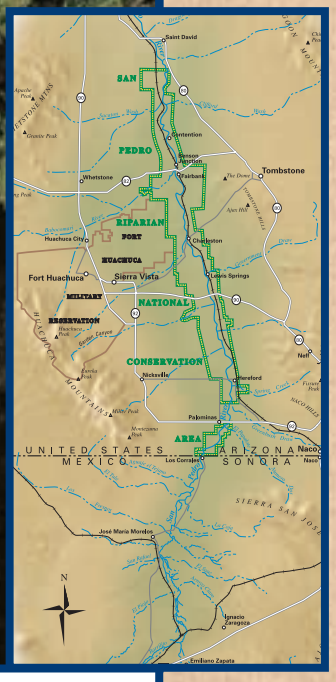
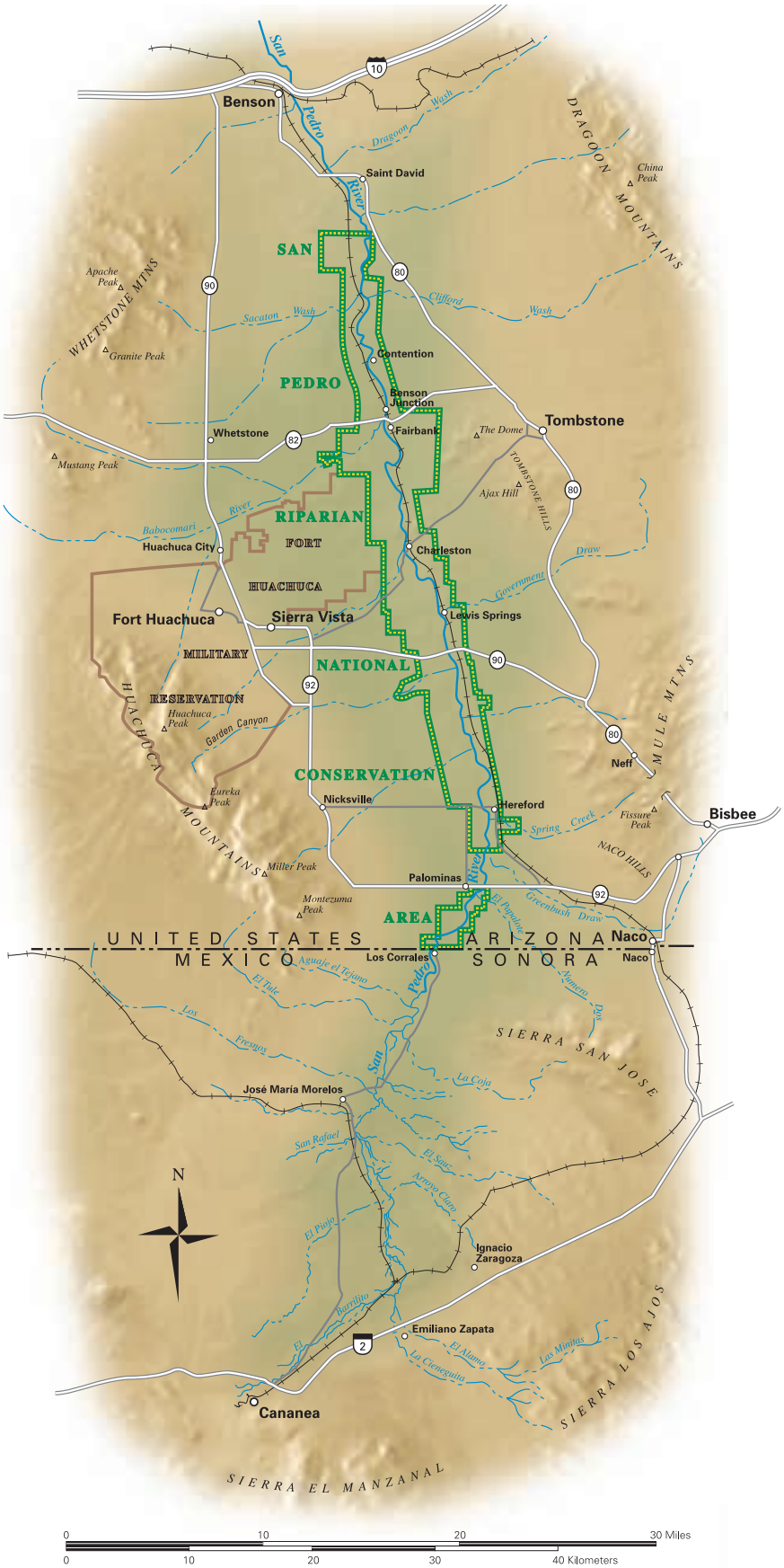
CCE
CCA
CEC

Ribbon of Life

An Agenda for Preserving Transboundary Migratory Bird Habitat on the Upper San Pedro River



The Upper San Pedro River System



On the Cover

Aerial photo of the San Pedro River at Saint David, Arizona, looking northwest to the Whetstone Mountains in the Coronado National Forest. The river is clearly delineated by the cottonwood trees along its banks, with creosote bush and mesquite covering the plains in the distance.

Photo by Adriel Heisey

Ribbon of Life

An Agenda for Preserving Transboundary Migratory Bird Habitat on the Upper San Pedro River

COMMISSION FOR ENVIRONMENTAL COOPERATION

1 9 9 9

This publication was prepared by the Secretariat of the Commission for Environmental Cooperation (CEC). The views contained herein do not necessarily reflect the views of the CEC, or the governments of Canada, Mexico or the United States of America.

Published by the Communications and Public Outreach Department of the CEC Secretariat.

For more information about this or other publications from the CEC, contact:

COMMISSION FOR ENVIRONMENTAL COOPERATION
393, rue St-Jacques Ouest, bureau 200
Montréal (Québec) Canada H2Y 1N9
Tel: (514) 350–4300 • Fax: (514) 350–4314

http://www.cec.org

ISBN 2-922305-36-8
(French edition: ISBN 2-922305-37-6;
Spanish edition: ISBN 2-922305-38-4)

Legal Deposit–Bibliothèque nationale du Québec, 1999
Legal Deposit–Bibliothèque nationale du Canada, 1999

Disponible en français–Disponible en español

Paper:	Fifty percent recycled, with 20 percent post-consumer content / no coatings, no elemental chlorine
Ink:	Vegetable ink containing no chlorine or heavy metals
Fountain Solution:	No isopropyl alcohol / less than one percent VOCs
Press Washes:	Low VOC press washes used
Design & Layout:	Station | Communications
Printed in Canada	

“Siempre beo y es ansi que por la mayor parte quando tenemos entre las manos alguna cosa preciosa y la tratamos sin impedimento no la tenemos ni la preçiamos en quanto vale ni entendemos la falta que nos haría si la perdiesemos y por tanto de continuo la bamos teniendo en menos pero despues que la abemos perdido y carecemos del beneficio de ella abemos gran dolor en el coraçon y siempre andamos ymaginatibos buscando modos y maneras como la tornemos a cobrar…”

Pedro de Castañeda,
*History of the Expedition,**
October 1596

“I have always noticed, and it is a fact, that often when we have something valuable in our possession and handle it freely, we do not esteem or appreciate it in all its worth, as we would if we could realize how much we would miss it if we were to lose it. Thus we gradually belittle its value, but once we have lost it and we miss its benefits, we feel it in our heart and are forever moody, thinking of ways and means to retrieve it….”

* A chronicle, in old Castilian Spanish, of Coronado’s expedition in search of the seven cities of Cibola. It is believed that Coronado’s party followed the San Pedro north from modern-day Sonora into what is now southeastern Arizona.

Table of Contents

Foreword

Biological diversity is a global asset of incalculable value to present and future generations. The three nations of North America, partners in the North American Agreement on Environmental Cooperation (NAAEC), are fully cognizant of the urgent need to conserve this vital asset and share an avowed commitment to maintain habitat by improving the management of natural resources for the preservation of endangered species. Accomplishing this task of conservation and management in the face of unsustainable human development patterns promises to be one of the most pressing issues of the coming decades.

Ribbon of Life marks the third report that the Secretariat of the Commission for Environmental Cooperation (CEC) has developed for the CEC Council under the authority of Article 13 of the NAAEC. This report puts forth a number of pragmatic actions aimed at balancing human activities with the preservation of important wildlife habitat along the upper San Pedro River.

The process that gave rise to this report has been designed to foster cooperative efforts to ensure the continued health of the San Pedro watershed. The complexity of this issue, further exacerbated by the transboundary nature of the upper San Pedro basin, calls for the development of new and innovative mechanisms to manage shared habitat and the natural resources on which it depends.

If adopted, the actions proposed here would serve to balance the often conflicting needs of humans and wildlife—meeting basic human water requirements without compromising the viability of important migratory bird habitat along the upper San Pedro River. The process followed in the study provides a concrete example of the CEC's unique capacity to engender constructive dialogue and stimulate meaningful responses at a regional level and beyond.

While it is far too early to conclude that the upper San Pedro River and its watershed are on a sustainable course, a growing number of public and private partnerships have come together with a renewed spirit and enthusiasm to find meaningful solutions in the basin. As a result, there is a brighter future on the horizon for one of North America's pre-eminent habitats for migratory songbirds and other species.

Janine Ferretti
Interim Executive Director

Acknowledgments

The CEC Secretariat wishes to acknowledge the contributions of, and express its gratitude to, the following participants in the Upper San Pedro Initiative:

The six members of the San Pedro Expert Study Team for their outstanding report, which will serve as a key technical reference document in the San Pedro basin for years to come;

The thirteen members of the Upper San Pedro Advisory Panel for their wisdom and endurance, with a special recognition to the panel co-chairs, Jack Pfister and Fedro Carlos Guillén Rodrígez, who took the lead in drafting the recommendations;

The Udall Center for Studies in Public Policy and its staff for their perseverance and professionalism in organizing public workshops, disseminating the expert report, and soliciting and recording public comments;

The States of Arizona and Sonora and the residents of the San Pedro valley, without whose patience and cooperation the initiative could not prosper;

CEC Director Greg Block for developing and overseeing the initiative;

CEC staff members Hernando Guerrero and Andrew Hamilton for their invaluable assistance and counsel throughout this project; and

Project Coordinator Richard Connor for his tireless enthusiasm and formidable coordinating skills.

Introduction

Every year, millions of songbirds migrate from their wintering grounds in Mexico and Central America to their summer breeding habitats in Canada and the northern United States. In order to successfully cross the desert landscapes of northern Mexico and the southwestern United States, migrating songbirds congregate and travel along a small number of north-south oriented corridors where they are able to find shelter, food, and water. Especially, they travel along the rivers: the Rio Grande/Río Bravo, the Colorado, the Santa Cruz, and the San Pedro.

Over the last century, we have lost much of the riparian habitat upon which many migratory bird species depend. Human activities are responsible for much of this loss, and what habitat still remains is at risk from climate variability and a host of human-induced stresses.

Unlike the other rivers listed above, the overall health and quality of the upper San Pedro River and its riparian habitat have not declined significantly over the last century. On both sides of the border, the San Pedro River continues to support riparian habitat of exceptional quality and increasing scarcity elsewhere, offering an alternative route for species whose previous migratory pathways have been lost or degraded to the point where they can no longer sustain large populations. Indeed, there is mounting evidence suggesting that more birds use the upper San Pedro now than ever before. However, there has also been growing concern that this valued transboundary ecosystem, and the hydrological system that supports it, may be on an unsustainable course.

