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The Water Report™

Water Rights. Water Quality & Water Solutions in the West

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Municipal Stormwater
& More!

THE COLORADO RIVER

HAS IT RUN OUT OF WATER?

by Lawrence J. MacDonnell, Porzak Browning & Bushong LLP (Boulder, CO)

On May 2, 2005, US Secretary of the Interior Gale Norton decided to maintain water releases from Lake Powell's Glen Canyon Dam at the currently established level for the balance of the 2005 water year. This decision came despite five consecutive years of well-below normal runoff in the Upper Colorado River Basin (Basin), which brought storage levels in Lake Powell down to 34% of capacity. In her letter to Basin state governors, the Secretary explained her decision as based on the improved snow pack this spring in the headwaters (which is slightly above average).

Close observers of the Basin should not have been surprised by the secretary's decision. Change of any kind does not come easily in the Colorado River Basin, and reducing the amount of water released from Lake Powell would have meant changing a practice that has been followed since 1970 — exacerbating disagreement among the seven Basin states.

The Colorado River and its tributaries are shared by seven states, two nations, and dozens of Indian tribes. Hydrologically speaking, the Basin is a modest source of water — generating an average of perhaps 17-to-18 million acre feet (MAF) of water annually. Formal allocation of the right to consumptively use 17.5 MAF has been established under the 1922 Colorado River Compact (Compact) and the 1944 Treaty with Mexico. Under these agreements 8.5 MAF is allocated to the Lower Basin, 7.5 MAF to the Upper Basin and 1.5 MAF to Mexico.

As the map on the next page illustrates, the two parts of the Basin in the US are hydrologically-defined, with a dividing point on the river at a point in northern Arizona called Lee Ferry. The Upper Basin includes significant portions of Colorado, Utah, and Wyoming and a portion of northwest New Mexico and northern Arizona. The Lower Basin includes almost all the rest of Arizona, and small portions of California, Nevada, New Mexico, and Utah.

Estimated consumptive uses of the Basin's water between 1996 and 2000 averaged over 19 MAF per year. About 11.8 MAF of this use occurred in the Lower Basin (not counting evaporation losses of about 1.3 MAF), with another 2.9 MAF going to Mexico.

FOUR IMPORTANT CONCLUSIONS MAY BE DERIVED FROM THE PROCEEDING INFORMATION:

- More water was being consumed on average each year in the Basin between 1996 and 2000 than the Basin apparently produces
- Lower Basin users exceeded their 1922 Colorado River Compact allocation
- More water went to Mexico than was legally obligated
- Upper Basin still is not consuming its full Compact allocation

By 2004, storage in Lake Powell was dropping to levels not seen since it first filled in the 1960s. The Upper Basin states began seriously contemplating the possibility that some existing uses might have to be curtailed if the drought continued. Storage in Lake Powell is regarded by the Upper Basin as its savings account. Under the 1922 Compact, at least 75 MAF of Colorado River water is expected to flow to the Lower Basin during every consecutive 10-year period. If native runoff in the Upper Basin is not sufficient to

WATER AND THE ENVIRONMENT

THE ROLE OF ECOSYSTEM RESTORATION

by Sharon B. Megdal

Restoration

On April 6, 2005, the University of Arizona Water Resources Research Center (WRRC) held another of its annual water conferences in Tucson, Arizona. This year the topic was "Water and the Environment: The Role of Ecosystem Restoration." This article provides a summary of some of the insights and information shared at the conference.

ARMY CORPS KEYNOTE

The keynote speaker, Mr. Bill Dawson, Director for Civil Works Planning and Policy for the US Army Corps of Engineers (Corps), provided an interesting perspective on ecosystem restoration. He noted that the environmental aspects of a project must be considered part of the whole. Dawson cautioned against simply adding-on environmental considerations to a developed project like the "extras" added to sweeten a car sale. In order to avoid the piecemeal approaches of the past, the Corps has developed a strategic plan which incorporates environmental operating principles.

CORPS ENVIRONMENTAL OPERATING PRINCIPLES INCLUDE:

- Strive to achieve Environmental Sustainability
- Recognize the interdependence of life and the physical environment
- Seek balance and synergy among human development activities and natural systems
- Continue to accept corporate responsibility and accountability
- Seek ways and means to assess and mitigate cumulative impacts
- Build and share an integrated scientific, economic, and social knowledge base
- Respect the views of interested individuals and groups.

