



Promoting In-Stream Flows in the Changing Western US

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Introduction

In-stream uses of water are a recent conception in western U.S. states. Beginning in the late 1800s, traditional prior appropriation law, and the water allocation systems that it informed, strongly incentivized users to appropriate water for beneficial uses such as agricultural and municipal water supply, hydropower generation, mining, and navigation. In-stream water purposes such as fish habitat, aquatic ecosystems, recreation, and aesthetic values were not considered reasonable and beneficial uses and therefore not afforded protection when western water was allocated. As a result, by the mid-1900s, many western rivers had been fully or overappropriated without consideration for in-stream water needs. Only in the 1980s did states start to consider in-stream flows within their water management systems.

Agriculture accounts for approximately 90% of western water use, but that proportion is declining rapidly to supply growing urban populations (Elias et al. 2016). Many of the fastest growing cities in the country are in the west, and municipal entities and urban water districts can charge higher rates for water than irrigation companies (Fort 2002). This major shift in water demands represents both an opportunity to increase in-stream uses and a challenge because declines driven by improving irrigation efficiency and reducing conveyance losses can decrease critical return flows to rivers and streams and negatively affect ecosystems.

Along with shifting water demands, climate change impacts are being preferentially felt in the west, where conditions are already arid and much of the water supply is stored in snowpack (Aguado et al. 1992; Barnett et al. 2008). Observations and future projections show an increase in temperature and the fraction of precipitation falling as rain instead of snow. These changes reduce water available to crops during the summer months and further compound tradeoffs between traditional agricultural, urban, and other water uses and at-risk ecosystems (Elias et al. 2016).

Public support for in-stream flow policies is growing because of changing cultural values for ecosystems, recreation, and aesthetics; a changing climate; and mounting awareness of ecosystem services

and the ecological consequences of traditional western water management (Endter-Wada et al. 2015). Existing in-stream flow policies vary by state, but generally include a set of possible entities that can participate (e.g., state agencies, municipalities, and individuals), in-stream purposes that are considered (e.g., fish, ecosystems, and recreation), and water rights transaction types that are permitted (e.g., temporary, permanent, and split-season) (Szeptycki et al. 2015). However, there are several limitations to implementing in-stream flows. The use-it-or-lose-it nature of western water law limits the availability of source water because water rights holders who conserve water and leave conserved water in a stream may lose (forfeit) their rights.

It is also challenging to reliably monitor and verify that water left in-stream for aquatic ecosystems flows past intermediary diversions to the in-stream point of use. These challenges are most critical in the late summer when aquatic ecosystems most need in-stream flows and water is naturally most scarce and also in highest demand by irrigation and urban users.

The state of Utah has the fastest growing population and second driest conditions of any state. Utah also has some of the highest municipal and agricultural water use and exemplifies several key challenges and opportunities for in-stream water management in western states (Office of the Utah Legislative Auditor General 2015). In-stream flows are important to discuss now because (1) water managers, users, environmental nongovernmental organizations (NGOs), and the general public are increasingly interested in in-stream flows; (2) the need to make recent research to manage water to enhance in-stream, floodplain, and wetland ecosystems (e.g., Auble et al. 2005; Alafifi and Rosenberg 2014; Alminagorta et al. 2016) more policy relevant; and (3) Utah and other western states are looking to further change their in-stream flow laws.

This forum article reviews the tools available to promote in-stream flows within the Utah water rights system and identifies implementation challenges. Two case studies on the Little Bear and Blacksmith Fork Rivers in northern Utah illustrate some of the challenges and potential paths forward to use existing laws and available tools. We outline key technical and legislative opportunities to promote in-stream flows in Utah both within and outside the existing water rights system. We also explain how work on in-stream flows in Utah is relevant for other western states. These tools, challenges, and opportunities stem from our review of relevant state statutes, conversations with staff from NGOs actively developing in-stream flow projects, and moderating a panel discussion at a regional Spring Runoff Conference held in Logan, Utah, in April 2018 that featured a Utah legislator who has authored in-stream flow bills, a member of the leadership team of the Utah Department of Natural Resources, and a local mayor looking to procure in-stream flows for a river that runs through his municipality.

Existing In-Stream Flow Tools and Challenges

Utah water law allows in-stream water use for “the propagation of fish, public recreation, or the reasonable preservation or enhancement of the natural stream environment.” Under the law, the Divisions of Wildlife Resources (DWR) and Parks and Recreation can appropriate water for in-stream uses [HB 58 (73-3-3), 1986].

A subsequent statute [HB 117, 2008] allows nonprofits that specifically promote fishing in Utah, such as Trout Unlimited (TU), to file temporary water rights applications for in-stream flows to protect native trout habitat.

