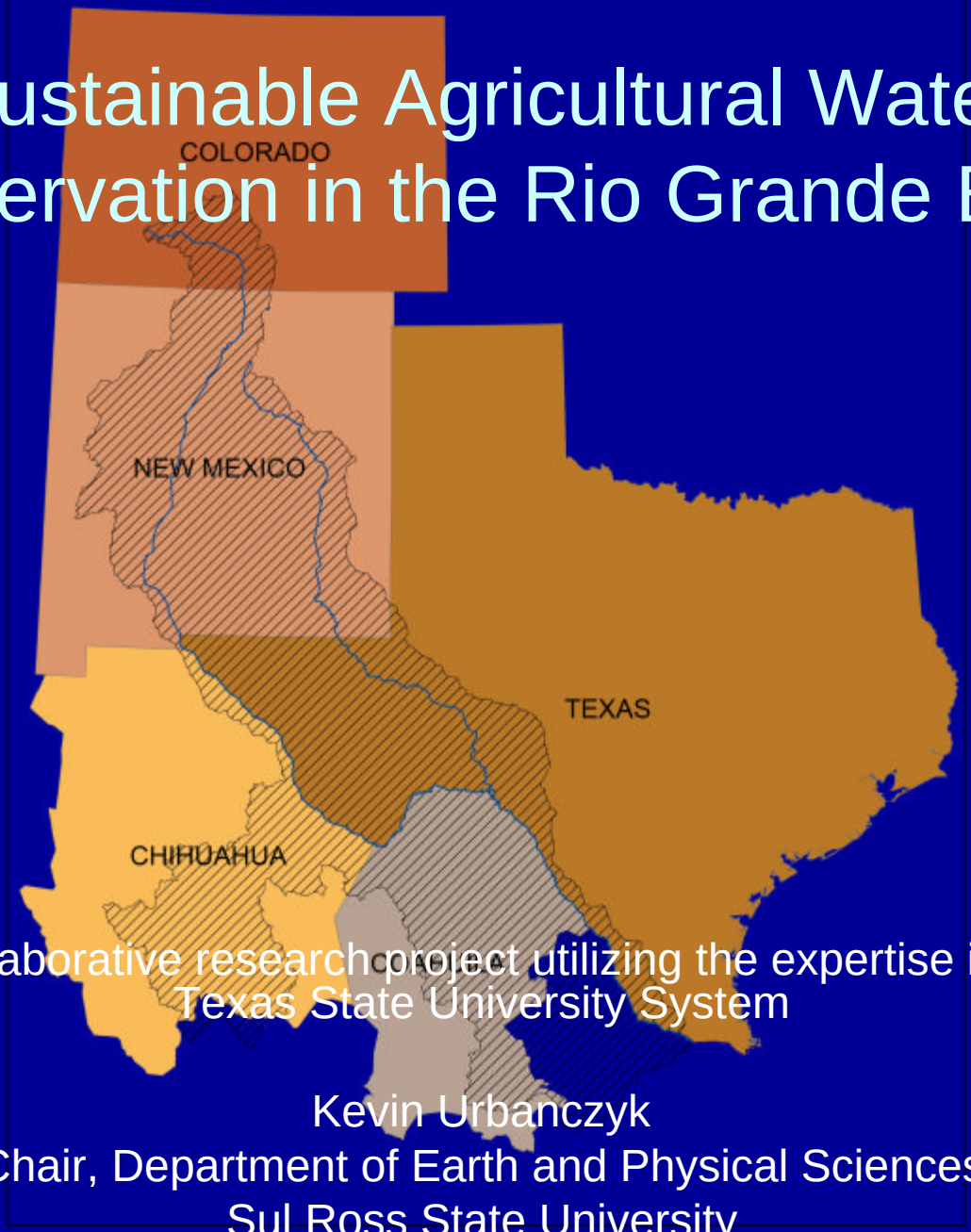
Sustainable Agricultural Water Conservation in the Rio Grande Basin