Corps Principles

Balance

Dawson noted that leaders, by definition, set direction and that effective environmental sustainability requires "a process whereby environmental and economic considerations are effectively balanced in project planning, design, construction, operation and maintenance."

Mr. Dawson explained how Corps projects fit within this new strategic approach using examples from the Florida Everglades, the Louisiana Coastal Area and various projects in Arizona. He noted that the current make-up of Corps personnel reflects evolving programs and areas of focus. Thirty years ago, over half of the Corps' 40,000 employees were engineers. There were virtually no scientists. Today, with 35,000 employees, the Corps has 7,000 engineers and over 14,000 scientists.

Dawson would like to see the United States be a world leader in environmental restoration and see more of it done here at home because "it is the right thing to do."

Evolving Corps

ECOSYSTEM RESTORATION OVERVIEWS

Three academicians provided additional overviews of ecosystem restoration.

Professor Cliff Dahm, University of New Mexico, spoke on "River and Riparian Restoration in the Southwest: A Summary from the National River Restoration Science Synthesis" (Synthesis Project). Professor Dahm provided an excellent overview of national and southwestern restoration projects. The Synthesis Project's objective is to characterize the status of restoration projects, including how science is used, and to identify activities that make restoration successful. The Synthesis Project has conducted numerous interviews to find out more about individual projects and established a national database which is available to interested parties. The researchers utilize information from both federal databases and local sources. Thirty states and 40,000 records are included in the database.

Professor Dahm's presentation showed breakdowns of the project by geographic area, intent of project and data source. Arizona had 197 of the 600 projects in the Southwest. The data indicate that the primary motivations for restoration projects are water quality management and riparian management. He noted the uneven nature of monitoring and assessment. The federal databases reflect only a small fraction of the total number of restoration projects, although they do include a significant fraction for some regions (such as the Southwest). However, the federal databases are better than regional sources at tracking cost and monitoring information. Differences between federal and regional data sources and among the regions themselves exist, in part, because of different definitions of restoration by states, regional management goals, and levels of coordination and cooperation among regional management authorities.

[SYNTHESIS PROJECT WEBSITE: www.nrrss.umd.edu/

Professor Dahm was a co-author for the article, "*Synthesizing US River Restoration Efforts*" which appears in the April 29th issue of Science]

National Database

Motivators

Restoration

Ecosystem Improvements

Resilience

Landscape Context

Multiple Objectives

Professor Julie Stromberg, Arizona State University, addressed the question: How do you measure the success of a restoration project? Her presentation examined two important indicators: ecosystem improvement and increased resilience.

MEASURES OF ECOSYSTEM IMPROVEMENT INCLUDE:

- Improved water quality
- Increased riparian vegetation abundance
- Increased population viability of target species
- Increases in bioassessment indices

Increased resilience refers to a system’s capacity to recover from natural disturbances such as floods and drought. This increased resilience would be indicated by the fact that few interventions would be needed to maintain the site.

Professor Stromberg discussed some specific Arizona restoration projects in the context of the landscape in which a restoration site is embedded. She questioned whether restoration success was even feasible given the current state of some landscapes. Where and how can we re-establish connectivity within and between river sites? What ongoing interventions will be necessary, if connectivity can’t be restored? Concerning restoration along the Salt River in the Phoenix metropolitan area, she noted that different projects along the river create opportunities for experimentation and hypothesis testing. It is possible to design large-scale experiments, with each restoration project or river reach functioning as an experimental unit.

As a segue from the general to the specific, your author gave the final presentation of the overview panel, entitled: “A Look at Ecosystem Restoration in Arizona” — based primarily on a nearly-completed study funded by the Corps. This study (as well as another ongoing study funded by the US Bureau of Reclamation) is designed to foster understanding of environmental enhancement projects in order to inform decision makers, professionals, and the public as they consider future investments to utilize water in a way that meets multiple public objectives. Eleven ecosystem restoration projects in the Tucson and Phoenix areas are included in the Corps-funded study. The report uses a template to present a summary

of information on the projects. The information summarized includes: planning objectives; recommended plan; cost; water source(s); and public outreach. The main purpose of the study is to showcase projects and examine the “lessons learned.” [The Corps funded study: “*Environmental Restoration Projects in Arizona: US Army Corps of Engineers’ Approach*” will be accessible in the near future from the University of Arizona website included at the end of this article.]