There is rapidly growing interest in protecting and enhancing in-stream flows in Utah. A recent survey of 2,400 households along the Utah Wasatch Front showed the majority of respondents support environmental policies that protect in-stream flows and fish and wildlife habitat (Endter-Wada et al. 2015). Respondents prioritized protecting in-stream flows above saving taxpayer money or ensuring water supply for economic development. Economic benefits of in-stream flows for outdoor recreation are also increasingly evident. A statewide angling survey indicated that fishing is an important economic driver in Utah, with 4.3 million fishing trips and 6.2 million angler days occurring in 2016 alone (Liliehalm et al. 2016).

However, major constraints on the entities that can own or lease in-stream flows, allowable in-stream purposes, and persistently high transaction costs have resulted in very few successful in-stream water rights transfers under the existing laws. Since 1986, DWR has acquired eight total in-stream flow rights (2.8 cubic meters per second [cms], 100 cfs) (Szeptycki et al. 2015) and TU has acquired two temporary rights (0.05 cms). This in a state that tallies approximately 1 million acre-feet per year in water supply available to municipal and industrial uses (Office of the Utah Legislative Auditor General 2015) and a much larger volume to agriculture. The few successful in-stream flow efforts were initiated reactively in response to local fisheries endangerment (e.g., Little Bear, Weber, and Lower Provo). Although this a start, many allowable in-stream flow protection mechanisms have yet to be tested either legally or with the Utah State Engineer.

Promoting In-Stream Flows

Work within the Existing Water Rights System

Several promising tools can work within the existing Utah water rights system to promote in-stream flows. These tools seek to overcome one or both of the following key challenges: (1) acquiring a water *source*, either through existing water rights (leased, donated, or sold) or unappropriated water, and (2) *shepherding* water from the identified source to the in-stream use location while preventing intermediary users from filing on or diverting the water.

- *Incentivize water conservation (source)*: An in-stream flow lessor encourages a water rights holder to conserve water. Then conserved (undiverted) water remains in-stream until the next downstream point of diversion. Water savings can occur through efficient irrigation technology, change in type of crop, metering, secondary water use, recycled water, irrigation scheduling, regulated deficit irrigation, or rate changes. Water savings often must be incentivized through tools such as voluntary landowner incentive programs.
- *DWR acquisitions (source and shepherding)*: DWR can acquire temporary or permanent water rights for in-stream uses by donation, lease, or exchange.
- *Federal Energy Regulatory Commission (FERC) Relicensing (source and shepherding)*: 23 active hydroelectric facilities in Utah require a FERC license to operate. In-stream flow releases can be a condition for relicensing. Public input is sought as part of the relicensing process, and timing is critical because licenses may last up to 40 years. This process can be protracted, expensive, and highly contentious.

- *Split-season irrigation (source)*: In late summer, irrigators forego use of their water right and leaves that water in-stream. The in-stream flow lessor often compensates the irrigator for the foregone late-season crop, which may be a third or fourth cutting of alfalfa. However, the State Engineer's Office has not traditionally allowed a water user more than one use per season, which a split-season lease would violate. It remains unclear whether split-season leases will be recognized without the need for statutory change.
- *Water banking (source and shepherding)*: A water rights holder deposits unused rights into the water bank (reservoir, aquifer, off-stream storage), which protects against rights forfeiture. Then, another entity (e.g., DWR, TU) leases or purchases the deposited rights from the bank for in-stream uses. The water bank facilitates short-term in-stream water rights transfers and can provide protection to shepherd in-stream water. In Idaho, more than 30 in-stream transfers have been processed through a statewide water banking system (Szeptycki et al. 2015).
- *Public Trust Doctrine (source and shepherding)*: The Public Trust Doctrine allows states to hold navigable, and sometimes non-navigable, waters in trust for use by the public for commerce, navigation, leisure boating, fishing, and other lawful purposes. What constitutes public trust resources has varied over time and across states. In Utah, issues involving the Public Trust Doctrine have primarily pertained to property rights and public access to waterways on private land (Craig 2010). In select cases, other states have expanded their public trust doctrine to supply and preference certain in-stream flows over prior appropriation water rights that caused environmental harm (e.g., Mono Lake, California, in 1985).

Case Studies

Each of the in-stream flow tools listed previously is nominally permitted under existing water rights law, but they have been rarely or are yet to be implemented. There is a need for case studies to test and demonstrate their efficacy. The following case study illustrates opportunities and challenges to promote in-stream flows using current laws and available tools.

