SIXTEENTH MEETING OF THE ARIZONA RIPARIAN COUNCIL

Rancho de los Caballeros
Wickenburg, Arizona
April 26-27, 2002

Water Resources and Sustaining Riparian Areas

PROGRAM AND ABSTRACTS
2002

Sixteenth Annual Meeting
Arizona Riparian Council
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WATER RESOURCES AND SUSTAINING RIPARIAN AREAS

FRIDAY, April 26

7:30-10:00 **Registration**

8:30-9:00 **Welcome** – Kris Randall, President

9:00-9:30 **Overview of Arizona Water Law** - Richard Campbell, Law Offices of Withey, Anderson, and Morris

9:30-10:00 **Arizona Department of Water Resources Programs and Perspectives** - Jim Holway, Arizona Department of Water Resources

10:00-10:30 **Governor's Water Management Commission: Perspectives on Riparian Protection** - Ruth Valencia, College of Ecosystem Science and Management, Northern Arizona University

10:30-10:45 **BREAK** - View Posters

10:45-11:15 **Water Follies: Groundwater Pumping and the Fate of America's Fresh Waters** - Robert Glennon, James E. Rogers College of Law, University of Arizona

11:15-11:45 **Issues Surrounding Exportation of Groundwater from the Big Chino Subbasin to the Prescott AMA** - John Munderloh, Yavapai County Water Advisory Committee

11:45-12:15 **Arsenic Master Plan (AMP)** - Tony Bode, Arizona Department of Environmental Quality

12:30-1:30 **LUNCH**

1:30-2:10 **Keeping the Streams Flowing: Development and Implementation of the Tonto National Forest Groundwater Policy** – Rich Martin and Grant Loomis, Tonto National Forest

2:10-2:30 **Panel Discussion**

2:30-3:00 **Brainstorm Session** - Kris Randall

3:00-3:15 **BREAK** - View Posters

3:15-3:30 ***Using Numerical Groundwater Flow Models as Water Resources Planning Tools***. Dale Mason, Arizona Department of Water Resources

3:30-3:45 ***Hydrologic Thresholds for Maintaining Cottonwood-Willow Stands along the San Pedro River, Arizona***. Sharon Lite and Julie Stromberg, Department of Plant Biology, Arizona State University

3:45-4:00 ***Restoration of Natural Processes to Benefit Riparian Habitat on the Bill Williams River, Arizona.*** William E. Werner, Arizona Game and Fish Department

4:00-4:15 ***Revegetation Guidelines for Sedges (*Carex *spp.) in Southwestern Riparian Meadows.*** James Steed and Laura DeWald, USDA Forest Service and School of Forestry, Northern Arizona University

4:15-4:30 ***Two Arizona Watershed Initiatives: Evaluating Public Partnerships as a Means of Water-Management Planning***. Anne Browning-Aiken, EJ. E. de Steiguer, and Robert Varady, Udall Center for Policy Studies, University of Arizona

4:30-4:45 ***Some Innovative Concepts for Resolving Water Quality/Quantity Conflicts over Arid Riparian Habitat*** E. Curley, Pima County Wastewater Management Department; R. Meyerhoff, CDM, Inc., Phoenix; T. Moore, Risk Sciences, Brentwood TN; Mark Murphy, URS Corporation, Phoenix and K. Sierra, Pima County Wastewater Management Department.

4:45-5:00 ***Wickenburg High School Constructed Wetland Outdoor Classroom***. Lauren Serrano, Wickenburg High School

7:00 Dinner at Hassayampa Preserve

POSTERS (View during breaks)

E C Bar Ranch Conservation Projects. Jim Crosswhite, E C Bar Ranch

Flora of the Upper San Pedro River. Elizabeth Makings, Department of Plant Biology, Arizona State University

Minor Inundation of Streamside Vegetation by Temporarily Restored Base Flow in Upper Fossil Creek, AZ. Zackary J. Mondry, Coconino National Forest

DO IT WITH VOLUNTEERS! Tonto National Forest riparian photo point program. Kathy Nelson, Tonto National Forest

Instream-Flow Water Rights for National Forests in Arizona. Kathy Nelson, Tonto National Forest and Zackary Mondry, Coconino National Forest

FIELD TRIPS - SATURDAY, APRIL 27

We encourage car pooling on field trips. Please properly prepare for hiking, don't forget water to drink, hat, sun screen, etc, and a sack lunch. Please meet at the Wickenburg High School at 8 AM. Conference participants will drive by the entrance to both the middle and high schools. The High School is the second entrance - it has a small brown block wall and metal arch at the entrance. The tour will start from the flag pole immediately in front of the Administration building, which is between the Performing Arts Center and the Gym. It is obvious upon driving into the school. Park in the first parking lot you come to. From the high school you will have the option of going to the Hassayampa Preserve or Box Canyon.