The information I presented focused primarily on projects in the Tucson. Ecosystem restoration projects can involve major investments and their development phases often span many years, even decades. Once completed, observable results may take time. Ecosystem restoration projects may be part of multiple-purpose projects and/or other infrastructure projects and usually involve multiple partners. Public input is essential. One of the projects included in the study did not move forward due to local opposition. Finally, vision is important — these projects often result from “outside the box” thinking



Wetland Pond, Ed Pastor Kino Environmental Restoration Project
Photo courtesy of Jennifer Jones

URBAN PROJECTS

MULTIPLE USES / MULTIPLE VIEWS

Mike Ellegood, Director of Public Works for Maricopa County (where Phoenix is located and over 50% of Arizona’s population reside), discussed his county’s interest in promoting multiple-use flood control facilities to protect natural Sonoran desert landscapes. These multiple-uses include open space, recreation and wildlife areas. He illustrated how public infrastructure can be used for environmental purposes, using as an example a site where “volunteer” riparian growth has resulted from urban runoff and wastewater discharges under the intersection of two freeways (see photo below). This habitat has been environmentally resilient. Mr. Ellegood underscored the many challenges associated with ecosystem restoration arising from conflicting resource uses. He noted the importance sand and gravel mining has for development, and advised a partnership approach.

Conflicting Uses



Volunteer Riparian Restoration at Freeway. Photo courtesy of Flood Control District of Maricopa County

Stress Removal

Julia Fonseca, Environmental Program Manager for Pima County Flood Control (Tucson area), has long-term experience with environmental restoration. She also discussed sand and gravel mining, but from a different perspective. Fonseca concentrated on the importance of removing stresses on environmentally sensitive areas, including riverbeds. She outlined the potential for limiting in-channel sand and gravel mining through land buyouts and regulation, with the goal being a more stable river channel. Ms. Fonseca also discussed taking advantage of opportunities. Fire or flood, for example, may lead to the increased willingness of property owners to sell their properties. Lands can then be restored to reduce damage from future drought and fire. Over time, the natural processes can be restored.

“Water Budget”

Characterizing sustainability as the ultimate “challenge,” Fonseca emphasized developing a “natural water budget” as a key component for long-term success. Effluent can play an important role in riparian projects near urban areas, as can stormwater harvesting. Failure to secure a natural water budget and a permanent water supply for sites/projects can result in a lack of sustainability.

Rio Salado Project: Phoenix Reach

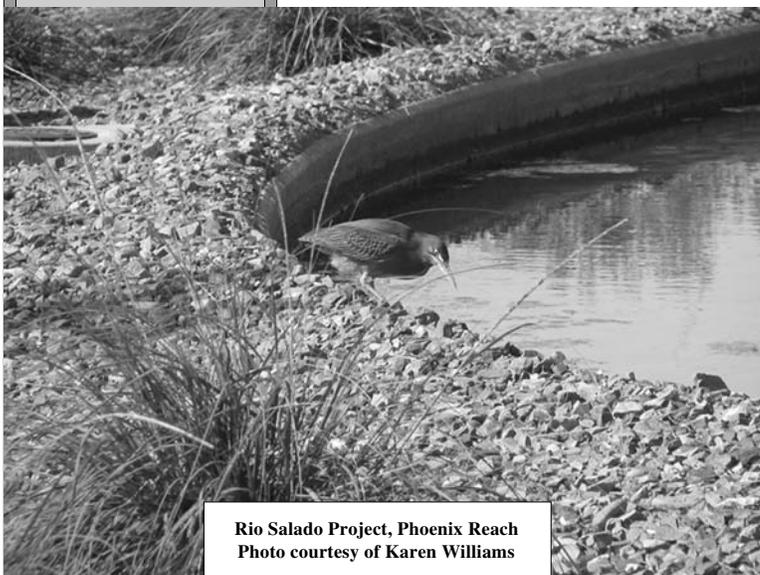
Funding

A major river/ecosystem restoration project is progressing on different reaches of the Salt River (Rio Salado) despite the lack of voter approval for an earlier concept of this project several years ago. Karen Williams, Rio Salado Project Coordinator for the Phoenix reach, reminded the audience that the Rio Salado Project’s concepts were developed by a class at Arizona State University. She explained how program funding developed over several years, pointing out the importance of Corps funding, which covers 65% of the capital costs of construction. The Arizona Water Protection Fund also provided funding for a wetland demonstration project. (The Arizona Water Protection Fund was established in the mid-1990s to provide funding for riparian restoration throughout Arizona. While it received state funding for several years, recent funding by the Arizona legislature has been very limited.)

