

**Workshop Summary**  
**Chihuahuan Desert Native Fish Conservation Network**  
**March 27-28, 2017**

**Kokernot Lodge at Sul Ross State University, 1104 Loop Road, Alpine, Texas 79830**

**Workshop Participants:**

Megan Bean (TPWD Inland Fisheries Division)  
Jeff Bennett (National Park Service)  
Tim Birdsong (TPWD Inland Fisheries Division)  
Mark Briggs (Fresh Water Program and Rio Grande/Bravo Program, World Wildlife Fund)  
Chris Chapa (Partners for Fish and Wildlife Program, USFWS Austin Ecological Services Field Office)  
Robyn Doege (Ft Worth Zoo)  
Gary Garrett (University of Texas at Austin)  
Julie Lewey (Devils River Conservancy)  
Steve Magnelia (TPWD Inland Fisheries Division)  
Russell Martin (TPWD Wildlife Division)  
Mike Montagne (USFWS Texas Fish and Wildlife Conservation Office)  
Seiji Miyazono (Texas Tech University)  
Sarah Robertson (TPWD Inland Fisheries Division)  
Ryan Smith (The Nature Conservancy of Texas)  
Billy Tarrant (TPWD Wildlife Division)  
Marcie Tuck (Big Bend Conservation Alliance)  
Stephanie Vail-Muse (Desert Fish Habitat Partnership)  
Lynn Wright (TPWD Inland Fisheries Division)

**Overview of the Texas Native Fish Conservation Network:**

Following roundtable introductions by workshop participants, Tim Birdsong (TPWD Inland Fisheries Division) kicked off the workshop with a presentation titled “Texas Native Fish Conservation Network: Bridging the “Knowing-Doing” Gap in Native Fish Conservation and Empowering Collaborative Stewardship.” Tim provided a general overview of the Native Fish Conservation Areas (NFCAs) approach, outlining planned goals/outcomes within NFCAs of achieving (1) wild, naturally-produced, self-sustaining populations of focal fishes, (2) restoration and maintenance of functional watershed processes that influence aquatic habitat conditions, and (3) sustained capacity for long-term management and collaborative stewardship.

Tim then summarized the purpose and planned approach of the Texas Native Fish Conservation Network (NFCN), discussed strategic elements (see *Texas NFCN Vision and Goals* listed below), and reviewed planned outcomes of the workshop, which generally included “standing up” the Chihuahuan Desert NFCN. Tim described the purpose of the Chihuahuan Desert NFCN as to (1) serve as a catalyst for cooperation, collaboration, and leveraging of technical and financial resources among conservation organization in the region, and (2) facilitate local implementation of the National Fish Habitat Action Plan and Texas Conservation Action Plan.

***Texas Native Fish Conservation Network Vision*** – Texas rivers are restored and conserved to the level that native fishes thrive as stable components of diverse ecological communities, simultaneously providing clean water, outstanding outdoor recreation, and a stable economic base for present and future citizens. Furthermore, citizens are well-informed of aquatic resource conservation issues, understand and appreciate the environmental, economic and societal benefits provided by aquatic resources, and act as stewards and advocates for conservation of aquatic resources.

***Texas Native Fish Conservation Network Goals:***

- 1) Protect and maintain intact, healthy habitats
- 2) Restore impacted habitats
- 3) Restore stream and habitat connectivity
- 4) Mitigate effects of invasive species

- 5) Organize conservation networks of public and private landowners
- 6) Develop conservation demonstration areas
- 7) Support research to fill critical information gaps
- 8) Conduct adaptive management and reporting

***Chihuahuan Desert Native Fish Conservation Network Strategies:***

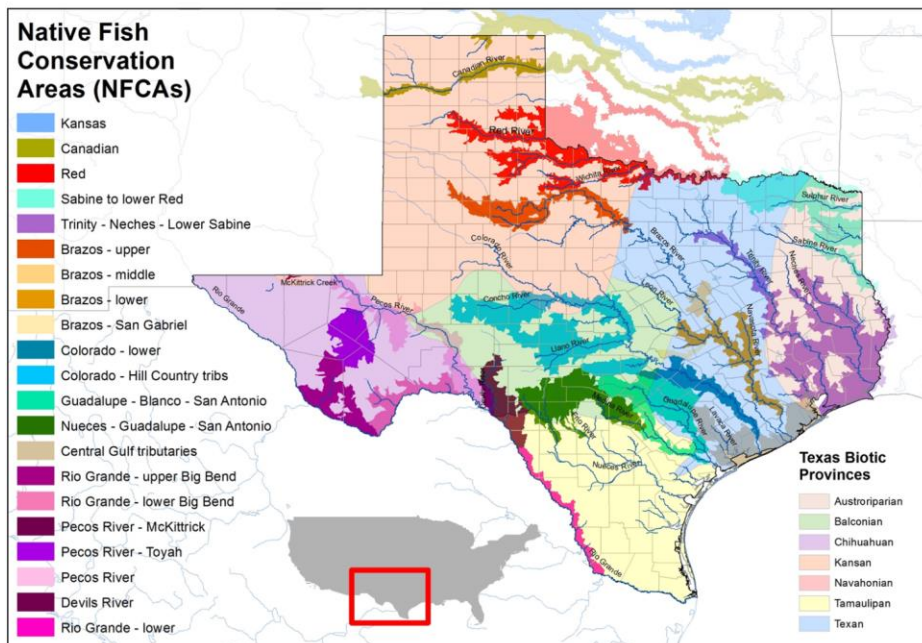
- 1) Identify priority research, monitoring, and restoration actions for preservation of native fishes, their habitats and other aquatic resources in priority river systems of the Chihuahuan Desert
- 2) Serve as a catalyst for cooperation, collaboration, and leveraging of technical and financial resources among local, state and federal natural resources management agencies, universities, non-governmental organizations, and other local partners that contribute to the conservation of native fishes and other aquatic resources in priority river systems of the Chihuahuan Desert
- 3) Facilitate local implementation of the National Fish Habitat Action Plan and Texas Conservation Action Plan