Wickenburg High School – Matt Peirce, Leader
Matt is a Wildlife Manager with the Arizona Game and Fish Department and he will talk to us about the constructed wetlands at the high school. We will walk the area containing the constructed wetland consisting of eight subsurface wastewater treatment cells and open water pond. Participants will be encouraged to walk on the cells and identify the various plants. All wastewater at the high school is treated and used within the campus. The subsurface cells contain a diversity of wetland plants that do not occur naturally as the plants were collected from the lower Santa Maria River, Date, and Humbug Creek and higher elevation wetland areas near Yarnell. The wetland cells also contain several of the common riparian deciduous trees. The treated water is pumped through a network of driplines to water trees planted adjacent to the wash bisecting the site. The goal of the project is create as diverse a wildlife habitat as possible using native plant species.

Hassayampa River Preserve – Jere Burdell, Leader
Jere is a Ph.D. candidate at Arizona State University's Department of Plant Biology. She will lead a trip through the Preserve and discuss the most recent research from Julie Stromberg's lab at Arizona State University, including Jere's mesquite bosque seed bank manipulation project (a restoration technique) and seed bank investigation of the Preserve's plant communities; Taly Dresner's seed dispersal research; and Julie's flood impact research.

Box Canyon - Jack Ragsdale, Leader
Jack is the Recreation Manager for the Bureau of Land Management in the Wickenburg area. He will show us Box Canyon and how it is being used recreationally.

FIELD TRIP - SUNDAY, APRIL 28

Harquahala Peak Smithsonian Observatory - John Anderson, Leader
John is the State Botanist for the Bureau of Land Management (BLM) will lead a field trip up the Harquahala Mountain Back Country Byway to the Harquahala Peak Smithsonian Observatory. The 10.5-mile drive to the summit of Harquahala Mountain offers dramatic views and a challenging four-wheel-drive adventure. The road is narrow, winding, and extremely steep in places. Harquahala Mountain is among the highest mountain summits (5,681 ft) in southwestern Arizona. The Harquahala Peak Smithsonian Observatory was built in 1920 to measure and record solar activity and was in operation from 1920-1925. The BLM has installed interpretative panels to describe the facility, the scientists, and their story. The byway starts on the south side of the Harquahala Mountain approximately one hour west of Wickenburg.

ABSTRACTS

(Abstracts are ordered alphabetically by first author.)

Bode, T. Arizona Department of Environmental Quality, 3033 N Central Ave, Phoenix AZ 85012. ***Arsenic Master Plan (AMP).***

The new arsenic standard of 0.01 mg/l will become effective in January 2006 and all community and non-community non-transient water systems will have to comply with the new standard. It is the goal of the Arizona Department of Environmental Quality (ADEQ) to have all water systems comply with the new arsenic standard. To that end, ADEQ has partnered with the Arizona Corporation Commission (ACC) and the Water Infrastructure Finance Authority (WIFA) to develop the Arsenic Master Plan to assist small water systems comply with the new Arsenic standard by leveraging all the available resources and streamlining existing processes that water systems have to go thru to increase their rates and secure loans and grants.

Browning-Aiken, A., EJ. E. de Steiguer, and R. Varady. Udall Center for Studies Policy, 803 E. lst St. Tucson, AZ 85719. ***Two Arizona watershed initiatives: Evaluating public partnerships as a means of water-management planning.***

In Arizona watershed initiatives demonstrate that collaborative basin-level planning and management have become an increasingly popular strategy for resolving conflicts over water resources. Watershed initiatives-called "partnerships," "water advisory councils or committees," or simply "community water groups"- are created by stakeholders as a vehicle for understanding and applying state water law, determining needs for scientific research, and providing a forum to discuss water issues. Experiences of two initiatives, the Upper San Pedro Partnership in southeastern Arizona and the Yavapai County Water Advisory Commission (WAC) in central Arizona, allows water managers and planners to see how organizational structure, goals, and operational modes suggest successful approaches to water planning and management.

