



# The Arizona Riparian Council Newsletter

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## AN EXPERIMENTAL FLOOD IN THE GRAND CANYON

Duncan Patten, Center for Environmental Studies, Arizona State University

### BACKGROUND

In 1963, Glen Canyon Dam was closed and all natural flows of the Colorado River through the Grand Canyon ended. For 20 years the "normal" flow of the river was dominated by hydroelectric demands of cities of the Southwest. This meant high discharges from the dam during the day and low discharges at night. It also meant more water released through the dam in summer and winter months to satisfy power demands. In 1982, the Bureau of Reclamation initiated a study of the downstream effects of dam discharges from Glen Canyon Dam. This was in response to pressure from the environmental community resulting from observations of obvious deterioration of river margin and eddy sediment deposits, and loss of native fish in the Colorado River within Grand Canyon National Park, among other riverine ecosystem changes. The Glen Canyon Environmental Studies (GCES) was established to undertake this study. Unfortunately, the years following initiation of the GCES studies were wet years which caused high discharges from Glen Canyon Dam. This did not allow the studies to determine much about the effects of low flows. One conclusion of the early studies was that flooding was detrimental to the downstream ecosystem. This was based on extensive loss of sediment following high (ca. 92,000 cfs) flows in 1983 followed by above-generator capacity (i.e., > 32,000 cfs) flows in a couple of the following years. By 1989 there was still a need to continue studies of sediment responses of other ecosystem components to dam operations, including effects on endangered species, such as the humpback chub (*Gila cypha*). Glen Canyon Environmental Studies II was thus initiated and continued through 1995. Much of the information generated during this period was used in writing the Environmental Impact Statement which recommended appropriate operations of Glen Canyon Dam to satisfy maintenance of the downstream ecosystem within Grand Canyon National Park and Glen Canyon National Recreation Area, a response to the Grand Canyon Protection Act, and to satisfy hydroelectric demands.

During the final few years of GCES II, operations of Glen Canyon Dam followed "interim flow" criteria which set high discharges no greater than 20,000 cfs, low discharges no lower than 8,000 cfs, and daily fluctuations no greater than 5,000 or 6,000 cfs depending on whether the months were a low or high water month. These limits almost "base loaded" the power production of the dam, that is, limited peak response to hydroelectric demands. The near constant flows in the river also allowed vegetation to invade low

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## PRESIDENT'S MESSAGE

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We would like to bid a fond adieu to Marie Sullivan, our current Vice President, who has recently accepted a position with the U.S. Fish and Wildlife Service in Sacramento, California. Marie has been an active member of the Arizona Riparian Council for the past seven years, serving as Member-at-Large for four years before becoming Vice President. We would like to thank Marie for all her hard work and dedication to this organization. She will be sorely missed and we wish her well in her new life. Marie will remain as Vice President until we are able to replace her. The Board of Directors will decide at its next meeting whether to hold an election by mail this fall, or whether to wait until the spring meeting. Regardless, we are soliciting nominees for office. If you would like to nominate someone, please contact one of the Officers or At-Large Board Members.

*Ruth Valencia*

## LETTER TO THE EDITORS

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RE: 1996, Vol. 9, No. 2, *Another Grazing Myth Exposed* by Jeff Burgess

I would like to discuss Jeff Burgess' article where he states that livestock waters are not needed for wildlife. Let us consider an area west of Wickenburg in which I have spent the last 30 years of my life. The area from Wickenburg going west to the Bill Williams River is about 44 miles. Going south from the Date Creek riparian area to the Harquahala Mountains is a distance of 33 miles. This area of about 1,452 mi<sup>2</sup> has no natural permanent water.

Nearly all of the livestock waters in this 1,452 mi<sup>2</sup> area have gone dry due to the worst drought since 1904. The southern end of the ranch I live on or about 50 mi<sup>2</sup> has three water holes remaining, which is a lot of water for a year like this. Two of these waters are supplied by pipeline and one is a stockpond that will soon go dry. I now have the feeling from Mr. Burgess' article that it would be better, if those water holes were not there.

Last October, at one of these water holes, I left a 10,000-gal tank full of water. The tank supplied two troughs. I added no more water to this tank for eight months. There were no livestock in the area. At the end of this period there were only 3,000 gal in the tank. Seven thousand gallons of water had disappeared. Since it covered a time period that was mostly cool and because the tank is enclosed, I believe that very little of that water evaporated.

Yet, during this whole time there were numerous traces of wildlife (deer, javelina, birds, bees, etc.) surrounding this water source. Would these wild animals even be alive, if it were not for this manmade water hole? Would there even be any deer, etc. in the entire 1,452 mi<sup>2</sup>, if it were not for manmade water holes?

Supplying this area with water during the eight-month period when there were no livestock now seems to be foolish on my part. Would Mr. Burgess suggest that I shut down these waters because they may be destructive?

There has been a large increase in small animals on this ranch, since I have been here. I have used livestock as a tool to improve the soil. When livestock are properly managed, they improve the range. Unfortunately, not all ranches have proper management, but the time is coming.

