

Halted EIS is Latest Incident in Ongoing Saga of CAP Negotiations

Settling Central Arizona Project issues has evolved into a long-running and complex saga. In a recent development, the U.S. Bureau of Reclamation halted work on an environmental impact statement (EIS) reviewing proposed modifications of existing CAP water allocations. BuRec had little choice in the matter since Senator Jon Kyl inserted into an appropriations bill an amendment to cut off funding for work on the EIS.

It is generally believed that Senator Kyl's amendment is intended to ensure that Arizona retains control of uncontracted CAP municipal and industrial (M&I) water and non-Indian agricultural water (NIA) in the face of what some officials perceive to be a possible federal threat to acquire the water. Kyl's action needs to be understood in the broader context of CAP affairs.

Recently the state and the federal government settled a longstanding dispute over Arizona's share of the cost of building the CAP project. (See March-April AWR) This was essentially a financial settlement. An assumption underlying this settlement was that

Continued on page 7



What is wrong with this picture taken in Phoenix circa 1943? Consider the well dressed figure in the photo. His attention is focused on something in the tree, while what to our contemporary eyes should occupy him – the sprinklers generously watering the sidewalk – seems to go unnoticed. Today there are laws against such water waste, and some cities are more forcefully enforcing such laws. (See page 4 for a description of Tucson's effort along these lines.) Photo: Arizona State Library, Archives and Public Records, Archives Division, Phoenix, #98-1071.

Pharmaceuticals In Our Water Supplies Are "Drugged Waters" a Water Quality Threat?

Developed to promote human health and well being, certain pharmaceuticals are now attracting attention as a potentially new class of water pollutants. Such drugs as antibiotics, anti-depressants, birth control pills, seizure medication, cancer treatments, pain killers, tranquilizers and cholesterol-lowering compounds have been detected in varied water sources.

Where do they come from? Pharmaceutical industries, hospitals and other medical facilities are obvious sources, but households also contribute a significant share. People often dispose of unused medicines by flushing them down toilets, and human excreta can contain varied incompletely metabolized medicines. These drugs can pass intact through conventional sewage treatment facilities, into waterways, lakes and even aquifers. Further, discarded pharmaceuticals often end up at dumps and landfills, posing a threat to underlying groundwater.

Farm animals also are a source of pharmaceuticals entering the environment, through their ingestion of hormones, antibiotics and veterinary medicines. (About 40 percent of U.S.-produced antibiotics are fed to livestock as growth enhancers.) Manure containing traces of such pharmaceuticals is spread on land and can then wash off into surface water and even percolate into groundwater.

Along with pharmaceuticals, personal care products also are showing up in water. Generally these chemicals are the active ingredients or preservatives in cosmetics,

Continued on page 2



C O N T E N T S

Water Vapors	3
News Briefs	4
AZ Water	
Community News	5
Guest View	6
Legislation and Law	7
Publications	8
Special Projects	9
Announcements	10
Calendar of Events	11

Pharmaceuticals...continued from page 1

toiletries or fragrances. For example, nitro musks, used as a fragrance in many cosmetics, detergents, toiletries and other personal care products, have attracted concern because of their persistence and possible adverse environmental impacts. Some countries have taken action to ban nitro musks. Also, sun screen agents have been detected in lakes and fish.

Researchers Christian G. Daughton and Thomas A. Ternes reported in the December issue of "Environmental Health Perspectives" that the amount of pharmaceuticals and personal care products entering the environment annually is about equal to the amount of pesticides used each year.

Concern about the water quality impacts of these chemicals first gained prominence in Europe, where for over a decade scientists have been checking lakes, streams, and groundwater for pharmaceutical contamination. American officials and scientists are taking note, with two recent U.S. professional organizations – the National Ground Water Association and the American Chemical Society – addressing the issue at their annual meetings this summer.

The issue emerged in Europe about ten years ago, when German environmental scientists found clofibrac acid, a cholesterol-lowering drug, in groundwater beneath a German water treatment plant. They later found clofibrac acid throughout local waters, and a further search found phenazone and fenofibrate, drugs used to regulate concentrations of lipids in the blood, and analgesics such as ibuprofen and diclofenac in groundwater under a sewage plant. Meanwhile other European researchers discovered chemotherapy drugs, antibiotics and hormones in drinking water sources.

In the United States, the issue might have attracted earlier notice if officials had followed up on observations made 20 years ago. At that time, EPA scientists found that sludge from a U.S. sewage-treatment plant contained excreted aspirin, caffeine and nicotine. At the time, no significance was attached to the findings.

In Phoenix about this time another event occurred that also might have alerted officials that pharmaceuticals could pose a water quality threat. Herman Bouwer of the U.S. Agricultural Research

Service in Phoenix recalls that clofibrac acid was found in groundwater below infiltration basins that were artificially recharging groundwater with sewage effluent. Bouwer says more attention should have been paid to the finding; if clofibrac acid could pass through a sewage treatment plant and percolate into the groundwater so also could many other drugs.

Europeans, however, took the lead in researching the issue. In the mid-1990s, Thomas A. Ternes, a chemist in Wiesbaden, Germany, investigated what happens to prescribed medicines after they are excreted. Ternes knew that many such drugs are prescribed, and that little was known of the environmental effects of these compounds after they are excreted. He researched the presence of drugs in sewage, treated water and rivers, and his findings surprised him.

...the amount of pharmaceuticals and personal care products entering the environment annually is about equal to the amount of pesticides used each year.

Expecting to identify a few medicinal compounds he instead found 30 of the 60 common pharmaceuticals that he surveyed. Drugs he identified included lipid-lowering drugs, antibiotics, analgesics, antiseptics, beta-blocker heart drugs, residues of drugs for controlling epilepsy as well as drugs serving as contrast agents for diagnostic X rays.

Results of recent research in North America also indicate reason for concern. At the June National Groundwater Association conference, Glen R. Boyd, a Tulane University civil engineer, reported detecting drugs in the Mississippi River, Lake Ponchartraine and in Tulane's tap water. Boyd and his team found in tested waters low levels of clofibrac acid, the pain killer naproxen and the hormone estrone. Samples of Tulane's tap water showed estrone averaging 45 parts per trillion with a high of 80 parts per trillion.

At the recent American Chemical Society conference, Chris Metcalfe of Trent University in Ontario reported finding a vast array of drugs leaving Canadian sewage treatment plants, at times at higher levels than what is reported in Germany. Such drugs included anticancer agents, psychiatric drugs and anti-inflammatory compounds. North American treatment plants may show higher levels of pharmaceuticals because they often lack the technological sophistication of German facilities.

