

Science and Policy Networks in the Southwest and U.S.-Mexico Borderlands

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Western Coalition of Arid States, Tucson, October 26, 2017

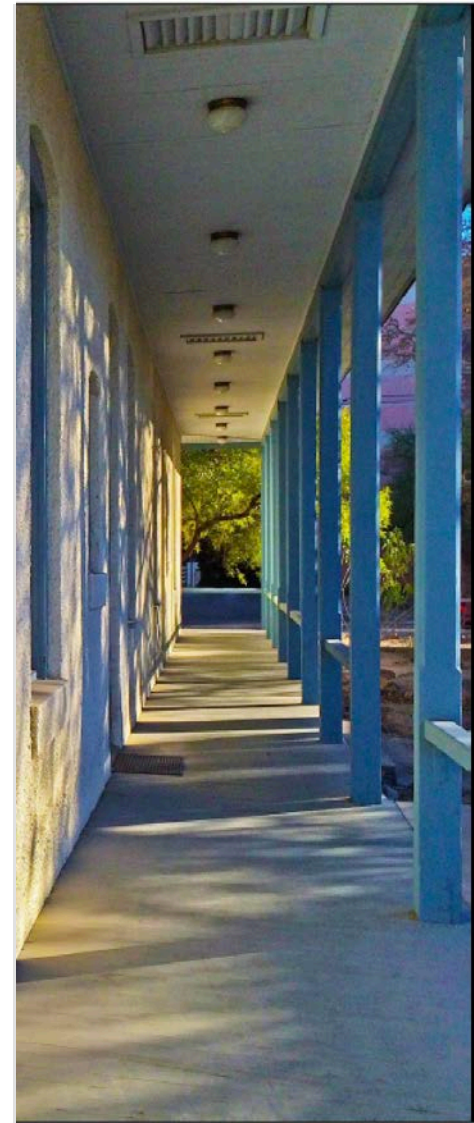
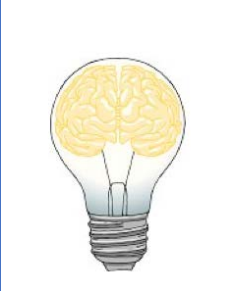


Photo by Robert Merideth



Public policy: the broad view

- Public policy - the definition and formulation of programs, legal instruments, regulations, and investment of tax-payer resources to pursue societal goals
 - Education
 - Public health
 - Environmental quality
 - Disaster response
 - etc.
- Policy-makers - individuals and institutions that act to initiate, implement, influence or revise policy
 - Public-sector agencies
 - Law-makers and the judiciary
 - Non-governmental organizations
 - Private sector
 - Opinion leaders



How is policy-making influenced?

- “Heat” - can drive external influence on policy-making
 - Numerous forms of advocacy
 - Lobbying
 - Political pressure
 - Media exposure
- “Light” - evidence-based decision-making, drawing on:
 - Science
 - Research
 - Objective study
 - Peer review

Challenges for evidence- based decision- making



- Consider how some terminology is used in common parlance
- “That’s an academic question” – irrelevant?
- “Everyone is entitled to his own opinion... not his own facts” D.P. Moynihan (btw, a PhD), increasingly being reinterpreted as “Everyone is ... entitled to his own facts”
- “No absolute truth” – contextual, subject to negotiation; beyond conventional political ideology
- “Post-truth”
 - Oxford English Dictionaries’ 2016 Word of the Year – “Relating to or denoting circumstances in which objective facts are less influential in shaping public opinion than appeals to emotion and personal belief”
- “Alternative facts” – belief systems?
- “Fake news” – undermining credibility of journalistic enquiry, fact-checking, or other forms of independent substantiation



Science – policy co-production

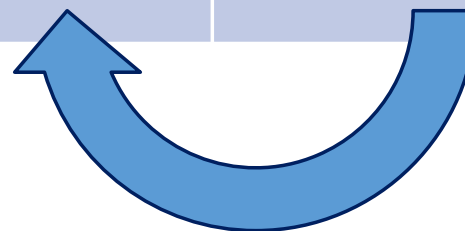
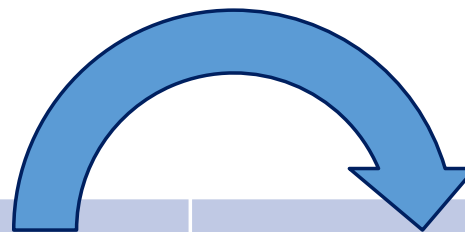
*Boundary
organization
strategy*

Research

- identify
- assess
- recommend
- test
- re-engage

Engagement

- involve
- prioritize
- apply
- verify
- iterate

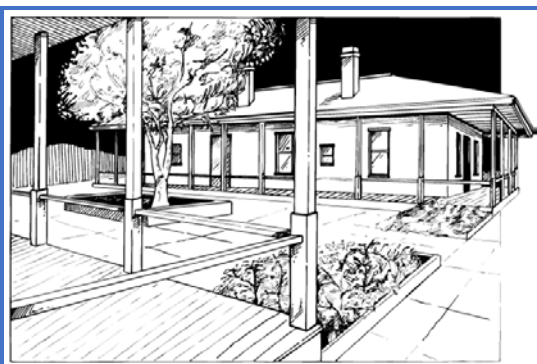




**Science for
policy,**

*Science
from policy*

- **Co-production**
 - Lemos & Morehouse (2005)
 - Jasanoff (2004)
- **Connecting science & decision-making**
 - Jacobs, Garfin & Lenart (2005)
 - Moss et al (2013)
- **Use-inspired science**
 - Stokes (2011)
- **Science-policy dialogues**
 - Scott et al (2012)
- **Transdisciplinarity, “Inreach”**



Introducing the Udall Center for Studies in Public Policy

- A UA applied policy research center, part of RDI (Research, Discovery & Innovation), reports to Senior Vice President for Research
- Founded in 1989, the Udall Center's core programs:
 - Environmental Policy (water security, climate adaptation, biodiversity conservation, ecosystem services, transboundary and international)
 - Native Nations Institute, established in 2001, focuses on Native nation building, data sovereignty and governance for Native nations, Native access to capital, child welfare policies, emerging patterns of Indigenous governance
- 14 senior staff (PhD, MBA, JD) – many with UA joint academic appointments; plus research and admin. staff, GRAs
- Approx. \$3M annual expenditure, two-thirds from grants and contracts
- Maintains a close and permanent relationship with the Morris K. Udall and Stewart L. Udall Foundation, a federal agency based in Tucson



Native Nations Institute

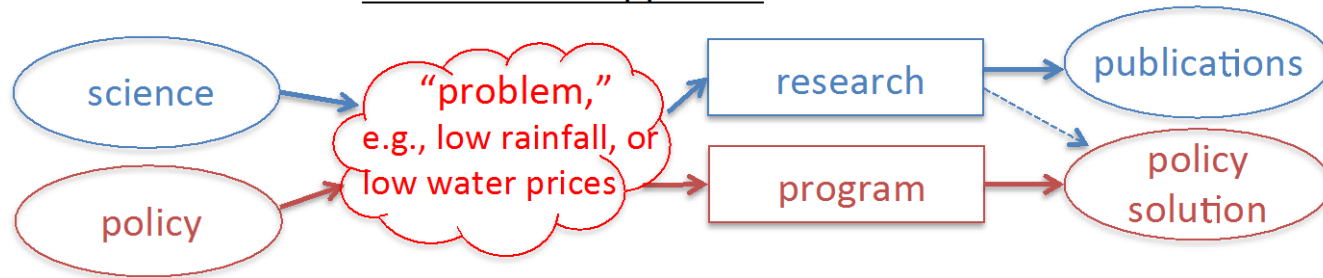
<http://nni.arizona.edu/>

- NNI core team at Udall Center
 - Research, Tribal services
- Extensive work with and for Tribes
- Outreach and inreach with advisory council

