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# Flowing into the Desert

## A Primer on Utah Water Law

# – FLOWING INTO THE DESERT – A PRIMER ON UTAH WATER LAW

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## INTRODUCTION

Utah is one of the driest states in the nation. Making sure the state manages water well is essential to its rapid population growth and economic expansion.

This report focuses on providing a background of Utah's water law. A basic understanding of water law is essential for any policy discussion about water. Water law provides the foundation upon which the rest of Utah's water policy is built. Any changes individuals or governments might need to make to ensure a safe and sustainable water supply will be easier or more feasible if they fit within the existing framework. However, larger changes can and have been made to the state's water law to help ensure Utah's water future. Since the total supply of water is limited by nature, much of the discussion orients around how the existing supply should be distributed. Utah's water law is the structure that organizes and determines that distribution.

There are concerns that Utah's water law a) provides incentives for water-right holders to waste water, b) distributes water in a way that might have been a better fit for historic needs rather than modern Utah needs, and c) limits how water can be used. After outlining Utah water law, this report briefly outlines these concerns and offers possible avenues for addressing these concerns.

Different regions around the world have adopted various types of water law based on their history and the availability of water. Water law attempts

## HIGHLIGHTS OF THIS REPORT



- Utah's water law is structured such that in times of shortage, the newest claims to water do not get any water while the oldest claims receive all the water of their claim. Water quantity may vary from year to year, but the system is transparent in who receives available water.
- Water can only be used in specific ways, and if not used it can be forfeited. Historically, this has created little incentive for conservation. This may be changing with recent legislation.
- Utah's water law has shown that it can be flexible to meet current needs. Recent legislation has updated allowable uses to benefit local ecological systems like the Great Salt Lake. Other legislation has created incentives for farmers to install more efficient irrigation systems and sell the conserved water.
- Utah law states that if water is not used for seven consecutive years, it is subject to forfeiture. However, there is little proactive enforcement. It is unclear how much water that is not being used as specified that could be reallocated to meet current needs.
- There are several possible water law changes for Utah policymakers to consider, including redefining beneficial uses, verifying beneficial uses, creating open water markets, and shortening the window to forfeiture.

to organize some basic questions surrounding the different water resources of a geography. They include:

- Who owns the water?
- Who can use the water?
- What uses are allowed?
- What happens if there is not enough water?
- How can permissions to use water be lost?

It should be noted that Utah Foundation researchers are not lawyers. While researchers have done their best to understand the complex code surrounding water law and discussed our findings with lawyers specializing in water law, nothing in this report should be construed as legal advice. The intent of this report is not to describe every detail of water law or exhaustively explain all the legal procedures involved in water rights, but to provide a baseline of knowledge to help Utah residents and policymakers understand the framework on which water policy takes place.

## THE WESTERN WATER MODEL

Often, water law speaks in terms of water rights. A water right is simply permission to use water in a specific way as allowed by state law. This is necessary because water is often considered public property and owned by the citizens of a region – as is the case in Utah.<sup>1</sup> By issuing water rights, governments can better manage the common resource while recognizing the interests of the water right holder.

The concepts of “prior appropriation” or “first in time” and of “beneficial use” are some of the founding principles of Western water law. This system was implemented in the more arid West as it was being settled and the demand for water grew. Under this system, those that acquired rights first are deemed senior right holders. As such, they are given priority to use their entire share of water prior to junior right holders.<sup>2</sup> This means that in a time of shortage, senior water right holders are entitled to their full share of water before junior claimants can use any of theirs. This can lead to scenarios where the junior right holders are not able to divert or pump any water because all the available water has been used by senior holders.<sup>3</sup> A water right can be acquired if the user has land adjacent to the water source or has built infrastructure such as ditches, canals, or pumps to move water from the original source to the land where it will be used.

To better optimize water usage for the public good, water right holders under this system are restricted to use the water for beneficial uses. This means that the water diverted could only be used for the purposes deemed as beneficial by the governing body and usually includes uses such as domestic consumption, agriculture, mining, power generation, or other economically beneficial activities.<sup>4</sup> More recently, Utah has also recognized the

1 Utah Division of Water Rights, 2011, “Water right information,” <https://waterrights.utah.gov/wrinfo/default.asp>.

2 Craig J. Smith, Jeffrey R. Gittins, 2012, “Water law for the layman”, *Smith Hartvigsen Law Firm*, <https://smithhartvigsen.com/water-law-for-the-layman/>.

3 *Ibid.*

4 *Ibid.*



use of leaving water in some streams and other bodies of water as a beneficial use to preserve water-dependent ecosystems.<sup>5</sup>

Finally, this system seeks to optimize water usage by including a forfeiture provision. Forfeiture clarifies that if a right holder does not use all or part of a water right for a designated time-period that the right may be lost and the water made available to junior right holders. While different governing bodies embrace various time frames to determine forfeiture, a continuous period of seven years or more is common, which is the period set by Utah statute.<sup>6</sup>

## THE RIPARIAN WATER MODEL

An effective way to highlight the principles of Western water law is to compare it to riparian water law. This is the predominant system to regulate water usage in the Eastern United States where water resources are more plentiful. Under this system, the right to the water is tied to the land where the water is located. This means that a property owner whose land physically touches a water source has the right to use water from that source for any reasonable use.<sup>7</sup> Reasonable use simply means that a water right

### There are some fundamental differences in water law between Eastern and Western states.

Figure 1: Summary of Riparian Water Law vs. Western Water Law

	Riparian (Eastern)	Prior Appropriation (Western)
How does one obtain the right?	The water right is owned by the property owner whose land the water touches. To obtain the right, one must purchase the land that the right is attached to.	The right is granted to one who shows intent to divert the water from the original source and put that water to beneficial use.
What can the water be used for?	The water may be used for anything that is deemed reasonable use.	The water may be used for anything that is deemed beneficial use.
How much water can be used?	As long as use is reasonable and does not harm other right holders, there are no restrictions on how much water may be used.	Each right holder may only use as much water as the right has specified.
How are water cuts determined when there are water shortages?	Holders must share the burden of reduced water usage.	Junior right holders are cut off from their allotments until all senior rights holder have enough water.
How are water rights lost?	Water rights are always attached to the land that touches the water resource and the rights cannot be forfeited.	Water rights may be forfeited if unused for a defined period of time.

5 House Bill 33, Instream Water Flow Amendments, 2022 Legislative Session, <https://le.utah.gov/~2022/bills/static/HB0033.html>.

6 Craig J. Smith, Jeffrey R. Gittins, 2012, "Water law for the layman", *Smith Hartvigsen Law Firm*, <https://smithhartvigsen.com/water-law-for-the-layman/>.

7 Aquaoso, 2020, "Water rights by state – The guide for agriculture & land professionals," <https://aquaoso.com/water-rights/>.

holder may not divert so much water from the system that other right holders sharing the same water source are adversely affected.<sup>8</sup> This means that, under riparian water law, in times of drought the burden of decreasing water usage is shared equally by all right holders in the system.<sup>9</sup>

## WATER LAW IN PRACTICE

Riparian and Western water law are the primary models for water law in the United States. However, many states do not strictly hold to just one model. For example, Texas and California both have legislatively imposed Western water law after water users already laid claim under riparian law and had to find ways to integrate those claims.<sup>10</sup>

While Utah's groundwater is also subject to Western water law, other states allow groundwater to operate under different frameworks. For example, in California, landowners can pump groundwater relative to their share of the overlying land.<sup>11</sup> In Arizona, groundwater can be pumped to meet "reasonable use" (although additional legislation added limits in areas threatened by overuse).<sup>12</sup> Texas, by contrast, has very limited restriction upon groundwater use. A landowner can pump any and all water underneath their property regardless of the impact to neighboring landowners.<sup>13</sup>

## Water Law in Utah

To understand water law in Utah, one needs to understand water rights, prior appropriation, and beneficial use. In addition, there are other actions and concepts to understand, including securing and changing water rights, forfeiture of rights, enforcement actions, adjudication, and inspections during the application process.

**Water Rights.** Water was important enough to make it into Utah's Constitution, which states, "All existing rights to the use of any of the waters in this State for any useful or beneficial purpose, are hereby recognized and confirmed."<sup>14</sup> This article confirmed the water right ownership of all parties that had begun appropriating water before Utah officially became a state. However, water in Utah is not owned by any individual person or entity. All water in the state is public property or is owned in common by

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8 Gary D. Libecap, 2008, "The state of water rights and western U.S. water markets," <https://www.hillsdale.edu/educational-outreach/free-market-forum/2008-archive/the-state-of-water-rights-and-western-u-s-water-markets/>.

