



Water Resources Research Center

College of Agriculture and Life Sciences

Institutional Mechanisms for the Assessment and Management of Transboundary Aquifers: The Importance of Partnerships

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Hydrological Programme Intergovernmental Council

“Hydrological Sciences for Policy Responses to Uncertain Global Change Futures”
UNESCO Paris, France



www.cals.arizona.edu/azwater

Outline of Presentation

- About the Water Resources Research Center and policy analysis
- US-Mexico Transboundary Aquifer Assessment Program
- Developing the partnerships for scientific investigations necessary for policy development
- Status of binational Arizona-Sonora efforts
- Note: The views expressed are my own and do not reflect the perspectives of other team members/partners.

About the Arizona Water Resources Research Center

Mission: The University of Arizona Water Resources Research Center (WRRC) promotes understanding of critical state and regional water management and policy issues through applied research, community outreach and public education.

The WRRC is committed to:

- assisting communities in water management and policy;
- educating teachers, students and the public about water; and
- encouraging scientific research on state and regional water issues.

Member of National Institutes for Water Resources (NIWR).
Water institutes/centers are federally authorized since 1964 to receive federal funding through the U.S. Geological Survey

Web site: www.cals.arizona.edu/azwater

Focus of my research and teaching is on water policy and management

- Particular emphasis is placed on how to achieve desired policy objectives in terms of institutional structures and possible changes to them.
- Policy: "a definite course or method of action selected (as by a government, institution, group, or individual) from among alternatives and in the light of given conditions to guide and usually determine present and future decisions." (Webster's Third International Dictionary)
- Institutions are the organizations, including government, laws, and regulations, that provide the context for policy making and implementation. (Sharon Megdal Definition)
- Context and partnerships are important to policy making.
- Note: My perspective is shaped by my experiences as a policy maker, including my current experience as an elected member of the board of the Central Arizona Project.

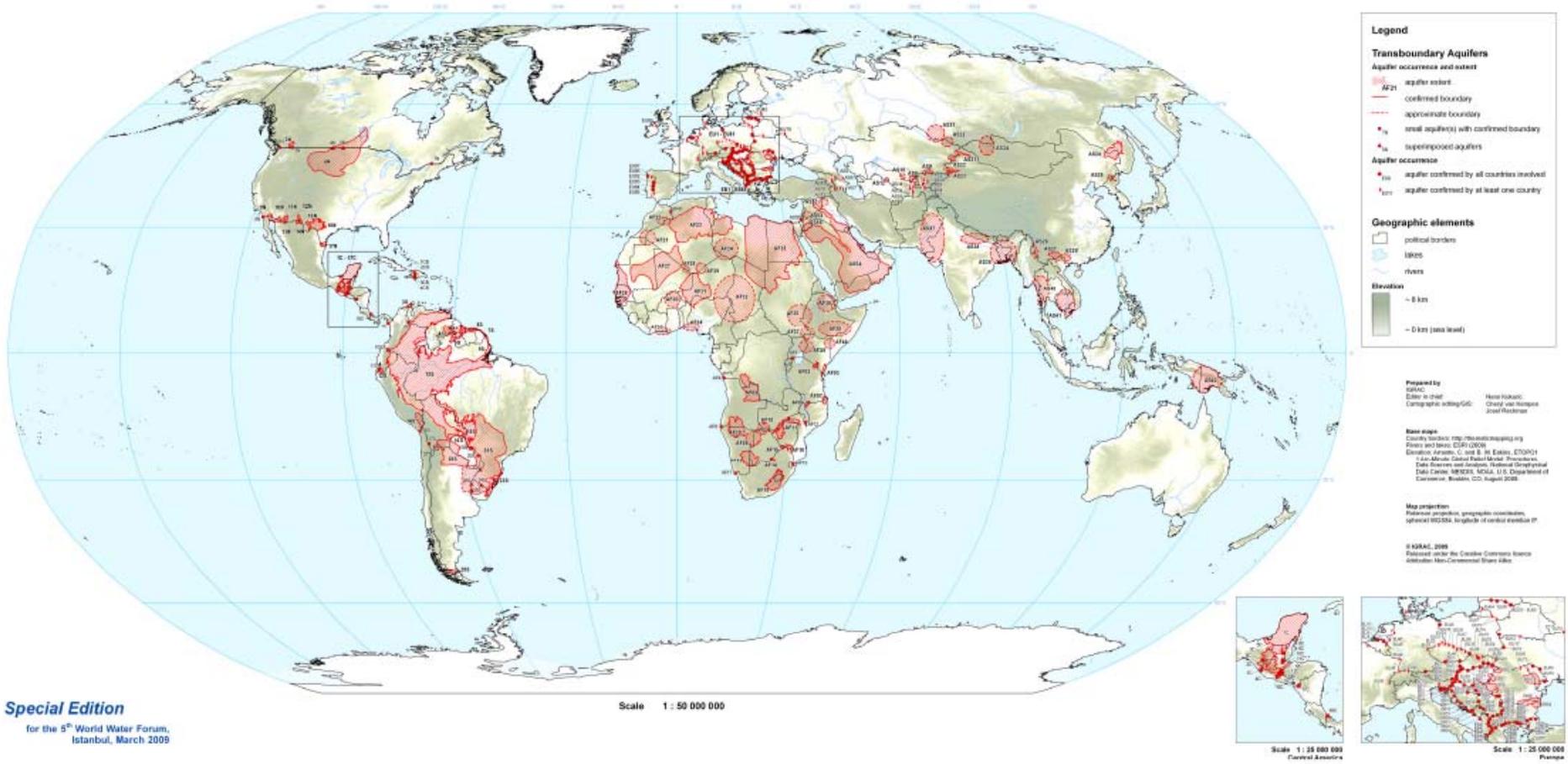
Water Management and Policy are shaped by...