The U.S.G.S. is currently conducting the first nationwide assessment of "emerging contaminants" found in selected streams, including the occurrence of human and veterinary pharmaceuticals, sex and steroidal hormones and other drugs such as antidepressants and antacids. One hundred stream sites were identified, representing a wide variety of geographical and hydrogeological settings. Four of these sites are in Arizona: Santa Cruz River at Cortaro Road; Santa Cruz River near Rio Rico; Salt River below 91st Ave. sewage treatment plant; and Gila River above diversions at Gillespie Dam.

Mapping of human genome means more drugs, possibly more pollution

Pharmaceuticals are greatly increasing in numbers and kinds, with greater likelihood of releases into the environment. Before the recent announcement of the almost complete categorization of the human genome, Christian G. Daughton and Thomas A. Ternes wrote in an article that appeared in *Environmental Health Perspectives*. "The enormous array of pharmaceuticals will continue to diversify and grow as the human genome is mapped. Today there are about 500 distinct biochemical receptors at which drugs are targeted. ... The number of targets is expected to increase 20-fold (yielding 3,000 to 10,000 drug targets) in the near future." The authors warn, "This explosion in new drugs will severely exacerbate our limited knowledge of drugs in the environment and possibly increase the exposure/effects risks to nontarget organisms."

continued on page 12



Water Vapors

Pat on Our Back

Demonstrating that good work pays off, the Water Resources Research Center's Project WET, (Water Education for Teachers) received \$3,500 from the Central Arizona Project. Project WET director Kerry Schwartz says the money is to be used to purchase Project WET curriculum and provide workshops to Arizona teachers. The nationally recognized curriculum covers grades K-12.

This May be Your Last Issue of *AWR*

We are in the process of updating our mailing list. If you received this newsletter you should also have received by now a postcard, with instructions of what you must do to remain on the WRRC mailing list. Remaining on the mailing list ensures that you continue to receive the newsletters and other WRRC information and announcements.

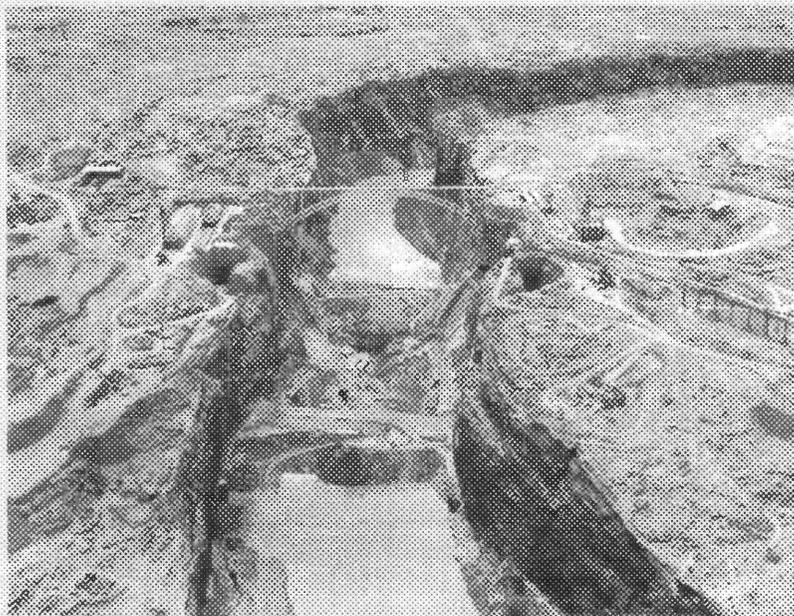
Unless you contact us, via email, fax or returned postcard, to keep your name on the WRRC mailing list, this may be your last copy of the *Arizona Water Resource* newsletter. Please contact us ASAP.

WRRC Involved in San Pedro History Project

Barbara Tellman, WRRC senior research specialist and Diana Hadley, research specialist at the Arizona State Museum, will be working on an environmental history of the San Pedro River, from its origins in Mexico to the town of Benson, Arizona. Funded by the U.S. Bureau of Land Management, the two-year project will produce the first comprehensive binational history of the upper San Pedro River and the human impacts upon it. A short, colorfully illustrated version in Spanish and English also will be available for schools and the general public. For more information, contact Barbara Tellman at 520-792-9591, ext. 17 or bjt@ag.arizona.edu (Barbara Tellman is one of the authors of the WRRC publication, *Arizona's Changing Rivers*, a volume that discusses human effects on Arizona riv-

Marc Reisner Dead at 51

Marc Reisner, author of *Cadillac Desert*, died July 21. His book about the troubled waters of the West is considered an environmental classic. In it he describes the efforts to surmount and defeat the natural limitations of the land, by exploiting available and not so available water resources. In this quest, water becomes a prized commodity, the means to adapt the West to accommodate Cadillac lives of comfort and indulgence.

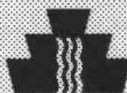


Constructions of Glen Canyon Dam in 1960., Photo: Arizona State Library, Archives and Public Records, Archives Division, Phoenix, #97-6110

"So we want to know, even if it seems an academic matter now, what it all amounts to that we have done out here in the West. How much was sensible? How much was right? Was it folly to allow places like Los Angeles and Phoenix to grow up? Were we insane or farsighted to build all the dams? And even if such questions seem academic, they lead to an emphatically practical one: What are we going to do next?" (from Epilogue, Cadillac Desert)

ers. In recognition of funding for the San Pedro study, *Arizona's Changing History* is

being offered at a reduced price. See "Publications" section for details.)



Arizona Water Resource is published 6 times per year by the University of Arizona's Water Resources Research Center. **AWR** accepts news, announcements and other information from all organizations

Arizona Water Resource Staff

Editor: Joe Gelt
 Editorial Assistant: Joel Spezeski
 Reporters: Val Little
 Barbara Tellman

WRRC Director: Dr. Peter Wierenga

Arizona Water Resource
 Water Resources Research Center
 College of Agriculture
 The University of Arizona
 350 North Campbell Avenue
 Tucson, Arizona 85719

520-792-9592; FAX 520-792-8518
 Email: wrrc@ag.arizona.edu



News Briefs

Utilities Issue Timely Consumer Confidence Reports

Demonstrating a fairly high rate of compliance, 92 percent of the more than 54,000 U.S. community water systems have provided their customers "Consumer Confidence Reports." Mandated by the 1996 Safe Drinking Water Act, this report informs the public about the source of their drinking water, detected contaminants and what, if any, actions were necessary.