Anyone is welcome to come and observe what is happening here. Date Creek Ranch raises organic apples and peaches for sale to the public. We also raise organic beef and we manage our cattle holistically (HRM). Sincerely,

Philip K. Knight

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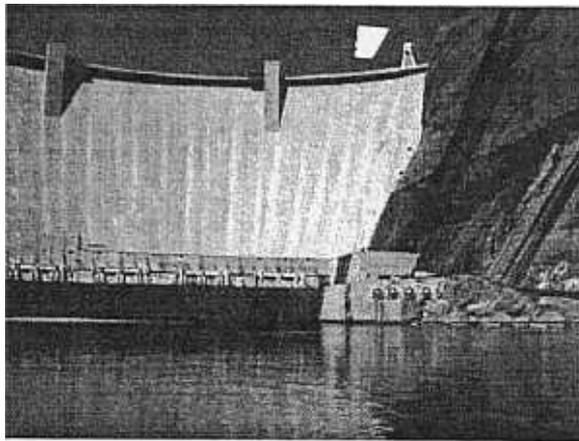
## Canyon..Cont from page 1

areas along the river, eroded low river margin sediment deposits, and filled in backwaters (eddy return channels) which are thought to be habitat for young native fish. This was a river that normally experienced wide seasonal fluctuations in flow, sometimes exceeding 200,000 cfs but most years reaching above 100,000 cfs during spring runoff. These natural "floods" did not allow vegetational encroachment, replenished eroded sand deposits, and scoured return channels. It became obvious that the riverine system in Grand Canyon needed a "flood" to restore some of the normal ecosystem processes and components that were greatly being altered by "interim flows." It should be pointed out that recommendations made for "interim flow" dam discharge criteria, which were based on our best understanding of the system and were designed to reduce continued deterioration of the riverine ecosystem, also included a recommendation for periodic controlled floods.

## THE EXPERIMENT

As GCES II came to a close, there were increasing requests by river researchers and resource managers to have a controlled "flood" experiment. Our initial goal was to have an experimental flood in spring 1995, but concerns by water and power managers derailed this effort and put off consideration until the Glen Canyon Dam EIS was complete. With intensive efforts by Dave Wegner, Program Manager of GCES, and others, a controlled flood experiment was finally approved for late March/early April 1996. The primary goals of

the experiment were to move sand from within the river channel into eddies under high water conditions so that when the river levels declined, "new sand" would be stored in above-river, elevated deposits (aka beaches). Also, the flood was to scour backwater channels and to remove some of the vegetation that had invaded the lower river edge deposits. All of



*Glen Canyon Dam discharging 8,000 cubic feet per second (cfs), March 25, 1996 (from US Geological Survey's Web Page).*

this was to happen without seriously affecting native or introduced fish (e.g., trout), endangered species (e.g., humpback chub, Southwestern willow flycatcher, and Kanab ambersnail), or cultural resources.

The experimental flood had a limited discharge. The peak was limited to 45,000 cfs by the U.S. Fish and Wildlife Service (USFWS), while the duration of the flood (one week) was limited by the amount of water available. The dam is designed to discharge over 200,000 cfs if generators, bypass jet tubes, and spillways are used. In 1983, when over 90,000 cfs were discharged, generators and jet tubes were the primary release mechanisms, as the spillways cavitated during initial use.

The pattern of the flood experiment was to precede and

follow the high discharge with four days of 8,000 cfs for pre-flood and post-flood data, including aerial photography. One March 26, 1996, Secretary of the Interior Bruce Babbitt, emphasizing the use of controlled floods for dams and riverine management, helped open the first of four bypass jet tubes which came online after all the generators were running at near full capacity. The

up-ramp from 8,000 cfs to 45,000 cfs took about 10 hours, while the down-ramp back to 8,000 cfs was stepwise, starting with down-ramping at 2,500 cfs and ending with 500 cfs. This gradual down-ramping was to "simulate" the declining limb of a natural flood.

## FINDINGS

Preliminary data and interpretation have been made available from discussions among the researchers. Further analyses may alter some of these findings. Channel cross-section data show that the eddies first scoured and then filled, including deposition of sand in locations which would become beaches when the river receded. Most of the sand buildup appears to have taken place in the first few days of the week-long flood. However, it is uncertain

whether the initial deposits are as stable as those that replaced them over the duration of the flood. Although this question is difficult to answer, it is important to know when designing duration of future floods.

Although some elevated sediment deposits (beaches) were eroded and decreased in size during the experiment, most either increased in area or had increased camping surface because of the loss or burial of vegetation that had invaded the camping areas. The depth of the new sand on the beaches was highly variable, ranging from a few centimeters to nearly a meter. With relatively high flows (ca. 15,000-20,000 cfs) during much of the summer of 1996, it is uncertain how long many of the "new" deposits will last. Research on long-term deposits in the Canyon, and those deposited during the high flows of the early 1980s, show a return to equilibrium under normal dam operations of about 10 years. With future dam operations controlled by decisions from the Glen Canyon EIS, the longevity of the deposits may be different. High discharge normally reworks debris fans which create rapids, however, the level of discharge during this experimental flood moved some debris fan rocks but did not sufficiently rearrange rocks to alter flows over debris fans or rapids.

Backwaters (eddy return channels) produced by the high discharge are now being used by young flannelmouth suckers. There is no evidence yet that these backwaters are commonly used by other native fish. The fish population, both native and nonnative, does not appear to have been negatively influenced. It will take

a much larger flood to "dislodge" nonnative fish from the mainstream of the Colorado River. The Lees' Ferry trout population also showed little effect from the experiment and fishing returned to an acceptable level shortly thereafter the flood experiment terminated.

The level of the experimental discharge was insufficient to have much impact on riparian vegetation. Some marsh areas were scoured or buried under sediment. At the beginning of the experiment, much dead or eroded shoreline tamarisk was washed down river temporarily "clogging" the eddies. This wood eventually moved downstream, some being reduced in size in rapids while other pieces made it to Lake Mead. The high discharges of 1983 had much more effect on riparian vegetation than did this 45,000 cfs experimental flood, eroding channel margins and thinning some of the tamarisk stands along the river. *Cladophora* beds in the Lees' Ferry reach were partially scoured, but recent evidence shows that these beds, a primary substrate for aquatic invertebrate larvae and diatoms (fish food) are rapidly recovering.

