 2013).

2 PROVO RIVER DECREE

In 1914, the Provo Reservoir Company decided to bring action against several Provo River water users to “have its water rights determined and to have an adjudication of rights to the waters of the Provo River” (Tanner v. Provo Reservoir Co. 1940). This action became known as No. 2888 Civil, the Morse Decree (named after the presiding judge, C. W. Morse), or the Provo River Decree of 1921.

The Provo River Decree divided the Provo River System into two subdivisions: the Provo Division and the Wasatch Division. The rights in the Provo Division were subdivided into Classes A through J according to date of appropriation. The largest water rights in total quantity of water are given to various irrigation, canal, and water companies (Provo River Decree 1921). For each water right, an area (in acres), a duty (in this case, the area divided by the flow), and a flow (in second feet) are specified (second feet are equivalent to cubic feet per second, as described in UCA §73-1-2). The Decree explicitly states that lower priority water rights take effect only when the quantity of water flowing in the Provo River is sufficient to satisfy all of the previously appropriated beneficial uses. In sum, the intention of the Provo River Decree was to allocate the available water in the Provo River to those that claimed a legitimate water right, according to priority.

The Provo River Decree settled any previous disputes regarding who owned the water rights on the Provo River. As a result, as long as no changes are made to a particular water right

in the decree, the decree still stands as valid for that right (Provo River Water Users Ass'n v. Lambert 1982). This simplifies appropriation under the permit system for Provo River water users in that historical use previous to the decree need not be consulted. In essence, the Decree reset the water rights on the Provo River.

2.1 Limitations of the Decree

The Provo River Decree was intended to settle previous disputes regarding water rights. Since then, it has been used to determine subsequent water rights and changes to those rights (Perez 2012). The application of a nearly one-hundred-year-old document to current situations obviously has its limitations. Among those limitations are possible ambiguities and the lack of flexibility in addressing the changing landscape of the area.

2.1.1 Ambiguity

The Provo River Decree was very precise in that it stated exact acreage, flow, and dates for each water right. Using the decree as a basis for determining current water rights is then at first glance, quite simple. However, under the current permit system, when a water right is evaluated during an appropriation application, change application, or transfer application, the state engineer can calculate water quantity in several ways.

One way to calculate water quantity in the case of irrigation is by the acreage of irrigated land. Water users have the option to plant whatever crops they desire from year to year, and determining the consumptive use of each crop for all irrigated land and its associated area for each water right would be logistically impossible. As a result, the Division of Water Rights maintains a standard for the quantity of water that is allocated for irrigation. Figure 2-1 shows the standard, or duty, for the state of Utah. In this figure, the colors represent the different

standards for each region as shown in the legend (listed as duty, values are in acre-feet per acre). The state is also divided into numbered sub-basins. For example, Provo City is within sub-basin 55 and a green region which corresponds to a standard for consumptive use of 4 ac-ft/ac. This standard varies by region because of climate, elevation, and local policy differences and is loosely based on the average consumption of a field of alfalfa (Briem 2013).

Thus, when a specific acreage is specified, as is the case for many water rights in the Provo River Decree, the state engineer can simply use the following equation to arrive at an annual quantity:

$$\text{Quantity} = \text{Area} \times \text{Consumptive Use} \quad (2-1)$$

where Quantity is in acre-ft, Area is in acres, and Consumptive Use is the Division standard for that region. Using this equation, beneficial use can be determined for each of the water rights in the Provo River Decree by their acreage.

The decree also specifies flows during certain parts of the year. The flows are in cubic feet per second (cfs), and dates specify when those flows are permitted. An example of these values is shown for the Timpanogos Canal Company in Table 2-1. Total quantity can thus be determined using these numbers as follows:

$$\text{Quantity} = \sum_{i=1}^n \text{Duration}_i \times \text{Flow}_i \quad (2-2)$$

where i represents each time period specified, the duration and flow are those specified for each time period, and n is the number of time periods.

