`MULTI-LEVEL COLLABORATIVE MANAGEMENT OF COLORADO'S INSTREAM FLOW PROGRAM`

by
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A thesis submitted to the Faculty of the Graduate School of the University of Colorado in partial fulfillment of the requirement for the degree of Master of Science Environmental Studies Program
2014

This thesis entitled:
Multi-level Management of Colorado's Instream Flow Program
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has been approved for the Program of Environmental Studies

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Date 5/15/14

The final copy of this thesis has been examined by the signatories, and we Find that both the content and the form meet acceptable presentation standards Of scholarly work in the above mentioned discipline.

IRB protocol # 14-0004

ABSTRACT

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Multi-level Collaborative Management of Colorado's Instream Flow Program

Thesis directed by Associate Professor Deserai Anderson Crow, Ph.D.

Managing water in a way that maintains human welfare and meets the demands of surrounding ecosystems involves a variety of stakeholders, diverse sets of values and, subsequently, a wide range of competing uses. Since the early 1970s, instream flow uses, or water intentionally kept in a stream for the purpose of preserving or improving the natural environment of that stream, have become an increasing part of the conversation about water allocation in the West. The management of Colorado water involves numerous values and interests, many of which are in direct conflict to each other. As such, it is often difficult to translate those competing interests into a real world management regime in which all values are represented. Collaborative management, a process of identifying and developing general programs, specific projects, and the subsequent institutional structures to implement those projects in the real world (Gerlach, 1995), offers a flexible, holistic, and balanced approach to water management and is particularly useful when considering instream flow protection in Colorado. The goal of the following analysis is to better understand the institutional arrangements that surround the implementation of Colorado's ISF Program in order to better explain whether the role of collaborative management in Colorado water governance has been and will be a successful approach to protecting ISF in Colorado.

ACKNOWLEDGEMENTS

Thanks you first and foremost to my adviser, Dr. Deserai Crow, who provided continuous support, guidance, and feedback throughout all of my research.

Thank you to Doug Kenney, whose insight into Colorado water was instrumental in broadening the value of my work.

Thank you to Katie Dickinson, whose insightful comments and tough questions made my research stronger.

Thank you to John Pitlick, whose knowledge of surface hydrology and experience with the USGS was instrumental to figuring out my data analysis approach.

Thank you to Andrew Wickert, whose endless support and willingness to help me problem solve for hours encouraged me to push my research further.

Thank you to Elizabeth Koebele who edited countless drafts of class papers and served as a sounding board for many ideas the last two years.

Thank you to all of my interviewees, who generously donated their time and expertise to making my research as informed as possible.

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CHAPTER I

INTRODUCTION

The quantity and quality of water available to a particular region is vital for ecological health, local and national economies, and functioning of government. Increased consumptive use threatens its availability for ecosystems and, consequently, future human use. Managing water in a way that maintains human welfare and meets the demands of surrounding ecosystems involves a variety of stakeholders, diverse sets of values and, subsequently, a wide range of competing uses. Additionally, in the Western U.S., water is appropriated using discrete property rights, which some argue are in contradiction to its continuity and connectivity as a resource, making competing claims and interests difficult to regulate (Easter and Tsur, 1995). Since the early 1970s, instream flow (ISF) uses, or water intentionally kept in a stream for the purpose of preserving or improving the natural environment of that stream, have become an increasing part of the conversation about water allocation in the West. ISF is important for aquatic organisms, wildlife, riparian areas, recreation and aesthetics, environmental protection, hydropower, navigation and channel maintenance (Gillian & Brown, 1997).

As water is appropriated and diverted for an increased number of beneficial uses, and as peak flows shift in magnitude and seasonality, human use will approach the limits as to the number of demands of what any given stream can supply (Leopold, 1994). Even with new technologies that maximize efficiency, there continues to be an overall trend of decreasing supply and increasing demand (Brown, et. al., 2013). Collaborative management, a process of

identifying and developing general programs, specific projects, and the subsequent institutional structures to implement those projects in the real world (Gerlach, 1995), offers a flexible, holistic, and balanced approach to water management and is particularly useful when considering Colorado water law and the preservation and improvement of the natural environment. The management of Colorado water involves numerous values and interests, many of which are in direct conflict to each other. As such, it is often difficult to translate those competing interests into a real world management regime in which all values are represented. Collaborative management allows different organizations with varying authority and goals, such as government agencies and NGOs, to leverage resources and skills in order to diversify available tools and create innovative and flexible management regimes that lead to greater on-the-ground success.

An in depth case study of the Colorado Water Conservation Board (CWCB), the only state agency allowed to hold a water right instream for environmental purposes, and the Colorado Water Trust (CWT), the only private entity and non-governmental organization actively working to secure water acquisitions for ISF uses on behalf of the CWCB, provides insight as to how the current institutional arrangements underlying Colorado's Instream Flow Program are an example of collaborative management and how collaborative management has played a role in the past and current success of the Instream Flow Program.

The following analysis uses 3-in-10 short-term leasing as a focal point from which to examine the broader institutional structures and context that surround the implementation of Colorado's Instream Flow Program. 3-in-10 short-term leasing is one of four major tools, along with appropriations, permanent acquisitions, and long-term leasing, that can be used to protect and restore ISFs in Colorado. 3-in10 short-term leases are policy tools in which a water right user is able lease their water right to the CWCB for ISF purposes for 3 years in any 10-year

period for no more than 120 days at a time. The CWT is the only organization to date facilitating these STLs with the CWCB (CWCB, 2013, "Temporary Loans and Leases of Water Rights for Instream Flows"). While 3-in-10 leases are only one of four policy tools used to protect ISF in Colorado, it is the only ISF policy tool that is managed through an administrative process as opposed to a judicial process. 3-in-10 leases are unique in their administration and therefore a useful focal point to describe surrounding institutional arrangements. However, 3-in-10 leases have only been used to protect ISF in Colorado since 2012. Therefore, there is not much data to perform a complete analysis of trends and the Colorado ISF Program, including analyzing three other policy tools along with the 3-in-10 leases, is used to define the scope of this analysis. The following analysis draws on existing water management literature, publically accessible data on Colorado stream flows and water rights, and interviews with key CWCB and CWT personnel involved in the implementation of the Instream Flow Program. The goal of the analysis is to better understand the institutional arrangements that surround the implementation of Colorado's ISF Program in order to better explain whether the role of collaborative management in Colorado water governance has been and will be a successful approach to protecting ISF in Colorado.

This paper begins with a discussion of past and projected trends in water use in the West and in Colorado, specifically with respect to ISF use. This is followed by a presentation of past and current water management strategies and a review of Colorado's Instream Flow Program using a multi-level governance framework, which includes constitutional, collective, and operational levels. At the constitutional level, I provide a brief history of Colorado water law, including a review of ISF legislation to date. At the collective level, I discuss the main actors and respective responsibilities in the ISF program. At the operational level, I explain the available policy tools. I then provide an overview of the relevant research questions and the quantitative

and qualitative methods used to answer those questions. I present results and key findings and discuss the major themes of those findings. Lastly, I connect the major themes to relevant gaps in literature and discuss future research implications.

Purpose of Study

Water Use in the West

Societies first started to manipulate water for human consumption with engineering projects used for flood control and eased navigation of waterways. As technology advanced, the years 1950-1980 marked the "Golden Age of Dam Building," where societies met and supplied almost every new human demand with large infrastructure projects such as dams, reservoirs, and pipelines, allowing human population to expand into previously undeveloped lands (Allan & Castillo, 2007). Today, water management strategies continue to rely on engineered structures to regulate water storage and distribution, but infrastructure is built with a limited lifetime and depreciates in stability and efficiency as it degrades over time (Russell et. al., 2009). With changes in climate and land use practices and, subsequently, the hydrologic cycle, there will be shifts between agriculture, municipal, industrial, recreational, and environmental water uses. In the last half century, focus from professionals in the water community has shifted from solely how to efficiently divert water to off-stream locations to the challenges associated with how to keep water in the stream for a variety of non-consumptive uses (Martin, 2011). Current water management goals account for more than just human uses when trying to optimize water use: they also consider water use for aquatic life and habitat. Historically, natural resource conflicts have stemmed from efforts to repurpose or change some aspect of the way in which a resource is controlled (Folk-Williams, 1988). Even with increased efficiency in water use, changing climate

and growing demand make any changes in water use contentious, to say nothing of changes to uses that may be perceived as a lower priority, such as the preservation and improvement of the natural environment.

Water right doctrines, including riparian law, prior appropriation, and dual systems, drive different state-level approaches to water management. Water policy and management in the Western U.S. is primarily defined by the Doctrine of Prior Appropriation and beneficial use, which is based on anti-speculation water right statutes and laws that date back to the second half of the 19th century. The Doctrine of Prior Appropriation consists of two main tenets: 1) any amount of water diverted from a stream must be put to "beneficial use," and 2) designated water rights are fulfilled hierarchically giving priority to those established at the earliest date (i.e. "first in time, first in right") (Colorado Foundation for Water Education (CFWE), 2004). In times of scarcity, relatively junior rights are curtailed, thus relatively senior rights are more secure. The Doctrine of Prior Appropriation also includes an abandonment of right clause, which states that after 10 years of intentional non-use, the water right can be re-appropriated. However, it is worth noting that forfeiture of a water right due to the abandonment clause rarely occurs because an intent to abandon the water right must be demonstrated in addition to the non-use of the water right. Additionally, prior appropriation designates water rights as not appurtenant to the land, meaning water rights can be sold, leased, transferred, and bought within and outside of their designated watershed so long as the transfer does not harm other rights on the river that depend on those flows (Hobbs, 1997).

Past trends and future projections regarding water security in the West indicate that current conflicting interests will only be exacerbated in the future by maintaining the status quo in water governance. With increasing conflict will come a need for more efficient use of

available resources and greater collaboration between vested parties to find "win-win" solutions that satisfy competing interests. Governance regimes such as top-down regulation or pure market mechanisms do not sufficiently balance competing interests, particularly in the governance of natural resources where the environmental interests are often under-represented or their top-down protection limits others interests. There is a demonstrated need for collaborative managment that proactively balances competing interests, in order to adapt to increasing water scarcity in the Western U.S.

Water Use in Colorado

History of Colorado Water Law

It is difficult to examine values and goals surrounding Colorado water without briefly discussing the history of settlement in Colorado and the deep seeded, cultural values associated with that settlement. In 1861, Colorado became a territory, comprised mostly of miners, who were encouraged to settle public lands through the Homestead Act of 1862. This settlement of public lands ultimately led to an increase in agricultural land use practices (Hobbs, 1997). In 1866, the Mining Act was passed, which allowed settlers to build ditches and reservoirs to divert water from public lands. Underlying all of Colorado water law was a fear that developers from the Eastern U.S. would speculate, purchase, and tie-up large amounts of water, preventing small farmers and settlers from maintaining their livelihoods in a new territory. Water policy in Colorado intended to equitably resolve conflicts by systematically issuing decrees between interested parties (Hobbs, 1997). Water in Colorado is constitutionally considered property of the public and water rights are usufructuary—the right is for the *use* of the resource and the public continues to *own* the resource (Loehman & Loomis, 2008). In the 1860s, Colorado created its

own water doctrine, which continues to be the purest form of prior appropriation in the Western U.S., to address the specific values and goals that emerged from its unique history of settlement (Crow, 2008). The Colorado Doctrine consists of four main tenets, which continue to influence the perception, values, and use surrounding water in Colorado today:

1) all surface and ground water is a public resource for beneficial use by public agencies,

2) a water right is a right to the use of a portion of the public's water resources,

3) water right holders may build facilities on the lands of others to divert, extract, or move water from a stream or aquifer to its place of use,

4) water rights holders may use stream and aquifers for the transportation and storage of water (CFWE, 2004).

In 1870, Nathan Meeker, agricultural editor for Horace Greeley's *New York Tribune,* founded the Union Colony of Colorado just south of the Cache La Poudre River at what is currently the City of Greeley, and the colony quickly began irrigating agricultural land situated many miles away from the river. The success of irrigation at the Union Colony drove the colonization of many other settlements such as Camp Collins (later known as Fort Collins), which was located many miles north but still along the Cache La Poudre River (Colorado Water Institute (CWI), 2014). Shortly after, in 1872, the Territorial Supreme Court settled *Yunker v. Nichols,* which affirmed that water could be carried across public and private land in order to reach its place of beneficial use, further supporting the ability of agriculturalists to irrigate land located far off-stream and completely breaking ties with the water law of the East, the Riparian Doctrine (CFWE, 2004). In 1874, the Cache La Poudre did not have enough water to meet the irrigation needs of both Camp Collins and the Union Colony, and since Camp Collins was located further upstream than the Union Colony, they were able to divert almost the full flow of

the river and left the Union Colony without sufficient water to irrigate their farmland. The Union Colony appealed to the local justice of the peace, claiming that they deserved the water since they had been irrigating the river first, who in turn appointed three commissioners to resolve the dispute. While there was no official court or established process for the Union Colonists to resolve their complaints, the two cities decided to agree to split the amount of water in the river, establishing a precedent for "first in time, first in right," which was later codified into Colorado's constitution in 1876 (CWI, 2014). In 1879, Colorado passed the Act Concerning Irrigation, which called for the adjudication of irrigation water rights through 10 water districts, each with its own commissioner and court. Courts would prioritize and allocate water based on historic use and assign water rights to the water user, not the ditch operator (Hobbs, 1997). In 1891, the Colorado Supreme Court determined that agricultural rights could be sold and transferred to municipal uses as long as there was no injury to other water rights and as long as there was "just compensation" for the water right. The decision also states that changes in the use of a water right required public notification and an opportunity for anyone with objections to be heard (Hobbs, 1997). In 1903, Colorado Legislature provided "for the adjudication of domestic and all uses other than irrigation" (Hobbs, 1997, p. 11). Until this point, domestic use had been considered "incidental and non-injurious to agricultural use" (p. 11).

The Colorado Water Conservation Board (CWCB) was established in 1937 to aid in the protection and development of the state's waters. Their current mission is "to Conserve, Develop, Protect and Manage Colorado's Water for Present and Future Generations" (CWCB, 2013, "About Us"). The 1969 Water Right Determination and Administration Act, created seven Colorado Water Court divisions, each staffed with an engineer, a water judge, a water referee, and a water clerk and essentially removed adjudication decisions from the far more numerous

and smaller water districts. Each division currently issues water decrees, which "confirm the priority date of the water right, its sources of supply, amount, point of diversion, type and place of use and includes conditions to protect against injury to other water rights" (CFWE, 2004, p. 12).

See Appendix A

Trends in Colorado Water Use

The hydrologic cycle plays an important role in determining physical water availability in any region (Leopold, 1994). Western states encompass notoriously arid regions and rugged terrain, adding to the complexity of water management and future water availability predictions. The topography of Colorado has a major influence on the availability of water and hydrologic patterns across the state. Water supply is dependent on seasonal snowpack usually produced between late fall and early spring. It is estimated that up to 80% of Colorado's surface stream flow originates from snowpack that accumulates during this period before melting in the April to July time-frame (McKee et al., 2000). However, drought is also very common throughout the state of Colorado. Single season droughts with precipitation of 75% or less of average for one to three months in a row occur nearly every year in Colorado (McKee et al., 2000). Despite all of the efforts to increase our scientific understanding of drought, there is still significant amount of uncertainty with respect to anticipating its arrival, duration, and severity. As Henz et. al. (2004), states in the Colorado Drought and Water Supply Assessment, "the only thing certain is that drought will come again" (p. 19). This has extremely important consequences as drought increases the vulnerability of relatively junior decreed water rights and can have a large impact on an aquatic ecosystems' abilities to rebound after atypical hydrologic periods.

Observational measurements of less Snow Water Equivalent (SWE) during late spring indicates Colorado is receiving greater amounts of precipitation as rainfall as opposed to snowfall, which can affect the amount of snowpack across the state as well as subsequent timing and quantity of snowmelt (Regonda et. al., 2004). In the last half century, peak snowmelt streamflow timing has shifted a minimum of a 1-2 days up to 1–4 weeks earlier as shown by several evaluations of data from the Sierra Nevada Mountains, the Rocky Mountains, and the Pacific Northwest (Stewart et al., 2004; Regonda et. al., 2004). Earlier snowmelt has several consequences for Colorado, including a prolonged dry period in the summer. However, Colorado is also very topographically diverse which means these larger scale trends may not be accurate on a local scale. Overall, stream flows are shifting in timing and magnitude.

Population growth and development in combination with a warmer and stormier climate makes society increasingly vulnerable to hydrologic variability. In 1950, Colorado's population was 1.3 million. By the year 2000, it more than tripled, reaching 4.3 million. CWCB's 2004 Drought and Water Supply Assessment concluded that Colorado's population is growing and will continue to grow in all seven major river basins, but will be disproportionately higher in certain basins. Among the fastest growing basins are the San Juan, South Platte, and the Colorado River basins. With changes in water availability and population growth, there is also a demonstrated need for specific interventions that will protect and improve current ISFs.

Instream Flow in Colorado

Currently, agriculture uses 86% of Colorado's water, municipal uses 11%, and industry uses 3% (CWCB, 2013, "Colorado's Water Needs"). According to Gillian and Brown (1997) water is only left as ISF without intentional policy interventions for four main reasons:

1) Geographic factors: water is difficult to obtain due to infrastructure constraints and high costs
2) Senior water rights: water is left instream to reach a downstream senior diversion point
3) Interstate allocations: water is left instream to reach a state border
4) Surplus flow: water is not needed for off-stream use (Gillian & Brown, 1997).

However, three of the four major river basins in Colorado's are over-appropriated for beneficial use (CFWE, 2004).

The CWCB defines ISF as "nonconsumptive, in-channel or in-lake uses of water made exclusively by the CWCB for minimum flows between specific points on a stream or levels in natural lakes" (CWCB, 2013, "Instream Flow Program"). ISF rights are meant to protect cold and warm water fisheries, waterfowl habitat, unique glacial ponds and hydrologic and geologic features, habitat for neotenic salamanders, riparian vegetation, and critical habitat for threatened and endangered fish (CWCB, 2013). According to Allan and Castillo (2007), stream features such as sediment, channel, riparian habitat, and longitudinal continuity are important for riverine ecosystem health. In many cases, these physical features provide the basis for ISF protection.

In a 2005 report commissioned by the CWCB examining the state of ISF Programs across the 18 Western States, Charney (2005) broadly suggests an effective ISF program is one that: "1) actively seeks to secure instream flows, 2) manages and defends the instream flows it has acquired, 3) has an active and ongoing dialogue with the public, state and federal agencies and nonprofit organizations, and 4) operates with an open public process" (Charney, 2005, p. 21). The report proposes there are nine specific characteristics that underlie a successful ISF Program:

1) Existence of legal mechanisms to protect instream flows
2) Permanence of the instream flow rights, reservations or permits
3) Resources available and dedicated to instream flow activities
4) Legally and scientifically defensible quantification methodology
5) Protection and enforcement of instream flow rights, reservation or permits
6) Partnerships
7) Planning/Needs identification
8) Evolving and dynamic programs
9) "On-the-ground" accomplishments (the volume of protected ISF or number of ISF water rights) (Charney, 2005, p. 21)

While Charney's nine characteristics offer a snapshot of Western U.S. ISF Programs, they do not directly explain why and how certain state programs are more likely to succeed compared to others or how success should be measured. However, out of the 18 Western states analyzed, those with water trusts (Colorado, Oregon, Washington, and Montana) have achieved the greatest success with respect to number of appropriations, acquisitions, and stream miles protected, see Table 1 (reprinted from Charney, 2005 Table 15), suggesting that there is something within these multi-level collaborative interactions that may increase the likelihood of on-the-ground success in protecting and restoring ISFs.

Table 1. On-the-ground Instream Flow Accomplishments for all 18 U.S. Western states. The table shows number, amount, and/or miles of instream flow appropriations and transfers for all 18 U.S. Western states and the number of state employees in 2005. The rows with asterisks (*) are those states with a state-wide water trust.

Note. Table 15. Accomplishments. Reprinted from "Decades Down The Road: An Analysis of Instream Flow Programs in Colorado and the Western United States," by S. Charney *Colorado Water Conservation Board Report*, p. 18. July 2005.

	Appropriations		Transfers		
State	# of Rights	Miles or CFS	# of Rights	Miles or CFS	# State Employees
Alaska	17 adjudicated (276 pending)	32.8 miles	0	0	4 Full-time equivalent (FTE)
Arizona	93 instream flow rights (some still being perfected)	Not available[22]	Not available	Not available	No FTE (at least 6 part-time)
California	Not applicable	Not applicable	Not available	Not available	6 FTE Equivalent
* Colorado	1,926 (including 476 lakes)	8,549 miles	21 (4 are leases)	398 cfs and 8,651 AF	7 FTE
Idaho[23]	85 licensed or permitted (includes 3 lakes)	>672 miles	Not available	Not available	5 FTE
Kansas	33 minimal desirable streamflows set on 23 streams (Stover 2005)	Not available	0	0	No FTE
* Montana	434 (Schenk 2005)	2477 miles	Not available	Not available	2 FTE
Nebraska	9 (France 2005)	Not available	0	0	No FTE
Nevada	11[24]	Not available	Not available	Not available	No FTE
New Mexico	0	0	2 - 3 permits, 0 rights	250 miles (approximate)	No FTE
North Dakota	0	0	0	0	No FTE
Oklahoma	0 (Illinois River and several tributaries designated through Scenic Rivers Act)	0	0	0	No FTE
* Oregon	1550 (includes lakes) (Rice 2005)	Not available	30 transfers; 15 conserved water; 280 leases	Not available	2 FTE Equivalent
South Dakota	5 (Duvall and Grunlund 2005)	No information	1 (Duvall 2005)	Not available	No FTE
Texas	Not applicable	Not applicable	0	0	9 – 10 FTE
Utah	Not applicable	Not applicable	4	Not available	No FTE
* Washington	180 streams conditioned with ISFs, closures in 20 basins (Bolender 2005)	Not available	79 (1 – 20 year leases); 12 (permanent)[25]	Over 5300 acre feet	12 FTE
Wyoming	97 (Annear 2005)	417 miles	0	0	2 FTE

CHAPTER II

REVIEW OF LITERATURE

In order to understand collaborative management's potential role in managing Colorado' ISF Program, it is first necessary to define collaborative management in the context of past and current water management strategies, alongside each of their strengths and weaknesses.

Water Management Strategies

Water's inherent ecological complexity, in combination with its utility for a wide variety of industries and importance for all life, makes management of the resource one of the most controversial and widely debated issues in natural resource scholarship. Water has attracted attention from scholars as a defining resource in economic efficiency, social equity, and environmental sustainability (Jonch-Clausen & Fugl, 2001). There is growing consensus that problems defining water scarcity do not stem solely from its physical or ecological availability, but rather the socio-economic and political factors that determine accessibility and use (Blomquist & Schlager, 2005). Water is also inconsistent over time and space, making management strategies hard to translate into different place-based contexts (Blomquist, 1995). Furthermore, wide consensus exists that water management is too complex for one institution to govern alone, indicating a need for collaborative management. Scholars are increasingly interested in institutional arrangements and the role they play in "allocating natural resource supplies, influencing demand, and overcoming conflict" (Blomquist, 1995, p. 55). According to

Blomquist (1995) there are two lessons to be learned from past water management literature: 1) including affected parties in any decision-making process is fundamental to successful management of water resources and 2) processes should be incremental and evolutionary; there are no comprehensive approaches or solutions to water management.

Kidd and Shaw (2007) provide two broad categories for organizing management around watersheds: centralized and polycentric. Centralized management is a practice in which there is only one or one group of decision-makers. Polycentric management decentralizes management to create multiple foci of decision makers. Watersheds nest hierarchically within one another and span political boundaries at all levels including local, state, and national (Blomquist & Schlager, 2005). However, in the United States there is no comprehensive federal water management policy. Consequently, water policies are made in an ad hoc, decentralized manner within the confines of arbitrary political boundaries with respect to physically defined watershed boundaries (Kidd and Shaw, 2007). While these arbitrary boundaries make comprehensive management difficult across a large regional scale, they also serve to contain the scope of complexity to a scale that does not overwhelm managers into inaction. Kid and Shaw (2007) contend that polycentric watershed-based organizing promotes active coordination between institutions across an entire river basin and presents the most "feasible, realistic, and effective" (p. 313) starting point in order to function within existing government arrangements. Kidd and Shaw (2007) also point out that polycentric basin-wide management promotes accountability by creating horizontal and vertical checks and balances between institutional counterparts and institutional hierarchies, respectively. However, watershed boundaries do not consider social or economic relationships between groups of people. In a case study Blomquist (1998) presents for the San Juan Basin Authority, he concludes that sub-watershed units, where stakeholders have

commonalities based on political identifications or affiliations, may be a more effective unit of governance compared to entire watershed units that encompass more diverse sets of stakeholders. While centralized governance allows for increased accountability and coordination, polycentric governance makes tasks such as resource allocation and information processing easier and increases flexibility to adapt to physical and economic changes (Easter & Tsur, 1995).

Frameworks such as Integrated Water Resource Management (IWRM) are proposed as holistic approaches to water governance that address the relationship between natural and human systems. However, as observed by Jonch-Clausen and Fugl (2001), there is debate surrounding the definition of IWRM and interpretations of the word "integrated." Kidd and Shaw (2007) offer a concise summary of the multidimensional aspects of the word "integration" in IWRM as physical, sectoral and organizational. Fischhendler and Heikkila (2010) emphasize that more recent IWRM literature agrees with this assessment. Several authors see the "integration" definition provided by Kidd and Shaw (2007) as impractical, contending that it can only be successfully implemented on a small scale since larger scale management involves too many component to meaningfully integrate them all (Tarlock, 2000; Blomquist and Schlager, 2005). Biswas (2004) critiques water resource management frameworks in general by pointing out that there are numerous "process" models and management strategies developed, none of which are completely comprehensive or adequate for managing resources. IWRM lacks any explicit definition as to how these ideas can be translated into programs, projects, and outcomes.

Many scholars advocate for market solutions to water management. Market advocates question the government's ability to respond effectively and efficiently to market failures. They suggest that water rights holders are entrepreneurs capable of performing their own cost-benefit analyses and working within functioning markets (Loehman & Loomis, 2008). Because water

rights in the Western U.S. are treated as discrete property rights, they are predisposed to market mechanisms to promote efficient use of water resources. However, because water is such a uniquely connected and complex resource, these property rights are often difficult to define and subsequently difficult to agree upon (Grigg, 2011). Water's connectivity makes exclusion and monitoring difficult, but Colorado's system of prior appropriation makes it at least possible (Brewer, et. al., 2006). Any movement and transfer of water in time or place can have effects on third parties that divert, consume or use water downstream of the transferred water right. In other words, water is inherently a common pool resource within the economic typology of goods; however, the institutional constraints surrounding Western water makes its management somewhere between a public and private good in that water rights are quantified, monitored, and enforced to varying degrees in order to make water more excludable and rivalrous than it would otherwise would be without those institutional arrangements.

Water has two properties that are important in a water market: 1) water flows; and 2) water moves in a cycle. This means the value of water will change as it moves through space and time. Water market transactions can be separated into three categories: water sales, 1-year leases, and multi-year leases (Brewer, et. al., 2006). In the Western U.S., most water markets treat water as a homogeneous commodity. However, in reality, prior appropriation creates a "heterogeneous water product whose value varies with the seniority of its appropriation" date (Pritchett et. al., 2008, p. 442). Water costs in the American West are associated with water quality, conveyance opportunities and local uses, and the security of the right, not only its scarcity value. There are also transaction costs associated with water's transport and treatment as well as an increased value in the summer when there are ebbs and flows. Water markets are notoriously imperfect when trying to quantify the value of non-human interests. The subjectivity and variability

involved in valuing these terms is extreme and, consequently, water markets are easily manipulated (Brewer et. al., 2006). According to Griffin (2008), water markets have been largely used to quantify human use values and, consequently, have been largely misapplied when used to try to protect ISFs because ISFs are inherently meant for non-human uses.

Most literature agrees that free markets are not an effective water management strategy on their own, but Loehman and Charney (2011) argue that economic strategies and water pricing are useful tools used in concert with ISF programs that focus on new appropriations and acquisitions as a way to collectively value entire water systems. They posit that market-based mechanisms are going to be increasingly used to facilitate ISF protection as inefficiency behind purely voluntary ISF Programs come to light. This is particularly true considering the willingness-to-pay for a water right often exceeds irrigated agricultural values and ISF programs will need to compete with private consumptive water users (Loehman & Loomis, 2008).

In recent years, leasing agreements have become widely discussed market mechanism in water management literature. According to King, et. al. in 2004, several models existed for providing liability waivers to landowners involved in leasing conservation easements, but few had been implemented for ISF leasing. Typical characteristics of water users willing to lease include owning a large number of irrigated acres, having concern for rural communities, and being willing to work with municipalities and other organizations to arrange lease agreements. These characteristics limit the range and number of water users willing to participate in leasing water rights (Pritchett, et. al., 2011). A water user may be willing to voluntarily donate or lease that water right, but may also have concerns about federal programs or structural evaluations that may reduce their original water right (Jenkins, 2007). Pritchett, et. al. (2011), contend there is relative ambivalence toward water leases in Colorado, which may be explained due to the fact

that reservoir projects, increased municipal conservation, and interbasin pipelines are generally supported by the water community, such that water right holders may see leases as a relatively small part of the larger solutions to complex water demand issues.

Overall, there are few case studies in the literature that discuss autonomous entities that have managed to successfully balance ISF protection and development in watershed management (Blomquist & Schlager, 2005; Kidd and Shaw, 2007). As Biswas (2004) sums up, "it is not very helpful to be long on concepts but short on their implementation potential" (p 254). The real need in managing resources is addressing the success with which processes are translated into practices (Biswas, 2004). According to most water management literature, the problems with the systematic application of policies and legislation to "real world" scenarios can be summarized in two main points: (1) the capacity and resources needed to implement management strategies (Fischhendler & Heikkila, 2010), and (2) the lack of empirical analysis to provide tools, methods, and frameworks for application (Medema & Jeffrey, 2005; Fischhendler & Heikkila, 2010; Geldorf, 1997). The challenges associated with translating theory into real world application is an almost universal theme in areas of resource management (Heikkila, 2004).

