TWENTY-FOURTH MEETING OF THE ARIZONA RIPARIAN COUNCIL AND MARSH BIRD IDENTIFICATION WORKSHOP

THE HOLIDAY INN
YUMA, ARIZONA
MARCH 17-19, 2011

WETLANDS ON THE EDGE: CHALLENGES IN WETLAND AND RIPARIAN RESTORATION

PROGRAM AND ABSTRACTS
2011

Twenty-Fourth Annual Meeting
Arizona Riparian Council
Wetlands on the Edge: Challenges in Wetland and Riparian Restoration
The Holiday Inn

Yuma, Arizona
March 17-19, 2011

Thursday, March 17

12:00 - 1:00	*Registration*
1:00-5:00	**Marsh bird identification workshop,** Courtney Conway, U.S. Geological Survey and Lin Piest, Arizona Game and Fish Department
6:00	Hospitality Suite (room to be announced)

Friday, March 18

7:30-8:30	Registration
8:00 - 8:20	*Welcome and Introductions* – Kris Randall, Arizona Riparian Council President
8:20 - 8:40	*Regional Overview, History, and Challenges Over the Past 30 Years* – Bill Werner, Contractor, Western Area Power Administration
8:40 - 9:10	*Challenges the City of Yuma has had Regarding Restoration and the Yuma Wetlands* – Charles Flynn, Executive Director, Yuma Crossing National Heritage Area

9:10 - 9:30 *Technical Aspects of Constructing the Yuma East Wetlands* – Kevin Eatherly, Assistant Director, Yuma Crossing National Heritage Area

9:30-10:00 *Wetland and Riparian Restoration Challenges on the Lower Colorado River* – Heidi Trathnigg, Fred Phillips Consulting, Flagstaff, AZ

10:00 - 10:15 **Break and Poster Viewing**

10:15 - 10:45 *Restoration of the Salton Sea* – Becky Blasius, Bureau of Reclamation, Boulder City, NV

10:45 - 11:15 *Mexican Perspectives on Restoration Along the Colorado River and the Southwest* – Yamilett Carrillo, Pronatura Noroeste

11:15- 12:00 *Panel Discussion and Audience Q&A*

12:00 - 1:30 *Lunch*

1:30-1:50 *Business Meeting*

1:50 - 2:05 *Development of Habitat in Imperial Irrigation District's Managed Marsh Complex* – Carla R. Scheidlinger, AMEC Earth & Environmental Inc., San Diego, CA

2:05 - 2:20 *The Lower Colorado River Multi-Species Conservation Program Implementation: First 5 Years* – Theresa Olson, Bureau of Reclamation, Boulder City, NV

2:20 - 2:35 *Tres Rios Wetland Restoration Project – A Grower's Perspective* – Steve Plath, Signature Botanica, Morristown, AZ

2:35 - 2:50 *Hydrochory Along a Free-Flowing Desert River* – Jackie Bestch, Andrea Hazelton, David Merritt, and Julie Stromberg, School of Life Sciences, Arizona State University, Tempe, AZ (to be presented by Kris Randall)

2:50 - 3:10 *Break and Poster Viewing*

3:10 - 3:25 *Herpetofauna and Riparian Microhabitat of Urban and Wildlife Reaches of the Salt River, Arizona* – Melanie Banville and Heather Bateman, Department of Applied Sciences and Mathematics, Arizona State University-Polytechnic, Mesa, AZ

3:25 - 3:40 *Potential Losses to Riparian Wildlife from Uranium Mining near Grand Canyon National Park* – Alicyn Gitlin, Sierra Club Grand Canyon Chapter, Grand Canyon Protection Campaign, Flagstaff, AZ

3:40 - 3:55 *Restoring Rivers in the Southwestern U.S. and Northern Mexico: Learning from the Past to Benefit the Future* – Daniel Bunting, School of Natural Resources and the Environment, University of Arizona, Tucson; Mark Briggs, Chihuahuan Desert Program, World Wildlife Fund, Tucson; Amy McCoy, Ecosystems Economics, University of Arizona, Tucson; Francisco Zamora, Sonoran Institute, Tucson; and Ari Posner, Department of Hydrology and Water Resources, University of Arizona, Tucson.

3:55 - 4:10 *Verde River Cooperative Invasive Plant Management Plan* - Heidi Trathnigg and Fred Phillips, Fred Phillips Consulting, Flagstaff, AZ

4:10 - 4:25 *Meeting the Challenge of Water for the Environment: Innovative Tools for Restoration Practitioners* - Candice Rupprecht, Joanna Nadeau, and Sharon Megdal, Water Resources Research Center, University of Arizona

4:25-4:45 *Wrap up*

6:00 - 8:30 *Dinner and Movies*

Posters (view during breaks)

Building Sustainable Riparian Habitats by Planting Trees Adapted to the Future – Alicyn Gitlin, Sierra Club Grand Canyon Chapter, Grand Canyon Protection Campaign; Sharon Ferrier and Thomas Whitman, Cottonwood Ecology Group, Northern Arizona University, Flagstaff.

Restoring Rivers in the Southwestern U.S. and Northern Mexico: Learning from the Past to Benefit the Future – Daniel Bunting, School of Natural Resources and the Environment, University of Arizona, Tucson; Mark Briggs, Chihuahuan Desert Program, World Wildlife Fund, Tucson; Amy McCoy, Ecosystems Economics, University of Arizona, Tucson; Francisco Zamora, Sonoran Institute, Tucson; and Ari Posner, Department of Hydrology and Water Resources, University of Arizona, Tucson.