***Planned Outcomes of the Chihuahuan Desert Native Fish Conservation Network Workshop:***

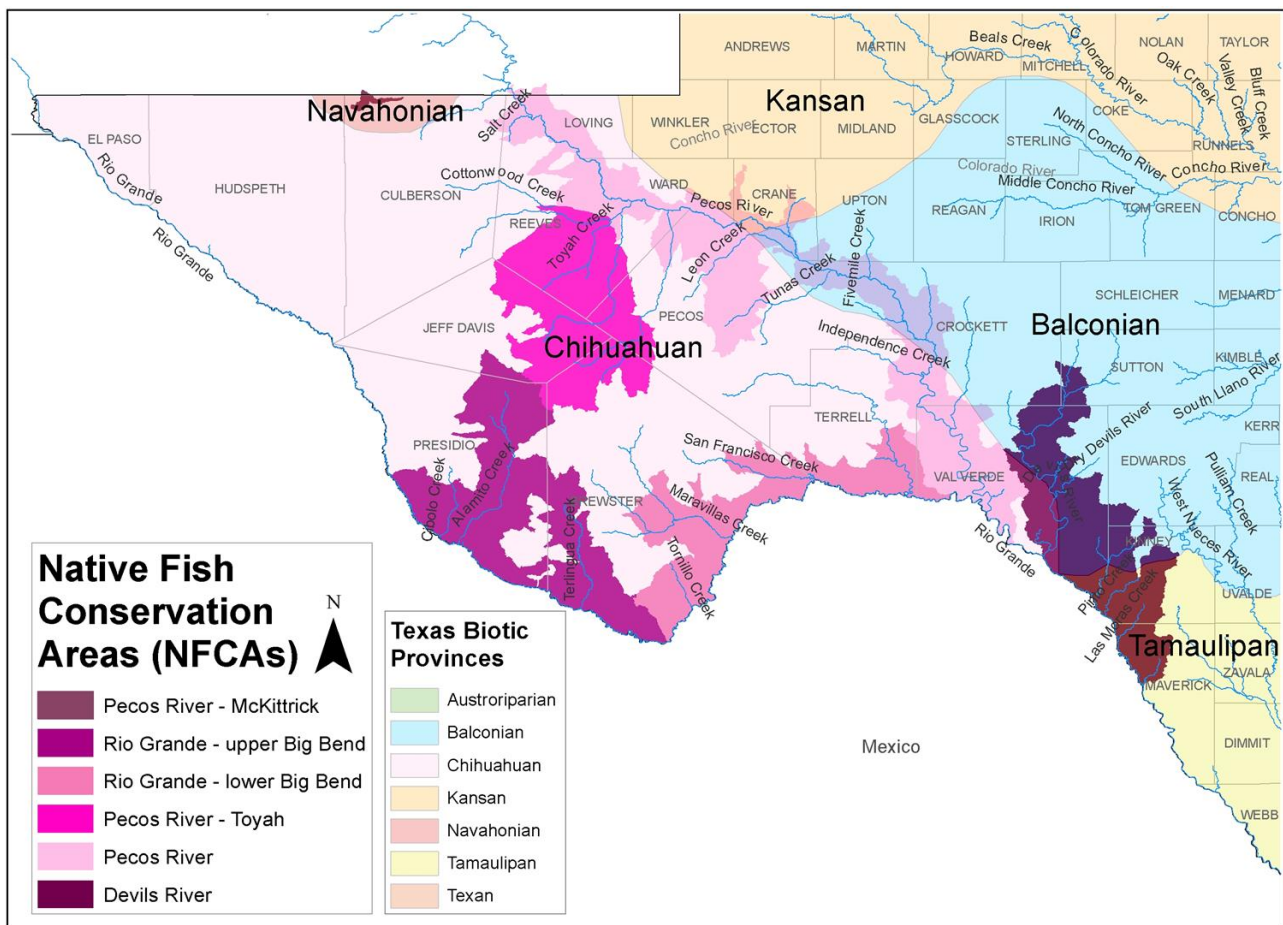
- Examine native fish “strongholds” in the Chihuahuan Desert ecoregion of Texas as identified through the Texas Native Fish Conservation Areas watershed-based prioritization
- Identify priority research, monitoring and restoration actions within this network of native fish “strongholds”
- Examine the need and immediacy, expected outcomes, and benefits to focal species from the recommended priority projects
- Explore partnerships and leveraging opportunities to deliver priority projects

***Texas Native Fish Conservation Areas Prioritization:***

Tim referred to the list of species identified as focal fishes for the Texas NFCAs Prioritization (previously shared with partners; see *Chihuahuan Desert NFCAs Focal Species and Goals* in Dropbox Folder), and spotlighted the modeled priority watersheds selected for inclusion in the Texas NFCN (see Figures 1 and 2 provided below).



**Figure 1** – Modeled priority watersheds selected as priority areas for conservation of 64 fishes identified within the Texas Conservation Action Plan as Species of Greatest Conservation Need.



