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Transboundary Water Sharing: Risk Perceptions Held by Texas Border Decision Makers

Lindsay Sansom, Ph.D.^{1*}

Abstract: Despite transboundary water resource management issues being a source of tension between neighboring states, little research has addressed what causes cooperation or conflict between differing governments along borders. For the most part, natural hydrological boundaries do not fall easily within political boundary delineations, so governance structures and management approaches are often very different once political jurisdictions are crossed, underscoring the importance of proper management of transboundary water resources. In order to better understand what drives cooperative or conflictual behavior among transboundary stakeholders, a cross-sectional study was conducted along the Texas-Mexico border. Questionnaires were collected (N=168) from Texas water managers along the southern border on issues related to their Mexican counterparts. The results revealed that a lack of trust for binational counterparts is correlated ($p < 0.001$) with a decrease in willingness to cooperate; likewise, as trust decreased, perceptions of risk increased. This approach can help identify a plausible intervention strategy that could target activities that build trust between individuals on both sides of the border to mitigate individuals' perceptions of risk.

Keywords: Transboundary water sharing, risk perception, trust, cooperation, conflict, Texas, Mexico

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Terms used in paper

Acronyms	Descriptive name
CPR	Common pool resource
IBWC	International Boundary and Water Commission
NAFTA	North American Free Trade Agreement
USMCA	United States, Mexico, and Canada Agreement

INTRODUCTION

Water is necessary for sustaining life, growing economies, and maintaining healthy ecosystems. However, for the most part, natural hydrological boundaries do not fall easily within political boundary delineations, so governance structures and management approaches are often very different once political jurisdictions, especially international boundaries, are crossed. Mismatches in governance occur frequently with water management precisely because of water's flowing nature across political jurisdictions. Surface water and groundwater resources cross political boundaries all the time, creating immense challenges for peaceful and efficient management. There are 263 transboundary rivers and lake basins worldwide, comprising slightly less than half of the Earth's land surface, and approximately 608 transboundary aquifers ([Wolf et al. 2007](#); [Conti 2014](#); [UN Water 2018](#)). These global hydrological and political realities create complicated social, economic, and environmental challenges for countries, which can hinder bilateral or multilateral cooperation regarding shared transboundary water management.

The sheer number of competing water uses within and across municipal jurisdictions can make it difficult to manage water flows from one city to the next within Texas, particularly in places where water is managed by multiple institutions without coordination. Management of water that crosses international boundaries requires careful balance of issues related to national sovereignty, equity, and accountability. While there are chal-

lenges associated with sharing scarce resources across borders, there is also an opportunity for cooperation to generate shared benefits and increased regional security. Cooperation can lead to more safe and secure regions by ensuring that both sides of the border are accommodating each country's respective needs to generate growth and stability.

Transboundary water issues include problems associated with a lack of coordination, lack of appropriate institutional structures, and lack of international agreements or problems with monitoring, enforcement, and sectioning associated with those agreements. These issues have become more prevalent around the world for a variety of reasons, including water scarcity, population growth, climate change, environmental degradation, and mismanagement across borders resulting from complex governance systems. The challenges associated with modern transboundary water management can be summed up as follows: Water is a necessary element for human survival and economic growth; there is limited supply, which is exacerbated by increased demand; management decisions about use, allocation, and distribution are made by different institutions at different scales, which impacts availability.

This study fills important gaps within the broader literature by combining a variety of theoretical approaches to address the problems associated with understanding how decision makers within different institutional settings choose to engage in cooperative or conflictual behaviors over shared transboundary waters. While transboundary water sharing has a long history rooted in international relations literature, little is known