Movie Descriptions

Common Ground

Common Ground, directed by Joe Hudson and Fred Phillips, documents the bi-national restoration of the Colorado River on a 23-mile section on the border with Mexico, known as the Limitrophe. Habitat is restored, jobs are created and security is enhanced when two nations collaborate on the rehabilitation of a degraded and crime-ridden no man's land.

Wild Versus Wall

The new Sierra Club border film, *Wild Versus Wall*, details the unique and diverse natural areas along the southern borders of California, Arizona, New Mexico, and Texas, and explains how they have been and will be affected by current and planned federal border policy and infrastructure, as well as the danger to our rights and safety imposed by sweeping new powers granted to the Department of Homeland Security. Since its launch, Wild Versus Wall has garnered thousands of hits online and is an Official Selection of the Sedona International Film Festival, 2009.

Power in the Pristine

Patagonia is one of the few places on the planet with untouched and undiscovered corners still remaining. Yet, at this very moment, its rivers and wildlands are under attack. Big business seeks to choke two of the region's most pristine rivers with mega-dams and plans to decimate unique forest ecosystems to build the longest power line in the world. Follow Team Rios Libres led by professional athlete, Timmy O'Neill and luminary writer, Craig Childs as they immerse themselves into this remote region. Find out what they discover on their journey from the source of the Baker River to the sea. Filled with inspiring imagery, compelling interviews and a bit of adventure, you'll gain an understanding of how this huge hydroelectric scheme would forever change the face and character of the area and why we must act now to Keep Patagonia Wild. For more info: http://www.rioslibres.com.

Saturday, March 19, 2011
Field Trips

Possible early bird (6 AM) trip to Mittry Lake for marsh bird observation.

8:00 AM

Meet in lobby to visit restoration projects in Yuma area. A box lunch will be provided. Plan to carpool if necessary and dress appropriately for going in the field. Don't forget water, sunscreen, hat, and shoes that could possibly get wet.

Marsh Bird Survey Training Workshop

Courtney Conway, USGS, Biological Resources Division, Arizona Cooperative Fish & Wildlife Unit 325 Biological Sciences East, University of Arizona , Tucson, AZ 85721

The Yuma clapper rail (*Rallus longirostris yumanensis*) is endangered in the United States and threatened in Mexico. Yuma clapper rails are year-round residents in emergent freshwater marshes of Arizona, California, Nevada, and northern Sonora with significant populations along the Colorado River (AZ, CA, NV), Cienega de Santa Clara (MX), Salton Sea (CA), and the Salt/Gila Rivers (AZ). Numbers have recently increased in the Virgin River (AZ, NV) and the Verde and Salt rivers east of the Phoenix metropolitan area (AZ). Annual surveys have been conducted at sites on the Colorado River since 1978 and surveys at other locations were added in subsequent years. These annual surveys are typically conducted by personnel from State and Federal agencies. All survey efforts are voluntary; there is no directed funding provided to field offices for personnel time to conduct (or train for) the surveys. It is vital that participants in this annual survey effort be competent in the ability to properly identify the calls of the Yuma clapper rail because the U.S. Fish and Wildlife Service (USFWS) relies heavily on the results of this annual survey effort for their 5-year reviews, for decisions on whether to down-list the bird to threatened, and for other planning efforts (i.e., refuge Habitat Management Plans). The conservation and efforts to recover and delist the Yuma clapper rail will be directly based on the quality of the data collected during this annual multi-agency survey effort coordinated by the USFWS. Without adequately trained surveyors, we cannot manage this endangered species adequately. The training workshop will also provide participants with the skills necessary to identify other priority species of concern (California black rails [*Laterallus jamaicensis coturniculus*], least bitterns [*Ixobyychus exilis*]) so that participants can record data on these species during their annual surveys. Since 2002, we have offered a 3-day marsh bird training workshop for agency personnel. This workshop includes some classroom instruction on survey methods and data recording, as well as 4 field sessions where participants break into small groups to gain experience distinguishing the various calls of the Yuma clapper rail from coexisting marsh birds. The workshop occurs in Yuma, Arizona, with field sessions that visit Imperial National Wildlife Refuge (USFWS), Mittry Lake Wildlife Management Area (Bureau of Land Management [BLM] and Arizona Game and Fish Department [AGFD]), and Imperial Dam (U.S. Bureau of Reclamation [BOR]). Habitat types covered during the training sessions (and those that will be surveyed during the annual survey effort that the workshops support) include all types of freshwater marsh in the region that contain the following plant species: southern cattail (*Typha domingensis*), California bulrush (*Schoenoplectus californicus*), chairmaker's bulrush (*S. americanus*), common threesquare (*S. pungens*), seep willow (*Baccharis salicifolia*), arrowweed (*Pluchea sericea*), and salt cedar (*Tamarix ramosissima*). The workshop will allow participants in the annual survey effort to provide reliable survey data for marshes all along the lower Colorado River (from the Grand Canyon south to the Colorado River Delta), throughout the Imperial Valley of California, and along the Gila, Verde, Salt, and Virgin River valleys. The primary audience for the workshops will be biologists and mangers that work for USFWS, BOR, BLM, AGFD, and California Department of Fish and Game (CDFG), plus biologists from tribal governments in the region and several NGOs that help agencies with their surveys (Audubon Society, etc). During the workshop, we'll learn to identify the calls of (and learn about the ecology and natural history of) the following species of wetland birds: Yuma clapper rail, California black rail, Virginia rail (*Rallus limicola*), sora (*Porzana carolina*), least bittern, American bittern (*Botaurus lentiginosus*), common moorhen (*Gallinula chloropus*), American coot (*Fulica americana*), and pied-billed grebe (*Podilymbus podiceps*). We will discuss 2 large-scale monitoring efforts for wetland birds: the 30-year Yuma clapper rail survey effort, and the National Marsh Bird Monitoring effort.