While proposed governance structures include river basin management, water demand management, ecosystem management, and IWRM, none are considered in the existing scholarship to be sufficiently comprehensive (Jonch-Clausen & Fugl, 2001). Collaborative management is not completely centralized or polycentric (Gerlach, 1995). It calls for multiple organizations and entities of different scales and specialized functions to correspond to the different tasks of water management (Blomquist, 1995). Gerlach (1995) further defines collaborative management as the process of identifying and developing general programs,

specific projects, and the subsequent institutional structures to implement those projects. Collaborative management allows different organizations with varying authority and goals, such as government agencies and NGOs, to leverage resources and skills in order to diversify available tools and create innovative and flexible management regimes appropriate for "real world" scenarios. Colorado's Instream Flow Program is a state-wide program, which means it inherently spans multiple basins of varying scales. The CWCB and the CWT are both entities with state-wide purviews. Collaborative management typically examines how to integrate management across watershed boundaries and the CWCB and CWT, while managing at the state-level, must integrate their management practices across multiple watersheds with distinct values and vested interests in water. Furthermore, the CWCB and CWT have very distinct missions, goals, motivation, and authority with respect to protecting and restoring ISFs throughout Colorado. Therefore, collaborative management is, in theory, a management approach that will lead to successful protection of ISFs in Colorado.

Multi-level collaborative management calls for multiple organizations and entities of different scales and specialized functions to address the different tasks of water management (Blomquist, 1995). Multi-level governance includes four levels of action situations as defined by Ostrom (2005) in the Institutional Analysis and Development Framework (IAD): operational, collective, constitutional, and meta-constitutional (Figure 1). Ostrom (2005) describes each of the situational levels as the following:

- Operational: "directly affect *day-to-day decisions* made by the participants in any setting" (p. 58).

- Collective-choice: “affect operational activities and results through their effects in determining who is eligible to participate and the specific rules to be used in changing operational rules” (p. 58).
- Constitutional: “first affect collective choice activities by determining who is eligible to participate and the rules used to be used in crafting a set of collective-choice rules that, in turn, affect the set of operational rules” (p. 58).
- Meta-constitutional: underlies all others, but is not frequently analyzed.

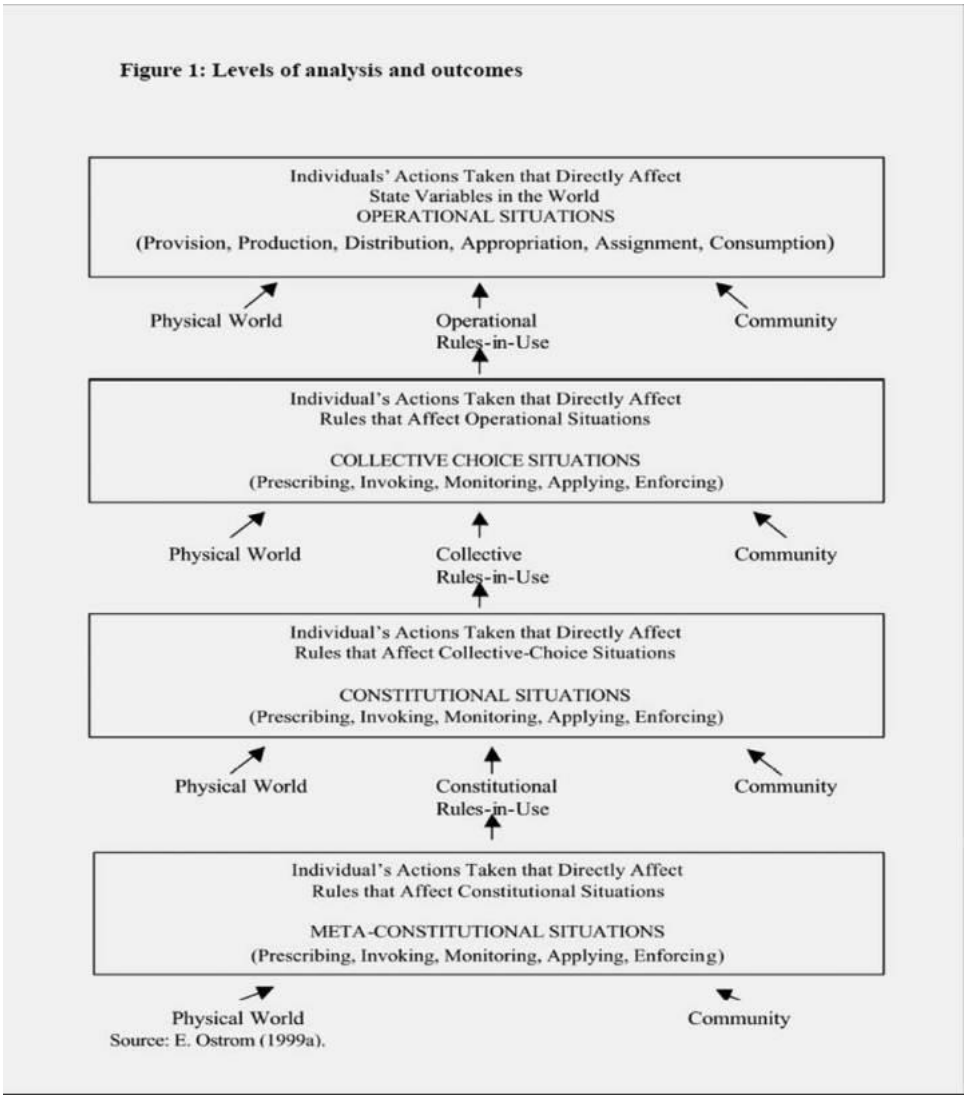

Figure 1. Levels of analysis and outcomes as seen in Ostrom (2005). The four institutional levels of analysis include operational, collective-choice, constitutional, and meta-constitutional.

The levels of analysis are particularly useful in describing Colorado's ISF governance structures, including relevant actors and patterns of interactions.

Collaboration between Government Entities and Non-governmental Organizations

According to King et. al. (2004), ISF management requires more than just maintaining a basic amount of water instream. Research, monitoring, education, outreach, communication,

protection, and restoration are also fundamental to the success of ISF programs, which usually means an increase in the need for funding and improved governance. Government agencies continue to be one of the most influential actors in water management and water programs. However, government agencies are often limited by political boundaries, resources, capacity, and conflicting public mandates (Loehman & Charney, 2011). On the other hand, NGOs have the ability to work on many fronts including as legal advocates, owners and stewards of property for environmental purposes, and researches and publishers on scientific issues (Paretchan, 2002). There are often barriers to individuals doing the types of work NGOs are capable of such as funding, data gathering, verification and legal defense (Gillian & Brown, 1997). NGOs have the ability to understand and institute legal proceedings at the agency level and seek judicial review of decisions, where individuals may lack capacity and skill to do so. NGOs can also provide a friendly face to private property owners. In states where only public agencies are allowed to hold ISF rights, NGOs can play a valuable role by acting as the broker and facilitator for transfers of water rights to state agents to hold for ISF purposes (Paretchan, 2002). Paretchan (2002) contends water rights holders are more likely to buy, sell, lease, trade, and use tax credit to protect ISFs, for which NGOs are ideal facilitators, as opposed to litigating issues in courts.

Capacity, resources, and governance structures are always limiting factors when implementing any natural resource management system. Collaboration between water organizations requires additional communication and sometimes time-intensive coordination between staff members, which can translate into additional costs for those actors involved (Fischhendler & Heikkila, 2010). NGOs in collaboration with government agencies can often connect communities most adversely affected by environmental conditions to appropriate programs (King et. al., 2004). When non-government organizations (NGOs) and governments

work together to manage public programs, they can leverage the flexibility and non-regulatory roles of NGOs, while drawing legitimacy from government agencies in order to bridge the gap between government programs and disengaged populations.

Both regulatory and voluntary approaches face difficulties and controversies when water basins are fully allocated. Loehman and Charney (2011) argue that pure voluntary and market solutions will underfund and underprovide water to meet ISF thresholds, which are pre-determined and often state approved ecological or hydrologic analyses. Brewer, et. al. (2006) contends voluntary water transfers are typically sporadic and reactive, meaning there is no real strategic shift to sectors where water is needed or demanded most. Thus, neither approach is a panacea. Loehman and Charney (2011) suggest "some form of action by state authorities will be required to provide appropriate levels of protection for water quality and ISFs" (p. 878) but argue for more secure funding and governance in order to adequately do so. However, they also recognize the experience of NGOs and local watershed organizations, which might suggest that direct state involvement may not be as necessary if local watershed management can be sufficiently activated and funded.

Trust & Legitimacy

Capacity, resources, and governance structures are all important when describing collaboration between government entities and NGOs, however so are the values and behaviors of the individual actors associated with those organizations. Political theory literature provides two important concepts when describing political values and behaviors and the governing structures with which they interact: trust and legitimacy.

Trust

Newton (2007) defines trust "as the belief that others will not, at worst, knowingly or willingly do you harm, and will, at best, act in your interests" (p. 343). Levi (1998) also states, "Trust is not one thing and it does not have one source; it has a variety of forms and courses" (as cited in Newton, 2007, p. 343) The origins of trust are generally described in two ways: 1) it is an individual property associated with individual characteristics and demographic features; 2) it is a property of social systems from social and political institutions. Trust is a product of experience; hence, it changes with changing circumstances. Political behavior scholarship distinguishes between trust between people (social trust) and trust in institutions, systems, rules and fundamental procedures (political trust). Social trust is interpersonal or horizontal trust between citizens, while political trust is vertical trust between citizens and political elites or political institutions (Newton, 2007). Trust is essential in any management regime that involves multiple organizations and entities of different scales working together to achieve specific ends within a community.

Legitimacy

The scholarship surrounding the definition, meaning, and origins of legitimacy in governance varies greatly. According to Cash et. al. (2002), legitimacy "refers to whether an actor perceives the process in a system as unbiased and meeting standards of political and procedural fairness" (p. 5). Hardin (2007), on the other hand, describes a more basic definition, which states a government has legitimacy if "the government is well established and it works in some important sense" (p. 239). Although a decision or process may be considered legitimate according to a set of pre-established rules, it is possible for that decision or process to be

perceived as normatively illegitimate by different people in different contexts. However, legitimacy should not to be confused with consent. While much of the political behavior scholarship argues consent is the basis of legitimacy, this definition only considers consent as it affects the *perception* of an entity's or program's legitimacy (Hardin, 2007). Legitimacy is essential for establishing processes that reduce the uncertainty of interactions between various actors across time and place.

Trust and legitimacy between actors is key in understanding any natural resource management regime, but so is understanding the physical resource.

Determining Instream Flow Thresholds

It is also important to consider how thresholds and biophysical requirements are determined when considering natural resource management. These methods vary widely across water management regimes, particularly when considering ISF thresholds. Bradford, et. al. (2011) explains that there are two schools of thought in determining instream flow requirements. The first assumes a strong empirical relationship between flow variability and ecosystem processes as predictors of river health and attempts to minimize hydraulic variability to the natural hydrograph (i.e. the natural flow paradigm) (Poff et al., 1996). The second attempts to adjust flow regimes to accommodate specific ecological requirements of an ecosystem (e.g. a keystone species' life history and habitat requirements). Caissie et al. (2007), point out that the second approach Bradford et. al. (2011) describes is a much more involved process requiring many more hydraulic and biological variables and that historic stream flow data from stream stations are a much simpler, less time and resource intensive method for evaluating ISFs. It is also important to note that literature surrounding ISFs in Colorado rarely mention the

effectiveness of ISF water rights in meeting pre-determined thresholds. When ISF water rights are mentioned with respect to effectiveness, it is usually to describe the relative junior priority of ISF water rights in Colorado and their vulnerability in dry years (Charney, 2005; Loehman and Charney, 2011).

Overall, current water management scholarship lacks the development of frameworks and supporting case studies that demonstrate how processes can be successfully translated into practices. The literature suggests collaborative management is a potential approach to bridging that gap. Literature surrounding management of natural resources through collaboration between government and non-government entities largely focuses on the sharing of resources and increased capacity and as the direct outcomes of those partnerships. While there is some focus on NGOs acting as buffers between potential program participants or private right holders and the government, the NGO & government organization literature does not explicitly address concepts such as trust and legitimacy, which political theory tells us are important in any citizen-government relationship or public program. References to an NGO being able to act as a buffer between citizens and government alludes to the broader concept of trust, but there is no direct mention of legitimacy when describing the government agency-non-government organization collaborative relationship.

CHAPTER III

THE CASE OF COLORADO'S INSTREAM FLOW PROGRAM

According to Ostrom's (2005) Institutional Analysis and Development Framework, institutions are prescriptions in the form of any norms, informal, or formal rules (or lack thereof) that structure repeated interactions between actors that typically reduce the uncertainty of those interactions occurring or the outcome of those interactions in the future. Ostrom (2005) states:

> "The opportunities and constraints individuals face in any particular situation, the information they obtain, the benefits they obtain or are excluded from, and how they reason about the situation are all affected by the rules or absence of rules that structure the situation. Further, the rules affecting one situation are themselves crafted by individuals interacting in deeper-level situations. For example, the rules we use when driving to work every day were themselves crafted by officials acting within the collective-choice rules used to structure their deliberations and decisions. **If the individuals who are crafting and modifying rules do not understand how particular combinations of rules affect actions and outcomes in a particular ecological and cultural environment, rule changes may produce unexpected and, at times, disastrous outcomes**" (p. 30).

The different levels of action situations Ostrom (2005) referred to in the preceding excerpt provide the structural framework for analyzing Colorado's Instream Flow Program at multiple levels (i.e. multi-level analysis). The following analysis focuses on the actions taken by key

actors in and between the constitutional, collective, and operational levels (Figure 1). While the main actors examined in this paper, the CWCB and the CWT, are situated at the collective level, their actions are often determined by key legislation, Colorado Supreme Court decisions, and the Colorado Constitution, which in turn affects the day-to-day decisions of municipal, agricultural, industrial, recreational, and environmental water users at the operational level (Figure 2 & 3).

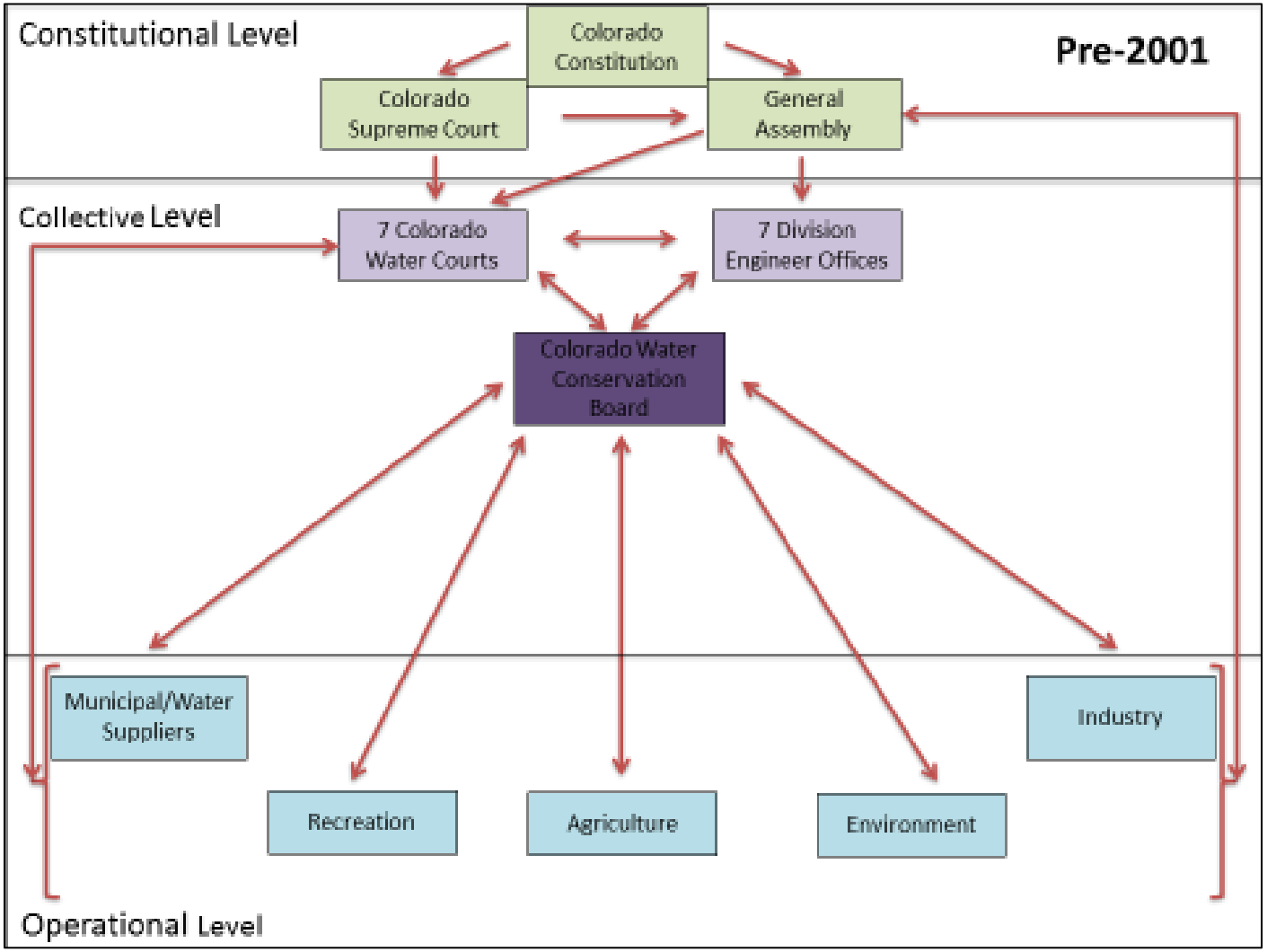

Figure 2. Pre-2001 Instream Flow Program Dynamics (with respect to Acquisitions). Instream Flow Program dynamics pre-2001, before the creation of the Colorado Water Trust. The diagram shows the various interactions, actors, and level of governance associated with ISF management in Colorado.

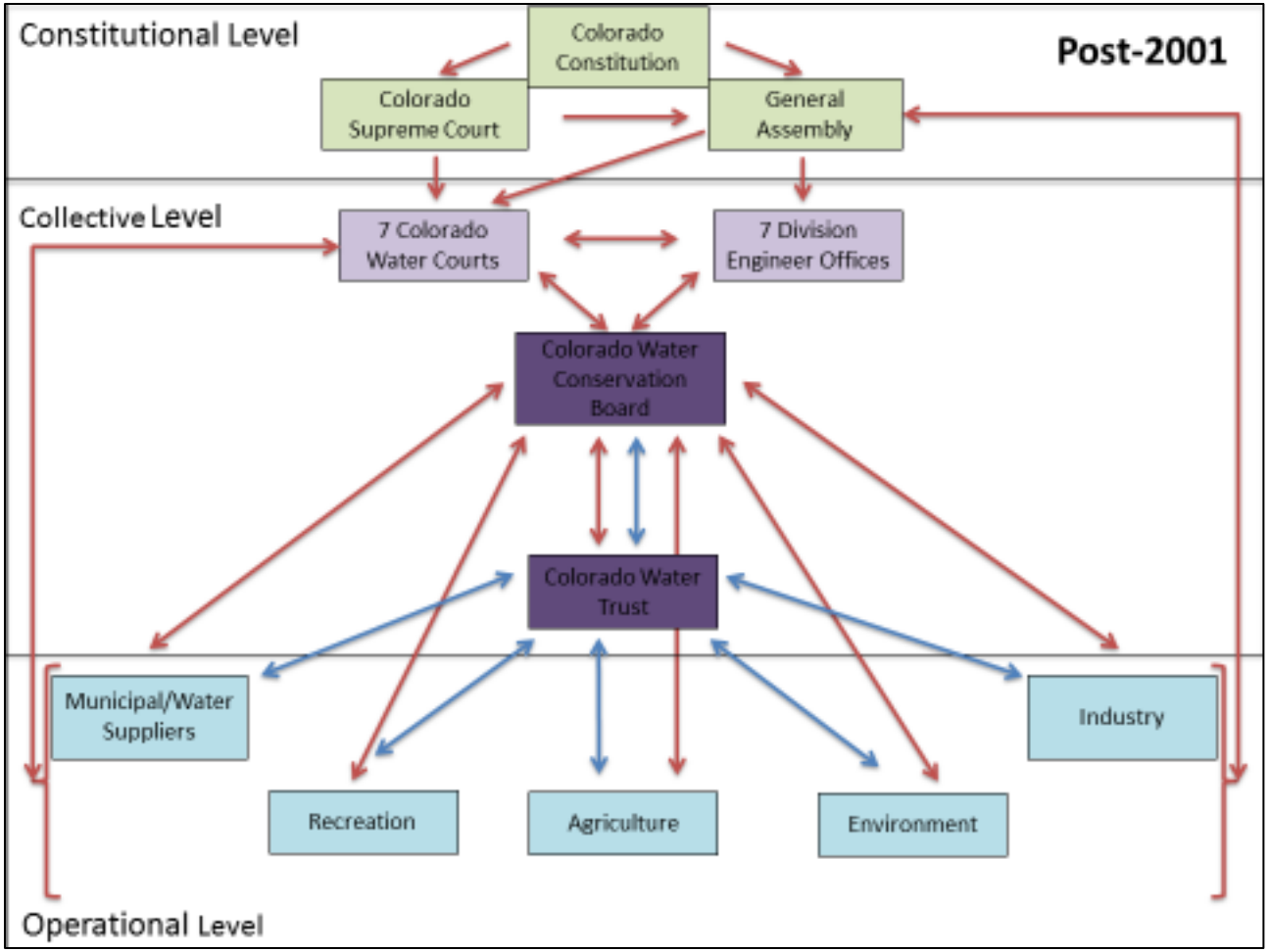

Figure 3. Post-2001 Instream Flow Program Dynamics (with respect to Acquisitions). Instream Flow Program dynamics post-2001, after the creation of the Colorado Water Trust. The diagram shows the various interactions, actors, and level of governance associated with ISF management in Colorado.

Governance of Colorado's Instream Flow Program at the Constitutional-Level

Federal Instream Flow Legislation

One of the first pieces of legislation to explicitly recognize the need to protect water within a stream channel was federal, the Clean Water Act (CWA). The CWA passed in 1972 and was based on the Federal Water Pollution Control Act of 1948. The CWA focuses on point source pollution released by manufacturing and construction, and the regulation, specific standards, and monitoring are all implemented at the state-level (Hobbs, 1997). While the CWA does not explicitly address issues of water quantity, minimum flow requirements are often established in order to reduce the concentration of pollutants. The passage of the Endangered Species Act (ESA) in 1973 was one of the first federally legislated statutes that serves to explicitly protect water as a resource for something other than human use. The ESA describes the severe decline in the diversity of U.S. native species and acknowledges their "esthetic, ecological, educational, recreational, and scientific value to our Nation and its people" (U.S. Fish & Wildlife Service, 2013). The purpose of the ESA is to "protect and recover imperiled species and the ecosystems upon which they depend" (U.S. Fish & Wildlife Service, 2013), which in many cases involves protecting aquatic habitat (e.g. water quantity and quality). However, the ESA and the CWA do not explicitly recognize water as a protected resource outside of providing for critical habitat or human consumption, therefore these are tools that indirectly protect ISF, but fail to provide flexibility and certainty for specific local contexts.

State Instream Flow Legislation

In the Western U.S, explicit water policies that designated ISF as "beneficial use" did not emerge until the latter half of the 20th century (Charney, 2005). In the early 1970s, ISF protection programs emerged in several Western states, each uniquely addressing and working within the

state's particular water rights system. In 1965, the Colorado Supreme Court upheld that an ISF was a riparian right, not consistent with the Doctrine of Prior Appropriation in *Colorado River Water Conservation District v. Rocky Mountain Power*. However, in 1973, the Colorado legislature passed SB 97 creating the state's ISF Program, which recognized the need to "correlate the activities of mankind with some reasonable preservation of the natural environment," allowing the CWCB "on behalf of the people of the state of Colorado, to appropriate or acquire… such waters of natural streams and lakes as may be required to preserve the natural environment to a reasonable degree" (as cited in Merriman & Janicki, 2013, p. 1). The statute was ultimately created in order to maintain state control over Colorado water in response to two events: 1) threats of a ballot initiative that would allow instream flow water rights to be held by private water users; 2) potential violation of a federal bypass flow requirement on the West Slope in the construction of the Fryingpan-Arkansas Project, a transbasin diversion, storage and delivery project which serves Southeastern Colorado, which was constructed by the Bureau of Reclamation from 1964 to 1981 (Bassi, 2014). SB 97 named the CWCB as the exclusive authority allowed to hold ISF rights through a *reach* of stream rather than just at a bypass *point*. Colorado is one of the only western states that limits the ability to appropriate, acquire, and protect ISFs to a single state agency. SB 97 effectively "removed the diversion requirement for the CWCB and allowed the Board to appropriate water 'instream'" (Merriman & Janicki, 2013, p. 1). The first ISFs were appropriated in July of 1973 on several stream reaches downstream of the Fryingpan-Arkansas Project (Bassi, 2014). In 1979, the Colorado Supreme Court upheld ISF water rights as constitutional in *Colorado River District v. Colorado Water Conservation Board*, in which the Colorado River District argued that because

there is no physical diversion associated with an ISF water right they should be void and subordinate to junior water rights (Bassi, 2014).

In 1981, the Supreme Court raised concerns over ISF water rights interfering with water development. In response, SB 414 stipulates: 1) ISFs from water imported out of basin do not give the CWCB any claim against the importer, 2) ISFs are subject to uses or exchanges of water with existing appropriation dates, and 3) the CWCB cannot condemn private lands to acquire ISF rights. SB 414 also requires the CWCB to assess the natural environment, water availability, and injury to third parties (Bassi, 2014). SB 414 limited and clarified the CWCB's ability to appropriate or acquire new water rights in order to decrease the potential that a decreed ISF water right would interfere with future water development.

In 1986, the Colorado General Assembly clarified CWCB's authority to acquire senior rights through purchase or donation in SB 91. This reaffirmed authority for acquiring water allowed the CWCB to more explicitly work with *willing* water users in order to *restore* flows to degraded stream systems on a voluntary basis (Loehman & Loomis, 2008). The legislation was introduced in response to proposed federal wilderness legislation in order to show federal entities that the state ISF Program could achieve federal stream protection goals (Bassi, 2014).

In 1987, SB 212 reaffirmed the CWCB as the *exclusive* authority to appropriate ISFs in response to an ISF right decreed to the City of Fort Collins for "recreational and piscatorial" uses. Legislators were concerned about more water court applications for ISF uses by entities "wishing to command the flow of streams for their own aims" and effectively decreased the ability of other potential water right holders to apply for those types of applications (Bassi, 2014).

In 1995, in *Aspen Wilderness Workshop, Inc. v. Colorado Water Conservation Board*, the Colorado Supreme Court determined that the CWCB cannot unilaterally reduce a decreed ISF water right without going to water court to change its decree (Bassi, 2014). In response, SB 64 was enacted in 1996 identifying procedures the CWCB must follow when reducing a decreed ISF water right, including filing with water court and a public notice and comment procedure, and clarified the Water Court's role in adjudicating ISF water rights as reviewers of the three ISF appropriation determinations (natural environment, water availability, and no injury) (Bassi, 2014).

In 2000, HB 1438 repealed the ability of the CWCB to acquire conditional water rights for ISF uses. Conditional water rights are extremely valuable. They are rights in which the water court fixes the priority date of a beneficial use even though the water right has yet to be appropriated and put to beneficial use, or in other words, the water right has not been perfected. The water court reviews the right every six years to ensure that the water right holder has "diligently pursue[d] completion of the project" (DWR, 2014, "Water Rights Dictionary"). Once the right is perfected, by being put to use, the water court will decree the conditional water right as an absolute water right. Conditional water rights can be transferred through donation, sale, or lease to another beneficial use other than the use for which the priority date was fixed (except ISF uses). The inability to transfer conditional water rights to instream flow water rights effectively sets aside large quantities of water that will only ever be used for consumptive uses and most likely those uses will be municipal or industrial (DWR, 2014, "Water Rights Dictionary")

Initially, CWCB had to determine if the natural environment would be preserved to a "reasonable degree" in order to appropriate new ISF water rights. However in 2001, SB 156

passed allowing CWCB to not only *preserve* but also *improve* the natural environment as a compromise with environmental groups who wanted to introduce legislation that would allow for private ISF water rights. SB 156 also prohibited CWCB from acquiring water rights that would require the removal of existing infrastructure without the owner's approval or that were acquired by condemnation (Bassi, 2014). SB 156 allows for a greater quantity of water to be appropriated and acquired for ISF uses by removing the ceiling that the "preserving" language imposed in limiting the assessment to the natural environment that already exists and extending it to the amount that can be determined as needed to "improve" the natural environment. However, the ISF quantity can still be limited by the "reasonable degree" requirement in which the CWCB or the water courts can subjectively determine an amount to be unreasonable and lower the quantity of the ISF right or deny the application altogether.

In 2002, Colorado experienced a major drought highlighting the need to transfer water quickly in times of critical water shortage, especially when those critical needs could be met voluntarily, as was the case in 2002. Until this time, all water appropriations and acquisitions for surface waters needed to be approved by Colorado's Water Courts. After the drought, HB 1320 passed in 2003, allowing temporary loans of water to CWCB for ISF use in counties and basins with declared drought emergencies without the need to seek judicial approval. The process in 2003 involved an administrative review by the Division Engineer (Merriman & Janicki, 2013). HB 1320 also established a notice and comment procedure requiring the Division Engineer to determine no injury in order to approve the loan (Bassi, 2014).

In 2005, HB 1039 1) removed the requirement of a declaration of drought for temporary loans to ISF water uses, 2) limited the use of the loaned water for ISF to water short decreed ISF water rights, 3) limited the loan to no more than three years for 120 days in any ten-year period,

and 4) provided a process for parties to comment on potential injury after each year a loan is exercised (Bassi, 2014). In 2005, in *Colorado Water Conservation Board v. City of Central*, the Colorado Supreme Court appealed a water court decision which approved an augmentation plan for the City of Central that did not protect ISFs from injury. The Colorado Supreme court upheld that augmentation plans are also subject to the principle that ISFs are fully adjudicated water rights and any augmentation plan with junior appropriations must not harm other water rights, including ISFs (Bassi, 2014).

In 2007, HB 1012, provided that the period of time water is loaned to CWCB for ISF use will not result in a reduction in any future the historic consumptive use analysis and will not be considered as intent of the water user to abandon their water right. In 2008, HB 1280 provided that in any future water court proceeding to change a water right that was loaned to the CWCB for ISF use will not consider any period of non-use in the historic consumptive use analysis due to leasing water to CWCB and will not consider the water right abandoned if that water right is part of a contract with the CWCB for ISF use.