## MANAGEMENT IMPLICATIONS

Most rivers in the West have had their flows altered by dams with often dramatic changes in downstream aquatic and riparian ecosystems. Goals of natural resource agencies, such as the National Park Service, are to begin to return natural processes in these systems which are disturbance systems, i.e., dependent on periodic disturbances such as floods. Therefore, use of controlled floods may begin to restore these riverine ecosystems. Under-

standing how a controlled flood might change, and perhaps improve, the riverine system was the primary purpose of this experimental high discharge. What is being learned from this experiment on the Colorado River may lead to future controlled high flows in other western rivers. Dams exist and there is little one can do about their existence, but knowing that they can be operated to reverse some of the changes they have created may be part of future approaches for adaptive management of western rivers.

*Editors Note:* In the last issue, you were referred to the U.S. Geological Survey page on the World Wide Web. This site can provide more information about the experimental flood.

The address is:

<http://wwdaztcn.wr.usgs.gov/flood.html>

## THE ARIZONA WATER BANKING AUTHORITY

**A**t this time, Arizona does not use its full 2.8 million acre-foot share of Colorado River water. The Arizona Department of Water Resources projects that the state will not fully use the resource until 2030. Until then, the accumulated amount of water left in the Colorado could be as high as 14 million acre-feet. The Arizona Water Banking Authority (AWBA) was created with the intention of storing unused Arizona Colorado River water to meet future needs for:

- (1) assuring adequate supply to municipal and industrial users in times of shortages or disruptions of the CAP system by providing a stored reserve of water that can be tapped in times of drought on the Colorado River;
- (2) meeting the management plan objectives of Arizona's groundwater code by providing the ability to replenish depleted groundwater aquifers with CAP water;
- (3) assisting in the settlement of Indian water rights claims by providing another pool of water to be used in settling these claims; and
- (4) exchanging water to assist Colorado River communities, e.g., cities in Mohave County could acquire credits through the AWBA for water stored in central Arizona and cash-in those credits by diverting water directly from the Colorado River. The AWBA could also contract with similar authorities in California and Nevada to allow these states to acquire a portion of Arizona's temporary surplus of Colorado

River water. The contracting state would pay to store water in Arizona, helping to replenish Arizona's aquifers, and in the future be able to draw out a similar quantity directly from the Colorado. This does not involve the sale of future rights to water, only a specific quantity of unused water.

A five-person AWBA will direct the activities. The Director of the Department of Water Resources will chair the Commission and members will include the President of the Central Arizona Water Conservation District and three persons appointed by the Governor (of these appointment one person will represent CAP municipal and industrial water users, and one person will represent Colorado River users along the Colorado, and one must be knowledgeable in water resource management issues). Additionally, the Senate and House of Representatives each appoint one non-voting ex officio member to the AWBA.

### GOVERNOR'S APPOINTEES

Tom Griffin was active in the creation of the Mohave County Water Authority and is very knowledgeable regarding Colorado River water issues. Mr. Griffin fills a position designated by state law to be a representative of water users in counties along the Colorado River.

Bill Chase has more than 20 years of professional water resource management experience in Arizona. He has extensive knowledge of Colorado River issues and

is recognized throughout the state for his leadership in water management. He fills a position designated by state law to be a representative of municipal and industrial entities for water delivered by the Central Arizona Project.

Richard S. Walden has significant experience in water resources policy and planning. He was a founding member of the Southern Arizona Water Resources Association and is currently a member of its Board of Directors. Mr. Walden fills a position required by state law to be an individual with extensive water resource management knowledge.

Governor Symington's three appointments will serve six-year terms and will join Arizona Department of Water Resources Director Rita Pearson and Central Arizona Water Conservation District President Grady Gammage as the AWBA's voting members. Legislators appointed to serve on the AWBA are Speaker of the Arizona House of Representatives Mark Killian and Senator Stan Barnes. These Legislators will serve as the AWBA's non-voting ex officio members.

### AWBA STUDY COMMISSION

In addition to the AWBA, the Legislature created a Study Commission to investigate opportunities for additional water banking issues, identify mechanisms to help Indian communities with rights to Colorado River water participate in the program,

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## ROOSEVELT DAM AND THE SOUTHWESTERN WILLOW FLYCATCHER

Henry Messing, U.S. Bureau of Reclamation

As many of you are most likely aware, the modifications to Roosevelt Dam, in central Arizona on the Salt River, ran into an eleventh hour conflict with the endangered Southwestern Willow Flycatcher (*Empidonax traillii extimus*) and the Endangered Species Act. The Bureau of Reclamation (Reclamation), U.S. Fish and Wildlife Service (Fish and Wildlife), Central Arizona Water Conservation District, Salt River Project, a host of cities in the Phoenix metropolitan area, and the Salt River Pima-Maricopa Indian Community have finally concluded formal consultation as required under the Endangered Species Act. Before detailing the specific results of this consultation and the contents of the biological opinion, I would like to present a brief background to include historical habitat changes in the area and habitat use by the Southwestern Willow Flycatcher.

A recorded description in 1926 from a resident who settled in the Tonto Basin in 1874 describes Tonto Creek as

*...timbered with the local creek bottom type of timber from bluff to bluff, the water seeped, rather than flowed down through a series of sloughs and fish over a foot in length could be caught with little trouble. Today this same creek bottom is little more than a gravel bar from bluff to bluff. Most of the old trees are gone, some have been cut for fuel, many others cut down for the cattle during droughts and the winters when feed was scarce on the range, and many have been washed*

*away during the floods that have rushed down this stream nearly every year since the range started to deplete.*

Cattle grazing evidently had a drastic impact on both upland and riparian habitats. When "Teddy" Roosevelt gave his dedication speech on March 18, 1911, from the crest of the stone confluence of the stone masonry dam that would bear his name, the Tonto Basin and the confluence of the Salt River and Tonto Creek probably was anything but timbered from bluff to bluff. Photographs taken in 1911 looking up Tonto Creek from the confluence show a shallow and wide, braided streambed typically associated with a degraded riparian system.