9 Ibid.

10 Californian State Water Resources Control Board, 2020, "The water rights process," [https://www.waterboards.ca.gov/waterrights/board\\_info/water\\_rights\\_process.html](https://www.waterboards.ca.gov/waterrights/board_info/water_rights_process.html); Texas Water, 2014, Texas water law, <https://texaswater.tamu.edu/water-law>.

11 Water in the West, "Groundwater in the west: Utah," Stanford University, <https://groundwater.stanford.edu/dashboard/utah.html>.

12 In some geographies reasonable use led to entities pumping more water than was being restored to the system. The state sought to control this method of water management in significant regions by creating Active Management Areas that regulated groundwater pumping permits and outlawed using groundwater for new irrigation. These regions are also required to create conservation plans, provide evidence of 100 years of water supply before further development, and meter and report the pumping of water. Outside of these Active Management Areas, the previous reasonable use laws are still in effect. See Water in the West, "Groundwater in the west: Arizona," Stanford University, <https://groundwater.stanford.edu/dashboard/arizona.html>.

13 Texas Water, 2014, "Texas water law," <https://texaswater.tamu.edu/water-law>.

14 Utah State Constitution, Article XVII, Section 1, [https://le.utah.gov/xcode/ArticleXVII/Article\\_XVII\\_Section\\_1.html](https://le.utah.gov/xcode/ArticleXVII/Article_XVII_Section_1.html).





*North Union Canal, Utah County, Utah, Credit: Flickr User arbyreed under license (CC BY-NC-SA 2.0)*

the people of the state.<sup>15</sup> Water rights do not grant ownership of water but rather grant holders use of the designated water as long as the water use aligns with the restrictions of the water right. Water rights are usually limited by five factors: designated beneficial use, priority date, water quantity, specified point of diversion and water source, and the specific location of the beneficial use.<sup>16</sup>

**Prior Appropriation.** Utah applies Western water law or appropriative water law to both its surface and ground water sources. The earliest and most senior rights were given to many of the early Utah pioneers who began diverting water for irrigation in the 1800s.<sup>17</sup> As the state's population and economy have grown, more entities have applied for and have received water rights to support the growing population and industry. With more rights being approved, the prior appropriation doctrine of water law becomes increasingly important. As the demand for water grows, this system outlines clearly that senior right holders have a priority to use the water allocated to them before any junior holder. Curtailment is when a junior

<sup>15</sup> Utah State Statute §73-1-1, <https://le.utah.gov/xcode/Title73/Chapter1/73-1-S1.html>; Water in the West, "Groundwater in the west: Utah," Stanford University, <https://groundwater.stanford.edu/dashboard/utah.html>.

<sup>16</sup> Utah Division of Water Rights, 2011, "Water right information," <https://waterrights.utah.gov/wrinfo/default.asp>.

<sup>17</sup> Utah Division of Water Rights, 2011, "Water right information," <https://waterrights.utah.gov/wrinfo/default.asp>.



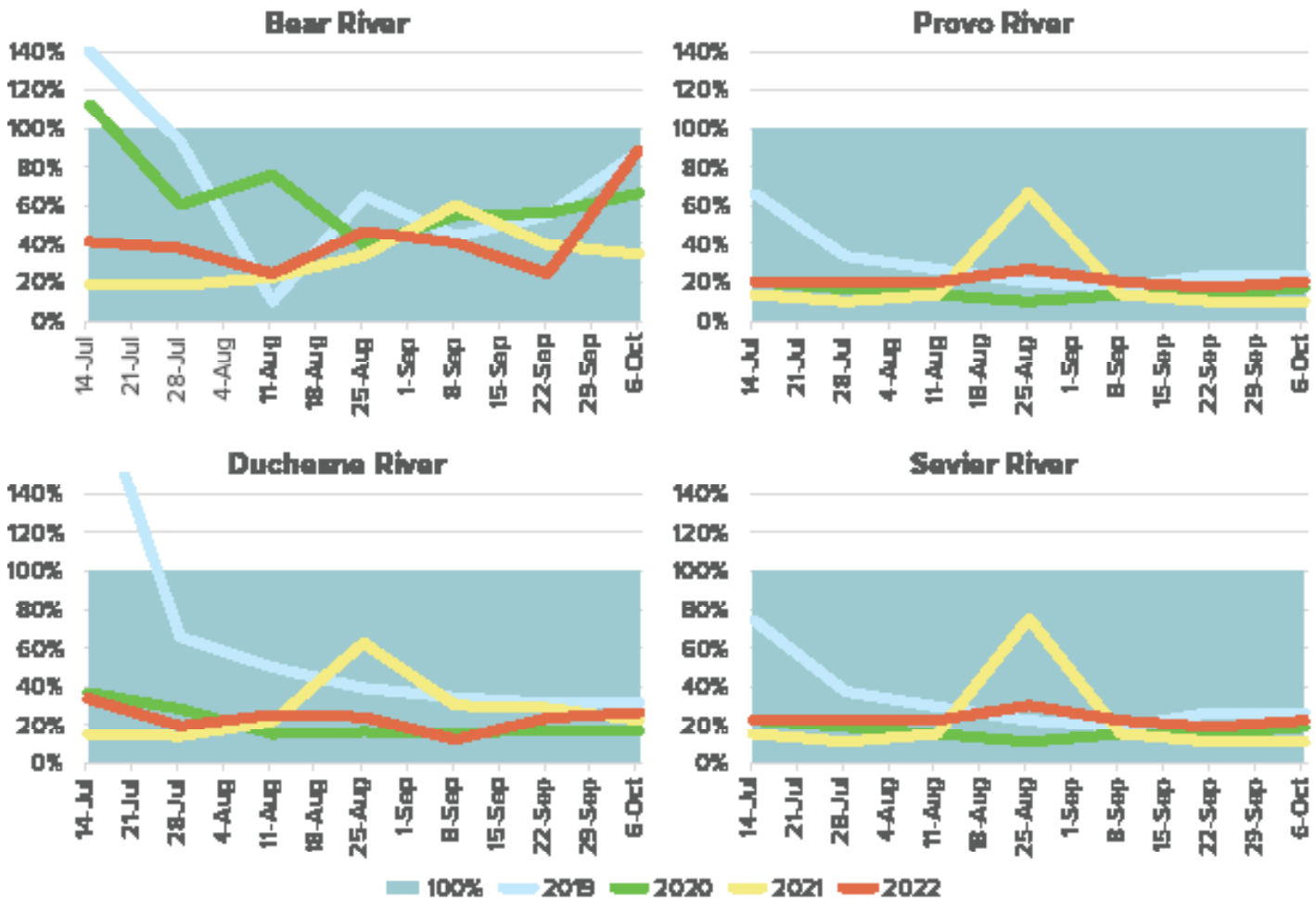
right holder is not able to use the water of their water right in order to allow senior right holders to use all the water allotted by their right.

Understanding how water rights are prioritized is a key part of Western water law because Utah so often faces shortages. The Utah Division of Water Rights posted 2019 to 2022 data on four representative water systems which illustrate how rare it is that there is enough water to supply all existing water rights year round. (See Figure 2.)

There are some exceptions to prior appropriation. If an upstream junior water right holder is using water, but a reduction of the water use would not benefit a downstream senior water right holder who is not receiving their full allotment, they would not be required to reduce the amount of water used. This situation is known as a futile call, which can only be determined by the State Engineer.<sup>18</sup>

### On average, only one-in-three water rights holders held enough priority to receive water during the summer and early fall months of 2019-2022.

Figure 2: Share of Water Rights Satisfied Across Four Representative Water Systems, Summer and Early Fall of 2019-2022



Source: Utah Division of Water Rights.

<sup>18</sup> Utah Division of Water Rights, 2010, "Distribution by water right priority," <https://www.waterrights.utah.gov/basics/032210.asp>.