Water Sources

Ms. Williams stressed the importance of obtaining water (which is “never free”) for the project. Phoenix drilled wells in the shallow aquifer so that the withdrawals would not adversely affect the deeper, more pristine, drinking water aquifers. Water delivery canals were lined, in part as the result of a cost/benefit analysis which weighed incidental seepage benefits and delivery efficiency. Re-vegetation of the storm drainage system is providing great benefits at little cost. While some of the 75,000 plants and shrubs being planted will be irrigated to get them established, proximity to the drainage system is expected to maintain them over time. Ms. Williams also emphasized the importance of meeting public expectations with regard to recreational features. Restroom facilities, benches, and education staging areas are all significant components of successful projects.

Ms. Williams noted that this inner-city project — which is to be the site of a new Audubon nature center — has the potential to provide ancillary benefits to distressed areas of the city. The distressed areas to which Ms. Williams referred were also commented upon by author Mark Reisner, who in *The Cadillac Desert: The American West and Its Disappearing Water*, wrote: “Phoenix owes its existence to [the Salt River], but even so it doesn’t seem to hold the Salt in high esteem. On both banks, the floodplain is encroached by industrial parks, trailer parks, RV parks, but no real parks. The flood channel itself has been developed to a degree, playing host to establishments which are, by nature, transient: topless bottomless joints, chop shops, cock-fighting emporia. Paris built its great cathedral by its river, Florence its palaces or art; Phoenix seems to have decided that its river is the proper place to relegate its sin.” The Rio Salado Project will change the landscape in this now distressed area.



Rio Salado Project, Phoenix Reach
Photo courtesy of Karen Williams

NON-URBAN ECOSYSTEM RESTORATION PROJECTS

Three speakers shared their experiences with non-urban projects.

Individual Initiative: Improving Property

Jim Crosswhite, Owner/Rancher of EC Bar Ranch, explained what he has been able to accomplish as an individual landowner. His projects have cost \$1.6 million, with the required 50% local match coming from his own pocket. He provided examples of types of completed projects, including elk proof fencing, stream channel restoration to reduce turbidity, and irrigation system improvements to establish and maintain growth.

MR. CROSSWHITE OFFERED THE FOLLOWING STEPS TO IMPROVING PROPERTY:

- Implement restoration practices using grant funding
- Maintain sustainable practices which enable taking advantage of a Natural Resource Conservation Service program that involves incentive payments to maintain existing conservation practices
- Provide long-term protection through conservation easements
- Monitor the project to illustrate results

Crosswhite installed a photographic monitoring system. He is currently establishing conservation easements for a three mile stretch of his property. He would like to help others obtain grants and offered people his website (www.ecbarranch.com) or a visit to his ranch for more information. His website is jam-packed with information indicative of his experience and success with obtaining grant funds.

Restoration & Spring Ecosystems

Professor Abe Springer, Northern Arizona University, discussed riparian ecosystems with springs as the primary water contributor. Spring ecosystems, while very important biologically, are also very susceptible to adverse impacts. Sensitive to climate change, they are often ignored in inventories. He covered several Northern Arizona case studies funded by the Arizona Water Protection Fund. Professor Springer’s experience has shown that successful projects require multi-disciplinary teams — including students. Team members need to communicate well with each other and with external parties. Agency support is essential to success and good science must be incorporated. He noted that the science “going in” may not seem difficult, but measuring success can be difficult. Recognizing the role of climate and incorporating land management issues are also critical for project success according to Springer.

Riparian Development & Protection

Errol Blackwater (Project Support Coordinator, Gila River Indian Community’s Pima-Maricopa Irrigation District) discussed his agency’s goal of implementing riparian protection areas. They are developing a native plant nursery to provide native plants to aid riparian restoration. He explained how, while riparian growth has relied mostly on surface water, irrigation tail water (“return flow”) has also been used to support the establishment of riparian habitats. The Gila River Indian Community recently received significant Central Arizona Project (CAP) water as part of the largest Indian water settlement on record. They are interested in developing demonstration riparian habitat areas. Blackwater noted that in the past federal agencies cut down cottonwood trees — some 400 years old— to save water. Mr. Blackwater commented on the importance of cultural and recreational opportunities and pointed to the need for dedicated short-term and long-term water supplies. The District’s next steps include: setting priorities; translating priorities into research plans; working closely within their Community; and investing in the future environment.

ARIZONA WATER STRATEGY

Alan Stephens, Chief of Staff to Arizona Governor Janet Napolitano, was the keynote luncheon speaker. Governor Napolitano has called for the development of the State’s first drought plan and stressed the importance of water conservation throughout the state. The Governor has also asked the State’s three universities to assist state water agencies and to collaborate on water resources research, technology development and export, and education.