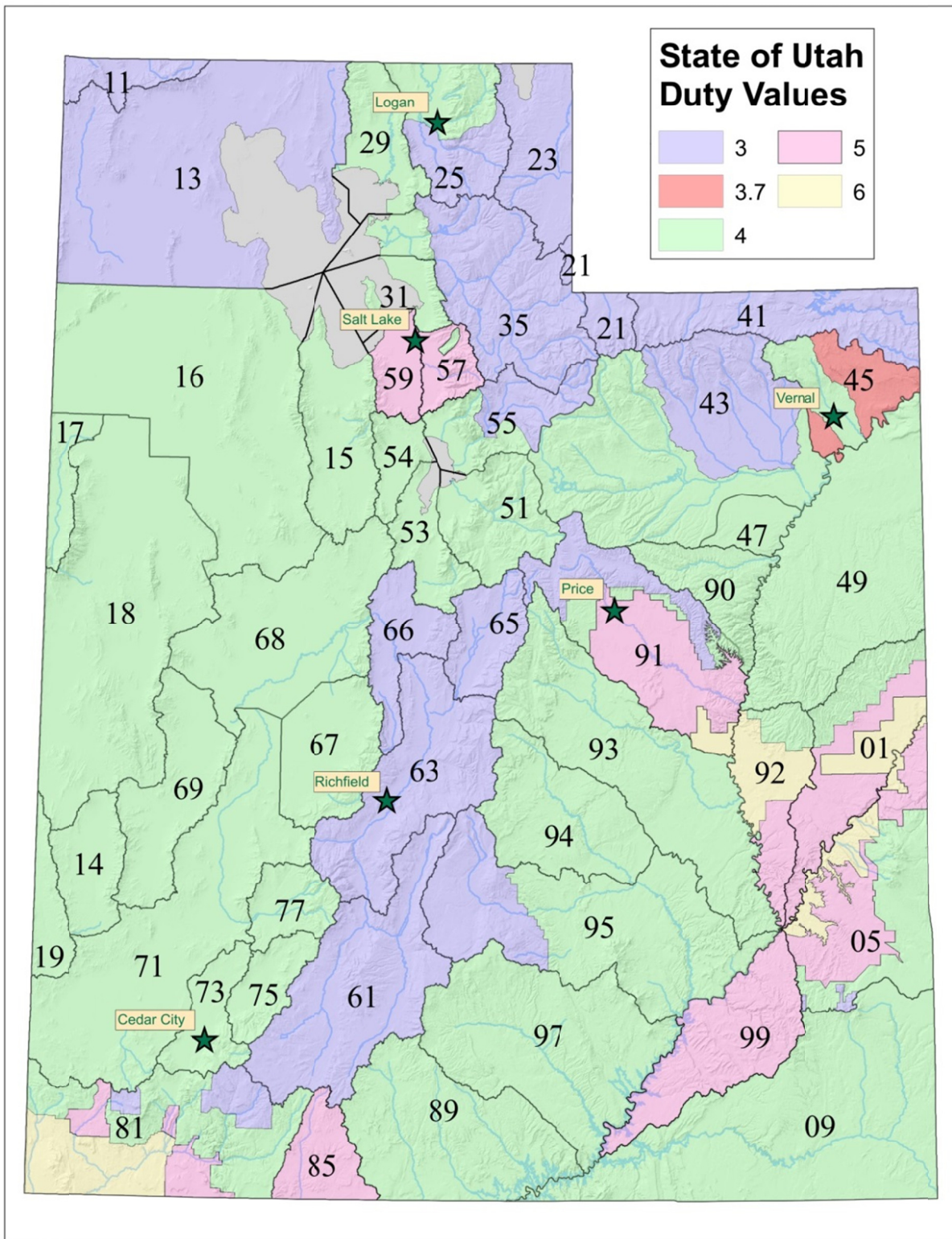


Figure 2-1: Map of consumptive use for irrigation (from Utah Division of Water Rights, <http://www.waterrights.utah.gov/wrinfo/policy/duty.asp>, accessed 6/13/2013)

**Table 2-1: Flow and duration specified for the
Timpanogos Canal Company**

Start Date	End Date	Duty (ac/cfs)	Flow (cfs)
May 10	June 20	60	14.12
June 20	July 20	66	12.83
July 20	May 10	75	11.29

Section 124 of the Provo River Decree (mis-labeled as section 134 in the original document) states that for those rights declared for irrigation purposes include the “...right to divert and use water for irrigation, culinary, domestic and agricultural purposes connected therewith.” It then mentions that culinary and domestic water can be used throughout the year as necessary, but that irrigation water can only be used during the irrigation season of each year. According to the Utah Division of Water Rights (Utah Division of Water Rights 2011), when water right quantities are calculated, the irrigation season is generally defined as “...April 1 to October 31 and/or the general frostfree period in the area.” This must be taken into account when using Equation 2-2 by adjusting the listed time periods in the decree to exclude the non-irrigation season.

Even accounting for this reduction in annual flow amounts, the annual quantities determined by these two methods (Equation 2-1 and Equation 2-2) can be significantly different. For example, the decree specifies an area of 847 acres for the Timpanogos Canal Company. Using Equation 2-1, a total annual quantity of 3388 ac-ft is obtained. Equation 2-2, however, results in about 5090 ac-ft, a difference of about 50% (see Appendix B for calculations).

2.1.2 Inflexibility

When the decree was written, the Provo River was subject to large flow variations due to seasonal runoff and the absence of human controls. It was a natural watercourse, and the typical

flow patterns were what governed appropriation. Additionally, water use was limited to the surrounding area that could be fed by gravity-driven flow.

Since then, the river has been heavily influenced by human activity. In an effort to control and regulate the flow in the Provo River as well as to provide storage for drought years, two reservoirs were built on the river: the Deer Creek Reservoir, constructed from 1938-1941, and the Jordanelle Reservoir, constructed from 1990-1993 (Montgomery Watson Inc. and Flo Engineering Inc. 1994). In addition to these reservoirs, significant diversions were built flowing into and out of the Provo River. The Weber-Provo Diversion Canal, designed to divert high flows from the Weber River into the Deer Creek Reservoir, was built during the 1930s and 1940s. The Duchesne Tunnel was built in 1954 to divert high flows from the Duchesne River into the Provo. Several other diversions have been built including the Murdock and Olmstead Diversions. These diversions move water both into and out of the Provo River Basin.

These modern modifications to the Provo River have three impacts related to water rights. Water use is no longer restricted to a limited area around the Provo River; the Provo River is now directly controlled and not a simple product of snowmelt; and reservoirs have introduced significant evaporative losses. The underlying assumption of the water rights in the Provo River Decree is that water rights are available to use nearby when there is enough water in the Provo River to satisfy those rights. This assumption can no longer apply if the location of use is unrestricted, flows are human-controlled, and water is lost due to evaporation.

