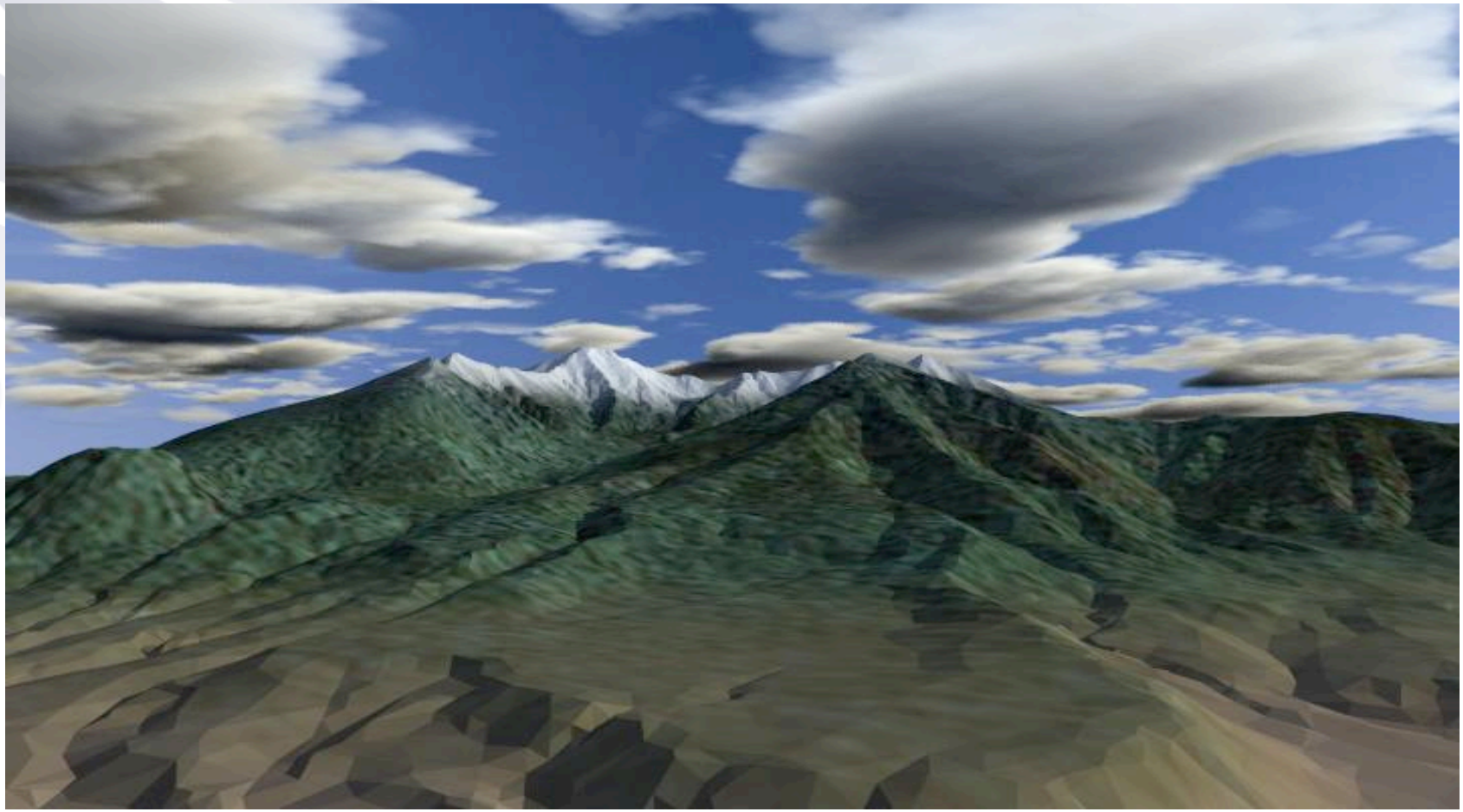
SAHRA Ed-KT Programs: Nov 2009



Legacy - Education

Enhancing hydrologic literacy by:

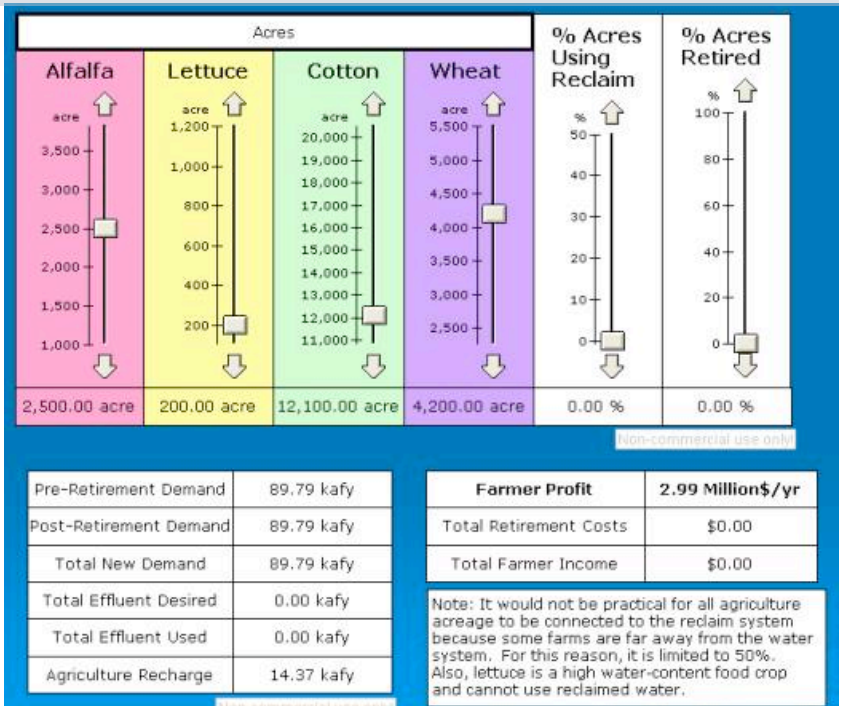
- Impacting student actions and decision-making through improved knowledge of regional water cycling & water resource issues;
- Producing a diverse generation of water professionals, students and faculty who approach water issues from a multi-disciplinary, basin scale perspective; and
- Improving communication between water professionals and stakeholders.

Arizona Water Issues

- Hydrologic Literacy
  - Watersheds
  - Water law/ Water markets
  - Water issues
  - Water resource mgmt.

