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Equal Footing, The Public Trust, and Arizona's Rivers

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[Editors' note: This article is being reprinted here in its entirety due to errors in the last issue. There were no errors in the article content, but in placement of citations in the text. Our apologies to Dr. Feller for the errors and thanks for his corrections.]

The Arizona Legislature keeps trying to give away the State's rivers, and the Arizona Center for Law in the Public Interest keeps stopping them. In the latest round of this perennial struggle, the Center represented a wildlife conservation organization and three private individuals challenging recent legislation relinquishing the State's claims to all of Arizona's rivers except for the Colorado. The legislation was based on the findings and recommendations of a commission that had determined that none of the rivers save the Colorado was navigable when Arizona became a state in 1912. In *Defenders of Wildlife v. Hull*,[1] the Arizona Court of Appeals held that the commission's findings of non-navigability, and the Legislature's action based on those findings, were invalid because the legislation guiding the commission prescribed the wrong standards for determining navigability. Although the Center has won this round, more rounds are sure to follow, and the rivers' ultimate fate remains uncertain.

The Equal Footing Doctrine and the Public Trust Doctrine

The legal battle grows out of the history of land ownership in the western United States and centers around two related legal doctrines, the "equal footing" doctrine and the "public trust" doctrine. Arizona and other western states were carved out of land that the federal government obtained from Indian tribes, Mexico, France, and Britain through wars, treaties, and purchases. When states were created out of these lands, the federal government retained title to the public lands, with two major exceptions. First, the federal government granted each of the western states substantial areas of land (in Arizona, four sections out of every township) for the support of public schools. These lands, known as "state trust" or "school trust" lands (not to be confused with "public trust" lands, which are discussed below) can be sold or leased by the state to commercial or other interests, with the revenues from the sales and leases going to the schools.

Second, under an 1845 decision of the U.S. Supreme Court,[2] each new state took ownership of the beds of all waterways within its borders that were navigable at the time of statehood. This rule is known as the "equal footing" doctrine because it is based on the principle that each new state is a sovereign entity on an equal footing with the original 13 colonies. Ownership of land underlying navigable waterways, unlike title to ordinary dry-land real estate, was viewed as an incident of sovereignty, without which the new states would not have been truly equal to the old ones.

The states' ownership of riverbeds and lakebeds, however, came with certain strings attached. Since these lands are not ordinary real estate, they cannot be bought and sold like ordinary real estate. Instead, according to another decision of the U.S. Supreme Court (this one in 1892),[3] the state owns these special lands as a trustee for the benefit of the public so that the public may use them for commerce, fishing, and navigation. Under this "public trust"

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doctrine, the state may not sell or give away these lands except for purposes that benefit these public uses. Subsequent decisions of some state supreme courts have expanded the purposes of the public trust to include recreation, wildlife conservation, and environmental protection as well as commerce, fishing, and navigation.[4]

EQUAL FOOTING AND THE PUBLIC TRUST IN ARIZONA

Through most of Arizona's history, the equal footing and public trust doctrines were ignored except as they applied to the Colorado River. The beds of the Agua Fria, Gila, Salt, Verde, and other rivers were treated as ordinary real estate. Some of these riverbed lands, dried up by dams and diversions, were granted or sold to private individuals or corporations and came to be used for agriculture, industry, sand and gravel extraction, homesites, and other private purposes.

In 1985, however, the State filed a lawsuit in which it claimed ownership of the bed of the Verde River near Cottonwood because the Verde had been navigable when Arizona became a state in 1912. This lawsuit, along with statements by then-Governor Bruce Babbitt and his State Land Commissioner, Robert Lane, that Arizona might assert rights to the beds of other rivers that were navigable in 1912, created a stir among riverbed property owners, who feared that their land titles were in jeopardy.[5]

The landowners turned to the Legislature, which was sympathetic to their concerns and hostile to the public trust doctrine. The Legislature responded with a bill that promised to renounce the State's claims to any riverbed property along the Gila, Salt, or Verde Rivers in exchange for a payment of just $25 per acre. The same bill gave up the State's claims to all other riverbeds, except that of the Colorado, for no payment at all. The bill was signed into law by then-Governor Evan Mecham in 1987. (Previously, Governor Bruce Babbitt, vetoed an earlier version of the bill in 1986.)

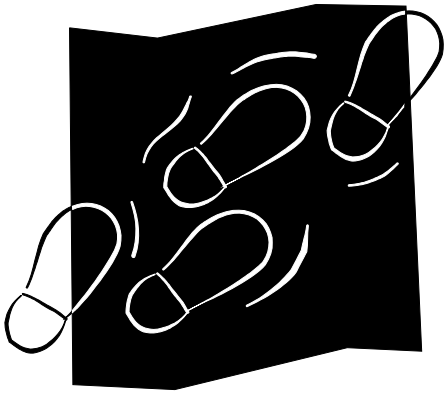
The Arizona Center for Law in the Public Interest went to court to challenge the Legislature's action, arguing that it violated the public trust doctrine. The Center also argued that the renunciation of the State's claims to riverbeds violated a clause of the Arizona Constitution, commonly known as the "gift clause," that forbids the State (and also counties and municipalities) from making "any donation or grant, by subsidy or otherwise, to any individual, association, or corporation."[6]

In its defense, the State argued that it was doubtful that any of Arizona's rivers other than the Colorado were navigable in 1912, and that it was therefore unlikely that the State would have succeeded had it tried to claim title to the beds of those rivers on the basis of the equal footing doctrine. Thus, the state argued, the act of the legislature renouncing such claims simply removed a cloud on the title to those lands, without giving up anything of real value.

The Maricopa County Superior Court concluded that, even if the rivers were navigable in 1912, the State had the power to relinquish its claims to the riverbeds. The Court therefore rejected the Center's claims and upheld the challenged legislation. In 1991, however, in *Arizona Center for Law in the Public Interest v. Hassell*,[7] the Arizona Court of Appeals sided with the Center and reversed the decision of the Superior Court. In so doing, it rendered Arizona's first major decision interpreting and applying the public trust doctrine.

The Court of Appeals first rejected the state's argument that the navigability of Arizona's rivers was so doubtful that the State gave up nothing of value when it disavowed its claims to them. Although the Court did not actually determine that any of the rivers were navigable at the time of statehood in 1912, it held that there was sufficient evidence of navigability that the State's interest in the riverbeds, "though still uncertain in value and extent, is sufficiently substantial to warrant gift clause and public trust analysis."