We may never know whether the Southwestern Willow Flycatcher inhabited the Tonto Basin in 1874 or in 1911. However, in 1993 this neotropical migrant was discovered to be nesting at the inflows of Tonto Creek and the Salt River into Roosevelt Lake. This discovery was made three years after modifications had begun to raise the dam's crest 77 feet. The modifications would remedy safety of dams issues, provide for additional flood control capabilities, provide for additional water storage space, and increase recreational opportunities. In March 1995, the Southwestern Willow Flycatcher was officially listed as an endangered species and the Bureau of Reclamation began preparing a biological assessment and initiated consultation with Fish and Wildlife.

This population is now the second largest known population in

the state, second only to the population in and around the Cook's Lake area on the San Pedro River. Overall, at both Tonto Creek and the Salt River, 21 flycatcher territories were estimated and 17 pairs of birds were confirmed during the 1995 breeding survey.

Like most southwestern lakes, riparian vegetation along the shoreline of Roosevelt Lake is extremely limited due primarily to seasonal and historic changes in water levels. Significant amounts of vegetation are generally restricted to inflow areas where the slopes are gentle and perennial flows or the groundwater table can sustain the vegetative growth.

The dominant plant along and immediately upstream of these inflow areas is the introduced saltcedar (*Tamarix chinensis*). In these areas, saltcedar is often present in pure or nearly pure dense stands. Height and density appear to be related to available soil moisture and the trees growing closer to the channels with perennial flows are generally taller and denser than those farther away. As one moves farther upstream on Tonto Creek and the Salt River the proportion of native cottonwoods (*Populus fremontii*) and willows (*Salix* spp.) increase, although the distribution of these natives is spotty at best.

While apparently suitable native habitat exists in the vicinity of the Tonto Creek inflow area, the Southwestern Willow Flycatchers are nesting in dense, relatively mature stands of saltcedar. The flycatchers were also discovered nesting in dense saltcedar along the Salt River

inflow area. In 1995, 15 nests were found and 2 were suspected, based on observations of adults with fledglings, for a total of 17 flycatcher nests. Twenty-three flycatchers were fledged and three nests were discovered to have been parasitized by cowbirds (*Molothrus* spp.).

Based on examination of aerial photographs between 1946 and 1990, it became clear that significant changes in the amounts and distribution of riparian vegetation have occurred in the Tonto Creek and Salt River arms of Roosevelt Lake. Analysis of these photographs and historic data on Roosevelt Lake conservation pool levels and floods indicate that changes in riparian vegetation have been caused primarily by the interaction of scouring floods and changing lake levels. High flows combined with low lake levels apparently can be more devastating than high flow events when lake levels are high. In the latter instance, the higher lake levels may dampen the energy of the flood flows in the vicinity of existing riparian habitat. Following large floods in 1978, 1979, and 1980, virtually no riparian vegetation was present along the Tonto Creek and Salt River inflows which today are now the important breeding areas for the Southwestern Willow Flycatcher. However, large sediment bars were also deposited upon which the existing habitat developed. Relatively higher lake levels since 1980 may have been a factor in sustaining this habitat to the present day.



Analysis of impacts from the operation of the modified dam was hampered by the lack of information on the habitat requirements and population dynamics of the flycatcher. In addition, only one study was found that contained useful information on the impacts of inundation to saltcedar. The sample in this study from San Carlos Reservoir was small and the trees sampled were significantly smaller than those currently being utilized by the Roosevelt Lake flycatchers.

Reclamation determined that the probabilities of impacts to the existing habitat resulting from scouring floods, low water levels, and fires appeared to remain about the same or decrease slightly with the dam modification. However, these probabilities appeared to more than offset by the potential negative impacts to the habitat resulting from an increased probability of inundation.

A common misperception is that the lake will be filled to the top of the new conservation pool...the trees will die, and the birds will be lost...end of story. Though the storage capacity of Roosevelt Lake will increase with the modifications, the lake levels will fluctuate widely annually and seasonally as they have in the past. Typically, lake levels are at their highest between March and May when winter precipitation and snowmelt combine to yield the highest inflows. Only in those occasional years when there is above-normal precipitation creating unusually large runoff events, will water be stored in the new conservation space. Downstream water orders will quickly lower these levels. Whatever levels the lake will be allowed to rise to, is largely subject to the whims and wishes of nature.

As expected, Reclamation and Fish and Wildlife biologists had different opinions on the potential impacts and end result of the modifications on the Southwestern Willow Flycatcher. Formal consultation was intensive and comprehensive. We looked at every conceivable angle for mitigating impacts onsite. Several alternatives for creation of new habitats were analyzed but all were rejected on the common ground that so little is known about the important habitat requirements of the species to be able to evaluate the likelihood of success. There was no guarantee that the Southwestern Willow Flycatchers would abandon the saltcedar in favor of artificially created "habitat."

Another management tool considered was managing the reservoir levels such that new riparian habitat is created at higher elevations without destroying existing occupied habitat. This option was eventually rejected due to a low probability of success because of the need to balance water needs for developing habitat with the need to avoid killing existing habitat or affecting reproductive attempts through prolonged inundation.

Fish and Wildlife issued its biological opinion on the project plans for the operation of the modified Roosevelt Dam in July 1996, and identified one Reasonable and Prudent Alternative (RPA) to "mitigate" the potential loss of this significant breeding population. This RPA contains the following components:

- Reclamation shall not permit long-term storage of water in the new conservation space until after September 1, 1996.
- Reclamation shall purchase, acquire, or otherwise arrange for

the acquisition and perpetual protection and management of appropriate replacement habitat for the Southwestern Willow Flycatcher. (An 800-acre parcel of land containing approximately 300 acres of streamside riparian habitat along the San Pedro River has been identified.

