TWENTY-SECOND MEETING OF THE ARIZONA RIPARIAN COUNCIL

HASSAYAMPA INN
PRESCOTT, ARIZONA
APRIL 11-12, 2008

THE VERDE RIVER: ARE GROWTH AND CONSERVATION MUTUALLY EXCLUSIVE?

PROGRAM AND ABSTRACTS
2008

Twenty-Second Annual Meeting
Arizona Riparian Council

The Verde River:
Are Growth and Conservation Mutually Exclusive?

Hassayampa Inn
122 E. Gurley Street
Prescott, Arizona 86301
April 11-12, 2008

Friday, April 11th: Plenary Session

7:30 - 8:15 ***Registration***

8:15 - 8:30 ***Welcome*** – Tom Hildebrandt, Arizona Riparian Council President

8:30 - 8:50 ***Introduction to the Landscape and Issues*** – John Rasmussen, Yavapai County Water Advisory Committee

8:50 - 9:30 ***The Hydrology and Recent Science of the Verde Headwaters and the Middle Verde*** – Abe Springer, Professor, Department of Geology, Northern Arizona University

9:30 - 10:00 ***The Biological and Resource Values of the Verde River System*** – Joanne Oellers, Center for Biological Diversity and Brenda Smith, U.S. Fish and Wildlife Service

10:00 - 10:20 ***Break and Poster Viewing***

10:20 - 10:50 ***Salt River Project Water Management Issues on the Verde*** – Greg Kornrumph, Principal Analyst, Water Rights and Contracts, Salt River Project

10:50 - 11:30 ***Perspectives from Verde River Area Communities*** – Diane Joens, Mayor of Cottonwood and John Munderloh, Water Resources Manager, Prescott Valley

11:30 - 11:50 ***Summary, Synthesis, and Visioning*** – John Rasmussen and Abe Springer

11:50 - 12:30 ***Panel Discussion and Audience Q&A***

12:30 - 1:45 ***Lunch***

1:45 - 2:00 ***Business Meeting and Introduction to Technical Session***

2:00 - 2:15 ***Intensive Methodology Used to Inventory, Monitor and Protect Riparian Habitats*** - Garry Rogers, Agua Fria Open Space Alliance, Inc.

2:15 - 2:30 ***Verde River Ecosystem Values (Phase 1)*** – Patty West, William Auberle, Nick Sheets and Dean Howard Smith, College of Engineering and Natural Sciences and W. A. Franke College of Business, Northern Arizona University

2:30 - 2:45 ***Conserve to Enhance: Voluntary Municipal Water Conservation to Support Environmental Enhancement*** - Joanna Bate, Sharon B. Megdal, and Andrew Schwarz, Water Resources Research Center, University of Arizona

2:45 - 3:00 ***Groundwater Sources, Flow Paths, and Residence Times in the Middle Verde River Watershed*** - Caitlan Zlatos, James F. Hogan, Kyle W. Blasch, Donald J. Bills, and Thomas Meixner, Department of Hydrology and Water Resources, University of Arizona and U.S. Geological Survey, Tucson and Flagstaff

3:00 - 3:30 ***Break and Poster Viewing***

3:30 - 3:45 ***Managing Water Supplies and Conservation of Fish and Wildlife in the Salt and Verde Rivers, Arizona*** - Charles Paradzick, Salt River Project

3:45 - 4:00 ***Ecological Implications of Verde River Flows*** - Jeanmarie Haney and Dale Turner, The Nature Conservancy

4:00 - 4:15 ***Hydrologic and Climatic Adaptations: Searching for a Correlation Between Ecological Similarity, Gene Flow, and Phenologic Variation*** - Alicyn Gitlin and Thomas G. Whitham, Northern Arizona University

4:15 - 4:30 ***The Arizona Rivers Project: Student-based River Restoration and Research*** - Martha P.L. Whitaker, John Madden and Jim Washburne, Arizona Rivers and SAHRA, University of Arizona

4:30 - 4:45 ***Direct Seeding for Riparian Revegetation*** - Matthew Grabau, Michael A. Milczarek, Martin Karpiscak, David Quanrud, Daniel Bunting, and Gregg Garnett, GeoSystems Analysis, Inc., University of Arizona, and U.S. Bureau of Reclamation ***CANCELED***

Posters (view during breaks)