The Court then went on to analyze the plaintiff's claims that the Legislature had violated the gift clause and the public trust doctrine by renouncing the State's claims to all riverbeds in the state except that of the Colorado. The Court held that the gift clause and the public trust doctrine, considered together, require that any disposition of public trust property by the state must meet three conditions to be valid: (1) the disposition must serve a valid public purpose; (2) the state must receive fair consideration for the property; and (3) the disposition must be "for purposes consistent with the public's right of use and enjoyment of [trust] resources" and must "satisfy the state's special obligation to maintain the trust for the use and enjoyment of present and future generations." The Court found that the Legislature's renunciation of the State's claims to riverbeds met the first condition because it served the valid public purpose of removing a cloud on the title to thousands of parcels of land. But the Court determined that the Legislature's action did not meet the second condition because the Legislature had surrendered the State's claims to the riverbeds without making, and without establishing any mechanism for making, any determination of

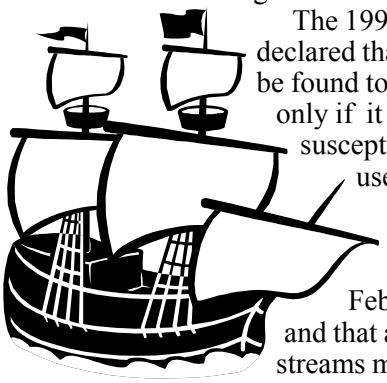


the value of those claims. Furthermore, the court held, the Legislature's action failed the third condition for a similar reason: the Legislature had made no attempt to determine the value of the riverbed lands for public trust purposes or to ensure that the public's ability to use those lands for such purposes would be maintained in the future.

WHAT IS A NAVIGABLE RIVER?

In *Arizona Center*, the Court of Appeals made clear that the Legislature was not free to simply abandon the State's claims to its riverbeds. But the Court also recognized that those claims are contingent; the State owns the bed of any given river if and only if that river is determined to have been navigable when Arizona became a state in 1912. Moreover, although the Court found that there was "substantial evidence from which a factfinder might conclude" that some of Arizona's rivers other than the Colorado were navigable in 1912, it did not determine that any of them actually *were* navigable.

After the Court issued its decision, the struggle between the Arizona Center for Law in the Public Interest and the Legislature turned to the issue of which, if any, of the rivers were navigable in 1912. Legislation enacted in 1992 created the Arizona Navigable Stream Adjudication Commission to gather information, hold hearings, and make determinations as to which rivers were navigable in 1912 and which were not. After the Commission made a preliminary determination that the Salt River was navigable, the Legislature in 1994 expressed its displeasure by reducing the Commission's role to making findings and recommendations, with the ultimate determinations left to the Legislature itself.[8] The 1994 legislation also adopted a set of standards and presumptions that virtually guaranteed that none of the rivers would be found to have been navigable in 1912.[9] It was these standards and presumptions that were challenged by the Arizona Center and found to be unlawful in the latest round of litigation.



The 1994 legislation declared that a river could be found to be navigable only if it was used or susceptible of being used for both commercial trade and travel as of February 4, 1912, and that all ephemeral streams must be found to be non-navigable. The legislation also created a series of presumptions in favor of finding rivers to be non-navigable, and stipulated that the presumptions could be overcome only by "clear and convincing evidence" to the contrary. It instructed the Commission to presume that a watercourse was non-navigable unless "sustained trade and travel occurred both upstream and downstream in the watercourse" *and* such trade and travel supported a "profitable commercial enterprise" *and* vessels such as keelboats, steamboats, or powered barges were used on the watercourse as of February 4, 1912. Furthermore, even if a watercourse met these criteria, the legislature instructed the commission to nonetheless presume that it was non-navigable if there were any "impediments to navigation" caused by water diversions, bridges, fords, dikes, or other structures, *or* if the federal government did not regulate the watercourse under the Rivers and Harbors Act, *or* if "[t]ransportation in proximity to the watercourse was customarily accomplished by methods other than by boat." Most remarkably, the 1994 legislation required that if *any* "portion or reach" of a river had previously been determined to be non-navigable in a "public proceeding," then the *entire river* should be presumed to be non-navigable.

As later described by the Court, the presumptions and limitations in the 1994 act of the Legislature "mak[e] it almost impossible for an Arizona watercourse to be determined navigable." Given these presumptions, it is not surprising that the Commission found every river it examined – including the Gila, the Salt, the Verde, the Agua Fria, the Bill Williams, the San Pedro, and the Hassayampa – to be non-navigable. The Legislature then passed laws ratifying and adopting the findings and recommendations of the Commission, declaring the rivers to be non-navigable, and disavowing any claim of title to their beds based on the equal footing doctrine.[10]

Through the use of the Commission and the one-sided directions given to the Commission, the legislature had achieved the same result that it had attempted to achieve in the legislation struck down by the court in *Arizona Center for Law in the Public Interest v. Hassell*: it had nullified the equal footing and public trust doctrines in Arizona. But the Arizona Center for Law in the Public Interest was not about to give up. It joined forces with three private individuals and Defenders of Wildlife to take the Legislature to court once again, this time arguing that the presumptions and limitations in the Legislature's instructions to the Commission violated long-established federal standards for determining the navigability of rivers.

As in the previous litigation, the Center lost in the trial court but prevailed on appeal. On February 13, 2001, the Arizona Court of Appeals issued its decision in *Defenders of Wildlife v. Hull.*[11] The Court held that "the assessment of navigability for the purpose of determining title to land under watercourses at the time of statehood is a matter of

federal law rather than state law," and therefore the Legislature was not free to create its own standards of navigability in its instructions to the commission.

The federal standard is set out in an 1870 decision of the U.S. Supreme Court titled *The Daniel Ball*:

> Those rivers must be regarded as public navigable rivers in law which are navigable in fact. And they are navigable in fact when they are used, or are susceptible of being used, in their ordinary condition, as highways for commerce, over which trade and travel are or may be conducted in the customary modes of trade and travel on water.[12]

The Court found that many of the limitations and presumptions in the Legislature's instructions to the Commission were inconsistent with the *Daniel Ball* test for navigability. The Court noted that, under the *Daniel Ball* test, a river as a whole may be determined to be navigable even though parts of it are non-navigable, that non-commercial trade or travel may justify a finding of navigability, that trade and travel are not *both* required, that ephemeral streams can be determined to be navigable, that trade or travel need not be both upstream and downstream, that recreational use of a river can support a determination of navigability, that the existence of impediments to navigation or the predominance of other modes of transportation does not negate the navigability of a river, and that regulation by the federal government under the Rivers and Harbors Act is not a prerequisite to a finding of navigability.

Since the standards applied by the Commission pursuant to the Legislature's instructions were in conflict with the *Daniel Ball* test, the court concluded that the Legislature's actions based on the Commission's findings and recommendations were unconstitutional:

> We find that the particularized assessment necessitated by [*Arizona Center for Law in the Public Interest v. Hassell*] was neither performed in accordance with the applicable federal law nor done in a manner consistent with the public trust doctrine. When this assessment is so abrogated, public trust land may be forfeited. Potential forfeiture of the watercourse bedlands, by being functionally identical to the outright disclaimer in *Hassell*, is a violation of the public trust doctrine and the Arizona Constitution's gift clause.

