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# **Creating Accountability with Interstate Cooperation: Unauthorized Water Use Enforcement on the Klamath River**

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## **Abstract**

While lacking coercive power to compel enforcement, interstate compacts create accountability through multiple sources and layers connecting enforcement behavior to oversight. Using logistic regression, we test a model of accountability and enforcement of unauthorized water usage on the Klamath River. Findings indicate unauthorized water usage is far more likely to be reported and enforced on the Klamath River than on neighboring rivers in the same counties. Conclusions indicate the increased institutional layers of interstate compacts lead to more accountability and stringent enforcement and reporting of unauthorized water use.

## **Introduction**

Water scarcity is a growing problem in the American West, where rising demand brought on by population and industrial growth, combined with the effects of climate change, are increasing demand and decreasing supply. A prolonged drought in California for example, has elevated policy discussions on water scarcity along with concerns around unauthorized water use. These policy debates about the present and future response to water scarcity in the state and across the region are driven by water scarcity's disruption of long standing irrigation practices and related economic consequences. Water rights management falls to the states, whose water use policy and practices are based on decades old expectations of water flows, where the prior appropriation system encouraged over use, as a "use it or lose it" regulatory environment shaped user decisions. States across the west are slowly responding with more robust approaches to managing water rights, and enforcement of those water rights. Scholarship on collaborative social-ecological systems management (Ostrom, 2007), a method for including a varied group of stakeholders who help regulators design water distribution systems and contribute themselves to sustainable management of scarce resources, has emerged as a mechanism for resolving the challenges posed by water scarcity that do not rely on top-down approaches (Singleton, 2002) These approaches are well suited to facilitate communication and prevent conflict among stakeholders, when employed under certain conditions, and remain the progressive standard for sustainable management of scarce resources (Anderies, Janssen, and Ostrom, 2004). However, the success of these approaches may be tied to proper water right enforcement mechanisms.

Many states do not have the proper enforcement regulations and capacity in place to monitor and deter unauthorized water use, a behavior that undermines the delicate balance managed by collaborative environmental policy making procedures. This may be due to the political dynamics in many states where agricultural interests are wary to introduce more government oversight on their operations. However, as water scarcity takes hold and becomes the new normal, river basins with transboundary characteristics raise important issues on how states will continue to manage this vital resource given the variation in state water management practices. While some western states have been slow to properly enforce water rights and collect data on unauthorized water use violations, others have been more advanced in their approach. These differences matter for basins, such as the Klamath River, which spans Southern Oregon and Northern California and serves as an example of how transboundary river systems pose legal and political questions for water management. The Klamath River Compact enacted in 1957 and the Klamath Basin Restoration Agreement (KBRA) enacted in 2010, set guidelines for California and Oregon to follow for water use management and dispute resolution.

While interstate compacts and agreements are a tool for horizontal cooperation on narrow policy issues, “states are cooperating with each other in myriad ways... [but] not all states cooperate at the same rate or in the same way” (Bowman, 2004, p. 544). Such cooperation is an example of “federalism without Washington” (Krane, 2002). On face value, the Klamath River compact and KBRA simply guides Oregon and California on how they manage their conflicts over water use. Further analysis, though, indicates a broader impact for state responses to scarcity in general, and for California’s enforcement of its own water use statutes, specifically. California has dozens of rivers and several major basins, but it is the Klamath River that has recorded a disproportionately high rate of reported unauthorized water use violations. We investigate why this disproportional response emerges, and argue interstate cooperative agreements create accountability and thus stricter enforcement actions on unauthorized water use from the state, as the pressure of these arrangements result in increased enforcement actions in California. There are no provisions in either the compact or the KBRA that dictates how states should manage unauthorized water use violations, making this observed difference in enforcement trends in the state even more surprising. We argue that this type of institutional arrangement may serve states as they work to undermine unauthorized water use, as added pressure to comply with the compacts result in more attentive management practices.

This paper is organized as follows. We first examine the role interstate compacts play in shaping state behavior. We move on to discuss the growing threat of water scarcity and the role of unauthorized water use and its enforcement. We then profile the particular dynamics of the Klamath River and offer some context to examine the role interstate compacts play in state enforcement of unauthorized water use. We then present a model examining reported unauthorized water use violations across California counties, and provide statistical support for the disproportionately high number of violations on the Klamath River. We close with a discussion of our findings and their implications for state response to water scarcity.

### **Interstate Compacts**

Interstate compacts are one mechanism in which states engage in horizontal federalism (ties between governments at the same level), as opposed to vertical federalism (ties between governments at different levels). Prior to the emergence of “wicked” problems that transect state jurisdictions and the era of cooperative federalism when there was little separation between federal and state functions, states rarely engaged in horizontal federalism. By the mid-20<sup>th</sup> century, “wicked” problems and an expanding state role in policy during the new federalist era created more interstate conflict and need for cooperation (Head, 2008). Interstate compacts have seen marked growth in recent decades with nearly a quarter adopted since 2000 and a majority since 1970 (Florestano, 1994; NCIC, 2017), indicating states are finding greater need to cooperate directly with other states as American federalism and policy problems have evolved.