Binational watersheds like the San Pedro Basin illustrate marked differences in management regimes. Economic development, embedded in disparate legal and institutional frameworks, impacts quality of life and prompts resource conflicts. Similarly, rapid population growth and potential for development, particularly in the Verde watershed in central Arizona, demonstrate the need for planning in order to assure sustainable water supplies. There, a strong watershed initiative is essential because (1) the Verde Watershed contains the Prescott Active Management Area (AMA), which is in deficit; (2) Native American communities have strong water claims; (3) there are endangered-species issues associated with reduced river flow; and (4) there exist important potential downstream-user water claims.

The University of Arizona's Udall Center for Policy Studies links policy-relevant research in the social and physical sciences by addressing water-allocation conflicts in the U.S. and water-quality concerns in Mexico. The work in these two watersheds is part of an NSF-funded program, SAHRA (Sustainability of semi-Arid Hydrology and Riparian Areas); and complements SALSA (Semi-Arid Land-Surface-Atmosphere), a global-change research project, and GAPP (GEWEX America Prediction Program).

Crosswhite, J. E C Bar Ranch, PO Box 44, Nutrioso AZ 85932. ***E C Bar Ranch conservation projects.*** **(POSTER)**

In 1996, I purchased a 275-acre ranch located in the White Mountains of eastern Arizona. The 1.5 miles of Nutrioso Creek on the property was rated in "non-functional" condition using the Bureau of Land Management proper functioning condition rating system for riparian zones. Due to many years of poor management, domestic livestock had over-grazed the ranch allowing rabbitbrush (*Chrysothamnus nauseosus*) to take over the pastures. The annual forage production was estimated at 300 lbs/acre. Only a small herd of about 25 cows could be supported with most of their time spent in the riparian zone just to survive.

In 1997, the Natural Resource Conservation Service completed a Conservation Plan that led to a series of projects designed to increase forage production, implement riparian and cross-fencing, off-channel drinkers, brush management, and irrigation system improvements. In 2000, I purchased an additional 110 acres downstream, including 1 mile of riparian zone rated in "non-functional" condition. In July 2000, the Arizona Department of Environmental Quality (ADEQ) completed the "Nutrioso Creek TMDL for Turbidity." Of 27 miles of Nutrioso Creek included on the 303d list in 1993 as an impaired water, the Total Maximum Daily Load (TMDL) report identified 3 miles of private property, including mine, and 4 miles of property owned by the US Forest Service that had excessive levels of turbidity. The nonpoint source of turbidity was described as exposed streambanks aggravated by large ungulate grazing, e.g., elk and livestock. Since the TMDL report was released, the ADEQ has awarded grants to me with tasks designed to implement TMDL recommendations.

All projects are on schedule with about 75% of the tasks already completed. Using a sprinkler system, rotational dormant-season grazing, and an elk-proof fence, sustainable forage production has increased to about 5,000 lbs/acre. Within five years, the 2.5 miles of riparian corridor on my property should reach "proper functioning condition." turbidity will be reduced to meet TMDL standards, and permanent habitat will be created for the threatened Little Colorado River spinedace (*Lepidomeda vittata*). I believe projects on the E C Bar Ranch demonstrate how the integration of conservation and sustainable agricultural best management practices can improve ranching economics, water quality, and wildlife habitat while meeting TMDL and other public policy objectives.

Curley, E. [1], R. Meyerhoff[2], T. Moore[3], M. Murphy[4], and K. Sierra[1]. [1]Pima County Wastewater Management Department, 201 N. Stone, 8th Floor, Tucson, AZ 85701-1207, [2]CDM, Inc., 4201 N. 24th St., Ste. 205, Phoenix, AZ, 85016, [3]Risk Sciences, 1417 Plymouth Dr., Brentwood, TN 37027, and [4]URS Corporation, 7720 North 16th St, Ste 100, Phoenix, AZ 85020. ***Some innovative concepts for resolving water quality/quantity conflicts over arid riparian habitat***

Water quality regulations and the myriad of programs developed to implement these regulations since 1972 have achieved considerable success in addressing the most important and most apparent water quality management issues. However, as we move into the second generation of implementation of environmental programs, there are many remaining water quality issues that can be solved only by finding innovative solutions. Increasingly, water quality and riverine habitat issues have come into conflict because of a number of problems with the way regulations are either written or implemented. How can water quality standards be made more protective of riparian habitat? We present here some results of our investigation of effluent-dependent water in the arid West.

Water quality standards are composed of criteria, based upon toxicology, ecology, and other natural sciences, and designated uses, which reflect social benefits. When the Clean Water Act was written, the full diversity of aquatic habitat was clearly acknowledged but not codified and the uses of water for habitat were expected by Congress to be developed and expanded over the years by the individual states. At present, however, the number of riverine-habitat-specific designated uses does not reflect the full complexity of riparian habitat.

