

# The Arizona Riparian Council Newsletter

A Quarterly Publication of ARC

Volume 6, Number 1

Winter 1993

## Studies, Inventories and Advice - SB 1030 in Action

Remember the battles in the 1992 Legislature over HB 2404 and its inadequate substitute SB 1030? Now SB 1030 is law and three state agencies must conduct detailed inventories and assessments of the state's riparian resources so that future consideration of riparian protection programs would be based on "sound scientific and economic evidence." The three agencies involved are the Department of Water Resources (DWR), the Game and Fish Department (G&F) and the Department of Environmental Quality (DEQ). The purpose of the law, as stated is:

*"to identify and classify the riparian areas in this state based on functions and values to assess the impact of various activities on riparian areas and to assess alternative strategies in light of their environmental costs and benefits and their economic impacts on various classes of land-owners and land users and on this state."*

After much discussion, the following definition became part of the legislation. (Note that ephemeral streams are excluded.)

*"Riparian area means a geographically delineated area with distinct resource values, that is characterized by deep-rooted plant species that depend on having roots in the water table or its capillary zone and that occurs within or adjacent to a natural or intermittent stream channel or within or adjacent to a lake, pond or marsh bed maintained primarily by natural water sources. Riparian area does not include areas in or adjacent to ephemeral stream channels, artificially created stockponds, man-made storage reservoirs constructed primarily for conservation or regulatory storage, municipal and industrial ponds or man-made water transportation, distribution, off-stream*

*storage and collection systems."*

Following is a very brief description of the roles of the three agencies. All work is to be completed by fall of 1993.

**Arizona Game and Fish Department's Statewide Riparian Inventory and Mapping Project**  
*Ruth Valencia, Ecosystems Program Manager*  
*Nongame Branch*

The charge given to G&F is to develop a geographic approach to identification, classification and quantification of the state's riparian resources. Specifically, G&F must develop a riparian classification system and

-- See SB 1030 - page 10

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## President's Message

*Marty Jakle*

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The elections are now behind us and everyone is curious and anxious to see in what direction the new mix of elected officials will steer public policy. One of the most important issues to the ARC membership is the direction this new mix of politicians will take regarding environmental policy, specifically issues which will affect riparian management.

The battle lines regarding environmental policy are becoming more sharply drawn. During the recent campaign, President Bush painted people concerned about environmental issues with a broad brush by referring derisively to them as "the spotted owl crowd." In short, the waters are getting rougher on environmental issues.

These thoughts bring me to the point of this article: What should the role of the ARC be in trying to promote sound riparian stewardship? This is an issue which the officers of this organization have struggled with since it was formed six and a half years ago.

Should our organization take a leadership role in promoting riparian stewardship? Or should our role be to provide technical information on riparian systems to decision makers (land management officials, politicians and others) who formulate policy?

I believe we should do both - take an active role in promoting sound riparian stewardship and provide technical information on riparian management. We have tried to do this in the past.

The ARC fills a special niche among the many species of environmental / professional organizations. While some groups may base their actions too often on what is perceived to be "environmentally correct," the ARC's recommendations are based solely on the best scientific data available.

As an organization we neither unilaterally support nor oppose such actions as grazing, timber harvest, mining, and other land uses. Instead, our position on an issue is determined by sound science based on objective research; our positions on issues are "hard data driven."

I believe that in the future the ARC will tend to become more involved in riparian management issues, both as an activist and technical expert, as the debate over use and management of these areas intensifies. To be effective, we will need to maintain our professional credibility. This can only be done by using sound scientific data as our compass heading to guide this organization to its position on riparian issues.



**Erosion in Brawley Wash**  
Photo: Soil Conservation Service

# BRAWLEY WASH RENOVATION

Barbara Tellman  
University of Arizona

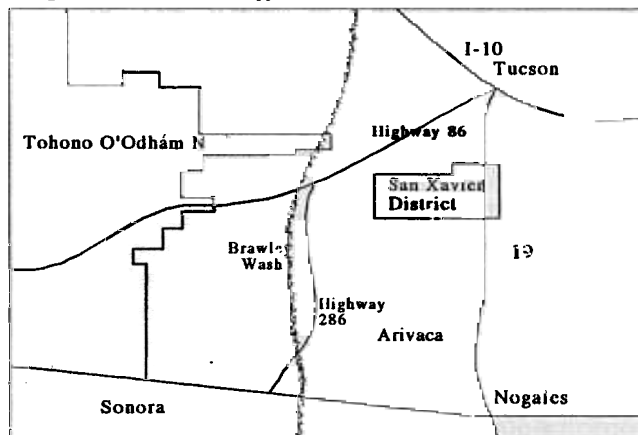
Brawley Wash runs north from Sonora, Mexico towards Marana, Arizona. (See map.) This area has been used for ranching for many years and 76% of the land use is rangeland. The watershed also includes the Buenos Aires National Wildlife Refuge to the southeast (17% of the land use). There are no perennial streams in the watershed.

Historically, the wash was a shallow, wide stream with large stands of sacaton grass reaching far into the surrounding area. According to ranchers' accounts, riparian trees were not common in the historic period. For many reasons, including historic overgrazing of the wash and its tributaries, severe erosion has developed. The channel is now deeply incised. Soil Conservation Service (SCS) estimates that about 532 acre-feet of sediment are transported north of Highway 86 annually, due to this erosion. Where prior to 1900 floods were unknown, the incised channel now sends floodwaters as far downstream as Marana. Gullying extends into tributary washes.

Now that this erosion/flooding process has begun, each year the wash degrades further leading to less recharge in the area, damage to roads and less and less riparian vegetation. The introduction of exotic grass species has also helped eliminate the historic vegetation

community. SCS believes that the start of the large scale change from grasslands to shrublands began in the 1920's. Several species toxic to cattle had moved far down in the watershed by the 1940's, as forage species were slowly removed by cattle.