As in many regions along the Mexican and US border, the upper San Pedro valley faces one of the most pressing challenges of the next century—water scarcity. Freshwater resources in the valley are shared by a diverse and growing community of users, representing a wide spectrum of social, cultural and economic values and interests. Should the human demand for water continue to exceed supply, the outstanding riparian habitat of the upper San Pedro valley, one of the most biologically diverse regions in all of North America, could be irreversibly compromised.

Bird populations are key indicators for the overall health of biodiversity because birds respond so quickly to changes and stresses in the ecosystems they inhabit. Since 1995, the North American Commission for Environmental Cooperation (CEC) has been working closely with a growing network of North American science and policy experts from governments and civil society to develop and launch an "Initiative and Action Plan for the Conservation of North American Birds (North American Agenda for Action 1999–2001)." During its 1996 annual session, the CEC Council highlighted the San Pedro Riparian National Conservation Area (SPRNCA) by recognizing the site as a "Globally Important Bird Area," signaling the Parties' commitment to working cooperatively for the protection of rare and biologically diverse habitats across North America.

The CEC Upper San Pedro River Initiative provides a ground-level look at the many challenges and opportunities that local communities, states, provinces and national governments will face as they consider measures to protect migratory species. And, as our experience in the San Pedro valley itself attests, the success of these conservation measures will require scientifically reliable and publicly available information, community involvement and an unprecedented degree of cross-border cooperation.

Procedural History

Objectives

In May 1997, the Secretariat of the CEC launched the Upper San Pedro Initiative to advance three concrete objectives:

- To initiate a process where diverse stakeholders from the region can develop and implement economically and environmentally sustainable strategies for enhancing and preserving the riverine ecosystem of the upper San Pedro watershed;
- To develop a model of cooperation that could have relevance to other transboundary basins; and
- To inform the broader public about the regional importance of preserving migratory bird habitat and the challenges and opportunities in conserving and protecting valued transboundary resources.

Expert Study

The three-phase initiative commenced with the commissioning of a technical report by an interdisciplinary team of experts on the physical and biological conditions required to sustain and enhance the riparian migratory bird habitat of the upper San Pedro River basin.

The San Pedro Expert Study Team was dealt a most difficult hand. Initially focusing on the Globally Important Bird Area highlighted by Council (located on the US reach of the upper San Pedro), the experts soon recognized that the interconnected ecological realities of the transboundary basin called for a more holistic treatment of the watershed. It was within that context that the team identified promising opportunities to protect or restore migratory bird habitat along the Mexican reach of the San Pedro River, including some of the best remaining stands of native grasslands in the entire region.

Accordingly, the experts included an analysis of potential actions in Mexico that could have a favorable impact on the entire upper San Pedro River system. It is important to note that the experts regarded these strategies as opportunities for Mexico to consider principally for the benefit of Mexican riparian habitat, an area recognized by that country's National Commission for the Understanding and Use of Biodiversity (*Comisión Nacional para el Conocimiento y Uso de la Biodiversidad*—Conabio) for its outstanding assemblage of biodiversity. Where these actions could also improve baseflows on the US side of the watershed, the experts felt that this contribution should be acknowledged in an appropriate manner.

The final report produced by the San Pedro Expert Study Team, *Sustaining and Enhancing Riparian Migratory Bird Habitat on the Upper San Pedro River* (Final Draft - March 1999), serves as a supporting annex to the present document and is included with it. The executive summary of the expert report is also appended as Attachment 1.

Upper San Pedro River Initiative Documents

The following documents, prepared as part of the CEC's Upper San Pedro River Initiative, are available on the CEC's web site <http://www.cec.org> or by contacting the CEC Secretariat.

- *Advisory Panel Report on the Upper San Pedro River Initiative*: Recommendations and Findings Presented to the Commission for Environmental Cooperation
- *Sustaining and Enhancing Riparian Migratory Bird Habitat on the Upper San Pedro River*: Final Draft from the San Pedro Expert Study Team
- Public Input Digest for the Upper San Pedro River Initiative (Summary of comments from the US public consultation process)
- Report of the Sonoran Public Workshop, held in Hermosillo, Sonora, August 1998

San Pedro Expert Study Team

Dr. John Bredehoeft has over thirty years of experience at the US Geological Survey in both research and high-level management. In the early 1980s, he served as the Regional Hydrologist for eight Western states. He participated in numerous national advisory committees for the National Research Council, the National Science Foundation and the Department of Energy, and is the former editor of the international scientific journal Ground Water. He is also the founder and a principal at HYDRODYNAMICS, a consulting group in California.

Dr. Ronald Lacewell has a doctorate in Agricultural Economics and is a professor at Texas A&M University. As Chairman of the Environmental Issues/Sustainability Team of the System Agricultural Program, he has organised teams to address environmental issues along the Rio Grande and other watershed regions. Dr. Lacewell has served as a consultant to the EPA, USDA and the Office of Technology Assessment of the US Congress. He has published extensively in academic journals on topics such as the effects of changing economic and groundwater conditions and the economics of irrigation.

Dr. Jeff Price is an ornithologist with a doctorate in Avian Ecology. A native of Arizona, he is currently a Principle at Carto Aves Consultants, located in Boulder, Colorado and Director of the United States Important Bird Areas Program. He is a regular contributor to academic journals and on-line magazines in relation to birds and their habitats. Dr. Price co-created the award winning CD-ROM Peterson Multimedia Guides: North American Birds, and recently authored a book entitled the Summer Atlas of North American Birds.

Dr. Héctor Arias Rojo is an expert in watershed management with a Doctorate from the University of Arizona. He is a Professor at the University of Mexico and at the *Colegio de Postgraduados*, and has published extensively on natural resources inventories, particularly in relation to the Upper San Pedro. Dr. Arias is currently a director at the *Centro de Investigación y Desarrollo de los Recursos Naturales de Sonora*.

Dr. Julie Stromberg is a Professor of Botany at Arizona State University, Tempe. She is an expert in plant ecology, with an emphasis on riparian ecosystems in the American West. Dr. Stromberg has published extensively on issues of vegetation and hydrology, including a case study on the San Pedro River. She has served on the Arizona Riparian Council and as Governor Appointee to the Arizona Water Protection Fund Board.

Greg Thomas, J.D. has over twenty-five years of experience as a public policy expert, professor and counselor in the conservation of natural resources spanning a broad range of expertise and institutions. He has worked as legal counsel to the US Department of Energy, and was a Fulbright Professor of Law and an advisor to the National Environmental Ministry in China. He is the founder and President of the Natural Heritage Institute, a non-profit natural resources advocacy organization in San Francisco, California.

Public Participation

With the release of the preliminary draft of the expert report (June 1998), the second phase of the initiative was launched. This was a public review and comment process, eliciting responses to the expert report and fostering a community dialogue concerning the findings of the report and the future of the river basin.

Over 650 people participated in focus groups and workshops in the region. More than 300 written comments were submitted, roughly half of which originated from outside the basin. Although several commentators from outside the basin represented environmental organizations, a much larger number were from private citizens, most of whom had visited the San Pedro valley and were moved by the natural beauty of the river and its surrounding habitat.

Advisory Panel

The third phase convened the thirteen-member Upper San Pedro Advisory Panel to consider the issues raised in the expert report and formulate policy recommendations on future directions for meeting the goals identified by the public and the expert team. Their recommendations—see Attachment 2, the *Advisory Panel Report on the Upper San Pedro River Initiative* (November 1998)—should be read carefully as an integrated package of procedural and substantive measures to be considered by anyone interested in the long-term viability of the river and the benefits it provides to humans as well as birds. We can only hope that the collaborative spirit that infused this diverse group of local and distant stakeholders is carried forward into the many decisions that must now be made in the basin.

Upper San Pedro Advisory Panel Members

Co-Chair: **Jack Pfister** recently served on Governor Jane Hull's transition team and is a Distinguished Research Fellow at Arizona State University. A native of Arizona with degrees in law and engineering from the University of Arizona, Mr. Pfister was General Manager of Arizona's Salt River Water Project for 15 years.

Co-Chair: **Fedro Carlos Guillén Rodríguez** served as Director of Environmental Education for Mexico's Secretariat of Environment, Natural Resources and Fisheries (Semarnap) from 1995 through 1998 and is currently Chief of the Public Participation, Liaison and Communication Unit of Mexico's *Instituto Nacional de Ecología* (INE).

Dr. Alejandro Castellanos is the General Academic Secretary of the University of Sonora and serves as a member of the expert panel created by Conabio to define and prioritize conservation areas in northeastern Mexico. Dr. Castellanos has conducted research on the physical ecology of phreatophytes, as well as subjects related to changes in vegetation cover and desertification.

Robert Halliday is a professional engineer with over 30 years experience in transboundary water management and is the former Director of Canada's National Hydrology Research Institute. Mr. Halliday is currently in private practice and serves as a member of the International Joint Commission's International Red River Basin Task Force.

Michael Harcourt is the former Premier of British Columbia and also served as Mayor of Vancouver. He is currently an adjunct professor at the University of British Columbia and a Senior Associate of the Sustainable Development Research Institute. Mr. Harcourt served on the National Round Table on the Environment and Economy in Canada.

Paul Hardy is Program Manager of the Upper San Pedro Program initiated by the Arizona chapter of the Nature Conservancy. He is co-author of *Ecosystem Management in the US* and has an M.B.A and a M.Sc. in Resource Management from the University of Michigan.

Jack Ladd is a lifelong resident of Southern Arizona, and has spent the past 45 years operating a family-run ranch. Mr. Ladd is currently a Supervisor for the Hereford Natural Resource Conservation District.

Rita Pearson is the Director of the Arizona Department of Water Resources. She served as former Governor Fife Symington's Deputy Chief of Staff and as Executive Assistant for Environment and Natural Resources. She has an M.B.A. and a J.D. from Arizona State University.

Ruth Russell is currently serving as the regionally nominated Board member for the Rocky Mountain region of the National Audubon Society. She has been a resident of Tucson since 1969 and is active in community affairs.

Cecilia Soto represented the state of Sonora, Mexico, at the state level from 1988-91 and at the Federal level (*diputada*) from 1991–94. In 1994, she was a presidential candidate in Mexico. She also served as the Secretary of the Ecology Commission, and participated in the preparatory meetings in New York for the Rio Declaration.

Robert Strain is Assistant Vice-president and Director of Information Technology of Science Applications International Corporation (SAIC). He is active in the affairs of Cochise County, serving as President of the Sierra Vista Economic Development Foundation, and is also a member of Friends of the San Pedro.

Kenneth R. Symmes is a former Brigadier General of the US Army (Signal Corps) and is currently working as a telecommunications consultant. He has been a resident of Sierra Vista for the past 25 years and is secretary/treasurer of the Cochise County Industrial Development Authority and secretary/treasurer of The Huachucans, a local community group.

John D. Wirth is President of the North American Institute, headquartered in Santa Fe, New Mexico, and was appointed by the White House to serve as one of five US members of the Joint Public Advisory Committee (JPAC) of the CEC in 1994. He was named Gildred Professor of Latin American Studies at Stanford University in 1991 and has written extensively on the issues of transborder air pollution and environmental history.