In emergency situations – as declared by the Governor – water used for drinking, sanitation, and fire suppression can be given a preferential right regardless of priority. During these emergency situations, agricultural water users have a secondary preferential right over all the remaining water uses. However, preferred water users may be required to compensate water users with priority for the water used as well as the economic impacts of not having that water immediately available.<sup>19</sup>

**Beneficial Use.** Beneficial use in Utah is legally defined as “the basis, the measure and the limit of all rights to the use of water in this state.”<sup>20</sup> The uses that are pre-specified as beneficial use on the Proof of Beneficial Use Application are listed as: irrigation, stockwatering (watering livestock), domestic, municipal, mining, power, and other.<sup>21</sup> More recently, in 2022, House Bill 33 was passed that allowed for instream flows to be considered a beneficial use in some cases. This allows for right holders to dedicate their water allocations to preserve water-reliant ecosystems by keeping that water in the natural system.<sup>22</sup>

**Securing Water Rights.** To secure a water right, applicants must first file an application with the Division of Water Rights outlining where and how the water will be used. The Division of Water Rights will post a notice about the proposed application for two weeks, after which any party that would like to protest the application has 20 days to submit a protest. Applicants have an opportunity to respond to any protest and the State Engineer may hold an informal hearing involving all the interested parties.<sup>23</sup> The Division of Water Rights then collects all the necessary information and if there is enough water to support the application and it will not impair any other existing rights, seems feasible and the applicant has the financial ability to complete the project, then generally the application will be approved.<sup>24</sup> This decision can be reconsidered and even appealed.<sup>25</sup>

However, that is not the end of the process. After the application has been approved, applicants have three to five years to build, install, or create whatever infrastructure is needed to actually use the water. Extensions are often available to those that request them. Finally, the water right is considered “perfected” and legally valid as real property only after the Division of Water Rights has received proof from a licensed engineer that the water is being used in the manner specified in the right.<sup>26</sup>

**Changing Water Rights.** Some areas of the state are closed to new water appropriation. In these areas, water can only be secured from purchasing an existing water right and submitting an application to change the use of that water right. When changing any of the five elements of a water right,

19 Utah Division of Water Rights, 2010, “Distribution by water right priority,” <https://www.waterrights.utah.gov/basics/032210.asp>.

20 Utah State Statute §73-1-3, [https://le.utah.gov/xcode/Title73/C73\\_1800010118000101.pdf](https://le.utah.gov/xcode/Title73/C73_1800010118000101.pdf).

21 Utah Division of Water Rights, “Proof of beneficial use of water,” <https://www.waterrights.utah.gov/proofs/proof1.pdf>.

22 House Bill 33, Instream Water Flow Amendments, 2022 General Session, <https://le.utah.gov/~2022/bills/static/HB0033.html>.

23 Utah Division of Water Rights, “Application process,” <https://waterrights.utah.gov/wrinfo/policy/ap-schem.pdf>.

24 Utah State Statute §73-3-7 (1) (a), <https://le.utah.gov/xcode/Title73/Chapter3/73-3-S8.html>.

25 Utah Division of Water Rights, “Application process,” <https://waterrights.utah.gov/wrinfo/policy/ap-schem.pdf>.

26 Utah Division of Water Rights, 2011, “Water right information,” <https://waterrights.utah.gov/wrinfo/default.asp>.



a change of use application is generally needed. The application process is similar to that of initially obtaining the right.<sup>27</sup> However, additional care is given to make sure that the change does not negatively affect other water right holders (known as quantity impairment in state statute).<sup>28</sup> That could be a matter of enough water to go around (if they are changing the source of withdrawal to a different location) or of timing (agriculture water is only used from spring to fall, while municipal water is used year-round), or of depletion (some uses return less water to the system than other uses).<sup>29</sup> In addition, applicants may be required to prove that the water being changed is not subject to forfeiture from non-use. If the Division of Water Rights finds evidence (or a protest is raised in response to the application) that the water in the water right in question may be subject to forfeiture from disuse and that starting its use again may impair the water for junior right holders, it may add additional requirements for the applicant (known in statute as raising the “rebuttable presumption of quantity impairment”). If this occurs, the applicant has the burden of proof to show the water right was either in use, or is exempt from forfeiture due to disuse for an allowable reason (see the subsection on Forfeiture, below, for more details on allowable reasons of non-use). Otherwise, the water right may be subject to forfeiture.<sup>30</sup> If resuming the water right after non-use does not appear to impact other water users in the community, the change of use application may still be granted. However, junior right holders could still bring the issue to

27 Utah Division of Water Rights, 2011, “Water right information,” <https://waterrights.utah.gov/wrinfo/default.asp>.

28 Utah State Statute §73-3-3 (1) (e), <https://le.utah.gov/xcode/Title73/Chapter3/73-3-S3.html>; Utah Division of Water Rights, 2022, “Understanding forfeiture, nonuse and rebuttable presumption,” <https://www.youtube.com/watch?v=U4G2YvE4i7w>.

29 Utah State Statute §73-3-3 (1) (e), <https://le.utah.gov/xcode/Title73/Chapter3/73-3-S3.html>.

30 Utah Division of Water Rights, 2022, “Understanding forfeiture, nonuse and rebuttable presumption,” <https://www.youtube.com/watch?v=U4G2YvE4i7w>.



court until 15 years after the period of non-use ended.<sup>31</sup> If the application for change is ultimately approved, the right maintains the original priority date.<sup>32</sup> Water rights can also be subdivided and the change applied to only a portion of the original right.<sup>33</sup>

**Forfeiture.** Water rights in Utah may only be forfeited after all or a portion of the water was not used for a period of seven consecutive years.<sup>34</sup> The forfeiture can only occur through the judicial system. The Division of Water Rights may refer cases to the court that involve forfeiture via enforcement actions investigating water misuse, through the systematic review of the water rights of a geographic area known as “general adjudication,” or as the result of finding signs of disuse during routine inspections. Because water rights may only be forfeited by a court decree, and because of the time and resources demanded, the Division of Water Rights does not focus upon policing water rights. Instead, their goal is to facilitate the efficient use of water in the state. In many cases, it is left up to an aggrieved party (a water rights holder that was using the water not used by the holder in question) to bring the case to court.<sup>35</sup>

However, there are several reasons that would allow non-use for seven consecutive years and still not result in forfeiture. Holders can apply for a non-use application with the Division of Water Rights for specific reasons such as economic depression or if there are complications in legal proceedings regarding the right. There are also other allowable reasons for non-use. For example, during dry years there may not be enough water for junior right holders. When the water source does not provide enough for a right holder, non-use would not be counted against the seven-year forfeiture provision. Other situations that may permit non-use without forfeiture include being part of a state approved conservation fallowing program, being stored in a reservoir or aquifer for future use, or while the use of the water is in the process of being changed.<sup>36</sup>

**Enforcement Actions.** The first of these methods is the most direct and is carried out by enforcement agents who work under the Division of Water Rights. These agents respond to petitions and complaints of water misuse made by neighbors or downstream water users who have been negatively impacted by water misuses. Specifically, water misuse is when a water user applies water outside the manner described in the water right. That could be an unapproved beneficial use or diverting more water than is allotted. In responding to these petitions, the enforcement agents gather evidence concerning the accusations. This process includes the verification of water rights and any quantity and beneficial use limitations.

31 Utah State Statute §73-1-4 (2) (c) (i); Comments with Eric Jones, Assistant State Engineer—Applications and Records, Division of Water Rights, 3 August, 2023.

32 Utah State Statute §73-3-3 (6) (a) <https://le.utah.gov/xcode/Title73/Chapter3/73-3-S3.html>.

33 Utah Division of Water Rights, 2014, “Utah’s water right process,” [https://waterrights.utah.gov/wrinfol/Brochures/water\\_right\\_process\\_pageformat.pdf](https://waterrights.utah.gov/wrinfol/Brochures/water_right_process_pageformat.pdf).

34 Interview with Eric Jones, Assistant State Engineer—Applications and Records, Division of Water Rights, 12 May, 2023.

35 Utah Division of Water Rights, 2022, “Understanding forfeiture, nonuse and rebuttable presumption,” <https://www.youtube.com/watch?v=U4G2YvE4i7w>.

36 Utah State Statute §73-1-4 (2) (e), <https://le.utah.gov/xcode/title73/chapter1/73-1-s4.html>; There also exists a sort of ‘statute of limitations’ on water non-use. If a rights holder goes through a period of non-use of seven consecutive years, but then resumes use and the case is not brought before the court within 15 years, the water is no longer subject to forfeiture. See Utah State Statute §73-1-4 (2) (c) (i), <https://le.utah.gov/xcode/title73/chapter1/73-1-s4.html>.



Big Springs of Zion, Credit: Flickr User Sathish J under license (CC BY-NC-ND 2.0)

If it is found that the accused party has been using more water than was allotted or was using the water for a beneficial use that was not listed on the right, then they receive an “enforcement action.” This is a notification to bring the water usage back into compliance with the usage requirements stated on the right. Should the water user not comply, a fine will be applied and if the water user continues not to apply, then the Division of Water Rights may rely on the judicial system to enforce compliance.