To stop this degradation and restore the wash to something close to its former



condition, SCS and the Natural Resource Conservation District (NRCD) have issued a report recommending that a demonstration grade control structure be built and that vegetative management practices be implemented. The structure would detain waters, allowing them to drop their sediment, gradually filling the channel. Benefits include better recharge in the area, less erosion and development of alluvial soil on which vegetation can become re-established. If the initial structure succeeds, several more structures are proposed. Similar structures in the San Simon Valley near Safford have proven to be highly effective in rebuilding a degraded channel. Lush grass now thrives here in a once highly eroded wash.

SCS and the NRCD recognize that a structure alone won't solve the problem. They also propose grazing management practices,

including fencing off areas along the wash and revegetation efforts. There has been some debate regarding the use of exotic grasses vs. native grasses.

If this project is implemented, monitoring of the results will offer many opportunities to study renovation of a watercourse. Studies will be needed regarding re-establishment of vegetation and wildlife, as a basis for determining the value of this approach for other degraded washes. Although this report was developed with the active involvement of all concerned parties (ranchers,

State Land Department, U.S. Fish and Wildlife Service and many others) and has widespread support, its implementation is far from certain. The estimated cost is about \$1,000,000 and there are no certain sources of funding. A project of this size does not fit SCS funding criteria. Innovative funding approaches are being studied, including contributions of expertise from various agencies and in-kind contributions from landowners. SCS has offered almost a quarter million dollars worth of staff time and expertise. Researchers interested in developing projects in the area could also make in-kind contributions to assure proper monitoring and follow-through.

For more information or a copy of the plan, contact SCS at 640-2549.

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## Riparian Recovery Stalled

Jeff Burgess

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Apache-Sitgreaves National Forest (ASNF) Supervisor John Bedell has one last opportunity to stop cattle from ruining the trout streams in Arizona's White Mountains.

There are over 650 miles of perennial streams in the White Mountains with the greatest concentration of cold running water in the state and the only place with threatened Apache trout. However, none of the streams are rated in excellent condition and 72% in unsatisfactory condition, primarily due to poor livestock management.

A recent study found White Mountain Apache Indian Reservation streams supported an average of 3.5 times the trout biomass of the forest's streams.

Nevertheless, ASNF claimed in its 1987 land management plan that grazing had no adverse effects on trout streams.

Appeals by the Arizona Game & Fish (G&F) Department and environmental groups forced the forest to amend the plan in 1989. ASNF promised that by 1992 they would implement better management on allotments identified as home to threatened or endangered species.

Most of the sensitive species rely on riparian habitat and the identified areas encompass 31 Apache trout streams.

ASNF also agreed to identify 10 high priority allotments and implement better grazing management on them by 1990. They

actually increased the number to 11. But the Mountain States Legal Foundation appealed on behalf of the Arizona Cattle Growers' Association.

ASNF has not issued a formal decision to revise the amendment, but they have implemented improved grazing management on only 4 of the 11. One of those was practically completed before the amendment was issued and the other three did not belong on the high priority list in the first place.

The Alpine Ranger District administers four of the remaining high priority allotments. District Ranger Dean Berkey began implementation of improved management on the forest's highest priority allotment, the West Fork, in 1989. He presented a new management plan in July 1991.

But he was forced to withdraw it because he'd failed to consult with the U.S. Fish & Wildlife Service (USFWS) concerning the plan's effects on the Apache trout. Only recently did he ask for a USFWS opinion. Implementation of new management on the three other high priority allotments has yet to begin.

In the meantime, the situation on the ground hasn't improved.

This led the National Wildlife Federation (NWF) to file an appeal against the issuance of the annual operating permits for the district's allotments still awaiting revision. The appeal asked Bedell to keep cattle off the allotments until they had new management plans.

"We're trying to make the point that no decision on is actually a decision to con-

tinue the status quo," NWF's Beth Wendel said.

ASNF recently denied the appeal on the grounds that issuance of a permit is not appealable. That left NWF with few options other than court.

ASNF's last three high priority allotments are administered by Springerville District Ranger Charles Denton. Last fall he asked G&F for state wildlife funds to implement a project dubbed the *White Mountain Grazing Complex*.

Denton proposed to use the money to pay a rancher, state legislator Jack Brown, to give up his grazing permit so the allotment could be retired. The territory would have been divided into portions which would have been added to surrounding allotments resulting in about 900 fewer head of cattle in the region.

Denton admitted grazing permits aren't owned by ranchers and he has the legal authority to reduce livestock numbers or revoke a grazing permit for good cause at any time without compensation.

"But if we have to go that way it'll take many years because there will be appeals," he said.

The funds Denton was pursuing would have come from the Heritage Fund.

The Arizona Attorney General's Office put an end to that plan last winter when it ruled the proposed payment to Brown would be an illegal gift of state funds. They explained the state would get nothing for its money but a promise from Brown to voluntarily relinquish his grazing permit. The G&F Commission

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responded by instructing the department to find a legal way to use state wildlife funds to help remedy the situation.

This summer G&F decided to circumvent the forest's stalled range management program by applying to the forest for special use permits to build fences to exclude cattle from stream reaches with critical trout habitat.

Forced to take action, Bedell recently made a commitment to Apache trout habitat recovery. He said he would name a team of wildlife experts to identify alternatives for improving stream habitat and promised the proposal would be ready in late 1993. He declared it a wildlife

project to be implemented separately from range management.

"Fencing off the streams isn't necessarily the objective but I'm sure it'll be included in the alternatives," Wildlife Manager Michael Rising said.

Regional G&F Supervisor Norris Dodd warns that certain conditions will have to be met before state wildlife funds are made available.

"We would want to buy total protection for the most critical stream reaches, not riparian pastures," he said.

Dodd pointed out riparian areas comprise less than 1% of the forest so excluding them from grazing would not jeopardize the local livestock

industry. Rising says tapping into the state's wildlife funds is not the forest's goal. "But it might be a mechanism in the end," he admitted.

