



Arizona Riparian Council

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NATIONAL FORESTS IN ARIZONA AND RIPARIAN AREAS

Janet Johnson Grove, Tonto National Forest, Phoenix Office

There are six National Forests in Arizona: the Apache-Sitgreaves (Supervisor's Office in Springerville), Coconino (Flagstaff), Coronado (Tucson), Kaibab (Williams), Prescott (Prescott) and Tonto (Phoenix).

APACHE-SITGREAVES

This 2,003,525-acre forest is located in central and eastern Arizona, and elevations range from 3,500-11,500 feet. It includes a vast ponderosa pine (*Pinus ponderosa*) forest above the Mogollon Rim, mountain meadows of the White Mountains and the Blue Range and Blue River along the New Mexico State line. Portions of Chevelon Creek, the Black River and the San Francisco River lie within the Apache-Sitgreaves National Forest.

COCONINO

The Coconino is an 1,821,495-acre forest on a pine-covered plateau cut by deep canyons and bordered on the south by the Mogollon Rim, a 1,000-foot cliff running for miles across central Arizona. Elevations extend from 2,600-12,633 feet. The Coconino includes the San Francisco Peaks, Oak Creek Canyon, and the Red Rocks country around Sedona. Important streams include the Verde River, Sycamore Canyon, Wet Beaver Creek, and West Clear Creek.

KAIBAB

The Kaibab borders Grand Canyon National Park to the north and south. A third block of the National Forest lies west of Flagstaff centered on I-40. Its 1,557,274 acres occupy an elevation range from 3,000-10,418 feet. Vegetation types include pine (*Pinus* spp.), spruce (*Picea* spp.), and aspen (*Populus tremuloides*) forests and mountain meadows. Kanab Creek is the most prominent stream. The limestone formations underlying most of the Kaibab National Forest are very porous, so that surface water and riparian areas are uncommon.

PRESCOTT

The 1,237,061 acres of the Prescott National Forest follow two parallel mountainous areas lying on either side of the Chino Valley. Elevations extend from 3,000-8,000 feet in the Sierra Prieta, the Bradshaw Mountains and Black Hills. Vegetation types include ponderosa pine, pinyon-juniper (*Pinus* spp.-*Juniperus* spp.) woodlands and grasslands. The Verde River is the most prominent riparian resource of the Prescott National Forest.

TONTO

Lying below the Mogollon Rim, the Tonto National Forest is a

2,873,300-acre contiguous block of land that extends from 1,300 feet in the Sonoran Desert to 7,900 feet. It is centered between the forested Colorado Plateau above the Mogollon Rim and the Basin and Range geology of western and southern Arizona. In addition to the Salt and Verde Rivers, there are a number of perennial and intermittent streams that cut through this transition zone: New River, Cave Creek, East Verde, Fossil Creek, Pinto Creek, Sycamore Creeks, Haigler Creek, Canyon Creek, Tonto Creek, and Cherry Creek.

CORONADO

The Coronado National Forest includes Arizona's southeastern mountain ranges. Elevations from 3,000-10,720 feet span the distance from Sonoran and Chihuahuan Deserts to spruce-fir (*Picea* spp.-*Abies* spp.) forests. Broad basins separate these
Cont. on pg. 3.....National Forests

Inside This Issue

President's Message	2
Everyone and Everything	7
Spring Meeting	8
Species Profile	9
Legal Issues	11
Noteworthy Publications	13
Committee Reports	14
Calendar	16

PRESIDENT'S MESSAGE

It's hard to believe that we just completed our 16th Annual Spring Meeting. I would like to thank all of the speakers and presenters for their contributions to this year's meeting. I was especially pleased to hear about the Wickenburg High School Constructed Wetland project and to see that there will be a next generation of scientists conducting riparian research.

A special thank you goes to Cindy Zisner who has been organizing spring meetings since day one. It goes without saying that without Cindy's help spring meetings would not be possible. Theresa Pinto also deserves a big thank you for handling the arrangements with Rancho de los Caballeros.

This year's meeting marked the end of Kris Randall's three-year tenure as President. Kris has provided great leadership over the years and we are very fortunate that she will remain an active participant in the Council. Janet Johnson also stepped down as Vice President this year. She to has contributed so much and her efforts will be missed. Please take the opportunity to say thank you to both of them when you can.

Tom Hildebrandt and I are excited about leading the Council and building upon the efforts of Kris and Janet. Our first priority will be to develop a clear direction for the Council. Our bylaws state the purpose of the Council is to "...provide for the exchange of information..." as it relates to riparian systems in Arizona. Our exchange of information generally

consists of two meetings (spring and fall) and the distribution of a newsletter three times per year. I am confident that the Council will always provide forums for the exchange of information, i.e., the meetings and newsletter. However, is there more that the organization can and should do, and how can we get more members actively involved in the Council? Or should the Council simply continue to provide for the exchange of information?

At the spring meeting, Kris Randall conducted a brief but productive "brainstorming session" to gather input from the participants as to what should be the focus of the Council and its Board. The brainstorming session produced several good ideas and comments on a variety of topics. Here is a summary of those comments and ideas.

- Provide more technical support for riparian area science.
- Become a riparian issues advocacy group and comment on riparian issues.
- Create a higher public profile for the Council and its efforts.
- Increase the number of members who are actively involved in the Council.
- Cooperate with other environmental organizations that have overlap with riparian issues/topics or science.
- Find new ways to communicate riparian system information.
- Define riparian area standards.

In addition, the question was asked: What riparian issues should the Council focus on? The issues that were brought up include:

- Governor's Water Management Commission
- Issue of subflow
- Forest restoration
- Fossil Creek restoration
- Water conservation education
- Use of effluent
- Drought impacts on riparian issues

It was suggested during the session that additional meetings be held in a few locations throughout the state (Tucson, Flagstaff, and Phoenix) to continue the process of determining where we are going as an organization. The Board has since met and discussed how to continue the evolution process. It was decided to use the Riparian Listserve and ask the membership to submit comments and ideas. Because the Listserve reaches most of the Council membership, more people should be reached than by conducting a meeting. I believe this process will improve the organization as a whole and provide the stimulus to get additional members actively involved in Council activities. I welcome your suggestions or ideas regarding the direction of the Council or possible meeting locations. Please email them to me at jinwood03@aol.com or call me at (480) 694-4116.

Jeff Inwood, President 

National Forests..Cont. from pg. 1

mountain ranges, or sky islands, from each other. Collectively, there are 11 blocks of federal land that comprise 1,717,857 acres. The headwaters of the rivers of southeastern Arizona originate in these isolated mountain ranges.