**Figure 2** – Modeled priority watersheds selected as priority areas for conservation of Chihuahuan Desert fishes identified within the Texas Conservation Action Plan as Species of Greatest Conservation Need.

Workshop participants reviewed the modeled priorities identified in Figures 1 and 2, and recommended the following edits:

- **ACTION:** Extend focal watershed polygons to include 1-km buffer for the full extent of each priority stream to the headwaters
- **ACTION:** Add or include the upstream extent of Cibolo, Calamity, Independence, Delaware, Fresno, and Little Aguja creeks

***Collaborative Stewardship within the Texas Native Fish Conservation Network:***

Tim then highlighted recent case studies and planned uses of the Texas NFCAs Prioritization (Figures 1 and 2) in guiding conservation investments by TPWD (and interested partners) in:

- Applied research (through grant programs administered by TPWD including ESA Traditional Section 6 and State Wildlife Grants)
- Species and habitat surveys (supported through the TPWD / UT-Austin Rapid Bioassessment / Bioblitz initiative)
- Stakeholder workshops (e.g., river conservation workshops for landowners and community organizations conducted in partnership with NGOs)
- Conservation education and outreach (e.g., Texas Master Naturalist Water Specialist Certification)
- Community service projects (e.g., river cleanups and habitat improvements supported by fly fishing clubs and Keep Texas Beautiful Chapters)
- Habitat restoration (on private lands through the Landowner Incentive Program or through partnerships with public land managers, river authorities, water utilities, and others)

- Habitat preservation through resource management agreements and conservation easements (supported through the Texas Farm and Ranch Lands Conservation Program and other partnerships with the Texas land trust community)
- Aquatic and riparian habitat restoration and preservation supported through civil restitution or damage recoveries from oil spills and other pollution events (NOTE: > 1,200 acres of riparian habitats have been restored or protected in Texas through these programs since 2010)
- Water rights leases and flow agreements (NOTE: new program recently initiated at TPWD – Environmental Flows Information Toolkit)
- Regulatory considerations (such as through TPWD Exotic Species, Nongame Species, or Instream Habitat Permitting)
- River access and conservation demonstration (through the River Access and Conservation Areas Program and Texas Paddling Trails Program)
- Recommended priority areas for Farm Bill conservation delivery programs
- Recommended priority areas for protection of “unique stream segments,” as designated by the Texas Legislature
- Project-based funding available through the Texas Parks and Wildlife Foundation’s Conserving Texas Rivers initiative (<http://www.tpwf.org/what-we-do/current-projects/>) and revenues generated through sales of the Texas Rivers Conservation License Plate (<http://conservationplate.org/>)

Tim then highlighted TPWD investments since 2010 in delivery of the NFCN approach in focal watersheds, which include:

- \$1.2M in TPWD funds leveraged against \$4.5M in project funds and \$11M in partner matching funds
- 54 river conservation workshops with engagement of > 1,500 landowners
- 200,000 acres committed to watershed conservation
- 12,789 acres under conservation easements
- 9,100 acres of habitats restored, including 50 springs and spring complexes
- 100 miles of new or improved access for bank, wade and kayak fishing through addition of 19 new access sites on 10 rivers

### **Desert Fish Habitat Partnership Overview:**

The next presentation, co-presented by Stephanie Vail-Muse and Megan Bean, was titled “Desert Fish Habitat Partnership: Coordinating Delivery of the National Fish Habitat Action Plan within the Desert Southwest.” The presentation highlighted the geographic scope, mission, and recent activities of the Desert Fish Habitat Partnership (DFHP; <http://www.desertfhp.org/>), and discussed interest in collaborating with local partners on conservation assessments and habitat restoration projects in the Chihuahuan Desert ecoregion of Texas.

### **Overview of the Chihuahuan Desert Native Fish Conservation Network Planning Process:**

Gary Garrett then gave a presentation titled “Conservation Planning to Guide Watershed-Scale, Multi-Species Conservation of Native Fishes in the Chihuahuan Desert.” Gary revisited the NFCAs approach and the strategic elements of the Texas NFCN and Chihuahuan Desert NFCN. Gary then walked workshop participants through elements of the document titled *Chihuahuan Desert Focal Species and Goals* (see Dropbox Folder). This included a general discussion of the approach taken to (1) identify focal species, (2) define the current and desired biological status of those species, (3) assemble information on threats to focal species, and (4) identify threat factors that can be managed.

Gary noted that more than 50% of the native fishes of the Big Bend NFCAs (i.e., Big Bend reach of the Rio Grande and tributaries; see Figure 2 above) are imperiled, locally extirpated, or extinct. Additionally, approximately 50% of the fishes identified as Species of Greatest Conservation Need have been extirpated from the Big Bend NFCAs, and about 30% of the species that currently occur in the Big Bend NFCAs are non-native.