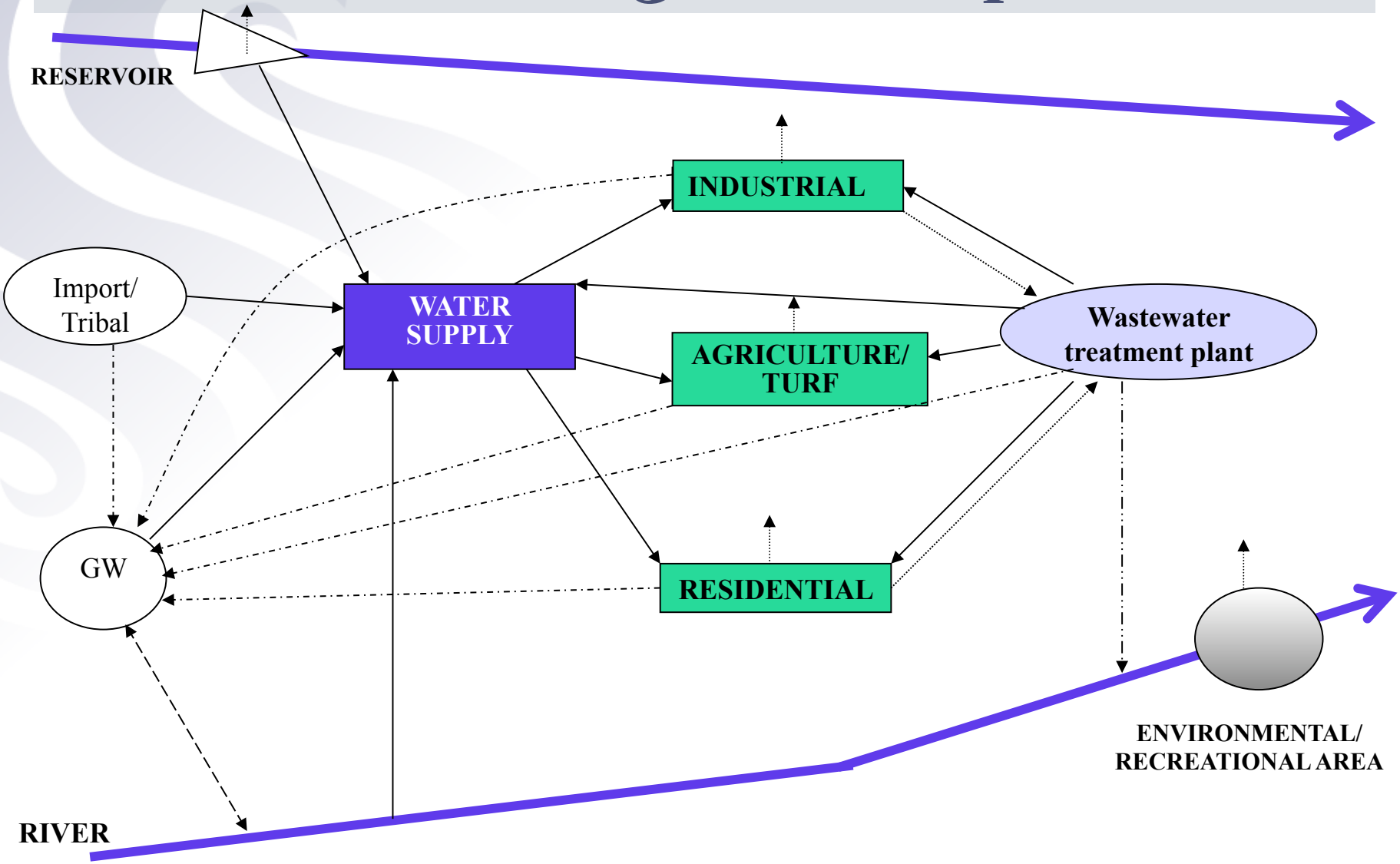
- GenEd core for non-sci majors
  - 60 students; 8 groups
  - No lab, 75 min

- Innovations: DSS models
  - Teach complex and inter-related concepts while keeping model details hidden



chubasco.hwr.arizona.edu/education/azwater

Water Plan 2030 – conceptual model

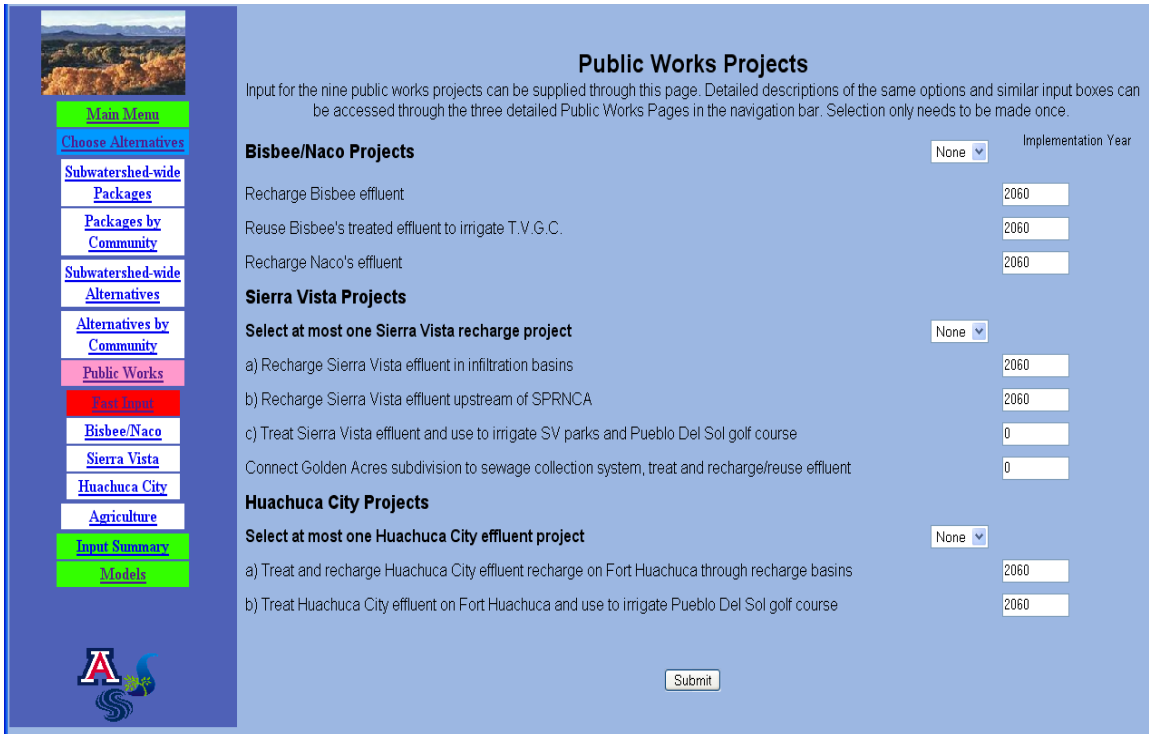


USPP Decision Support Model

- Evaluate impact of alternative water transfer scenarios or water conservation / recharge measures

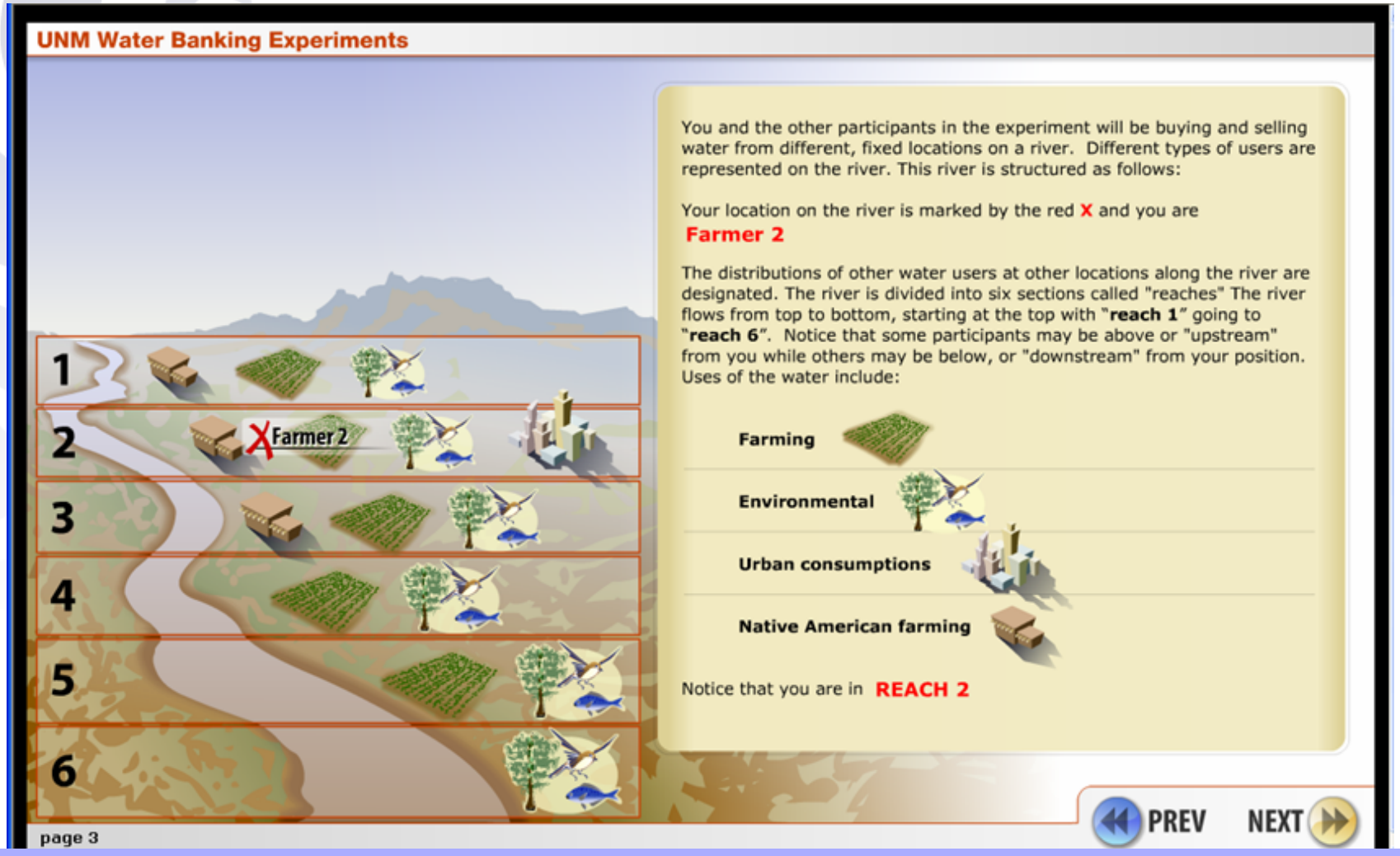
  (1) define timing and magnitude through interface pages

  (2) DSS computes the magnitude and spatial distribution of pumping and recharge.