Incentivizing Conservation on the Little Bear River

Irrigation diversions on the low-gradient South Fork Little Bear River in northern Utah drive chronic summer dewatering of native trout habitat. The watershed is 88% privately owned and water is heavily allocated for irrigation, limiting the water available to remain in-stream. A single hour of channel dewatering can have a population-level impact on fish through physiological stress, reduced food supply, and reduced habitat availability that may take years to recover (Schmutz et al. 2015). To address this concern, TU—a local NGO that constitutes an acceptable leasing entity under HB 117—worked with a local rancher to install a more efficient irrigation system to reduce water demand. In exchange, TU temporarily leased 0.008 cms of senior water rights from the landowner during the irrigation season from May 1 to September 30 under HB 117. Leased water remains in-stream for 2 miles to the next point of diversion to benefit a locally important fishery for native Bonneville cutthroat, wild brown trout, and mountain whitefish. Leasing senior water rights overcame the limitation of acquiring junior water rights that may receive little to no water in dry years.

TU faced several challenges in the Little Bear River in-stream flow lease agreement. Although temporary leases are much preferred to permanent transfers by most private water rights holders for their flexibility and limited commitment, the leasing entity must

renegotiate or transfer rights when the water rights change owners. It took 3 years for TU to complete the lease, they had to establish new lease agreements each time the land and water rights switched owners, and they only obtained a 4-year rather than a 10-year lease because of ownership change. The stream length augmented by in-stream flows was also limited by downstream diversions. Unclear water rights allocations (often based more on common practice than measurement), inconsistent measurement units (e.g., time window, volume, rate), and complex climate and hydrology all contributed to uncertainty in achieving in-stream flow objectives.

Other tools besides leases may help promote in-stream flows on the Little Bear River. Split-season irrigation could be used to procure in-stream water in dry years if a farmer is willing to accept payment to forgo a third or fourth cutting of alfalfa and leave water in-stream. Secondary metering could promote water conservation by providing the landowner with more information about their water usage. A water banking system would make water available to the highest beneficial use, which may be in-stream flows. If there are economic incentives and legal assurances for water rights holders to maintain the local fishery above a late-season crop harvest, farmers could lease or sell their water rights to in-stream leasing entities through the water bank.

Balancing Multiple Uses on the Blacksmith Fork River

The lower Blacksmith Fork River in Nibley, Utah, supports a substantial brown trout fishery and a riparian corridor that provides summer shading and privacy to local homeowners. In dry summers, the river is frequently dewatered by diverters to irrigate adjacent homeowner and municipal property as well as small farms. Local homeowners and city officials have expressed interest in keeping water in the river through the summer to maintain recreation, aesthetics, and wildlife. One proposed solution is to reallocate a previously contaminated spring owned by Nibley City as a source of in-stream flow water. However, Utah law does not allow municipalities to file in-stream water rights applications. Without an in-stream water right transfer, there is no guarantee the spring water could be shepherded through the dewatered section past multiple diversions. This uncertainty in the proposal's in-stream benefits constrains infrastructure (e.g., monitoring gauge, canal to transport source water to river) or political (e.g., promoting constituency support) investments by the city. Additional challenges include unclear water rights and priority in the basin, limited flow measurements, and inconsistent measurement units (e.g., time window, volume, discharge).

Allowing municipalities like Nibley City to file for in-stream water rights in addition to DWR and TU would increase the potential sources of in-stream water and empower more stakeholders to acquire in-stream rights. Considering more in-stream purposes would also allow for explicit recognition of a broader suite of potential benefits than native trout alone. In addition to supporting native trout habitat, likely benefits of in-stream flows on the Blacksmith Fork River not currently considered under state water laws include riparian vegetation, recreation such as riverside trails, and aesthetic benefits such as enhancing city parks and private property adjacent to the river.

Expand Existing In-Stream Water Rights Law

In addition to currently available tools, several statutory modifications could help promote in-stream flow efforts and provide more clarity on the interpretation of laws governing in-stream water uses:

- *Allow more entities to participate*—Currently, in-stream water source identification and shepherding require DWR or TU be involved. Expand the entities that can participate in *HB 117* to allow conservancy districts, local irrigation districts, water

user associations, municipalities, individual water rights holders, and NGOs. More participating entities will offer more opportunities for partnerships, collaborations, and bottom-up alliances to secure in-stream flows.

