

Intranational Cooperation and Conflict over Freshwater: Examples from the Western United States

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Abstract: From the Klamath basin in the Pacific Northwest to the Jordan basin in the Middle East, water conflicts can be disruptive, and affect a wide range of stakeholders, often with varying interests. As competition between water users and water use sectors increases, the potential for conflict increases, especially when governing institutions differ (Jarvis et al. 2005). However, research has shown that cooperation is more prevalent than conflict in international river basins (Wolf 1998; Wolf et al. 2003). As the demand for water approaches or meets available supply, intranational conflicts may increase (Postel and Wolf 2001). This paper explores cooperative and conflictive behavior over freshwater at two intranational scales in the western United States. Incidents of cooperation and conflict were collected and coded using a standardized classification system and compiled into event databases. As was found in international river basins, cooperation is more common than conflict in intranational settings.

Keywords: *Conflict, water resources, western United States*

The western United States (West) is home to some of the world's most developed rivers. Irrigation canals and water diversion projects criss-cross the land, and are fed by massive reservoirs created by dams that supply hydroelectric power to much of the region. Infrastructure was constructed to allow humans to inhabit and grow crops in arid regions. Water is increasingly being transferred away from agriculture to meet the needs of growing urban populations and instream uses, primarily habitat for endangered species (Platt 2004; Cortese 2003). Further, Native American tribes are asserting their right to the water owed them by treaties and multiple settlements have been signed to accommodate these rights. All of these factors add stress to the hydropolitical systems of the region, which increases the potential for conflict (Jarvis et al. 2005). Further, according to the U.S. Bureau of Reclamation (USBR) (2005), "the demands for water in many basins of the West exceed the available supply even in normal years." As the demand for water approaches or meets available supply, intranational conflicts may increase (Postel and Wolf 2001). In order

to explore this relationship, the following paper discusses interactions over freshwater in two regions in the West identified as having moderate and high potential for water supply crises by 2025 (USBR 2005). An event database approach is used to quantify and categorize stakeholder interactions over freshwater on an intranational scale. Results are then compared to findings of research conducted at the international river basin scale.

Event Data

Event data are central to this research. An event is any interaction between parties that is action-defined, recorded, and made available to the public. To be a hydropolitical event relevant to this research, an action must be driven by some aspect or dimension of fresh water resources (water as a scarce or consumable resource, or as a quantity to be managed), and occur within one of the geographic study areas. For development of the event databases, teams of trained coders conducted searches of media databases (e.g., Lexis-Nexis), and coded hydropolitical events to a scale ranging from intense conflict (negative values) to intense

cooperation (positive values). The more negative or positive a number is, the more intense the interaction between stakeholders. Event intensity corresponds to what action actually occurred, from a verbal argument, to the signing of an international agreement. This ranking gives a measure of the intensity of interactions between and among stakeholders, and provides a method to show behavioral changes over time (Shellman 2004). It is not a measurement of the attitudes expressed implicitly or explicitly in the media stories (Smith et al. 2001).

While political scientists have been analyzing event data, natural resource scientists and managers have not utilized this resource mainly because these event databases focus on diplomatic and militaristic behaviors and have not been well suited to environmental issues (Schrodt 1994). The Transboundary Freshwater Dispute Database (TFDD) is so suited. The TFDD classification scheme was created by modifying the Conflict and Peace Database (Azar 1980) ranking system to adjust for water resource management issues and concerns at the international level (Wolf et al. 2003). Further modifications were made to adapt the TFDD classification scheme to the

intranational scale. The Intranational Political Interactions (Moore and Lindstrom 1996) was used to describe local political actions in each intensity level, and additional intranational cooperative actions were modified from The Struggle Spectrum (Keltner 1994). After considering all of these factors, scales were constructed in which the conflict-cooperation intensities for this research range between 7 (most cooperative) and -7 (most conflictive) on the international scale and 5 (most cooperative) and -5 (most conflictive) intranationally. Neutral events are ranked zero (Table 1). (See Table 2 for examples.)