There are two general explanations for why states engage in interstate compacts. First, formalized interstate cooperation offers an opportunity to preempt federal action by solving interstate conflicts at the state-level (Bowman, 2004; Bowman and Woods, 2007). Interstate compacts are a means for addressing problems beyond the power of a single state or conflicts between states without including the federal government; thus preserving state power and limiting federal opportunity to expand its influence (Nice, 1984; Bowman and Woods, 2007). However, Bowman and Woods (2007) argue that rather than a strategic move at preemption by the states, compacts are actually an attempt to “fill the void left by national government retrenchment, in effect as an alternative means to coordinate national policy from the bottom-up” (p. 364). Woods and Bowman (2011) rectify these opposing viewpoints by contending whether states use compacts to preempt federal incursion or to respond to federal inactivity is driven by the types of policies being considered, with states using the former for economic policies and the latter for social and criminal justice policies. Further research also suggests that internal politics dictates motivations for dealing with certain types of policy (Bowman and Woods, 2007, 2010).

Second, horizontal federalism is a special case of policy innovation where states have responded to “wicked” problems with new tools. States are forced to be more innovative when solving problems that do not conform to traditional institutional jurisdictions. Bowman (2004) finds that unlike other forms of horizontal federalism, such as multistate legal actions or uniform state laws, participation in interstate compacts is not predicted by measures of policy innovation, policy liberalism, or government capacity. However, subsequent research indicates those measures are substantive predictors of state participation in compacts as well (Bowman and Woods, 2007; Nicholson-Crotty, et al, 2014). Furthermore, Nicholson-Crotty, Woods, Bowman, and Karch (2014) argue “a state’s receptivity to national compacts is positively correlated with its ranks on most other indices of innovativeness” (p. 321). Additional research

also indicates that states use compacts to supplement weak fiscal and institutional capacity (Bowman and Woods, 2007). In either case, states see greater potential for resolving conflicts through interstate cooperation than through traditional federal hierarchy.

Interstate cooperation requires traditional federal hierarchical arrangements to be supplemented by new horizontal ties between states. These ties extend the scope of state operations into interstate jurisdictions by creating mechanisms of shared governance (Schlager and Heikkila, 2009). The most common ties are relative to regulation or rule-making, collective choice decision making (e.g., compact commission), or compliance monitoring and information sharing. On the other hand, ties relative to compliance enforcement are the least common and of the lowest quality (Heikkila, Schlager, and Davis, 2011). The extent and quality of ties between states is a function of interstate conflict, where shared governance is designed to address the scope of the inter-jurisdictional problem. Studying 14 interstate river compacts, Heikkila, Schlager, and Davis (2011) find “more extensive types of linkages emerging in those basins where states faced more severe challenges around water management, such as conflicts over water allocation, extreme weather events, or development water storage projects... Compacts that face fewer water management challenges made fewer investments in linkages” (p. 140).

Among the biggest challenges for interstate compacts is compliance enforcement, as shared governance relies on cooperative behavior from member states. Compacts, for the most part, provide few horizontal mechanisms to force compliance as there are neither sanctions within their constitutions nor a means for states to sanction other member states. More recently, compact drafters are recognizing this as a potential problem, with older compacts being renegotiated and revised accordingly and new compacts incorporating stronger enforcement provisions. However, specific enforcement provisions vary widely between compacts, and some do contain provisions for direct enforcement (Heikkila, Schlager, and Davis, 2011). Nevertheless, vertical mechanisms, either through collective decision making bodies or the courts, still serve as a key tool to encourage compliance. Like member states, compact commissions can request a state violating provisions enforce the compact and hope for compliance (Schlager and Heikkila, 2009). Additionally, some compact commissions have coercive tools, such as the power to make binding rules and levy fines for noncompliance. The U.S. Supreme Court is the body of conflict resolution when all other remedies fail. As compacts are viewed as contracts, states are legally bound to their provisions and may not adopt laws which directly conflict with those obligations. However, as the purpose of compacts is to limit federal intrusion into interstate matters, seeking remedy from federal courts defeats the purpose and is a rare choice (Schlager and Heikkila, 2009; Heikkila, Schlager, and Davis, 2011). The only direct means for compact enforcement is through state administrative processes. Thus, compacts are fundamentally reliant on voluntary cooperation from member states.

There are mixed incentives for compliance and enforcement, as costs are unevenly distributed between and within states. First, between states, rulemaking creates incentives for compliance or noncompliance through the allocation of resources to member states. Compact compliance may harm your own citizen for the benefit of those of another state or indirectly conflict with policy. For example, in water regulatory compacts, fixed allocation rules incentivize noncompliance by forcing upstream states to bear the brunt of water shortages, compared to delivery percentage rules which more equally distribute those costs (Bennett and Howe, 1998; Schlager and Heikkila, 2011). Furthermore, during a drought year, there may not be enough available water to both comply with state granted water rights and compact agreed upon allocations. Thus, states can be forced to choose between their intra- and interstate obligations (Heikkila, Schlager, and Davis, 2011). Second, within states, “centralized administrative systems result in state governments bearing the costs of compliance actions, whereas polycentric administrative systems distribute costs” across the system (Schlager, Heikkila, and Case, 2012, p. 494). For polycentric systems, compliance enforcement is driven by local costs associated with compliance (or noncompliance), compared to centralized systems where compliance costs are considered as part of the larger policy system. Thus, polycentric systems are likely to see far more variability in compliance than centralized systems, as cost assessment occurs from the bottom-up rather than from the top-down.