EPA reports that 253 million Americans received their first annual report by October 19, 1999, the first established deadline, with reports again due July 1. The 12 percent of drinking water systems that failed to meet the October 19 deadline — and this included about 184 Arizona systems — received EPA reminder letters or notices of violation. By July 1, the non-compliance was reduced to eight percent.

In an effort to ensure that the eight percent noncomplying systems provide the reports to the public, EPA has thus far issued more than 1,500 Administrative Orders to systems in violation of the law.

For more information about the Consumer Confidence Report Rule consult the website: www.epa.gov/ogwdw/ccr1.html

More Lawsuits Along Colorado River

Further contributing to its reputation as the river to spawn the most lawsuits, two additional suits were recently filed regarding the Colorado River.

Eight Mexican and U.S. environmental groups filed suit against five federal agencies for failing to protect endangered wildlife and habitat in the Colorado River Delta region and in the Gulf of California in Mexico. The suit charges that the Endangered Species Act requires the agencies to do more to protect endangered species in the region and restore the ecosystem. The suit aims to have federal agencies consider the effects of dams and other upriver activi-

Tucson Saves Water With Law & Order and Education

Tucson's innovative water conservation strategy relies on stricter laws, increased penalties for violations and education. Education is the key, to first prevent law-breaking but also to enable those who break the law to avoid the increased penalties for their water wasting misdeeds.

First, stricter water conservation laws were put in place. On the books since 1983, the Tucson Water Waste ordinance makes it illegal for water to run off one's property and onto another's property or public right-of-way. This provision was recently modified, and now water improperly used within property boundaries also can be an infraction. For example, to allow water to pond in any street or parking lot to a depth greater than 1/4 inch or over a cumulative surface area greater than 150 feet in any street or parking lot is now prohibited. Also noted as infractions are certain uses of misting systems as well as sprinkler systems spraying sidewalks. Fines and penalties were increased.

With the stricter law and increased penalties the city is offering training and

technical assistance to keep water users on the right side of the law. Tucson Water is providing free irrigation system evaluations and on-site landscape irrigation audits to commercial and multi-family properties.

If, however, the infraction continues a citation will be issued. Even at this point, the lawbreaker is offered a recourse. An offender can attend a diversion program for water conservation in lieu of paying assessed fines, much like ticketed motorists can avoid fines and insurance penalties by attending traffic school. A person attending the diversion program or class will learn about design and maintenance practices for outdoor irrigation systems. The diversion program represents an innovative approach to water conservation.

More efficient record keeping also is being implemented. The number and types of complaints will be recorded as well as kind of actions taken to resolve the problem. Follow up and compliance activities also will be noted.

ties on endangered species in the delta area.

The suit charges the agencies have not considered the impacts of their actions on the delta and have not taken conservation measures to protect endangered species in Mexico. The legal strategy is to connect river management to environmental damage occurring across the border. This could set the stage for a request that the United States allocate a portion of its water to the Mexican wetlands. Some officials fear the suit could affect the future of the Southwest's water supply.

The international coalition is made up of environmental, social and economic interests and includes the Defenders of Wildlife and the Center of Biological Diversity. The U.S. Fish and Wildlife Service, Bureau of Reclamation, National Marine Fisheries Service and the U.S. Departments of Interior and Commerce are the involved federal agencies.

"Today's action is a landmark step in

rectifying the biological, ethical, and legal disaster wrought upon this part of Mexico by the United States," says Rodger Schlickeisen, president of Defenders of Wildlife

In the second lawsuit, the Grand Canyon Private Boaters Association, American Whitewater and the National Parks Conservation Association filed suit in U.S. District Court in Phoenix against Interior Secretary Bruce Babbitt and Grand Canyon Park Superintendent Rob Arnberger. The suit challenges the permitting process for rafting the Colorado River through the Grand Canyon. It seeks a permanent injunction to require the Park Service to resume work on an abandoned wilderness and river management planning process and a reduction or elimination of motorized water craft on the river.

Prompting the lawsuit is the allegation that the Park Service does not ensure fair access to everyone wanting to use the river

through the park. The lawsuit further alleges that the Park Service has failed to protect environmental and wilderness qualities of the river and the back country.

The suit requests that the Court act to ensure that the permit system provides more favorable opportunities for private boaters getting on the river. The way the system has been working since 1980 private boaters have been allocated 32 percent of the permits to raft on the Colorado through the Grand Canyon, with commercial rafting companies getting 68 percent of the permits. (The full text of the complaint can be found at www.gcpba.org)

"This suite is basically about democracy," says Randall Rasmussen, policy analyst for the National Parks Conservation Association. "The Parks Service has short-circuited a process, and our objective is simply to get it back on track so that all parties can continue to participate equally."

Canadian Researchers Work on E.coli Vaccine

In an effort to confront the threat of E.coli in drinking water at its bovine source, the Canadian National Research Council's Institute for Biological Sciences (NRC-IBS) is conducting research to develop a vaccine for cattle against the E.coli 0157 bacterium. Cattle, the primary source of E.coli infections for humans, caused the recent tragedy in Walkerton, Ontario, a town of 5,000 people 90 miles west of Toronto. At least seven people died and thousands sickened from drinking water infected with E. coli bacteria. Humans pick up E. coli from cattle either by drinking water contaminated by cattle feces or eating undercooked meat.

Dr. Malcolm Perry and colleagues of the NRC-IBS' Immunochimistry Program developed the vaccine they hope will eliminate the bacterium at the source. They began researching E.coli 0157 in the early 1980s following disease outbreaks in Canada. They were successful in isolating and chemically identifying a unique component of the E.coli 0157 — an antigenic marker. Applied as the basis of a diagnostic tool to detect E.coli 0157, the antigen could form the basis of a specific vaccine.

The researchers later discovered other,

non-pathogenic bacteria that carried markers identical or chemically similar to the E.coli 0157 antigenic marker. Oral immunization of mice with some of these non-pathogenic bacteria produced antibodies that successfully prevented colonization by E.coli 0157 in the animals. Administered directly to cattle the vaccine is expected to trigger an immune response against E.coli 0157 by producing protective antibodies to prevent the growth of the bacterium in the animal's gut. The vaccine is being tested and evaluated at the Veterinary Infectious Disease Organization in Saskatoon.

Meanwhile a special report of the Environmental Commissioner of Ontario blamed the Walkerton tragedy on inadequate groundwater protection laws and policies, a system the report characterized as a "confused patchwork."