MANY RIVERS TO CROSS

The battle over disposition of Arizona's rivers is far from over. Some of the parties on the losing side in *Defenders of Wildlife* have filed a motion for the Court of Appeals to reconsider its decision. If that motion does not succeed, it is likely that the same parties will ask the Arizona Supreme Court to look at the case.

Moreover, the decision in *Defenders of Wildlife,* like the earlier decision in *Arizona Center for Law in the Public Interest v. Hassell*, did not determine which, if any, of Arizona's rivers other than the Colorado were navigable in 1912 and are therefore subject to the equal footing and public trust doctrines. It merely decided that the Legislature's attempt to declare them all non-navigable by fiat was invalid. It is now up to the Legislature to craft a new process for assessing navigability, and it seems fair to assume that the results of that process will again be legally challenged by the Arizona Center for Law in the Public Interest and other environmentally oriented organizations.

WHAT ABOUT THE WATER?

To those concerned about riparian and aquatic habitat, the struggle over disposition of the *beds* of rivers may seem like a sideshow. Water is the crucial element that distinguishes rivers and streams from dry lands. Many of Arizona's rivers, even if navigable in 1912, have since been dried up by dams, diversions, and groundwater pumping and now provide little or none of the values – fishing, commerce, recreation, wildlife habitat – that the public trust doctrine should protect.

What role will the public trust doctrine play in the future of such rivers if they are ultimately determined to have been navigable at the time of statehood? According to one of the three Court of Appeals judges who decided *Defenders of Wildlife v. Hull*, the answer may be little or none. In a concurring opinion, Judge Jon W. Thompson observed that in western states such as Arizona, where water rights are governed by the doctrine of prior appropriation, the application of the public trust doctrine may be different than in eastern states that follow the doctrine of riparian rights. Specifically, he opined that "public trust purposes in Arizona would seemingly include private appropriation and exploitation." Therefore, according to Judge Thompson, "[i]t is not a foregone conclusion that lands underlying 'streams' that were navigable at the time of statehood but now contain little or no surface water could not be granted to private owners as this legislation seeks to do." If this view were to prevail, it is possible that the fight over navigability could turn out to be much ado about nothing.

There is, however, an alternative to Judge Thompson's view that the doctrine of prior appropriation modifies the public trust doctrine. The alternative view is that the public trust doctrine modifies the doctrine of prior appropriation. This view has

been set forth most authoritatively in the decision of the California Supreme Court in *National Audubon Society v. Superior Court*, more commonly known as the Mono Lake Case, where the Court held that the public trust doctrine is an inherent limitation on water rights obtained through appropriation.[13] According to the California Court, the state has the power and the duty to re-examine old water rights that were initially granted without consideration of the public trust, and to modify those rights if necessary to protect trust values. Moreover, the court held that the state's power and duty of re-examination extends to water rights on tributaries of navigable waters as well as on the navigable waters themselves.

So far, no case has been presented to the Arizona courts that would require them to decide whether to adopt the holding of the Mono Lake Case. But a 1999 decision of the Arizona Supreme Court, in a case challenging yet another attempt by the Legislature to quash the public trust doctrine, suggests that the doctrine does have some role to play in Arizona water law. In *San Carlos Apache Tribe v. Superior Court,*[14] the Court struck down a statute that declared that the public trust "is not an element of a water right" and that ordered courts adjudicating water rights "not [to] make a determination as to whether public trust values are associated with any or all of the river system or source."[15] In striking down the statute the Court declared:

> The public trust doctrine is a constitutional limitation on legislative power to give away resources held by the state in trust for its people. The Legislature cannot order the courts to make the doctrine inapplicable to these or any proceedings. . . . That determination depends on the facts before a judge, not on a statute. It is for the courts to decide whether the public trust doctrine is applicable to the facts. The Legislature cannot by legislation destroy the constitutional limits on its authority.

The question left open by the Court's decision is whether the "resources held by the state in trust for its people" include the water, as well as the beds, of navigable rivers. If the Court eventually adopts the affirmative answer given by its California counterpart in the Mono Lake Case, then the struggle over the ownership of Arizona's river beds could turn out to be but a prelude to a larger struggle over whether water should be returned to some of those beds that are now dry.

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2. *Pollard v. Hagan*, 44 U.S. 212 (1845).
3. *Illinois Central Railroad v. Illinois*, 146 U.S. 387, 434 (1892).
4. *Kootenai Environmental Alliance v. Panhandle Yacht Club,* 105 Idaho 622, 632, 671 P.2d 1085, 1095 (1983); *Borough of Neptune City v. Borough of Avon-by-the-Sea*, 61 N.J. 296, 309, 294 A.2d 47, 54 (1972); *Marks v. Whitney*, 6 Cal.3d 251, 260, 491 P.2d 374, 380 (1971).
5. *Land Department v. O'Toole,* 154 Ariz. 43, 44 - 46, 739 P.2d 1360, 1361 - 63 (1987) (citing *State of Arizona v. Valley Concrete and Materials*, No. 45245 (Yavapai County Superior Court, filed April 26, 1985)).
6. ARIZ. CONST., art. IX, § 7.
7. *Arizona Center for Law in the Public Interest v. Hassell,* 72 Ariz. 356, 837 P.2d 158 (1991).
8. A.R.S. §§ 37-1123.
9. A.R.S. § 37-1128.
10. A.R.S. §§ 37-1129 to 37-1129.16.
11. *Defenders of Wildlife v. Hull*, 18 P.3d 722 (2001).
12. The Daniel Ball, 77 U.S. 557, 563 (1870).
13. *National Audubon Society v. Superior Court,* 33 Cal. 3d 419, 658 P.2d 709 (1983).
14. *San Carlos Apache Tribe v. Superior Court*, 193 Ariz. 195, 972 P.2d 179 (1999).
15. A.R.S. § 45-263.B.

SPECIES PROFILE

GILA CHUB (*GILA INTERMEDIA*)

by David A. Weedman, Arizona Game and Fish Department, Region VI, Mesa, Arizona

My last several hours have been spent watching the birds frolic along Cienega Creek in south central Arizona, a birding paradise. It's starting to get warmer, the sun is shining brightly and it's time to sit a while, have a drink of water and finish filling out my journal. There's a nice spot under the trees next to that deep pool, so I sit to relax before walking back to my truck. Just as I'm about to sit, I notice something out of the corner of my eye. There, in the shadow of that submerged tree limb, I see a fish dart into hiding. It's about 6 inches long, looks a little like some trout I caught last year, but chubbier and colored a bit different. After a few minutes of writing in my field book, I notice the fish has come out from the shadows and is now cruising around the pool.