In addition to in-stream changes, there have been significant changes in water use in the area. Irrigation companies (each consisting of many shareholders) still hold very large water rights. As the Provo area has become more urban, many shareholders are now using their water to irrigate residential or commercial landscaping rather than crops (see water user survey results,

chapter 3), as was historically the case. Because this water use still falls under the category of irrigation, it is restricted to the same irrigation season as cropland and beneficial use is calculated using the same estimated consumptive use per acre. This can lead to augmentation or diminution of water rights as the use has changed. For example, while the irrigation season set forth by the state engineers office may be long enough to accommodate most or all of the crop irrigation in the area, landscaping often requires water during the non-irrigation season for soil hydration or colder-weather plants. The water right is not flexible enough to reflect such changes in use, and the water users may suffer as a result.

3 TIMPANOGOS IRRIGATION COMPANY PROOF

3.1 Background

As part of the requirements to receive funding for this thesis, a delineation of irrigated areas of the Timpanogos Irrigation Company was performed. The Timpanogos Irrigation Company diverts water from the Provo River, and thus falls under the jurisdiction of the Provo River Decree. The company is mentioned directly in the decree as the Timpanogus [sic] Canal Company with specifics regarding allowable flows and acreage. As a result of this delineation and the required water user survey, many insights were gained regarding the practical application of the Provo River Decree and prior appropriation to a specific water right.

The Timpanogos Irrigation Company owns water right numbers 55-11298, 55-11303, and 55-11311 (Utah Division of Water Rights 2013). As is typical with irrigation companies, the company itself owns the water rights and shareholders own shares of the company and a right to use a portion of the water.

On August 9, 2009, a change application was approved for the company in which an error in irrigated acreage from a previous application was corrected. The previous change application was submitted as part of the Wasatch County Water Efficiency Project (WCWEP), sponsored by the Central Utah Water Conservancy District. Under the WCWEP, the canal that diverted water for use by the Timpanogos Irrigation Company was replaced with an enclosed pipe, necessitating a change application.

In addition, the Timpanogos Irrigation Company has plans to change the current point of diversion due to insufficiencies with the current diversion. This will require another change application indicating a permanent change of the point of diversion.

When a change application is submitted and approved, a proof of beneficial use is required to demonstrate beneficial use subsequent to the change. For the Timpanogos Irrigation Company, a proof is due for the approved change application of August 2009 and a similar proof will be due for the anticipated change application for the change of diversion.

3.2 Map Requirement

One of the requirements of a proof of beneficial use is a map showing the “place of use of water and a statement of the purpose and method of use” (UCA §73-3-16). As part of the work for this thesis, a proof map was prepared for the Timpanogos Irrigation Company. Rule 655-5 of the Utah Administrative outlines the specific requirements of those maps and the details needed. For irrigation, the specific location where the water will be applied on a parcel of land is required (R655-5-2.7.1). Because the vast majority of Timpanogos Irrigation Company shareholders use their water for irrigation, a delineation of the irrigable areas of land owned by shareholders will be necessary.

A list of shareholders was obtained from Henry Todd, president of the Timpanogos Irrigation Company. According to that list, there are 167 water users that own shares in the company. While most of the water users are individuals, there are several larger entities with shares in the company including Brigham Young University and Provo City.

Shareholders were contacted in order to determine what land was irrigated by each water user. This contact was done in three stages:

1. Questionnaire

On November 26, 2012, shareholders were contacted by mail and provided with a questionnaire to determine the details of their water use. The questionnaire consisted of two pages. The first page was a letter that outlined the purpose of the survey and the second page contained the questions for the water users. A copy of the questionnaire is shown on the following two pages (Figure 3-1 and Figure 3-2).

2. Phone

Shareholders that did not respond to the questionnaire by January 1, 2012 were contacted by phone. The same questions were asked and answers were recorded. If the water user did not answer, up to five additional attempts were made until the water user was contacted.

3. Residence

Shareholders that did not respond to phone calls were visited in-person and their place of residence. Again, the same questions were asked and the answers were recorded.

Karsten Busby
170A CB
Brigham Young University
Provo, UT 84602
November 26, 2012

Dear Timpanogos Water User:

I am sending this letter in behalf of the Timpanogos Canal Irrigation Company and in consultation with Henry Todd, President.

In order for the canal company to properly document its water rights, and to aid the Timpanogos Canal in its administrative duties, we have attached a short survey about your water usage. Your cooperation in completing this survey will ensure continued use of the water rights that the company currently holds.

We ask that you complete and return the survey by January 1, 2012. If we do not receive your survey by that date, you will be contacted by phone.

Your cooperation is much appreciated.

Karsten Busby
Master's Student
Brigham Young University
Department of Civil and Environmental Engineering

Figure 3-1: Page one of questionnaire

Shareholder Information:

1. Full Name: _____
2. Number of allocated shares: _____
3. Most Common turnout number (s) or name(s): _____
4. Do you store any water (please circle)? Y N
5. For what purpose if your water used (check all that apply):
 - Outside use, including irrigation, water features, lawn care
 - Stockwatering
 - Domestic (inside use)
 - Municipal
 - Mining
 - Power
 - Other (please specify): _____
6. Where is your water most commonly used (address and/or detailed description)?

Figure 3-2: Page two of questionnaire

Not all water users were contacted. Four water users no longer lived at their listed address. Six water users no longer used the listed phone number and were unavailable at their listed address. Nineteen water users were not contacted after five phone call attempts and one residence visit. Three water users either hung up the phone or were unwilling to provide

information. In total, specific water use information was obtained for 135 water users, or 81% of those listed. Of those 135 water users, nineteen do not currently use their allocated water.

