

Pecos River Basin Assessment Program

Annual Report
December 2006



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Partners
Texas Cooperative Extension
Texas Agricultural Experiment Station
International Boundary and Water Commission Clean Rivers Program
Texas Water Resources Institute



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Introduction

The Pecos River is a greatly depleted western river winding 418 miles through hot, dry, semi-arid landscapes in Texas. It is the largest river flowing into the Rio Grande River in Texas. However, flow in the once great Pecos River has dwindled to a mere trickle due to many causes, both natural and man-induced. Its upper reaches in Texas now resemble a poor quality creek rather than a river.

Due to the lowered water quality and stream flows, the aquatic community of the Pecos River has been drastically altered according to fishery biologists and to local users of the river. No longer does it have a healthy diverse community of aquatic plants, invertebrates, microorganisms, fish and amphibians. The greatly reduced aquatic diversity has been negatively affected by changes in river hydrology, riparian community destruction, oil and gas activities, irrigation demands, long and short-term droughts, damming of the river and the desertification of the upland watershed due to grazing mismanagement. These factors have allowed non-native plant species, such as saltcedar, to dominate the riparian systems within the watershed.

According to IBWC data, Pecos River flow accounts for 11% of the stream inflow into Lake Amistad and 29.5% of the total salt loading. Salinity in Amistad exceeded 1000 ppm for a month in 1988, and has fluctuated since. It is important to control salt loading from the Pecos River to the Rio Grande River if we are to be successful in keeping salinity of Lake Amistad below 1000 ppm.

The decreasing water quality in the Pecos River has negatively affected the Rio Grande River. An international river, the Rio Grande is relied upon by both Mexico and the United States as a source of water for drinking, irrigation and industry and as such, it depends heavily upon its major Texas tributary – the Pecos River. The Pecos River itself is also the lifeblood of many communities within its reaches, providing irrigation water, recreation and recharge for underlying aquifers. The environmental condition of both the Pecos River and the Lower Rio Grande River is extremely crucial to hundreds of thousands of residents of both Mexico and the United States.

This project assesses the physical features of the Pecos River Basin, facilitates communications with stakeholder groups and landowners in eight neighboring counties and monitors the water quality of the Pecos River. Through this project a Watershed Protection Plan will be developed to assess current management measures as well as determine what future management measures need to be implemented in the river basin to protect the water quality of the Pecos River.

Task 1

Basin Assessment

Subtask 1.1 Aerial Photography, Delineation and Characterization

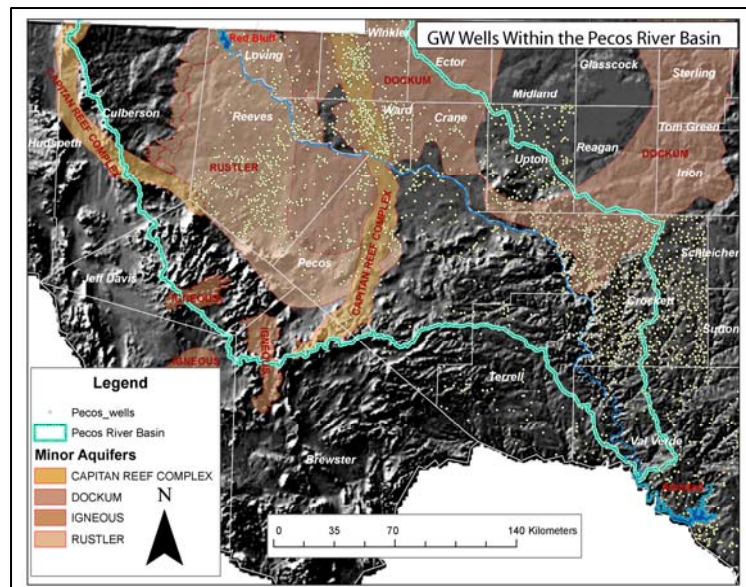
Investigators:

Dr. Charles Hart and Dr. Zhuping Sheng

Aerial imagery of the Pecos River from Grandfalls to the confluence of the Pecos and Rio Grande Rivers (214 river miles) was captured and processed under contract by Aerial Imagery Services. Using these images, the amount of acreage infested with saltcedar was delineated in ArcView. The images also differentiate between varied densities of saltcedar.