That fish isn't a trout at all; it's the Gila chub, *Gila intermedia*. I've still got my binoculars at hand, so I use them to get a closer look without spooking the fish back into hiding. I notice that he's very chunky and generally dark overall, except down near the belly, where he starts to lighten up. As I watch more intently, I notice that the corners of his mouth and base of the paired fins are a brilliant, almost fire-red color. It is spring after all, breeding season for many animals, including the Gila chub.

As I sit watching the chub slowly exploring his realm, memories of the many interesting facets of his aquatic existence, learned while writing a report, come back to me. Gila chub generally spawn in late spring to early summer. Males will become brightly colored, displaying bright red to orange hues on the base of fins, portions of the ventral abdomen and caudal peduncle (thick tail). Their fins may be washed with a lemon-yellow coloration, especially larger ones. The body will maintain a blue-black color above the lateral line, fading to lighter colors on the abdomen. Females may exhibit some of the same coloration during breeding, although much less intense. Spawning may be sporadic throughout the reproductive season (late spring through summer), and likely occurs over beds of submerged aquatic vegetation or among root wads (Minckley 1973). Several males will escort a ripe female. When ready, the female will deposit eggs on the chosen substrate in association with one or more of the males who immediately fertilize the eggs. Some data suggest that Gila chub begin spawning when they reach 3 inches in length and when water temperatures rise above 17 degrees C (Griffith and Tiersch 1989, Nelson 1993), but the indeterminate growth exhibited by fishes allows them to mature at variable sizes. Most will mature in their second or third year of life. Female Gila chub generally reach about 10 inches in length with males rarely exceeding 6 inches. However, I collected a behemoth Gila chub measuring 12 inches from Bonita Creek in 1993.

Gila chub is one of six species of chubs found in Arizona. All chubs are in the minnow family called Cyprinidae. Cyprinids are the most common family of fishes historically found in Arizona, with fishes in the genus Gila (so named after the Gila River) being the most diverse. Other fishes in this genus extend throughout western North America. The Gila chub was originally described in 1854 using specimens collected from the Santa Cruz River (Baird and Girard 1854). Two of the other species, the Yaqui chub (*Gila purpurea*) and Sonora chub (*G. ditaenia*), are only found in Arizona in small localized populations in the headwaters of the Yaqui and Sonoyta river basins of extreme southeastern and southern Arizona, respectively.

The Gila chub exhibits a disjunct distribution that extends from western New Mexico to central Arizona and from the Mogollon Rim south into northern Mexico, but only in streams of the Gila River basin. It is disjunct in the fact that it occupies smaller tributary streams of the Salt, Verde, San Pedro (including headwaters in Mexico), San Francisco, San Carlos and Gila river basins. Roundtail (*Gila*

Gila chub, Gila intermedia.

robusta), bonytail (*G. elegans*) or humpback (*G. cypha*) chubs likely occupied the main channels of the larger rivers. Their presence may have genetically swamped any opportunity for exchange between the isolated populations of Gila chub. The Gila chub also was found historically in the Santa Cruz River basin, where it was the only chub known.

The Gila chub has suffered loss of several of its historic populations, and depression of many other populations has been a result of the same factors that continue to threaten Arizona's dwindling riparian areas (Weedman et al. 1996). Diversion, damming, and groundwater pumping have dried many formerly flowing streams, or reduced flows to the point of being inhospitable to larger-bodied fishes. Fishes that are not native to Arizona almost invariably occupy the remaining surface water and prey upon the natives or compete with them for food and space.

Cienega Creek, Pima County Arizona. Photograph by D. A. Weedman.

Populations of Gila chub can still be found in tributaries to the upper Gila, Verde, Santa Cruz and Agua Fria rivers. They are also found in two tributaries of the San Pedro River and its headwaters in Mexico. Historic populations existed in the San Carlos River drainage, but their existence there now is unknown. Populations also are known from the headwaters of the Verde River and two tributaries of the Babocomari River. Gila chub have disappeared from the entire mainstem Santa Cruz River, the only two known locations in the Salt River basin and the San Simon River. Of the 24 remaining populations of Gila chub, only the one in Cienega Creek was considered stable and secure. The other habitats were either threatened by various habitat factors or the populations were unstable due to limited reproduction or recruitment (Weedman et al. 1996).

My thoughts on this uniquely adapted desert dweller are briefly interrupted when I see the chub dart out, catch and eat a smaller fish swimming near the surface of the pool. The food this time may have been an endangered Gila topminnow (*Poeciliopsis occidentalis occidentalis*); a small livebearer that commonly occurred with the Gila chub. Gila chubs generally are omnivorous in their diet. Adults appear to be principally carnivorous, feeding on large and small aquatic and terrestrial invertebrates and sometimes other small fishes (Rinne and Minckley 1991). Smaller individuals often feed on organic debris and aquatic plants. Adults usually move and feed more during the evening and early morning, but young are active throughout the day (Rinne and Minckley 1970; Minckley 1973; Griffith and Tiersch 1989). Under aquarium conditions, I have observed Gila chub attack and consume young longfin dace (*Agosia chrysogaster*) as well.

The Gila chub evolved and co-occurs with other native fishes such as longfin dace, Sonora sucker (*Catostomus insignis*) and desert sucker (*Pantosteus clarki*). The Gila chub commonly inhabits pools or deep runs in smaller streams and cienegas. It is generally secretive when spooked, but adults can be observed in deep pools farther from cover in the summer. Undercut banks, submerged logs and dense aquatic vegetation provide ideal cover. Young-of-the-year fish inhabit shallow shorelines with dense aquatic vegetation while older juveniles use swifter currents in deeper water (Minckley 1973).

Arizona's dwindling riparian areas are home to a wide variety of terrestrial and aquatic vertebrates. Arizona has 35 species of native fishes, while more than 70 alien kinds have been introduced around the state. Although fish are much more difficult to observe than birds and mammals, they still can be considered "watchable wildlife." A good pair of binoculars or better yet, a mask, snorkel and swimsuit will provide you with hours of cool entertainment in any of Arizona's streams, rivers and lakes. My first time observing fish at their level, submerged, opened a whole new world to me. A good field guide, left on the bank of course, for reference may just open up a new world of exploration for you.

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WENDELL L. MINCKLEY, PROFESSOR EMERITUS

Wendell Minckley, better known as "Minck," died on June 22, 2001. Dr. Minckley came to Arizona State University in 1963 where he conducted research and taught for 38 years.