A collaborative research project utilizing the expertise in the Texas State University System

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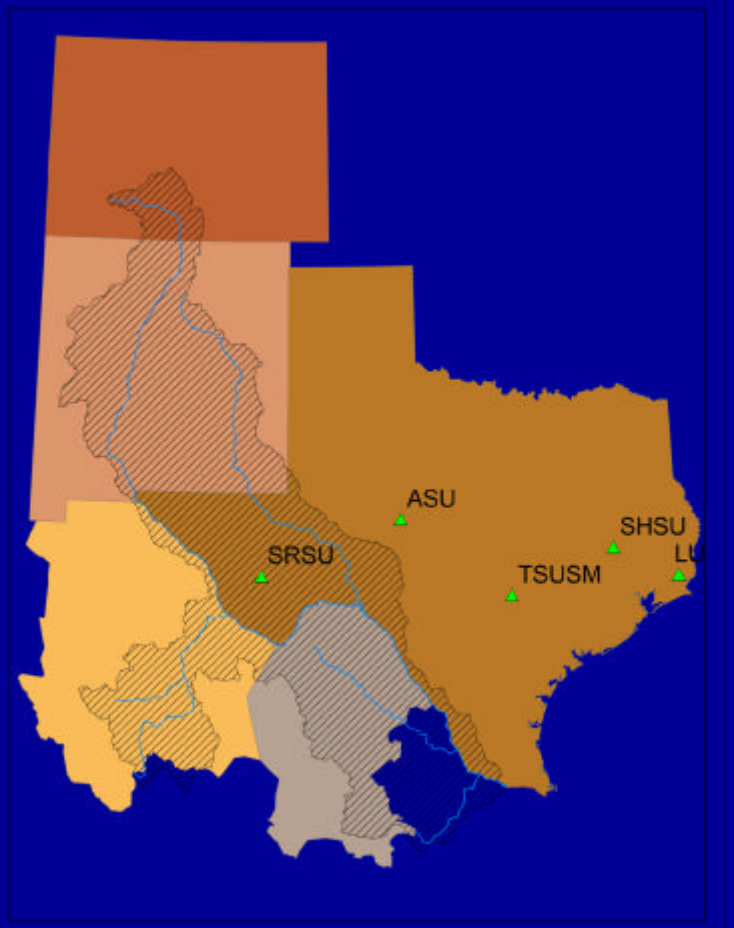
The Texas State University System and the Rio Grande Basin

- Sul Ross State University (SRSU)
- Texas State University-San Marcos (TSUSM)
- Lamar University (LU)
- Sam Houston State University (SHSU)
- Angelo State University (ASU)