At the end of 2006, a total of 13,497 acres of saltcedar had been treated along the Pecos River and selected tributaries (see following page). Saltcedar acreages were overlaid on existing coverages to determine the area of saltcedar that had not been treated with herbicides through 2006. The analyses show that 1,137 acres of saltcedar have not been treated to date.

Additional treatments are scheduled to begin in September 2007 and will focus on the 1,137 acres that have not been treated. Some applications may take place on re-growth areas, but they will not be the priority in this phase of treatment.



Groundwater well location interactive map

Aerial photographs, delineations and characterizations are currently being incorporated into multi-layered, interactive maps. Work is scheduled to be completed on these maps in the next fiscal year. These maps will cover the entire basin and link with a database allowing the user to access information about certain points, such as water quality testing sites. The map above is an interactive coverage of the Texas portion of the basin and ground water wells in and around its boundaries.

Background documents collected to date include the following:

- TCEQ Fisheries Report
- USGS biological data on rare and threatened species of the Rio Grande River border region
- Texas Water Development Board (TWDB) groundwater quality and hydrogeology reports
- TWDB Irrigation surveys
- United States Bureau of Reclamation data on Balmorhea Springs
- TCEQ list of impaired waters
- Texas Parks and Wildlife Department (TPWD) natural resources evaluation report
- USGS stream gage data and information on the Pecos River alluvial aquifer
- TWDB maps and cross-sections of the Pecos River alluvial aquifer
- Draft Far West Regional Water Plan (TWDB)
- TCEQ water rights information for the Pecos River in Texas
- United States Bureau of Reclamation reports about irrigation systems in Balmorhea, Texas and Carlsbad, New Mexico
- Economic issues associated with preserving habitat for the Silvery Minnow in the Pecos River system (United States Fish and Wildlife Service)
- AQUATOX model training
- USDA irrigation data from 1899
- USDA-ARS Riparian Buffer Effectiveness field tool and model
- TPWD information on vegetation, birds, desert spring fishes, golden algae, prairie dogs and waterways analysis
- EPA Watershed Training Module
- EPA Watershed Handbook
- Pecos River Compact Strategic Plan
- Texas Water Development Board annual groundwater report
- River Basin Performance Indicator-Universities Council on Water Resources
- Various news releases

Information has been added to the database as it was received. Notable inclusions this year were information from state water planning groups, the New Mexico saltcedar project, the Pecos River fisheries report and EPA watershed academy information. Data and information will continue to be collected throughout the duration of the project.

In addition, the investigator for this subtask is also working on a basin-wide groundwater database.

Subtask 1.3 Aquatic Life and Habitat Inventory

Investigator: Wayne Belzer

The USGS was hired as a sub-contractor to conduct an aquatic life and habitat survey of the Pecos River from Independence Creek south to its confluence with the Rio Grande. This work was completed during June of this year. The IBWC and TCEQ are coordinating to conduct the aquatic life and habitat survey on the Upper Pecos River. Progress in their effort to conduct the study was halted earlier in the year by high flow in the river from irrigation water released from Red Bluff. The majority of funding for this subtask is being provided by the Clean Rivers Program administered by TCEQ.

A graduate student from Sul Ross State University was hired to conduct vegetation surveys at selected locations along the river bank this summer. Results from this effort are still pending.

Subtask 1.4 Identify and Characterize the Volume and Quality of Tributaries and Springs

Investigator: Wayne Belzer

Continued drought throughout the river basin has resulted in un-measurable flows in the tributaries identified for this study. Monitoring will proceed when measurable flow returns. Funding and direction for this subtask are being shared with the IBWC Clean Rivers Program.

Subtask 1.5 Identify and Characterize Saline Water Sources Entering the Pecos River

Investigator: Dr. Seiichi Miyamoto

Work on this task was completed during the last year. The main deliverable of this subtask was the report titled “Reconnaissance Survey of Salt Sources and Loading into the Pecos River.” This document was drafted and has been revised, approved and sent to the TSSWCB and is now 100% complete.