Wendel says NWF is concerned about whether the project is the best way to work toward Apache trout habitat recovery.

"His team is not going to consider stocking levels or how changing grazing practices in the riparian areas will effect the uplands," she said.

NWF and G&F officials have made it clear they are nearly out of patience.



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## Heritage Funds in Action

Passage of the Heritage Initiative was a major victory two years ago and survived attacks in the legislature. The money is now at work in a many ways throughout the state. State Parks (SP) and Game and Fish (G&F) each have \$20 million to spend annually on environmental study and protection, and as recreational facilities. As we face another legislative session, it will be helpful to be aware of what we have gotten for our money. The agencies have approached their task differently, with SP depending more on grants and G&F doing more work in-house.

As you can see from the lead article in this newsletter, G&F will use a portion of that money for riparian inventories. Listed below are some of the other water-related uses made of last year's funds, out of a total of approximately \$1,230,000 in 65 grants, of which approximately 36% were related to lakes, wetlands and riparian areas.

1. Barrier-free fishing facilities at Pinetop-Lakeside, Mittry Lake and Kaibab Lake;
2. Wildlife studies and bird counts at Sierra Vista, Tucson and the Verde River;
3. Urban riparian wildlife projects in Tucson, Carefree and Flagstaff;
4. Species studies of mud turtles, Apache trout, ranid frogs, Arizona water shrew, and

three species of amphibians;

5. Educational materials on topics such as "Incorporating Wildlife into Tucson's River Parkways;" and

6. Wetland development in Flagstaff.

SP distributed almost \$6 million dollars in Heritage grants for the 1991-92 fiscal year. Of this amount \$595,500 (about 10%) went to projects directly associated with riparian areas.

The largest riparian-related State Parks grant went to Santa Cruz County for development of the Guevavi Ranch Preserve on the banks of the Santa Cruz River (\$342,500). Other grants were to Clarkdale for the Rio Verde Park; to Cottonwood for a Riverfront Regional Park and to State Parks for Slide Rock Park Facilities.

Thirteen environmental education grants were awarded for a total of almost \$120,000. Friends of the San Pedro River received funds for docent training; Sabino Canyon Volunteer Naturalists has funds for activity packets and Prescott College will do a riparian forum and curriculum.

Heritage money was also used to acquire land along the Verde River near Cottonwood. All these achievements and many more make clear how valuable that funding source is and how important it is for it to be preserved in the face of anticipated budget battles in the legislature.

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## Ecosystem profile:

Julie Stromberg,  
Arizona State University

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### Southern Arizona Cienegas

**Description.** "Cienega" is a Spanish term for marshland derived from a rootword meaning "100 waters." The term is applied to a variety of freshwater wetlands throughout the Southwest. These range from marshes at the headwaters of high-elevation mountain streams surrounded by Rocky Mountain conifer forest, to those associated with backwaters of Arizona's low-elevation desert rivers, vegetated by stands of tall "graminoids" (grass-like plants) including cattail (*Typha* spp.), bulrush (*Scirpus* spp.), and reed (*Phragmites* spp.). A third type is the riverine marshland found within mid-elevation zones of southern Arizona's desert grassland biome.

Cienegas are characterized by specific types of landforms, hydrology, vegetation, and soils. They occur in wide, gently sloping river valleys in areas where groundwater intersects the surface, forming perennial waters bordered by drier margins with intermittently saturated soils. Such sites occur at spring-fed headwaters of streams (e.g., Canelo Hills Cienega) and also farther downstream in the floodplains of lower river reaches (e.g., portions of Cienega Creek). Cienega vegetation often occurs in zones or bands that reflect gradients of water availability. Areas with saturated

soil or shallow water are vegetated mainly by low-statured members of the rush and sedge families including rush (*Juncus*), sedge (*Carex*), flat sedge (*Cyperus*), and spike rush (*Eleocharis*). Many grasses and forbs (e.g., *Berula erecta*, *Bidens laevis*, *Lobelia cardinalis*) also are present. Most plants in these zones are "emergent macrophytes" that have roots anchored in subsurface sediments and upper stems and leaves above the water level. Deeper waters support floating and submergent aquatic vegetation such as duckweed (*Lemna*), pondweed (*Potamogeton*), and water pennyroyal (*Hydrocotyle*).

A wide variety of riparian herbs grow at the margins of cienegas including many that depend on subsurface water tables (e.g., *Sporobolus wrightii*, *Distichlis spicata*). Hydrophytic shrubs and trees often grow at the periphery or interior of the cienegas. Cienega soils usually consist of deep layers of sponge-like organic peats and fine-textured silts. These soils build over time as the productive cienega vegetation annually grows and decomposes, and as silts are trapped during occasional flood flows. Organic deposits can be several meters deep, as seen in eroded streambanks downstream from Babocomari Cienega and others.

**Historical abundance.** Cienegas historically were abundant in southern Arizona. For example, ten cienegas occurred along the San Simon River and its tributaries including the San

Simon Cienega at the NM-AZ boundary. This was a watering stop for military surveyors and was described as flowing through braided channels between low or nonexistent marshy banks. The upper San Pedro River 100 years ago also was unincised and marshy over much of its length, with an abundance of beaver dams, "boggy banks", and marsh vegetation. Centuries of human impacts including farming, grazing, and trapping of beavers have taken their toll on cienegas. Babocomari Cienega, for example, was the site of a Spanish *visita* in the 1600s and 1700s, a military camp in late 1800s, and has been periodically overgrazed by sheep and cattle since the 1500s.