Wendell L. Minckley was born on November 13, 1935 in Ottawa, Kansas. He graduated from Kansas State University in 1957, where he majored in wildlife and fisheries biology. In 1959 he received a master's degree in zoology (ichthyology) at The University of Kansas. He was awarded a Ph.D. in biology at The University of Louisville in 1962. His dissertation was an exhaustive study of the aquatic ecology of Doe Run, a stream in Meade County, Kentucky. His minor was geology, a discipline that would prove foundational for his later studies of the zoogeography of Southwestern fishes. A one-year appointment in the Biology Department at Western Michigan University preceded a move to Arizona State University in 1963 as Assistant Professor of Zoology. Professor Minckley was among the first faculty members recruited to move ASU from its traditional roots as Arizona Territorial Normal School toward the Research I University that it is today. He played a seminal role in that transformation as he received major research awards, trained students, and established an internationally recognized research program in aquatic ecology, systematic ichthyology, and conservation biology.

Dr. Minckley and his students studied aquatic ecosystems and Southwestern fishes. He was the author and editor of 3 books and 175 journal articles and book chapters. He published *Fishes of Arizona*, the first compendium of the fishes of this region. Teaming with colleagues he produced major papers on the Gila and the Colorado rivers; the fishes of the Rio Yaqui in Mexico; Southwestern aquatic communities; environmental change in Arizona streams from the1800s to the late 20th century; and the zoogeography of the freshwater fishes of western Mexico and the U.S. He was a major contributor to the forthcoming *Fishes of Mexico*.

Dr. Minckley's research documented change in habitats and organisms. Increasing demands for water in the American Southwest began around 1900– disrupting aquatic habitats and pushing most native fishes toward extinction. Dr. Minckley was among the founders of the Desert Fishes Council, a group dedicated to conserving aquatic habitats and fishes in arid lands. He was a tireless conservationist, combining research, training students, and service to state and federal agencies. He wrote popular articles that he saw as important vehicles for fostering a conservation ethic. He was a gifted naturalist; five species (a snail, scorpion, beetle, fly, and a cichlid fish) are assigned the name "*minckleyi*" in recognition of his discoveries. Several of these species are from Cuatro Cienegas, Coahuila, Mexico. He was instrumental in having this region designated a Natural Protected Area to conserve its remarkable flora and fauna.

Throughout his career, Dr. Minckley served state and federal agencies as well as professional societies. Protection of the scarce aquatic resources of the Southwest was always paramount. His opinions could be controversial since they frequently varied with the recommendations of agencies and developers concerning use and protection of aquatic resources. He served on state and federal committees to review the status of endangered fish species and their habitats. In 1984-85 he was Senior Fisheries Biologist at Dexter National Hatchery, NM, devoted to conserving endangered species. Most recently, he served on the U.S. Academy of Science Committee to review the Glen Canyon Monitoring and Research Program.

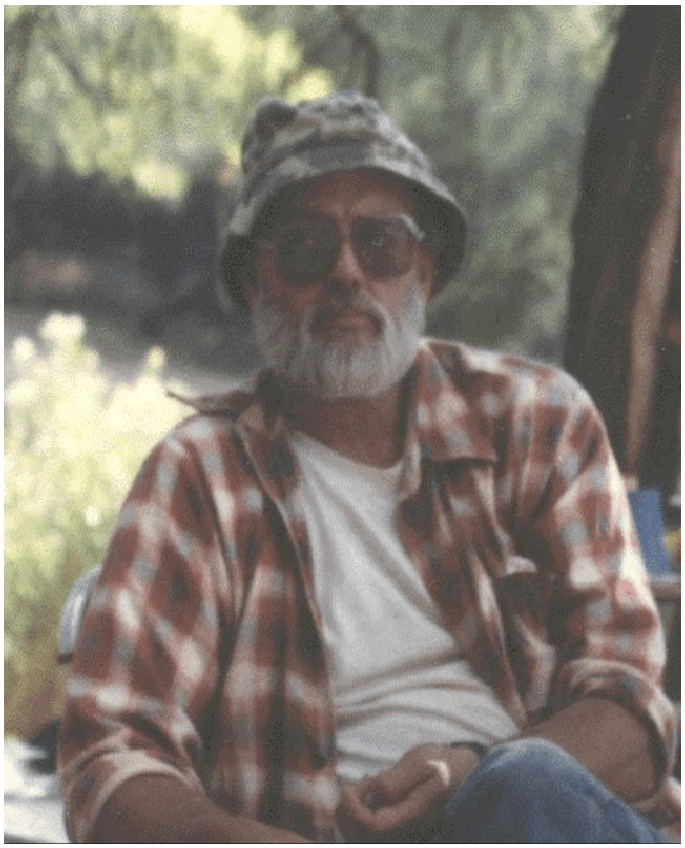
Dr. Minckley was an internationally respected authority on the systematics, ecology, and conservation biology of the fishes of the southwestern U.S. and Mexico. These animals interested him as exceptional examples of the process of evolution, and his research was among the first to draw attention to the forces driving this fauna to extinction. With James Deacon, he published *Battle Against Extinction* (1990). In the Preface they wrote:

> *Conservationists agree as a group...that diversity must be maintained for the welfare of the biosphere, as well as for the welfare of humans. Those who embrace other philosophies are often just as firmly convinced of their alternative views, and only education based on tangible data and logical, documentable results of research and observation can be expected to change their minds. This volume provides such information, and we hope it is widely used as a reference to provide examples of what has been learned, and accomplished, in dealing with an obscure group of animals that depend on water in an improbable place.*

Aquatic ecosystems provided Professor Minckley with the context for understanding the evolution of fishes. He spent his career fighting against the anthropogenic changes destroying the organisms he loved and their habitats.

His family requests that donations be sent to Desert Fishes Council, Department of Biology, Arizona State University, Tempe AZ 85287-1501, USA.

[Eds' note: Dr. Minckley was a member of the ARC. The above information was adapted from the ASU Biology Department.]



LEGAL ISSUES OF CONCERN

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

THE COLORADO RIVER DELTA: RECENT LEGAL AND POLICY DEVELOPMENTS

Lack of freshwater inflow from the Colorado River caused by dams and water diversions have caused the wetland ecosystem in Mexico's Colorado River Delta to decline from some 1.9 million acres to 150,000 acres over the last 60 years.[1] In addition, the decline in fresh water making it through the Delta and into the Sea of Cortez is responsible for steadily increasing levels of salinity in these ecosystems, which is raising concerns among biologists.[2] The Delta, and the Sea of Cortez (aka Gulf of California) to which it drains, are home to a number of species listed as endangered or threatened under the federal Endangered Species Act, including the Vaquita porpoise,[3] the Totoaba fish,[4] and the Southwestern Willow Flycatcher.[5] In addition, Mexican fishery officials are worrying about the affect of rising salinity levels on the $220 million shrimp industry in the Sea of Cortez.[6] This article discusses the relationship between these environmental and economic issues and the following recent U.S. legal and policy decisions regarding the Colorado River: (1) the Lower Colorado Multi-Species Conservation Program; (2) the Department of Interior's Interim Colorado River Surplus Criteria; and (3) the U.S.-Mexico Joint Declaration regarding the Colorado River Delta.