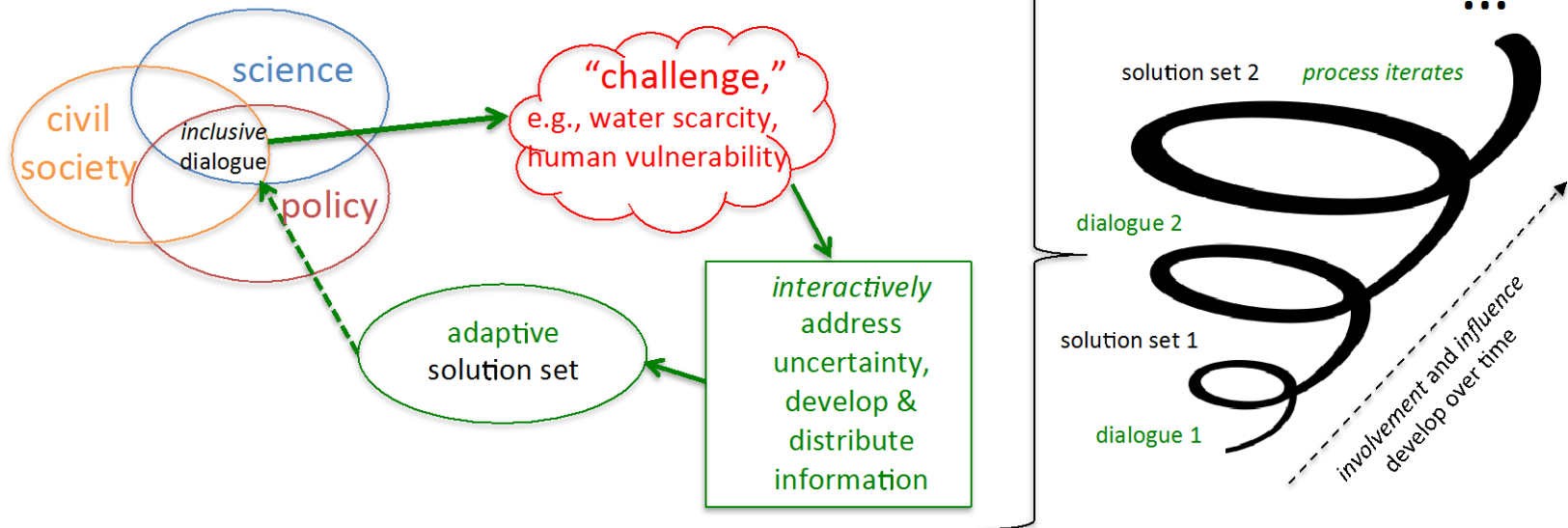


Science – policy dialogues: what works, what doesn't

Conventional approach

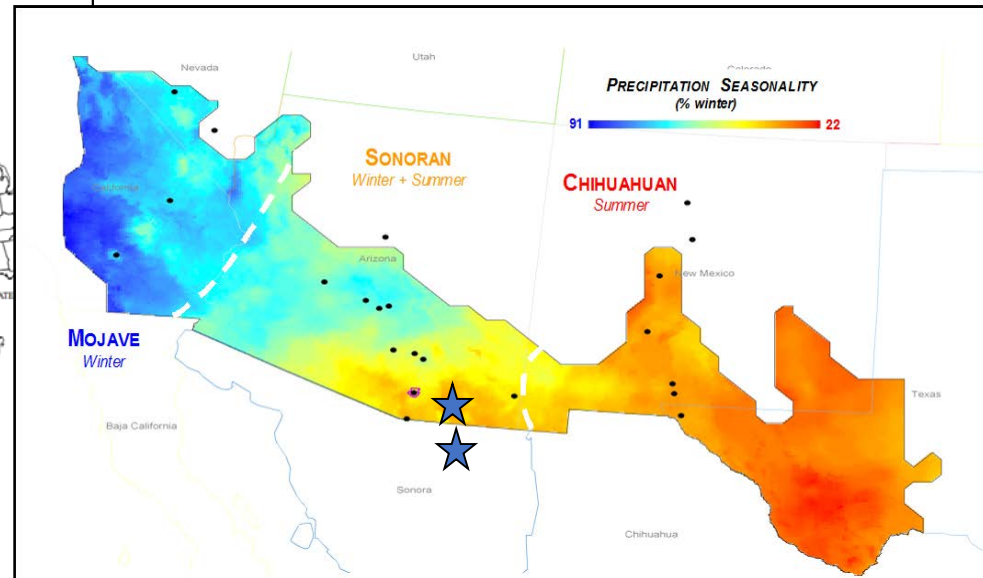
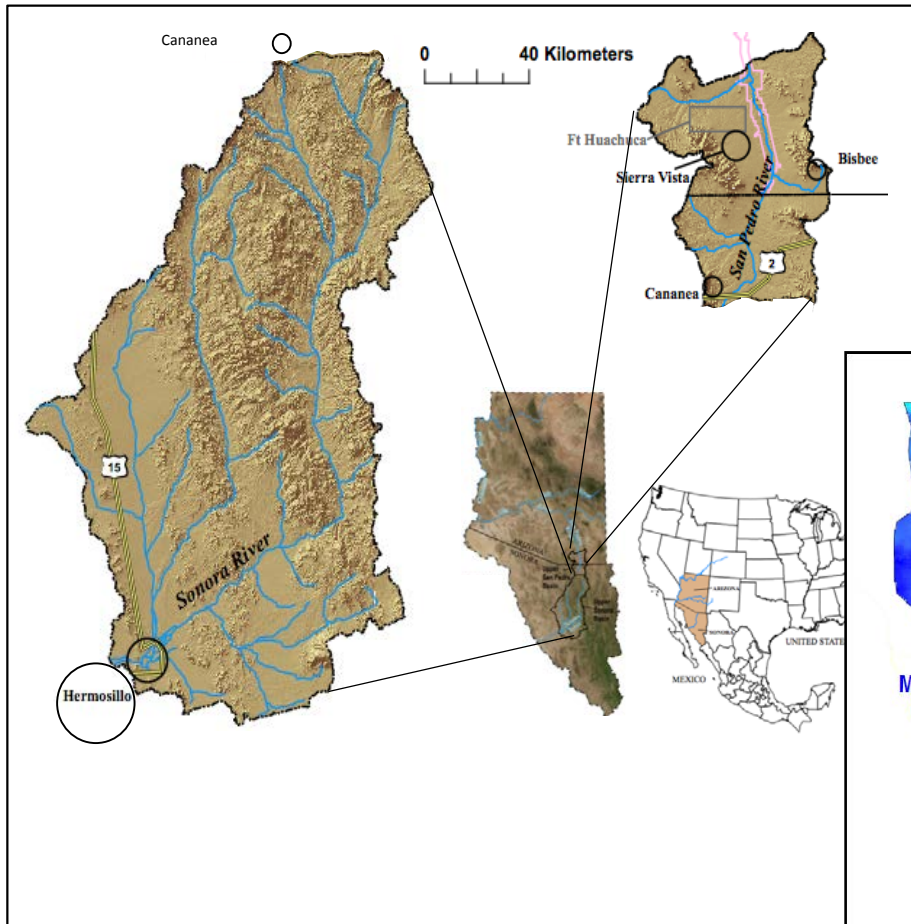


Policy-dialogue approach



Case example: Study watersheds

- Sonoran Desert, grassland, desert scrub, riparian forests, upland oak-conifer forests
- Climate: monsoon-dominated Río Sonora, bimodal precipitation - San Pedro
- Urban growth, military, mining, ranching
- San Pedro Riparian National Conservation Area (SPRNCA); Ajos-Bavispe Reserve