Reclamation is pursuing the acquisition of the land by a third party with a history of managing ecologically sensitive habitats.)

- Reclamation shall establish a Southwestern Willow Flycatcher management fund in the amount of \$1,250,000. This fund will support activities that promote the continued survival of the species while the long-term benefits of the other components of the RPA are being realized.
- Reclamation will staff a Southwestern Willow Flycatcher Conservation Coordinator to assist Fish and Wildlife in initiating recovery and conserva-

tion planning and to ensure that the components of this RPA are accomplished.

- Reclamation will initiate a research and monitoring program that will consist of studies to (1) monitor population size, nesting attempts, and productivity; (2) obtain demographic data suitable for modeling population dynamics; (3) obtain data on dispersal patterns and rates and patterns of immigration/emigration; (4) obtain and analyze genetic samples for comparison with other flycatcher programs range wide; and (5) monitor changes in habitat extent and vegetative species composition and structure in response to inundation.
- To help decrease incidences of nest abandonment due to cowbird parasitism and increase flycatcher fledgling productivity, Reclamation will implement a cowbird trapping program along the San Pedro River.

Reclamation and Fish and Wildlife are working cooperatively to ensure that the RPA is implemented in a timely and effective manner. During the 1996 breeding season, numerous birds at Roosevelt Lake were banded and nests monitored. As other programs are implemented and data begins to trickle in, we will learn more about the ecology of the Southwestern Willow Flycatcher and its habitat requirements. Sooner or later, however, resource managers will also have to address the complex issue of single species management within an ecosystem dominated by an exotic plant. Certainly, the scenario of managing and protecting saltcedar for an endangered species is distasteful and was not anticipated. Future discussions and debates promise to be both intellectually stimulating and lively!

## FYI....

Duncan Patten who was the first President of the Arizona Riparian Council, is an Emeritus Professor of Botany, and former Director of the Center for Environmental Studies at Arizona State University became President of the Society for Wetland Scientists at its 17th Annual Meeting in Kansas City, Missouri. The Society of Wetland Scientists has over 4,000 members from 37 countries and 12 Chapters in the United States and Canada. Its purpose is to promote the exchange of information related to wetlands and riparian systems through research, education, management, and publication of a scientific journal, *Wetlands*.

## THE COFFEE-MIGRATORY BIRD CONNECTION REVISITED

by Chuck Hunter, Southeast Coordinator for Partners in Flight

As the Southeast Coordinator for Partners in Flight, I am often asked about what actions the average American citizen can do to help conserve neotropical migrants and other birds. Partners in Flight is now maturing to the point of providing some reasonably effective management guidelines for land managers and recommendations to homeowners on how to develop bird-friendly backyard habitats. However, I have been at a loss about what to tell the average citizen interested in conserving the tropical habitats that support many neotropical migrants during our winters — until recently. Several interested folks, including myself, have through some investigation discovered American importers who specialize in what could be called “bird-friendly” coffees. First, a little background on the coffee-bird connection.

I had the opportunity recently to attend an Atlanta Audubon Society meeting where Dr. Russell Greenberg spoke on the coffee connection to migratory bird conservation. Dr. Greenberg is with the Smithsonian Institution's Migratory Bird Center (Center) and is world-renowned for his work with neotropical migrants and the habitats they depend upon in southern Mexico and Central America. Dr. Greenberg is also coauthor of an excellent book entitled *Bring Back the Birds* and a Center fact sheet entitled *Why Birds are Crazy for Coffee*. I learned from Dr. Greenberg's presentation about the historical economic ties this and other

developed countries have to coffee production and how land-use trends in tropical coffee-growing areas are changing rapidly from small family operations to more corporate-level coffee-growing plantations. This change is being fueled by the growing worldwide demand for coffee (at least, I know my demand for good coffee is ever growing), and also cacao products. Not unlike other predictable supply and demand responses to growing demands, the rush to provide short-term increases in coffee production has led to a very serious deterior-



ation of tropical environments.

Small, usually family owned, coffee farms support traditional strains of coffee that require extensive shade from usually, native trees. Although “shade coffee” farms are not the primary tropical rainforests we have so much concern about, shade coffee does provide important habitat for many neotropical migrants and a surprising number of neotropical resident birds that are otherwise lost from areas where more intensive agricultural practices are

the norm. The development of coffee strains tolerant of extensive exposure to the sun (“sun coffee”) a few decades ago perhaps led to short-term increases in profits for large coffee roasting companies. However, this conversion also results in rapidly increasing soil erosion, acidification, and higher toxicity of tropical soils and waters, as well as increasing exposure of both coffee workers and birds to dangerous chemicals. In addition, the removal of shade trees over coffee farms leads to reducing the suitability of coffee habitats in supporting most migrants and almost all forest-adapted resident tropical birds.

Well, how does all this background on changing coffee-growing trends relate to our desire for both a good cup of that “ole go-juice” in the morning and at the same time effect positive change in tropical environments? The bottom line: the chances are good that most of us when we make our consumer choices for coffee products for day-to-day home and work place consumption will opt for the cheaper products. Therefore, we place more and more pressure unknowingly on small family coffee growers to sell their lands to large landowners, who then convert shade-grown to sun-grown coffees, with the end result of fewer acres of available habitat for birds and, ultimately, more poverty and exposure to contaminants for people in affected areas.

There is some good news, however, for the environmentally minded coffee consumer. An

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**ABWA...Cont from page 5**

and review the first year of operation of the AWBA. The Study Commission will submit an interim report of its recommendations and analyses to the Legislature by November 1, 1997 and will submit a final report by November 1, 1998. The Commission will consist of the AWBA members, two ex-officio members and nine individuals appointed by the Director of Water Resources.