In addition to intensity, events were coded to different issue type categories. All the issue types can be generalized into water supply events (e.g., quality, conservation, flooding) or water allocation events (e.g., intergovernmental, water rights, instream uses). Categories were originally developed for the international scale (Wolf et al. 2003), and subsequently modified for the intranational scales which do not focus on transnational issues. Regardless of scale, each event can be classified as only one issue type.

Table 1. The conflict-cooperation intensity scales used to code events for this research.

International		Intranational
Formal declaration of war	-7	N/A
Extensive war acts	-6	N/A
Small scale military acts	-5	Small scale acts of violence, protests, vandalism
Political-military hostile actions	-4	Litigations, appeals of administrative actions
Diplomatic-economic hostile actions	-3	Fines, proposal and permit denials, halting negotiations
Strong verbal hostility	-2	Petitions, withdrawal of third-party support
Mild verbal discord	-1	Delays, report reviews, voicing opposition, editorials
Neutral or insignificant	0	Judicial rulings, no comment statements, announcements
Minor official exchanges	1	Voicing opinions of approval, court-forced negotiations, editorials
Official verbal support	2	Meetings, third-party support, negotiation requests
Cultural or scientific agreement	3	Permit approvals, fixing violations, negotiations begin
Non-military econ., tech., indus., agreement	4	Lawsuit settlements, regulation approval, management transfers
Military economic or strategic support	5	State bill passage, compacts or official agreements
International freshwater treaty	6	N/A
Voluntary unification into one nation	7	N/A

Table 2. Example events from all three databases.

Date	Basin	Event summary	Issue type	Intensity
7/3/1978	Amazon (International)	Treaty for Amazonian Cooperation	Economic Development	6
6/3/2004	Lower Green (UC Region)	Members of the Ute Indian Tribe have sued the Bureau of Indian Affairs (BIA) for allowing non-Indian irrigation companies to divert water off Indian lands	Intergovernmental	-4
8/23/1995	Rio Grande- Elephant Butte (UC Region)	Albuquerque area water plan, focusing on conservation measures, is nearing approval	Conservation	2
4/21/2001	Umatilla (Oregon)	The city of Pendleton and the Umatilla Tribes reached a water rights agreement involving the city's point of diversion in the Umatilla's north fork.	Water rights	4
7/9/2001	Klamath (Oregon)	In protest of a federal decision to not release water for irrigation to maintain instream flow for fish, dam head gates have been removed by area farmers	Instream	-5

Study Areas

The Transboundary Freshwater Dispute Database (TFDD) research group has investigated hydropolitical interactions at multiple scales of analysis. First, international river basins, those containing portions of more than one country (Figure 1), were analyzed (Wolf et al. 2003). Then the methodology used at the international scale was modified to study interactions in intranational settings; starting within the state of Oregon (intrastate), and followed by a regional analysis of the U.S. Bureau of Reclamation's Upper Colorado (USBR UC) Region (interstate) (Figure 2). Both of these intranational studies focus on political regions rather than hydrologic boundaries. However, events within these study areas were coded to U.S. Geological Survey (USGS) hydrologic accounting units, which are watersheds. While there are international basins in both of the intranational study areas, only events of intranational interaction were coded.

Freshwater in Oregon

Generally, precipitation decreases from west to east across the state. Oregon's distinct climatic zones are created by the relative locations of the

Pacific Ocean and Cascade Mountains. The western valleys receive high rainfall (762-15,524 mm/yr, 30-60 in/yr) mostly between November and March (Taylor and Hannan 1999). Snowmelt is also an important source of water for rivers originating the Cascades. The maximum precipitation received in Oregon is over 5,000 mm/yr (200 in/yr) (Taylor and Hannan 1999). In contrast, the eastern semi-arid portion of the state contains vast areas that receive less than 305 mm/yr (12 in/yr) of precipitation (Allan et al. 2001). Approximately two-thirds of Oregon's 3.8 million people live in the western wet portion of the state (Allan et al. 2001; U.S. Census 2010). Major population centers include Portland, Salem, Corvallis, and Eugene. The USBR identifies portions of the state as having moderate potential for water supply crises by 2025 (USBR 2005).

