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Panel Presentation: Tamarisk Control and Riparian Restoration on the Rio Grande Border

Panel Participants: Tyrus G. Fain, Jennifer Atchley Montoya, Mark Briggs, Joe Sirotnak, Mark Lockwood, Jack DeLoach, Mark Donet, and Mike Davidson

Source: Cathryn A. Hoyt and John Karges (editors) 2014. *Proceedings of the Sixth Symposium on the Natural Resources of the Chihuahuan Desert Region* October 14–17, 2004. pp. 71–85.

Published by: The Chihuahuan Desert Research Institute, Fort Davis, TX.
Submitted in 2004

Recommended citation: Fain, T.G., J.A. Montoya, M. Briggs, J. Sirotnak, M. Lockwood, J. DeLoach, M. Donet, and M. Davidson. 2014. Panel presentation: Tamarisk control and riparian restoration on the Rio Grande border. In: C.A. Hoyt & J. Karges (editors). *Proceedings of the Sixth Symposium on the Natural Resources of the Chihuahuan Desert Region. October 14–17*. Chihuahuan Desert Research Institute, Fort Davis, TX. pp. 71–85. http://cdri.org/publications/proceedings-of-the-symposium-on-the-natural-resources-of-the-chihuahuan-desert-region/

Panel Presentation: Tamarisk Control and Riparian Restoration on the Rio Grande Border

An eight-member panel reported on the status of tamarisk control and riparian restoration along the upper Rio Grande of Texas, and discussed the challenges facing the comprehensive binational effort to control tamarisk (salt cedar) and arundo in the stretch of the river from Fort Quitman to Amistad Dam, Texas.

Panel Members:

- Tyrus G. Fain, Rio Grande Institute, Marathon, Texas
- Jennifer Atchley Montoya, World Wildlife Fund, Las Cruces, New Mexico
- Mark Briggs, Rio Grande Institute, Tucson, Arizona
- Joe Sirotnak, Big Bend National Park, Texas
- Mark Lockwood, Texas Parks and Wildlife Department, Fort Davis, Texas
- Dr. Jack DeLoach, USDA Agricultural Research Service, Temple, Texas
- Mark Donet, Chihuahuan Desert Resource Conservation and Development Area, Alpine, Texas
- Mike Davidson, Rio Grande Institute, Terlingua, Texas

OPENING REMARKS
Riparian Restoration along the Upper Rio Grande Border: Challenges to Meet

Tyrus G. Fain, Rio Grande Institute

Unique challenges face invasive plant control and re-vegetation efforts along our international river. Although the joint U.S.-México stewardship of the Rio Grande-Rio Bravo border may have failed to halt the invasions of tamarisk (salt cedar) and arundo (giant cane), the people who live and work along the river have not given up. Dedicated professionals and public servants on both sides of the border continue to address the problem.

Tamarisk, also known as salt cedar and *pino salado*, is an aggressive, drought-resistant shrub introduced to North America from Asia during the twentieth century to control erosion along riverbanks. That seemingly rational action has led to costly and

biologically catastrophic consequences—a virtually uncontrollable tamarisk proliferation along the banks of rivers, creeks, and arroyos leading to loss of native cottonwood and willow and emergence of virtually impenetrable monocultures. Interestingly, when the tamarisk plant was imported, no thought was given to importation of the parasitic insects that limit its propagation. The plant's thirsty and tenacious root system, combined with a productive seed cycle and an ability to survive droughts, makes tamarisk extremely difficult to control or eliminate.

Along the Rio Grande and other rivers in the western United States, there is overwhelming evidence that tamarisk infestations are causing widespread harm to the ecosystem and critical habitat. The widespread tamarisk populations are also depositing salts in the soils, depleting water tables, and reducing water salvage potential in drought-prone areas. Recreational use of many infested areas has become impossible; important trails, campground, and vistas are being lost to the public.

Today, we will hear news and comment from a panel of experts who will discuss dimensions of work underway or planned on the Rio Grande-Rio Bravo. Topics include survey and problem assessment needs, reports on Mexican and U.S. control projects in Boquillas Canyon, potential for biological control, eradication with herbicide spraying, habitat protection and restoration issues, organizing land managers for cooperative efforts, and legal and treaty issues.

