Arizona Riparian Council

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CAN OFF-STREAM LIVESTOCK WATERING CONTRIBUTE TO RIPARIAN CONSERVATION?

by Roger Joos, Vice President, Arizona Riparian Council

Properly functioning riparian systems are critically important to biological diversity, especially in the arid West. Degradation of riparian systems has long been attributed to livestock grazing. Livestock negatively affect riparian systems primarily by reducing vegetation. This reduction in vegetation can lead to changes in channel morphology, increased flood frequency, increased turbidity, loss of wildlife habitat and eventual reduction in water flows. Additionally, fecal contamination poses health risks to humans and wildlife. There is an unprecedented need to restore aquatic and riparian systems to preserve the biological diversity of these systems. A critical first step in restoration is to remove or lessen the impact of the agent(s) causing degradation. Because sociopolitical efforts to remove cattle from public lands have been less than successful, new and diverse methods need to be implemented to protect, enhance, and create riparian areas. One tool to help achieve this is the use of off-stream watering systems. Off-stream watering is simply the process of providing a water source for livestock away from streams or dirt stock tanks (hereafter referred to as dirt tanks). These systems range from simple animal operated diaphragm pumps that do not require a power source to more complex pumping systems where a significant lift of the water is required. Here I provide a review of research demonstrating that off-stream watering sources can eliminate or reduce livestock use of riparian systems, increase performance and health in livestock, and finally, an overview of available pumping systems.

Historically, riparian area protection was accomplished simply by fencing off a section of the dirt tank or stream that was to exclude livestock. Recent research has shown that cattle use of riparian areas can be reduced significantly even without fencing. The distance that cattle will travel to water, preference for drinking out of troughs and a preference for cleaner water are the primary factors that can keep cattle out of riparian the zone.

Research by Gillen et al. (1984) and Gerrish et al. (1995) show that cattle prefer to graze within 200 m of water. Does this mean that strategic placement of water sources away from the stream can reduce use of the riparian areas?

Miner et al. (1992) evaluated the effectiveness of an off-stream water source in reducing the amount of time a group of hay fed, but free-ranging cattle spent in or adjacent to a stream during winter months in central Oregon. Even when hay was placed equidistant between the water tank and the stream, use of the stream was reduced by 90%. The strong preference demonstrated in this study was possibly due to warmer water temperature in the trough but was more likely due to ease of access and stability of the substrate around the trough compared to the soft stream banks.

Numerous other studies have shown that cattle do prefer to drink from troughs over streams. Clawson (1993) tested the hypothesis that off-stream water would reduce impacts of grazing cattle in a mountainous riparian zone during the summer months. He concluded that cattle preferred to drink from a water trough 75% of the time. Godwin and Miner (1997) observed a 94% reduction in time that cattle spent in an Oregon creek when an off-stream water tank was available. A study in two cow-calf operations in southwest Virginia by Sheffield et al. (1997) concluded that cattle drank from a trough 92% of the time, compared to the time which they spent drinking from the stream.

Water quality is also a factor in why cattle prefer troughs over streams or dirt tanks. Surber et al. (2003) found that cattle prefer

Cont. pg. 3 . . . . . Watering

Inside This Issue

PRESIDENT'S MESSAGE

Well, we're all running a little late this issue, but that's partly because we've been busy getting lots done! For those of you who might have missed our fall meeting, we had a great time at the Horseshoe Ranch along the Agua Fria River, learning about our Rapid Stream and Riparian Assessment (RSRA) project, about the local river system, and about the birds and other aspects of the wildlife there. About 15 of the attendees signed up to continue to participate in our assessments which will be starting up in earnest this spring. Tim Flood has a short recap of the meeting elsewhere in this issue.

We've also been active recently in the issues associated with last season's great increase in recreational pressure at Fossil Creek. As many of you know, the return of flows to the stream about a year ago have made the area much more attractive to a variety of recreationists. Some of these folks are irresponsible, but just as much of a problem is the Forest Service's failure to plan for this recreational pressure and provide the toilets, trash receptacles, signage and enforcement presence which might facilitate more appropriate behavior. Your Council was one of a coalition of conservation organizations that sent a letter to the two Forests (Coconino and Tonto) asking that they either do a better job of managing recreation, or that they close the area to recreational use until they can. We've also been participating in a stakeholder's group the Forests established and its subcommittees to try to contribute to resolution of these issues.

Our educational and outreach efforts continue as well, with participation at a number of events during the fall, and many more scheduled for the spring. Please join us and help share time at our display booth with our regulars, it's always fun to be at the various fairs and workshops, and our outreach is a positive and rewarding experience. There are several upcoming in February and March.

The Council Board is also busy preparing our spring meeting plans. We're joining with other partners to help draw attention to the issues of the Verde River headwaters and their impacts throughout the length of this special Arizona river. Our meeting is slated to be held at the Hassayampa Inn in Prescott and is scheduled for April 11 and 12, which is immediately prior to a week of awareness sponsored by the Center for Biological Diversity. Our meeting is intended to serve as an introduction to the scientific and community underpinnings of the issues. Please plan to join us.

In an effort to be brief in my last President's message (really, I do make the effort...!) I shortchanged some important folks in crediting our partners for last spring's meeting. I was very remiss in not mentioning the great job and leadership effort contributed by Chris Jones and his associates (George Zaimes and Michael Crimmons) from the University of Arizona's Cooperative Extension Service. It was Chris who originally approached us about teaming up and it was he and the others who spearheaded our effort to build the program and bring in our speakers. Great job guys and (belatedly) thanks a bunch!

Finally, two pleas for your assistance. Our terrific newsletter editor Cindy Zisner is always looking for articles, either lead articles or supporting ones, to feature in the newsletter. Please consider contributing something on an aspect of your work or your experience that might be featured in our newsletter, or help us find that special someone who has an article in them just waiting for a chance to be published.

The second plea is for you (Yes You!) to join us on our board of directors. We've got two openings this year, and we are just waiting for you to step up and say you'd like to join the team. It's a great group and we'd love to have you. Please contact Roger Joos (rejoos@fs.fed.us) who is leading our nominating committee.