3.3 Delineation

To demonstrate the place of use for the users that provided their data, a delineation of each property was created using ArcGIS ArcMap 10.1. To determine what areas that could be irrigated, a georeferenced Bing aerial background image was used. Only areas that were determined to be irrigable were delineated. For example, if a lot contained buildings, sidewalks, driveways, or other areas that clearly did not require irrigation, those areas were excluded from the delineated area. Because the aerial images were not from directly overhead, portions of each lot were hidden from view by buildings, trees, or other structures. Google Maps and Google Streetview were consulted to accurately delineate these hidden portions of the image. An example delineation is shown in Figure 3-3.



Figure 3-3: Example GIS delineation

3.4 Results

While some general trends and conclusions can be made from the information obtained by water users, individual information and specific details are private property of the Timpanogos Irrigation Company and as such are confidential. Specific details (including, but not limited to: names, contact information, individual water use history, and individual acreage details) will not be disclosed in this thesis.

The vast majority of shareholders are individual property owners that use their water for private landscaping. Brigham Young University-owned land, however, constitutes the majority of the total irrigated area. A map of much of the BYU owned areas that are either currently

irrigated or for which there are future plans to irrigate using Timpanogos Irrigation Company water is shown in Figure 3-4 (the pipeline is shown in green).

The total areas for BYU-owned property, privately-owned property, and property for which the water is currently not being used is shown in Table 3-1. As shown in the table, BYU owns the vast majority of irrigated property, with 80 acres. At least 4.1 acres are not currently

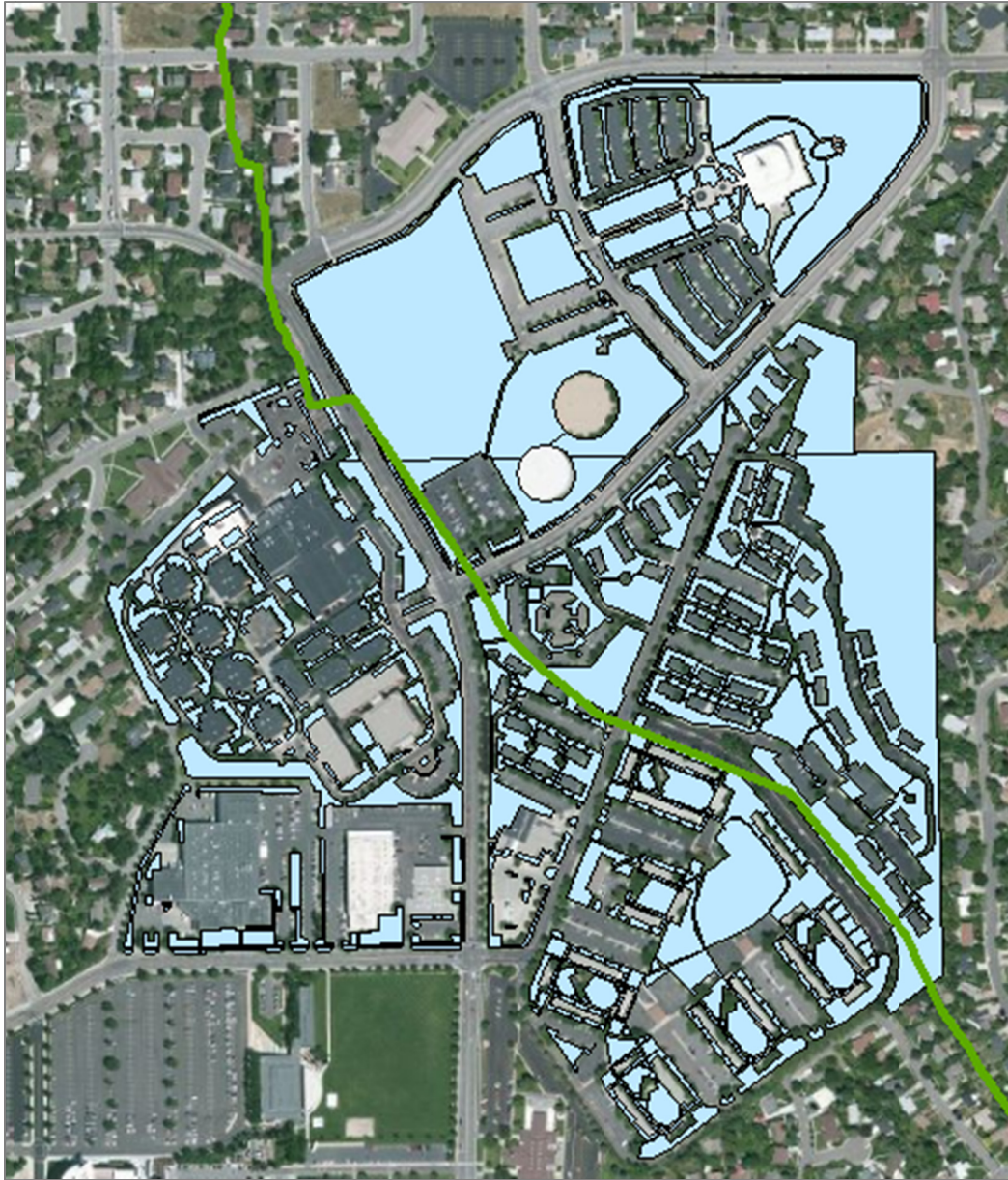


Figure 3-4: BYU property delineation

Table 3-1: Irrigated area by type

Category	Total Area (acres)
Brigham Young University	80.0
Privately-owned	49.5
Non-users	4.1

being irrigated but are owned by shareholders. The Timpanogos Irrigation Company should take steps to encourage these water users to either use their water beneficially or transfer their shares to others that could use the water. The completed delineation is shown in Appendix A.