Freshwater in the Upper Colorado Region

The USBR UC Region covers portions of seven states, and includes both the upper Colorado River basin and the upper Rio Grande River basin. The management region is the source of freshwater for some of the largest and fastest growing cities in the U.S., including Denver, CO, Las Vegas, NV, Los Angeles, CA, and Phoenix, AZ. None of these are within the UC Region (National Research Council

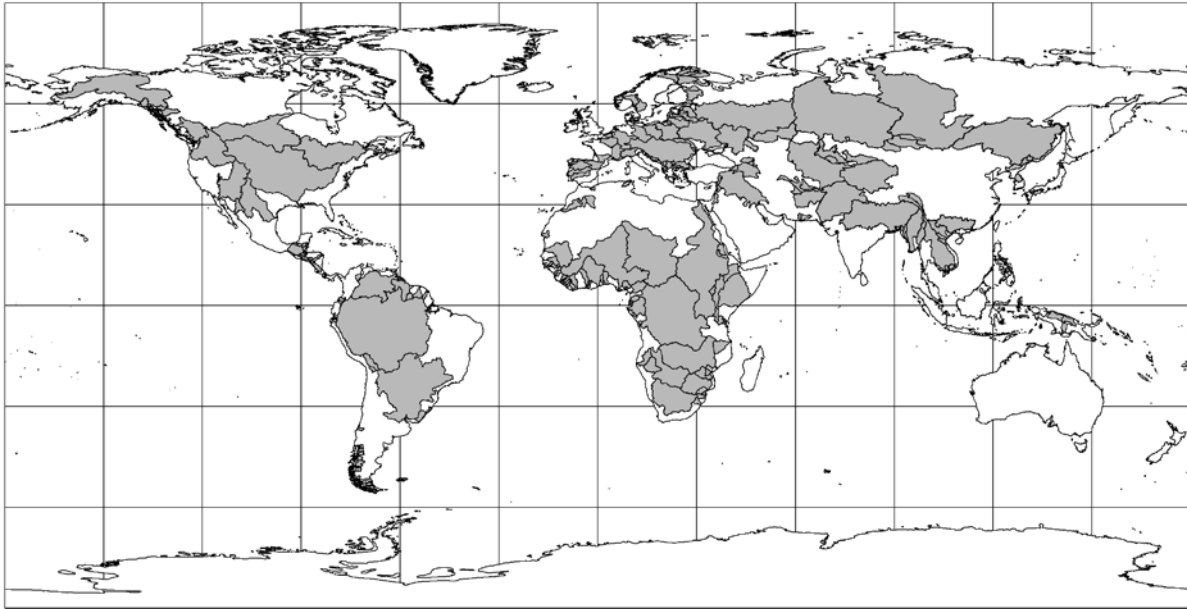


Figure 1. International river basins of the world. Source: Transboundary Freshwater Dispute Database.