Sonoran Desert Ephemeral Drainage Plant Communities of the White Tank Mountains, AZ - Matt *Haberkorn, Phoenix College*

Watershed Visualization in the Verde Basin - John Madden and Jim Washburne, Sustainability of Semi-Arid Hydrology and Riparian Areas, The University of Arizona

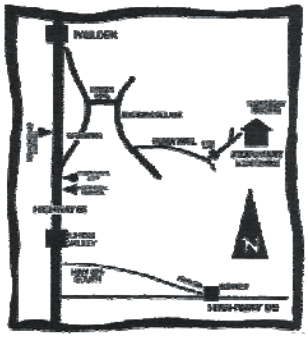
Saturday, April 12, 2008
Verde River and Springs Field Trip

8:30 am Depart from Hotel (carpooling encouraged); see map
9:00 am Convene at Little Thumb Butte Bed and Breakfast

On your way north on Hwy 89 to the Bed and Breakfast take note of the development occurring in the town of Chino Valley and in the Big Chino Valley. If you cross the Verde River at (mostly dry) Sullivan Lake you've missed the turnoff; go back. We will convene in front of the Little Thumb Butte Bed and Breakfast located on a bluff overlooking the Verde River canyon. After a welcome by Ann Harrington (site host) and Jeff Pebworth (Arizona Game and Fish Department) we'll hike a trail leading down to Granite Creek and its mouth at the Verde River. This is the location of Stillman Lake, created by the sediment fan of Granite Creek. From there we can hike 1 mile upstream to see a meadow with impressive petroglyphs on the volcanic rocks. Then we'll hike 2 miles downstream to observe the headwaters springs and the lush riparian habitat it supports. Some wet crossings or mud may be encountered. Bring your binoculars. Return to cars for box lunch and finish around 1:00 pm. Total hiking distance ~3-5 miles.

Google Instructions From Hassayampa Inn

Head east on E Gurley St toward S Marina St – 1.1 mi
Slight left at AZ-89 – 3.6 mi
At the traffic circle, take the 2nd exit and stay on AZ-89 – 17.3 mi
Turn right at N Old Hwy 89 – 1.6 mi
Continue straight to stay on N Old Hwy 89 – 259 ft
Turn right at E Rimrock Rd – 0.4 mi
Turn right at N Hackamore Ln – 1.6 mi
N Hackamore Ln turns left and becomes N Mandan Ln
Little Thumb Butte, 1252 Morgan Ranch Rd, Paulden, AZ 86334



Biographies of Invited Speakers

Diane Joens, Mayor of Cottonwood

Diane Joens is Cottonwood's Mayor. She was raised in Sierra Vista, AZ. Diane attends Yavapai College and plans to seek a degree from Arizona State University in interdisciplinary studies. She is a graduate of Project CENTRL, a two-year state-wide leadership program supported through the University of Arizona and the Center for Rural Leadership. Diane was editor and publisher of a community project, the *Verde River Almanac*. She is cochair of the Yavapai County Water Advisory Committee, a member of the Verde River Basin Partnership, and cofounder of the Stewards of Public Lands. She is a proponent of trails and bicycle pathways. The Verde River is one of Diane's primary interests. She involves community to create a healthy watershed and desires to maintain a prosperous, sustainable economy and a high quality of life in Cottonwood and the upper Verde Valley. The Verde River is a significant water supply and recreation corridor. Beyond its physical importance, the future condition of the Verde River will eventually represent how successful Arizona is in finding accommodation for all the roles that rivers play.

Greg Kornrumph, Principal Analyst, Water Rights and Contracts for Salt River Project

Greg Kornrumph has worked in the water rights/management profession for over 20 years (17 at Salt River Project [SRP], 5 at Arizona Department of Water Resources). He holds a B.A. in Geology/Environmental Sciences from Whitman College, Walla Walla, Washington. In addition to his water rights responsibilities, he is SRP's liaison to communities and interest groups on the Salt and Verde watersheds, develop water supply plans for SRP power plants and negotiate water exchange agreements. Greg is an Arizona native, spending much of his childhood hiking, fishing and exploring the Salt and Verde Rivers. He is married and has two teenage children.