Gary summarized content assembled for all focal species, including threats, description, range, habitat, and biology, and discussed common threats and limiting factors for species conservation in the region (e.g., habitat fragmentation, barriers to migration, spring flow declines, reduced stream flow, loss of natural flow regime,

habitat loss, pollution, overharvest, and hybridization with, competition with, and predation by non-native species). Gary then provided an overview of the watershed-based planning process developed to guide and facilitate conservation delivery within the Texas NFCN, which consists of the following:

- Determine specific regulatory, voluntary and policy-oriented conservation actions that the conservation partner network can implement to ensure long-term persistence of focal species within the NFCAs;
- Develop conservation and restoration plans designed to conserve native fishes to the level that populations thrive as stable components of diverse ecological communities, simultaneously providing clean water, outstanding outdoor recreation and a stable economic base for present and future citizens of the watershed; with each plan including the following:
  - prioritized inventory of intact watersheds for preservation
  - land management practices within associated watersheds to improve or maintain water quality and sediment flow
  - improved water management plans
  - water rights acquisition and flow agreements to improve or maintain appropriate hydrologic conditions
  - prioritized inventory of barriers that fragment populations and impede life history requirements
  - barrier removal or redesign to restore connectivity
  - regulatory and management actions to restore or improve the ecological balance in habitats negatively affected by nonindigenous invasive or problem species
- Establish a holistic, watershed-scale approach to restoration and management that will address threats and limiting factors.
- Delineate actions specific to addressing focal species threats.
- Coordinate conservation actions at sufficient scales to meet all life history stages of the focal species.
- Restore and conserve habitats using voluntary tools such as financial incentives, conservation easements and landowner agreements.
- Organize networks of public and private landowners committed to the cooperative conservation of land and water resources within the watershed.
- Detail methods to prevent introductions of invasive species and minimize impacts of existing invasive species.
- Describe benefits of restoration and management actions to other native species.
- Describe conservation and management actions that are cost effective and sustainable over time.
- Develop conservation demonstration areas
  - Provide fishing, paddling, and hiking opportunities;
  - Promote sustainable public use of rivers;
  - Demonstrate best management practices; and
  - Highlight restoration actions through educational kiosks

Gary wrapped up his presentation by referencing similar watershed-based conservation planning efforts that have been conducted within the southern Great Plains and Edwards Plateau ecoregions, which are profiled on the Native Fish Conservation Network Website at [www.nativefishconservation.org](http://www.nativefishconservation.org)

### **Priority Conservation Actions / Funding Needs Identified for the Chihuahuan Desert NFCN:**

Following the presentations outlined above, the workshop transitioned to a roundtable discussion of priority research, monitoring, and restoration actions for preservation of native fishes, their habitats and other aquatic resources within the Chihuahuan Desert NFCN. Below is a summary of recommended priorities, concluding with a list of action items to be addressed within the next 6-12 months.

- Science to inform management of ciénega complexes in the Chihuahuan Desert
  - Case Study – Diamond Y Preserve:
    - 8 endangered aquatic species; last wild population of Leon Springs Pupfish
    - Flows and water quality are being monitored at two springs

- Recent changes to wetland habitat conditions; need for research to understand changes in vegetative communities (potentially associated with hydrologic changes) and actions that can be taken to better manage these wetlands systems through fire or other actions
    - 2 small-scale habitat enhancement/restoration project proposals have been assembled to address immediate habitat management needs for the pupfish (\$30-\$40k range per project)
      - Opportunity to include a monitoring/evaluation components that would generate a set of guidelines or best management practices for vegetation management in ciénegas (e.g., hydrology/water management, use of fire, grazing, etc; \$60-\$80k; possible graduate student project)
      - Could also include a saltcedar control and monitoring component (additional \$120k)
    - Need to monitor status and trends of refuge population (continue Dr. Itzkowitz's research/monitoring), establish additional refuge populations (possibly at Dexter or San Marcos National Fish Hatcheries), and assemble plans for water quality monitoring and disaster response in the event that oil and gas activity impacts the springs and pupfish population
    - The abovementioned components have the potential to be funded through ESA Section 6
- Science to increase understanding of groundwater-surface water interactions, establish environmental flows targets, and develop strategies to effectively manage groundwater to achieve specific targets for spring discharge and instream flows
- Devils River science needs:
  - Range-wide genetics, habitat, and flow-ecology assessment for Conchos Pupfish
  - Assessment of subterranean fauna
  - Additional monitoring:
    - Ensure regular fish monitoring in the Devils River and Dolan Creek
    - Spring ecosystem / salamander monitoring
    - Continue the streamflow gauge operation on Dolan Creek for at least 5 years
    - Explore transfer of Bakers Crossing gauge from IBWC to USGS
    - Add at least one more groundwater well recorder and ensure location in best areas
    - Add water quality monitoring sites throughout the river
  - Improved ability to evaluate effects of pumping on Devils River flow and springs in the Devils River basin
    - Water budget in the Devils River basin including the full area of groundwater contributions in the basin
    - Understanding and modeling of aquifer flow paths in the upper Devils River
  - Increase understanding of flow reduction effects on Devils River Minnow and other biota and water quality
  - Increase understanding of Devils River contributions to salinity budget of Lake Amistad
  - Examine water availability and importance of Devils River in meeting downstream agricultural and municipal water supply needs in the lower Rio Grande
  - Assess specific habitat and flow-ecology needs of Texas Hornshell (soon to be federally listed) in the Devils River; biology/habitat requirements may make this the best indicator species for environmental health; incorporate biology/habitat requirements into water management framework (e.g., groundwater-flows management plan currently being examined jointly by TWDB, TCEQ and TPWD through a Legislative directive)
  - Assess spring- and aquifer-associated communities throughout the basin, especially Pecan Springs
  - Examine relationships among groundwater levels, spring discharge, instream flows, and habitat availability for focal fishes and Texas Hornshell in the Devils River

- Devils River habitat restoration
  - Conduct a riparian restoration project downstream of Dolan Falls (.25 mi downstream; 100-m reach has been cleared; initial outreach/education to landowner by DRC, and explore possible riparian restoration workshop and riparian planting project
  - West bank six miles downstream of Bakers Crossing – 2 miles of riparian degradation that could be addressed similar to the above project; road construction that brought gravel from Nueces (possible introduction of Arundo?)
  - Blue Sage and Rock Canyon subdivisions – Need riparian education and need to explore opportunities for septic system replacement/redesign
  
