ARROYO

Vol. 6 No. 4

Spring 1993

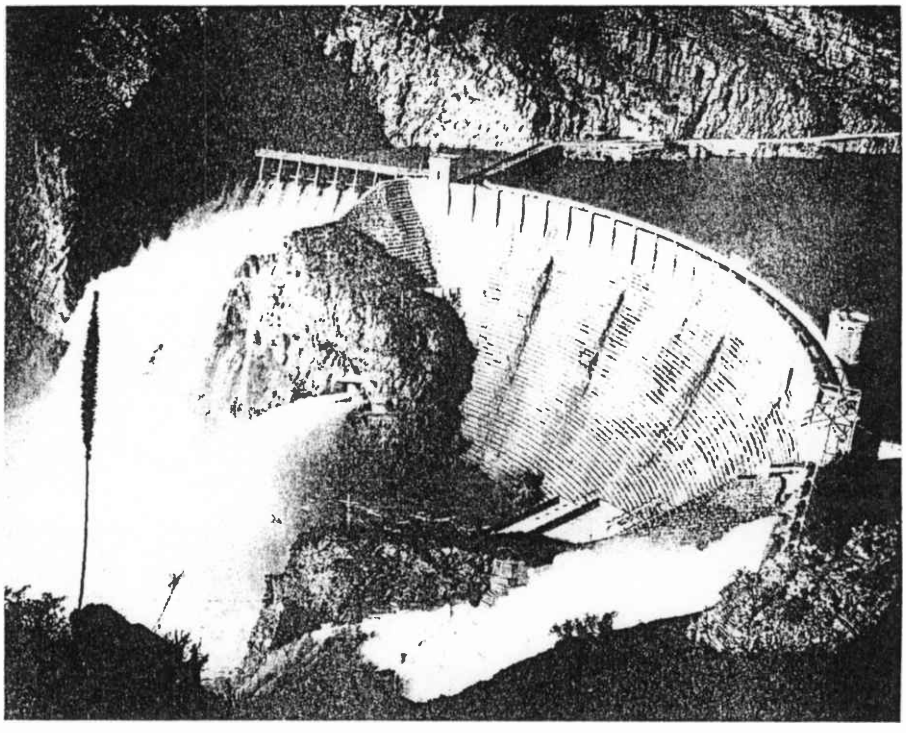
Managing the Flow to Better Use, Preserve Arizona's Rivers

by Joe Gelt

Tecumseh, Shawnee Chief, expressed bewilderment that intruding whites expected Indians to sell land. "Sell a country!" he exclaimed, "Why not sell the air, the great sea, as well as the earth? Did not the Great Spirit make them all for the use of his children?"

Puzzled by land ownership, Tecumseh might be doubly perplexed by efforts to manage rivers. He rightly might ask, "Are not rivers naturally animated like clouds and wind? Do not rivers respond to the same natural forces as mountains? Rivers flow; they don't follow management plans."

As events turned out, the West was won; land is owned; and rivers are indeed managed to control their use. Much can be learned about a society's values from its strategies to manage and care for its rivers. An especially limited natural resource in Arizona, rivers are valued for many reasons, from practical to spiritual, from irrigation to meditation. What we choose for our rivers and for what reasons expresses as much about our culture as Tecumseh's remark tells of the Shawnee.



More than just a dam, Roosevelt Dam stands as a monument symbolizing the power to control or manage natural resources to serve human needs. The dam is presently undergoing modifications . (Photo: UA Graphics)

The Need to Protect Rivers

A river is managed to control its use. More specifically, river management is a strategy to promote cooperative river use among various, even competing interests, while at same time protecting a river's natural or environmental values. Pollution, dams, development, diversion, timber, grazing, mineral extraction and recreation are important river management issues.

In Arizona and throughout the United States rivers increasingly are perceived as a resource in need of protection. Some explain this recent and growing interest in preserving rivers as not unlike the battle to save an endangered specie. Defenders gather to save what is becoming scarce, whether an animal or a natural resource like a river. Only a fraction

of Arizona's riparian conditions remain intact.

Arizona is not a state with abundant and bountiful rivers. Few blue river lines appear on an Arizona map. River management is not thus unimportant to Arizona. That rivers, streams and wetlands occupy one half of one percent of the state demonstrates that these are rare and valued natural resources, to be used as well as treasured and, therefore, managed carefully.