- *Allow more in-stream purposes*—Currently, allowed in-stream purposes under *HB 117* focus on creating native trout habitat. Expand allowable in-stream purposes to include other ecological endpoints such as aquatic and riparian species and habitat.
- *Allow water users multiple uses per season*—Current law is silent on whether water users can have multiple uses per season. The State Engineer's Office has traditionally allowed only a single use. Modifying *HB 117* to recognize multiple uses per season would allow split-season leases and other mechanisms that simultaneously promote in-stream, agricultural, and possible other uses.
- *Allow permanent transfers*—Permanent protection of undiverted water rights for in-stream flows under *HB 117* would encourage water conservation and provide a critical additional water source for in-stream uses. Allow permanent transfers of undiverted water rights to permitted entities in cases with clear biological need for in-stream water.
- *Expand HB 58 to allow more entities to participate*—Currently, only the Divisions of Wildlife Resources and Parks and Recreation can appropriate water rights for in-stream flows under *HB 58*. Allow more state entities to participate and allow these entities to shepherd in-stream water past diversions. Increased participation would reduce transaction costs (time and resources) and encourage more in-stream water rights transfers under the statute.
- *Expand the Public Trust Doctrine to include an ecological public trust (source and shepherding)*—Expanding to promote in-stream flows in Utah will require expanding the definition of public trust resources to include ecological integrity in waters and on adjacent lands. Expansion could also seek to broaden commerce to allow ecosystem services and their associated economic values.

Broader Implications for Western Water Management

Six recommended tools to improve in-stream flows in Utah also apply to numerous other western states (Table 1). For example, Arizona, Colorado, Idaho, New Mexico, and Wyoming also only allow specified state agencies to lease or purchase water rights for in-stream uses (Szeptycki et al. 2015). These states could all encourage more bottom-up approaches by allowing other entities such as nonprofits, municipalities, water districts, and private individuals to secure water rights for in-stream flow purposes. Although all 10 western states now recognize the environmental as a beneficial use, the specific purposes that qualify for in-stream water rights remain highly constrained or not well specified in Arizona, Montana, New Mexico, Nevada, and Wyoming. Expanding in-stream purposes in these states would encourage more holistic approaches to maintain river ecosystems and promote more ecological benefits per unit of in-stream water. Five states already allow split-season uses, but the practice requires more extensive testing and use. Similarly, permanent in-stream water rights transfers are already allowed in all states except Utah and Idaho but require more testing and use. Expanded use of permanent transfers would help secure long-term in-stream benefits and encourage investments in long-term restoration or recreational activities. Although Idaho, Texas, and recently Colorado already have active water banks, other states such as

Table 1. Key recommendations to promote in-stream flows across western states

Recommendation	Utah	Arizona	California	Colorado	Idaho	Montana	New Mexico	Nevada	Texas	Wyoming
Allow more entities to participate	X	X	—	X	X	—	X	—	—	X
Allow more in-stream purposes	X	X	—	—	—	X	X	X	—	X
Allow multiple uses per right	X	—	—	—	X	X	X	X	—	X
Allow permanent transfers	X	—	—	—	X	—	—	—	—	—
Establish water bank	X	X	X	—	—	X	X	X	X	—
Incentivize water conservation	X	X	—	X	X	—	X	X	—	X

Source: Data from Szeptycki et al. (2015).

Note: X indicates states that have not yet fully implemented these measures.

New Mexico and Nevada (similar to Utah) allow water banking but banking requires more extensive testing and use. Finally, only California, Montana, and Texas explicitly allow conserved water to be transferred to in-stream uses. Applying this tool in other states would incentivize conservation and efficiency measures and provide critical source water for in-stream purposes without constraining current activities. As states adopt these tools, they can provide a wealth of information and experience to help other states overcome challenges and identify best paths to implement.

Conclusions

Overappropriated western water management systems and the use-it-or-lose-it nature of western water law prefer existing agricultural and urban water uses and make it difficult to acquire and shepherd in-stream source water to the in-stream point of use. At the same time, many western states are experiencing rapid population growth supported by agricultural to urban water transfers, and residents increasingly support water management policies that promote and maintain in-stream flows. This transition period presents an important opportunity to extend western water laws to explicitly include multiple in-stream uses alongside traditional agricultural, urban, and other uses. Within Utah, in-stream flow policies could be improved by expanding existing laws to allow more local, state, and regional entities to participate; allow more in-stream purposes; explicitly allow multiple uses per season; and permit permanent water rights transfers to instream uses. These tools can also be beneficially applied in other western states, while tools that are already allowed require more extensive testing and use. All of these tools will empower a more diverse set of local water users to create bottom-up in-stream flow projects and give these local users more flexibility to meet their specific water management objectives.

Data Availability Statement

All materials used during this study are available in an online repository IN-STREAM (2019) at <https://digitalcommons.usu.edu/instream/>.

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