MANAGEMENT OF RIPARIAN AREAS

Management of riparian areas varies with each National Forest, depending on issues, staffing, and riparian area resources. Almost all activities managed by National Forests affect streams and riparian areas: recreation, road construction, wildlife, fisheries and especially threatened and endangered species, timber harvest, livestock grazing, urban development, and fire management. Many individuals at both the District Ranger and Forest Supervisor levels share coordination of riparian area management. Two of the six National Forests in Arizona have full-time riparian area program managers. Three of the forests have hydrologists and three have watershed staff trained in other disciplines. The following summaries were written by a collective of individuals who are involved in the management of riparian areas on their National Forests. Workloads precluded some National Forests from contributing to this article. Contributors to this article include Rory Steinke, Dick Fleishman, Jeff Hink, and Janie Agyagos, Coconino National Forest; Dave Brewer, Kaibab National Forest; Michelle Girard, Prescott National Forest; and Janet Johnson Grove, Kathy Nelson, Mike Ross, Grant Loomis, Lynn Mason, and Rich Martin, Tonto National Forest.

Coconino National Forest

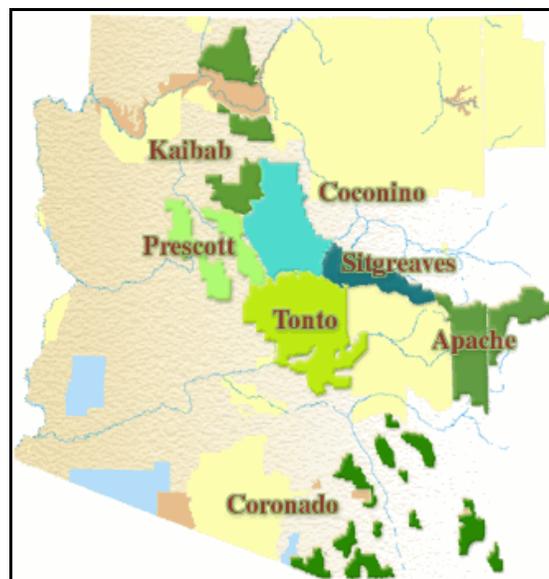
The following are some of the riparian improvement projects and activities currently underway on the Coconino National Forest.

The Coconino National Forest has planned and implemented riparian restoration projects in various locations in the Lake Mary watershed, and Clover Springs in the West Clear Creek watershed.

The Coconino National Forest has identified numerous high-elevation riparian areas that have been degraded by a variety of manipulations over most of the last century.

Typical stream conditions can be described as highly eroded, with active down cutting, head cutting, and substantial lateral erosion. In many cases, floodplains have been abandoned with a subsequent loss of the riparian vegetation that helps to maintain stream channel stability. Given enough time in the absence of additional disturbances, these degraded channels would likely restabilize on their own, although substantial soil erosion would continue to occur. In reality, disturbances from ungulate grazing have and continue to hamper vegetative recovery necessary for significant stabilization to occur.

Recognizing a need for a more aggressive approach, the Forest has formed a strong collaborative relationship with Northern Arizona University to investigate and implement channel modifications based on natural channel properties identified in relatively undisturbed portions of similar stream types. Current channel conditions are assessed by performing a topographic survey of the channel and near channel areas. These measurements provide critical design parameters that describe channel geometries, including width, mean and maximum depth, sinuosity, meander length and curvature, entrenchment and flood prone areas. Measurements are performed for both degraded and



Location of National Forests in Arizona. Map from Rocky Mountain Region 3 website. (<http://www.fs.fed.us/r3/forests/az.html>).

reference reaches. This information is combined with existing hydrology and watershed data to evaluate the size and frequency of flows expected for these streams.

The actual channel modification is performed using a small bulldozer, Bobcat, and other tools where appropriate. Generally, stream gradient is lowered by introducing greater sinuosity or meander to the stream. Appropriate cross-sectional geometries are also constructed to contain relatively frequent flood flows while allowing higher flood flows to spill out into the floodplain area. The channel modification is accompanied by an aggressive revegetation program designed to help stabilize the stream channel and control erosion in disturbed areas adjacent to the stream. Where possible, sod mats and clumps are salvaged and replanted after construction. Hydromulching or seeding with a seed mix of native seeds is applied over most disturbed areas. Given the abundance of uncontrolled grazing from elk (*Cervus elaphus*) in most of these higher elevation areas, at least short-term fencing is required for successful revegetation.

Finally, project areas are monitored over time to provide

information that will be used in future restoration activities. The project areas also provide valuable learning opportunities for a variety of University disciplines.

Riparian area improvement has been noted through implementation of numerous exclosures, and improved grazing strategies located throughout the Forest.

Improvements to Riparian Areas, Streams, Upland Soil Condition, and Road Obliteration

In the Oak Creek watershed, 30 acres of gully systems were stabilized through channel design and shaping located in the headwaters of the West Fork of Oak Creek.

Also in the Oak Creek watershed, 150 acres of trails were stabilized, relocated, or obliterated on heavily impacted social trails. Rock cairns, trail signage, revegetation with native seed, installation of water bars, and drainage ditches to Forest standards channels water and sediment to reduce erosion, peak flow and protect the soil and water resource.

Restoration began on 15 acres of meadows at Bow Ribbon Park and at Allen Lake Landing by cutting down ponderosa pine seedlings and saplings and leaving the slash on site to create surface roughness, create microclimate, and retain moisture and soil on-site West Clear Creek 5th Code and Wet Beaver Creek 5th Code, respectively, Verde River Watershed.

In the Lake Mary watershed, 10 acres of riparian stream channel were stabilized at Hoxworth Springs, a tributary to Lake Mary. Twenty-five miles of road were either obliterated, or had drainage structures constructed on them to reduce nonpoint source sediment from the road surface. Lake Mary is a significant source of water for the City of Flagstaff.

In the enclosed basin of Mormon Lake and Mormon Lake watershed, 100 acres of heavily

impacted dispersed recreation sites were rehabilitated and closed to vehicular traffic to protect the unique wetland characteristics of the lake bed.

Noxious weed treatment has occurred on 175 acres by hand pulling of bull thistle (*Cirsium vulgare*) and spotted knapweed (*Centaurea melitensis*) at a variety of sites District-wide. Elk exclosures were constructed at Frog Spring, East Clear Creek Watershed, Little Colorado River Watershed.

Additionally, stream flow data on 20 perennial streams located on the Coconino, Prescott, and Apache-Sitgreaves National Forests is being collected for the acquisition and of instream flow water rights with the objective of maintaining in stream flow for wildlife, fisheries and recreation use.

The region has adopted a groundwater policy which in essence, assures that withdrawal of groundwater does not adversely affect adjacent riparian areas.