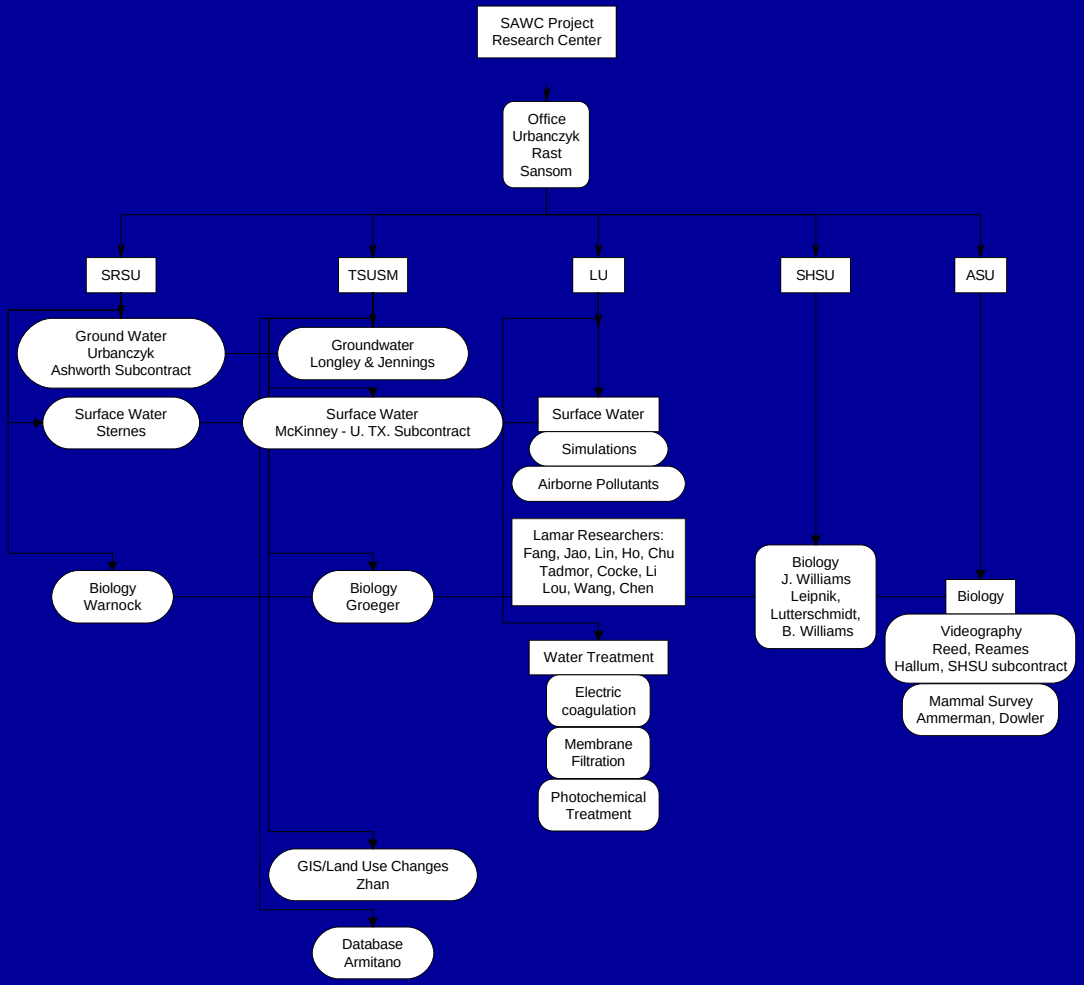
SAWC Project

- Spring, 2003 – Dr. Walter Rast (TSUSM)
  - Wrote the original proposal for utilizing the expertise found in the TSUS
  - June 23, 2003 - Representative Henry Bonilla (Rep., Texas 23rd Congressional District)
  - The project "***will address conservation issues in the Basin and possible solutions to the area's ongoing water struggles***"