about the driving factors for individual decision makers (nested within institutional settings) to engage in cooperation or conflict over international transboundary water issues. Substantial efforts have gone into conceptualizing key metrics of successful cooperation over internationally shared water resources; however, most do not have a strong empirical approach or rigorous empirically grounded theoretical underpinnings, and most only focus on how institutions can encourage cooperation or conflict, ignoring the role of individuals within institutions. Additionally, most of the literature is focused on surface water sharing. Drivers of cooperation or conflict over transboundary groundwater resources are poorly understood, partially due to the complicated nature of the hydrological system and partially due to the complex historical progression of laws governing water. International relations literature offers clear conceptual approaches to understanding issues of water security, power dynamics, and nation-to-nation cooperation and conflict ([Rowland 2005](#); [Zeitoun and Warner 2006](#); [Zeitoun and Mirumachi 2008](#); [Berardo and Gerlak 2012](#); [Subramanian et al. 2012, 2014](#)). However, it does not consider the role that individual decision makers play from within institutions responsible for executing international treaties and agreements. Common pool resource (CPR) theory is ideal for exploring the relationships between individual resource users in a given system; however, this approach has not often been applied to large-scale transboundary resources and does not consider the role of individual decision makers nested within larger institutional settings ([Fleischman et al. 2014](#); [Villamayor-Tomas et al. 2014](#); [Garrick et al. 2018](#)). Instead, CPR theory offers insight into resource-user decisions based on institutional constraints. Risk perception and trust literature has been traditionally applied to understand how stakeholders within a system use risk perceptions to respond to specific hazards or make specific decisions ([Lopes 1994](#); [Siegrist et al. 2000](#); [Siegrist et al. 2005](#); [Earle and Siegrist 2008](#); [Earle et al. 2010](#); [Subramanian et al. 2012, 2014](#)). While this approach offers a model for understanding individual perceptions to physical hazards, it does not consider how those perceptions can be aggregated by institutional setting nor how those perceptions may drive willingness to cooperate or engage in conflict over shared binational waters. This study bridges these issues by combining several theoretical concepts to understand how perceptions of risk and trust held by individuals within larger institutional settings can be aggregated to predict willingness to cooperate or engage in conflict over transboundary water resources in an international setting.

This article looks more in-depth at the complexities surrounding transboundary water sharing, with a particular focus on what variables drive decision makers to engage in cooperative or conflictual behaviors over transboundary water sharing across an international border. The study tests the following two hypotheses: 1) Trust will be positively correlated with will-

ingness to cooperate, and 2) Risk perception and trust will be inversely correlated; as risk perception increases, trust decreases. Transboundary water management and sharing issues are timely all over the world, where surface water is becoming over-allocated, polluted, or scarce. Due to this reality, many countries are turning to groundwater resources to make up for the lack of available surface water. While countries generally have treaties in place for surface water that crosses international boundaries, the same cannot be said for groundwater. In many ways, customary international groundwater law is still in a nascent state, and countries are struggling to identify the best ways to share this precious resource across international boundaries.

A case study on the Texas-Mexico border is provided to illuminate many of the potential directions for positive relationships, as well as many of the potential pitfalls. This region offers an ideal study location owing to the United States' and Mexico's long history of surface water-sharing treaties. Despite this long history of cooperation over surface water, there is still not a legal treaty mechanism in place for bilateral groundwater sharing. As in many places around the globe, stakeholders on both sides of the Texas-Mexico border are feeling the negative impacts of surface water scarcity; this is because by the time the Rio Grande reaches Texas, it is often overallocated, polluted, and/or suffering from severe drought conditions ([Nava and Sandoval Solis 2014](#)). In most places along this border, stakeholders are turning to groundwater sources to fill the demand gap. Globally, most countries, including the United States and Mexico, do not fully understand the complex transboundary nature of shared aquifers. Lacking knowledge, legal precedent, and/or experience, many countries are leery of the risks associated with formal cooperation. This study examines risk perceptions held by decision makers in Texas regarding transboundary surface water and groundwater cooperation with Mexico. This case serves as a pilot project to test the identified concepts and is intended to offer an approach for doing comparative analysis in binational or multinational settings. The outlined approach offers a promising new metric for understanding potential bottlenecks to transboundary cooperation along the U.S.-Mexico border and globally.

BACKGROUND

In Texas, we have a saying: "Whiskey is for drinking and water is for fighting over." Water availability ranges drastically from East Texas, where water is more plentiful, to arid West Texas. The Texas-Mexico border is made up by the Rio Grande, which stretches for nearly 2,000 miles from the tip of West Texas to the Gulf of Mexico in South Texas. While Mexico and the United States have a long history of promoting cooperation over surface water, arid conditions consistently threaten political-diplomatic relations and there is mounting evidence