Firm Wants to Mine Along Pinto Creek, Gets EPA Permit

EPA officials issued a stormwater drainage permit to the Carlota Copper project on Pinto Creek, and environmentalists fear this action is likely to lead to the eventual construction of the controversial mine, despite their long-term opposition to it. The project involves 3,050 acres of private and U.S. Forest Service land, with much of the land along the 28 mile long Pinto Creek, described as one of "the last true desert streams in the state." In 1997 and 1998, American Rivers, a national organization, listed Pinto Creek, which drains into Roosevelt Lake, as one of the nation's most endangered streams.

Cambior Inc., a Canadian firm, plans to move the creek several hundred yards via concrete dams and diversions to allow mining of ore beneath the natural stream bed. EPA says moving the stream will prevent the underlying ore from leaching more copper into the stream. EPA also reports that Cambior Inc.'s plans meet Clean Water Act standards. Further, EPA reports that the company agrees to clean up toxic waste from the nearby Gibson mine and not to increase the amount of copper in Pinto Creek. The Gibson mine has been leaching copper into Pinto Creek since it closed about ten years ago.

AZ WaterCommunity NEWS

The University of Arizona's College of Agriculture has changed its name to the College of Agriculture and Life Sciences, also to be known by the acronym CALS. The addition of "Life Sciences" reflects the college's interdisciplinary focus, beyond the conventional understanding of agriculture, to also include areas concerned with natural resources and water-related studies. CALS includes programs in arid lands studies, renewable natural resources, soil, water and environmental sciences and the Water Resources Research Center.

John Thorston resigned as Special Master of Arizona's general stream adjudication effective June 30. Thorston, who was appointed by the Arizona Supreme Court in 1990, will continue as a part-time special master until the end of 2000. A new full-time master is then expected to be appointed.

Also Judge Susan Bolton, presiding judge for the Gila River adjudication since 1994, has been nominated to the U.S. District Court in Phoenix. Pending Senate confirmation, Bolton would likely assume this new judgeship by the end of 2000. The Arizona Supreme Court would then assign a new judge to the Gila River adjudication.

The University of Arizona James E. Rogers College of Law announced that the George Mason Green and Lois C. Green Foundation has endowed a faculty chair in water and natural resources law.

Gila Bend is receiving a \$535,085 federal grant for a new water treatment facility to help the town cope with high levels of fluoride in its water. The U.S. Department of Agriculture is granting \$120,000 to the Palo Verde Mountain Community Water Co-op for a new well and storage tank and about \$1.3 million in a loan and grant to Somerton to replace water lines.



Guest View

Using Reclaimed Water Helps Cities Meet Conservation Goals

Donald E. Agthe, economic consultant, Tucson, AZ and R. Bruce Billings, Department of Economics, University of Arizona, contributed this Guest View

Cities facing groundwater depletion, water shortages, and/or the development of expensive new water sources have the option of meeting some of their water demand with reclaimed water. Most cities produce considerable amounts of treated effluent, some of which is further treated by filtration and disinfection to produce reclaimed water. As water-scarce southwestern cities grow they face an increasing demand for water and an increasing supply of wastewater that could be treated and sold as reclaimed water.

Since only about 20 percent of current urban water use is for drinking and sanitary uses, it is likely that cities facing the need for increased water supplies could easily substitute reclaimed water for much of the potable water currently used. Some reclaimed water is already treated to meet drinking water standards but is not used for drinking water because of negative public perception. Yet, in some Third World countries, reclaimed water treated to drinking water standards is accepted by consumers as drinking water. Furthermore, unplanned wastewater reuse occurs when a community dumps its treated effluent into a waterway used by a downstream community as a potable water source. Communities on the Mississippi River commonly use unplanned reclaimed water as their source of drinking water.

In addition to substituting for potable water, reclaimed water can also be used to recharge aquifers depleted by groundwater mining. Groundwater mining lowers the water table which leads to plant species dying, higher pumping cost by users, and potential subsidence damage to roads, buildings, and utility infrastructure. Recharge of reclaimed water can be accomplished through the use of injection wells and recharge basins or by discharging the water to natural recharge areas. The reclaimed water acts to recharge the aquifer, thus reducing subsidence damage and raising water table levels to protect plants and lower pumping costs. The downside to recharge is that rising water tables may lead to greater flooding of basements and low lying areas built upon after the beginning of aquifer depletion. Furthermore, if the quality of the recharged water is lower than that in the aquifer, recharge will lead to a long term decline in groundwater quality. Of the three recharge methods mentioned, injection wells usually have the highest likelihood of aquifer degradation.

Reclaimed water may be less expensive than potable water from

new sources. While reclaimed water requires extra treatment and the development of a second delivery system, potable surface water supplies must also be treated and distant supply sources require new pumps, the purchase of water rights, storage reservoirs, and major additions to the delivery pipe system. After use, most potable water becomes wastewater which requires treatment to meet U.S. EPA disposal standards, a cost that must be assigned to the original potable water. Thus, reclaimed water may be cheaper or more expensive than groundwater depending upon the circumstances.

After the treatment facility, the major economic concerns for reclaimed water are delivery costs and proper pricing. Since potable water and reclaimed water cannot be mixed, the community must install a dual water system to serve the reclaimed water demand. This restriction generally limits the potential buyers to large users and those users in a specific geographic area to which delivery service is economically feasible.

The price of reclaimed water must be lower than that of potable water to induce purchase of the reclaimed water because of additional internal costs to the user. An internal dual water distribution system must

be installed to keep potable and reclaimed water separate for health, product, and process purposes. Furthermore, employees and final product consumers must be made aware of the potential risks by the use of warning signs, leaflets, and/or educational programs.

In the absence of legislative fiat, the selection or rejection of reclaimed water by customers is based on relative price and costs associated with use. User costs can be reduced by offering grants to pay for installation of the necessary infrastructure. Raising the relative price of potable water to large users, especially turf users, would encourage substitution of reclaimed water.

Most cities sell their reclaimed water at a loss. As sales increase, these losses will be reduced or eliminated by economies of scale in treatment and delivery systems. Currently, most reclaimed water is sold to public schools, golf courses, and parks. Cities should intensify their marketing efforts to industrial, agricultural, and commercial users. In some cases, legislation is needed to alter grandfathered water rights that make pumping of groundwater cheaper than reclaimed water in these markets.

There are clear economic benefits to the use of reclaimed water in the avoidance of groundwater depletion and the development of expensive new surface or groundwater supplies. Subsidy of reclaimed water programs to achieve these benefits may provide sufficient positive externalities to offset subsidy's cost.



Growing southwestern cities with increasing demand for water could treat their expanding supply of wastewater for reuse.