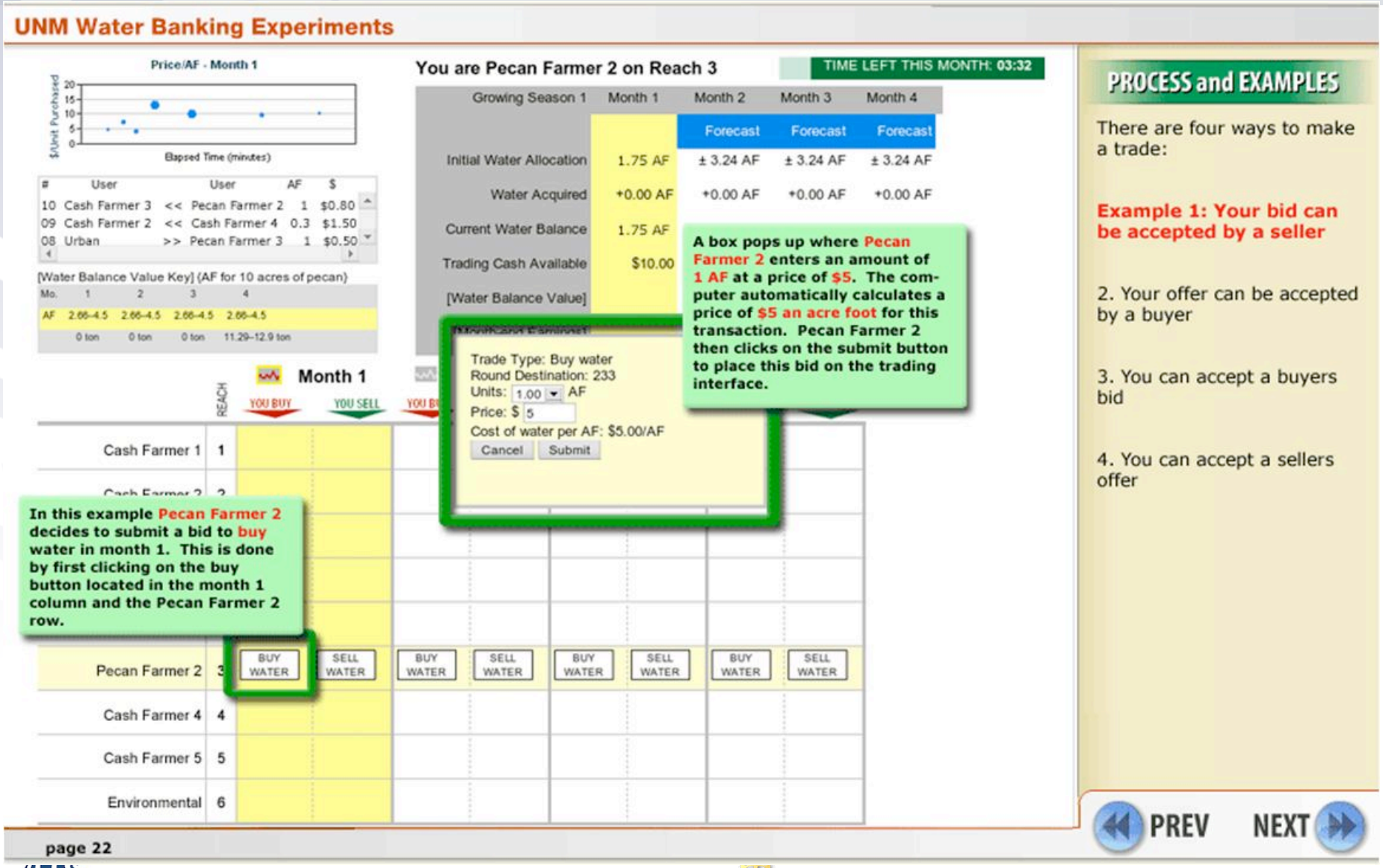
uspp.ce.arizona.edu/webapplication1/

Water Trading Experiment



www.sahra.arizona.edu/UNM/experiments/tutorial3/type_a/index.php

Water Trading Experiment

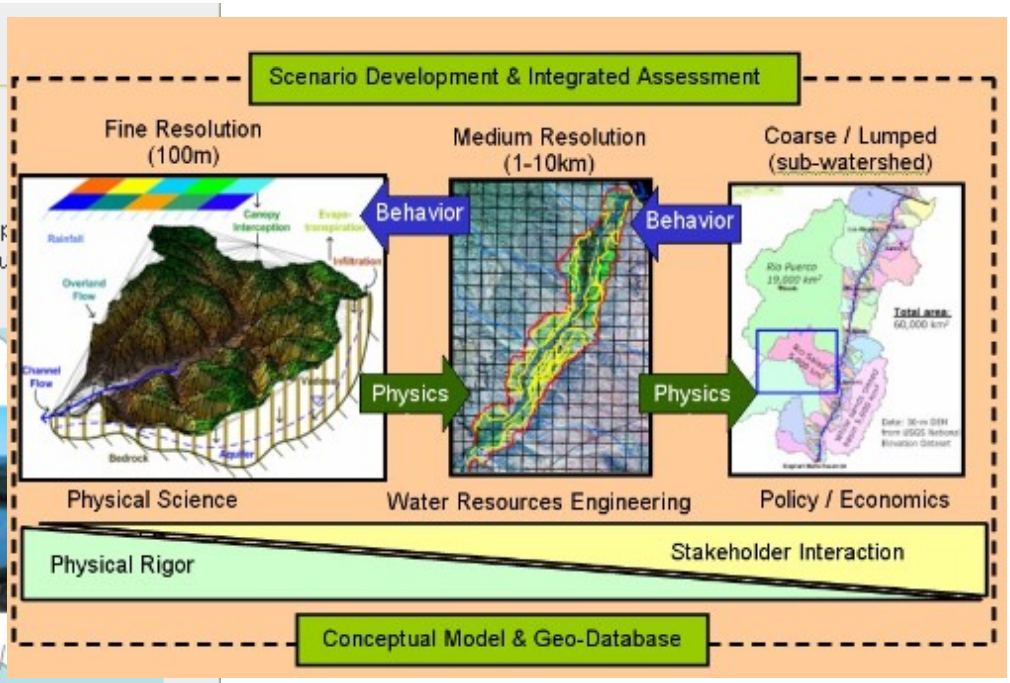


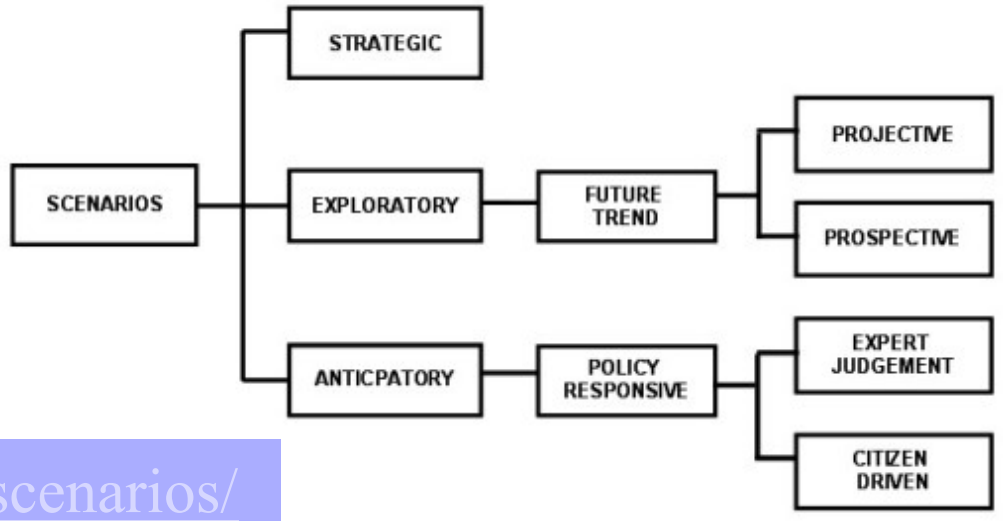
Welcome to SAHRA Scenario Development!