Conclusions and Recommendations

In the present document, the Secretariat reports to Council on the nature of the challenges faced in the San Pedro River basin and the potential for cooperative actions to address them. In so doing, the Secretariat does not seek to improve upon the outstanding work of the expert team and the advisory panel, which were responsible for undertaking the substantive elements of the study. The reports of those two groups together present a baseline of current conditions and an outline of promising directions for a sustainable future in the river basin. Rather, this report highlights several key elements from those documents and brings to Council's attention actions it can take to support the initiatives described by the expert team and/or recommended by the advisory panel. Collectively, we believe these efforts will serve as a reference point for action for years to come.

Conclusions of the CEC's Upper San Pedro River Initiative

1 Coordinated binational resource management is essential to protecting valuable habitat in the upper San Pedro basin.

The profusion of cross-border contacts among nongovernmental organizations, scientific bodies, business, and all levels of government are evidence of the evolution of our traditional approaches to transboundary resources in response to the reality on the ground. Already, our border institutions are responding to revolutionary communications technologies in ways that promote greater transparency and public participation in decision making along the borders. And our improved understanding of the ecological functioning of ecosystems has forced us to recognize their complex interdependencies. Both the expert team and the advisory panel recognized these end-of-the-century developments. In this sense, their analysis and recommendations constitute a truly 'modern' approach.

While the specific physical, cultural and economic settings of different transboundary basins argue against a uniform, 'one-size-fits-all,' approach to transboundary watershed management, a number of common process considerations and substantive principles emerge from the work of both the expert and advisory bodies. Indeed, the process of developing the upper San Pedro report itself provides insight into various approaches to complex regional issues of a transboundary nature. At a minimum, the lessons of cooperative transboundary resource management must begin with sound science, public access to information and a full menu of cooperative management tools and strategies that account for the interdependent ecological realities of watersheds and their inhabitants.

The need to enhance transborder cooperation among stakeholders in the upper San Pedro basin was recognized by the expert team, the advisory panel, and many commentators from both Mexico and the United States.

Many participants have proposed the development of a binational management plan. As the advisory panel noted in their report, "a long-term, sustainable solution will require a well coordinated comprehensive basin-wide plan involving the participation of all principal stakeholders in the upper San Pedro valley." The expert team also addressed the need for coordinated resource management (Section 6.5) and proposed a number of actions that would lead to the creation of a basin-wide strategic plan (Section 8.1).

The advisory panel made two recommendations contemplating the participation of relevant international agencies:

- "The CEC has initiated a process which we believe has narrowed the bounds of discussion for finding sustainable solutions….[W]e call on the CEC and other international organizations such as the International Boundary Waters Commission (IBWC) and the Border Environment Cooperation Commission (BECC) to be available, if basin residents and their local government entities request their aid, to facilitate and assist in attaining many of the goals and objectives identified in our report." (Panel recommendation B-2)
- "An analysis of the strengths and weaknesses of existing transboundary entities may provide insight into the requirements for effective basin-wide water management. The recently established 'El Paso del Norte Air Quality Management Task Force' represents a good model for binational use and might be a starting point in considering the structure of such a body. The IBWC and the BECC, in

cooperation with federal, state and local officials and private citizens could play an integral role in developing and operationalizing the proposed body." (Panel recommendation B-3)

2 Further research is required to fill a number of gaps in the information base currently available to citizens and decision-makers.

The management of shared resources is improved by making information about the resource widely available to the public. Despite the impressive amount of data currently available in the basin, there are still several unanswered questions regarding the upper San Pedro River system. Both the expert team and advisory panel have outlined a number of areas that they conclude require further research. As the advisory panel observed: "Additional research and intensive monitoring represent important components of an integrated plan to sustain the riparian bird habitat on the upper San Pedro River."

The expert report lists a number of research areas where the knowledge base should be strengthened in order to better guide future strategies (Section 8.2). Although each of the proposed research areas deserve recognition, the following advisory panel recommendations warrant special consideration from Council:

- "We recommend that a broad, interdisciplinary group of experts review and validate the research agenda submitted by the upper San Pedro expert team (and others) in order to prioritize research items and coordinate future research among the many institutions and agencies active in the basin." *(Panel recommendation C-1)*
- "A San Pedro watershed database should be developed to unite and organize available data for the public and experts. Additional information from the Mexican reach of the river is needed to further our understanding of the hydraulic regime in the basin, especially data respecting the southern limits of the aquifer, the impact of water use at the Cananea mines, irrigated agriculture upriver, and the historic and current state of the riparian and upland habitat in Mexico. Additionally, we note the importance of the Charleston and Palominas gauging stations, and suggest the installation of gauging stations at key points along the Mexican reach of the river as well." *(Panel recommendation C-2)*
- "In both countries a host of federal, state and local laws do not always allow or encourage practices that will contribute to sustainable development, maintaining ecosystem values, and preserving an undiminished flow in the upper San Pedro River. Officials and citizens should review relevant laws and regulations thoroughly with a view toward modifying laws that militate against a sustainable future for the river." *(Panel recommendation B-1)*

3 Diverse stakeholders from the region are actively engaged in developing strategies for enhancing and preserving the riverine ecosystem of the upper San Pedro watershed. More can be done to support and facilitate these efforts.

A robust dialogue between local groups, elected officials and business has contributed to greater consensus on the nature of the problem and resulted in the development of specific initiatives and actions.

Since the initial consultations were held last summer, citizens on both sides of the border have formed (or have continued) joint task forces, consultation bodies and study groups. Governments can assist by helping to design, and participate in, a comprehensive process to channel the energy of local 'champions' on both sides of the border into a coordinated, basin-wide effort. Once stakeholders have developed a clear set of priorities and options, the process must provide a forum for cross-border dialogue to ensure that actions are coordinated and complementary.

In addition to those outlined above, a number of advisory panel recommendations establish a procedural framework for attaining these goals and provide the Parties with clear guidance on future directions. Below, we highlight several of the most relevant recommendations.

In the United States:

- "We encourage the voluntary retirement of irrigated fields in the basin between Mexico and the northern boundary of the SPRNCA. These areas should be converted to other types of open space, such as non-irrigated range land, parks, or wildlife preserves through outright purchase or through the

use of conservation easements. Other undeveloped parcels of land in that area should be considered for the same action, particularly if they have a potential for irrigation." *(Panel recommendation A-2)*

- "A mechanism must be developed to constrain the continued overdraft of groundwater and to assure that future conservation and recharge efforts benefit the San Pedro River." *(Panel recommendation A-3)*
- "Water conservation education efforts should be pursued with vigor," and "one central entity or agency should be designated and funded to conduct a continuing public information and education program." *(Panel recommendation A-11)*
- "Establish a partnership between private and public local leaders to implement a set of projects and activities as identified more specifically through the baseline research, the expert's report and the public input process. Simultaneously, a broader planning process designed to converge with Mexican planning initiatives should be initiated." *(Panel recommendation B-4)*
- "Federal, state, local, and private funding sources should be tapped to contribute to solutions in the basin. However, funders should receive meaningful assurances that the impact of their contribution will not be offset or neutralized by the actions of non-cooperative user groups. A comprehensive, binding, long-term plan could provide the kind of assurances likely to attract substantial funding from outside the basin." *(Panel recommendation B-5)*

In Mexico:

- "An open and participatory consultation process should be designed and carried out to provide information and guide future initiatives. The outreach strategy should be conducted with the awareness that grasslands and riparian habitat are showing increasing signs of stress, threatening the livelihood of local residents." *(Panel recommendation B-6)*
- "Following more extensive stakeholder consultations and a public information campaign, Mexico should consider anew an earlier proposal crafted by the *Centro Ecológico de Sonora* and adopted by Conabio to create a conservation zone within specified portions of the sub-basin." *(Panel recommendation B-7)*
- "The CEC should remain available to work with the appropriate Mexican authorities to enlarge public participation and build capacity on the Mexican side of the watershed. Specifically, the CEC could assist by promoting public outreach and education and by working with Mexico to hold additional workshops and informational sessions. Residents in Mexico must be given the opportunity to study the resources of their basin and determine future direction and priorities for water use. Such a process will assure the public knowledge of existing science and will help identify areas in need of further research." *(Panel recommendation B-8)*

4 In order to continue fostering public support for the preservation of migratory bird habitat, the broader public should be kept informed of the challenges and opportunities in conserving and protecting valued transboundary resources.

While the importance of local stakeholder involvement can not be understated, we are mindful, as the advisory panel notes, that the San Pedro valley constitutes a unique and special place of national and continental importance and, as such, is deserving of broader recognition.

Throughout the San Pedro Initiative process, the CEC Secretariat has made relevant documents, including the expert team and advisory panel reports, available to citizens throughout North America via the CEC's web site and direct mailings. News regarding the initiative was also reported in over 20 newspapers and magazines across the United States and northern Mexico, as well as on local television and radio. Finally, the work of the CEC is also being disseminated to the broader public by others who have featured the San Pedro to students and the public in a variety of fora, including, most recently, the La Paz Binational Conference on Groundwater Management, the Sutton Colloquium on International Environmental Law and Policy, and the Second Annual Meeting on the Border Environment.

The San Pedro Initiative is but one of many designed to ensure that migratory pathways for birds and other species are protected in North America. The CEC and its member governments can multiply their efforts to make their citizenry aware of the benefits of conserving these special places.

For example, the Secretariat of the CEC is currently developing a project to evaluate and promote ecotourism opportunities in protected areas across North America. In addition to encouraging economic policies that conserve, protect, and enhance the natural environment, ecotourism can serve as a valuable educational tool in the promotion of exceptional habitat. Yet another CEC project will establish biodiversity conservation mechanisms that will enable the Parties to identify biological priorities and initiate collaborative actions to protect North American bird populations and support the conservation of migratory and transboundary species and their habitats.

Recommended Council Actions

Despite several early signs of progress, transforming proposals into concrete actions on the scale necessary to protect the watershed will not likely be accomplished without agreement on an overall framework for continuing cooperation. Council is in a unique position to facilitate the development of such a framework, using the recommendations from the expert team and advisory panel as a starting point for coordinating national departments and agencies in formulating a unified and comprehensive response.

Having considered the issues raised in this report, Council may wish to formulate recommendations to the Parties and/or direct the Secretariat to undertake the following actions:

1) Designate an interagency working group to develop an implementation strategy for selected panel recommendations, including a mechanism for binational consultation and cooperation.
2) Provide direct support for local efforts, such as the Upper San Pedro Partnership and other emerging proposals, as part of the CEC's North American Bird Conservation Initiative (CEC Project 99.02.05).
3) Direct the Secretariat to work with the Parties and others to identify potential funding mechanisms to support the implementation of selected advisory panel recommendations
4) Organize a workshop on lessons learned in transboundary water management, with a particular emphasis on regional, basin-specific management frameworks for transboundary groundwater resources. Workshop attendees would include representatives from relevant local, state and federal government and others, including institutions involved in transboundary resources along the US-Mexico border, such as the IBWC, BECC and NADBank. In addition, the workshop should include certain key institutions from outside the US/Mexico border area that have acquired considerable experience in addressing similar issues, such as the International Joint Commission (IJC).
5) Initiate a pilot project to apply the principles and approaches developed in the CEC's work on Sustainable Tourism in Natural Areas (Project 99.01.05). The upper San Pedro valley already attracts roughly US$6 million in tourism revenue, much of which is directly related to bird watching. However, the benefits from virtually all of the valley's tourism are currently incurred within the US portion of the basin. Although ecotourism will not, in itself, provide the ultimate solution for preserving the upper San Pedro River ecosystem, it does provide an important opportunity for economic betterment in both countries.