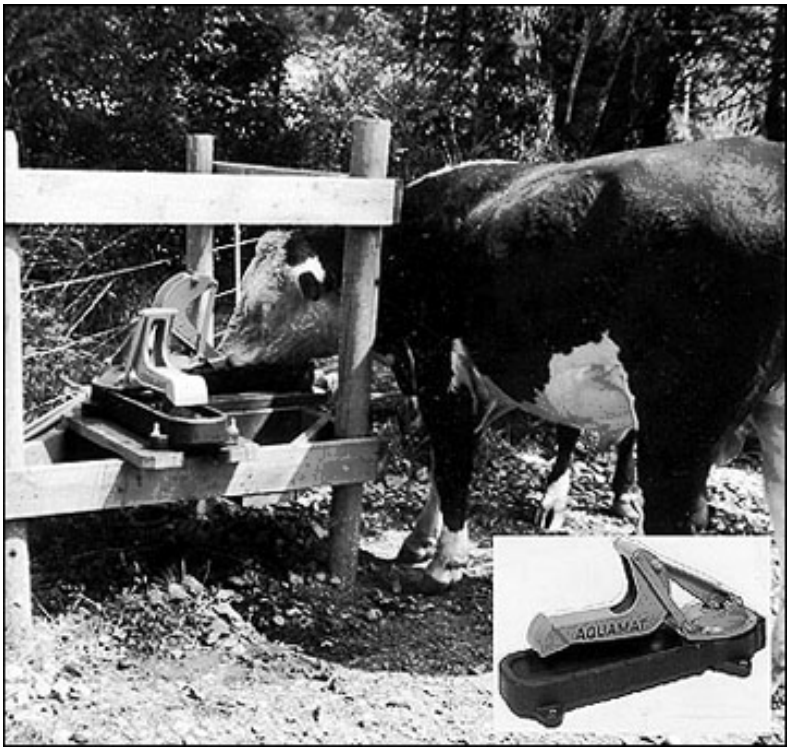
Tom Hildebrandt, President
Arizona Riparian Council

Watering . . . . . Cont. from pg. 1

troughs over muddy banks and turbid water. They designed an experiment to determine if cattle would prefer a trough over an unfenced dirt tank. Cattle at three sites were given the choice of drinking from dirt tanks or troughs placed 50 to 150 ft away from the dirt tanks. Water was supplied to the troughs directly from the dirt tanks via gravity flow or a solar pumping system. Seventy-six percent of the cattle that approached a dirt tank with a trough nearby watered at the trough. Cattle that drink from dirt tanks stir up sediments as they move into the water. The second animal to drink will typically move farther into the tank to get to cleaner water, which exacerbates sediment disturbance and when done regularly maintains poor water quality. Water pumped to the troughs from dirt tanks consequently is cleaner because of the decreased disturbance. Not only do cattle prefer clean water it can actually improve animal health.

Observations by Willms et al. (2002) and Patterson et al. (2003) show that cattle gain significantly more weight when drinking fresh water or dirt tank water pumped to a trough vs. direct dirt tank water. As most ranchers are in business to maximize profits, the installation of trough watering systems on their allotments would be an economically sound investment.

The application of off-stream water to dirt tanks can not only have an economic benefit to the rancher, but a tremendous benefit to wildlife. Dirt tanks are increasingly replacing or augmenting diminishing natural water sources. However, the heavy use of these waters by livestock (and elk) prevents shoreline and emergent aquatic vegetation from becoming established. Trough watering systems at perennial dirt tanks would allow for this vegetation to become established, providing habitat for numerous species of amphibians, native fish, waterfowl and many other species. Although research has shown promising results without fencing, it is still recommended when applying this system at dirt tanks, especially in the southwest. The relatively small amount of fencing typically needed would not be prohibitively expensive and would ensure that livestock are completely excluded.



Using a nose pump. (Photo by R. Joos).

There are numerous types of pumps currently available that can facilitate off-stream watering. Gravity flow systems are extremely reliable, low-cost, and low-maintenance. These systems are applicable on dirt tanks when the trough can be placed below the low-water mark. Nose pumps are an efficient, animal-operated device applicable to streams and dirt tanks. These pumps can lift water 25 ft and for a horizontal distance of 125 ft. Solar pumps are extremely effective in delivering water to heights over 200 ft. Although costly, they are reliable and effective at remote sites and where a significant lift of water is required. Hydraulic ram pumps use the kinetic energy of falling water from a spring or creek to pump water to a higher elevation, without an external power source. The fall of the water source must be at least 2-3 ft and a minimum flow of 1gallon per minute is required. Ram pumps can be inexpensive and long lasting. Another pump that requires no electricity or fuel is the sling/ propeller pump. These pumps can lift water 25-80 ft depending on the design. A minimum of 1 to 2 ft of flowing water is required to power this pump. They are relatively inexpensive and portable.

When building or purchasing a trough it is important that trough design adheres to guidelines that allow ease of use and escape for all wildlife species. Bat Conservation International recently published a guidebook titled *Water for Wildlife: A Handbook for Ranchers and Range Managers*. The Arizona

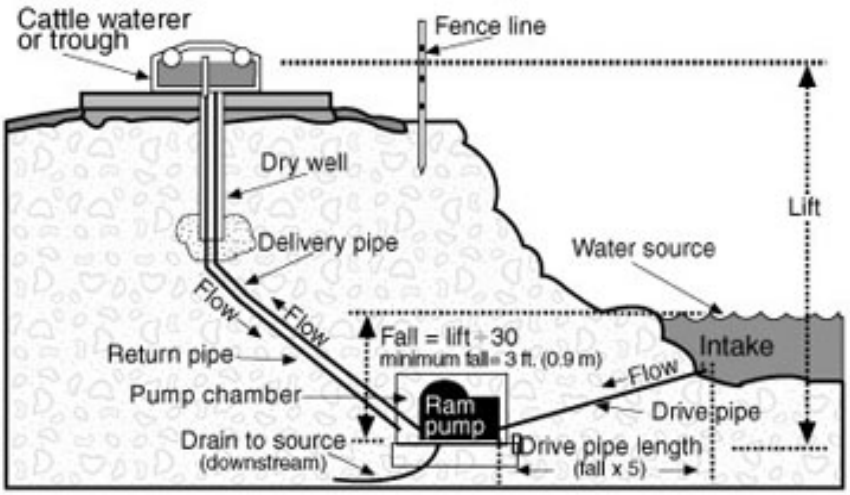


Diagram of a ram pump system.

