
GLOBALIZATION AND WATER RESOURCES MANAGEMENT: THE CHANGING VALUE OF WATER

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WATERSHED COUNCILS ALONG THE U.S.-MEXICO BORDER: THE SAN PEDRO BASIN

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ABSTRACT: The U.S.-Mexico border region is a laboratory for studying transboundary environmental processes within dissimilar societies. Binational watersheds like the San Pedro Basin flowing from Sonora, Mexico, into Arizona in the United States illustrate marked differences in management regimes. Economic development, embedded in disparate legal and institutional frameworks, impacts quality of life and prompts resource conflicts. In such a setting, watershed councils offer a promising management model. Following the HELP (Hydrology for Life, Environment and Policy) framework, the work of The University of Arizona's Udall Center for Policy Studies links policy-relevant research in the social and physical sciences by addressing water-allocation conflicts in the United States and water-quality concerns in Mexico. The effort promotes citizen participation in research, management, and decisionmaking to help improve communication and coordination on water issues in both the United States and Mexico. One result of citizen participation has been the "bottom-up" emergence of a watershed council, the Upper San Pedro Partnership, in the southwestern United States. To further guide future research and policy, the Center has completed and disseminated a binational survey of public perception of water issues. The work is part of a National Science Foundation-funded program, Sustainability of semi-Arid Hydrology and Riparian Areas (SAHRA); and complements the Semi-Arid Land-Surface-Atmosphere Program (SALSA), a global-change research project, and GEWEX America Prediction Program (GAPP), a research program linking precipitation predictions to water-resources management.

KEY TERMS: transboundary watershed, watershed councils, water-resources management, public participation.

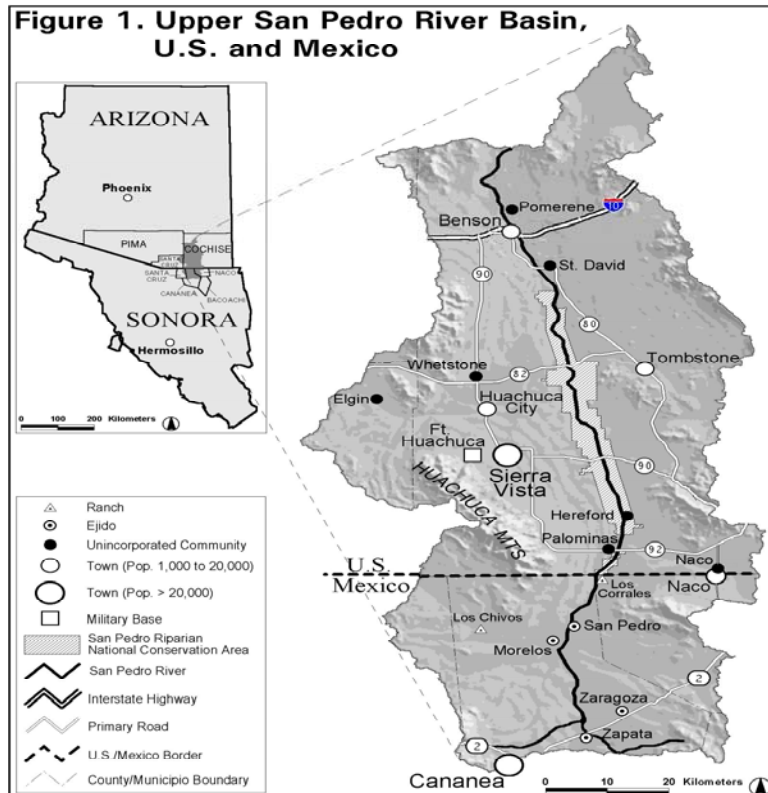
INTRODUCTION

The U.S.-Mexico border region is a laboratory for studying transboundary environmental processes within dissimilar societies. Binational watersheds like the San Pedro River Basin illustrate how marked differences in management regimes, stress from economic growth, and population expansion impact human health and the sustainability of a riparian ecosystem. In this context--watershed councils, supported by effective communication between scientists, stakeholders, and policymakers--offer a promising management model. The University of Arizona's Udall Center for Studies in Public Policy, following the Hydrology for Life, Environment and Policy (HELP) framework, has been linking policy-relevant research in the social and physical sciences to community-water-management problems in the Upper San Pedro Basin as part of a global effort to establish a network of catchments addressing the most critical water-policy and management issues. This work also is part of a National Science Foundation-funded project Sustainability of semi-Arid Hydrology and Riparian Areas (SAHRA), which addresses similar concerns within the North American Southwest and complements the Semi-Arid Land-Surface-Atmosphere Program (SALSA), a global-change research project, and GEWEX America Prediction Program (GAPP), a research project linking precipitation predictions to water-resources management.