- Resource Availability
- Location of water demands and supplies
- Economics
- Historic and Current Legal/Institutional Framework
 - The nature of involvement of multiple governmental and non-governmental entities, including the extent of centralized versus decentralized decision making
- Politics of Area
- Public values
- Information



Transboundary Aquifers of the World

- Update 2009 -



Special Edition
for the 5th World Water Forum,
Istanbul, March 2009

U.S.-Mexico Transboundary Aquifer Assessment Program

- December 2006, U.S. Congress approved and President Bush signed the U.S. - Mexico Transboundary Aquifer Assessment Act, which authorized the US-Mexico Transboundary Aquifer Assessment Program (TAAP)
- Purpose of TAAP is to provide scientific information that will be useful to policy makers and water managers
- Program authorized for 10 years by US Congress



TAAPP involves three U.S. states and two Mexican states. The Arizona-Sonora component includes two transboundary aquifers



Partnerships are embedded in TAAP

- Law establishes US Geological Survey (USGS) - university partnership
 - 50% of appropriations to USGS
 - 50% of appropriations to federally recognized Water Institutes/Centers located at universities
 - Water Institutes/Centers may subcontract with partners, including Mexico (match required)
- USGS and universities directed to collaborate with:
 - State water resource agencies
 - Any affected Indian tribes
 - International Boundary and Water Commission as appropriate
 - **Mexico**
 - Others

Partnerships must accommodate and reflect asymmetries of institutions/laws

- US federal government does not regulate water rights; groundwater management is a state government responsibility
- TAAP program authority is assigned to USGS within the US Department of the Interior
- The International and Boundary Water Commission (IBWC) has a US Section (IBWC) and a Mexican Section (Comisión Internacional de Límites y Aguas (CILA)), each with a Commissioner and professional staff. US IBWC and CILA are federal agencies
- The US section has certain responsibilities per treaty obligations dealing with transboundary surface waters but historically has had limited involvement in groundwater
- Mexican federal agencies have authority over surface water and groundwater
- **Process requires working through International Boundary and Water Commission for binational study efforts**