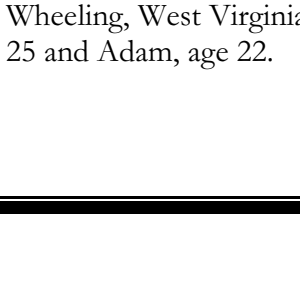
Abstracts and Biographies of Invited Speakers

Bill Werner, Contractor, Western Area Power Administration.

Bill graduated from the University of Arizona in 1977. Bill worked for Arizona Game and Fish from 1977 to 2004, as a wildlife manager, habitat specialist, habitat program manager, and aquatic habitat coordinator. After retirement he was environmental program manager for Arizona Department of Water Resources for 5 ½ years. He now works as a contractor for Western Area Power Administration and is involved in numerous renewable energy projects.

Regional Overview, History, and Challenges Over the Past 30 Years.

Over the last 30-35 years there have been a variety of efforts to manage or reestablish riparian plant communities and habitat along the lower Colorado River corridor. Efforts have been motivated by a need for compensatory mitigation for project impacts, to offset changes from past projects, or simply to maintain a diminishing resource. Changed and changing conditions have affected the outcome of many of these efforts and success has been less than desired in many instances. Programs have included: research efforts; mitigation for the Title I Salinity Control Program; mitigation at a project scale; habitat improvement through habitat management plans; planning through the Water Resources Development Act of 1986; and management efforts under the Grand Canyon Protection Act. Issues have included: inadequate planning, salinity in water and soil, inadequate soil moisture, changing hydrologic conditions, inadequate management, lack of experience with contracting writing contract specifications, and fire. Some programs have focused on establishment of plants with minimal ongoing management. More successful programs include maintenance, data collection, and adaptive management. Financing has ranged from inclusion in construction funding to an ongoing funding stream. Challenges we now face include how to learn from past efforts, plan for successful projects, and how to manage and maintain those projects through time.



Charles Flynn, Executive Director, Yuma Crossing National Heritage Area

Charles Flynn has served as the Executive Director of the Yuma Crossing National Heritage Area Corporation since its inception in 2000. Under his leadership, the Heritage Area is guiding $100 million of public and private investment along the Lower Colorado River. Charles Flynn graduated from Stanford University in 1974 with a BA/MA in American History. He worked for Mayor Edward Koch of New York from 1974-1981. From 1981-1993, he served as CEO of a family-owned resort in western Pennsylvania, during which time he also served on City Council in Meadville, PA. From 1994 to 1999, he led a $25 million riverfront redevelopment project in Wheeling, West Virginia. He is married to Ann Walker, and they have two children – Brendan, age 25 and Adam, age 22.

Challenges the City of Yuma has had Regarding Restoration and the Yuma Wetlands
Charles Flynn discusses what it has taken to develop the partnerships to undertake the Yuma East Wetlands restoration project. While the technical aspects of this restoration have been difficult, in some ways the partnering has been a greater challenge. Historically-wary stakeholders, including the Quechan Indian tribe, private landowners, area farmers, City of Yuma and state (both Arizona and California) and federal agencies all came together to support a restoration plan for the 1,400 acre area. The strength of this partnership served as the foundation for a successful fundraising effort which exceeded $10 million in grants and appropriations.

Kevin Eatherly, Assistant Director, Yuma Crossing National Heritage Area

C. Kevin Eatherly currently is the lead project manager and Deputy Director for the Yuma Crossing National Heritage Area, a comprehensive riverfront redevelopment that involves over $100 million of public and private investment in commercial, environmental, recreational, and historic preservation projects. Since 1999, he has guided dozens of projects from concept to full completion, and was one of the architects of the Long-Range Management Plan for the Yuma Crossing National Heritage. After graduating with a Bachelor of Science from Northern Arizona University, Kevin Eatherly worked for Arizona State Parks from 1991-1999, progressing from a staff aide to Park Manager of the Quarter Master Depot State Historic Park. During his 2-year tenure as Park Manager, he managed a $1 million renovation of the facility, which is a key component of the Yuma Crossing National Historic Landmark.

Technical Aspects of Constructing the Yuma East Wetlands
Kevin Eatherly discusses the various methods used to undertake restoration in one of the most inhospitable environments for restoration in the Southwest -- difficult soil conditions and limited water flows. Many experts in 2001 told us that restoration in Yuma was "impossible." He reviews the successes and failures of clearing and weed suppression methods for non-native vegetation; the pros and cons of drip irrigation; tailoring planting to hydrological and soil salinity conditions; and the successful adoption of mass agriculture techniques of laser leveling and flood irrigation for native plant restoration.