Game and Fish Department also has a publication titled *Wildlife Water Development Design Standards.*

Development of off-stream watering systems can and should be a part of riparian conservation in the 21st century. It will take creative partnerships and collaboration among agencies, NGO's, private landowners and permittees to make it an integral part of riparian conservation. In the Southwest much of the vegetation available for livestock consumption is located in or adjacent to riparian areas. Research is needed to determine if off-stream watering will be as effective in keeping livestock out of the riparian zone without fencing as it is in the mesic regions where the aforementioned studies were conducted.

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SPECIES PROFILE

PHAINOPEPLA (*PHAINOPEPLA NITENS*)

by Carol Birks, Arizona Department of Water Resources

Riparian areas are the lush green ribbons of vegetation alongside rivers, streams, lakes, springs and wetlands. They are wonderful places to relax and observe nature because the increased amount and variety of vegetation attracts an abundance of wildlife. One distinctive bird found along streams and adjacent areas from central Arizona south to central Mexico is the Phainopepla, *Phainopepla nitens*, our only silky flycatcher.

This easily seen bird is slender, 7 to 8 inches long, with a long notched tail and red eyes. It is easy to recognize because of its crested head and frequently it perches at the top of trees making it easy to spot. The male is glossy black and displays white wing patches when flying while the female is dark grey with less distinctive wing patches.

The black color seems unusual for the desert since black absorbs more heat than a lighter color but the bird's feathers keep excessive heat from reaching vital body parts. During the cooler morning hours when the air is still and the bird has its feathers flat against its body, the heat absorbed by the black feathers quickly warms the bird. During the hotter part of the day, when the wind is blowing, the bird rests with its feathers fluffed to create air spaces between the body and feathers. Then moving air currents can whisk away the trapped heat before it has time to be absorbed by the bird.

Their diet consists of insects and fruits, especially mistletoe berries, and they use several techniques to forage. Primarily the Phainopepla takes its food from the foliage or branches of trees and not from the ground. It will also leave its perch for short flights to capture flying insects and it can remove food from plants while hovering.

Phainopeplas are territorial and will defend mistletoe clumps from other species. Winter territories are held separately by both sexes. When mistletoe berries are clumped, large nesting/feeding territories occur. When berries are scattered, territories may only consist of the nesting tree, breeding is in loose colonies and feeding is social. Additional behaviors are exhibited during the breeding season. The male performs aerial courtship displays and rises up to 300 feet, and circles or zigzags above his territory. Frequently several birds will be performing this behavior simultaneously. Small feeding groups, chases and courtship feeding may also occur. Courtship feeding is an interesting behavior because it is more than a ceremonial or pair bonding event; it provides the female with additional nutrients which increases clutch size.

These birds prefer to nest in deciduous trees and shrubs. It nests early in desert-scrub ecosystems and then moves to moister riparian areas as the temperature climbs; it

*Phainopepla (*Phainopepla nitens*). Photo courtesy of E. Shochat.*

*Mistletoe (*Phoradendron californicum*). Photo by C. Birks.*

may nest again. Nests are found in the crotch of trees or in clumps of mistletoe 4 feet or higher above the ground. They are compact, shallow, cup-shaped and made from twigs, flowers, plant down, or leaves bound with spider silk and lined with hair and down. Both male and female participate in nest-building activities.Eggs are grayish and spotted with violet or black and are incubated by both parents. The eggs hatch in 14 days, and both parents take care of the of the helpless, downless, altricial young. Rarely, the Phainopepla is a cowbird host.

Phainopeplas numbers are declining in Arizona mainly due to loss of habitat. As development occurs native vegetation is replaced with lawns and imported species and the Phainopepla loses its food sources, especially mistletoe berries, and nesting sites. Protecting open space and creating corridors between open areas will help the Phainopepla population because it does not tolerate humans well nor nest in urban areas.

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STUDENT AND VOLUNTEER MONITORING OF ARIZONA RIVERS AND RIPARIAN AREAS

Martha P. L. Whitaker and Jim Washburne - SAHRA, University of Arizona

Two University of Arizona hydrologists along with colleagues at Phoenix College and Northern Arizona University are among the first to receive a three-year grant from Science Foundation Arizona's (SFAz) K-12 Student and Teacher Discovery Program. The project, “Student and Volunteer Monitoring of Arizona Rivers and Riparian Areas” (Arizona Rivers), hopes to re-energize the spirit of scientific discovery in Arizona classrooms by fostering partnerships among students, volunteers, and local water experts to monitor the health of Arizona's rivers and riparian ecosystems. This grant supports SFAz's goal to stimulate experiences in an informal (nonclassroom) environment through hands-on collaborations between students and researchers that encourage design, implementation, and innovative use of science and math.

The mission of Arizona Rivers is to facilitate collaborations between teachers/students and scientists/watershed managers and promote long-term research and monitoring of riparian environments in Arizona. We will involve students of all ages in addressing issues or questions that are developed locally and pertain to Arizona's streams, including water quality, stream restoration, riparian ecology, and habitat preservation. A primary goal is to foster effective partnerships among schools, watershed management groups, state, county, or municipal regulators, and other water professionals. Workshops to be held in Tucson, Phoenix, and Flagstaff are being developed to train teachers, students, water professionals, and other volunteer river monitors about standard protocols for environmental data collection, and to promote new collaborations and data exchange. The first workshop was held 6-8 August 2007 at Phoenix College. Two critical tasks that readers might be able to assist with include becoming classroom/student mentors and identifying high-priority monitoring sites. Teachers and students need help defining testable research questions, understanding the context of local water issues, maintaining monitoring equipment, interpreting data, and sharing their observations with a wider community.

High-priority monitoring sites are those with significant issues related to water quality, channel stability, ecologic function, or potential for change that are both accessible by volunteers and of interest to a wider community, particularly state and county agencies.

An example partnership might be a high school science class working with a well-established watershed monitoring group (WMG). The WMG could mentor the students by providing: background information about a nearby riparian ecosystem; guidance about what type of data collection would be most useful for a specific site; and ideas for student-based research projects using student-collected monitoring data.