Nevertheless, to ensure compliance and preserve state autonomy, compacts rely on mechanisms to create accountability for enforcement, rather than coercion (Schlager, Heikkila, and Case, 2012). Accountability is complex and multidimensional (Romzek and Ingraham, 2000; Hill, 2009; Gregory, 2012). As Ostrom’s institutional analysis and development (IAD) framework demonstrates, governance occurs through multiple sources and layers, and interstate compacts rely on those same dynamics for accountability (Ostrom, 2007; Heikkila, Schlager, and Davis, 2011). For interstate compacts, there are three primary sources of accountability (rules, monitoring, and networks)

across three layers (intra-state, horizontal, and vertical). Rules are the most essential source of institutional and political accountability as a means to limit discretion through unambiguous objectives (Considine, 2002; Forrer, Kee, Newcomer, and Boyer, 2010; Considine and Moilanen, 2012; Gregory, 2012). Compact rulemaking carries political and institutional legitimacy through the power vested to it by member states and Congress, creating the most obvious and pressing source of accountability (i.e., it is the law!). (Schlager and Heikkila, 2009; Schlager, Heikkila, and Case, 2012).

Additionally, monitoring systems and professional and political networks strengthen accountability in collaborations and contractual relationships (Dicke and Ott, 1999; Bryson, Crosby, and Stone, 2006; Forrer, Kee, Newcomer, and Boyer, 2010). Monitoring creates accountability through organizational-level responsibility for a collective problem (Provan and Lemaire, 2012), and it “lessens the mistrust and tensions between states” (Schlager and Heikkila, 2011). Both of which are key components of successful shared governance tools and collaborations (Bryson, Crosby, and Stone, 2006; Provan and Lemaire, 2012). Professional and political networks, on the other hand, create personal accountability for bureaucrats, through cultural tools such as ethical codes (Considine and Moilanen, 2012). Interstate compacts strengthen administrative and political networks between states by creating personal connections, which in turn create social expectations of performance. Most commonly, compacts create high quality rulemaking and monitoring ties, and strengthen professional and personal networks (Bowman, 2004; Heikkila, Schlager, and Davis, 2011). Thus, weaknesses in enforcement ties between states are compensated for strength of ties that create accountability.

These sources of accountability function on three layers, as accountability has transboundary dimensions connected to other governmental bodies, vertical and horizontal links, and traditional channels supplemented with stakeholder relationships (Considine, 2002; Kettl, 2006; Forrer, Kee, Newcomer, and Boyer, 2010). First, compacts require approval of member states, and in providing that approval also provides all the legitimacy and authority of law. As compacts are contracts, compact obligations carry the same weight as state law which cannot contradict compact agreements. In *West Virginia ex rel. Dyer v. Sims* (1951), the U.S. Supreme Court ruled “a compact constitutes not only law, but a contract which may not be amended, modified, or otherwise altered without the consent of all parties” (p. 28). Additionally, state laws and compact regulations tend to be written to complement each other. Rules are established by both state law and compact obligations, essentially “doubling” the sources of accountability by providing further legitimacy (Schlager, Heikkila, and Case, 2012). For example, failure to enforce water allocation rules on a non-compact governed river would elicit intra-state institutional response for violating state law, while failure to enforce rules on a compact river would elicit intra-state institutional response for both violating state law and contract obligations.

Second, as compacts are approved by other member states, there is accountability to those horizontal sources (Heikkila, Schlager, and Davis, 2011; Schlager, Heikkila, and Case, 2012). States are not only accountable directly to their citizens and institutions but also indirectly to the citizens and institutions of other member states. In other words, failure to enforce regulations on a non-compact governed river would only elicit response from that state’s citizens and its institutions, but on a compact governed river, response from other member states and their institutions would be added to those intra-state responses. Third, as some compacts may require Congressional consent,<sup>1</sup> include collective decision making bodies, and can be litigated in the federal courts, there is further institutional accountability from those vertical sources (Kettl, 2006; Schlager and Heikkila, 2009; Heikkila, Schlager, and Davis, 2011). To add to the previous example, a state would also find itself with responses from collective decision making bodies, the federal courts, and potentially even Congress. Thus, as layers are added, the sources of accountability multiply and place more pressure on states to comply and enforce compact agreements. At the street-level where bureaucrats make enforcement decisions, compacts create multiple layers of oversight of their behavior and increase the likelihood of attention being drawn to their actions (Lipsky, 1983). As a result, they are more likely to act stringently in enforcement when dealing with issues governed by interstate compacts, compared to those governed only by state law. In practice, bureaucrats are more likely to respond to reports, investigate potential violations, and follow-through with administrative procedures. In other words, increased accountability leads to more stringent enforcement. Additionally, as this culture of enforcement diligence emerges, citizens are more likely to report violations, as they become aware that their reports result in actions from the state.