John Munderloh, Water Resources Manager, Town of Prescott Valley

John Munderloh is the Water Resources Manager for the Town of Prescott Valley where he works to secure long-term water resources for the community and the region. John has spent 20 years working on water-related issues for several stakeholders including state and local governments, mining, municipal, and irrigation interests, and power utilities throughout Arizona and other western states. In these various capacities, John has participated in numerous water rights analyses for court proceedings, designed irrigation, conveyance, storage, pumping, recharge and recovery facilities, and developed hydrologic analyses and water portfolios. As a Yavapai County native, John first became aware of the importance of water on the ranches and farms where he grew up. He has a B.S. in Agricultural Engineering from the University of Arizona and currently enjoys the challenges of developing a secure water supply for rural Arizona, while maintaining its unique natural resources.

Joanne Oellers, Center for Biological Diversity Verde Campaign Coordinator

Joanne Oellers, Center for Biological Diversity Verde Campaign Coordinator since 2006, earned her B.S. in biology from Northern Arizona University, and recently completed a Masters thesis on population dynamics of deer mice, voles, and Sin Nombre Virus at Grand Canyon. For the last 16 years she has taught classroom and field biology at Yavapai College, Prescott College, and Embry Riddle Aeronautical University, and has lead Elderhostel groups throughout the Southwest. She enjoys sharing her passion for biology in the community and in the field and takes great satisfaction advocating protection of the Verde River ecosystem and other natural areas. She believes the welfare of human beings is deeply linked to nature and that we each have an important role in helping protect species and their habitat.

Jeff Pebworth, Regional Wildlife Program Manager, Arizona Game and Fish Department

Jeff is the Regional Wildlife Program Manager for the Arizona Game and Fish Department's Kingman Regional Office. Jeff oversees the management of Department properties within the Region including the Upper Verde River Wildlife Area which is part of the destination area for the field trip. Jeff has extensive experience with the history of the purchase of this wildlife area, as well as its biological resource values.

John Rasmussen, Coordinator, Yavapai County Water Advisory Committee

John Rasmussen is the Coordinator of the Yavapai County Water Advisory Committee (WAC) whose members represent all of the governmental jurisdictions in Yavapai County and the Arizona Department of Water Resources. Prior to joining the Water Advisory Committee in October of 2005, he worked as the hydrologist for the Klamath Basin Reclamation Project in southern Oregon and northern California. Amongst the similarities and differences, the need for consensus building and a data-informed bridge between science and policy is apparent in both regions. John has a M.S. in geophysics from the University of Oregon and a B.A. in geology from Whitman College. He is a registered geologist and has worked as a consultant in the environmental, hydrologic, geophysical and geotechnical fields. John is committed to helping the Water Advisory Committee maintain their tradition of management-relevant scientific discovery and objective analysis of factual information. He realizes that water is a keystone issue of our time and is privileged by the opportunity to communicate and collaborate with so many dedicated people.

Brenda Smith, Assistant Field Supervisor, U.S. Fish and Wildlife Service, Ecological Services Field Office, Flagstaff

Brenda Smith is the Assistant Field Supervisor for Ecological Services at the U.S. Fish and Wildlife Service's Flagstaff office. She previously worked with the Bureau of Land Management at the Kingman office. Currently she is involved with coordinating efforts for long-term planning on the Verde River.

Abe Springer, Professor of Geology, Department of Geology, Northern Arizona University

Abe Springer is a Professor of Geology in the Department of Geology at Northern Arizona University (NAU) and he is the NAU Water Coordinator for the Arizona Water Institute. In Fall of 2007, he was the Fulbright Visiting Chair of Water and Environment at the University of Lethbridge, Alberta, Canada, studying the ecohydrology of springs of western Canada. He received his B.A. in Geology from the College of Wooster and his M.S. and Ph.D. in hydrogeology from The Ohio State University. Since arriving at NAU in 1994, he has become an avid trail runner and model railroader. Among the courses he has taught at NAU are hydrogeology, geology of Arizona, environmental geology, applied geology, groundwater modeling, contaminant transport modeling, and many others. Dr. Springer and his students study local and regional groundwater flow systems and human impacts on them, apply principles of sustainability to aquifer management through models, quantify the hydrological function of groundwater dominated ecosystems, the role of land-use change and disturbance on groundwater flow systems, and restoration of riparian ecosystems. Most of these studies are interdisciplinary and consist of a mix of field and lab work, and basic and applied research. He has collaborated with ecologists, botanists, plant physiologists, foresters, land managers, engineers, and many different sub-disciplines within the earth sciences. Funding for these studies has come from many different local, state, and federal agencies and entities and from private sources. Dr. Springer and his students have studied over 600 springs the past 10 years in the southwestern U.S and beyond. With colleagues, he has developed a new, comprehensive spring classification system which is featured in the upcoming book *Aridland Springs in North America: Ecology and Conservation.*

ABSTRACTS

Abstracts are listed alphabetically by first author.