Legislation and Law

CAP Negotiations...continued from page 1

the federal government would acquire more CAP water to help settle Indian water right claims and for other federal purposes. This is a water allocation issue, to be negotiated with the state separately from the financial settlement. Such negotiations are now underway.

Another negotiation currently underway is between various state parties and the Gila River Indian Community (GRIC), to resolve tribal water claims. Certain issues remain to be settled, but the parties to the negotiations have generally agreed to the quantity of water the tribe is to receive and its sources. CAP water will be the largest single source.

The EIS was being done in anticipation of a reallocation of CAP water in accordance with the various settlements — the financial settlement, the overall water settlement and the GRIC settlement. The parties involved in these settlements anticipate a reallocation of CAP water to achieve desired objectives. The federal government decided an EIS was necessary before allocating the water.

The EIS, still in a draft version, describes the environmental effects of proposed modifications to previous CAP water allocation decisions. The EIS describes various options: a proposed settlement alternative — this alternative reflects the current negotiations among the parties in the ongoing water settlements — along with three non-settlement alternatives and a no action alternative.

An important item within the EIS is a consideration of the 65,647 acre-feet of uncontracted M&I water in the CAP canal. The Arizona Department of Water Resources (DWR) has made recommendations for allocating this water to various cities, towns and water companies within the state, although the Secretary of the Interior has yet to approve these recommendations. His approval of DWR's recommendations, however, is part of the repayment settlement worked out between the state and the federal government. The proposed settlement alternative within the EIS reflects this understanding: "A total of 65,647 acre-feet of currently uncontracted M&I priority water would be allocated and contracted to M&I entities consistent with state recommendations."

EIS non-settlement alternatives 2 & 3, however, describe much different scenarios, assigning uncontracted M&I priority water to settle Indian water claims. These alternatives also contain provisions to assign NIA water to federal uses. This also goes against the grain of the repayment settlement between the state and the federal government. As part of the repayment settlement about 100,000 acre-feet of NIA water is to be allocated to benefit state parties. The inclusions of these alternatives, albeit nonsettlement alternatives, is a source of anxiety to various state interests.

Some state interests are concerned that if federal officials take the position that satisfactory progress is not being made in the GRIC negotiations or in the overall water settlement, they will unilaterally claim the M&I priority water and the NIA water for federal purposes, specifically for GRIC and other tribes. They could then refer to the EIS to demonstrate National Environmental Policy Act compliance. It is well known that U.S. Secretary of the

Interior Bruce Babbitt considers the settling of Indian water rights an important priority during his remaining months in office, and some believe he might attempt to unilaterally appropriate CAP water to achieve his goal.

This is the background to Kyl's amendment which states, "No funds provided in this or any other Act may be used to further reallocate Central Arizona Project water or to prepare an Environmental Assessment, Environmental Impact Statement, or Record of Decision providing for a reallocation of Central Arizona Project water until further Act of Congress." This imposes a rather formidable obstacle to any possible federal efforts to reallocate CAP water for its own purposes, to the disadvantage of Arizona's CAP allocation plans.

Court Says Connection Fees are Charges, Not Taxes

A recent South Carolina Supreme Court decision held that connection fees imposed by a water and sewer district on new customers to be charges for services, not taxes. Home and lot owners in a subdivision developed in the 1960s challenged the fees as an illegal tax. (*Ford v. Georgetown County Water & Sewer District*, 2000 WL 718440)

Initially, individual wells and septic tanks could be installed on every third lot within the subdivision, with the condition that the lot owner would connect to a community water and/or sewer system when available. A district was eventually formed and installed a central water and sewer system. Connection and impact fees were imposed

Although having agreed to the original conditions lot owners now challenged the fees, claiming that such fees are general revenue measures unrelated to services provided and are therefore taxes imposed without representative government. The Court disagreed, concluding that a charge imposed for a service does not constitute taxation. It stated, "The District has only required the impact fee of residents who will benefit from the service to pay the fee (the new customers and individuals requesting additional capacity)."

The court relied on two previous decisions. One decision, *J.K. Construction, Inc. v. Western Carolina Regional Sewer Authority*, involved customers of a regional sewer authority who claimed that new account fees imposed on new or upgrading customers to pay for future capital improvement were taxation. The Court disagreed citing five reasons for its decision: (1) The required payment primarily benefits those who pay it, because they receive the benefit of proper treatment and disposal of sewage as result of improvements made with the proceeds; (2) The proceeds are dedicated solely to capital improvements; (3) The proceeds will not exceed the cost of improvements; (4) The fee has been uniformly imposed; (5) The authority intended to classify the payment as a charge.



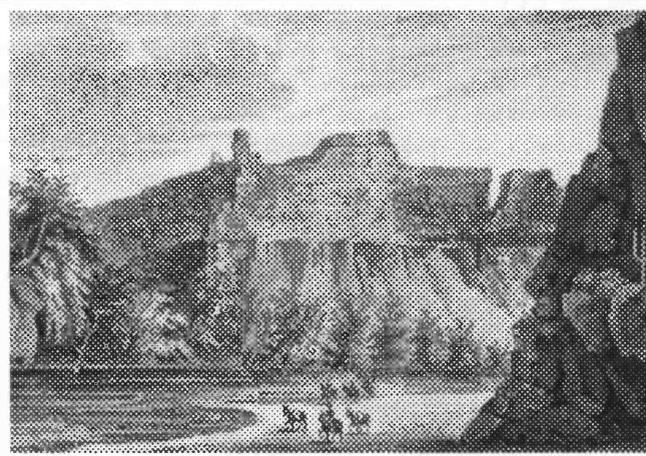
Publications

ADEQ Water Quality Assessment Report

The Arizona Department of Environmental Quality's water quality assessment report 2000 is available. The status of surface water and groundwater is described in the report, including information about monitoring, water quality standards and the assessment process. The report can be downloaded from ADEQ's website: <http://www.adeq.state.az.us/environ/water/assess/hsa.html>. Also a hard copy of the report is available for \$30 by calling 602-207-2202 or 1-800-234-5677, ext. 2202. (Federal, state, tribal or local agency representatives can obtain a free copy by contacting Danese Cameron at 602-207-4569.

WRRC Fall Back-to-School Book Sale

The following Water Resources Research Center's publication is offered at a reduced price, from \$15 or \$17.50 with bibliographic data base on disk, to \$12 and \$14.50 respectively, until Nov. 15. Order from the WRRC, University of Arizona, 350 N. Campbell, Tucson, AZ 85719; 520-792-9591; email, wrrc@ag.arizona.edu. Payment by check or credit card. See WRRC website for instructions on credit card use (www.ag.arizona.edu/AZWATER) Under Publications click "Arizona Changing Rivers."