**General Adjudication.** Adjudications are systematic legal processes that the Division of Water Rights carries out to verify the rights held in a geographical area. They do this by notifying all potential rights holders of the process and giving them 90 days to provide verification, or claim, of their water rights.

After reviewing all the claims, the court publishes a list of all unclaimed rights, those rights the Division of Water Rights knows of, but for which no claim was filed. At this point, entities have 90 days to submit a petition or objection to the list of unclaimed rights that was published by the court. The state engineer then makes a final attempt to contact any remaining party that might own water rights in the area to give them a chance to file their claims. The court reviews each petition and ultimately proposes a determination that will also allow 90 days for entities to submit objections and petitions. Once all the rights in an area have been verified and all petitions have been resolved, the rights are published, and any unverified rights are no longer recognized.<sup>37</sup>

<sup>37</sup> Utah Division of Water Rights, 2018, “General adjudication information,” <https://www.waterrights.utah.gov/adjinfo>.

While the established time limits for notification may lead one to believe this is a process that can be completed in a year or two, the entire process usually spans decades. The Utah Division of Water Rights is conducting adjudications with the goal of verifying and publishing all water rights for the entire state. The process is time-consuming and has not yet been completed for every water system in the state.<sup>38</sup> Some of these adjudications began a hundred years ago in the 1920s and the process is expected to take many more years to complete.<sup>39</sup> However, the Utah State Legislature has allocated more resources to the Division of Water Rights in recent years to accelerate the process.<sup>40</sup> Once all of the state's water rights have been published, it is anticipated that the process will begin again.

**Inspections During the Application Process.** The final verification procedure is through the water right application process. To be approved for a water right or to have the use of a right changed, a licensed engineer or an engineer from the Division of Water Rights must complete an inspection.<sup>41</sup> Should the engineer determine that a water right had been unused for a period of seven consecutive years, the right may be subject to forfeiture.<sup>42</sup>

## Who Oversees Water Law in Utah

**State Legislature.** The Utah State Legislature writes and revises state statute which codifies water governance in the state.

**State Engineer.** According to Utah statute, the State Engineer is, “responsible for the general administrative supervision of the waters of the state and the measurement, appropriation, apportionment, and distribution of those waters.”<sup>43</sup> The State Engineer is the head of the Division of Water Rights and is appointed by the Governor with the consent of the Senate.<sup>44</sup> Some of the responsibilities that the State Engineer is tasked with include making rules for water measurement and reporting, the inspection of dams, the enforcement of fines and penalties, the determination of water rights, and much more. The State Engineer is currently supported by deputies and assistant engineers who specialize in various aspects of water governance.

**State Courts.** The courts are the final arbiters on water right ownership. This can be done by settling disputes between multiple interested parties, settling adjudications, or decreeing the forfeiture of rights after being presented with evidence.

**Water Commissioner.** State statute defines commissioners' responsibilities as assuring “that water is properly measured, divided and distributed

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38 For the purposes of general adjudications, water systems are defined as hydrological areas pre-defined by the Utah Division of Water Rights. Comments with Eric Jones, Assistant State Engineer—Applications and Records, Division of Water Rights, 3 August 2023.

39 Utah Division of Water Rights, 2018, “General adjudication information,” <https://www.waterrights.utah.gov/adjinfo>.

40 Senate Bill 221, Water Related Sales and Use Tax Amendments, 2022 General Session, <https://le.utah.gov/~2022/bills/static/SB0221.html>.

41 As part of this inspection, proper headgates must be approved by the inspecting engineer. To help enforce water users to only take the allocated water, headgates are designed to only allow the amount of water through as specified on the water right (with some margin for error). Additionally, the engineer will inspect water usage. Interview with Eric Jones, Assistant State Engineer—Applications and Records, Division of Water Rights, 12 May, 2023.

42 Interview with Eric Jones, Assistant State Engineer—Applications and Records, Division of Water Rights, 12 May, 2023.

43 Utah State Statute §73-2-1 (3) (a), <https://le.utah.gov/xcode/Title73/Chapter2/73-2-S1.html>.

44 Ibid.



to the water users in accord with their respective water rights.”<sup>45</sup> As such, commissioners must keep records of water availability, water right holders’ calls for water, and the amount distributed to most efficiently manage water as specified on the individual rights. Water commissioners are appointed by the State Engineer.<sup>46</sup> There are roughly 36 water commissioners that currently oversee more than 40 water distribution systems.<sup>47</sup> They are supported by deputy commissioners and office staff.

## Water Rights Example

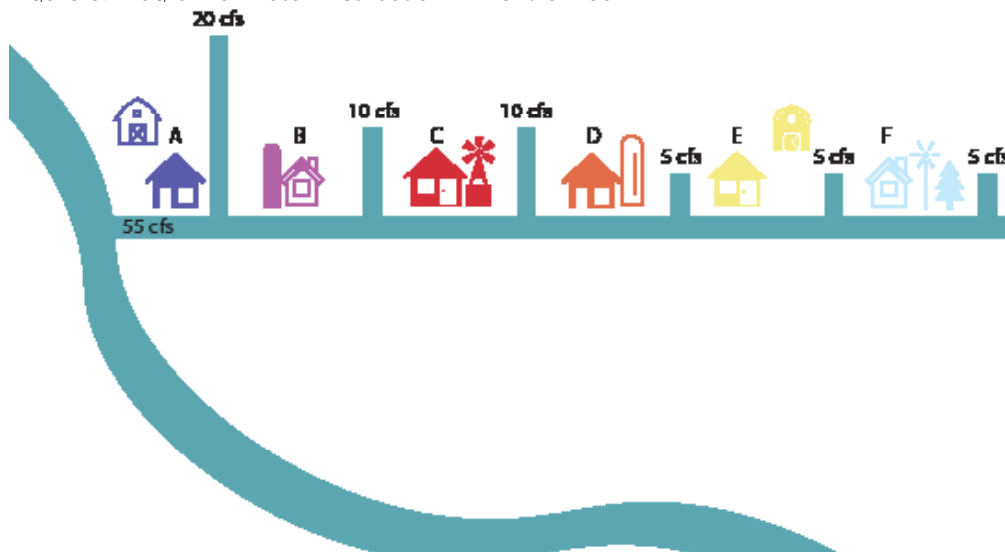
Water rights can be very complex as there are thousands of entities that hold water rights with different levels of priority on water from many surface and ground water sources. It will be much easier to understand the many dynamics that are in play with a simplified example.

**A Plentiful Water Year.** Suppose a water system has six farms with water rights to the system. The rights start with farm A which has the highest priority rights down to farm F with the lowest priority. The allocations are stated in flows of cubic feet per second (cfs), as follows:

- Farm A – 20 cfs
- Farm B – 10 cfs
- Farm C – 10 cfs
- Farm D – 5 cfs
- Farm E – 5 cfs
- Farm F – 5 cfs

### In a plentiful water year both senior and junior holders receive expected water.

Figure 3: Diagram of Water Distribution in Plentiful Year



The six farms require a total of 55 cfs to fulfill everyone’s water rights. After analyzing the various calls for water, the water commissioner sends 55 cfs of water toward these six farms, and each farm has enough water to meet their needs. (See Figure 3.)

<sup>45</sup> Utah Office of Administrative Rules, 2007, “Natural Resources,” <https://adminrules.utah.gov/public/rule/R655-15/Current%20Rules>.

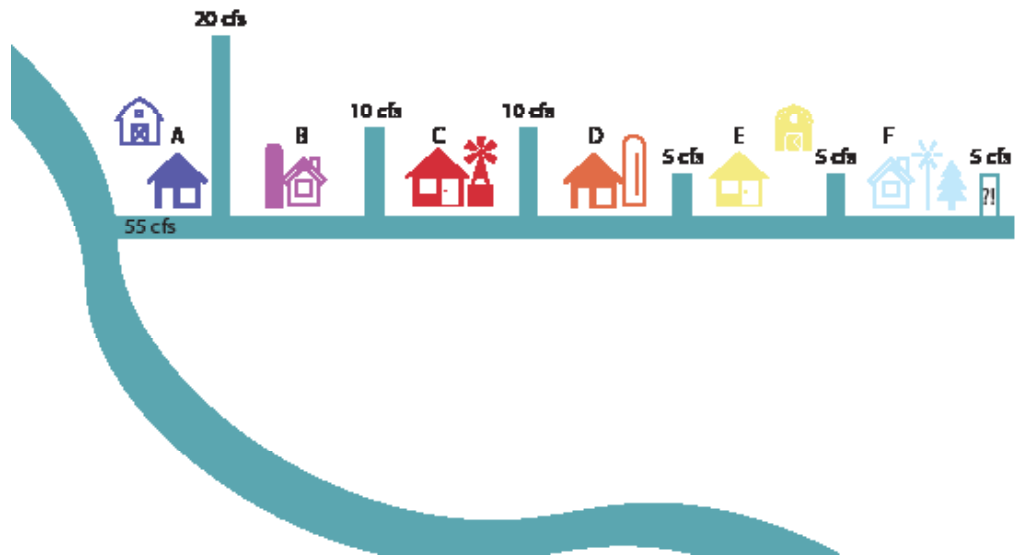
<sup>46</sup> Utah State Statute §73-5-1, [https://le.utah.gov/xcode/Title73/Chapter5/C73-5-S1\\_2021050520210701.pdf](https://le.utah.gov/xcode/Title73/Chapter5/C73-5-S1_2021050520210701.pdf).