IBWC Joint Cooperative Agreement
was signed on August 19, 2009 to
facilitate binational work



**Signing Ceremony at Boundary Monument #1
in El Paso/Juarez
Principal Engineers John Merino (U.S.) and
Luis Antonio Rascón Mendoza (Mexico)**

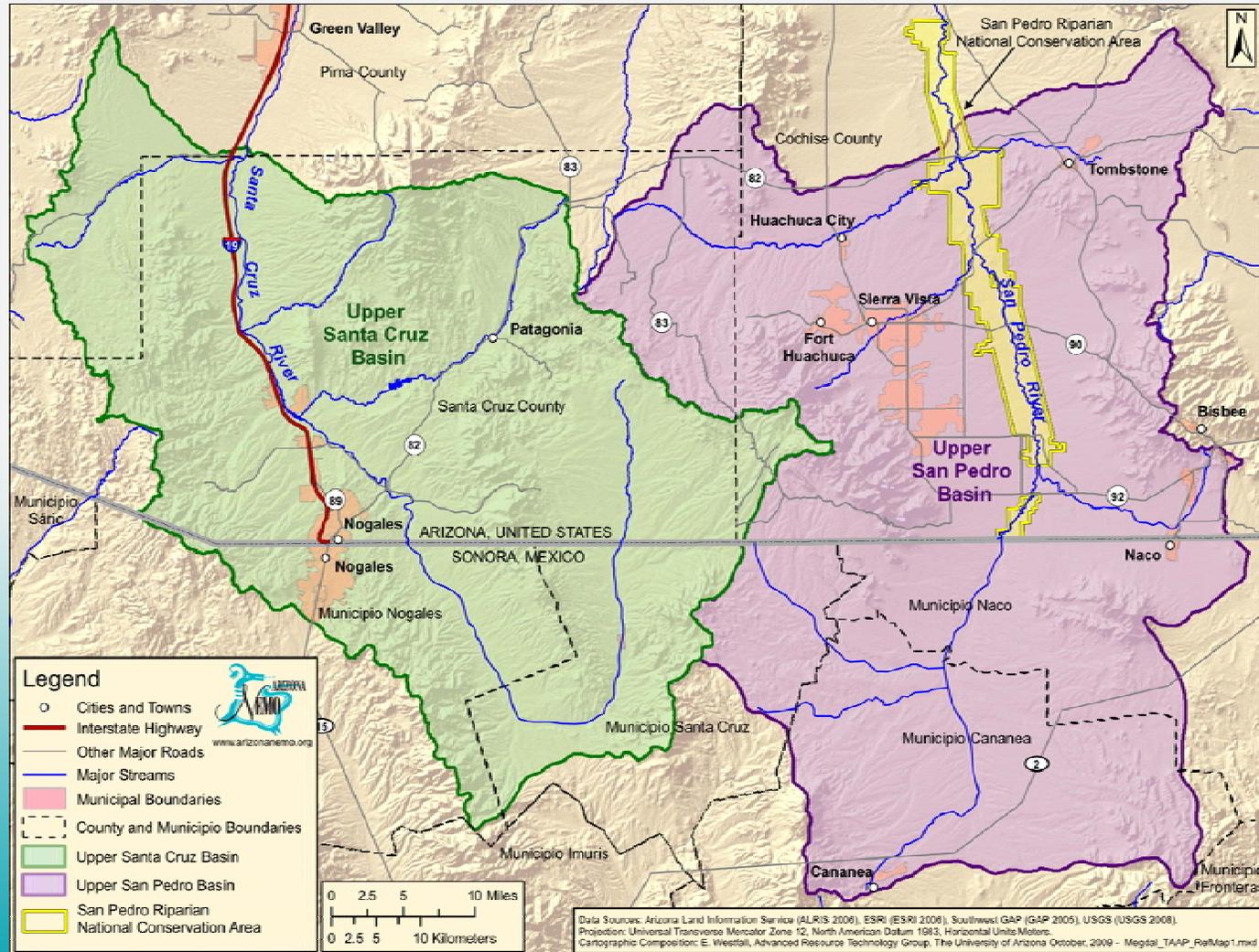
Joint Cooperative Framework

- The objective of the joint cooperative process for groundwater research is to improve the knowledge base of transboundary aquifers.
- The following is carried out within the IBWC framework:
 - Assure concurrence of the US and MX for binational aquifer assessment activities
 - Facilitate agreement on the aquifers that will be evaluated jointly
 - Establish and coordinate binational technical advisory committees for each aquifer
- IBWC serves as an official repository for binational studies developed

Arizona-Sonora Aquifers Progress

Santa Cruz

San Pedro



Have worked on building shared vision with stakeholders

- Cross-border meetings and field trips have involved numerous governmental and non-governmental stakeholders
- Emphasis on shared priorities
 1. Water availability
 2. Climate change
 3. Water quality
- Bilingual materials (factsheets, meeting minutes, etc.)



Fact sheets are prepared in English and Spanish

RESUMEN: Programa de Evaluación de Acuíferos Transfronterizos E.E.U.U. – México: Sección- Arizona (TAAP-A/S)
 Los acuíferos compartidos por Arizona y Sonora Versión: 3 de Marzo de 2010

Acerca del Programa

El TAAP tiene su origen en la Ley Pública 109-448, firmado por el Presidente el 22 de Diciembre de 2006, como el Transboundary Aquifer Assessment Act. El Acta aplica a los estados de Texas, Nuevo México, y Arizona donde cuatro acuíferos transfronterizos han sido designados para evaluación prioritaria: siendo el Hueco Bolsón y Mesilla en la región de El Paso / Ciudad Juárez y los acuíferos de las cuencas altas del Río Santa Cruz y Río San Pedro en la región fronteriza de Arizona – Sonora (vea mapa). El TAAP tiene un mandato para 10 años, con \$50 millones de dólares autorizados para apropiarse durante este periodo. Hasta la fecha se ha apropiado \$500,00 cada año fiscal (2008 y 2009).