LAW & ENVIRONMENTAL POLICY

Two attorneys addressed the role of the legal system in effecting environmental policy: Joy Herr-Cardillo of the Center for Law in the Public Interest and CAP attorney Tom McCann.

Ms. Herr-Cardillo led off by noting that courts do not create policy; they implement the policies embodied in law. Like most people, lawyers realize litigation is inefficient. When the law is not being enforced, however, she is glad to have access to the courtroom to ensure that the law is being applied fairly. Arizona’s courts have upheld separate treatment of surface water and groundwater. This purely legal disconnect between surface water and groundwater makes it difficult to address certain issues. (Virtually all water resource professionals working in Arizona would generally agree with this

Restoration

Ranch Improvements

Conservation Easements

Springs Source

Native Plants

Tailwater

Dedicated Supply

Drought Plan

Litigation’s Role

**Restoration
Citizen
Initiatives**

**Deference to
Agencies**

**Litigation
Responses**

**Incorporating
Public Input**

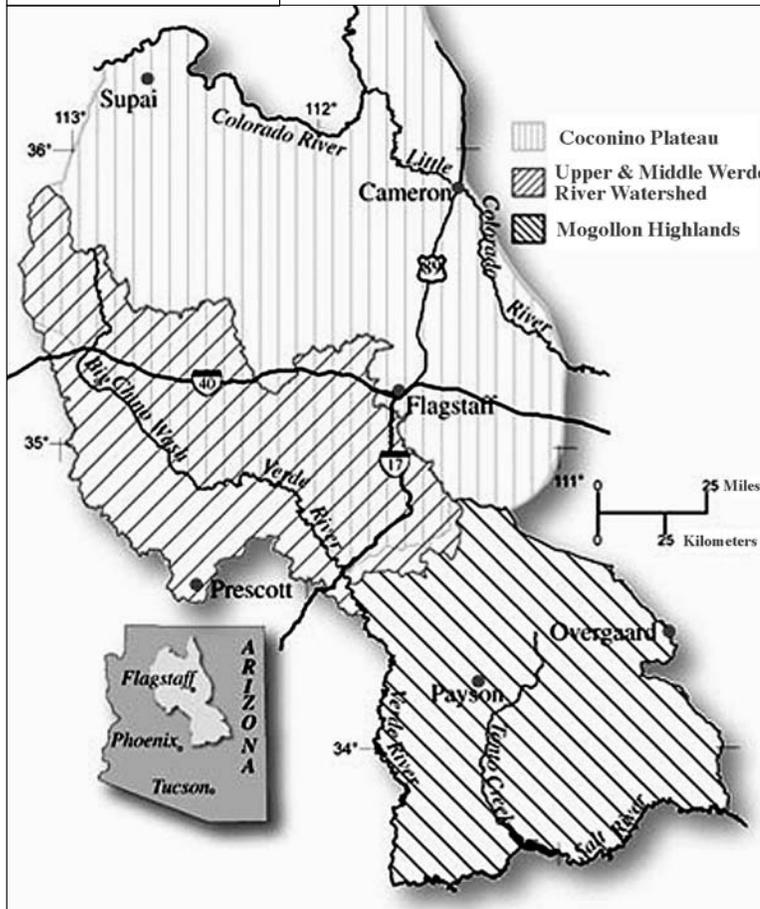
observation.) Under these conditions, what is the alternative to use of the judicial system? Ms. Herr-Cardillo observed that nothing has resulted from the 2001 riparian protection recommendations of Governor Hull's Water Management Commission. Citizen's initiatives are an option – and are popular vehicles for effecting policy in Arizona. She noted that while the legal system may have some problems, it is an integral and indispensable part of our three-pronged system of government.

Mr. McCann stated he agreed generally with Ms. Herr-Cardillo that the legal system plays a crucial role in environmental policy. His presentation noted that courts have frequently thrown out challenges due to deference afforded to the agencies making decisions. He cited the decision of the US Environmental Protection Agency (EPA) regarding the Navajo Generating Plant (concerning Grand Canyon haze), where the Court deferred to the agency to resolve the matter. He noted that when CAP challenged the US Fish and Wildlife service in the 1990s, CAP lost. The Center for Biological Diversity, which sued from the other direction, also lost. It is very difficult to reverse or change a substantive decision of an agency. Where a challenge is successful, it is typically over a process violation, such as failing to consider something deemed necessary under the National Environmental Policy Act (NEPA). Even successful lawsuits rarely change the ultimate outcome; the courts simply correct the process but then come back and reaffirm the original decision. McCann observed that these lawsuits waste tremendous amounts of resources in time and money. He concluded that a collaborative approach is a better use of resources than use of the legal system.