In this paper, we discuss the various effluent-dependent riparian environments of the arid West and compare them to the designated uses and water resource conflicts of their watersheds. These conflicts are both economic and regulatory, as human water users compete with wildlife and local, state, and federal agencies struggle to innovate compromise. We suggest that many of the tools needed to implement innovation are already available.

Glennon, R., James E. Rogers College of Law, University of Arizona, 1201 E. Speedway, Tucson AZ 85721-0176. ***Water follies: Groundwater pumping and the fate of America's fresh waters.***

The impact of groundwater pumping on the environment is an enormous problem known only to a few scientists, lawyers, water managers, and those misfortunate to have suffered the consequences. It is not simply an arid lands problem. We in Arizona would be surprised to learn that a river in Massachusetts has gone dry due to groundwater pumping. I will discuss my forthcoming book which puts the problem in a national context.

Holway, J. Arizona Department of Water Resources, 500 N 3rd St, Phoenix AZ 85004. ***Arizona Department of Water Resources programs and perspectives***.

The Arizona Department of Water Resources was established by the 1980 Groundwater Management Act. The majority of the agency's efforts focus on groundwater management within five Active Management Areas (Phoenix, Pinal, Prescott, Santa Cruz and Tucson). Agency programs with a focus on surface water or riparian areas include: surface water rights administration, issuance of instream flow permits, water protection fund grants, and rural watershed studies. The agency also provides technical support to the adjudications court on surface water rights.

In this presentation I will provide a very brief overview of the Active Management Area programs, particularly those related to assured water supply requirements for new subdivisions and permitting of wells. I will describe efforts to develop coordinated surface water and groundwater management approaches for the Santa Cruz AMA. I will also provide updates on the status of the Governor's Water Management Commission recommendations, which included riparian protection provisions, and updates on administrative and legal proceedings concerning the relationship between surface water and groundwater management.

Lite, S.[1], and J. Stromberg[2]. [1]Department of Geography, Arizona State University, PO Box 870104, Tempe AZ 85287-0104 and [2]Department of Plant Biology, Arizona State University, PO Box 871601, Tempe AZ 85287-1601. ***Hydrologic thresholds for maintaining cottonwood-willow stands along the San Pedro River, Arizona.***

Groundwater and surface flow declines are threatening the integrity of riparian ecosystems throughout the southwestern United States. Due in large part to these and other hydrologic alterations, pioneer tree communities have shifted from native Fremont cottonwood-Goodding willow (*Populus fremontii-Salix gooddingii*) forests to woodlands of the exotic tree/shrub saltcedar (*Tamarix ramosissima*). Saltcedar woodlands often have different ecological functions and sometimes offer lower quality wildlife habitat than cottonwood-willow forests. While previous work has focused on the physiological responses of these species to decreases in water availability, little attention has been given to shifts in community and population structure in response to decreases in surface flow frequency and groundwater levels. This study identified hydrologic thresholds above which cottonwood-willow communities maintain dominance over saltcedar stands along the San Pedro River in Arizona. Major changes in species composition occur at groundwater depths below approximately 3.6 meters and as surface flow frequency declines below approximately 70%. Fremont cottonwood and Goodding willow maintain dominance at sites with flow frequencies and groundwater depths above these levels. Since saltcedar is a shrub species with higher stem densities than Fremont cottonwood and Goodding willow, these shifts in species composition correspond to changes in community structure. Total stem density increased as flow frequency decreased and densities were highest at sites where flow frequency was less than 50%. The number of cottonwood and willow size classes increased at the wetter sites, indicating higher age class diversity in these areas. These variations in community structure can have implications for the functioning of the ecosystem. For example, fewer age classes may provide lower habitat diversity, and increased stem densities may trap more sediment and cause changes in channel and flood plain morphology.