Given the complexity of accountability, “public agencies are asked to conform simultaneously to several legitimate but often competing accountability expectations” (Dicke and Ott, 1999, p. 511). These sources and layers of accountability are balanced against each other in a sophisticated calculus when complex conflicts emerge. Certainly,

not all these sources and layers of accountability are equal nor are they valued the same. Enforcement is likely most stringent when accountability expectations are aligned. Incentives for non-compliance are created when states must choose between their citizens and their compact obligations. When this conflict is reduced, states are most likely to enforce and comply with compact obligations. For example, if water resources are equitably divided between states, there is less likelihood of non-compliance than if one state takes an unequal share of the burden (Bennett and Howe, 1998).

Additionally, enforcement is likely most stringent when there are multiple layers and sources of accountability. In centralized systems, accountability is created at the state-level, where monitoring is aggregated and central decision-makers form professional and political networks, while in polycentric systems, street-level bureaucrats are closer connected to monitoring and networks (Schlager, Heikkila, and Case, 2012). Therefore, in a polycentric system, street-level bureaucrats are faced with a greater individual burden of accountability across all layers and sources, where in a centralized system they are separated from it. As implementation decisions tend to be made at the local-level, polycentric systems would result in more stringent enforcement due to greater individual accountability (Lipsky, 1983). Furthermore, the character of compact agreements is different when states are physically connected, compared to when states do not share proximity (Bowman and Woods, 2007). While rules maybe the same across geography, problems transecting borders are the purpose of interstate cooperation, so monitoring and profession networks in those areas are likely stronger than areas geographically separated. Thus, areas near interstate borders will have more stringent enforcement compared to areas farther away from border.

### **Unauthorized Water Use**

Among the most prominent uses for interstate compacts and agreements since the early 20th century has been to settle conflicts over interstate river basins and water allocations, with 38 separate compacts (or 19.8%) aimed at water issues (NCIC, 2017). While not new, conflict resulting from resource scarcity is becoming a more prominent issue across the globe (Homer-Dixon, 1999). Scholars have raised serious concerns about the linkages between food shortages, water scarcity, and the degradation of arable land (Floyd, 2013). While most of this literature has focused on the non-western world, there are clear applications to conflicts within the U.S. The environmental security literature has outlined general trends in resource scarcity for coming decades as climate change will alter long standing weather patterns bringing chaos to established agricultural practices including structural shortages, resource capture, and ecological marginalization (Homer-Dixon, 1999). Others downplay the deterministic position that scarcity undermines stability and leads to conflict, and highlight the capacity for states and institutions to muster the necessary ingenuity to inhibit the conflicts associated with scarcity (Salehyan, 2008). Many contributions have highlighted institutional roles in managing the impacts of scarcity.

For western U.S. states, existing institutions managing water are not well prepared to deal with the economic impact of water scarcity, and in some cases, can encourage water use violations. The prior appropriation system which western states utilize, prioritizes senior water right holders over junior rights. While water right holders must demonstrate beneficial use, typically defined as agricultural, industrial or municipal use, the economic value of competing uses is not evaluated in allocating water supplies. This sets the conditions where scarcity can undermine the ability of economic productivity of junior water users, even if their productivity has greater value than senior water users. While there are beneficial use standards, critics argue that these encourage users to use or lose their water rights, which further contributes to individual decision making on water use that may not incorporate the overall statewide economic impact. While emerging water markets may alter this, there is no set approach to ensuring that water will go to the most valuable use in a given basin during times of scarcity. Furthermore, the political power of the agricultural sector in many western states prevents more robust enforcement practices, as such measures would likely interfere with business operations.

There is evidence to suggest that water scarcity will remain a major issue in the American West for decades to come. A sizable portion of the water used in irrigation and energy production in the region is stored in mountain snowpack. Such snowpack feeds river systems late into the growing season when there is little reliable rainfall. The current assessment and projected impact of climate change, sees a sizable reduction in size of the region's snowpack. Less snow is combined with warmer springs, which can contribute to earlier melting of the snowpack, and thus reduce flows later in the growing season, increasing the cost of agricultural production and limiting overall yields. Snowpacks in the Cascade Mountains for example, have decreased by 20% since the 1950s (Mote, et al, 2014), and the U.S.

Environmental Protection Agency (EPA) measurements over the same period for other mountain ranges produces similar results (EPA, 2016a, 2016b). Likewise this process increases the probability of floods, and negatively affects hydropower generation (EPA, 2016a, 2016b).

The impact on agricultural production is particularly worrisome for a state like California, where the agricultural industry grossed \$47 Billion in 2015 and employed several hundred thousand workers (CDOL, 2016). In order to deal with the negative consequences of scarcity, and in the case of California protect the sizable economic productivity related to a resource like water, states have two general options to manage water. First, states can take control of water distribution, and determine who gets water based on how productive their use is. This is not a major occurrence in western states due to the prior appropriation system which tends to prevent water distribution as long as users meet basic criteria for use. While beneficial use can factor into the application of water rights, there is little legal enforcement from U.S. states on water users ensuring they are efficient with their water use or that the water is used for the most economically productive activity beyond municipal use being prioritized over industrial or agriculture. While state governments can pursue collaborative environmental policy making strategies, they do not necessarily address the issue of unauthorized water use or economic prioritization. Further, there are few legally mandated conservation efforts, and farmers are not required to use water conservation best practices.