THE LOWER COLORADO MULTI-SPECIES CONSERVATION PROGRAM AND RELATED ISSUES

In 1994, the U.S. Fish and Wildlife Service (USFWS) declared critical habitat for the following lower Colorado River fish listed as endangered under the federal Endangered Species Act: The Razorback Sucker; Colorado Squawfish (since renamed the "Colorado Pikeminnow"); Humpback Chub; and Bonytail Chub (commonly referred to as the four "big river" fish).[7] As a consequence, federal, state, private, and public interest stakeholders quickly realized that a coordinated, comprehensive approach to conservation and compliance with the Endangered Species Act would be required for operation of the lower Colorado River. After two years of preparation, a Steering Committee (currently comprised of 27 members) was formed in January 1997 to develop a Multi-Species Conservation Plan (MSCP) for the lower Colorado River.[8] The Steering Committee identified four primary goals of the MSCP: (1) to ensure that lower Colorado River basin operations remain in compliance with the ESA, and work toward recovery of listed species and reduce likelihood of additional species listings for a 50-year period; (2) to maintain the status quo on water diversions and power production from the River[9]; (3) to provide for mechanisms that would allow federal and non-federal entities to legally "take" endangered species in the course of their operations; and (4) development of interim conservation measures to address the immediate needs of certain endangered species.[10]

While the MSCP process was taking shape, the Bureau of Reclamation was completing a Biological Assessment for its proposed operations and maintenance program for the Lower Colorado River in response to USFWS' critical habitat designations for the four big river fish.[11] Despite pressure from environmentalists concerned about the effect of the Bureau's operations on the Mexican Colorado Delta, the Bureau limited the geographic area of its 1996 Biological Assessment to the mainstream of the Colorado from Lake Mead to the Southern International Boundary with Mexico. Subsequently, in its Biological Opinion of the Bureau's Biological Assessment, USFWS accepted the Bureau's decision not to include the effect of its operations on species in Mexico (i.e., the Delta or Sea of Cortez) within the scope of analysis.[12] However, since USFWS had found that the Bureau's ongoing lower basin operations would result in continued take of endangered species in the U.S., USFWS required the Bureau to take "reasonable and prudent measures" to minimize the impacts of its operations on these endangered species in the U.S. USFWS recognized that one such measure the Bureau could take would be to participate in the MSCP process and assist in development of the conservation plan for the lower Colorado River. With input from the Bureau, among others, the MSCP's environmental consultants released an administrative draft Conservation Plan for comment by Steering Committee members on July 10, 2001.[13] The draft Plan is currently receiving comments from MSCP participants. Not surprisingly, the Plan continues to limit the geographic scope of the MSCP to the U.S. side of the Mexico border.[14]

LITIGATION

After failing to convince either the Bureau or USFWS to include the Delta within their scope of analyses, environmental organizations participating in the MSCP Steering Committee attempted early on to obtain a commitment that the MSCP would consider transfers of Colorado River water to the Delta. However, after the Steering Committee voted in a November 1998 meeting to not consider the possibility of such a water transfer, the major participating environmental organizations, including Center for

Biological Diversity, walked out on the MSCP process. Subsequently, Defenders of Wildlife, joined by the Center and a number of Mexican environmental organizations, filed suit in U.S. District Court in June, 2000[15] alleging, among other things, that the Endangered Species Act's Section 7 consultation provisions required the Bureau, USFWS, and the National Marine Fisheries Service (with jurisdiction over endangered marine life such as the vaquita porpoise) to take into consideration the effects of lower Colorado River operations in Mexico.[16] In an early procedural victory for plaintiffs in this case, the court, in an October 2000 order, denied motions to intervene in the lawsuit by a number of municipal and private water users, including the State of Arizona. The court reasoned that since the environmental organizations were merely seeking another Section 7 consultation, and not seeking injunctive relief that would specifically impact any of the proposed intervenor's Colorado River water allocations, the intervenors did not have "standing" to appear in court. In other words, the intervenors had failed to demonstrate an "injury in fact" pursuant to Article III of the U.S. Constitution - at least at that stage of the proceedings.[17]

The outcome of this case is eagerly anticipated because of the profound impact it would have on the MSCP process if the court agreed that the Bureau and USFWS were required under the Endangered Species Act to take into account the effects of Bureau operations in Mexico. The case may also settle the long-standing issue of the extent to which U.S. agency action in foreign countries must comply with Endangered Species Act requirements (an issue last substantively addressed by the federal courts in 1990).[18]

RECONSULTATION

Another looming issue regarding the MSCP process is the expiration of the USFWS Biological Opinion on May 15, 2002. In 1997, USFWS considered its Biological Opinion as temporary, lasting for only a five-year period until the expected completion of the MSCP in 2002. The MSCP process, however, is one year behind schedule. It is also possible that the above-mentioned litigation may delay finalization of the MSCP until after May 15. If so, the Steering Committee expects that another round of Section 7 consultation would have to be reinitiated by the Bureau, and another lengthy comment period required.[19]

CALIFORNIA'S COLORADO RIVER USE PLAN AND THE DEPARTMENT OF INTERIOR'S INTERIM SURPLUS CRITERIA

Under the terms of the 1964 Decree of the U.S. Supreme Court in *Arizona v. California*, and other federal laws[20] comprising the "Law of the River", California is entitled to an allocation of 4.4 million acre feet (maf) of Colorado River water. Nonetheless, California has for years been diverting well over 5.0 maf by relying on the historical inability of Arizona and Nevada to fully utilize their apportioned shares of Colorado River water.[21] However, Arizona has recently begun to store its previously unused portion of Colorado River water pursuant to its new water banking authority,[22] and Nevada probably reached its full apportionment in 2000.[23] Thus, California was put in a position where it could only receive more water than its 4.4 maf allotment in years of declared surplus. Normally, the Department of Interior makes its Colorado River surplus determination on an annual basis.[24] If conditions warrant (i.e., there is over 7.5 maf available to be released from Lake Mead), surplus water may be made available to California. Since surpluses cannot be guaranteed every year, and because California required some certainty in its water planning, the Department of Interior issued Interim Surplus Guidelines this year that, in essence, declare a surplus of Colorado River water until the year 2016.[25] As a condition of this declaration of a 16-year surplus, California has been forced to implement a "Colorado River Water Use Plan" (formerly known as the "4.4 Plan") to reduce its consumption of Colorado River by 2016 to 4.4 maf.[26] This scheme provides California with what one water specialist terms a "soft landing" in its efforts to wean itself of surplus water.[27]