Río San Pedro - Mexico



Photos: L. House-Peters

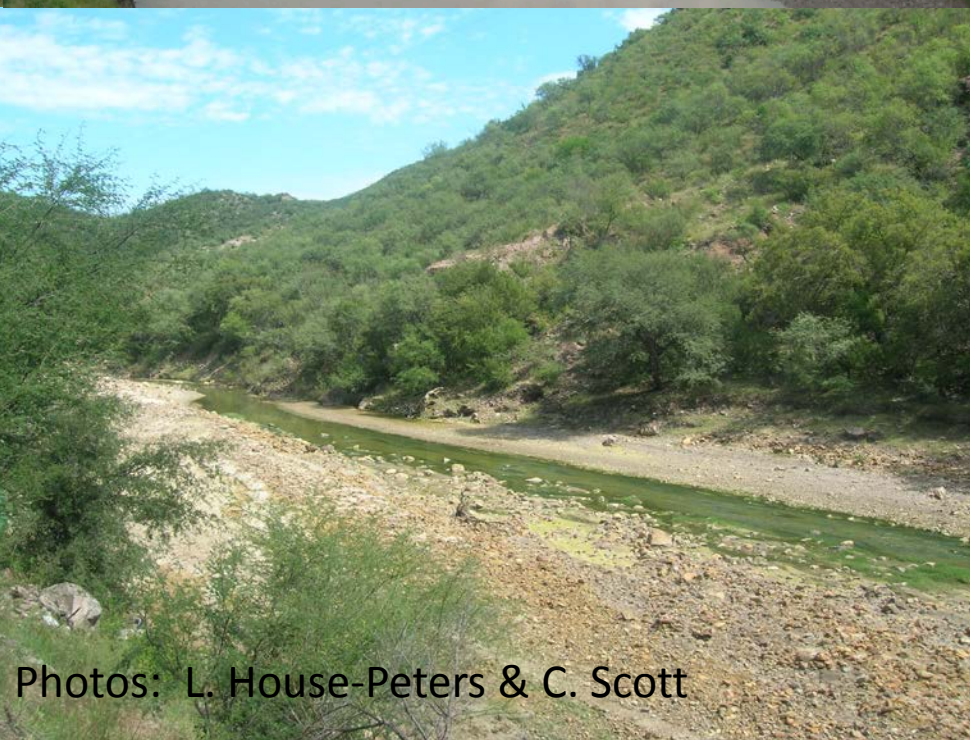




Río Sonora



Río Bavispe



Photos: L. House-Peters & C. Scott

Arizona Daily Star

tucson.com

Sunday, October 5, 2014
\$2 plus tax • \$3 outside Southern Arizona

UNKNOWN HAUNT SONORA RIVER VALLEY



PHOTO BY KELLY FRESHNELL / ARIZONA DAILY STAR

In Sananichi, Sonora, Ana Maria Diaz wrestles a 5-gallon jug of water while redistributing the home's supply of drinking water into gallon jugs. For days after the spill, many residents continued to drink water from contaminated wells.

LIVELIHOODS WASHED AWAY BY ACID SPILL

2 months after mine accident, farmers, families don't know what to believe

By Perla Treviso

ANANICHIL, Sonora — Everything here comes from the river.

The water rushes along both sides of the lush green, arroyo-like basin, with cottonwood, mesquite trees, and some acorn trees in the Sonora valley.

Lydia Diaz had a good life here. The river provided her family's cows with water to drink and grass to eat, other-
wise her four teenage children fill of milk every day.

TOMORROW
A visit to Tucson, the town closest to the spill

A whole liter at a time if they wanted that much. She didn't need to buy groceries — with the river's help, the corn, beans, squash and green beans the family planted in a nearby field grew plentiful enough to feed all six of them.

She and her husband had



Lydia Diaz washes dishes using as little water as possible. She has running water a few hours at a time, once or twice a day.

See RIVER, A4

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"It
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make an informed
placement, she said. "I would want as much
information as possible if I were making a de
cision for a family member."

Part of Higgins' job is to help resolve com
plaints from families, but even she some
times finds it difficult to get a full picture of a

See COMPLAINTS, A4

NEED HELP?

For help choosing a long-term care home or to
resolve problems at a facility, contact the Pima
Council on Aging's ombudsman at 750 7262 or
hospice.org.

Video

2 Free Issues of Forbes

Search companies, people and lists

The Most Interesting Man
Revolutionizing The Health
World

10 Calculated Risks That
Lead To Startup Success

Arizona Daily Star

tucson.com

Monday, October 6, 2014
\$1 plus tax • \$3 outside Southern Arizona

Toxic spill in Mexico leaves fear, anger in its wake

Answers on long-term
impact on the land,
water, difficult to get

By Perla Treviso

ARIZONA DAILY STAR

BACANUCHI, Sonora — The makeshift town hall was packed by the time Mayor Vidal Vázquez arrived. The residents of this small town of a few hundred people, which shares the name with the nearby river where millions of gallons of toxic solution were dumped, had been waiting for him.

A few sat in plastic chairs; most stood against the wall or sat on boxes of bottled water. Those outside strained to get a look through the windows. Nearly two months after the Aug.

6 and 7 copper mine spill, which was followed by heavy rains brought by Hurricane Odile that further contaminated the land, residents are frustrated and feel as though they've been forgotten.

"This is the town that's worse off, and no one is doing anything about it," said a man in a blue baseball cap. "How is it possible that in nearly two months they are digging wells in other places but not here?"

Vázquez explained what the federal, state and local governments are doing. "Remember, when you told me there was a spill, I got on my horse; it took me two hours," he said, "but I went to check it out and reported it to the authorities."

Vázquez was referring to a second

spill, after rains from Odile caused the dams to overflow.

He also told them about a new committee that all the mayors, the government and the mine's owners, Grupo Mexico, are part of.

They will oversee the \$150 million trust Grupo Mexico established to begin covering damages.

Farmers will get about \$700 per acre of land up to approximately 25 acres. They will also get about \$1,000 for up to 41 head of cattle and \$27 for each additional head, up to 300.

None of this sat well with the community, many of them ejidatarios who work the communal land, nor with the Cananea attorney they hired to



KELLY FRESHNELL / ARIZONA DAILY STAR

Romeo Castro, a chemical biologist with the state of Sonora, gets samples to test for contamination at the Arizpe Well #1 site near the Rio Bacanuchi last week.

See WATER, A4

has been in the center of the
in northern Mexico caused the
history.