Director Pearson's appointments to the Study Commission represent municipal, industrial, agricultural, and Indian tribe interests along the Colorado and throughout central and southern Arizona.

Mary Ann Antone is an elected representative from the Sif Oidak District to the Tohono O'odham Tribal Council Legislative Branch. She is active in the negotiations for the implementation of the Southern Arizona Water Rights Settlement Act and in other land and water issues before the U.S. Congress.

Karen Barfoot is a water resources advisor to the City of Chandler. In this capacity she advises the City Manager, Mayor, and Council on water issues. She also supervises the implementation of Chandler's Water Conservation Plan.

Cynthia Chandley is an assistant counsel on water and environmental law to the Phelps Dodge Corporation. She has extensive experience in water rights litigation and environmental law and has practices in both the public and private sector.

Gary Hanson is the water resources director for the Colorado River Indian Tribes. He is an attorney with extensive experience in water resources planning.

Mark Myers operates a private consulting practice in Tucson. His work focuses on multiple purpose projects related to land use, natural resources, water policy, and environmental policy.

Paul Orme is a water and agricultural lawyer from Mayer.

He is active in the Cattle Growers' Association and is a member of the Arizona Water Protection Fund Commission.

Donald Pope is manager of the Yuma County Water Users' Association. He directs the activities related to administering, operating, and maintaining the Valley Division of the Yuma Project.

Lawrence Robertson has experience in water, energy, municipal, and public utility law. He is an attorney in private practice in Tucson.

John Sullivan is an associate general manager in the Water Group at the Salt River Project. He manages overall operations for the Salt River Valley Water Users' Association.

*For more information, please contact Tim Henley, Manager or Jimmy Jayne, Technical Administrator/AWBA at (602) 417-2442 or fax at (602) 417-2424.*

## **1996-97 ARIZONA WATER PROTECTION FUND REQUESTS DROP NEARLY 50%**

The application for the second funding cycle of the Arizona Water Protection Fund (AWPF) grant program came to a close on August 1, 1996. What a difference one year can make! Funding requests for this cycle totaled just over \$14.2 million compared to \$27.6 million for the 1995-96 cycle. This represents a decrease in funding requests of almost 50%. The current balance in the AWPF is approximately \$8.3 million.

Although the amount of funds requested dropped significantly, the number of grant applications submitted during the second funding cycle was close to the

number received during the last funding cycle. The number of grant applications dropped from 82 in 1995-96 to 70 in 1996-97. Tricia McCraw, AWPF Program Manager, indicated that interest in the grant program has remained fairly constant, but that the number of applicants seeking large (over \$1 million) grant funds had decreased.

Once again, most of the grant requests were in the Capital Projects, Water Acquisition, and Other category. Fifty-three applications were submitted in this category with funding requests totaling over \$13.2 million. Sixteen applications were received in the

Research and Data Collection category. Funding requests were approximately \$935,000. The maximum funding limit for this category is 5% of the total amount funded during this cycle. Only one application for \$30,000 was submitted in the Water Conservation category.

All applications are available for review by the public at any of the five Arizona Department of Water Resources offices. Public comments on any application were due by September 29, 1996. The AWPF Commission will select applicants to be funded on October 28, 1996.

**Coffee...Cont. from page 9**

increasing number of importers/ coffee roasting companies are specifically marketing organically grown shade coffees, from socially and environmentally responsible coffee growers. Roughly translated, these buyers are spending much extra time searching for the best coffee beans available from small family farms or cooperatives where probably the best bird habitat remains in coffee-growing areas. Several of these companies even cater their products specifically to those of us concerned about tropical bird conservation. Because of their efforts, the coffee products from these companies are, on average, more expensive than grocery store or even specialty coffee shop products.

The Rainforest Alliance is taking the lead in developing an "ECO-O.K." certification program for coffee, bananas, cacao, oranges, and other tropical products. The following is an excerpt from a recent American Birding Association newsletter, *Winging It* 8(5):2, regarding the establishment of criteria for ECO-O.K. coffee:

*In order to be declared ECO-O.K., coffee plantations must meet strict standards in eight areas: (1) conservation of forests and soils, (2) prevention of water pollution at coffee mills, (3) management of agrochemicals, (4) waste management, (5) biodiversity conservation, (6) mill management, (7) environmental education and training, and (8) compliance with employment, health, and environmental laws. In order to coordinate these activities, the Smithsonian Migratory Bird Center will convene the 1st*

*Sustainable Coffee Congress, on September 16-18, 1996.*

ECO-O.K. coffee is not yet available but several companies strides to set buying criteria and goals for gradually supporting the above standards. If change is to be effective we need to reward responsible companies that are working to maintain what is left of the coffee-migratory bird connection. In order for these companies to stay competitive in our free-market system, they need to know there is a viable market for their products and we need to vote with our feet and pocketbooks..

Below are the addresses and some selected marketing statements for coffee importers/roasters who have come to my attention so far. I am not endorsing any of these companies nor their products, but I encourage all of us to receive catalogs from these companies and shop wisely for the products we want. Make sure through written or verbal communication to let the companies you do order from know why you have decided to buy their product and that you are interested in how their company is addressing the Rainforest Alliance standards listed above.

Thanksgiving Coffee Company  
19100 South Harbor Dr.  
PO Box 1918  
Fort Bragg, CA 95437  
(800) 648-6491  
FAX: (707) 964-0351  
e-mail: tcc@mcn.org

*Not Just a Cup...But a Just Cup™*  
Has developed buying criteria for *Green Coffee Beyond Organic™* to meet environmental and social values to include conservation of migratory birds.

The Brown and Walker Co.  
PO Box 192, Hilltop House

Stevensville Road  
Underhill Center VT 05490  
(800) 769-2392

A bird (Brown Creeper) is used in their logo; working to expand their line of organic shade-grown coffees; 5% of their profits on all sold products goes to wildlife habitat conservation and assisting coffee workers in the tropics through well-known conservation groups.