Bate, J., S. B. Megdal, and A. Schwarz. Water Resources Research Center, University of Arizona, 350 N. Campbell Ave, Tucson, AZ 85719. ***Conserve to Enhance: Voluntary Municipal Water Conservation to Support Environmental Enhancement***.

Amidst growing demands for water in almost all water use sectors, innovative strategies are needed to meet riparian water needs. This project focuses on voluntary municipal water conservation as a source of water for riparian areas. Existing water conservation programs may not effectively target water uses that are motivated by environmental concerns. In a report from the first phase of this project dated July 2006, the authors recognized the ongoing need for supplemental inputs of water in riparian restoration projects, which are increasingly common. Also, public concern surrounding the need to protect natural water flows is growing. In recent papers, the authors proposed a mechanism by which voluntary municipal water conservation could provide funds to cover the cost of acquiring and delivering water to environmental enlacement projects. These studies explore some of the basic elements as well as challenges involved in implementing this concept. Under the *Conserve to Enhance* program, participants that reduce water use can pay for water they did not use, creating a fund to purchase water for environmental purposes. We also propose a simpler program as an alternative. Discussions with regional water experts brought forth issues related to measuring conservation, cooperation with water utility partners, competition for scare resources, and management and allocation of funds generated by the program. If successful, the mechanism could also support environmental water needs throogh purchase of easements along waterways to retire groundwater pumping or purchase of water rights for instream flow purposes. The current phase of the project seeks to pilot the *Conserve to Enhance* mechanisms, by expanding outreach within local and regional stakeholders to discover the possible partnerships, and identifying opportunities for and obstacles to implementing the program.

Gitlin, A., and T. G. Whitham. Department of Biological Sciences, Northern Arizona University, PO Box 5640, Flagstaff, AZ 86011-5460. ***Hydrologic and Climatic Adaptations: Searching for a Correlation Between Ecological Similarity, Gene Flow, and Phenologic Variation***.

Riparian restoration often involves transplanting plant propagules, and in Arizona, cottonwood and willow species (*Populus* spp. and *Salix* spp.) are some of the most commonly transplanted species due to their fast growth in disturbed environments. However, there is very little understanding of how to choose locally adapted plant stock with an adequate level of genetic diversity for the transplant site. For example, it is important to correlate plant phenology with local conditions so that plants aren't killed by frosts that occur after leaf-out, and so that seed release is coincident with the proper hydrological conditions for germination; simultaneously, increasing the level of genetic diversity improves population resilience of the dominant plant while increasing associated community biodiversity. Though it is known that the genetics of these dominant plants drive many above- and below-ground ecosystem processes, and influence the arthropod, bird, and fungal communities that will colonize a site, there are large gaps in our knowledge about the genetic structure of natural populations at the watershed scale. Without this understanding, we are limited in our ability to mimic natural populations. New research aims to map some of the influences that drive local adaptation in riparian trees, and to learn how this geographic variation correlates with gene flow within and across watersheds. The Verde River watershed, which has a high level of hydrologic, topographic, and climatic variation, will act as a model system for the primary phase of this project.

Grabau, M. R.[1], M. A. Milczarek[1], M. Karpiscak[2], D. Quanrud[2], D. Bunting[2], and G. Garnett[3]. [1]GeoSystems Analysis, Inc., 2015 N Forbes, Suite 105, Tucson, AZ 85745; [2]Office of Arid Lands Studies, The University of Arizona, 1955 E Sixth St, Tucson, AZ 85719; and [3]US Department of the Interior, Bureau of Reclamation, Lower Colorado Region, PO Box 61470 Boulder City, NV 89006.