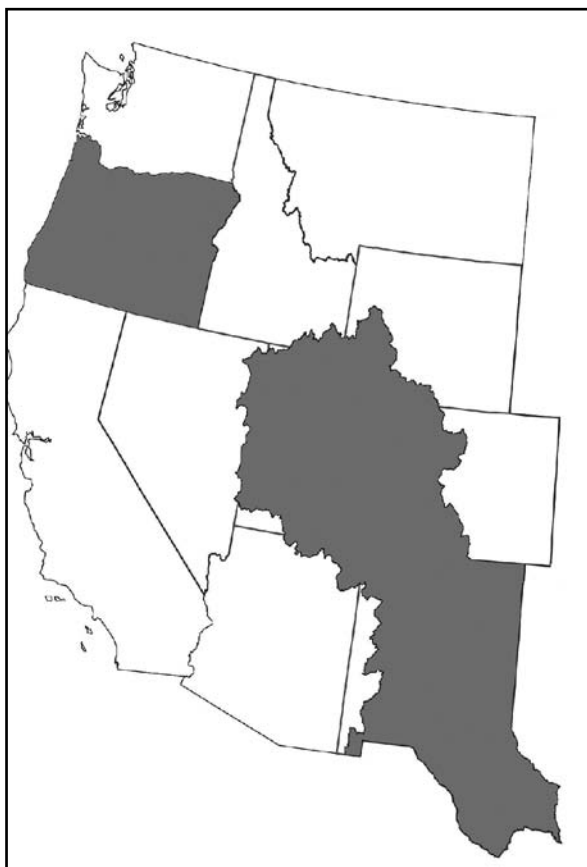


Figure 2. Intranational hydropolitical study areas. Data Source: Transboundary Freshwater Dispute Database.

2007). Major population centers within the region include Albuquerque, NM, Santa Fe, NM, and Salt Lake City, UT. The rivers of the region are fed primarily by snowmelt in the Rocky Mountains, and travel through some of the driest parts of the U.S. Average annual precipitation in the region ranges from 232 mm/yr (3 in/yr) near Lake Powell to 615 mm/yr (24 in/yr) in the mountains in northeastern Utah. The maximum is more than 1,700 mm/yr (67 in), while the minimum is less than 3 mm/yr (0.1 in) in these locations (USBR 2006). According to the USBR, portions of the UC Region are highly likely to experience water supply crises by 2025 (USBR 2005, 3).

Results and Discussion

The following section details the major findings of the two intranational study areas. Event intensity and issue type are discussed independently for each of the two regions. Finally, the intranational studies are compared with the findings from international river basins.

Intranational-Intrastate Scale: Oregon, U.S.A.

Of the 393 events coded between 1990 and 2004, more events in Oregon were cooperative (214, 54 percent) than conflictive (138, 35

percent), even though mildly conflictive (intensity -1) events outnumbered mildly cooperative (intensity +1) events 69 to 50 (Figure 3). However, for more intense events there are twice as many cooperative ones (164, 42 percent) as conflictive (69, 20 percent). The extremely cooperative events (intensity +5) outnumber the most intense conflictive events by a margin of 3 to 1. The 41 neutral events make up 10 percent of the reported news events. Of the 12 most extreme events (+5 or -5), only 3 were extremely conflictive. Cooperative events outnumber conflictive events, and a low proportion of events are of extreme intensity (-5 and +5). Most of the basins on the western side of the Cascade Mountains have relatively high cooperative intensity averages. Basins to the east, where water is less available, have a greater range of cooperative intensities. No geographic pattern is seen in the distribution of conflictive intensities among the basins in Oregon.

In Oregon, most events revolved around water quality issues (158, 40 percent), while fewer events involved water quantity (78, 20 percent). Extremely cooperative events (intensity +5) spanned five issue types: water quality, infrastructure, navigation, intergovernmental, and fish passage. Extremely conflictive events (intensity -5) only concerned instream issues. Water rights events were more widely distributed than instream events among the basins of Oregon. The Klamath basin held an overwhelming majority of instream water resource events (78 percent), while no basin had more than 25% of the water rights events.

Intranational-Intrastate Scale: Upper Colorado Region, U.S.A.

Of all three scales, this one produced the largest number of events, 3,867. From 1970 through 2005, a majority of events in the UC Region were cooperative, 1,584 (52 percent) to 1,455 (48 percent) (Figure 4). Neutral events occurred most frequently, followed by mild dissent (-1) and mild support (+1). Several lawsuits (-4) occurred during this time period, along with several settlements (+4). Nearly one-quarter of all events coded were extreme (+/- 4 and +/- 5), with less than 1.5 percent being the most extreme. Of all the extreme events, 392 were cooperative and 336 were conflictive. Intensities varied across the UC Region with no discernible geographic pattern.