Responding to the growing interest in river management, the University of Arizona's Water Resources Research Center cosponsored a regional symposium, "Riparian Management: Common Threads and Shared Interests," held in Albuquerque, New Mexico, February 19-21. Information from the symposium is included in the following discussion.

Strategies to Manage Rivers

Strategies to manage rivers are many and varied. For purposes of this discussion, however, river management strategies are divided into three categories. The first strategy is termed the "engineering fix" and includes methods that rely on structural techniques or, more specifically to this discussion, on dams and diversions to manage rivers.

Management by rules and regulations includes strategies that rely on official authority and the force of law. This also has been designated the "top-down" approach. Finally, the "bottom-up" approach refers to consensus-building or forming a community of interest to collectively and actively develop and support river management activities.

The categories are not hard-and-fast designations that together describe all aspects of river management. Nor are they mutually exclusive: strategies from each category might be used to manage a single river. Such categories however serve a purpose. They help emphasize that rivers are indeed managed, in different ways and for different purposes and ultimately to different effects.

The Engineering Fix

Dams are a river management strategy of far-reaching consequences, capable of disrupting and redistributing river flow. Dams once were considered public monuments of sorts, memorials celebrating the builder's cleverness and skills and a tribute to a river's usefulness in serving human needs. In the West, where flowing streams are few and water needs are many, most flowing rivers were dams waiting to happen.

Once generally perceived as admirable and worthy projects of wide public benefit, large scale dams increasingly are viewed as anachronisms, of excessive economic and environmental cost. Of late, a public voice critical of environmentally damaging dams is gaining volume and credence. The natural benefits of a free-flowing river increasingly are being balanced against the advantages of dam operations, and the latter often are found wanting. In some instances actual dam removal is a considered option.

Dams figure prominently in the management of two Arizona rivers: the Salt and Colorado. Both will be discussed to describe changing perceptions of dams and their use to manage and control river flow.

The Salt River

Experiencing severe hardships in the hot, dry climate, many early Arizona settlers rightly thought of the desert environment as harsh. Some perceived it as a challenge to be surmounted, even a threat to be defeated. The desert wilderness was to be conquered, and rivers were to be tamed. In 1979 the Salt River Project (SRP) published a history of the Salt River's development titled "The Taming of the Salt."

Although named for a mythological bird that arises reborn from the ashes of its own funeral pyre, the City of Phoenix has origins of water, not fire. Because of the flow of the Salt River, Phoenix could accommodate a great influx of population. Without the Salt River, Phoenix would not have grown and expanded into the city it is today.

The agricultural pursuits of early Phoenix settlers were hardly encouraged by the erratic flow of the Salt River. Dwindling in summer, the Salt River would flood at other times of the year, bursting rock and brush dams and washing out fields.

Frontier life was such that an unreliable water supply sparked social unrest and instability. A managed river would ensure a dependable water supply which, in turn, would promote security and inspire confidence among Phoenix settlers.

Begun in 1905, Roosevelt Dam was completed in 1911, the nation's first reclamation project. The dam originally was intended as a water storage and control project. Its potential to generate hydroelectric power

Arroyo is published quarterly by the Water Resources Research Center, College of Agriculture, 350 N. Campbell Avenue, University of Arizona, Tucson, Arizona 85721; (602) 792-9591. Each issue of *Arroyo* focuses on a water topic of current interest to Arizona. A list of past *Arroyo* topics is available upon request, and back issues can be obtained. Subscriptions are free, and multiple copies are available for educational purposes. The editor invites comments and suggestions.

Water Resources Research Center
Director, *Hanna J. Cortner*
Editor, *Joe Gelt*

soon was recognized and developed. With a capacity of 1,336,734 acre-feet (af), Roosevelt Dam forms the largest lake in SRP's Salt and Verde river system, larger than SRP's five other storage reservoirs combined.

More Salt River dams were forthcoming. In 1908 the Granite Reef Diversion Dam was built 50 miles down river from Roosevelt Dam, below the confluence of the Salt and Verde rivers. Mormon Flat Dam was built downstream from Roosevelt Dam between 1923 and 1925. The dam includes water storage (Canyon Lake, 57,852 af) and hydroelectric capacity.