Arroyo cutting in Southwest rivers during 1890 to 1915 resulted in loss of much cienega vegetation. A variety of factors interacted to cause this regional conversion of shallow-banked rivers with high water tables to downcut rivers with deep water tables, including overgrazing by cattle during the 1890s drought which left the riverine systems susceptible to erosion from large floods. Construction of dikes and wagon roads also reduced stream flow and accelerated erosion at about this same time. At the San Simon Cienega, for example, erosion and channel entrenchment after 1885 caused water levels to drop and prevented the area from sustaining a permanent marsh. An artificially maintained cienega persists there and is now the only one in the watershed. Only about a

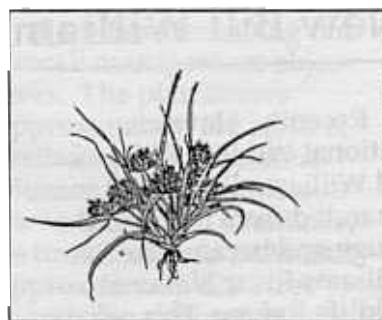
dozen small cienegas persist in southern Arizona, mostly at sites that have been somewhat protected from past hydrologic impacts, notably headwater streams stabilized by check dams (that is, Arivaca Cienega).

**Riparian forests.** Today and historically, cienegas co-occurred with riparian forests, a vegetation type that also has undergone regional decline. For example, Sonoita Creek historically had abundant marshy areas and rampant malaria but also supported giant cottonwoods with trunk diameters up to 2.7 m. Cienega Creek in the 1800s also had an abundance of large cottonwood trees as well as marsh vegetation. The San Pedro River historically had shallow braided channels flowing through lush riparian marshlands as well as through riparian forests cottonwood and willow. Relative abundance of marsh vs. riparian forest may have differed between high gradient, erosional reaches that typically alternated with lower gradient, aggrading reaches, but precise historical abundance of the two vegetation types is difficult to determine. Many turn-of-the-century photographs of southern Arizona rivers show treeless floodplains at sites that today are forested by cottonwoods, and some have taken this as evidence that cottonwood forests have invaded historical marshlands. However, this evidence is suspect because many of these photographs were taken after a period of major riparian impacts, e.g., at a time when wooded areas

were intensively harvested for fuelwood and when cattle were so abundant they had to browse on woody vegetation. One must go far back in time to document "natural" abundances of riparian and wetland vegetation types. According to historical accounts, the Rio Grande River in 1812 had "luxurious groves" of "beautiful forests" and "infinite herds" of cattle. By 1839, cottonwoods were sparse along the river banks, and tributaries were "now nearly bare... their inhabitants ... forced to resort to the distant mountains for most of their fuel."

**Restoration.** Cienega pools and marshes provide refuge for many types of waterfowl including the Mexican duck, (*Anas diazi*) and for endangered and threatened species of fish including Sonoran topminnow (*Poeciliopsis occidentalis*) and several types of chub (*Gila* spp.). Cienegas also provide habitat for many rare and endangered wetland plant species. They are hydrologically important because their vegetated surface moderates peak flows, while their sponge-like soil stores water and increases base flows during drought periods. For these reasons and many more, protection and restoration of cienegas is imperative.

Several projects in recent years have focused on riparian forest restoration but the same is not true for cienega restoration. Some former cienega sites are recovering naturally from past down-cutting. The San Pedro River, for example, is becoming less entrenched and is



widening its floodplains, aided in part by the presence of cottonwood trees and other plants that help to stabilize banks, increase bank storage of water, and spread flood flows laterally.

Palynological studies testify to the long-term (>5,000 yr) historical persistence of cienegas, as well as to their ability to reform after periodic episodes of erosion.

We can do a variety of things to accelerate the recovery process, paramount of which is recharging aquifers, perhaps with effluent) to raise the water tables. We can protect cienega soils from the effects of overgrazing, and can improve cienega habitat by constructing non-regulating check dams and reintroducing beavers, whose dams can locally raise water tables and increase lateral water flow. Old bridges that confine the channel can be replaced with new structures that allow for greater lateral spread of floodwaters. We can experimentally attempt to create new cienegas, for example, by transplanting seed banks from donor marshes. An important step in the healing process that we all can undertake is to increase our awareness and appreciation of these regionally significant wetland types.

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## New Bill Williams National Wildlife Refuge

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Recently, Havasu National Wildlife Refuge's Bill Williams River Unit was separated from its parent refuge and became the Bill Williams River National Wildlife Refuge. This refuge is one of over 470 national wildlife refuges managed by the Department of Interior's U. S. Fish and Wildlife Service. The new refuge is located halfway between Parker and Lake Havasu City, Arizona, along Highway 95. It includes the marshy delta area of the Bill Williams River, at the confluence with the Colorado River, and a 9-mile corridor along the river encompassing about 6,000 acres of desert riparian and upland habitat.

The refuge will preserve, protect and enhance some of

the last remaining riparian habitat in the Lower Colorado River Valley. Protection and enhancement of habitat for neotropical migrant and resident bird species, as well as the many other species that use the cottonwood-willow habitat along the river, are management priorities.

The refuge faces many of the same problems that other riparian corridors in the Southwest face. Altered water flows have created conditions that favor the invasion of non-native saltcedar (*Tamarix chinensis*) at the expense of native vegetation. Although some bird species will use saltcedar in the Lower Colorado River Valley, the majority prefer cottonwood and willow trees

for nesting and escaping the extreme summer heat. Saltcedar is present on the refuge, but it is not yet the dominant vegetation type, and management hopes its invasion will be controlled and further reduced.

In the past few years, cottonwood poles have been planted on the Refuge in efforts to restore vegetation lost in recent fires. This year, more poles will be planted and restoration efforts will continue. Volunteers are needed to help with this project. Interested persons should contact the Refuge Manager or the Refuge Biologist, Barbara Raulston, at 60911 Hwy. 95, Parker, AZ 85344 or call (602) 667-4144.

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## Arizona Rivers Assessment Near Completion

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The past several years have seen riparian issues come to the forefront of public and political awareness in Arizona, as reflected in the legislation described on page one of this newsletter. Arizona State Parks has also been involved and since 1989 has been part of a project that is the first of its kind in the Southwest - the Arizona Rivers Assessment.