<sup>47</sup> Utah State Statute §73-3-3 (6) (a) <https://le.utah.gov/xcode/Title73/Chapter3/73-3-S3.html>; Boyd Clayton, 2013, Utah Division of Water Rights, Change Applications and Priority, [https://webcache.googleusercontent.com/search?q=cache:e\\_YGC3DaD1wJ:https://waterrights.utah.gov/meetinfo/m20130318\\_law/20130318-bclayton-ChangeApps\\_Priority.docx&cd=1&hl=en&ct=clnk&gl=us](https://webcache.googleusercontent.com/search?q=cache:e_YGC3DaD1wJ:https://waterrights.utah.gov/meetinfo/m20130318_law/20130318-bclayton-ChangeApps_Priority.docx&cd=1&hl=en&ct=clnk&gl=us).

**Junior Right Holder Not Getting the Expected Water.** In the case that farm F realizes that it is not receiving the 5 cfs to which it is entitled even when there is enough water, it can submit a petition to the Division of Water Rights to notify the state that another water user is using more than they are allocated. (See Figure 4.) The division will send an enforcement agent to collect evidence of the violation of any water rights and will attempt to settle the disputes informally. If formal enforcement is necessary, the guilty party may be subject to fines, replacing water taken, and paying for the Division’s expenses in the process.<sup>48</sup>

**If a water right holder is not receiving the expected water, they can petition the Division of Water Rights for redress.**

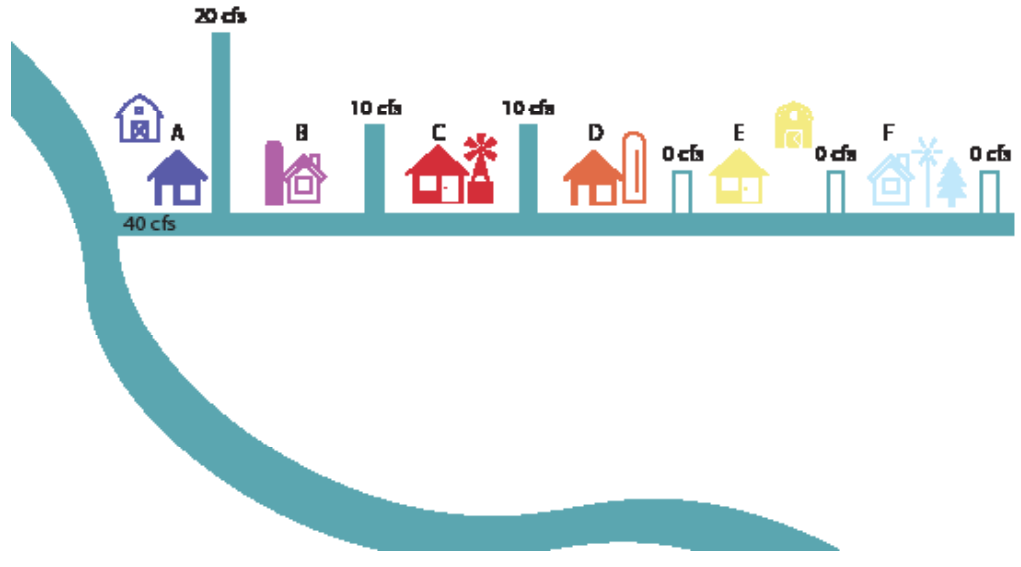
Figure 4: Diagram of Water Distribution in Plentiful Year, but Water Goes Missing



**A Dry Year.** In a dry water year, a water commissioner reconciles the call for water against the water available and diverts a determined amount of water for the farms to use. In this scenario, the commissioner may only be able to divert 40 cfs of the water to the farms. As a result, farms A, B, and C will be able to use all of that water, leaving the remaining farms without any water. (See Figure 5.)

**In a dry water year, senior holders receive expected water while junior holders receive none.**

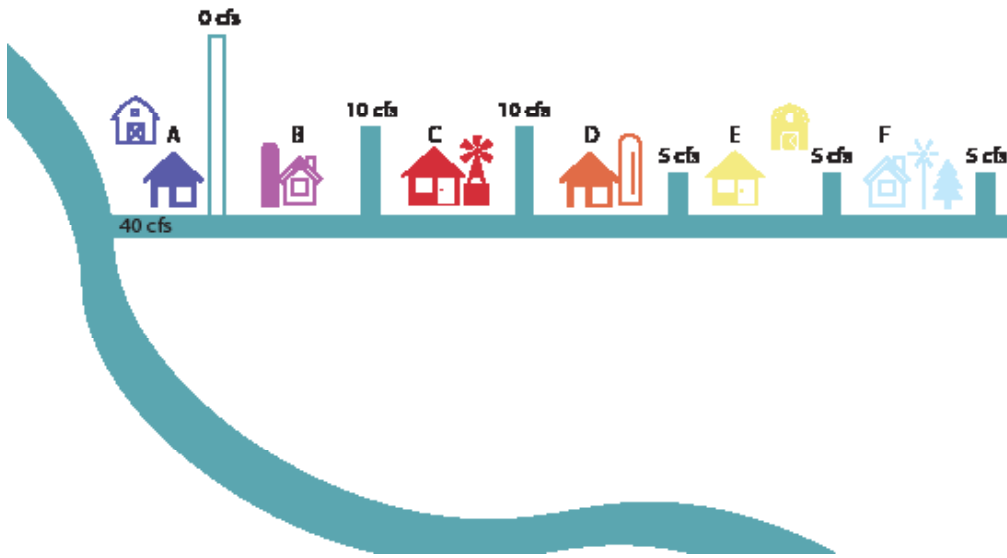
Figure 5: Diagram of Water Distribution in Dry Year



48 Utah Division of Water Rights, 2022, “Enforcement actions,” <https://www.youtube.com/watch?v=BM1BdSMr8Vs>.

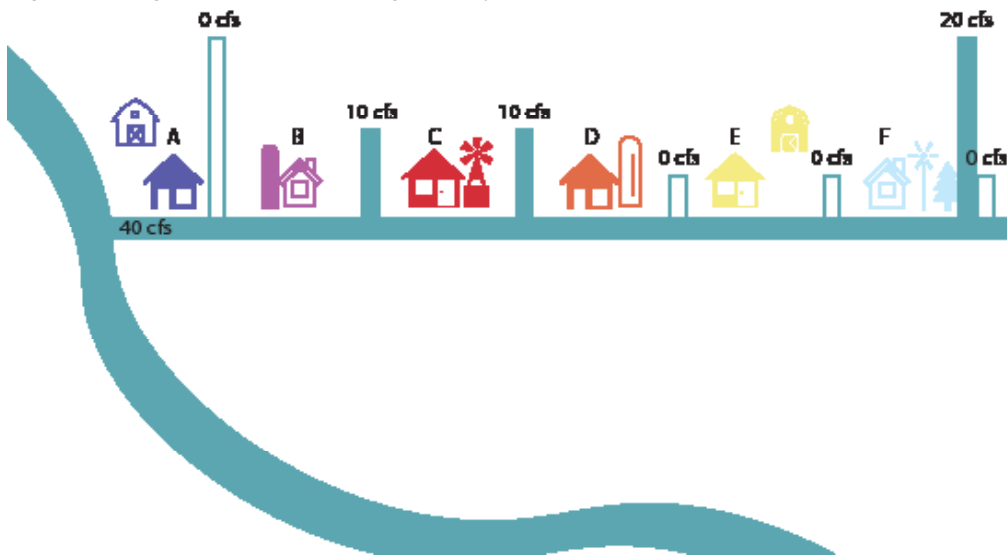
## In a dry water year if senior rights holders don't use all of their water, junior right holders can utilize it.