Construction on Horse Mesa Dam located between Roosevelt and Mormon Flat dams was begun in 1924. It forms a large reservoir (Apache Lake, 245,138 af) and includes hydroelectric generating units. The Steward Mountain Dam built between 1928 and 1930 to increase water storage facilities forms Saguaro Lake (69,765 af). Verde River dams include Barlett Dam completed in 1939. Located on the Verde River above its confluence with the Salt River, Barlett Dam controls the flow of the Verde River and stores 178,186 af. Horseshoe Dam was built above Barlett Dam between 1944 and 1946 and stores 131,427 af.

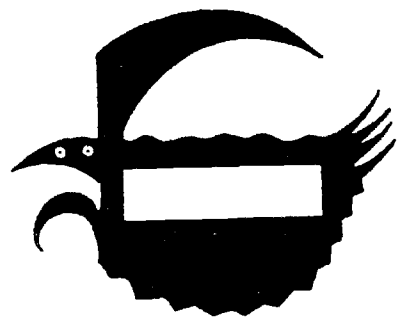
The SRP water delivery system includes 1,262 miles of canals, laterals, and ditches. The Arizona and South canals carry water from Granite Diversion Dam. Water is supplied to irrigation districts, cities, farms, and residential irrigators through smaller canals, laterals and ditches.

The taming or the managing of the Salt River is the damming of the river. Above the dams in the Globe area the Salt River flows through an area of great natural beauty. Below the dams the river does not exist, except as a channel for floods and effluent flows.

The Salt River is managed less as a river system and more as a series of reservoirs. Electricity, water supply, flood protection, and recreation are the river's priority benefits.

Even now, when dams and their effects are viewed critically, the Salt River dams seem not to be the target of much criticism, certainly not compared to structures in the Northwest. There are several reasons for this.

For one, Phoenix's survival depends upon the Salt River dams. This is a formidable consideration to daunt critics. Plans to drastically alter the management of the Salt River are unlikely to make much headway.



Ancient Pueblo bird design

That the Salt River dams were constructed in the somewhat distant past further dampens controversy. The dams now are an established fixture, with no one remembering the river without the dams. The more recently proposed Orme Dam, which would have been built at the confluence of the Salt and Verde rivers, lacked this advantage. The argument that Orme Dam was needed for increased storage did not hold up to the concern that the structure would disrupt various riparian features including the nesting of bald eagles as well as flood Indian lands.

Glen Canyon Dam on the Colorado River

Support for dams generally has given way to a revisionist attitude. Even established dams are getting second looks. River conservation groups are well aware that over 230 hydropower licenses are to expire in the United States in the 1990s, with 170 licenses expiring in 1993. This is viewed as a major opportunity to improve natural river conditions by modifying dam operations.

This revisionist attitude is evident in Arizona, as the Bureau of Reclamation prepares an Environmental Impact Statement (EIS) on Glen Canyon Dam operations. This study is in response to concerns about the uncertainty of the dam's environmental effects. The EIS is to determine how best to reregulate the flow below the dam to lessen damage to beaches within the Grand Canyon and to protect trout and endangered fish.

Of the 43 reservoirs, dams and diversion structures regulating the Colorado River, the Glen Canyon Dam is the key structure. The Glen Canyon Dam controls the plumbing of the Colorado River system and is central to the allocation of Colorado River water. Except for Crystal Dam on the Gunnison River in Colorado, Glen Canyon Dam is the first Colorado River system dam to undergo a formal environmental review.

The Glen Canyon Environmental Studies (GCES) project is gathering scientific and technical information for assessing the downstream and upstream impacts of the Glen Canyon Dam. Effects on natural and recreational resources are being examined, as well as consequences to Native American cultures. The range of topics includes reptiles, ethnohistory, beach formation, exotic fish, and whitewater boating.

Some people view the Glen Canyon study as the first step of a comprehensive EIS evaluating the management of the entire Colorado River system. Bruce Babbitt advocated this strategy prior to becoming Secretary of the Interior. He now is in the position to see it carried out.

River Management by Rules and Regulations

Various laws and public policies are useful when managing and preserving rivers. In effect, this approach represents river management by rules and regulations or the "top-down" approach. Official authority sanctions and enforces certain actions deemed beneficial to rivers.