KAIBAB NATIONAL FOREST

The Kaibab National Forest has roughly 5 miles of perennial streams and 1,200 acres considered riparian. Most of the riparian areas are associated with manmade facilities like dams and stock tanks. The notable exceptions to that is Kanab Creek, North Canyon, Little Hells Canyon, Big Springs, and Tule Wash. These areas are considered either perennial or intermittent flow regimes and display riparian vegetation.

Over 75% of riparian zones meet or exceed desired conditions. Most improvement in riparian conditions is the result of complete exclosure of livestock from the lake (e.g., JD Dam - 1988, Coleman Lake - 1984, Moritz Lake - 1995) or significant reductions in term permitted numbers (Little Hells Canyon and Tule Tank Wash). In most cases there has been a large increase of riparian indicator species like willows (*Salix* spp.) sedges (*Carex*

spp.), box elder (*Acer negundo*), and cottonwood (*Populus* spp.).

PRESCOTT NATIONAL FOREST RIPARIAN AREA MANAGEMENT

The Verde River continues to be a focal point for riparian management activities on the Prescott National Forest. We participated in several Verde Canyon Railroad trips that were offered free of charge to the public by the Bureau of Reclamation, Verde Natural Resource Conservation District, and several other partners. The objective was to get the public on the river to enjoy our natural resources and provide environmental education.

We are working on several grazing allotments and other projects to improve conditions, particularly within the Verde Watershed. We are consulting with the U.S. Fish and Wildlife Service on critical habitat for spikedace (*Meda fulgida*) and loachminnow (*Tiaroga cobitis*). As part of this consultation we analyzed watershed condition of five, 5th Code watersheds within the Verde Watershed. We found conditions varied from satisfactory in the Sycamore Canyon area, impaired on the majority of the watershed, to unsatisfactory on an area of the Upper Verde. We conducted a survey of the ephemeral drainages and gullies within the Verde Watershed and found that they may be a source of sediment to the Verde River following large rainfall events. We are continuing to conduct field work concerning the condition of these drainages to assess their impact on water quality.

We are now implementing projects and Best Management Practices on the problems areas that were identified. Some of the projects include improved livestock distribution, and changes in other grazing practices. Livestock no longer have access to the Verde River on 14 of the 15 allotments

administered by the Prescott Forest. We have implemented grassland restoration projects on approximately 5,000 acres with impaired or unsatisfactory soil conditions to increase vegetative ground cover (reduce soil erosion), and increase infiltration. A secondary benefit to the restoration is improved wildlife habitat, especially for antelope and quail. Several road closures and improved road maintenance has also been implemented.

We installed a low-flow gauge on the Verde River in cooperation with the Verde Watershed Association (VWA). The VWA is sponsoring several studies within the watershed to help determine groundwater supplies and develop a water budget. We are also working with the U.S. Geological Survey and Salt River Project to operate and maintain the Paulden stream gauge on the Verde River.

We are participating in the development of a management plan for the Wild and Scenic portions of the Verde River with the Coconino and Tonto National Forests. The objective is to determine long-term management goals and objectives to ensure protection of the wild and scenic qualities of the Verde River.

Enough about the Verde River—we have several other beautiful riparian areas on the Forest. Residents of the Agua Fria Watershed have formed an association and we are a member of this group. We are sharing the data we have from within the watershed to help the group determine where we may need additional information. We are in the process of assessing watershed condition within the Agua Fria 4th Code watershed. The Gila chub (*Gila intermedia*) has been proposed for listing under the Endangered Species Act. There are known populations within this watershed and we felt it was important to get a handle on habitat and watershed conditions.

We are working with several universities on research and monitoring projects concerned

with watershed issues. We are working with the University of Arizona to implement monitoring of vegetation and soil conditions on several range allotments, watershed treatment areas, and prescribed burns. This monitoring will help us determine if we met our management objectives in a timely manner. Plans are being finalized to re-measure the flows from several of the springs on the Prescott, Coconino, and Tonto Forests through an agreement with Northern Arizona University, as well as cooperating with the education programs offered by the Verde Watershed Research and Education Program. We have been in contact with faculty of Arizona State University to explore the possibility of monitoring riparian conditions on several of our smaller perennial and ephemeral streams, and riparian exclosures.

Several exclosures and photo monitoring points have been established on riparian areas across the Forest including: Yellowjacket, Cienega, Joe Best Spring, Copper Canyon, Verde River, North Mine Spring, South Fork of Walnut Creek, Sheep Camp Springs, and Mule Camp Springs. We have implemented an instream flow measuring project on Walnut Creek, Big Bug, Turkey, Mint Wash, Cienega, and Sycamore Creeks. We hope to receive an instream flow right on these streams in the future. We continue efforts to receive an instream flow water right on the Upper Verde River.

TONTO NATIONAL FOREST RIPARIAN AREA PROGRAM

The Tonto National Forest includes almost 3 million acres of land in a contiguous block that lies north and east of Phoenix. Elevations extend from about 1,500 feet at the confluence of the Salt and Verde Rivers to Aztec Peak at 7,733 feet in the Sierra Ancha Mountain Range. Major ecosystems include Sonoran Desert, semidesert grassland, chaparral,

pinon-juniper woodland, and montane coniferous forests. Conservative mapping efforts have estimated 1,300 miles and 29,000 acres of riparian vegetation, although the actual numbers may be double this estimate. Long recognized as an important resource on the Tonto National Forest, the Watershed staff includes two hydrologists, a riparian ecologist, an instream flow water rights/photopoint program coordinator, soil scientist, and a team of three monitoring specialists.

Permanent Photopoint Program

In 1989, the Tonto National Forest entered into a program with volunteers to establish and maintain a permanent photopoint data base. Thirteen years later, there are about 700 photopoints across the riparian areas of the Tonto National Forest. About 30 volunteers locate and re-photograph about 300 sites per year.

Instream Flow Program

The Tonto National Forest has received Certificates of Water Right for Pinto, Arnett, Sycamore and Cave Creeks, Seven Springs and the Lower Verde River. An instream flow water right allows an agency or individual the right to keep a desired quantity of water in a stream. A Certificate of Water Right for Instream Flow Protection is a property right and places its owner in an advantageous position within the water rights hierarchy of a watershed. The Pinto Creek permit was a crucial bargaining chip when the Carlotta Copper Project's proposed groundwater pumping threatened to dewater Haunted Canyon and Pinto Creek. The Arnett Creek permit is included within a native fish reintroduction project. The Verde River has been certificated from Beasley Flat, at the downstream terminus of the Verde Valley, to just above Horseshoe Reservoir. This water right, shared by the Tonto, Prescott and Coconino

National Forests, is the largest single nonconsumptive appropriation in Arizona at this writing. The Tonto National Forest is currently pursuing 12 additional water rights. Applications are on file for the East Verde River, Camp, Christopher, Haigler, Fossil, Cherry, Tonto, Workman and Reynolds Creeks. Monitoring is ongoing at Red Creek, Tangle Creek and New River and applications are forthcoming.