Heidi Trathnigg, Principal Biologist, Fred Phillips Consulting, LLC
Heidi Trathingg, M.S. is the principal biologist for Fred Phillips Consulting, LLC. She is responsible for designing and writing resource management plans, site specific monitoring plans, research plans, permit applications, and funding proposals. She also conducts research, endangered species surveys, and vegetation monitoring. In 2008, she completed a two year research project looking at the recovery of herpetofauna, mammals, invertebrates and avifauna in restored riparian and wetland habitats along the Lower Colorado River. These data provided a baseline to refine and focus efforts on the recovery avifaunal and butterfly communities in mature restored sites, which is the focus of her current research. She is also currently writing the Verde River Invasive Plant Species Management Plan, which is a multi-stakeholder effort to prioritize invasive plant species removal along the entire Verde River corridor. Ms. Trathnigg earned her B.A. in biology and environmental studies from the University of California at Santa Cruz and her M.S. in biological sciences from Northern Arizona University.

Wetland and Riparian Restoration Challenges on the Lower Colorado River

The lower Colorado River, especially around the Yuma area, is in dire need of riparian and wetland restoration, however the field conditions present provide a challenging venue for accomplishing restoration. Water diversion projects have greatly reduced the water available to the riparian and wetland habitats within the Yuma area and have prevented large scouring flood events that deposit nutrient rich soils and reduce soil salinities. Additionally, highly aggressive invasive species such as saltcedar (*Tamarix* spp.) and reed (*Phragmites* sp.) dominate the riparian habitats and are difficult to control. Finally, Yuma is located on the international border with Mexico, which presents border security concerns and transient occupation.

Fred Phillips Consulting (FPC) has overcome some of these challenging field conditions in the Yuma area by implementing an adaptive management approach. After the initial invasive plant species clearing has concluded a site analysis is conducted to determine the depth to water and soil salinities across the site. This initial survey provides information to develop the appropriate restoration plan using species that can tolerate the varying site conditions. Some of the successful techniques that have been employed to deal with high soil salinities and lack of low salinity water, include the creation of backwater channels that can be manipulated to flood irrigate the project area with low salinity water; planting native species tolerant of high soil salinities; and flushing soil salts using agricultural techniques. FPC has experimented with a variety of different planting techniques, including pole and plug planting, seeding, potted plants, and deep root pots to determine the most successful techniques for the site conditions present. Finally, FPC has developed restoration plans that compliment habitat as well as border security and prevention of transient occupation. The results of these efforts have lead to increased contiguous riparian and wetland habitat which has hosted breeding Yuma clapper rail (*Rallus longirostris yumanensis*), migrating willow flycatchers (*Empidonax traillii*) and transitory yellow-billed cuckoos (*Coccyzus americanus*).

Yamilett K. Carrillo, Watershed Sustainability Program, Pronatura Noresta

Dr. Carrillo works at Pronatura Noroeste as head of the Watershed Sustainability Program. She has participated in the restoration of riparian areas and other wetland types in the Colorado River Delta, Mexico since 1998. After finishing her Ph.D., her work expanded to other areas of northwest Mexico besides the Delta, on areas related to wetland restoration, soil and water conservation, agriculture-wetland relationship, watershed sustainability, and natural resource economics.

Restoration of the Colorado River Delta in Mexico

The restoration of riparian systems in western North America deals with the challenge of scarce water resources and the prevalence of the invasive saltcedar (*Tamarix* spp.). These have been critical issues in the Colorado River Delta, in Baja California and Sonora, Mexico, where the development of the basin caused the loss of over 80% of the wetland area in the last 100 years. In spite of the impacts, the Colorado River Delta has experienced a recovery of riparian vegetation and birds in response to inadvertent river flows that have reached the area since 1981 and agricultural run-off that has maintained important wetland areas, such as the Hardy River and the Cienega de Santa Clara. In 1996, a binational initiative for the restoration of the Colorado River Delta was started by a coalition of environmental groups, government agencies and academic institutions from both sides of the border. The initiative has been supported by three major components: 1) research and planning activities, 2) public policy and outreach, and 3) implementation of restoration mechanisms. An important step in this process was the identification and publication of the Conservation Priorities for the Delta, a document that has functioned as the blueprint for action. In addition, Pronatura and other environmental organizations have been working to identify the water needs for each of the target areas, in terms of required flow, hydroperiod and water quality. With this information, we have been able to move forward with restoration mechanisms, including the creation of a Water Trust for the acquisition of irrigation rights in the Mexicali Valley to restore instream flows and the formalization of an agreement with the Government of Baja California for the allocation of at least 30% of the effluent of "Las Arenitas" Wastewater Treatment Plant for the Hardy River. Overall, we have been able to secure 9,960 acre-feet per year of water for the environment in the Delta. At the same time we have been implementing on the ground restoration projects at 15 sites, covering 915 acres of marsh, mesquite (*Prosopis* spp.) bosque and cottonwood-willow (*Populus-Salix*) forest. The institutional support within Mexico and the collaboration through the binational negotiations have been critical factors in supporting the restoration progress in the delta. During these years we have learned that the delta maintains a resilient ecosystem, where restoration, allocation of water for the environment and the protection of large tracts of land is feasible, and that there is a strong institutional and community support for these efforts. The current conditions in the basin present formidable challenges ahead for water supply and riparian conservation, however, the collaboration and participation of stakeholders and water users in both the U.S. and Mexico could lead to agreements for additional dedication of water for the environment and the restoration of the Colorado River Delta.