View on the Gila' from Emory's 1855 survey

Arizona's Changing Rivers:

How People Have Affected the Rivers

Barbara Tellman, Richard Yarde and Mary G. Wallace

Rivers write their own histories in geological records. Yet published river histories also are needed to tell of human influences on rivers. Like geological forces, such influences have profoundly affected Arizona's rivers. *Arizona's Changing Rivers* relates the history of Arizona's major rivers, describing each in the context of the human events and occurrences that took place in the area.

Watershed Information Sheet

The Watershed Information Sheet, published weekly, provides information about issues affecting all watershed groups in the state. Information on meetings, agendas and discussions are included. The online publication describes cooperative efforts between the people of Arizona and local, state and federal programs, as citizens work together to manage their backyards. To sign up for the sheet email Dan Salzler at azwatershed@aol.com. dan salzler

Climate Change Impacts on the United States

Ordered by Congress in 1990, this federal report was four years in the making and is considered the first such comprehensive effort by any country. Relying on computer models and historical data, the report describes drastic climatic changes likely to occur in the United States due to global warming. These include potentially severe droughts, increased risk of flood and substantial shifts in agriculture. Yet, the report concludes "for the nation as a whole, direct economic impacts are likely to be modest," and "American society would likely be able to adapt to most of the impacts," although "particular strategies and costs [are] not known." The report is available for review at <http://www.usgcrp.gov>

The likely effects of warming over the next century in California and the Southwest according to "Climate Change Impacts on the United States:" *Temperatures rise, but rainfall may double, with grasslands and even forest forming in parts of Nevada and Arizona. That could be of enormous importance to the region, where population is rising fast.*

National Water Quality Inventory

Commissioned by Congress, this Environmental Protection Agency report evaluates the progress the United States has made in protecting its waters since the implementation of the Clean Water Act over 30 years ago. Based on a 1998 assessment of the nation's waterways, the report serves as a snapshot of U.S. water quality conditions. Among its findings the inventory reports that about 40 percent of the nation's monitored waterways remain too polluted for fishing and swimming. For further information and a copy of the inventory visit www.epa.gov. or call the EPA's National Service Center for Environmental Publications at 800-490-9128.

ADWR Verde River Watershed Study

The Arizona Department of Water Resources has issued a comprehensive study of the Verde River Basin, available in book form and CD-ROM. The study includes water budgets for five regions, a summary of the natural resources of the 5,000 square mile area and documentation of current and historical surface and groundwater supplies, with a final chapter with conclusions and recommendations about the region's water supplies. The 500-page book (\$35) and the CD-ROM (\$10) can be ordered from the ADWR website, (water.az.gov) or by calling the agency bookstore at 602-417-2485.



Special Projects

NAU Education and Research Program Focuses on Verde Watershed

Northern Arizona University's new Verde Water Research and Education program is concerned with water quantity issues in the Verde watershed. A rapidly growing population in the area is causing an unprecedented increase in water demand, and the new NAU program will assist stakeholders and local communities cope with the situation.

The Salt River Project gave a \$250,000 gift to the newly established NAU Center for Sustainable Environments to support the project for five years. (See sidebar for information on the NAU center.) The project is expected to be self-sustaining after five years of SRP funding. Program strategies include establishing a clearinghouse or repository for Verde watershed information and conducting research on water supply issues of concern to the area.

Varied and extensive information exists pertaining to the Verde watershed, including historical photos and documents, studies and research results. No central location presently exists, however, for storing and accessing this valuable information for understanding past and present conditions of the watershed. To meet this need, the project will establish a data and information storage and exchange facility devoted to the Verde watershed, to be located on the NAU campus. A bibliography published by the Verde Watershed Association is a prime resource for identifying information and materials.

Information within this clearinghouse will include not just books and other printed resources, but also non-traditional materials such as GIS and other types of digital information. Much of the materials, including photos, will be digitized for distribution via the Web. Project plans include establishing the first ongoing database about the Verde watershed. The project also is planning a Verde watershed conference, possibly in the spring 2001, and the creation of a website.

Results from previous research will be included within the resource center, to help establish an information base and to guide future research efforts. The Arizona Department of Water Resources, the U.S. Geological Survey, U.S. Forest Service and the Salt River Project all have conducted research in the Verde watershed, with varying objectives. Results from these previous studies will be available to integrate into new research planned as part of the NAU research and education project.

Integrating new and previously done research is part of the project strategy. For example, project researchers intend to integrate a new study with work from the Beaver Creek study, done during the 1950s into the 1980s. The Beaver Creek project studied forest management to increase water yield through vegetation management. This has since become a discredited concept, and the new research will be concerned with ecological restoration to improve conditions in the ecosystem. As part of this approach, researchers will reevaluate work from the Beaver Creek project to determine its potential to support the health of ecosystem.

Research also will examine reduced stream flow in the area.

Studies are being considered to establish a base flow analysis over time of some gauged streams in the Verde watershed. Since some of the gauging records do not go back very far, researchers may have to rely on indirect techniques, e.g., aerial photo analysis or vegetation analysis, to determine historical flow conditions. Other research topics include studying the relationship of climate to long-term water supplies. Another project likely to be undertaken is a comprehensive study of springs in the Verde watershed. Four to six NAU undergraduate and graduate students will conduct research as part of the project, under faculty supervision.

The project plans an interdisciplinary approach, to include researchers from the school of forestry, college of engineering, college of arts and sciences and possibly the college of social and behavioral sciences. The program itself is not a degree granting program. Students will conduct research through existing degree programs at the university.

Those benefitting from the project and its research will mainly include stakeholders within the watershed. Two organizations that include wide representation of area stakeholders are the Verde Watershed Association and the Yavapai County Water Advisory Committee. Among state watershed organizations, the Verde Watershed Association is considered an achiever, with a demonstrated track record of successful cooperative efforts in watershed affairs. Yavapai County's Water Advisory Committee includes representatives from the communities within the Verde watershed.

Abe Springer, (520-523-7198; abe.springer@nau.edu) associate professor of geology, and Charles Schlinger, (520-523-0652; charles.schlinger@nau.edu) assistant professor of civil engineering, are co-directors of the project.