The Regional Forester has approved funding for acquiring water rights on streams throughout the state. This includes the 12 applications on the Tonto listed above and another 44 streams throughout the Coronado, Coconino, Prescott and Apache-Sitgreaves.

Groundwater Policy

The Tonto National Forest has adopted a set of procedures for evaluating groundwater withdrawal requests on its lands. The intent is to protect water-dependent resources on the forest and minimize effects on adjoining wells. The procedures include an initial screening phase, an exploration and testing phase and a production phase. The wellfield would reach the production phase if adverse impacts can be avoided or mitigated. The procedures developed on the Tonto have been adopted by the Southwestern Regional Office in Albuquerque with a few minor changes and are being considered for inclusion in a national policy currently under development at the Washington Office of the Forest Service.

Threatened and Endangered Species Program

Riparian areas provide critical habitat for many of the Southwest's threatened and endangered species. Lawsuits related to the Forest's noncompliance with the Endangered Species Act on grazing management actions have been the most significant factor

affecting changes in riparian area management. The Forest-wide riparian monitoring program, drought policy development, and many recent changes in livestock management, have had their impetus in settlement agreements or the need to protect listed species or their habitat. Riparian utilization standards and both species and habitat-monitoring programs are integral to the riparian monitoring and management program on the Forest.

Inventory and Monitoring Efforts

Hydrologists and riparian ecologists have developed a data base of stream channels and riparian vegetation. We have National Wetland Inventory Map coverage for the entire Forest. In 1982, Higgins and Ohmart completed a structural classification of riparian areas on the Tonto National Forest. Riparian vegetation was inventoried on 120 key reaches in the early 1990's.

Over 320 stream reaches have had some level of stream channel inventory and assessment. Stream channel cross sections have been completed on over 210 stream reaches. The condition of 168 stream reaches has been assessed using a method developed on the Tonto National Forest. We have established 65 permanent stream channel cross sections. Many of these cross sections are located in riparian pastures and enclosures that have been constructed over the past 10 years.

In 1998, the Tonto National Forest developed grazing guidelines for use on trees, shrubs, and herbaceous vegetation, and defined acceptable levels of impacts to streambanks. A monitoring protocol was developed for measuring

riparian vegetation utilization and streambank alteration. We currently have a three-person monitoring team working with the Districts to assure compliance with grazing guidelines.

Drought Policy

The Forest adopted a drought policy in 2001. It defines drought according to the Standard Precipitation Index and then outlines actions to be taken on grazed lands to protect rangelands. We have recently acknowledged the current drought and are assessing allotments on a case-by-case basis.

Restoration Projects

The Forest has attempted to restore degraded stream channels to a higher level of stability using Rosgen stream restoration principles. The first effort was at Tangle Creek next to the Tangle Creek Administrative site where bank erosion was eroding into developments at the site. This effort was completed with mixed results in 1997. The second effort was to restore a reach of Pinto



Fossil Creek Springs.

Creek damaged by a spill of 300,000 cubic yards of tailings into the creek next to BHP's Pinto Valley Mine. Physical restoration of the channel was completed in 1998, riparian recovery is continuing. The third effort is to restore approximately 1 mile of Cherry Creek. A Water Protection Fund grant was received for this project and implementation is expected in the fall of 2002.

Watershed Assessments

The Tonto is initiating watershed assessments on some of its higher priority fifth code watersheds. The watershed assessment process is issue driven, the analysis method depends on the issues faced in the watershed. As an example the issues faced in one watershed are primarily related to off road vehicles, while those in a second (sub fifth code scale)

watershed were fire related. The Forest hopes to complete analysis of all its watersheds in ten years.

Wild and Scenic Plan

The Tonto is working with the Prescott and Coconino to develop a management plan for the Wild and Scenic Portions of the Verde River. Completion of the plan is projected for 2003.



EVERYONE AND EVERYTHING IN THE DESERT

by Matt Chew, Department of Biology, Arizona State University

In May 1996 the optimistically named "First Conference on Research and Resource Management in Southern Arizona National Park Areas" was held in Tucson. It appears the optimism was well-founded. The conference is now a biennial event. The fourth conference convened on May 15, 2002, was sponsored by seven federal and two Arizona agencies, the Western National Parks Association, the University of Arizona, and the Sonoran Institute. I have attended all four and helped plan the third; somehow they just keep getting better. These conferences are the place to find out about practically everything going on around here. My problem is to employ something other than superlatives; so much enthusiasm might ruin my reputation.

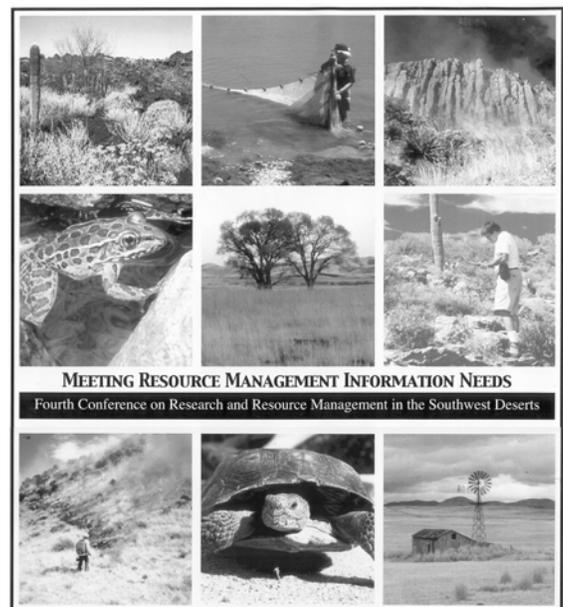
The best thing about this conference is the tight regional, rather than topical, focus. Practically anything related to "resource research and management in the southwestern deserts" (an evolution from the original parks focus) can expect a hearing. This year's theme was "Meeting Resource Management Information Needs" so there was much discussion of how to collect, analyze and use data. But it was hardly a number-crunching festival. Technical methods shared the spotlight with research results, but so did ways of putting information to use. Over

60 submitted papers and nearly 30 posters covered an amazing range of topics. Just a few highlights in alphabetical order: badgers and bobcats (infrared video); Border Patrol (dispersing alien plants); frogs (welcome and unwelcome); gemsbok (at White Sands); Indian Nations (working with); illegal aliens (at Organ Pipe National Monument); Lehmann's lovegrass (birds nesting in); mosquitoes (in restored wetlands); pollinators (Yuma Proving Ground); rotifers (inventory and diversity); Russian olive (seed banks); springsnails (habitat loss); topminnows (how *not* to manage); Virtual America (National Park Service on the web); warblers (habitat partitioning).