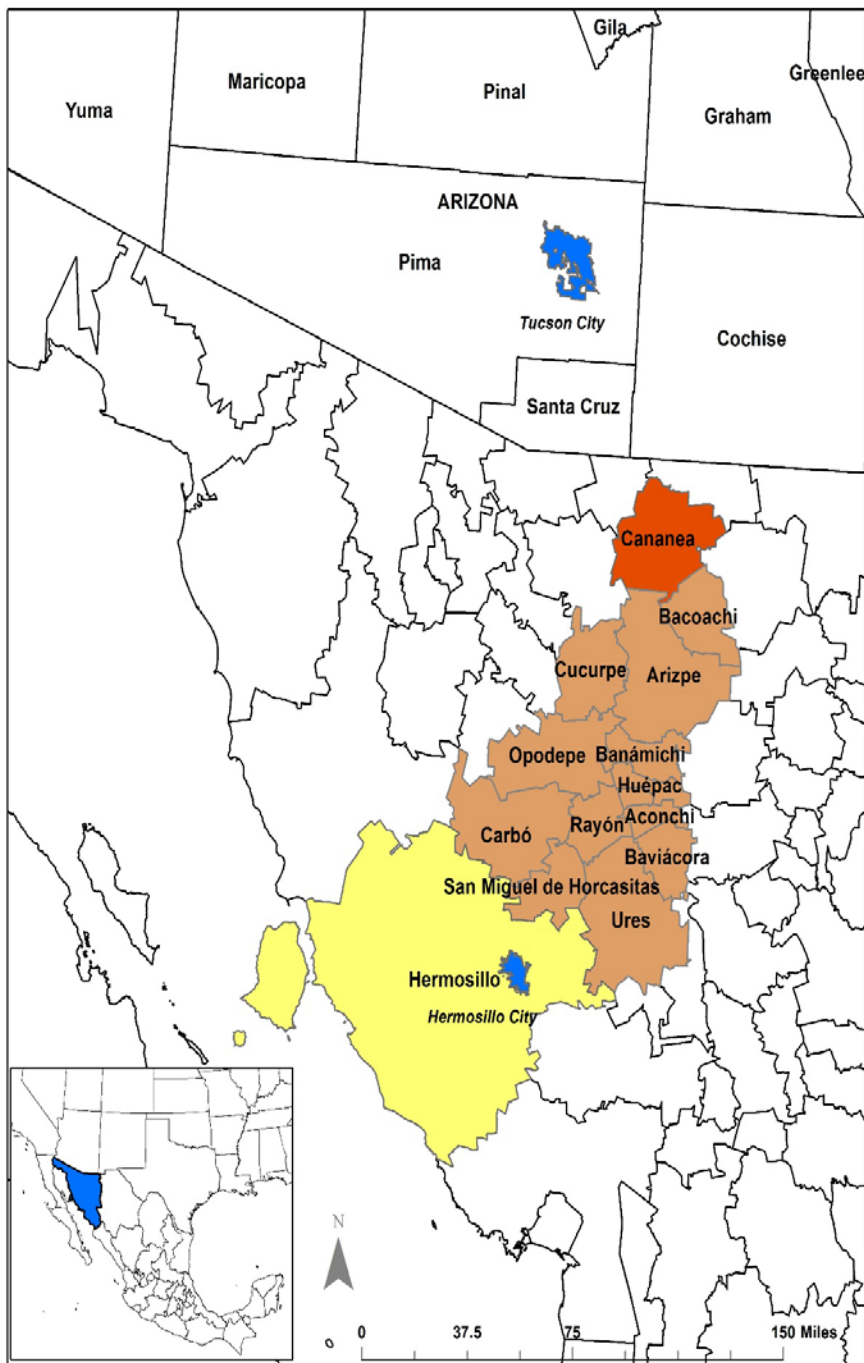
Templating

Plan your
Surgery with
TraumaCad!



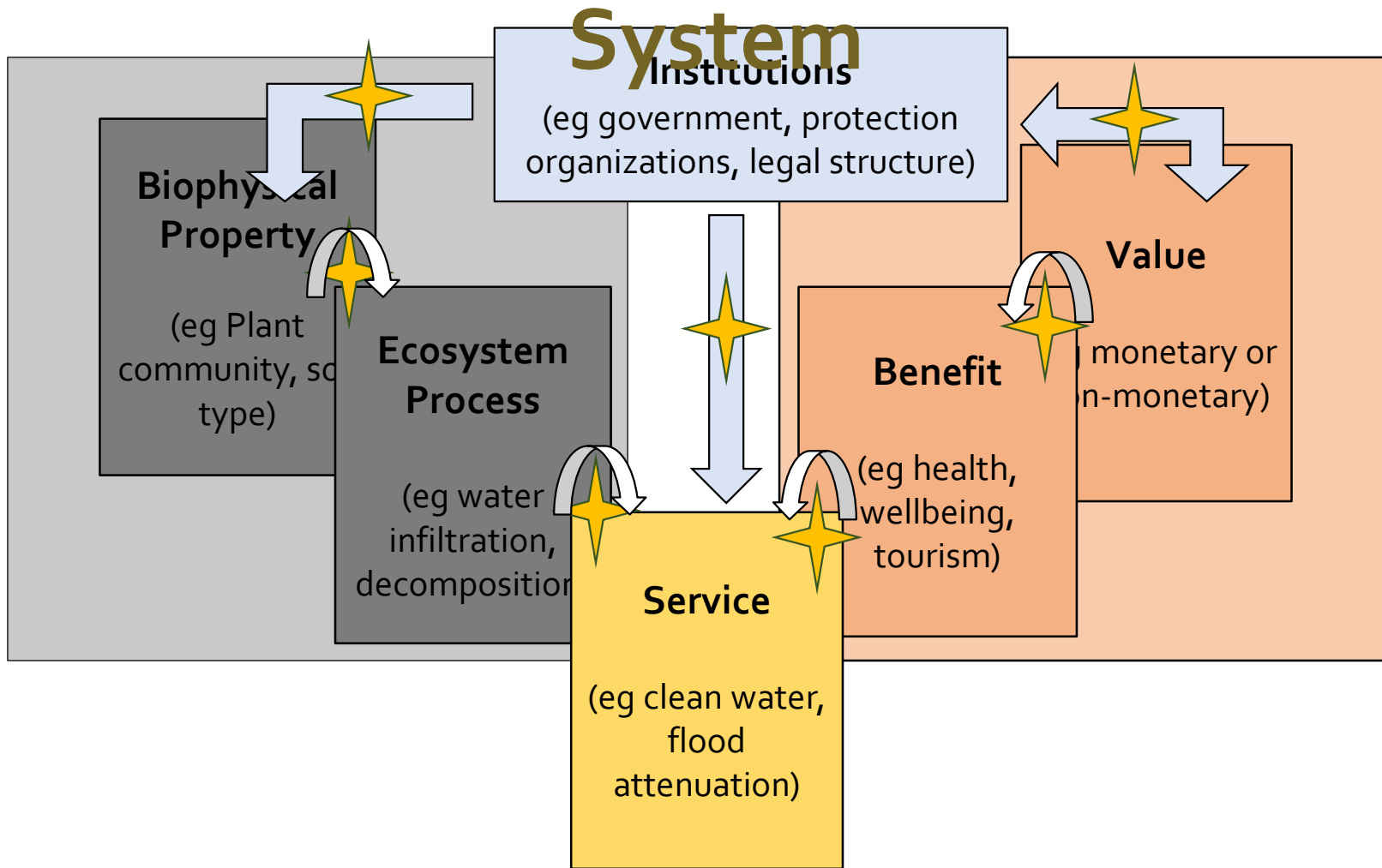
FOTOGALERIA
EL IMPARCIAL.COM

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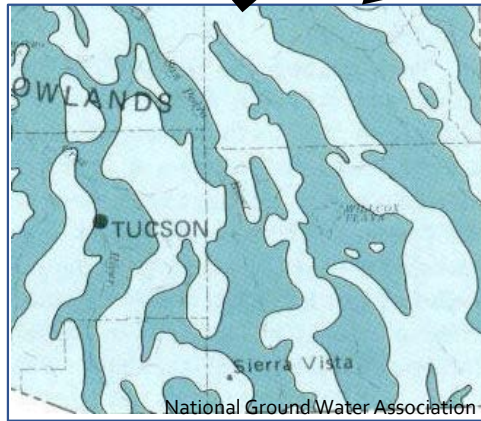
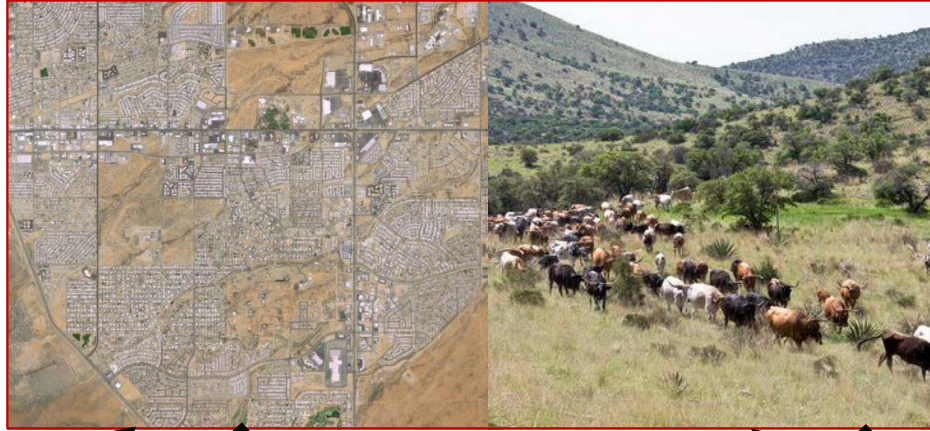
- August 7th, 2014
- 32.4 acre-feet of copper leaching solution
- Río Bacanuchi: Headwaters of Rio Sonora
- More than 20,000 people affected, not including Hermosillo City
- Hundreds of millions of pesos of estimated damages