Welcome to the scenario development web community!

While there are a lot of resources on the web and in print media about scenario develop
of those resources are specific to the unique problems of developing scenarios for natu
and environmental modeling.

Scenario planning allows us to imagine all possible futures that can occur; including e
the range of possibilities between them. Scenarios require us to think with an open m
what may happen, since we want to consider all plausible futures and not just the m



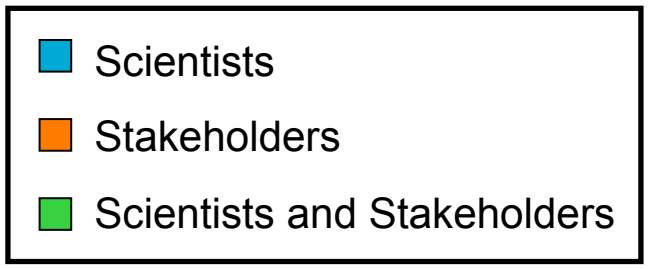


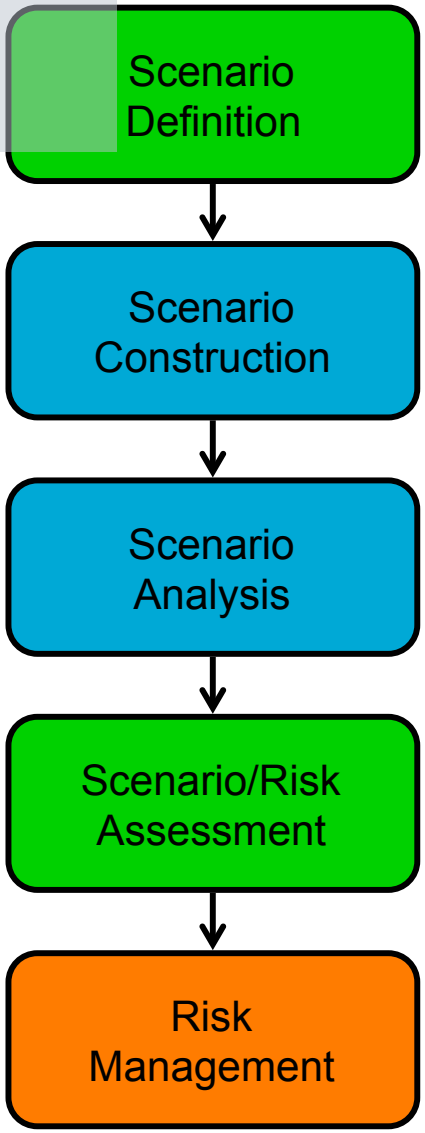
www.sahra.arizona.edu/scenarios/

Scenario Development - 5-Phase Plan

What is a Scenario?

- IPCC definition:
  " A scenario is a coherent, internally consistent and plausible description of a possible future state of the world. It is not a forecast; rather, each scenario is one alternative image of how the future can unfold."



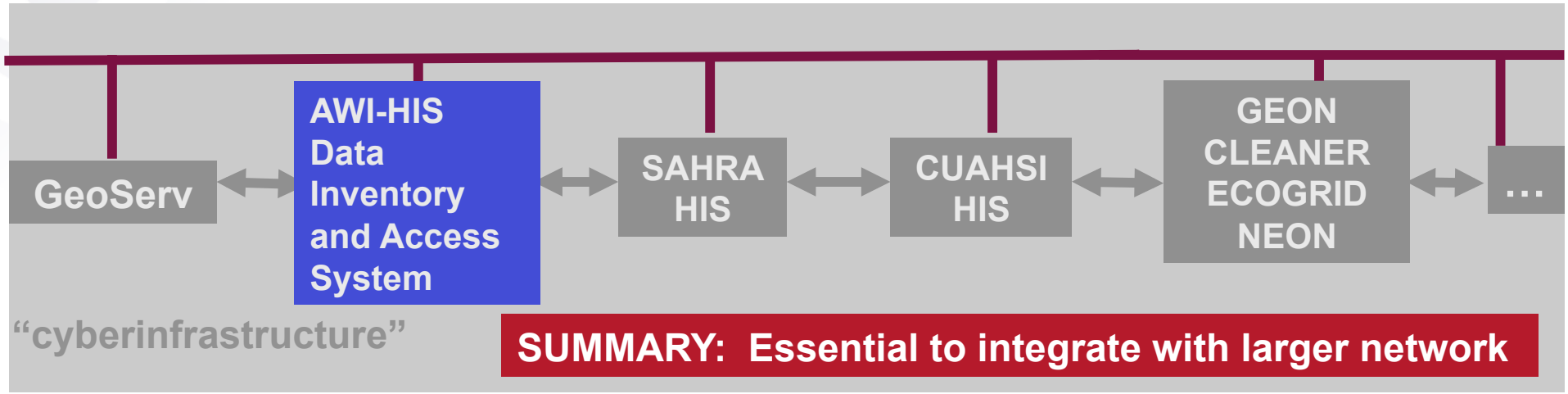


AHIS – AZ Hydrologic Information System

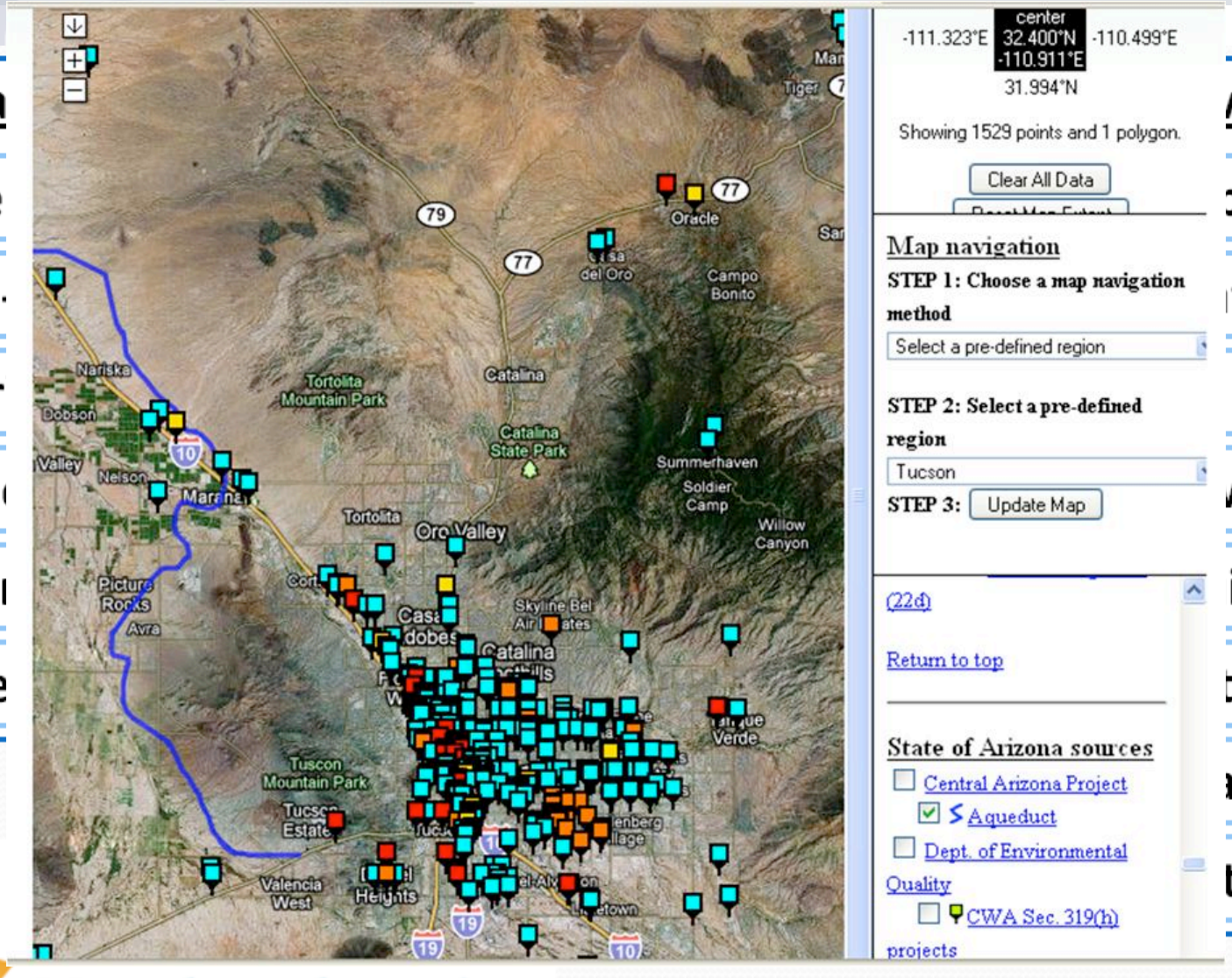
Water Related Data Inventory and Access System