Direct Seeding for Riparian Revegetation. **CANCELED**

Current methods of cottonwood and willow revegetation rely on vegetative propagation. If direct seeding of riparian species can be achieved, restoration costs could be dramatically reduced while increasing genetic diversity, and establishing higher-density native vegetation. Revegetation from seed has been observed in natural and managed riparian ecosystems where moist, bare soil was available during seed dispersal. However, large-scale restoration with native cottonwood and willow seed has yet to be practiced due primarily to perceived limits of seed viability. A study is being conducted for the Bureau of Reclamation to assess the feasibility of direct seeding at revegetation sites on the lower Colorado River. The feasibility study consists of a phased, 3-year, germination, greenhouse, and field study program. Germination and greenhouse study results indicate that: 1) viability of cottonwood and willow seed can be extended to at least 23 months using simple preservation methods; 2) removing seed hairs greatly increases germination rates for broadcast seeding, and 3) seeding allows dense cottonwood and willow establishment and survival. Soil conditions (i.e., bulk density, texture and fertility) and seeding rates were shown to significantly affect plant establishment, growth, and resultant species diversity. Current field studies are focused on determining optimum seeding and irrigation methods. Although Fremont cottonwood establishment was favorable during 2007 field studies, results indicate the need for intensive weed management in retired agricultural fields. The goals of 2008 field studies are to improve establishment rates of Goodding's willow, and monitor long-term vegetation dynamics in existing field plots.

Haberkorn, M. Biology Department, Phoenix College, 1202 W. Thomas Rd, Phoenix, AZ 85013.

Sonoran Desert Ephemeral Drainage Plant Communities of the White Tank Mountains, AZ.

Ephemeral drainages within the southwestern United States have received considerable research attention within the past century. Hundreds of articles and books have been published describing and debating the hydrology, geomorphology, and incision of these common drainages. Qualitative descriptions of drainage plant communities have been made numerous times. However, a literature search for quantitative studies on drainage plant communities yielded fewer than five publications. Of these publications, none give a comprehensive explanation of drainage plant communities and the environmental constraints determining these communities. This lack of ephemeral drainage vegetation research is alarming considering the importance of vegetation to hydrology/ geomorphology, the rapid development of the United States Southwest, and the shear abundance of these "xeric riparian" drainages. Conservation paradigms for protection of valuable groundwater and perennial waterways should include ephemeral drainages. Unfortunately, it appears that far too often issues surrounding ephemeral drainage plant communities have been overlooked. For this particular study, the abundance of ephemeral drainage research within the earth sciences provided a solid foundation on which to build an understanding of drainage plant communities.

Within this ongoing study, a small Sonoran Desert ephemeral drainage watershed in piedmont flanking the White Tank Mountains (west of Phoenix, AZ) was utilized to identify plant communities quantitatively. Geomorphology, channel morphology, and hydrology were also observed in order to describe vegetation distribution. Three primary plant communities were found through cluster analysis, (1) upland *Parkinsonia microphylla*, *Ambrosia deltoidea*, and *Encelia farinosa* community, (2) basin *Acacia greggii*, *Ambrosia deltoidea*, *Larrea tridentata*, and *Lycium* sp. community, and (3) terminal fan *Prosopis velutina* and *Parkinsonia florida* community. Plant species composition of each community was determined to be controlled by distinct geomorphic histories. These histories involve channel incision history and geomorphic surface age, both of which were found to play particularly important roles in determining channel morphology and hydrology. Geomorphic surface age and the associated channel incision history and hydrology were determined to be the strongest determinants of plant community composition within the watershed examined. It is hoped that conclusions from this continuing research can aid in future conservation planning.

Madden, J., and J. Washburne. Sustainability of Semi-Arid Hydrology and Riparian Areas, The University of Arizona, PO Box 210158, Tucson, AZ 85721-0158. ***Watershed Visualization in the Verde Basin***.

Come fly with us through the Verde River watershed of Arizona! Under an NSF Geosciences Education Program grant, Sustainability of Semi-Arid Hydrology and Riparian Areas (SAHRA) is developing an educational DVD about watershed basics in the Southwest. A 3-D flythrough of the Verde watershed, located north of Phoenix AZ, is the first module for a series of visualizations that will improve the hydrologic literacy of students in grade 8-14 classrooms. The goal of this tool is to educate students and others about basic hydrologic processes and important watershed concepts. The narrated visualizations will foster an understanding of what watersheds are and how they work that goes beyond what can be conveyed using static maps and graphs. Other modules in the series include: "What is a Watershed?," which focuses on how watersheds are defined and relate to other boundaries; "Watercycles and Watersheds," which focuses on the Southwestern water cycle and seasonal changes in its precipitation pattern; "Infiltration and Recharge," which makes visible otherwise unseen processes occurring beneath the surface; and "Watersheds and Landcovers," which explores how land use and landcover change affects watershed runoff. Training based on these DVD-based visualizations will be offered to teachers and students in conjunction with another innovative outreach program SAHRA offers, which allows teachers to check out classroom kits of materials to facilitate hands-on water education. The 3-D visualizations will be incorporated into other SAHRA workshops as well as an undergraduate-level course. A web-based component of the program well be publicly accessible via SAHRA's website.