El TAAP-AZ (la porción de Arizona de todo el estudio) es un esfuerzo colaborativo entre la United States Geologic Survey (USGS), el Water Resources Research Center (WRRC), y el Udall Center for Studies in Public Policy (ambos de la Universidad de Arizona). Una variedad de otros interesados de los EEUU y México han participado en la definición de prioridades para el proceso de evaluación. TAAP-A/S (los acuíferos transfronterizos de los ríos Santa Cruz y San Pedro) ha participado en el programa ISARM (Gestión de los Recursos Acuíferos Internacionalmente Compartidos) de la UNESCO.

Colaboración con TAAP-A/S

México: Comisión Nacional del Agua; Comisión Estatal del Agua-Sonora (Unidad Camanah); OOMAPAS-Nogales; Universidad de Sonora; Colegio de Sonora; Instituto Tecnológico de Sonora
Estados Unidos: Departamento de Recuperación; Departamento de Recursos Hídricos de Arizona; Ciudad de Nogales, Arizona; Amigos del Río Santa Cruz, Consorcio del Alto Río San Pedro
Binacional: Comisión Internacional de Límites y Aguas; Comité de Agua de la Comisión Sonora-Arizona

Progreso y Actividades Futuras

- Definición del plan de trabajo de entre un grupo binacional de interesados.
- Dar a conocer al TAAP-A/S al público por medio de conferencias y reuniones comunitarias.
- Recopilación de materiales científicos y otra material publicada en una base de datos con facilidad de búsquedas, en línea, y bilingüe acerca de los acuíferos binacionales del Santa Cruz y San Pedro.
- Etapas iniciales de modelación de transporte de contaminantes y formación de un marco hidrogeológico para el Santa Cruz.
- Monitoreo inicial de recarga y escurrimiento y modelación en el San Pedro.