Second, states can strictly enforce water rights by closely monitoring use and detecting unauthorized water users. Unauthorized water use is the consumption or transport of any sizable amount of water without authorization from water system managers. When accessing surface water, unauthorized water use can be conducted in two basic ways. The first is for a water user with a legal right to withdrawal from a managed source, by simply taking more than their allotted share, such as when an agricultural user pumps more water from an irrigation canal or adjusts their canal gate to be open longer or at a higher level than what their right dictates. Second, using the same method as the first, however, in this instance the individual in question pumps or extracts water from a proximate source without a water right. For example, when a landowner has access to an adjacent water source such as a river and pumps water directly from that source, or in the case of ground water, drills a well without authorization. The methods of unauthorized water use are not technically complicated and in many cases do not require more than one person to successfully complete. Further, such violations are difficult to detect because of rural settings of many water users and difficulties in measuring water flows. Typically, enforcement mechanisms require a reported violation, followed by an investigation into the specifics of the case, and then potentially criminal or civil proceedings. Unauthorized water use complaints can reach California Water Resources Control Board (CWRCB) from either citizens making direct reports to the state (there is a toll free number for California residents) or third party agencies (such as the Department of Agriculture, law enforcement, or irrigation districts) passing along a complaint that was brought to their attention but falls outside their jurisdiction.

Individuals who engage in unauthorized water use fall into two broad categories: those who do not know they are violating water law; and those who knowingly violate the law. In the former, the contact between the state and unauthorized water users becomes about education as opposed to criminal or civil proceedings. In the latter, the motivation is clear, especially for repeat offenders or agricultural users for whom additional water can result in additional production and economic gain. Unlike other property crimes, unauthorized water use hurts everyone else in a given basin since the water is transferrable, making enforcement an important action undertaken by state agencies to mitigate the negative consequences of scarcity (Ostrom, 2015). However, the specifics of enforcement has yet to be fully examined by the literature. Some Western states operating under the prior appropriation system do not collect data on unauthorized water use violations (i.e., Colorado, New Mexico, and Wyoming). Other states have only limited data available (i.e., Idaho and Oregon), while others have long established data investigative units and personnel dedicated to the problem as is evident through their data collection practices (i.e., California and Utah). This variation in enforcement makes the Klamath River an interesting case to examine.

### **Klamath River Compact**

The Klamath River headwaters lie on the east of the Cascade Mountains in Central Oregon and flows over 260 miles through California into the Pacific Ocean, making it one of only three rivers to start east of the Cascade Mountains and drain into the Pacific. The Klamath is the second largest river by volume in California, and was once the third most productive salmon and steelhead river in the western U.S. The basin drains 10.5 million acres in Southern Oregon and Northern California across six counties, three in Oregon and three in California. Oregon and California

entered into a compact on the governance of the river basin in 1957 with the intended purpose of facilitating “the orderly, integrated, and comprehensive development and use” for conservation, irrigation, protection of fish, wildlife and recreation, industrial purposes, hydroelectric generation, and flood prevention (Klamath River Basin Compact).

In recent decades, the river has been the source of a heated political battle between environmental advocates (represented by tribes and environmental groups) and traditional agricultural users. The history of the conflict dates back to the turn of the century, when the federal government created the Klamath Irrigation Project to facilitate agricultural growth along the Oregon-California border. In 1954 Congress terminated federal recognition of the Klamath Tribe, and converted their land into national forest and wildlife refuge. In 1957, Oregon and California, with Congressional approval, enacted the Klamath River Basin Compact between the two states, designed to manage use disputes. Over time, stakeholder relationships in the basin become more complicated, as the re-recognition of the Klamath Tribes brought an additional actor back into negotiations. The passage of the Endangered Species Act which brought in federal regulators seeking to protect a number of fish species including Chinook Salmon, Steelhead Trout, and others (U.S. Fish and Wildlife, 2017), fueled an change in the balance of power among conservationists and water users. In 2001, a substantial drought resulted in the Klamath Irrigation Project that serves 1,400 farmers having its water shut off, prompting a very public response by water users and their supporters, as demonstrators formed a bucket brigade to divert water to irrigation canals and U.S. Marshals were dispatched to regain order. The following year the Bush Administration resumed water deliveries, which resulted in a substantial die off of Chinook Salmon, which further galvanized tribal governments and environmental organizations to confront management issues in the basin.