The assessment is a statewide comprehensive inventory and evaluation of river and riparian-related resource information, which is being coordinated and staffed by the Streams and Wetlands Program of Arizona State Parks and the Rivers, Trails, and Conservation Assistance Program of the National Park Service. Its purposes are the determination of the relative significance of each river segment based on all its environmental values, and the compilation of data to support this determination. The goal of the project is to provide a tool that can be used by resource management agencies, organizations

and decision-makers to plan for the future of Arizona's rivers and riparian heritage and to balance the needs for resource conservation and economic development.

From the start, the Assessment was set up as a cooperative, multi-group effort, involving local, state and federal agencies, tribes, organizations and individuals who own or manage rivers and riparian areas, have responsibility for those areas or who have information about them.

Approximately 1,500 stream segments have been identified for assessment, along with criteria for inventory and classification. The assessment is essentially done and the final report should be available in the spring of 1993.

Contact State Parks for more information.

*From an article by Pam Hyde for State Parks*



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## Cook's Lake Update

*Diane Laush, Bureau of Reclamation*

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Progress is being made on Bureau of Land Management (BLM) acquisition of Cook's Lake for protection purposes. Negotiations with two of the three land owners have been finalized and the land purchased. Hopefully, negotiations will be finalized with the last landowner soon. Meanwhile, the Interagency Management Team is alive and well and still working on completing the management plan. I am expecting a final document by

February 1993. The management plan will be written in two phases. Phase I will involve completion of all special conditions described within the Section 404 permit. Phase II will deal with the long-term management considerations. The basic plan will be written with enough flexibility to allow for ease of management later. In other words, when BLM takes over management of the site (in about five years), they will need the flexibility to manage a dynamic ecosystem. Management strategies considered sound today, may need to be altered in the future. Because of this need, we prepared a

final update describing our overall management objectives. The plan covers approximately 150 acres of wetland and buffer areas (Bureau of Reclamation-owned) that will eventually be turned over to BLM and approximately 129 acres of soon-to-be-restored mesquite bosque (ASARCO-owned) that may be turned over to The Nature Conservancy (TNC).

TNC is tentatively planning a field trip to the site in April 1993 to be co-led by myself and Tom Collazo. Anyone interested in attending should look for the information in the upcoming TNC newsletter or contact me directly at 870-6763.

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## VOLUNTEER MONITORING PROGRAM UNDERWAY

*Sherry Sass, Friends of the Santa Cruz River (FOSCR)*

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A question that often comes up in discussions about the Upper Santa Cruz River is "How clean is it?" Manpower constraints limit the amount of sampling DEQ can do, so knowledge about water quality is rudimentary. But by 1993, with the help of several government agencies, FOSCR volunteers will gather the necessary information to answer this vital question more definitively. (See the autumn 1992 issue of this newsletter for background.) Many other states, especially in the East, have already developed volunteer-based water quality monitoring programs, but this will be a first for Arizona. Monthly sampling and volunteer training have begun.

The study will serve several purposes. For DEQ, it will provide much-needed data on the biological and chemical components of an effluent-dominated stream, so future decisions on water quality standards will have a better scientific foundation. The study will provide solid baseline information and will educate local residents about the river in their backyards, as well as indicate if pollution problems are currently impacting the river, and if they are, where problems appear along the watercourse. The State Parks Board (SPB) views the study as the first pilot project for its



natural resources site stewardship program" which may be a model for use throughout Arizona. Four sites have been selected for the study: three downstream of the wastewater treatment plant and one upstream, on a rare natural perennial stretch. Measurements include chemical/physical data, information on nutrients and toxins, fecal coliform counts, and streamflow. The aquatic insect community will also be sampled, giving a good integrated measure of the ability of the water to support life. Photo stations will record changes in the riparian vegetation and stream bed configuration, and vegetative transects may become an additional source of information beginning in spring 1993.

This study could not have been possible without an unprecedented amount of cooperation among SPB, DEQ, the Santa Cruz County Health Department, the International Boundary and Water Commission and the City of Nogales. FOSCR is proud to be working with all these committed professionals towards gaining a better understanding of our river and its riparian environment.

For more information call Lin Lawson (DEQ - 626-5321) or Sherry Sass (398-9093).

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SB 1030 - from page 1 and subsequently, develop a hierarchical designation system based on relative functions and values of the system.

In addition, G&F is directed to map riparian vegetation in the state, giving priority to areas associated with perennial waters, along with identification of the general land ownership and current land uses of those areas

The project will be conducted under a phased approach because of the monumental scope of the undertaking. The first year of the inventory will be directed toward classifying and mapping vegetation associated with perennial stream segments. The results of the process will meet the requirements of the legislation as well as provide the agency with a basis for surveying and studying other sensitive ecosystems in the state.

The project will develop:

1. a methodology for classifying wildlife functions and values associated with riparian areas;
2. a statewide GIS database of riparian vegetation associated with perennial waters along with general information on ownership and land use, that can be expanded to include riparian vegetation along intermittent and ephemeral waters; and
3. a queryable information system that can respond with data about the dominant vegetation type, structural composition and habitat condition. Products will include a map of riparian areas associated with perennial waters classified

by vegetation type and wildlife habitat functions along with a summary of findings.

The project will be accomplished by G&F staff and outside consulting services. The Arizona Cooperative Fish and Wildlife Research Unit at the University of Arizona will perform the actual mapping component. A digital image classification procedure using LANDSAT Thematic Mapper imagery, topographic data and low altitude airborne videography will be used. G&F biologists will assist in the process by ground-truthing representative sample points of vegetation identified from the aerial videography images. Additional data will be collected at each site to assist in determining the quality and condition of wildlife habitat in that area. Our goal for the first year is to visit approximately 200 sites. (Each site is about 0.5 to 0.75 miles in length, roughly corresponding to a single frame of videography. The number of sampling points established at a site is determined by the extent of riparian vegetation and the heterogeneity of that vegetation.)