Another type of partnership could involve a state, county, or municipal agency working with a WMG. The agency could provide guidance about the location and type of data collection or river restoration activities that would be most useful from their perspective. The WMG, in turn, could recruit and mentor additional volunteers

Cont. Students . . . . . pg 12

FALL CAMPOUT 2007

The 2007 Fall Campout was held on the weekend of October 27-28 at the Horseshoe Ranch near Cordes Lakes. Approximately 30 people from across the state attended this event. At the Saturday afternoon meeting Tom Hildebrandt, President, and Tim Flood, Conservation Committee Co-chair, presented an overview of the Rapid Stream Riparian Assessment (RSRA), a protocol for monitoring the quality of riparian areas. This event brought together three groups – the Arizona Riparian Council, Audubon Arizona, and the Friends of the Agua Fria National Monument – that are initiating a project to assist the Bureau of Land Management in monitoring the quality of the riparian habitat along the Agua Fria River. The Fall Campout also featured Candice Rupprecht from the University of Arizona who presented a brief overview of the Master Watershed Stewardship program established by the University of Arizona's Cooperative Extension Service. This program trains volunteers in a variety of watershed science and monitoring techniques and requires them to do volunteer service in their chosen watershed to be fully qualified. We hope they will volunteer to work with us on RSRA evaluations.

The event was graciously hosted by the Horseshoe Ranch, a private in-holding within the Agua Fria National Monument. The grassy lawn provided a comfortable location for the daytime presentations, the evening barbeque, and tents for the campout. The newly remodeled kitchen and mess hall offered convenience for food preparation.

The methodology of RSRA consists of documenting the status of 25 measurable indicators across 5 functional categories: water quality, hydro-geomorphology, fish and aquatic habitat, riparian vegetation, and terrestrial wildlife habitat. The assessments of the 25 indicators are most efficiently conducted by a team of 3-5 people. The presentations on Saturday covered the rationale for scoring the 25 indicators. See last newsletter's feature article for a more detailed accounting of the RSRA.

On Sunday morning the attendees participated in a field exercise on the nearby Agua Fria River. Subgroups discussed how they would score the indicators contained within one or two of the categories. Most attendees agreed the RSRA provides a valuable way to assess and appreciate the functional status of riparian areas.

The Council Board promotes the use of the RSRA protocol for riparian monitoring and plans additional training in the use of the protocol later this spring. When a sufficient number of Council members become proficient in its use, we intend to expand to other Arizona streams nominated for assessment by Council members. To join the team or for information about the training contact Tim Flood, tjflood@att.net or (602) 265-4325.

QUANTIFYING RIPARIAN EVAPOTRANSPIRATION

By Russell L. Scott, David C. Goodrich, David G. Williams, Travis E. Huxman, and Kevin R. Hultine

Editor's Note: This article is reprinted from Southwest Hydrology *January/February 2008:28-29, 34 with permission from the editor.*

Riparian corridors are hot spots of biological activity and provide valuable habitat, supporting significant biodiversity in semiarid regions such as the southwestern United States. Yet rural and urban developments increasingly are impacting the vitality of riparian areas by changing land use, diverting water, and lowering the water table. The San Pedro River in southwestern Arizona is a good example of such a situation. Population growth and the resulting increase in groundwater pumping in the Upper San Pedro Basin have created concern that the water table may fall below the rooting zone of the riparian vegetation, leading to abrupt changes in many ecosystems.

A multidisciplinary group of government scientists and university has been working to better understand the hydrological functioning of riparian systems in the Southwest, particularly the quantification of riparian evapotranspiration (ET). Groundwater modeling studies have long shown that water use by riparian vegetation is an important component of the basin water balance. Yet because the quantification of ET was based on indirect techniques like streamflow data or by untested empirical approaches, its magnitude was highly uncertain.

REFINING RIPARIAN ET MEASUREMENTS

Our focus over the last 10 years has been on making direct measurements of ET using micrometeorological and plant physiological techniques. Micrometeorological techniques like Bowen ratio or eddy covariance quantify ET over an area of around 0.2 to 0.4 mi^2, so measurements using these methods were made in carefully chose sites with uniform stands of vegetation, like the floodplain grasslands and mesquite shrublands and woodlands along the San Pedro. Shrublands and grasslands along the old alluvial terraces were found to have similar annual ET rates of around 24 to 28 inches per year, while the more mature and dense mesquite woodlands typically have annual rates greater than 28 increase (Scott and others 2006a, Williams and Scott in press). This represents a significant groundwater use: ET *in excess* of precipitation, as annual rainfall totals have ranged from only about 10 to 12 inches. On a leaf-area basis alone, mesquite transpiration is considerably higher than that of grass. This finding has management implications because mesquite are readily expanding into grassland areas, which likely has resulted or will result in increasing groundwater use the whole riparian system (Scott and others 2006b). These investigations also revealed that grasses can only access groundwater at depths of 11 ft or less, but the deeper-rooted trees access groundwater at depths greater than 36 ft.

In riparian plant communities like the long, narrow cottonwood galleries or stands of seepwillow (a dominant understory plant along the river) that were not amenable to micrometerological techniques, sap flow sensors were deployed in our studies to quantify water flow in roots, branches, and stems of the dominant plant types (see top of next page). This technique was used in combination with plant surveys of total sap wood area and canopy cover to determine transportation. Cottonwood and willow forests along a perennial flow reach (depth to groundwater ranging from 3 to 7 ft) had the highest water use with rates exceeding 37 inches for a growing season. Cottonwoods along an intermittent reach of the river where the depth to groundwater ranged from 10 to 13 ft were more water stressed and used only about 20 inches over the same time period (Gazal and others 2006). Transpiration rates for seepwillow were about 31 inches, similar to the cottonwood overstory despite the reduced atmospheric demand of the understory environment (Scott and others 2006a).

SCALING UP FROM SITE TO REACH

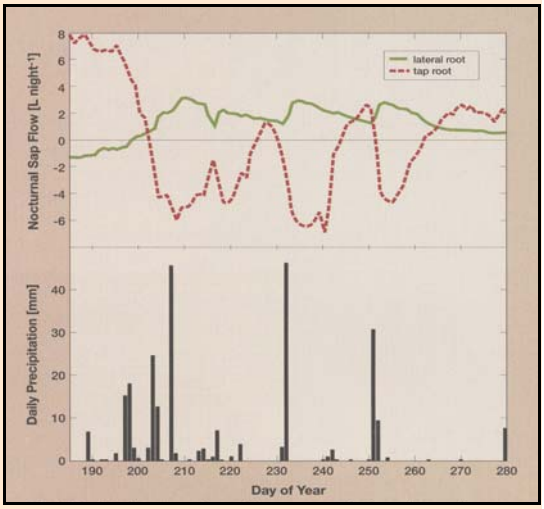
Two approaches were used to scale up the site-based measurements to obtain total riparian vegetation water use along entire reaches of the San Pedro. The first used a detailed vegetation map and the second used vegetation indices and surface temperature from satellites to provide spatially explicit data.