The drought conditions and stakeholder mobilization, produced two agreements during the Obama Administration, the Klamath Basin Restoration Agreement (KBRA) in 2010 and the Klamath Hydroelectric Settlement Agreement (KHSA) in 2016. KBRA settled several points of conflict among diverse stakeholders arising from compact provisions, with particular focus on ensuring water deliveries and maintaining water flows for fish throughout the Klamath River Basin including tributaries (DOI 2017). In effect, KBRA remedied shortcomings of the compact to enhance its effectiveness in reducing conflict, and KHSA outlined the process for removing four dams (Iron Gate, J.C. Boyle, Copco 1 and Copco 2) owned by PacificCorp by 2020 with the intended goal of restoring fish habitats and Salmon runs, a major policy goal for several tribal governments and environmental organizations. The process of negotiating the agreements resulted in the political mobilization of various stakeholders and brought renewed attention to water management practices in the basin. Nevertheless, there is no language in the Klamath River Compact or additional legal mechanisms that forces Oregon or California’s water management agencies to apply additional resources for enforcement or a higher standard to unauthorized water use violations for the Klamath River. Additionally, while KBRA created additional processes for remedying conflicts and increased awareness of water issues, it did not include specific provisions governing enforcement.

The lack of specific enforcement mechanisms is important as California relies on a polycentric enforcement system with nine regional water quality control boards, creating variations that are strongly influenced by local-level decision making (CWRCB, 2017). As satisficing is standard operating procedure for street-level bureaucrats, changes in enforcement behavior are influenced by additional pressures for performance, due to increased accountability (Lipsky, 1983). Of the 592 statewide reported alleged water usage violations in California between 2005 and 2015, 71 (11.7%) occurred in the three Klamath River Basin counties (Del Norte, Humboldt, and Siskiyou counties), with 23 (3.8%) occurring on the Klamath River or its tributaries. However, those counties are mostly rural farming communities representing approximately 0.4% and 0.5% of California’s economy and population, respectively (BEA, 2017). We argue that alleged water use violations occur at a disproportionately high rate in the Klamath River Basin, because there is a higher level of enforcement, and therefore accountability, for water use violations in those counties, compared to the rest of California. While the data does not contain information on who reported the unauthorized use, we argue that the increased pressure from the compact increases both the enforcement actions of state officials, but also contributes to a culture of reporting that may not exist in other parts of the state given the compact, its nature and duration, and the shared border with Oregon.

## Methods

We test effectiveness of interstate cooperation on enforcement and accountability for water use violations using logistic regression, with odds ratios reported. Additionally, we use robust standard errors to correct for heteroscedasticity, detected in the models by diagnostic tests. Further tests indicated no other assumptions were violated.<sup>2</sup> The dataset features 22 county-river segments, consisting of 12 rivers (Butte, Eel, Klamath, Mad/Redwood,



Mattole, Pit, Sacramento, Salmon, Scott, Shasta, Smith, and Trinity) in three counties (Del Norte, Humboldt, and Siskiyou). Unauthorized water use enforcement occurs at the county level for specific rivers and their tributaries. Using county-river segments allows for enforcement observation to mirror the institutional approach to enforcement. We identified the Klamath River Basin counties as Del Norte, Humboldt, and Siskiyou. Additionally, each county has at least two other major rivers (CARA, 2017). Thus, the dataset allows comparison of the Klamath River to other rivers in the same institutional enforcement context. We observe county-river segments annually for 11 years between 2005 and 2015, creating a dataset of 242 observations. We use multiple years to maximum data and control for fluctuations in environmental and socio-economic pressures on water resources. The California Rivers Assessment (CARA) and the U.S. Geological Survey (USGS) provided data on county-river segments.

We model the dependent variable as a dummy variable comparing county-river segments with and without reported violations each year, with no violations as the base category. Measuring reported unauthorized water use violations in this way allows us to compare the probability of a reported violation occurring on each river within each county; or, in other words, if there is a greater probability of enforcement on Klamath county-river segments, compared to other county-river segments in or near the Klamath River Basin. We assume the probability of water use violations is equal for all rivers within each county and for all three counties when controlling for resource pressures and river significance (see below). Unauthorized water use is a function of supply and demand, where limited supply and high demand lead to illegal water usage. We use control variables to account for supply pressures from water availability and river significance, and demand pressures from population growth, water consumption, and agricultural activities. When controlling for the supply available from each county-river segment and the demand placed upon it, water use violations should be equal across all rivers.

We assume any variation in residual reported violations is a function of enforcement and accountability. That is, violations are reported because the state is accountable for their enforcement actions in response to those violations. In other words, if actual violations are occurring at an equal rate, an increased rate of reported violations would suggest increased accountability for enforcement of water regulations. Of the 242 annual county-river segments, violations occurred for 23 (9.5%), with 11 (4.5%) occurring on the Klamath River.<sup>3</sup> The CWRCB provided the necessary data. Statewide reported alleged violations include unauthorized diversions (54.1%), public trust violations (13.3%), waste and unreasonable use (9.1%), permit compliance violations (7.1%), priority system violations (5.9%) as well as other various violations (7.8%) with many incidences including multiple violations (21.7%).

Independent variables control for interstate accountability, socio-economic and environmental pressures on water resources, and river significance. We measure interstate accountability with two dummy variables: compact and KBRA. Compact compares county-river segments governed by the Klamath River Compact to county-river segments that fall outside of its purview, with the latter as the base category. Similarly, KBRA compares county-river segments governed the Klamath Basin River Agreement of 2010 to county-river segments that fall outside of its purview, with the latter as the base category. Compact and KBRA overlap after 2010 as both are aimed at management of the same river segments. While VIF scores indicate there is no issue of multicollinearity in any models, it is difficult to separate these arrangements. Instead, we view KBRA as an update to the existing arrangement created by the Klamath River Compact. CARA and USGS provided data (CARA, 2017; USGS, 2017a).