Paradzick, C. Salt River Project, PAB 352, PO Box 52025, Phoenix, AZ 85072-2025. ***Managing Water Supplies and Conservation of Fish and Wildlife in the Salt and Verde Rivers, Arizona.***

The Salt River Project (SRP) manages seven reservoirs in central Arizona to meet the water supply needs of the metropolitan Phoenix area. Water supply management goals seek to maximize certainty in both hydrologic objectives and regulatory compliance. We accomplish these goals through three main program areas: Water Management, Community Programs, and Environmental Compliance. This presentation will focus on the challenges SRP faces in addressing the interface between water supply management and wildlife and fisheries conservation needs, and it will discuss the approaches and programs we implement to meet regulatory requirements. As an example, SRP and the City of Phoenix have developed a Habitat Conservation Plan on the Verde River to mitigate the effects of dam and reservoir operations on federally listed birds and fishes. The Plan also provides significant benefit to unlisted native aquatic species by addressing threats and instituting conservation measures, which may reduce the need to list and protect these species under the Endangered Species Act in the future.

Rogers, G. Agua Fria Open Space Alliance, Inc., PO Box 711, Dewey, AZ 86327. ***Intensive Methodology Used to Inventory, Monitor and Protect Riparian Habitats***.

Techniques for identifying and mapping existing vegetation that were developed by European scientists during the past century have been accepted world-wide as the standard system for vegetation inventory. The system is formally recognized and supported by agencies of the US government. Intensive, on-the-ground, applications of the standard follows the basic synecological procedure for identifying vegetation entities (entitation), fitting the entities to the classification system, and producing maps. For synecologists the opportunity to identify a new vegetation entity for addition to the national classification is the most exciting aspect of the work, comparable in many ways to identifying a new plant or animal species. Desert riparian habitats may contain such previously unrecorded entities.

Techniques for monitoring landscape change are numerous. Detailed vegetation maps, quantitative characterizations of vegetation and environment, and even charts of individual plant locations are all used to monitor change. One technique that is especially well-suited for use with on-the ground vegetation inventories is repeat photography. Ground-level photographs taken from documented positions can be used to illustrate entity boundaries and profiles, and can be repeated at any desired time interval to efficiently identify important changes.

Protecting riparian habitats requires control of land use. The inventory and monitoring methods described above are important but useless without proper land-use management. The rarity and high value of riparian habitats justifies land purchase, and when this is not possible, intensive efforts must be made to negotiate an appropriate conservation easement. Throughout the United States options exist for agreements with land owners that are compatible with zoning ordinances and economic potential. This is especially true of riparian habitats that are susceptible to flooding and cannot be directly developed.

Application: During August 2008, the Agua Fria Open Space Alliance is launching a pilot project utilizing the above techniques. The project includes a one-week lab and field training session beginning on August 4, followed by two weeks of field work. Volunteers are invited to contact AFOSA for details.

West, P.[1], W. Auberle[1,2], N. Sheets[3], and D. H. Smith [3,4]. [1]The Ecological Monitoring and Assessment Program, Northern Arizona University, PO Box 5845, Flagstaff, AZ 86011-5845; [2]Civil and Environmental Engineering, Northern Arizona University, PO Box 15600, Flagstaff, AZ 86011-5600; [3]Sustainable Energy Solutions, College of Engineering and Natural Sciences, Northern Arizona University, PO Box 15066, Flagstaff, AZ 86011-5006; and [4]W. A. Franke College of Business, Northern Arizona University, PO Box 15066, Flagstaff, AZ 86011-5066. ***Verde River Ecosystem Values (Phase 1)***.