In terms of issue type, the majority of events related to water rights, infrastructure, water quality, and intergovernmental relations, respectively. Water rights events tended to be more conflictive (328, 41 percent) than cooperative (284, 35 percent). Litigations are the main mechanism stakeholders have to alter a water right, thus the high frequency of -4 intensity events. There is also a lot of mild verbal dissent and support over water rights events. This holds true for all issue types.

Hydropolitical events relating to infrastructure tended to be more cooperative (399, 51 percent) than conflictive (237, 30 percent). The high proportion of +2 and +4 events shows that people are willing to not only make proposals for collaboration, but also form collaborative groups when infrastructure

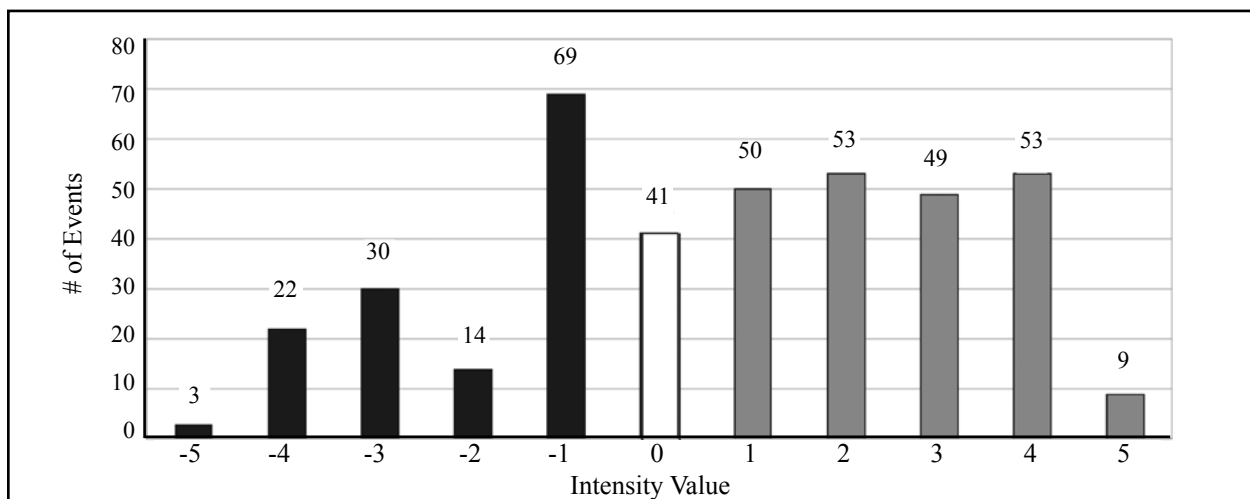


Figure 3. Distribution of events in Oregon, an intranational-intrastate region.