Becky J. Blasius, Bureau of Reclamation

Ms. Blasius works at the Bureau of Reclamation's Lower Colorado Regional Office in Boulder City, NV. She has over 13 years of educational and professional experience dealing with water quality and water management projects. She manages the Brawley Wetlands Program and serves as the Lower Colorado Region's Water Quality and Wetlands Coordinator. Ms. Blasius is a native of Michigan where she received her Bachelor of Science in Human Physiology and Master of Science in Aquatic Ecology/Entomology at Michigan State University.

Restoration of the Salton Sea

The Salton Sea is a terminal hypersaline (48,000ppm), and nutrient-rich lake in the Sonoran Desert of southeastern California. It lies at the bottom of the Salton Basin, a remnant of Lake Cahuilla. The Sea's source water is primarily, agricultural drainage from the Imperial, Coachella, and Mexicali Valleys and smaller contributions from municipal effluent and stormwater runoff. Annual inflow to the Sea is 1.36 million-acre-feet per year. The lake covers about 376 mi^2 (970 km^2), making it the largest in California. While it varies in dimensions and area with changes in agricultural runoff and rain, it averages 35 mi (56 km) by 15 mi (24 km) with a current elevation at about 227 feet below mean sea level, maximum depth of 51 ft (16 m), with a total volume of about 7.5 million acre-feet (9.25 km^3). The Sea is a major resting stop for migratory and resident birds on the Pacific Flyway. Millions of migratory birds use the Sea every season and approximately 400 species have been recorded within the Salton Sea ecosystem. Several endangered species, including the desert pupfish (*Cyprinodon macularius*), and the Yuma Clapper Rail (*Rallus longirostris yumanensis*), inhabit the Salton Sea or adjacent habitats.

The Salton Sea is under stress, and habitats associated with it continue to deteriorate as the Sea's salinity increase, nutrients flow in, elevation decreases, temperatures fluctuate and oxygen in the water is depleted. Deteriorating conditions may be threatening the reproductive ability of some species, and may be causing additional ecosystem health problems.

Congress passed the Salton Sea Reclamation Act in 1998, (Public Law 105-372) which directed the Secretary of the Interior, acting through the Bureau of Reclamation, to "complete all studies, including, but not limited to environmental and other reviews, of the feasibility and cost-benefit of various options that permit the continued use of the Salton Sea as a reservoir for irrigation drainage and: (i) reduce and stabilize the overall salinity of the Salton Sea, (ii) stabilize the surface elevation of the Salton Sea, (iii) reclaim, in the long term, healthy fish and wildlife resources and their habitats, and (iv) enhance the potential for recreational uses and economic development of the Salton Sea."

Abstracts

Abstracts are listed alphabetically by first author.

Banville, M. J., and H. L. Bateman. Department of Applied Sciences and Mathematics, Arizona State University, Polytechnic Campus, 6073 S Backus Mall, Mesa, AZ 85212. *Herpetofauna and Riparian Microhabitat of Urban and Wildland Reaches of the Salt River, Arizona.*

Riparian ecosystems support a high diversity and abundance of wildlife species and are used as migration corridors. Unfortunately, less than 10% of Arizona's original riparian acreage remains. Urbanization can also alter vegetation structure and composition of riparian systems, affecting habitat suitability for many wildlife species. Rehabilitation of degraded riparian systems can be performed to mitigate for habitat loss. However, there is little published information on how riparian rehabilitation activities impact non-avian wildlife communities. Herpetofauna play a valuable ecological role in ecosystems and are important to monitor because they respond to structural changes occurring in their habitat. We evaluated herpetofauna abundance, species richness, and diversity as well as riparian microhabitat characteristics from three reaches along the Salt River, Arizona. The extent of riparian rehabilitation effort and degree of urbanization vary between reaches. One wildland reach is located on Tonto National Forest and two urban reaches are located within the greater Phoenix area. The wildland reach was previously disturbed but closure to authorized grazing and off road vehicles have facilitated the recovery of the riparian community. One of the urban reach has been recently rehabilitated whereas, the second is highly disturbed. We predicted that greater structural diversity of microhabitat and lower urbanization would favor herpetofauna abundance, richness, and diversity. At each reach, we performed visual surveys for herpetofauna along eight transects (n=24) spanning the riparian zone to determine species presence and abundance. Microhabitat characteristics such as ground substrate, vegetative cover, woody debris, stem density, and plant species richness were quantified along each transect. Preliminary results show significant differences for herpetofauna species richness between all reaches with a mean number of species per transect of 3.9, 2.4 and 0.6 for wildland, urban rehabilitated, and urban disturbed reaches, respectively. Diversity indices (Shannon-Weiner and Simpson) were significantly greater at the wildland reach whereas, diversity along the two urban reaches did not differ. Abundance of herpetofauna was approximately six times lower along the urban disturbed reach compared to the wildland and urban rehabilitated reaches, which did not differ. Principal Component Analysis (PCA) was performed to reduce the number of microhabitat variables to fewer factors and used to model herpetofauna-habitat relations. Management suggestions for rehabilitating degraded riparian ecosystems to promote herpetofauna abundance and diversity will be developed based on wildlife-habitat models. Preliminary results suggest that rehabilitated urban areas may support high numbers of lizards, but urbanization may negatively influence overall herpetofauna diversity. Rehabilitating an area by providing a diversity of vegetation species and cover types (i.e., shrub, ground, and overstory), and planting native trees such as mesquites could provide habitat to support abundant native herpetofauna.