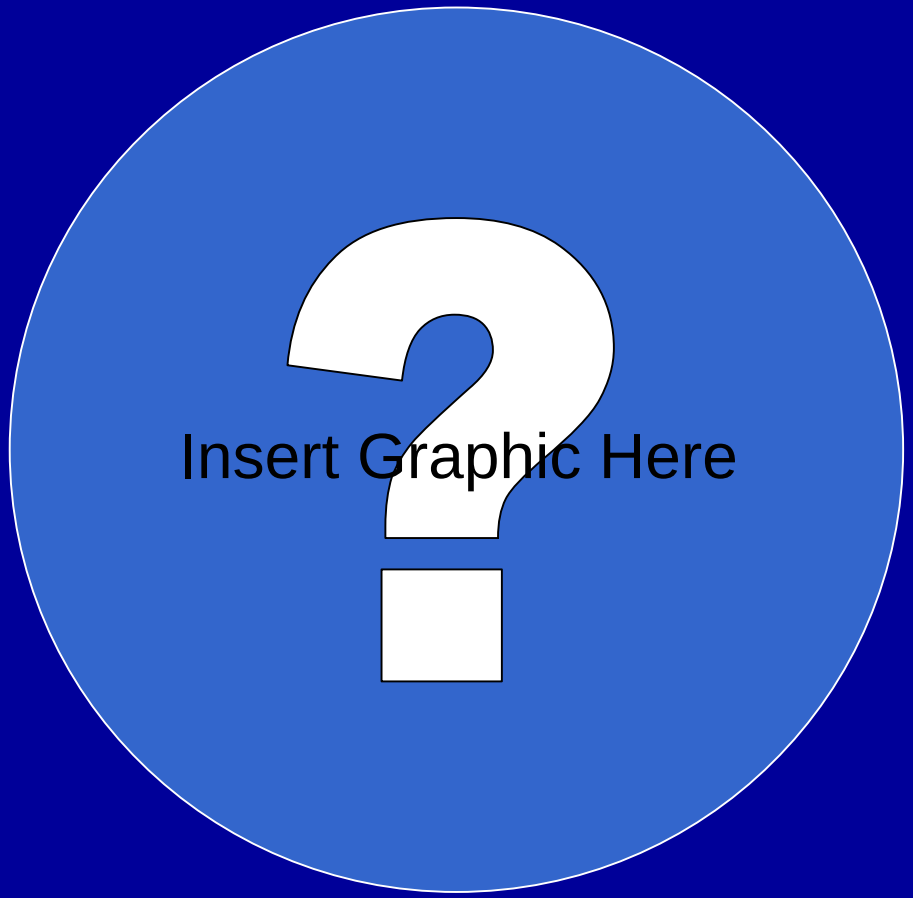
Advisory Panel

- Stottlemyer – USGS/BRD
- Ardis, Stefanov – USGS / WRD
- Eister – TX Dept. Ag.
- Hayes – Geospatial Ext. Spec.; Coop. Ext. Serv.
- Williams – Panhandle Groundwater Conservation District
- Harris – TX Water Res. Inst., RGBI
- Thornton – Intern. Env. Man. Services
- Brisbin – Rio Grande Council of Governments

Project Structure



Project Structure



Rio Grande Basin Diagnostic Study

- **Objective:**
  - **To define and assess the present environmental status of the Rio Grande and its drainage basin, and its existing and emerging environmental problems, their root causes, trends and impacts**

Rio Grande Basin Diagnostic Study

- **Action:**
  - **Upon completion of the Objective, to formulate elements for an environmentally-sound, integrated Action Plan for the sustainable use of the Rio Grande and its resources throughout its drainage basin**

Scope of Diagnostic Study

- **1. Physical and Biological Environment of the Basin**
  - **Topography, Climate, Geology, Soil, Land use, Biodiversity and Water Resource Availability**
- **2. Socioeconomic Characteristics**
  - **Social Development**
  - **Economic Development**

Scope of Diagnostic Study

- **3. Water uses and demands**
  - **Agriculture, Municipal, Energy, Industrial, Recreation, Environmental maintenance**
- **4. Policies and Legislation**
  - **Water, Environment, Land Tenure, Transboundary issues**
- **5. Institutions**
  - **Governmental, non-Governmental, Research scientific/technical**