In response to Ms. Herr-Cardillo's statement that the threat of litigation can cause the parties to talk and, thus, litigation is an important part of the toolbox, Mr. McCann acknowledged that things do happen due to a threat of a lawsuit or the lawsuit itself. Attorney Carol Rose, who served as moderator of the panel, noted that a lawsuit may also be a vehicle of public education and that mediation can sometimes assist in resolving complex policy matters.

The panel generated an interesting discussion with some audience members focusing on public input. One person asked how to seriously engage — and listen to — the public. Ms. Herr-Cardillo noted that open houses are held but sometimes there appears to be no real interest in incorporating opposition views. Mr. Ellegood cited the difficulty of getting the public to share their views, unless, that is, a bulldozer appears in their backyards. The challenge of obtaining public input and incorporating it into decision making in a meaningful way was agreed to be an issue requiring attention.

Verde Watershed Area
Courtesy of Kyle Blasch, USGS



VERDE RIVER WATERSHED RESTORATION

Another panel focused on restoration work in the Verde River watershed. The Verde River watershed, north of Phoenix, provides water to the metropolitan Phoenix area through the Salt River Project (one of the first authorized projects built by the US Bureau of Reclamation). This largely rural watershed has a rapidly growing population. Area development is placing increasing demands on groundwater aquifers. There is much debate over water acquisitions and transfers in the area, as well as serious concerns about the region's high-value riparian areas. The region is the subject of much study and restoration activity.

US Geological Survey (USGS) hydrologist Kyle Blasch discussed how ongoing investigations in the Verde watershed are part of a larger effort to understand rural watersheds in Arizona. Development of regional databases, conceptual models, and numerical models is fostering greater understanding of groundwater systems. These efforts support ecosystem work by improving the understanding of: the pre-development hydrologic system; the current hydrologic system; natural variations in hydrologic processes; and anthropogenic changes to the system. They also allow for informed modeling of future scenarios, which is important to planning and understanding the possible impacts of plans. Major issues of concern include water quantity and water quality, and particularly the prevalence of naturally occurring arsenic.

Restoration

Incidental Take

Mitigation Habitat

Large-Scale Approach

Paul Cherrington, Manager of Water Engineering and Transmission for the Salt River Project, spoke about the Roosevelt Habitat Conservation Plan (RHCP). He explained that this plan was the result of federal Endangered Species Act (ESA) protections for the Willow Flycatcher that were associated with water levels at Theodore Roosevelt Dam. The height of the dam was raised in the first half of the 1990s to allow for new storage and flood control space, and to insure dam safety. However, some dry years followed and the water level was not immediately increased. Birds moved into the lower space that had been expected to be under water. An ESA incidental take permit — which allows for harm to an ESA-protected species under stipulated circumstances — therefore became required. A Habitat Conservation Plan (HCP) had to be filed that demonstrated minimization and mitigation of the taking. The incidental take permit, issued after eighteen months, included provisions for four bird species (i.e., Bald Eagle (threatened); Yellow-billed Cuckoo (candidate); Yuma Clapper Rail (endangered) as well as the Willow Flycatcher (endangered)). The RHCP commitments include acquiring 2,250 acres of alternative mitigation habitat (a three-to-one mitigation ratio) and preparing a habitat management plan. One-third of the habitat had to be acquired before the permit was issued. In the Verde area, the 124-acre Camp Verde Riparian Preserve in Camp Verde was purchased. The Salt River Project is working on a baseline environmental inventory at the Preserve and focusing on several associated challenges. Previous activities at the site included recreation (e.g., target-shooting) and livestock use deemed incompatible with mitigation objectives. Old appliances had been dumped at the site and there are adjacent commercial and industrial land uses. The Salt River Project has acquired acreage at five different locations, including land in the Lower San Pedro and the Upper Gila watersheds.

The Nature Conservancy in the Verde River Watershed

The next speaker on the Verde River panel was Pat Graham, Arizona State Director of The Nature Conservancy (TNC). Through the years TNC has recognized that focusing solely on individual preserves is not sufficient, because their preserves are surrounded by a sea of change. The organization now looks beyond individual preserves to a larger scale. This approach is illustrated by TNC’s efforts in the Verde River watershed. The Verde River is unique because it is one of the few rivers in Arizona with a year-round flow, and the river’s headwaters flow from a large grassland-alluvial basin.