BACKGROUND

Origins and Parameters of the Binational Partnership For Chihuahuan Desert Borderlands Conservation: Status and Future

Jennifer Atchley Montoya, World Wildlife Fund
Mark Briggs, Rio Grande Institute

Origins (*Jennifer Atchley Montoya)*—World Wildlife Fund resource assessments show a distinct and growing threat to the fragile riparian ecosystems along the Rio Grande and its several tributaries in the stretch below El Paso downstream to the Amistad Reservoir. The waters of the Rio Grande are not only depleted by drought and over-allocation, they are degraded by a variety of sources associated with human activity, including the proliferation of invasive plants, especially tamarisk and arundo.

Cross-jurisdictional cooperation always poses great challenges, and when the jurisdictions to be crossed include the state and federal agencies of two sovereign nations, the challenges are even greater. We applaud the formation and the on-going work of the Binational Partnership for Chihuahuan Desert Borderlands Conservation,

formed in 2002 when World Wildlife Fund, with additional funding from the Trull Foundation and Friends of Big Bend National Park, convened the superintendents of important land agencies in the Big Bend area. Partners include:

- Big Bend National Park, National Park Service
- Big Bend Ranch State Park, Texas Parks and Wildlife Department
- Black Gap Wildlife Management Area, Texas Parks and Wildlife Department
- Área de Protección de Flora y Fauna, Cañon Santa Elena, Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT)
- Área de Protección de Flora y Fauna, Maderas del Carmen (SEMARNAT)
- Rio Grande Wild and Scenic River, National Park Service

Collectively, the six partners manage over 1 million ha of protected lands in parks and preserves along 322 km of Rio Grande riverfront. Thanks to the cross border dialogue and inter-jurisdictional planning sessions, the Partnership is now undertaking an unprecedented collaborative program. The first steps involve projects to control salt-cedar infestation and restore native riparian resources at selected sites in a trans-boundary corridor extending through the Big Bend of the Rio Grande.

The binational partnership exemplifies the spirit of cooperation called for by Secretary of Interior Gale Norton and Secretary of Agriculture Ann Veneman at the 2004 Western States Tamarisk Conference in Albuquerque. The Partnership's mission is riparian restoration to improve biodiversity, stream flow, water quality, and public access on both sides of the Rio Grande-Rio Bravo. They are committed to adopting a sustainable strategy that will control streamside tamarisk infestations obstructing access and choking-out native habitat. That is no easy task.

The Partnership has begun work on the first of a series of pilot projects that can inform a comprehensive regional effort on control of invasive plants and restoration of native habitat. Before reviewing the work of the Partnership, it is useful to understand its origins and the role played by organizations within and outside of government to make it succeed. Here is a brief chronology, ignoring for lack of time and space, the decades of work that so many have put into Rio Grande-Rio Bravo matters.

1998: The Forgotten River—Shortly after its formation, the non-profit Rio Grande Institute (RGI) began hosting a series of regional planning workshops with support from the U.S. Economic Development Administration. A 1998 workshop on "The Forgotten River" at Indian Hot Springs in Hudspeth County, Texas, brought together more than a dozen representatives of NGOs and government agencies, including the World Wildlife Fund, the National Park Service, the International Boundary and Water

Commission, the Bureau of Reclamation, the University of Texas at El Paso, and Rio Grande Restoration. Hydrologists, biologists and resource managers reviewed the issues facing tourism development and resource managers.

Threats posed by emerging tamarisk monocultures at various places along the Rio Grande emerged as key concerns to be addressed in follow-up work. Among those concerns were impact on stream flow, water quality, wildlife habitat, recreation resources, nature tourism potentials, and the quality of life of people who live and work along this stretch of the river. Subsequently, a number of participants created the Forgotten River Action Committee.

1999: Cuidad Juarez meeting—Interior Secretary Bruce Babbit and the Secretaria of SEMARNAT, Julia Carrabias, signed a letter of intent to work together on problems of the Forgotten River. Subsequently, the World Wildlife Fund (WWF) initiated conversations with México's Secretaria de SEMARNAT and U.S. Department of Interior to explore the needs and opportunities for natural resource protection in the Chihuahuan Desert, especially the Big Bend area where U.S. and Mexican federal resource agencies hold significant assets. Both governments agreed that more could be done for these threatened resources and committed their staffs to hosting a symposium in 2000 to identify the major problems.

2000: White Paper on Historic Rio Grande Conditions—In preparation for the binational symposium, World Wildlife Fund commissioned a white paper to document pre-European settlement conditions along the Rio Grande in order to articulate reasonable biological goals for restoring the river.