Figure 6: Diagram of Water Distribution in Dry Year when Senior Holders Forgo Full Utilization of Their Right



## Recent legislation allows senior holders to lease their water to others.

Figure 7: Diagram of Water Leasing in a Dry Year



the commissioner sends 40 cfs to the farms, farm F has the priority for 20 cfs but not for the original 5. If farms F, B, and C all use the full amount of their right then farms D, and E will still not receive any water. (See Figure 7.) It should be noted that in a dry water year, farm A could also lease the wa-

**Temporary Lower Use During a Dry Year.** Should farm A decide to fallow its fields for a season, this allows for the 20 cfs allotted to farm A to flow down to the other farms. In the case of a dry water year, this would allow for enough water to be used by farms D, E, and F. (See Figure 6.) As long as farm A uses its water right once in seven years, the right will not be at risk of forfeiture.

**Long-Term Lower Use.** In the case that farm A knows in advance that it will not need or will be unable to use the water for a period longer than seven years, the farm may submit a non-use application. A non-use application may only be granted for a maximum of seven years.<sup>49</sup>

**Water Leasing During a Dry Year.** With Senate Bill 26 that passed in 2020, farm A could lease all its water right to farm F, who would then have the water priority for the duration of the lease.<sup>50</sup> Because this would change the location of beneficial use, a change application would be required to be submitted. Any time that one of the five items listed on a water right is changed, a change application must be submitted.<sup>51</sup>

After approval, when the

49 Utah State Statute §73-1-4 (4) (a), <https://le.utah.gov/xcode/title73/chapter1/73-1-s4.html>.

50 Senate Bill 26, Water Banking Amendments, 2020 General Session, <https://le.utah.gov/~2020/bills/static/SB0026.html>.

51 Wilhelmsen, Teresa, 2023, Presentation on Day 2 of the 2023 Stegner Symposium on the Great Salt Lake, [https://www.youtube.com/watch?v=\\_E8UstgKsIk&list=PLrMz\\_WZNoCYQ7VOv\\_LjDd3uZz-bVgJPBh&index=9](https://www.youtube.com/watch?v=_E8UstgKsIk&list=PLrMz_WZNoCYQ7VOv_LjDd3uZz-bVgJPBh&index=9).



ter to conservation groups who could then use that water for conservation purposes. Each lease is negotiated individually, so the farm must decide whether it is beneficial to lease its water or if it could make more by simply growing and selling crops.

Another leasing option that may be more widely available in the future would be through the use of water banks. The state has undergone a research period where three pilot programs have been tested to better understand whether water banking is a viable option for the state. The idea is that if farm A knows it will not use all of its water, it can submit a change application and allow the water bank to manage the water that farm A no longer needs. This would allow for farm F to approach the water bank for any additional water that may be available in the area instead of working directly with farm A to come to an agreement.

### Earmarking for the Great Salt Lake During a Dry Year.

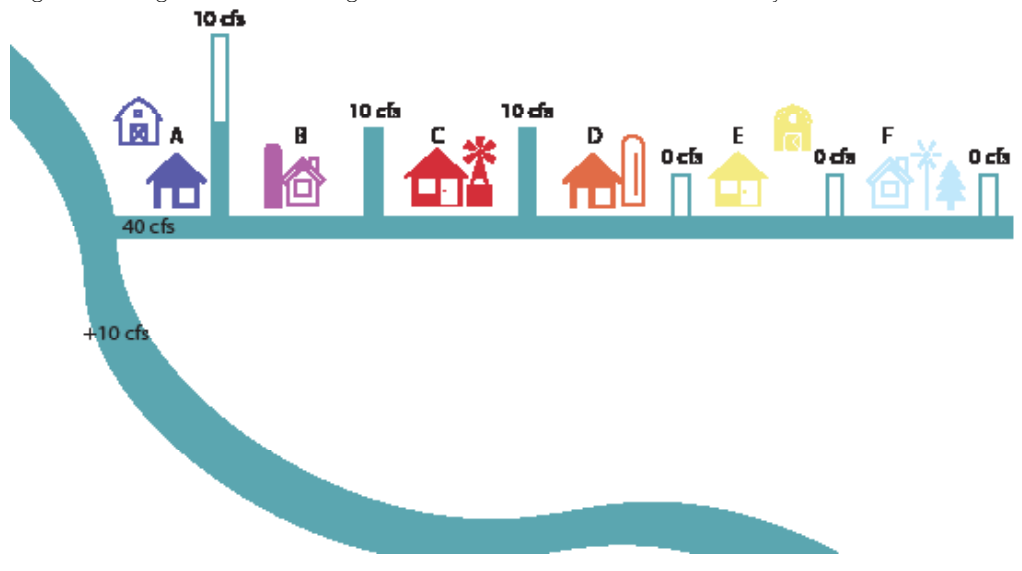
In another scenario, suppose that the water system that the farms rely upon also feeds into the Great Salt Lake. Farm A might decide that it would prefer to permanently reduce farming operations to support the Great Salt Lake ecosystem and only use half of its 20 cfs allocation. If the farm does nothing more than let the other half run downstream past the farm, it has no guarantee that the water it is not using will make it to the lake. It would be assumed by the junior water rights holders that farm A was not using

the water, so it can now take its allocation. In the dry water year scenario, if farm A decided to use only 10 cfs and let the other 10 cfs run down to the lake, it may never make it to the lake because farms D and E could use that 10 cfs for their farming operations.

In order to guarantee that the water makes it to the lake, farm A would need to work with the Division of Water Rights to submit a change application where the beneficial use of the water would change from agriculture to use on sovereign land for the benefit of the Great Salt Lake. If farm A's beneficial use was changed, when a commissioner sends 40 cfs down to the farms, 10 cfs would be reserved for the Great Salt Lake because it has the highest priority with farm A. (See Figure 8.) Such a change would be permanent until another change application was submitted to put that water back toward agriculture uses. This is the same process for any in-stream flows for any environmental or conservational purposes. Changing the use of water in this manner does not alter the seniority of the right.<sup>52</sup>

### Recent legislation allows water rights holders to reserve water for environmental use.

Figure 8: Diagram of Reserving Water for the Great Salt Lake in a Dry Year

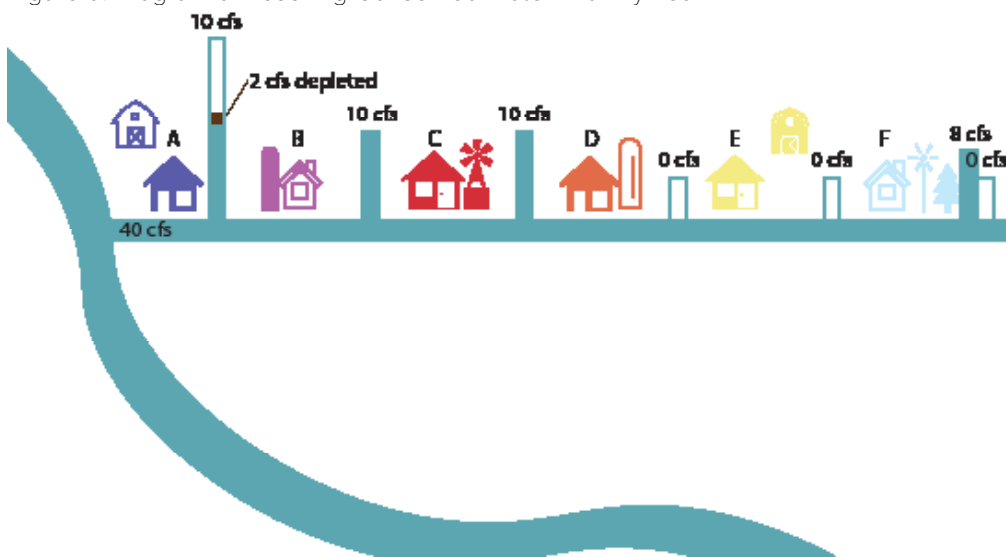


52 Utah State Statute §73-3-3 (6) (a) <https://le.utah.gov/xcode/Title73/Chapter3/73-3-S3.html>; Boyd

**A More Efficient Watering Method During a Dry Year.** If farm A decided to adopt more efficient watering systems (i.e., adopting sprinklers instead of flood irrigation), new problems are introduced. When water is applied for agricultural irrigation, a proportion of that water is expected to return to the natural system and be available for use by a downstream owner. However, more efficient water systems change the proportion of water expected to return to the natural system. In addition, more efficient water systems can also allow more intensive farming, which also may alter the proportion of water expected to be available for reuse downstream. As a result, more efficient watering systems will conserve water at the farm level, but its conservation impact on the watershed level will be smaller.