The legislation requires G&F to coordinate and consult with other local, state and federal agencies. Many riparian inventories have been completed by various agencies across the state using a variety of methods. Although the data collected in each case may not be directly applicable to our mapping methodology, these inventories may contain information that will assist us in making determinations about the quality and condition of wildlife

habitat along a river corridor. This winter, we will be conducting a series of regional coordination meetings with federal, state and county agency representatives to coordinate efforts. A technical group composed of non-agency scientists will also be formed to provide constructive review and comment on methodology. The task is massive, the timeframe is short, but our commitment is strong. It is our goal to complete the riparian vegetation map in the first year to serve as a basis for continued inventory, research and monitoring to enhance our understanding and management of these important ecosystems.

Although the legislation provided no specific funding to G&F for these tasks, the activities have been incorporated into a Heritage funded program. The Inventory and Monitoring Fund provides the mechanism to carry out the mission with respect to wildlife habitat conservation, restoration and enhancement.

#### **The Department of Environmental Quality Component**

*Kris Randall, DEQ,  
Head, Hydrologic Habitat  
Modification Program*

SB 1030 requires DEQ to identify and evaluate at least 12 activities that occur in riparian areas. These include sand and gravel operations, timber harvesting, agricultural land clearing, wetland drainage, and road and bridge construction.

DEQ will use water quality data contained in water year assessment reports (305(b) and 205(j))

that the agency provides annually to the Environmental Protection Agency. Also, the database compiled by State Parks in their Arizona Rivers Assessment will be utilized. Journal articles that evaluate the effects these activities may have will be utilized to the extent practicable.

The Legislature appropriated no funds for this work. The work will all be done by existing ADEQ staff within the Hydrologic Habitat Modification Program. For information, call Kris at 207-4510.

### **The Role of the Department of Water Resources**

*Greg Bushner, Supervisory Hydrologist & Project Manager*

DWR's role is to evaluate the hydrologic effects of groundwater pumping and surface water appropriations on riparian areas. DWR will also develop recommendations for alternative regulatory program designed to balance the protection of riparian areas with existing and future groundwater pumping and new surface water diversions or changes in point of diversion.

Because of the short time-frame (about a year) allowed for this study, DWR has chosen three case study areas for rather detailed investigations, rather than attempt to study the entire state.

The three areas will be:

1. the Upper San Pedro, where quite a bit of information is already available and which includes a protected area;

2. the Upper Santa Cruz River which runs the gamut from lush effluent-dominated areas to badly eroded areas nearly devoid of vegetation; and

3. the Verde Valley, which includes protected areas and areas experiencing pressures.

All of these areas are in larger watersheds in alluvial basins where development pressures are expected to continue or increase. The studies will look at the present status of the area, projected future conditions, climatological factors, the hydrologic cycle as well as biological studies. The biological studies will look at indicator species, needs of riparian communities and what the necessary water flow regimes should be.

While DWR intends to fully utilize past studies, the intent is not to rehash previous work, but to develop useful new information as a basis for legislation.

The Legislature appropriated \$250,000 for this

study. Some of the work will be contracted out to other entities, such as the Center for Environmental Studies at ASU. For information, contact Greg Bushner at 542-1586.

### **Riparian Advisory Committee**

The Governor has appointed a 34-member Advisory Committee as set forth in the legislation. The committee is required to have a specific makeup intended to represent elements of the community concerned about riparian management. ARC members appointed are Marty Jakle, Eva Patten, Julie Stromberg, Anita MacFarlane, and Barbara Tellman. The first meeting was held on Dec. 17 at DEQ. in Phoenix.

## **News Briefs**

**Wild and Scenic Rivers Meetings** The Arizona Congressional delegation will hold a series of meetings in Arizona on the Wild and Scenic Rivers Act to educate the public on the Act.

Meetings are scheduled in Payson on January 9, Phoenix on January 14, and Tucson sometime in February. For information about times and locations or about American Rivers' revised Arizona Wild and Scenic Rivers Proposal, call American Rivers at (602) 264-1823. The Sierra Club and all Congressional Offices will also have details about the meetings.

**The Society of Wetlands Scientists** is reactivating the Western Chapter. An organizational meeting was held in Davis CA in October where, among other things, an Annual Meeting was planned. That meeting will be held in Davis on March 25-27. Contact Leslie Gecy at (916) 852-1300 for information and to receive mailings.

**A Verde River Watershed Conference** will be held January 16 in Prescott to discuss development of the Verde Watershed Association, begin development of a management plan, select a board and other matters. This is a followup to the successful conference held last spring and described in a recent issues of this newsletter. For information, contact the Cocopai RC&D, 1633 S. Plaza Way, Flagstaff AZ 86001. \$40 fee.

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## Project Profiles

*Julie Stromberg, Section Editor*

### U of A Groundwater-surface water Interaction Studies

Interaction of groundwater flow and surface stream flow is the research focus of Dr. Thomas Maddock III and his students in the Department of Hydrology and Water Resources at the University of Arizona. Modelling projects are providing information on how management of groundwater resources may affect surface stream flows in the San Pedro River and the Bill Williams River, affecting the viability and potential for restoration of riparian areas.