2000: Binational Symposium—In 2000, a binational symposium established a committee called the Binational Rio Grande-Rio Bravo Ecosystem Workgroup (BREW). Following the symposium, World Wildlife Fund began promoting cross-border collaboration among the protected areas in the Big Bend region. Using the model of the trans-frontier preserves established in many African countries, World Wildlife Fund embarked on a planning and stakeholder-involvement exercise to promote cross-border collaboration between the U.S. and México.

Fall 2000: Chihuahuan Desert and Cross-Cultural Solutions Project—This effort was initiated by World Wildlife Fund, the Friends of Big Bend National Park (FBBNP), the Trull Foundation, and the Summerlee Foundation. The project's purpose was to develop a joint management plan for adjacent U.S. and Mexican protected areas. Three workshops were organized for:

- Managers of six adjacent protected areas in the Big Bend area
- Representatives of the four sponsoring bodies

- Managers of adjacent private protected areas in Mexico
- Related not-for-profit organizations in the U.S. and México.

2002: Stakeholders meeting—During the spring and summer, three meetings were held to inform stakeholders on on-going progress. These meetings were held in Alpine, Texas (April 24 through 26 and September 3 through 6), and in Ciudad Chihuahua, Chihuahua (July 31 through August 2).

2004: Funding granted—In 2004, both the Meadows Foundation and the World Wildlife Fund provided funds for on-site work on two pilot projects, one in Boquillas Canyon, and the second in Colorado Canyon.

Throughout this four-year process, international, federal, state, and local agencies, as well as non-profit organizations on both sides of the border, have been playing important supporting roles for the work of the Partnership (see Appendix 1 for a complete list of collaborators).

From 2000 through 2004, the meetings and projects helped managers identify both conservation priorities and potential funders who could assist in providing the support to address these needs. Among the principal issues addressed were:

- The river itself (water quality, quantity, and riparian restoration),
- Removal of exotic species—techniques applicable to the area,
- Reintroduction of native species,
- Environmental education and community outreach,
- Challenges posed by population growth and development,
- Cooperative conservation work with landowners and tourism industry,
- Need for critical review of eradication techniques applicable upstream.

The Rio Grande Institute (RGI) participated in the 2002 meetings, and through a Memorandum of Agreement with World Wildlife Fund provided funding and oversight of the Institute's involvement. Supplemental funding was provided by grants from the Trull Foundation and Friends of Big Bend National Park.

Parameters (*Mark Briggs*)—The first task of the Partnership's work is elimination of tamarisk infestations; the second task is re-introduction of native plant life. The fieldwork beginning now at two pilot projects represents the first step in implementation of a sustainable riparian resource preservation strategy jointly developed by the U.S. and Mexican partners along the main stream and tributaries of the Rio Grande as it flows through the federal and state protected areas of the Big Bend.

Two purposes underlie our strategy, one is environmental, and the other is economic. By restoring native vegetation in areas heavily infested by tamarisk, the

Partnership seeks to bring better balance to the ecosystem, to restore wildlife habitat, and to increase stream flow. A coherent resource management strategy focused on critical areas will support the region's budding resource-based tourism economy by opening (and re-opening) infested areas to birding and recreational trails. These critical areas are termed "resource islands," and have been systematically identified by teams of U.S. and Mexican scientists interacting through the Partnership, and supported by World Wildlife Fund and the Rio Grande Institute. We are pursuing four core objectives with our current funding: (1) foster cross-jurisdictional collaboration, (2) target restoration efforts, (3) institutionalize cross-jurisdictional cooperation, and (4) identify and engage technical assistance resources.

Pilot projects—We are undertaking the eradication and control of salt cedar and cane at two sites along the Rio Grande. Termed "pilot projects," one location is at the mouth of Boquillas Canyon in Big Bend National Park, and the second location is in Colorado Canyon, in Big Bend Ranch State Park (Texas Parks and Wildlife Department). These two pilot projects will be described later in greater detail by my partners in these efforts, Joe Sirotnak (BBNP) and Mark Lockwood (TPWD). Here, I will sketch the parameters for work at both sites.