Vegetation Mapping

Detailed vegetation maps were used to quantify the total area of the different riparian vegetation communities and then multiply these areas by their respective estimates of ET obtained from the micrometeorological or sap flow measurements (Goodrich and others 2000, Scott and others 2006a). Riparian groundwater use in 2003 for a 30-mile reach along the San Pedro River from the international boundary to the USGS stream-gauging station near Tombstone was calculated to be about 7,300 to 9,000 acre-ft (around 9 to 11 million m^3) per year. For the entire Sierra Vista subwatershed, estimates were 25 to 57% greater than the amount determined by the Arizona Department of Water Resources based solely on stream gauge information. Mesquite groundwater use was the dominant

THE WATER BANKING MESQUITES

One of the most fascinating results of our research was the discovery of "hydraulic redistribution" by mesquite, or the transfer of soil water via plant roots in response to water potential gradients. Growing evidence suggests this process is prevalent in any ecosystem that contains plants with roots that span moisture potential gradients. Hultine and others (2004) discovered that riparian mesquites have the ability to redistribute near-surface soil moisture to the deeper vadose zone throughout the entire year (see fig). Measured nighttime sap flow in a mesquite taproot was upward before the monsoon onset, but because downward when the surface soil was moist, and sap in lateral roots moved toward the stem. Moisture redistribution followed the moisture potential gradient with upward "lifting" of deep vadose zone Moisture or groundwater during the dry season and downward descent of precipitation during times of abundance surface moisture. I this way, they found that mesquite can "store" rainfall deeper in the vadose zone, away from scavenging understory plant roots and bare soil evaporation processes, and then later use this moisture to support transpiration. We are currently examining the ecohydrological significance of this process in nonriparian mesquites, preliminary results suggest it plays a pivotal role in their successful expansion into grassland ecosystems.

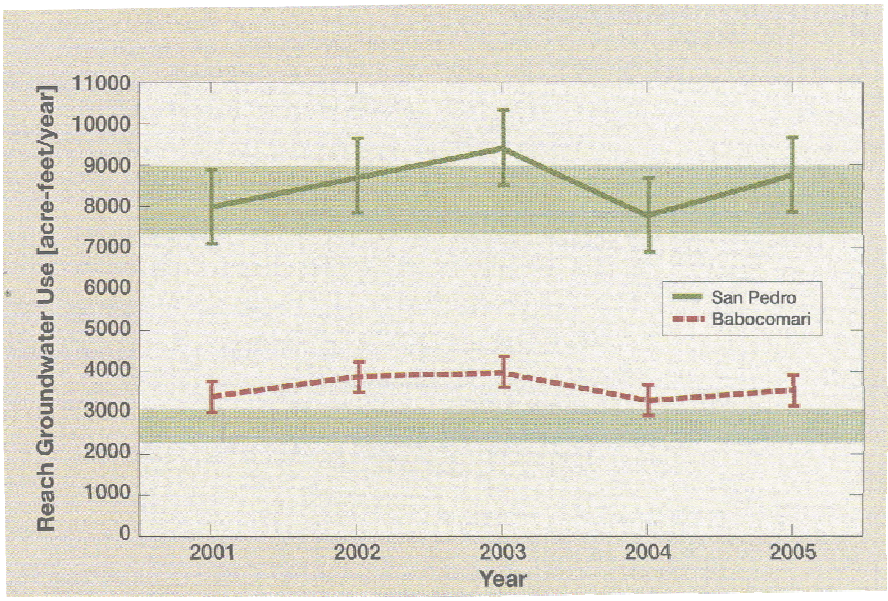


(Top) Total nighttime sap flow of the tap root an da lateral root of a mesquite tree; calculated from half-hourly measurements between 8 PM and 5:30 AM. Negative values represent reverse flow (away from the crown). A significant negative correlation is observed between nocturnal sap flow in the taproot and in the lateral root (R^2=0.85, P<0.0001). (Bottom) Daily precipitation totals at the field site during the study. Adapted from Hultine and others (2004).

component of total riparian water use (58 percent), owing to its high abundance, followed by cottonwood-willow, open water, sacation, and tamarisk.

Satellite Data

More recently, a second approach to scaling up site-based measurements has been to connect satellite measurements of surface temperature and vegetation greenness with multiple years of site-specific ET data in a statistical modeling framework (Scott 2007). Because the satellite data have spatial resolution of about 800 ft and temporal resolution of every 16 days since the year 2000, multiyear ET estimates, which implicitly account for the spatial heterogeneity of the vegetation functioning, were possible over the entire basin. Annual riparian groundwater use from 2001 to 2005 within the subwatershed was nearly constant over the study period despite an ongoing drought, indicating that the vegetation's access to groundwater has so far buffered it against meteorological drought. For the same reach of the San Pedro, the annual amounts determined by this new approach range from 7,800 to 9,400 acre-ft (9.6 million to 11.6 million m^3), within the range of values determined by Scott and others (2006a)



2001-2005 reach-level riparian groundwater use (ET in excess of precipitation) along the san Pedro and Babocomari rivers in the Sierra Vista subwatershed. The ranges of estimates determined by Scott and others (2006) for 2003 are indicated in the shaded regions.

for 2003. However, because of the larger estimates for groundwater use for the main tributary of the San Pedro, the Babocomari, watershed totals were close to or exceeded the upper end of the range of previous estimates.

This work has been supported by the USDA-ARS, SAHRA, and Upper San Pedro Partnership. Our scope has also broadened to involve researchers of the Rio Grande and Colorado River basins so that generalized methods can be developed with broad application.

Contact Russell Scott at russ.scott@ars.usda.gov.

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22ND ANNUAL MEETING, APRIL 11-12, 2008 IN PRESCOTT

This year's meeting, ***The Verde River Ecosystem: Are Growth and Conservation Mutually Exclusive?*** will be held in Prescott at the Hassayampa Inn.

AGENDA

The plenary session will occur Friday morning at 8:15 with

- An Introduction to the Area and Issues
- The Environmental Values and Threats
- Salt River Project and Legal Perspective
- Community Perspectives
- Synthesis and Vision for the Future
- Question and Answer Session

There will be a technical session in the afternoon of submitted abstracts.