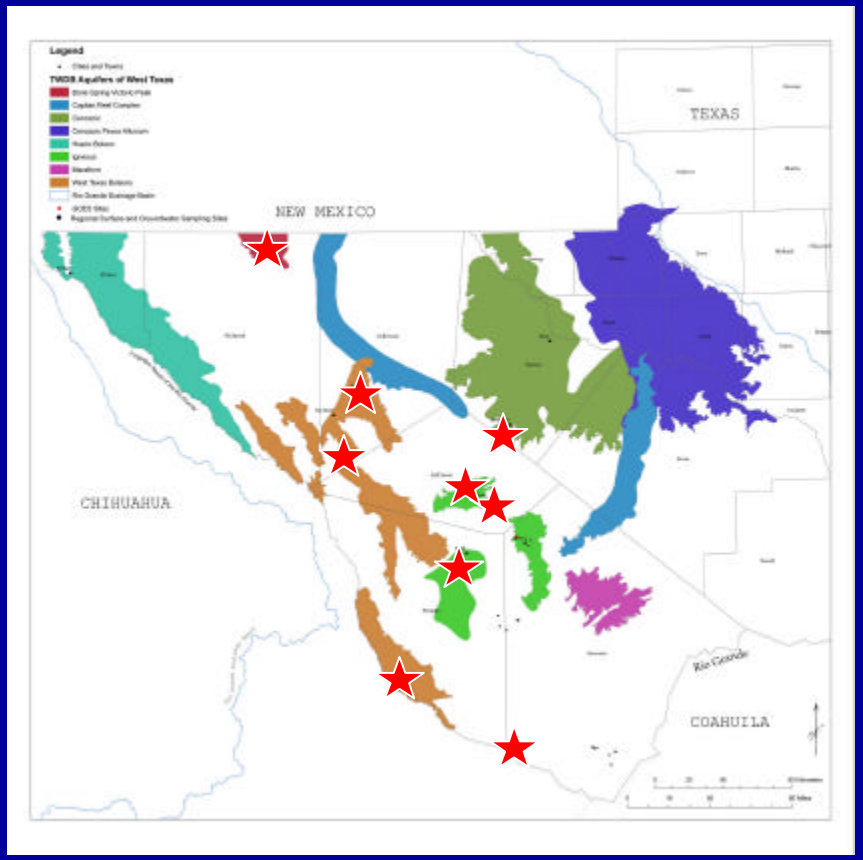
Scope of Diagnostic Study

- **6. Environmental Degradation, causes, trends and impacts**
- **7. Basin-wide Cooperative Action Plan**

Research

Groundwater Investigations

- Ground water
  - Monitoring
  - Basic hydrogeologic information, refine existing GAM model
  - Geochemistry
  - Spring Survey
  - *Benefits: Improve understanding of water availability / water quality issues in an area in which we lack good current data in order to provide information for land use and policy decisions*



Surface Water Investigations

- Surface water
  - Microbial pathogens
  - Airborne Pollutants – Community Multi-Scale Air Quality Model
  - Forgotten Reach
  - Ecological characterization of fish
  - Amistad Reservoir
  - *Benefits: Create a water quality assessment, provide state-of-the-art information for environmental and agricultural applications*

1. Physical and Biological Environment of the Basin

6. Environmental Degradation, Causes, Trends, and Impacts

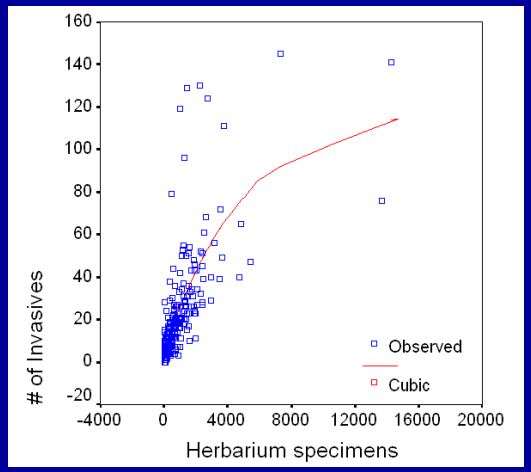
Biological Resources

- General Biological Assessment
  - Upland Watershed management – surface runoff, erosion, wildlife
  - Land use practices, biodiversity, metrics – selected applications of an Index of Biological Integrity
  - Regression analyses of flora of Texas Consortium and US Census Bureau data; Principal Components Analysis (PCA) of Invasive Plant Species (IPS)
  - *Benefits: Provide information to assist decisions related to water use; make recommendations for ranch and wildlife management practices, ecotourism, and drought preparedness; create metric for identifying the health of systems*