Hydrology linked to Ecosystem Services: Emerge from the Social-ecological



Agent-Based Modeling (ABM) Approach

Social

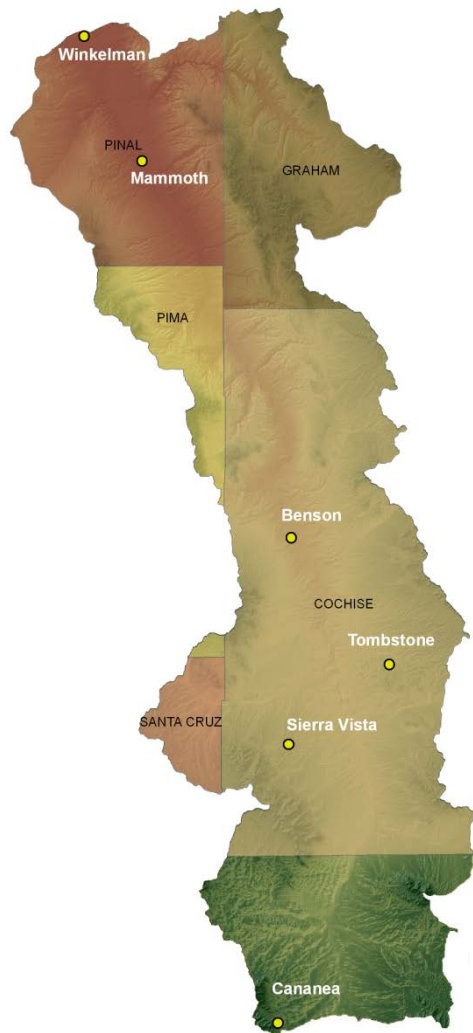


Hydrological

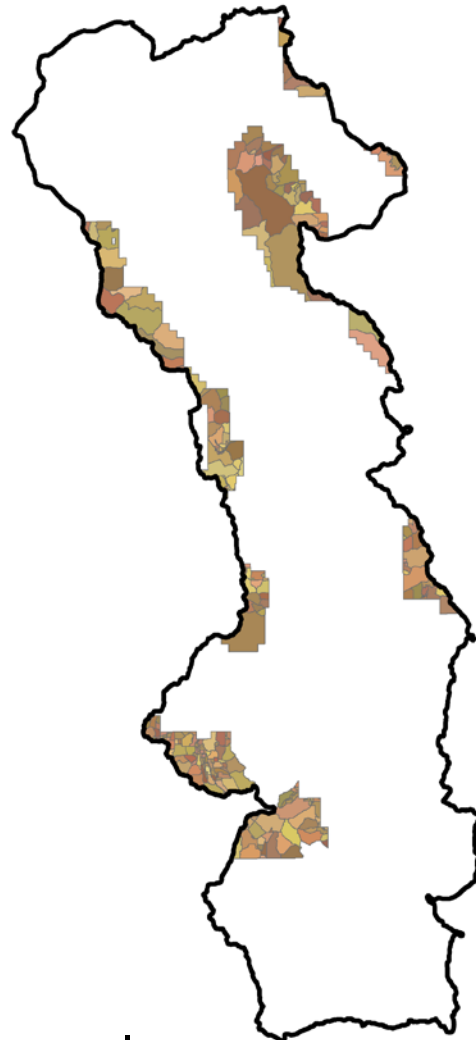


Ecological

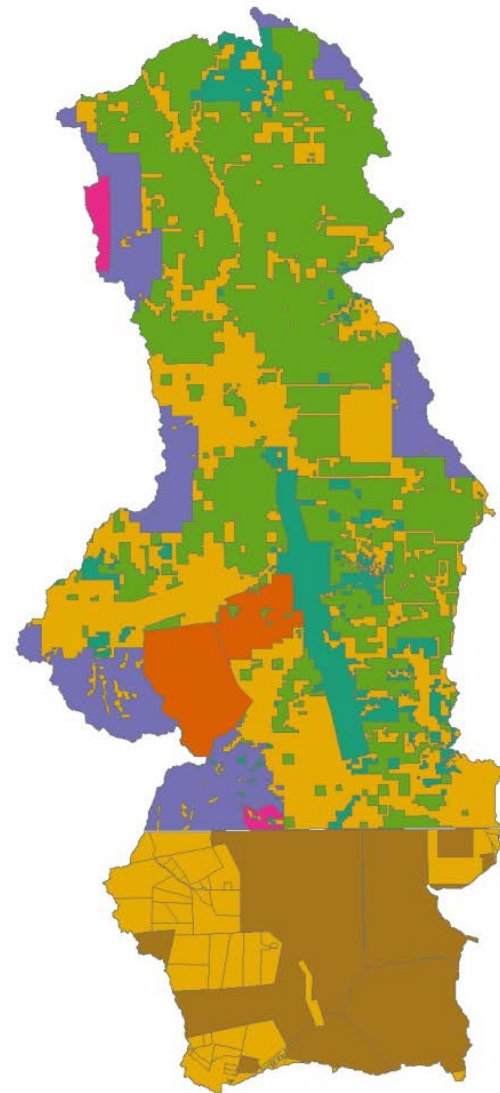
Example Social Data



County/ International
Boundaries



Pastures



Land Ownership

- BLM
- DoD
- Forest Service
- NPS