## Increased efficiency enables some conserved water to be resold.

Figure 9: Diagram of Reselling Conserved Water in a Dry Year



Senate Bill 277 passed in March 2023 provides grants to promote more efficient watering systems.<sup>53</sup> As a part of the grants, the Utah Division of Water Rights will measure how much water was being consumed before adopting more efficient technology, how much is being consumed with the more efficient watering systems, and how much water is being saved (through the reduction in consumption after the efficient technology is adopted). At that point, farm A could – subject to a change of use application – expand operations, lease, or sell that water right to others. (See Figure 9.)

**Water Rights May Not be Involved.** It is also possible that these farms do not own any water rights but are shareholders in an irrigation or canal company that owns the rights. Some irrigation companies operate as retailers as other operate as holding entities for individual’s water rights. Irrigation companies where individuals hold the water rights operate similarly to the scenarios outlined above. For irrigation companies that operation as water retailers, the irrigation company’s policy would dictate how water and discipline are carried out.

## WATER LAW AND UTAH’S FUTURE

Utah faces a challenging future as one of the driest states in the nation and one of the most quickly growing states in the nation. The distribution of water will play a strong role in both population and economic growth opportunities available in the state. As a necessary resource for growth, the

Clayton, 2013, Utah Division of Water Rights, Change Applications and Priority, [https://webcache.googleusercontent.com/search?q=cache:e\\_YGC3DaD1wJ:https://waterrights.utah.gov/meetinfo/m20130318\\_law/20130318-bclayton-ChangeApps\\_Priority.docx&cd=1&hl=en&ct=clnk&gl=us](https://webcache.googleusercontent.com/search?q=cache:e_YGC3DaD1wJ:https://waterrights.utah.gov/meetinfo/m20130318_law/20130318-bclayton-ChangeApps_Priority.docx&cd=1&hl=en&ct=clnk&gl=us).

53 Senate Bill 277, Water Conservation and Augmentation, 2023 General Session, <https://le.utah.gov/~2023/bills/static/SB0277.html>.

state will need to be careful in how it manages water today and in the future.

Water availability has a direct effect on Utah's economy as it is a key input for major industries such as power generation, mining, and agriculture. As the economy of the state grows, Utah will become a more desirable destination and will continue its large population growth as well. A larger population will also require more water resources to maintain a high quality of life for Utah residents. Additionally, the importance of saving water for natural ecosystems has been heightened due to research on the Great Salt Lake.<sup>54</sup>

It is important that the laws and regulations in Utah create an environment where water can be used efficiently to meet economic, population, and health expectations. Water law is important in facilitating efficient use and creating incentives for stakeholders in how to best use the water. For this reason, it is critical that water governance is carried out carefully to promote the best use of this important resource.

### Advantages of Western Water Law

In some ways, Western water law sets up Utah well as it faces its future challenges.

**Ensuring Beneficial Use.** One way that it does this is by ensuring beneficial use. The state regulates allowable uses and allows for flexibility as the social and economic landscape changes.<sup>55</sup> Policymakers can adjust what is defined as beneficial use to ensure water is not used outside of acceptable uses.

**Clear Allocation.** Additionally, Western water law has the benefit of making clear how water will be allocated given the water availability in any year. It is a stable system, so all players know exactly how the water will be used and how they can use it each year. With stable expectations of how the water may be used from year to year, stakeholders can make plans and adapt with variable water quantity from year to year.

### Disadvantages of Western Water Law

There are some notable disadvantages to Western water law as well. These could cause problems going forward. Some of these include adverse incentives, not enough resources for proper enforcement, and an unequal distribution of rights.

**Waste.** One potential problem with Western water law is tied up in the philosophy "use it or lose it" – if water is not used for seven consecutive years it is subject to forfeiture. This may create an incentive for water right holders to divert or pump more than the minimum amount of water needed. Utah statute declares that a portion or all of a water right can be forfeit if allowed to run to waste for seven continuous years.<sup>56</sup> In addition, another

54 Abbott, Benjamin W., et al, 2023, "Emergency measures needed to rescue Great Salt Lake from ongoing collapse," <https://s3.documentcloud.org/documents/23564741/gsl-emergency-report-2023.pdf>.

55 Lewis, Emily E., 2023, "Western water law 101: Not broken and ready to meet the moment," A presentation at the Wallace Stegner Center on January 19, 2023, <https://www.youtube.com/watch?v=ozzhw9MvHyM&t=2436s>.

56 Utah State Statute §73-1-4 (2) (d) (i) <https://le.utah.gov/xcode/title73/chapter1/73-1-s4.html>.





Waterway, Battle Creek, Pleasant Grove, Utah., Credit: Flickr User Don LaVange under license (CC BY-SA 2.0)

Utah statute states that water is not subject to forfeiture “if a water user has beneficially used substantially all of the water right within a seven-year period.” This allows for some flexibility of use as crop or watering needs may fluctuate from year to year. Based on the current level of enforcement by the Utah Division of Water Rights, it would be difficult to discover and determine that a portion of water was being allowed to run to waste because more water than necessary was being applied to the land.

A commonly recognized problem is that there is little incentive for farmers to install watering systems with higher efficiency if they then lose the right to use the water conserved.<sup>57</sup> Senate Bill 277 passed in March 2023 was specifically designed to address this concern, allowing farmers to subdivide their water right and sell the conserved water, providing a financial incentive to free up water for other uses.

Even worse than just overwatering is diverting water without putting it to the defined beneficial use in order to create the appearance that the water is being used according to the water right. For example, a farmer may open the head gates to divert water even though no crops were planted that year to make it appear that the water right would not be subject to forfeiture. While such use of water may not lead to large amounts of water depletion, it is clear that water simply being run through a system is not being put to the most efficient use in a dry, growing state. Utah statute clearly states that water that is let run to waste is still subject to forfeiture.<sup>58</sup> However, because the Utah Division of Water Rights uses metering and head gates as one of the primary forms of enforcement, gathering evidence to prove such wasteful usage would likely be much more difficult. This leads to the next problem: enforcement.

**Enforcement.** Due to the large geographical area of the state, enforcing proper water usage is extremely difficult. With limited resources, it is difficult for the state to manage all the water spread across such a wide area. The Utah Division of Water Rights is not a policing entity. Instead, they promote efficient water usage and distribution for the benefit of Utah citizens.

<sup>57</sup> Clyde, Steven, Emily Lewis, Jeff DenBleyker, Bob Harding, et al., 2020, “Legal analysis and review of select strategies for Great Salt Lake,” Prepared for the Great Salt Lake Advisory Council, Utah Department of Natural Resources and Utah Department of Environmental Quality, <https://documents.deq.utah.gov/water-quality/standards-technical-services/great-salt-lake-advisory-council/activities/DWQ-2020-017633.pdf>.

<sup>58</sup> Utah State Statute §73-1-4 (2) (d) (i), <https://le.utah.gov/xcode/title73/chapter1/73-1-s4.html>.

Because of this, it can be difficult to know whether each right is always used for its intended purpose.

**Inefficient Allocation.** One final disadvantage of Western water law is that prior appropriation may not be the most efficient method of allocating limited water resources. Because of this doctrine, the highest priority water rights were allocated to early Utah settlers experiencing far different challenges than we face in the state today. While many of the oldest rights have been abandoned or have had their uses changed to meet modern needs, it is possible that the highest priority water rights are no longer being allocated to the greatest needs in today's Utah. While one of the advantages of Western water law is its flexibility to meet changing needs, the disadvantage is that it is up to individual water right owners to adapt and become more flexible.

## POSSIBLE CHANGES TO WATER LAW

There have been a number of suggestions as to how water law might be modified to better fit Utah's future.

### Redefining Beneficial Uses

In order for the Western water law and its application in Utah to be effective, the list of beneficial uses may need to be flexible to meet changing needs and objectives in the state while continuing to be clearly defined and enforceable. The state has recently been updating possible beneficial uses as news about the danger of a dried-up Great Salt Lake has surfaced. Legislation has defined beneficial use to include the preservation of natural ecosystems for wild fisheries and for the preservation of the Great Salt Lake. It is likely that as new issues arise in the state that legislators may need to consider additional changes to the definition of beneficial use.