NAU's Center for Sustainable Environments

Northern Arizona University's newly created Center for Sustainable Environments is to serve as a campus focal point for the study of environmental issues. CSE is a physical and intellectual hub, to focus and coordinate the work of the many NAU programs, scholars and students committed to understanding and resolving environmental issues. In recognition that an understanding of environmental issues requires a multidisciplinary effort, CSE offers an interdisciplinary approach, with scientists, engineers, students, educators, business leaders, government agencies and community members working together to create new and comprehensive ways of addressing environmental issues, through research, education and outreach. CSE will support not only existing academic programs but develop new opportunities for collaborative innovative environmental work across disciplines. Gary Nabhan recently was appointed the first CSE director. Check the CSE website for additional information: <http://environment.nau.edu>



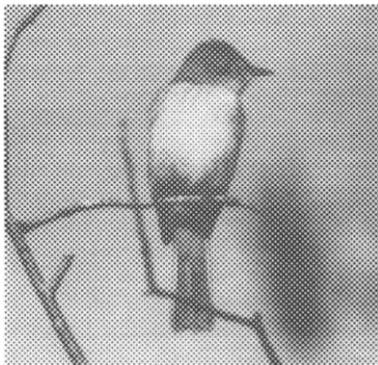
Announcements

Tri-State Seminar on the River

The 16th annual Tri-State Seminar on the River will be conducted September 28 - 30 in Laughlin, Nevada. The tri-state area is Arizona, California and Nevada, and the seminar is billed as a training opportunity for water and wastewater industry professionals. The seminar includes training sessions in wastewater treatment, wastewater collection and industrial and hazardous waste. For more information about the conference contact seminar chairperson Randy Hines, phone: 760-337-1522; fax: 760-337-4563; For registration information contact, Annette Duarte, phone: 520-740-6539; fax 520-620-0135.

Willow Flycatcher Conference

A conference titled, the "Ecology and Conservation of the Willow Flycatcher," will be conducted in Tempe, October 24-26. The conference will focus on research relating to willow flycatcher biology, management, and conservation. In addition to serving as a forum for presentation of recent research, the conference will highlight examples of successful habitat restoration or other conservation, management, or recovery actions, with a field trip scheduled to willow flycatcher breeding habitats at Roosevelt Lake. The conference is sponsored by the U.S. Geological Survey, U.S. Bureau of Reclamation and U.S. Fish and Wildlife Service, and hosted by Arizona State University. Information is available at http://www.usgs.nau.edu/wifl_conf. For additional information contact Mark Sogge, phone: 520-556-7311, ext. 232; email: Mark.Sogge@nau.edu.



Willow Flycatcher. (Photo: George Andrejko, Arizona Game & Fish Department)

AHS Annual Symposium

The Arizona Hydrological Society's 13th annual symposium will be held September 20-23 in Phoenix. Titled "Environment Technologies for the 21st Century," the conference will address such topics as groundwater cleanup, geophysical methods in hydrology, water recharge/reuse methods and strategies, and GIS applications in hydrologic modeling. Field trips also are planned to various sites along the Salt River and to Tempe Town Lake. For additional information about the symposium, as well to register for the event, visit the Arizona Hydrological Society's website: www.azhydrosoc.org

Nominations for Most Endangered Rivers

American Rivers is now accepting nominations for the Most Endangered Rivers Report of 2001, which will be released in April 2001. Nomination forms are available on American Rivers' Web page at www.americanrivers.org/template4.asp?cat=2&page=2&id=2153&filter=0 All nominations must be submitted by October 1, 2000 to be considered.

U.S./Mexico Colorado River Symposium

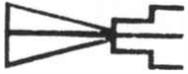
The University of Arizona's Udall Center and the University of California Institute for Mexico and the United States (UC MEXUS), in conjunction with the Ford Foundation and several government agencies and organizations, will host a binational public symposium on September 29 to address questions about management and policy in the Lower Colorado River Delta and the Upper Gulf of California. Questions to be addressed include: What are the major environmental and water-related issues in the region? What is the history of environmental policy regarding these issues between Mexico and the United States? The day-long, public event will be held in Ensenada, Baja California, Mexico. Persons interested in attending the conference should contact Andrea Kaus at UC MEXUS; email: akaus@ucrac1.ucr.edu; phone: 909-787-3586.

Transboundary Groundwater Conference

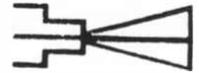
The Association of Ground Water Scientists and Engineers annual conference — "Ground Water: A Transboundary, Strategic and Geopolitical Resource" — will be conducted December 13-14, in Las Vegas, Nevada. This conference will explore the technical, cultural, legal, economic, military, social, and political facets of ground water as a transboundary, strategic, and geopolitical resource, with "transboundary ground water" broadly defined as ground water moving across the boundary between any two or more political jurisdictions. For additional conference information contact Bob Masters, conference coordinator, e-mail: rmaste@ngwa.org; phone: 1-800-551-7379, ext. 527 or 1-614-898-7791, ext. 527 or check the NGWA's website, <http://www.ngwa.org/education/agwse2.html>

Arizona Water Protection Fund Public Comment

Public comment is invited on the 19 proposals submitted for 2000 Arizona Water Protection Fund grants. A copy of each proposal can be reviewed at any Arizona Department of Water Resources office. Those interested in submitting comments should mail them before September 30 to the Arizona Department of Water Resources, Arizona Water Protection Fund, 500 N. Third St., Phoenix, AZ 85004. For more information contact Ruben Teran at 602-417-2400 ext. 7016.



Calendar of Events



RECURRING



Arizona Hydrological Society (Flagstaff). 2nd Tuesday of the month (during the school year). Meeting times and locations may vary, NAU, Southwest Forest and Science Complex, 2500 S. Pine Knoll Dr., Room 136, Flagstaff. Contact: Abe Springer 520-523-7198, email: abe.springer@nau.edu

Arizona Hydrological Society (Phoenix). Usually 2nd Tuesday of the month, locations vary. Contact: Christie O'Day 602-379-3087, ext 224. cmoday@usgs.gov or beth.proffitt@worldnet.att.net

Arizona Hydrological Society (Tucson). Usually 2nd Tuesday of the month. Contact: Mike Block 520-575-8100 or mblock@metrowater.com

Arizona Water Banking Authority (Phoenix). Next quarterly meeting will be held on Sept. 13 at the ADWR in Phoenix. Contact: Nan Flores 602-417-2418.

Arizona Water for People Committee. Phoenix, meets on the 2nd Thursday of even-numbered months at City of Phoenix Squaw Peak Facilities, 6202 N. 24th St., Phoenix at 6 p.m. Contact Dave Christiana 602-417-2400, ext 7339; Tucson, meets the 3rd Thursday of even-numbered months. Time and place varies. Contact Sheila Bowen, 520-625-8409 or sbowen@communitywater.com

Arizona Water Protection Fund Commission. Contact: Irma Lisa Horton 602-417-2400 ext. 7016.