Betsch, J.[1], A. Hazelton[1], D.Merritt[2], and J. Stromberg[1]. [1]School of Life Sciences, Arizona State University, Tempe AZ 85287-4501; and [2]U.S. Forest Service, Natural Resources Research Center, Ft. Collins, CO 80526. *Hydrochory along a Free-Flowing Desert River.*

Hydrochory-the dispersal of seeds through water-influences establishment and maintenance of riparian plant communities but has been little studied in dynamic semi-arid streams. We examined how abundance, species richness, and composition of hydrochores vary with stream flow rate, season, and position within the water column. Further, we asked how hydrochory patterns relate to phenology of seed ripening and dispersal. Finally, we asked how the composition of hydrochores relates to that of seeds deposited on the riverbank and to extant vegetation.

We trapped hydrochores and sampled herbaceous and woody vegetation and litter/soil seed banks from an undammed reach of the Verde River, AZ, USA, over six months during the growing season. Additionally, phenology of plant flowering and fruiting was measured in the riparian zone over a 12-month period. The viable seed content of the hydrochore and litter/soil samples was assessed using the emergence method, with seedling number and identity monitored in the greenhouse for one-year post collection.

A total of 56 hydrochorous species were encountered, represented by 1,111 seedlings. Hydrochore richness and abundance varied seasonally and increased during periods with high stream flows. In terms of composition, wetland hydrochores were more constant through time compared with upland hydrochores, which showed stronger seasonal pulses. Species varied in their temporal patterns of hydrochory, and we classified three phenological hydrochory strategies-pulse species are transported in the water in accordance with their short dispersal period, constant species disperse in the water throughout the year, and intermediate species show characteristics of both. There was moderately high similarity between the species composition of hydrochore samples and soil/litter seed bank samples (Sorenson's Index of 0.49) and between hydrochore samples and extant vegetation (0.40), suggesting that hydrochory does influence or is influenced by community structure.

Bunting, D[1]., M. Briggs[2], A. McCoy[3], F. Zamora[4], and A. Posner[5]. [1]School of Natural Resources and the Environment, University of Arizona, Tucson, AZ; [2]Chihuahuan Desert Program, World Wildlife Fund, Tucson, AZ; [3]Ecosystems Economics, University of Arizona, Tucson, AZ; [4]Sonoran Institute, Tucson, Arizona; and [5]Department of Hydrology and Water Resources, University of Arizona, Tucson, AZ. *Restoring Rivers in the Southwestern U.S. and Northern Mexico: Learning from the Past to Benefit the Future*. **(Presentation and Poster)**

On December 7-10, 2010, over 176 scientists, conservationists, land managers, representing 16 federal agencies, 8 state agencies, 18 universities, 17 private organizations, 13 non-governmental organizations, 4 county and city agencies, and 2 tribal nations from the U.S., Mexico, and Australia met to discuss their river restoration and conservation experiences and the main challenges they see in the future. The overall goal of the conference was to document and organize the main lessons learned from these experiences into an applied river restoration guidebook. Our presentation and poster at the ARC meeting will summarize some of the main lessons that were put forward by participants during the conference and provide - for consideration and comment - an outline of the guidebook chapters that we are producing from conference results.

Selected challenges and main lessons learned that were conveyed by conference attendees include:

- Rivers are water and sediment, and understanding the sediment budget is critical for developing sound, long-term viable river restoration objectives;
- Stop the bleeding - Where possible, emphasis needs to be placed on reducing or eliminating the root causes of river ecological deterioration;
- Don't let reaction from the status quo to changes proposed to historic river management stop you;
- Include water users in efforts at the 'conservation' table is critical to securing environmental flow and long-term river conservation success;
- Expect uphill battles and setbacks along the way;
- Don't stop at the border - Though challenging, efforts in the Colorado River Delta, Rio Bravo, San Pedro, Santa Cruz River and elsewhere demonstrate the feasibility and reward of transboundary river conservation projects;
- Creating novel multi-functional landscapes that provide a range of ecosystem services needs to be a future priority;
- Enjoy the successes and show them off even if small in scale;
- Developing a framework that effectively incorporates climate change information into long-term river conservation planning will be critical for future success.

The guidebook is designed for river practitioners who are planning river conservation and/or restoration projects. It will be distributed in both Spanish and English. Composed of three main sections: (i) Diagnosis; (ii) Planning and Treatment; and (iii) Post-implementation, the guidebook will walk readers through the main steps that need to be considered as part of developing a viable and successful river restoration program. Chapters on such emerging and pertinent themes as environmental flow, native fish conservation, climate change, and transboundary river conservation will be developed as part of the 'planning and treatment' section. Our presentation will summarize the current outline for the guidebook, highlighting key aspects with the purpose of eliciting comment and input from meeting attendees.

Gitlin, A. Sierra Club Grand Canyon Chapter, Grand Canyon Protection Campaign, 318 W. Birch Ave., Flagstaff, AZ 86001. *Potential Losses to Riparian Wildlife from Uranium Mining near Grand Canyon National Park.*