Participantes platican sobre el plan de trabajo durante el taller de TAAP-A/S el 3 y 4 de Noviembre 2009.

RESUMEN: Programa de Evaluación de Acuíferos Transfronterizos E.E.U.U. – México: Sección- Arizona (TAAP-A/S)
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Lista de Actividades y Logros Selectos

5 de Nov de 2007- Reunión binacional patrocinada por el Departamento de Recursos Hídricos de Arizona abordando el proceso de priorización, y el alcance del TAAP – Santa Cruz.

30 de Abril de 2008- El TAAP-A/S organizó una reunión binacional para reparar modelos hidrologicos en Nogales, AZ.

11 de Junio de 2008- Personal del TAAP-A/S participó en una reunión organizado por el Upper San Pedro Partnership (USPP) en Sierra Vista, Arizona.

20 de Junio de 2008- Reunión del Comité de Agua de la Comisión Sonora-Arizona en Phoenix con presencia del TAAP-A/S, invitado por los Comisarios de la CELA.

Octro de 2008- TAAP-A/S es incluido en el Programa Mundial para Evaluación Hidrológico (WHYMAP) del 5^o World Water Forum, Estambul, Turquía

2 de Diciembre de 2008- TAAP-A/S es presentado en la Conferencia Internacional de Ecoses del Agua, Cambio Global, y Agua Subterránea: Respuesta de Gestión - convocado por la UNESCO y USGS en UC Irvine para la comunidad internacional de investigación y política.

19 de Agosto de 2009- Comisarios de EEUU y México aprueban el informe común de los ingenieros principales referente al proceso de cooperación conjunta para el programa de evaluación de acuíferos transfronterizos

20 de Agosto de 2009- TAAP-A/S presentada por Sharon Magdal en World Water Week en Estocolmo, Suecia

3 y 4 de Noviembre de 2009- TAAP-AZ patrocina el taller "Desarrollando un plan de trabajo para la evaluación de los acuíferos Santa Cruz y San Pedro" en Tucson, Arizona.

Marzo de 2010- Fondos federales aprobados para el TAAP-A/S: \$166,666 para el WRRC y \$166,666 para el Centro de la Ciencia del Agua del USGS

Comisión TAAP A/S Para Mayor Informacion, favor de acudir al <http://www.cab.arizona.edu/taap/taap>

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Binational workshop in November 2009 to develop work plans for Santa Cruz and San Pedro Aquifers (See web site on last slide)

Para la Versión Español, Haz Clic [Aquí](#)

**The U.S. - Mexico Transboundary Aquifer Assessment Program Workshop:
Developing a Work Plan for the Assessment of the Santa Cruz and San Pedro Aquifers**

**Hosted by the University of Arizona Water Resources Research Center
and the United States Geological Survey**

Desert Diamond Casino-Hotel: Tucson, Arizona

November 3 - 4, 2009

Workshop Agenda

Workshop goals: Review progress of the Arizona-Sonora component of the U.S.-Mexico Transboundary Aquifer Assessment Program (TAAP) and confirm or modify priorities in the draft work plan that will guide assessment of the Santa Cruz and San Pedro aquifers.

Tuesday November 3, 2009

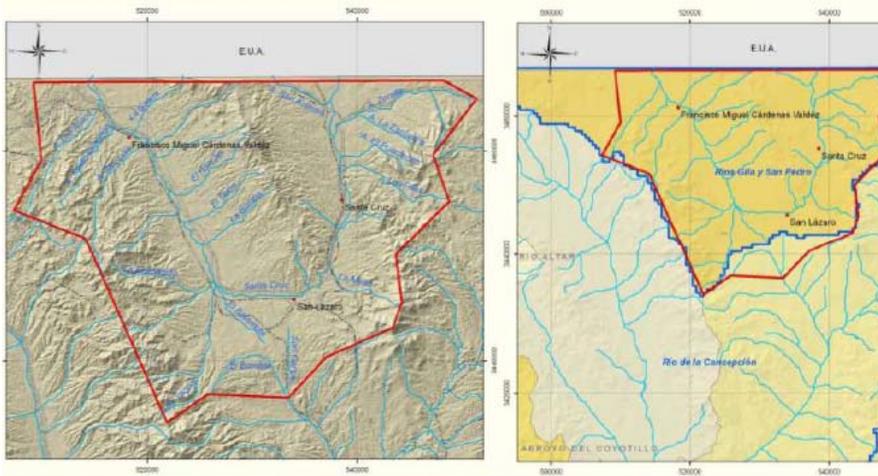
1:00 p.m. – 5:30 p.m.