- Private
- State
- Ejido

Land Cover GIS Data

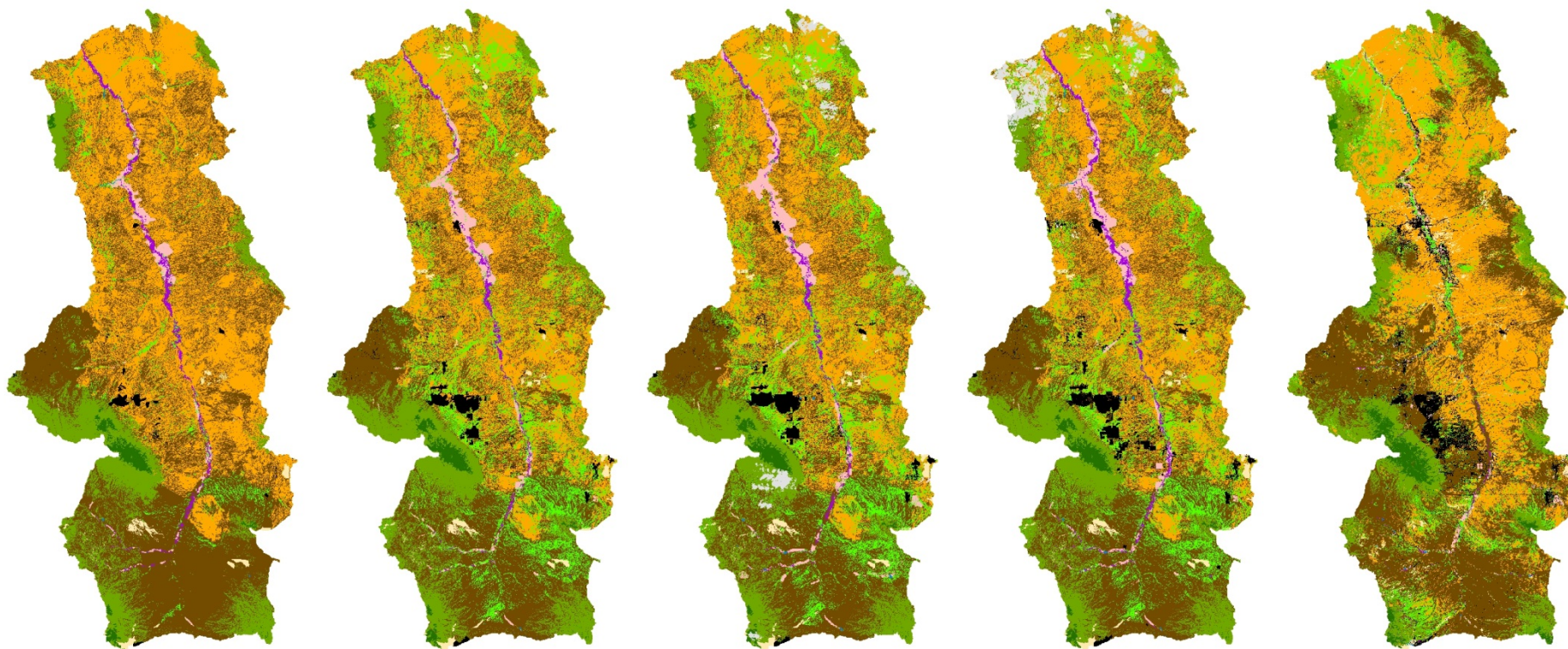
1973

1986

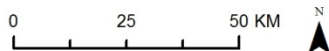
1992

1997

2010



Legend

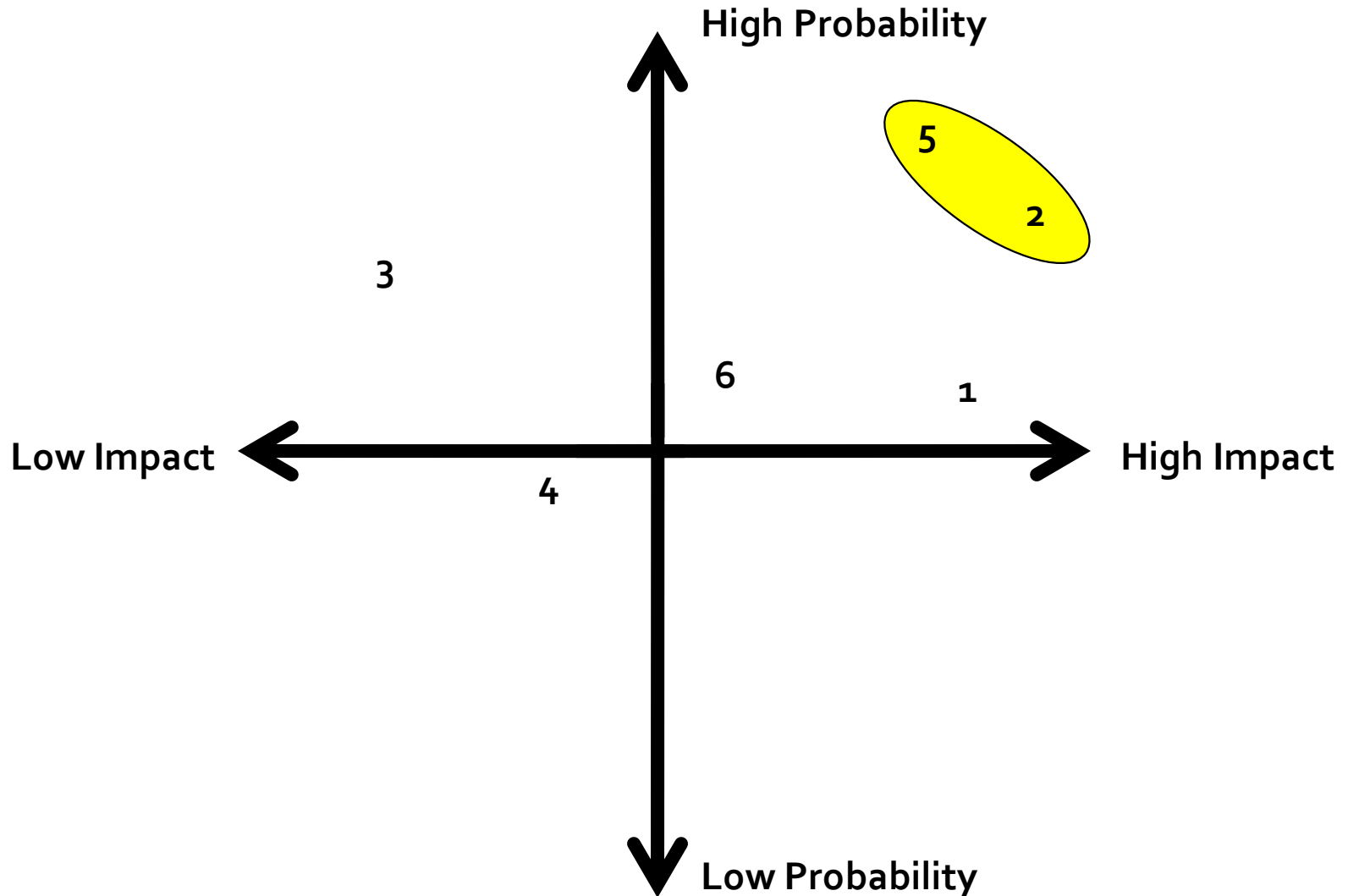


Source: San Pedro Geodata Browser

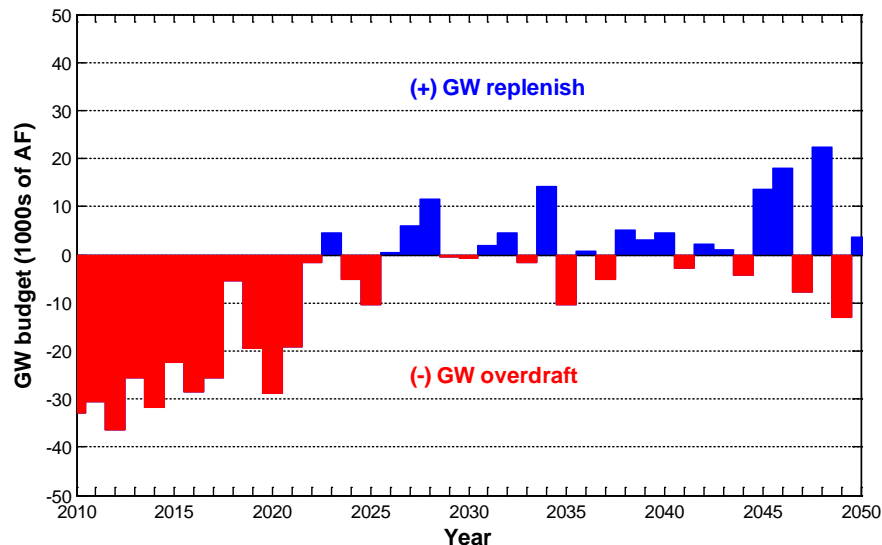
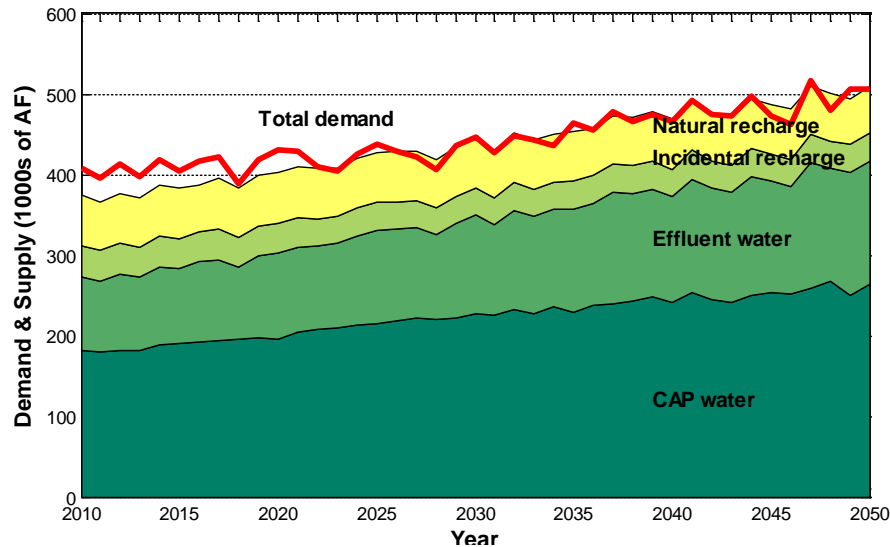
Probability-Impact for Social-Ecological Systems (SES) Scenario Assessment