Come to Prescott early and join us Thursday evening at an informal social at the Hassayampa Inn. There will be a field trip on Saturday to the headwater springs of the Verde River.

REGISTRATION

You may register online through PayPal with your credit card at <http://azriparian.asu.edu/2008/registration.htm>. Please make sure to fill in the shipping information on the PayPal page.

You may also print off a pdf of the registration form at <http://azriparian.asu.edu/docs/arc/2008/2008Registration.pdf> and mail it in with your check or PO.

FACILITIES

Reservations may be made by at the Hassayampa Inn by calling them at (800) 322-1927 or (928) 778-9434 and mention the Arizona Riparian Council. There is also a map to the Hassayampa Inn on their website <http://www.hassayampainn.com/html/home.html>.

NOTEWORTHY PUBLICATIONS

by Elizabeth Ridgely, One Green World, LLC

Jenkins, M. 2007. The Efficiency Paradox. *High Country News* February 5, 2007.

In 1937 cotton was growing on the U.S. border in Mexicali. Then in 1946 water began rising out of the ground and inundating the fields. By 1952 it was over 3 feet high. The water was leaking out of the All-American Canal, just over the border. The canal carries nearly one-fifth of the water in the Colorado River to farms in California's Imperial Valley. Because it is earthen and was never lined with concrete, it leaks 22 billion gallons of water a year. That water percolates underground and re-emerges in the Mexicali Valley. With the aid of the Mexican government, farmers built their own canal to capture the leakage, which is now funneled to farms in the area. Today there are more than 14,000 farmers in the Mexicali Valley.

San Diego and the Imperial Irrigation District are working to remove the All-American Canal from service and replace it with a new one, excavated next to the existing one and lined with concrete to prevent seepage. The conserved water, that has sustained the farmers in Mexico for more than half a century, will be transferred to San Diego. The biggest costs of the efficiency could ultimately be to the foundering ecosystem of the Colorado River Delta.

In 1983, Robert Stavins, with the Environmental Defense Fund, wrote a proposal called *Trading Conservation Investments for Water*. The idea was to salvage water that had already been diverted into California but then lost to leakage. The Metropolitan Water District (Met) could fund water-efficiency improvements in the Imperial Valley in exchange for the water saved by those improvements. Rather than suggesting a full-blown transfer of farmers' water, the report proposed helping them tighten up their water-supply system and resurrect water that seemingly had vanished.

In 1988, Met agreed to spend more than $200 million lining and automating the Imperial Irrigation District's canal system, freeing up enough water to serve more than 200,000 homes each year. The Imperial Irrigation District will squeeze out 15%of its water for transfer to residents of southern California's cities, without reducing agricultural productivity. Much of that water, including that saved by lining the All-American Canal, will go to the 3 million people supplied by the San Diego County Water Authority.

In its last 100 miles, the Colorado provides water to some half-million acres of farmland, and 3.1 million people. This occurs not only in the Mexicali Valley but also in places like Tijuana, which lies on the coast, just across the border from San Diego, and is the largest city in Baja California. That water is the last of the river's flow: the 9% under a 1944 treaty with the U.S.

Last year, the Mexicali Economic Development Council sued the U.S. in U.S. court, alleging that the federal government failed to adequately consider potential harm to animals on the U.S. endangered species list that depend on leakage-fed wetlands along the border. It also alleged that the canal lining would deprive Mexicali Valley of water that they had come to depend on and acquired rights to, and would set off a wave of migration by displaced farmers. The federal appeals court in San Francisco has temporarily stopped the project.

A new study funded by the North American Development Bank details that almost all the water currently available for farms and cities in the Mexicali Valley is already being used. Farmers are also pumping out almost 25% more groundwater than is recharged each year. Mexicali and Tijuana now use about 12% of the valley's water, but are expected to need twice as much by 2030.

The Mexican government lined the main canals in the valley with concrete, then turned its attention to the secondary canals. Next, they worked on small ditches that deliver water directly to the fields. Finally, it paid for half the cost of laser levelers. Water is more evenly applied to leveled fields so that the amount available for consumption by crops is increased. Leveling reduces the amount lost to percolation and runoff.

Farther down the river is the Colorado River Delta where, before dams, the river created nearly 2 million acres of wetlands as it flowed toward and into the Sea of Cortez. Surrounded by the Sonoran Desert, the Delta was the heart of a complex ecological web that provided crucial habitat for resident populations of wildlife, nourished marine fisheries in the Gulf of California, and formed a critical link in the Pacific Flyway for birds flying north from Central America. For millions of years, the Delta received the entire flow of the river. As the first round of water conservation began playing out in the 1930s and the dams went up on the Colorado River, that water disappeared.

Ed Glenn, a University of Arizona researcher, has extensively studied the Delta. The river ecosystems here, “were shaped by the pulse flood regime that's common on arid-zone rivers, and especially ones driven by El Niño cycles. In really wet years, pulse floods germinate the trees, and then the water retreats and those trees can live on groundwater.” Without the floods that the native cottonwoods need to germinate

and reproduce, they were crowded out by tamarisk. However, in 1983, El Niño storms put so much snow and rain into the Rockies that the U.S. government was forced to open the spill gates on Glen Canyon Dam as torrents of water charged toward the sea. The downriver surge broke Mexican levees and inundated much of the Delta. The Delta showed signs of renewed life.

In 1999, Environmental Defense took up the Colorado River Delta's cause. A reliable source of water for a base flow, backed up with the occasional flood, could probably keep alive the 150,000 acres of wetlands that had come back. Almost as soon as it was proposed, the current drought affected the Colorado River, and the surplus water evaporated.

The Delta cannot be restored unless the seven Colorado River U.S. states that control 91% of the water in the river help. There is a clear ecological link between the U.S. and the Delta. The river in Mexico provides crucial habitat both for birds that are federally protected endangered species in the U.S. and for migratory birds that wing their way up the Pacific Flyway.

The states and the U.S. federal government did not include the Delta in the equation for managing the river. In 2005, California, Nevada, and Arizona signed the Multi-Species Conservation Program for the Lower Colorado River, designed to protect endangered species, while allowing those states to continue taking water out of the river. The Delta is absent from the plan. From synching up the operation of Hoover and Glen Canyon Dams to meet water demands more efficiently, to building a new "Drop 2" reservoir in the Imperial Valley to catch inadvertent overdeliveries and flash floods that otherwise would escape down the river to Mexico, the states are turning their collective weight toward taking out every inefficiency on the river.