Control of salt cedar and cane—Eradication work will focus predominately on removing tamarisk (*Tamarix ramosissima*) with herbicide, but some giant cane (*Arundo donax)* may be removed mechanically. Herbicide treatment will involve spot-treating individual trees, incorporating a strategy successfully used over the last three years by restoration teams formed from local villages (ejidos) by the Areas Protegidas staff of SEMARNAT. The technique involves making deep cuts with machetes just above the trunks of targeted trees. Biodegradable gauze is then inserted into the trunk and sprayed with a targeted jet of the herbicide, Garlon®. Garlon® is slowly taken down into the root system of the tree, and kills it over a period of months. Although follow-up treatments were necessary on a few trees, success rates were extraordinarily high in the Mexican experiments.

Re-introduction of native vegetation—Replanting of native vegetation will be closely monitored under controlled conditions to inform the development of a native plant re-introduction strategy over a larger area. For revegetation work at the two pilot projects, native planting materials will be collected from Sul Ross State University and Texas Parks and Wildlife Department facilities, based on the following criteria.

- Plants will be native to the Rio Grande in the Big Bend area;
- Plant choices will be made in a collaborative dialogue among staff from the six Partners, assisted by experts from universities and research centers recruited by

World Wildlife Fund and RGI;

- Plants must be adaptable to current ecologic conditions of the specific morphologic surfaces that are selected for planting (including soil chemistry and particle-sizes, flood frequency, depth to saturated soils);
- Plants will be expected to survive in the long-term without human intervention after the first two growing seasons.

Anticipated plant materials include the following, listed according to location:

- Floodplain surfaces: riparian deciduous trees such as *Populus fremontii, Salix gooddingii, Salix exigua, Fraxinus velutina, Fraxinus berlandieriana,* and *Fraxinus cuspidata;*
- Terrace surfaces: *Prosopis glandulosa, Prosopis pubescens, Celtis reticulata, Lycium, Atriplex canescens, Sporobolis airoides, Suaeda*, and *Chilopsis linearis;*
- Moist stream banks and backwater: *Juncus*, *Eleocharis*, and *Scirpus*, as well as woody plants such as *Baccharis salicifolia*;
- Seeds: mesquite (*Prosopis*), saltbush (*Atriplex*), ash (*Fraxinus berlandieriana)*, and sacaton (*Sporobolus*). Seeds are collected locally and grown out at nurseries;
- Bosques: cottonwood and willow pole branches will be collected in areas along the Rio Grande (or in tributaries) where these trees exist in significant numbers.

Education and outreach components—Education and community outreach are being incorporated into the projects. The work crews employed by SEMARNAT for eradication work in the canyons are drawn from the nearby low-income ejido communities and represented a significant portion of the heads-of-household in those communities. They return from their work on the project with a practical understanding of riparian restoration.

With support from the Texas Center for Service Learning, an AmeriCorps*VISTA center, RGI is using riparian restoration as the focus of a three-year program involving students at Presidio and Marfa independent school districts. In the program, the students learn about invasive species and ecological diversity from RGI lecturers recruited from The Nature Conservancy, the Chihuahuan Desert Research Institute (CDRI), and Sul Ross State University. Following academic exposure to the subject, the students and their teachers will visit restoration sites and participate in re-vegetation work—providing a learning experience and employing their energy as a service to the community.

FIELDWORK

Binational Cooperation on Salt Cedar Removal and Re-introduction of Native Plants in Boquillas and Colorado Canyons of the Rio Grande

Joe Sirotnak, Big Bend National Park
Mark Lockwood of Texas Parks and Wildlife Department

Boquillas Canyon (*Joe Sirotnak*)—Big Bend National Park (BBNP) is a participant in the Binational Partnership for Chihuahuan Desert Borderlands Conservation, linked with our neighbors at the Área de Protección de Flora y Fauna, Maderas del Carmen (SEMARNAT), Big Bend Ranch State Park, and Black Gap Wildlife Management Area. Within the parameters of the Partnership, BBNP is working on a pilot project at the entrance to Boquillas Canyon.

The entrance to Boquillas Canyon is a heavily visited area where tamarisk and giant cane infestations have almost blocked access to trails into the canyon. In early 2005, once approvals are provided by the International Boundary and Water Commission (IBWC) and the Comisión Internacional de Limites y Agua (CILA), binational crews will begin eradication work on several acres of salt cedar and cane, and select sites for plantings of cottonwood and other native species. Wildlife specialists are advising on habitat development opportunities at the opening of this massive canyon.