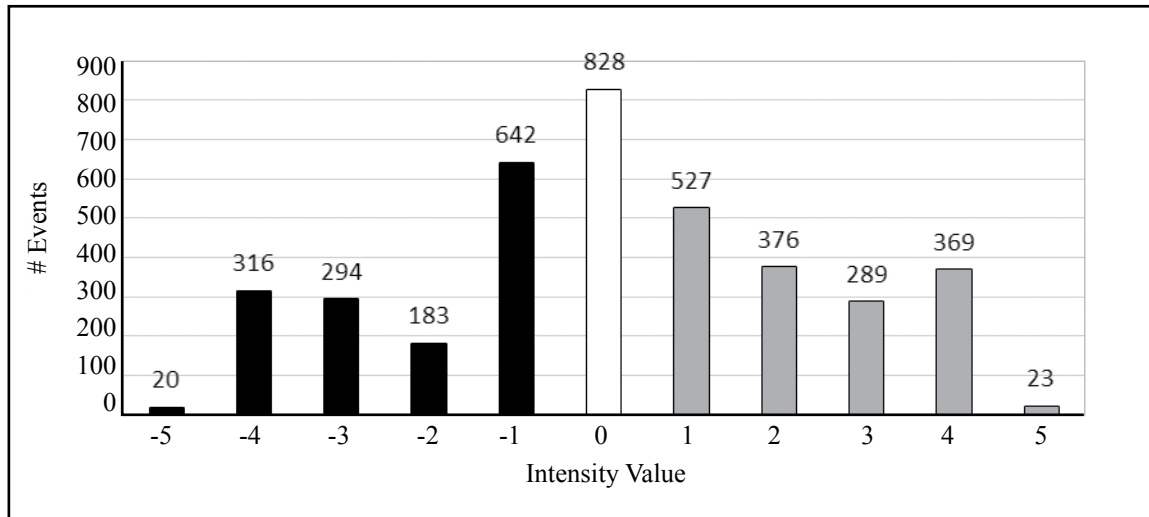


Figure 4 Distribution of events in the Upper Colorado Region, an intranational-interstate region.

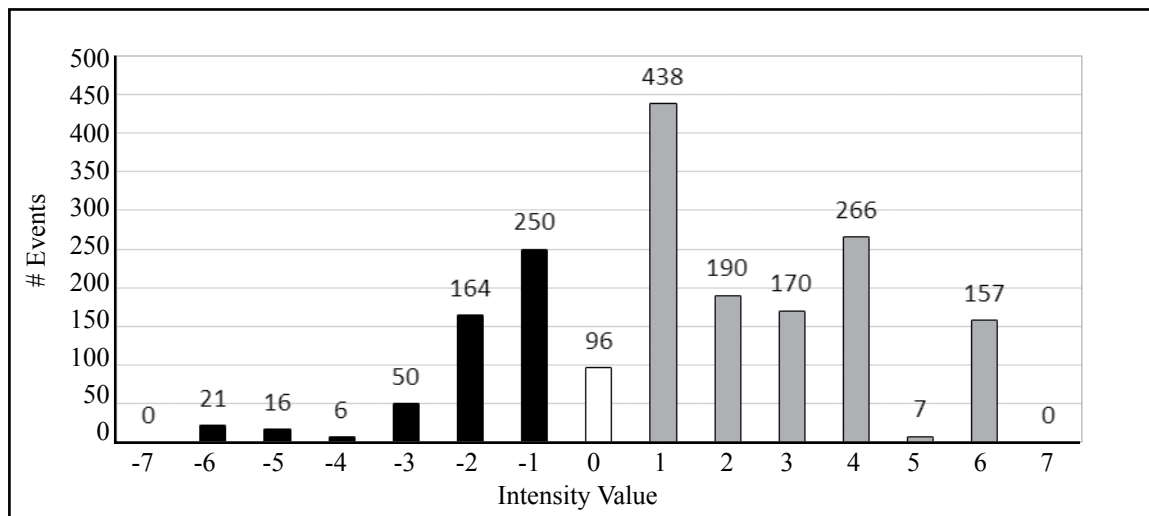


Figure 5. Distribution of events in international river basins. Source: Wolf et al. 2003.

is involved. Interestingly, the rivers of the UC Region are some of the most heavily developed in the world, but the region has the lowest percentage of events in this category of all three scales.

Water quality events tended to be more conflictive (288, 43 percent) than cooperative (239, 36 percent). The largest number of conflictive events was permit violations (-3). There were also a large number of +4 events, indicating a willingness to work together to manage water quality.

There were more events of intergovernmental conflict (278, 45 percent) than cooperation (239, 39 percent). The largest number of both conflictive and cooperative events were mild verbal dissent

(-1) and support (+1). This is an example where conflict is greater than cooperation, but it is mostly talk.

Intranational and International Comparisons

Generally, several aspects of event distribution along the conflict-cooperation spectrum mirror results previously found at the international scale. At all scales, cooperative events outnumber conflictive events (Figure 3, 4, and 5; Table 3). Further, at all scales of analysis a large proportion of events were low intensity, and verbal interactions (intensities +1, 0, and -1). However, a higher proportion of verbal actions are conflictive

Table 3. A comparison of events’ intensity at all three scales of analysis. Values are percentages of total events per study area. International data source: Transboundary Freshwater Dispute Database.