Over the three days, six invited speakers beginning with Karen Wade, Intermountain National Park Service Regional Director, and ending with Jeff Ruch, Executive Director of Public Employees for Environmental Responsibility (PEER) provided perspective on the uses and abuses of science and scientists in resource management. By Friday afternoon, we had all been informed, entertained, provoked, alarmed, angered,

relieved, and even slow cooked (the air conditioner broke down Thursday). We left with our brains full, exhausted but looking forward to another round in 2004. If you want to know what's going on in Southwestern desert research, and who's doing what, BE THERE.

For more information on the conference just completed, and (eventually) information on the upcoming fifth conference, bookmark the USGS Sonoran Desert Field Station website at <http://www.werc.usgs.gov/sdfs>.



MEETING RESOURCE MANAGEMENT INFORMATION NEEDS
Fourth Conference on Research and Resource Management in the Southwest Deserts

May 15-17, 2002

16TH ANNUAL MEETING IN WICKENBURG

The 16th meeting of the Arizona Riparian Council was held April 26-27, 2002, in Wickenburg at the the Rancho de los Caballeros. This year's theme was *Water Resources and Sustaining Riparian Areas*. There were 69 attendees from throughout the state and New Mexico.

An overview of Arizona water law was presented by Richard Campbell from the Law Offices of Withey, Anderson, and Morris in Phoenix. Jim Holway, Assistant Director, Groundwater Division of the Arizona Department of Water Resources told us about the Department's programs and perspectives. Ruth Valencia, Arizona Riparian Council representative to the Governor's Water Management Commission, filled us in on the Commission and perspectives on riparian protection. Some of the nation's groundwater pumping follies and the fate of our fresh water were presented by Dr. Robert Glennon, James E. Rogers College of Law at the University of Arizona. Watch for an announcement of his upcoming book in a future newsletter. John Munderloh, Yavapai County Water Advisory Committee, presented information on issues surrounding exportation of groundwater from the Big Chino subbasin to the Prescott AMA. The development and implementation of the Tonto National Forest groundwater policy was presented by Rich Martin and Grant Loomis, Tonto National Forest, Phoenix.

These invited presentations were followed by seven presentations of submitted papers and six posters were on display. The program with abstracts is available on the ARC website at <http://aztec.asu.edu/ARC/Program16.pdf>.

About 20 people attended the dinner held at the Hassayampa Preserve. We were entertained by a cowboy poet and storyteller. He had some very interesting stories

to tell about the history of Wickenburg.

Field trips on Saturday began at the Wickenburg High School where Matt Peirce, Arizona Game and Fish Department, and Clare Peirce, teacher at Wickenburg High School told us about constructed wetlands on the high school grounds. From there participants either went to the Hassayampa Preserve or to Box Canyon. The Hassayampa Preserve trip was led by Jere Boudell, Ph.D. candidate in the Department of Plant Biology at Arizona State University. She told us about her seed-bank research and other research from Dr. Julie Stromberg's lab at Arizona State. Jack Ragsdale, Recreation Manager, along with John Anderson, State Botanist, both of Bureau of Land Management, led the other trip to visit Box Canyon. The Box Canyon is a scenic canyon along the Hassayampa River and a short drive from downtown Wickenburg. The Hassayampa is perennial through the canyon and supports a relatively healthy riparian ecosystem. Due to its beauty, proximity to town, and easy accessibility, the canyon is popular with campers, off-road vehicle users, and equestrians.

One management issue regarding this area is whether the recreation use is impacting the riparian habitat. To help answer that question, we conducted a Proper Functioning Condition assessment for the area. Although the results of the PFC are not official, the group decided that the area was Functional At Risk, with a downward trend. Everyone enjoyed the trip, as well as the lively discussion debating what the "correct" answers were for the PFC checklist.

At the meeting we elected two new officers, President Jeff Inwood and Vice President Tom Hildebrandt. A membership dues increase was voted in, the new individual rate will be \$20 and for institutions or organizations, \$100. Please check your mailing address now – if it says PLEASE RENEW after your name please do so. If you are reading this newsletter because it was sent to someone else at your office who's no longer there, please subscribe in your name or ask your office to do so to continue receiving it. The mailing list is being cleaned up and past dues will be removed. We hope that you enjoy the newsletter and want to continue to receive it by sending in your dues.



Jere Boudell leading group at Hassayampa Preserve.



SPECIES PROFILE



ARIZONA ALLIGATOR LIZARD (*ELGARIA KINGI*)

by Ross Timmons, Tempe, Arizona

Walking out from the mouth of a canyon one late spring afternoon, I was immediately struck by the difference in temperature. In the shade of the canyon, the air had been noticeably humid, and the temperature in the low- to mid-80's. Standing in the full sunlight of the afternoon, the difference was remarkable, with the temperature approaching 100°F, and little humidity. The canyon was steep-sided, relatively narrow, and well shaded. Trees covering the canyon bottom included evergreen oaks (*Quercus* spp.), walnut (*Juglans major*), sycamore (*Platanus wrightii*), Arizona ash (*Fraxinus pennsylvanica*), and an occasional ponderosa pine (*Pinus ponderosa*). Not surprisingly, I soon returned to the shelter of the canyon. During the spring of most years, stream flows were continuous throughout much of its upper reach, becoming intermittent by late summer. This year, flows throughout had already disappeared, and only small pools and occasional water seeps remained. Vegetation on the surrounding slopes of the upper canyon was primarily pinyon (*Pinus* spp.) and juniper (*Juniperus* spp.), with chaparral species predominating the slopes below its mouth.

Heading back, up canyon, my attention was drawn to a flurry of noise and motion in the leaf litter to my left. I stopped in midstride, looking towards the disturbance. Remaining still for several moments, I carefully examined the area, trying to determine the source of commotion. What finally caught my eye was a slight movement in the debris; slowly poking through the dead leaves was a lizard 10-12 inches long, looking

as if two-thirds of its length was tail. Its colors blended incredibly well with the background, making it nearly impossible to distinguish. As I slowly squatted down, it scuttled into the crack of a nearby bedrock outcrop, stopping just inside. Moving closer to get a better look, I only succeeded in chasing the animal deeper into the recesses of the crack, and out of sight.