Pueblo to People  
2105 Silber Rd, Suite 101-77  
Houston TX 77055  
(800) 843-5257  
(713) 956-1172  
FAX (713) 965-8443

*Our Coffee is Good for Coffee Workers, the Birds and You!*  
Repeats information from Smithsonian Migratory Bird Center.. Coffee from Equal Exchange. Other products include a wide selection of traditional crafts and food from Latin America. A nonprofit organization, they ask you use their regular phone line, if possible.

Green Mountain Coffee Roasters  
33 Coffee Lane  
Waterbury VT 05676  
(800) 223-6768  
(802) 244-5621  
FAX (802) 244-1395

Coffee sold all over New England and elsewhere; promote "stewardship" line of coffees; a percentage of profits go to well-known conservation groups working in the tropics; they work directly in support of health care and good working conditions on coffee-producing farms.

Equal Exchange  
101 Tosca Drive  
Stoughton MA 02072  
(617) 344-7227

Pay a financial premium to farmers who grow coffee without pesticides, using sustainable farming methods. Quote from Mexican coffee farmer, Sr. Cipriano Hernandez Rebollelo, "growing organically is a way of

protecting our health and protecting the land for our children. If we spray the crops, it will kill the birds, and if the birds die, there will be no more music in the mountains."

Starbuck Coffee Company  
2203 Airport Way South  
PO Box 34067  
Seattle WA 98124-1067  
(206) 447-1575

Has developed a *framework for a code of conduct*. This includes an environmental mission statement to understand environmental issues and share information, develop innovative and flexible solutions, among other items.

I would be interested in adding to this list as there are undoubtedly other importers/roasters who market environmentally friendly coffee products. In the meantime, imagine all state and federal employees working in wildlife, park, and other natural resource agencies willingly pooling their hard-earned dollars to buy bird-friendly coffees for themselves and visitors. What better outreach tool could there be than informing the public about the plight of neotropical migrants and what local land managers are doing on this side of the migration route to conserve these species, including setting an example in their choice of coffee products. Add to this scenario, the members of local Audubon chapters and other bird enthusiasts doing the same thing at home and in their workplace. Together we can truly make a positive difference in the conservation of birds in the neotropics and enjoy good coffee at the same time.

*Editor's Note: For further information, Dr. Greenberg recently coauthored an article in BioScience. Perfecto, I., R. A. Rice, R. Greenberg, and M. A. Van Der Voort. 1996. Shade coffee: a disappearing refuge for biodiversity. BioScience 46(8):598-608.*

## VOLUNTEER CORNER



Fall is fast approaching, in fact it's here! It's time to plan our annual spring technical meeting. If anyone would like to participate in planning and helping out at next spring's meeting, please contact one of the officers. Before we know it spring will be here!



The Tonto National Forest, Adopt-A-Shore, Arizona Clean and Beautiful, SRP, and Salt River Recreation are sponsoring a cleanup of the lower Salt River Recreation Area on Saturday October 12, 1996, from 9 AM to 1 PM. The sponsors will provide hot dogs and soft drinks and participants will receive 1997 tubing passes and be entered into a drawing for prizes. Please bring drinking water, rubber-soled shoes, sun screen and gloves. Let's get some Arizona Riparian Council members out there to help! We will have the Council display there as well. Please call Connie or Kelly at (602) 379-6446, Mesa Ranger District for further information and to volunteer.





## LEGAL ISSUES OF CONCERN

*Chris Vamos and David Nelson, Law Offices of Kane Jordan von Oppenfeld Bischoff & Biskind, P.L.C.*

### WILL ARIZONA'S RIPARIAN ENVIRONMENTS BE CHALLENGED BY THE NEW WATER BANKING ACT?

The Arizona Water Banking Act is the most recent attempt by Arizona to secure Colorado River water for Arizona's future. Arizona's long-standing concern with providing a secure water supply for its citizens goes back to the turn of the century, when the Colorado River Basin states — Arizona, California, Nevada, New Mexico, Colorado, Utah, and Wyoming — began to compete for secure water supplies to meeting their increasing demands. With its rapid development, California's need for water threatened neighboring states. Out of this concern grew the Colorado River Compact of 1923, the first meaningful document attempting to allocate Colorado River water. It took another 40 years and intense legal battles, however, before the United States Supreme Court ultimately decreed that the water could be allocated, giving each of the Basin states rights to the Colorado River.

The seven states making up the Colorado River Basin are currently divided into two basins, Upper and Lower, with each basin entitled annually to 7.5 million acre-feet. In addition, by treaty with the U.S. government, Mexico is entitled to 1.5 million acre-feet. This totals 16.5 million acre-feet from the Colorado, which historically flows at only 15.1 million acre-feet per year. Thus, the water wars begin.

While there has been no major crisis to date, mainly because the only state to use all of its allocation is California, the problem arises as one looks to the future. Arizona's entitlement is 2.8 million acre-feet, and currently an average of 700,000 acre-feet per year of its water allotment flows down the Colorado River unused. But a burgeoning economy and accompanying growth will consume Arizona's entire Colorado River water allotment by the year 2030.

The recent enactment of the Arizona Water Banking Act is an attempt by Arizona to secure its rights to its full entitlement of Colorado River water and provide a continued source of water when shortages develop. The Act establishes the Arizona Water Banking Authority, whose goal is to take Arizona's yearly unused water allotment in the near term, store the water in storage facilities in and around Arizona, and produce it in future years as Arizona's demand increases. The Authority also may contract with Nevada and California to allow these states to "store" or "bank" water in Arizona, with the right to withdraw "credits" and receive deliveries in the future.