Francisco Zamora works for the Sonoran Institute and manages its Delta restoration program. His group is now partway into a pilot restoration project on the river, an effort largely focused on reestablishing cottonwood, willows and mesquite in areas overtaken by tamarisk. The main need now is water. Zamora has sought money from the National Water Commission, to install stream gauges to quantify how much water makes its way through, so scientists at the Autonomous University of Baja California and the University of Arizona can construct a hydrologic model to figure out the intricacies of flow patterns.

Wastewater flows into the Delta are now, at most, 2 m^3/sec – < 0.4 of 1% of the river's long-term annual average flow. Zamora is trying to find another 2 m^3/sec. The city of Mexicali may donate the outflow from a new wastewater treatment plant to the Delta. Zamora has also identified nearly 15,000 acres of farmland in the Mexicali Valley that could be bought or leased to free up more water for the Delta. The money may come through a grant from the U.S. Fish and Wildlife Service to buy water rights from 114 acres of farmland. A new provision in Mexican national water law would be used to dedicate that water for the Delta. However, if 2 m^3/sec is bought, but 2 are lost because of efficiency improvements elsewhere, then nothing will be gained. It will become necessary to use efficiency to fight the environmental impacts of efficiency itself.

The Delta advocates have proposed a further expansion of the trading-conservation-investments-for-water idea, in which water users in the U.S. could fund water-efficiency programs in Mexico, in exchange for the conserved water. That could obviate the need for new projects like the Drop 2 reservoir, which will essentially use up any unintentional excess that heads ends up in the Delta. To pay down the ecological debt run up by every person who depends on water from the Colorado River, untangling the competing demands on the river will be necessary. It is tempting to argue that the development of the Colorado was made feasible in the first place only by writing off the cost of its environmental effects on the Delta. Those costs are a small portion of the total amount of water in the river and the money spent to develop that water. They are so small that including them in the dealmakers' calculations from the very beginning would have never come close to breaking the river-development plans.

Students . . . . . Cont from pg 6

and groups such as K-12 classes, scout troops, or retired citizens.

School collaborations will be encouraged in several ways. Schools in Tucson, Phoenix, and Flagstaff will be able to borrow water-quality monitoring equipment through two collaborating programs. *Water in Arizona - Teacher Resources* kits are available from the SAHRA Center at the University of Arizona (www.sahra.arizona.edu/water/) and include supplies to facilitate classroom-wide participation in water education activities. *Healthy Water-Healthy People* water testing and macro-invertebrate kits are also available for use from *Arizona Project WET* (ag.arizona.edu/azwater/wet/). Arizona Rivers will administer a small grants program (up to $250) for K-16 teachers to facilitate student-based research. This modest funding can be used for basic expenses to help classrooms engage in riparian monitoring, such as helping pay for equipment or field trips.

If you or your organization are interested in volunteering, learning more about this project, or applying to the small grants program, contact Martha Whitaker at mplw@hwr.arizona.edu or visit www.azrivers.org.

LEGAL ISSUES OF CONCERN

*Richard Tiburcio Campbell, U.S. Environmental Protection Agency**

HOMELAND SECURITY AND THE SAN PEDRO RIVER

**Editor's Note: Richard Campbell is an attorney with Region 9 of the U.S. Environmental Protection Agency's Office of Regional Counsel. This paper does not represent the views of the EPA or the United States.*

> *"Id possumus quod de jure possumus"*
> *("We may do only that which by law we are allowed to do.")*

Significant issues of Constitutional law are currently in play along the international boundary line between Arizona and Mexico as it cuts across the San Pedro River.

In *Defenders of Wildlife v. Bureau of Land Management*, D.D.C. 2007 (Docket No. 1:07-cv-01801-ESH), plaintiffs Defenders of Wildlife and the Sierra Club appeared before the United States District Court for the District of Columbia to challenge the Bureau of Land Management's (BLM) and Department of the Interior's (DOI) grant of a right-of-way to the U.S. Army Corps of Engineers (Corps), on behalf of Department of Homeland Security (DHS), to construct a border wall, vehicle barriers and all-weather road on the San Pedro Riparian National Conservation Area (San Pedro NCA), located on the U.S.-Mexico international border in southeast Arizona. Plaintiffs contend that by granting the right-of-way based on an Environmental Assessment that addresses a segment of a much larger border wall project, defendants are violating the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321, et seq., the Arizona-Idaho Conservation Act, 16 U.S.C. § 460xx-1 (The Arizona-Idaho Conservation Act established the San Pedro NCA), and the Administrative Procedure Act (APA), 5 U.S.C. §706.

The San Pedro River is a unique and invaluable environmental resource-a freeflowing river whose perennial flow is now a rare occurrence in the Southwest. In 1988, approximately 40 miles of the upper San Pedro River corridor administered by the BLM was designated by Congress as the nation's first Riparian National Conservation Area, and the river and its larger watershed are widely recognized as one of the most biologically diverse areas in North America. The San Pedro is particularly renowned for its avian diversity; in addition to attracting tens of thousands of birders each year, it was recognized by the National Audubon Society as its first Globally Important Bird Area and designated as a World Heritage Natural Area by the United Nations World Heritage Program. The San Pedro River and its watershed provide habitat for a great diversity of mammals, reptiles, insect, and plant species. A binational resource, the headwaters of the San Pedro begin near the town of Cananea, Sonora, Mexico, and the river flows approximately 25 miles before crossing the U.S.-Mexico border and into the San Pedro NCA.

The events leading up to this lawsuit began August 10, 2007, when the Corps submitted a right-of-way application on behalf of DHS to build "pedestrian fencing" and an all-weather road along the San Pedro NCA's southern boundary. On August 31, 2007, BLM issued a "Final" Border Fence EA, Decision Record, and Finding of No Significant Impact (FONSI). BLM's decision authorizes construction of a 14-17-ft high wall along the entire 2-mile southern boundary of the San Pedro NCA, except for 1,490 ft within the river and its floodplain and a historic corral area, where "temporary vehicle barriers" will be installed, and 275 ft in five dry washes along the NCA boundary, in which permanent vehicle barriers would be installed rather than a wall. Under BLM's decision, the "temporary" vehicle barriers would apparently be removed by crane during periods of seasonal flooding. The proposed border wall and vehicle barriers will cross the San Pedro River and its floodplain, as well as 30 ephemeral drainages to the east of the River, and 36 ephemeral drainages to the west of the River. In their complaint, Plaintiffs alleged that construction of the wall would irreparably harm wildlife because the wall would threaten the biological integrity of the wildlife populations in this region, which relies on genetic interchange.