This may well describe a typical encounter with the Madrean alligator lizard, *Elgaria (Gerrhonotus) kingi*. One of six North American species of alligator lizards belonging to the genus *Elgaria*, *E. kingi* is the only species found in Arizona. Occurring throughout much of the central and southeastern portions of the state, its range also encompasses portions of southwestern New Mexico, and extends as far south as the Mexican states of Jalisco and Colima (Corichi and Villeda 1995). The Madrean

alligator lizard is often described as a montane species, occupying rocky areas in suitable riparian habitats and drainages, in association with conifer forest, oak woodland, and chaparral communities. Studies indicate that it also occurs at lower elevations and dryer habitats, such as semidesert grasslands and creosote (*Larrea tridentata*) desert-scrub, throughout portions of its range (Bowker 1988, Degenhardt et al. 1996).

A member of the family Anguillidae, the Madrean alligator lizard shares a number of characteristics common to all species of this family, such as dorsal and ventral scales underlain by bony plates called osteoderms. Osteoderms add rigidity to the body and may form an effective armor against injury by small predators. Distinctive lateral folds of skin between the reinforced dorsal and ventral scales on either side of the body presumably accommodate the expansion necessary during



Arizona alligator lizard. Photo from Reptiles and Amphibians website (<http://www.brennanart.com/herps.php>).

breathing, feeding, and pregnancy (Stebbins 1985).

The Madrean alligator lizard may reach a total length in excess of 14 inches, with the tail often greater than twice the length of the body. Coloration is variable, the usual pattern being alternating bands of grayish-tan and brown, the brown bands being 3-4 scales wide, with the posterior margins bordered by black. Black-and-white spots are present along the upper lip. The legs of this species appear disproportionately small to its size. In our area, the only species that the Madrean alligator lizard is likely to be confused with is one of several species of skinks, but dissimilar color patterns, distinctive lateral folds, and body proportions should readily distinguish it.

Although probably not an uncommon species, the secretive behavior of the Madrean alligator lizard makes an encounter with it relatively rare. During hotter and drier periods of the year, they may shift their periods of activity to the cooler early mornings and evenings, further decreasing the likelihood of an encounter. Information on the diet of the Madrean alligator lizard is lacking, but likely includes a wide variety of insects and other invertebrates, such as spiders, centipedes and scorpions.

Little is known of the reproductive biology of this species. Reports by Degenhardt et al. (1996) suggest that breeding occurs during the autumn months, and females may store sperm overwinter. Madrean alligator lizards are oviparous, laying a clutch of 9-15 eggs during early summer. Degenhardt et al. (1996) collected a female and 12 eggs that were hatching from a rock crevice, which they felt might indicate parental care in the species.

Predators of the Madrean alligator lizard include birds of prey, mammals (such as the ringtail cat [*Bassariscus astutus*] and gray fox [*Urocyon cinereoargenteus*]), and various

species of snakes. While attempting to avoid capture, it often displays a rapid, almost serpentine motion, readily disappearing amongst rocks, loose leaf litter or other available debris. When caught, they may thrash about, attempting to bite and smearing feces on the captor. As with many lizards, the Madrean alligator lizard readily loses its tail (referred to as tail autotomy), leaving the potential predator focused on a wriggling tail in its grasp, while the lizard escapes to cover. When attacked by a whipsnake (*Masticophis* spp.), one individual was recorded grasping its own tail in its jaws and forming a loop of its body, presumably too large for the snake to swallow (Bowker 1987). The success of this strategy is unclear, however, as the animals were interrupted the animals, causing the snake to release the lizard before the outcome was determined.

Potential threats to this species are unclear. Its cryptic nature and lack of historical data on its abundance prevents any conclusions regarding impacts over recent decades. Degradation of many riparian communities due to overgrazing in the past have likely produced indirect impacts to the species, but to what extent is not quantifiable. The strong association of the Madrean alligator lizard with riparian areas suggests that management practices beneficial to riparian communities should also benefit this species. In chaparral and desert grasslands, controlled burning to prevent excessive fuel loads or to remove invasive exotic plants, may prove beneficial to this and other occupants as well.

The next time you find yourself wandering down a cool canyon or stream bank, take a few minutes to look and listen as you pass; you might just have a chance encounter with this attractive Arizona lizard. As with most Arizona wildlife, a great deal of enjoyment and information can be gained by taking the time to

observe them in their natural setting.

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LEGAL ISSUES OF CONCERN

Richard Tiburcio Campbell, Law Offices of Withey, Anderson & Morris, Phoenix

NOT FIT FOR DUTY: BIOLOGICAL OPINION REGARDING EFFECT OF FORT HUACHUCA'S EXPANSION PLANS ON SAN PEDRO RIVER INVALIDATED IN FEDERAL DISTRICT COURT

On April 11, 2002, the federal district court in Tucson, Arizona, issued an Order declaring that the U.S. Fish and Wildlife Service ("USFWS") Biological Opinion for the U.S. Army's operations at Fort Huachuca was arbitrary, capricious, and contrary to the legal requirements of the Endangered Species Act ("ESA"). *Center for Biological Diversity, et al., v. Rumsfeld*, CIV99-203 TUC ACM (April. 1, 2002). The Order may significantly alter growth patterns in and around Fort Huachuca. The Army, however, is still considering whether to appeal the decision.

The Fort Huachuca army base is located near Sierra Vista in southern Arizona, and in the San Pedro aquifer. Current estimates of annual overpumping from the San Pedro aquifer range up to 9,400 acre-feet, according to the NAFTA Commission for Environmental Cooperation. The adverse impact of groundwater pumping in and around Fort Huachuca on the San Pedro River, and the San Pedro River Riparian National Conservation Area, is well documented.¹

As the largest single groundwater pumper in the area, Fort Huachuca has recently begun looking for ways to minimize its impact on groundwater supplies by requiring, among other things, flushless urinals, and recharge of treated wastewater (at about 600 acre-feet annually).² Organizations such as the Center for Biological Diversity ("Center") are dissatisfied with such efforts since they do not address what they consider to be the primary issue, uncontrolled future growth in the area.³ Fort Huachuca, it is charged, is the primary catalyst for such growth in the surrounding area due to its

relationship with the local and regional economy.

On March 30, 1998, Fort Huachuca formally requested consultation under Section 7 of the ESA with USFWS in regard to the cumulative impacts of its ongoing operations (through 2009) on several species listed as endangered or threatened under the ESA, including the Huachuca Water Umbel (*Lilaeopsis schaffneriana* ssp. *recurva*) and the Southwestern Willow Flycatcher (*Empidonax traillii* ssp. *extimus*).