Additionally, eight variables account for socio-economic and environmental pressures, and river significance.<sup>4</sup> Population, income, and farm earnings measure socio-economic pressures. We measure population as annual percentage change in county population; farm earnings as annual percentage change in total income of farm labor and proprietors from agricultural production within each county; and, per capita income as annual personal income per capita for each county in \$10,000s. U.S. Bureau of Economic Analysis provided data (BEA, 2017). River discharge, water consumption, and Klamath Irrigation Project measure environmental pressures. We measure river discharge as annual percentage change of water discharge from each county-river segment,<sup>5</sup> and water consumption as annual per capita total surface water consumption from public supplies within each county (in millions of gallons of water used per day).<sup>6</sup> USGS provided data (USGS, 2017a, 2017b). Klamath Irrigation Project is dummy variable comparing county-river segments within the Klamath Irrigation Project to county-river segments outside of it. Finally, river length and river hydrological units measure river significance. We measure river length as the total length of the river in miles. We measure hydrologic units as the hydrologic unit watersheds developed by USGS, and “represent roughly an area between one-half and one million acres, and correspond to the drainage of a coastal or main tributary river” (CARA, 2017). CARA provided data for river length and hydrological unit watershed variables (CARA, 2017).

[Table 1 about here]

## Results

Table 2 displays logistic regression results. First, findings for compact and KBRA indicate interstate accountability has a very strong influence on reported violations of unauthorized water use in the Klamath River counties of California. Based on the findings, violations are more likely to be reported on county-river segments governed by both the compact and KBRA than other county-river segments. However, KBRA has a stronger substantive impact on reported violations than compact, and compact is not statistically significant in the first model. While the findings for compact are limited, the findings as a whole suggest formalized agreements have important influence on reported violations. While VIF scores indicate no multicollinearity, it is difficult to separate the compact and KBRA as they overlap after 2010. It is likely the more substantive relationship for KBRA is a result of it building on the successes of the compact, which suggests that revised and renegotiated interstate agreements improve functioning and enhance enforcement. Additionally,  $R^2$  and BIC statistics indicate there is a substantive increase in explanatory power when both variables are included, and both interstate compact and KBRA are individually substantive predictors. Taken as a whole, these findings indicate that interstate compacts can be successful in creating increased accountability for enforcement of water use regulations.

[Table 2 about here]

Second, findings for socio-economic and environmental pressures on water resources are also substantive predictors of reported violations suggesting increased threats to environmental security lead to conflicts over resources. Findings indicate increases in population growth and higher per capita income lead to greater probability of reported violations. As consumption pressure increases, the probability of conflict increases. However, findings also suggest socio-economic pressures are less substantive predictors of reported violations than interstate accountability. Findings for population were only statistically significant in two of three models. Additionally, findings for river length indicate the probability of reported violations increases on longer rivers, which is a function of river significance in terms of either more actual violations or increased enforcement. Findings for farm earnings, water consumption, Klamath Irrigation Project, and river discharge were not statistically significant in any model. Finally, coefficients and statistical significance between models were consistent, suggesting reliability of results. The pseudo  $R^2$  indicates all models are moderately strong predictors of reported violations.

## Conclusions

Interstate cooperation reduces inter-jurisdictional conflicts while preserving state autonomy by empowering states to cooperate, and relies on accountability, rather than coercion. Additional layers of accountability create an increased incentive to enforce compliance and abide by negotiated solutions to interstate conflicts. As previous research indicates, formalized interstate cooperation results in a system of linkages between states that create accountability through rules, monitoring, and professional and political networks (Bowman, 2004; Heikkila, Schlager, and Davis, 2011). In doing so, there are both vertical and horizontal as well as intra-state layers that connect regulations to organizations and individuals within state enforcement systems. Accountability is most effective when it can be derived from multiple sources and layers, and filters down to the local level. Interstate compacts are effective in creating accountability because they “multiply” effects from individual sources by layering intra-state, horizontal, and vertical links between states and other stakeholders. These multiple sources and layers increase the likelihood that failure to comply will be noticed and elicit an institutional response. In other words, this multiplicative approach makes it more difficult to hide non-enforcement and creates more mechanisms for response when it is realized, accounting for the increased level of enforcement on the Klamath as opposed to other rivers throughout California.

More specific to water management, by extending institutional arrangements to match the geographical boundaries of resources, interstate compacts may reduce conflict during times of resource scarcity as they increase the willingness and capacity of enforcement agencies to better manage shared resources. As our analysis of the Klamath River demonstrates, interstate compacts significantly increase accountability and enforcement as violations were disproportionately more likely to be reported on compact governed waterways. Additionally, the 2010 KBRA which addressed contemporary conflicts has further increased accountability and enforcement, by updating mechanisms with new stakeholder relationships and enforcement issues in mind. When controlling for other variables effecting violations, reported violations are substantially higher on the Klamath River than other adjacent rivers, suggesting the

state is more likely to enforce violations on the Klamath River than on other rivers in the same counties due to increased accountability. As California has a polycentric enforcement system, local enforcement agencies and street-level bureaucrats are responding to the enhanced accountability on their organizational- and individual-level performance, where increased potential attention to their decisions leads to more stringent enforcement actions.