The Cochise County Flood Control District funded Vionnet and Maddock (1992) to update a model of groundwater flow and surface-groundwater interaction in the San Pedro basin from the Mexican Border to Fairbank, AZ, using the USGS modeling program, MODFLOW. The area includes nearly all the San Pedro Riparian National Conservation Area (SPRNCA). The original model was developed by Freethy (1982) to study groundwater depletions near Sierra Vista and was later used by DWR (1991) in its evaluation of water resources for the General Adjudication of the Gila River System. The revised model more accurately represents the alluvial aquifer and the interaction of surface flows in the San Pedro and Babocomari rivers with the multi-aquifer groundwater flow system. The model shows how groundwater pumping from the basin fill aquifer may affect hydrologic conditions in the alluvial aquifer and in the

rivers. Simulation results indicate that pumping from the basin fill aquifer is beginning to intercept groundwater flow to the alluvial aquifer; and that, for the next few decades, hydrologic conditions in the alluvial aquifer will minimize the effects of this pumping on surface water flows. Eventually, however, pumping from the basin fill aquifer will capture significant quantities of water from the surface flows and reduce water tables in the alluvial aquifer, as does irrigation pumping from the alluvial aquifer already. Such changes are likely to have adverse impacts on the viability of aquatic and riparian biota.

Braun et al. (1992) developed a spreadsheet-based model of the water budget and water management systems of the upper San Pedro basin from the Mexican Border to the Narrows, also funded by Cochise County Flood Control District. The model includes a simple algorithm for estimating the cumulative effects of simulated changes in surface water flows on the viability of riparian vegetation. Twenty-year projections based on present water management policies, average climatic conditions, present economic conditions, and present rates of population growth indicate that declines in annual surface flows are likely in both the Sierra Vista and Benson sub-basins, indirect consequences of pumping from the basin fill aquifer. Reductions in agricultural pumping from the alluvial aquifer will have the greatest benefit to surface flows and riparian vegetation acreage. In the long run, pumping from the basin fill aquifer will have an increas-

ingly strong impact on alluvial aquifer and surface flows, and on riparian vegetation.

Other studies have a goal of expanding the groundwater-surface flow interaction models to encompass the entire San Pedro basin. A model for the middle San Pedro basin is being developed by D. Braun and P. Jahnke, again using MODFLOW. A similar model for the lower San Pedro basin is being developed by W. Cooley (DWR). The middle San Pedro model includes the northern end of the SPRNCA the perennial reaches of the San Pedro River near Cascabel, and the lower perennial reaches of other tributaries nearby. The model will provide a detailed examination of surface flow-groundwater flow interactions. It is being prepared under contract with The Nature Conservancy to help evaluate threats and restoration potential for riparian and aquatic habitats.

An integrated water budget model for the Bill Williams Wildlife Refuge is being developed by L. Vionnet and C. Harshman, funded by the U.S. Fish and Wildlife Service. Emphasis is on the stream-aquifer interaction process and how present human activities can affect the refuge ecosystem. Integrated models also will be constructed for other refuges on the Colorado River in Arizona. The integrated models combine a surface-water model and a ground-water model, and are developed on a desktop computer with PC/AT architecture equipped with two state-of-the-art RISC processors, the Intel i860. GIS is used for processing.

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## Conferences and Meetings

**Ecological Society of  
America Annual Meeting,  
August, 1992 in Hawaii.**  
*Julie Stromberg*

The meeting theme was "Voyageurs" and many talks focused on invasions by non-native species. Jackson described how salinity of Colorado River floodplain soils has increased because flood flows no longer flush salts accumulated from agricultural runoff. These factors have contributed to the increased abundance of the exotic, salt-tolerant *Tamarix chinensis* (salt-cedar), while reducing abundance of less salt-tolerant natives such as *Populus fremontii* (Fremont cottonwood) and *Salix gooddingii* (Goodding willow). Smith and Busch also focused on *T. chinensis* and discussed ecophysiological attributes that allow it to survive in drier, salty floodplain soils. They also described how the invasion of this exotic tree has modified riparian fire regimes. The San Juan River is another dammed and regulated river that is undergoing invasion by exotics (*T. chinensis* and *Elaeagnus angustifolia*, or Russian olive) at the expense of the native cottonwood and willows. Tremble and Waring recounted how this transition is reducing the abundance and diversity of insects and thus of the riparian avifauna, which includes many insectivorous birds.

Other riparian talks focused on biodiversity. Spanglet's ASU thesis, suggests that several species of mixed broadleaf trees col-

lected from geographically isolated Arizona streams are beginning to diverge genetically. These data highlight the importance of preserving populations of riparian species within many different streams. Friedman and others described how riparian vegetation varied temporally and spatially within a single floodplain in Colorado. Composition of the vegetation varied as a function of age of the floodplain terrace, due, in part, to the fact that different floods deposit sediments of slightly different texture, nutrient, and water holding content, and thus support a unique assemblage of species.

Several talks focused on water quality functions of riparian ecosystems. Weller and others showed that the ability of riparian ecosystems to intercept agricultural nutrient runoff varies strongly as a function of width of the buffer strip. Whigham and O'Neill described how riparian trees reduce nitrogen levels from subsurface water. After absorbing nitrates and nitrites from the water into the roots, the trees deposit organic nitrogen on the surface soil as litter. At that point much of the nitrogen is lost from the system as nitrogen gas.

**Tools and Strategies for the  
Enhancement and  
Maintenance of Instream  
Flows. Jackson Hole.  
October, 1992. Trout  
Unlimited and the Bureau  
of Reclamation.**  
*Barbara Tellman*

Conference topics were highly diverse, covering technical recovery strategies, legal remedies and economic realities. Sessions of special interest to the Arizona water community are briefly described below. These are only a sampling of a

full two days of information and thought provoking ideas.

Water conservation strategies were discussed as they relate to instream flow. Most appropriation states are similar to Arizona in that wasteful use is built into surface water law under the "use it or lose it" approach. Some states (e.g., Idaho) have adopted a "water banking" system whereby large users (such as agriculture) will adopt conservation measures (e.g., drip irrigation), then sell their excess water to a water bank without losing any of their surface water rights.

Conjunctive management of ground and surface water was discussed by Eliud Martinez, New Mexico State Engineer who described how New Mexico manages ground and surface water as a unified system.