Very few studies have documented damages to riparian wildlife from uranium mining, and most have focused on risks from radiation. Since 2003, thousands of new mine claims have been established in the Grand Canyon watershed, and radiation is only part of the cumulative impacts predicted near Grand Canyon if mining proceeds. Riparian and spring habitats are essential to much of Grand Canyon's wildlife: over 46 macroinvertibrates, representing over 43 genera, and 3 amphibians were identified during a single sampling effort at 15 springs; 59 birds and 10 rare and endangered bat species reside in Grand Canyon riparian habitats. Horn Creek, Salt Creek, Kanab Creek, and the Little Colorado River are unfit for human (and presumably for wildlife) consumption and bathing due to previous mining activities. Water contaminated by uranium, arsenic, lead, nickel, selenium, and other metals, or acidified by mining activities, could be further degraded if mine pumping reduces water supply. Impacts on Grand Canyon wildlife have not been examined; however, metal contaminants in stream sediments in Montezuma Creek, UT, correlate with aquatic macroinvertebrate contamination; Tims Branch, a tributary of the Savannah River, had greater contamination in its riparian soils and understory than in stream sediments and overstory. These studies may indicate particular risk to the base of the food web at biodiversity hotspots. Exacerbating these effects, noise levels at 100-2000X ambient can harm bats; loss of riparian vegetation can lead to increased songbird nest predation; mine roads increase accessibility of remote springs; non-native weeds spread easily into newly cleared ground. Ore hauling traffic from just one mine, the Canyon Mine, is predicted to impact 13% of "all reliable waters in the area which are historically used by wildlife" along a major ungulate and mountain lion corridor. 78 mine claims are within bighorn sheep habitat near Kanab Creek. The Department of the Interior is considering withdrawal of nearly 1 million acres near Grand Canyon from new mines. Riparian advocates are asked to support this withdrawal.

Gitlin, A.[1], S. Ferrier[2], and T.G. Whitham[2]. [1]Sierra Club Grand Canyon Chapter, Grand Canyon Protection Campaign, 318 W. Birch Ave., Flagstaff, AZ 86001; and [2]Cottonwood Ecology Group, Northern Arizona University, PO Box 5640, Flagstaff, AZ 86001. *Building Sustainable Riparian Habitats by Planting Trees Adapted to the Future*. **(Poster)**

Large sums are being invested in riparian restoration and enhancement projects, and rapid planning will be required to replace vegetation being defoliated by the tamarisk leaf-eating beetle (*Diorhabda elongata*). Many restoration projects take place in locations watered with effluent discharge or along streams with regulated hydrology; as a result, local vegetation may not be adapted to current conditions. Even along unregulated southwestern rivers, spring floods are receding earlier due to warmer spring temperatures. In these cases, planted stock may not release seed at an appropriate time to reproduce and create a self-sustaining population. If local adaptation to hydrological regime exists, riparian planting stock derived locally or acquired from large commercial nurseries may not be an economical choice for the long term. We recorded the timing of seed release in a common garden setting, where trees from across the state of Arizona were planted side-by-side in a single place. Research at the garden, located at the Palo Verde Ecological Reserve, CA, along the lower Colorado River, revealed that timing of seed release differed significantly between the locations where trees were sourced.

Olson, T. Bureau of Reclamation, PO Box 61470, Boulder City, NV 89006. *The Lower Colorado River Multi-Species Conservation Program Implementation: First 5 Years*.

The Lower Colorado River Multi-Species Conservation Program (LCR MSCP) is a multi-stakeholder federal and non-federal partnership responding to the need to balance the use of lower Colorado River water resources and the conservation of native species and their habitats in compliance with the Endangered Species Act. The LCR MSCP is a 50-year plan to conserve at least twenty-six covered species along the lower Colorado River, from Lake Mead to the Southerly International Boundary with Mexico, through the implementation of a Habitat Conservation Plan (HCP). The Bureau of Reclamation began implementation of the HCP in October 2005. Several large-scale habitat creation areas have been planned and initiated, with many covered species utilizing these sites. Research and monitoring programs are ongoing for covered fish and wildlife including species specific research, system-wide species monitoring, and post-restoration monitoring.

Plath, S. Signature Botanica LLC, P.O. Box 512, Morristown, AZ 85342. *Tres Rios Wetland Restoration Project - A Grower's Perspective*.

The Tres Rios Wetland Restoration Project along the Salt River in south Phoenix, Arizona, is one of the largest urban restoration projects in the southwestern U.S. encompassing over 350 acres upon its completion. The project is currently entering its third phase, with installation to begin in the spring of 2012. Various growers had been enlisted during the first two phases to produce the plant material for the project which included marsh, riparian, mesquite bosque and upland species of plants. As one of the growers for the project, Signature Botanica was enlisted to grow assorted riparian and mesquite bosque species. One of the goals by Signature Botanica was to propagate from site-specific seed or vegetative material within the watershed of the Salt River. Selection of the species grown for the project as well as the initial types of containers used was chosen by designers with a landscape architecture background. From an ecological restoration viewpoint several of the species selected, for example, *Baccharis salicifolia* and *Tessaria sericea*, were unnecessary due to the propensity of these species to pioneer disturbed areas without assistance. From a horticultural perspective timing of the propagation of species such as *Populus fremontii* and *Salix exigua* became difficult due to contractual delays. Likewise delays in installation added an additional challenge to maintain moisture loving species during hot summer months. Success is optimized by selecting appropriate container types, depending on species and eventual water application. Signature Botanica suggested production in containers ranging from 10-cubic-inch cones to 6-inch diameter by 30-inch tall "Tallpots" to maximize a given plant's potential. The necessity to speed up or slow down a given species' growth to produce a plant of appropriate root mass within a container was another challenge in the production and maintenance process.

Rupprecht, C., J. Nadeau, and S. Megdal. Water Resources Research Center, University of Arizona, 350 N. Campbell Ave, Tucson, AZ 85719. *Meeting the Challenge of Water for the Environment: Innovative Tools for Restoration Practitioners*.