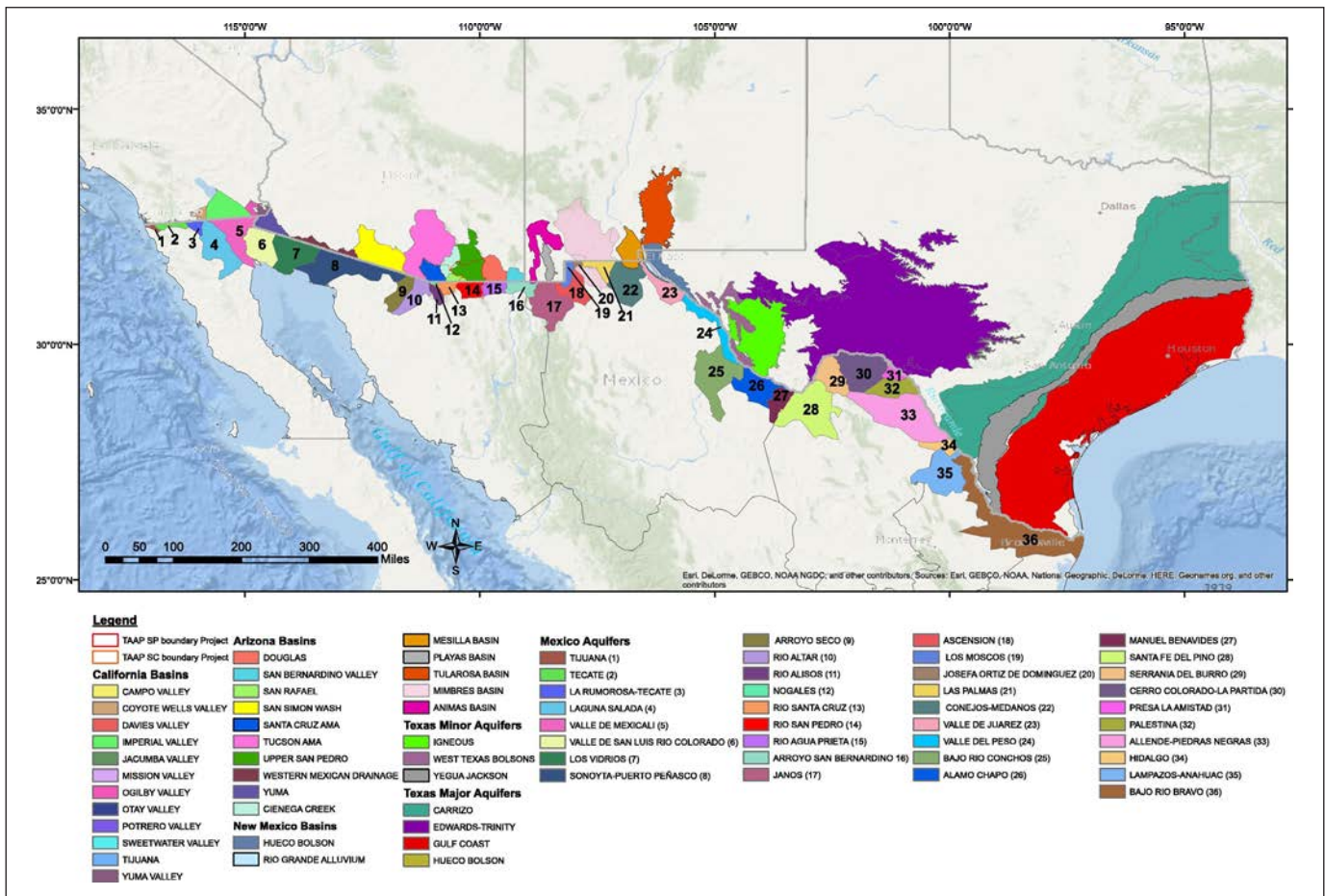


Figure 1. Potential transboundary aquifers between the United States and Mexico (Sanchez et al. 2016).

of tensions bubbling beneath the surface, particularly considering the ever-increasing demand at state and local levels (Nava and Sandoval Solis 2014).

Current research asserts that cross border tensions over water represent serious challenges to water security and international diplomacy (Subramanian et al. 2012, 2014). The primary U.S.-Mexico institutional framework for dealing with transboundary water issues is the 1944 U.S.-Mexico Water Treaty for the Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande (hereafter, referred to as ‘the Treaty’), which created the International Boundary and Water Commission (IBWC). Since that time, the IBWC has focused much attention on shared surface water, especially the water of the Rio Grande/Rio Bravo. However, in addition to the surface waters of the Rio Grande/Rio Bravo, there are considerable underground water resources, which are not fully covered under the Treaty (Figure 1).