In 2008, HB 1346 also passed allowing the CWCB to use up to $1 million of the severance tax fund annually for ISF leasing and purchasing water rights (Loehman & Loomis, 2008). The Species Conservation Trust Fund also provides up to $500,000 annually for acquiring water to preserve habitat for declining native fish if the $1 million from the severance tax funds is fully appropriated under SB 156 (Benson, 2012). In 2009, an incentive tax credit was created though HB 1067 for water users who voluntarily and permanently donate their rights to the CWCB ISF Program (Benson, 2012). This is a refundable tax credit created for 50% of the value of the donated water right, capped at $2 million per year, and is not available in years when the general fund is not projected to grow by 6% over the previous fiscal year (Bassi, 2014). In 2009,

SB 235 also made $500,000 available to CWCB if the $1 million from the severance tax funds is fully appropriated from the sale of Colorado wildlife habitat stamps (Bassi, 2014). In all, the CWCB has at $1 million dollars every year to spend on acquisitions and an additional $1 million if the first $1 million dollars is completely appropriated.

As of 2012, the CWCB had protected over 9,005 stream miles out of the 39,479 stream miles in Colorado, or about 22.8% of all Colorado stream miles, for ISF use (CWCB, 2013, "Instream Flow Program"). Currently, Colorado's ISF Program protects coldwater and warm water fisheries, waterfowl habitat, unique glacial ponds and habitat for neotenic salamanders, riparian vegetation, unique hydrologic and geologic features, and critical habitat for threatened or endangered native fish (CWCB, 2013, "Instream Flow Program"). The CWCB implements the ISF Program through three main activities: applying for new ISF appropriations, acquitting water through a sale, donation, or lease, and monitoring and protecting decreed ISF water rights.

Recently, ISF has been more holistically defined within the context of 'environmental flow,' which Loehman and Charney (2011) use to emphasize that "restoration is not simply a matter of water, because river health is not just a single dimension" (p. 873) and "that water management should be responsive to environmental and ecosystem needs" (p. 874). The value of ISF is recognized by a diverse set of professionals and stakeholders from a diverse set of disciplines, including lawyers, economists, biologists, planners, and environmental staffers (Loehman & Charney, 2011). Statutorily defined beneficial uses in Colorado currently include:

> "augmentation, *CWCB ISF and natural lake levels*, commercial, domestic, dust suppression, evaporation from a gravel pit, fire protection, fish and wildlife culture, flood control, industrial, irrigation, mined land reclamation, municipal, nature centers, power generation, produced water from gas production, recreation on reservoirs, recreational in-

channel diversions, release from storage for boating and fishing, snowmaking, and stock watering" (CFWE, 2004, p. 7).

Colorado's approach of integrating ISF into the state's water right allocation system places these water rights on an even plane with all other beneficial water uses. ISF water rights are permanent, fully adjudicated water rights consistent with Colorado's Prior Appropriation Doctrine (Almy & Shellhorn, 2007; Loehman & Loomis, 2008).

"Colorado water law is based on 150 years of legal, constitutional, and administrative precedent" (Crow, 2008, p. 645). While a majority of Colorado water law encourages traditional consumptive uses of water, "the water law system has evolved to include new codified uses of water" (Crow, 2008, p. 645). Overall, trends in legislation towards increasing flexibility are positive for achieving greater environmental protection. However most literature argues that ISF legislation alone will not be sufficient to protect and improve ISFs in the face of increasing variability and climate change (Adler, 2007; Almy & Shellhorn, 2007; Grigg, 2011; Loehman & Charney, 2011; Loehman & Loomis, 2008; Pritchett, et. al., 2008; Scott, et. al., 2013).

See Appendix B

Governance of Colorado's Instream Flow Program at the Collective-Level

Colorado Water Conservation Board

Today, most water rights are decreed in the Colorado Water Courts with the sole aim of meeting some explicit human need or demand, save one: CWCB instream flows (ISF) and natural lake levels rights. The CWCB can add water to Colorado's ISF Program in two ways: 1) appropriate un-appropriated water for a new ISF water right or 2) acquire water through a change of use case for absolute flow or storage rights on either a permanent or temporary basis (Beatie,

2009). The CWCB is composed of a fifteen member governing board with a seven member Stream and Lake Protraction Section staff that provides the board with legal and engineering analyses and monitors ISFs for legal and physical protection. The board has diverse geographical representation and must report to the Colorado General Assembly each year concerning spending (CWCB, 2013, "About the CWCB").

One of the main responsibilities of the CWCB board is to translate the restrictions and requirements laid out in any statute pertaining to ISFs into the "Rules Concerning the Colorado Instream Flow and Natural Lake Level Program" (ISF Rules), or Code of Colorado Regulations (CRS) 408-2. The CCRs are the administrative rules of Colorado's executive agencies, which includes the CWCB. The ISF Rules guide the CWCB ISF staff in running the ISF Program and outline procedures for interacting with the water courts, outside agencies and organizations, and other water users:

- ISF Rules 1-4 includes a title, explanation of purpose, statutory authority, and key definitions.
- **ISF Rule 5 describes the procedure, timeline, and requirements for recommending and contesting new appropriations.**
- **ISF Rule 6 outlines the procedures, requirements, and limitations for acquiring a permanent or temporary water right for ISF purposes**.
- ISF Rule 7 outlines the CWCB's response to inundation of decreed ISF water rights due to artificial impoundment of water.
- **ISF Rule 8 describes when and how the ISF staff will monitor and take action to protect ISF.**
- ISF Rule 9 explains when and how the CWCB can modify an existing ISF by reduction,

segmentation or subtraction of water.

- ISF Rule 10 outlines procedures for entering into an enforcement agreement in order to preserve or improve the natural environment to a reasonable degree.

The rules are comprehensive in guiding the CWCB in managing the ISF Program, however, rules 5, 6, and 8 are most important for this paper as it focuses on new appropriation and acquisition policy tools.

Several ISF Rules are just reiterations of the restrictions, requirements, and authority set forth in legislative statutes. However there are many ISF Rules that require the CWCB to interpret statutes in order to create more focused rules and procedures for the interactions between the CWCB board and staff with other entities, organizations, and individuals.

For example, section 37-92-102 (4)(a) of the Colorado Code states, "Utilizing a public notice and comment procedure, the board, in its discretion, may determine whether or not to appropriate minimum stream flows or natural lake levels, or decrease such an appropriation, to preserve the natural environment to a reasonable degree." They have since translated this constitutional-level rule into a collective-level rule: ISF Rule 5c. Board Approval Process, which describes a processing timeline for recommending and applying for a new appropriation (Figure 4).

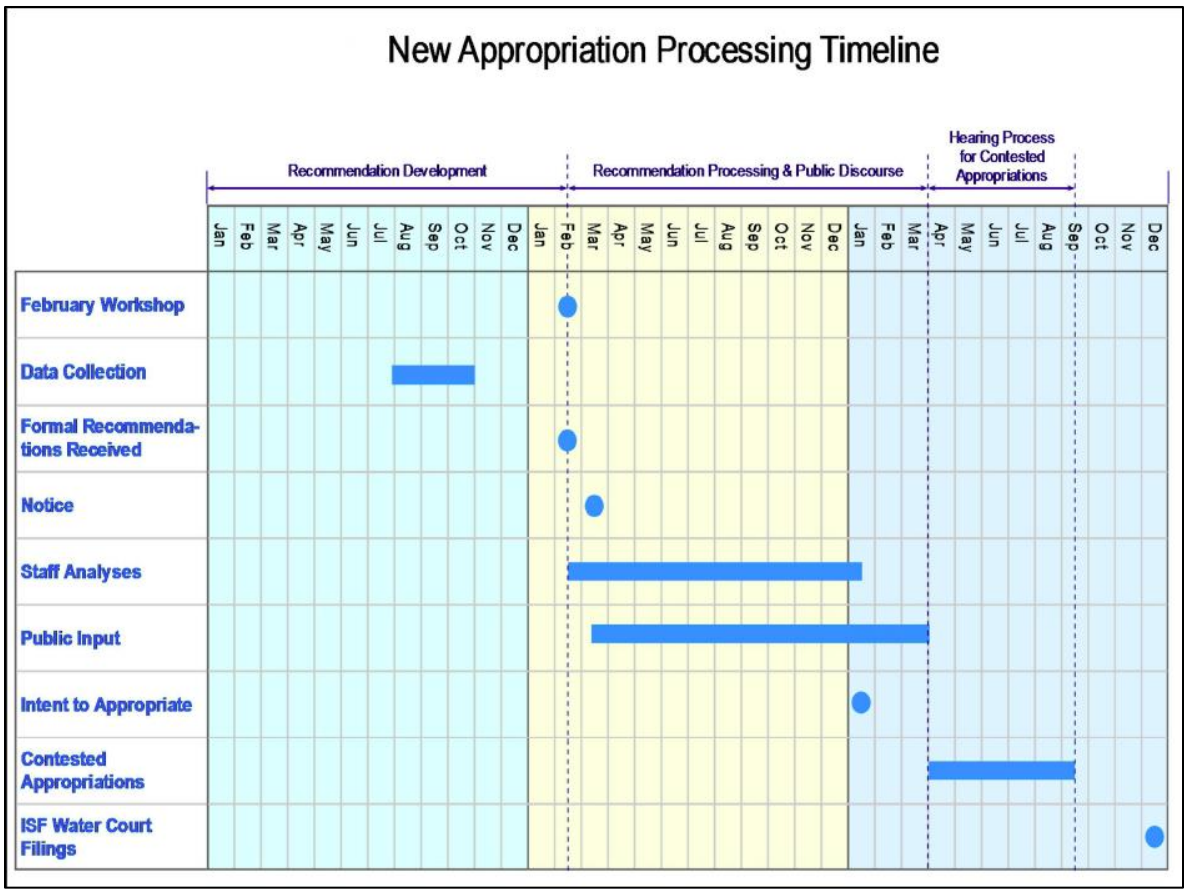

Figure 4. New Appropriation Processing Timeline as seen on CWCB website. The processing timeline outlines the various steps involved in developing, recommending, and contesting a recommendation for a new ISF appropriation up to the point at which the CWCB will file through the Water Court. The timeline shows that completely processing a recommendation can take up to 3 years—maybe longer if contested. http://cwcb.state.co.us/environment/instream-flow-program/Documents/Appropriations/NewAppropriationsTimeline.pdf

Section 37-92-102 also requires the CWCB to request recommendations for new ISF appropriation from state and federal agencies such as Colorado Department of Parks and Wildlife, the U.S. Department of Agriculture, and the U.S. Department of Interior, as well as NGOs such as Trout Unlimited and The Nature Conservancy (Loehman & Loomis, 2008). Individuals are also allowed to appeal to the CWCB. These agencies, organizations and individuals must address the unique biological requirements of each stream reach with respect to water availability. The CWCB helps to further standardize this process by providing an Instream Flow Recommendation Questionnaire and accepting the R2CROSS method as a standard

measurement technique in quantifying how much water is needed to preserve or improve the environment to a reasonable degree. The R2CROSS system takes into account both hydrologic and biological measures, is efficient with respect to time and labor, and is fairly easy to understand from the general public's perspective. Instructions and calculation tools are made accessible to anyone online in the form of a user manual and programmed excel file for calculations.

Once the ISF recommendation is complete using the R2CROSS method, the CWCB staff will determine whether there is sufficient water in the stream system to meet the biologic and hydrologic requirements. If there is insufficient water, the CWCB staff may ask the cooperating agency to reconsider their recommendation and see if there is an alternative way to protect the aquatic ecosystem with the water available (Espegren, 1996). After reviewing and prioritizing recommendations and requests, the CWCB decides which recommendations to pursue as permanent, fully adjudicated ISF water rights through the Colorado Water Courts based on need and feasibility.

Additionally, offers to acquire senior water rights for ISF uses are considered by the CWCB on an *as-offered* basis (Merriman & Janicki, 2013). The CWCB rarely takes a proactive role in acquiring water rights as most of their resources are devoted to strategic ISF appropriation planning and monitoring decreed ISF water rights. If a water right is offered for an acquisition agreement, the CWCB has 120 days to decide the terms and conditions of the offer if they choose to accept it at all. While there is a standardized formal process for a water right holder to offer their water right to the CWCB, there is not consistent or formalized program for accepting/agreeing to acquisitions as there is for new appropriations.

The CWCB's strategic plan states the CWCB's board intends to "continually work with key program stakeholders and the public to engage educate inform and create mechanisms to obtain feedback and understand stakeholder needs regarding the CWCB authorities, base programs, and program applications" (CWCB, 2013, "Stream and Lake Protection Section 2005 Strategic Plan"). While the CWCB does not actively pursue or seek out new appropriations and acquisitions, they do work to make sure the ISF Program is constantly evolving to adapt to changing needs and concerns in the Colorado water community. The CWCB typically does this by working with key community partners, such as the CWT.

Colorado Water Trust

According to King, et. al. (2004), "water trusts are private, nonprofit organizations that acquire water rights in order to enhance instream flow for conservation purposes" (p. 494). According to Beatie (2009), "…water trusts have been formed to protect and enhance streamflows by using market-based, voluntary, cooperative transactions that put older, more defensible water rights back into streams for the benefit of aquatic ecosystems, the flora and fauna that depend on them, and the people who enjoy them" (p. 4). The Oregon Water Trust was established in 1993, followed by the Washington Water Trust in 1998. Water trusts are typically found in the Western U.S., where almost every state that follows the Prior Appropriation Doctrine also maintains their own ISF program. Water trusts are often seen as part of a larger trend in decentralization of federal and state authority in natural resource management. Water trusts also barrow heavily from the land trust models developed in the Eastern U.S. (King, et. al., 2004).

The Colorado Water Trust (CWT) is a registered 501(c)(3) non-profit organization

established in 2001 that "engages in and supports voluntary efforts to restore and protect streamflows in Colorado to sustain healthy aquatic ecosystems" (CWT, 2013, "Home"). The diversity of tools the CWT has had at its disposal has changed over time. Current tools include: water rights sales, water rights donations, long-term leases, short-term leases, dry-year transactions, structural and alternative use solutions, water rights trust, conservation easements, and creative combinations of all of the above (CWT, 2013) According to Beatie (2009), the CWT "pursues and supports the following ISF program areas: (1) conducting water rights acquisitions; (2) implementing physical, structural, and management solutions to improve streamflows; and (3) providing technical support for land trusts with water issues that often arise in connection with their land conservation activities" (p. 10). The creation of the CWT effectively established an alternative pathway for private water right holders willing to donate, sell, or lease their water rights for ISF use (Figure 4 & 5). The CWT works within existing constitutional and collective institutional structures in order to achieve on-the-ground success in protecting and improving ISFs. As such, the CWT often interacts with water users at the operational level.

In 2012, the CWT helped to implement 3-in-10 short-term leases for the first time by creating the Request for Water (RFW) program by translating the requirements and restrictions set out in the statutes and ISF Rules into a structured process for individual water users to follow. The CWT set guidelines for the RFW application process including offering a minimum of 1 cubic feet per second (cfs) of water per offer form, setting expectations for preliminary and follow-up inspections, addressing additional considerations when the water right holder submitting the Offer is not the sole owner of the water right, and providing a complete picture of the entire short-term leasing process, as shown in Figure 5.

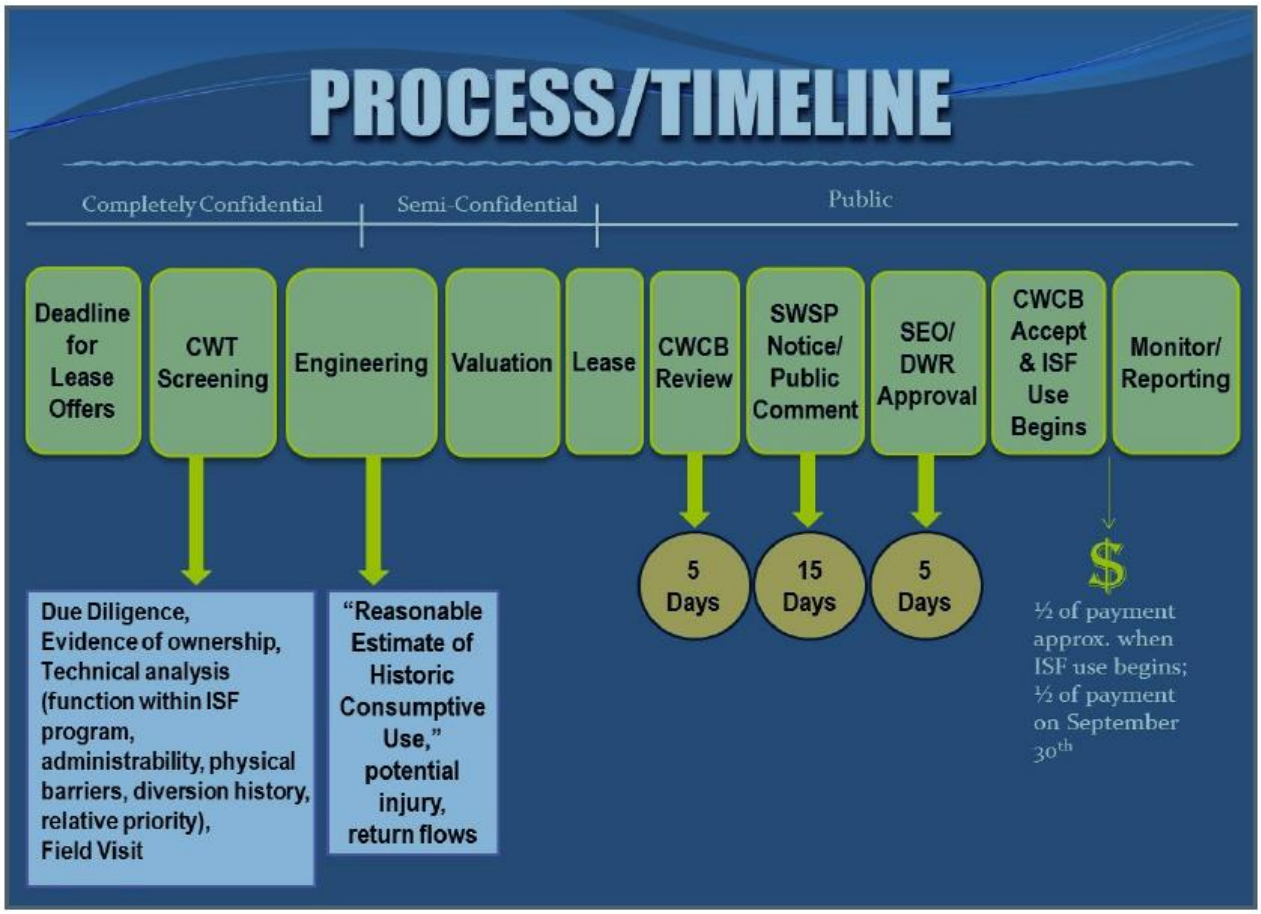

Figure 5. Process/Timeline for 3-in-10 STLs as seen on CWT website. The timeline provides a clear picture of the 3-in-10 short-term leasing process from when the water right is offered through the point at which the water lessor will be compensated. The timeline specifies which steps are confidential as well as the distinct responsibilities of the various actors. http://www.coloradowatertrust.org/campaigns/request-for-water-2013

Governance of Colorado's Instream Flow Program at the Operational-Level

Decreased availability and growing demand make any changes to water use contentious, particularly when the new uses are inherently different than traditional consumptive beneficial uses, such as ISF uses. Accordingly, participation at the operational level in Colorado's ISF program is strictly voluntary. The Colorado General Assembly has increasingly passed legislation that encourages voluntary participation in the ISF Program, by legislatively removing barriers and increasing incentives for participation, which provides organizations and entities with a greater diversity of tools use to protect and improve ISFs (Figure 6). Within a system that historically privileges consumptive water uses, the CWCB effectively translates their legislative authority to preserve and improve the natural environment into four main policy tools: Appropriation, Permanent Acquisitions, Long-term Leasing (LTL), and 3-in-10 Short-term Leasing (STL).

Appropriations

An ISF appropriation is an ISF water right that is recommended to the CWCB by an outside organization or agency such as CPW, BLM, or the USDA. New appropriations have been allowed since 1973 with SB 97, which created the Colorado Instream Flow and Natural Lake Level Program to be administered by the CWCB (CWCB, 2013, "Historic Timeline). ISF appropriations are permanent, fully adjudicated water rights administered in the same priority system as consumptive water rights. They must be decreed through one of the seven state water courts where the CWCB must show that the water right will preserve or improve the natural environment to a reasonable degree, there is water available for the water right, and that the new water right will cause no material injury to any other vested or decreed water right users

(CWCB, 2013, "Instream Flow Program"). ISF rights are vulnerable to calls from upstream senior water rights when there is not enough water in a stream to meet all decreed uses because they typically do not have appropriation dates that pre-date large consumptive uses. For this reason, ISF appropriations are effective tools for protecting ISFs and preventing stream flow conditions from worsening, but do not directly restore stream flow (Beatie, 2009).

Permanent Acquisitions

Acquisitions are ISF rights acquired by the CWCB from another water user. These are also known as change of use cases, where water rights are transferred through the water courts from one decreed beneficial use to another. In the case of ISF acquisitions, the change of use is from a consumptive beneficial use to a non-consumptive beneficial use. Acquisitions have also been allowed since 1973 with SB 97. ISF flow acquisitions are also permanent, full adjudicated water rights administered in the same priority system as consumptive water rights. An acquisition is a market mechanism, meaning that the CWCB or the CWT, in many cases, will pay the seller or lessor a fair market value for the use of the water (Loehman & Loomis, 2008).

Long-term Leases and Contracts

Long-term leasing (LTL) has also been statutorily allowed since 1973. A LTL is a temporary acquisition that must be decreed through Colorado's water courts. In 2008, Colorado passed legislation (H.B. 1280) removing any reduction of the historic consumptive use due to non-use in years the water right is leased to the CWCB in any future water court cases and removed the presumption of abandonment (CWCB, 2013, "Historic Timeline"). LTLs are not a

permanent change of use, meaning the lessor retains ownership of the water right, however the change of use still goes through a full adjudication process through the water courts.

3-in-10 Short-term Leases

3-in-10 Short term leases (STLs) have been allowed in times of drought since 2003, without a declaration of drought since 2005, and without a reduction to historic consumptive use or presumption of abandonment since 2008. An agricultural water user can lease their water right to the CWCB for ISF purposes for 3 years in any 10-year period for no more than 120 days at a time. 3-in10 leases require administrative approval from the Division Engineer's Office. The CWT is the only organization to date facilitating these STLs with the CWCB (CWCB, 2013, "Temporary Loans and Leases of Water Rights for Instream Flows").

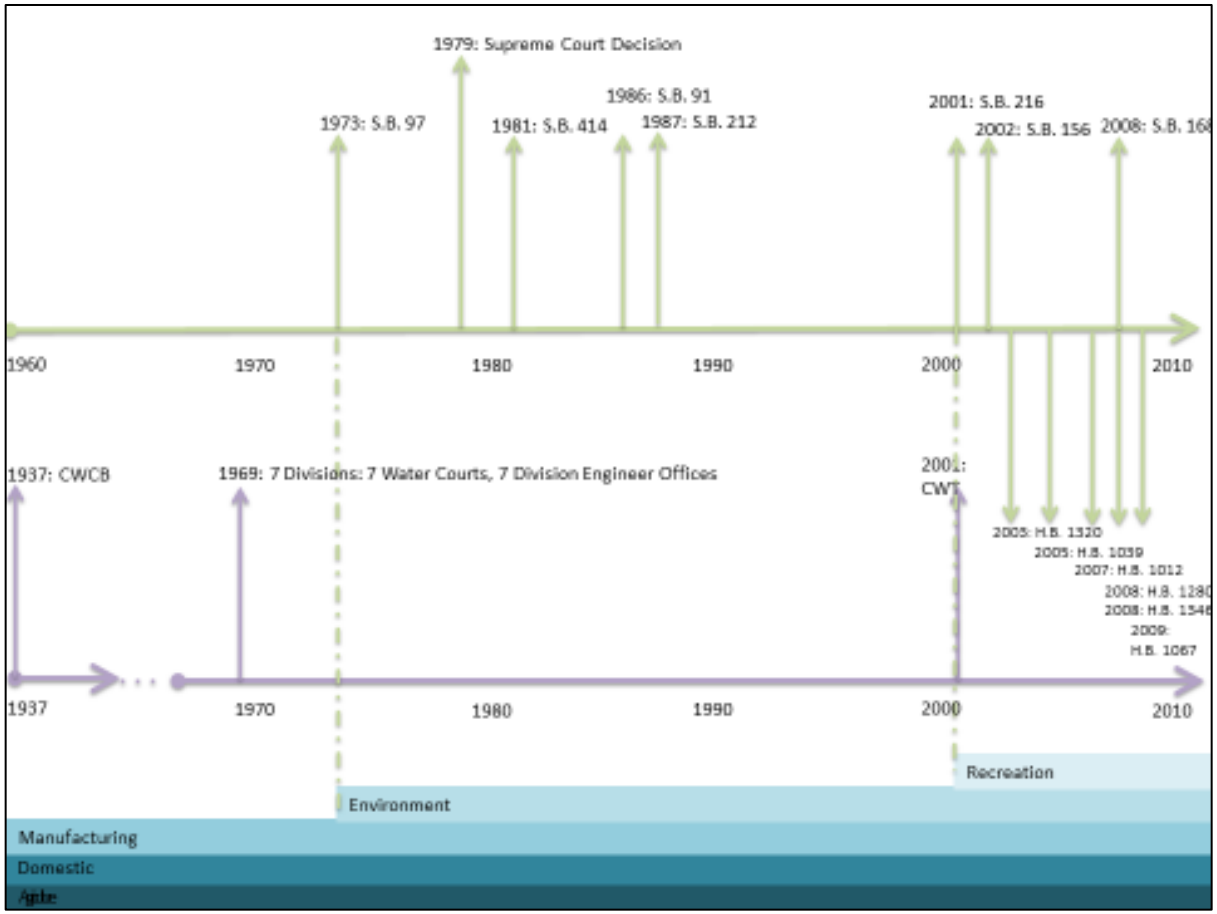

Figure 6. Historic Instream Flow Timeline: Constitutional, Collective, and Operational Evolution. The top timeline shows the passage of key legislation since the ISF Program's inception in 1973 to present (constitutional level). The middle timeline shows the establishment of the two main actors in this analysis in relation to the key ISF legislation (collective level). The bottom bars show how the recognition of beneficial use has changed relative to the constitutional and collective changes (operational level). (See Appendix A for details on Senate and House Bills used in the figure).

Table 2. Four Main ISF Policy Tools. The table describes the characteristics of each policy tool, the associated key legislation, the effect of that legislation, and notes the number of transfers to date associated with each of the tools.

ISF Policy Tool	Key Legislation	Effect of Legislation	Characteristics
Appropriations	S.B. 97 (1973)	● Creates the Colorado Instream Flow and Natural Lake Level Program to be administered by the CWCB	● Permanent, fully adjudicated rights ● CWCB Required Findings: -3 considerations[1] ● Water Court Process ● Depend on water availability ● Junior to most consumptive water rights
Acquisitions	S.B. 91 (1986)	● Clarified CWCB's authority to acquire water rights through donation, acquisition or lease	● Permanent, fully adjudicated rights ● CWCB Evaluation: -11 considerations[2] ● Water Court Process ● Potential relatively senior priority date ● Water market mechanism (unless donated)
Long-term Leases & Contracts	S.B. 91 (1986)	● Clarified CWCB's authority to acquire water rights through donation, acquisition or lease	● Temporary water rights ● Water court process ● Water market mechanism
	H.B. 1280 (2008)	● No reduction of the historic consumptive use ● No presumption of abandonment	
3-in-10 Short-term Leases	H.B. 1320 (2003)	● Authorizes temporary loan during times of drought or other emergency	● Temporary water rights ● Administrative review process ● Water market mechanism
	H.B. 1039 (2005)	● Removes the drought declaration requirement	
	H.B. 1280 (2008)	● No reduction of the historic consumptive use ● No presumption of abandonment	

[1] To determine if a new appropriation water right filing is appropriate, the CWCB determines: 1) natural environment, 2) water availability, and 3) material injury (Rules Concerning the Colorado Instream Flow and Natural Lake Level Program, Section 5i).

[2] To determine the appropriateness of an acquisition, the CWCB considers the following: 1) the proposed reach of the stream or lake level, 2) the natural flow regime, 3) material injury, 4) historical consumptive use and historic return flows available for instream flow use, 5) the natural environment, 6) location of the water rights on the subject stream(s), 7) effects on relevant interstate compact issues, 8) effect on maximum utilization of state waters, 9) if the acquired water will be available for subsequent downstream use or reuse,

CHAPTER IV

METHODS

Colorado is unique in the American West as the state with the purest form of Prior Appropriation and as the only state to completely manage surface water allocations through a judicial system. Within Colorado, the CWCB is the only entity allowed to hold ISF water rights, and, currently, the CWT is the only organization actively pursuing acquisitions on behalf of the CWCB. Therefore, a holistic, in-depth single-case study design is appropriate for the following analysis (Yin, 2002).

While the literature suggests collaborative management is an appropriate natural resource management approach for translating processes into on-the-ground practices and increased outcomes, particularly in the case of water management, it is important to have concrete case studies that can explicate how collaborative management is effective in protecting ISFs in Colorado, if at all. Therefore, the main research question for the following analysis is: *RQ: Has multi-level collaborative management been and will it be a successful approach for protecting instream flow in Colorado?*

In order to answer this broad research question, several levels of sub-questions will guide separate sections of the analysis:

<u>RQ1:</u> *Why and how has Colorado's ISF Program been successful so far?*

<u>RQ1a:</u> *How frequently have the four ISF policy tools been used over time?*

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10) costs associated with completing the transaction, 11) administrability of the acquired water right (Rules Concerning the Colorado Instream Flow and Natural Lake Level Program, Section 6e).

RQ1b: How often and when are decreed ISF water rights thresholds not met?

RQ2: What barriers to and opportunities for the success of Colorado's ISF program exist?

RQ2a: How were the 3-in-10 short-term leases derived from legislation and translated into on-the-ground ISF protections?

RQ2b: Does the CWT, as a non-governmental organization, provide trust in the implementation of Colorado's ISF Program, while CWCB, as a government agency, provides legitimacy?

RQ3: What role does and will collaborative management play in the past and future success of Colorado's ISF Program?

RQ3a: How has and will 3-in10 STLs affect future ISF legislation and ISF Program management decisions?

The following methods include both quantitative and qualitative approaches. Quantitative approaches are used to describe trends in the use of ISF policy tools and efficacy of ISF water rights, while qualitative approaches are used to determine and describe the institutional arrangements underlying the role of collaborative management in the implementation of the ISF Program.