Arizona Water Resources Advisory Board. Phoenix, meets at the ADWR 10am to 12 noon. quarterly meetings aug 4 and nov 3. Contact: Bobbie Wood 602-417-2410. bjwood@adwr.state.az.us

Central Arizona Water Conservation District. Usually 1st and 3rd Thursdays of the month, time to be determined one week in advance. CAP Board Room, 23636 N. 7th St., Phoenix. Contact: Ardis McBee 623-869-2210. amcbee@cap-az.com

City of Tucson Citizens Water Advisory Committee. Usually 1st Tuesday of the month, 7:00-9:00 a.m., 310 W. Alameda, Tucson. Contact: John O'Hara 520-791-5080 ext. 1446.

Maricopa Association of Governments/Water Quality Advisory Committee. Contact: Lindy Bauer 602-254-6300.

Maricopa County Flood Control Advisory Board. Usually 4th Wednesday of the month, 2:00 p.m., 2801 W. Durango, Phoenix. Contact: Kathy Smith 602-506-1501 or kks@mail.maricopa.gov

Phoenix AMA, GUAC. Scheduled monthly, please call. Conference Room A, 500 N. 3rd St. Phoenix. Contact: Mark Frank 602-417-2465.

Pima Assoc. of Governments Environmental Planning Advisory Committee meets first Friday of every month at 9:30am 1:30pm., 177 N. Church St., Suite 405, Tucson. Contact: Claire Zucker 792-1903 czucker@pagnet.org.

Pima Assoc. of Governments Water Quality Subcommittee. Usually 3rd Thursday of the month, 1:30pm., 177 N. Church St., Suite 405, Tucson. Contact: Claire Zucker 792-1903 czucker@pagnet.org.

Pinal AMA, GUAC. Usually 3rd Thursday of the month, 2:00 pm. Pinal AMA Conference Room, 1000 E. Racine, Casa Grande. Contact: Randy Edmond 520-836-4857.

Prescott AMA, GUAC. 2200 E. Hillsdale Rd., Prescott. Contact: Phil Foster 520-778-7202.

Santa Cruz AMA, GUAC. Usually 3rd Wednesday of the month, 9:00 am, Santa Cruz AMA Conference Room, 857 W. Bell Rd, Suite 3, Nogales. Contact: Kay Garrett 520-761-1814.

Tucson AMA, GUAC. Usually 3rd or 4th Friday of the month, 9:00 a.m., Tucson AMA Conference Room, 400 W. Congress, Suite 518, Tucson. Contact: Kathy Jacobs 520-770-3800.

Tucson AMA, Safe Yield Task Force. Every Wednesday. Contact Kathy Jacobs 520-770-3800.

Verde Watershed Association. Contact: John Parsons and Tom Bonomo, VWA Newsletter Editors, Verde Watershed Association, P.O. Box 4595, Camp Verde, AZ, 86322. 520-567-2496. Message phone: 520-649-9978, email: verdewatershed@yahoo.com; website <http://vwa.southwest-water.org>

Water Users Association of Arizona. 2nd Friday of the month at noon (except in September). Call for reservations and exact location. Contact: Paul Gardner, 480-987-3240.

Yavapai County Flood Control District Board of Directors. Contact: Ken Spedding, 520-771-3197.

UPCOMING



Groundwater Education Conference

"Asking the Right Questions," a conference to evaluate the impact of groundwater education, will be held in Nebraska City, Nebraska November 13-15. The premise of the conference is that evaluating the impact of groundwater education and other natural resource programs will result in programming with a positive public impact. Sponsored by the Groundwater Foundation, the conference will help participants to understand the best use of evaluation to effectively build support of environmental education. For more information contact Cindy Kreifels at The Groundwater Foundation, phone: 1-800-858-4844, 402-434-2740; email: cindy@groundwaer.org

Pharmaceuticals...continued from page 2

Stream sites were chosen that were expected to be highly susceptible to contamination by targeted compounds. Testing the sites will provide an initial indication of the potential for these compounds to enter the environment, as well provide an opportunity for developing suitable laboratory methods for measuring compounds in environmental samples at very low (sub-ppb) levels.

Detected contaminants include caffeine, which was the highest-volume pollutant, codeine, cholesterol-lowering agents, anti-depressants, and Premarin, an estrogen replacement drug taken by about 9 million women. Also chemotherapy agents were found downstream from hospitals treating cancer patients. Final results from the study are expected to be released in the fall. For additional information about the U.S.G.S. study check the website: toxics.usgs.gov/regional/emc.html

What risk does chronic exposure to trace concentrations of pharmaceuticals pose to humans or wildlife? Some scientists believe pharmaceuticals do not pose problems to humans since they occur at low concentrations in water. Other scientists say long-term and synergistic effects of pharmaceuticals and similar chemicals on humans are not known and advise caution. They are concerned that many of these drugs have the potential of interfering with hormone production. Chemicals with this effect are called endocrine disrupters and are attracting the attention of water quality experts.

To some scientists the release of antibiotics into waterways is

particularly worrisome. They fear the release may result in disease-causing bacteria to become immune to treatment and that drug-resistant diseases will develop.

Scientists generally agree that aquatic life is most at risk, its life cycle, from birth to death, occurring within potentially drug-contaminated waters. For example, anti-depressants have been blamed for altering sperm levels and spawning patterns in marine life. Most studies of pharmaceutical and pharmaceutically active chemicals in water have mostly focused on aquatic animals.

For example, recent British research suggest that estrogen, the female sex hormone, is primarily responsible for deforming reproductive systems of fish, noting that blood plasma from male trout living below sewage treatment plants had the female egg protein vitellogenin. This finding would seem to be consistent with what U.S. researchers suspect has occurred downstream from treatment plants in Las Vegas and Minneapolis. Carp in these areas show the same effects as the British fish.

Some scientists believe arid regions of the West are especially vulnerable to the effects of drug-contaminated effluent. These areas are more likely to have streams that rely almost entirely on effluent for flow, especially during dry months. Further, effluent is extensively used in irrigation and even for recharging drinking water aquifers. Also, areas of the West have attracted large number of retired people who are likely to use more pharmaceuticals than other population segments; thus more pharmaceuticals in wastewater.



Arizona Water
Resource

Water Resources Research Center
College of Agriculture
The University of Arizona,
350 N. Campbell Ave
Tucson, AZ 85721

Address Service Requested

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