Section 7 of the ESA requires all federal agencies to "insure" that "any action authorized, funded or carried out" is not "likely to jeopardize the continued existence of any endangered or threatened species" (16 U.S.C. §1536(a)(2)). This proscription applies to "all activities or programs of any kind" and includes the granting of contracts, licenses, and permits, and "actions directly or indirectly causing modifications to the land, water, or air" (50 C.F.R. §402.02). Federal agencies, such as the U.S. Army, may request formal consultation under Section 7 of the ESA to determine whether their activities will jeopardize listed species. At the conclusion of formal Section 7 consultation, USFWS issues a Biological Opinion (50 C.F.R. § 402.02). The Biological Opinion includes a detailed description of the impact of the agency's action on listed species (and their designated critical habitat, if any). The Biological Opinion may also include mandatory (and sometimes voluntary) conservation measures to be implemented to protect the species. For instance, if USFWS finds that the action will jeopardize a species or adversely modify critical habitat, then it must

suggest "reasonable and prudent alternatives" that will not cause jeopardy to the species or adverse modification of critical habitat. Following the issuance of the Biological Opinion, the federal agency must then determine whether and in what manner to proceed, i.e., the federal agency has an independent duty to insure its actions satisfy Section 7 and the ESA's jeopardy standard. See 16 U.S.C. §1536(a)(2).

USFWS issued a draft Biological Opinion regarding Fort Huachuca on January 4, 1999 that concluded, among other things, that additional groundwater pumping at Fort Huachuca would cause jeopardy to the Huachuca Water Umbel and Southwestern Willow Flycatcher, and would cause adverse modification of designated critical habitat.⁴ However, in its Final Biological Opinion on October 27, 1999, USFWS included a "no jeopardy" finding in regard to groundwater pumping. This decision was based in part on the negotiation of a Memorandum of Agreement (MOA) between USFWS and the Army after the draft Biological Opinion had been circulated. The MOA included a number of mandatory reasonable and prudent alternatives regarding groundwater that were devised to avoid a jeopardy finding. The no jeopardy finding was also made in reliance on Sierra Vista's implementation of an effluent recharge project designed to delay the impacts of deficit groundwater pumping.

The Center and The San Pedro 100, subsequently filed suit against the Army in 2000, challenging the effectiveness of the measures outlined in the final Biological Opinion and in the MOA since they did not require any specific, enforceable measures

to address the development and unrestrained groundwater pumping resulting directly or indirectly from Fort Huachuca's actions.⁵ The court agreed, finding that:

The Final BO does not require the Army to balance its water use on base or in the subwatershed ... The Army is only required to participate in the USPP [Upper San Pedro Partnership], an organizational partnership, ... [and] support the USPP ... in the development and adoption of a regional water management plan, the RWRMP, within three years.

There are no requirements in the Final BO to reduce reliance on groundwater pumping by any particular amount or to achieve any measurable goals with respect to water recharge ... Without such specificity, the mitigation measures in the Final BO are merely suggestions.⁶

The court also found that USFWS' reliance on Sierra Vista's recharge project was misplaced in light of the court's belief that a 13,000 acre-feet deficit is expected to exist by 2030:

"Assuming the project is successful, its positive effects will be short-term and inadequate. It will recharge roughly 1,516 acre-feet per year from 2000 to 2010 and 1,762 acre-feet from 2010 to 2020, a small fraction of the growing deficit."⁷

Moreover, the court found that the recharge project only served to "delay and mask" the effects of deficit groundwater pumping for the next three years while growth at Fort Huachuca would continue unabated.⁸

In conclusion, the court found that:

The Army knew of the need to take immediate and drastic measures to maintain flows in the San Pedro River ... The Army, however, refused to commit to any specific mitigation measures Instead, the Army sought to rely on the FWS' arbitrary and capricious determination that its action was not likely to cause jeopardy.⁹

In response to the court's Order the Army is reportedly working with USFWS on revising the Biological Opinion, and is also contemplating appealing the decision.

Collateral damage of the Order includes Sierra Vista's airport expansion plans. The expansion was dependent on the transfer of 203 acres of land near the Libby Airfield to Sierra Vista. The land transfer was halted by the Army since the Fort no longer has a valid biological opinion in place regarding its ongoing activities.¹¹

Representative Jim Kolbe (R-Ariz) recently proposed legislation that would have limited the Fort's responsibilities for excessive groundwater pumping of the San Pedro River under the Endangered Species Act. This bill failed in Congressional committee action on May 9.¹¹ However, A U.S. House committee agreed May 14 to attach Kolbe's legislation to an emergency appropriations bill. The appropriations bill is at the time of this writing headed for a vote in the House and then the Senate.¹²

NOTES

1. The San Pedro River was placed on American Rivers' 1999 List of Nation's Most Endangered Rivers; *see also* Governor's Riparian Habitat Task Force, *Streams and Riparian Resources. Final*

Report and Recommendations of the Governor's Riparian Habitat Task Force, Phoenix, Arizona, at 148 (October 1990); *see also* Lite, S., and J. Stromberg, Department of Geography, Arizona State University, *Hydrologic thresholds for maintaining cottonwood-willow stands along the San Pedro River, Arizona*, presented at the 16th annual meeting of the Arizona Riparian Council (April 26-27, 2002).

2. *Arizona Republic*, "Arizona's Vanishing Wilderness" (August 29, 1999).
3. *Id.*
4. Southwestern Willow Flycatcher has been voluntarily suspended by USFWS in Arizona at the time of this writing in response to the Tenth Circuit Court of Appeal's decision vacating Flycatcher critical habitat in New Mexico. *See New Mexico Cattle Growers Association vs. USFWS*. 248 F.3d 1277 (2001).
5. Order at 4.
6. *Id.* at 15-16.
7. *Id.* at 18.
8. *Id.* at 19-20.
9. *Id.* at 22.
10. *Arizona Daily Star*, "Court Ruling Clips Wings of SV Airport Expansion" (May 7, 2002).
11. *Arizona Republic*, "Effort to Exempt Army from Conservation Fails" (May 10, 2002).
12. *Arizona Republic*, "U.S. panel limits Army's river liability" (May 15, 2002).





NOTEWORTHY PUBLICATIONS

Jere Boudell, Department of Plant Biology, Arizona State University

Mushet, D. M., N. H. Euliss, Jr, and T.L. Shaffer. 2002.

Floristic quality assessment of one natural and three restored wetland complexes in North Dakota, USA. *Wetlands* 22(1):126-138.

The Mushet et al. paper consists of an evaluation of Swink and Wilhem's floristic quality assessment method. In Swink and Wilhem's method, plants are assigned a value from 0-10 by a panel of experts. An average value can then be assigned to an area to represent the "quality" of the area under assessment. This method has been criticized because the values are "subjective" due to their assignment by a panel of experts. Mushet et al. evaluated this method in one natural and three restored wetland complexes.

In the Swink and Wilhem floristic quality assessment method, plants are assigned a value from 0-10 (C values) based on their degree of tolerance to disturbance and their fidelity to a specific habitat. In this method, a very conservative species would be assigned a value of 10 if it has a very low tolerance to disturbance and a very high fidelity to a specific habitat. A C value is then assigned to each species that is known to be found in the area under assessment by a panel of experts. To determine the areas overall quality, an average C value is calculated. A Floristic Quality Index (FQI) can also be determined simply by dividing the sum of the C values by the square root of N (total number of species). The FQI then incorporates species richness into the index.