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Study Area and Objectives

The San Pedro River originates in northern Sonora, Mexico, and flows north into Arizona, eventually joining the Gila River, which flows into the Colorado River. Agriculture, cattle grazing, mining, and recreation are the predominant land uses, as well as increasing urbanization. The Upper San Pedro Basin (USPB) is one of the most ecologically diverse areas in the western hemisphere. The San Pedro Riparian National Conservation Area (SPRNCA), an approximately 18,200-hectare area managed by the Bureau of Land Management, is located entirely within the basin. The area is also the focus of an extensive series of observation and modeling activities by the SALSA Program and others.



Most of the water demand in the basin is for mining, municipal and domestic use, and irrigated agriculture. Recent research suggests that riparian vegetation also requires a large portion of the water budget. The basin is currently considered to be in a water deficit, with annual water withdrawals exceeding recharge by approximately 6-to 12-million cubic meters. Water use is increasing and is expected to continue to do so. Increased copper production from extensive ore reserves in Mexico further limits groundwater availability for municipal and agricultural uses in that country and compromises extensive water-conservation efforts. Furthermore, in the U.S. portion of the basin, population trends mirror those in other regions of the Southwest, with a roughly 50 percent increase projected between 2000 and 2030, which will result in a major rise in water use to support municipal and domestic needs.

Water is managed by a complex array of federal, state, and local agencies on both sides of the border. In addition, a number of nongovernmental organizations, particularly environmental groups, are involved in water-policy and water-management discussions in the basin. One of the first applications of international environmental law under NAFTA resulted in a study of excessive groundwater pumping within the basin and its possible impacts on the San Pedro riparian system, whose loss would impact critical migratory bird populations in Canada, the United States and Mexico. Many would agree that the primary goal of water management in the basin is sustainable development. Highly efficient water management on multiple fronts is required to achieve this goal, because the basin is already estimated to be in overdraft due to floodplain-aquifer pumpage (Arias 2000), highly efficient water management on multiple fronts is required. In a positive development, the Upper San Pedro Partnership was formed in 1998 to meet water needs in the Sierra Vista subbasin of the USPB and to sustain the viability of SPRNCA. Recently community stakeholders have been attempting to establish a grass roots watershed association on the Mexican portion of the USPB as well.

Methodology

In 1998 the Udall Center conducted the public-input process for the Commission on Environmental Cooperation's

(CEC) study of the Upper San Pedro Riparian Area. The study, *Ribbon of Life: An Agenda for Preserving Transboundary Migratory Bird Habitat on the Upper San Pedro River*, recommended the creation of a coordinated resource management program to develop a basin-wide water-management plan by bridging gaps among government agencies, private landowners, and other resource users. The idea of this program was to minimize conflicts, and the authors recommended a joint presidential proclamation to make it binational. The study also recommended reduction in irrigated agriculture in the basin, the development of recycling and recharge initiatives to reduce municipal and domestic water demands in the Sierra Vista subbasin, and the designation of a Mexican protected area similar to the SPRNCA (CEC 1999). That same year the Udall Center helped SALSA to organize the binational San Pedro Conference *Agua Dividida—Áreas Comunes* or *Divided Waters-Common Ground*, in which physical and social scientists shared their work and discussed watershed concerns with municipal officials, government agencies, nongovernmental organizations and interested citizens.

In addition, the Udall Center has modeled a participatory approach to social-science research by undertaking a public-interest survey in water issues, with input from community leaders and by training local residents to administer the survey. This survey, entitled *Views from the Upper San Pedro River Basin: Local Perceptions of Water Issues* has just been published in Spanish and English. At the same time, the efforts spearheaded by the SALSA research program continue with resources provided through the basin and the SAHRA Science and Technology Center, which takes a highly interdisciplinary approach to working with communities to address basin-management needs. Specifically, the Udall Center continues to promote communication and collaboration between scientists and water stakeholders and managers, as well as between the Upper San Pedro Partnership and an incipient Mexican watershed association.