For example, the National Wild and Scenic Rivers Act, the only federal legislation dedicated specifically to river protection, was passed by Congress in 1968 to preserve the nation's free-flowing streams. Congress passed the act in response to the concern that many U.S. rivers were dammed, channelized and/or diverted.

Streams eligible for protection under this program must be free-flowing, with no major dams or other diversions altering their flow. Also, such rivers are to be valued for one of the following qualities: "scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values." Rivers and streams classified under the act are designated either wild, scenic or recreational.

A wild-and-scenic designation affects how a river is managed. Federally funded dams or water projects cannot be built in the designated area. Also, restrictions may be placed on new mining claims, but established claims remain in effect. Not affected are farms, homes, and cabins along the river. Their use continues as before. The only Arizona river thus far designated as wild and scenic is a 40.5 mile segment of the Verde River. This occurred in 1984.

The Arizona Rivers Coalition associated with American Rivers recently identified about 90 Arizona rivers eligible for wild-and-scenic designation. Of this number, the coalition proposed that Congress actually designate 40 rivers as wild and scenic.

The coalition's work was in response to a perceived lack of activity on the part of responsible federal agencies. The 1968 act directed federal land agencies to evaluate rivers to determine eligibility and suitability for wild-and-scenic designation. Little, if any, activity occurred.

Ancient Hopi bird design

The coalition's list prompted Arizona's congressional delegation to request that federal agencies take action. In response, BLM identified 24 rivers statewide and the U.S. Forest Service found 62 eligible for wild-and-scenic consideration. Their lists include all the rivers identified by the Arizona Rivers Coalition. The federal agencies now are in the preliminary stages of resource analysis to determine the impacts of such designations. This stage is to be completed by September.

Also, the federal Endangered Species Act is useful for protecting and managing rivers. A goal of the act is to provide "a means whereby the ecosystem upon which endangered species and threatened species depend may be conserved."

The U.S. Fish and Wildlife Service is proposing critical habitat areas along the Colorado, Salt, Gila, and Verde rivers for some river fish listed as threatened and/or endangered. These include razorback sucker, boneytail chub, and humpback chub. The granting of such a designation would require an evaluation or review of any federal activities that might affect the critical habitat area.

Also useful as a river management tool, the federal Clean Water Act of 1972 is to "restore and maintain the chemical, physical and biological integrity of the nation's waters." Administered by the Army Corp of Engineers, Section 404 of the Clean Water Act requires a permit to discharge dredge or fill material into waters of U.S. Waters of the U.S. is defined broadly to include dry Arizona riverbeds. Enforcement of Section 404 was an issue about a year ago when fill material was dumped in the Salt River at the Tri-Cities Landfill.

Instream flow protection is another strategy useful for protecting rivers. According to the Prior Appropriations doctrine, which guides Arizona's allocation of surface water, appropriated water must be diverted from a river and applied to a beneficial use. Beneficial use traditionally has been defined as a consumptive use; i.e., use in mining and agriculture. Clearly the Prior Appropriations doctrine – at least as traditionally defined – is not conducive to preserving stream flow.

With the growth of an environmental ethic, some people argued that leaving water within a streambed as instream flow is a justified and worthy beneficial use. And in fact official recognition of instream flow as a beneficial use has developed. Thus far, the Arizona Department of Water Resources has approved two instream flow certificates, and has 9 permitted applications and 57 pending applications in various stages of completion.

Also, the public trust doctrine may have potential as a strategy to protect fish, wildlife, and recreation. As recently interpreted, this doctrine allows a state agency to consider the gain and advantages to the public over private interests when regulating

the allocation and use of some natural resources.

The California State Supreme Court approved applying the public trust doctrine to preserving Mono Lake. Some observers believe this action will have ramifications in other states. A flexible use of the doctrine is one strategy for overriding existing water law. If and how the doctrine should be applied in managing Arizona rivers is debated.

The above strategies have the force of law. As such they bestow both benefits and disadvantages. The benefits are obvious. Certain kinds of actions are enforced, others are prohibited. The main disadvantage is that the laws are coercive and against the perceived interests of some individuals or groups. Officialdom is viewed then as dictating the rules of the game.

For example, landowners may resent efforts to manage rivers because they are suspicious that a government entity is conspiring to deprive them of their rightful ownership or use of the land. The specter of "taking" thus arises.