Along the nearly 2,000-mile border sit approximately 36 potential transboundary aquifers, with only 11 officially recognized as transboundary and only four designated as priority aquifers for data sharing (Sanchez et al. 2016). Currently, there is no formal binational governance mechanism in place

to manage these transboundary aquifers. Additionally, a number of other geopolitical challenges complicate water-sharing relations. From current trade disagreements to tensions over new U.S. immigration reform, there are several social, economic, and political obstacles that are considered higher political priorities and can complicate U.S.-Mexico relations over transboundary water-sharing arrangements. The following section will provide some insight into current U.S. affairs on the U.S.-Mexico border in order to provide context and political background information, which could confound or alter perceptions of risk and trust for this Texas-Mexico case study.

Social, economic, and political settings

There are numerous diplomatic constraints along the border that serve as a barrier to further development of transboundary water management. The U.S.-Mexico relationship over issues surrounding trade, immigration, and complications from the drug war has changed dramatically over the last two decades and has influenced perceptions of risk.

There has been a long-standing power asymmetry between the United States and Mexico, where the United States is a

hegemonic leader. This asymmetry is largely a result of how historical treaties have been negotiated between the two countries. Despite the asymmetry of power between the two countries, there was a maturing relationship spurred along in the mid-1990s with the North American Free Trade Agreement (NAFTA), which was designed to allow for easier economic exchange between the United States, Mexico, and Canada (Villareal and Fergusson 2017). In the summer of 2017, President Donald Trump's Administration announced that it would be renegotiating NAFTA. In the fall of 2018, an agreement was reached. The new agreement is known as the United States-Mexico-Canada Agreement, (USMCA). It is still unclear whether environmental agreements negotiated under NAFTA will apply under this new agreement, and it will take time for policy-makers and researchers to sort through the new language. This level of uncertainty influences perceptions regarding the efficacy of environmental cooperation with Mexico.

Reforming the U.S. immigration policy, deporting undocumented immigrants, and taking more active measures along the Mexico border has been a central thrust of the Trump Administration (Rogers 2018). A series of executive orders on immigration were signed by President Trump focusing on drastically expanding the border wall and increasing law enforcement along the border. Recent changes in rhetoric and policies has led to a serious degradation in relationships between the United States and Mexico. Despite claims by the Trump Administration, more Mexicans have been leaving the United States than arriving, and border apprehensions are at a 40-year low (Seelke 2019). However, there has been significant negative press over Trump's policy to separate families at the border. Tensions over immigration policy reform have been very high on both sides of the border, which impacts how decision makers in the United States and Texas perceive their binational counterparts.

The U.S.-Mexico border has been a focal point of the war on drugs since Richard Nixon's presidency five decades ago. The border drug war has undergone several reorganizations and strategies over this time, but little progress has been shown. Well-organized, funded, and armed illegal drug cartels have formed and operated, moving an estimated \$19 to \$29 billion in drug revenue annually into the United States (U.S. Department of Homeland Security 2010). In 2007, U.S. President George W. Bush and Mexican President Felipe Calderón enacted a cooperative initiative, called the Merida Initiative, in order to share in the responsibilities and solutions in curbing narcotics trafficking. The U.S. Congress pledged up to \$1.4 billion in appropriations (U.S. Department of State 2008). The success of this initiative has been limited; the most violent year on record related to drug cartels occurred in 2017, and the Trump Administration is likely to rethink several key provisions of this partnership in the years to come (LaFranchi 2017).

All of these social, political, and economic issues are at the forefront of the media discussion. As controversy stirs over immigration reform and trade, water management has taken a political back seat. However, massive media coverage of these issues often has a polarizing impact and has the potential to influence previously held perspectives on risk and trust. Within the broader context of these major issues, water managers on both sides of the border must still come together to address the challenges of transboundary water management.