This cooperative project with the Maderas del Carmen protected area draws heavily on the experience the Mexican managers have acquired in control and revegetation projects carried out in Boquillas Canyon in recent years. The choices of control techniques and sites for the pilot project have been informed by a unique collegial effort among resource managers, government agencies, and NGOs. Beginning in 2001 with support from the World Wildlife Fund, Friends of Big Bend National Park, and the Trull Foundation, the effort continues through grants awarded in 2004 to the Rio Grande Institute from the World Wildlife Fund and the Meadows Foundation that will permit binational on-site removal and revegetation work by the Partners to begin in spring 2005.

Colorado Canyon (Mark Lockwood)—Big Bend Ranch State Park and the Santa Elena protected area are planning a restoration project at Colorado Canyon. Here, the infestation of tamarisk has rendered a campground and picnic area on the American side of the river virtually inaccessible, and is also reducing river access on the Mexican side. Plans include removal of the tamarisk, reforestation with native cottonwoods, and installation of an interpretive educational display about invasive species.

FUNDING

Options for a Conservation Partnership Initiative for Salt Cedar and Cane on the Rio Grande from El Paso to Amistad: Funding Prospects and Partners

Mark Donet, Executive Director,
Chihuahuan Desert Resource Conservation and Development Area

The Conservation Partnership Initiative (CPI) of the USDA Natural Resources Conservation Service (under authorities provided by the Soil Conservation and Domestic Allotment Act of 1935) offers a mechanism to foster partnerships that will focus technical and financial resources on conservation priorities in watersheds of special significance, such as the Forgotten River stretch of the Rio Grande. CPI funding is administered in two phases, a project planning phase followed by a project implementation phase.

With the Rio Grande Institute, the Chihuahuan Desert Resource Conservation and Development Area (CDRCDA) is working to control salt cedar and giant cane along the Rio Grande by uniting farmers, ranchers, community leaders, private citizens, non-governmental organizations, and state and federal agencies in a self-sustaining, public-private partnership to build an effective, long-term, and collaborative conservation program that will protect and enhance the Rio Grande from El Paso to Amistad Dam. In applying for CPI funding for project planning, we formulated seven objectives for our proposed collaborative public-private implementation strategy for removing invasive, non-native plants, and restoring native habitat along the El Paso-Amistad Dam reach of the Rio Grande. These objectives are:

(1) To formalize a public-private cooperative riparian restoration partnership;
(2) To develop a digitized map of habitat conditions;
(3) To assess and classify available work sites and match them to the most appropriate control and removal strategies;
(4) To re-establish native habitat following removal of invasive, non-native species;
(5) To develop "model" habitat restoration and protection plans for a range of identified sites, and introduce them to landowners and land managers;
(6) To coordinate our implementation planning with Mexican efforts; and
(7) To develop proposals for an implementation phase.

Proposals for the implementation phase of the project will be submitted to the appropriate agencies if or when funding postulated by the recently passed U.S. House and Senate bills becomes available.

Each project implementation proposal must include: a comprehensive restoration action; realistic budgets and funding commitments; informed action; and measurable outcomes.

In September 2004, we at the Chihuahuan Desert RC&D worked with the Rio Grande Institute (along with thirteen other senior partners, known as the "Rio Grande Riparian Habitat Restoration Partnership") to prepare an application for CPI funding. We proposed that the project be managed by the Chihuahuan Desert RC&D and the Rio Grande Institute, linked by a Memorandum of Agreement. The Chihuahuan Desert RC&D will work to incorporate landowners into the effort and to lay groundwork for control strategies and habitat restoration, while RGI will concentrate on planning, securing expert consultants, and taking the lead on coordination with Mexican efforts. Sponsor members of the Chihuahuan Desert RC&D include city and county government, non-profit organizations, and farmers and ranchers in six Texas Rio Grande border counties. An estimated fifty sponsor members own properties on the Rio Grande or its tributaries. The Rio Grande Institute is based in Marathon, a small community in Brewster County in the Big Bend area of southwest Texas, and is a part of the Public Policy Information Fund, a non-profit, Texas 501 (c)(3) corporation.

For the 18-month project planning phase, we requested $200,000 in federal funds to be matched by $200,000 in-kind from the Restoration Partnership (primarily Rio Grande Institute, World Wildlife Fund, National Park Service, Texas Parks and Wildlife Department, and Profauna Noreste, AC).