DISCUSSION

The Upper San Pedro Partnership

A coordinated resource management program may slowly evolve within the basin, although probably not through a joint presidential recommendation. Border residents, especially on the U.S. side, have a history of resistance to “interference” by federal, state, and county, let alone international, agencies in local land and water management (Varady, et al. 2001). At least three water-management groups have arisen in the Sierra Vista subbasin. The Upper San Pedro Partnership consists of federal, state, and local agencies that collectively work to initiate water-research projects in order to implement water-management policies and projects in the Sierra Vista subbasin. The Partnership has evolved from a single body into a commission with a number of subcommittees: an advisory committee, an administrative committee that controls financial matters, a coordinating committee that directs the group’s activities, a technical advisory subcommittee that evaluates research projects, and an outreach committee that publicizes the Partnership’s work. The San Pedro Joint Task Force, a two-year advisory committee made up of planning and zoning commissioners from the city of Sierra Vista and Cochise County, was gradually absorbed into the Partnership. A third group, Dialogue San Pedro, consisting of academics, public officials, environmentalists, property-rights advocates, and other concerned citizens, discussed options for improving education, information-exchange, and coordinated water management in the basin. This group, convened by the Udall Center, disbanded in late 2000 and merged with the Partnership (Varady et al 2001). A fourth group with binational membership, the San Pedro Foundation, has recently emerged with the goal of fund-raising for water-conservation projects in the basin.

Of these four groups, the Partnership has evolved as the dominant water-management group; it delegates water research topics in the basin and makes recommendations to the Sierra Vista town council and the Cochise County planning and zoning committee. While membership in the Partnership is limited, nonmembers may attend committee meetings (except administrative) and speak, but they are not allowed to vote. At present the Partnership is concerned chiefly with trying to establish, through research projects, how much water the SPRNCA requires to be maintained as a reserve and how to balance growth with other water needs. The Partnership’s conservation plan targets reduced water consumption, reuse or recharge of effluent, and increased recharge of stormwater.

Mexican Coalitions for the Upper San Pedro Basin

At least two environmental groups with a strong focus on the San Pedro River have emerged in the Mexican portion of the basin. The goals of the two groups, which are known only by their leaders’ names, indicate a different set of priorities from those of the Partnership. Both leaders initially supported the creation of a Mavavi Reserve, which would have included the existing Ajos-Bavispe Reserve and the San Pedro riparian area in Mexico. Following the lead of the CEC study, former Secretaría del Medio Ambiente Y Recursos Naturales y Pesca (now SEMARNAT) Julia Carabias Lillo and former U.S. Secretary of the Interior Bruce Babbitt signed a letter of intent to create a conservation area on the Mexican side of the basin and to increase cooperation on basin-wide issues (Hess 1999). However, the Sonoran Mining Commission, supported by the owner of the Cananea copper mine located near the headwaters of the San Pedro, blocked political acceptance of the reserve out of fear that its creation would preclude further mineral extraction or perhaps require a cutback on current production. As a result of this confrontation and of SEMARNAT’s encouragement to the Sonoran town of Cananea to organize its own environmental association, the leaders of the two groups broadened the scope of their efforts to include other environmental

issues besides water within the San Pedro Basin. The one more publicly inclusive of the two groups has a strong interest in communicating with the Partnership, especially to learn how the Partnership was organized and funded. The Udall Center continues to facilitate this transboundary dialogue, provide the two Mexican groups with contacts in other binational basins along the U.S.-Mexico border, and help them find funding.

Upper San Pedro Basin Survey

People who live and work in the Upper San Pedro Basin are an important source of information about water conditions, water management, and water-policy challenges in that basin. The basin survey illustrates how both U.S. and Mexican residents emphasize the importance of improving binational communication and cooperation. At the same time, their water needs and interests differ. A total of 285 residents throughout the Mexican portion of the basin completed questionnaires, representing approximately 0.75 percent of the total population and 1.4 percent of the population 15 years and older. A total of 420 residents were surveyed in the U.S. portion, a number determined by the Center for Economic Research to reflect the area's population with a 95 percent degree of confidence and a sampling error of +/- 2.5 percent. U.S. residents ranged in age from 18 to over 60 and had lived in the area for an average of nearly 12 years. In addition, 16 individuals working on water issues in the basin (eight from Mexico and eight from the United States) were interviewed regarding their opinions on policy options and research needs related to water sustainability. Interviewees included elected officials, federal and state agency scientists, local water-company managers, academics, and interest-group representatives. It is important to note that the sample size is very small, and therefore the interviews simply represent the opinions of 16 well-informed individuals.

According to the survey, Mexican residents "are faced with major water-supply and water-quality problems, and their top priority for both water management and water-policy is an assured supply of potable water." They were also concerned with environmental conditions in the region, particularly those related to the San Pedro River, but they were not familiar with the connection between surface water and groundwater or with the concept of a watershed approach. Mexican residents were also interested in learning more about water issues, water-management and policy options, and individual conservation practices. They considered the U.S. experiences as a possible source of this information and public education as a means of conveying such information. Those interviewed still support the creation of ecological reserves to protect water resources. Finally, both U.S. and Mexican water scientists and managers identified Mexican groundwater hydrology as a major research need. They identified a lack of basic water-supply and water-use data on which to base management and policy decisions (Moote and Gutiérrez 2001).