This presentation covers two interrelated strands of work at the University of Arizona's Water Resources Research Center (WRRC) that are designed to address the challenge of securing water for the environment. A 2006 report that studied 30 environmental enhancement projects in Arizona found 80% required supplemental water sources, showing a need to establish water sources for the environment. The latest incarnation of work building on these findings is the Arizona Environmental Water Needs Assessment project, conducted in 2010 and funded by the Nina Mason Pulliam Charitable Trust. In order to increase understanding of how environmental water needs are measured, the WRRC assessed studies and associated methods used to quantify water requirements of Arizona's riparian areas and aquatic ecosystems. The assessment provides a systematic synthesis of information for use in local, regional, and statewide discussions about meeting the water needs of river and riparian systems.

Included in the assessment are a summary report, a guidebook of existing methodologies, a decision tree for determining the ideal study strategy for a given environment, and GIS maps of the study information. These materials are intended to inform the public, scientific communities, and policy makers about the state of the knowledge of Arizona's environmental water needs and to increase the collective ability of interested parties to conserve, preserve, and possibly restore riparian and aquatic habitats.

Through this assessment, the project will also identify opportunities to implement innovative mechanisms to purchase water for the environment, such as Conserve to Enhance. Environmental restoration and enhancement efforts often need funding to purchase needed water. To address this challenge, the WRRC has developed and is implementing the innovative Conserve to Enhance mechanism to bring the environment to the table as a paying water customer. While much water conservation in growing regions simply translates into more water to accommodate growth, a Conserve to Enhance program offers municipal water customers the option of donating the money they save through voluntary water conservation actions to selected enhancement projects to support environmental water needs. Development of the Conserve to Enhance program has been supported by the United States Bureau of Reclamation.

This presentation will provide results from the statewide assessment of environmental water needs and an update on Conserve to Enhance piloting efforts. Specifically, the presentation will discuss how utilities, governmental agencies, non-governmental organization, academia and the public can collaborate to benefit the environment and solicit feedback on how environmental managers can utilize these tools to secure needed water for specific environmental enhancement projects.

Scheidlinger, C. A. AMEC Earth & Environmental, Inc., 9210 Sky Park Court, Suite 200, San Diego, CA 92123. *Development of Habitat in Imperial Irrigation District's Managed Marsh Complex*.

The Water Transfer Project addresses the conservation, use, and transfer of Colorado River Water by the Imperial Irrigation District (IID) and its partners. One mitigation measure implemented by the IID for impacts associated with this project is the creation of a 959-acre managed marsh complex to provide wetland and native woodland habitat for species that normally use drain and canal vegetation for their life history needs. Phase 1 is 365 acres, which encompasses 20 cells designed to accommodate a variety of habitats, including riparian forest, mesquite woodland, and emergent aquatic wetlands. Principal targets for the project are the Yuma clapper rail and California black rail. We worked with IID on design, adaptive management for water delivery, and planting and invasive species control for the Phase 1 project. Water management included development of meandering channels for riparian vegetation, flow-through provision for marsh cells, and precise depth control to facilitate plant establishment at different water levels. Soil preparation included ripping and discing for root-zone enhancement for trees and agricultural style surface preparation for seeding. Over 150 acres were seeded to achieve high plant species diversity, augmented by planting of wetland species. Transplanted tree species intergrade with marsh species in some cells, enhancing ecological diversity. After 12 months, vegetation is well-developed and bird and invertebrate species diversity is high.

Trathnigg, H., and F. Phillips. Fred Phillips Consulting, LLC, 401 South Leroux St., Flagstaff, AZ 86001. *Verde River Cooperative Invasive Plant Management Plan*.

The Verde River is treasured for its wildlife habitat, water supply, recreational opportunities and natural beauty. It is one of the most substantial free flowing rivers in Arizona. While the river corridor is primarily comprised of native riparian vegetation, invasive species, particularly saltcedar, Russian olive, tree of heaven and giant reed, threaten the health and sustainability of these native vegetation communities. In 2010, Friends of the Verde Greenway with help from Fred Phillips Consulting conducted a workshop with federal, state, tribal, non-profit and private corporation stakeholders to launch a cooperative effort to unify the best management practices in order to have a coordinated approach to managing invasive plant species in the Yavapai County FEMA floodplain along the Verde River. From this meeting a "Cooperative Invasive Plant Management Plan" was conceived. The principal vision of the Plan is to: Restore and maintain a diverse, self-sustaining ecosystem by managing the removal of invasive plant species in the riparian corridor of the Verde River and its tributaries through cooperative stakeholder participation. The primary purpose of the Plan is to: 1) provide a clear framework with obtainable goals and measurable outcomes and milestones that will result in net ecological benefit; 2) take a science-driven approach to identify the priority invasive plant species and the best management practices for treatment by integrating existing weed removal plans; 3) identify priority areas, cost and available labor sources to initiate removal efforts; and 4) develop a coordinated monitoring plan. The principal goal of the Plan, proceeding from the vision above, is to: reduce invasive woody and herbaceous plant species through various control methods within the Yavapai County FEMA floodplain to eliminate the seed sources in order to prevent further invasive plant species infestation, to allow native plant species to thrive, and allow the riparian and wetland areas to become more naturally functioning, sustainable and resilient to change. This presentation will discuss the developed Plan, challenges to coordinating a multi-stakeholder effort and the accomplishments of the stakeholder group.