Quantitative Data Collection and Analysis

Instream Flow Policy Tool Trends

The frequency of use of ISF policy tools is an important first step in understanding why the CWCB and CWT use certain policy tools at certain times. Therefore, ISF water right trends are analyzed in two ways: 1) the relative priority of ISF water rights compared to all other Colorado water rights using appropriation dates binned by year and 2) the frequency of use of all

four policy tools over time. The Colorado Decision Support System (CDSS) is a water management system developed by the CWCB and the DWR and maintained by the DWR for each of Colorado's major water basins. The CDSS maintains various datasets that are easily exported from their public website. However, the CDSS does not allow for relational searches across datasets. Therefore, several datasets from the CDSS, CWCB staff, and online records were used in an ad hoc fashion to combine and cross reference relevant information. The datasets include:

- **Water Rights-Net Amounts List**[3] containing the current status of all water rights based on a history of all their court decreed actions.
- **Water Rights-Diversion Structures List**[4] containing physical, manmade structures used for diverting, storing, releasing, or measuring water and their associated stream systems
- **ArcGIS Attribute Table of decreed ISFs**[5] containing the number of decreed ISF appropriations and acquisitions as of 2012 and their associated latitude and longitude locations, case numbers, and stream miles protected.
- **CWCB Dataset of Gages located within ISF Water rights**[6] containing gage names, locations, and agencies and ISF case numbers, decreed amounts and times, and upper and lower terminus locations.

[3] This dataset can be accessed through the DWR's HydroBase Bulk Data Exporter. https://data.colorado.gov/Information-Sharing/DWR-Water-Right-Net-Amounts/acsg-f33s

[4] This dataset can be accessed through the DWR's HydroBase Bulk Data Exporter. https://data.colorado.gov/Information-Sharing/DWR-Administrative-Structures/vz77-kxck

[5] The ArcGIS database for ISFs was provided by the CWCB staff for analysis and the attribute table was subsequently exported as an excel file

[6] An excel file was provided by the CWCB staff using information from their GIS database and was subsequently formatted for appropriate analysis and cross-referencing

- **Customized dataset from the CWCB's ISF database** [7] containing all new ISF appropriations as of 2013, their associated watersheds, case numbers, decreed amounts and dates, and stream miles protected.
- **CWCB's online searchable ISF database** [8] containing priority dates for permanent acquisitions.
- **CWCB's online record**[9] of completed transactions including permanent acquisitions, long-term leases, and short-term leases and associated case numbers, priorities, and decreed amounts.

In order to determine the overall priority of all ISF water rights in Colorado, I calculated the appropriation date frequency per year for all water rights in Colorado from Net Water Right Amounts dataset and subtracted the appropriation date frequency per year for ISF water rights.

In order to track how often appropriations and acquisitions are used as policy tools, I took the first two numbers of each of their case numbers, which corresponds to the year in which the water right was applied for through the water courts. Acquisitions are often offered in an ad-hoc manner after which they are consolidated and applied for in one court case. They might cover various times of the year and various locations, but will be offered by the same water user or offered at the same location. However, the CWCB records these water court cases as one ISF water right.

Instream Flow Biophysical Threshold Trends

[7] An excel file was provided by the CWCB staff using their internal ISF database and was subsequently formatted for appropriate analysis and cross-referencing

[8] http://cwcb.state.co.us/technical-resources/instream-flow-water-rights-database/Pages/main.aspx

[9] http://cwcb.state.co.us/environment/instream-flow-program/Pages/CompletedTransactions.aspx

Examining how often ISF thresholds are not met in a spectrum of wet to dry years will provide insight into how effective the current use of ISF policy tools is in keeping water in a stream channel. As previously mentioned, recommenders for new appropriations use the R2CROSS system to determine biophysical need because it considers both hydraulic and biological measures, is efficient with respect to time and labor, and fairly easy to understand from the general public's perspective. The CWCB, on the other hand, determines water availability with modeling tools and gages located throughout Colorado. ISF protection and monitoring rests on the assumption that when a pre-established threshold is met or exceeded (i.e. the R2CROSS recommendation), it follows that the natural environment, including the underlying ecological and biological components, is preserved or improved. Therefore, gage data is an appropriate indicator for determining the extent to which ISFs are protected.

The following data collection and analysis was performed in collaboration with a graduate student in the Department of Geology at CU Boulder. We downloaded discharge data from 56 United States Geological Society (USGS) gages located within the reach of a fully adjudicated ISF water right throughout the state of Colorado. ISF gages include those monitored by the USGS which are publically available and consistently updated on the Consortium of Universities for the Advancement of Hydrologic Science, Inc. (CUAHSI) online database.

> "The **CUAHSI** is a 501(c)3 research organization representing more than 100 U.S. universities and international water science-related organizations. CUAHSI receives support from the National Science Foundation (NSF) to support the advancement of water science in the United States" (CUAHSI, 2012).

This database includes stream gages from 31 different agencies. Data from CUAHSI was downloaded using a specific Python Hydrologic Information System (PyHIS) module developed

by the Texas Water Development Board. This allows the data to be translated into WaterML for further coding in Python. Python was used to build statistical codes and interface options for user data selection and processing. For each gage, we downloaded the daily mean discharge and the annual discharge for the available period of record. Periods of record for each gage are inconsistent with respect to the number of range of years of data collection, which largely depend on USGS funding for each gage.

Quartile Plots

We paired each daily discharge measurement from the entire period of record for each USGS gage with the decreed ISF water right volume (cfs) and counted the total number of days over the period of record for which that ISF minimum right volume was not met. We compared these measurements against the annual discharge over the period of record to determine if the daily mean discharge is below the ISF threshold during wet, above average, below average, or dry years. A year is determined to be a "dry" year if the annual discharge is in fourth quartile and a "wet" year if the annual discharge is in the first quartile of the annual discharge for the entire period of record. A year is determined to be "above median" or "below median" if the annual discharge was above or below the median annual discharge for the period of record, but not within the 4^{th} or 1^{st} quartile, respectively.

For each gage, we labeled each day over the period of record in one of eight categories based on whether the daily mean discharge was above, at, or below the ISF right threshold and if the annual discharge was considered "wet," "above median," "below median," or "dry." We calculated the percentage of total number of daily mean discharges that meet or exceed the ISF threshold for each gage individually for each period of record. We also aggregated the

percentages weighted evenly by gage for any gage that had a period of record from 2003-2014, as 2003 was the latest initial year for any period of record across all 56 gages. Any gage that did not continue through 2014 was dropped from the sample, which left us with 52 gages total for the aggregated data.

Proximity Plots

The ISF water rights and associated gages are placed into four distinct categories based on five distinct trends in the percentage of the ISF threshold not met between all four quartiles. One ISF water right and gage is selected for the three most common trends and analyzed further by creating proximity plots totaling three example gages. The GIS maps provided by the DWR are not sufficiently precise with respect to stream lines, water right structures, and USGS gage locations in order to determine relative proximity of water rights to a specific gage location. Therefore, a 1 arc-second Shuttle Radar Topography Mission (SRTM) elevation map was used to build a drainage network using a flow accumulation and drainage direction algorithm. The algorithm creates a line along which the USGS gages are properly aligned. We found all water rights located along the flow path within 20 kilometers upstream and downstream of the USGS gage. For upstream water rights structure, the 20 kilometers includes any water right structure located on a tributary. However, downstream water rights structures located on tributaries will not affect upstream ISF rights independent of whether they are relatively junior or senior to that ISF right. Therefore, a 250-meter buffer was created along the flow path line to find water structures along what would be the main stem of the stream on which the USGS gage is located. We then calculated the distance of each water right structure located within 20 kilometers upstream and downstream of the gage. For the downstream water right structures, we found the

portion of the main stem that was closest to the water right structure to determine the starting point in order to calculate distance. Upstream distances were assigned a negative value and downstream distances were assigned a positive value. All water right structures located within the designated area were ordered by priority according to their administration number. Any water right that was administratively junior to the ISF was excluded from the data and the 20 most administratively senior consumptive water rights were ordered and categorized as either upstream or downstream of the USGS gage located within the ISF water right.

The resulting plots are presented for three example gages and associated ISF water rights, which represent the most frequent trends in the data. While the quartile and proximity graphs do not allow for a comprehensive understanding of what is happening at each ISF location, they provide insight on key hydrographic differences between ISF locations and are used as a basis for generating potential water right administration scenarios. The examples were chosen, not as statistically representative cases of the four qualitative trends, but rather as cases that demonstrate distinct qualitative trends between all 56 gages and that have sufficient data to create a plausible narrative with respect to the consumptive senior water rights surrounding each gage location. This quantitative analysis is also supported with quotes from interviews with ISF practitioners to provide context for the interpretation of the observed patterns.

Qualitative Data Collection and Analysis

Understanding how collaborative management has been used in Colorado's ISF Program in the past is important to understanding how collaborative management might help Colorado's ISF Program adapt to an uncertain future. One-on-one interviews with key personnel at the CWCB and CWT provide valuable insight into how the ISF Program has been implemented

through the ISF policy tools to date as well as challenges for the future. Interviews are used to identify baseline biophysical and legal criteria for the 3-in-10 short-term leases, identify perceived characteristics pertaining to a water user's willingness to participate in a 3-in-10 short-term lease, the role of the CWCB and CWT in implementing the short-term leasing program, and future challenges of the ISF Program.

Semi-Structured Interviews

Interviewees

I conducted semi-structured interviews with the Colorado Water Trust and Colorado Water Conservation Board employees. The Colorado Water Trust has seven full-time employees an including Executive Director, an Operations Manager, a Communications and Development staff member, a Transaction Specialist, a Colorado Open Lands Fellow, a Staff Attorney, and a Director of Engineering. The Colorado Water Conservation Board Stream and Lake Protection Section has seven full-time employees including a Section Chief, a Deputy Section Chief, a Senior Water Resource Specialist, a Water Resource Engineer, a Hydrologist, a Water Resource Specialist, and a Hydrographer. While there are a total of 14 potential interviewees between the CWT and CWCB, I chose participants based on their knowledge, experience, multiple perspectives, and ability to provide useful information about 3-in-10 short-term leasing in Colorado, which resulted in nine total interviews between the two entities.

Interview Design

I followed what Rubin and Rubin (2005) describe as the tree-and-branch method in order to structure interviews. The interviews were divided into equal parts based on the following broad categories:

- Staff member's role in implementing the leasing program, if any
- Baseline biophysical and legal criteria for short-term leasing
- Perceived participant characteristics pertaining to short-term lessor's willingness to participate
- Role of the CWCB and CWT in the short-term leasing program
- Future Challenges

Each category had at least one main question, after which the interviews consisted of a series of follow-up questions and probes to accommodate for both detail and depth in responses. Each interview contained the same basic format and main questions to build in redundancy in order to check interviews for consistency (Rubin & Rubin, 2005).

I transcribed each recording within 2 weeks of the interview using intelligent verbatim level transcription as to include only the level of detail likely to be analyzed and likely to influence the interpretation of the transcription. I analyzed the qualitative data following the basic, seven step process outlined in Rubin and Rubin (2005). Before I transcribed the interviews, I developed an initial coding scheme based off on a review of current literature. However, according to Rubin and Rubin (2005) the coding process should accommodate any emergent themes and concepts. Therefore, I iteratively adjusted the code as I transcribed and reviewed the interviews in order to achieve more inclusive end-results.

1) The *Recognition* step included a review of all of the transcripts in order to identify initial concepts, themes, events, and topical markers pertaining to the four broad interview categories including the staff member's role in the short-term leasing process, short-term lessor participation criteria, perceived characteristics for short-term lessor willingness to participate, and the role of the CWCB and CWT in the ISF Program. I merged emergent themes, concepts, events, and topical markers with the initial codes established from the current literature review.
2) A second review of the transcripts served to iteratively *Clarify*, *Synthesize*, and *Elaborate* those key concepts, themes, events, and topical markers.
3) I finally labeled the concepts, themes, events, and topical markers with a final *Coding scheme* in order to *Sort* the data units and ultimately *Synthesize* those concepts, themes, events, and topical markers.

The final codebook, which includes coding instructions, is attached as *Appendix C*. I de-identified interviewees during the coding process by assigning each transcript an individual alphanumeric code. The codes include the state, entity type, and subject identifier. For example, CO-GOV-01 is associated with the first interview transcribed for a staff member at the Colorado Water Conservation Board.

CHAPTER V

RESULTS PART I

Instream Flow Policy Tool Use and Biophysical Threshold Trends

Past trends in ISF policy tool use and ISF biophysical thresholds are presented in this section. ISF water rights can be decreed through either an appropriation or an acquisition, which translates into four main policy tools: new appropriations, permanent acquisitions, long-term leasing, and short-term leasing. Each of these tools has distinct requirements for use and vary in the extent to which they are able to protect and restore ISFs. The goal of this analysis is to understand when each ISF policy tool has been used to date as well as the relative effectiveness of their use in order to understand why and how the CWCB and CWT choose to use the four policy tools and whether or not this is important to the collaboration between the two entities. Therefore the overarching research question guides this analyses: *RQ1: Why and how has Colorado's ISF Program been successful so far?*

In order to understand the overarching research question, three sub-questions guide the following analysis. Outside of legislative restrictions, the CWCB and CWT may choose to use one tool more than another for reasons such as resources, capacity, or political factors. Therefore, tracking the frequency of ISF policy tool use over time is a key first step in understanding why the CWCB and CWT use certain policy tools more frequently than others. The first sub-question begins this analysis:

RQ1a: How frequently have the four ISF policy tools been used over time?

As shown in Table 2, each of the four main policy tools has been used with varying frequency due to changes in statutes and actors involved. As of 2012, there were 146,455 decreed water rights in the state of Colorado and only 1,601 of those are designated ISF water rights (~1.1%) (Colorado Division of Water Resources, 2014, "Colorado Decision Support System: Water Rights").

Table 3 ISF Policy Tool Use. The table notes the number of transactions or transfers as of 2012 associated with each of the ISF policy tools.

ISF Policy Tool	Number of Times Used
Appropriations	1,582
Permanent Acquisitions	19 (2 pending)
Long-term Leases	6
Short-term Leases	7

Appropriations

Of the 1,601 decreed ISF water rights, 1,582 of those are new appropriations, none of which will have appropriation dates before 1973. Table 2 shows that new appropriations have been the most frequently used approach thus far. However, the timeline of the use of appropriations and permanent acquisitions, tracked by the years in which the ISF right was applied for through the water courts (Figure 7), shows that the number of times new appropriations have been used is skewed towards the 1970s and has dropped off in recent years. Any single average number of number of appropriations created per year since 1973 would hide the decreasing trend, however one CWCB staff member stated that the new appropriations have averaged out in recent years to 10-15 per year. Although in 2013, the CWCB only received two

recommendations, indicating that the number of recommendations per year can still be variable (Personal Communication CO-GOV-04, May 3, 2014).

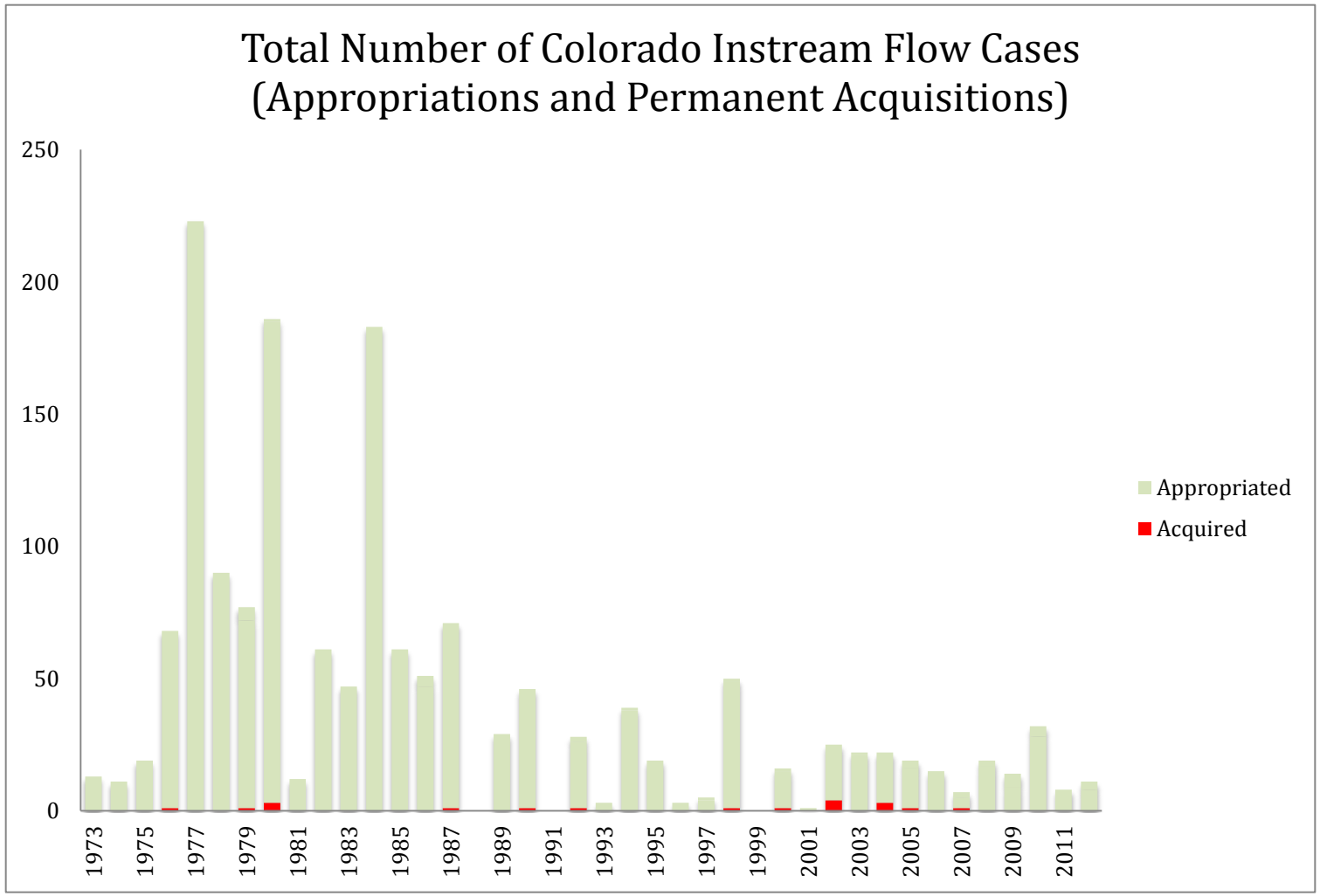

Figure 7. Total Colorado ISF Cases : Appropriations and Permanent Acquisitions. The graph shows the frequency of ISF cases over-time beginning in 1973. Cases are distinguished between appropriations (light green) and acquisitions (red). Note that ISF cases numbers and derived years were used to represent the year in which an ISF was applied for through a water court. This date does not represent the year in which the right was decreed by the water courts.

Permanent Acquisitions

Since 1973, there have been 19 permanent ISF acquisitions agreements, with two currently pending (Figure 7). Acquisitions, or the change of use for an existing decreed water right to ISF use on either a permanent or temporary basis, can potentially have an appropriation date senior to consumptive diversions and restore ISF within a river basin (Figure 8).

Long-term Leasing and Contracts

Currently, there are six long-term leases and contracts in use by the CWCB (CWCB, 2013, "Completed Transactions"). While long-term leasing has been statutorily allowed since 1973 and reaffirmed in 1986, these transactions are more difficult to track over time because leasing terms and conditions end. Therefore, this number may not represent the total number of leases that have been completed since 1986.

3-in-10 Short-term Leasing

3-in-10 STLs have been statutorily allowed specifically for ISF without a declaration of drought since 2005 and the reduction of historic consumptive use penalties and presumption of abandonment was removed in 2008, but the 3-in-10 legislation was first implemented in 2012 and thus far 7 leases have been approved.

Overall, the data show a trend of less utilization of permanent on-the-ground policy solutions for ISF protection (i.e. appropriations) over time and variable use of policy tools that both restore and protect ISF permanently or temporarily (i.e. acquisitions). When ISF water rights are compared to all other water rights in terms of their priority dates, the trend shows that

most of the decreed ISFs priority dates fall after 1973 and a majority of all other water rights fall before 1973 (Figure 8).

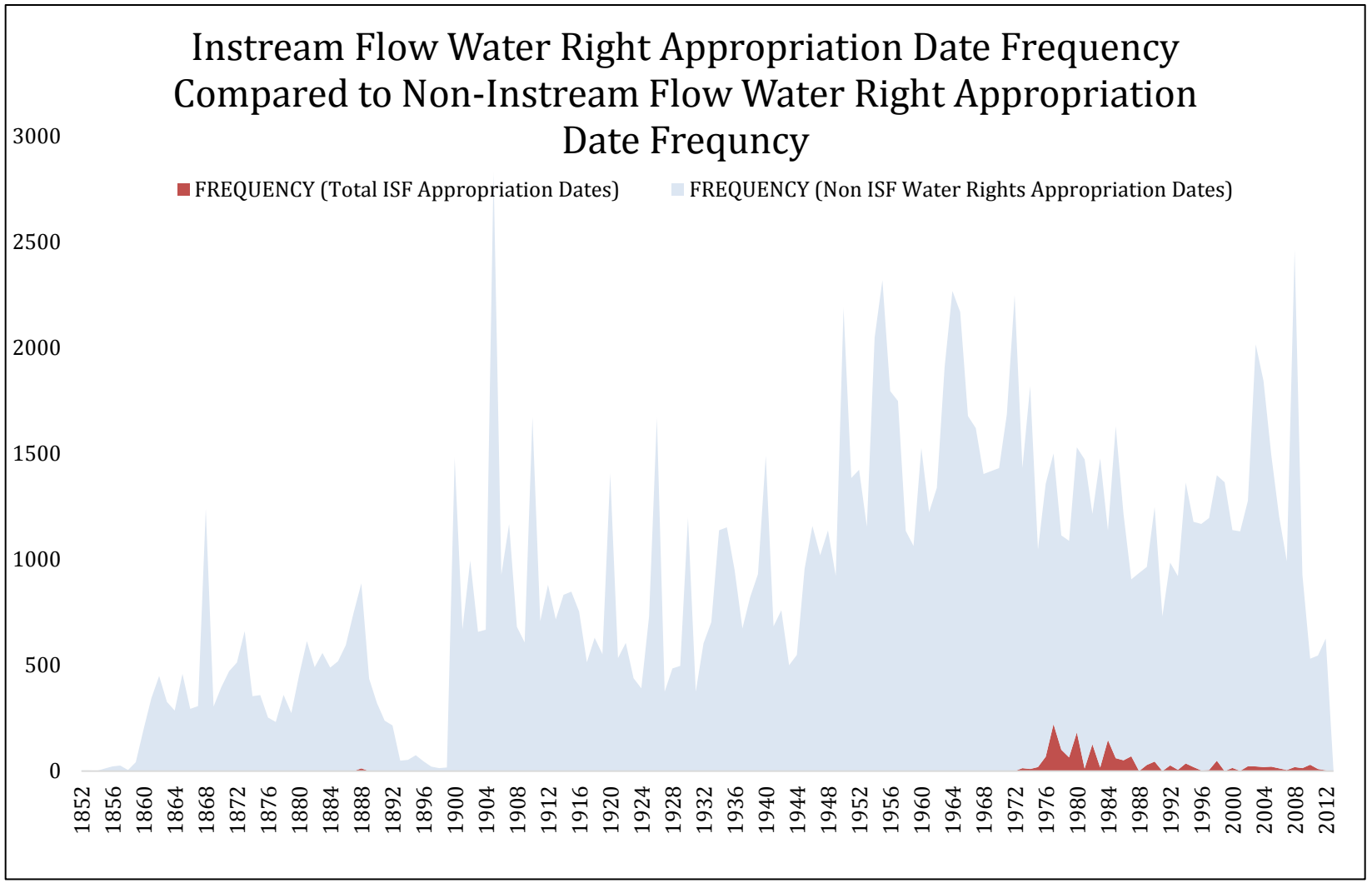

Figure 8. Appropriation Date Frequency: All Water Rights vs. ISF Water Rights. Histogram of current number of water rights decreed in Colorado, categorized by the year of their appropriation date. Light blue represents any decreed water right for beneficial use in Colorado. Red columns represent the subset of those decreed water rights as those decreed for instream flow use. Instream flow water rights comprise just over 1% of the total number of decreed water rights in Colorado.

Understanding the biophysical trends of ISF thresholds in Colorado and how often ISF thresholds are met across Colorado provides valuable insight into the relative effectiveness of the use of different policy tools. Every ISF water right has an associated decreed quantity of water (cfs) that is based on how much water is *needed* to preserve or improve the natural environment between two specific locations along a stream, how much water is *available* to preserve or improve that specific natural environment, and how much water can be decreed *without causing injury* to any other water right on the same stream. This threshold can change throughout the year as the amount of water in any given stream changes throughout the year. The two reasons this threshold is not met are 1) natural variability of water in the stream system and 2) the relative decreed timing, amount, and priority of nearby diversions. A majority of the academic literature on ISF water rights in Colorado notes that ISFs are relatively junior water rights because they were not legislated until 1973, which is accurate, but then go on to say that because ISFs are junior, these rights are most often not met in dry years. Examining how often ISF thresholds are not met in a spectrum of wet to dry years provides valuable insight into how effective the current use of ISF policy tools is in achieving the intended outcome of keeping water in a stream channel in order to preserve or improve the natural environment. The following sub-question guides this section of the analysis:

RQ1b: How often and when are decreed ISF water rights thresholds not met?

Figure 9 shows the percentage of days in which an ISF is not met aggregated from 05-06-2003 to 4-22-2014 for all gages across all 7 water divisions. Of the 52 gages sampled from 05-06-2003 to 4-22-2014, 10.7% of the daily mean discharges of all of the days sampled were below the ISF threshold in a "Wet" year, 9.7% of the daily mean discharges were below the ISF threshold in an "Above Median" year, 21.3% of the daily mean discharges were below the ISF

threshold in a "Below Median" year, and 27.1% daily mean discharges were below the ISF threshold in a "Dry" year (Figure 9).

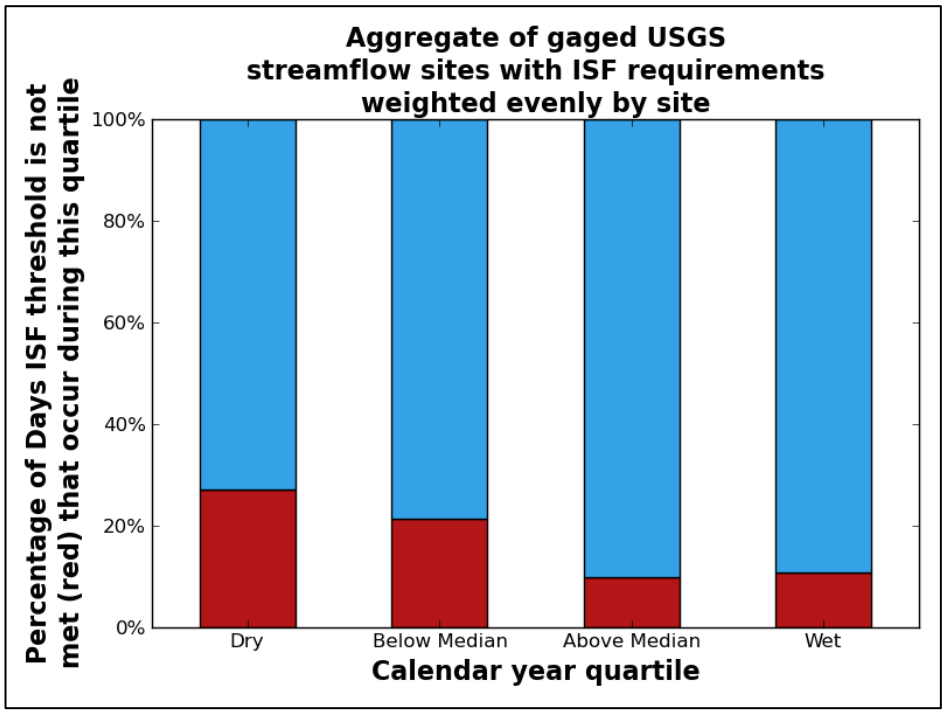

Figure 9. Percentage ISF threshold not exceeded for all USGS stations sampled. The percentage of days the ISF threshold was not exceeded is shown in red and the percentage of days the ISF was exceeded in show in blue across all USGS gages sampled. This includes 52 of gages that have periods of record between 2003-present. 10.7% of the days that the ISF threshold was not met were in a wet year, 9.7% of the days that the ISF threshold was not met were in an above median year, 21.3% of the days that the ISF threshold was not met were in a below median year, and 27.1% of the days that the ISF threshold was not met were in a dry year.

The overall trend in Figure 9 shows that in the past 11 years decreed ISF thresholds have been met for a majority of the time in which the ISF water right is supposed to protect a stream reach independent of whether or not it is a wet or dry year. While the trend in Figure 9 does not quantitatively mimic the natural hydrograph, qualitatively it follows the basic notion that when there is less water in the stream during dry years, ISF water rights (which are fulfilled when water is left in the stream between two specific points) would be fulfilled less often independent of administration.