Related to the above is the fear that river protection may threaten livelihood and lifestyle. Concern is raised that the local economy is deprived of the economic advantages of such activities as farming and grazing when rivers and other natural resources are protected.

The above fears and concerns have spawned the "Wise Use Movement" (WUM). An offshoot of the "Sagebrush Rebellion," WUM actively opposes river conservation efforts, particularly those at the federal level. Its agenda includes modifying or weakening the Endangered Species Act and the Clean Water Act. WUM has been involved in efforts to stop wild-and-scenic designations in several states.

A river management plan's ability to rise to the challenge of the private ownership issue is a good test of its flexibility and effectiveness. A beginning premise of such a plan is that all people gain when rivers are preserved and managed effectively. Further, a broad range of people and interests need to be involved, sharing information and contributing ideas.

Public Participation

Increasingly the public is demanding to be equal partners in public policy decision making, rather than being merely consulted or, worse yet, informed of a decision after the fact. This movement is evident in a range of public policy areas, but is especially apparent in natural resource management. An opportunity to members of the public, this movement represents a challenge to professional managers.

Dr. Don Wilkin of the University of Arizona has studied this process which he calls the democratization of natural resource decision making. Local people, those who must live with a decision, are key participants because they often have a broader perspective on the problem than the natural resource managers whose interests may be more focused. Wilkin believes that success greatly depends upon a broad understanding of the natural resource in question, including related social, political, and legal implications.

Wilkin explains that this shared understanding then must be applied to decision making, with the intent of working out a middle-ground position of some advantage, theoretically, to everyone. Guided by a spirit of compromise, this process goes against the prevailing notion that decisions result in winners and losers.

The public is actively involved in the managing of two Arizona rivers: the Verde and San Pedro. Public involvement, however, came about differently with each river.

The Verde River

The Verde River is perennial and flows from the high mountains in northern Arizona to the central valley. Verde Valley residents were aware of deteriorating conditions along the Verde River and were determined to protect it. The river segment of concern was the 55-to-60 mile middle stretch of the river, from Taco, north of Clarkdale, to Beasley Flat, south of Camp Verde.

Residents faced a thicket of issues including water quality and quantity, erosion and loss of riparian habitat, private property/recreation access conflicts, commercial uses, confusing regulations and inconsistent management along the corridor, and open spaces.

The Verde Resources Association (VRA) was formed to address various concerns. During 1988 and 1989 the association conducted meetings to work out a Verde River strategy, but to little effect. Divisiveness ruled, with various interests working in opposition.

Meanwhile Arizona State Parks (ASP) identified the area for a multi-objective river corridor study. In use nationally, this planning process stresses the importance of wide community involvement, with various interests – public, private, environmentalist, rancher, landowner, recreationist, and others – working together to identify the problems and opportunities of managing a river. River issues are defined broadly to include economic, social, cultural, legal, recreational, and environmental concerns.

ASP's corridor study provided the VRA an opportunity to channel its frustrated efforts into a process that promised results. A corridor project steering committee was established made up of various interests. Members included representatives from the Arizona Fly Casters Club,

Arizona Fish and Game Department, Northern Arizona Audubon Society, as well as a rancher, farmer, construction contractor, and well driller. To keep people informed, a mailing list was compiled with the names of about 500 residents, landowners, organizations, and agencies.

The overall vision statement developed by program participants conveys the sense and level of participation involved in the project: "The Verde River Corridor is an invaluable resource to the people of the Verde Valley affecting each resident, landowner, business, and tourist in some way. Planning for the wise use, protection, and enhancement of the Verde river and its associated natural, cultural, scenic, agricultural, economic, and recreational resources should be a priority for everyone."

Five subcommittees were established to address community-identified concerns. These concerns were private property, economic/commercial uses, land conservation, recreation, and water. The task was to develop a plan of action to preserve the river and its resources, in balance with growth and economic vitality.

The Verde River Corridor Project began in the fall of 1989. The planning phase of the project concluded in June 1991. A final report was published, along with a plan of action with recommendations.

Community interest in the Verde River continued beyond the completion of the corridor study. The bylaws for a Verde Watershed Association were presented and adopted at a meeting in January 1993. It was proposed that the association focus on the prime recommendations that came from the corridor project.