Attachment 1

Sustaining and Enhancing Riparian Migratory Bird Habitat on the Upper San Pedro River

San Pedro Expert Study Team Report

Executive Summary

March 1999

Objectives and Scope

This report was prepared by an interdisciplinary team of experts commissioned by the Secretariat of the Commission for Environmental Cooperation (CEC), which was established under the North American Agreement on Environmental Cooperation (NAAEC), the environmental side agreement to the North American Free Trade Agreement (NAFTA).[1] The biological treasures of the planet are often not confined within national boundaries. Structures for multi-national conservation of such shared resources are rare. As an adjunct to the trading relations created by NAFTA, the CEC provides an important opportunity to address the nexus between uniquely valuable transborder riparian habitat for migratory songbirds and the pervasive depletion of groundwater in the rapidly developing border region between the United States and Mexico. As this report reveals, the best prospects for solutions will require an unprecedented degree of cooperation by government and citizenry on both sides of the border.

Economic and ecological values converge dramatically along the upper San Pedro River. Originating in Sonora, Mexico, the San Pedro River runs north into Arizona, where the river and the aquifer that helps supply it nourish a diverse and growing community of ranchers, farmers, urban dwellers and military base residents. The San Pedro watershed is also home to one of the largest surviving expanses of southwestern cottonwood-willow riparian forest, serving as an important corridor for millions of migratory birds. The riparian area along the San Pedro is a lifeline for a great variety of birds that winter in Mexico and breed during the summer months in the United States and Canada. Over the past several years, there has been growing concern that this valued ecosystem, and the hydrological system that supports it, may be on an unsustainable course.

The objective of this investigation is to provide information of use in maintaining a high quality, self-sustaining riparian ecosystem within and beyond the San Pedro Riparian National Conservation Area (SPRNCA), which the US Congress established in 1988 in recognition of the unique and fragile San Pedro riverine ecosystem. In 1996, the SPRNCA was recognized by the CEC Council as an "Important Bird Area" of concern to the countries that signed NAFTA.

The team was charged with conducting an independent, objective and technically sound inquiry into the operative ecological, biohydrologic, socio-economic, and legal/institutional circumstances that characterize the availability of base water flows needed to sustain and enhance the riparian area along the upper San Pedro River, with particular emphasis on the area highlighted by the Council as an "Important Bird Area." The report also contains a neutral evaluation of the potential efficacy and practicality of the solution opportunities under active discussion and consideration by the responsible governmental agencies and local water-use stakeholders.

The expert team has adopted a bird's eye view of habitat availability, which transcends political boundaries and considers the upper San Pedro basin as a unitary ecosystem. We have utilized existing data and analytical tools, combined with extensive interviews of knowledgeable governmental and nongovernmental experts. We have been impressed with the universal importance to the quality of life in the valley that is attached to the riparian zone and its wildlife by all of the persons we have interviewed, notwithstanding their disparate interests and perspectives.

Substantial consensus exists as to the nature of the hydrologic problem. Solutions in the basin are inhibited not so much by conflicts over hydrology as concerns over the allocation of the costs and benefits of the remedies. It is unlikely that any set of solutions will work unless the responsibilities of conservation are shared and the importance of locally generated and supported initiatives cannot be overstated.

[1] NAAEC was negotiated by the United States, Canada and Mexico. It provides a framework, and establishes the Commission for Environmental Cooperation, to facilitate effective cooperation in the conservation, protection and enhancement of the environment in the three countries. An objective of the Agreement is to "increase cooperation between the Parties to better conserve, protect and enhance the environment, including wild flora and fauna" and the Council of the Commission "may consider and develop recommendations regarding the conservation and protection of wild flora and fauna and their habitat, and specially protected natural areas and the protection of endangered and threatened species." This report to the Secretariat of the Commission was developed under Article 13 of NAAEC. That article enables the Secretariat of the Commission to prepare reports for Council on any matter within the scope of the Commission's annual work program.

Analytical Approach

The report employs a cascading analysis, starting with a description of the habitat characteristics that need to be sustained if the area is to continue to serve as the refuge for millions of songbirds on their migration path within North America. The report then analyzes the stream flows, root zone moisture, and floodplain groundwater depths necessary to maintain the riverine habitat the birds depend on. Since baseflows and other water sources are a function of discharges from the regional groundwater aquifer, we then analyze and quantify the effects on baseflow of the net depletions to the aquifer (resulting from the existing withdrawals exceeding the annual recharge) which amount to an estimated 7,000 acre-feet per year at the current level of pumping. The relative demands and economics of the current water uses are also described. Finally, the report evaluates a number of options for either bringing the aquifer closer to balance or supplementing baseflows as needed.

With respect to the Mexican side of the border, the report analyzes the cross-border hydrologic connections, the potential for improving the riparian habitat south of the border to create an expanded and continuous adjacent riparian conservation zone, the requisite changes in groundwater withdrawals in Mexico, and the resulting effects on baseflows on both sides of the border.

Ecological Features

The San Pedro River riparian ecosystem is of critical importance in maintaining regional biodiversity at the ecotone between the Sonoran and Chihuahuan Deserts and Plains grassland. It contains one of the richest assemblages of species and supports one of the most important migratory bird habitats in North America; indeed, roughly half of the birds that breed in this arid region are dependent upon it. Today, over 20 different biotic communities occur in the upper San Pedro River basin, and the river itself sustains three types that are considered endangered:

- Fremont cottonwood/Goodding willow forests: yellow-billed cuckoo, yellow warbler, gray hawk, southwestern willow flycatcher and Wilson's warbler are among the many bird species that depend on these forests for their dense canopy, structural diversity, and rich insect-based food source.
- Riverine marshlands or *ciénegas*: these areas often have the highest avian species richness of any area along the river.
- Big sacaton grasslands, a vegetation type that has declined by over 90 percent due to land conversion and hydrologic change: among the birds that use the sacaton grasslands are Botteri's and Cassin's Sparrows.

The Mexican portion of the watershed lies within a region called the Mexican Xeric Formation, which is considered "regionally outstanding" due to its biological values. Four major biotic communities have been identified in the watershed, two of forest affinities and two of grassland affinities. These include some 260 species of vertebrates of which 64 species are threatened, endangered or rare, such as the black tail prairie dog, the Mexican gray wolf, and black bear in the mountain region. A total of 117 species of birds have been identified in the area, and 16 are listed under some protection status. Since 1970, there has been a notable decline in the natural riparian habitat, particularly along reaches near the US border.

On the US side of the border, the San Pedro River has one of the highest bird diversities of areas its size in the United States:

- Nearly 390 bird species have been recorded within the upper San Pedro River valley (more than 350 of them within the boundaries of the SPRNCA), of which 50 are neotropical migrants.
- Between one million and four million migrating songbirds use the riparian habitat annually as they move between their wintering grounds in Mexico and Central America and their breeding grounds in the United States and Canada.
- More than 15 percent of the world's known population of western yellow-billed cuckoo breeds along the San Pedro.
- The southwestern willow flycatcher, listed as endangered by the US federal government, has recently (1997) attempted to nest in the SPRNCA after a 25-year absence. This attempt was unsuccessful and the

species did not nest in the SPRNCA in 1998. The SPRNCA has been designated critical habitat for this species.

- Twelve bird species found annually along the Upper San Pedro are classified as *Wildlife of Special Concern* in Arizona. This represents 41 percent of the birds found on that list. These species are American bittern (rare migrant), least bittern (rare migrant), bald eagle (rare winter visitor), Swainson's hawk (summer breeder), ferruginous hawk (rare winter visitor), western yellow-billed cuckoo (summer breeder), green kingfisher (resident), southwestern willow flycatcher (summer breeder), thick-billed kingbird (rare migrant), azure (eastern) bluebird (irregular in winter), Swainson's thrush (rare winter visitor) and Baird's sparrow (rare winter visitor).

The SPRNCA currently contains, or contained within the last 150 years, more than 80 species of mammals, one of the richest assemblages of land mammal species in the world. More than 40 species of reptiles and amphibians have also been found within the boundaries of the SPRNCA.

The upper San Pedro River provides habitat for at least three species listed as federally endangered by the United States Fish and Wildlife Service: southwestern willow flycatcher, Huachuca water-umbel, and jaguar. Critical habitat has been designated along the San Pedro River for the southwestern willow flycatcher.

Throughout this document, when we use the term 'riverine,' we are including the aquatic and wetland ecosystems that occur in and along the river as well as the riparian vegetation and other life forms that occur along the river banks and throughout the floodplain.

Biohydrologic Requirements for Riparian Habitat of the Upper San Pedro River

Riparian ecosystems are fragile. The abundance, diversity, and health of riparian and wetland ecosystems are strongly influenced by the hydrologic regime, that is, by the amount, timing, and pattern of surface and groundwater flow.

The San Pedro is uninterrupted by dams, from its headwaters in Sonora to its confluence with the Gila River in Arizona, the only major diversion being downstream of the SPRNCA at St. David. Surface water flow varies strongly between and within years. During storm flows, the shallow alluvial aquifer (or flood plain aquifer) is recharged by the stream. This supports both the riparian vegetation and provides groundwater flow back to the stream from the shallow aquifer following storms. Overbank flows (floods) in summer and winter also directly provide a source of water for the riparian biota. Winter floods and associated high spring flows maintain a rich diversity of native forbs and grasses and create the conditions that allow for new generations of pioneer cottonwood and willow trees to establish, by depositing sediment and moistening seedbeds.

The San Pedro has its lowest stream flow rates in April through June. Stream flow during this period derives mainly from groundwater inflow. These low flows are the maintenance flows that provide essential conditions for survival of riparian biota. Discharge from the aquifer provides the baseflow of the river during this period. These discharges come from the very large transnational regional aquifer, which holds some 50 million acre-feet of groundwater in storage in the Sierra Vista sub-basin. A flood plain aquifer of varying extent mediates between this regional aquifer and the surface flows.

As stream flows change from perennial to intermittent and as depth to groundwater increases, wetland plant species decline in abundance while upland species increase. At depths approaching about five meters, groundwater becomes inaccessible to most herbaceous species. Of the tree species in the San Pedro riparian ecosystem, Goodding willow and Fremont cottonwood require the shallowest groundwater. Compared to Fremont cottonwood, salt cedar is more drought tolerant, deeper rooted, better able to access deeper groundwater, and better able to use precipitation-based soil water in addition to groundwater. Thus, it often displaces Fremont cottonwood as conditions become dry. Much of this change occurs along a continuum, but, to some extent, thresholds of change can be identified.