METHODS

Site location

The Texas-Mexico border was chosen as an appropriate case study to pilot this novel approach to exploring the potential drivers of cooperation and conflict, which are vital for understanding what leads to improved water security outcomes. This socio-ecological system is complicated politically, socially, economically, and environmentally. Clear delineations of the surface water system, the Rio Grande/Rio Bravo, are present, and a polycentric governance system is in place for this resource. However, there are still issues of overdraft, pollution, and poor collective management owing to a lack of consistent monitoring, effective sanctioning, and enforcement of the rules in place (Milman and Scott 2010; Nava and Sandoval Solis 2014). Additionally, management along this massive system is very disjointed, leaving gaps in management as well as overlaps in jurisdiction (Eckstein 2012; Nava and Sandoval Solis 2014). Transboundary groundwater offers a larger challenge still due to the vastly different approaches to groundwater management on both sides of the border. Not only are boundaries not clearly delineated, but in some cases the aquifers are still poorly understood, or lack data, or the approach to data collection is completely different on both sides of the border, making data-sharing efforts even more challenging (Sanchez and Eckstein 2017). Additionally, there are no transboundary groundwater-sharing agreements in place on the Texas-Mexico border, and there is little to no political incentive to negotiate such an agreement. Thus, there are no clear boundaries, there are not adequate rules or procedures in place for management, and there is no monitoring, sanctioning, or enforcement. In short, transboundary aquifers along the Texas-Mexico border are an ideal example of a CPR that is vulnerable to the "tragedy of the commons" (Hardin 1968). Water managers and decision makers in the border region offer an ideal case to study how perceptions of risk and levels of trust influence willingness to cooperate or engage in conflict. By starting initially with decision makers in Texas, this new approach can be piloted to test potential correlations.

Study design

A cross-sectional study design was used to collect and analyze survey data from known transboundary water decision makers in Texas along the border with Mexico. Decision makers were defined based on governance tier and included participants from local, state, and federal levels of governance. Participants were selected from each Texas county that borders Mexico and included representatives from all agencies with relevant water management decision making capacity. The response rate for elite surveys is extremely important in establishing the external validity of the resulting data; this study was designed to follow a protocol expected to maximize the response rate (Dillman et al. 2009). The result is a quantitative analysis that combines elements of political science, international relations, social psychology, and sociology. The survey was designed to help explain when and why decision makers at various tiers of governance make the decision to cooperate or engage in conflict either formally or informally over surface water and groundwater resources. Data was collected regarding individual perceptions of risk and trust, individual levels of engagement in binational cooperative efforts, and individual attitudes toward cooperative or conflictual behavior. Data was aggregated into institutional settings and analyzed by looking at different tiers of governance to provide a deeper understanding of how individual behavior is aggregated at the institutional level.

Questionnaire development

The survey was developed in order to measure participants' perception of risks and levels of trust on decisions to engage in binational water cooperation and/or conflict. Cooperation and conflict were considered central dependent variables for measuring the independent variables of risk perception and trust. Within the measures of cooperation and conflict, several questions asked about risks associated with groundwater and surface water to capture possible differences in perceptions and trust regarding the two sources. The questionnaire also included general positional questions, such as experience cooperating with binational counterparts (stakeholder engagement), time worked in position, perceived reliance on groundwater, and perceived transboundary nature of border aquifers. Demographic information was collected on age, gender, race, educational background, and political affiliation. For the initial pilot study, surveys were only distributed on the Texas side of the border in order to determine proof of concept. For this approach to be fully applied, future studies should include both sides of the border to identify potential bottlenecks for cooperation and allow for comparative analysis.

The questionnaire was administered using mixed modes. The initial survey was mailed with a pre-paid return envelope. The

mailed survey included, in the cover letter and at the top of the questionnaire, a web link to an online version of the questionnaire that had the exact same content as the paper questionnaire. This provided participants with the option of responding online or in print. For those respondents whose email addresses were known, follow-up notices were sent out two weeks after the paper questionnaire was sent.

Surveys were administered to all appropriate local, Texas state, and federal water decision makers with official responsibilities for water policy and management along the Texas-Mexico border. An initial list of 755 officials was compiled, consisting mainly of municipal, county, regional, statewide, and federal officials. Approximately 85% of the list of potential participants were local public officials and 15% were state or federal officials.

Descriptive statistics were calculated for each variable. Composite scores for trust, perceptions of risk, and willingness to cooperate were calculated by summing the total scores of the five ordinal questions related to each category. For instance, for trust, five different variables were created to measure different aspects of trust, and those variables were combined to create a composite score in order to capture one overarching metric for trust. This process was repeated for risk perception and willingness to cooperate. Creating a composite score for each set of metrics allowed for measuring the statistical relationships between categories. A scatterplot, r^2 value and corresponding p-values were reported to estimate the impact that levels of trust had on an individual's perceived risk or willingness to cooperate over shared transboundary issues.