PHASE I → **PHASE II** → **PHASE III** → **PHASE IV**

PHASE I	PHASE II	PHASE III	PHASE IV
ESTABLISH RELATIONSHIP W/ DATA PROVIDERS	DATA INVENTORY CATALOG [metadata only]	INVENTORY QUERY [provide links and downloads for available data]	DATA CONNECTIVITY TO APPLICATIONS



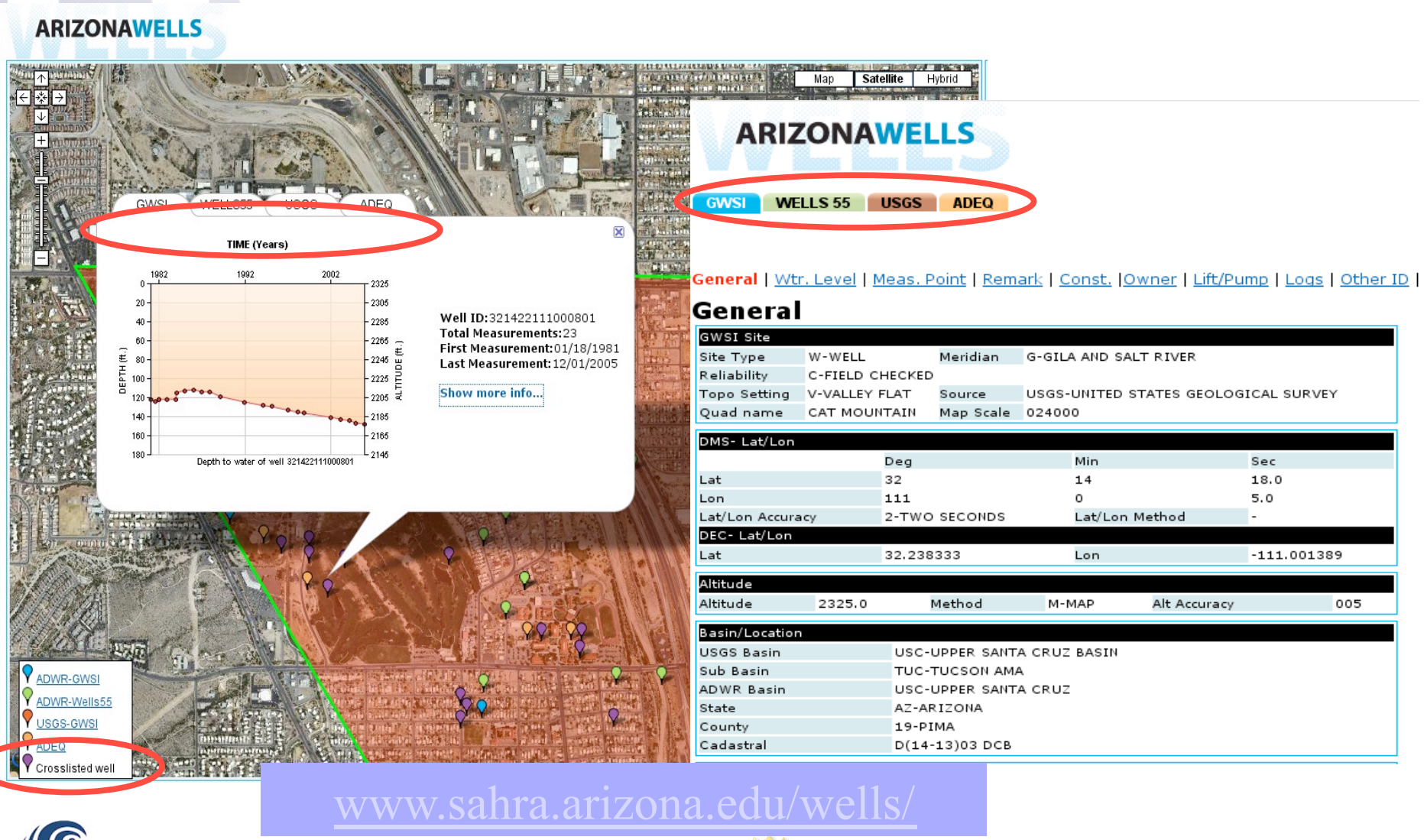
AZ Hydrologic Information System



Hydrologic Information System

chubasco.hwr.arizona.edu/ahis-drupal/

Arizona Wells



www.sahra.arizona.edu/wells/

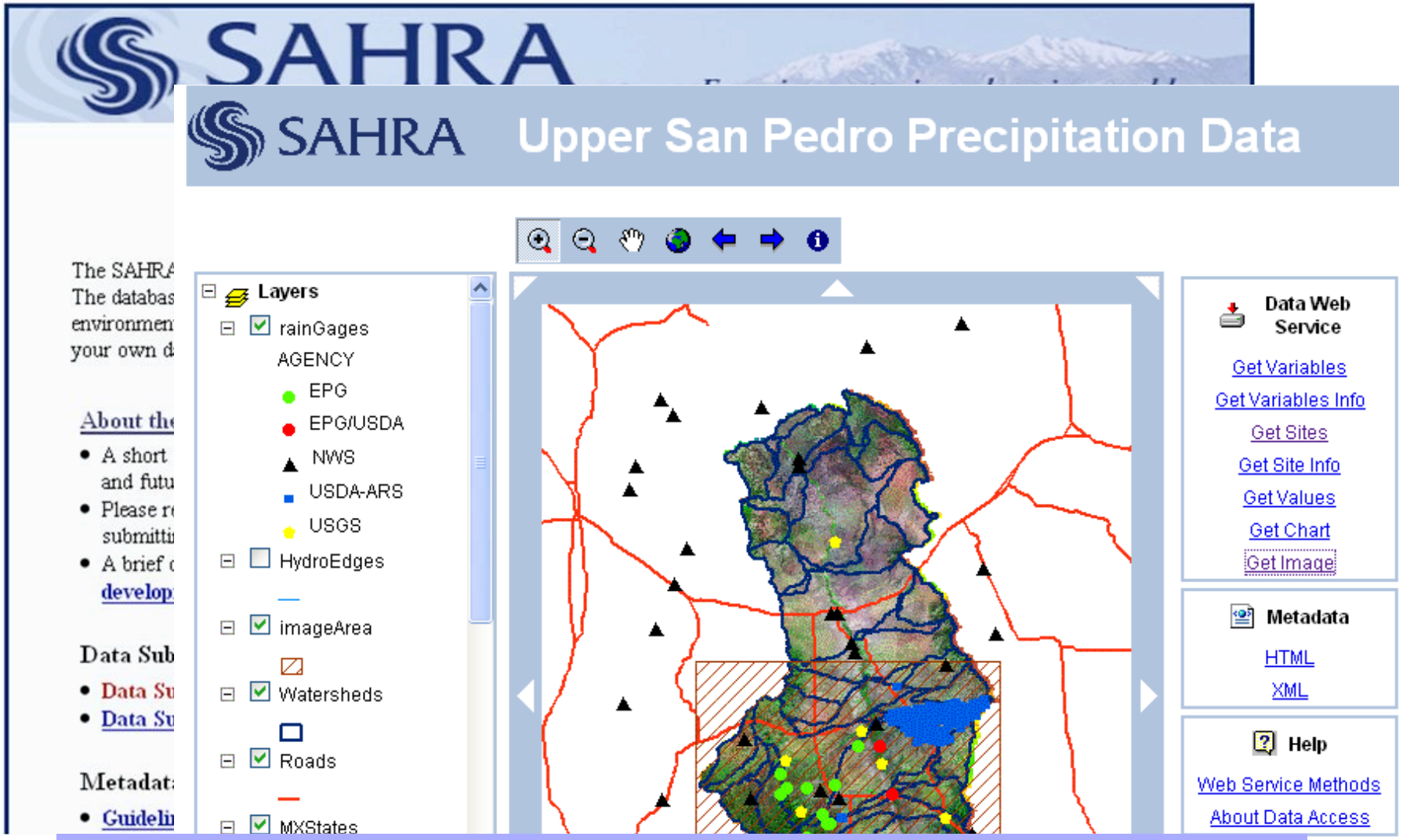
Rainlog.org: Volunteer Data Collection