What is most significant about the Verde Watershed Association is its grass-roots organization. The association was formed by people and interests in the watershed, and not mandated by a court or federal or state agency, although such agencies have supported its formation.

Although demonstrating a creditable and committed interest, grassroots or community efforts face operational limitations. For example, without some form of direct official or government participation, such efforts may lack the political power to bring about change. Participants then have no assurances that their work will bear fruit. Also community efforts may lack the financial resources for basic operational expenses.

These concerns bring up the problematic role of government agencies in community-based projects. The tactic is to have government involved, but not in control. After all, government performs useful services. Along with providing political clout, government agencies are a source of needed funding. For example, the Verde River Corridor study benefited from ASP funds to communicate information and build a community of interests.

The role of government evidently is not completely settled in the Verde River organization. Some participants recently have voiced concern that agency officials or bureaucrats are exerting too much control, at the expense of community participation. They claim, for example, that agendas are addressing highly technical topics, with the result that public interest has flagged.

A second river corridor project is underway focusing on the Santa Cruz River in Santa Cruz County. ASP is conducting the study, with the involvement of community and other interests. The project began about March and will continue for a year.

The San Pedro River

Public participation also plays an important role in managing the San Pedro River. With the San Pedro, however, public participation was born of controversy. The background to the San Pedro situation and its present status presents a contrast to occurrences along the Verde River.

The San Pedro flows north from Sonora, Mexico, then meanders through broad meadows and the Huachuca and Mule mountain ranges of Southern Arizona, flowing 100 miles before joining the Gila River near Winkelman. The river is perennial, undammed, with intact riparian areas, and is said to support one of the richest wildlife populations in the United States—345 species of birds, 82 species of mammals, and 47 species of reptiles and amphibians.

In April 1986 the U.S. Bureau of Land Management acquired a 33-mile long, three-mile wide stretch of the San Pedro River between Hereford and St. David. Congress, through passage of the Arizona Idaho Conservation Act, designated the area the San Pedro Riparian National Conservation Area on November 18, 1988. This action was intended to protect and enhance this section of the desert riparian ecosystem, a remnant of what was once an extensive Southwest network of similar riparian systems.

After the San Pedro Riparian National Conservation Area was established, BLM proposed that islands of existing riparian habitats be set aside downriver, beyond the boundaries of the established conservation area. This would include stretches of the river extending north of Benson to the San Pedro's confluence with the Gila River.

According to BLM these stepping stones of intact riparian habitat would secure the entire length of the river for migration, as well as provide protection from development. The agency requested congressional funding to purchase private lands from willing landowners within the identified island area.

The Safford BLM district prepared a Resource Management Plan describing the agency's intention of expanding its protection of the San

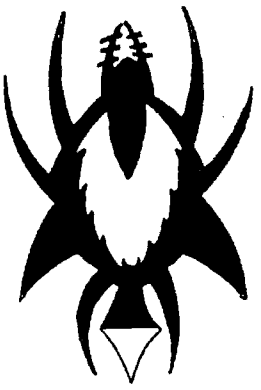
Pedro River. The final version of the resource plan included legal descriptions and maps that identified specific areas for acquisition. These were not contained in the circulated draft version of the document. The discrepancy between the two versions of the document aroused the suspicions of downriver landowners who felt threatened by BLM plans.

They suspected that a conspiracy of sorts was afoot. Some suspected that the draft document did not include maps and legal descriptions to evade their notice in the final version. The plot seemingly thickened when a BLM document surfaced urging congressional support for the Bureau's land acquisition plan. The rationalization for support of the plan included information to the effect that land acquisition was not controversial in the Draft Resource Management Plan.

Lines were drawn, and accusations arose. They included claims that the government was out to acquire all private lands to advance a socialistic agenda. Some suspected a BLM-Nature Conservancy linkage of dubious intent. Critics argued that government purchase of lands is to the disadvantage of local communities that then lose tax monies. Roused by suspicion and distrust the public was having its say.

In response to the controversy, the Arizona State BLM Director declared a moratorium on land acquisitions outside the San Pedro National Conservation Area, except for 12 pending acquisitions. Also the director initiated a Coordinated Resource Management (CRM) process to help resolve the San Pedro River controversy.