RESULTS

A total of 755 decision makers were contacted on the Texas-Mexico border; owing to undeliverable mail, a net number of 707 recipients were ultimately contacted. The sample included a comprehensive list of decision makers in Texas that operate at the local, state, and federal level to make decisions about water management in the border region. Out of 707 net surveyed recipients, 168 responded either online or via mailed response for a total response rate of 23.8%. During the data collection phase, there was massive flooding on the border, particularly in cities of the Rio Grande Valley during June of 2018 (Alamdari 2018). This could have influenced the response rate for city officials and for utilities or other types of water managers, who are often the primary agencies to respond to these types of hazards. Another limitation to data collection was the limited availability of public data on emails for local and special district officials. This is in part due to the nature of these districts, which do not have much interaction with the public; thus, the need for transparency is lower.

Table 1. Sample characteristics.

Sample characteristics	N (%)
Gender	
Male	119 (77.8%)
Female	34 (22.2%)
Race	
Non-Hispanic White	72 (47.4%)
Hispanic or Latino	72 (47.4%)
Other	8 (5.3%)
Age in groups	
< 35	7 (4.6%)
36 – 54	54 (35.1%)
55 – 74	81 (52.6%)
75+	12 (7.8%)
Education	
At least some college	29 (18.9%)
Associates degree	8 (5.2%)
Bachelor's degree	57 (37.3%)
Graduate degree	43 (28.1%)
Terminal or professional degree	16 (10.5%)
Political ideology	
Very liberal	9 (5.9%)
Slightly liberal	15 (9.9%)
Moderate	45 (29.8%)
Slightly conservative	54 (35.8%)
Very conservative	28 (18.5%)

The sample was comprised of 77.8% men and 22.2% women (Table 1). This gender composition is not a surprise, as it is well known that men dominate the water management field, as well as elected positions in government, though this trend is starting to change. The sample population was 47.4% Non-Hispanic White, 47.4% Hispanic, and 5.3% “Other.” As seen in Table 1, the sample population was also older and more well-educated, with 60.4% 55 years or older and over 75% having a bachelor's degree or higher. Within the sample, there were more conservatives than liberals, with 54.3% (N=82) conservative-leaning, 29.8% (N=45) moderates, and 15.8% (N=24) liberal-leaning.

Overall, respondents believed that benefits of cooperation outweighed potential costs. Most respondents were willing to cooperate and were less willing to accept conflict, even in the face of severe water shortages. The only deviations from this trend were found in one measure of conflict, which asked respondents if they were willing to withhold water from the

Colorado River in protest to failed Mexican deliveries to the Rio Grande. In response to this question, most were willing to accept this type of conflict. It is suspected that this result is due to more recent negative experiences with inconsistent Mexican deliveries out of the Rio Conchos during times of severe drought. “Trust” revealed more mixed responses. Most respondents expressed that, in general, people were trustworthy; however, the majority did not think that Mexican water managers could be trusted to manage water efficiently. Respondents also believed that international rules for groundwater sharing were inadequate. Over 32% of the respondents reported that their communities relied heavily or somewhat heavily on groundwater resources. While respondents reported that they were willing to participate in binational stakeholder engagement efforts, very few actually had participated in these types of efforts.

The first hypothesis tested expected that trust would be positively correlated with willingness to cooperate. Figure 2 visualizes this relationship with a scatterplot and a fitted ordinary