Potential users for these data include:

- drought monitors
- master watershed stewards
- irrigation schedulers
- weather reporters
- water educators
- invasive species eradicators

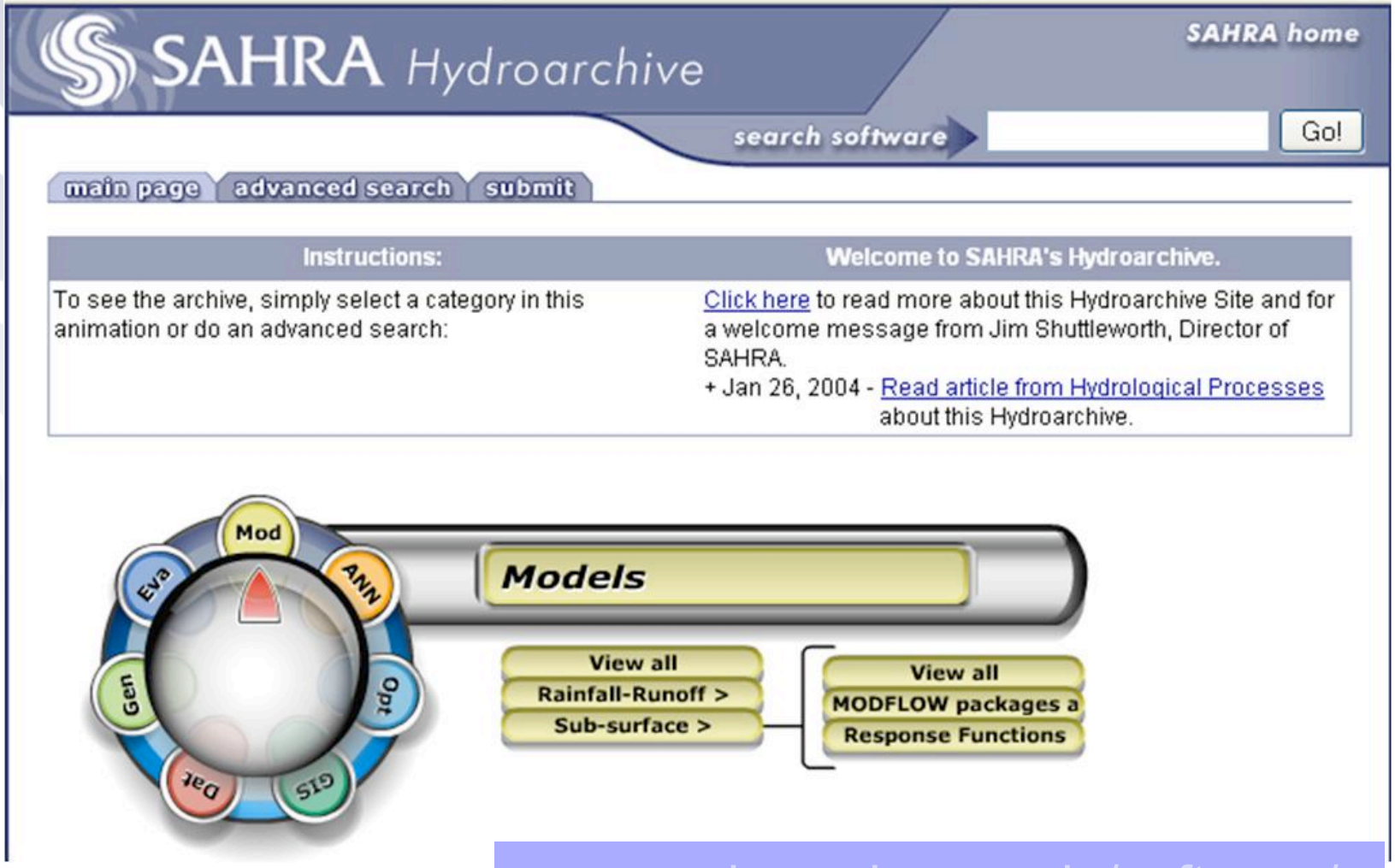
rainlog.org

SAHRA GeoData Database



www.sahra.arizona.edu/research_data/SAHRAGeoDB/

SAHRA Hydroarchive

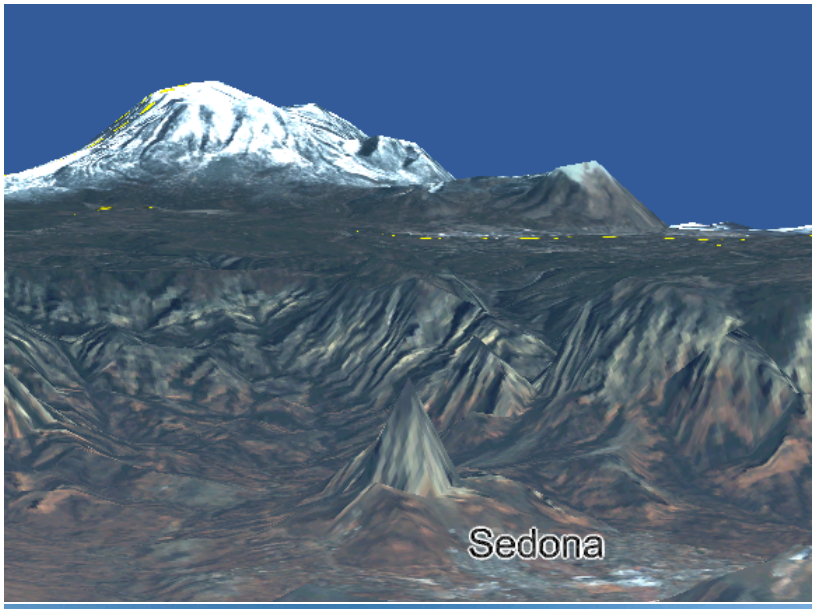


www.sahra.arizona.edu/software/

Watershed Visualization

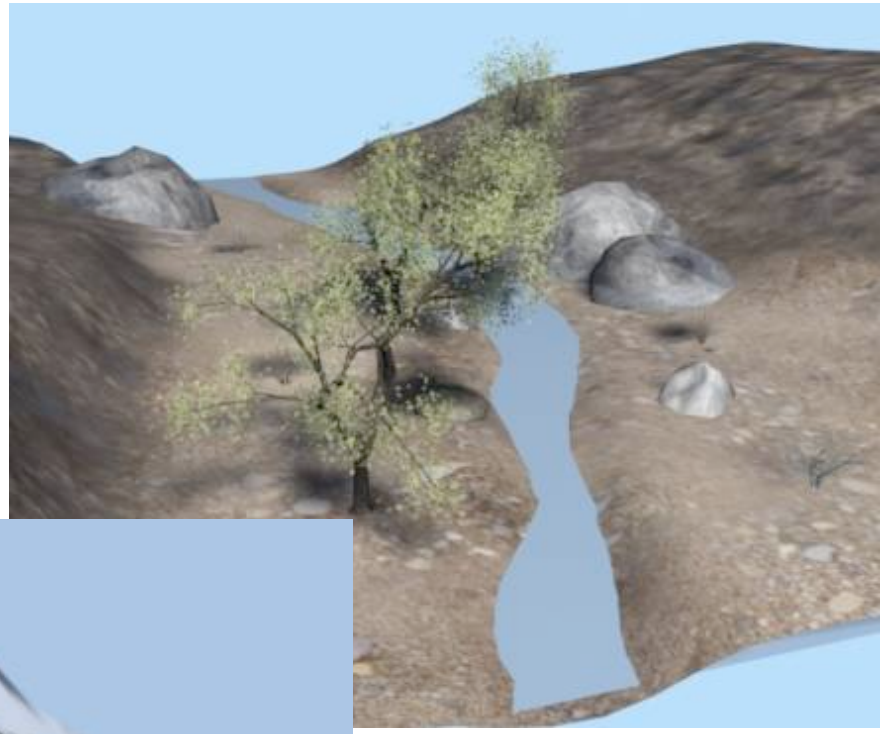
- Finally Complete!
- NSF GeoEd funding $260k
- Verde Basin Focus
- Products: DVD and Web site