Mushet et al. carried out floristic assessments of 16 natural wetlands and a total of 37 restored wetlands. First the authors used the C values assigned by the panel in their assessment of each of the areas.

Then the authors made assignments based on their field-collected data. Mushet et al. found that the average C and FQI values based on their data were higher than the panel assigned values. However, the difference between the values was not significant. The authors conclude that C values assigned by a panel of experts who are familiar with the local flora can provide adequate information on which to base a floristic assessment.

Jansen, A., and A. I. Robertson. 2001. Relationships between livestock management and the ecological condition of riparian habitats along an Australian floodplain river. *Journal of Applied Ecology* 38:63-75.

Jansen and Robertson developed an appraisal method to assess the ecological condition of riparian areas. It was used to assess how the effects of cattle grazing on riparian areas vary along the Murrumbidgee River in south-eastern Australia.

Jansen and Robertson's rapid assessment method is based on six subindices: (1) Habitat - habitat continuity, (2) Cover - vegetation cover and structural complexity, (3) Banks - bank and soil structure and stability, (4) Debris - standing and fallen debris, (5) Natives - dominance of natives vs. exotics, and (6) Species - indicative species. Each subindex score was weighted based on the relative "importance" of each subindex. For example, Natives and Species were given lower weighting than other subindices. For each area assessed, the subindex scores were averaged and then summed to give a total score for each site. The overall assessment scores ranged from 0 (worst) to 50 (best).

The author's assessed three main categories of land use within 138

sites. The categories consisted of private property used for grazing and agriculture, state forests used for harvesting, and crown land that had a variety of uses. At each site, the following was measured: (1) Habitat - width of riparian vegetated bank and length of continuous riparian vegetation, (2) Cover - canopy, understory, and ground cover and number of vegetation layers, (3) Banks - bank stability, aquatic woody debris, and soil structure, (4) Debris - leaf litter, standing dead trees, and terrestrial woody debris, (5) Natives - canopy, understory and ground cover, and (6) Species - *Eucalyptus camaldilensis* (Red River gum - the dominant riparian tree) regeneration and damage to the regeneration of *Phragmites australis*. The authors also recorded several indicators of land management practices such as land use and tenure type in order to facilitate the correlation of the condition of riparian areas assessed to management practices.

Jansen and Robertson found that all subindex scores increased with an increase in riparian condition scores; however, the average abundance of exotic species was high in all areas and bank condition averages were low. They found that distance upstream, and grazing practices such as stocking rate and periods of paddock rest accounted for 76% of the variance in riparian condition. The authors suggest that decreasing stocking rates, resting paddocks, and providing water sources away from rivers could increase riparian condition.

Indices of ecological condition can be a fast method of assessing ecological condition. However, it is important to modify any index for the particular area that is to be assessed. It is also important to make assessments at many loca-

tions instead of a few to get an accurate assessment of the ecological condition of an area. Indices

have the potential to decrease the time involved in assessing ecological condition and increase the

accuracy of assessments, which can only lead to better land management.



COMMITTEE REPORTS

TREASURER'S REPORT

Oct 2000 to Oct 2001

Oct 00 Balance: \$10,998.49
 Oct 01 Balance: \$ 8489.65

Expenditures: \$10,036.34
 Fall Meeting \$110.13
 CES¹ \$3,941.56
 Folders and Name Tags \$2,587.27
 Spring Meeting \$3,379.88
 Bank fees \$ 17.50

Income: \$7,527.50
 Dues \$515.00
 Meeting + Dues \$5,397.50
 Donation \$1,615.00

Oct 2001 through May 16, 2002

Expenditures:
 Fall Meeting \$130.19
 Booth Space \$95.00
 Copies for fact sheets \$529.69
 CES¹ \$2,236.10
 Spring Meeting \$3,506.02
 Bank fees \$10.00

Income:
 Dues \$292.50
 Meeting + Dues \$5,525.00

Current Balance: \$7,798.15

¹CES costs are for copying and postage for the newsletters and meeting announcements, with administrative fees and a few phone calls.

EDUCATION COMMITTEE

It's been a while since you've been updated on the activities of the Education Committee. The \$1,615 donation that we received last year from Wild Oats Market was used toward photocopies of our fact sheets that are distributed at environmental education fairs. We continue to display our booth at many of the environmental education fairs and events. Below are listed those in the past year. Most of these events occur in the spring and fall.

September 2001

Arizona Association for Environmental Education Meeting in Flagstaff
 Verde River Days, Dead Horse Ranch State Park

October 2001

Arizona Science Teachers Association, Phoenix
 Las Cienegas Open House, Bureau of Land Management

November 2001

Governor's Pride in Arizona Awards, Phoenix

March 2002

Feathered Friend Festival, Riparian Institute, Gilbert

April 2002

Living Desert, Earth Day Celebration, Glendale
 Earth Day Event, Gentle Strength Coop, Tempe

The Council display is in need of a redo. It's been through many, many events and some of the pieces are in need of repair or replacement. New photos and help would be appreciated. I can always use volunteers who are willing to help by manning the booth at these fairs. I love to do it but just can't do them all. Special thanks go to Theresa Shaffer, Theresa Pinto, Diane Laush, Tom Lazzelle, and Kris Randall who have helped this past year. If anyone is interested in helping please give me a call (480) 965-2490 or email me at Cindy.Zisner@asu.edu

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 September, the deadline for submittal of articles is August 15, 2002. Please call or write with suggestions, publications for review, announcements, articles, and/or illustrations.

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CALENDAR

Arizona Riparian Council Board of Directors Meeting, July 17, 2002, 4:00 PM. Arizona Game and Fish Department Office, Flagstaff.

Fall Campout and Get Together, planned for September 2002. EC Bar Ranch, Nutrioso. Contact Cindy Zisner (480) 965-2490 or Cindy.Zisner@asu.edu for more information.

Arizona Hydrological Society 2002 Annual Symposium, September 18-20, Radisson Woodlands Hotel, Flagstaff Arizona. Contact Sean Welch at (928) 523-7290 or Sean.Welch@nau.edu or Christie O'Day at (480) 736-1093 X224 cmoday@usgs.gov for further information.

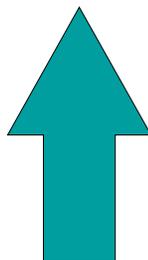
2002 Watchable Wildlife Conference, October 16-18, Saint Paul, Minnesota. For detailed information and to register go to <http://www.watchablewildlife.org>



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