TNC’S EFFORTS IN THE VERDE RIVER WATERSHED ARE BASED ON THREE GOALS:

- 1) Encourage collective water resource decisions. There are many interests and parties within the Verde River watershed, and TNC is uniquely suited to craft collaborative partnerships and ensure that science is incorporated into decisions.
- 2) Maintain and restore healthy grassland over the Big Chino aquifer. To achieve this goal, TNC is purchasing development rights and participating in trust land law reform in Arizona.
- 3) Encourage sustainable water use to meet the needs of both the people and the flow of the Verde River. To achieve this goal, TNC is working to mitigate the export of water from the Big Chino aquifer, limit further depletion of the aquifer and enhance recharge.

Dam Removal

Professor Charles Schlinger of Northern Arizona University (NAU) discussed the Childs-Irving power plant decommissioning and environmental restoration on Fossil Creek. Fossil Creek is an important tributary to the Verde River and contributes 30% of the Verde’s flow during the low-flow month of June. The Childs-Irving hydroelectric plant is three miles upstream from the natural confluence of Fossil Creek and the Verde River. In March 2005, the Federal Energy Regulatory Commission provided final approval to decommission the Childs-Irving Plant. Decommissioning the dam will restore Fossil Creek’s 46 cubic feet per second base flow and the fourth largest travertine (i.e., limestone-forming) system in North America. This ecosystem restoration effort also affords a unique opportunity to restore native fish to the system. The US Bureau of Reclamation has installed a fish barrier to keep non-native fish from Fossil Creek and all non-natives have been removed. Once the dams have been decommissioned and flow restored, NAU will research how the system recovers, focusing on travertine development, aquatic species interaction, sediment research and monitoring, recreation and visitor impacts, and stream-flow gauging.

Verde River

Photo Courtesy of Pat Graham



Restoration

Dams' Impact

Multi-Species Conservation

Removing Non-Native Species

Mexican Delta

LOWER COLORADO MULTISPECIES CONSERVATION PROGRAM

The next panel focused on the Lower Colorado Multispecies Conservation Program (LCMSCP). Recently finalized, the LCMSCP will be the focus of much investment and extensive monitoring.

The context for the LCMSCP was provided by Bill Werner, Arizona Department of Water Resources, who noted that although Salt River Project's reservoirs have risen considerably, the major storage reservoirs on the Colorado River (i.e., Lake Powell and Lake Meade) still remain at levels far below that prior to the beginning of the drought.

Perri Benemelis, Arizona Department of Water Resources, discussed the competing demands for Colorado River water. She remarked that the Colorado River is substantially over-allocated. The presence of dams on the river has altered the channel forming processes and the natural regeneration of riparian habitats along the River. The restoration efforts along the Colorado River are driven by compliance with the National Environmental Policy and the Endangered Species Acts. The LCMSCP is not a recovery-based program. Its goal is to offset the adverse effects of water diversion. Developing the LCMSCP was an arduous process, taking ten years to get through the planning phase. It is estimated that program implementation will cost \$630 million over 50 years.

Chris Harris, Administrator for the LCMSCP, addressed the challenges and opportunities for restoration along the Lower Colorado River. There are 26 species covered by the multispecies conservation plan, including species from aquatic, marsh, and riparian habitats. He noted that unlike the restoration opportunities in an area such as Fossil Creek where the dam will be removed, it is not feasible to remove the dams along the Colorado River. The challenge of restoration on the Colorado is to see what can be done within the given constraints. The most pressing problems are managing non-native species, such as salt cedar, and controlling wildfires. The management of the restored areas will be dynamic and adaptive. Monitoring and research from one year will be incorporated into the subsequent year's plan. LCMSCP personnel have identified 35,000 acres of habitat with high restoration potential. Finally, Harris noted that throughout the process there have been tensions as well as collaboration among the many diverse groups involved in the LCMSCP.