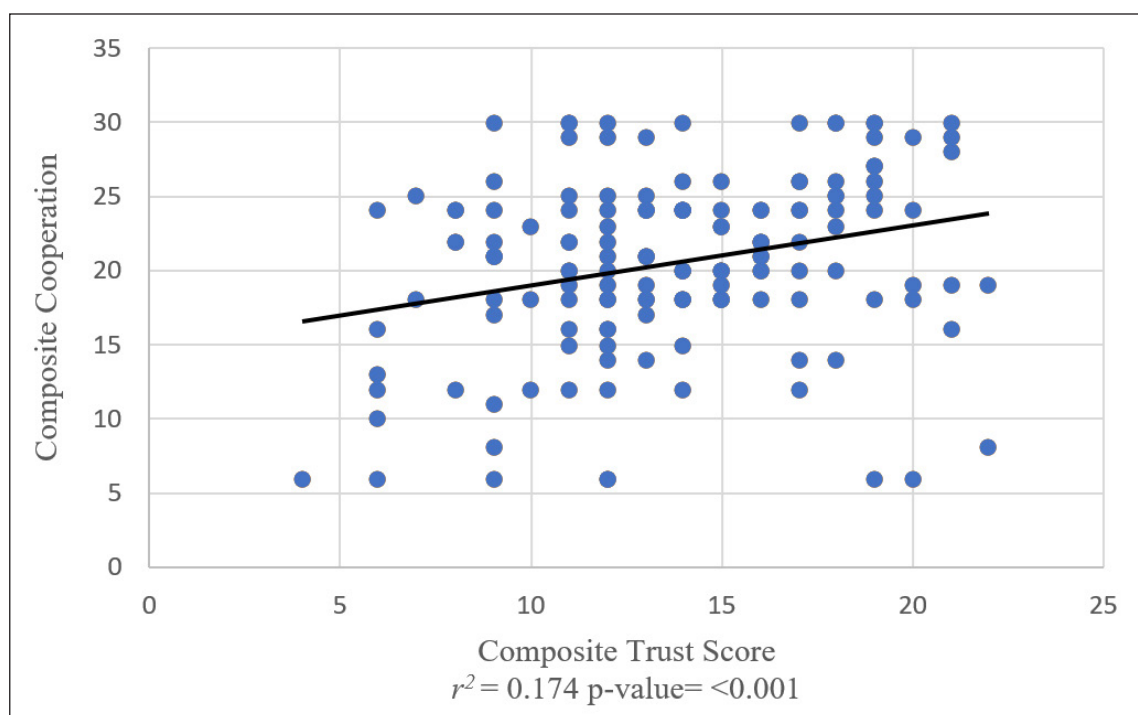


Figure 2. Composite cooperation score by composite trust score.

least squares regression trend line. While the regression model only accounted for 17.4% of the variance ($r^2=0.174$), it was highly significant ($p\text{-value}<0.001$). This finding suggests that as trust rises, so does willingness to cooperate. Though this study was not designed to be able to measure a causal relationship, the correlation does provide evidence to support the hypothesis.

The second hypothesis predicted that risk perception and trust would be inversely correlated: as levels of trust increased, perceptions of risk would decrease. As seen in the scatterplot shown in Figure 3, there is an inverse correlation between the composite score of risk perceptions and the composite score of trust.

Figure 3 shows that as perceptions of risk increase, trust decreases, which supports the hypothesis. This relationship is highly statistically significant, with an r^2 value of 0.295 and a $p\text{-value}$ of <0.001 .

CONCLUSIONS

Managing water across borders is complex and fraught with political, social, economic, and environmental challenges. However, the challenges of cooperative management of transboundary water are increased by issues of state sovereignty, increased pressures from population growth and competing water uses, uncertainties from climate change, and difficulties associated with modelling complex hydrological realities. Managing water resources that cross an international boundary

has often created multilateral relationships that are characterized by tension or tenuous cooperation, and these tensions are often exacerbated by power asymmetries. Transboundary water governance presents one of the most complex and challenging issues of coupled human-natural systems anywhere in the world, and it is valuable to study the characteristics that influence decision making in transboundary water-sharing settings.

Institutions are comprised of individuals, and the role of individuals within institutional settings have been understudied. The results of this study show that perceptions of risk and levels of trust held by individual decision makers nested within institutional settings can offer insight into how decisions are made regarding willingness to cooperate or engage in conflict over shared transboundary water resources. The case study between Texas and Mexico was an ideal political, institutional, and geographic setting for testing these concepts. Results showed a positive relationship between trust and willingness to cooperate; as trust increased, willingness to cooperate also increased. As predicted, there was an inverse correlation between risk perceptions and trust; as trust increased, risk perceptions decreased. These findings are useful for understanding what influences cooperative and conflictual behaviors over shared transboundary waters.

In the U.S.-Mexico region, an expanded study could be performed by adjusting the questionnaire to make it more appropriate for local settings on each side of the border. Comparative studies could then be performed to analyze different perceptions of risk and levels of trust to identify points of contention