While the delineation provides a useful reference for the place of use for the Timpanogos Irrigation Company, 19% of water users were not contacted do to unwillingness or repeated failed attempts. To properly calculate total irrigated area, these users need to be contacted or the total number should be adjusted to reflect this uncounted use.

It is also important to note that the current record of water users is outdated and contains several errors. Several water users' contact info was out-of-date. Many water users that were listed are now deceased and the water right has been passed to a family member. The irrigation company should update these records to reflect these changes.

4 OPTIONS FOR CHANGE

4.1 Water User Changes

Utah water law provides water users with several options when change is desired including adjudications, change applications, and judicial review.

Adjudications can resolve disputes and establish the water rights in areas where those rights may be unclear or interfere with each other. Because the Provo River Decree has a similar effect to an adjudication in that it established the water rights from that point forward, an adjudication is not needed nor would it benefit water users. The water rights have been determined and an adjudication would not change those rights.

Change applications are available and required for any permanent or temporary changes to a water right including the type, place, and time of use, and quantity. In a change application, a water user must declare the original nature of their water right and the changes that will be implemented. In addition, the user must submit a proof of beneficial use explaining the nature and extent of his or her water use including an explanation of exactly where the water will be used and for what purpose.

Judicial review is a broad term used to describe any issue that is brought before the courts. Judicial review can be used to evaluate decisions made by the state engineer (UCA §73-3-14), determine whether a water right is subject to forfeiture due to non-use (UCA §73-1-4), and resolve disputes between water users.

4.2 Barriers to Change

4.2.1 The Permit System

The three avenues for change are limited by the current application of the doctrine of prior appropriation through the permit system for two reasons. First, the priority of a water right cannot change because the date of appropriation is set. Second, all aspects of a water right that can change are subject to additional scrutiny when any single change is desired. These two issues are discussed below.

An adjudication would result in no change where one has been made because of the tenet that “first in time is first in right.” Therefore, regardless of how long ago an appropriation was made, if it came first, it has priority. An adjudication would review the levels of priority that have already been established and confirm their validity.

Water users that would like to submit a change application for whatever reason are presented with unusual barriers due to the doctrine of prior appropriation. These problems arise from the increased scrutiny given to the water right undergoing a change application. For example, the no-harm rule prohibits water users from making changes that can adversely impact other water users. Over-allocation of water rights in many of Utah waterways has been a problem in the past (Hartvigsen 2012), and as a result, use of even established water rights can be viewed as harmful to other water users because it deprives them of their ability to use the limited water. A change application affords an opportunity for the state engineer to reevaluate the harm cause by the water right in question, even if that right has been used without incident up to the time of application.

In addition, the state engineer can evaluate the beneficial use of a water right in several ways, as shown above by the different calculation methods (2.1.1), and will generally tend to

award the smallest amount obtained (Hartvigsen 2012) in order to reduce the problems caused by over-appropriation. These issues lead to a general reluctance to file any type of change because of the possibility of a reduction in the amount of allocated water.

4.2.2 Problems with Prior Appropriation

The current system of water rights is insufficiently flexible to deal with the changing landscape of water use in the Provo River. While several options for small-scale change have been presented, they are ineffective because of the nature of water law in the west. These problems are deeper than simple issues with the Provo River Decree. Rather, they are problems inherent in the system of prior appropriation.

As mentioned previously, the doctrine of prior appropriation had certain intentions aimed toward early settlement. Specifically, the law was meant to respect early water users in order to draw more people west. This has resulted in a particularly rigid system of water rights. Because the idea was to maintain original water rights and in essence “keep things as they are,” change is difficult and met with opposition. New water users, regardless of their type of use, must compete with entities such as irrigation companies that have existed since before Utah became a state. This system thus favors agricultural water use, as that was the original use of the early settlers that later joined together to form the irrigation companies we have today. As the Utah population has moved rapidly from rural to urban areas (Hobbs 2002), water rights are still owned by the original irrigation companies that were formed to support agriculture.

In addition, a system based on date of appropriation implies that earlier water rights are more important than water rights appropriated at a later time, regardless of the nature of use. When conflicts arise due to scarcity or over-appropriation, it becomes apparent that certain water uses are truly more important than others (for example, providing drinking water to a population

over recreational use at a waterpark), but prior appropriation does not allow for an analysis of this relative importance. Longevity is the only factor considered.

An additional shortfall of the prior appropriation doctrine is the fact that the “use it or lose it” principle discourages conservation. Individual conservation can result in use of less water and therefore forfeiture, so that a water user is disinclined to seek more efficient practices for fear of losing a portion of his or her water right (Russell 1997). This is exacerbated by the fact that the definition of beneficial use has not changed with improvements in technology and conservation knowledge (Daniels 2007). Water right quantities involve a right to water required for transport, or carrier water (UCA §73-3-3.5), and thus the user is not held accountable for losses due to seepage and evaporation that could be reduced by improved systems. It is therefore to a water user’s advantage to use as much water as he or she possibly can to show the “beneficial use” of their full water right. Losses due to inefficient transport and distribution methods are neglected because decreased losses would mean decreased use and therefore, a decrease in quantity.