RECONNAISSANCE SURVEY OF SALT SOURCES AND LOADING INTO THE PECOS RIVER

S. Miyamoto, Fasong Yuan, and Shilpa Anand
Texas A&M University Agricultural Research Center at El Paso
Texas Agricultural Experiment Station

In cooperation with

Will Hatler and Alyson McDonald
Texas Cooperative Extension
at Fort Stockton

Gilbert Anaya and Wayne Belzer
International Boundary & Water
Commission, U.S. Section



A Reconnaissance Report Submitted to
U.S. Environmental Protection Agency
In Partial Fulfillment of
A contract US EPA, No. 4280001
TR - 291
December 2005

Cover of the
Reconnaissance
Report
Identifying and
Characterizing
Saline Water
Source

Subtask 1.6 Simulate Flow and Salinity of the Pecos River for Evaluating River Management Options

Investigator: Dr. Seiichi Miyamoto

This subtask has progressed significantly in the past year. Analysis of data used to incorporate into salt routing models was completed. The report, "Influence of Tributaries on the Salinity of Amistad International Reservoir," has been reviewed, revised and has been sent to the TSSWCB for approval. This document explores the sources of salinity entering the Pecos and gives insight into their relative contributions as compared to other



sources. Reservoir model development and application have been completed for Red Bluff and has been reviewed. Streamflow and salt routing simulations were initiated using the SWAT model as the starting model and have been completed using the ROTO model. Riparian zone simulations have also been completed.

*Researchers collecting
water samples to test for
salinity levels*

Subtask 1.7 Economic Modeling of the Pecos River Basin and Assessment of Saltcedar Control Activities

Investigator: Bill Thompson

Mr. Bill Thompson, the investigator for this subtask, was called to active duty in the Army National Guard and has been deployed overseas. As a result, work on this subtask ceased upon his departure. He is scheduled to return in early 2007 and will resume work on this subtask. Once work on this subtask has resumed, it should take an estimated four to six months to complete task related work.

Task 2

Educational Programming

Subtask 2.1 Publish Written Informational Materials to Educate Private Landowners, Stakeholders and Policy Makers about the Pecos River basin and the Effects of Saltcedar

Investigator: Texas Cooperative Extension

A historical document titled “The Influence of Human activities on the Waters of the Pecos Basin of Texas: A Brief Overview” was drafted and has now been finalized. This document includes oral interviews that were conducted last year with several residents of the region. The purpose of those interviews was to gain knowledge of how conditions in the region have changed over time. This document will be available in early 2007.

A complementary fact sheet was also developed in an effort to condense information from the historical document. This fact sheet is currently in the process of being reviewed and will be released some time in early 2007.

A brochure that presents an overview of the project was developed by staff from Texas Cooperative Extension and the Texas Water Resources Institute. A total of 2,000 copies of the brochure were printed and this publication is being distributed throughout the basin.

All Project Publications Are Available on the Project Web Site

<http://pecosbasin.tamu.edu/publications.php>

Subtask 2.2 Educational Meetings of Interested Parties for Input and Organizational Support

Investigator: Texas Cooperative Extension

Numerous meetings were held throughout the basin over the past year. These meetings are held at varying locations in an effort to include as many interested stakeholders as possible. Meetings held during the second year of the project include:

- *Discovery Meetings* – Held at Mentone, Imperial, Iraan and the Independence Creek Nature Preserve to discuss development of the basin wide watershed protection plan. County officials, stakeholders and anyone else who wanted to attend the meetings were invited; a total of 73 people attended these four meetings. Major concerns voiced were:
 - The need to continue efforts to treat the remaining saltcedar infestations in the basin, remove debris from treated areas, re-vegetate after saltcedar has been removed and to treat re-growth areas.
 - Retaining private property rights after plan implementation with a main goal of reducing or limiting government regulation, regulating public access, minimizing litter and trespassing and limiting public access to the river to decrease liability for the landowner.
 - Improving water quality, namely decreasing salinity levels and defining the desired “improvement” level, increasing water quality monitoring along the river, increasing testing or monitoring of abandoned oil and gas wells as well as monitoring brine disposal more closely.
 - Other concerns and/or areas of interest that were mentioned during these meetings are listed on the following page. Not all comments or concerns were included in this report, but they were duly noted and taken into consideration for future project activities.
- *Informational Meetings* – Project personnel presented the project to interested groups at the following events:
 - The program was briefly presented to youth and teachers at the Pecos County Ag Day in Fort Stockton; over 200 brochures were handed out.
 - A presentation giving an overview of the project was given at a meeting of the Crockett SWCD; brochures were also distributed.
 - Project members attended the annual Rio Grande Basin Initiatives conference and distributed copies of the Year One Annual Report.