- Rio Grande
  - WWF is cooperating with Big Bend NP and other partners (binational effort) to examine flow regimes and develop a sediment budget in order to identify flow restoration targets to improve sediment management and overall habitat conditions
  - Arundo control is ongoing to restore riparian plant communities along the Big Bend Reach of the Rio Grande; monitoring of riparian plant communities and channel morphology is ongoing
    - Need to add a component that evaluates biotic response to Arundo control efforts (NOTE: USFWS has plans to sample fish and inverts in 2017)
    - Need to explore opportunities for TPWD AIS Program to cost-share control and monitoring efforts
    - Explore opportunities for use of Arundo biocontrols; potential to expand the ongoing USDA Arundo biocontrol program that is active in the lower Rio Grande
      - Need education/outreach to landowners in advance of biocontrol program
      - NPS is currently working on an EIS for control of aquatic and riparian invasives along the boundary of the national park
  - Continuing need for cost-share support of Arundo control; Ongoing control is necessary to provide the conditions to restore channel morphology upon ideal flow conditions (natural pulses or regulated/targeted releases through a formal e-flow program in partnership with Mexico)
  - Explore opportunities to partner with TPWD to expand Arundo control downstream into the Black Gap reach; TPWD AIS funding has the potential to provide cost-share funding; USFWS Partners Program is interested in supporting Arundo control on private lands in the area
  - Revegetation of riparian habitats on Terlingua Creek
    - Science need – is revegetation benefiting groundwater systems, channel morphology, and habitat conditions for focal species
    - Need to identify additional landowners to expand riparian restoration efforts on Terlingua Creek
  - Rio Grande Silvery Minnow repatriation efforts:
    - Stocked approximately 750,000 RGSM over past three years
    - Monitoring continues, but additional staff is needed
      - Need to explore a programmatic relationship with Sul Ross (or another university) to support/involve faculty, post-docs, graduate students, etc. in research/monitoring efforts
        - Coordinate w/ Sul Ross to schedule a meeting with key faculty/leadership in summer 2017; share the multi-year work plan and Chihuahuan Desert NFCAs map, and communicate interest in a long-term partnership to help deliver the work plan; Russell Martin will help organize meeting
        - TPWD Wildlife Division recently established similar relationship and funded position to conduct grasslands research in the region; offers opportunity to establish transboundary program, which is limited within US federal and state agencies.
        - Could be cost-shared by WWF, USFWS (Partners Program and FWCO), NPS, and TPWD

- Conduct river trails assessment for the Big Bend Reach of the Rio Grande (to identify a network of single-day paddling opportunities); examine opportunities to enhance outreach and education efforts associated with Arundo control, RGSM reintroduction, and other conservation projects; use the river trails to promote river conservation
- Need to conduct an assessment of the recreational and economic value of paddling, wildlife viewing, and other conservation-oriented recreation on the Big Bend Reach of the Rio Grande
- Mexican Fawnsfoot and Salina Mucket – temperature tolerances, distribution, and fish-host work needs to be completed
- Rio Grande tributaries
  - Riparian fencing should be explored for all tributaries
  - Terlingua Creek
    - Continue to deliver/expand large-scale riparian restoration in Terlingua Creek and explore opportunities in other tributaries in the Big Bend Reach of the Rio Grande
    - Property is for sale on Terlingua Creek near Study Butte
    - Hundreds of thousands of acres of grasslands restoration and riparian restoration could be conducted at O2 Ranch and adjacent ranches
      - Additional monitoring/evaluation should be conducted
      - Evaluating effects/appropriateness of fire for specific soil types in the region should be included as a component of a research/monitoring plan
  - Alamito Creek
    - Continue investments in riparian restoration at the Alamito Creek Preserve and other areas of Alamito Creek
      - Use as conservation demonstration area for grazing practices and other management actions
      - Long-term monitoring sites should be established to evaluate effects of management actions on subsurface water levels/flows
    - Alamito Creek at Big Bend Ranch SP has opportunities for riparian restoration
  - 
  - Ciénega Creek
    - A small dam removal project could be conducted at Ciénega Creek in BBRSP
  - Tornillo Creek –
    - No saltcedar or Arundo; opportunities for riparian/spring restoration; could be used as a case study in planning/conservation of ephemeral streams in the region
- Pecos River Tributaries
  - Davis Mountains streams
    - Big Aguja, Little Aguja, Limpia, Madera, and Cherry creeks:
      - Status of Rio Grande Chub and Chihuahua Catfish
      - Hydrology and water quality
      - Inverts, plants, etc.
      - Effects of wildfire on condition of stream habitats
      - Improve access through roadway improvements on private lands (potential volunteer service project)
    - Need for fencing of Limpia Creek through Farm Bill riparian programs, LIP, USFWS Partners or otherwise; need to reduce landowner cost-share to increase participation
    - Calamity Creek at Elephant Mountain WMA – need to explore bank stabilization/riparian restoration
    - Wildfire concerns within Davis Mountains; need for fuel reduction program
      - Davis Mountains Preserve has conducted fuel reduction and thinning on approximately 600 acres
  - Alpine Creek –