Makings, E. Department of Plant Biology, Arizona State University, PO Box 871601, Tempe AZ 85287-1601. ***Flora of the upper San Pedro River***. **(POSTER)**

Biological inventories advance our understanding of our natural resources. Floristic studies that document species present in a particular region can be critical in management/restoration decisions, as well as provide a basis for scientific research in numerous fields. A flora of the upper San Pedro River in southeast Arizona was undertaken in February 2001 and will continue through 2003. Cottonwood-willow riparian corridors, sacaton grasslands, mesquite bosques, cienegas, and Chihuahuan Desert communities contribute to the remarkable character and diversity of this study site. The free-flowing San Pedro River is an important reference area for degraded riparian ecosystems throughout the Southwest. The San Pedro River has been identified as critical habitat for many species of plants and animals and was designated a National Conservation Area in 1988. The goal of this study is to provide information on the occurrence and status of the vascular plants of this area as groundwater pumping is a dynamic threatening to alter the present community structure. Over 465 taxa in 82 families have been identified and hundreds more expected. Two new records for the state have been collected: *Mancoa pubens* (Brassicaceae), and *Tagetes minuta* (Asteraceae). A digital database is being compiled with information on each plant's phenology, abundance, life span, native/exotic status, wetland occurrence, and patch type.

Martin, R., and G. Loomis, Tonto National Forest, 23 24 E McDowell Rd, Phoenix AZ 85006.
Keeping the streams flowing development and implementation of the Tonto National Forest ground water policy.

Increased population growth and development in and around the Tonto National Forest near Phoenix, Arizona, is resulting in increased demand for water supplies. Because most surface water sources are already fully appropriated the search for development of new water supplies has centered on development of ground water resources. Some of the focus has been on developing groundwater sources beneath the Tonto National Forest. Demand for development of groundwater sources on the Forest has come from a new copper mine proposed in the Globe-Miami Mineral District, for highway construction and widening, and from communities and subdivisions on private lands within the Forest. Through a series of aquifer tests that the Forest required before it would permit groundwater development on National Forest System (NFS) lands the Forest detected adverse impacts to surface water dependent resources. As a result of these adverse impacts the Forest recognized the need to develop a groundwater policy that would protect water dependent resources from groundwater development. The policy that was subsequently developed identifies the objective of protecting water dependent resources and describes the steps that proposed groundwater developments must follow before development of groundwater will be permitted (if it is permitted) on the Forest.

The talk will describe a series of case studies that revealed the need for a consistent Forest-wide groundwater policy on the forest and the elements of the policy that the Forest has successfully implemented over the past year. The talk will illustrated the interdependence between ground and surface water, the dramatic impacts that groundwater withdrawals can have on surface waters, and how implementation of the policy provides us with an additional tool to protect streams, springs and riparian areas on the Forest.

Mason, D. Arizona Department of Water Resources, Hydrology Division, 500 N Third St, Phoenix AZ 85004. ***Using numerical groundwater flow models as water resources planning tools.***

Numerical groundwater flow models can be valuable tools for water resource planners in guiding long-term water resources management. With sufficient data and an accurate calibration, groundwater flow models can simulate the complexities in regional groundwater flow systems and their responses to applied stresses. To help develop and test long-term water management plans, the Arizona Department of Water Resources has developed groundwater flow models for the Active Management Areas (AMAs) within the State of Arizona. The goals of the AMAs are to eliminate the sever historical water level declines observed in most AMA's and to provide a system of water rights for allocating the limited groundwater resources to effectively meet future water needs. Water resource planners have used the AMA groundwater flow models to determine current regional aquifer conditions and to test the potential long-term affects of groundwater management decisions on regional aquifer systems. Predictive model simulations, which simulate future aquifer responses to a given set of water use demands, have allowed Department planners to project future impacts on water resources and make recommendations to water resource decision-makes regarding water management plans.

Two case studies are the Salt River Valley Model and the Prescott AMA model. The Salt River Valley (SRV) model was used to simulate the regional aquifer response to a most likely set of water use projections developed with the cooperation of Phoenix area water providers. As a result of the predictive model scenario a number of Phoenix-area water providers instituted plans to increase their use of renewable surface water supplies and improve the infrastructure needed for deliver of renewable surface water supplies. The Prescott AMA model was used as a basis for the Department's declaration that the AMA was no longer at Safe-Yield. Water budgets and water level data developed for the Prescott AMA regional groundwater flow model indicated that annual groundwater withdrawals were consistently exceeding recharge to the AMA's regional aquifer system. As a result of these findings, the Director of the Department issued a decision in January of 1999 the Prescott AMA was no longer at Safe-Yield.

Mondry, Z. J. USFS Coconino National Forest, 2323 E. Greenlaw Lane, Flagstaff AZ 86004.
Minor inundation of streamside vegetation by temporarily restored base flow in Upper Fossil Creek, AZ. **(POSTER)**

In the next few years, the Coconino and Tonto National Forests anticipate restoration of approximately 40 cubic feet per second (hereafter cfs) of base flow to Fossil Creek after decommissioning of flow-diversion infrastructure operated by the Arizona Public Service Company (hereafter APS) since the early 1900's. In planning for restored flows, the Forest Service is assessing the existing condition of riparian soils and vegetation along Fossil Creek. However, increased water surface height (or width) after restored flows and possible effects on streamside vegetation and turbidity are still uncertain.