These problems are evident when dealing with water rights within the Provo River Decree. The decree established priority, and many of the highest priority rights were given to irrigation companies. Many of the water rights in these companies are used by shareholders to irrigate private landscaping. This is done both on a small scale, such as private yards, and on a larger scale, in the case of Brigham Young University. Landscape irrigation does not fit very well with the strict definition of irrigation in the quantity required per acre nor in the time period during which irrigation is required. For example, mature trees present in landscaping may consume much more water per acre than alfalfa and may require water during a longer period of

time each year. Lack of flexibility regarding the definition of irrigation results in a “one-size-fits-all” policy that does not take into account individual user needs.

Priority assignment of water rights has additional consequences: water users with high-priority water rights are motivated to retain their water rights regardless of use or need. In dealing with water users in the Provo area, it is evident that many users continue to pay dues for their water rights regardless of the fact that they have little or no intention of using the water in the near future. Many water users have high-priority water rights that have been passed on through generations within the same family, making the idea of giving up their water right due to non-use unthinkable.

Filing a change application leads to the problems discussed about the system rigidity including fear of quantity reduction. In addition, diversion structures are often outdated and inefficient. Changing the diversion would require a change application and so no action is taken in many situations where it would improve the system.

4.3 Future Change

The most basic underlying principle behind Utah water law is that water is property of the public and that water users have only a right to use that water (UCA §73-3-14). Current practices are not consistent with this principle in that they encourage water users to waste and discourage newer, more beneficial uses of water.

Because it is the system of permits and the prior appropriation itself that has led to the need for change, change from within that system via change applications, judicial review, or other means is difficult. On the other hand, some of the greatest changes to the way water is managed in Utah have been from institutions outside of the administrative system (Daniels 2007). Examples of this on the Provo River include the June Sucker Recovery Implementation

Program (JSRIP) (June Sucker Recovery Implementation Program 2013) and the Wasatch County Water Efficiency Project (WCWEP) sponsored by the Central Utah Water Conservancy District (CUWCD). One of the purposes of JSRIP is to allocate water to maintain a minimum baseflow in the Provo River for June sucker spawning, a public beneficial use that would not otherwise be appropriated by private water users. Under the WCWEP, the CUP enclosed open canals such as the Timpanogos and Upper East Union canals to increase efficiency. In return, the CUP received the water saved from evaporation and percolation to allocate for other public uses. From these examples, it is evident that external agencies and organizations with enough influence can institute limited changes within the rigid system of Utah water rights. Change on a broader scale, however, would need to address the shortfalls of the system itself.

The issues presented demonstrate that the problems are not simply local issues or shortfalls of the Provo River Decree. Rather, they are problems with the system of prior appropriation. These problems result from the inability to recognize relative benefit, a lack of conservation incentives, and rigidity associated with water rights based on temporal priority. It should also be noted, however, that this system has been in place since before Utah became a state. There are other aspects of prior appropriation that need to be considered. A more detailed analysis of the past and present influences of external organizations such as those mentioned in the previous paragraph should be conducted to determine whether such changes have and will be sufficient to deal with many of these shortfalls. Economics of exchange should also be considered and the effects that the free exchange of water rights has had on recognizing relative benefit and facilitating changing use patterns.

5 CONCLUSIONS

The history of Utah water law reveals the original intent of the system we have today: to draw settlers to the west, to preserve original water rights, and to avoid waste. The doctrine of prior appropriation was applied as common law and later as statutory law when water rights were solidified.

The Provo River Decree is an example of the application of this doctrine. Water rights that had been appropriated earlier were given priority and the specific details such as quantity and duration of flow were set out in the decree.

Changing demographics as well as the need for more efficient practices have tested the limits of the doctrine of prior appropriation. The rigid system that was intended to preserve water rights for the original users is now a barrier to change and best use practices. A history of over-appropriation has led to a resistance to change on the part of water users.

The problems with the Provo River Decree are not unique and are inherent in the system of prior appropriation. To address these problems, it appears that large-scale change is needed that will recognize the relative benefit of different types of water use as well as reward conservation and inefficient water use. In order to better assess the need for such change, additional studies should be undertaken regarding the impact of water right exchange on the relative benefit of water rights as well as the past and present effects of external organizations on water rights in the area.

REFERENCES

- Briem, John, interview by Karsten Busby. *Utah Division of Water Rights* UT, (January 14, 2013).
- Clawson, Thomas W. *Fundamentals of Water Law in Utah: Protecting Water Rights, Use and Quality*. Eau Claire, WI: National Business Institute, Inc., 2002.
- Clyde, Steven E. *Part XI- River Basins and State Surveys: Utah*. Vol. 4, in *Waters and Water Rights*, edited by Amy K. Kelley, 1-31. LexisNexis/Matthew Bender, 2011.
- Daniels, Brigham. "Emerging Commons and Tragic Institutions." *Environmental Law* 37, no. 3 (2007): 515-571.
- Esq., Lawrence J. MacDonnell. *Part XI- River Basins and State Surveys: Colorado River Basin*. Vol. 4, in *Waters and Water Rights*, edited by Amy K. Kelley, 5-54. LexisNexis/Matthew Bender, 2011.
- Getches, David H. *Water Law in a Nutshell*. St. Paul, MN: Thomson/Reuters, 2009.
- Gittins, Jeff. *Utah Water Law and Water Rights*. May 17, 2013.
<http://utahwaterrights.blogspot.com/> (accessed May 20, 2013).
- Hartvigsen, David B., interview by Karsten Busby. *Partner, Smith Hartvigsen* Salt Lake City, UT, (November 6, 2012).
- Hobbs, Frank and Nicole Stoops. *Demographic Trends in the 20th Century*. U.S. Census Bureau, Census 2000 Special Reports CENSR-4, Washington, D.C.: U.S. Government Printing Office, 2002.
- Hutchins, Wells Aleck. *Water Rights Laws in the Nineteen Western States*. 3 vols. Washington, D.C.: Natural Resource Economics Division, Economic Research Service, United States Dept. of Agriculture, 1971.
- Jennifer Jean Jensen, Executor and Personal Representative of the Estate of Marilyn Hamblin, Plaintiff and Appellant, v. Kent Jones, Utah State Engineer, Defendant and Appellee*. 20090742 (Supreme Court of Utah, 2011).