In a related matter, on May 23rd, 2001, Arizona and Southern California's Metropolitan Water District (MWD) entered into an Interim Surplus Agreement.[28] Under this agreement, MWD agreed to implement conservation measures and water transfers to gradually reduce diversions of Colorado River water to 4.4 maf by 2016.[29] In return, Arizona agreed to waive a portion of its rights to surplus water and prevent contractors within Arizona from ordering surplus water in certain quantities in certain years.[30]

Environmentalists are in opposition to these surplus determinations. Currently, Colorado River water only reaches the Delta, and then the Sea of Cortez, in surplus years. In an October 27, 2000 letter to the Bureau of Reclamation, the Defenders of Wildlife, Center for Biological Diversity and other environmental groups expressed their concern that by allowing California's demand to drive the surplus determination, it becomes very unlikely that "excess" Colorado River water, i.e., flood flows, will continue to reach the Delta. The Department of Interior, however, has indicated that it is the position of the U.S. State Department that "the United States does not mitigate for impacts in a foreign country."[31] On the other hand, in its interim surplus determination, the Department also expressed hope that future discussions between Mexico and the U.S. International Boundary and Water Commission could result in a solution.[32] One step toward a possible solution is the possibility of a revision to the agreement between

Mexico and the U.S. regarding deliveries of Colorado River water to Mexicali's farmers, dicussed below.

THE JOINT DELTA DECLARATION AND POSSIBLE CONCEPTUAL MINUTE

On May 18, 2000, Mexico's Secretariat of Environment, Natural Resources and Fisheries, and the U.S. Department of Interior issued a joint declaration pledging to work together "to strengthen cooperative action and mechanisms to improve and conserve the natural and cultural resources of the Colorado River Delta."[33] This Joint Declaration marked the first instance of formal recognition by the U.S. of environmental issues concerning the Delta. As a result, the International Border Water Commission is reportedly in the process of drafting a "conceptual minute" that may further identify measures to be taken by the U.S. and Mexico to ensure the continued biological relevance of the Delta. This minute would be in addition to the Commission's Minute 242,[34] which guarantees water of good quality and low salinity, to Mexico's farmers in Mexicali. It is rumored that this conceptual minute may address the fate of the Wellton-Mohawk Desalinization Facility (aka 'desalter') in Yuma, Arizona. The desalter was built to reduce the salinity of drain waters from the Wellton-Mohawk Irrigation and Drainage District in Arizona, and enable their delivery to Mexico within the terms of the 1944 agreement. However, the desalter is nonoperational, and has been since 1987, for lack of federal funding. Thus, this highly saline irrigation tail water is currently diverted, via canal, to an area in the Colorado River Delta referred to as the Cienega de Santa Clara. This wetland area, designated as a United Nations biosphere reserve, has become over the decades dependent on delivery of this saline water from the U.S. Thus, the fate of this portion of the Delta is intimately tied with the operation of the Yuma desalter.

It is also hoped that a conceptual minute would address the following issue: Under the terms of the U.S.-Mexican Water Treaty of 1944, Mexico has no obligation to use any of its water allotment for species preservation.[35] This last issue has been a major sticking point in any discussions concerning the Delta because of fears that any water voluntarily provided to the Delta by the U.S. would instead end up in the fields of Mexicali farmers. Many MSCP participants, as well as environmentalists, are hoping that the increasing spirit of cooperation between the new Fox administration in Mexico and the U.S. will allow for a new conceptual IBWC minute, as well as other binding commitments to preserve the Delta.

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3. Listed as endangered in 50 Fed. Reg. 1056 (Jan. 9, 1985).
4. Listed as endangered in 44 Fed. Reg. 21289 (April 10, 1979).
5. Critical habitat designated in 62 Fed. Reg. 39129 (July 22, 1997)
6. *See* Ignacio Ibarra, "Shrimped Out in Sonora", *Arizona Daily Star* (March 9, 2001); Usha McFarling, "Marine Life Decline in Colorado Delta Studies", *Los Angeles Times*, (Dec. 2, 2000); Tom Knudson, "A Dying Sea", *Sacramento Bee* (December 10-13, 1995)
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10. *See* MSCP website.
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14. *Id.* at Section 1.4.
15. *Defenders of Wildlife, et. al. v. Babbitt*, D.D.C. Civ. No. 00-1544 (June 28, 2000).
16. *Defenders of Wildlife, et. al.* v. *Babbitt* Complaint at ¶67.
17. Order, *Defenders of Wildlife, et. al. v. Babbitt*, Civil Action No. 00-1544 (JR) (Oct. 13, 2000).
18. *Defenders of Wildlife v. Hodel*, 707 F. Supp. 1082 (8th Cir. 1989)(holding that "the 1986 regulations promulgated by the Secretary of Interior which limited the application of the ESA to those activities occurring within the United States or on the high seas are contrary to the ESA."); *aff'd Defenders of Wildlife v. Lujan,* 911 F.2d 117, 123-125 (8th Cir. 1990) ("We believe that the answer to the extraterritorial issue can be found in the plain words of the statute. Our examination of the statute's legislative history, however, also reinforces our conclusion

… that Congress intended that the Act's consultation requirement apply to projects in foreign nations"); reversed on other grounds [standing] by *Lujan v. Defenders of Wildlife*, 504 U.S. 555 (1992).

19. April 26, 2001 Steering Committee Motion Regarding SAIC/Jones & Stokes Work Plan, included in MSCP Steering Committee notes for July 31, 2001 Phoenix, Arizona meeting.
20. *See* Colorado River Basin Project Act of 1968 (CRBPA) and the Long Range Operating Criteria adopted by DOI pursuant to the CRBPA.
21. U.S. Department of the Interior, Bureau of Reclamation, Colorado River Interim Surplus Criteria Final Environmental Impact Statement (FEIS), Executive Summary at 7 (December 2000).
22. The Arizona Water Banking Authority was created under A.R.S. § 45-2401 *et seq*.
23. Colorado River Interim Surplus Criteria FEIS at 7.
24. Colorado River Interim Surplus Criteria FEIS at 4-5.
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26. *Id.* at 8.
27. Dennis Underwood, Colorado River specialist for the MWD of Southern California, as quoted in "Colorado River Deal Near," *Los Angeles Times*, Dec. 14, 2000.
28. Interim Surplus Guidelines Agreement Between the State of Arizona and the Metropolitan Water District of Southern California (May 23, 2001)
29. *Id.* at Article 2.1.2.
30. *Id.*
31. Colorado River Interim Surplus Criteria FEIS at 26 ("Transboundary Impacts")
32. *Id.*
33. Remarks by Secretary of the Interior Bruce Babbitt Colorado River Water Users Association Meeting Las Vegas, Nevada (December 14, 2000), at http://www.lc.usbr.gov/~pao/crwuasph.html.
34. IBWC Minute 242, "Permanent And Definitive Solution To The International Problem Of The Salinity Of The Colorado River," dated Aug. 30, 1977.
35. Memorandum from Mr. John Leshy, Solicitor, DOI to Mr. Eluid Martinez, Commissioner, BurRec, dated August 14, 2000.