Our analysis also demonstrates that violations are more likely to occur as socio-economic pressures squeeze water resources. The findings suggest that as demand for resources increase, violations are more likely to occur. In other words, as competition for resources increases there will be more conflict as rules are challenged. As previous scholars have argued, resource scarcity is likely to increase in coming decades, leading to a corresponding increase in interstate conflict. Managing interstate conflict will be among the governance challenges of the 21st century, and horizontal cooperation is an effective tool to meet that challenge. More traditional tools for inter-jurisdictional conflicts within a federal system, rely on hierarchical relationships and coercive power. However, as previous findings indicate, vertical federalism creates new forms of conflict and power struggles (Riker, 1987). Horizontal cooperation, on the other hand, relies on shared governance and can produce better outcomes, especially as it relates to common-pool resources (Ostrom, 2007, 2010). As scholarly work within the environmental security literature has demonstrated, the need for institutional structures that are better able to manage the competing demands and emergent conflicts surrounding scarce resources is badly needed around the world. In the U.S., interstate compacts and agreements may be the best choice for institutional arrangements to prepare states to respond to water scarcity. While unanswered questions about interstate cooperation remain, extant literature, along with this analysis, is very optimistic about their ability to reduce interstate conflict by increasing horizontal cooperation.

However, our findings are limited by the use of reported violations as a measure of enforcement, assumptions made about the variation in violations, and the limited scope of the investigation. Reported violations is a proxy measure for enforcement, and while we have controlled for the purported causes, these findings may be skewed by the prevalence of actual violations. Additionally, our data does not include the source of reported violations, which limits our inferences on the sources of accountability. Furthermore, our analysis relies on data from only three counties in California, due to limited data availability on violations in other compact river basins and from other states. While we believe these findings are reflective of interstate compact effects on accountability in shared water resources specifically, the small scope of the investigation limits the generalizability to other policy areas. As previous research indicates interstate compacts vary between policy areas and linkages are effected by geographical proximity, the applicability of these findings is likely reduced when considering compacts that are significantly different from the Klamath River Compact.

Moving forward, future research can further examine what other institutional incentives exist that can further raise the level of enforcement of unauthorized water use. In particular, future research should explore the mechanisms of accountability in institutionalized horizontal cooperative agreements, like interstate compacts or agreements. Furthermore, as previous scholarship indicates proximity has a substantive impact on horizontal cooperation, future research should consider how shared borders impact accountability and enforcement in cooperative agreements. Additionally, analysis is needed to examine how the model outlined here can be applied to other areas of resource management. Water scarcity is not the only resource limitation that states and nations are likely to face in coming years, which means inter-jurisdictional conflicts will only increase across a variety of mediums. Research should determine how these findings apply to resources such as energy and food. Furthermore, while centered on the U.S., these findings also have implications for interstate conflict in other parts of the world. Our findings concerning horizontal cooperation certainly applies internationally as well, especially considering the supra-national organizations like the European Union which create the potential for vertical institutional links similar to those described here. Finally, this research has wide applicability across several fields of scholarship, such as environmental or security studies, and these findings should be integrated with those streams of research to expand our understanding of interstate resource conflict.

### Author Biographies

Luke Fowler is an assistant professor of public administration at Boise State University. His research interests include environmental and energy policy, state and local government, public budgeting and finance, and administrative and policy theory. His related work has been published in *American Review of Public Administration*, *Environmental Politics*, *State & Local Government Review*, and *Journal of Environmental Assessment Policy and Management*.

Isaac Castellano is a lecturer of political science at Boise State University. His research examines state security responses to issues such as climate change, resource scarcity, inter-state conflict, and civil war intervention.

### Notes

1. In *Virginia v. Tennessee* (1893), the U.S. Supreme Court found that Congressional consent is only required if interstate agreement altered the balance of power between states and the federal government.
2. In addition to other tests specifically mentioned, we followed Menard's (2002) general approach to logistic regression diagnostics, using the Box-Tidwell transformation to test for linearity and Studentized residuals to test for outliers. Neither test indicated assumptions were violated.
3. Alternative forms of the dependent variable and statistical models were tested. However, since only seven county-river segments (2.9%) had multiple violations during a single year and data distribution is within the reported threshold for logistic regression, we determined these were the best fit for the data (King and Zeng, 2001).
4. For these eight predictors, correlations range from -.301 to .316. VIF statistics indicate no multicollinearity exists in any model presented.
5. If county-river segment discharge was measured at multiple sites, the average of all sites was used. If discharge was not measured for a specific county-river segment, the average of all sites in adjacent counties was used.
6. Data was only available for 2005 and 2010; 2005 data was used for years 2005 through 2009, and 2010 data for years 2010 to 2015.

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