For the project implementation phase, we projected a budget of $800,000 to $4,000,000, over five to ten years. Project implementation will benefit approximately 350 to 500 landowners along the Rio Grande on the U.S. side of the river.

BIOLOGICAL CONTROL

Research on Biological Control of Salt Cedar in the United States with Emphasis on Texas and New Mexico

Dr. Jack DeLoach, USDA Agricultural Research Service

The "Garlon ® swab" technique applied to tamarisk infestations in the narrow canyons of the Rio Grande is too labor intensive (and too costly) for areas where the salt cedar infestation covers a broad expanse. The most significant infestation expanses

are located upstream of the land managed by the Partnership, and are largely privately owned. World Wildlife Fund and RGI are undertaking a systematic review of the two control options applicable to large infestations, (1) application of the herbicide Arsenal® via aerial spraying using small planes and helicopters, and (2) the introduction of natural biological predators that feed on tamarisk. The first option is being evaluated by a project along the Pecos River managed by D. Charles Hart of Texas A&M; Dr. Hart was unable to join us today.

The second option, biological control, has been investigated for many years by Dr. Jack DeLoach. Dr. DeLoach is preparing to brief U.S. and Mexican officials on plans for an experimental release of Asian leaf beetles (*Diorhabda elongata deserticola)* along the Rio Grande in Hudspeth County. Dr. DeLoach's scholarly description of his work with biological control of salt cedar is included in this volume, under separate title.

WRAP-UP

Building a Foundation of Support for Binational Research and Action

Tyrus G. Fain, Rio Grande Institute
Mike Davidson, Senior Consultant, Rio Grande Institute

A Comprehensive Forgotten River Program (Ty Fain)—The Partnership and RGI are proud of their accomplishments, but are also fully aware of their economic and jurisdictional limitations. An effective control program will need to extend several hundred miles, beginning below Elephant Butte Dam above El Paso and continuing downstream to Amistad Reservoir. It will also need to cover several tributaries to the Rio Grande, including the Pecos River in the U.S. and the Rio Conchos in Mexico. Great challenges lie ahead.

Through its broad commitment to, and involvement in, conservation of the Chihuahuan Desert ecosystems, World Wildlife Fund is assisting development of a comprehensive restoration program for the Forgotten River. Playing a lead role, Environmental Defense is securing federal cooperation for a comprehensive assessment of the Forgotten River area working in close consultation with IBWC-CILA, the U.S. Army Corps of Engineers, and other U.S. and Mexican stakeholders.

As we await action on the much needed comprehensive assessment, RGI is proceeding to "jump-start" some local interest with demonstration projects. An important request is pending with the Environmental Protection Agency (EPA) for

funding to RGI and the Chihuahuan Desert Resource and Development Area to support design for a collaborative program on small plots with private landowners in the area between the Big Bend Ranch State Park and El Paso. RGI continues to consult on how to proceed in that area with Rio Grande Council of Governments, IBWC-CILA staff, local elected officials, research groups, and landowners.

The benefits of a comprehensive binational effort include the following:

International benefits

- Creates a specific bi-lateral collaboration strategy in a border area,
- Demonstrates that disturbed areas can be restored,
- Creates a sustainable, binational model for ecological restoration of the area,
- Meets an objective of the joint 2000 declaration between the U.S. and Mexico,
- Creates opportunities to achieve future bi-lateral agreements in other fields.

Ecological benefits

- Increases the flow and maintains the quality of the water,
- Restores natural physical and biotic conditions necessary for wildlife diversity,
- Restores the original assemblage of terrestrial and aquatic species,
- Maintains the soil's physical, chemical, and biological balance,
- Frees the channel to meander naturally, moving sediments necessary for a healthy river,
- Supports a major objective of the Wild and Scenic River program.

Social benefits

- Raises the quality of life of the region's population by eliminating certain health threats, creating employment, providing a sustainable future for those who want to establish roots in the community, improving educational opportunities, empowering communities that solve their own problems, introducing productive activities, and promoting ecotourism,
- Increases the flow of water for downstream farms,
- Maximizes the river potential for current and future generations.

Economic benefits

- Re-opens lost farmland,
- Provides more and improved water for use in irrigation and industry,
- Removes a major obstacle for cross-border nature based tourism and river recreation along the Rio Grande-Rio Bravo.