		Potential for impact on SES	
		Low	High
Probability of Occuring	Low	High-value, low-water crops replace grains	Ft. Huachuca closure
	High	Rapid invasion of non-native grasses	Drought frequency increases with climate change

Scenario Development



Resource Sustainability



Indicators

Reliability – frequency of system failure

Resiliency – average time required for a system to recover from failure

Vulnerability – intensity of system failure

Remediability – system improvement over time

Restorability – storage surplus/deficit over long period of time

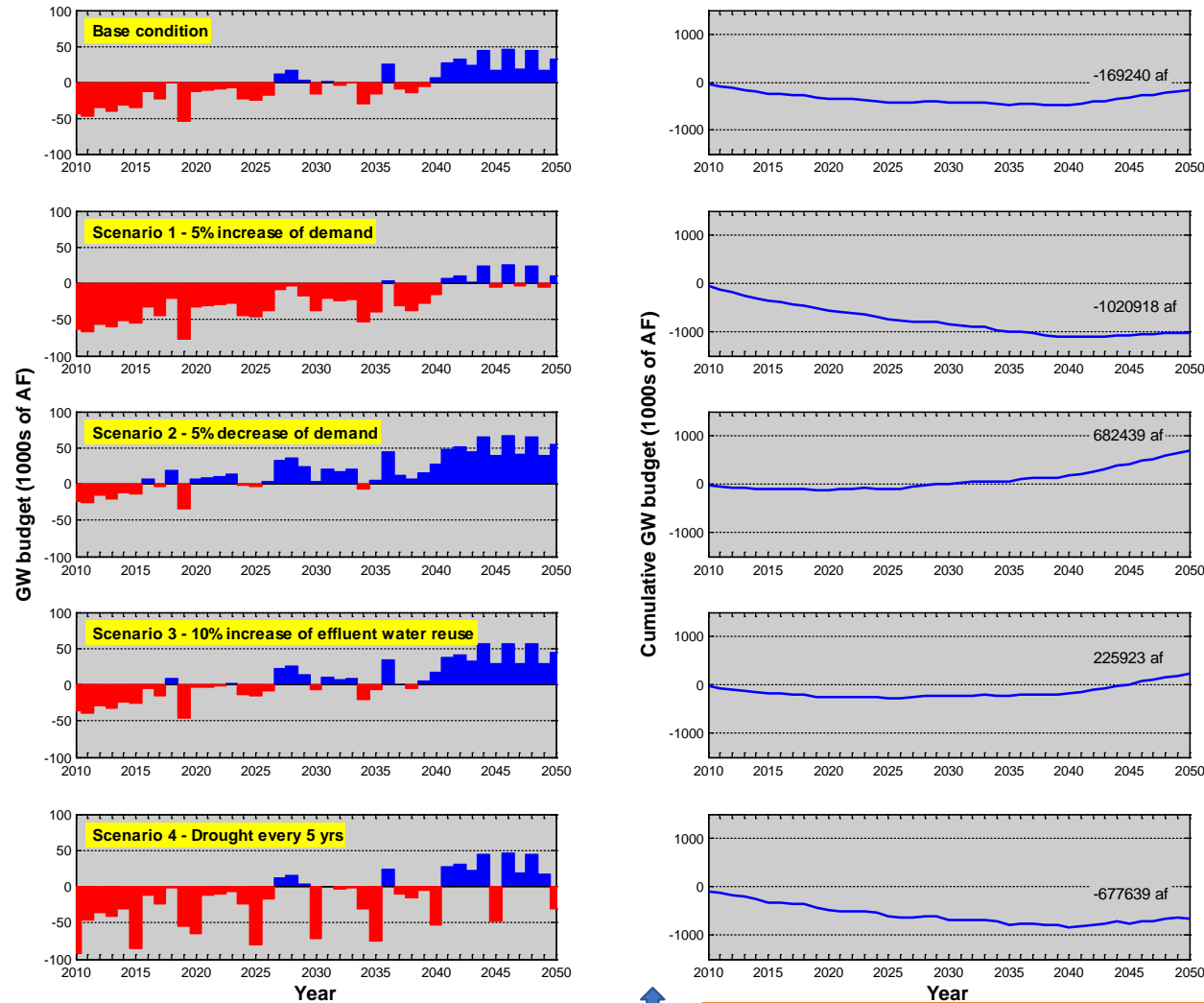
Completed work

- Lumped system model
- Scenario analysis

Future directions

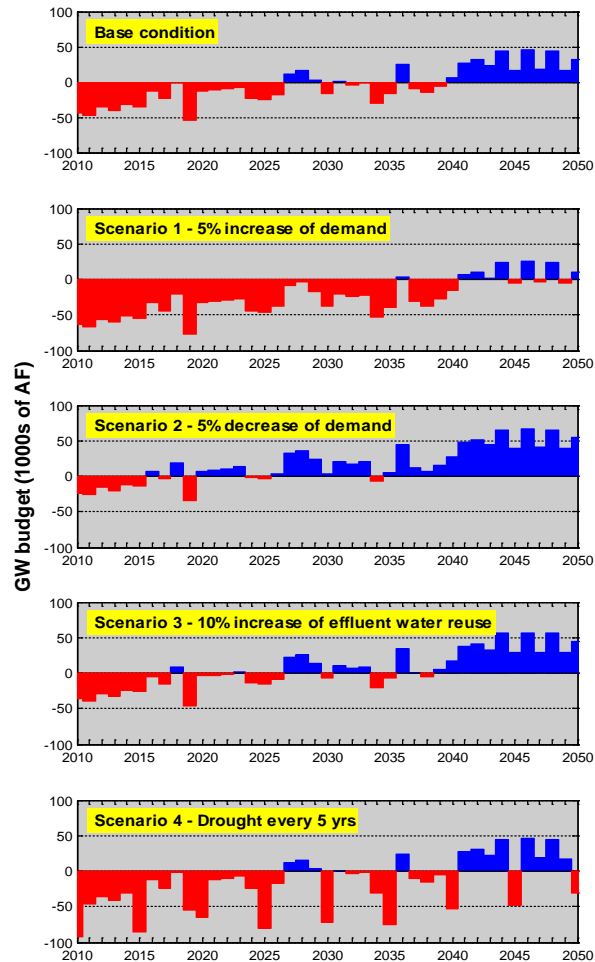
- Implement distributed model (MS-MQ-MU model)
- General system applications
- Resource vs. user sustainability
- Network flow optimization model