The Central Utah Project was a panel topic. This major water supply project differs from the CAP in several important ways. While its major role is to deliver water to numerous users, including cities, it is designed to incorporate maintenance of existing streamflow and restoration projects on several northern Utah streams. The final design was a combined effort of state water interests, Indian tribes and environmental groups.

Manipulation of reservoir storage capacity was also described as a useful way to increase streamflow at critical times without hampering water rights, resulting in dramatic improvement in fish survival and reproduction.

A *Proceedings* will be published.

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## Noteworthy Publications

Pat Ellsworth, Section Editor

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### Articles and Reports

Clifford, H. F. and R. J. Casey. 1992. Differences between operators in collecting quantitative samples of stream macroinvertebrates. *J. Freshwater Biol.* 7: 271-276.

Comparing an experienced and an inexperienced operator, the authors found differences in collecting efficiency for chironomid larvae, limnephilid larvae, and for total number of organisms. Collecting efficiency seemed to decrease for both operators after ten transects were sampled perhaps due to fatigue.

Crandall, K. J. Leones and B.G. Colby. 1992. Nature-based tourism and the economy of Southeastern Arizona. Dept. of Agriculture and Resource Economics. University of Arizona. Tucson.

This report details the impacts of visitation to Ramsey Canyon Preserve and the San Pedro Riparian National Conservation Area.

Gregory, S. V., F. J. Swanson, W. A. McKee, and K. W. Cummins. 1991. An ecosystem perspective of riparian zones. *BioScience* 41: 540-551.

This article emphasizes ecological linkages between aquatic and terrestrial ecosystems in the context of fluvial landforms and geomorphic processes.

Hughes, R. M. and R. F. Noss. 1992. Biological diversity and biological integrity: current concerns for lakes and streams. *Fisheries* 17: 11-19.

These authors urge us to extend our concern about species extinction to encompass temperate aquatic assemblages and to broaden our environmental ethic to protect species and their ecosystems before they become endangered.

Novak, M. A. and R. W. Bode. 1992. Percent model affinity: a new measure of macroinvertebrate community composition. *J. N. Am. Benthol. Soc.* 11: 80-85.

Percent model affinity establishes a model community composition for a particular habitat and measures affinity to the model by means of a percentage similarity index.

Petersen, R. C., Jr. 1992. The RCE: a Riparian, Channel, and Environmental inventory for small streams in the agricultural landscape. *Freshwater Biol.* 27: 295-306.

This inventory was designed for rapid use on a large number of streams. It produces a numerical score to facilitate stream monitoring programs and comparison of streams within a region. It is based on the view that where non-point source pollution dominates, the condition of small streams can be assessed by appraisal of the physical condition of the riparian zone and stream channel.

Schlosser, I. J. 1991. Stream fish ecology: a landscape perspective. *BioScience* 41: 704-712.

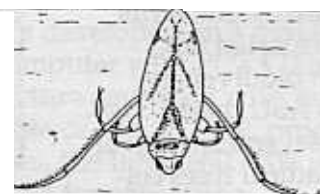
The author exhorts aquatic ecologists to use emerging quantitative techniques to analyze relationships between biological processes in stream fish and large-scale environmental heterogeneity.

Tyus, H. M. 1991. Movements and habitat use of young Colorado squawfish in the Green River, Utah. *J. Freshwater Ecol.* 6: 43-51.

It has been thought that young squawfish use backwaters preferentially in summer and fall. Thus stream managers may seek to maximize backwater habitat rather than manage for a diversity of habitats. This study indicates that young Colorado squawfish use a variety of habitats in addition to backwaters, and that water temperature plays a role in habitat selection.

Wellnitz, T. A. 1991. A continuous suction device for collecting aquatic insects. *J. Freshwater Ecol.* 6: 223-225.

This simple, inexpensive device is powered by a cordless electric drill. It is useful for capturing small insects that normally escape or are damaged by other collecting methods. It is especially helpful when collecting from cobble, leaf packs, and aquatic vegetation.



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

The purpose of ARC is to provide for the exchange of information on the status, protection, and management of riparian systems in Arizona. The term "riparian" includes vegetation, habitats or ecosystems that are associated with bodies of water or are dependent on the existence of perennial, intermittent, 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 are \$10. Additional contributions are gratefully accepted.

This newsletter is published three times a year to communicate current events, issues, problems, and progress involving Arizona's riparian systems, to inform ARC members about Council business, and to provide a forum for you to express your views or news about riparian topics. The Spring Issue will be mailed in May, with the deadline for submittals April 1, 1993. Please call or write with suggestions, publications for review, announcements, articles, and/or illustrations. Information on computer disk (any type) is preferred.

**Barbara Tellman, Editor**  
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## The Arizona Riparian Council

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Land Use: Mark Heitlinger	(602) 622-3861
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To join the  
Arizona Riparian Council,  
contact

Cindy Zisner at  
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Tempe AZ 85287-3211

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Annual dues are \$10.

## Calendar

**Jan.** - *Game and Fish Department. Heritage Fund Grant Workshops* - various dates and places throughout the state. Call 789-3250 for details.

**Jan. and Feb.** - *Wild and Scenic Rivers Meetings* - See page 11.

**Jan. 16** - *Verde River Watershed Conference* - See page 11.

**Feb. 4-6** - *Riparian Management Conference* in Albuquerque. Call (602) 792-9591 for conference flyer.

**Feb. 24-26** *Annual Meeting*. Society of Wetland Scientists - Rocky Mountain Chapter in Denver, Colorado.

**March** - *First Annual Meeting*. Western Chapter of the Society of Wetland Scientists in Davis, California See page 11.

**April 16-17** - *Arizona Riparian Council Annual Meeting*. Rio Rico. Special mailing and call for papers will be sent in January.

**May** - *Advance Planning of Wetlands: Wetlands and Watershed Management Conference* - Reno - Association of State Wetlands Managers. Call for papers deadline is February 1, 1993. Call (518) 872-1804 for information.



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