June Sucker Recovery Implementation Program. *Achieving Recovery: Water Management & Protection*. May 2013. <http://www.junesuckerrecovery.org/achi-wate.html> (accessed 2013).

Lawrence W. Searle and Ann C. Searle, Plaintiffs and Appellants, v. Milburn Irrigation Company, William M. Hanilton, and The Utah State Engineer, Jerry D. Olds, P.E., Defendants and Appellees. 20040406 (Supreme Court of Utah, 2005).

Montgomery Watson Inc. and Flo Engineering Inc. *Provo River Restoration Project Technical Report, Vol I*. Orem: Central Utah Water Conservancy District, 1994.

NOAA National Climatic Data Center. *Historical Climatology Series 4-2*. 2013. <http://www.ncdc.noaa.gov/oa/climate/normal/usnormalsprods.html#HCS5> (accessed May 23, 2013).

Perez, Marcos Antonio. "State of Utah: Proof of Beneficial Use of Water for the Upper East Union Irrigation Company." Master's Project Report, Civil & Environmental Engineering, Brigham Young University, Provo, UT, 2012.

Provo City, a Municipal Corporation of the State of Utah, Plaintiff and Respondent, v. Hubert C. LAMBERT, State Engineer of the State of Utah; Provo River Water Users Association, a corporation; Kennecott Copper Corporation, a corporation; Salt Lake City,. 14605 (Supreme Court of Utah, January 24, 1978).

Provo Reservoir Company, A Corporation, Plaintiff v. Provo City et el, Defendants. 2888 Civil (Fourth Judicial District Court of the State of Utah, 1921).

Provo Water Users Association, a corporation, et al., Plaintiffs and Respondents, v. Hubert C. LAMBERT, as State Engineer of the State of Utah; Provo City Corporation, et al., Defendants and Appellants; Lawson O. Hamblin and Ida Hamblin, his wife. 16724 (Supreme Court of Utah, 1982).

Russell, Karen A. "Wasting Water in the Northwest: Eliminating Waste as a Way of Restoring Streamflows." *Environmental Law* 27, no. 1 (March 1997).

Salt Lake City Corporation, Plaintiff and Apellee, v. Big Ditch Irrigation Company, James Garside, J.L. C., and Ryan Litke, Defendants and Appellants. 20090757 (Supreme Court of Utah, 2011).

Strawberry Water Users Association, a Utah nonprofit corporation; and Strawberry High Line Canal Company, a Utah nonprofit corporation, Petitioners and Appellants, v. Bureau of Reclamation; United States of America; and Department of the Interior... 20040270, 20040334 (Supreme Court of Utah, 2005).

Tanner v. Provo Reservoir Co. 6063 (Supreme Court of Utah, 1940).