However, as more uses for water are determined to be beneficial to the state and its citizens, it should also be noted that there may need to be further limitations on what should be considered beneficial. As more uses are deemed beneficial, there may not be enough water to meet the demands of each use. There may come a time where beneficial use will need to exclude certain uses as well. Should the state continue to grow and the demand for water grows as well, voters and policymakers will need to prioritize how water will be used. It is plausible that legislators will have to make difficult decisions on which uses are most beneficial and exclude others to meet water demands. This could lead to limiting the growth of water dependent industries such as mining, agriculture, recreation, or power generation.

### Verifying Beneficial Use

Because there is an incentive to use the water to maintain ownership of the right, there is likely inefficient water use or even misuse in the state. While the Utah Division of Water Rights is the main regulatory body for verifying beneficial use, the agency does not have the resources to regularly inspect to make sure that each entity is using the water for the beneficial use that is stated on the right. One possible change to improve efficient water use could be to verify the beneficial use through regular inspection and enforcement.



Currently, such inspection or enforcement is irregular and only takes place when a complaint is made by an adversely affected party. As such, water misuse may be taking place without the knowledge of anyone that can enforce the proper water use. By having routine or random inspections that will ensure beneficial use, the limited water supply in the state could be properly allocated to promote the most efficient use.

One disadvantage of this approach is that it would be extremely unpopular for current right holders who may feel inspections to be intrusive.<sup>59</sup> Additionally, it would require significant funding and appropriate task force workers would need to be found, hired, and trained to fulfill this role. Because of the large geographical area of the state and the complexity of the water systems and water rights, a sizeable group of well-trained individuals would be required to make an impact on water efficiency. Additional resources would then be required to complete the forfeiture process through the judicial system.

### Open Water Markets

Legislation has tried to sidestep the difficulties of verification by passing laws that allow for incentivize water leasing and selling conserved water. These would ideally allow for water right holders to allocate their water to more efficient uses when it is not needed at any given moment. While this kind of legislation helps realign the incentives toward more efficient uses, it is unclear whether right holders take advantage of these programs.

These legislative actions are taking a few steps toward a more robust system of water markets. Water markets face a number of challenges, from legal requirements creating large transaction costs, to the fact that water rights are localized in space, time, and use, to the variableness of water availability. At the same time, water markets hold some of the most promise in reallocating water to the most needed areas. The Utah Water Banking



Alicia, North Fork of the Duchesne River, Near Tabiona, Utah, Credit: Flickr User Ken LUND under license (CC BY-SA 2.0)

<sup>59</sup> Interview with Eric Jones, Assistant State Engineer—Applications and Records, Division of Water Rights, 12 May, 2023.

Act (Senate Bill 26) in 2020 created a pilot program to find ways to improve water markets in Utah. The act created two possible structures. The first is water bank structure built to facilitate interested parties to make individual contracts. The second was the creation of a water bank that functions similarly to private irrigation companies. In this system, water right holders would “deposit” their rights into the organization which could then be leased by interested parties. Three pilot programs to test this act have been conducted and a full report on the effectiveness and usefulness will be released in November of 2023.<sup>60</sup>

A natural outgrowth of water markets is a water futures market, where instead of a buyer and seller transacting water in the present, they agree to transact water at a future date at a set price. Futures contracts are well established in the agriculture world where farmers use them to mitigate risk. California created a water futures market in 2020.<sup>61</sup> It is not clear as to how beneficial this futures market has been in allowing the relocation of water in more efficient ways. There are reports of hesitancy by farmers to be involved, and concerns that mitigating risk financially may not help address the physical risks to the state’s water system.<sup>62</sup> This is a possible solution that would need some further research.

The disadvantage of both strategies is that such a system could also incentivize speculation on water prices within water markets. In doing so, speculative investors could possibly out-price water users to the point that it would no longer make sense to own water rights and to shut down operations that are beneficial to the state and its residents. At the same time, higher priced water might better represent the “true cost of water.” The current lower cost of water benefits those with older priority dates. Holders with junior claims bear the economic cost of not gaining access to water that they might under a water market system.

### Shortened Window to Forfeiture

One final possible solution would be to shorten the time frame before water rights are forfeited. By doing this, water right holders would have a greater incentive to make use of the change applications for non-use or to more actively seek out leasing opportunities in years where they may not need as much water. Due to a greater threat of forfeiture, right holders would need to be more conscious of their water use and would be able to plan accordingly.

The disadvantages of such a strategy would require more inspection and enforcement, which has its own problems as mentioned previously. Currently, state adjudications do not move quickly enough to be able to enforce shorter forfeiture time frames so a new system of verification of use would need to be implemented. Additionally, this strategy would likely be unpopular among water right holders as they already fear forfeiture with the current time frame of seven years. It is possible that a shorter time frame would lead to even greater misuse because of the fear of forfeiture.

60 Lewis, Emily E., 2023, Presentation on Day 2 of the 2023 Stegner Symposium on the Great Salt Lake, [https://www.youtube.com/watch?v=\\_E8UstgKsIk&list=PLrFmz\\_WZNoCYQ7VOv\\_LjDd3uZzbVg-JPBh&index=9](https://www.youtube.com/watch?v=_E8UstgKsIk&list=PLrFmz_WZNoCYQ7VOv_LjDd3uZzbVg-JPBh&index=9).

61 Kammeyer, Cora, 2021, “California’s water futures market: Explained,” *Pacific Institute*, <https://pacinst.org/californias-water-futures-market-explained/>.

62 Cohen, Michael, 2021, “Implications of California’s water futures market,” *Pacific Institute*, <https://pacinst.org/implications-of-californias-water-futures-market/>.



## International Alternatives to Water Law



While Western water law and riparian water law are the primary models in the United States, other countries take different approaches. This sidebar briefly highlights some points of Israel and Australia water law: governmental appropriation during drought and a free-market approach to water rights.

Israel's approach has many similarities to Western water law. All water sources are controlled by the state and all citizens are given the right to use the water. This right is granted as long as the use does not lead to the salination or depletion of the water source. However, according to the Water Law of 1959, the Director of the National Authority may order the reduction of water from a given source if it is decided that such action is required.<sup>63</sup> Instead of letting the system of prior appropriation determine who must decrease their water use in times of drought, the government makes those decisions. Resources suggest that the government has been reducing the allocation of water in agriculture for some time already.<sup>64</sup>

Australia has decided to use a water market system manage water usage. While the system was originally very similar to the riparian right system, the government has made the transfer of rights easier by allowing for the unbundling of the water right from the land.<sup>65</sup> This allows for more free market transactions of water rights by creating water brokers that can buy water rights to more efficiently match interested buyers and sellers of rights.<sup>66</sup> However, the water market in Australia does not include the entire country, but creates smaller markets called catchment areas where the trading of water rights must be contained.<sup>67</sup>

## CONCLUSION

The State of Utah has been managing water in one of the most arid climates in the United States for many decades. Throughout the state's history, it has relied solely on Western water law to govern this scarce resource. Such governance has served the state well for much of its history, but adjustments may be helpful to meet the demands of a changing future. There are many regions throughout the United States and the world that are also navigating the uncertainty of future water resources. Utah should utilize and learn from the experiences of other governmental bodies that are working to solve similar water issues. Such experience can help guide how the state proceeds to provide a high standard of living for its residents.

The importance of careful and effective water governance will only increase as Utah's population and economy grow. While legislators have already begun to make some adjustments to adapt to this new future, regular consideration and careful planning may be required to maintain the quality of life that Utah helps foster for both existing and new residents.

63 Food and Agriculture Organization of the United Nations, "Unofficial translation of Israeli Water Law, 5719-1959," <https://faolex.fao.org/docs/pdf/isr1321.pdf>.

64 Marin, Philippe, Shimon Tal, Joshua Yeres and Klas Ringskog, 2017, "Water management in Israel: Key innovations and lessons learned for water-scarce countries," World Bank Group, <https://documents1.worldbank.org/curated/en/657531504204943236/pdf/Water-management-in-Israel-key-innovations-and-lessons-learned-for-water-scarce-countries.pdf>.

65 Department for Environment and Water, 2023 "Unbundling water rights," South Australia, <https://www.environment.sa.gov.au/topics/water/water-licences-and-permits/unbundling-water-rights>.

66 Ibid.

67 Department of Climate Change, Energy, the Environment and Water, 2023, "Australian water markets," Australian Government, <https://www.dcceew.gov.au/water/policy/markets>.



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**Wheeler Machinery**

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