Scenario Analysis of the TAMA GW budgets



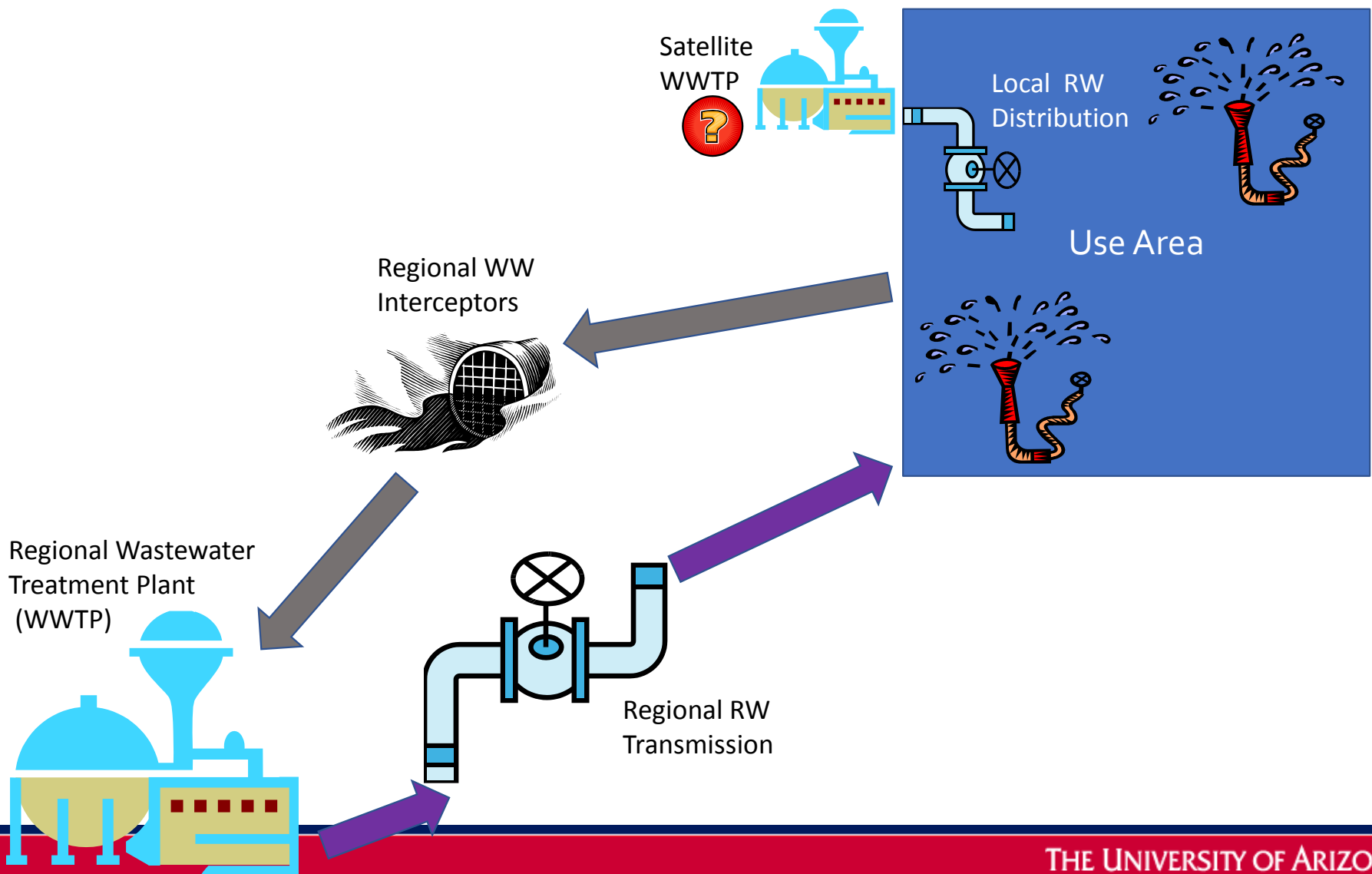
20% decrease in natural recharge and CAP delivery

Sustainability Measures



	Reliability (R1)	Resiliency (R2)	Vulnerability (R3)	Restorability (R4)	Sustainability
Base Condition	0.39	0.16	0.53	0.43	0.38
Scenario 1	0.20	0.15	0.00	0.13	0.12 (↓0.26)
Scenario 2	0.73	0.45	0.85	1.00	0.76 (↑0.38)
Scenario 3	0.54	0.32	0.70	0.67	0.55 (↑0.17)
Scenario 4	0.32	0.21	0.13	0.36	0.26 (↓0.12)

Satellite versus Centralized Reclamation



Principles for science – policy dialogues

Engagement, engagement, engagement

- Iterative process
 - Inclusivity, trust-building
- Need “socialization” and institutional incentives to promote transdisciplinarity in:
 - University departments, science funding bodies
 - Policy-makers
- Use-inspired, policy-relevant research
- Generational shift? the shape of science to come



Udall Center emerging directions -

Energy policy

- Regional US-Mexico opportunities
 - US-Mexico climate-smart energy, private-utility collaboration
- Renewables including for Native nations
 - Native Nations, Public lands – energy generation and transmission
- Global water-energy-food nexus
 - Hydropower-irrigation nexus
 - Mountain water towers (Himalayas, Andes)
 - Electricity-groundwater pumping nexus



*Water-
energy-food
nexus*

- Emerging collaboration with
 - UA Institute for Energy Solutions
 - US Institute for Environmental Conflict Resolution
- SEMARNAT – Mexico's environment ministry (includes water commission, CONAGUA)
- International research institutes
 - CGIAR
 - ICIMOD



Udall Foundation
CIVILITY, INTEGRITY, CONSENSUS

**Udall
Center
collabor-
ation with
Udall
Foundation**

- **US Institute for Environmental Conflict Resolution**
 - Energy generation and transmission
 - Public lands
 - Tribal lands
 - Dam removal, rewilding rivers
 - White Salmon, Yakama
 - Elwha
- **Udall Foundation's flagship outreach and engagement initiatives of direct relevance for the Udall Center**

IAI
Inter-American Institute
for Global Change Research

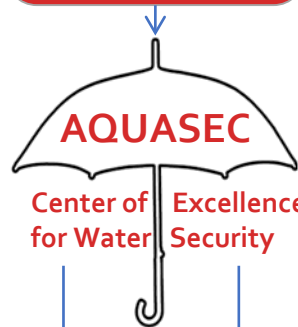


CRNs
Research
Projects

Centers of
Excellence

Training
Programs

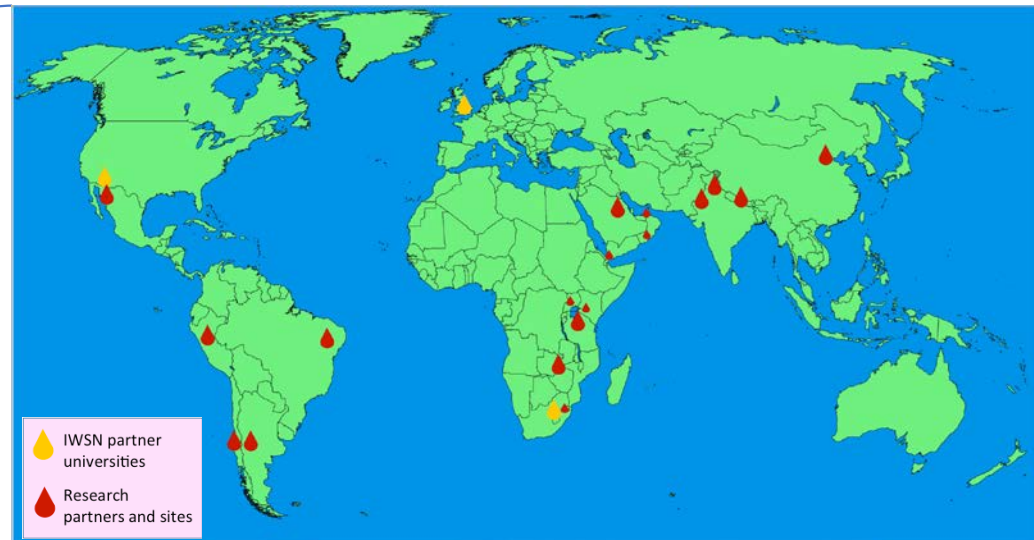
Science
communication
& other
programs



"Aguascapes"
Innovative
Science and
Influential Policy
Dialogues in the
Arid Americas

Lloyd's
International
Water Security
Network (IWSN)

Same
Partners
in the
Americas



Consortium for Arizona-Mexico Arid Environments (CAZMEX)

CONACYT (Mexican National Council for Science & Technology),
Agnese Nelms Haury Program, Brown Foundation

Objectives

- generate basic scientific knowledge; monitor biophysical, social dynamics in Sonoran Desert region, other arid environments
- Create strategies to improve quality of life and sustainably adapt to changes (climate, environmental, social, political)
- Strengthen, forge new binational partnerships to study the binational socio-ecological region

Thank you

Christopher Scott

udallcenter.arizona.edu/people/christopher-scott

geography.arizona.edu/user/christopher-scott



Photo by Chrys Kaparanis