The desired state is one typified by the highest level of native species diversity, community-type diversity, productivity, and resistance to disturbance. Ecosystems with these characteristics are considered to have the greatest degree of ecosystem health. This state is characterized by perennial (year-round) surface flows

and by floodplain groundwater that does not drop below the level of the stream thalweg (low point of the channel) any time during the year. Although many types of riparian plants (including Fremont cottonwood) tolerate intermittent stream flows, many of the other components of a healthy riverine ecosystem do depend on perennial stream flows. These conditions provide for the greatest avian diversity and abundance, and should be maintained over much of the length of the San Pedro River. These conditions maintain habitat for the southwestern willow flycatcher, green kingfisher, gray hawk, western yellow-billed cuckoo and neotropical migrants.

Groundwater-Surface Water Interactions in the Upper San Pedro Basin

In the natural or pristine state of groundwater systems, recharge is in dynamic equilibrium with discharge. The recharge comes from precipitation while the discharge under natural conditions goes to: 1) support riparian vegetation, and 2) provide the baseflow to streams. Groundwater pumping disrupts the natural balance because an additional discharge is imposed on the system. To reach a new steady state, recharge must be increased or discharge must be decreased, and/or both.

Withdrawals due to pumping will eventually be offset by reductions in the groundwater discharges that maintain baseflows in the river and are used by riparian vegetation. Thus, in the upper San Pedro basin, pumping reduces the flow of the river and consequently adversely affects the riparian vegetation. In order to maintain the riverine habitat in a healthy state, it is necessary to maintain flow in existing perennial reaches of the upper San Pedro River, even during prolonged dry periods.

Trends in the flow of the river are of interest in assessing anthropogenic impacts. The long-term trend in low-flow conditions was investigated using a moving set of 10-year flow-duration curves at the Charleston and Palominas gauges. It is clear that the low flow has been steadily decreasing over the period of record, which begins in 1935. The recorded flow at Palominas is especially interesting, since it is the highest gauge on the river. The plot of flow at Palominas indicates that the flow, even in the 1940s, was about 50 percent of the flow at Charleston. This suggests that between Palominas and Charleston the river gains in baseflow from groundwater discharge. Today, the flows in the reach upstream of the SPRNCA are intermittent.

Important also is the fact that the low flow at Palominas has steadily declined since 1940, reflecting groundwater withdrawals both in Mexico and in the Palominas area of the United States. There is little doubt that agricultural pumping near the river, on both sides of the border, has contributed significantly to this trend. Although much of the irrigation has been eliminated in the US portion of the basin, irrigation near the border in Mexico appears to have increased since 1970.

Models developed by the Arizona Department of Water Resources and others indicate that groundwater pumping in the Sierra Vista sub-basin has impacted baseflow in the river, reducing the groundwater discharge at this point to perhaps 30 percent of its initial amount. In some places the gradient (or slope) of the water table is currently flat, indicating that groundwater is no longer flowing to the river at these locations. The models of the system suggest that the pumping probably began to have a significant impact in the 1960s and 1970s.

The transborder connections between groundwater sub-basins of the upper San Pedro basin are not well known. As a result, there remains considerable uncertainty as to the overall effect of groundwater pumping in Mexico. The contribution to SPRNCA baseflows from Mexico appears minimal at this time. Agricultural pumping south of the border is likely to impact stream flow entering the United States, but it is not likely to effect groundwater levels in the Sierra Vista sub-basin. Pumping in the Cananea region, located in the far southern portion of the watershed, is too far removed to directly impact groundwater in the Sierra Vista sub-basin. However, pumping in this area undoubtedly impacts the baseflow of the river near Cananea.

Water-use Patterns and their Social and Economic Context

In addition to the water demands of the riparian vegetation itself (from evapotranspiration), the principal competing claimants on the aquifer system are irrigated agriculture, the private water companies serving the municipality of Sierra Vista and Fort Huachuca, and domestic wells in the unincorporated area of Cochise County. These are listed in the order of potential threat to the hydrologic balance necessary to maintain riparian habitat in the SPRNCA, reflecting the resurgence of irrigation, expanding urban centers, and the

reduction in demands by the fort as a result of recent conservation and recycling efforts and recent military basing decisions, such as downsizing. The groundwater sub-basin deficit today is approximately 7,000 acre-feet per year and, in the absence of the type of control measures and enhancements evaluated in this report, at growth rates projected by the Arizona Department of Water Resources, this will increase to 13,000 acre-feet by the year 2020. Overall, the rate of extractions from the aquifer increased substantially from 1940 to 1988, the date at which the SPRNCA was created, and has declined slightly since then.

Two aspects of the local water economy warrant particular notice in devising a conservation strategy for the SPRNCA. First, the staple of the local economy is Fort Huachuca and the supporting services provided by the basin's only substantial urban center, the city of Sierra Vista. The city and the fort are the largest and second largest water consumers in the basin, respectively. Second, the importance of irrigated agriculture to the local economy is small compared to the potential impacts of that water use upon the aquifer water balance.

When the SPRNCA was designated, the Bureau of Land Management (BLM) purchased and retired the then-existing irrigation water rights within the SPRNCA. A purchase by the Nature Conservancy of the remaining 202 hectares (500 acres) of irrigated lands outside the SPRNCA completed the buyout of agricultural use. Recently, however, agricultural pumping has renewed in this area. Large new irrigation wells have been developed to irrigate over 500 acres of land. A potential conflict with irrigated agriculture relates to the SPRNCA being a prime area for birdwatching. Current local revenues based on 1997 bird watching signups suggest an economic impact that may exceed US$6 million per year from this activity.

Solution Opportunities

The fundamental purpose of this report is to add to the discussion over whether and how the communities on both sides of the border, by their own initiative and through their governmental institutions, can control the fate of the priceless riparian habitat of the San Pedro Basin. Unless steps are taken, water-use trends which are already established will eventually jeopardize this natural asset which enriches the quality of life within this basin and the biodiversity of the entire hemisphere.

Ironically, as one scientist has commented, the threat to the SPRNCA is not that water is scarce in the upper San Pedro basin, but that it is abundant. Because the regional aquifer holds so much water, new wells are readily and inexpensively developed. It is hard to convince local water users that there is a water supply problem requiring restrictions on land uses. Yet, the basin is in deficit by an estimated 7,000 acre-feet per year and this deficit is certain to grow in the absence of policy interventions. The "water user" that will first experience the consequences of this deficit is the baseflow in the San Pedro, on which the vitality of the riverine habitat depends. Like the proverbial canary in the mine, only when this habitat expires will other water users know they have a problem. But by then it will be too late to take the measures necessary to preserve it. Indeed, at that point the necessary measures will entail dramatic reductions in the level of groundwater extractions that have been allowed to develop in the meantime. Limiting aquifer development is itself a difficult task; reversing development may be impossible.

The report looks at only those solution opportunities that would be effective under current conditions. While river entrenchment due to an earthquake last century or reduced precipitation due to climatic variations may affect river flows compared to some historic baseline, these factors are not susceptible to human intervention today. Moreover, while the growth of riparian vegetation is today a significant "consumer" of water in the system—indeed, the largest single consumer, as reflected in the water budget—the objective of this report is to determine how this natural treasure can be sustained, not reduced to accommodate unbounded human demands. (In fact, there is reason to doubt that reduction in cottonwood cover would reduce evapotranspiration, as the report reveals.) The range of management options considered is limited to those that are consistent with that objective.

In sum, the major threats to the viability of the riparian resource are the creeping incremental demands on the groundwater that sustains it. But the problem to be addressed is not just tomorrow's development of the aquifer. Even the current level of development of the aquifer is unsustainable and will eventually bring this resource to grief unless mitigating measures are taken.

The report evaluates measures to recharge the aquifer and measures to reduce extractions from it. The solution opportunities evaluated in this section fall into these two categories. This combination of strategies

would substantially reduce the hydrologic deficit but would not be sufficient to balance the water budget at the current level of development, leaving the riparian habitat at perpetual risk. Looked at analytically, there are three ways to address the residual deficit: (1) reduce water consumption below the current levels, which would entail reversing growth in the basin with severe economic consequences; (2) import water from other basins, which would be costly, legally complicated and potentially counterproductive if it fuels additional water demands; or (3) draw on the water in storage in the aquifer, which would add to the deficit.

The expert team was able to identify only one wholly in-basin strategy that would bring the aquifer into balance. We do not propose this scenario; but in the interest of complete analysis, we describe it as follows. The basin could sustain a riparian habitat zone comparable in quality and extent to the SPRNCA if the protected area were shifted southward to straddle the US-Mexico border. The report shows that it is possible to re-establish the riparian habitat zone within the Mexican reach of the San Pedro to a level comparable to that of the SPRNCA by restoring flows by retiring irrigated agriculture and restricting grazing access. The perennial flows in the reach from the border to the vicinity of Charleston can be maintained by redistributing the current pumping for the city of Sierra Vista and Fort Huachuca to locations north of the Babocomari Valley, out of the Sierra Vista sub-basin. This would likely decrease the discharge to the river in this northern reach and, in effect, sacrifice its riparian habitat quality in exchange for re-establishing habitat of approximately comparable quality within Mexico, south of the existing SPRNCA. The reach north of the Babocomari can be salvaged under this scenario by importing water from other basins to meet the needs of Fort Huachuca and the private water companies, thus avoiding the development of new wells in the northern reach.

The solution opportunities evaluated in the report fall into three categories of acceptability, as follows:

1) *Measures that are hydrologically effective and economically achievable:*
   - reducing irrigated agricultural use on the Mexican side of the border to enhance riparian habitat and increase baseflows;
   - limiting extractions for irrigated agriculture from the aquifer on the US side of the border; and
   - water conservation and recycle/recharge initiatives to reduce demand on the aquifer for domestic water use, including Sierra Vista, Fort Huachuca and Cochise County.
2) *Measures with uncertain or unquantified hydrologic benefit:*
   - improving mountain front recharge along the Huachuca Mountains;
   - reintroducing beavers into the San Pedro River;
   - improving the vegetation on the valley floor to increase recharge to the aquifer;
   - local runoff retention and infiltration enhancement projects; and
   - pumping groundwater to maintain streamflow in periods of drought.
3) *Measures that are economically problematic:*
   - closing Fort Huachuca;
   - importing water from the Douglas basin or the Central Arizona Project; and
   - redistributing pumping to minimize the cone of depression near Fort Huachuca and Sierra Vista.

The report concludes that the most hydrologically effective and institutionally practical conservation initiatives include the aggressive pursuit of water conservation and recycle/recharge programs and the reduction of current agricultural extractions from the aquifer.

1 Initiatives to Reduce Extractions from the Binational Hydrologic System

It is important to recognize the strong efforts in water conservation that have been implemented and that are being discussed at Fort Huachuca and the city of Sierra Vista. The fort has capped off old lines, retrofitted residential units to low flow and adopted xeriscaping, now conducts leak detection surveys, uses treated effluent on lawns and golf courses, captures rooftop water for use on vegetation, and employs other practices. The city of Sierra Vista has implemented demonstrations and community outreach, retrofitted to hands-free water facilities, adopted desert landscaping, encouraged giving restaurant water only on request, given awards for community stewards of water, performed water audits, and is moving into recharge of

treated effluent. These efforts demonstrate that the community is active in addressing the water issues of the region. Other potential water-saving opportunities are discussed below.

a) Reduce and limit extractions for irrigated agriculture from the aquifer on the US side of the border

The amount of agricultural water use in the US portion of the basin is small today, but has a pronounced effect on the flow of the river. Eliminating irrigation in the basin, especially in the Hereford area where it is relatively close to the river, would have a well-defined, positive impact on the flow of the river. This statement is targeted to irrigated agriculture and does not include the ranching community.