- Ideal conservation demonstration area; natural trail exists; birders already frequent the site; opportunities exist for riparian restoration and flow improvements; water is currently pumped to irrigate the golf course; water lines exist to transfer wastewater discharge into Alpine Creek; City Manager has shown willingness to amend the discharge permit to redirect water into Alpine Creek; City of Alpine is also working to establish a more formal city-wide trails program; Kokernot Lodge could serve as a nature center to promote ecotourism throughout the region, and promote access/use of the trail along Alpine Creek and use of the creek as a river conservation demonstration area for the region; possible native fish refugia project; possibly include conversation about developing a regional Natural Resources Office Complex
- Region-scale assessment of the restoration potential of streams throughout the region; where are conditions appropriate for restoration of wetter riparian plant communities?
- Need for increased resources for research/monitoring to evaluate restoration strategies/techniques being used throughout the region; develop BMPs for stream corridor restoration; communicate what does not work and why
- Lower Pecos River
  - Need to conduct river conservation workshops for landowners, building support for possible reintroduction of RGSM
    - Need to explore Independence Creek Preserve as a location to host a riparian conservation workshop
    - Need to reach out to Terrell County TPWD biologist to explore landowners to possibly host a riparian workshop
    - Terlingua Creek riparian restoration project is funded/planned; opportunities to spotlight as a demonstration project for Pecos River landowners
  - USFWS is prepared to reintroduce RGSM to the lower Pecos River
    - Build landowner partnerships to support reintroduction of RGSM to the lower Pecos River
  - Conduct large-scale assessment of riparian plant communities to inform control of riparian invasive plants
  - Explore engagement of landowners in large-scale riparian restoration through control of Arundo and other riparian invasive plants
- Explore opportunity for a post-doc or graduate student to collate/summarize work conducted in the region; possible clearinghouse assembled/maintained
- Pinto Creek – Nine miles of critical habitat for Devils River Minnow; salvage effort conducted during drought conditions; approximately 80 were collected from wild to establish a refuge population at the San Marcos hatchery; 30-40 wild adults remain in the creek; populations of all small-bodied fishes have declined
  - Need to develop a plan to reestablish/repatriate native fish communities in Pinto Creek
    - Need for genetic assessment of hatchery population of DRM
    - Need to identify wild source for other native fishes (to be reintroduced to the creek)
    - Fin clips need to be taken of catfish
    - 2-3 different landowners have been identified that may be willing partners, but a reintroduction will likely be contentious; outreach efforts need to occur with local landowners
- Pecos Pupfish:

- Refuge population at Ft Worth Zoo (established ~ 5 years ago); approximately 100 individuals exist in the refuge population; a new facility is being constructed and opportunities exist to update education/outreach messaging associated with the Pecos Pupfish exhibit
    - Opportunity for captive studies
      - Lab-based life history
      - Assemble genetic management/restoration plan
        - Examine need to add wild individuals to the refuge population to maintain genetic diversity
    - Several AZA institutions in Texas commit resources toward local conservation projects
  - Rillito Springs refuge
    - New spring emerged in 2006; 30 gallons/min; Pecos Pupfish have been introduced; ongoing monitoring and management is being conducted by USFWS; additional refuge populations are needed
      - Shrimp farms could be assessed as potential refuge populations
      - Additional Pecos River tributaries should be evaluated to identify other possible refugia, particularly areas void of Sheepshead Minnow and where barriers exist to upstream movement/establishment
        - Canyon systems/tribs along lower Pecos River may provide opportunities for Pecos Pupfish refugia
  - Willing landowner in Pecos County to explore riparian restoration opportunities (NOTE: Russell and Megan intend to conduct site visit in spring 2017)
    - Artificial wetlands
  - Salt Creek
    - Continue monitoring of Pecos Pupfish and hybridization w/ Sheepshead Minnow
    - Upper 2-3 miles of Salt Creek does not have Sheepshead Minnow
      - Need to document the existing barrier that has prevented upstream movement; determine what would serve as an effective barrier if the need existed to construct additional barriers to protect Pecos Pupfish from hybridization
      - Opportunities for habitat restoration/improvements are limited
- Balmorhea State Park Monitoring – In response to increased oil/gas activity near Balmorhea, a USGS gauge has been installed, water quality monitoring is being conducted, and fish/invertebrate communities are being monitored
  - Phantom – Bureau of Reclamation is interested in offloading the property; Apache has shown interest in supporting monitoring, etc.; need to develop a plan for long-term management of the infrastructure (for the organization that eventually takes ownership/management of the project)
  - Restore the Rio Grande beavers, Pecos River muskrats, and otters
  - Need for additional plant materials, particularly cottonwood trees for riparian restoration projects; several potential locations could be used to establish riparian plant nurseries – e.g., Elephant Mountain, Sul Ross greenhouse, stock ponds, TAMU-Kingsville, TX Forest Service, etc.; restoration sites could also be thinned to secure plant materials for other sites

#### **Science Needs Recommended for Inclusion in the Next State Wildlife Grant Aquatics RFP:**

- 1) Ciénega Research and Management Recommendations/BMPs (Ryan, Megan)
  - a. Increase understanding of flow alteration, marsh encroachment, and other changes to the system
  - b. Establish benchmarks based on historical conditions
  - c. Develop strategies to inform effective management
- 2) Science to increase understanding of groundwater-surface water interactions, establish environmental flows targets, and develop strategies to effectively manage groundwater to achieve specific targets for spring discharge and instream flows (Ryan, Jeff)