The CRM strategy encourages wide participation in natural resource management. Through CRM, landowners, land users, government agencies, and interest groups concerned with the San Pedro Valley work together to resolve problems and conflicts. Further, resource problems are addressed along resource boundaries and are not defined by private, agency or political jurisdictions. CRM is designed to work at the local level, with the philosophy that those who live, work and recreate in an area have the greatest interest in its prudent management and use.



Ancient Pueblo bug design

An organization was established, the San Pedro Coordinated Resource Management Group. The group includes representatives from the five Natural Resources Conservation Districts along the San Pedro River, The Nature Conservancy, the Audubon Society, the Wildlife Federation, the Soil Conservation Service, the U.S. Forest Service, State Game and Fish, and the State Land Department as well as landowners, farmers and ranchers. Membership in the committee is open to interested participants, whether organizations or individuals. The first meeting was held in July 1992 and attracted 125 people.

The organization's purpose is to discuss and identify alternative river management plans to the direct purchasing of land. Identified options have included easements, cooperative management, land exchanges, and zoning.

The process is strictly voluntary, with no one obliged to participate. The absence of certain players concerns some participants. For example, the counties and the U.S. Forest Service are not actively involved. The process works to the extent that a broad range of committed interests participate, with progress evident.

And to some participants progress is evident. BLM now has a forum for describing its management objectives and strategies and for receiving public input. An agreement has been reached among various agencies, including BLM and The Nature Conservancy, that land acquisition is not essential for managing some natural resource areas. Further, any land purchases that agencies deem essential are to be reviewed by the group.

The group also is considering broadening its focus to consider a general management plan for the entire watershed. Some general principles have been set, and specific goals and objectives are to be worked out.

Most involved parties feel positive about the process. Some, however, complain that its workings are slow, a consequence of various and competing interests expressing their views. Yet a process is in place, and it has promoted cooperation and communication among interests.

Public participation obviously worked out differently in the San Pedro and Verde rivers management processes. Public participation was proactive from the beginning with the Verde River, with local people and interests taking the initiative to work out management strategies. Public participation in managing the San Pedro River was sparked by objections to BLM plans, and in that sense it was reactive.

Another difference is evident. With the federal government administering the San Pedro Riparian Conservation Area, it already is a major player in San Pedro River management and can be expected to be influential in further plans and projects.

This is not the situation with the

Verde River. An official summarized the difference this way: The public is the tail wagged by the dog in the San Pedro River process, whereas in the Verde River the public is the tail wagging the dog.

Conclusion

River management plans are varied and complex, strategically developed for the circumstances of individual rivers. A river management plan may involve a single agency regulating a river or a more comprehensive effort, with varied organizations, from grassroots to federal, working together to ensure river protection and appropriate uses. Enforcement varies from laws to cooperative arrangements.

Ultimately, however, by designating river uses, river management is managing those who use a river. River management manages people, and this is what complicates the issue. As depicted in Stephen Foster's song "Old Man River," a flowing river is a symbol of purity and simplicity. It becomes complex when divvied among various users.

This dual vision of a river – a river is beautiful as well as useful – is beneficial when management plans are made. It ensures that the aesthetics of a river will be considered, along with its ecosystem and whatever direct human uses are requested. The aesthetic factor is what makes river management different from many other water issues.

The writer thanks all the people who contributed information to this newsletter, especially the following: Kate Bradley, Lamar Smith, Don Wilken, *University of Arizona*; Tom Gatz, *U.S. Fish and Wildlife*; Jesse Juen, Greg Yuncevich, *Bureau of Land Management;* Duncan Patten, *Arizona State University*; Gail Peters, *American Rivers*; Karen Reichhardt, *Army Corps of Engineers*; Tanna Thornburg, *Arizona State Parks;* Dave Wegner, *Glen Canyon Environmental Studies*.

The ideas and opinions expressed in the newsletter do not necessarily relect the views of any of the above people.

THE UNIVERSITY OF
ARIZONA
TUCSON ARIZONA

ARROYO

UNIVERSITY OF ARIZONA
Water Resources Research Center
Tucson, Arizona 85721

W R R C

Water Resources Research Center

NON-PROFIT ORG.
US POSTAGE
PAID
TUCSON, ARIZONA
PERMIT NO. 190