However, when these data are compared between gages over a larger and more variable period of record the pattern of ISF being met a majority of time but less in dry years does not always hold true. Out of the 56 total USGS gages sampled over their entire period of record, five categories of distinct qualitative trends appear. The following 5 categories describe the percentage of days the ISF threshold is **not met** ordered from most often to least often:

1) dry years > below median years > above median years > wet years
2) dry years > above median years > below median years> wet years
3) below median years > dry years > above median years > wet years
4) all years met
5) only not met in dry years

In the case of Colorado water, changes in the natural pattern of the hydrograph is most certainly associated with the number and quantity of diversions throughout the state. However, in the case of ISFs, the underlying notion that a junior water right will be filled less often than a senior water right when located within the same drainage system is made more complex by the fact that ISF water rights are met when water is left within the channel, not when water is diverted from the channel as is the case with most any other water right. Before walking through three examples detailing how individual ISF thresholds are met or not met to various degrees in relatively wet and dry years, it is important to explicitly outline four basic principles on which the analysis is based:

1) A water right that is located upstream of an ISF water right and is junior to that ISF water right will <u>not</u> prevent surface water from reaching that ISF water right

2) A water right that is located downstream of an ISF water right and is junior to that ISF water right will not affect the amount of water that passes through the ISF water right

3) A water right that is located upstream of an ISF water right and is senior to that ISF water right

    a. has the potential to prevent surface water from ever reaching that ISF water right

    b. will return a portion of that water right to the stream as return flow, which may occur below or within the downstream ISF water right (Figure 10)

4) A water right that is located downstream of an ISF water right and is senior to that ISF water right has the potential to pull water through an upstream ISF water right by curtailing water rights that are upstream and senior to the ISF water right but are also junior to the senior downstream water right (Figure 11)

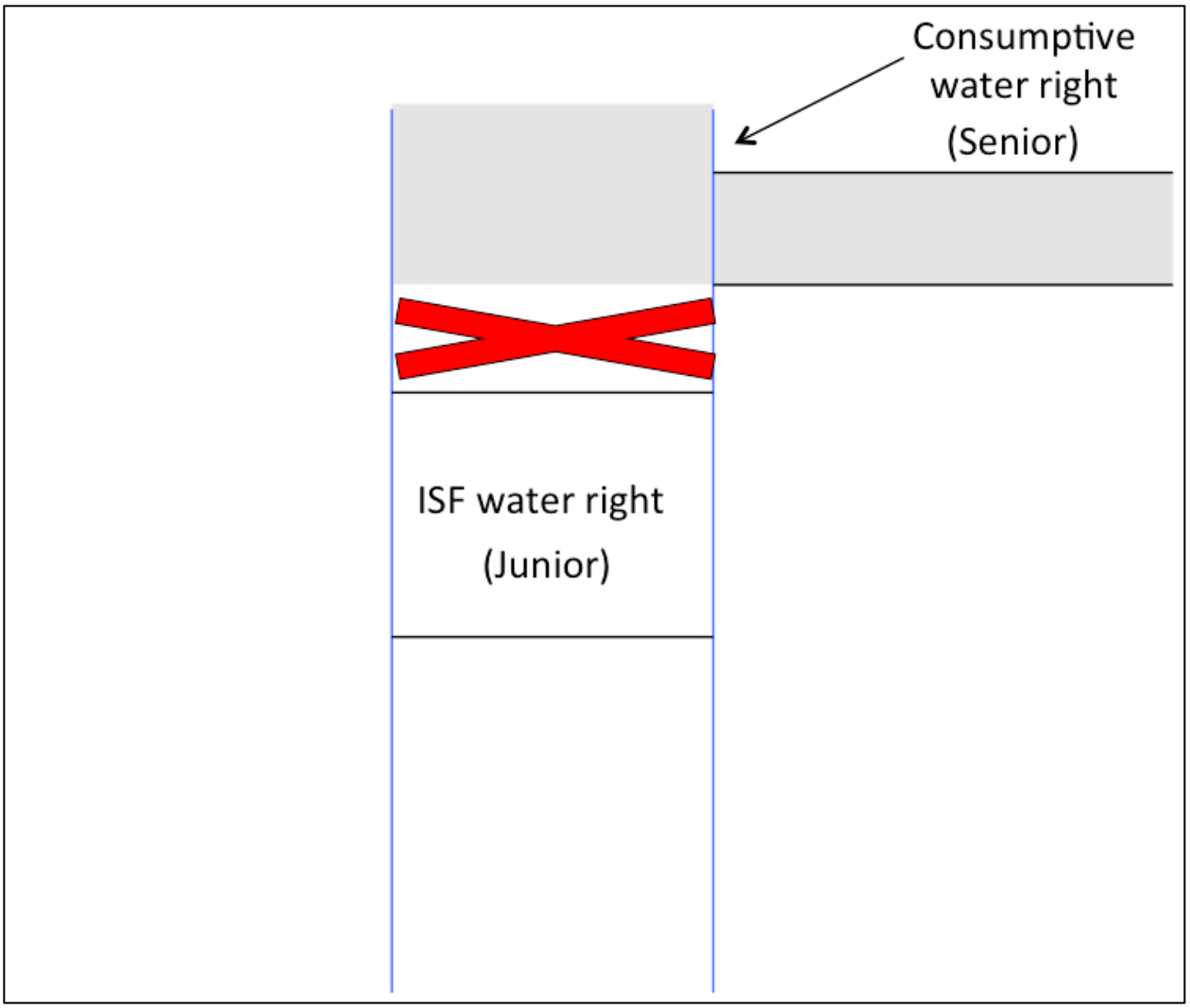

Figure 10. ISF water right administration with a senior upstream water right. The upstream senior water right has the potential to prevent surface water from ever reaching the downstream ISF water right. The black lines are the diversion structures and upstream/downstream point of the ISF water right. The blue lines are the main stem and the grey shading is surface water in the stream or being pulled into a diversion structure.

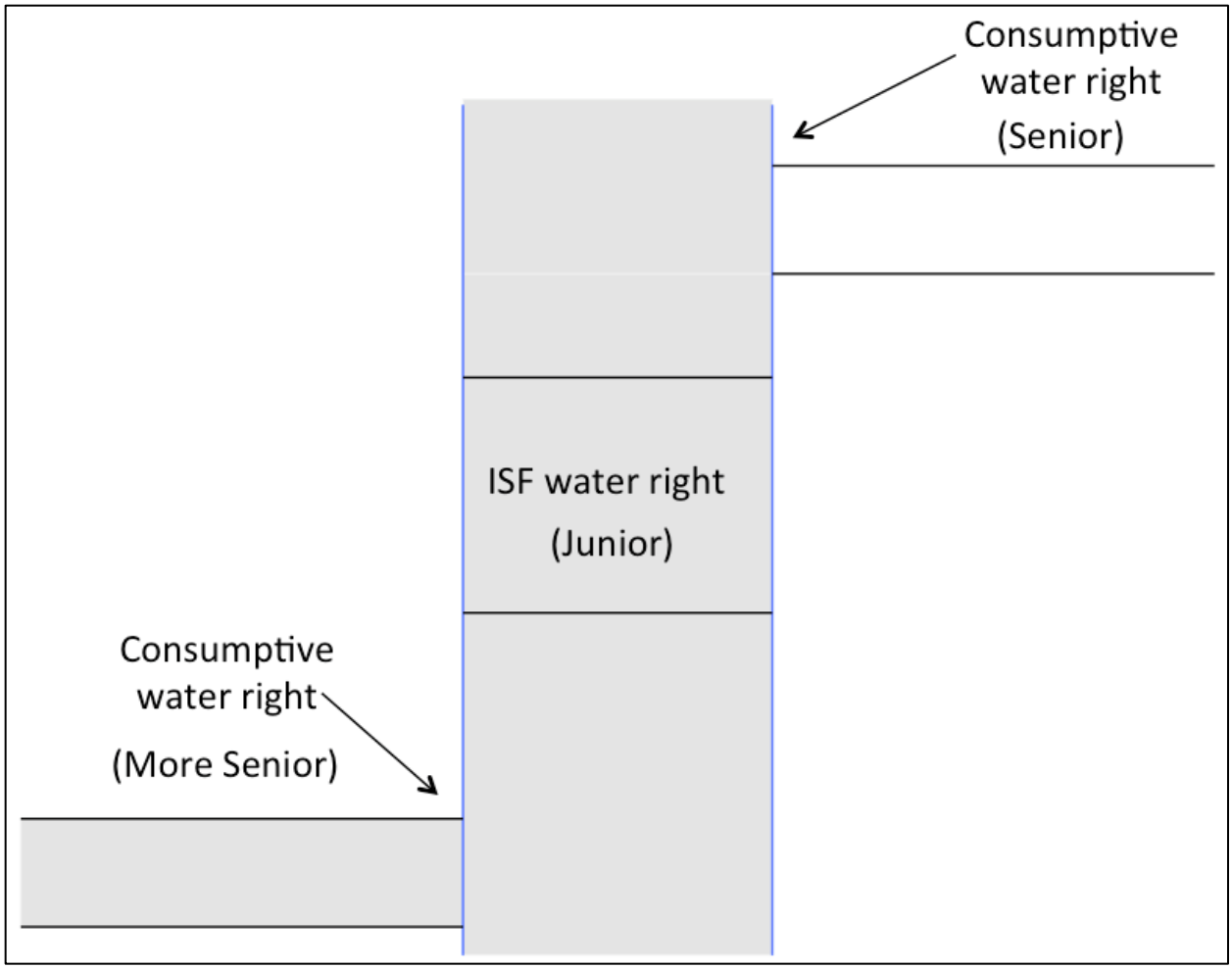

Figure 11. ISF water right administration with a senior upstream and downstream water right. A senior water right that is located downstream of an ISF water right has the potential to pull water through an upstream ISF water right by curtailing water rights that are upstream and senior to the ISF water right but are also junior to the senior downstream water right. The black lines are the diversion structures and upstream/downstream point of the ISF water right. The blue lines are the main stem and the grey shading is surface water in the stream or being pulled into a diversion structure.

Examples 1: USGS Gage 09304500
Period of Record: 10-01-1901 to 4-22-2014
Days in Period of Record: 41,111
ISF Threshold: 200 cfs from 1/1 to 12/31
Segment Length: 43 Miles
Type of ISF Water Right Transaction: Appropriation
Case number: 5-77W3652C
Location: Water Division 6, Yampa/White Basin, Water District 43, Rio Blanco

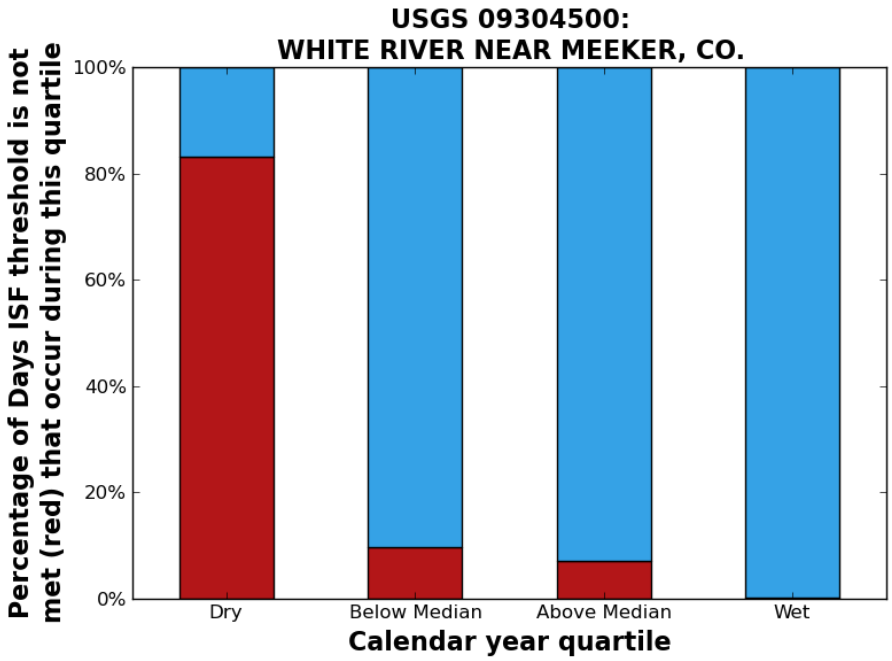

Figure 12. Percentage ISF threshold not exceeded for all USGS gage 09304500. The percentage of days the ISF threshold was not exceeded is shown in red and the percentage of days the ISF was exceeded in show in blue across all USGS gages sampled. 0.2% of the days that the ISF threshold was not met were in a wet year, 7.0% of the days that the ISF threshold was not met were in an above median year, 9.7% of the days that the ISF threshold was not met were in a below median year, and 83.2% of the days that the ISF threshold was not met were in a dry year.

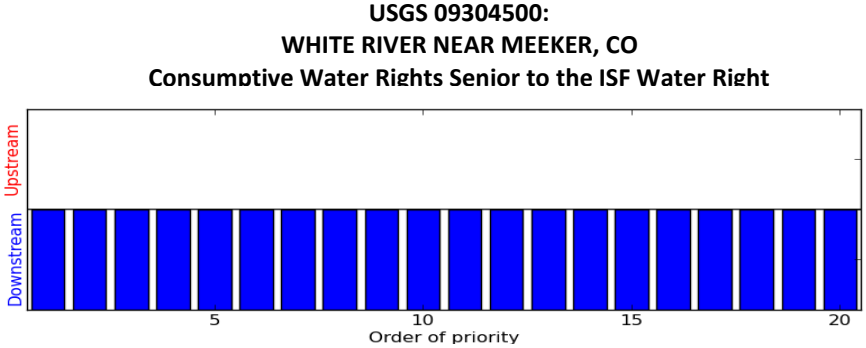

Figure 13. Consumptive Water Rights Senior to the ISF Water Right. Of the 20 most senior water rights by administration number located within 20 km upstream and downstream of the ISF water rights and within 250 m of the stream on which the ISF water right is located, all 20 are downstream of the ISF water right.

Figure 12 shows that the percentage of days the ISF threshold is not met is greatest in dry years, followed by below median years, followed above median years, followed by wet years. This trend makes sense according to what we would expect if the percentage of days the ISF threshold is not met follows the natural hydrograph. However to really understand what is driving that trend it is important to examine the surrounding administrative structures. Figure 13 shows that out of the 20 most senior water rights located within 20 km upstream of downstream of the gage are all located downstream of the ISF water right, meaning none are consumptive water rights preventing water from passing through the ISF water right. The following are two potential scenarios that explain the trend in Figure 12:

Potential Scenario 1:

If there is a consistent pre-determined amount of water that has to pass through the ISF water right in order to reach the downstream senior water rights with no upstream water right interference, the trend in the ISF threshold being met across all four quartiles should mimic the natural hydrograph if there is too little water in the stream to meet downstream senior water rights in dry years. This scenario assumes that the aggregate amount of water needed to meet senior downstream water rights amounts to more than the decreed 200 cfs year-round ISF threshold.

Potential Scenario 2:

If there is a consistent pre-determined amount of water that has to pass through the ISF water right in order to reach the downstream senior water rights with no upstream water right interference, but the aggregate amount of water needed to meet the senior downstream water rights is less than the decreed 200 cfs year-round ISF threshold, the trend in the ISF threshold being met may also mimic the natural hydrograph.

Examples 2: USGS Gage 09061600
Period of Record: 06-08-2002 to 04-22-2014
Days in Period of Record: 4,338
ISF Threshold: 1.5 cfs from 1/1 to 12/31
Segment Length: 37 miles
Type of ISF Water Right Transaction: Appropriation
Case number: 5-85CW262
Location: Water Division 5, Colorado Basin, Water District 37, Eagle County

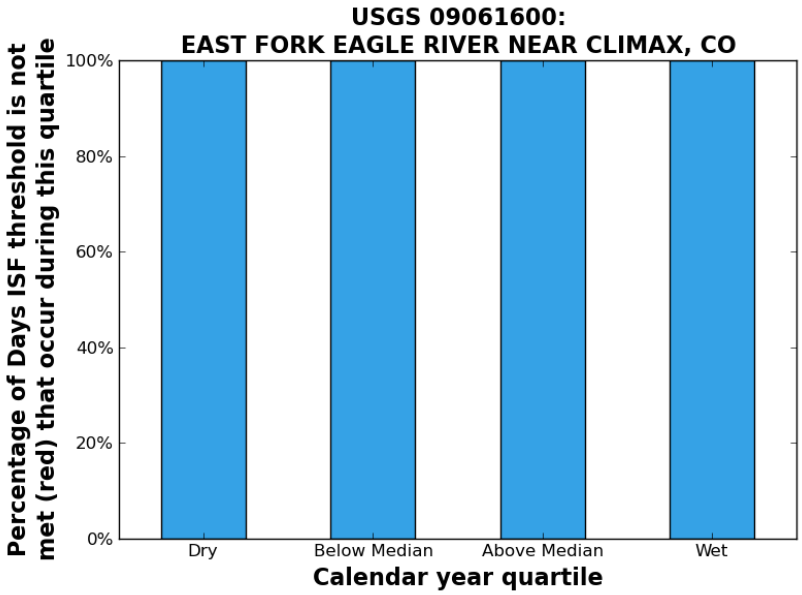

Figure 14. Percentage ISF threshold not exceeded for all USGS gage 09061600. The percentage of days the ISF threshold was not exceeded is shown in red and the percentage of days the ISF was exceeded in show in blue across all USGS gages sampled. The ISF threshold was met 100% of the time in a wet, above median, below median, and dry years.

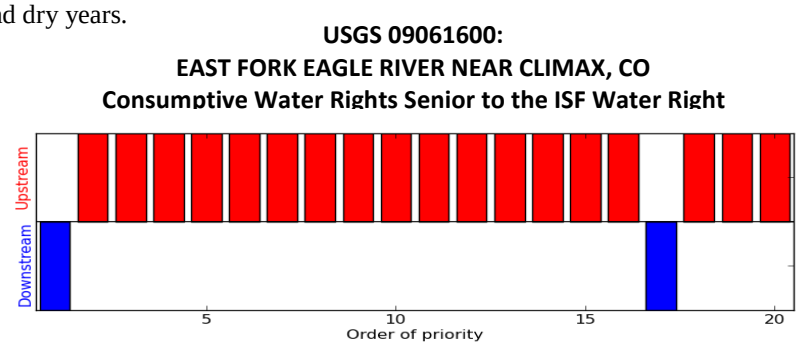

Figure 15. Consumptive Water Rights Senior to the ISF Water Right. Of the 20 most senior water rights by administration number located within 20 km upstream and downstream of the ISF water rights and within 250 m of the stream on which the ISF water right is located, 18 are downstream of the ISF water right and 2 are located upstream of the water right.

Figure 14 shows that the ISF water right at this location is met 100% of the time across all four quartiles. Figure 15 shows that out of the 20 most senior water rights located within 20 km upstream of downstream or the gage, two are located downstream of the ISF water right, and 18 are located upstream of the ISF water right. This means there are 18 consumptive senior water rights that could potentially prevent water from passing through the ISF water right. It is worth noting that the most senior water right out of the 20 most senior is located downstream of the ISF water right. The following are two potential scenarios that explain the trend in Figure 14:

Potential Scenario 1:

The ISF water right and surrounding consumptive water rights are always met because there is always sufficient water in the stream to meet every use.

Potential Scenario2:

The most senior water right out of the 20 most senior water rights located within 20 km upstream and downstream of the gage is located downstream of the ISF water right, which has only 1.5 cfs year-round threshold, and is a larger quantity than the ISF water right. In dry years that downstream senior right may curtail one or many of the consumptive water rights upstream of the ISF, pulling enough water through the ISF water right in any degree of dry years.

Examples 3: USGS Gage 06710385
Period of Record: 08-01-1984 to 04-22-2014
Days in Period of Record: 10,856
ISF Threshold: 10 cfs from 4/15 to 10/15
5 cfs from 10/16 to 4/14
Segment Length: 13.5 miles
Type of ISF Water Right Transaction: Appropriation
Case number: 1-94-CW258
Location: Water Division 1, South Platte Basin, Water District 9, Jefferson County

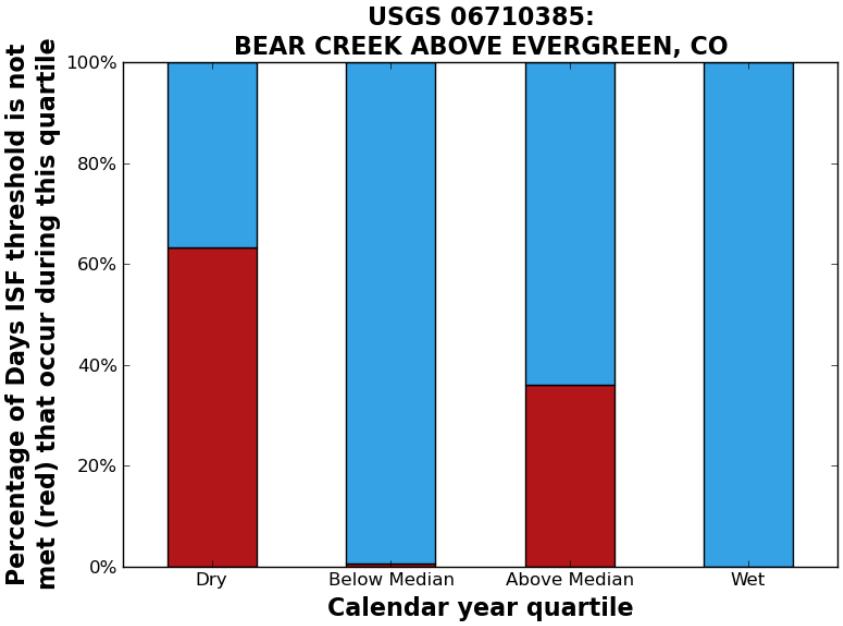

Figure 16. Percentage ISF threshold not exceeded for all USGS gage 06710385. The percentage of days the ISF threshold was not exceeded is shown in red and the percentage of days the ISF was exceeded in show in blue across all USGS gages sampled. 0% of the days that the ISF threshold was not met were in a wet year, 36.1% of the days that the ISF threshold was not met were in an above median year, 0.6% of the days that the ISF threshold was not met were in a below median year, and 63.33% of the days that the ISF threshold was not met were in a dry year.

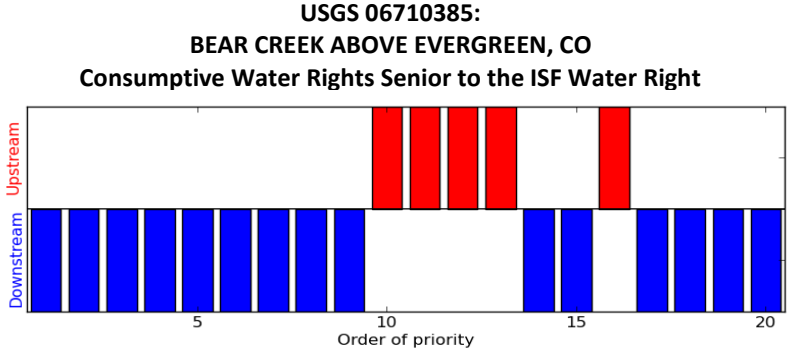

Figure 17. Consumptive Water Rights Senior to the ISF Water Right. Of the 20 most senior water rights by administration number located within 20 km upstream and downstream of the ISF water rights and within 250 m of the stream on which the ISF water right is located, 15 are downstream of the ISF water right and 5 are located upstream of the water right.

Figure 16 shows that the percentage of days the ISF threshold is not met is greatest in dry years, followed by above median years, below median years, and finally wet years. However, this trend does not follow what we might expect according to the natural hydrograph, indicating that other factors play a role in determining whether or not an ISF threshold is met at any given point in time. Figure 17 shows that out of the 20 most senior water rights located within 20 km upstream of downstream of the gage, 15 are located downstream of the ISF water right, and 5 are located upstream of the ISF water right. This means there are 5 consumptive senior water rights that could potentially prevent water from passing through the ISF water right. The following are two potential scenarios that explain the trend in Figure 16:

Potential Scenario 1:

Wet Year

The ISF water right and surrounding consumptive water rights are always met because there is sufficient water in the stream to meet them all.

Above Median Year

The senior consumptive water rights located upstream of the ISF are being met and diverted from the stream meaning there is not sufficient water to meet the downstream ISF water right as often as in a wet year. However, the return flow from the consumptive uses are sufficient in quantity, timing, and location to meet the downstream senior instream flows so that they are not curtailing enough of the upstream water rights and pulling water through the ISF water right.

Below Median Year

There is not enough water to fulfill both the consumptive water rights upstream of the ISF water right and the senior downstream water rights, the consumptive upstream water rights

are curtailed to the downstream senior water right, which pulls water through the ISF water right and the threshold is met more often than in an above median year.

Dry Year

There is not enough water to fully meet the downstream senior water rights, so even if they pull water through the ISF water right it is not sufficient to meet the ISF threshold.

Potential Scenario 2:

Wet Year

The ISF water right and surrounding consumptive water rights are always met because there is sufficient water in the stream to meet them all.

Above Median Year

There is enough water to meet all 5 consumptive uses leaving insufficient water in the stream to meet the two seasonal ISF thresholds as often as in a wet year.

Below Median Year

There is not enough water to meet the least senior downstream water right, which curtails the least senior upstream water right, letting enough water through the ISF water right to meet both of its season thresholds more often than in an above median year.

Dry Year

There is not enough water to meet all nine of the most senior downstream water rights, and the aggregate of those that can be met is much less than the seasonal ISF thresholds.

Overall the three examples do not provide sufficient evidence in order to conclusively determine what is happening administratively at each gage, but they do provide enough evidence to suggest that ISF thresholds are not always met the least in dry years. Table 3 shows that out of

the 56 USGS gages analyzed, 32 USGS gages followed the trend in which most of the days in which the ISF threshold was not met fall in the dry years, followed by below median years, above median years, and finally wet years. This is a similar trend to Example 1 above. Twelve of the 56 USGS gages followed the trend in which most of the days in which the ISF threshold was not met fall in the dry years, followed by above median years, below median years, and finally the wet years. This trend is similar to Example 3 above. Only two of the 56 USGS gages followed a trend in which most of the days in which the ISF threshold was not met fall in below median years, followed by dry years, above median years, and finally the wet years. Five of the 56 USGS gages showed the associated ISF water right only not met in dry years. Seven of the 56 USGS gages showed the associated ISF right being met for 100% of the period of record for that gage. It is important to note that while Table 3 shows the frequency with which the 56 sampled USGS gages fit the qualitative trends, it says nothing about the extent or degree to which each gage fits each qualitative trend.

Table 4. Frequency of 5 Distinct Trends in Percentage of Days ISF threshold is Not Met. The table shows 5 qualitative trends across dry to wet year quartiles in which the percentage of days the ISF threshold is not met is ordered from most often to least often from left to right.

Qualitative Trend: Percentage of days the ISF threshold is not met ordered from most often to least often across quartiles from left to right				**Number of USGS Gages**
Dry	Below Median	Above Median	Wet	32
Dry	Above Median	Below Median	Wet	12
Below Median	Dry	Above Median	Wet	2
Only Not Met in Dry Years				5
All Years Met				7

While more than 50% of the USGS gages in the analysis showed that ISF thresholds were not met most often in a relatively dry year, 25% of the gages sampled showed that ISF thresholds are not met most often in a below median or above median year. These results have important

implications for how the CWCB and CWT determine when and where to use different ISF policy tools to protect and restore ISF.

A majority of literature surrounding ISFs in Colorado points to the fact that because ISFs were not legislatively recognized as a beneficial use until 1973 most ISF water rights have junior priority dates compared to most other consumptive water rights. Figure 8 shows that this is true. However, the results from RQ1b show that the assumption that relatively junior ISFs are not fulfilled in dry years in the same way relatively junior consumptive water rights with diversions are not met in dry years is not always true. This is a particularly important concept with the implementation of the 3-in-10 STLs, which were developed and implemented for the first time in response to an impending drought in 2012. Most ISF personnel and water managers who work on ISF issues or the administration of water rights on a daily basis are aware of this concept:

> "…in a really dry year, like in 2000, 'oh no this is a really bad year. Instream flows are really going to suffer.' Well they didn't necessarily suffer because the call went all the way up and went to the smaller sub-basins. It wasn't just a main stem Colorado River call … it went up all the way up the Colorado River and in smaller basins the call was moving way up into the headwaters areas so that instream flows, which are typically higher up, were benefiting because water was being called through the reach … So 2000 wasn't necessarily a bad year for the instream flow program. And I think we've seen that in similar drought years … it's going to vary depending on the stream." (CO-GOV-04)

The 3-in-10 STLs, while developed as an ISF protection tool in response to a projected dry year, are not legislated as a drought tool. Statutorily a 3-in-10 STL can be used in any situation in which a decreed ISF water right is water short, which might occur as a result of drought, but it also might occur in a relatively wet year due to other administrative factors. This idea is explicitly recognized by several ISF practitioners:

> "… these short term projects are not just drought projects—they can work anywhere that an instream flow is water short. So if the CWCB has appropriated an instream flow and it's generally water short we can bring water through the short-term leasing program to that water right … so it's not just a drought tool." (CO-NGO-04)

> "…we also relied on some information that we gained from some of the other groups and also from internal knowledge of you know people that live in these areas and say that the river is short here every single year—it's even worse in a drought." (CO-NGO-01)

However, the narrative among some ISF practitioners exists that 3-in-10 STLs are tools used in response to drought or in dry years or at the very least that a dry year is when the tool would be most useful.

> "…it's hard to know in advance if you're going to need it. This year was a perfect example … the Water Trust I imagine had some thought of other partial years they could do but they didn't really need it because we had a much wetter fall even though it was kind of dry overall." (CO-GOV-01)

> "… one thing that that came up was because we're using it in a dry year…" (CO-GOV-05)

> "I think there's a lot of expense and a lot of work that's required in order for either a permanent acquisitions or … dry year leases …" (CO-GOV-04)

> "that it [offered water right] was of senior enough priority that it would still have water available to it in a dry year." (CO-GOV-02)

While there seems to be an inherent assumption in the academic literature that ISF thresholds are met less often in drought years and somewhat among ISF practitioners that the 3-in-10 STLs are a drought response tool, determining how to use ISF policy tools most effectively is extremely context dependent.

CHAPTER VI

RESULTS PART II

Understanding the trends in the frequency of use of ISF policy tools and biophysical characteristics of ISF thresholds is only one part of a larger programmatic picture. The following findings focus on barriers and incentives to participating in Colorado's ISF Program, the roles of the various actors involved, current and future challenges, the strengths and weaknesses of judicial and administrative processes, and the treatment of ISF under Colorado water law and by the Colorado water community. Colorado's Instream flow program was established in 1973 and has been managed by the CWCB for over 40 years. The goal of this analysis is to explicate the evolution of past and current institutional arrangements surrounding Colorado's ISF Program in order to determine whether or not collaborative governance has played a role in the success of the ISF Program. Therefore the overarching research question is: *RQ2: What barriers to and opportunities for the success of Colorado's ISF program exist?*

Institutional Interactions

Legislation governing Colorado's ISF Program has evolved over time to better clarify what can and cannot be done to protect ISFs as one of many vested water interests in Colorado. However, how that legislative evolution has been translated into new policy tools and by whom is not well explicated. A recently developed policy tool, the 3-in-10 STLs, provides a useful

example to understand if and how the implementation of ISF legislation is an example of collaborative management.

RQ2a: How were the 3-in-10 short-term leases derived from legislation and translated into on-the-ground ISF protections?

Colorado's ISF Program is not a regulatory program. Because ISFs are administered as any other beneficial use the only way the CWCB can acquire a water right is if a water right holder voluntary changes the use of their water rights permanently or temporarily. The only way the CWCB can appropriate water is if partner agencies make recommendation and other water right users do not have a legitimate reason to oppose the appropriation. Therefore voluntary participation and cooperation from the water community is necessary in order to protect and restore instream flows. Therefore, success of translating ISF legislation into on-the-ground ISF practices depends on perceived barriers and incentives to participation in the ISF Program on the part of private water right holders. It is important to note that much of the following section of analysis covers perceived barriers and incentives to participation in the ISF Program as a whole and not solely the 3-in-10 STL agreements. However, this is appropriate as it is difficult to de-couple perceptions surrounding a single policy tool from a larger program of which it is a part.