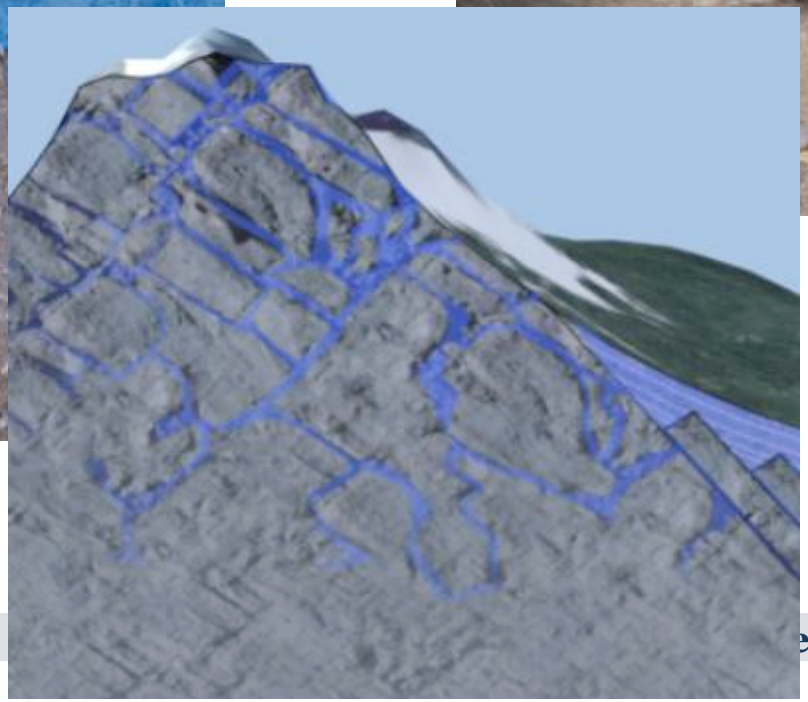
- Primary Questions
  - What does a watershed look like?
  - What is a watershed (WS)?
  - Where does water in a WS come from? (water cycle)
  - How does GW recharge occur?
  - How does runoff become a river?



www.sahra.arizona.edu/education/wsviz

WS Viz: Recharge & Infiltration





Balance between realism & conceptual process

Personnel Considerations

- Associate Directors of KT and Edu
  - Gary Woodard & Jim Washburne
- Editors
  - Betsy Woodhouse, Erika Noebel, Louise Shaler
- Database managers/developers
  - Matt Garcia, Matej Durcik
- Database/Web programming
  - Ramon Vazquez
- Graphic Artist
  - Shiloe Fontes
- Web development & Support
  - Cindy Grooms
  - Louise McDermott

EarthBuzz

- Collaboration with NCED & SMM & 5 STC's
- Focus is man's effect on the planet – Anthropocene era
- Product:
  - Kiosk / Web site
  - Ask a scientist
  - Blogs
  - Background

www.sciencebuzz.org/museum/ask/huxman

Scientific Literacy Initiatives

- **Ocean literacy** is an understanding of the ocean's influence on you—and your influence on the ocean.

An ocean-literate person:

- understands the Essential Principles and Fundamental Concepts about the functioning of the ocean;
- **can communicate** about the ocean in a meaningful way; and
- is able to make informed and responsible decisions regarding the ocean and its resources.

COSEE

Earth science literacy

- Big ideas- Earth is:

3) a complex system of interactions between rock, water, air and life.