1. Physical and Biological Environment of the Basin

6. Environmental Degradation, Causes, Trends, and Impacts

7. Action

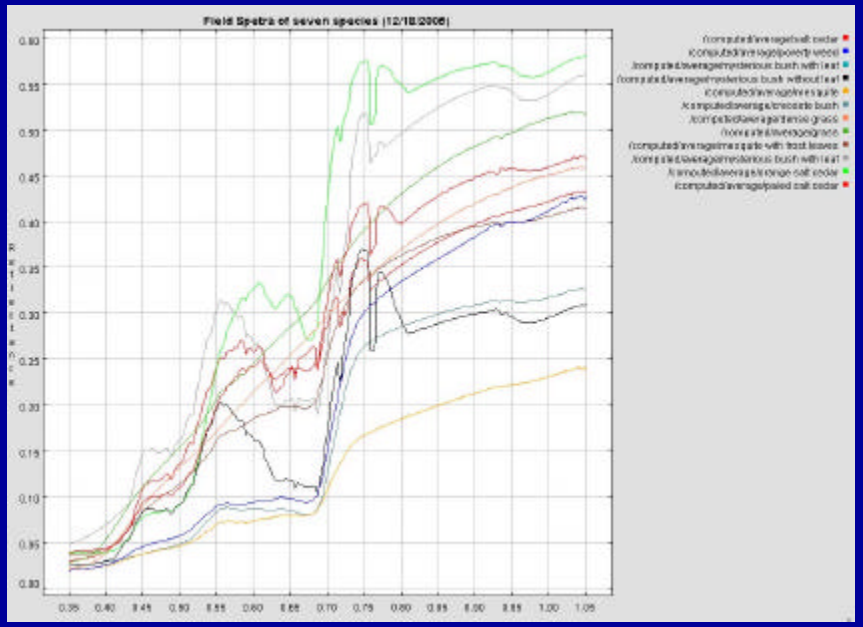


Surface Water Treatment

- Surface Water Treatment:
  - Bench-scale development and testing of membrane filtration, electrochemical and photochemical decomposition treatment techniques and the experimental application of these techniques to on site Rio Grande samples
  - A portable briefcase-sized laboratory has been developed for the analysis of Arsenic and a photochemical technique for removing E-Coli was successfully tested.

GIS / Remote Sensing

- Compile water demand and land use/cover on the U.S. side of the Rio Grande
- Collect other GIS databases related to the Rio Grande from US federal and state agencies (USGS, NASA, EPA, TWDB, TXDOT) for hydrology, water quality, climate, and socioeconomics on the US side
- Classify Landsat images for Mexican Rio Grande bordering land use/cover for existing land use
- Test the ability of the spaceborne high spatial resolution and hyperspectral resolution image in differentiating saltcedar from other vegetation types



Data Management

- Database Management and Clearinghouse:
  - The development of the central data repository for the research.
  - A compilation of existing data and information on the Rio Grande and the development of a data structure for a user-friendly web based clearinghouse that includes data from both sides of the US/Mexico border.
  - Project generated data to be made available here

1. Physical and Biological Environment of the Basin

5. Institutions

Other Projects

- ***K-12 Curriculum Materials: Sustainable Water Resources in the Rio Grande***
- ***Collaboration Assessment: Water Projects in the Texas Rio Grande Valley***

3. Socioeconomic Characteristics

5. Institutions

Summary

- These projects are designed to contribute to a common goal of defining and assessing the environmental status of the Rio Grande and its drainage basin
- The long term goal is to formulate an action plan for the environmentally sound use of the river and its resources throughout the drainage basin

Collaborations

- Rio Grande Basin Initiative - Texas A&M and New Mexico State University project
  - USDA funded, basin wide project with a focus on agriculture; merges well with the TSUS project
  - Spring 2005 combined meeting in Alpine
- Center for Research in Water Resources, University of Texas at Austin
  - David Maidment, Deane McKinney and Carlos Patino-Gomez
- United States Geological Survey – Texas District, Water Resources Division
  - Hydrogeology: Stefanov, Stanton, Kress, Shah
- NPS – Big Bend National Park, collaboration on erosion study in the Rosillos Mountains, collaboration on spring survey (Pine Canyon)
- Groundwater Conservation Districts – Collaborate on choice of wells to monitor, provide meters for selected wells, provide general ground water information
- TWDB – Collaborate on Groundwater Availability Models
- TPWD – Spring survey