NOTEWORTHY PUBLICATIONS

Jere Boudell, Department of Plant Biology, Arizona State University

Stromberg, J. C. 2001. Biotic integrity of *Platanus wrightii* riparian forests in Arizona: First approximation. *Forest Ecology and Management* 142: 251-266.

Indices of biological integrity have been the subject of much interest. Practitioners, managers, and ecologists alike are interested in a time and fund saving methodology for approximating ecosystem condition. An index of biological integrity must be tailored for the particular ecosystem type that it is intended to be used in. The biohydrological relationships of riparian plant communities dominated by *Platanus wrightii* were investigated. This information was used to form a preliminary index of biological integrity for the Interior Riparian Deciduous Forest of the Southwest.

Four study areas were selected in the Tonto National Forest and in the Fort Huachuca Military Base. Nine study sites were selected that varied in stream flow frequency (perennial, intermittent, or ephemeral flow). Surface flow presence/absence data were collected. The stem water potential of *P. wrightii* were sampled. Increment cores or basal stem slabs were collected to determine *P. wrightii* growth rate. *P. wrightii* seedling growth rate was also determined. Finally, *P. wrightii* stem density and community structured was determined.

Statistical analysis revealed that the average pre-dawn water potential varied with the average seasonal depth-to-groundwater. The radial growth rate of *P. wrightii* was greatest in areas with shallow groundwater. Seedlings were taller at perennial sites and the root:shoot ratio varied with hydrologic condition. However, *P. wrightii* stem density did not respond to differences in any of the hydrologic variables measured. Average wetland indicator scores varied with differences in many of the variables. Woody plant species richness also varied according to several hydrologic variables.

Based on these results, the author suggested that several of the biohydrologic variables could be used as indicators of ecosystem degradation due to stream dewatering. *P. wrightii* xylem water potential and radial growth rate were sensitive to site hydrology. These two variables could be used to indicate the decline of Southwestern interior forest ecosystem stability. Deter-

mining radial growth rate by increment borers and stem slabs are destructive methods. The author suggests that perhaps annual branch growth rate could be used instead. Although woody plant species richness also varied with hydrologic condition, it could have been affected by other factors such as disturbance intensity and frequency. Further investigation is needed to determine the relationship of woody species diversity to a variety of factors. Wetland indicator scores also varied with hydrologic condition. However, the differences between wet and dry sites varied little. Thus, the use of wetland indicator scores in an index of biological integrity would reveal little concerning site condition. Stem density and total woody plant stem density did not respond to differences in hydrologic condition and would not be useful in an index of biological integrity.

Indices of biological integrity can be very useful in determining site condition. This investigation reveals that in Southwestern Interior riparian forests *P. wrightii* xylem water potential, radial growth rate, and perhaps woody species richness could indicate ecosystem degradation due to stream dewatering.

Jackson, R. B., S. R. Carpenter, C. N. Dahm, D. M. McKnight, R. J. Naiman, S. L. Postel, and S.W. Running. 2001. Water in a Changing World. *Ecological Applications* 11(4): 1027-1045.

Many agencies are involved in management of water resources. Each agency has its own agenda to meet when it comes to managing the various aspects of the water cycle. Unfortunately, there is not one central agency with which representatives from the various agencies can meet to discuss the status of the entire water cycle. With the impact of global climate change looming over the horizon, coupled with increases in the demand on water resources due to an increasing population, an urgent need exists for improved management of water resources.

In this report, Jackson et al. described the global water cycle, anthropogenic influences on the system, potential changes to the system, and potential priorities for research and management. Jackson et al. report that currently, more than 1×10^9 km^3 of water is present on the Earth. Less than 3% of the water is useful for crop irrigation or for human consumption. Most of this water is stored in the polar ice caps and glaciers. The amount of water withdrawn for human use has risen exponentially within the last 100 years. However, water does not reach everyone equally in the world. This deficiency is responsible for approximately 250×10^6 cases of water-related diseases and $5\text{-}10\times10^6$ deaths each year. The authors point out that proper management is critical to meet the growing demand on water resources.

Human population growth is increasing faster than our useable water is being replaced. While climate change will cause an increase in precipitation, it will not uniformly increase the availability of fresh water. A greater evaporative demand on plant and soil water will also decrease the amount of fresh water available for human consumption. Jackson et al. note that many areas will experience an increase in drought due to an increase in surface temperatures. Already in many areas, current water use outstrips supply with a resulting shrinkage in lake volume, salt-water encroachment on aquifers, and depletion of groundwater.

The authors pull together research on many water cycle topics and tie them together with how the results relate to the water cycle as a whole. Robust examples are sprinkled throughout the report, which aid the reader in understanding the issues involved with managing water resources. Other topics addressed in this report include the state of the groundwater supply, human appropriation of freshwater supply, and the deleterious effects of overconsumption on present and future aspects of the water cycle. Jackson et al. tie all of the information together to paint a picture of the future condition of the water cycle. The report ends with a list of research and management priorities and a statement of need for a combined effort to effectively manage this critical resource for the future.

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

The purpose of the Council is to provide for the exchange of information on the status, protection, and management of riparian systems in Arizona. The term "riparian" is intended to include vegetation, habitats, or ecosystems that are associated with bodies of water (streams or lakes) or are dependent on the existence of perennial or ephemeral surface or subsurface water drainage. Any person or organization interested in the management, protection, or scientific study of riparian systems, or some related phase of riparian conservation is eligible for membership. Annual dues (January-December) are $15. Additional contributions are gratefully accepted.

This newsletter is published three times a year to communicate current events, issues, problems, and progress involving riparian systems, to inform members about Council business, and to provide a forum for you to express your views or news about riparian topics. The next issue will be mailed in January, the deadline for submittal of articles is December 15, 2001. Please call or write with suggestions, publications for review, announcements, articles, and/or illustrations.

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CALENDAR

Restoring Streams, Riparian Areas, and Floodplains of the Southwest, October 29-31, 2001, Albuquerque, NM. Training workshop for technical and semi-technical audience. For full details and to register online go to http://www.aswm.org/meeting/stream01.htm

The 33rd Annual Meeting of the Desert Fishes Council, will be held 15-18 November 2001. The meeting will be hosted by U.S. Fish and Wildlife Service and Sul Ross State University (SRSU) and take place at University Center, SRSU, Alpine, TX. Questions about the meeting may be addressed to Nathan Allan at nathan_allan@fws.gov.

Meeting Resource Management Needs, Fourth Conference on Research and Resource Management in the Southwestern Deserts, May 15-17, 2002, Tucson, AZ. Call for papers deadline January 14, 2002. Contact Bill Halvorson, 520-670-6885 or halvor@srnr.ariona.edu for more information.

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