Ecological Monitoring and Assessment (EMA) Program & Foundation's current Verde Initiatives include complementary but distinct projects referred to as Verde River Ecosystems Values (Phase 1), and Verde River Science Outreach and Education (Phase 2). The following summary is of Phase 1. Verde Ecosystems Values (Phase 1) will focus on the identification of ecosystem values provided by the Verde River. Ecosystem values can be simply understood to be the goods and services derived from, "the conditions and processes through which natural ecosystems, and the species that make them up, sustain and fulfill human life" (Daily 1997). The goal of Phase 1 is to provide the stakeholders (including tribes, municipalities, and resource managers) of the Verde Valley with an evaluation of the ecosystem values, or goods and services; they receive from the Verde River. EMA is in Step 1 of this process which is to interview community leaders to develop a list of those values. The list will be used by an economic expert to develop the procedure and methods in Step 2 which involves determining more specific weighted equivalents or scaling of each of the values.

Whitaker, M. P. L.[1], J. Madden[2], and J. Washburne[2]. [1]Arizona Rivers Project, The University of Arizona, Department of Hydrology & Water Resources, PO Box 210011, JW Harshbarger Building, #11, Tucson, AZ 85721-0011; and [2]Sustainability of Semi-Arid Hydrology and Riparian Areas, The University of Arizona, PO Box 210158, Tucson, AZ 85721-0158. ***The Arizona Rivers Project: Student-based River Restoration and Research***.

The Arizona Rivers Project (AZ Rivers: www.azrivers.org) is an endeavor funded by Science Foundation Arizona to facilitate collaborations between students/teachers and scientists/watershed managers to promote long-term research and monitoring of riparian environments in Arizona. Although primarily focused on enhancing the riparian research skills of students, AZ Rivers wants to work closely with existing watershed groups to support local outreach, share successful public engagement and monitoring strategies, and promote the collection and exchange of volunteer-collected riparian data. Additionally, we hope to facilitate collaborations and mentoring between Arizona Riparian Council (ARC) members and their local schools. In particular, AZ Rivers is seeking mentors and leads to potential applicants for its first summer Riparian Research Experience (RRE), June 15 – July 2. This program will allow ten high school students to learn about and visit four of Arizona's river ecosystems, one of which is the Verde River. The goal of the RRE is to train the high school students in a variety of field research skills, expose them to several different riparian habitats across the state, and prepare them and their mentors to develop a student-based individual or class research project in the forthcoming school year. In addition to the RRE, AZ Rivers is planning two summer workshops for teachers and scientists/watershed experts who are interested in helping students and teachers engage in riparian research, monitoring or related school-based projects. The first workshop is scheduled for May 12-14 at Phoenix College; the other will be held at Mingus Springs Camp July 17-20, 2008. At the workshops and RRE, participants will learn several environmental protocols that include: water quality; macroinvertebrate analyses; bird and plant census; and invasive species identification and eradication. One hallmark of our workshops is a significant presence by local water experts and we hope to attract ARC representatives at each of our workshops this summer.

Zlatos, C. M.[1], J. F. Hogan[1], K. W. Blasch[2], D. J. Bills[3], and T. Meixner[1]. [1]Department of Hydrology and Water Resources, University of Arizona, Tucson, AZ 85721; [2]U.S. Geological Survey, Tucson, AZ; and [3]U.S. Geological Survey, Flagstaff AZ. ***Groundwater Sources, Flow Paths, and Residence Times in the Middle Verde River Watershed***

In the hydrogeologically complex Middle Verde River watershed, we aim to determine the hydrologic connection between aquifers underlying the Colorado Plateau and adjacent aquifers in the Verde River watershed and achieve an improved understanding of water sources and flow paths that contribute to and sustain the Verde River. Two seasonal surface water datasets collected from the Verde River and its tributaries (Oak Creek, Wet Beaver Creek, and West Clear Creek) and a groundwater dataset were analyzed for oxygen and hydrogen stable isotopes and major solute concentrations. Analyses based on solute relationships (i.e., sulfate-chloride and calcium-strontium) show evidence of distinct solute sources for the Verde River and its tributaries, as well as the geochemical distinctions between groundwater from the C, Redwall-Muav, and Verde Formation aquifers. Distinct Verde River trends, including overall increases in solute concentrations along two reaches (kilometers 13 to 32 and 60 to 68, as measured upstream from USGS gauge 09506000), suggest dissolution of evaporite deposits within the Tertiary lakebed-derived Verde Formation. Notably, groundwater from Verde Formation wells in the Cornville/Lower Oak Creek region is geochemically similar to groundwater from the C and Redwall-Muav aquifers, suggesting hydrologic connection between the two aquifers.