On March 13, 2002, Jack Norman (Hydrologist, Coconino National Forest) and I visited Fossil Creek in the vicinity of Irving power plant. Two days earlier, APS had returned all flow to Fossil Creek from the dam near Fossil Springs downstream about 4 miles to Irving power plant in order to repair the diversion flume. During regular diversion, base flow in this reach is about 2 cfs. We measured 39.7 cfs of restored flow at the bottom of this reach. Considering this a rare opportunity, we performed reconnaissance surveys along Fossil Creek from Irving power plant upstream about 1 mile to document channel conditions and inundation of streamside vegetation during this temporary restoration of base flow.

Few trees were inundated adjacent to low-gradient pools and runs. Here, mature Arizona alders (*Alnus oblongifolia*) and Fremont cottonwoods (*Populus fremontii*) grew on or beyond relatively high stream banks made of fine sediment. More trees were inundated along steeper, boulder-cobble riffles. Inundated trees were mostly young willows (*Salix* sp.) rooting directly within the active channel. Turbidity was not apparent at any of the sites we surveyed.

Given existing channel morphology, we may anticipate some early mortality of streamside vegetation (mostly young) due to inundation by restored base flow. However, stream bed aggradation by the deposition of travertine could result in the inundation of larger floodplain areas over time. Nonetheless, restored base flow will likely preserve and even enhance riparian areas along Fossil Creek in the future due to overall increased water availability and soil moisture. Although this reconnaissance was limited to one day along a short reach, these observations could be useful to ongoing planning efforts for restoring base flow to Fossil Creek.

Munderloh, J. Yavapai County Water Advisory Committee, 1015 Fair Street, #317, Prescott AZ 86305. ***Issues surrounding exportation of groundwater from the Big Chino subbasin to the Prescott AMA.***

Concern about sustainable water supplies is common to much of rural Arizona. In the past decade Yavapai County has been placed among the fastest growing counties in the Nation. The communities within the County are challenged with meeting needs of yet more growth while still retaining the rural atmosphere and natural features that attract people to the area. One of Yavapai County's natural attributes is the perennial Verde River. Since most of the County's population is based within or immediately adjacent to the Verde River watershed, maintaining the health of the river has become a regional priority.

The Verde River begins its perennial reach about a ½ mile below Sullivan Lake in the Big Chino subbasin as a sluggish stream of less than 1 cfs (cubic feet/second). Between miles 2 and 3, however, the stream flow rapidly increases to 15 or 20 cfs. These unnamed springs provide the main source of water for the first 30 miles of river.

Although the source of groundwater that supplies the "Verde River" springs is a part of the local controversy, most agree that at least some of the spring water comes from the Big Chino subbasin. The Big Chino subbasin represents a significant groundwater bank for Yavapai County. The communities in the Prescott AMA look to this groundwater bank as a way to meet future demand. The City of Prescott currently holds legislative rights to export up to 14,000 acre-feet per year from the Big Chino, and other municipalities can export groundwater from retired agricultural lands. However, many downstream communities and environmental interests are concerned about the effect that pumping groundwater will have on the "Verde River" springs. At stake on Prescott's side of the issue is the need for additional sources of water and a state mandate that the Prescott AMA reach safe yield by year 2025 - a goal that cannot be met without outside sources of water. On the other side of the issue is the environmental concern over a unique watercourse that is also habitat for threatened and endangered species. The downstream water right holders (including federal reserved right holders) are also keenly concerned that pumping groundwater will negatively impact their water rights.

The downstream interests believe that some further scientific investigation should be conducted to determine the pumping impacts before groundwater withdrawals begin. The incorporated communities in Yavapai County have combined their resources in partnership with the County, Arizona Department of Water Resource, and the U.S. Geological Survey to study this interaction and examine the groundwater hydrology throughout the system. Although Prescott is a participant in the regional water resource studies, that community feels that they should exercise their legislative right to import water from the Big Chino while they can. By doing so, they can demonstrate impacts to the Verde River springs by direct measurement and mitigate impacts if they occur.