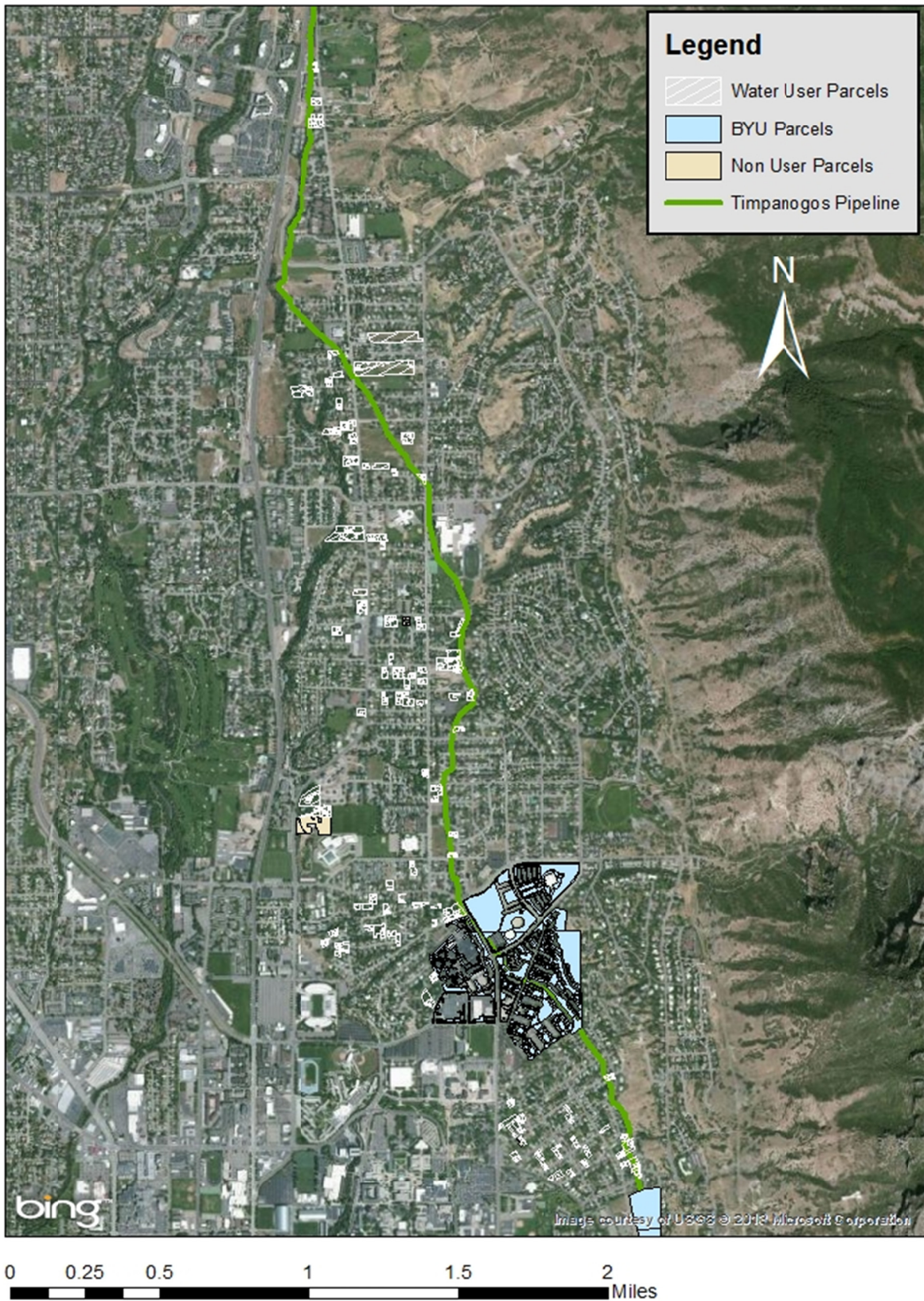
Utah Division of Administrative Rules. "Utah Administrative Code Rule 655." Salt Lake City, UT, April 1, 2013.

Utah Division of Water Rights. *Water Right Information*. 2011.
<http://www.waterrights.utah.gov/wrinfo/default.asp> (accessed May 20, 2013).

—. *Water Right: 55-11006*. 2013. <http://waterrights.utah.gov/cblapps/wrprint.exe?wrnum=55-11006> (accessed May 20, 2013).

Utah State. "Utah Administrative Code Title 73: Water and Irrigation." Salt Lake City, UT: Utah State Legislature, 2013.

APPENDIX A. COMPLETED DELINEATION MAP



APPENDIX B. CALCULATIONS

The Provo River Decree lists the following for the Timpanogos Canal Company:

Timpanogos Canal Company,	847 Acres.	Water Right #55-11006
From May 10th to June 20 th ,	Duty 60,	14.12 Second-Feet
From June 20th to July 20th,	Duty 66,	12.83 Second-Feet.
From July 20th to May 10th,	Duty 75,	11.29 Second-Feet

To calculate the quantity of beneficially used water for the Timpanogos Canal using Equation 2-1, the number of acres listed in the decree is substituted into the equation along with the standard consumptive use value for the area (4 ac-ft/ac according to Figure 2-1) as shown:

$$Q = 847 \text{ ac} \times 4 \text{ ac-ft/ac} \quad (\text{B-1})$$

$$Q = \mathbf{3388} \text{ ac-ft}$$

To calculate the quantity of beneficially used water using Equation 2-2, the flow-duration table above is used. First, the durations must be modified so that the time period reflects the irrigation season rather than the entire year. This is done by adding one row from April 1 (the start of the irrigation season) to May 10 and changing the end data on the final row to October 31 (the end of the irrigation season), as shown:

Table B- 1: Adjusted time periods

Start Date	End Date	Flow (cfs)
4/1	5/10	11.29
5/10	6/20	14.12
6/20	7/20	12.83
7/20	10/31	11.29

The duration of each time period is calculated in days and then is converted to seconds and multiplied by the flow in cfs, resulting in a volume in cubic feet. This is then converted to acre-feet. An example calculation for the first row of Table B- 1 (duration = 39 days) is shown below:

$$Q = 39 \text{ days} \times \frac{24 \text{ hr}}{1 \text{ day}} \times \frac{3600 \text{ s}}{1 \text{ hr}} \times 11.29 \text{ cfs} \times \frac{1 \text{ ac}}{43560 \text{ ft}^3} \quad (\text{B-2})$$

$$Q = 873 \text{ ac-ft}$$

Performing this same calculation on the entire table yields the following results:

Table B- 2: Total quantity determined by flow-duration

Start Date	End Date	Flow (cfs)	Duration (days)	Duration (s)	Quantity (ft³)	Quantity (ac-ft)
4/1	5/10	11.29	39	3369600	3.81×10^7	873
5/10	6/20	14.12	41	3542400	5.00×10^7	1148
6/20	7/20	12.83	30	2592000	3.33×10^7	763
7/20	10/31	11.29	103	8899200	1.00×10^8	2306
Total:						5092

The percent difference was then calculated for the values resulting from Equation B-1 and Table B- 2 as follows:

$$\frac{5092 \text{ ac-ft} - 3388 \text{ ac-ft}}{3388 \text{ ac-ft}} = 50\% \quad (\text{B-3})$$