Tamarisk is a scourge that is inflicting damages calculated into the millions of dollars by destroying vital habitat, and challenging the effectiveness of our international system for control of invasive species. RGI is proud to be playing a supporting role

as this unique cross-border collaboration gets underway and takes its place among the few dramatic successes we have had in managing and protecting resources on our border.

Tourist Asset Development Project (*Mike Davidson*)—As a follow-up to Ty's comments on the economic benefits of the control of invasive species in the Rio Grande and its tributaries, Ty has asked me to give a brief overview of the work the Rio Grande Institute is undertaking with regard to developing tourist assets. The following description hits the high points of our efforts over three years in six counties (Brewster, Culberson, El Paso, Hudspeth, Jeff Davis, and Presidio) of far west Texas. The Rio Grande Institute is helping local communities develop the diverse elements of the region's natural and cultural heritage as assets for sustaining a heritage tourism industry.

Itineraries and trails—With support from RGI, managers of local, state and federal parks and preserves have identified existing and new sites that are being linked into interpretive trails and itineraries. Together they form an "asset base" for local and regional heritage tourism marketing promotions and resource preservation efforts.

Business and workforce—RGI consultants will advise area outfitters, tour operators, and gallery owners as they explore collaborative marketing, foster entrepreneurship, and take on issues of common concern. A parallel workforce development effort is creating a regional program to recruit, train, and certify the professional interpretive guides needed to sustain a growing heritage tourism industry, under the working title "Chihuahuan Desert Guides Guild."

Information and Maps—Development is underway on locally focused, locally managed, information and mapping systems that offer tourists easy access to logistical and interpretive information about heritage tourism destinations through internet websites, strategically placed electronic kiosks, and CDs that can be borrowed or purchased from local merchants.

The tourist asset development project implements recommendations of a *Far West Texas Economic Development Strategy* reaffirmed by the Rio Grande Council of Governments in 2003, and a *Strategic Plan for Economic Development thorough Cultural and Nature-Based Tourism* prepared by RGI in 2002 with financial support provided by the Texas legislature through Sul Ross State University.

The U.S. Economic Development Administration (EDA) has made a grant to the Public Policy Information Fund-Rio Grande Institute in support of the project. A wide variety of organizations also have contributed funds or other support to the

Rio Grande Institute's projects involving tourism and resource preservation. They include the Rio Grande Council of Governments, the Nature Conservancy of Texas, the Chihuahuan Desert Research Institute, World Wildlife Fund, The Meadows Foundation, Big Bend National Park, Big Bend Ranch State Park, and the Texas Parks and Wildlife Department. The Big Bend Texas Mountain Travel Association will be a major beneficiary of the project.

Appendix 1—List of Collaborators

1. Binational Partnership for Chihuahuan Desert Borderlands Conservation
2. Chihuahuan Desert Borderlands Conservation
3. The Trull Foundation, Texas
4. World Wildlife Fund (WWF), Washington D.C. and Las Cruces, New Mexico
5. Profauna C.A., Coahuila
6. Friends of Big Bend National Park, Texas
7. Texas State Historical Association, Texas
8. Rotary International-International Peace Park Committee
9. Cemex, Coahuila
10. Rio Grande Institute (RGI), Texas
11. The Nature Conservancy of Texas
12. U.S. Geological Survey, Mid-Continent Ecological Service Center, Colorado
13. U.S. Bureau of Reclamation, Texas
14. International Boundary and Water Commission-Comision Internacional de Limites y Agua (IBWC-CILA)
15. Instituto Coahuilense de Ecologia, Coahuila
16. Binational Rio Grande/Rio Bravo Ecosystem Work Group (BREW)
17. Secretaría de Medio Ambiente y Recursos Naturales-Comisión Nacional de Áreas Naturales Protegidas (SEMARNAP)
18. Secretaría de Medio Ambiente y Recursos Naturales-El Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias
19. Secretaría de Medio Ambiente y Recursos Naturales-Delegación del Estado de Chihuahua
20. Museo Maderas del Carmen, AC, Coahuila
21. Chihuahuan Desert Research Institute (CDRI), Texas

22. Chihuahuan Desert Resource Conservation and Development Area (CDRCDA), Texas
23. Texas Parks and Wildlife Department (TPWD)
24. Big Bend Tourism Council, Texas
25. The Tamarisk Coalition, Grand Junction, Colorado
26. Forgotten River Action Committee (FRAC), Texas
27. Environmental Defense, Texas
28. Big Bend Trails Alliance, Texas