Tangible Barriers

As Table 5 and Table 6 describe, based on interview data, barriers to participation in Colorado's ISF Program can be tangible or intangible and vary between the four different policy tools. Tangible barriers to participation include those that come at a monetary or resource cost to the water right holder. Permanent acquisitions and LTLs require approval through the water courts which can be very expensive process for the water holder interested in donating, selling,

or leasing their water right and requires sole decision-making power on part of the water right holder. Acquisition agreements require an engineering report calculating the historic consumptive use of the offered water right. For temporary acquisitions, this analysis may expose the fact that the water right holder is using less water than reported or thought, or the analysis may interfere with the sale of the water right in the future if multiple independent analyses from multiple sources do not match. STLs also require a certain amount of capacity on the part of the water right holder. If the STL requires the water right holder to remove land from production, the water right holder will lose a source of income. However, depending on that water right holder's degree of dependency on the income earned from the land being used, they may be more or less willing to remove part of their land from production. Multi-year contracts in which a water right holder has obligations to fulfill with a third party and cannot break the contract in order to lease the water temporarily can also logistically prevent a water right holder from entering into an acquisitions agreement.

Intangible Barriers

Conversely, intangible barriers to participation include those that come at a psychic or social cost to the water right holder. Trust is defined in two ways in this analysis: political, or vertical trust in institutions, and social, or horizontal trust in people. Interview responses suggest a perceived lack of political trust in the government, particularly when dealing with water rights. The government is often seen as taking a resource that belongs to private water right holders, one on which many of those private water right holders' livelihoods depend. However, government is not the only source of distrust surrounding the ISF Program. Familiarity with water markets can also affect whether or not a water rights holder will be willing to participate in the ISF Program.

This level of familiarity refers to, for example, whether a water right holder understands how a water lease might work between any two water users, not necessarily just within the ISF Program. This familiarity may be further developed if the potentially interested water right holder knows and identifies with another water right holder that has participated in a contract that works within a water market. In other words, if there is a certain amount of social trust established between past and potential water market participants, a water rights holder might be more willing to participate in the ISF Program. Respondents also referred to the level of social trust between potential participants and the CWT as an important factor that might influence a water right holder's willingness to participate. Water right holders that are more familiar with the CWT, including their staff, their work, or their reputation, seem more likely to have a conversation about using their water right to protect ISF. Additionally, a water right holder may be reluctant to relinquish control over their own individual water rights in what they see as publicly owned and what should be a publicly operated resource. Interview respondents also suggested that many water right holders may see ISF water rights, both appropriations and acquisitions, as obstacles that will ultimately affect their ability to change the use, location, and timing of their decreed water right in the future. Other water right users may believe that the responsibility for keeping water in a stream lies with them and not the government. Furthermore, water right holders may question the legitimacy of ISFs and the ISF Program. Respondents reported water right holder perceptions of ISFs as non-traditional water uses, and therefore, not a use of water that should exist. Or, in the case of the STLs, they may be skeptical of a policy tool, which before 2012, was never used. One respondent even described temporary acquisitions being grouped and conflated with permanent "Buy and Dry" transfers, which are largely opposed throughout Colorado.

Table 5. Tangible Barriers to Participation in Colorado's Instream Flow Program

	Instream Flow	New Appropriations	Permanent Acquisitions	Temporary Long-term Leases	Temporary Short-term Leases	Relevant Quotes
Financial			● Water Court can be very expensive and uncertain for any of the parties involved in the process.			"Well the barrier is water court--it's expensive and it's risky and people aren't interested in doing it." (CO-NGO-02)
Historic Consumptive Use Analysis				● Exposure of reasonable estimate of historic consumptive use to public may affect the water right holder's ability to sell the water right down the road		"It's an expedited process but it's like an expedited mini-change case so you're having to expose your historical consumptive use and a lot of people don't really like doing … [an] attorney was just highly skeptical of even considering the program because of opening up the water right to eventually the public, even if we are very confidential, because once it goes to the State it gets noticed...." (CO-NGO-03)
Ownership			● The water right holder Lacks sole decision making power over the water right.			"A lot of water users also own water that is somehow not—they don't have sole say over what happens so it's either in a trust or it's encumbered by a conservation easement so they are not the only person whose opinion goes into the decision." (CO-NGO-01)
Capacity					● Taking land out of production potentially takes away a source of income for water right holders ● Third party, multi-year contracts may prevent a water right holder from leasing their water for certain periods of time in order to fulfill other obligations ● A water right holder that greatly depends on their water right for their livelihood may not be willing to try something new that could pose risk to their livelihood	"… the quintessential rancher—he needs that land year-in and year-out. You know if he's built ... a particular genetic herd and they have a five year contract with somebody to provide beef ... and may have multi-year contracts for the inputs for that herd ... they can't really just like turn off one year and turn back on because everything is based on not just a yearly thing ... so I think that it's harder to find the right fit for somebody who's actually using that land for a living than these other groups but I also think ... with creative arrangement you can still get those folks in the program. " (CO-NGO-02)

Table 6. Intangible Barriers to Participation in Colorado's Instream Flow Program

	Instream Flow	New Appropriations	Permanent Acquisitions	Temporary Long-term Leases	Temporary Short-term Leases	Relevant Quotes
Political Trust	● Distrust the government by the water community and the view that government is taking a resource upon which people's livelihoods depend.					"But there's always this trust issue that government's coming in, taking something. I hear it called, even though it's not a 'takings', I hear it called a 'takings' all the time…" (CO-GOV-04)
			● Lack of familiarity on water right holder's part with the water market and water transactions			
Social Trust			● Lack of familiarity on water right holder's part with the CWT, their work, how they do their work, or their staff			"... [if] they can talk to someone who has worked with us or talk with someone who has gotten checks from us and can say, 'oh yea that the amount that I got for my water was what they said it was, everything worked out, they came out here, and they weren't a pain in the ass.' You know it speaks to how the program worked and how it impacted their daily life ..." (CO-NGO-01)
					● Water right holder's awareness of other successful transactions and identification with those water users	
Relinquishing Control	● Water community sees ISF rights as setting a bad precedent in limiting the way in which water can be used in the future ● Water community does not see need for government involvement in protecting ISF					"'There's too many state employee. You're taking all the water. This is our resource. We are out there. We will protect it—just leave it to us.' … A lot of the farmers and ranchers are actually very good stewards of the land ... but nobody has a crystal ball so if they sell their land or they're running their head gate in a certain way ... and that's why the program comes in ... " (CO-GOV-04)
					● Water right holders do not want to give up control of their private property.	
Legitimacy			● ISF seen as a 'non-traditional' beneficial use by water right holder			"We had some of our lessors just oppose, but not by people who would actually be injured but just based on the fact that they were a transfer of any kind to an environmental purpose or just out of their traditional purpose." (CO-NGO-01)
					● The 3-in-10 statute had never been used for instream flow before 2012.	
Political			● Perception on the water community's part that transfers to instream flow is exactly the same as drying up agricultural lands through a transfer to municipal uses.			"One big challenge for the leasing is the perception that it isn't just another way of buy and dry … No one wants to be drying up agricultural land for any reason. For municipal use or for instream flows." (CO-GOV-01)

Incentives

In contrast to barriers, Table 7 describes incentives to participation in Colorado's ISF Program, which also vary between the four different policy tools. Incentives range from purely financial motivations, to more altruistically motivated efforts to protect the natural environment, to those that allow the potential water right holder to maintain flexibility in their choices.

In any acquisition, if a water right holder is able to maintain either the full or partial income they would have earned using the full water right, participating in the ISF Program can be financially beneficial. For example, in the case of 3-in-10 STLs, agricultural compensation for partial or full replacement of a water right holder's revenue from crop yield in a year when they will not be able to use their full water right due to water availability or any other subjective reason could leave the water right holder in a better financial position than if they did not participate in the lease agreement.

ISF water rights can only be decreed if a natural environment exists, meaning if a water right holder or a member of the community takes part in decreeing an ISF water right, their efforts may have ultimately benefited the environment. Interview respondents suggested a water right holder or member of the water community may participate in establishing a new ISF water right, either through an appropriation or an acquisition, because they wish to protect the natural environment due a sense of stewardship or duty to the environment, such as an organization with environmentally focused mission or mandate. On the other hand, a water right holder may want to protect the natural environment for other motivations that have to do with their enjoyment of natural resources, such as recreational opportunities.

Acquisitions, permanent and temporary, under Colorado water law allow for wide variety of contract terms and conditions, which can be tailored to individual water right holders' needs.

Respondents explained that the ability to participate in a program that offers a water right holder an alternative to selling their water right is a huge draw. The flexibility of the acquisition agreements allows for more opportunities for win-win situations. In the case of the STLs, there is no obligation on the part of the water right holder to participate. Instead both the lessor and lessee engage in a good faith conversation at the beginning of each year in order to determine if the lease makes sense for all parties involved. If it does not make sense for either party, neither is obligated to proceed. The STLs can also be used as a sort of trial run in order to see how a water right transfer will be received by other water users in a permanent change case, how a permanent change case process would work for that water right holder, how the different entities such as the CWT and the CWCB implement the ISF Program, and to see how subsequent years in a full 3-in-10 STL would work after the first year.

Overall, barriers and incentives were important considerations when the CWCB and CWT decided to translate never-before used legislation into a policy tool that depends on voluntary participation from water right holders. While some of the barriers and incentives could be planned for on both the CWT and CWCB's part, most were and are still being elucidated as both entities gain more experience in using the 3-in-10 leasing tool. Implementing the 3-in-10 leasing tool also provided an opportunity for both entities to learn about barriers and incentives to other policy tools and ISF Program in general as the STLs are inherently juxtaposed with other actions both entities take in the water community.

Table 7. Incentives to Participate in Colorado's Instream Flow Program

	Instream Flow	New Appropriations	Permanent Acquisitions	Temporary Long-term Leases	Temporary Short-term Leases	Relevant Quotes
Financial			● Ability to maintain any form of revenue from instream flow (partial or full agricultural production, fishing rights, etc).			"… if it looks like it's going to be a dry year where their water right will still yield something that they would be able to lease but maybe not enough to successfully be able to irrigate their crop and if they're being paid for the water in that year it might be better for them and less headache and maybe more profitable for them to enter into a lease with the Water Conservation Board." (CO-GOV-02)
					● Agricultural compensation for partial or full replacement of a water right holder's revenue from total crop yield in a year when they will not be able to use their full water right due to water availability or any other subjective reason.	
Protection of Natural Resources	● Water right holder might be an entity with an environmentally focused mission or mandate ● Water right holder may have strong conservation values ● Water right holder may want to preserve recreational opportunities associated with instream flow on or near their property.					"It's also you know for the communities to be able to recreate in the river and you know not have a horrible dry spot in the river right as it runs through town during the tourist season. So it's community, recreation, environmental, but yea…the biggest reason to invest even that amount of money for one year is to keep the river from crashing." (CO-NGO-01)
Flexibility			● Acquisitions can be different types of contracts with different terms and conditions for each water right holder including different methods to value the water right use for compensation.			"… I think is the flexibility of our program in that you know we can be flexible in how we value things but also the types of contracts that we get with folks." (CO-GOV-05)
					● There is no obligation to lease with a 3-in-10 short-term lease and the contract allows for some flexibility in determining when and how often the lease will occur (up to 3 years within the 10 year period).	"…you don't pick the three years before going into the deal you know it's not okay well it's got to be 2013, 2014. If you have the discussion at the beginning of each year—what do you want to do with your water right this year? Do you want to go ahead and irrigate? Do you want to put it in the program? … So they get to choose along the way…" (CO-GOV-05)

Trial Run		●The short-term leasing can be used to see how a water right transfer will be received by other water users, as a preview of a permanent change case (i.e. donation or sale) or long-term lease process, to try the CWT, CWCB on for size, or to see how subsequent years in a full 3-in-10 lease would work.	"It's a nice stepping stone to a permanent one if a water rights owner wants to see … how does this work and … who is concerned about it, so it's a good trial." (CO-GOV-02) "The other thing the temporary tool does is allows somebody to try the Water Trust for size and the state on for size and the Instream Flow Program on for size so they don't have to make a huge economic decision about what they are going to do with their water right." (CO-NGO-02) "They just wanted to do it that one year, and we said fine, we'll use the 3-in-10 statute but we'll just request a 1-year approval. They came back the next year and said okay well now we want to do another one." (CO-GOV-05)

After understanding the various barriers and incentives to participation in the ISF Program and particularly the 3-in-10 STL agreements, it is also important to understand which actors are involved in creating or overcoming those barriers and incentives and how. Currently, the two *main* actors are the CWCB, a government agency, and the CWT, a non-profit organization. Literature surrounding management of natural resources through collaboration between government and non-government entities fails to explicitly address concepts such as trust and legitimacy. The CWCB seems well positioned to provide legitimacy as a state agency, where the CWT is best suited to build political trust with water rights holders as a non-regulatory, non-advocacy non-government organization. Therefore, the following sub-question guides this analysis:

> *RQ2b: Does the CWT, as a non-governmental organization, provide trust in the implementation of Colorado's ISF Program, while CWCB, as a government agency, provides legitimacy?*

As shown in Table 8, the roles of the main actors (CWCB and CWT) and well as minor actors (Water Courts and Division of Water Resource Engineer's Office) vary in level of involvement and responsibilities across all four ISF policy tools.

Trust

There are two forms of trust considered in this analysis: political trust and social trust. The lack of political trust, previously discussed as a barrier to participation, seems to stem from a general distrust of government which carries over to distrust of government agencies, like the CWCB. The staff at the CWCB seems to recognize that the agency evokes feeling of distrust by

its very nature. The staff sees addressing issues of trust as a part of their jobs and report working hard to ensure interactions with water right holders do not worsen that perception:

> "… sometimes you'll have a county commissioner come up and point you in the chest and say you better not mess with my farmers and ranchers there won't be enough of you … that type of hostility occurs. But I think what helps … in those situations is that our staff is very professional and we just take that as you know this is part of our job and … being professional actually diffuses a lot of those really tense situations." (CO-GOV-04)

While it seems most of the trust issues stem from a lack of political, or vertical, trust in government agencies by private water right holders, agencies and organizations are made up of people. Therefore, social trust is also important to consider. The CWT is well positioned to build political trust by establishing social trust between individual water right holders and staff members.

> "… the agricultural field, or community, is one that you need to spend a lot of time building relationships with so it's not something that you'll see necessarily tangible results from within one year … we got a lot of good results from the work that we put in but not in terms of like a lease on the ground. It was building relationships, understanding the problems that they had with the statute and the way that the statute required common ground …" (CO-NGO-01)

As a third party, non-regulatory, non-government organization the CWT is able to act as a buffer between individual water holders who are less willing to work with a government agency, in order to establish a relationship and create an avenue for that water right holder to become more familiar with the ISF Program, which may eventually lead to increased political trust.

Legitimacy

Because this analysis uses a multi-level collaborative management framework that focuses on different actors, including one that is a non-governmental organization, the definition pf legitimacy is extended beyond government entities to any organization involved in establishing formal or informal institutional structures. The CWCB, CWT, Water Courts, DWR,

Colorado General Assembly and other environmental organizations establish legitimacy to varying degrees through their various roles in the ISF Program. The CWCB is perhaps the most important actor in establishing legitimacy in the ISF Program, as it is the only entity allowed to hold a water right instream in the entire state. As such, it is usually involved in almost every aspect of establishing an ISF water right, or at the very least, needs to be involved in establishing the formalized processes. The CWCB translates the requirements and restrictions laid out in any ISF statutes passed on by the Colorado General Assembly into ISF Rules, which dictate when, where and how various other entities can and should participate in the ISF Program as well as how the CWCB or CWCB staff will respond in each of those situations. The CWCB also provides independent evaluations of any new appropriation recommendation and is responsible for the legal and physical protection of decreed ISF water rights. They CWCB essentially establishes a process in which the uncertainty involved in whether or not an interaction between two actors will occur and when is largely reduced. In other words, the CWCB provides legitimacy in governing of the ISF Program by establishing processes that work consistently between all three levels of governance by interfacing with the Colorado General Assembly and Water Courts at the constitutional level, other entities and organization at the collective level, and private water right holders at the operational level.

> "We go through our analyses and bring it to the board and the board has to decide if they want to form their intent to appropriate or not. That's letting everybody know that we're going to file for this water right but there's a process for people to oppose it still … it's a lot of effort and a lot of work to put together almost like a trial for these things. Then the board could reconsider and decide that it—no they don't want to get the ISF now or they could vote to approve it and then it goes to water court." (CO-GOV-01)

The CWT provided legitimacy with respect to establishing the 3-in-10 STLs through their 2012 and 2013 Request for Water Program. The CWT provides legitimacy to governing the

RFW Program at the collective level, operating between the CWCB, also at the collective level, and individual water users at the operational level.

> "They [CWT] tried to accept as much of the burden and the weeding through as possible so they put the notice out, they received all of the applications, and I think they got I can't remember if it was 30-40-50 applications—they had a lot of interest and then weeded those down to the top—or the ones that looked like they were going to go were like twelve and then we ended up processing four in the end." (CO-GOV-05)

The DWR plays a very important role in establishing legitimacy in that it is the agency responsible for enforcing the proper administration of water rights. In this respect, the DWR has water commissioners that are responsible for curtailing consumptive diversion when necessary and are the ones that will enforce any call the CWCB decides to make on a river in order to protect their decreed ISF rights. The DWR is also the entity that administratively approves the 3-in-10 STLs.

> "So what they [DWR] did—there's the substitute water supply request that they get and this is the format that they're used that they've been doing for years and years … so they're used to that process and what those approvals look like and so we used that as a model." (CO-GOV-05).

While both the CWCB and the CWT provide most of the legitimacy concerning establishing processes in which other water rights holders can participate, the Colorado General Assembly provides legitimacy in determining the institutional arrangements that dictate how the CWCB can exercise its authority to govern the ISF Program. Colorado's seven Water Courts also provide a certain amount of legitimacy through Water Court rules, which govern the process by which water right holders can argue oppose water right applications and through which precedents are set.

> "… for the most part what her bill does is give sort of a blessing to what we already think could already probably happen in the right technical circumstances ... but it's always easier rather than trying to convince somebody to run a test case or something if you have a law written in—somebody is going to be more willing to have that conversation" (CO-NGO-02)

While trust and legitimacy are two of the most important concepts to consider in the collaborative management structures surrounding Colorado's ISF Program, there are several other concepts that are just as important to consider when trying to fully explicate the roles of the CWT and CWCB in establishing trust and legitimacy.

Resources and Capacity

First, the CWCB and CWT both provide resources and capacity to implement the ISF Program, through appropriations and acquisitions, in the form of staff time, technical expertise, and funding, but do so in very different ways due to differences in institutional constraints. The CWCB is a government agency and as such must work within formalized rules that dictate how much funding it will have available to it in any given year and its ability to grow its staff. The CWT, on the other hand, is a private organization which has no formalized institutional constraints dictating how large it can grow its staff and in theory has no limits as to how much money it can raise, although there are various norms, informal rules, and interactions that may realistically limit this capability, such as availability of grants or capacity of private donors.

> "I think it's working out really well having the Water Trust do the engineering portion … is probably a much better model than trying to do it in house especially with the whole thing of small government as opposed to larger government … So I think that the model where you have the outside working on it in sort of this collaborative effort is the best way at this point in time." (CO-GOV-03)

> "… it's essentially an extension of that understanding that we [CWT] would do all of the tire kicking we would raise the money we would essentially package everything up so that the CWCB could just go as soon as the water right acquisition was ready for them…" (CO-NGO-01)

While other entities and organizations have expressed interest in helping the CWCB secure new acquisitions, the CWT is already familiar with the process and requirements that make for a successful application.

Other entities, like CPW, BLM and the USDA also provide resources for new appropriations in the form of technical expertise when they make recommendation for new ISFs. CPW in particular can help individuals with the engineering analyses and R2CROSS method in order to find and recommend locations where the natural environment could benefit from ISF protections.

> "We'd like to grow that program [appropriations] and get the basin round tables in the state who are trying to identify non-consumptive needs to use our program as a tool to meet those non-consumptive needs in their basin. So identify streams where there are Colorado cutthroat trout, where maybe we could partner with BLM, or Colorado Parks and Wildlife, or Trout Unlimited or whoever, bring it the basin roundtable, and say we collected the data … and this will meet your non-consumptive need or a portion of the non-consumptive need … but I think the staff that we have is adequate right now to do that kind of base work that's going on with new appropriations." (CO-GOV-03)

The DWR also plays an informal role in monitoring decreed ISF rights as they are a sister agency to the CWCB and have staff whose jobs lend to noticing when a water right is out of priority in the administration system.

> "But I would say we get calls from all different types of people—we get calls from the Division Engineer's Office a lot of times and they're just water commissioners who [say] 'hey I noticed on this stream that this, you know, segment didn't have what appears to be your instream flow reach, and I know because I'm on the steam that there are some junior ponds upstream that are junior to the instream flow water right and I can curtail them and put some more water in the stream if you place a call.'" (CO-GOV-03)

Outreach

Second, both the CWCB and the CWT lack a proactive approach to outreach to increase participation in the ISF protection and restoration activities, although the CWT has slowly started

to do more focused outreach in recent years as a result of their Request for Water Program. It is important to note that not being proactive does not mean either organization is not intentional about their outreach strategy. The CWCB tends to take a more reactive approach due to staffing and resource limitations, where the CWT tends to take a more reactive approach because they want to be careful in how they establish trust with the water community.

Policy

Third, the CWCB and CWT approach policy in very different ways. The CWCB is a state agency whose governing board is a composed politically appointed individuals. They participate in the policy process and are ultimately the ones responsible for adopting ISF Rules according to policy decisions when appropriate. However, the CWCB is cautious about proposing new legislation because there is always a chance that the end results will leave ISF protection worse off than doing nothing. The CWT does not participate in policy decisions or advocacy, but makes sure to be aware of pertinent policy decisions when they affect their work.

> "But you know these are some areas of policy and law that would be interesting to work on but every time—if we and one of our allies takes things over to, as they say, the gold dome—things get chopped up and sometimes we end up with something worse than what we started with. So anytime we go into legislation we go in with a lot of caution…and, and buy-in from the community is probably very helpful before you go in and…" (CO-GOV-05)

> "… the CWCB's board has to go through a board process where they accept a proposed acquisition either permanent or like a long-term lease… and that can be political. So there's always danger there that the State, like that body, could develop a policy saying that they didn't want to look at instream flows in a particular basin or sourced from a particular stream or something like that so… we're still dealing with a politically appointed body of individuals who get to decide which water rights can become instream flow water rights. So I see that as sort of like an on-going risk as well…" (CO-NGO-02)

> "…We're [CWT] the only non-profit that works exclusively in the acquisitions and who sort of doesn't point fingers at other people about how they use their water." (CO-NGO-02)

> "We [CWT] generally don't engage in any advocacy or policy work, but we also aren't burying our heads in the sand we need to know what's happening around us, so I generally stay in touch with what's happening in the policy arena and determine if and how that will impact the work that we are trying to do and then if necessary come up with a response." (CO-NGO-01)

The Colorado Water Congress is another non-profit organization that works to vet various water legislation in Colorado. They either come out in support or against proposed legislation and their input is well-recognized throughout the water community.

> "… certainly buy-in from Water Congress you know, have it well-vetted to see if anybody sees any problems with this before you go in there …" (CO-GOV-05)

Innovation

Fourth, as a government agency and NGO, the CWCB and CWT are inherently able to take the initiative to implement new programs and policy tools to varying degrees. The CWT initiated the collaborative effort required to establish an almost entirely new process for restoring ISFs. The initial steps and formation of the tool was in response to what looked like a very low water year in 2012 and a lack of an adequately solidified plan to protect threatened ISFs on the part of the CWCB. The CWT approached the CWCB with the idea of using the 3-in-10 statute to approve STLs in order to meet expected water short decreed ISF water rights. This allowed the CWT to drive the creation of a new collaborative process using information from successes and failures of other efforts to use STLs protect ISF in the Pacific Northwest.

> "… we [CWT] were on a full call with the board members—we had been watching to know what's been coming, what's been coming, what's been coming [drought]. We were talking about a totally separate project—the drought came up in the complication and the board member said what's are—are we going to do something about the drought?" (CO-NGO-04)

> "… the board said go for it—do this thing, so we started building what it would look like, raising money, how do we solicit you know interest from people… so we looked at successes and failures in the PNW and … put together a sort of general structure of what the process would look like, forms, FAQs that kind of thing…" (CO-NGO-04)

> "The way that we work is that we really try to use every single tool that's available under the law and try to use them in ways that are creative." (CO-NGO-01)

> "…they [CWT] met with us first [CWCB] to sort of tell us they were going to do this and then they sort of kicked it out there and we were like okay what's going to happen? We work for the state, we're completely understaffed, and have so much to do but we were excited about the program and we were like okay well how can we help, how can we make this work with the staff that we have and thank god [CWT] is really staffed up over there." (CO-GOV-05)

> "The last two years you know the Water Trust has its request for water program which we're really grateful that they took the bull by the horns and had a structured approach to it." (CO-GOV-02)

While the CWT took on as much of the burden and workload of structuring what the application process would look like from their end, the CWCB was willing to try out the new arrangement and needed to work out what the application process would look like in getting administrative approval from DWR, as they are always named as the water holder with any ISF water right.

> "… we kicked those [short-term leases] off for the first time in 2012 and that as you know is a statute that has been on the books and had never been invoked so it was interesting paving the path and trying to figure out how that was going to work and to prevent injury to other users and a lot of work was needed on getting those established ..." (CO-GOV-05)

> "I was kind of the liaison between all of that and trying to convince the DWR that this was going to be okay and they were trying to convince me that you know well if you if you want this then here are you know our expectations on this." (CO-GOV-05)

> "I mean for instance when we turned in these requests upstairs they didn't even have a code to enter them…and we were like okay well how much are we supposed to pay and you know….you figure all that out. It was fun to get a new statute going for the first time that had been around for a while. But it was certainly not without its challenges." (CO-GOV-05)

Overall, the results suggest that the CWT is best suited to establish trust with the water community and legitimacy is addressed by several actors, however the CWCB plays a particularly important role in establishing legitimacy.

Table 8. Roles of different entities involved in Colorado's Instream Flow Program

	CWCB	CWT	Water Courts	DWR	Other Entities
Trust	Lack of political trust in government and consequently government agencies	Establishes and builds political trust via social trust as a non-government organization	N/A	N/A	N/A
Legitimacy	Provides legitimacy to entire ISF Program through Instream Flow Rules, independent evaluations, and legal and physical protection	Provides legitimacy to 3-in-10 short-term leasing tool through 2012 and 2013 Request for Water Program	Provides legitimacy to judicial process by establishing court rules, hearing opposing arguments, establishing precedent	Provides legitimacy to entire ISF Program through physical protection enforcement and administrative approval process of 3-in-10 short-term leases	●*Colorado General Assembly* creates legislature that governs the ISF Rules ● *Environmental organization and other citizens* alert CWCB to ISF violations
Resources	Institutional limitations on resources and staff; particularly for acquisitions	No institutional limitations on resources and staff; particularly for acquisitions	N/A	N/A	*CPW, BLM, and USDA* make recommendations for new ISF appropriations
Capacity	Lacks a true acquisitions program; maintains databases; physically and legally protects decreed ISFs	Partially fills the void of true acquisitions program	N/A	Helps to physically and legally protect decreed ISF rights by alerting CWCB of violations	Other entities are interested in facilitating acquisitions but are not familiar with the process
Outreach	Does not actively reach out to water users; reaches out when opportunities present themselves	Has started to actively but very *cautiously* reach out to water users	N/A	N/A	N/A
Policy	Participates and adopts ISF Rules according to policy decisions when appropriate	Does not participate in policy decisions, but is aware of the surrounding policy arena	N/A	N/A	*Colorado Water Congress'* support is important for any new legislation
Innovation	Willing to try new creative arrangements	Tries to use every tool under the law in creative ways	N/A	Willing to try new creative arrangements	N/A

With projected changes in Colorado water supply and population growth, beneficial uses of water will increasingly come into conflict with one another. The majority of Colorado water law encourages consumptive uses of water, but the legislation has evolved over time to include non-consumptive uses, including ISFs. While collaborative management as defined in the literature focuses on translating processes into on-the-ground practices and outcomes, it is also important to consider how current practices might influence future processes. Therefore the overarching research question is: *RQ3: What role does and will collaborative management play in the past and future success of Colorado's ISF Program?*

Trends in legislation towards increasing flexibility can be positive for achieving greater ISF protection when they lead to a greater number of policy tool options. However, the success of on-the-ground ISF protection is an important feedback in determining future legislation and program implementation. The 3-in-10 STLs again provides a useful example in understanding what the development of the tool might mean for future legislation and management of the ISF Program, as they are the first ISF policy tool approved through an administrative process as opposed to a judicial process. The following sub-question is used to guide the following analysis:

RQ3a: How has and will 3-in10 STLs affect future ISF legislation and ISF Program management decisions?

When asked about trends in the ISF Program over time and into the future, many responses referred to current and future challenges that would vary across all four ISF policy tools (Table 9). It is again important to note that much of the following section of analysis covers challenges to ISF Program as a whole and not solely the 3-in-10 STL agreements. However, this again is appropriate as it is difficult to de-couple the some challenges surrounding a single policy

tool from a larger program of which it is apart.

Table 9. Current and Future Challenges to Colorado's Instream Flow Program

<table>
<tr><th></th><th>Instream Flow</th><th>New Appropriations</th><th>Permanent Acquisitions</th><th>Temporary Long-term Leases</th><th>Temporary Short-term Leases</th><th>Relevant Quotes</th></tr>
<tr><td rowspan="2">Resources</td><td colspan="3"></td><td colspan="2">● Appraisal of water rights can vary greatly with time, location, use, and need making valuation of a water right difficult
● Time and money to purchase and lease water for ISF
● Balancing up front cost with long-term benefit of temporary tools compared to permanent tools</td><td rowspan="2">"Paying for the water rights is expensive especially if you are only getting it on a temporary basis … We do the same amount of work to look at a water right for a temporary project as we do for a permanent project.." (CO-NGO-01)</td></tr>
<tr><td colspan="4"></td><td>● Easy to fundraise for innovative program in the beginning</td></tr>
<tr><td rowspan="3">Capacity</td><td rowspan="3"></td><td colspan="4">● Additional decreed ISFs corresponds with additional operation and management responsibilities for physical and legal protection
● Opposition to growing government in order to CWCB to increase capacity</td><td rowspan="3">"… I think that as we move forward with short-term leasing … one of the things that we're going to run into is staffing limitations … in order to get more staff as a state agency you have to have a position item that goes through the Colorado State Legislature—they have to approve it … it's very difficult. For political reasons or whatever, it's growing government …" (CO-GOV-03)</td></tr>
<tr><td></td><td colspan="3">● Geographic limitations to finding new opportunities based on centralized location of staff in Denver
● Time and money to find opportunities to purchase and lease water</td></tr>
<tr><td colspan="3"></td><td>● Additional accounting and reporting required vs permanent change case
● ~10 times the offers for leases compared to permanent acquisitions</td></tr>
</table>

Political	**● Colorado Water community's distrust of government in taking resources that belong to the public** **● CWCB potentially viewed as competing with other water users for un-appropriated or transferrable water** **● Opposition to Public Trust Doctrine and support of ISF Program as a substitution**		**"... there's a little political sensitivity about drying up ag [agriculture] and about the board's competing with other potential lessees or buyers or water so we jus-it's a voluntary program." (CO-GOV-02)**
		● Perception on the water community's part that transfers to instream flow is exactly the same as drying up agricultural lands.	
Trust	● Trust is variable depending on person and their individual situations ● Farmers and ranchers would like to protect ISF themselves, but no guarantee ● ISFs are still perceived as something new		"…every water right is different so it just depends on the person and their expectations." (CO-GOV-05)
Processes	**● Judicial process can be expensive, unfair, and risky—especially with respect to ISFs**		"…it's not necessarily the people that are attacking these change cases it's just the nature of the beast of these change cases… not only because it's adversarial but because it's just such a cumbersome process—take it out of that realm and we can start seeing maybe more movement—more movement, quicker." (CO-GOV-05)
		● Can never lease a water right again after participation in a 3-in-10 short-term lease ● CWCB must be conservative about requests for temporary change of use to ISF in administrative approval process ● Difficult for the 'quintessential farmer' to plan for a short-term lease ● Difficult to implement a short-term lease in real-time	

Resources

First, the biggest current and future challenge for the ISF Program with respect to resources is the acquisition process. Acquisitions are very labor intensive and, in terms of leases, are not permanent, meaning there is high up front cost for often very little water and, with the STLs, for a very short amount of time.