- | | |
|-----------|--|
| 1:00-1:15 | Welcome and introductions <ul style="list-style-type: none">• Sharon Megdal, Water Resources Research Center (WRRC)• Natalie Luna, Office of Congressman Raúl Grijalva |
| 1:15-2:00 | Setting the stage: overview of TAAP, summary of progress to date (Arizona-Sonora component) <ul style="list-style-type: none">• Lucas Oroz, National Water Commission of Mexico (CONAGUA) [eng / esp]• Transboundary Aquifer Assessment Program in Arizona and Sonora [eng / esp]<ul style="list-style-type: none">• Sharon Megdal, WRRC• James Callegary, USGS• Christopher Scott, University of Arizona, Udall Center for Studies in Public Policy• William Alley, United States Geological Survey (USGS) |

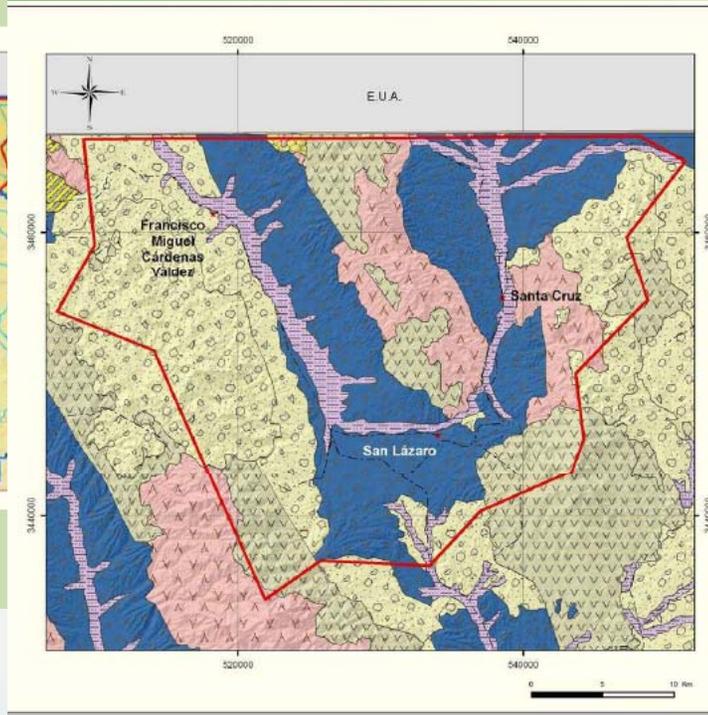
HYDROCLIMATOLOGY

Principal Drainages

Basins



HYDROGEOLOGICAL UNITS



Estudio Regional de Evaluación Hidrogeológica del Acuífero Santa Cruz, Mpio. Santa Cruz y Nogales, Sonora
(Obtención de la Disponibilidad del Acuífero según los términos de referencia establecidos por la NOM-011-CNA-2000)

Figura:

Unidades hidrogeológicas

Localización Nacional:	Localización Regional:
Regionalización del Estado de Sonora	Ubicación del Área de Estudio en el Estado de Sonora

Simbología:

Unidad I Aluvial	Unidad IV Volcánica
Unidad II Fluvial	Unidad V Misisipense
Unidad III Volcánica	Unidad VI Continental
mos: Paleontológica	Noques
Localidades Prehistóricas	Acuífero Pta. Santa Cruz