The survey points out that "many U.S. residents were concerned about the health and viability of the San Pedro River and its associated riparian habitat. They specifically identified growth management, recharge, and conservation as water-policy and water-management priorities." Researchers and water managers acknowledged that while considerable hydrologic research, including geohydrologic modeling and recharge and evapotranspiration studies, was currently underway in the basin, research also was needed on growth-management options and water pricing. They also talked about the challenge of making technical research tangible to the lay public. U.S. residents seemed to be aware of this need for clear information, for they considered themselves less than well informed on water issues in the basin (Moote and Gutiérrez 2001). From the USPB survey several recommendations became clear:

- Develop programs for binational and watershed-wide information exchange, including media-based, Internet-based, and community-based public-education programs,
- Develop a Mexican watershed council-like forum that can interface with the Upper San Pedro Partnership,
- Share research results with communities.

At times lack of communication, coordination, and understanding of the water resources of the basin have contributed to suspicion and mistrust over water matters. Some people in the Sierra Vista subbasin believe that the Cananea mine's withdrawal of groundwater is affecting the U.S. water supply. Others in Mexico think that Sierra Vista wants more water from the Mexican portion of the basin so that it can keep up its growth rate. People on either side can and do think the other side wants their water. In this respect, recommendations can help water stakeholders and managers in both countries understand the complex issues that shape the perspectives of borderlands residents.

Policy Issues

Both the U.S. and Mexico advocate the development of integrated watershed planning and management in border watersheds. In 1992 Mexico established the *Ley de Aguas Nacionales* (National Water Law), which called for the development of watershed councils to serve the many users of hydrologic resources, establish water infrastructure, and preserve water resources in the borderlands (La Ley de Aguas Nacionales, reprint 1997). The United States Environmental Protection Agency (U.S.EPA) and Mexican SEMARNAP offered a water-management plan in the 1996 Border XXI Framework Document (U.S.EPA 1997). However, three policy issues--illegal immigration, drug trafficking, and a new

Mexican watershed initiative--run side by side in the U.S.-Mexico borderlands, and the first two at times cancel out the watershed initiative. The numbers of illegal immigrants, including those who die in their attempts to cross the border into the United States in the desert heat and drug traffickers, draw more binational attention than environmental policy issues. Because of concerns for these problems, researchers sometimes find their work hazardous or challenging. The San Pedro is known as an immigration corridor for humans as well as for birds.

These issues also reflect some of the economic differences between Mexico and the United States. Mexico's economic policies, specifically its struggle to overcome debt through privatization, have tended to favor businessmen, while workers have gradually lost power to claim salary increases through unions, and farmers have lost much of their former government subsidies. Add to this the peso devaluations and high inflation since 1982, and the driving forces of immigration to the United States become clear. At the same time U.S. immigration laws make it difficult for individuals to obtain legal entry to work, even though the U.S. service industry and agriculture encourage immigration.

Mexican President Vicente Fox's recent "Crusade for Forests and Watersheds" promotes the formation of domestic watershed councils to manage basins more effectively and to conserve water. SEMARNAT is in charge of carrying out this initiative, but it has informed the Mexican San Pedro water stakeholders that they should create their own watershed organization. Furthermore, the Mexican National Water Commission (CNA), which has published specific guidelines for the formation of watershed councils, has not attended any public meetings to discuss water issues, and it is unclear how CNA might feel about grassroots efforts to create a watershed association outside CNA guidelines.

Nongovernmental Organizations (NGOs)

Nongovernmental organizations interested in environmental issues proliferate along the U.S.-Mexico border. Some of them, such as the Border Ecology Project, The Nature Conservancy, the Southeastern Arizona Bird Observatory, and the Audubon Society, are U.S. groups that have collaborated with Mexican environmental groups such as Instituto del Medio Ambiente para Desarrollo Sustentable (Environmental Institute for Sustainable Development or IMADES) and the National Protected Areas (reserves) in Mexico on air-and water-quality monitoring, educational programs, or social assessments. Others, such as the Arizona-Sonora Desert Museum, emphasize the binational nature of their educational outreach efforts. Still others, such as La Red Fronteriza de Salud y Ambiente (Border Health and Environmental Network), advocate environmental education and attempt to link to their U.S. counterparts.