In early October 2007, the government began construction of the wall. On October 5, 2007, plaintiffs asked the District Court for a temporary restraining order (TRO), arguing that the EA failed to consider the cumulative impacts of the border wall on wildlife and the environment, and was issued without any public involvement, which violated NEPA, the Arizona-Idaho Conservation Act, and the APA.

On October 10, 2007, the District Court, finding a substantial likelihood of success on the merits, and that the equities favored plaintiffs, granted the TRO, ordering that

> "construction of, and the activities related to the

> construction of, all border walls, fences or roads within the San Pedro Riparian National Conservation Area be halted immediately pending further order of the Court."

Among other findings, the Court stated that defendants' "discussion of cumulative impacts ... suffer[s] from both a factual and legal flaw," that Plaintiffs had introduced "sufficient evidence ... to show that [border wall and road construction] could have effects on [wildlife migration]," and that defendants'

> "failure here to not even acknowledge the potential cumulative impacts of anything outside of the San Pedro watershed, including other border fencing areas, renders this EA inadequate under NEPA because the Agency cannot convincingly establish that they have adequately identified relevant areas of environmental concern."

On October 19, 2007, DHS Secretary Chertoff waived 19 environmental laws in connection with border wall construction pursuant to his authority under the federal Real ID Act, which provides that,

> "[n]otwithstanding any other provision of law, the Secretary of Homeland Security shall have the authority to waive all legal requirements such Secretary, in such Secretary's sole discretion, determines necessary to ensure expeditious constructionof border roads and barriers." See 8 U.S.C. § 1103.

The following federal laws were waived:

1. NEPA
2. Endangered Species Act
3. Clean Water Act
4. National Historic Preservation Act
5. Migratory Bird Treaty Act
6. Clean Air Act
7. Archeological Resources Protection Act
8. Safe Drinking Water Act
9. Noise Control Act
10. Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act,
11. Comprehensive Environmental Response, Compensation, and Liability Act (i.e. "Superfund")
12. Federal Land Policy and Management Act
13. Fish and Wildlife Coordination Act
14. Archeological and Historic Preservation Act
15. Antiquities Act
16. Arizona-Idaho Conservation Act of 1988
17. Wild and Scenic Rivers Act
18. Farmland Protection Policy Act
19. Administrative Procedure Act.

See 72 Fed. Reg. 60870 (October 26, 2007) (the waiver was published seven days after issuance)[1]. Secretary Chertoff had already issued a similar waiver on September 22, 2005, when he invoked the REAL ID Act to waive eight laws – including the Coastal Zone Management Act – in relation to a 14-mile San Diego border fence project, and on January 19, 2007, when he invoked the waiver to waive nine laws in relation to the border fence across the Barry M. Goldwater Range in Arizona.

On October 22, the Department of Justice, on behalf of the government defendants, moved the District Court to dissolve the TRO and dismiss plaintiffs' complaint. The government's argument is that Congress in the REAL ID Act gave the DHS Secretary the "plenary"[2] power to waive all legal requirements if the DHS Secretary determines, in the Secretary's "sole discretion," that the waiver is necessary to ensure expeditious construction of barriers and roads.

On November 1, 2007, plaintiffs amended their Complaint so as to allege that DHS Secretary Chertoff's waiver, and the authority to waive all laws provided by the REAL ID Act, violate the U.S. Constitution's principles of Separation of Powers. Specifically, Article I, Section 1 of the US Constitution directs that "[a]ll legislative Powers herein granted shall be vested in a Congress of the United States." Similarly, Article II, Section 1 of the Constitution states that "[t]he executive Power shall be vested in a President of the United States of America." Under these constitutional provisions, Congress may not delegate legislative authority to an executive branch agency. Plaintiffs allege that the REAL ID Act impermissibly delegates legislative powers to DHS Secretary Chertoff, a politically appointed Executive Branch official.

Plaintiffs are also continuing to request that the District Court require the government to perform an Environmental Impact Statement, rather than an EA, to better analyze the impacts of the border wall project, along with related infrastructure such as roads, at numerous locations along the U.S.-Mexico border in the State of Arizona.

At the time of this writing, no schedule for hearing this Constitutional argument had been set.

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[1] Government Printing Office website: <http://a257.g.akamaitech.net/7/257/2422/01jan20071800/edocket.access.gpo.gov/2007/pdf/E7-21125.pdf>

[2] The legal definition of "plenary" is "full, entire, complete, absolute, perfect, unqualified." Black's Law Dictionary (Rev. 4th Ed. 1986)

The Arizona Riparian Council (ARC) was formed in 1986 as a result of the increasing concern over the alarming rate of loss of Arizona's riparian areas. It is estimated that <10% of Arizona's original riparian acreage remains in its natural form. These habitats are considered Arizona's most rare natural communities.

The purpose of the Council is to provide for the exchange of information on the status, protection, and management of riparian systems in Arizona. The term "riparian" is intended to include vegetation, habitats, or ecosystems that are associated with bodies of water (streams or lakes) or are dependent on the existence of perennial or ephemeral surface or subsurface water drainage. Any person or organization interested in the management, protection, or scientific study of riparian systems, or some related phase of riparian conservation is eligible for membership. Annual dues (January-December) are $20. Additional contributions are gratefully accepted.

This newsletter is published three times a year to communicate current events, issues, problems, and progress involving riparian systems, to inform members about Council business, and to provide a forum for you to express your views or news about riparian topics. The next issue will be mailed in May, the deadline for submittal of articles is April 15, 2008. Please call or write with suggestions, publications for review, announcements, articles, and/or illustrations.

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CALENDAR

Arizona Riparian Council Board Meetings. The Board of Directors holds monthly meetings the third Wednesday of each month and all members are encouraged to participate. Please contact Cindy Zisner at (480) 965-2490 or Cindy.Zisner@asu.edu for time and location.

Arizona Riparian Council 22nd Annual Meeting, April 11-12, 2008, Hassayampa Inn, Prescott. This year the meeting will focus on upper Verde River issues.

2008 National River Rally, May 2-5, 2008, Sawmill Creek Resort, Huron, Ohio. For more information go to http://www.rivernetwork.org/rally.

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