Areas of interest for stakeholders present at the four Discovery Meetings:

- Saltcedar should remain the targeted species in brush control efforts with other species controlled on a secondary level
- Debris removal needs to occur to prevent flood damage to structures and to reduce fire hazards along the river
- Cost share programs and other funding sources are needed for new treatment areas and for continued treatment of re-growth
- Salinity entering the river from New Mexico needs to be defined and addressed
- Sustained flows are desired in the river, a better understanding of river hydrology, base flows, groundwater and surface water quantity are needed along with a revised management plan for reservoir releases
- Education efforts are needed to promote public awareness of the project, emphasize the need for saltcedar removal, develop procedures for land improvement through stewardship and increase tourism awareness
- Loss of water rights to New Mexico
- The importance of the Pecos River
- More salinity studies needed in the basin
- River desalinization options
- Re-vegetation after saltcedar removal
- Increasing water conservation in West Texas
- Retaining and increasing recreation and fishing opportunities along the river by constructing public parks and re-stocking the river with fish
- Increasing flows in the Delaware River
- Limit and regulate public access to the river to avoid liability issues, decrease litter in the river and on adjacent private lands and to prevent trespassing on private properties
- Determine the effects that wildlife has on water quality
- Plant cover needs to be established on abandoned croplands
- A joint effort with New Mexico should be pursued
- Have better monitoring of the oil and gas industry, their disposal of brine, well casings penetrating aquifers, current and historic exploration and abandoned oil wells and the need to plug them
- Flood gauges are needed along the river to warn downstream residents of the approaching danger
- New withdraws from the river need to be avoided
- Concerns were voiced about surface water law, water mining activities in the area, the increase in land along the river being developed into subdivisions and water marketing to other areas of the state

- *Skill Level Meetings* – Project personnel presented the project to interested groups at the following events:
 - The project was presented at a Rangeland Watershed Monitoring Workshop in Odessa. Participants at this meeting included ranchers from Ward, Ector and Crane Counties.
 - A paper discussing the quantity and fate of water salvage as a result of saltcedar control was presented at the International Conference on Hydrological Sciences for Managing Water Resources in the Asian Developing World in China June 8-10.



Iraan Stakeholder Meeting


Subtask 2.3 Develop a Web Site for Dissemination of Information

Investigators: Texas Cooperative Extension
Texas Water Resources Institute

The project Web site, <http://pecosbasin.tamu.edu>, has been developed and is continually updated. It includes a user-friendly version of the project work plan, project documents, biographical sketches of project leaders and links to related information. On-going activities and project updates are posted to the Web site.

PECOS RIVER BASIN ASSESSMENT PROGRAM

NAVIGATE PHOTOS ↓



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"DEVELOPING A *PLAN FOR RESTORATION* THROUGH ASSESSMENT, AWARENESS, AND INVOLVEMENT"

Objectives

- Establish a research baseline for the Watershed for water quality and quantity monitoring.
- Educate rural and urban stakeholders on issues relating to water quality and quantity issues in the Pecos River Basin.
- Develop a Watershed Protection Plan for Pecos River segments 2312, 2311 and 2310.