The greater problem may be future agricultural well development. The amount of land in private and state ownership near the river is quite extensive and these lands are potentially available for agricultural development. The cost of buying out agricultural irrigation rights on the non-federal lands near the river should not be large and the potential loss in economic activity in the basin associated with such buy-outs would be small. Three avenues for eliminating agricultural irrigation extractions from the aquifer are evaluated:

- creation of an irrigation exclusion zone in the Sierra Vista sub-basin, by acquiring irrigation development rights from private land owners on a voluntary and compensated basis and by exchanging state lands for BLM lands in upland areas;
- utilizing regulatory devices such as restrictions on irrigation under the Arizona Groundwater Management Act and prohibitions on actions that affect habitat for endangered species under the federal Endangered Species Act; and
- obtaining a decree for the fundamental reserved water right to baseflows in the San Pedro Riparian Conservation Area under the Gila Basin General Adjudication that would be superior to the post-1988 rights to pump subflow for irrigation.

The acquisition and exchange option is deemed preferable to the regulatory option because it is likely to be more acceptable to the local community and because Arizona's legal restrictions on access to aquifers do not fit the San Pedro baseflow situation very well. It is also preferable to the water right adjudication because it is more certain and prompt.

b) Reduce irrigated agricultural use on the Mexican side of the border to enhance riparian habitat and increase baseflows

Although it has declined, there is a reasonably healthy and well-developed riparian corridor along the main stem of the San Pedro River in Mexico. There is also significant groundwater development for irrigation in Mexico, not far south of the border. Much of the irrigation in Mexico is in the flood plain of the river, within three to five kilometers (two to three miles) of the stream. Reducing irrigation along the border in the Mexican portion of the basin would be helpful in restoring and maintaining the riparian corridor in Mexico. This would make possible the creation of an adjacent or binational riparian conservation zone. Such an area would be beneficial not only to migratory wildlife but would also have carbon sequestration potential and some tourism potential. An opportunity to enhance tourism in Mexico, perhaps by extending the excursion train that runs along the San Pedro River, would yield economic benefits while preserving the riparian corridor.

Optimistically, a significant reduction in irrigation on this stretch of the river could also restore low flows at Palominas to about the 1940 level. That would mean an improvement from about two cubic feet per second (cfs) in median flows (50 percent exceeded) today to about seven cfs. Such an improvement would be likely, even considering the additional water that would be consumed by the riparian vegetation (evapotranspiration) that might be restored south of the border. The five cfs improvement would yield about 3,500 acre-feet of additional water at Palominas, some of which could be available to counteract the hydrologic deficit in the US portion of the basin. However, the social and economic implications of retiring irrigated agriculture in targeted areas of the Mexican portion of the basin must be considered.

Before irrigated agriculture can be retired, funding mechanisms must be sought to ensure that affected parties are duly compensated and that viable, long-term economic alternatives are attractive to local residents.

c) Water conservation and recycling initiatives to reduce demands on the aquifer for domestic water use

An array of water conservation and recycling initiatives is being implemented by Fort Huachuca and the city of Sierra Vista. Other initiatives, such as the comprehensive plan of Cochise County and the Water Issues Group, have been aborted (see Appendix F), but may come once again into consideration. All of these would be worthwhile options to keep the hydrologic deficit in the aquifer as small as possible. The most pertinent of these are discussed and evaluated in the report.

d) Reduce demands on the aquifer by Fort Huachuca

This military installation will be subject to continuing review as further base closings are considered. The carrying capacity of the local groundwater system is a relevant factor, and it is obvious that closing the fort or reducing the personnel assigned to it would help restore the regional aquifer to hydrologic balance. However, that measure is neither necessary nor sufficient in itself to solve the baseflow problem for the SPRNCA. Moreover, the hydrologic problem can be solved with far less disruption to the local economy through other solution opportunities. We estimate the loss to the local economy that would be associated with closing the fort at significantly in excess of US$150 million per year.

The fort has made impressive strides in reducing its consumptive water use through conservation and recycling programs, and is actively investigating other recharge options. We are advised by fort personnel that water pumping is down from 3,000 acre-feet annually in 1990 to 2,300 acre-feet today; about 25 percent of the fort's pumping is being offset by sewage recharge, and plans are underway to collect storm water for recharge. The fort's net withdrawal from the aquifer is now probably significantly less than 2,000 acre-feet annually—perhaps less than 25 percent of the total domestic pumping in the basin, using 1990 figures.

e) Limit access to the aquifer for domestic wells in the rural areas of Cochise County

Domestic wells pose less of a threat to the water balance in the basin than irrigation wells because of their smaller capacity. Nevertheless, the aggregate effect of unbounded housing development on private and state lands in the basin could be quite substantial. Growth management devices, such as the density restrictions proposed, but not adopted, in the Cochise Comprehensive Management Plan, would be beneficial. We are advised that these might be acceptable to land developers if uniformly applied and enforced. Over time, growth will need to be managed, otherwise private water consumption will all but guarantee a chronic water deficit situation.

2 Measures to Increase Recharge of the Regional Aquifer

a) Improve mountain front recharge along the Huachuca Mountains

The principal source of recharge to the major aquifer appears to be runoff from the Huachuca Mountains to the west. This runoff may account for as much as 50 to 60 percent of total recharge. Hypothetically, if runoff could be contained in recharge basins, the wetted area would be reduced, which would have the effect of reducing evaporation. This could increase the recharge to the principal aquifer. However, more research is needed to estimate the increase in recharge, if any, and the associated ecological costs.

b) Recharge Sierra Vista and Huachuca City sewage

The city of Sierra Vista is already recharging reclaimed sewage equal to 30 percent of the Sierra Vista pumping, or about 2,000 acre-feet of water annually. The City might improve the efficiency of this project by exploring relocation options relative to the clay deposit in the valley fill west of the San Pedro River. Direct recharge could also be explored instead of a wetland percolation lagoon, but this can only be done with very clean water. Tertiary treatment may be required prior to direct aquifer injection, which may be cost prohibitive. The efforts of Sierra Vista provide insight for Huachuca City in contributing to recharge of treated effluent.

The groundwater basin can be managed by judiciously placing the recharge of Sierra Vista sewage in a location where it will tend to isolate the impacts of the cone of depression on the river. Sierra Vista's consultants ran several groundwater model scenarios in an attempt to locate the place where the impact of the recharge would be most beneficial. A location was chosen where recharge tends to isolate the impacts of the cone of depression from the closest point to the river. However, as long as the deficit in the water balance is not eliminated, the cone will continue to grow, integrating the impact of the sewage recharge until a new

equilibrium is attained. Locating the sewage recharge judiciously, as Sierra Vista has, can buy more time before pumping impacts the river significantly.

c) Re-introduce beavers into the San Pedro River

The BLM is commencing a program to reintroduce beavers into the riparian area of the upper San Pedro River. It is generally accepted that beavers would increase the areas of open water and foster wetlands, thus increasing rates of evapotranspiration from the stream/riparian area. On the other hand, there would be shifts in relative abundance of marshland and forested areas, and thus evaporative increases could be offset by reduced abundance of trees that are transpiring groundwater.

d) Importing water from the Douglas basin to recharge the aquifer

The pattern of water development in the western United States has been one of mining local groundwater until it becomes depleted, and then importing supplemental water from a neighboring basin. Not surprisingly, options for solving the water imbalance in the upper San Pedro basin include water importation. In this section of the report, we summarily consider the possibility of importing water from the Douglas basin to the east. The disadvantages of water importation remedies are twofold: (1) importation tends to transfer the problem of water scarcity to the neighboring watershed and economy, and (2) importation removes the imperative, or at least the incentive, to manage water demands in the basin of import. Imported water tends to fuel additional growth, leading to a continuing cycle of excess demands met through additional trans-basin diversions.

In considering water augmentation options, the expert team is conscious of the importance of structuring them so as to avoid the pitfall of simply fueling unbounded growth in water demands. This could be done by making the right to use imported water conditional upon the recipient achieving a specified target reduction in groundwater use. In this way, a fraction of imported water would be used to support growth and a fraction would be used to reduce the groundwater deficit. Economics is not a barrier to the Douglas basin alternative, but the law is. Currently, transferring water across basins is prohibited. An act of the legislature would be required. The cost of importing Central Arizona Project water, by contrast, is much greater.

Even without interbasin transfer, another possibility to reduce the pressure on withdrawals in the Sierra Vista region relates to 960 acre-feet of water provided by The Arizona Water Company, a Sierra Vista water company, to the City of Bisbee. If this water is pumped from the Sierra Vista basin and delivered to Bisbee, serious consideration is warranted in developing the water sources in the Douglas basin and reducing pumpage by 960 acre-feet in the upper Sierra Vista basin.

3 Pumping Groundwater to Maintain Stream Flow in Periods of Extreme Drought

In order to maintain the riverine habitat in a healthy state, it is necessary to maintain flow in existing perennial reaches of the upper San Pedro River, even during prolonged dry periods. As an emergency measure, groundwater could be pumped into the stream to maintain flow. Our flow-duration analysis suggests that, at current rates of withdrawal, the stream will be dry during the driest months in the driest years. It suggests that if the groundwater discharge to the stream were reduced by two cfs above Charleston, it would be necessary to pump groundwater approximately 10 percent of the time to maintain flow in the stream. However, further study would be required to determine the amount of pumped groundwater required to maintain flow to meet the soil moisture requirements over the full width of the riparian habitat.

Other Possible Water Conservation Tools

There are many additional ways to address a water resource issue such as exists in the upper San Pedro. These include rezoning to control the location of growth and/or to provide for a maximum density of population, purchase of conservation easements, setting a moratorium on building or drilling new wells, limiting or setting a moratorium on new water connections, implementing a maximum aquifer withdrawal level per year, establishing a water market for efficient allocation, etc. These include their own set of challenges, with many requiring dramatic changes in Arizona law. However, we see many of these types of alternatives being implemented in other states.

Institutional Considerations

There are many entities with interests relating to the San Pedro Riparian Zone and the groundwater and surface water on which it depends. They include federal, state and local agencies, local landowners, private water companies and environmental organizations. At present, there exists no process or structure to integrate and produce coordinated plans of action for these entities. This lack of a coordinated planning structure has inhibited the development of a common view of the nature and dimensions of the hydrologic problem affecting the long-term viability of the SPRNCA.

Coordinating structures have been established to good effect in other jurisdictions. We suggest that proven models be adapted and implemented in the upper San Pedro basin. Adaptation will be necessary because the coordinating structure needs to be binational, including both Mexican and US officials and private sector stakeholders. Initially, it might be something less formal than, but might evolve into, a binational river basin commission. Creation through joint presidential proclamations by the two national leaders would lend formality and prestige to such a structure, which would enhance its prospects for success.

Bird Habitat Restoration Opportunities within Mexico

This report describes three potential scenarios for conserving/restoring riparian habitat in the Mexican portion of the upper San Pedro basin. All involve the restoration of surface flows and the exclusion of cattle from the riparian area. The first addresses habitat for migratory birds, the second for breeding southwestern willow flycatchers and the third for western yellow-billed cuckoo. Each requires a more extensive tract of habitat than the one before it. In all cases, more is better and one long continuous tract is better than several smaller islands of habitat.