Elaboró: **Para:**

Datos Geográficos: **Fecha:**

Proyección: Transversa de Mercator
Datum: UTM 14Q UTM 1984

Julio de 2008

Day Two

8:00-9:15 **Thematic overview of TAAP Santa Cruz and San Pedro draft work plan (co-moderated by Sharon Megdal, WRRRC and Roberto Senci3n, CONAGUA)**

- Opening Remarks – Sharon Megdal, WRRRC and Roberto Senci3n, CONAGUA
- Binational institutions, management, and policy – Christopher Scott, Udall Center [eng / esp]
- • Santa Cruz and San Pedro water balance studies in Mexico – Lucas Oroz, CONAGUA [eng / esp]
- Geophysical, hydrologic, and water quality modeling – James Callegary, USGS

9:15-9:30 **Organize breakout groups to review Santa Cruz and San Pedro aquifers work plan**

Status of binational efforts

- Both countries agree that the Santa Cruz and San Pedro aquifers should be studied through a binational effort
- Establishing necessary interagency-intergovernmental contractual agreements
- Developing an integrated work plan for the Santa Cruz and San Pedro Aquifers. Most recent meeting held 30 June 2010 in Nogales, Sonora.
- University of Sonora (MX) researchers will carry out work in Mexico



Photo taken 30 June 2010

Some particular challenges

- On the U.S. side, we must establish appreciation for the importance of federal funding for the program, although the program addresses a limited geographic reach of the United States and focuses on groundwater.
- Need continuity of effort
- Mechanisms for contracting
 - Flow of funds is complicated



Policy responses to global change

- Differing rates of urbanization, population growth and economic growth in and across the binational aquifers
- Region predicted to become hotter and drier by climate models
- Recharge in the Santa Cruz aquifer depends on ephemeral flows and effluent discharges from an international treatment plant on the US side; some basins with limited storage capacity
- San Pedro River flows intermittently
- Transborder aquifer assessment and modeling are essential to policy development
- Collaboration of multiple agencies and universities are fundamental to making progress.



Partnerships – especially new ones -- require

- Time
- Perseverance (persistence)
- Flexibility
- Creativity
- Respect for different perspectives
- Appreciation of the need for multiple types of expertise
 - Work plan to include hydrological as well as socio-economic studies, depending on funding
 - Securing funding has been challenging
- Good and regular communication

Arizona-Sonora aquifers recently added as ISARM case study to increase awareness of our efforts and learn from other experiences

- ISARM2010 Conference Paper: “Institutional assessment of the transboundary Santa Cruz and San Pedro aquifers on the United States – Mexico border”, co-authored by some of the partners:
 - Sharon Megdal, University of Arizona
 - Roberto Sención, Comisión Nacional del Agua, México DF, México
 - Christopher Scott, University of Arizona
 - Lucas Oroz, Comisión Nacional del Agua, Hermosillo, Sonora, México
 - James Callegary, United States Geological Survey, Tucson, AZ, USA
 - Robert Varady, University of Arizona
- ISARM of the Americas meeting in October 2010

Closing Comments

- Policy responses in these times of global change and great uncertainty depend on
 - (1) good information
 - (2) good dissemination of that information
 - (3) good understanding of the information.
- Where institutional mechanisms for transboundary assessment do not exist, they will need to be created.
- Where they do exist, it will likely take considerable effort for them to become effective facilitators of binational water assessments.

Closing comments (continued)

- The IBWC/CILA cooperative framework and USGS-university partnership have established a good foundation upon which we are building.
- Working through the institutional framework for binational cooperation is a prerequisite for the scientific studies to be accepted by both nations and helpful to their policy making.
- Developing the necessary partnerships is therefore crucial to success,

Questions?/Comments

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Transboundary Aquifer Assessment Program
<http://ag.arizona.edu/azwater/taap/index.html>