Capacity

Second, capacity is an issue for both the appropriation and acquisition process. One major issue for the CWCB is that as the number of new ISFs protections are added to the ISF program, the obligation and workload associated with protecting those ISFs also increases. Need for increased physical protection requires increased monitoring. If there is an injury to an ISF right in which the CWCB would like to place call, they need to install a gage in order to show that their water right is physically not being met. Increased number of ISF water rights also increases the legal protection requirement, which is monitored by reviewing monthly law resumes for each of the seven divisions. Essentially, the need for ISF protection will continue to increase over time, while the ability of the CWCB to increase capacity through increased staff members is limited as a government agency. As acquisitions are quickly proving to be an effective tool for restoring ISFs, increased capacity will be needed to *find* those opportunities across the state. Another limitation is that all of the CWCB and CWT staff is based in Denver, which limits their ability to do on site visits and conduct outreach face to face with potential community members. With new STLs, there is also additional reporting and accounting required for each ISF lease compared to permanent acquisitions. As new policy tools, such as the 3-in-10 STLs are developed, which remove barriers to participation, increased interest and number of

offers is also likely.

Political

Third, distrust of the government is another current challenge that will most likely not change going forward. The CWCB in particular, as the only entity allowed to hold an ISF water right and as a government agency, is cautious about the number and types of ISF water rights it pursues since it does not want to be perceived as competing with other consumptive water users for either available or transferrable water. Other Western states have something called the Public Trust Doctrine as a form of ISF protection and restoration, however Colorado has had the ISF program for 40 years and many people in the water community consider this to be a great success as ISFs are administered on an equal footing with non-consumptive water rights. While this makes ISF protection politically feasible, establishing new ISF protections is limited by voluntary participation in the ISF Program and opposition from the water community in court cases.

Trust

Fourth, the most challenging aspect of establishing political or social trust between water right holders and the CWCB or CWT is the variability of every individual's situation. This can also be undermined by the fact that many water right holders would like to be trusted with the responsibility of keeping water instream themselves and resent that the responsibility is centralized through a state agency. Others are still wary of any kind of ISF protection because they continue to see it as new use, even though it has been around for 40 years. ISFs are non-

traditional in the sense that they keep water in the stream as opposed to putting water to consumptive beneficial use.

Process

Fifth, while the current judicial processes surrounding ISF approval has been largely successful to date, the process can be very cumbersome, expensive, risky, and often unfair. The 3-in-10 STLs are the only ISF water rights that can go through an administrative approval with the Division Engineer's Office, but once they are approved and the 10 years is over, that water right can never be leased again. The process for hearing opposition to those leases is limited compared to Water Courts. The DWR somewhat addresses this by only approving the amount included in the lease application in the strictest light. Additionally, the way 3-in-10 STLs are structured makes it difficult for what might considered to be the 'quintessential famer' to participate because they are typically more dependent on the water for their livelihood and cannot make decisions about their water right in the time frame needed to complete a 3-in-10 STL. While 3-in-10 STLs can be processed and approved very quickly compared to a Water Court change case, they are still difficult to arrange in real-time in response to changing biophysical contexts.

The last category of current and future challenges prompts further questioning as to how the judicial and administrative approval processes compare. Colorado is the only Western prior appropriation state that uses a judicial system to administer their water rights. There are only two types of water right approvals that do no go through the water courts: Substitute Water Supply Plans and 3-in-10 STLs. As table 10 shows, the system of administration can affect the frequency of use and outcomes of various policy tools including the four ISF policy tools.

New appropriations, permanent acquisitions, and long-term leases must go through Water Court for judicial approval, which due to recent court rules changes, must be settled in 2 years. The 3-in-10 short-term lease process takes up to 30-60 days. The judicial process is also more expensive with court fees alone, where the administrative approval process through the DWR for the 3-in-10 STLs costs $100. However, with Water Courts, the expense is put solely on the water right holders and the water community. Any increase in responsibility on part of the DWR, would require an increase in staff time and resources, which would put the expense on taxpayers, as DWR is a state agency. A full change of use case in Water Court also requires a complete historic consumptive use analysis, and in the case of new appropriations, an R2CROSS analysis to determine the need of the natural environment. The STLs only require an estimate of the historic consumptive use and can only serve a water short decreed ISF water right, which means there is no need for further analysis of the natural environment. While both systems allow for transactional, or contract, flexibility, the STL process can be somewhat more flexible simply because there are less statutory requirements for DRW to follow. For new appropriations, permanent acquisition and LTLs, there are legislatively mandated processes for hearing and considering opposition to proposed ISFs. The Water Courts must hear anyone who opposes and shows up to Water Court. Consequently, Water Court can be a little unfair in that the outcomes

are inconsistent between cases, users, and divisions. The outcomes very often depend on the actors who oppose the case, the capacity and resources they have, and the level of energy they are willing to expend to oppose that case. With respect to ISFs, the CWCB is the only actor allowed to file for an ISF water right and the only actor allowed to legally protect decreed water rights. The CWCB has one staff member devoted to filing new cases and opposing any injury from other proposed consumptive water rights. The CWCB has anywhere from 100-200 open cases at any one time. As a government agency, they have limitation as to how much money they can spend opposing cases that prose potential injury to their water rights.

> "Because permitting like it seems like it almost would kind of be treated the same but because it's judicial, and I say adversarial because everybody here is an attorney, and you get in there and depending on the resources or the level or energy or the level of physical injury….it's not necessarily fair." (CO-GOV-05)

> "…but they [DWR] were saying because both the SWSP and our temporary loan requests did not go through the court and through the normal channels—I mean it is publicly noticed, which means it has a 30-day turn around—but DWR told us it needs to be as strict as possible. Because it didn't go through that process so…so we realized we have to be very conservative in our request if we want them approved." (CO-GOV-05)

Table 10. Judicial versus Administrative System

	Judicial System	Administrative System
Instream Flow Policy Tools	● New Appropriations, Acquisitions, Long-term Leases must go through the Water Courts in order to be decreed.	● Short-Term Leases must be approved by the Division of Water Resources-Engineer's Office.
Time Required	● 2-year rule to streamline process	● 30-60 day process
Required Analysis	● Water court trial requires a full engineering report for historic consumptive use analysis for change case	● DWR Application for approval requires reasonable estimate of historic consumptive use analysis
Expense	● Water Court is expensive	● Administrative process is $100
Treatment of ISF	● Water users ask for full diversion amount in a change case and see who complains	● Looks at SWSP and short-term lease requests in the strictest light
Fairness	● Adversarial process ● Not necessarily consistent outcomes: depends on the resources, level of energy of opposition, level of physical injury	● Not adversarial ● Every application is treated consistently.
Flexibility	● Allows for contract flexibility	
		● More flexible requirements than a full Water Court change case
Opposition	● Water Court rules mandate how to deal with opposition	● Less strict mandates for DWR for how to deal with opposition
Onus of Expense	● Water Courts put expense of approving water rights in private hands of the water community	● Need to make sure DWR is equipped with tax payer money

Comparing the two approval systems also raises the question as to how ISF is treated in the water community and through formalized institutional structures. Under Colorado water law, ISF is treated subordinately in several important ways:

- Instream flow is the only beneficial use in Colorado that cannot accept a transfer from a conditional water right.
- The CWCB is the only entity authorized to hold a water right instream, while private water right users are able to hold all other beneficial uses.
- Most consumptive beneficial uses have been statutorily recognized in Colorado since 1876, when Colorado became a state, while ISF rights have only been statutorily recognized as a beneficial use since 1973.

Through the formalized institutional process, ISF is further disadvantaged through the Water Courts and DWR approval process. New beneficial uses are increasingly met by transferring water rights through the water courts from one decreed beneficial use to another. Consequently, decreed agricultural water rights, as the most common type of water use in the Colorado, are targets for these types of change of use cases (i.e. transfers). There is a marked trend of increasing agricultural to municipal water transfers. Consumptive water rights can also be transferred to an instream flow use. Permanently transferring water uses from agriculture to ISF is usually less financially beneficial for agricultural users compared to municipal transfers. ISF tends to be seen as a barrier to future water development by more traditional consumptive users like irrigators and municipal water suppliers. However, change of use cases to municipal and industrial uses do not see the same amount of opposition as change cases to ISF.

> "… like the full water court process … to kind of vet that out with the water community, you know, 'Here's what normal change case looks like, we're trying to mimic it. What is it we're doing that doesn't look the same?' because we want it—to have it be just the

same—everybody's used to these things so just treat them like it's nothing new. Because right now they're treated like they're something new and crazy… that's why the water court process gets so expensive." (CO-GOV-05)

"When you are changing a water right to instream flow …people seem to think of it as different, you know, you are doing something so different, and it's like we're trying to model them on standard changes because when you change a water right from irrigation to municipal uses, everybody's pretty used to those, so I try to model as closely as possible—these change cases—on that, but it still brings up—the reaction is just—it's different. It's different because you are putting it in the river… but putting it in the river and taking it out of the river … still the numbers should be the same." (CO-GOV-05)

"… what is different about our program [ISF Program] is that we're asking for the full diversion rate … So we want the full diversion rate from diversion point down to where the return flows came in. And we're very explicit about that. In a normal change case—let's say again irrigation to municipal uses… they will ask for a quantification of the consumptive use…And they don't really focus on the diversion so the diversion doesn't get cut down because it's just kind of a by the way…and I've been told it goes along with the water right so I'd like that to go along with our water rights too. That would be nice if we would get the full 6 [cfs] and we wouldn't be scrutinized down to the 1.5 [AF]…I think what I'd like it to just model other change cases a little bit better because they are getting a lot more water than we are and we're being a little too strict on ourselves—we're not even requesting it." (CO-GOV-05)

"It's [ISF] the only water right in the entire state that cannot accept conditional water rights…it's the only beneficial use—you can't have an instream flow and start with a conditional water right and change it. Somebody went to legislature with a bill … that nobody should ever change a conditional water right. It's conditional. It's never been developed. It was made for this particular purpose, in this particular area. So you shouldn't be able to change it for a different purpose somewhere else with that senior date on it. That got changed during the legislative process down to okay *only* an instream flow can't take a conditional water right and put the water back in the river so…that's a little—I guess it's a little bit of a sore spot for us because conditional water rights have proven to be very valuable. Almost more valuable than absolute water rights." (CO-GOV-05)

All of the challenges associated with the ISF Program will be important when considering future ISF legislation, not only with respect to political and administrative feasibility, but also when considering the cost-effectiveness of new policy tools with respect to time and resources.

CHAPTER VII

DISCUSSION

Throughout this analysis six major themes come to light pertaining to the implementation of Colorado's ISF Program: (1) past institutional arrangements at all levels of governance have led to ISF water rights that protect the natural environment from future degradation and less on restoring a previously degraded natural environment; (2) broadly, decreed ISF water right thresholds are most often not met in dry years, but this is highly variable for individual ISF water rights and depends as much on the surrounding administration of the water right as it does on the natural hydrograph; (3) 3-in-10 short-term leases are not legislated as a drought tool, but the narrative surrounding their development and use often implies that they are and will only be used in dry years; (4) current institutional arrangements have evolved in recent years to include more collaboration, particularly at the collective level of governance, which in turn have resulted in greater opportunity for on-the-ground success at the operational level; (5) the necessary division of programmatic roles between government agencies and NGOs lends towards a collaborative approach to establishing trust and legitimacy; and (6) future institutional arrangements surrounding Colorado's ISF Program will depend on on-the-ground successes and failures of current ISF policy tools.

Past trends in ISF policy tool use show us that appropriations have been and continue to be the most frequently used policy tool to protect ISFs, but only help to prevent further dewatering of a stream from the time they are appropriated and only to the extent that an appropriation has seniority within its relative administration system. Acquired water rights can

have prior appropriation dates that pre-date 1973 and can restore ISF to a stream, but again only to the extent that the acquisition has seniority within its relative administration system. Nevertheless, appropriations are a better-developed policy tool compared to acquisitions. The CWCB has a formalized recommendation process with which most organizations and individuals in the Colorado water community are familiar. The CWCB also relies on other entities and organizations to make recommendations for new ISF water rights, which are limited by determining a natural environment, water availability, and causing no injury to other water rights. Effectively, new appropriations require certain biophysical conditions to be met along a stream and adequate cooperation from the water community in order for the board of the CWCB to consider applying for a new ISF water right through the water courts. Unlike acquisitions, new appropriations do not rely on voluntary participation from water right holders. Additionally, the potential for injury is less with a new appropriation compared to an acquisition because the appropriation date will be junior to all other previously decreed water rights. Hence, there is typically *less* opposition from the water community for new appropriations, but opposition can still stem from other water users who are concerned about how the new ISF water right will affect their ability to change and use their own decreed water rights in the future. The injury associated with new appropriations is, in a sense, speculative. Acquisitions, on the other hand, have the potential to injure water users to a greater extent compared to new appropriations. Acquisitions require a change of use of a decreed water right, which means any water user who was relying on the time, location, or quantity of water associated with that water right could potentially be injured in real-time. This greater potential for injury can mean *more* opposition from the water community when attempting to acquire water. Acquisitions also have a formalized process, but require voluntary participation from water right holders and offers of

donations, sales, or leases are only considered on an as-offered basis. Acquisitions also need to consider more biophysical requirements, such as return flows and interstate compact agreement limitations. Consequently, acquisitions are more time and resource intensive than appropriations and, often, more widely opposed and subsequently litigated.

However, as there is less un-appropriated water in river basins throughout Colorado, there will be fewer opportunities to appropriate new water for ISF. The effectiveness of new appropriations increases over time as they gain in relative seniority as new junior water rights are appropriated, whereas acquisitions result in an immediately relative senior water right that has the potential to restore water to the stream once it is approved through the water courts or DWR. New appropriations are an effective long-term tool, but are typically not appropriate for addressing more immediate threats to the degradation of a stream. Recognition of these differences drove the creation of the CWT in 2001, which has since been working to fill the lack of capacity and resources available to the CWCB to sustain a formalized acquisitions program. As a non-profit organization, the CWT does not have the same institutional constraints as the CWCB and is better able to access a wider diversity of resources and build capacity quicker. While the resulting collaboration between the CWT and CWCB has resulted in several acquisitions over the last 13 years, the formalized processes surrounding acquisitions are still nowhere as streamlined as the formalized processes underlying new appropriations. However, recent institutional changes in the governance structures surrounding acquisitions indicate that this may not always be the case in the future.

The administrative context surrounding individual water rights is important when considering both consumptive and non-consumptive water rights. However, non-consumptive water rights do not follow the same principles as consumptive water rights that divert water from

the stream in order to use their water right. Pre-determined ISF thresholds are met when water is left within a stream, which can happen when an intentional policy tool keeps water in the stream or when some other administrative factor prevents water from being removed from the stream. Academic literatures focusing on ISFs that are administered within a prior appropriation system, and particularly in Colorado, fails to adequately explicate the inherent differences in fulfilling ISF water rights, save one: Gillian and Brown (1997). Gillian and Brown outline the four main reasons ISF are left within a stream system including geographic factors, downstream senior water rights, interstate allocations, and surplus flow. Senior water rights are particularly important when they are close enough in proximity and large enough in quantity to be able to affect how much water flows through a decreed ISF right. Senior water rights that are located upstream from an ISF water right can prevent sufficient water from passing through that ISF water right, while a senior water right located downstream of an ISF water right can potentially pull sufficient water though that ISF water right in order to meet its decreed threshold. However, these general principles can vary widely due the number of senior water rights located upstream and downstream of the ISF water right, their relative quantities, as well as the amount and timing of the decreed ISF water right. Most of the academic literature seems to largely ignore to these nuances and the overall context dependency of when and how often ISF thresholds are met and default to the description that overall ISF water rights are junior and therefore not met in dry years. This is an important concept when considering how to maximize the efficiency of current ISF policy tool use.

One current ISF policy tool, the 3-in-10 short-term leases, were developed and implemented for the first time in 2012 in reaction to what looked like it was going to be a very dry year across all of Colorado. As a result, much of the narrative surrounding the use and

implementation of 3-in-10 STLs focuses on how they have been used as a temporary tool in dry years. However, the 3-in-10 STLs are not legislated as a drought tool, as the requirement for a county drought emergency declaration was removed in 2005. One critique of the 3-in-10 STLs is that they provide only a very small amount of water for a very short amount of time at almost the same expense as a permanent acquisition. However, the counter-argument is that the STLs are a long-term solution in that they maintain the long-term health of stream system by preventing extensive damages to the ecosystem from which it would be difficult to rebound. While 3-in-10 STLs have a role to play as a response option to oncoming drought, they cannot only be seen and used as a reactive response to drought. Once a 3-in-10 agreement is established, although the lessor is able to, s/he is under no obligation to lease their water. They solely agree to have a conversation about leasing in any year that they are still allowed under the 3-in-10 STL agreement and determine whether or not the biophysical conditions suit both the lessor and lessee to a degree that they agree to move forward with the exchange. This means if a 3-in-10 STL is established in a dry year with the option to renew for the full 3 years, the benefit derived from the exchange will most likely be limited, at the very least, to the same or similar biophysical conditions that prompted the exchange in the first year, to say nothing of any other non-biophysical subjective reason a lessor or lessee may not want to go forward with the exchange. If 3-in-10 STLs are constrained by their yearly and uncertain biophysical contexts, using 3-in-10 leases only as a drought response might limit their future use to only drought years. However, there are a number of situations in which an ISF threshold is not met, or in other words water short, other than drought such as a large upstream senior water use. While this idea is very explicitly recognized by staff at the CWT, the narrative that explains 3-in-10 leasing as drought tool persists.

Water management literature specifically calls for better-explicated governance structures that help to bridge the gap between process and practice. The development and implementation of the 3-in-10 STL tool is en excellent example of how a policy tool that very quickly resulted in on-the-ground ISF protection was derived from the informal and formal changes to institutional arrangements across all three levels of governance. Formal and informal institutional arrangements surrounding the ISF Program have evolved in recent years across all three levels of governance to address the past trends and challenges associated with using acquisitions to restore ISF. It is important to consider acquisitions as three distinct tools: permanent acquisitions, temporary long-term leases, and temporary short-term leases. These distinctions are important when considering the formal and informal institutional barriers and incentives to voluntary participation in an acquisition agreement, particularly when considering future use. Permanent acquisitions are permanent changes of use to ISF through a donation or sale, meaning the original water right holder will no longer have anything to do with the water right in the future. Leases, on the other hand, are temporary changes of use to ISF, which means a water right holder maintains ownership and must consider how the temporary change of use will affect the use or sale of their water right in the future. Constitutionally, because acquisitions rely on voluntary participation, statutes have been revised to remove fundamental formalized barriers to participation. The statutory changes that took place were an incremental evolution of Colorado water law and institutional structures as opposed to any singular change. The 2003 statute allowing leases or loans of water for instream flows in times of drought emergency built on an already codified formal rule (C.R.S. 37-83-105), which allowed transactions between agriculture

users in times of drought. The 2005 statute fine-tuned the 2003 statute by amending C.R.S. 37-83-105 to restrict the loan and lease of water through the STL tool to water short decreed ISF water rights and for 3 years in any 10-year period for no more than 120 days and most importantly removed the need for a declaration of drought. These statutes effectively removed formalized barriers to when and where the leases could be used across all users. A 2008 statute removed one of the largest formalized barriers to voluntary participation, the presumption of abandonment and formalized penalties to historic consumptive use, in which a water right user could have ended up worse off after leasing their water to the CWCB for any period of time. These changes at the constitutional level of governance were incremental, piecemeal, and slow. In this sense, the constitutional level changes resulted in more flexibility and policy options for protecting ISF, but there was no comprehensive or intentional shift towards using any sort of well-defined tool or process in mind when these changes occurred. Collectively, barriers and incentives were addressed through the formalized Request for Water Program in which 3-in-10 STLs for ISF were implemented for the first time in 2012 by the CWT. The lag-time between the removal of formalized barriers at the constitutional level to the formation of new intuitional structures at the collective level shows the importance collaborative management at the collective level. In 2012, the CWT had been working for 11 years on permanent acquisitions and LTLs with water users at the operational level, including irrigators and municipalities, in order to address the lack of capacity at the CWCB to concentrate on a formalized acquisitions program. As a non-profit (i.e. not a government agency), the CWT was able to build capacity very quickly with new leadership, starting in 2007. The CWT does not have to consider the political ramifications that go along with 'growing government' like the CWCB does, and are able to solicit public and private funding and, therefore, effectively do not have an institutionally

formalized funding ceiling like the CWCB. The CWCB can only receive more funding for acquisitions if that source of funding is legislatively approved.

The lack of institutional constraints on the CWT ultimately led to increased innovation at the collective level. Innovation, in this case, was twofold. *First,* there was the operational innovation that took place in recognizing the status quo approach to physical and legal ISF protection had not been and would not be sufficient to protect many decreed ISFs with the approaching drought in 2012 and that the change in the biophysical context might change the operational efficiency of water use across different consumptive and non-consumptive decreed water rights. For example, a decrease in widespread water supply within stream systems administered by prior appropriation will most likely not curtail the most senior rights, will partially curtail relatively junior water rights, and will fully curtail the most junior water rights within a basin. This creates a situation in which water rights that are partially met may not be as useful or valuable to the water user, particularly when considering irrigation uses. *Second,* there was the innovation that took place in creating a formalized pathway at the collective-level to work within formalized institutional structures at the constitutional-level. The CWT was instrumental in recognizing the need for and taking the initiative to begin a conversation about using the statutorily allowed 3-in-10 STLs in response to an oncoming drought. Because they were familiar with the formalized processes established by the CWCB, they were able to approach that conversation with a proposed structured approach to how they would help handle voluntary participation at the operational level. However, the CWCB and DWR still needed to figure out if and how that process would work as an administratively approved application that still followed the constitutional level rules laid out in the aforementioned statutes. Once the CWCB and DWR decided on what the application should look like, the CWT was integral in

creating a formalized process through the Request for Water Program in which individual actors at the operational level could understand and participate. CWT's activity at the collective level in collaboration with the CWCB affected participation from water users on the operational level, ultimately due to incremental increases in flexibility in legislation at the constitutional level. This multi-level collaborative management structure ultimately facilitated the development of a new policy to protect and restore ISFs in Colorado lending support to the assertion that collaborative mangement is an appropriate management approach for Colorado's ISF Program, particularly when it occurs at the collective level.

The collaboration between the CWCB and CWT at the collective level reflects the academic literature in their sharing of resources and capacity. The CWCB is very resource and staff limited, which actually drove the creation of the CWT in 2001. However, the underlying missions of the CWCB and CWT are very different in that the CWCB must balance conservation, protection, and development of the state's waters, the CWT has a much narrower mission of protecting stream flows to sustain the aquatic health of streams. In this sense, only part of what the CWCB and CWT aim to do overlap. Consequently, the CWT only focuses on the acquisitions portion of the ISF Program, but is able to fundraise and grow their staff much faster than the CWCB. The lack of the same institutional constraints as the CWCB, affords the CWT more flexibility in their ability to generate new resources, which is invaluable to a program that is continually resource and staff limited. The overall division of roles between the CWT and CWCB, particularly with respect to the CWT providing additional resource and capacity for acquisitions, is an important to the overall success of the ISF Program and is fundamental to the ways in which each entity interacts with the Colorado water community.

Ultimately, collaboration between government agencies and NGOs is much more nuanced and complex than the literature might suggest, particularly with respect to trust and legitimacy. While there is significant coverage in the literature of how government agencies and non-profits can work together collaboratively to share resources and build capacity and how non-profits can act as a buffer or liaison between those that do or do no trust the government, the literature lacks specific mention of trust and legitimacy, two concepts derived from political theory scholarship that seem to underlie most citizen-government relationships. One reason for this could be that the literature lacks any focus on the individuals that make up those government agencies and non-profits, their expertise, or their past experience with the community with which they are trying to connect or provide a service to. For example, the CWT is a non-profit organization comprised of technical experts, not advocates or decision-makers. However the literature rarely distinguished between the different kinds of NGOs and the different composition of staff members that make up a non-profit organization. This non-advocacy, non-regulatory, non-government role is a something the CWT can leverage when establishing social trust with individuals in the water community. Establishing social trust can, in turn, help to slowly establish greater political trust in the CWCB and the ISF Program, if the CWT helps to facilitate an acquisition for the ISF Program. The CWCB, on the other hand, is often immediately associated with deep seeded values that go along with distrust of government and, consequently, so is their staff. Instead of seeing the CWCB as taking a balanced approach to developing and protecting the state's water, the water community typically views the CWCB as 'taking' a resource that belongs to them. However their staff is well aware of this and acts to at the very least not exacerbate those feelings of distrust. In this sense, the CWT is well-positioned to build trust,

particularly at the operational-level of governance, while in many cases the most the CWCB can do it not contribute to distrust.

However, the CWCB may have a role to play in tangentially establishing political trust when they establish legitimacy. Legitimacy in this analysis is defined as some process being well established and working in some important sense. The CWCB plays an important role in establishing legitimacy in the ISF Program, as they are the only entity allowed to hold a water right instream and manages the ISF Program by creating ISF Rules. These rules set the governing processes for protecting ISF throughout Colorado and dictate the ways in which the CWCB interacts with private water right holders, sister agencies, private organizations, and other entities. When a water right holder donates, sells, or leases their water right to the CWCB and sees that it is protected and used in the way in which is supposed to be according to the ISF Rules, they may have more trust in the CWCB and the ISF Program. The centralized manner in which ISF water right ownership is managed through the CWCB is also advantageous with respect to tracking ISFs, data management, and the operations and management that go into protecting and monitoring those water rights after they are decreed. ISF monitoring and protection is very resource intensive because the nature of ISFs is different. There is no diversion structure and therefore no head gate to tightly regulate flow rates. The physical monitoring relies heavily on informal reporting from the DWR or citizens, and if the CWCB ever wants to place a call on the river they need to have a gage in place to do so. Effectively, ISFs are more vulnerable than consumptive water rights and require constant legal protection and monitoring. The expense and resources required to do this are all centralized through the CWCB Stream and Lake Protection Section where the staff can streamline processes and management as opposed to privatizing ISFs where the protection and monitoring would be fragmented, potentially

redundant, and even counterproductive. The CWCB ultimately provides legitimacy to the ISF Program independent of distrust. The centralized management helps to ensure that ISFs are used properly to protect or restore ISF. The CWT even recognizes this fact in their Frequently Asked Questions document for the Request for Water Program, where they state, "If you lease your water through CWT's Request for Water program, it will be protected as an instream flow through Colorado's Instream Flow Program. CWT will work closely with the CWCB to ensure your water right is being used properly for flow restoration" (Request For Water FAQ, p. 3).

The CWT also plays a role in establishing legitimacy in a less formal sense, particularly when they created the Request for Water Program in 2012, in order to process offers for the 3-in-10 STL agreements. Creating a program and structure with which water right holders could interact consistently helped to establish the legitimacy of the 3-in-10 STLs. The Water Courts and DWR play smaller, but important roles in establishing legitimacy for the ISF Program. The Water Court and DWR are the entities that approve and help enforce decisions involved in the STL Program. They are the actors that ensure the established processes in the ISF Program are followed according to Colorado water law. Ultimately, the results emphasize the importance of NGOs in being able to leverage the legitimacy of a government agency by working through established government programs, while simultaneously distancing themselves from government agencies in order to establish trust with a community. The relationship and division of roles between CWT and CWCB allows these two entities to collaboratively address trust in and legitimacy of the ISF Program.

Future challenges to the ISF Program will include many of the same challenges the program currently faces such as adequate resources and building capacity. Others include those that stem from the effective use of the ISF policy tools and the acceptance of ISF water rights by

the water community. The CWCB is currently adequately staffed for new appropriations applications, but even with the CWT helping to facilitate acquisitions there is still a need to increase the effectiveness of the acquisitions process. While permanent acquisitions can be very effective in restoring ISFs, particularly if they have a relatively senior priority date, they are a long-term permanent solution that involves a very slow, cumbersome, expensive and risky judicial process. STLs, which go through an administrative approval process, may be more effective with respect to making progress in protecting ISFs in real-time, but are limited in the length of time in which they can protect an ISF water right. They also cannot be used to create a new ISF protection, but rather can only support an already decreed water short ISF water right. Although a temporary tool, 3-in-10 STLs are a long-term solution biologically and ecologically because they can prevent a river from cratering. It is also difficult to de-couple the effectiveness of a temporary acquisition that may later lead to a permanent acquisition. In the future, the effectiveness of the ISF Program will rely on the number and effectiveness of acquisitions it can secure. At the collective level, the CWCB and the CWT can do this in two ways: 1) use temporary solutions to fulfill immediate and temporary needs while permanent solutions are streamlined and 2) streamline the permanent acquisition process. These are both directly related to not only voluntary participation of water right holders, but also cooperation from the water community.

In order to increase voluntary participation in acquisition agreements, the CWCB will need to work to reduce institutional barriers, while highlighting institutional incentives. Many of the tangible barriers to participation are not necessarily things that can be changed at the collective level. However, recognizing those barriers can help the CWCB streamline which potential water right holders are not only more willing to participate in the ISF Program but also

water rights that are more likely to meet the formalized requirements. Trust is one the most important intangible barriers to voluntary participation and will continue to be a challenge in the future. However, the CWCB is not well positioned to address trust as it is a government agency and a generalized distrust of government usually stems from core values of individuals, rather than more easily addressed misconceptions or bad experiences, although those are also important to consider. The CWT, on the other hand, is well positioned to establish social trust with individuals in the water community as a non-governmental organization.