Components

- Basin Assessment: Texas Agricultural Experiment Station researchers will develop a baseline assessment on the Pecos River Basin with regards to stream channel morphology, riparian vegetation, land use, salinity mapping, water inflows and outflows, aquatic habitats, historical perspectives and economic modeling.
- Educational Programming: Texas Cooperative Extension will work with various state and local agencies to assemble a series of publications and organize and conduct a series of educational meetings targeted at landowners, stakeholders and policymakers in the Pecos River Basin.
- Monitoring Programs: Through data collection and analysis as well as water use studies, personnel will estimate the effect of salt concentration and fate of water salvaged throughout the Pecos Basin in order to provide a viable level of in-stream

The Pecos River flows from its origins in New Mexico through hot, dry, semi-arid landscapes in Texas. It is the largest Texas river basin that flows into the Rio Grande. As such, water use and hydrologic issues in the Pecos Basin will profoundly influence the future of the Rio Grande Basin.

The flows of the once great Pecos River have dwindled to a mere trickle due to natural and man-induced causes. Today, the upper reaches of the Pecos River in Texas now resemble a very poor quality creek rather than a river. If the integrity of the entire Rio Grande basin below the Pecos is to be improved and maintained, then it is crucial to protect water quality and quantity throughout the Pecos Basin in order to provide a viable level of in-stream

Pecos River Basin Assessment Program Web site homepage

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Task 3

Establish a Monitoring Program

Subtask 3.1 Develop a QAPP for Sampling Protocol

Investigators: Wayne Belzer and Kevin Wagner

The QAPP for the project was reviewed and approved by the EPA during the first quarter of year two. An amendment to the QAPP was made in subtask 1.3 to allow for USGS to be subcontracted to conduct the aquatic life and habitat inventory in the portion of the river below Independence Creek to its confluence with the Rio Grande. This amendment was submitted and approved by the EPA.

Subtask 3.2 Water Quality Monitoring, including Total Dissolved Solids (TDS), Total Suspended Solids, Potential Hydrogen (pH), Dissolved Oxygen (DO) and Electrical Conductivity (EC)

Investigator: Wayne Belzer



Water quality samples being collected

Routine water quality samples have been, and continue to be, collected at established locations along the Pecos River as part of the International Boundary and Water Commission Clean Rivers Program.

These data have been used for analyses conducted under task one of this project.

Water quality sampling will continue for the duration of the project.

Subtask 3.3 Quantity and Fate of Water Salvage as a Result of Saltcedar Control

Investigators: Dr. Charles Hart, Dr. Zhuping Sheng,
Alyson McDonald

Additional profile data were collected from bore holes in an effort to determine the hydraulic properties of shallow aquifers. Profiles from sites A and B were verified and finalized as well. Water level monitoring data was assessed to determine the relationship between surface water and ground water and was also analyzed using statistical methods. Some well monitoring data were lost when flooding submerged a data logger causing it to malfunction. Land surface and ground water surface profile data, and water quality data were evaluated and interpreted.

A literature review was developed in preparation for an interim report on this subtask which has now been prepared. A presentation of monitoring data was made at the American Geophysical Union Conference in San Francisco, CA in December 2005. Another presentation on this topic was also presented at the Rio Grande Basin Initiative Annual Conference, March 29, 2006. A paper discussing this subtask was also presented at the International Conference on Hydrological Sciences for Managing Water Resources in the Asian Developing World June 8 – 10 in China.



Recording water levels in a monitoring well



Collecting water levels and water quality data from a monitoring well



Pressure sensitive data loggers used to calculate water loss



River flow measurement at Pecos River study site

Task 4

Watershed Protection Plan

Subtask 4.1 Develop Annual Reports and a Final Report Summarizing Basin Assessment, Educational Programming and Monitoring

Investigators: Texas Cooperative Extension
Texas Water Resources Institute

The annual report summarizing activities for year one has been developed and was submitted to TSSWCB and EPA and posted to the project Web site. The year two annual report has been developed and will be sent to TSSWCB and EPA; once it meets their approval, it will be posted to the project Web site.

Subtask 4.2 Produce the Final Watershed Protection Plan for the Pecos River Segments 2312, 2311 and 2310

Investigators: Texas Cooperative Extension
Texas Water Resources Institute

A working draft of the *Watershed Protection Plan for the Pecos River* is currently being developed and is scheduled for completion in early 2007. At that time, the editing and review process will begin. The final document is expected to be complete sometime during year three of the project.



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