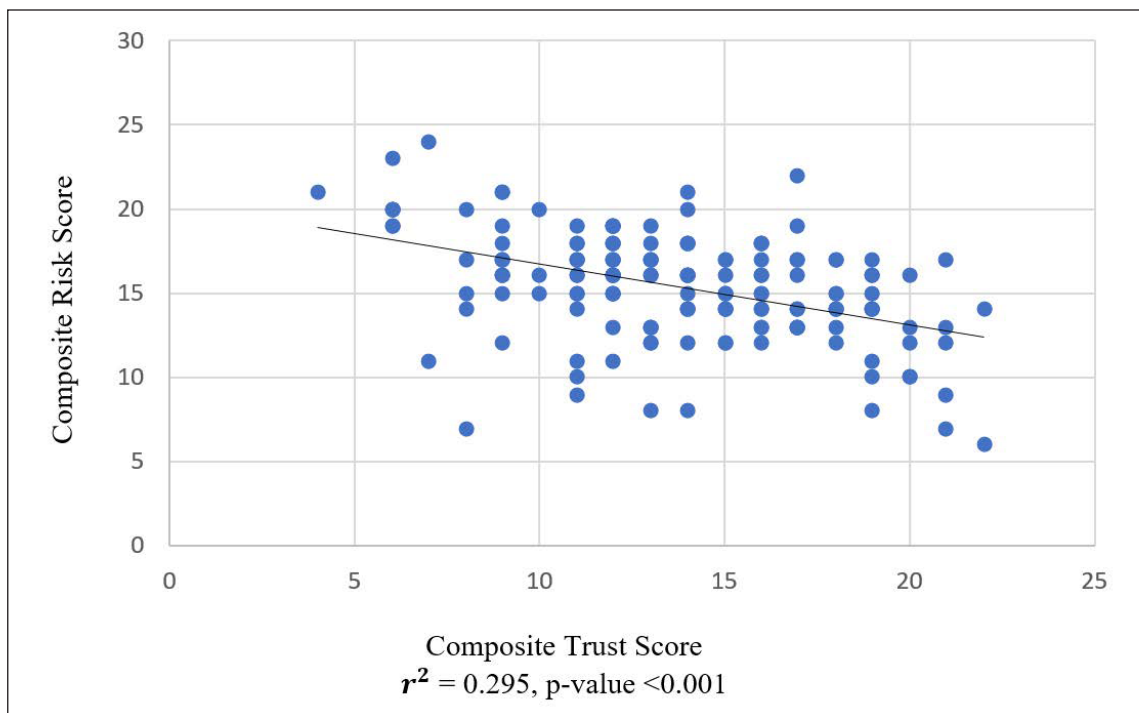


Figure 3. Scatter plot of risk perception composite score and trust composite score.

between binational counterparts within different states. This information would be very useful for designing appropriate intervention strategies to improve levels of trust and reduce perceptions of risk. One finding that is particularly relevant for designing interventions is that as respondents participated more frequently in binational stakeholder engagement efforts, levels of trust increased and perceptions of risk decreased. This indicates that individual decision makers operating within their respective institutional settings are influenced by experience, knowledge, and frequency of interaction with binational counterparts. Future interventions could be designed at the most appropriate governance levels to increase bilateral interactions.

Implications for future studies and other global questions

Not only can this approach be applied to the broader U.S.-Mexico border region, but it could be very useful for international transboundary water-sharing settings all over the world. The survey approach is designed to be flexible and take into consideration different socio-political contexts and governance structures. This approach is designed to enable comparative analysis regarding perceptions held in distinctly different social, economic, political, and environmental settings. Results from this study show promise for a new quantitative study design, which tests how perceptions of risk and levels of trust held by individual decision makers within institutional settings could influence willingness to cooperate over shared

transboundary waters, in particular groundwater. Future studies could use this novel approach in more contentious international water-sharing settings to gain a deeper understanding of potential barriers to cooperation from distinctly different perspectives. The approach used within this study could provide additional insight into the institutional barriers by analyzing individual decision makers' perceptions of risk to cooperation and levels of trust in bilateral or multilateral counterparts. Additionally, this can reveal perceived challenges from power asymmetries and perceived problems with current international treaties, agreements, or other procedures for water management. This study also offers support for the idea that the degree of governing structures, rules in use, and procedures in place have the ability to impact or influence perceptions of risk and level of trust for cooperating over surface water versus groundwater. When combined with a strongly CPR approach, this quantitative measurement of decision maker perspectives has a potential to increase understanding on the role of trust and risk perceptions in making cooperative decisions over shared natural resources. Future studies could also use this approach to explore perceptions of water value, water-trade links across borders, and other issues that come up between counties that share valuable water resources. To conclude, the novel approach utilized by this study has great potential for identifying and addressing barriers to cooperation or barriers to overcoming conflictual relationships in many different international transboundary water-sharing settings.

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