Nelson, K. Tonto National Forest, 2324 E McDowell, Phoenix AZ 85006. ***DO IT WITH VOLUNTEERS! Tonto National Forest riparian photo point program.*** **(POSTER)**

When the Tonto National Forest began to emphasize improved riparian area management, it became apparent that better resource information was needed. In 1990 the Forest began establishing permanent photopoints in key riparian areas to document baseline conditions and monitor change over time. Photos demonstrate change in riparian vegetation and stream channel condition.

While the benefits of photopoints was apparent, the Tonto did not have the funding or personnel to keep up with the repeat photography. Mothers for Clean Water (MFCW), a nonprofit organization, volunteered to help. A partnership was established between the Tonto and MFCW providing an opportunity for the Riparian Photo Point Program to grow. Currently 60 volunteers are sent out annually to replicate the photos at over 600 permanent photopoints on almost every allotment and every major riparian area.

Photopoints are used to highlight and prioritize the need for change in riparian area management. As riparian pastures and exclosures are constructed, and grazing strategies rethought, photopoints are used to monitor the recovery of riparian areas. They help managers differentiate between the effects of natural disturbances, such as flooding, and management activities. Photopoints from reference areas are used to help define the potential of altered sites. The photopoint database is used extensively in training sessions, lectures and slide presentations.

The Tonto National Forest fully recognizes how critically important our riparian areas are to people for water, wildlife habitat, and recreation; yet, the Forest simply could not conduct intensive and comprehensive Forest-wide monitoring without the help of MFCW. The Forest's photopoint data base is widely recognized for its quality among agencies, organizations and individuals. It is an acknowledged model of a Forest-wide monitoring strategy and is widely used for project planning and management.

Nelson, K.[1], and Z. Mondry[2]. [1]USFS Tonto National Forest, 2324 E. McDowell Road, Phoenix, AZ 85006, and [2]USFS Coconino National Forest, 2323 E. Greenlaw Lane, Flagstaff, AZ 86004.
Instream-flow water rights for National Forests in Arizona. **(POSTER)**

Protecting flows in streams and rivers on Arizona National Forests has become increasingly important as area populations and their demands on scarce water resources continue to grow. A key mechanism to help protect these flows is an instream-flow water right. An instream-flow water right is a legal entitlement to surface water within a specific stream reach for the beneficial uses of fish, wildlife, and/or recreation. At the national level, the Forest Service has been frustrated in attempts to obtain such rights using the Federal Reservation Doctrine. However, the Forest Service has cooperated with the Arizona Department of Water Resources to obtain instream-flow water rights under State law.

The Tonto and Coconino National Forests submitted their first applications for instream-flow water rights in 1985. Since then, certificates of water right have been acquired for the Lower Verde River (shared with three National Forests, it is the single largest instream-flow water right in Arizona), and for Pinto Creek, Arnett Creek, Cave Creek, Sycamore Creek, and Seven Springs Wash on the Tonto National Forest. Additionally, the Tonto National Forest has active applications for water rights on eight other streams. The Coconino National Forest had not pursued certification of water rights applied for in 1985. Recently, the Southwest Regional Office of the Forest Service granted funding for an accelerated program of work for water rights in Arizona. As part of this program, the Coconino National Forest is now actively pursuing certified water rights for eight perennial streams with applications dating to 1985. In addition, the Apache-Sitgreaves and Prescott National Forests have begun the instream-flow water rights process on five and four perennial streams, respectively.

Acquiring instream-flow water rights is an effective way to preserve surface water for fish and wildlife habitats, and recreation. Successes like the Lower Verde River water right have already proven their value for maintaining flows when conflicts arise. With continued efforts, instream-flow water rights will help sustain riparian areas on National Forests across Arizona for future generations.

Serrano, L. (Contact Clare Peirce). Wickenburg High School, 1090 Vulture Mine Rd, Wickenburg AZ 85390. ***Wickenburg High School constructed wetland outdoor classroom.***

A brief overview of what the students at Wickenburg High School have done with their outdoor classroom site. The site is held in a Conservation Easement with the Arizona Game and Fish Department, as well as being a constructed wetland. The wetland is where all of the school's wastewater is treated. The water is then pumped into a dripline for various native plant species.