One of the biggest current and future challenges to streamlining the acquisitions process is the judicial approval process. Water courts are one way for water users to express concerns about the use of state water, as it is a publicly owned resource. In theory, this allows changes in state water use to reflect the changing values of state water users. This idea of other water users being able to oppose an application for the use of a public resource is vital to understanding the strengths and weaknesses of both the judicial approval process and administrative approval process.

The cumbersomeness of the judicial system is very much related to the number and type of water users that oppose the application. Effectively, the more opposition to an application the more likely it will get tied up in water court (up to 2 years) and the riskier and more expensive the application becomes. As a state agency with limited resources, the CWCB cannot afford to address every single opposition or injury to its water rights, even if they are successful in identifying injury to one of its water rights. ISFs are physically and inherently different than consumptive water rights, but are set on an equal footing with other water rights within the prior appropriation system in terms of administration. However, just because ISF water rights are administered equally, they are still treated subordinately in terms of the formal and informal

institutions that surround them. The formal, constitutional level institutions that govern the judicial process for water rights puts ISF water right cases at a disadvantage. The CWCB is a state agency, dependent on taxes and legislatively administered funds to purchase or lease ISF water rights. Due to politically motivated factors, the CWCB can only grow their staff so much, something private water right holders do not have to consider. The CWCB Stream and Lake Protection Section has one staff member dedicated to addressing legal protection on a staff of seven. Working within a judicial system in which the outcomes of a case depend on not only the evidence and due diligence, but also the number and type of stakeholders that choose to oppose that case, the CWCB is not on an equal footing with other water right holders with respect to time and resources when it comes to defending a case in court. Part of the streamlining process will be to decrease the amount of opposition to change of use cases with ISFs.

Alternatively, the administrative approval process, which currently is only used for Substitute Water Supply Plans and 3-in10 STLs, in theory, treats every application by the same set of rules with a limited number of expected outcomes for each application. However, the opportunity for water users to oppose those applications is limited. The DWR addresses this issue by viewing any application for temporary approval in the strictest light possible in order to minimize the amount of what would be opposition to a change of water use. Temporary tools like the 3-in-10 STLs are useful for addressing overall barriers to participation in the ISF Program such as water right holder's reluctance in relinquishing control, concerns about ISFs interfering with future water development, and a lack of familiarity with a water market or the ISF Program in general. In addition to the need for a tool to address oncoming drought, the 3-in-10 STL's ability to address those barriers may explain why the tool was developed and implemented so quickly resulting in immediate on-the-ground ISF Protection.

The successful 3-in-10 STL agreements will create a literature of past successes from which the CWCB and CWT can draw when creating narratives about the ISF Program. While there is risk associated with taking decisions surrounding water use out of the water court for fear that the decisions surrounding water use across the state will no longer reflect the values of the water community, approval of the 3-in-10 STLs through the administrative process is inherently more efficient with respect to time and resources for everyone involved. The administrative approval process will become more important as Colorado experiences increased changes in the biophysical conditions of water resources, creating an increased need proactive institutional changes that will allow for flexible decision-making when water managers need to adapt to changing conditions without harming ISFs. The novelty of this approval process for ISF protection has important future considerations.

While the 3-in-10 STLs are a useful example in explicating how incremental changes to ISF legislation at the constitutional level, allowed for greater innovation at the collective-level, and ultimately led to increase ISF protection at the operational level. However, with the successful on-the-ground application of the 3-in-10 STLs and new administrative approval process for ISFs, these on-the-ground accomplishments provide an important feedback mechanism, which could have important implications for new ISF legislation. The multi-level structure used in this analysis allows us to see that feedback between institutional levels is not unidirectional, but rather on-the-ground accomplishments (or lack thereof) at the operational level can also influence changes at the constitutional level (see Figure 11 as a reminder of Colorado ISF Program's institutional levels as of 2001).

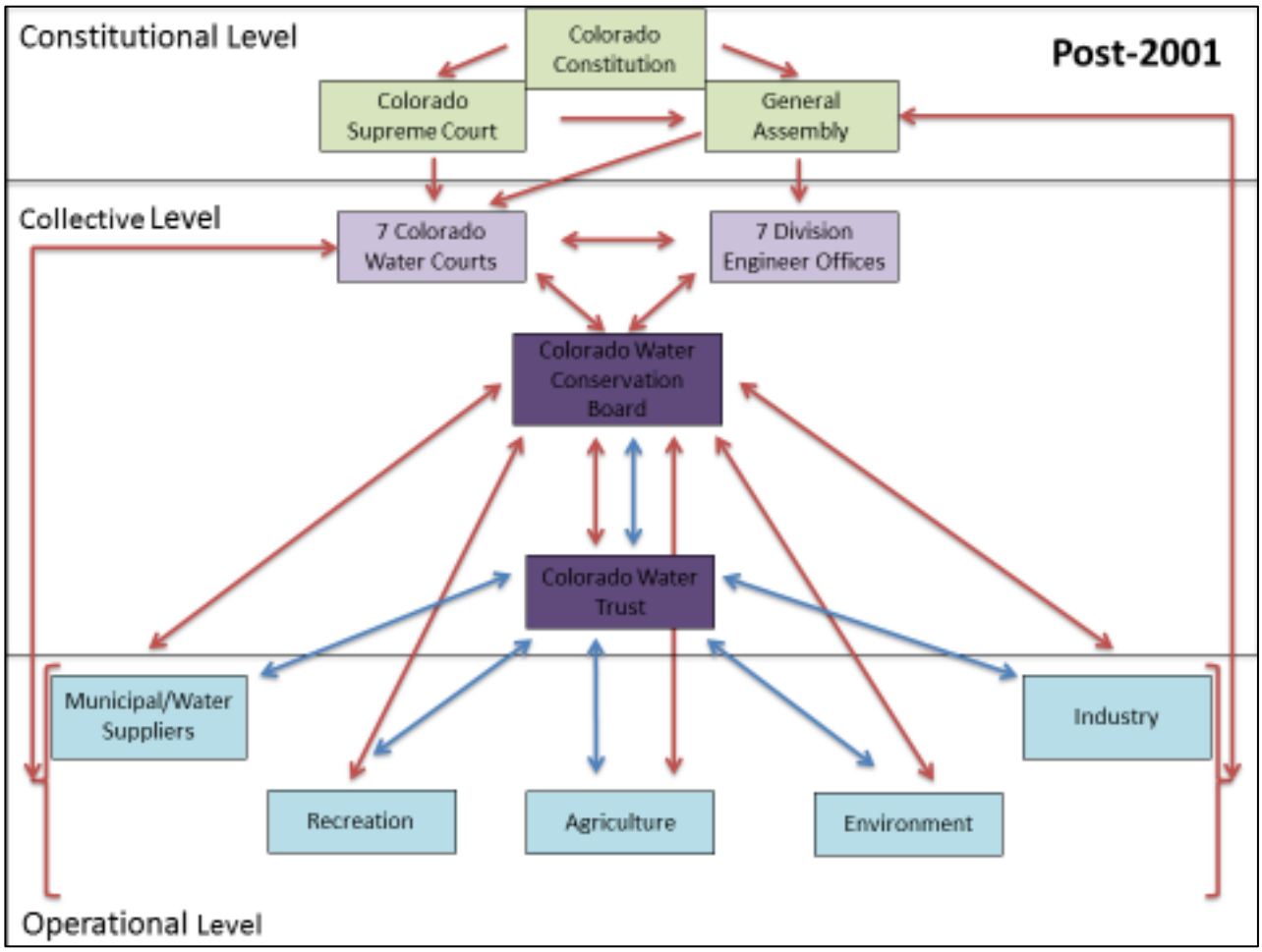

Figure 18. Post-2001 Instream Flow Program Dynamics (with respect to Acquisitions). Instream Flow Program dynamics post-2001, after the creation of the Colorado Water Trust. The diagram shows the various interactions, actors, and level of governance associated with ISF management in Colorado.

Overall, the findings suggest that collaborative management has led to varying levels of success in the implementation of Colorado's ISF Program. At the collective level, collaborative management between the CWT and CWCB has resulted in alternatives pathways for interaction between operational water right holders and the CWCB, which has increased capacity for ISF water right acquisitions via CWT staff and resources. Collaborative management between the CWT and CWCB has also been successful in partially shifting ISF protection from the judicial system, where it is inherently disadvantaged compared to other uses, to an administrative system, where it will in theory be treated more equitably, through the implementation of 3-in-10 STLs.

At the operational level, 3-in-10 leases have increased the number of options for water right holders to participate in the ISF Program and have resulted in seven STLs leases in just two years, which is a much faster rate of realization compared to permanent acquisitions.

On the other hand, collaborative management between the CWT and CWCB has been limited in its success with respect to the number and effectiveness of the ISF protections at the operational level. 3-in-10 STLs are temporary and consequently have a limited potential for preventing further degradation of a stream system. An increase in capacity for acquisitions since 2001, with the creation of the CWT, has yet to lead to an increase in the number of permanent acquisitions. While the creation of the CWT itself is still a fairly recent development in the context of Colorado water, trends in ISF protection over time show that the policy tools that are most effective in restoring *and* further protecting a stream system from being further degraded, acquisitions, are still only a small fraction of the total number of ISF water rights that exist. Additionally, a majority of ISF water rights in Colorado are appropriated ISF water rights that are very small quantities, which may or may not meet the originally recommended quantity needed to maintain the ecological health of the stream and, furthermore, may or may not be met at certain times of the year when the ecological health of a stream is at greatest risk.

Collaborative management has successfully resulted in new institutional structures, which have increased the number of ways to increase ISF protections at the operational level, but this initial quantitative analysis suggests that this may not be sufficient to adapt to projected biophysical changes in stream flow in Colorado as it does not address the quantity of the ISF protections. While ISF thresholds are met a majority of the time, the quantity of the ISF water right is also important to consider as it may not necessarily lead to an increase in ecological

health. However, an analysis of the effectiveness of the quantity of the ISF water rights on ecological health is outside the scope of this analysis.

The findings suggest that institutional structures have recently changed in important ways due to collaborative management, which show promise in helping to address future ISF needs. The findings highlight the need to understand how collaborative management, institutional structures, and on-the-ground outcomes at the operational governance level interact.

CHAPTER VIII

CONCLUSION

While the findings in this analysis are very specific to the intuitional arrangements and patterns of interactions in the Colorado water community they are important for the broader understanding of multi-level collaborative management as a way to balance flexibility and certainty in natural resource management. The findings also provide an important case study for what seems to be lacking in the collaborative management literature, which is the application of a conceptual frameworks to on-the-ground implementation. Understanding how patterns of interactions between actors within and between governance levels provides insight into the degree of institutional flexibility and uncertainty at each governance level. Institutional arrangements can help drive collaboration and collaboration, in turn, can change institutional arrangements, which in the case of the ISF Program has been effective but incremental.

While the findings provide one example of collaborative management in water management across multiple governance levels, the findings have several limitations. First, Colorado is a state with one of the purest forms of prior appropriation, limiting the extent to which the findings specific to the Colorado ISF Program can be applied to other state ISF Programs. Second, while nine staff members out of the 14 potential CWCB and CWT interview subjects were interviewed, the results may have benefited from interviewing staff members from some of the other agencies involved such as the DWR. Third, results about perceived barriers and incentives to participation in the ISF Program on part of water right holders are all from third-party observers, not the water right holders themselves, which may have limited the

number of reported barriers and incentives or affected the way in which they were framed. Fourth, results describing how often and when ISF decreed water right thresholds are not met are limited to the number of water rights that have gages located within the decreed stream reach. There are 135 ISF rights that contain gages, however the availability of resulting reported gage data also limited the number of gages we chose to use to only those monitored by the USGS. Fifth, the way in which water right data is managed and publically accessible was a major limitation to the ability to track ISF policy tool use over time as the decreed dates for acquisitions or change of use cases are not recorded consistently within the CDSS system. There is no single, relational database for Colorado water rights, which limits the extent to which different aspects of water rights can be analyzed to determine important correlations.

The findings also have numerous implications for future studies. Interviewing staff members from the CWCB and CWT was beneficial as a first step in explicating potential incentives and barriers to participation in the ISF Program, but it would also beneficial to try to better understand if what ISF practitioners perceive as barriers and incentives match up with what potential program participants perceive as barriers and incentives. Additionally, knowing if there are any important patterns or correlations as to geographic locations water right holders have certain perceptions of barriers and incentives could have important implications for outreach strategies. It would also be beneficial to try to obtain a larger sample size of for gage data for instream flows in order to elucidate other key qualitative trends and try to match those trends with potential administrative patterns or specific actions. Future work should also consider the quantities of the ISF water rights and the effectiveness in protecting the biological and ecological needs of stream systems. Particularly the discrepancies in recommended quantities of

ISF thresholds and realized quantities in the appropriation process. These would all have important implications for using ISF policy tools most effectively.

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X. KEY TERMS AND ACRONYMS:

Acre-Foot Volumetric measurement of water used for quantifying reservoir storage capacity and historic consumptive use. This is the amount of water that will cover an acre of land at a depth of one foot, or 325,851 gallons of water.[10]

Acquisition: change of use case specific to instream flows (also referred to a change of use; change case; transfer; acquisition)

Adjudication: The process for obtaining a water court decree for a conditional water right, a finding of reasonable diligence, an absolute water right, an exchange, an augmentation plan, a change of water right, or a right to withdraw non-tributary water or Denver Basin groundwater that is outside of a designated groundwater basin. [10]

Administration Number: A calculated number developed by the Division of Water Resources to provide a simple and efficient method of ranking decrees in order of seniority.[11]

Appropriation Date: Placement of a specified portion of the waters of the state to a beneficial use pursuant to the procedures prescribed by law. Speculation is prohibited. The appropriator must have its own use for the water or have a contract to serve the customers that the water will benefit. Only previously un-appropriated surface or tributary groundwater water can be appropriated. The appropriator must have a plan to divert, store, or otherwise capture, possess and control the water for beneficial use.[10]

Call Demand for administration of water rights. In times of water shortage, the owner of a decreed water right will make a "call" for water. The call results in curtailment orders against undecreed water uses and decreed junior water rights as necessary to fill the beneficial use need of the decreed senior calling right.[10]

Case Number: the case number of the Water Court action.

Cubic Feet Per Second (cfs) Measurement of flow rate of water in running stream or taken as direct diversion from the stream. Water flowing at 1 cfs will deliver 448.8 gallons per minute or 648,000 gallons per day or approximately 2 acre feet per day.[10]

Colorado Revised Statutes (C.R.S.) The annual compilation of Colorado statutes and court rules published by the Colorado General Assembly. Also called "the red books."[10]

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[10] Information compiled from Colorado Foundation for Water Education's Citizen's Guide to Colorado Water Law https://www.yourwatercolorado.org/flip/catalog.php?catalog=waterlaw

[11] Information compiled from DWR's database dictionaries ftp://dwrftp.state.co.us/cdss/webtools/data_dictionary_CallChronology.pdf

Consumptive Use Water use that permanently withdraws water from its source; water that is no longer available because it has evaporated, been transpired by plants, incorporated into products or crops, consumed by people or livestock, or otherwise removed from the immediate water environment.[10]

CWCB: Colorado Water Conservation Board

CWT: Colorado Water Trust; also referred to by some interviewees as the Trust or the Water Trust

DWR: Colorado Department of Water Resources (also referred to as the Division Engineer's Office/Office of the Division Engineer)

Injury: The action of another that causes or may cause the holders of decreed water rights to suffer loss of water at the time, place and amount they would be entitled to use under their water rights if the action had not occurred. Injury is a significant issue in any water court proceeding and in determinations of the State and Division Engineers.[10]

Priority: The ranking of a water right vis-à-vis all other water rights drawing on the surface stream and tributary groundwater system. Priority is determined by the year in which the application for the water right was filed. The date the appropriation was initiated determines the relative priority of water rights for which the applications were filed in the same year. Priority is the most valuable aspect of a water right because priorities determine who may divert and use water in time of short water supply.[10]

Preserve or Improve: refers to language written into the statute allowing the CWCB to protect instream flows in order to *preserve or improve* the natural environment

Protect and Restore: refers to the actions taken to protect instream flow or restore instream flow

Statute A law enacted by a legislative body such as the U.S. Congress or the Colorado General Assembly.[10]

Substitute Supply Plan: A State Engineer-approved temporary plan of replacement supply allowing an out-of-priority diversion while a plan for augmentation is proceeding through the water court. The State Engineer may also approve substitute supply plans for water exchanges, water uses that will not exceed 5 years and limited emergency situations affecting public health or safety.[10]

Stream reach: the length of stream located between two points

XI. APPENDICES
Appendix A

History of Foundational Federal and ColoradoWater Laws and Policies[12]		
Year	**Act or Court Case**	**Outcome**
1861	Colorado becomes a Territory	Increased growth and economic prosperity depended on ability to obtain land and water rights
1862	Homestead Act	Allowed settlers to settle public lands
1866	Mining Act	Allowed settlers to build ditches and reservoirs and divert water on public lands to reach place of beneficial use
1872	*Yunker vs. Nichols*	Allowed water to be diverted from public lands, across private lands
1876	*Union Colony vs. Greely*	Established "First in time, first in right" precedent
1879	Adjudication Act	Puts General Assembly in charge or priority dates and quantities; Foundation for judicial as opposed to administrative water right system
1891	*Strickler vs. City of Colorado Springs*	Agricultural rights could be sold and transferred to municipal uses but required public notification and anyone with objections the opportunity to be heard.
1902	Reclamation Act	Later became Bureau of Reclamation
1903	Adjudication Act	Domestic uses are now adjudicated along with irrigation uses
1937	Creation of Colorado Water Conservation Board	Established to aid in the protection and development of the state's waters
1968	Creation of Colorado Department of Natural Resources	CWCB becomes a division within DNR
1969	Water Right Determination and Administration Act	Created 7 Colorado Water Court divisions to issue water decrees
1970	National Environmental Protection Act	Requires federal agencies to integrate environmental values into their decision making processes by considering the environmental impacts of their proposed actions and reasonable alternatives to those actions
1972	Clean Water Act	Recognizes water quality as a protected resource in providing for critical habitat or human consumption
1973	Endangered Species Act	Describes severe decline in diversity of U.S. native species and acknowledges their "esthetic, ecological, educational, recreational, and scientific value to our Nation and its people"

[12] Information compiled from combination of Colorado Foundation for Water Education's Citizen's Guide to Colorado Water Law and CWCB's Historical Timeline

Appendix B

Key Instream Flow Legislation[13]		
Year	**Colorado Assembly Bills**	**Change in Implementation**
1973	S.B. 97	Creates the Colorado Instream Flow and Natural Lake Level Program to be administered by the Colorado Water Conservation Board
1979	*Colorado River District v. CWCB*	Upheld that ISF rights are constitutional
1981	S.B. 414	ISF appropriations based upon water imported from one basin to another do not give CWCB any right or claim against the importer of the water, are subject to uses or exchanges of water existing on the date ISF appropriated, and the state and others may not condemn private land to gain access to ISF water rights. CWCB to must assess natural environment, water availability, and no material injury to water rights before applying to water court for an ISF water right.
1986	S.B. 91	Clarifies CWCB's authority to acquire water, water rights or interests in water to preserve the natural environment
1987	S.B. 212	Reaffirms CWCB as exclusive authority to hold an instream flow water right
1995	*Aspen Wilderness Workshop, Inc. v CWCB*	CWCB must go through Water Court to receive a decree in order to modify or reduce a decreed ISF water right
1996	S.B. 64	Outlined the procedure CWCB must follow in order to modify an existing decreed ISF, including filing through Water Court and issuing a public notice
2000	H.B. 1438	Repealed power of CWCB to acquire conditional water rights for instream flow use
2001	S.B. 156	Authorizes CWCB to acquire water, water rights or interests in water for the purpose of *improving* natural environment as opposed to solely *preserving* natural environmental
2001	S.B. 216	Establishes recreational in-channel diversions as a beneficial use of water in Colorado
2003	H.B. 1320	Authorizes temporary loan of water rights for instream flow use during times of drought or other emergency and designates the DWR with power of approval and establishes process for public notice and comment
2005	H.B. 1039	Removes the drought declaration requirement for loan of water rights for instream flow use, limit the exercise of a loan to no more than three years in any ten year period and provide a process for parties to comment on potential injury after each year a loan is exercised
	CWCB v. City of Central	Upheld that augmentation plans are also subject to the principle that ISFs are fully adjudicated water rights and any augmentation plan with junior appropriations much protect other water right, including ISFs
2007	H.B. 1012	Provides that the period of time water is loaned to CWCB for ISF use will not result in a reduction in any future the historic consumptive use analysis and will not be considered as intent of the water user to abandon their water right.
2008	H.B. 1280	Provides that leasing water to the CWCB for instream flow use will not result in a reduction of the historic consumptive use for the leased water right in any future water court proceeding to change that water right, and will not give rise to a presumption of abandonment of that water right.
	H.B. 1346	$1 million appropriation from the Severance Tax Trust Fund Perpetual Base Account for ISFs
	S.B. 168	Allocates $500,000 from the Species Conservation Trust Fund for instream flow acquisitions for ISF purposes if Severance Tax is fully appropriated
2009	H.B. 1067	Allows CWCB to approve instream flow incentive tax credit for permanent transfers of water rights to the ISF Program.
	S.B. 235	Made $500,000 available to CWCB if the $1 million from the severance tax funds is fully appropriated from the sale of the Colorado wildlife habitat stamps

[13] Information compiled using CWCB's Historical Timeline (2013)

Appendix C

Multi-level Governance of Colorado's Instream Flow Program Codebook

RESEARCH QUESTION:

Research Question: Has multi-level collaborative management been and will it be a successful approach for protecting instream flow in Colorado?

In order to answer this broad research question, several levels of sub-questions will guide separate sections of the analysis:

RQ1: Why and how has Colorado's ISF Program been successful so far?

RQ1a: How frequently have the four ISF policy tools been used over time?

RQ1b: How often and when are decreed ISF water rights thresholds not met?

RQ2: What barriers to and opportunities for the success of Colorado's ISF program exist?

RQ2a: How were the 3-in-10 short-term leases derived from legislation and translated into on-the-ground ISF protections?

RQ2b: Does the CWT, as a non-governmental organization, provide trust in the implementation of Colorado's ISF Program, while CWCB, as a government agency, provides legitimacy?

RQ3: What role does and will collaborative management play in the past and future success of Colorado's ISF Program?

RQ3a: How has and will 3-in10 STLs affect future ISF legislation and ISF Program management decisions?

CODING INSTRUCTIONS:

- Coders should read through the full transcript prior to beginning coding
- Coders should review codebook before coding
- When coding, coders should:

- Code entire sentences, including any necessary contextual information around that sentence (when appropriate or necessary)
- If coding for a single word using a 'find' search, read the entire question response by the subject in order to capture any context surrounding the word in question
- Code for a single category of code at a time (i.e. code an entire document for all codes under super-code 'roletype' and then return to the beginning of the transcript to code for all codes under super-code 'stlreq')

CODEBOOK

- ROLETYPE – the different roles the Colorado Water Conservation Board (CWCB), the Colorado Water Trust (CWT), the Division of Water Resources (DWR), and the Water Courts (WC)
  - CWCB – mentions of the Colorado Water Conservation Board with respect to their role in managing Colorado's Instream Flow Program
    - TRU – mentions of trust as a role the CWCB fulfills
    - LEG – mentions of legitimacy as a role the CWCB fulfills, including references to consistent monitoring and enforcement of Colorado's Instream Flow Program
    - RES – mentions of resources as a role the CWCB fulfills
    - OTR – mentions of outreach as a role the CWCB fulfills
    - CAP – mentions of capacity as a role the CWCB fulfills
    - POLY– mentions of policy as a role the CWCB fulfills
    - INNOV– mentions of innovation as a role the CWCB fulfills
    - IMPL– mentions of implementation as a role the CWCB fulfills
  - CWT – mentions of the Colorado Water Trust with respect to their role in managing Colorado's Instream Flow Program
    - TRU – mentions of trust as a role the CWT fulfills
    - LEG – mentions of legitimacy as a role the CWT fulfills, including references to consistent monitoring and enforcement of Colorado's Instream Flow Program
    - RES – mentions of resources as a role the CWT fulfills
    - OTR – mentions of outreach as a role the CWT fulfills
    - CAP – mentions of capacity as a role the CWT fulfills
    - POLY– mentions of policy as a role the CWT fulfills
    - INNOV– mentions of innovation as a role the CWT fulfills
    - IMPL– mentions of implementation as a role the CWT fulfills
  - DWR – mentions of the Division of Water Resources with respect to their role in managing Colorado's Instream Flow Program
    - TRU – mentions of trust as a role the DWR fulfills

        - LEG – mentions of legitimacy as a role the CWCB fulfills, including references to consistent monitoring and enforcement of Colorado's Instream Flow Program
        - RES – mentions of resources as a role the DWR fulfills
        - OTR – mentions of outreach as a role the DWR fulfills
        - CAP – mentions of capacity as a role the DWR fulfills
        - POLY– mentions of policy as a role the DWR fulfills
        - INNOV– mentions of innovation as a role the DWR fulfills
        - IMPL– mentions of implementation as a role the DWR fulfills
    - WC – mentions of the Water Court with respect to their role in managing Colorado's Instream Flow Program
        - TRU – mentions of trust as a role the WC fulfills
        - LEG – mentions of legitimacy as a role the WC fulfills, including references to consistent monitoring and enforcement of Colorado's Instream Flow Program
        - RES – mentions of resources as a role the WC fulfills
        - OTR – mentions of outreach as a role the WC fulfills
        - CAP – mentions of capacity as a role the WC fulfills
        - POLY– mentions of policy as a role the WC fulfills
        - INNOV– mentions of innovation as a role the WC fulfills
        - IMPL– mentions of implementation as a role the WC fulfills
    - OTHENT
        - TRU – mentions of trust as a role that other entities fulfill
        - LEG – mentions of legitimacy as a role that other entities fulfill, including references to consistent monitoring and enforcement of Colorado's Instream Flow Program
        - RES – mentions of resources as a role that other entities fulfill
        - OTR – mentions of outreach as a role that other entities fulfill
        - CAP – mentions of capacity as a role that other entities fulfill
        - POLY– mentions of policy as a role that other entities fulfill s
        - INNOV– mentions of innovation as a role the role that other entities fulfill
        - IMPL– mentions of implementation as a role the role that other entities fulfill

- POLYTLS – the different attributes, characteristics, abilities of policy tools available to protect instream flow
    - NWAPP – mentions of the characteristics of new appropriations
    - ACQ – mentions of the characteristics of acquisitions
    - PERM – mentions of the characteristics permanent acquisitions (i.e. transfers, i.e. change cases). These are specific only to permanent acquisition; not temporary leases (long-term or short-term).

    - STL – mentions of the characteristics of short-term leases
    - LTL – mentions of the characteristics long-term leases
    - SWSP – mentions of the characteristics substitute water supply plan
    - NEWLEG – mentions of the characteristics new legislative tools (i.e. efficiency transfer, flex tools)

- STLREQ – the basic biophysical and legal or statutory requirements needed for a short-term lease for instream flow protection or improvement
    - BIOPHY – mentions of the biophysical requirements needed protect instream flow under a short-term lease (i.e. location, instream flow threshold)
    - LEGSTAT– mentions of the legal or statutory requirements needed to enter into a short-term lease by either the Colorado Water Conservation Board or the private water rights holder

- BARPART – perceived barriers to voluntary participation by a water rights holder in a short-term lease by CWCB and CWT staff
    - FIN – mentions of finances as perceived barriers to a private water right holder participating in a short-term lease
    - CAP – mentions of capacity as perceived barriers to a private water right holder participating in a short-term lease (e.g. irrigator with lots of acres can fallow part of fields)
    - POLT – mentions of politics as perceived barriers to a private water right holder participating in a short-term lease (e.g. government control)
    - TRU – mentions of trust as perceived barriers to a private water right holder participating in a short-term lease
    - LEG – mentions of legitimacy (i.e. monitoring end enforcement) as perceived barriers to a private water right holder participating in a short-term lease
    - CTRL – mentions of control as perceived barriers to a private water right holder participating in a short-term lease (i.e. can choose to participate or not)
    - HCUA– mentions of historic consumptive use analysis as perceived barriers to a private water right holder participating in a short-term lease
    - OTHER – mentions of anything other than the above barriers

- INCPART – perceived barriers to voluntary participation by a water rights holder in a short-term lease by CWCB and CWT staff
    - FIN – mentions of financial as a perceived incentive for a private water right holder to participate in a short-term lease
    - EE – mentions of an environmental ethic as a perceived incentive for a private water right holder to participate in a short-term lease

    - PNR – mentions of preserving natural resources as a non-monetary benefit as a perceived incentive for a private water right holder to participate in a short-term lease
    - TRI– mentions of using the short-term leasing as a trial run as a perceived incentive for a private water right holder to participate in a short-term lease
    - FLEX– mentions of flexibility of the program or contracts as a perceived incentive for a private water right holder to participate in a short-term lease

- CURCHALL – current challenges to protecting and improving instream flow in Colorado through the Colorado Instream Flow Program
    - RES – mentions resources as a current challenge to protecting and improving instream flow
    - CAP – mentions capacity as a current challenge to protecting and improving instream flow
    - POLT – mentions politics as a current challenge to protecting and improving instream flow
    - TRU – mentions trust as a current challenge to protecting and improving instream flow
    - PROC – mentions the system or process as a challenge to protecting and improving instream flow

- FUTCHALL – current challenges to protecting and improving instream flow in Colorado through the Colorado Instream Flow Program
    - RES – mentions resources as a future challenge to protecting and improving instream flow
    - CAP – mentions capacity as a future challenge to protecting and improving instream flow
    - POLT – mentions politics as a future challenge to protecting and improving instream flow
    - TRU – mentions trust as a future challenge to protecting and improving instream flow
    - PROC – mentions the system or process as a future challenge to protecting and improving instream flow

- ISFDIFF- how instream flows are perceived or institutionally treated by individuals, groups, legislature, or the judiciary in the Colorado water community
    - PERCDIFF – mentions of how instream flows are still perceived as new beneficial use compared to other non-consumptive or consumptive uses
    - SUBORD – mentions of how instream flows are treated differently than other beneficial uses in legislation and implementation

- SYST – specifically refers to either an judicial or administrative process
    - ADM – mentions of an administrative process
    - JUDIC – mentions of a judicial process

- MISC – any other unexpected or important quotes worth note