- a. Need to connect DFCs to e-flows for the Rio Grande and tribbs; important to work with willing GMD
  - i. Independence Creek and the lower Pecos are recommended priorities for this study
- 3) Mexican Fawnsfoot and Salina Mucket – temperature tolerances, distribution, and fish-host work needs to be completed (Clint)
- 4) Devils River habitat model refinements and continued funding for UTBEG, including additional monitoring wells and data collection (Sarah, Ryan)
- 5) GIS-based regional assessment (w/ the possibility of a field-based component) of water table in ephemeral streams of the region to determine restoration potential (use of ground-penetrating LIDAR or other remote sensing data/techniques); model/project likelihood of restoration success given environmental conditions identified that influence restoration (Russell, Jeff, Megan)
  - a. Shop to Desert LCC

### **Recommended Actions within the Chihuahuan Desert NFCN (Next 6-12 months):**

- Explore establishment of an incentives program for Davis Mountain fuel reduction/thinning and riparian livestock fencing using funding such as NRCS/FSA Riparian CRP funding or State EQIP Initiative, or NFWF through TPWD LIP (Tim, Russell, Megan, TNC contact, USFWS Partners Program, Arlene – TPWD LIP)
- Organize meeting with Sul Ross in summer 2017 (July or August) to explore programmatic partnership to increase involvement in biological monitoring and riparian restoration in the region (through cost-share support from multiple cooperating agencies) and explore interest in converting Kokernot Lodge into a Nature Center as a part of Alpine Creek restoration/demonstration project
- Build capacity for riparian restoration in Big Bend tribbs
  - Provide support to increase supply of plant materials by establishing a nursery or supporting a contract with an existing greenhouse
  - Explore partnerships with non-profits to administer large-scale riparian restoration program including riparian restoration workshops, volunteer coordination, planning/delivery of service projects (explore opportunities w/ WWF, RGJV, BBKA, others); explore opportunities to hire a full-time biologist to provide support
- Conduct data/information mining/sharing project and collate/summarize relevant research, monitoring, and restoration actions that have occurred within the Chihuahuan Desert over the past 10 years, and assemble a historical summary of regional conservation efforts (as far back as possible)
  - Conduct pilot project in the Devils River watershed conducted by DRC; assemble proof of concept and lessons learned to guide a work plan for the entire Chihuahuan Desert (Julie, Sarah, Megan, Ryan, Gary)

### **Post-Workshop Input from World Wildlife Fund:**

After the meeting, Mark Briggs provided some follow-up details and thoughts on a few of the topics we discussed:

#### 1) Managing giant cane along RGB

Objective: Eradicate dense stands of giant cane along channel margins with objective of destabilizing channel banks, evacuating sediment and widen channel morphology to more desirable condition. Although channel morphologic objectives of cane eradication were the focus when we began battling cane six years ago, objectives of cane management have been expanded to include recreation, aesthetics, and aquatic and riparian habitat.

Methods: Conduct prescribed burns where we can. Treat with Imazapyr six weeks later. Most of our treatments occur during the spring. We are doing a prescribed burn next week, for example.

Monitoring: riparian vegetation and channel morphology has been the focus

Results: To date, 60 km of cane has been treated along both sides of river between Solis and end of Boquillas Canyon.

Main Partners: Big Bend NP, CONANP, Profauna, and RGSSS (consultants), as well as citizens from several riverside towns who make up trained work crews. Sul Ross State University is being supported by a grant with us to assess channel morphologic change in Boquillas Canyon.

Immediate next steps: This year's focus is from Tally to Gravel Pit. Next year, we'd like to turn our attention to the Black Gap reach, working with TPWD, CEMEX and Adam's reach. Preliminary meetings with these future partners in this effort seem promising.

Needs: Every additional cent we get can be put toward increasing length of treatment. Monitoring aquatic response is also an important need. Three main questions that we'd like to address with an expanded monitoring program are: (i) Does cane eradication promote channel widening processes? (ii) And, if so, to what extent do such processes benefit the aquatic environment?; and (iii) Is there any flow augmentation from cane treatment? Although we have no illusions that cane eradication will result in large increment of flow, it seems possible that a small, yet important bump may be achieved during the time of year when base flow is lowest (in the 100 - 200 cfs range) and evapotranspiration rates are highest. Measuring flow response during such a period before and after treatment is high on our list. The subsequent question, if indeed there is a base flow bump, is whether such a bump persists and is of any benefit to native aquatic fauna.

## 2) Revegetation along local tributaries

Objective: plant dense stands of obligate riparian plants to establish habitat for key wildlife species as grey hawk and yellow-billed cuckoo, as well as decrease system hydrologic flashiness, increase sediment deposition, augment channel widening processes and potentially recharge of shallow riparian water table.

Methods: Pole plantings of mostly coyote willow (*S. exigua*) augmented with *S. gooddingii*, *P. fremontii*. Poles are harvested late fall early winter, soaked and planted in areas that afford some level of flood scour protection and shallow depths to saturated soils.

Results: To date, over 8,000 obligate riparian trees planted along three miles of Terlingua Creek at O2 Ranch. About 35% survival rate. Most mortality due to summer desiccation. Good growth rate on survivors. Subsequent plantings conducted last month appear to be doing very well and will hopefully increase overall survival rate.

Immediate Next Steps: Meetings with O2 Ranch and a landowner just downstream of the O2 show great promise for continuing revegetation actions downstream of current planting effort. Funding in hand will support some of this work.

Main Partners: O2 Ranch, RGSSS consultants, Sul Ross State University

Needs: With trained crews in place and ready to go, additional funds can be matched for greater impact. Current funding in hand will potentially support less than half of the 8,000 planting effort we did the last year. As with cane work, additional support for monitoring is needed to gauge how well planing meets stated channel morphologic and hydrologic objectives. Also, to what extent will the riparian habitat benefit aquatic habitat?