Intensity	International	UC Region	Oregon
-7	0%	N/A	N/A
-6	1%	N/A	N/A
-5	1%	1%	1%
-4	0%	8%	6%
-3	3%	8%	8%
-2	9%	5%	4%
-1	14%	17%	18%
0	5%	21%	10%
1	24%	14%	13%
2	10%	10%	13%
3	9%	7%	12%
4	15%	10%	13%
5	0%	1%	2%
6	9%	N/A	N/A
7	0%	N/A	N/A

intranationally, and cooperative at the international scale. At all scales of analysis, the extreme ends of the intensity scale are not common.

Water quality events are more frequent at the intranational scale than the international scale (Table 4). This trend can be attributed to the localized effects of water quality problems. Often these events concern small-scale polluters affecting local water bodies, such as waste water treatment plant overflows, leaking underground storage tanks, and railroad spills. Water quality issues severe enough to concern international parties are much fewer and farther between than these localized water quality concerns, leading to higher frequency of water quality events as the spatial scale decreases. The opposite pattern occurs for issues of water quantity. Events in international basins occur more frequently than intranationally, the pattern holding as scale decreases. At all scales, actions concerning intergovernmental relations occurred with the same general frequency, indicating that while the political authority may differ between the scales, water resource managers and stakeholders at all levels require the same amount of action to build institutional capacity.

The high frequency of low intensity events

Table 4. A comparison of events’ intensity at all three scales of analysis. Values are percentages of total events per study area. International data source: Transboundary Freshwater Dispute Database.

Issue Type	International	Upper Colorado	Oregon
Water Quality	6%	17%	40%
Water Quantity	46%	40%	20%
Infrastructure	29%	19%	25%
Intergovernmental relations	14%	18%	13%
Flood Control	2%	1%	1%
Other: Navigation, Economic Development, Border Issues	3%	1%	1%

illustrates that it is commonplace for stakeholders to speak out against issues they oppose, and in support of those they favor. However, the low frequency of conflictive events illustrates that this verbal expression does not always progress into conflictive action. This research shows that intranationally, conflict over water resources is more likely to be mild and verbal, rather than extreme.

Conclusions

This research also shows that individual cases alone do not provide a complete picture, because they are not set in the broader spatial and temporal setting. For example, the conflictive outbreak in the Klamath basin in 2001 may be the most prominent water resources event in Oregon, but it certainly is not representative of the range in intensities and issues of water resource management.

Whether at the international or intranational scale, conflict is not as prevalent as cooperation in water resources interactions. Stakeholder interactions occur over a variety of issue categories, with the patterns varying by scale. Interactions are also more likely to be low intensity than high intensity. The cooperative trend observed at multiple scales goes against traditional thinking about freshwater interactions, that conflict is the norm. Since water is essential to human civilization, people

work together to manage it. This is evident at all three geographic scales studied by Transboundary Freshwater Dispute Database researchers by the amount of cooperation that has occurred historically. A great deal of time, effort, and resources are invested to bolster institutional capacity. The goal is to prevent conflictive interactions between stakeholders when perturbations to the system occur, even though capacity building activities are often reactive adaptations. Focusing resources on building institutional capacity and resilience could help to minimize conflicts in the future.

Acknowledgements

This research was supported by the following programs:

USGS - Oregon Center for Water and Environmental Sustainability (CWES) - Basin level datasets for anticipating future water scarcity and conflict in Oregon.

USBR - Western Water Institutional Solutions: Identification, Development, and Application of Institutional Solutions for Western Water Problems.

Preliminary results were presented at the 2007 Association of American Geographers Annual Meeting, San Francisco, CA – Water Conflict and Cooperation II Paper Session – Cooperation and Conflict over Water in the Western United States.

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