The Water Banking Act creates some interesting riparian issues. Arizona will "bank" its surplus Colorado River water allotment by pumping the water through the Central Arizona

Project into storage facilities such as dry riverbeds and wells. Some storage facilities over the years may create wonderful riparian habitats. These habitats may be jeopardized when credits are cashed in and water is withdrawn. If endangered species make these areas home, a legal battle may ensue forestalling water withdrawal in years of drought when the credits are most likely to be utilized.

Another issue involves the identification and characterization of water storage facilities. Not unlike the Strategic Petroleum Reserve, which has lost millions of barrels of crude oil in the salt domes of Louisiana, some of Arizona's storage facilities could be short of their supply when they are called on for withdrawals.

In summary, Arizona's Water Banking Act promises significant scientific and legal challenges in the years ahead. If the storage facilities don't work as planned, riparian environments may be pitted against municipal demand, perhaps even more so than today. For further information on Arizona's Water Banking Act, contact Rolf von Oppenfeld or the authors at (602) 955-9200.



## NOTEWORTHY PUBLICATIONS

Ron Tiller

Busch, D.E. 1995. Effects of fire on southwestern riparian plant community structure. *The Southwestern Naturalist* 40(3):259-267.

The author utilized a compilation of fire records from the lower Colorado River floodplain to assess change in riparian community structure resulting from fire. During the 12-year period of evaluation, approximately 37% of the riparian vegetation in the study area burned. Fire extent was associated with the area of *Tamarix ramosissima* habitat burned, whereas fire affected disproportionately small areas formerly dominated by *Prosopis* spp. *Tamarix* and *Tessaria sericea* were dominant in post-fire riparian communities. *Tessaria* replaced riparian trees in response to fire in habitats dominated by *Populus fremontii*/*Salix gooddingii* and *Prosopis*. Species turnover was low over the post-fire periods evaluated, so the replacement of riparian forests by water- or salinity-stress-tolerant shrubs was considered to be long-lived.

Everitt, B.L. 1995. Hydrologic factors in regeneration of Fremont cottonwood along the Fremont River, Utah. Pages 197-208 in *Natural and Anthropogenic Influences in Fluvial Geomorphology*. American Geophysical Union. *Geophysical Monograph* 89.

The author examined regeneration of *Populus fremontii* along the middle portion of the Fremont River, Utah. Sampling of tree ages and analysis of streamflow

data showed that cottonwoods were of uniform age and represented the survival of a single cohort which established following a spring snowmelt flood in 1973. This spring flood was sufficiently large to cause channel scour and overbank deposition, and occurred during the floodplain construction phase of the geomorphic cycle on the Fremont River. This flood was followed by a season of high base flow, and several hydrographically quiet years. Reservoir operations in the upper Fremont River partially regulate snowmelt runoff in most years. However, in extraordinary years such as 1973, the reservoirs probably delay the flood peak rather than advance it, and contributed to the long tail of moderate summer flow which aided seedling survival.

Sala, A., S.D. Smith, and D.A. Devitt. 1996. Water use by *Tamarix ramosissima* and associated phreatophytes in a Mojave Desert floodplain. *Ecological Applications* (3):888-898.

The authors measured water use by the introduced shrub *Tamarix ramosissima* and three co-occurring, native phreatophytes in the lower Virgin River floodplain (southern Nevada) using the stem-heat-balance method. During the growing season, measurements were conducted on *Tamarix* in a closed, monospecific stand and in a mixed community with native species *Pluchea sericea*, *Prosopis pubescens*, and *Salix exigua*. Objectives of the study were (1) to determine whether leaf-area-based water use of *Tamarix* is higher than that of co-occurring native riparian

taxa, (2) to assess the role of *Tamarix* stand leaf area index (LAI, leaf area per unit ground area) on *Tamarix* water loss, and (3) to verify whether *Tamarix* is capable of using large amounts of water under the extreme evaporative demands that characterize arid environments. Leaf-area based sap flow rates were comparable in the four species despite large differences in individual leaf area and total water loss. Daily water use of *Tamarix* was sufficient to compensate for water loss at the leaf level, even during times of atmospheric water demand. Under conditions of high potential evapotranspiration (PET), maximum sap flow rates of *Tamarix* on a leaf-area basis were significantly higher at locations where *Tamarix* LAI was lower, indicating that highly transpiring *Tamarix* stands may reduce leaf-level evaporative demand. However, daily estimates of transpiration of dense *Tamarix* stands exceeded PET, which confirmed that mature *Tamarix* can lose very high quantities of water due to the maintenance of high leaf area. Results from this study and others demonstrate that, at least under moderate to high water tables, key variables controlling water use by riparian stands include structural characteristics such as LAI and density. The authors recommend that management practices aimed at conserving water should be geared towards avoiding the development of dense *Tamarix* thickets along arid water courses, particularly if it is confirmed that these tend to attain higher LAI than native riparian communities.

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 \$15. 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 January with the deadline for submittal of articles December 15, 1996. Please call or write with suggestions, publications for review, announcements or articles.

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## CALENDAR

**The Future of Arid Grasslands: Identifying Issues, Seeking Solutions, October 9-13, 1996.** Quality Inn, Tucson, Arizona. For more information contact, the Water Resources Research Center, University of Arizona by FAX 792-8158 or e-mail [bjt@ag.arizona.edu](mailto:bjt@ag.arizona.edu).

**Riparian Inventory Methods, October 22-23, 1996.** Red Rock State Park Education Center, Sedona, Arizona. Call Cindy at (602) 965-2490 or e-mail [Cindy.Zisner@asu.edu](mailto:Cindy.Zisner@asu.edu) for more information.

**A Multidisciplinary Conference: The Central Arizona Highlands, November 9, 1996.** For conference information contact, Deborah Young at (520) 445-6590 X3 and for registration information contact Richard Sims at (520) 445-3122.

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