These NGOs can be the initiators, funding sources, or part of the building blocks for binational watershed management.

With the mounting concern for environmental degradation due to rapid development and poor management practices, their voices have become much stronger along the border. The Upper San Pedro Basin is no exception to this rule. The Partnership has at least two NGO members, and the Mexican watershed initiative may initially take the shape of an environmental NGO.

APPLICATIONS AND IMPLICATIONS

The experiences of these watershed groups in the USPB has several implications for transboundary resource management:

- Policy or diplomatic solutions mandated from above may not succeed without local support. Attempts to establish the Mexican Mavavi Reserve through government mandate without building local support caused a backlash by mining interests.
- Borderlands environmental coalitions initiated by local groups may be more effective at addressing shared problems than national initiatives. Water stakeholders' needs are steeped in local context, and the border region generally lies within a semiarid landscape that features a rapidly increasing population. While the U.S.EPA, the U.S. Bureau of Land Management, and other agencies can provide some local support to border communities, a coalition of local stakeholders should respond to its own water issues in order to find solutions that address water needs equitably.
- Economic-development policies should coincide or at least not conflict with environmental policy. Mexican economic policy has established industrial expansion as one of the cornerstones of the country's recovery from debt and recession. Privatization of industries, including mining, tends to emphasize profit at the cost of protecting environment.
- Coalitions of local stakeholders should be inclusive and the process transparent, but this can lead to power struggles. In Cananea public discussions of natural-resources or environmental issues have tended to take place behind closed doors. With Fox's Crusade, the conflict has become more open and heated, with the mining companies using the press and media to promote fear of unemployment and recession if a San Pedro reserve were established. In Sierra Vista, while most of the meetings are open, the Partnership consists almost entirely of agency and municipal leaders and thus does not represent all stakeholders' interests.
- Borderlands coalitions as well as national policy initiatives face potential fear of "outside interference," especially in view of the lack of economic and institutional parity between the two countries. Cananea townspeople think Sierra Vista wants them to cut back on water use so that Sierra Vista can have more water for growth.

- When local watershed groups possess different missions or goals, it is more difficult for two groups of stakeholders to maintain common dialogue over watershed management. Cananea residents are primarily concerned with obtaining a delivery system that provides a secure supply of potable water now. Sierra Vista wants to ensure both the SPRNCA's continued existence and a level of economic growth that will threaten neither the present nor future supply of water.
- More effective decisionmaking occurs when social scientists and natural scientists work together. Many of the decisions about how much water exists, the nature of the connection between the U.S. and the Mexican sides of the basin, and the kind of management decisions that are made depend on hydrologists and engineers. Yet how this information is interpreted, how attitudes and values shape decisionmaking, and how coalitions and alliances among stakeholders are formed requires the help of social scientists.
- Knowledge of social history helps to understand stakeholders' perspectives. Social memory of past events plays an important role in understanding current values and expectations. On the American side of the basin, the legacy of a frontier fort and an "independent spirit" characterize many of the stakeholders' reasons for coming to the area. On the Mexican side, Cananea has a reputation as a town that sparked the Mexican Revolution with its 1906 strike against the American mine owner, William Greene, who once wanted to make Cananea a part of the United States. More recent history plays out in conflicts among community leaders who lack trust in each other.

CONCLUSIONS

Binational water-resources coordination and management in the basins and subbasins within the border region suggest that, for the most part, informal communication and cooperation among local agencies and NGOs have been successful. However, according to the 1906 and 1944 water treaties between the United States and Mexico, any formal binational mechanism that regulates or reallocates water must involve the International Boundary and Water Commission (IBWC) and its Mexican counterpart, the Comisión Internacional de Límites y Aguas (CILA) as the lead agencies. In addition, although informal Mexican groups exist in each of these watersheds, the leadership of the CNA is required for any watershed council, as set out by the Mexican national water law (Brown and Mumme 2000; Brown 2001). However, although IBWC/CILA have acknowledged the need to develop a comprehensive groundwater agreement for the border region in Minute 242 (1973), they have been unwilling to delegate authority and resources at the regional or local level. As Brown and Mumme suggest, perhaps these agencies could build on the binational success of local project initiatives.

While the process of coordinating binational resource management is a slow one, residents, scientists, and water managers have addressed USPB water issues with intensity if not enthusiasm. The research coordination, the binational forums in the basin, the evolution of the Upper San Pedro Partnership, and the efforts of binational NGOs and governmental agencies working together all suggest a growing momentum toward coordinated water-resources management. There exists a clear interest on both sides in learning how to do this effectively, and all parties recognize that watershed management should transcend borders.

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