Steed, J.[1], and L. DeWald[2]. [1]USDA Forest Service, Rocky Mountain Research Station, 2500 S. Pine Knoll Drive, Flagstaff, AZ 86001, and [2]School of Forestry, Northern Arizona University, Box 15018, Flagstaff, AZ. ***Revegetation guidelines for sedges (*****Carex*** ***spp.) in southwestern riparian meadows.***

Riparian meadows are important features in montane regions of the Southwest, providing valuable ecological and economic benefits including habitat for terrestrial and aquatic wildlife, flood attenuation, water storage and purification, forage production, and recreation opportunities. Sedges (*Carex* spp.) are an important component of these ecosystems, and often dominate their flora. However, many Southwestern meadows have undergone channel incision causing lowering of the water table that favors mesic, often exotic, plant species over sedges and other native hydric species. To enhance revegetation efforts in degraded meadows, we have developed revegetation guidelines for sedges based on knowledge gained from recent field and greenhouse revegetation studies. This presentation seeks to make restoration facilitators aware of some factors that should be considered when planning and conducting revegetation projects in riparian meadows. These include site preparation considerations, matching appropriate species to environmental conditions and restoration goals, selection of an appropriate revegetation approach, selection and acquisition of transplant materials or seeds, selection of the best season for revegetation, and additional considerations during and after revegetation. A greater understanding of sedge ecology and phenology will also improve revegetation success. Therefore, background information on common Southwestern sedges including their growth and phenological characteristics, and environmental tolerances and preferences will also be given. Other keys to successful revegetation efforts include properly employing physical restoration activities (e.g. bank shaping, alterations to meadow hydrology) to create desirable conditions for transplant establishment or seed germination, controlling impacts from elk and livestock during restoration, and understanding that transplants are less tolerant of stressful conditions, such as waterlogged or dry soils, than established plants.

Valencia, R. College of Ecosystem Science and Management, Northern Arizona University, Flagstaff AZ 86001. ***Governor's Water Management Commission: Perspectives on riparian protection.***

In May 2000, Governor Jane Dee Hull convened a Water Management Commission to evaluate the goals outlined in the 1980 Groundwater Act, to study ways to reduce the use of mined groundwater, to increase the use of renewable water supplies, to determine how best to ensure reliable and sustainable supplies in the future, and to determine if changes were needed to statutes, rules or policies to improve water management in Arizona. Commission members represented agricultural interests, municipalities, developers, local governments, state government, state legislators, mining interests and other members of the regulated community. Although the original Executive Order 2000-7 specified that environmental interests were to be represented on the commission, it became readily apparent that the environmental community was not represented in the original selection of commissioners. To rectify that oversight, four additional commissioners were appointed in August 2000. One of those seats was offered to the Arizona Riparian Council. The ARC Board asked Ruth Valencia to represent the organization on this Commission.

The Commission focused solely on issues within the five Groundwater Active Management Areas (AMAs). From the outset, this limited the influence this commission would have over some of the most important streams, rivers and riparian areas in the state. However, decisions regarding water usage within Arizona's large metropolitan areas have indirect effects on many of these rivers and streams.

This talk will explore four of the commission's recommendations, or lack of recommendations, that directly or indirectly affect protection of riparian and aquatic ecosystems, including restrictions on groundwater pumping adjacent to specific stream reaches within AMAs, conservation programs/issues, statewide water planning, reinstatement of funding to the Arizona Water Protection Fund and financial support for infrastructure.

Werner, W. E., Arizona Game and Fish Department, 2221 W Greenway Rd, Phoenix AZ 85023. ***Restoration of natural processes to benefit riparian habitat on the Bill Williams River, Arizona***.

Beginning in 1990 an interagency effort, lead by Arizona Game and Fish Department, was begun to address competing water management concerns for management of Alamo Lake and the Bill Williams River downstream. During the process optimal and acceptable prescriptions for operation of Alamo Dam were developed for a number of interest areas, including riparian habitat. These recommendations and others were screened through dam operation constraints. Alternatives were then developed which included common factors. Riparian habitat stream flow requirement factors included seasonal base flows for downstream riparian habitat needs, including releases needed to overcome effect of Planet Ranch pumping, and releases to mimic natural flood flow events in pattern if not in magnitude. Other common factors included rate of change of reservoir elevation limitations for lake fishery spawn, rate of change of reservoir releases limited for public safety, reservoir drawdown at 5-year intervals for inspection and maintenance. Performance of alternatives was modeled using the HEC-5 computer model using daily hydrologic data for the period 1928–1993. A consensus recommendation to the Corps of Engineers was developed based on review of alternative performance relative to agency goals. The Corps of Engineers then conducted formal reconnaissance and feasibility studies and an environmental impact statement on alternatives, including the consensus recommendation. Fortuitously, during the process heavy rainfall necessitated large reservoir releases, providing an opportunity to monitor effects of the recommended schedule and initiating adaptive management. Cottonwood and willow trees have flourished in areas where decadent stands had been dying out.

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