Considerations for Action

The expert team's work is not really done without briefly indicating where we think our analysis leads. Certain considerations for action are listed at the end of the report. In propounding these we are mindful that this report is wholly the product of the expert team and does not necessarily reflect the views of the CEC, its member governments, or any of the individuals with whom we interacted in our investigation. Our purpose is to improve the quality and expand the bounds of the discussion among the stakeholders about possible courses of action to sustain and enhance the riparian habitat of the upper San Pedro basin on both sides of the border. The ultimate policy decisions lie not with us, but with the San Pedro basin communities and their local, state and national governments.

Attachment 2

Advisory Panel Report on the Upper San Pedro River Initiative

Recommendations and Findings presented to the Commission for Environmental Cooperation

November 1998

Introduction

In addition to serving as one of the most important corridors for migratory songbirds in North America, the Upper San Pedro River and its surrounding habitat constitute an extraordinary biological treasure chest, housing an astonishing number of mammals and reptiles, upland grasses and native trees and shrubs. Containing more than just a river, the San Pedro Valley also possesses an exceptionally clean and clear atmosphere and enjoys a rich cultural and historic heritage, and is home to a steadily growing community of basin residents.

The Advisory Panel is impressed with the value placed on the river by individuals and organizations inside and outside the San Pedro Valley. We believe that the will to protect the river and other valued habitats in the basin exists; the challenge lies in harnessing this energy and channeling it into an enduring and constructive process involving stakeholders from within and outside the basin in both Mexico and the United States. In short, we believe the fundamental question has matured into one of how, not why.

Unlike many watersheds whose riparian habitats have already been lost or significantly degraded, the Upper San Pedro currently supports some of the last and best examples of broadleaf gallery forest and, in Mexico, native grasslands. While more research and monitoring is necessary to better understand how human activity is affecting these systems, action to preserve this special place for generations to come should not be deferred.

Our sincere hope is to begin to give shape and meaning to this new direction in the findings and recommendations that follow.

Procedural History

In May 1997, the Secretariat of the Commission for Environmental Cooperation (CEC) launched the Upper San Pedro Initiative. The objectives of this initiative were threefold:

- Initiate a process where diverse stakeholders from the region can develop and implement economically and environmentally sustainable strategies for enhancing and preserving the riverine ecosystem of the Upper San Pedro watershed.
- Develop a model of cooperation that could have relevance to other transboundary basins.
- Inform the broader public about the regional importance of preserving migratory bird habitat and the challenges and opportunities in conserving and protecting valued transboundary resources.

The three-phase initiative commenced with the commissioning of an independent technical report by an interdisciplinary team of experts on " the physical and biological conditions required to sustain and enhance the riparian migratory bird habitat of the Upper San Pedro River Basin." The draft report was released on 15 June 1998, and was revised and reissued on 8 September, subsequent to the phase II public review and comment process. A final report will be issued by the expert team.

Phase II included a public review and comment process eliciting responses to the 15 June technical report, which fostered a community dialogue about the findings of that report and the future of the river basin.

Phase III convened the thirteen-member Upper San Pedro Advisory Panel to consider the issues raised in the report and by the public and to formulate recommendations on future directions to meet the goals identified by the public and the expert team.

Preamble

Recognizing the need and importance for cross-border cooperation to protect and conserve valued transboundary ecological resources and applauding the CEC effort to promote and foster such cooperation;

Acknowledging the extraordinary ecological significance of the binational San Pedro River, including its role as an important corridor for migratory birds, and emphasizing the value placed on this resource by local, national and international communities;

Mindful of the need to implement equitable strategies respectful of national sovereignty and the unique cultural, economic and social characteristics of basin residents;

Commending the Upper San Pedro Expert Team for preparing a science-based evaluation of the state and sustainability of the riparian habitat along the Upper San Pedro River;

Concerned that the Upper San Pedro River is threatened by unsustainable water use patterns; and

Convinced that local solutions are essential and that participatory and straightforward processes must be designed to ensure that local solutions are proposed and adopted,

The Upper San Pedro Advisory Panel respectfully issues the following findings and recommendations

1 General Findings

The Upper San Pedro River[1] constitutes one of the most important remaining flyways for neotropical migratory birds wintering in Mexico and breeding in the United States and Canada. The riparian and surrounding upland habitat also supports one of the richest assemblages of biodiversity in North America. The continental importance of the riparian zone is beyond dispute.

The riparian habitat is sustained by baseflows from the regional aquifer. The best available evidence indicates that the riparian and other important habitat along the San Pedro River from the Mexican border through the northern boundary of the San Pedro Riparian National Conservation Area (SPRNCA) will be jeopardized if the overdraft from the aquifer is not addressed. Despite some uncertainties, there is persuasive evidence that the baseflow in the US reach of the river will be affected in the future if the current rate of withdrawals from the aquifer remains unchanged. In Mexico, there is growing awareness of symptoms indicating stresses on the grasslands and riparian areas of the Mexican sub-watershed.

We believe the unique ecological treasures of the Upper San Pedro can and must be preserved, yet there is no one solution to reducing any overdraft of the regional aquifer that may exist and to bringing the groundwater budget into balance. Indeed, a long-term, sustainable solution will require a well coordinated, comprehensive basin-wide plan involving the participation of all the principal stakeholders in the Upper San Pedro Valley. Multiple initiatives must be deployed, and all those involved in accomplishing them should share burdens equitably.

First priority should be given to voluntary initiatives implemented at the local level, with intensive monitoring to assess whether and when to consider more rigorous measures. Similarly, priority should be accorded to those projects or actions that yield the greatest impact at the lowest relative cost. Ultimately, because the Upper San Pedro constitutes an exceptionally rich resource for the North America continent, an equitable share of funding should be sought from state, federal and other sources outside the basin.

While achieving a water balance in the basin represents a significant challenge, we are confident that a focused campaign to save the river will succeed. Efforts made to date to reduce farm irrigation water demand, to institute water conservation measures at Fort Huachuca, to develop effluent recharge in Sierra Vista and to

[1] Throughout this report, we use the term Upper San Pedro River in reference to the stretch of the San Pedro River located between its headwaters a few miles south of the town of Cananea, Sonora, and the town of St. David, Arizona, to the north.

build capacity for sustainable land use practices in Mexico are highly commendable. These actions establish a record of success and help to build the foundation for a strong water conservation ethic. New and bolder initiatives can be launched from this platform.

Finally, we are mindful of the asymmetries present across borders respecting the degree to which communities have been consulted, informed and mobilized to find solutions for a sustainable future in the basin. We recognize the need for greater involvement on the part of potential stakeholders in Mexico, acknowledging that Mexican citizens residing in the Upper San Pedro Basin must engage in an open and robust dialogue to explore opportunities for conservation, preservation and economic betterment. Accordingly, we believe that a broad and participatory consultative process should be initiated to determine the goals and opportunities for conservation along the Mexican reach of the Upper San Pedro River.

2 Recommendations

A. Water Conservation, Harvesting and Reductions

In order to balance the water budget for human and ecological needs, basin residents must adopt aggressive water conservation and harvesting strategies. Differences in the primary user groups across borders suggest implementing a different mix of measures to achieve a balanced water budget.

United States

1. The Advisory Panel members note the enthusiasm exhibited by many basin residents for enhancing mountain front, urban and rural recharge in order to capture more water for infiltration into the aquifer. At the same time, there is a need to perform a careful study of existing recharge projects to attempt to quantify their effectiveness. If such projects are determined to be hydrologically beneficial, we recommend aggressive recharge initiatives be pursued in key areas throughout the basin.
2. We encourage the voluntary retirement of irrigated fields in the basin between Mexico and the northern boundary of the SPRNCA. These areas should be converted to other types of open space such as non-irrigated rangeland, parks, or wildlife preserves through outright purchase or through the use of conservation easements. Other undeveloped parcels of land in that area should be considered for the same action, particularly if they have a potential for irrigation.
3. A mechanism must be developed to constrain the continued overdraft of groundwater and to assure that future conservation and recharge efforts benefit the San Pedro River. An example of such a mechanism would be the establishment of a cap on groundwater withdrawals, but the Advisory Panel recommends that the local stakeholders determine the most effective mechanism. Failure of local stakeholders to develop a workable mechanism at the local level is an invitation for constraints imposed by higher levels of government.
4. The residents in the Sierra Vista Sub-basin should update the county and municipal comprehensive plans with the goal of guiding and managing future development and growth. Discussions on growth may well take place within the context of recent state growth management and open space initiatives. Panel members emphasized the value of sharing knowledge and experiences from other rapidly growing urban and rural areas in North America.
5. The Panel members acknowledge the efforts that Fort Huachuca has made in reducing its on-base water consumption by 26 percent since 1991 and we do not advocate the closure of the Fort as a method of reducing water consumption in the basin. Indeed, the Panel regards the leadership of the Fort as setting a positive example for the community in seeking resolution to the concerns addressed in this report. The federal government should provide Fort Huachuca with additional resources to carry out its conservation plans, and the Fort's proposed effluent recharge project should be a priority for future funding. In as much as the Fort is the largest employer in the area, with many people in the Sierra Vista area directly or indirectly dependent upon it, we encourage the Fort to continue its partnership efforts with the off-base community to the maximum extent allowed by applicable laws.

6. Recent recommendations from the World Bank, the United Nations Environment Program and a variety of national bodies urge that water be priced as a commodity. The current policy of the Arizona Corporation Commission does not recognize the value of water conservation in setting rates of private water companies. This policy and any other state laws that impede conservation efforts should be identified and evaluated. We do not, however, advocate the imposition of a groundwater pump tax.
7. We recognize that importation of water from beyond the basin is generally regarded unfavorably. However, the continual growth in the Sierra Vista and Hereford areas and the uncertain status of the Mexican portion of the basin may require at some future time that consideration be given to the importation of water in order to preserve the SPRNCA.
8. State and local authorities should actively encourage, and consider initiatives for, conservation and augmentation measures taken by individuals and businesses, including low-water-use appliances and showerheads, xeriscaping, and more efficient irrigation and watering systems. Specific targets and schedules for reducing urban water use would assist this process. As an example, we encourage the city-county San Pedro Joint Task Force to continue developing such initiatives with substantial public participation.
9. Although in some areas it may be too late for a change in zoning regulations, we recommend that low-density housing regulations be enacted and enforced in the Hereford Area along a one-mile-wide corridor on each side of the river. Also where appropriate, zoning should provide for open spaces of "green belts" throughout the basin.
10. The State should consider an initiative to purchase and retire development rights on state lands in the Sierra Vista Sub-basin. A reduction in residential development potential and the resulting decrease in the economic value of state lands may make them more affordable for outright purchase by existing ranchers that are currently leasing the land from the State.
11. Owners and lessees of rangeland throughout the basin should be encouraged and given aid to build structures for capturing stormwater runoff for infiltration to the aquifer. Owners of smaller tracts of rural land should be advised of best management practices for containing stormwater runoff on their properties.
12. Water conservation education efforts, such as the multi-partner Water Wise program, should be pursued with vigor. In order to persuade both urban and rural property owners that water conservation is not only commendable but also absolutely necessary, one central entity or agency should be designated and funded to conduct a continuing public information and education program.