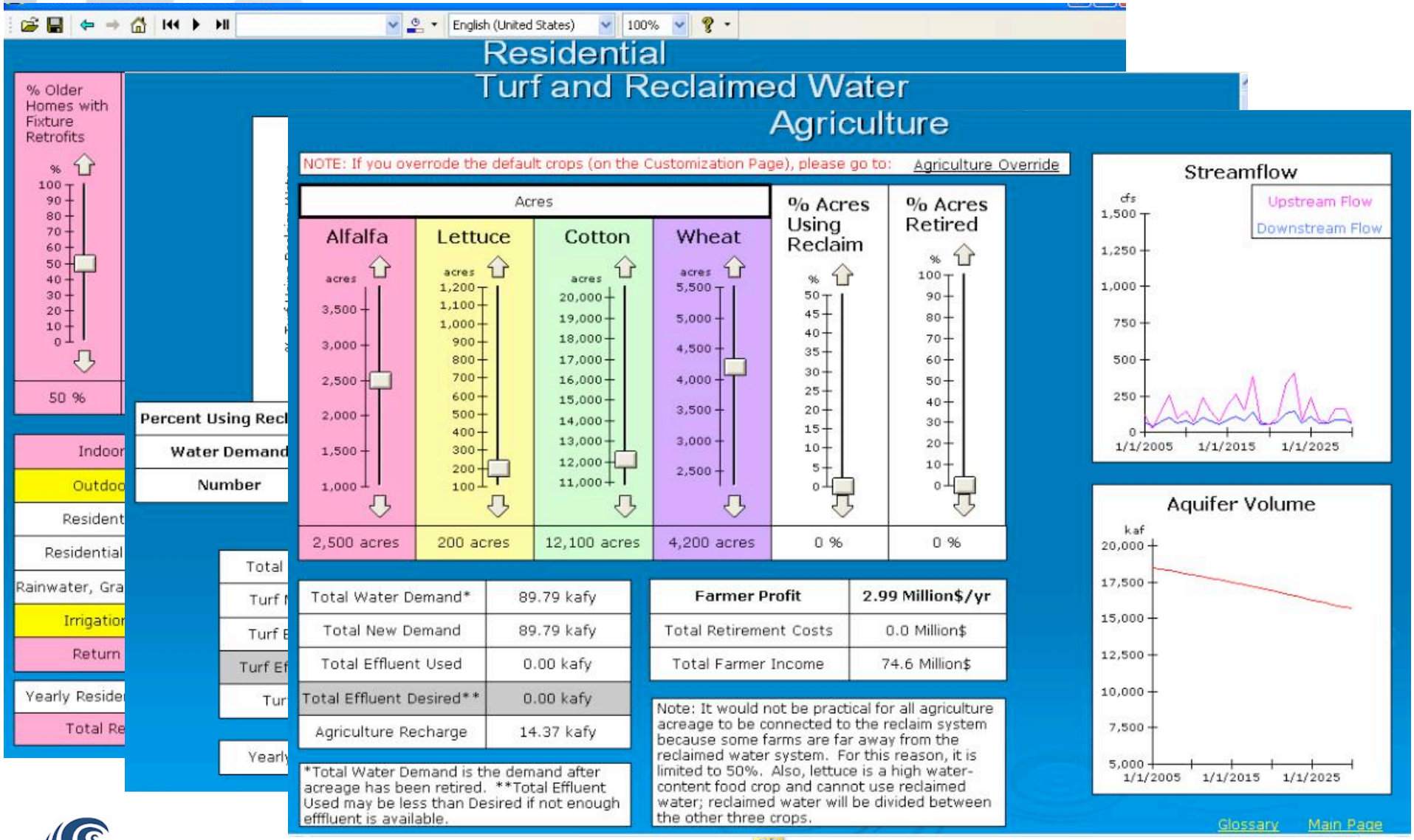
4) continuously changing

5) Earth is the water planet

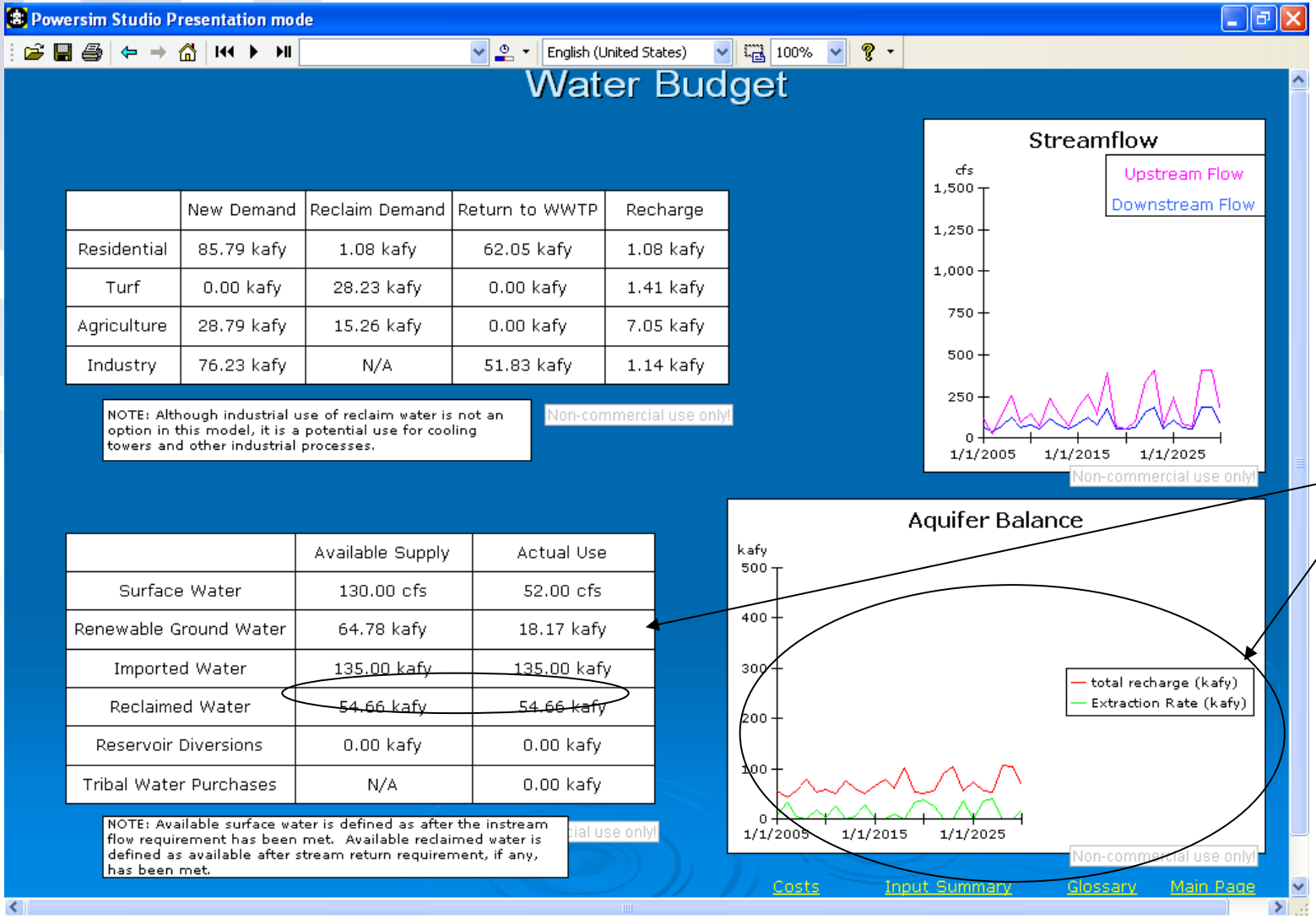
- Water is essential for life
- Water's unique physical and chemical properties are essential to the dynamics of all Earth's systems
- Earth's water cycles between atmo, lakes, ice, aquifers …
- Water shapes landscapes

www.earthscienceliteracy.org

Water Plan 2030 – User interface



Water Plan 2030 – Goal: Safe Yield



	New Demand	Reclaim Demand	Return to WWTP	Recharge
Residential	85.79 kafy	1.08 kafy	62.05 kafy	1.08 kafy
Turf	0.00 kafy	28.23 kafy	0.00 kafy	1.41 kafy
Agriculture	28.79 kafy	15.26 kafy	0.00 kafy	7.05 kafy
Industry	76.23 kafy	N/A	51.83 kafy	1.14 kafy

NOTE: Although industrial use of reclaim water is not an option in this model, it is a potential use for cooling towers and other industrial processes.

	Available Supply	Actual Use
Surface Water	130.00 cfs	52.00 cfs
Renewable Ground Water	64.78 kafy	18.17 kafy
Imported Water	135.00 kafy	135.00 kafy
Reclaimed Water	54.66 kafy	54.66 kafy
Reservoir Diversions	0.00 kafy	0.00 kafy
Tribal Water Purchases	N/A	0.00 kafy

NOTE: Available surface water is defined as after the instream flow requirement has been met. Available reclaimed water is defined as available after stream return requirement, if any, has been met.

An example of a region meeting safe yield. Extraction does not exceed total recharge, also known as renewable groundwater. The Aquifer Volume graph in this case would actually be slowly rising.

Web Site: www.azrivers.org

PHOENIX COLLEGE | THE UNIVERSITY OF ARIZONA® | NORTHERN ARIZONA UNIVERSITY

Arizona Rivers

Mission:

to facilitate collaborations between teachers/students and scientists/watershed managers to promote long-term research and monitoring of riparian environments in Arizona.

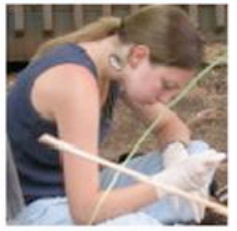
Goals:

- Promote education, monitoring, research and conservation related to Arizona's rivers and riparian habitats.
- Facilitate collaborations between students/teachers, citizen scientists and water professionals who study our rivers.
- Build effective networks of watershed-based mentors to support student and classroom research and education about rivers and riparian areas.
- Encourage the use of best practices related to watershed/riparian conservation and management.

How to get involved:

Arizona Rivers, is looking for teachers, students, citizen scientists, and student organizations (scouts, 4-H, FFA, science clubs, etc.) who are interested in partnering with volunteer river monitors and local watershed experts to:

High School Riparian Research Experience



Summer 2008 - Success!

RRE 2008 summary

APPLICATION

Program Overview (pdf)

General Schedule (pdf)

Student Application (pdf)

Camp Needs (pdf)

Camp Rules (pdf)

PARENTAL FORMS

Field Consent

Arizona Rivers

Student and Volunteer Monitoring of Arizona Rivers and Riparian Areas

- SfAZ grant, $280k for 1 year
- Co-I's: Whitaker, Washburne and Madden
- Sub's: Phoenix College - Pepe, NAU – Shannon;
- Focus: Facilitate and coordinate training and effective deployment of volunteer monitors, especially schools
- Leverage:
  - GLOBE database and protocols
  - SAHRA water kits

www.azrivers.org

SCIENCE FOUNDATION ARIZONA

An NSF Science and Technology Center

Riparian Research Experience

2008 @ Biosphere 2!

- 18 days: Jun 15-Jul 2

2009 @ SW Academy

- 15 days: Jun 6-20

2010 @ TBD?

- 15 days: Jun 11-16

- 3 days – intensive training
- 2 days – skills devel.
- 8 days – exploring & monitoring Arizona's rivers
- 2 days – analysis & report

www.azrivers.org

Water in Arizona - TEacher Resources

- Kits for classrooms
  - Water Quality
  - Aquatic Life
  - Watersheds
  - Urban Hydrology

- Distributed in AZ, NM
- Mapped to Standards
- On-line assessment tool
- Integrated with new programs: AZrivers, WSviz

www.sahra.arizona.edu/water