The Colorado River Delta Project

Dr. Francisco Zamora Arroyo, Project Manager for the Colorado River Delta Project at The Sonoran Institute, spoke on activities taking place south of the border. Although the Mexican delta is not a part of the LCMSCP, there are many restoration opportunities there. The Sonoran Institute has developed a map of the possible restoration activities in the Delta, while recognizing that restoration to historic levels is not possible. They have identified 264,438 acres for protection and 594,958 acres for restoration within the Delta. The overarching problem that they face is a lack of secure water flows. Each of the sub-



El Tapon Project Area, Mexico. Photo courtesy of AEURHYC, A.C. & Francisco Zamora Arroyo

ecosystems within the Delta, however, has distinct attributes and priorities. The El Tapon Project area (see picture below) includes a series of check dams. In several areas, control of salt cedars is a concern. The restoration of many areas in the Delta is driven by a desire to use it for ecotourism. In moving forward with these projects, Project personnel have identified the need for a comprehensive restoration strategy and plan, as well as the need for the Mexican government to designate the area as a Restoration Zone. He concluded by indicating that restoring key areas of the Delta will be hard to achieve until the governments of the United States and Mexico increase their commitment to improving and repairing the health of these ecosystems.

Restoration

Shrinking
Finances

Effort = Progress

FUNDING

The final panel of the day addressed funding opportunities. Ecosystem restoration requires substantial financial backing, often from multiple sources. Representatives from the Arizona Water Protection Fund, the US Army Corps of Engineers, the Arizona Department of Environmental Quality and the Natural Resource Conservation Service spoke. While noting funding opportunities, all cited needs that exceeded available and sometimes shrinking resources. David McKay, who recently became Arizona's State Conservationist, noted the importance of increasing funding for watershed planning.

CONCLUSION

In retrospect, ending the conference with a discussion related to funding seems fitting. However pressing the impetus for ecosystem restoration, the costs can be considerable. Nevertheless, individuals and agencies should not be dissuaded. Although the efforts take considerable time, the conference clearly left me optimistic. Regardless of project size, the various presentations demonstrated that substantial progress in project development, implementation and assessment is being made. Although collaboration can be difficult, it will ultimately lead to greater success in developing viable projects and securing funding. Environmental considerations, perhaps once the stepchild of public works and other projects, are now in the foreground.

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CONFERENCE WEBSITE: the conference agenda and presentations, where available, can be found at www.cals.arizona.edu/azwater/.

Sharon B. Megdal, PhD is Director of the Water Resources Research Center (WRRC) and Professor in the Department of Agricultural and Resource Economics at the University of Arizona. Dr. Megdal's work focuses on state and regional water resources management and policy. She is a frequent lecturer and writes a water policy column for the WRRC's bi-monthly newsletter, *The Arizona Water Resource*. Megdal holds PhD and MA degrees in Economics from Princeton University, where she specialized in public sector economics and econometrics, and an AB degree in Economics from Douglass College of Rutgers University, where she was Phi Beta Kappa. She has served on numerous state boards and commissions, including the Water Quality Appeals Board and the Governor's Water Management Commission. She thanks Kelly Mott Lacroix, Chris James and Jackie Moxley for assistance in preparing this article. Special thanks go to all the speakers at the conference.



2005 SEDIMENTS CONFERENCE



by Laura Kennedy, Kennedy/Jenks Consultants (San Francisco)

Sediments

The Environmental Law Education Center Sediment Conference, which was held on May 6, 2005 in Portland, Oregon provided perspectives on the legal, technical, and policy issues associated with cleaning up contaminated sediment sites.

Keynote Speaker: Integrated Approach

Eric Stern, the Regional Contaminated Sediment Program Manager for US Environmental Protection Agency (EPA) Region 2 (New York), specializes in contaminated sediments and provided the keynote address for the conference. Mr. Stern discussed some of the difficulties of characterizing and remediating contaminated sediment sites, such as the inability to see the extent of the entire problem, the complicated physical system and contaminant exposure pathways, and the complex sediment management paradigms used by various federal and state agencies. Sediments do not fit neatly within agency structures as there are many cross-program applications, such as the Comprehensive Environmental Response Compensation and Liability Act (CERCLA or Superfund), the Clean Water Act, and Dredged Materials Management.

Mr. Stern advocated for an integrated approach to contaminated sediment management. He discussed the need to develop long-term self-sustaining enterprises in the environmental management of sediments by recognizing that sediment management is ultimately a business. Because sediments are a non-renewable resource, the management of sediments needs to be sustainable. Sediments can be processed with mixed feeds to sustain long-term business models, maximize beneficial uses, and reduce demand for non-renewable resources, while providing a sustainable use of contaminated sediments. Examples of sustainable sediment uses include cement-lock, BioGenesis sediment washing, and renewable confined disposal facilities.

[FOR MORE INFORMATION about reinventing sediment management, contact Mr. Stern: 212/ 637-3806]

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