Mexico

13. A better understanding of the hydrologic regime on the Mexican reach of the Upper San Pedro River is needed prior to making specific recommendations for action in the basin. For example, the extent of irrigated agriculture and its impact on the river needs further study, as does the impact of vegetative disturbances in the uplands on the riparian system. Also, the impact of groundwater pumping at the Cananea mines and the extent to which it is recycled should be quantified at the same time.

B. Institutional Considerations

As we note earlier, the development of a comprehensive, binational water planning and management plan will require a great degree of cooperation and coordination. Indeed, the reality of a shared transboundary aquifer transcends one-dimensional solutions and calls for innovative mechanisms and approaches.

1. In both countries, a host of federal, state and local laws do not always allow or encourage practices that will contribute to sustainable development, maintaining ecosystem values, and preserving an undiminished flow in the Upper San Pedro River. Officials and citizens should review relevant laws and regulations thoroughly with a view toward modifying those that militate against a sustainable future for the river.
2. The CEC has initiated a process that we believe has narrowed the bounds of discussion for finding sustainable solutions to ensuring that future generations can enjoy the cultural, scenic, historic and

ecological bounty offered by the extraordinary riparian and other habitat in the Upper San Pedro Valley. This process should not lose momentum. Accordingly, we call on the CEC and other international organizations such as the International Boundary Waters Commission (IBWC) and the Border Environment Cooperation Commission (BECC) to be available, if basin residents and their local government entities request their aid, to facilitate and assist in attaining many of the goals and objectives identified in our report.

3. An analysis of the strengths and weaknesses of existing transboundary entities may provide insight into the requirements for effective basin-wide water management. The recently established "El Paso del Norte Air Quality Management Task Force" represents a good model for binational use and might be a starting point in considering the structure of such a body. The IBWC and the BECC, in cooperation with federal, state and local officials and private citizens, could play an integral role in developing the proposed body and making it operational.

United States

4. In the United States, we recommend a two-track approach. The first involves a partnership between private and public local leaders to implement without delay a set of projects and activities as identified more specifically through the baseline research, the expert's report and the public input process (i.e., recharge, water conservation, etc.). Simultaneously, a broader planning process designed to converge with Mexican planning initiatives should be begun.
5. Federal, state, local, and private funding sources should be tapped to contribute to solutions in the basin. However, donors should receive meaningful assurances that the impact of their contribution will not be offset or neutralized by the actions of non-cooperative user groups. A comprehensive, binding, long-term plan could provide the kind of assurances likely to attract substantial funding from outside the basin.

Mexico

6. As discussed above, an open and participatory consultation process should be designed and carried out to provide information and guide future initiatives. The outreach strategy should be conducted with the awareness that grasslands and riparian habitat are showing increasing signs of stress, threatening the livelihood of local residents.
7. Following more extensive stakeholder consultations and a public information campaign, Mexico should consider anew an earlier proposal, crafted by the *Centro Ecológico de Sonora* and adopted by the *Comisión Nacional para el Conocimiento y Uso de la Biodiversidad*, to create a conservation zone within specified portions of the sub-basin.
8. The CEC should remain available to work with the appropriate Mexican authorities to enlarge public participation and build capacity on the Mexican side of the watershed. Specifically, the CEC could assist by promoting public outreach and education and by working with Mexico to hold additional workshops and informational sessions. Residents in Mexico must be given the opportunity to study the resources of their basin and determine future direction and priorities for water use. Such a process will assure the public knowledge of existing science and will help identify areas in need of further research.

C. Further Research and Monitoring

Additional research and intensive monitoring represent important components of an integrated plan to sustain the riparian bird habitat on the Upper San Pedro River. In general, the Advisory Panel is impressed with the quality and quantity of data summarized in the Expert Report. Nonetheless, significant data gaps remain, particularly regarding the hydrologic regime and historic and current uses in Mexico. While additional research should not delay the implementation of water conservation and augmentation measures, it is important to get an early start on an expanded research and monitoring agenda to improve the information available to decision-makers.

1. We recommend that a broad, interdisciplinary group of experts review and validate the research agenda submitted by the Upper San Pedro expert team (and others) in order to prioritize research items and coordinate future research among the many institutions and agencies active in the basin. Future research should, in any event, include regional-scale studies, such as SALSA,[2] to increase our understanding of land-water interactions, as well as small-scale studies on pilot recharge projects.
2. A San Pedro watershed database should be developed to unite and organize available data for the public and experts. Additional information from the Mexican reach of the river is needed to further our understanding of the hydraulic regime in the basin, especially data respecting the southern limits of the aquifer, the impact of water use at the Cananea mines, irrigated agriculture upriver, and the historic and current state of the riparian and upland habitat in Mexico. Additionally, we note the importance of the Charleston and Palominas gauging stations, and suggest the installation of gauging stations at key points along the Mexican reach of the river as well.
3. The BLM should specifically quantify the hydrological requirements for managing the SPRNCA and define the amount of water that must be delivered to the floodplain aquifer within the SPRNCA boundary. The SPRNCA's requirement must be included in the basin's overall groundwater model to provide certainty for cultural (non-commercial) users. An intensive monitoring program will provide feedback to managers on the effectiveness of conservation and augmentation measures. Periodically, a broad, basin-wide review of the hydrologic, ecological and socioeconomic data should be undertaken to assess progress and impacts.
4. Another research need relates to phreatophytes[3] and baseflow. Although studies in other basins have shown that phreatophyte control does not necessarily improve baseflow, a study specific to the San Pedro would help alleviate public concerns and complement future water management decisions.
5. Every effort should be made by BLM to regenerate grasslands in SPRNCA with native grasses, particularly sacaton. While the hydrologic benefit of this action remains unquantified, the potential exists to reduce erosion and runoff and aid in recharge. Additionally, re-establishing grasslands should be undertaken in state lands, private lands in the United States and Mexico, and in *ejidos*[4] in Mexico.
6. Re-location of the riparian area was deemed undesirable by a large portion of the public that participated in this process, and the Panel concurs. However, extending the riparian corridor in Mexico to preserve additional habitat is an option that warrants further investigation.

[2] Semi-Arid Land-Surface-Atmosphere study (US Department of Agriculture).

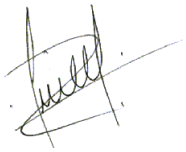
[3] The term "phreatophytes" designates deep-rooted plants that obtain their water from the water table or from moisture in the soil layer directly above it.

[4] Community farms.

3 Conclusion

In light of the energy and enthusiasm expressed by citizens living within the Upper San Pedro Basin, the Advisory Panel remains confident that sustainable solutions to protect the riparian habitat are within reach.

The Advisory Panel is willing to continue to serve as a resource on behalf of the CEC to advise, support and monitor local and regional efforts, providing contacts, networking, and other resources as may be requested by the local communities and stakeholders in the basin.



Fedro Carlos Guillén Rodríguez
Panel Co-Chair

Jack Pfister
Panel Co-Chair

Upper San Pedro Advisory Panel

- Dr. Alejandro Castellanos Villegas
- Robert Halliday
- Michael Harcourt
- Paul Hardy
- Jack Ladd
- Rita Pearson
- Ruth Russell
- Cecilia Soto
- Robert B. Strain
- Kenneth R. Symmes
- John Wirth

Postscript for CEC Advisory Panel Report

Jack Pfister

The views of some panel members were moderated during the process of arriving at a consensus report. As one of the individuals that helped facilitate this moderating process, I felt it important to capture a strong, but understated conclusion of many of the panel members. Although not all panel members agree, many feel there is compelling evidence that the current overdraft of the groundwater aquifer threatens the future of the San Pedro River. If the overdraft is permitted to grow in a linear response to population growth in the basin, the riparian area of the San Pedro will be irreparably damaged. The damage to most of Arizona's riparian areas occurred at a time when there was little understanding of the consequences of mining groundwater. Today we can predict with great certainty the consequences of unconstrained pumping.

The Panel worked very hard and effectively to raise important issues and concerns, but the Report will not alter the course of events. Only a determined effort by local political and civic leaders can protect the San Pedro. The Panel struggled with terms such as "smart growth" and "sustainability" to guide the local leaders. Because there was not agreement on the meaning of these terms, the Panel elected not to use them.

Many Panel members believe that the river will survive only if the local leaders have the courage and creativity to give protecting the River the same priority and energy as promoting growth. The local leaders must develop strategies that will accommodate future levels of growth that will not destroy the river and that can be "sustained" with acceptable environmental consequences. There are no Arizona models to emulate, only sad lessons from failed opportunities. The Panel wishes the local stewards God speed and good luck. Observers in the CEC countries will be watching with interest as the local stewards assume this daunting task.

The Commission for Environmental Cooperation

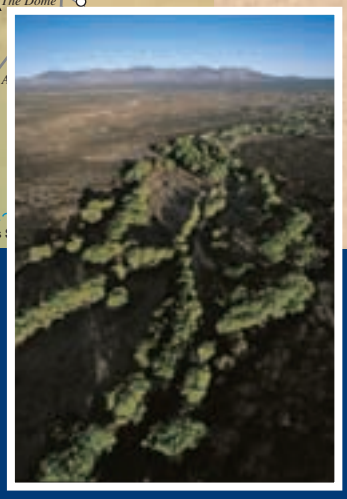
In North America, we share a rich environmental heritage that includes air, oceans and rivers, mountains and forests. Together, these elements form the basis of a complex network of ecosystems that sustains our livelihoods and well-being. If these ecosystems are to continue being a source of future life and prosperity, they must be protected. Doing so is a responsibility shared by Canada, Mexico and the United States.

The Commission for Environmental Cooperation (CEC) is an international organization created under the North American Agreement on Environmental Cooperation (NAAEC) by Canada, Mexico and the United States to address regional environmental concerns, help prevent potential trade and environmental conflicts and promote the effective enforcement of environmental law. NAAEC complements the environmental provisions established in the North American Free Trade Agreement (NAFTA) to which it is a side accord.

The CEC accomplishes its work through the combined efforts of its three principal components: the Council, the Secretariat and the Joint Public Advisory Committee (JPAC). The Council is the governing body of the CEC and is composed of the highest-level environmental authorities from each of the three countries. The Secretariat implements the annual work program and provides administrative, technical and operational support to the Council. The Joint Public Advisory Committee is composed of fifteen citizens, five from each of the three countries, and advises the Council on any matter within the scope of the agreement.

Mission

The CEC facilitates cooperation and public participation to foster conservation, protection and enhancement of the North American environment for the benefit of present and future generations, in the context of increasing economic, trade and social links among Canada, Mexico and the United States.



"Siempre hea y es assi que por la mayor parte quando tenemos entre las manos alguna cosa preciosa y la tratamos sin impedimento no la tenemos ni la preçiamos en quanto vale ni entendemos la falta que nos haria si la perdiesemos y por tanto de continuo la bamos temendo en menos pero despues que la abemos perdido y carecemos del beneficio de ella abemos gran dolor en el coraçon y siempre andamos ymaginando buscando modos y maneras como la tornemos a cobrar..."

COMMISSION FOR ENVIRONMENTAL COOPERATION
393, rue St-Jacques Ouest, bureau 200
Montréal (Québec) Canada H2Y 1N9
Tel: (514) 350-4300 Fax: (514) 350-4314

http://www.cec.org

Station | Communications