## 3) Environmental flow along RGB

Objective: This is a long-term effort to discuss with CONAGUA the potential of changing timing, discharge, and/or duration of releases from Luis Leon dam to better meet our restoration objectives for the Rio Grande/Bravo downstream of Rio Conchos confluence. It is a bit of stretch to call this a concerted program. WWF-DF has a close partnership with CONAGUA. Any effort we do with them would be an extension of work we are doing nationally and at the invitation of CONAGUA.

Methods: work closely with CONAGUA and look for opportunities and overlap between our priorities and theirs, particularly in the Rio Conchos.

Results: Last year, CONAGUA solicited a letter from WWF to summarize e-flow needs of the Big Bend reach of the RGB. With the participation of local partners (e.g., Utah State University, SRSU, BIBE), the letter was informally submitted by WWF to CONAGUA last year. By 'informally', what is meant is that the solicitation was passed through and only involved WWF Mexico City channels. This is seen as an important step in a long-term multiple step process that will hopefully result in an expansion of stakeholders (e.g., other federal agencies, state department, others) in more formal discussions. Next steps will be identified by CONAGUA at their discretion.

Immediate Next Steps: Continue working with CONAGUA on work directly and indirectly associated with e-flow (example of indirect is to work collaboratively with them on water and natural resource priorities along lower Rio Conchos). Also, continue to work with scientists and other experts to augment estimates of e-flow needs for the RGB reach through Big Bend.

Main partners: CONAGUA and local partners in Big Bend who are involved in quantifying e-flow needs.

Needs: We'd like to work closely with fish biologist to develop Hardy type ecological models along targeted reaches of the RGB in Big Bend. One possible next step is to augment our annual riparian monitoring assessment, which is from Lajitas through lower Canyons, with fish biologists who can help us identify critical habitat, which

could become foci of ecological modeling and more robust quantification of e-flow needs. Maybe we can discuss details of how such participation and expertise could be beneficial.

#### 4) Rio Grande/Bravo Water Forum

Objective: bring together teams of folks who are working on water and natural resource conservation to learn from one another and enhance collaboration for greater impact (see attached 2 page summary).

Immediate Next Step: Send Desert Fish a revised agenda (probably can do this in a couple of weeks) as well as work with you all on the possibility of including in the Forum a desert fish team.

Main Partners: Desert LCC, CONAGUA (indirectly through WWF-DF), IMTA, Coca-Cola North America, Tecnologico de Monterrey, and South Central Climate Science Center.

Needs: We are looking for additional funding to cover travel grants and next steps that are identified during the Forum.

We also discussed how to include Mexico in the Desert Fish Network's planning process and database. A couple of things we discussed in this regard:

- adding shape files to your database with macro descriptions of on-going native fish work in the RGB basin in Mexico;
- reach out to WWF and our partners in the region to gather above with idea of participation in a native fish meeting down the road;
- take advantage of RGB Forum to do some sort of a native fish summary of work taking place throughout the basin.

#### **Post-Workshop Input from The Nature Conservancy of Texas:**

Following the workshop, Ryan Smith provided lists of research, monitoring and restoration actions identified as priorities for management of aquatic resources at the network of preserves in the Chihuahuan Desert ecoregion managed by The Nature Conservancy of Texas. These needs are listed below.

#### Independence Creek:

- Determine if monitoring Caroline Springs (T5) flow is feasible
- Ensure adequate well monitoring on the preserve and throughout the watershed
- Determine approach to monitoring stream cross-sections, determine if riparian monitoring is needed
- Determine local and regional groundwater flow paths, what areas contribute flow to the creek and springs and identify any threats to the aquifer system

#### Sandia Springs:

- Pecos sunflower assessment and monitoring
- Ensure adequate aquifer level monitoring
- Determine if riparian/wetland monitoring is needed, develop method
- Contribute to overall understanding of the groundwater system that feeds the Balmorhea Springs complex
- Mapping of watercourse, dams and habitats
- Ongoing stewardship needs, primarily saltcedar removal

#### Diamond Y:

- Establish baseline and regular monitoring of rare fishes, invertebrates and Pecos sunflower
- Re-establish USGS springflow gage
- Establish additional flow monitoring of the downstream reach
- Ensure adequate aquifer level monitoring
- Determine if riparian/marsh monitoring is needed and, if so, develop method
- Contribute to understanding of the groundwater system feeding Diamond Y Spring
- Assess small scale connectivity within each reach

#### Davis Mountains:

- Establish baseline and regular monitoring of Rio Grande chub and evaluate need to monitor Little Aguja pondweed, Davis Mountains snail and other aquatic species
- Establish approach to map Little Aguja pools and monitor both flow and water quality
- Ensure adequate aquifer level monitoring to track aquifer health
- Evaluate need for regular water quality sampling in springs
- Determine if riparian monitoring is needed and, if so, develop method
- Evaluate effects of historical land use change, drought and wildfires on Madera Creek watershed conditions, flow and biota, includes baseline aquatic biological inventory and flow monitoring

#### Devils River:

- Monitoring
- Spring ecosystem, salamander monitoring
- Continue the streamflow gage operation on Dolan Creek for at least 10 years
- Add at least one more groundwater well recorder and ensure location in best areas.
- Re-establish TCEQ water quality recorder
- Improved ability to evaluate effects of pumping on Devils River flow and springs in the Devils River basin
- Water budget in the Devils River basin, including the full area of groundwater contribution to the basin
- Understanding and modeling of aquifer flow paths in the upper Devils River
- Better understanding of flow reduction effects on Devils River minnow and other biota and water quality